

Whole Number Place Value

The value of a digit depends on its place within the number.

A comma is used to separate the **place value periods** and makes the number easier to read.

H	T	O	H	T	O	H	T	O	H	T	O
Billions			Millions			Thousands			Ones		
4	7	3	6	0	1	0	8	2	5	9	3

place value
place value period
standard form
word form
expanded form
compare numbers
round numbers

Standard form	473,601,082,593
Word form	four hundred seventy-three billion, six hundred one million, eighty-two thousand, five hundred ninety-three
Expanded form	$400,000,000,000 + 70,000,000,000 + 3,000,000,000 + 600,000,000 + 1,000,000 + 80,000 + 2,000 + 500 + 90 + 3$
Expanded form with multiplication	$(4 \times 100,000,000,000) + (7 \times 10,000,000,000) + (3 \times 1,000,000,000) + (6 \times 100,000,000) + (1 \times 1,000,000) + (8 \times 10,000) + (2 \times 1,000) + (5 \times 100) + (9 \times 10) + (3 \times 1)$

Strategies for Comparing and Ordering Numbers

Compare the number of periods.

$$2,126,826 > 216,924$$

Millions Period > Thousands Period

Compare the places in a period.

$$75,541 < 675,809$$

Ten Thousands < Hundred Thousands

Compare the digits in a place.

$$15,893 < 15,938$$

8 Hundreds < 9 Hundreds

Exercises

1. **four hundred twenty-one million, sixty-three thousand, nine hundred eighty-seven; $400,000,000 + 20,000,000 + 1,000,000 + 60,000 + 3,000 + 900 + 80 + 7$**

Write the number in word form and expanded form.

1. 421,063,987

2. 673,911

3. 200,037,402,586

Use the numbers in problems 1–3 to find the answer.

4. Name the greatest place of each number.

5. In which numbers does 3 have a value of 3,000?

421,063,987 and 673,911

6. Write the number with the least value in expanded form with multiplication. **$673,911 = (6 \times 100,000) + (7 \times 10,000) + (3 \times 1,000) + (9 \times 100) + (1 \times 10) + (1 \times 1)$**

Write a comparison sentence using $>$, $<$, or $=$.

10. $14,625,902 > 5,986,597$

11. $125,008 < 125,080$

12. $893 \text{ million} < 2 \text{ billion}$

13. $998,651,083 = 900,000,000 + 90,000,000 + 8,000,000 + 600,000 + 50,000 + 1,000 + 80 + 3$

2. **six hundred seventy-three thousand, nine hundred eleven; $600,000 + 70,000 + 3,000 + 900 + 10 + 1$**

3. **two hundred billion, thirty-seven million, four hundred two thousand, five hundred eighty-six; $200,000,000,000 + 30,000,000 + 7,000,000 + 400,000 + 2,000 + 500 + 80 + 6$**

4. **hundred million; hundred thousand; hundred billion**

Write the number in standard form.

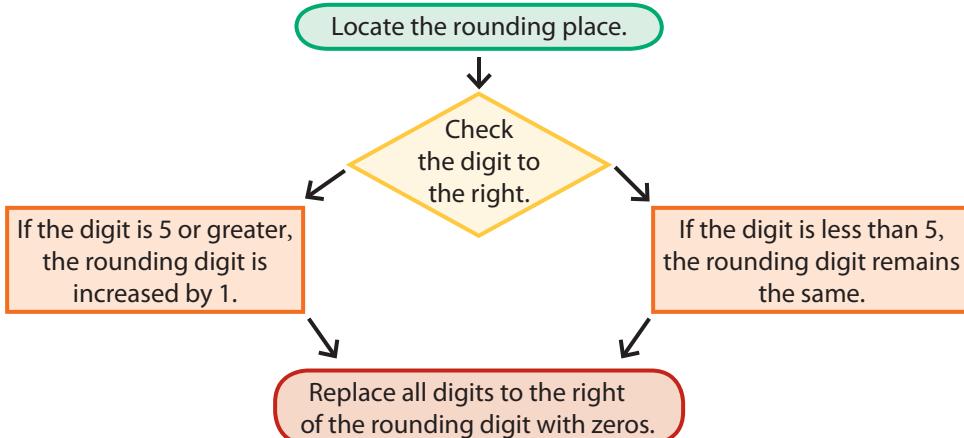
7. 30 billions, 407 millions, 17 thousands, 603 ones

30,407,017,603

8. forty-five million, two hundred twenty thousand, three hundred seven **45,220,307**

9. $300,000,000,000 + 40,000,000,000 + 6,000,000,000 + 50,000,000 + 9,000,000 + 60,000 + 8,000 + 700 + 4$
346,059,068,704

Rounding Whole Numbers



Round to the place of greatest value.

679,152,678

700,000,000

Round to the nearest one million.

679,152,678

679,000,000

Exercises

Write the answer using 568,932,475,018.

14. Round to the nearest ten million.

568,930,000,000

15. The value of each 5 in standard form

500,000,000,000; 5,000

16. Round to the nearest one billion.

569,000,000,000

17. The value of 9 in standard form **900,000,000**

18. Round to the nearest hundred thousand.

568,932,500,000

19. The digit in the Ten Thousands place **7**

20. 568,932,000,000 is rounded to the nearest **one million**.

21. The greatest place **hundred billion**

Write the numbers from *least to greatest*.

22. 26,583 2,658 26,853 23,598
2,658 **23,598** **26,583** **26,853**

23. 703,567 703,765 703,675 703,766
703,567 **703,675** **703,765** **703,766**

Practice & Application

24. Write the number that is 1,000 *more than* 298,370. **299,370**

25. Write the number that is 1,000 *less than* 6,581,257. **6,580,257**

26. Write the standard form for $80,000,000 + 2,000,000 + 600,000 + 90,000 + 3,000 + 10$.
82,693,010

27. Write 37,596,042 in word form.

28. Write the value of 8 in 608,396 in standard form.
8,000

29. Which two *ten thousands* is 81,960 between?
80,000 and 90,000

30. Round 15,058,296 to the nearest one million.
15,000,000

31. Round 351,798,200 to the greatest place.
400,000,000

32. Rearrange the digits in 21,034,065 to make the largest number possible. (Use all digits.)
65,432,100

33. Rearrange the digits in 21,034,065 to make the smallest number possible. (Use all digits.)
10,023,456

34. Write 106,000; 105,421; 105,986; and 105,682 from *least to greatest*.

105,421; 105,682; 105,986; 106,000

Journal Entry: Explain how adding commas to 17398052 helps you read the number.

17,398,052; The commas separate the periods. This makes the number easier to read as hundreds, tens, and ones of each period.

27. **thirty-seven million, five hundred ninety-six thousand, forty-two**

Add Whole Numbers

Addition is used to find the total of two or more numbers or sets. The numbers or sets being added together are the **addends**. The total is the **sum**. Addition begins in the place with least value and continues to the place with greatest value, renaming as necessary.

$$\begin{array}{r} \text{1} \text{1} \\ 3,154 \\ + 861 \\ \hline 4,015 \end{array}$$

$$\begin{array}{r} \text{1} \text{1} \\ 159,043 \\ + 2,345,826 \\ \hline 2,504,869 \end{array}$$

addition
addend
sum
estimate
rounding
front-end estimation

An **estimate** is an approximate answer. An estimate can be used to check the accuracy of a solved problem. Estimates may be written, but the goal is to use mental math to find estimates.

To find an approximate sum, we can use **rounding** or **front-end estimation**. Sometimes a number may be rounded to a place other than the greatest place to give an approximate amount.

Round to the greatest place

Round each number to the place of greatest value.

Estimate
 $4,000$
 $+ 700$
 $\hline 4,700$

$$\begin{array}{r} \text{1} \text{1} \\ 4,178 \\ + 682 \\ \hline 4,860 \end{array}$$

Front-end estimation

Add the digits in the two greatest places for a more accurate estimate.

Estimate
 $15,000$
 $+ 26,000$
 $\hline 41,000$

$$\begin{array}{r} \text{1} \\ 15,678 \\ + 26,311 \\ \hline 41,989 \end{array}$$

Round to a given place

The Jones Hardware Store inventory list accounts for **617,603** nails. Mr. Jones rounds to the nearest one thousand and tells a customer he has about **618,000** nails in his store.



Exercises

Round each addend to the greatest place to estimate the sum.

1. $18,209 + 27,652$ 2. $143,688 + 81,704$ 3. $587,169 + 253,482$ 4. $3,945,100 + 1,069,388$
50,000 **180,000** **900,000** **5,000,000**

Use front-end estimation to estimate the sum.

5. $36,249 + 37,155$ 6. $149,652 + 286,927$ 7. $48,015 + 39,866$ 8. $19,735 + 3,487$
73,000 **420,000** **87,000** **22,000**

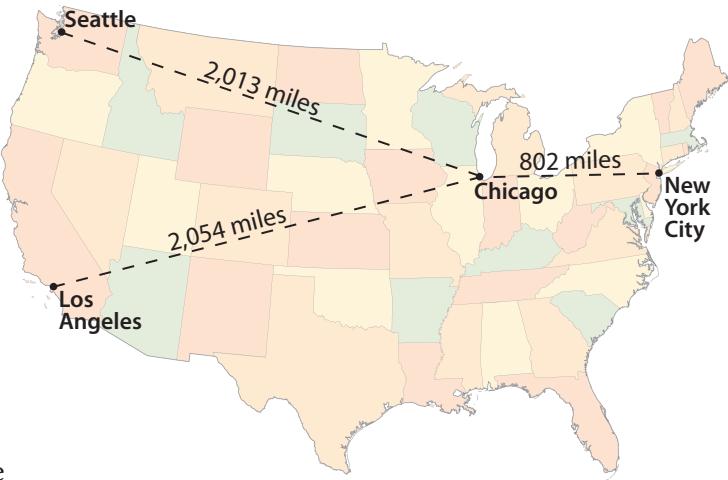
Add.

9. $139,728$
 $403,680$
 $+ 391,499$
934,907
10. $1,397,240$
 $600,817$
 $+ 129,007$
2,127,064
11. $14,659$
 $72,019$
 $+ 53,832$
140,510
12. $900,000,000$
 $17,580,013$
 $+ 395,602$
917,975,615

13. $15,642 + 1,389,420$ 14. $400,607 + 3,589$ 15. $136 + 49 + 210 + 108$
1,405,062 **404,196** **503**

Use the map to find the answer.

16. Mr. Johnson flew from his hometown of Los Angeles on a business trip. He flew to Chicago and then from Chicago to New York City. What was the total distance of his flights?
 $2,054 + 802 = 2,856 \text{ mi}$
17. Mr. Brown was meeting Mr. Johnson in New York City. How far did Mr. Brown fly if he flew from Seattle to Chicago and then from Chicago to New York City? **$2,013 + 802 = 2,815 \text{ mi}$**
18. Estimate the number of miles flown by Mr. Johnson and Mr. Brown.
 $3,000 + 3,000 = 6,000 \text{ mi}$
19. Find the number of miles Mr. Johnson flew while making a round trip (flying to the meeting and then flying home). **$2,856 + 2,856 = 5,712 \text{ mi}$**



Practice & Application

20. Add commas to 20043170.
20,043,170
21. Write the name of the greatest place in the number for problem 20. **Ten Millions place**
22. Write 18,396,470,502 in expanded form.
23. Write *six hundred forty-nine thousand, five hundred seventeen* in standard form. **649,517**
24. Write the value of 9 in 19,325,644 in word form.
nine million
25. Write two facts with a sum of 12 using different addends for each fact. **Answers may vary.**
 $5 + 7 = 12; 8 + 4 = 12$
26. Find the sum of 94, 87, 57, and 19. **257**
27. Find the sum of 903,871 and 89,532. **993,403**
28. Write the number that is 1,000 *more than* 329,990. **330,990**
29. Write a number sentence using the *greater than* symbol to compare the numbers 300,999 and 309,900. **$309,900 > 300,999$**

30. Write 2,291,620; 2,291,206; 2,921,260; and 2,291,026 from *greatest to least*. **2,921,260; 2,291,620; 2,291,206; 2,291,026**
31. Round 1,398,750 to the nearest hundred thousand. **1,400,000**
32. Round 7,521,024,308 to the greatest place.
8,000,000,000
33. Write the next eight numbers for the *count by 6* pattern: 6, 12, 18, 24. **30, 36, 42, 48, 54, 60, 66, 72**
- J** Journal Entry: Estimate the sum of 158,341 and 211,977 by rounding to the greatest place.
 $200,000 + 200,000 = 400,000$
- J** Journal Entry: Estimate the sum of 158,341 and 211,977 by front-end estimation. **$150,000 + 210,000 = 360,000$**
- J** Journal Entry: Explain why using front-end estimation for the addends 158,341 and 211,977 gives a more accurate estimate than rounding to the greatest place. Find the sum.
Rounding to the place of greatest value gives an overestimate of about 30,000. Front-end estimation gives an underestimate of about 10,000.
 $158,341 + 211,977 = 370,318$

22. **$10,000,000,000 + 8,000,000,000 + 300,000,000 + 90,000,000 + 6,000,000 + 400,000 + 70,000 + 500 + 2$**

Subtract Whole Numbers

Subtraction is used to find the difference between two numbers or the amount left when something is taken away. The **minuend** is the number from which another number is subtracted. The number that is subtracted from the minuend is the **subtrahend**. The answer to a subtraction problem is the **difference**. Subtraction begins in the place with least value and continues to the place with greatest value, renaming as necessary.

Addition and subtraction are **inverse operations** (opposite). A solved subtraction problem can be checked by addition.

subtraction
minuend
subtrahend
difference
inverse operation
estimation

$$\text{minuend} - \text{subtrahend} = \text{difference}$$

$$\text{difference} + \text{subtrahend} = \text{minuend}$$

Because addition and subtraction are inverse operations, we can write related equations.

$$\begin{array}{r} 7 + 8 = 15 \\ 15 - 8 = 7 \end{array}$$

$$\begin{array}{r} 8 + 7 = 15 \\ 15 - 7 = 8 \end{array}$$

$$\begin{array}{r} 32 + 68 = 100 \\ 100 - 68 = 32 \end{array}$$

$$\begin{array}{r} 68 + 32 = 100 \\ 100 - 32 = 68 \end{array}$$

Estimation is used in subtraction to find an approximate difference or to check the accuracy of a solved problem. To find an approximate difference, we can use rounding to the greatest place or front-end estimation.

Round to the greatest place

$$\begin{array}{r} \begin{array}{r} 110 \\ 200,000 \\ - 40,000 \\ \hline 160,000 \end{array} & \begin{array}{r} 9 \\ 11013 \quad 815 \\ 203,495 \\ - 39,308 \\ \hline 164,187 \end{array} & \begin{array}{r} 11 \quad 1 \\ 164,187 \\ + 39,308 \\ \hline 203,495 \end{array} \end{array}$$

Solve

Check

Front-end estimation

$$\begin{array}{r} \begin{array}{r} 413 \\ 530,000 \\ - 170,000 \\ \hline 360,000 \end{array} & \begin{array}{r} 4130 \quad 16813 \\ 531,693 \\ - 170,858 \\ \hline 360,835 \end{array} & \begin{array}{r} 1 \quad 1 \quad 1 \\ 360,835 \\ + 170,858 \\ \hline 531,693 \end{array} \end{array}$$

Solve

Check

Exercises

Round each number to the greatest place to estimate the difference.

1. $8,426 - 2,950$
5,000

2. $76,844 - 12,218$
70,000

3. $29,502 - 16,321$
10,000

4. $818,073 - 165,469$
600,000

Use front-end estimation to find a more accurate estimate.

5. $8,426 - 2,950$
5,500

6. $76,844 - 12,218$
64,000

7. $29,502 - 16,321$
13,000

8. $818,073 - 165,469$
650,000

Solve.

9. $243,715 - 125,972$
117,743

12. $63,000 - 1,826$
61,174

Solve. Use addition to check.

15. $190,000 - 87,623$

102,377

19. $50,004 - 26,175$

23,829

10. $900,487 - 191,981$
708,506

13. $600,000 - 231,972$
368,028

16. $5,000 - 3,261$
1,739

20. $17,593 - 8,632$
8,961

11. $625,333 - 178,066$
447,267

14. $701,233 - 496,798$
204,435

17. $13,700 - 6,523$
7,177

21. $86,000 - 9,017$
76,983

18. $163,000 - 58,126$

104,874

22. $405,090 - 231,972$

173,118

Solve. Do the operations in parentheses first.

23. $(13 - 3) + 8$ **18**

24. $27 + (2 + 18)$ **47**

25. $(17 - 7) + 8$ **18**

26. $75 - (41 + 19)$ **15**

27. $50 + (19 + 11)$ **80**

28. $(100 - 40) - 20$ **40**

29. $(39 + 11) - 6$ **44**

30. $(17 + 13) - 20$ **10**

Solve.

31. One afternoon at Oakview Christian Camp, 80 canoeists were on the lake. Fifty-eight of the canoeists were campers and the rest were counselors. How many of the canoeists were counselors? **$80 - 58 = 22$ counselors**

32. Before the first activity of the day, campers have 20 minutes for cabin clean-up, 25 minutes for breakfast, and 30 minutes for cabin devotions. Does it take more or less than an hour to complete their morning routine?

$20 + 25 + 30 = 75$ min; more than an hour

Practice & Application

35. Write equations for the fact family using 3, 9, and 12. **$3 + 9 = 12; 9 + 3 = 12; 12 - 9 = 3; 12 - 3 = 9$. Order may vary.**

36. Find the sum of 67 and 15. Write another addition equation and two subtraction equations using the same numbers. **$67 + 15 = 82; 15 + 67 = 82; 82 - 15 = 67; 82 - 67 = 15$**

37. Write three facts with a sum of 10 using different addends for each fact. **Answers may vary.**

$2 + 8 = 10; 3 + 7 = 10; 4 + 6 = 10$

38. Write the largest four-digit whole number.

9,999

39. Write the number that is 1,000 less than 150,390.

149,390

40. Write the sum of 17,398 and 209,343.

226,741

41. Write the value of 6 in 1,631,700 in standard form and word form. **600,000; six hundred thousand**

42. Which two *hundred thousands* is 108,964 between? **100,000 and 200,000**

43. Estimate the difference of 413,982 and 192,116 by using front-end estimation.

$410,000 - 190,000 = 220,000$

44. Write the next nine numbers for the *count by 7* pattern: 7, 14, 21. **28, 35, 42, 49, 56, 63, 70, 77, 84**

33. The camp has 108 canoe paddles. A recent inventory determined that some of the paddles had to be repaired. If only 88 paddles remained at camp, how many paddles were sent to be repaired? **$108 - 88 = 20$ paddles**

34. Alana and Andrea each wrote a report about the week at camp. Alana's report was 671 words long. Andrea's report was 1,159 words long. How much longer was Andrea's report?

$1,159 - 671 = 488$ words

45. Use the clues to write the number.

- 6 in the Hundred Thousands and Tens places
- 4 in the Millions place
- 9 in the Ten Thousands place
- No other place has a digit with value 4,690,060

Use the part-whole model to answer problems 46–47.

whole		
part	part	

179,357,065	
179,356,000	
n	

46. Evaluate the whole and the part. Name the places with different values. **one thousands, tens, and ones**

47. Write an equation to find the unknown part. Solve. **$179,357,065 - 179,356,000 = n$; $n = 1,065$**

48. Draw a part-whole model to show the solution for problem 34.

- J **Journal Entry:** Explain why rounding the addends 3,884,298; 117,351; and 281,496 to the nearest ten thousand gives an estimate closer to the actual sum than rounding to the greatest place. **More of the digits/places in each number are added.**

48.	1,159
671	488

Complete **DAILY REVIEW C** on page 403.

Decimal Place Value

A **decimal** is a number that contains one or more digits to the right of the Ones place. Those digits are a decimal fraction and have a value less than 1. The decimal fraction is separated from the whole number by a **decimal point**. Using the base ten system, the place value chart can be extended to the right of the Ones place to show decimal fraction values. Each place decreases in value as you move to the right from the whole number and the decimal point.

Hundreds	Tens	Ones	Tenths	Hundredths	One Thousandths	Ten Thousandths
		4	3	5	8	6

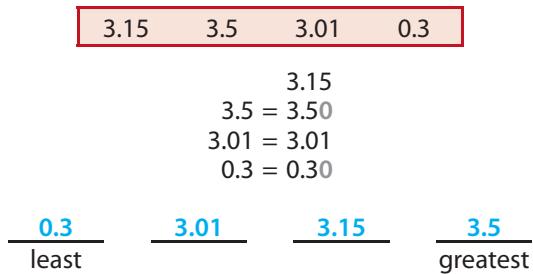
decimal place values

- tenths
- hundredths
- one thousandths
- ten thousandths

decimal point equivalent decimals rounding decimals

Standard form	4.3586
Fraction form	$4 \frac{3,586}{10,000}$
Word form	four and three thousand, five hundred eighty-six ten thousandths
Expanded form	$4 + 0.3 + 0.05 + 0.008 + 0.0006$
Expanded form with multiplication	$(4 \times 1) + (3 \times 0.1) + (5 \times 0.01) + (8 \times 0.001) + (6 \times 0.0001)$

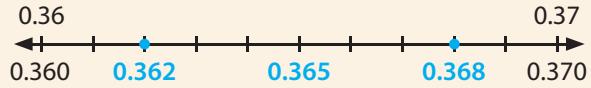
Zeros can be annexed to help you compare decimals when the number of decimal places varies. The zeros make an **equivalent decimal**, but the value of the decimal does *not* change.



Decimals can be **rounded** to different places.

Thinking of the location of a decimal on a number line can help you round the decimal.

0.362 rounds *down* to 0.36 0.368 rounds *up* to 0.37



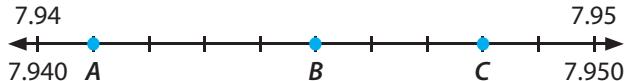
Exercises

Write the value in **standard form**.

1. $7 + 0.3 + 0.06 + 0.008$ **7.368** 2. $4 + 0.1 + 0.002$ **4.102** 3. $3 \frac{902}{10,000}$ **3.0902** 4. $\frac{471}{1,000}$ **0.471**

Use the number line to solve.

11. **0.6 and 0.7 are greater than 0.5, so they will round to 1 whole.**



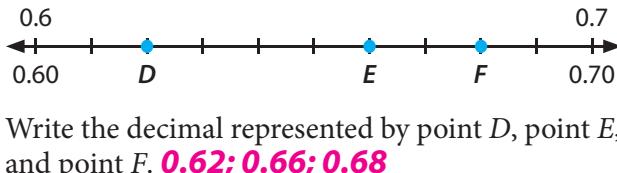
5. Write the decimal represented by point A, point B, and point C. **7.941; 7.945; 7.948**

6. Round point A and point B to the nearest hundredth. **7.94; 7.95**

7. Round 7.94 to the nearest whole number. **8**

8. Use the expanded form to show why $7.943 > 7.94$.

$$7.943 = 7 + 0.9 + 0.04 + 0.003; 7.94 = 7 + 0.9 + 0.04$$



9. Write the decimal represented by point D, point E, and point F. **0.62; 0.66; 0.68**

10. Round point D and point F to the nearest tenth. **0.6; 0.7**

11. Explain why 0.6 and 0.7 round to 1.

12. If this number line were extended, what would the next tenth be? **0.8**

Write the value of 5 in the number.

13. 29.0502 **0.0500** 14. 4.3256 **0.0050** 15. 51.987 **50** 16. 43.506 **0.500** 17. 3.9875 **0.0005**

Write a comparison sentence using $>$, $<$, or $=$.

18. $0.5 < 0.55$ 19. $0.63 > 0.603$ 20. $0.8 < 0.888$ 21. $2.606 < 2.66$ 22. $0.18 < 0.2$ 23. $0.1 > 0.05$ 24. $4.04 <$ four and four tenths
25. $0.009 =$ nine thousandths 26. seven hundredths $>$ eleven thousandths

Write the numbers from *least to greatest*.

27.

0.4079	0.7	0.479	0.4793
0.4079	0.479	0.4793	0.7

28.

5.682	5.421	5.6	4.986
4.986	5.421	5.6	5.682

Solve.

29. $13,942$
 $71,806$
 $+ 42,999$
128,747
30. $1,398,420$
 $625,916$
 $+ 21,387$
2,045,723

31. $16,000$
 $- 4,579$
11,421
32. $802,000$
 $- 29,876$
772,124

Practice & Application

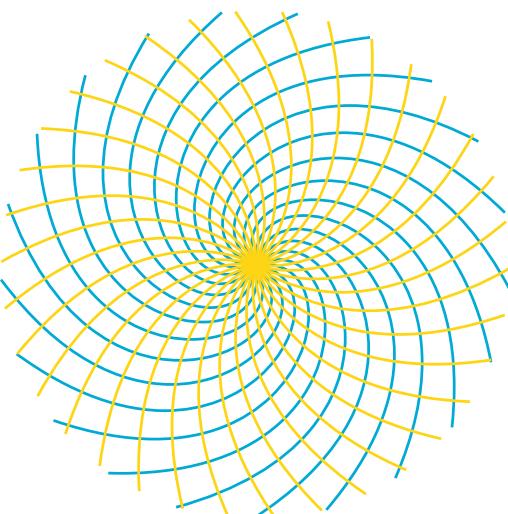
33. Write the next six numbers in the *count by 8* pattern: 8, 16, 24, 32. **40, 48, 56, 64, 72, 80**
34. Use front-end estimation to estimate the sum of 47,607 and 21,049.
47,000 + 21,000 = 68,000
35. Round to the nearest one thousand to estimate the difference of 58,577 and 21,049.
59,000 - 21,000 = 38,000
36. Round 573.073 to the nearest whole number.
573

37. Round 573.073 to the greatest place. **600**
38. Which two *hundred thousands* is 391,360 between? **300,000 and 400,000**
39. Write the number that is 1,000 *less than* 290,384.
289,384
- J Journal Entry: Draw a part-whole model for $7,983 + n = 10,500$. Explain how subtraction can help you solve this problem.

PATTERNS IN MATH

Fibonacci, an Italian mathematician, devised a list of numbers now called *Fibonacci numbers*. The first few numbers in this sequence are 1, 1, 2, 3, 5, 8, 13, 21, and 34. Notice that each number is the sum of the two numbers before it. What are the next four Fibonacci numbers? **55, 89, 144, 233**

The spirals of a sunflower are formed by the individual florets in such a way that there are 21 spirals clockwise and 34 spirals counterclockwise. Notice that 21 and 34 are next to each other in the Fibonacci sequence. A similar arrangement of spirals is found in pinecone scales. As we notice the Fibonacci sequence in nature, we are reminded that there is more to the world than what we can see. There must be a very smart, very powerful Person behind it all—designing everything and holding it all together. The Bible tells us who this Person is. What does Psalm 145 say about who this Person is and what He is like?



Complete **DAILY REVIEW** d on page 403.

Add & Subtract Decimals

Adding and subtracting decimals is similar to adding and subtracting whole numbers.

- Align the numbers according to place value.
- Begin adding or subtracting in the place with least value and continue to the place with greatest value, renaming as needed.

Aligning the decimal points of the numbers will help you accurately align the places. Remember that zeros can be annexed at the end of a decimal as needed when the number of decimal places in the numbers varies.

adding decimals
subtracting decimals
round decimals to estimate
Addition Properties

- Associative
- Commutative
- Identity

$4.3 + 2.9 = \underline{\quad}$

$4.3 - 2.9 = \underline{\quad}$

$$\begin{array}{r} 4.3 \\ + 2.9 \\ \hline 7.2 \end{array}$$

$$\begin{array}{r} 4.3 \\ - 2.9 \\ \hline 1.4 \end{array}$$

$15.3 + 12.75 = \underline{\quad}$

$15.3 - 12.75 = \underline{\quad}$

$$\begin{array}{r} 15.30 \\ + 12.75 \\ \hline 28.05 \end{array}$$

$$\begin{array}{r} 15.30 \\ - 12.75 \\ \hline 2.55 \end{array}$$

Estimate the answer by **rounding** each decimal to the greatest place. If a closer estimate is desired, round each decimal to the nearest whole number or another place within the decimal. Estimate using mental math.

Estimate the sum and difference of **4.3** and **2.9** to the greatest place.

$4 + 3 = 7$

$4 - 3 = 1$

Estimate the sum and difference of **15.3** and **12.75** to the greatest place.

$20 + 10 = 30$

$20 - 10 = 10$

Find a more accurate estimate by rounding to the nearest whole number.

$15 + 13 = 28$

$15 - 13 = 2$

Exercises

Solve.

$$\begin{array}{r} 1. \quad 3.7 \\ + 8.5 \\ \hline 12.2 \end{array}$$

$$\begin{array}{r} 2. \quad 7.06 \\ + 8.9 \\ \hline 15.96 \end{array}$$

$$\begin{array}{r} 3. \quad \$10.01 \\ + \$25.89 \\ \hline \$35.90 \end{array}$$

$$\begin{array}{r} 4. \quad 3.33 \\ - 1.7 \\ \hline 1.63 \end{array}$$

$$\begin{array}{r} 5. \quad \$4.99 \\ + \$3.99 \\ \hline \$8.98 \end{array}$$

$6. \quad 26.1 + 17.89$

$\textcolor{red}{43.99}$

$10. \quad \$34 - \24.97

$\textcolor{red}{\$9.03}$

$7. \quad 6.5 - 2.95$

$\textcolor{red}{3.55}$

$11. \quad 3.01 + 5.9$

$\textcolor{red}{8.91}$

$8. \quad 8.3 - 2.1$

$\textcolor{red}{6.2}$

$12. \quad \$12.05 + \11.99

$\textcolor{red}{\$24.04}$

$9. \quad 39.01 - 18.2$

$\textcolor{red}{20.81}$

$13. \quad 17.01 + 5.988 + 20.002$

$\textcolor{red}{43.000 \text{ or } 43}$

Estimate by rounding to the greatest place.

Find a closer estimate by rounding to the nearest whole number.

$14. \quad 6.05 + 9.6$

$\textcolor{red}{16; 16}$

$15. \quad 127.2 - 30.943$

$\textcolor{red}{70; 96}$

$16. \quad \$15.87 + \21.13

$\textcolor{red}{\$40 \text{ or } \$40.00; \$37 \text{ or } \$37.00}$

$17. \quad 98.4 + 1.2 + 26.99$

$\textcolor{red}{131; 126}$

$18. \quad 43.001 - 29.5$

$\textcolor{red}{10; 13}$

$19. \quad \$601.99 - \173.25

$\textcolor{red}{\$400 \text{ or } \$400.00; \$429 \text{ or } \$429.00}$

Solve.

20. Burger Bonanza sells a hamburger for \$1.99, fries for \$1.49, and a drink for \$0.99. How much would the entire meal cost?

$\textcolor{red}{\$1.99 + \$1.49 + \$0.99 = \$4.47}$

21. How much would you save if the hamburger combo meal cost \$3.99?

$\textcolor{red}{\$4.47 - \$3.99 = \$0.48}$

22. Donovan and Jason went to Burger Bonanza.

Donovan spent \$4.95 and Jason spent \$6.95.

Estimate the total amount spent by both boys.

$\textcolor{red}{\$5 + \$7 = \$12 \text{ or } \$5.00 + \$7.00 = \$12.00}$

23. If Donovan paid for his lunch with a ten-dollar bill, about how much change would he receive?

$\textcolor{red}{\$10.00 - \$5.00 = \$5.00}$

The **Addition Properties** are rules for all addition equations. Applying these rules when adding helps you to solve the problem using mental math or makes the computation quicker.

Commutative Property

The order of addends can be changed without changing the sum.

$$4 + 9 = 9 + 4$$

$$a + b = b + a$$

Thinking of $9 + 4$ allows me to mentally count on the smaller number to find the sum of 13.

Associative Property

The grouping of addends can be changed without changing the sum.

$$(25 + 33) + 17 = 25 + (33 + 17)$$

$$(a + b) + c = a + (b + c)$$

Grouping the 33 and 17 allows me to mentally make 10 in the Ones place.

$$25 + 50 = 75$$

Identity Property

When 0 is added to an addend, the sum is the other addend.

$$37 + 0 = 37$$

$$a + 0 = a$$

Nothing is added to 37.

Exercises

Use the Associative Property to regroup the addends to make the addition quicker. Solve.

24. $(5 + 6) + (4 + 7) + 3$

$5 + (6 + 4) + (7 + 3) = 25$

25. $\$3.20 + (\$4.80 + \$15.65)$

$(\$3.20 + \$4.80) + \$15.65 = \23.65

26. $(16.4 + 12.2) + 10.8$

$16.4 + (12.2 + 10.8) = 39.4$

Use the Commutative Property and the Associative Property to group the addends to make the addition quicker. Solve.

27. $23 + 44 + 57$

$(23 + 57) + 44 = 124$

30. $3 + 2.05 + 7.2$

$(3 + 7.2) + 2.05 = 12.25$

28. $\$5.25 + \$9.11 + \$14.75$

$(\$5.25 + \$14.75) + \$9.11 = \29.11

31. $49 + 38 + 51$

$(49 + 51) + 38 = 138$

29. $17 + 12 + 18 + 13$

$(17 + 13) + (12 + 18) = 60$

32. $12.5 + 4.005 + 1.5$

$(12.5 + 1.5) + 4.005 = 18.005$

Write an equation and solve.

33. four and ninety-eight hundredths added to seventeen hundredths

$0.17 + 4.98 = 5.15$

35. two and four hundredths less than seven and one tenth

$7.1 - 2.04 = 5.06$

34. the difference between 3,670 and 973

$3,670 - 973 = 2,697$

36. one thousand more than 13,500

$13,500 + 1,000 = 14,500$

Practice & Application

37. Write 439.1, 439.09, 439.6, and 439.001 from least to greatest. Find the sum of the numbers.

$439.001, 439.09, 439.1, 439.6; 1,756.791$

38. Write the count by 9 numbers from 9 to 90.

$9, 18, 27, 36, 45, 54, 63, 72, 81, 90$

39. Round 1,389,462 and 732,690 to the nearest ten thousand. **$1,390,000; 730,000$**

40. Estimate the sum of 6.931, 3.4, and 19.702.

$7 + 3 + 20 = 30$

41. Write 28,307,013 in word form and expanded form.

42. Draw a number line. Label the endpoints 7,000 and 8,000. Identify and plot the halfway point.



43. Plot 1,790 on a number line with 1,000 and 2,000 as endpoints.

44. Use the Commutative Property and the Associative Property to solve the equation.

$(37 + 46) + 73 = ?$ **$46 + (37 + 73) = 156$**

45. Solve the equation $65 + 90 + 35 = ?$. Change the order and group the addends to make it easier to solve. **$(65 + 35) + 90 = 190$**



Journal Entry: Define the terms *sum* and *difference* and give an example of each using 17, 38, and 55. Circle the sum and the difference.



Solving Problems

Being a good problem solver is a necessary skill for all aspects of life. Use the **Problem-Solving Plan** as a guide to help you find solutions to math problems. The following observations should be made when solving problems.

- Is there enough information to solve?
- Is information from a previous problem required?
- Does solving the problem require more than one step?
- Is there more than one way to solve?

Problem-Solving Plan
strategy
part-whole model
variable

For more complex problems, it may be helpful to use a **strategy** to solve the problem. Problem-solving strategies include drawing a picture, making a graph or list, solving backwards, guessing and checking, and solving a simpler problem.

A **part-whole model** can help you visualize the part of the problem that is missing. Knowing that addition combines two or more parts to find the whole (total) and subtraction takes the whole and separates it into parts will guide you in the completion of the model. Remembering that subtraction is the inverse of addition will help you solve unknown-part or missing-part problems. Use a **variable** to represent the unknown quantity.

whole	
part	part

The parts are known.
The whole is unknown.

There are 176 reference books and 2,782 novels in the school library. How many books are in the library?

	<i>n</i>
176	2,782

$$176 + 2,782 = \text{unknown whole}$$
$$176 + 2,782 = 2,958 \text{ books}$$

The whole and one part is known.
One part is unknown.

The pet shop sold 1,008 puffer fish last month. They sold a total of 4,398 fish for the month. How many fish other than puffers did they sell?

	4,398
1,008	<i>n</i>

$$1,008 + \text{unknown part} = 4,398$$
$$4,398 - 1,008 = 3,390 \text{ other fish}$$

Exercises

Write an addition equation for the part-whole model. Solve.

1.

	<i>n</i>
3,819	4,231

$$3,819 + 4,231 = 8,050$$

2.

	15,000
500	<i>n</i>

$$500 + \text{n} = 15,000;$$
$$15,000 - 500 = 14,500$$

3.

	120	
10	50	<i>n</i>

$$(10 + 50) + \text{n} = 120;$$
$$120 - 60 = 60$$

Solve for the unknown whole or the unknown part. Draw a part-whole model for the equation.

4. 987 tickets sold on Monday and 349 tickets sold on Tuesday $987 + 349 = 1,336 \text{ tickets}$

5. the cost of a bottle of water for \$1.39 and a bottle of soda for \$1.89 $\$1.39 + \$1.89 = \$3.28$

6. 2,013 tickets of 4,500 tickets have been sold
 $2,013 + \text{n} = 4,500;$
 $4,500 - 2,013 = 2,487 \text{ tickets}$

7. the change from \$20 after purchasing sunglasses for \$13.39 $\$13.39 + \text{n} = \$20;$
 $\$20 - \$13.39 = \$6.61$

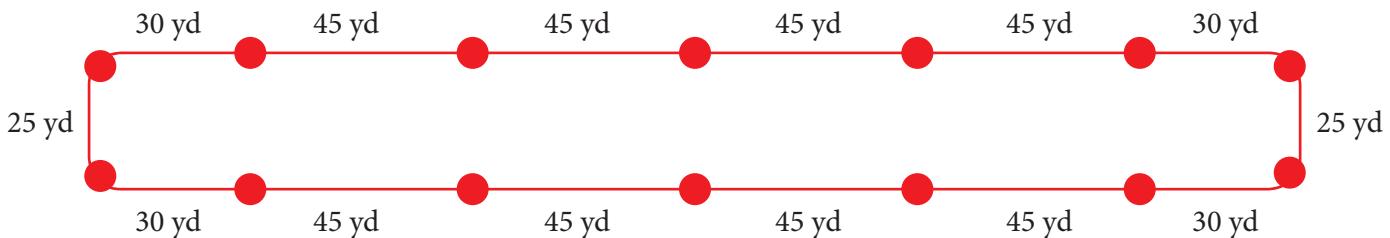
8. the length of the 100-foot towline remaining after 38.5 feet has been removed $100 - 38.5 = 61.5 \text{ ft}$

9. 35 minutes spent looking at boats and equipment; 25 minutes spent watching water skiers
 $35 + 25 = 60 \text{ min}$

Solve.

- 10.** It will take Jay, Nathan, and Uncle Paul 2 hours to get to the water-skiing show. Nathan brought a 40-minute CD and a 75-minute CD. How many minutes short of 2 hours are the CDs? $40 \text{ min} + 75 \text{ min} = 115 \text{ min}$; $120 \text{ min} - 115 \text{ min} = 5 \text{ min}$
- 11.** Tickets for entrance to the water park cost \$16.95 for adults and \$11.95 for students. Jay and Nathan qualify for the student entrance fee. What will the ticket cost be for Uncle Paul, Jay, and Nathan? $\$16.95 + (\$11.95 + \$11.95) = \40.85
- 12.** It costs \$1.25 extra for the shows. What will the total ticket price be if they each attend 2 shows?
- 13.** A three-passenger jet ski displayed at the show costs \$8,500. It has a 16.4-gallon gas tank. The one-passenger jet ski has a 4.5-gallon gas tank. What is the difference in size of the fuel tanks? $16.4 \text{ gal} - 4.5 \text{ gal} = 11.9 \text{ gal}$
- 12.** $(\$1.25 + \$1.25) + (\$1.25 + \$1.25) + (\$1.25 + \$1.25) = \$7.50$; $\$7.50 + \$40.85 = \$48.35$

- 14.** A water-skiing course is set up with buoys in the formation shown below. What is the perimeter of the course? $30 \text{ yd} + 45 \text{ yd} + 45 \text{ yd} + 45 \text{ yd} + 45 \text{ yd} + 30 \text{ yd} + 25 \text{ yd} + 30 \text{ yd} + 45 \text{ yd} + 45 \text{ yd} + 45 \text{ yd} + 45 \text{ yd} + 30 \text{ yd} + 25 \text{ yd} = 530 \text{ yd}$

**Practice & Application**

- 15.** Find the sum of 17,060 and 31,931,501. **31,948,561**
- 16.** Estimate the difference between 27,400 and 11,790 using front-end estimation. **16,000**
- 17.** Round the number to the nearest ten thousand.
1,576,284 84,970 360,483 9,642
1,580,000 **80,000** **360,000** **10,000**
- 18.** Write 39,460; 39,466; 39,409; and 39,406 from greatest to least. **39,466; 39,460; 39,409; 39,406**
- 19.** Write the largest three-digit whole number. **999**
- 20.** Write the smallest three-digit whole number. **100**
- 21.** Round 17,486 to the nearest one thousand to give the approximate number of fliers distributed to announce the grand opening of Steve's Sandwich Shoppe. **17,000**



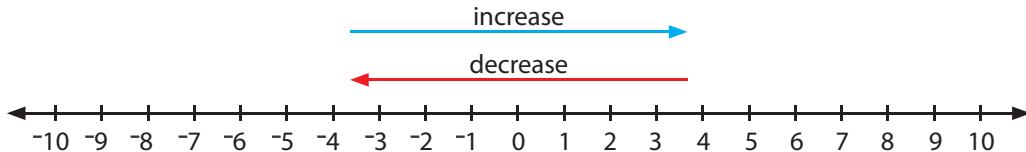
Journal Entry: Explain how knowing that addition and subtraction are inverse operations can help you solve $89 + n = 165$.

**Answers will vary. Knowing that subtraction undoes addition allows me to write these equations to solve:
 $89 + n = 165$; $165 - 89 = 76$.**

Positive & Negative Numbers

You can extend what you know about comparing and adding whole numbers to **positive** and **negative numbers**. This number line shows the first 10 positive numbers and their opposite 10 negative numbers. Zero is neither positive nor negative.

positive numbers
negative numbers



$$6 < 7$$

$$-6 > -7$$

$$0 < 2$$

$$0 > -2$$

$$-5 < 10$$

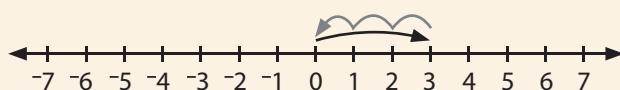
$$5 > -10$$

Numbers **increase** in value as you move to the right on the number line and **decrease** in value as you move to the left. The value of a negative number is always *less than* the value of a positive number.

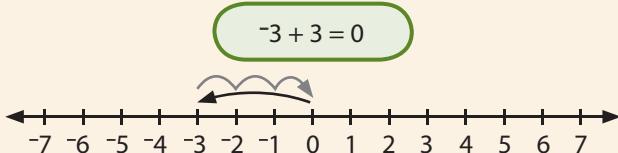
On the number lines below, the first addend is represented by a black arrow from zero. Notice that the sum does *not* change when the Commutative Property of Addition is applied.

When combining **opposites**, the sum is always zero.

$$3 + -3 = 0$$

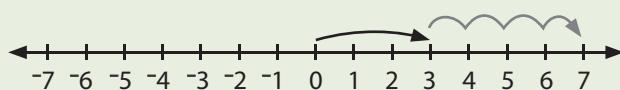


$$-3 + 3 = 0$$

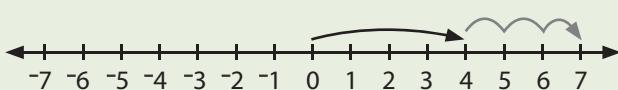


These addition equations combine numbers with **like signs**. The sum will be more positives, or

$$3 + 4 = 7$$

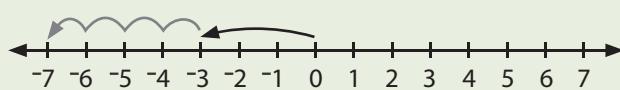


$$4 + 3 = 7$$

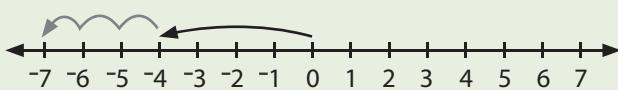


the sum will be more negatives.

$$-3 + -4 = -7$$

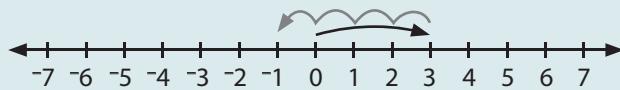


$$-4 + -3 = -7$$

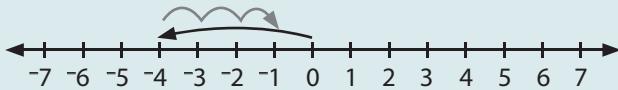


These addition equations combine numbers with **unlike signs**. When there are more negatives than positives, the sum is negative.

$$3 + -4 = -1$$

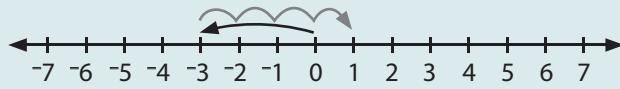


$$-4 + 3 = -1$$

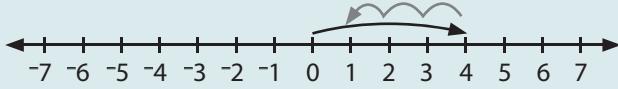


When there are more positives than negatives, the sum is positive.

$$-3 + 4 = 1$$



$$4 + -3 = 1$$



Exercises

Write a comparison sentence using $>$ or $<$.

1. $7 > -7$

2. $4 > -10$

3. $11 > 9$

4. $-51 > -61$

5. $-2 < 1$

6. $0 > -3$

7. $-8 > -10$

8. $-28 < 20$

Draw a number line to show the given number and its opposite.



Add.

13. $-2 + -1 = -3$

16. $0 + -6 = -6$

19. $-8 + -3 = -11$

22. $-9 + 4 = -5$

14. $-6 + 3 = -3$

17. $4 + 6 = 10$

20. $1 + -1 = 0$

23. $10 + -20 = -10$

15. $7 + -3 = 4$

18. $4 + -6 = -2$

21. $-7 + 8 = 1$

24. $-5 + 15 = 10$

Write the numbers from least to greatest.

25.	1,738	1,699	1,783	1,718
	1,699	1,718	1,738	1,783

27.	5.06	5.61	5.16	5.062
	5.06	5.062	5.16	5.61

26.	-11	10	0	-13
	-13	-11	0	10

28.	-8	-12	-5	4
	-12	-8	-5	4

Solve.

Draw a part-whole model for the equation.

29. $n + 235 = 980$

980 - 235 = 745

30. $3,270 - n = 1,785$

3,270 - 1,785 = 1,485

31. $n - 15.96 = 81.7$

15.96 + 81.7 = 97.66

32. $3,009 + n = 4,986$

4,986 - 3,009 = 1,977

33. $15 + 6.75 = n$

15 + 6.75 = 21.75

34. $2.75 - 1.4 = n$

2.75 - 1.4 = 1.35

35. $-3 + -8 = n$

-3 + -8 = -11

36. $4 + -2 = n$

4 + -2 = 2

37. $-1 + 3 = n$

-1 + 3 = 2

Practice & Application

38. Identify the addends and sum in the equation $-6 + 2 = -4$. **addends: -6 and 2; sum: -4**

39. Identify the difference, minuend, and subtrahend in the equation $17.8 - 14.02 = 3.78$. **minuend: 17.8; subtrahend: 14.02; difference: 3.78**

40. Write two addition and two subtraction facts with 6, 5, and 11. **$6 + 5 = 11$; $5 + 6 = 11$;
 $11 - 5 = 6$; $11 - 6 = 5$**

41. Use the Commutative Property to write nine addition facts with a sum of 10.

42. Rewrite the equation using the Associative Property. Solve.

$(17 + 25) + 15 = ?$ **$17 + (25 + 15) = 57$**

$31 + (19 + 27) = ?$ **$(31 + 19) + 27 = 77$**

43. Write the value of 8 in 18,360,930 in standard form and word form. **8,000,000; eight million**

44. How many desserts are on a table if there are 360 cookies, 145 brownies, and 160 fruit cups? **$360 + 145 + 160 = 665$ desserts**

45. Round to the greatest place to estimate the distance traveled by missionaries if they drove 1,450 miles in June and 3,965 miles in July. **$1,000 \text{ mi} + 4,000 \text{ mi} = 5,000 \text{ mi}$**

46. Draw a rectangle to represent an apple orchard. Label the long sides 217.5 feet and the short sides 195.5 feet. Write an addition equation to find the perimeter of the apple orchard. **Equation may vary. $217.5 \text{ ft} + 195.5 \text{ ft} + 217.5 \text{ ft} + 195.5 \text{ ft} = 826 \text{ ft}$**

Roman Numerals

The Roman numeration system was developed in Rome sometime between 500 BC and AD 100. It is an “additive-subtractive” system, which means that the value of the numeral is based on the position of the numeral within the number.

Roman numerals are typically used for clocks, in names, as chapter numbers in books, and to display years or special events (e.g., Super Bowl).



Roman numerals follow a pattern using symbols.

$$I = 1 \quad V = 5 \quad X = 10 \quad L = 50 \quad C = 100 \quad D = 500 \quad M = 1,000$$

- The symbol for 1, 10, or 100 should be used no more than 3 times in a row.

$$VIII = 8 \text{ because } 5 + 1 + 1 + 1 = 8 \quad DCC = 700 \text{ because } 500 + 100 + 100 = 700$$

- When a lesser symbol comes *after* a greater symbol, the lesser symbol is *added* to the greater symbol.

$$LVI = 56 \text{ because } 50 + 5 + 1 = 56 \quad MDCI = 1,601 \text{ because } 1,000 + 500 + 100 + 1 = 1,601$$

- When a lesser symbol (I, X, or C) comes *before* a greater symbol, the lesser symbol is *subtracted* from the greater symbol. (Only one symbol may be written to the left to subtract.)

$$IX = 9 \text{ because } 10 - 1 = 9 \quad CM = 900 \text{ because } 1,000 - 100 = 900$$

Writing a Roman numeral in expanded form can help you determine the number.

Super Bowl XLV was won by the Green Bay Packers in the year MMXI.

$$\text{XLV} = 40 + 5 = 45$$

$$\text{MMXI} = 2,000 + 11 = 2,011$$

Exercises

Write the number in Roman numerals.

1. 16 **XVI**
2. 34 **XXXIV**
3. 97 **XCVII**
4. 116 **CXVI**
5. 548 **DXLVIII**
6. 844 **DCCCXLIV**
7. 1,321 **MCCCXXI**
8. 2,915 **MMC MXV**

Write the Roman numeral in **standard form**.

9. DLV **555**
10. XLIII **43**
11. LXXIX **79**
12. LXXVIII **78**
13. MDCVII **1,607**
14. XXXIX **39**
15. CCCLII **352**
16. CXCIV **194**

Write the answer.

17. Brent wrote 104 as CIII. Was he correct?
No, the answer is CIV.
18. Janelle has read chapters 1–8 of the novel she is reading for a book report. List the Roman numerals for the chapters she has read. **I, II, III, IV, V, VI, VII, VIII**
19. The minute and hour hand point to XII. What time is it? **12:00**
20. Write the page number of this page in Roman numerals. **XVIII**

21. Write the Roman numeral of the Olympic Games that follow the 28th games. **XXIX**
22. George wrote his age 30 as XXL. What did he do wrong? Write his age correctly. **Only 1 smaller unit may come before a larger unit; XXX.**
23. Write 1,437 in Roman numerals.
MCDXXXVII
24. What number cannot be expressed in Roman numerals? **0**

Solve.

25. $75,309 + 6,587$ **81,896**

31. $6.09 + 17.803$ **23.893**

37. $6 + -6$ **0**

26. $100,915 + 3,960,499$ **4,061,414**

32. $21.013 + 34.69$ **55.703**

38. $-1 + 5$ **4**

27. $7,862 + 20,484$ **28,346**

33. $1.14 - 0.36$ **0.78**

39. $0 + -7$ **-7**

28. $5,000 - 398$ **4,602**

34. $11.18 - 4.962$ **6.218**

40. $-3 + -8$ **-11**

29. $176,281 - 29,584$ **146,697**

35. $10 - 4.65$ **5.35**

41. $4 + -6$ **-2**

30. $60,400 - 3,419$ **56,981**

36. $\$7 - \6.50 **\$0.50**

42. $-5 + 8$ **3**

Round to the greatest place to estimate the sum or difference.

43. $5,728 + 2,970$ **9,000**

44. $878.61 + 29.53$ **930**

45. $10.007 - 2.96$ **7**

Estimate the sum or difference using front-end estimation.

46. $23,475 + 71,608$ **94,000**

47. $836,111 + 579,403$ **1,400,000**

48. $628,450 - 247,066$ **380,000**

Practice & Application

49. Draw a clock with Roman numerals for the hours. Set the clock for 10 minutes before 12 o'clock.

50. Write the current year in Roman numerals.

Answer will vary.

51. The Roman Colosseum had about 80 entrances. Four of the entrances were reserved for the emperor and his guests. How many entrances were left for the spectators to use? **$80 - 4 = 76$**

52. The Colosseum was used for about 4 centuries. Write a four-addend equation to show this length of time in years. (1 century = 100 years)

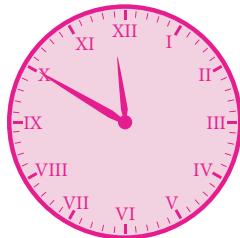
$100 + 100 + 100 + 100 = 400$ years

53. The Roman Colosseum was completed in AD 80. Write the Roman numeral for the completion date. **LXXX**



The Roman Colosseum is a great architectural monument. It seated 50,000 spectators. The Roman numeral for 50,000 is **L**.

49.



Complete **DAILY REVIEW** h on page 405.

Patterns

Often one operation (+, -, ×, ÷) is performed to continue the pattern in a sequence.

$$\begin{array}{ccccccc} 1, & \swarrow & 5, & \swarrow & 9, & \swarrow & 13 \\ & +4 & & +4 & & +4 & \end{array}$$

Apply the $+4$ pattern:
 $1 + 4 = 5$; $5 + 4 = 9$

Add 4.
 $n + 4$
17 21 25

1. Examine each pair of numbers in the sequence to determine a repeating pattern.

2. Apply the repeating operation(s) pattern to the sequence.

3. If the operation(s) works for the sequence, use the repeating pattern to extend the sequence.

Sometimes two operations are performed to continue the pattern sequence.

$$\begin{array}{ccccccc} 3, & \swarrow & 4, & \swarrow & 6, & \swarrow & 10, & \swarrow & 18 \\ & +1 & & +2 & & +4 & & +8 \\ & \times 2 & & \times 2 & & \times 2 & & \times 2 \end{array}$$

Apply the $\times 2$ pattern:
 $3 \times 2 = 6$, 4 is 2 less than 6, so subtract 2; $6 - 2 = 4$

Apply the $\times 2 - 2$ pattern:
 $3 \times 2 = 6$, $6 - 2 = 4$
 $4 \times 2 = 8$, $8 - 2 = 6$

Multiply by 2; then subtract 2.
 $2n - 2$
34 66 130

Exercises

Write the next 3 numbers in the sequence.
Name the pattern or explain your answer.

1.

2	7	12	17
---	---	----	----

22 27 32 add 5
2.

100	95	90	85
-----	----	----	----

80 75 70 subtract 5
3.

1	2	4	8
---	---	---	---

16 32 64 multiply by 2
4.

2	3	5	9	17
---	---	---	---	----

33 65 129 multiply by 2 and subtract 1
5.

$\frac{1}{3}$	$\frac{2}{3}$	$\frac{3}{3}$	$\frac{4}{3}$
---------------	---------------	---------------	---------------

 $\frac{5}{3}$ $\frac{6}{3}$ $\frac{7}{3}$ add $\frac{1}{3}$
6.

2	5	11	23
---	---	----	----

47 95 191 multiply by 2 and add 1

7.

-6	-4	-2	0	2
----	----	----	---	---

4 6 8 add 2
8.

-3	-3	-1	-1	1	1	3
----	----	----	----	---	---	---

3 5 5 add 0; add 2
9.

9,876	987.6	98.76	9.876
-------	-------	-------	-------

0.9876 0.09876 0.009876 divide by 10
10.

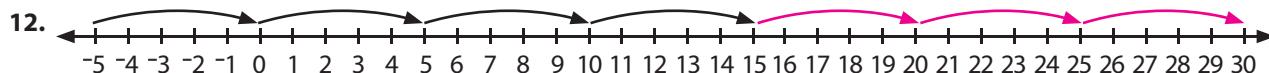
128	64	32	16	8
-----	----	----	----	---

4 2 1 divide by 2
11.

1	1	2	2	3	3	4
---	---	---	---	---	---	---

4 5 5 add 0; add 1

Follow the pattern to show the next 3 jumps on the number line.



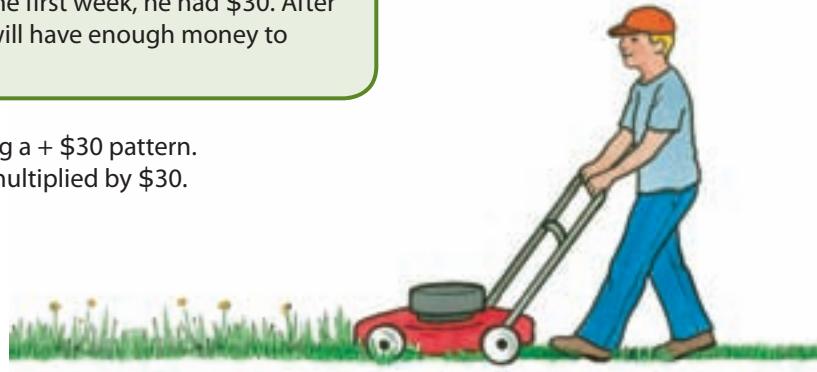
- J Create your own seven-number sequence that follows a pattern. **Answers may vary.**

Alex started a mowing business. After he gave his tithe the first week, he had \$30. After the second week, he had \$60. Alex wants to know if he will have enough money to purchase a push-mower for \$130 after the fourth week.

Alex put his earnings in a chart through week 3 by following a $+ \$30$ pattern. He noticed that his total earnings were the week number multiplied by \$30.

Week	1 $\times \$30$	2 $\times \$30$	3 $\times \$30$	4
Total	\$30	\$60	\$90	?

$+ \$30$ $+ \$30$



Alex calculated his total after 4 weeks by multiplying $4 \times \$30 = \120 . He will not be able to purchase the mower after the fourth week.

Exercises

Use the pattern to complete the table and find the answer.

13. Mr. Diaz milks his cow each day. If the cow's milk production follows the pattern below, how much milk will he have on Day 5 and Day 6? **32.5 and 39 gallons**

Day	1	2	3	4	5	6
Total Gallons	6.5	13	19.5	26	32.5	39

Use the pattern to solve.

14. Liz Anne uses 4 cups of buttercream frosting for one rainbow sheet cake. She uses 8 cups to make 2 cakes. How much frosting will she need for the 8 cakes that were ordered for Saturday? **32 cups**
15. For 7 sweetheart cakes, Liz Anne uses 63 red frosting flowers. For 6 of the cakes, she uses 54 flowers. How many of the red flowers will she need for one cake? **9 red flowers**

Extend the pattern to Steps 5 and 6.

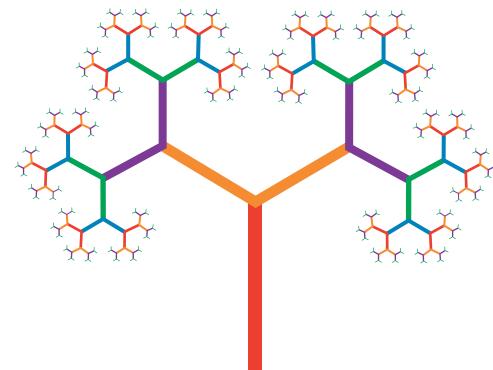
- 16.
- | Step | 1 | 2 | 3 | 4 |
|-------|---|---|---|----|
| | 1 | 4 | 9 | 16 |
| Total | 1 | 4 | 9 | 16 |

17. How many total dots would be in Step 8? **64**

Extend the pattern to Steps 4 and 5.

- 18.
- | Step | 1 | 2 | 3 |
|-------|---|---|---|
| | 2 | 5 | 8 |
| Total | 2 | 5 | 8 |

19. Explain this pattern. **multiply by 2**



A fractal branch

Fractals are geometric patterns often found in nature. The figures are repeated over and over in a smaller scale.

CHAPTER 1 REVIEW

Write the number in **standard form**.

1. 49 billions, 307 millions, 4 thousands, 39 ones
49,307,004,039

2. sixteen million, one hundred forty thousand, ninety-two
16,140,092

3. thirteen and two hundred seven thousandths
13.207

7. **1,000,000 + 70,000 + 3,000 + 200 + 60 + 9**

Write the number in **expanded form**.

7. 1,073,269 8. 4.987

8. **4 + 0.9 + 0.08 + 0.007**

Write a comparison sentence using **>**, **<**, or **=**.

11. $489 > 4.89$

12. $\frac{16}{100} = 0.16$

13. $1,989 < 2,000$

14. $10 \text{ thousand} < 10 \text{ million}$

15. $7 > -7$

16. $21.065 < 21.603$

17. $-3 < 1$

18. $1,000,000 > 947,502$

19. $130,987 >$ one hundred thirteen thousand, nine hundred eighty-seven

20. $149,706,000 < 100,000,000 + 40,000,000 + 9,000,000 + 700,000 + 60,000$

Write the numbers from *least to greatest*.

21.

400,906	400,096	400,960	400,690
---------	---------	---------	---------

400,096 400,690 400,906 400,960

23.

17.038	17.08	17.308	17.083
--------	-------	--------	--------

17.038 17.08 17.083 17.308

22.

8.96	8.906	8.9	8.096
------	-------	-----	-------

8.096 8.9 8.906 8.96

24.

-4	-1	7	-12
----	----	---	-----

-12 -4 -1 7

Draw a number line to complete.

25. Label the endpoints 10 and 20.

Draw a dot to show the approximate location of 15.

26. Label the endpoints 0 and 10.

Draw a dot to show the approximate location of 7.5.

27. Label the endpoints -10 and 0.

Draw a dot to show the approximate location of -4.

28. Label the endpoints 5,000 and 6,000.

Draw a dot to show the approximate location of 5,800.



Round to the greatest place to estimate the sum or difference.

29. $67,380 + 5,274$ **75,000**

30. $22,003 - 13,675$ **10,000**

31. $36.2 - 18.375$ **20**

Estimate the sum or difference using front-end estimation.

32. $34,475 + 6,056 + 92,800$ **132,000**

33. $802,000 - 317,876$ **490,000**

34. $58.496 + 1.054$ **59**

Solve.

35.
$$\begin{array}{r} 243,942 \\ 571,806 \\ + 209,999 \\ \hline 1,025,747 \end{array}$$

36.
$$\begin{array}{r} \$417.49 \\ \$103.98 \\ + \$41.51 \\ \hline \$562.98 \end{array}$$

37.
$$\begin{array}{r} 500,000 \\ - 17,943 \\ \hline 482,057 \end{array}$$

38.
$$\begin{array}{r} 49.039 \\ - 19.467 \\ \hline 29.572 \end{array}$$

39. $\neg 3 + \neg 2$ **5**

40. $1 + \neg 4$ **3**

41. $0 + \neg 6$ **6**

42. $\neg 5 + 7$ **2**

Use an addition property to complete the equation.

43. $478 + 29 = \underline{\quad} + 478$ **29**

44. $315 = \underline{\quad} + 315$ **0**

45. $(81 + 71) + 60 = 81 + (\underline{\quad} + 60)$ **71**

Follow the directions.

46. Write the places in order from *greatest* to *least*.

Hundred Thousand

Million

Hundredth

Hundred Thousand

Million

Tenth

Tenth

Hundredth

47. Do numbers *increase* or *decrease* in value as you move right on a number line? **increase**

48. Solve $1,495 - 738 = \underline{\quad}$. Write an addition equation to check your answer.

757; 757 + 738 = 1,495

49. Write 19, 53, 846, and 1,265 in Roman numerals.

**19 = XIX; 53 = LIII; 846 = DCCCXLVI;
1,265 = MCCLXV**

Solve.

54. Eric spends 10 minutes each night, Monday through Friday, reviewing his math facts. He spends 30 minutes each week reviewing his spelling words. How much review time does Eric spend each week reviewing math and spelling? **Equations may vary. $10 + 10 + 10 + 10 + 10 + 30 = 80$ minutes**

55. Kathleen read 3,922 pages for the summer reading program. She read 746 pages from mystery books, 1,347 pages from historical novels, and the rest came from biographies. How many pages of biographies did Kathleen read? **$746 + 1,347 = 2,093; 3,922 - 2,093 = 1,829$ pages**

50. Write two addition equations and two subtraction equations using 8, 12, and 20. **$8 + 12 = 20; 12 + 8 = 20; 20 - 12 = 8; 20 - 8 = 12$**
51. Round 11,564,298 to the nearest one million and the nearest ten thousand. **12,000,000; 11,560,000**
52. Draw a part-whole model for the equation $n + 6.84 = 19.05$. Solve. **19.05 - 6.84 = 12.21**
53. Write 278,946,384 in expanded form and word form. **200,000,000 + 70,000,000 + 8,000,000 + 900,000 + 40,000 + 6,000 + 300 + 80 + 4; two hundred seventy-eight million, nine hundred forty-six thousand, three hundred eighty-four**



19.05	
n	6.84

Test Prep

Mark the answer.

1.
$$\begin{array}{r} 337 \\ + 954 \\ \hline \end{array}$$

A. 1,283
 B. 1,291
 C. 623

2.
$$\begin{array}{r} 590,006 \\ - 357,324 \\ \hline \end{array}$$

A. 231,692
 B. 131,782
 C. 232,682

3. $164 + n = 831$

A. $n = 667$
 B. $n = 995$
 C. $n = 7$

4. $3.7 + 4.52 = ?$

A. 8.22
 B. 489
 C. 822

5. $57 \times 8 = ?$

A. 406
 B. 456
 C. 449

6. $79 \times 10 = ?$

A. 709
 B. 790
 C. 7,900

7. $8 \times n = 96$

- A. $n = 44$
 B. $n = 15$
 C. $n = 12$

8. $37 \div 6 = ?$

- A. 21 r3
 B. 5 r7
 C. 6 r1

9. Find the perimeter (distance around).

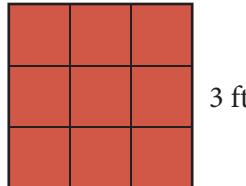


4 in.

6 in.

- A. 20 in.
 B. 24 in.
 C. 10 in.

10. Find the area (number of square units).



3 ft

- A. 6 ft^2
 B. 12 ft^2
 C. 9 ft^2

Mark the equation.

11. 43 students and 18 more students

- A. $43 \times 18 = 774$
B. $43 + 18 = 61$
C. $43 - 18 = 25$

12. 27 packs of gum with 5 sticks in each pack

- A. $27 \div 5 = 5 \text{ r}2$
B. $27 \times 5 = 135$
C. $27 - 5 = 22$

13. 96 cookies distributed into packages of 12 cookies

- A. $96 \div 12 = 8$
B. $96 \times 12 = 1,152$
C. $96 + 12 = 108$

14. 26 band members with 3 members out sick

- A. $26 \div 3 = 8 \text{ r}2$
B. $26 + 3 = 29$
C. $26 - 3 = 23$

15. 7 rows of 6 chairs

- A. $56 \div 8 = 7$
B. $7 - 6 = 1$
C. $7 \times 6 = 42$

Mark the fraction or mixed number.

16. 

A. $\frac{8}{11}$

B. $\frac{2}{3}$

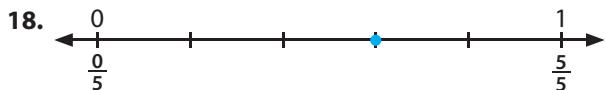
C. $\frac{1}{6}$



A. $\frac{5}{6}$

B. $\frac{3}{9}$

C. $\frac{1}{2}$



A. $\frac{3}{5}$

B. $\frac{4}{7}$

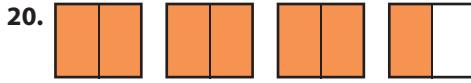
C. $\frac{3}{4}$



A. $\frac{12}{6}$

B. $2\frac{1}{2}$

C. $\frac{5}{3}$

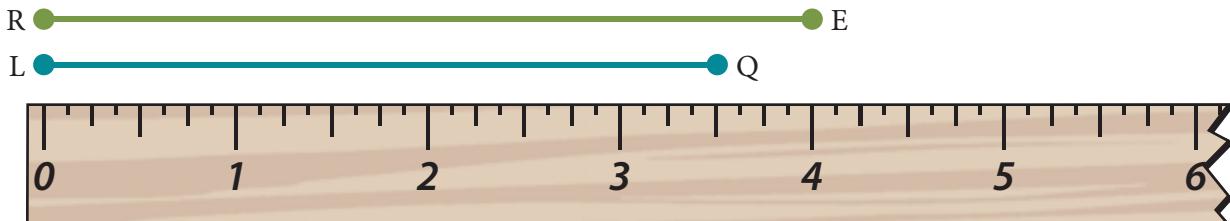


A. $\frac{7}{10}$

B. $3\frac{1}{2}$

C. $4\frac{1}{6}$

Mark the answer.



21. What is the length of \overline{LQ} ?

- A. $3\frac{1}{3}$ in.
- B. $4\frac{1}{2}$ in.
- C. $3\frac{1}{2}$ in.

22. What is the length of \overline{RE} ?

- A. $3\frac{3}{4}$ in.
- B. 4 in.
- C. 5 in.

23. $80,000 + 7,000 + 300 + 20 + 5 = \underline{\quad}$

- A. 87,305
- B. 87,325
- C. 873.5

24. $600 + 30 + 2 + 0.5 = \underline{\quad}$

- A. 632.5
- B. 6,325
- C. 63.25

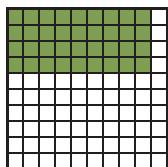
25. $643,872 + 10,000 = \underline{\quad}$

- A. 653,872
- B. 743,872
- C. 643,873

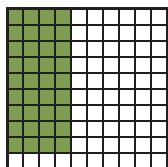
Multiplication

Multiplication is a form of addition. It is used to find the **product** (total) when equal sets are joined. The first **factor** of a multiplication equation tells the number of sets; the second **factor** tells the size of each set. When illustrating or writing an equation for a word problem or phrase, determine the number of sets and how many are in each set.

$$4 \times 9 = 36 \\ (4 \text{ sets of } 9)$$



$$9 \times 4 = 36 \\ (9 \text{ sets of } 4)$$



multiplication
factor × factor = product
multiple
multiplication properties
prime number
composite number
common factor
greatest common factor

A **multiple** is the product of a whole number and any given number.

- The first four nonzero multiples of 3 are **3, 6, 9**, and **12**.
- The first four nonzero multiples of 4 are **4, 8, 12**, and **16**.
- 12** is a multiple of both 3 and 4.

A multiplication equation can be written several ways. In the following problems, 3 and 4 are known factors, a is an unknown factor, and 12 is the product.

$$4 \times 3 = 12 \quad 3 \cdot 4 = 12 \quad 3a = 12 \quad 3(4) = 12$$

Properties of Multiplication

Commutative Property

The order of factors can be changed without changing the product.

$$4 \times 6 = 6 \times 4 \\ 24 = 24 \\ a \cdot b = b \cdot a$$

Identity Property

When 1 is a factor, the product is the same as the other factor.

$$6 \times 1 = 6 \\ a \cdot 1 = a$$

Zero Property

When 0 is a factor, the product is always 0.

$$4 \times 0 = 0 \\ a \cdot 0 = 0$$

Associative Property

The grouping of factors can be changed without changing the product.

$$(6 \times 4) \times 5 = 6 \times (4 \times 5) \\ 24 \times 5 = 6 \times 20 \\ 120 = 120 \\ (a \cdot b) \cdot c = a \cdot (b \cdot c)$$

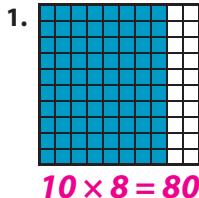
Distributive Property

The product of any 2 factors can be found by separating 1 factor into parts or addends. Multiply each part or addend by the other factor and add the partial products.

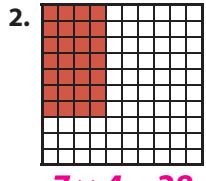
$$6 \times 27 = \\ 6 \times (20 + 7) = \\ (6 \times 20) + (6 \times 7) = \\ 120 + 42 = 162$$

Exercises

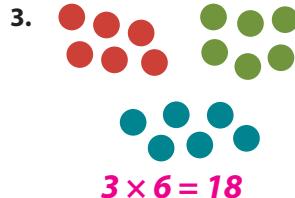
Write a multiplication equation for the picture. Solve.



$$10 \times 8 = 80$$



$$7 \times 4 = 28$$



$$3 \times 6 = 18$$

30				
6	6	6	6	6

$$5 \times 6 = 30$$

Write a multiplication equation for the phrase. Solve.

Draw a picture to illustrate. **Pictures may vary.**

5. 4 bags of 11 rubber bands

$$4 \times 11 = 44 \text{ rubber bands}$$

8. 3 boxes of a dozen doughnuts

$$3 \times 12 = 36 \text{ doughnuts}$$

6. 9 cornstalks in each of 7 rows

$$7 \times 9 = 63 \text{ cornstalks}$$

9. 7 packages of 15 pencils

$$7 \times 15 = 105 \text{ pencils}$$

7. 6 pizzas cut into 8 pieces each

$$6 \times 8 = 48 \text{ pieces}$$

10. 23 students in each of 5 rooms

$$5 \times 23 = 115 \text{ students}$$

Solve.

11. 5×8 **40**

12. 3×7 **21**

13. 10×9 **90**

14. 12×4 **48**

15. 11×6 **66**

16. 7×7 **49**

17. 9×4 **36**

18. 6×1 **6**

19. 8×2 **16**

20. 0×3 **0**

Use the multiplication properties to write the missing number.

21. $15 \times (10 \times 8) = (15 \times \underline{10}) \times 8$

22. $4,937 \times \underline{1} = 4,937$

23. $492 \cdot 374 = 374 \cdot \underline{492}$

24. $12 \times \underline{12} = 12 \times (10 + 2)$

25. $5,431 \times \underline{0} = 0$

26. $4 \times 27 = 4 \times (\underline{20} + 7)$

Use the Associative Property and/or the Commutative Property to solve.

Show your grouping. *Answers may vary.*

27. $2 \times (7 \times 5)$

(2 × 5) × 7 = 70

28. $(2 \times 9) \times 3$

(2 × 3) × 9 = 54

29. $2 \times (2 \times 8)$

(2 × 2) × 8 = 32

30. $(5 \times 4) \times 3$

(4 × 3) × 5 = 60

Use the Distributive Property to solve.

31. 6×12

32. 8×15

33. 4×23

34. 5×17

A **prime number** has exactly two different factors: 1 and itself.

A **composite number** has more than two factors.

List all the pairs of factors whose product is that number.

Compare the factors of two numbers to find **common factors** and the **greatest common factor**.

Remember:

Because 1 is a factor of all numbers, it is not listed as a common factor.

Number	Factor pairs	Factor order	Type of number
29	1×29	1, 29	prime
18	1×18 2×9 3×6	1, 2, 3, 6, 9, 18	composite
42	1×42 2×21 3×14 6×7	1, 2, 3, 6, 7, 14, 21, 42	composite

Common factors of 18 and 42:

2, 3, and 6

Greatest common factor (GCF): **6**

Exercises

Write the factor pairs for the numbers that are composite.

Write **prime** if there are no other factors.

35. 9

1×9

3×3

36. 12

1×12

$2 \times 6; 3 \times 4$

37. 11

1×11

prime

38. 36

1×36

$2 \times 18; 3 \times 12; 4 \times 9; 6 \times 6$

39. 24

1×24

$2 \times 12; 3 \times 8; 4 \times 6$

Practice & Application

40. What are the common factors of 12 and 24?

12 and 36? **2, 3, 4, 6, 12; 2, 3, 4, 6, 12**

41. What is the greatest common factor of 9 and 12?

24 and 36? **3; 12**

42. List the first twelve nonzero multiples of 3, 6, and 9.

43. Circle the common multiples of 3 and 9 in green.

44. Circle the common multiples of 3 and 6 in red.

45. Will the next multiple of 3 be a common factor of 6 or 9? Explain your answer.

46. The first four prime numbers are 2, 3, 5, and 7. There are four more prime numbers less than 20. What are they? **11, 13, 17, 19**



Explain the relationship between the numbers 3 and 6. Use the terms *multiple* and *factor*.

The numbers 3 and 6 are related because 6 is a multiple of 3 and 3 is a factor of 6.

Complete **DAILY REVIEW** on page 406.

Multiples of 10

Knowing **multiples of 10** helps you apply multiplication properties and use **mental math** to solve multiplication problems.

$$10 \times 10 = 100$$

$$100 \times 100 = 10,000$$

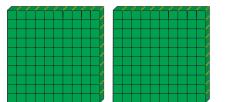
$$10 \times 100 = 1,000$$

$$100 \times 1,000 = 100,000$$

$$10 \times 1,000 = 10,000$$

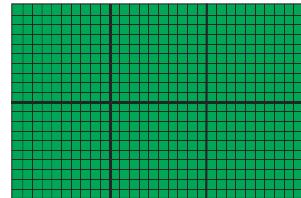
**multiples of 10
mental math**

The Associative Property and the Commutative Property allow numbers to be rearranged to find a product.



$$\begin{aligned}3 \times 200 &= \\3 \times (2 \times 100) &= \\(3 \times 2) \times 100 &= \\6 \times 100 &= 600\end{aligned}$$

Fact: $3 \times 2 = 6$



$$\begin{aligned}20 \times 30 &= \\(2 \times 10) \times (3 \times 10) &= \\(2 \times 3) \times (10 \times 10) &= \\6 \times 100 &= 600\end{aligned}$$

Fact: $2 \times 3 = 6$

When multiplying a factor times a multiple of 10, 100, or 1,000:

1. Multiply the basic fact.
2. Write the same number of zeros in the product as the number of zeros in the multiple of 10, 100, or 1,000.

When both factors are multiples of 10, 100, or 1,000:

1. Multiply the basic fact.
2. Write the number of zeros that are in both factors combined.

Exercises

Use the Associative Property and the Commutative Property to complete the equation.

Show your grouping.

1. $3 \times 20 =$
 $3 \times (2 \times 10) =$

2. $4 \times 50 =$
 $4 \times (5 \times 10) =$

3. $70 \times 90 =$
 $(7 \times 10) \times (9 \times 10) =$

4. $30 \times 800 =$
 $(3 \times 10) \times (8 \times 100) =$

Use mental math to solve. Write only the answer.

5. 4×20 **80**

8. 30×60 **1,800**

11. 70×8 **560**

14. 600×10 **6,000**

6. 40×20 **800**

9. 30×600 **18,000**

12. 50×700 **35,000**

15. 40×500 **20,000**

7. $40 \times 2,000$ **80,000**

10. 300×600 **180,000**

13. 40×90 **3,600**

16. 80×800 **64,000**

Choose an expression for the phrase. Solve and write the label.

20 × 40

2 × 400

200 × 4

40 × 20

4 × 20

17. the total weight of four pumpkins weighing twenty pounds each **$4 \times 20 = 80$ pounds**

18. four pumpkins given to each of the two hundred workers **$200 \times 4 = 800$ pumpkins**

19. the pumpkin patch visited by forty groups of twenty students **$40 \times 20 = 800$ students**

20. twenty containers with forty pumpkins in each **$20 \times 40 = 800$ pumpkins**

21. two days of four hundred visitors at the pumpkin patch **$2 \times 400 = 800$ visitors**

The Distributive Property can be used to find the product mentally when one factor is a multiple of 10.

$$\begin{aligned}20 \times 17 &= \\20 \times (10 + 7) &= \\(20 \times 10) + (20 \times 7) &= \\200 + 140 &= 340\end{aligned}$$

$$\begin{aligned}42 \times 500 &= \\(40 + 2) \times 500 &= \\(40 \times 500) + (2 \times 500) &= \\20,000 + 1,000 &= 21,000\end{aligned}$$

$$\begin{aligned}20 \times 325 &= \\20 \times (300 + 20 + 5) &= \\(20 \times 300) + (20 \times 20) + (20 \times 5) &= \\6,000 + 400 + 100 &= 6,500\end{aligned}$$

Exercises

Use the Distributive Property to solve. Write all of the steps.

22. 40×68

23. 200×13

24. 75×300

25. 20×415

26. 21×50

27. 80×110

28. 40×92

29. 16×30

Practice & Application

30. Write the next three numbers in the pattern:

3,460; 3,471; 3,482; 3,493. **3,504; 3,515; 3,526**

31. Write a multiplication equation for the addition equation. Solve.

$$45 + 45 + 45 \quad \mathbf{3 \times 45 = 135}$$

32. Solve. Use the Commutative Property to write the equation another way.

$$30 \times 4 \quad \mathbf{120} \quad 12 \times 20 \quad \mathbf{240} \quad 400 \times 60 \quad \mathbf{24,000}$$

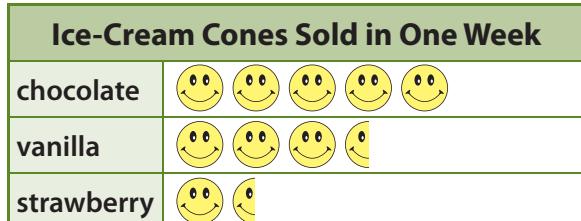
33. What addition equation could be written for 6×45 ?

$$\mathbf{45 + 45 + 45 + 45 + 45 + 45}$$

34. Write the factor pairs for the products 15, 18, and 27.

$$\mathbf{15: 1 \times 15; 3 \times 5} \quad \mathbf{18: 1 \times 18; 2 \times 9; 3 \times 6} \quad \mathbf{27: 1 \times 27; 3 \times 9}$$

Use the data from the pictograph to find the answer.



Key = 10 cones

41. How many cones of each flavor were sold this week?

chocolate: 50, vanilla: 35, strawberry: 15

42. How many more chocolate cones were sold than strawberry cones? **35 more chocolate**

43. If this graph remains the same for 4 weeks, how many cones of each flavor will be sold?

chocolate: $4 \times 50 = 200$

vanilla: $4 \times 35 = 140$

strawberry: $4 \times 15 = 60$

J Explain the difference between least common multiple (LCM) and greatest common factor (GCF) using 10 and 15.

The least common multiple is found by listing multiples of each number until a common multiple is found. The greatest common factor is found by listing all of the factors of each number and choosing the greatest one.

LCM: 1, 2, 5, 10

LCM of 10 and 15 is 30.

GCF: 1, 3, 5, 15

GCF of 10 and 15 is 5.

Complete **DAILY REVIEW** b on page 407.

Exponents

Multiplication is a short way to write a repeated addition equation. When a factor is repeated in a multiplication equation, it can be written in exponent form.

$$7 + 7 + 7 + 7 + 7 + 7 + 7 = 7 \times 7 \quad 7 \times 7 = 7^2$$

The **base** tells what number is repeated as a factor.

The **exponent** tells the number of times the base is repeated as a factor.

base
exponent
powers of 10
squared number

Standard Form	Factored Form	Exponent Form
1,000,000	$10 \times 10 \times 10 \times 10 \times 10 \times 10$	10^6
100,000	$10 \times 10 \times 10 \times 10 \times 10$	10^5
10,000	$10 \times 10 \times 10 \times 10$	10^4
1,000	$10 \times 10 \times 10$	10^3
100	10×10	10^2
10	10	10^1
1	1	10^0
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10^1}$
$\frac{1}{100}$	$\frac{1}{10 \times 10}$	$\frac{1}{10^2}$

When 10 is the base, the exponent is the same as the number of zeros in the standard form.

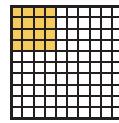
Exponents can be used to express the **powers of 10** in the expanded form of a number.

$$546.32 = (5 \times 100) + (4 \times 10) + (6 \times 1) + (3 \times \frac{1}{10}) + (2 \times \frac{1}{100}) = \\ (5 \times 10^2) + (4 \times 10^1) + (6 \times 10^0) + (3 \times \frac{1}{10^1}) + (2 \times \frac{1}{10^2})$$

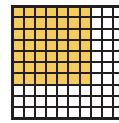
Numbers written in exponent form can be factored to find the standard form.

Exponent Form	Word Form	Factored Form	Standard Form
2^5	two to the fifth power	$2 \times 2 \times 2 \times 2 \times 2$	32
3^7	three to the seventh power	$3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$	2,187
9^4	nine to the fourth power	$9 \times 9 \times 9 \times 9$	6,561
4^2	four to the second power, or four squared	4×4	16

When a number has an exponent of 2, it is called a **squared number**. An array created for a squared number always forms a square.



$$4^2 = 4 \times 4$$



$$7^2 = 7 \times 7$$

Exercises

Write the expression in **exponent form**.

1. $5 \times 5 \times 5$ **5^3**

4. 4×4 **4^2**

7. $6 \times 6 \times 6$ **6^3**

2. $9 \times 9 \times 9 \times 9 \times 9$ **9^5**

5. $8 \times 8 \times 8 \times 8$ **8^4**

8. $2 \times 2 \times 2 \times 2 \times 2 \times 2$ **2^6**

3. $3 \times 3 \times 3 \times 3$ **3^4**

6. $1 \times 1 \times 1$ **1^3**

9. 7 **7^1**

Write the number in **factored form**.

Use a calculator to solve and write in **standard form**.

10. 4^5 **1,024**

11. 8^0 **1**

12. 2^4 **16**

13. 7^4 **2,401**

14. 3^2 **9**

15. 9^3 **729**

16. 5^6 **15,625**

17. 1^{10} **1**

18. 6^6 **46,656**

19. 8^5 **32,768**

Write the number in **expanded form** with multiplication using exponents.

20. 3,862

21. 496

22. 27,296

20. $(3 \times 10^3) + (8 \times 10^2) + (6 \times 10^1) + (2 \times 10^0)$

23. 7.84

24. 12.18

25. 3.76

21. $(4 \times 10^2) + (9 \times 10^1) + (6 \times 10^0)$

22. $(2 \times 10^4) + (7 \times 10^3) + (2 \times 10^2) + (9 \times 10^1) + (6 \times 10^0)$

Write the number in **standard form**.

26. $(6 \times 10^3) + (7 \times 10^2) + (8 \times 10^1)$ **6,780**

23. $(7 \times 10^0) + (8 \times \frac{1}{10^1}) + (4 \times \frac{1}{10^2})$

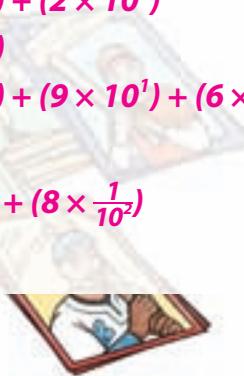
27. $(5 \times 10^0) + (6 \times \frac{1}{10^1}) + (2 \times \frac{1}{10^2})$ **5.62**

24. $(1 \times 10^1) + (2 \times 10^0) + (1 \times \frac{1}{10^1}) + (8 \times \frac{1}{10^2})$

28. $(8 \times 10^5) + (6 \times 10^4) + (2 \times 10^3) + (1 \times 10^2) + (7 \times 10^0)$ **862,107**

25. $(3 \times 10^0) + (7 \times \frac{1}{10^1}) + (6 \times \frac{1}{10^2})$

29. $(4 \times 10^6) + (3 \times 10^5) + (1 \times 10^3) + (9 \times 10^2)$ **4,301,900**



Complete the table.

Write the **factored form** and the **standard form** of the squared numbers.

30.

	1^2	2^2	3^2	4^2	5^2	6^2	7^2	8^2	9^2	10^2	11^2	12^2
Factored form	1×1	2×2	3×3	4×4	5×5	6×6	7×7	8×8	9×9			
Standard form	1	4	9	16	25	36	49	64	81	100	121	144

10 × 10

12 × 12

11 × 11

Solve.

31. Maria read 30 pages of her book each day on Monday and Tuesday. She read 50 pages each day on Thursday and Saturday. How many pages did she read?

$$(2 \times 30) + (2 \times 50) = 60 + 100 = 160 \text{ pages}$$

32. Mark wrote the number of baseball cards he has as $10^2 - 14$. How many cards does he have?

$$10^2 - 14 = (10 \times 10) - 14 = 100 - 14 = 86 \text{ cards}$$

33. Martin bought 3 chocolate candies and 2 lollipops for each of his 4 younger sisters. How many pieces of candy did he buy?

$$4 \times (3 + 2) = 4 \times 5 = 20 \text{ pieces of candy}$$

34. Monica participated in a walk-a-thon to raise money for her school. She received pledges of \$20 from 10 sponsors. How much money did she raise? $10 \times \$20 = \200

Practice & Application

35. Write an equation using multiplication for $21 + 25 + 21 + 25 = 92$. $(2 \times 21) + (2 \times 25) = 92$ or $2 \times (21 + 25) = 92$

36. What is the product of 40 and 600? **24,000**

37. Use the Distributive Property to solve 38×50 .

38. Write the products from *least to greatest*.

8^2	2×8	2^3	7×1
7	8	16	64

37. $(30 + 8) \times 50 =$
 $(30 \times 50) + (8 \times 50) =$
 $1,500 + 400 = 1,900$

39. Round to the greatest place to estimate the answer.

$$78,950 - 8,817 \quad 6,432 + 21,790 \quad 0.417 + 0.308$$

71,000 **26,000** **0.7**

40. Write the expanded form and word form for 269.097.



The presidential election takes place every 4 years. In 2008 the 44th president was elected. Use the term *multiple* to explain why 2018 is not an election year. **2018 is not a multiple of 4.**

40. $269.097 = 200 + 60 + 9 + 0.09 + 0.007$;
two hundred sixty-nine and ninety-seven thousandths

Complete **DAILY REVIEW C** on page 407.

1- & 2-Digit Multipliers

When multiplying by a one-digit factor, multiply each place in the **multiplicand** by the **multiplier**.

An estimated product can be found by **rounding** the multiplicand to the greatest place. Multiply the rounded number by the one-digit multiplier. To find a more accurate estimate, use **front-end estimation** and multiply the two greatest places by the one-digit multiplier.

multiplicand
multiplier
estimate by rounding
front-end estimation
Distributive Property
partial products

James knows that there are 5,280 feet in one mile. He wants to find out how many feet long the Fort Peck Dam in Montana is. The dam is about 4 miles long.

$$4 \times 5,280 = \underline{\hspace{2cm}} \text{feet}$$

Round to the greatest place
 $4 \times 5,000 = 20,000$

Front-end estimation
 $4 \times 5,200 = 20,800$



The short form of multiplication combines the steps of the **Distributive Property**.

Distributive Property	Short Form
$\begin{aligned}4 \times 5,280 &= \\4 \times (5,000 + 200 + 80) &= \\(4 \times 5,000) + (4 \times 200) + (4 \times 80) &= \\20,000 + 800 + 320 &= 21,120\end{aligned}$	$\begin{array}{r}1\ 3 \\5,280 \\ \times \quad 4 \\ \hline 21,120\end{array}$

Multiply the **ones** by 4.
Multiply the **tens** by 4.
Rename 30 of the 32 tens as 3 hundreds.
Multiply the **hundreds** by 4.
Add the renamed 3 hundreds.
Rename 10 of the 11 hundreds as 1 thousand.
Multiply the **thousands** by 4.
Add the renamed 1 thousand.

Exercises

Round to estimate the product. Solve.

1. 78
 $\times 6$
480; 468

2. 295
 $\times 4$
1,200; 1,180

3. 529
 $\times 8$
4,000; 4,232

4. $2,759$
 $\times 3$
9,000; 8,277

Use front-end estimation to find a more accurate estimate.

5. $7 \times 2,440$ **16,800**

6. $5 \times 3,012$ **15,000**

7. $9 \times 1,799$ **15,300**

8. $3 \times 8,423$ **25,200**

Write the product.

9. 74
 $\times 5$
370

10. $7,009$
 $\times 9$
63,081

11. $68,691$
 $\times 7$
480,837

12. $4,160$
 $\times 3$
12,480

13. 9×38 **342**

14. 4×648 **2,592**

15. $5 \times 1,093$ **5,465**

16. $4 \times 8 \times 6$ **192**

17. 3×29 **87**

18. 6×953 **5,718**

19. $8 \times 1,249$ **9,992**

20. $(2 \times 25) \times 5$ **250**

21. 7×120 **840**

22. 2×263 **526**

23. 7^3 **343**

24. $6 \times 3 \times 7$ **126**

Solve.

25. The family's camping destination will be reached in three days if they travel 317 miles each day. How many miles from home will they travel? **$3 \times 317 = 951$ miles**

When multiplying by a two-digit factor, multiply each place in the **multiplicand** by each place of the **multiplier**.

Estimate the product by **rounding** both factors to the greatest place and multiplying.

James used his knowledge of 5,280 feet = 1 mile to find out how many feet are in the 24 miles between his house and his grandmother's house. $24 \times 5,280 = \underline{\hspace{2cm}}$ feet

Estimate
 $20 \times 5,000 = 100,000$



Solve by using the Distributive Property to find the **partial products**.

$$\begin{aligned}24 \times 5,280 &= \\(20 + 4) \times 5,280 &= \\(20 \times 5,280) + (4 \times 5,280) &= \\105,600 + 21,120 &= 126,720\end{aligned}$$

$$\begin{aligned}20 \times 5,280 &= \\20 \times (5,000 + 200 + 80) &= \\(20 \times 5,000) + (20 \times 200) + (20 \times 80) &= \\100,000 + 4,000 + 1,600 &= 105,600\end{aligned}\quad \begin{aligned}4 \times 5,280 &= \\4 \times (5,000 + 200 + 80) &= \\(4 \times 5,000) + (4 \times 200) + (4 \times 80) &= \\20,000 + 800 + 320 &= 21,120\end{aligned}$$

Solve by using the short form to find the partial products.

$$\begin{array}{r} \overset{1}{\cancel{5}} \overset{1}{\cancel{2}} \overset{8}{0} \\ \times \quad \overset{1}{\cancel{2}} \overset{4}{4} \\ \hline 21,120 \quad (4 \times 5,280) \\ + 105,600 \quad (20 \times 5,280) \\ \hline 126,720 \end{array}$$

- Find the first partial product by multiplying 4 times 5,280.
- Find the second partial product by multiplying 20 times 5,280.
Remember that the multiplier (2) is really a multiple of 10 (20). Write a zero in the Ones place of the second partial product as a placeholder.
- Add the partial products.

Exercises

Round both factors to the greatest place to estimate the product. Solve.

26. 78

$\times 34$

$2,400; 2,652$

27. 42

$\times 69$

$2,800; 2,898$

28. 289

$\times 51$

$15,000; 14,739$

29. $4,962$

$\times 56$

$300,000; 277,872$

30. 68×729

$49,000; 49,572$

31. 77×75

$6,400; 5,775$

32. $62,713 \times 34$

$1,800,000;$
 $2,132,242$

Use the **Associative Property** and/or the **Commutative Property** to solve.

Show your grouping.

33. $25 \times 75 \times 4$

$(4 \times 25) \times 75 =$

$100 \times 75 = 7,500$

34. $3 \times 60 \times 55$

$(3 \times 60) \times 55 =$

$180 \times 55 = 9,900$

35. $85 \times 14 \times 8$

$(8 \times 14) \times 85 =$

$112 \times 85 = 9,520$

Use 7×473 for problems 36–38.

36. Round to estimate the product. $3,500$

37. Use the Distributive Property to find the product. $3,311$

38. Is the estimated product greater than or less than the product? Explain why.
greater than

Follow the directions.

39. Write a multiplication equation for the picture.

$$\begin{array}{cccccc} \triangle & \triangle & \triangle & \triangle & \triangle & \triangle \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \\ & & & & & \end{array}$$

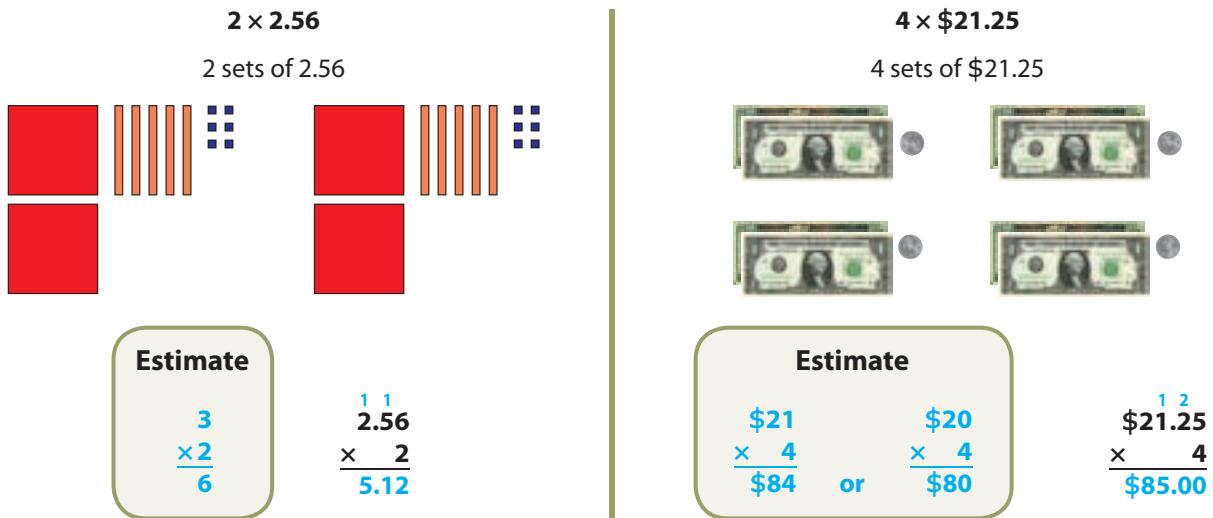
$3 \times 2 = 6$

J Explain how you can use the Distributive Property to mentally solve $3 \times 2,326$.

Multiply Decimals by a Whole Number

The process of multiplying a decimal by a whole number is similar to the process of multiplying whole numbers. After multiplying all places, the decimal point must be placed in the correct location in the product. The number of decimal places in the product is determined by the number of places in the decimal factor.

Estimate the product by rounding the decimal to the nearest whole number or to the greatest place. Choose whichever place allows you to find the estimate using mental math. The estimate will help you with the placement of the decimal point in the product.



Exercises

Estimate the product. Solve. *Estimates may vary depending on estimating strategy used.*

1. 3.018×5
15; 15.090

2. 16.7×8
160; 133.6

3. 4.009×3
12; 12.027

4. 32.4×10
300; 324.0 or 324

5. 1.98×13
26; 25.74

6. 20.05×7
140; 140.35

7. $\$25.05 \times 12$
\$360 or \$300; \$300.60

8. $\$42.16 \times 2$
\$84 or \$80; \$84.32

9. 3×0.09 **0.3; 0.27**

10. $11 \times \$4.99$
\$55; \$54.89

11. $10 \times \$2.50$
\$30; \$25.00

12. 6×1.013 **6; 6.078**

Solve. *Equations may vary.*

13. Mrs. Mowrey found shirts on sale for \$24.95. She bought one for her husband and one for each of her two sons. How much did the shirts cost?
 $3 \times \$24.95 = \74.85

14. Mrs. Mowrey also bought a suit for her husband for \$189.99. How much more did she spend on the suit than on the three shirts?

$\$189.99 - \$74.85 = \$115.14$

15. Caryn baked 256 cookies for a church fellowship. Three plates with 14 cookies each were left over after the fellowship. How many cookies were eaten?
 $256 - (3 \times 14) = 256 - 42 = 214$ cookies

16. Mr. Phelps bought four steaks to cook out on the grill for the family. Two of the steaks weighed 1.14 pounds each, and the other two steaks weighed 1.26 pounds each. How many pounds of steak did Mr. Phelps buy in all? **$(2 \times 1.14 \text{ lb}) + (2 \times 1.26 \text{ lb}) = 2.28 + 2.52 = 4.80 \text{ lb}$**
17. Mr. Phelps also brought three bags of vegetables to cook on the grill. If each bag weighed 10.7 ounces, what was the total weight of the vegetables purchased? **$3 \times 10.7 \text{ oz} = 32.1 \text{ oz}$**

Powers of 10

When multiplying a decimal by a power of 10, move the decimal point one place to the right for each zero in the factor (10, 100, 1,000). Annex zeros as needed.

$$10^1 \times 23.75 = \\ 10 \times 23.75 = \underline{237.5}$$

Think 23.75

$$10^2 \times 0.956 = \\ 100 \times 0.956 = \underline{95.6}$$

Think 0.956

$$10^3 \times 368.1 = \\ 1,000 \times 368.1 = \underline{368,100}$$

Think 368.100

Exercises

Use mental math to solve. Write only the answer.

18. 10×14.9 **149**

19. 100×1.42 **142**

20. 100×6.39 **639**

21. $10^1 \times 87.5$ **875**

22. 10×0.012 **0.12**

23. 1000×3.78 **3,780**

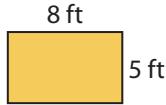
24. 1000×2.86 **2,860**

25. $10^2 \times 97.25$ **9,725**

Practice & Application

26. What is 90,000 more than 1 million? **1,090,000**

27. Write an equation using multiplication to find the perimeter of the quadrilateral.



$$(2 \times 8 \text{ ft}) + (2 \times 5 \text{ ft}) = 16 \text{ ft} + 10 \text{ ft} = 26 \text{ ft}$$

28. Choose the expression that has the same value as 6×9 .

$3^2 \times (2 \times 3)$

$2 \times (3 \times 3)$

$3 \times (2 \times 2)$

29. Write the expanded form for 187.396 and 18.7396.

$$\underline{187.396 = 100 + 80 + 7 + 0.3 + 0.09 + 0.006};$$

$$\underline{18.7396 = 10 + 8 + 0.7 + 0.03 + 0.009 + 0.0006}$$

Use illustrations *a*, *b*, and *c* for problems 34–36.

34. Write an equation for the array in illustration *a*. Use the Commutative Property to write another equation. Illustrate the new equation. **$7 \times 8 = 56; 8 \times 7 = 56$**

$$\begin{aligned} 65 + 35 &= 100; 35 + 65 = 100; \\ 100 - 35 &= 65; 100 - 65 = 35 \end{aligned}$$

30. Write two addition equations and two subtraction equations using the numbers 100, 65, and 35.

31. What product does 4^5 represent?

$$\underline{4 \times 4 \times 4 \times 4 \times 4 = 1,024}$$

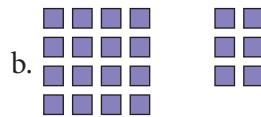
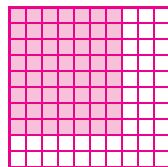
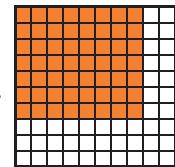
32. List the first twelve nonzero multiples of 8.

$$\underline{8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96}$$

33. Write three facts for each of the composite numbers 24 and 12. **Answers may vary.**

$$\underline{24: 1 \times 24; 2 \times 12; 3 \times 8; 4 \times 6}$$

$$\underline{12: 1 \times 12; 2 \times 6; 3 \times 4}$$



35. The expression $(4 \times 4) + (3 \times 2)$ could be written for illustration *b*. Write this expression using exponents and solve. **$4^2 + 6 = 22$**

36. Which expression is true of illustration *c*: $(3 \times 7) + 4$ or $3 \times (7 + 4)$? Explain your answer.

$$\underline{(3 \times 7) + 4; \text{there are 3 rows of 7 plus 1 row of 4.}}$$

3-Digit Multipliers

The number of digits in the multiplier typically matches the number of **partial products** in the solution. However, because the Commutative Property allows the order of the factors to be changed, if a factor has a zero in it, you can use that factor as the multiplier and eliminate finding a partial product.

partial products
compensation

The Tennessee Valley Authority was created in 1933 to help build dams and provide electricity. A small town in the valley had a population of 203 people in the early 1930s. After a dam was built, the town's population increased 125 times. What was the new population?

$$125 \times 203 = \underline{\hspace{2cm}} \text{people}$$

$\begin{array}{r} 203 \\ \times 125 \\ \hline 1015 \\ 4060 \\ \hline +20300 \\ \hline 25,375 \end{array}$ <p>(5 \times 203) (20 \times 203) (100 \times 203) (125 \times 203)</p>	$\begin{array}{r} 125 \\ \times 203 \\ \hline 375 \\ +25000 \\ \hline 25,375 \end{array}$ <p>(3 \times 125) (200 \times 125) (203 \times 125)</p>
---	--

Exercises

Round both factors to the greatest place to estimate the product. Solve.

1. 498
 $\times 318$
150,000; 158,364

2. 639
 $\times 548$
300,000; 350,172

3. 786
 $\times 308$
240,000; 242,088

4. $8,645$
 $\times 729$
6,300,000; 6,302,205

5. 42×784
32,000; 32,928

6. 749×254
210,000; 190,246

7. 629×36
24,000; 22,644

8. $72 \times 9,015$
630,000; 649,080

Solve.

9. 77×281 **21,637**

10. $3 \times \$19.28$ **\\$57.84**

11. $14 \times \$3.86$ **\\$54.04**

12. 5×6.793 **33.965**

13. 117×428 **50,076**

14. 15×27 **405**

15. 21×150 **3,150**

16. 11×9.8 **107.8**

Solve. **Equations may vary.**

17. The Wagner family traveled from Utah to Pennsylvania to visit the Johnstown Flood National Memorial. They drove the following distances each day: Monday, 632 miles; Tuesday, 685 miles; Wednesday, 713 miles; Thursday, 610 miles; and Friday, 805 miles. How many miles did they travel in all? **$632 + 685 + 713 + 610 + 805 = 3,445$ miles**

18. If they traveled the same route on the way home, what is the total distance for the round trip?
 $2 \times 3,445 = 6,890$ miles

19. Before leaving Utah, the Wagners' car odometer read 38,597 miles. What was the odometer reading when the family arrived in Johnstown?
 $38,597 + 3,445 = 42,042$

20. Mr. Wagner's car gets approximately 26 miles per gallon. He paid an average of \$2.87 per gallon. What was the cost of gasoline for the entire trip if he used 265 gallons? **$265 \times \$2.87 = \760.55**

- J Sam estimated the product for 29×573 as 18,000. Would the actual product be *less than* or *greater than* the estimate? Explain your answer. ***less than the actual product because both numbers are rounded up to estimate***



The Unger House, Johnstown Flood National Memorial

Colonel Elias J. Unger built this house in the mid-1880s. The house and property were added to the Johnstown Flood National Memorial in 1981 to help preserve the historic scene.

Mental Multiplication Strategies

Front-End Multiplication (Distributive Property)

Use front-end multiplication (Distributive Property) to multiply by a one-digit factor.

$$\begin{array}{r} 5 \times 27 = \\ (5 \times 20) + (5 \times 7) = \\ 100 + 35 = \textcolor{blue}{135} \end{array}$$

$$\begin{array}{r} 4 \times 268 = \\ (4 \times 200) + (4 \times 60) + (4 \times 8) = \\ 800 + 240 + 32 = \textcolor{blue}{1,072} \end{array}$$

Compensation

Use compensation when one of the factors is 9 or 11. You can multiply by 10 and **add** or **subtract** a set of the other factor.

$$\begin{array}{r} 9 \times 46 = \\ 10 \times 46 = 460 \\ 460 - 46 = 414 \\ 9 \times 46 = \textcolor{blue}{414} \end{array}$$

Subtract a set of 46.

$$\begin{array}{r} 11 \times 54 = \\ 10 \times 54 = 540 \\ 540 + 54 = 594 \\ 11 \times 54 = \textcolor{blue}{594} \end{array}$$

Add a set of 54.

Right-to-Left Cross Multiplication

Use right-to-left cross multiplication when multiplying two-digit factors.

$$28 \times 32 =$$

1. **Multiply the ones.**

$$8 \times 2 = 16$$

Write **6** in the Ones place.

2. **Cross-multiply.**

$$\begin{array}{l} 8 \times 3 \text{ tens} = 24 \text{ tens} \\ 2 \text{ tens} \times 2 = 4 \text{ tens} \\ 24 \text{ tens} + 4 \text{ tens} + 1 \text{ ten} = 29 \text{ tens} \end{array}$$

Write **9** in the Tens place.

3. **Multiply the tens.**

$$2 \text{ tens} \times 3 \text{ tens} = 6 \text{ hundreds}$$

$$6 \text{ hundreds} + 2 \text{ hundreds} = 8 \text{ hundreds}$$

Write **8** in the Hundreds place.

The product is **896**.

$$\begin{array}{r} \text{Remember} \\ \text{the 1 ten.} \\ \begin{array}{r} 1 \\ \times 28 \\ \hline 6 \end{array} \end{array}$$

$$\begin{array}{r} \text{Remember} \\ \text{2 hundreds.} \\ \begin{array}{r} 21 \\ \times 28 \\ \hline 96 \end{array} \end{array}$$

$$\begin{array}{r} 21 \\ \times 28 \\ \hline 896 \end{array}$$

Exercises

Use front-end multiplication to solve. Write only the answer.

21. 5×36 **180**

22. 7×62 **434**

23. 6×48 **288**

24. 8×24 **192**

Use compensation to solve. Write only the answer.

25. 9×78 **702**

26. 9×34 **306**

27. 9×88 **792**

28. 9×64 **576**

29. 11×72 **792**

30. 11×16 **176**

31. 11×58 **638**

32. 11×37 **407**

Use right-to-left cross multiplication to solve. Write only the answer.

33. $\begin{array}{r} 23 \\ \times 12 \\ \hline 276 \end{array}$

34. $\begin{array}{r} 84 \\ \times 56 \\ \hline 4,704 \end{array}$

35. $\begin{array}{r} 35 \\ \times 32 \\ \hline 1,120 \end{array}$

36. $\begin{array}{r} 63 \\ \times 48 \\ \hline 3,024 \end{array}$

Solve.

37. Kristie participated in 3 marathons of 26.2 miles each. What was the total number of miles she ran?
 $3 \times 26.2 = 78.6$ miles

38. The school purchased 11 cases of paper at a cost of \$15.75 per case. What was the total cost of the paper?

$11 \times \$15.75 = \173.25

39. An airplane made 14 trips of 4,890 miles each this month. How many miles did it fly in all?
 $14 \times 4,890 = 68,460$ miles

Complete **DAILY REVIEW** f on page 409.

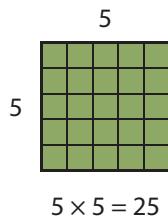
Squares & Square Roots

A **square** is the product of a number times itself.

The product of a whole number squared is a **perfect square**.

Since $5 \times 5 = 25$, then $5^2 = 25$.

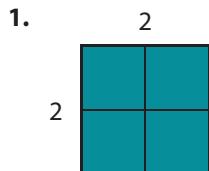
The exponent 2 is used to express a number squared.



square
perfect square
square root
hypotenuse
Pythagorean theorem

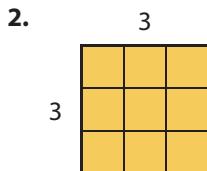
Exercises

Find the square of the number. Write the equation.



$$2^2 = 4$$

$$\underline{2} \times \underline{2} = \underline{4}$$



$$3^2 = 9$$

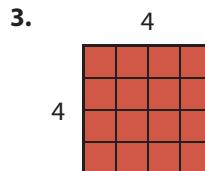
$$\underline{3} \times \underline{3} = \underline{9}$$

$$4. 9^2 = 81$$

$$\underline{9} \times \underline{9} = \underline{81}$$

$$5. 10^2 = 100$$

$$\underline{10} \times \underline{10} = \underline{100}$$



$$4^2 = 16$$

$$\underline{4} \times \underline{4} = \underline{16}$$

$$6. 6^2 = 36$$

$$\underline{6} \times \underline{6} = \underline{36}$$

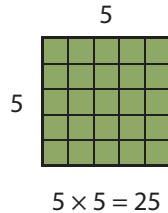
A **square root** is one of a number's two equal factors.

$\sqrt{}$ is the **square root sign**.

Read $\sqrt{25} = 5$: "the square root of 25 equals 5."

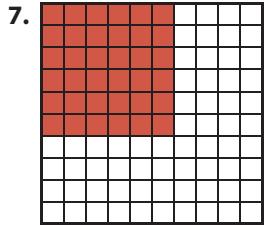
Finding the square root of a number is the inverse of squaring a number.

Since $5^2 = 25$, then $\sqrt{25} = 5$.

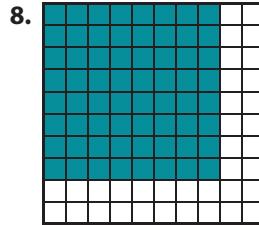


Exercises

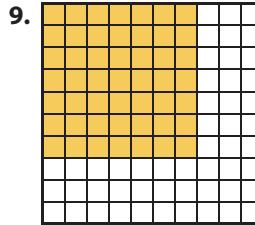
Find the square root of the number by using the array.



$$\sqrt{36} = \underline{6}$$



$$\sqrt{64} = \underline{8}$$



$$\sqrt{} = \underline{7}$$

Find the square root.

$$10. \sqrt{4} \quad \underline{2}$$

$$11. \sqrt{9} \quad \underline{3}$$

$$12. \sqrt{81} \quad \underline{9}$$



Mom's waffle iron makes square waffles. Each waffle has 16 squares.

How many squares are along one side of each waffle? Why? **4 squares;**
because the waffle is a square and the square root of 16 is 4.

Complete the perfect squares and the square roots.

13. Since $1^2 = 1 \times 1 = 1$, then $\sqrt{1} = \underline{\quad}$. **1**

14. Since $2^2 = 2 \times 2 = \underline{\quad}$, then $\sqrt{4} = \underline{\quad}$. **4; 2**

15. Since $3^2 = 3 \times 3 = \underline{\quad}$, then $\sqrt{9} = \underline{\quad}$. **9; 3**

16. Since $4^2 = 4 \times 4 = \underline{\quad}$, then $\sqrt{16} = \underline{\quad}$. **16; 4**

17. Since $5^2 = 5 \times 5 = \underline{\quad}$, then $\sqrt{25} = \underline{\quad}$. **25; 5**

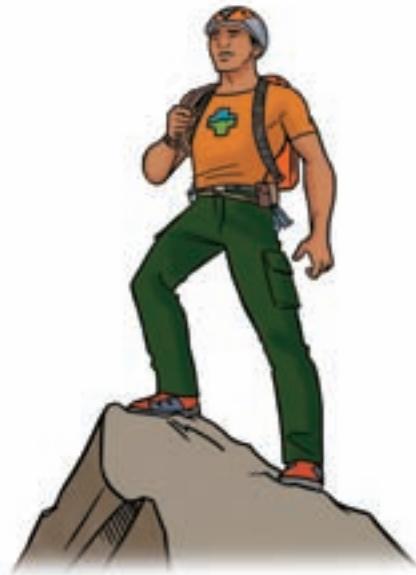
18. Since $6^2 = 6 \times 6 = \underline{\quad}$, then $\sqrt{36} = \underline{\quad}$. **36; 6**

19. Since $7^2 = 7 \times 7 = \underline{\quad}$, then $\sqrt{49} = \underline{\quad}$. **49; 7**

20. Since $8^2 = 8 \times 8 = \underline{\quad}$, then $\sqrt{64} = \underline{\quad}$. **64; 8**

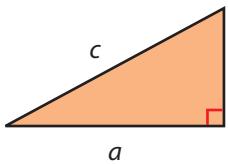
21. Since $9^2 = 9 \times 9 = \underline{\quad}$, then $\sqrt{81} = \underline{\quad}$. **81; 9**

22. Since $10^2 = 10 \times 10 = \underline{\quad}$, then $\sqrt{100} = \underline{\quad}$. **100; 10**

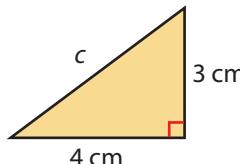


Pythagorean Theorem

In a right triangle, the three sides are related. The longest side of the triangle (the side opposite the right angle) is called the **hypotenuse**. The square of the hypotenuse is equal to the sum of the squares of the other two sides. This rule is called the **Pythagorean theorem**.



$$a^2 + b^2 = c^2$$

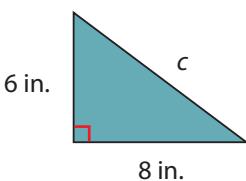


$$\begin{aligned} 4^2 + 3^2 &= c^2 \\ 16 + 9 &= c^2 \\ 25 &= c^2 \\ \sqrt{25} &= c \\ 5 \text{ cm} &= c \end{aligned}$$

Exercises

Find the length of side c of the triangle. Complete the equation.

23.



$$6^2 + 8^2 = c^2$$

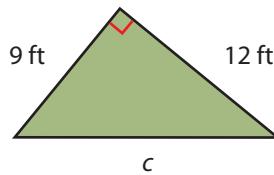
$$\underline{\quad} + \underline{\quad} = c^2 \quad \mathbf{36; 64}$$

$$\underline{\quad} = c^2 \quad \mathbf{100}$$

$$\sqrt{\underline{\quad}} = c \quad \mathbf{100}$$

$$\underline{\quad} \text{ in.} = c \quad \mathbf{10}$$

24.



$$\underline{\quad}^2 + \underline{\quad}^2 = c^2 \quad \mathbf{9; 12}$$

$$\underline{\quad} + \underline{\quad} = c^2 \quad \mathbf{81; 144}$$

$$\underline{\quad} = c^2 \quad \mathbf{225}$$

$$\sqrt{\underline{\quad}} = c \quad \mathbf{225}$$

$$\underline{\quad} \text{ ft} = c \quad \mathbf{15}$$

Use a calculator to solve.

25. 14^2 **196**

26. 13^2 **169**

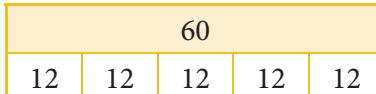
27. 17^2 **289**

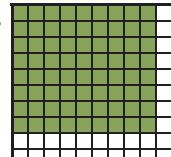
28. 20^2 **400**

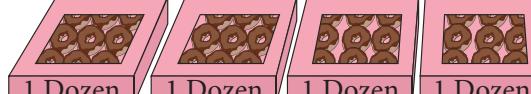
29. 18^2 **324**

CHAPTER 2 REVIEW

Write a multiplication equation for the picture. Solve.

1. 
 $5 \times 12 = 60$

2. 
 $8 \times 9 = 72$

3. 
 $4 \times 12 = 48$

Use mental math to solve. Write only the answer.

4. 5×50 **250**

5. 60×40 **2,400**

6. $8,000 \times 5$ **40,000**

7. 900×200 **180,000**

8. 700×60 **42,000**

9. 800×9 **7,200**

10. 300×400 **120,000**

11. $40 \times 2,000$ **80,000**

Use front-end estimation to find a more accurate estimate. Solve.

12. $\begin{array}{r} 5,684 \\ \times \quad 3 \\ \hline 16,800; 17,052 \end{array}$

13. $\begin{array}{r} 28,167 \\ \times \quad 5 \\ \hline 140,000; 140,835 \end{array}$

14. $\begin{array}{r} \$45.72 \\ \times \quad 4 \\ \hline \$180.00; \$182.88 \end{array}$

15. $\begin{array}{r} \$17.61 \\ \times \quad 8 \\ \hline \$136.00; \$140.88 \end{array}$

Round both factors to the greatest place to estimate the product. Solve.

16. $\begin{array}{r} 165 \\ \times \quad 56 \\ \hline 12,000; 9,240 \end{array}$

17. $\begin{array}{r} 756 \\ \times \quad 31 \\ \hline 24,000; 23,436 \end{array}$

18. $\begin{array}{r} 953 \\ \times \quad 72 \\ \hline 70,000; 68,616 \end{array}$

19. $\begin{array}{r} 1,795 \\ \times \quad 308 \\ \hline 600,000; 552,860 \end{array}$

Use the multiplication properties to write the missing number.

20. $0 \times 81 = 0$

23. $9 \times 6 = (9 \times 3) + (9 \times \underline{3})$

21. $46 \times 19 = 19 \times \underline{46}$

24. $17 \times (30 + \underline{4}) = 17 \times 34$

22. $6 \times (14 \times 10) = (6 \times \underline{10}) \times 14$

25. $1 \times 307 = \underline{307}$

Use the Associative Property and/or the Commutative Property to solve.

Show your grouping.

26. $5 \times 7 \times 8$ $(5 \times 8) \times 7 =$
 $40 \times 7 = 280$

27. $4 \times 17 \times 25$ $(4 \times 25) \times 17 =$
 $100 \times 17 = 1,700$

28. $21 \times 3 \times 11$ $(21 \times 3) \times 11 =$
 $63 \times 11 = 693$

Use the Distributive Property to solve.

29. 49×80 **3,920**

30. 60×107 **6,420**

31. 219×30 **6,570**

Label the number as prime or composite.

Write two facts for each composite number.

32. 17
prime

33. 49
composite
 1×49
 7×7

34. 55
composite
 1×55
 5×11

35. 30
composite
 1×30
 2×15
 3×10
 5×6

36. 23
prime

Complete the table.

37. Standard Form	Factored Form	Exponent Form
216	$6 \times 6 \times 6$	6^3
625	$5 \times 5 \times 5 \times 5$	5^4
1,024	$4 \times 4 \times 4 \times 4 \times 4$	4^5
1,000,000	$10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$	10^6
1,000	$10 \times 10 \times 10$	10^3
100,000	$10 \times 10 \times 10 \times 10 \times 10 \times 10$	10^5

Write the number in standard form.

38. $(6 \times 10,000) + (3 \times 1,000) + (9 \times 10) + (4 \times 1)$ **63,094**

39. $(6 \times 10^3) + (3 \times 10^2) + (9 \times 10^1) + (4 \times 10^0)$ **6,394**

40. $(6 \times 10^2) + (3 \times 10^0) + (9 \times \frac{1}{10^1}) + (4 \times \frac{1}{10^2})$ **603.94**

Solve.

41. List the factors of 18 and 24 in order. **18: 1, 2, 3, 6, 9, 18; 24: 1, 2, 3, 4, 6, 8, 12, 24**

42. What is the greatest common factor of 18 and 24? **6**

43. List the multiples of 18 and 24 to find a common multiple.

18: 18, 36, 54, 72; 24: 24, 48, 72
A common multiple of 18 and 24 is 72.

Solve. **Equations may vary.**

44. Mrs. Davidson bought a 10-pound Thanksgiving turkey that was priced at \$0.89 per pound. How much did the turkey cost?
 $10 \times \$0.89 = \8.90

45. Grandma gave \$4.50 to each of her eight grandchildren. How much money did she give in all?
 $8 \times \$4.50 = \36.00

46. Coach Rees totaled the basketball players' scores for the season. Daniel and Aaron each scored 167 points, and Andrew scored 112 points. What was the total number of points the three boys scored?
 $(2 \times 167) + 112 = 334 + 112 = 446$ points

47. Mr. and Mrs. Calvin have saved \$2,150 each year for 4 years for their trip to the Holy Land. The trip costs \$4,500 per person. How much more money do they need for their trip?
 $(2 \times \$4,500) - (4 \times \$2,150) = \$9,000 - \$8,600 = \$400$



Sea of Galilee

Test Prep

Mark the property.

1. $583 + 14 = 14 + 583$

A. Commutative

B. Associative

C. Identity

2. $136 + 0 = 136$

A. Commutative

B. Associative

C. Identity

3. $(23 + 41) + 72 = 23 + (41 + 72)$

A. Commutative

B. Associative

C. Identity

4. $15.7 + a = a + 15.7$

A. Commutative

B. Associative

C. Identity

5. $a + (b + c) = (a + b) + c$

A. Commutative

B. Associative

C. Identity

Mark the answer.

6. What is the difference between 7,693 and 9,762?

A. 2,001

C. 2,069

B. 2,036

D. none of the above

7. What is the sum of 2,683 and 5,937?

A. 8,277

C. 8,944

B. 8,620

D. none of the above

8.
$$\begin{array}{r} 4,320 \\ 26,393 \\ 17,825 \\ + 32,285 \\ \hline \end{array}$$

A. 79,357

B. 80,004

C. 80,823

D. none of the above

9. A family took \$300.00 on vacation. They returned home with \$72.50. How much did they spend?

A. \$227.50

C. \$237.40

B. \$372.50

D. none of the above

10. $8.2 - n = 3.9$

A. 43

C. 4.3

B. 4.1

D. none of the above

Mark the answer.

11. $(8 \times 10,000) + (6 \times 1,000) + (4 \times 100) + (4 \times 10) + (5 \times 1)$

A. 806,445

B. 86,445

C. 864.45

12. $(8 \times 100) + (2 \times 10) + (3 \times 1) + (6 \times 0.1) + (4 \times 0.01) + (8 \times 0.001)$

A. 823.648

B. 823.68

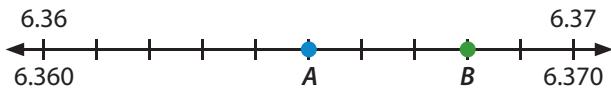
C. 8.23

13. seven hundred fifty million, four hundred three thousand, eight hundred twelve

A. 705,403,812

B. 75,403,812

C. 750,403,812



14. Point A

A. 6.35

B. 6.365

C. 6.4

15. Point B

A. 6.361

B. 6.368

C. 6.45

180		
110	40	n

A. $n = 40$

B. $n = 55$

C. $n = 30$

1,500		
n	n	n

A. $n = 50$

B. $n = 30$

C. $n = 500$

n	
1,700	300

A. $n = 14$

B. $n = 2,000$

C. $n = 1,400$

275	
33	n

A. $n = 91$

B. $n = 9$

C. $n = 242$

n		
9	9	9

A. $n = 27$

B. $n = 3$

C. $n = 36$

Use the data from the pictograph to find the answer.

Cards Made for Veterans	
October	★ ★ ★ ★ ★
November	★ ★ ★ ★
December	★ ★ ★ ★ ★ ★ ★ ★
January	★ ★ ★ ★ ★
February	★ ★ ★ ★ ★ ★ ★ ★ ★
March	★ ★ ★ ★ ★ ★ ★

★ = 50 cards

21. What is the difference in the number of cards made in November and January?
- A. 100
B. 50
C. 25
22. How many cards were made in February?
- A. 575
B. 475
C. 525
23. In December, 350 of the cards were Christmas cards. How many December cards were not for Christmas?
- A. 100
B. 200
C. 250
24. In which month were the least number of cards made?
- A. January
B. October
C. November
25. How many cards were made from January through March?
- A. 2,300
B. 1,150
C. 1,125

HIGH POWER CALCULATIONS

Remember, an exponent tells how many times the base number is multiplied by itself.

$$10^{12} = \underbrace{10 \times 10 \times 10 \times 10 \times 10 \times 10}_{\text{12 factors}} \times \underbrace{10 \times 10 \times 10 \times 10 \times 10 \times 10}_{\text{12 factors}} = 1,000,000,000,000$$

The number 10 is multiplied by itself 12 times to equal 1 trillion.

Do you know the word *googol*? A googol is a 1 followed by 100 zeros. In exponential form, a googol is “ten to the hundredth power”— 10^{100} . The mathematician Edward Kasner, who introduced the term *googol*, credited his nine-year-old nephew Milton Sirotta with naming this number.

It can be helpful to use a calculator when working with large numbers in exponential form. Write the following numbers in **standard form**. Use a calculator to multiply.

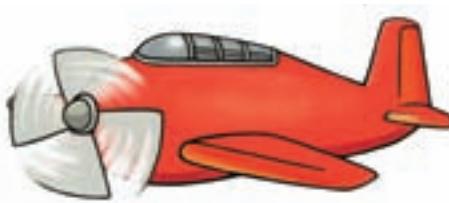
- | | | | |
|-------------------------|-----------------------------|-----------------------------|-----------------------------|
| 1. 3^7 2,187 | 2. 25^5 9,765,625 | 3. 0.11^3 0.001331 | 4. 0.2^7 0.0000128 |
| 5. 7^6 117,649 | 6. 15^6 11,390,625 | 7. 2.1^5 40.84101 | 8. 0.14^3 0.002744 |

Multiply to rename each number in **standard form**. Use a calculator.

- | | | |
|---|---|---|
| 9. 3^2 9
33^2 1,089
333^2 110,889
$3,333^2$ 11,108,889 | 10. 6^2 36
66^2 4,356
666^2 443,556
$6,666^2$ 44,435,556 | 11. 9^2 81
99^2 9,801
999^2 998,001
$9,999^2$ 99,980,001 |
|---|---|---|

Solve.

- | | |
|---|---|
| 12. $9 - 2$ 7
$9^2 - 2^2$ 77
$59^2 - 52^2$ 777
$559^2 - 552^2$ 7,777 | 13. $8 - 3$ 5
$8^2 - 3^2$ 55
$58^2 - 53^2$ 555
$558^2 - 553^2$ 5,555 |
|---|---|



Division

Division is the **inverse operation** of multiplication. Multiplication joins equal sets to find the total. Division equally distributes the total into a given number of sets or into sets of a given number.

inverse operation
dividend, divisor, quotient
check division with multiplication

Mrs. Markham has 36 math problems for students to solve. She distributed the problems evenly among 4 students. How many problems did each student receive?

36			
9	9	9	9

$36 \div 4 = 9$ problems for each student
(find the number in each set)

Mrs. Markham has 36 math problems for students to solve. If she gives 4 problems to each student, how many students will receive problems?

36								
4	4	4	4	4	4	4	4	4

$36 \div 4 = 9$ students will receive problems
(find the number of sets)

$$36 \div 4 = 9$$

$$4 \overline{)36}$$

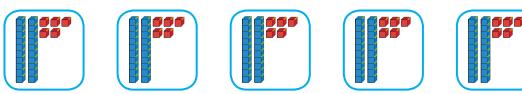
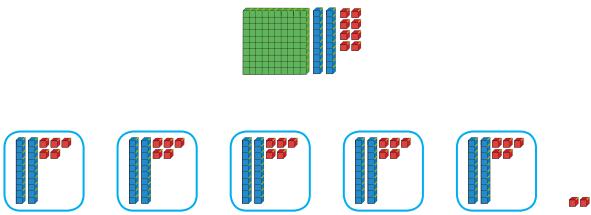
$$\frac{36}{4} = 9$$

The **dividend** is 36, the **divisor** is 4, and the **quotient** is 9.

Divide 128 into 5 sets.

- Rename 1 hundred as 10 tens.
- **Divide 12 tens by 5.**
- Rename 2 tens as 20 ones.
- **Divide 28 ones by 5.**

$$5 \overline{)128} \quad \begin{array}{r} 25 \\ -10 \\ \hline 28 \\ -25 \\ \hline 3 \end{array}$$



$$128 \div 5 = 25 \text{ r}3$$

Check the division problem using multiplication.

$$(\text{divisor} \times \text{quotient}) + \text{remainder} = \text{dividend}$$
$$(5 \times 25) + 3 = 128$$

$$\begin{array}{r} 2 \\ 25 \\ \times 5 \\ \hline 125 \\ + 3 \\ \hline 128 \end{array}$$

How would you picture this equation if you were dividing 128 into sets of 5?

Exercises

Solve the division fact.

1. $16 \div 2 = 8$

2. $28 \div 4 = 7$

3. $77 \div 11 = 7$

4. $\frac{21}{3} = 7$

5. $\frac{42}{6} = 7$

6. $56 \div 7 = 8$

7. $32 \div 8 = 4$

8. $\frac{40}{5} = 8$

9. $\frac{16}{4} = 4$

10. $\frac{63}{7} = 9$

Write four equations for the fact family.

11.

3	8	24
---	---	----

12.

8	9	72
---	---	----

13.

5	12	60
---	----	----

Solve using the long division process.

14. $5 \overline{)265} \quad 53$

15. $6 \overline{)57} \quad 9 \text{ r}3$

16. $3 \overline{)516} \quad 172$

17. $9 \overline{)452} \quad 50 \text{ r}2$

18. $4 \overline{)329} \quad 82 \text{ r}1$

19. $4 \overline{)17} \quad 4 \text{ r}1$

20. $7 \overline{)250} \quad 35 \text{ r}5$

21. $8 \overline{)918} \quad 114 \text{ r}6$

22. $5 \overline{)75} \quad 15$

23. $8 \overline{)728} \quad 91$

Write a division equation for the phrase.

Draw a part-whole model to illustrate.

24. 20 cups of coffee placed on 5 tables

$$20 \div 5 = 4 \text{ cups}$$

25. 40 balloons tied in groups of 4

$$40 \div 4 = 10 \text{ groups}$$

26. 96 blankets delivered to 8 shelters

$$96 \div 8 = 12 \text{ blankets}$$

Solve.

27. Bailey is in charge of making sandwiches for the relief shelter. She has 219 slices of bread. How many sandwiches can she make using 2 slices of bread for each? What can be done with any extra bread? $219 \div 2 = 109 \text{ r}1$; **109 sandwiches; make a half sandwich**

28. Calvary Baptist Church donated cases of orange juice to a relief shelter after a hurricane. There are 32 ounces of juice in each carton. How many 6-ounce servings can be poured from one carton? $32 \div 6 = 5 \text{ r}2$; **5 servings**

29. Caleb helped his father deliver cots to shelters. There were 749 cots in storage. Three hundred additional cots were purchased. How many could be left at each of the seven shelters? $749 + 300 = 1,049$; $1,049 \div 7 = 149 \text{ r}6$; **at least 149 cots**

Find the missing part.

30. The divisor is 7.
The dividend is 364.
The quotient is 52.

$$364 \div 7 = 52$$

31. The divisor is 9.
The dividend is 2,439.
The quotient is 271.

$$9 \times 271 = 2,439$$

32. The divisor is 124.
The dividend is 620.
The quotient is 5.

$$620 \div 5 = 124$$

Practice & Application

33. Find the product of 370 and 49. **18,130**
34. Use front-end estimation to estimate the sum of 329,683 and 731,990. **1,050,000**
35. Subtract 32,786 from 700,000. **667,214**
36. Write 17.586 in expanded form. **(1 × 10) + (7 × 1) + (5 × 0.1) + (8 × 0.01) + (6 × 0.001)**
37. Write the value of 3 in 93,290,000 in word form. **three million**
38. What is the greatest place in 76,500,000,000? **Ten Billions place**
39. Use division to find the missing factor in $n \times 6 = 90$.
 $90 \div 6 = 15$; $n = 15$
40. Write 23.097, 23.9, 23.079, and 23.709 from least to greatest. **23.079, 23.097, 23.709, 23.9**

- J Solve $739 \div 4$. Draw a picture using ■ for hundreds, | for tens, and ● for ones to illustrate 739 being divided into 4 sets. **184 r3**



Churches often serve as emergency Red Cross shelters during hurricanes and other natural disasters. Church members donate their time and resources to minister to displaced and hurting people.

Multiples of 10

A whole number is **divisible** by another whole number if there is no remainder. You can use **divisibility rules** to determine whether a whole number is divisible by 2, 3, 4, 5, 6, 9, or 10.

**divisible
divisibility rules
compatible numbers**

Divide by Multiples of 10

Use mental math to find the quotient when the dividend and the divisor are multiples of 10. When only the divisor is a multiple of 10, think of **compatible numbers** as you use the long division process.

1. Decide where to start.

$$\begin{array}{r} \text{xx} \\ 50 \overline{)4,500} \end{array}$$

2. Think of the basic fact or think of the compatible numbers.

$$90 \times 50 = 4,500$$

$$\begin{array}{r} \text{xx} \\ 40 \overline{)1,651} \end{array}$$

$$40 \times 40 = 1,600$$

3. Solve using mental math or solve using the long division process.

$$\begin{array}{r} 90 \\ 50 \overline{)4,500} \end{array}$$

$$\begin{array}{r} 41 \text{ r}11 \\ 40 \overline{)1,651} \\ -160 \\ \hline 51 \\ -40 \\ \hline 11 \end{array}$$

Exercises

Choose the divisors that the number is divisible by.

1. 590 is divisible by ____.

2	3	5	10
---	---	---	----

2. 1,265 is divisible by ____.

2	5	9	10
---	---	---	----

3. 486 is divisible by ____.

2	3	4	9
---	---	---	---

4. 138 is divisible by ____.

2	3	6	9
---	---	---	---

5. 1,784 is divisible by ____.

2	3	4	6
---	---	---	---

6. 756 is divisible by ____.

2	4	6	9
---	---	---	---

Solve.

7. $\begin{array}{r} 1,263 \\ 5 \overline{)6,315} \end{array}$

12. $\begin{array}{r} 24 \\ 20 \overline{)480} \end{array}$

17. $1,860 \div 30$ **62**

8. $\begin{array}{r} 274 \\ 4 \overline{)1,096} \end{array}$

13. $\begin{array}{r} 53 \\ 30 \overline{)1,590} \end{array}$

18. $669 \div 30$ **22 r9**

9. $\begin{array}{r} 598 \text{ r}6 \\ 8 \overline{)4,790} \end{array}$

14. $\begin{array}{r} 40 \text{ r}43 \\ 50 \overline{)2,043} \end{array}$

19. $725 \div 80$ **9 r5**

10. $\begin{array}{r} 315 \\ 3 \overline{)945} \end{array}$

15. $\begin{array}{r} 32 \\ 80 \overline{)2,560} \end{array}$

20. $2,485 \div 20$ **124 r5**

11. $\begin{array}{r} 911 \\ 9 \overline{)8,199} \end{array}$

16. $\begin{array}{r} 64 \text{ r}25 \\ 70 \overline{)4,505} \end{array}$

21. $5,307 \div 10$ **530 r7**

Use mental math to solve.

22. $140 \div 20$ **7**

23. $500 \div 50$ **10**

24. $6,300 \div 90$ **70**

25. $80,000 \div 40$

2,000

26. $210 \div 70$ **3**

Use the statement to write an equation and solve.

Michael has 145 marbles.

27. How many pouches will he need if he puts 5 marbles in each pouch? $145 \div 5 = 29$; **29 pouches**
28. How many pouches will he need if he puts 8 marbles in each pouch? $145 \div 8 = 18 \text{ r}1$; **18 pouches, 1 marble left over**
29. If Michael has only 4 pouches, how many marbles will be in each? $145 \div 4 = 36 \text{ r}1$; **36 marbles, 1 left over**

Write an equation and solve. Draw a picture to illustrate. Explain what could be done with the remainders.

33. 63 golf balls shared by 9 golfers

$$63 \div 9 = 7; 7 \text{ golf balls}$$

34. 110 pencils in groups of 5

$$110 \div 5 = 22; 22 \text{ groups}$$

35. 32 orange segments shared among 5 siblings

$$32 \div 5 = 6 \text{ r}2; 6 \text{ segments each}$$

Use mental math to solve.

36. $90 \overline{)3,600}$ **40**

37. $50 \overline{)15,000}$ **300**

38. $70 \overline{)7,000}$ **100**

39. $20 \overline{)400}$ **20**

40. $10 \overline{)3,000}$ **300**

Complete the table.

Rule: $\times 4$	
In	Out
6	24
60	240
600	2,400
6,000	24,000

Rule: $\div 8$	
In	Out
32	4
320	40
3,200	400
32,000	4,000

Rule: $+ 10,000$	
In	Out
1,700	11,700
21,900	31,900
50,080	60,080
91,700	101,700

Rule: $- 100$	
In	Out
1,600	1,500
2,000	1,900
18,473	18,373
20,000	19,900

Practice & Application

45. Write a division equation in which the divisor is 30, the dividend is 3,600, and the quotient is 120. **$3,600 \div 30 = 120$**
46. Complete the comparison sentence using $>$, $<$, or $=$. $(3 \times 2) \times 40 = (5 + 3) \times 30$
47. Write the name of the place for 3 in 1,139,468,000. **Ten Millions place**
48. Write the value of 7 in 1,786,908,000 in standard form. **700,000,000**
49. Round to the greatest place to estimate the sum of 689,300 and 103,599,201. **100,700,000**
50. Estimate the seating capacity of an auditorium if there are 48 rows of 65 chairs. **3,500 chairs**

J Explain how marking the places that will be in the quotient can help you find the correct quotient for $9\overline{)8,181}$ and $90\overline{)8,181}$. **Marking the places shows how many digits will be in the quotient and where you will begin writing the quotient.**



Complete **DAILY REVIEW** b on page 410.

2-Digit Divisors

Before solving a division problem, you can estimate the quotient by rounding the divisor to a multiple of 10 and using as the dividend a number that is compatible with the rounded divisor—a multiple of the rounded divisor. By using two multiples of the divisor as dividends, you can find an **estimate range** for the quotient.

$$\begin{array}{r} 80 \\ \times 3 \\ \hline 6,099 \end{array}$$

Numbers compatible with 80 that have a product close to 6,000:

$$70 \times 80 = 5,600 \quad 80 \times 80 = 6,400$$
$$5,600 \div 80 = 70 \quad 6,400 \div 80 = 80$$

Using the lower fact and the higher fact that have products closest to the dividend allows you to find an estimate range of **70 to 80**.

estimate range
adjust the quotient
remainder

$$\begin{array}{r} 73 \text{ r40} \\ 83 \overline{)6,099} \\ -581 \\ \hline 289 \\ -249 \\ \hline 40 \end{array}$$

When solving division problems, you may need to **adjust the quotient** up or down.

Adjust the quotient **up** when the remainder is the same as or greater than the divisor.

$$\begin{array}{l} 70 \times 60 = 4,200 \\ 80 \times 60 = 4,800 \\ \text{Estimate range: } 70-80 \end{array}$$

$$\begin{array}{r} 60 \\ 56) 4,639 \\ -392 \\ \hline 71 \end{array}$$

71 > 56
adjust **up**

$$\begin{array}{r} 82 \text{ r47} \\ 56) 4,639 \\ -448 \\ \hline 159 \\ -112 \\ \hline 47 \end{array}$$

Adjust the quotient **down** when the product is greater than the dividend.

$$\begin{array}{l} 300 \times 20 = 6,000 \\ 400 \times 20 = 8,000 \\ \text{Estimate range: } 300-400 \end{array}$$

$$\begin{array}{r} 20 \\ 23) 6,190 \\ -69 \\ \hline 3 \end{array}$$

69 > 61
adjust **down**

$$\begin{array}{r} 269 \text{ r3} \\ 23) 6,190 \\ -46 \\ \hline 159 \\ -138 \\ \hline 210 \\ -207 \\ \hline 3 \end{array}$$

Exercises

Choose two facts that could be used to give an estimate range for the quotient.

Write the estimate range.

1. $1,537 \div 8$

$100 \times 8 = 800$

$200 \times 8 = 1,600$

$300 \times 8 = 2,400$

100-200

2. $4,963 \div 69$

$60 \times 70 = 4,200$

$70 \times 70 = 4,900$

$80 \times 70 = 5,600$

70-80

3. $7,034 \div 82$

$80 \times 80 = 6,400$

$90 \times 80 = 7,200$

$100 \times 80 = 8,000$

80-90

4. $33,936 \div 47$

$500 \times 50 = 25,000$

$600 \times 50 = 30,000$

$700 \times 50 = 35,000$

600-700

Write the estimate range.

5. $21 \overline{)869}$

6. $50 \overline{)2,785}$

7. $44 \overline{)7,983}$

8. $78 \overline{)1,499}$

9. $25 \overline{)5,601}$

Solve.

10. $52 \overline{)936}$

11. $18 \overline{)3,852}$

12. $33 \overline{)1,902}$

13. $30 \overline{)2,954}$

14. $41 \overline{)3,906}$

15. $7 \overline{)1,491}$

16. $25 \overline{)5,075}$

17. $12 \overline{)61,324}$

18. $51 \overline{)95,138}$

19. $9 \overline{)1,798}$

Use the divisibility rules to explain your answer.

20. Is 135 divisible by 5 and 10?

21. Is 642 divisible by 2, 3, 4, and 6?

When a dividend is not divisible by the divisor, there is a **remainder** in the quotient. Sometimes the remainder can be dropped because it is not needed to solve the word problem. Sometimes the quotient will need to be increased by 1 to account for the remainder.

Amanda has 22 baby carrots to give to 7 friends. How many carrots can she give to each friend?

$$22 \div 7 = 3 \text{ r}1; 3 \text{ carrots}$$

$$\begin{array}{r} 3 \text{ r}1 \\ 7)22 \\ -21 \\ \hline 1 \end{array}$$

Amanda can give each friend 3 carrots, and there is 1 carrot remaining.

Timothy and 9 of his friends planned a camping trip. They will travel with 4 friends in each car. How many cars are needed?

$$10 \div 4 = 2 \text{ r}2; 3 \text{ cars}$$

$$\begin{array}{r} 2 \text{ r}2 \\ 4)10 \\ -8 \\ \hline 2 \end{array}$$

Only 8 boys will fit in 2 cars. A third car is needed to transport the 2 remaining boys.

Exercises

Solve. Explain what could be done with the remainders. **Explanation of remainders may vary.**

22. Three brothers were given 37 baseball cards. Each of them was to keep an equal number of the cards. How many cards did each boy receive?
 $37 \div 3 = 12 \text{ r}1; 12 \text{ cards}$
23. Mrs. Hagan planned to have 138 guests at the anniversary party. If each table can seat 8 people, how many tables are needed?
 $138 \div 8 = 17 \text{ r}2; 18 \text{ tables}$
24. How many bags of 2 dozen cookies can be filled from 1,500 cookies?
 $1,500 \div 24 = 62 \text{ r}12; 62 \text{ bags}$

25. The librarian is transferring books to the new bookshelves. She plans to divide 1,892 books equally among 37 shelves. How many books will be on each shelf?
 $1,892 \div 37 = 51 \text{ r}5; 51 \text{ books}$
26. The flower plantation had 380 flowers to plant in 15 rows. How many flowers will be in each row?
 $380 \div 15 = 25 \text{ r}5; 25 \text{ flowers}$
27. There are 1,000 marbles in each box. A store ordered 3 boxes. How many bags of 20 marbles each can be made? **$(1,000 \times 3) \div 20 = 3,000 \div 20 = 150; 150 \text{ bags}$**

Practice & Application

28. Write the number that is 1,000 less than 40,789.
39,789
29. In which place is 4 located in 3,477,609?
Hundred Thousands place
30. Write a multiplication equation for $2,117 + 2,117 + 2,117 + 2,117 = 8,468$.
 $4 \times 2,117 = 8,468$
31. Write three facts for the composite number 36.
Answers may vary. $3 \times 12, 4 \times 9, 6 \times 6$
32. Solve the problem. Remember to solve parentheses first. $(7 \times 8) + (45 \div 3) =$
 $56 + 15 = 71$
33. Write 654.17 in expanded form with multiplication.
 $(6 \times 100) + (5 \times 10) + (4 \times 1) + (1 \times 0.1) + (7 \times 0.01)$
34. Write a word problem about pumpkins for $198 \div 18$. Use the divisor as the number of sets.
Answers will vary.
35. Write the values of the expressions $2 \times 9, 3^2, 2 + (3 \times 3)$, and 2^3 in least to greatest value.
 $2^3 [8], 3^2 [9], 2 + (3 \times 3) [11], 2 \times 9 [18]$
36. Solve each problem and explain why the answer labels are different.
 360 popcorn balls in 20 baskets
 360 popcorn balls with 20 in each basket
 $360 \div 20 = 18 \text{ popcorn balls in each basket}$
 $360 \div 20 = 18 \text{ baskets of popcorn balls}$

DID YOU KNOW

In 1979, meteorologists began naming tropical storms in the Atlantic Ocean with the names of men and women. There are 6 lists with 21 names on each list, a name for each letter of the alphabet, except for Q, U, X, Y, and Z. These lists are rotated every 6 years. The first 4 names on the list for 2011 were Arlene, Bret, Cindy, and Don. In what year will this list be repeated?



Complete **DAILY REVIEW C** on page 411.

Divide a Decimal by a Whole Number

When a whole number is not divisible by the divisor and there is a remainder, you can continue dividing the whole number by annexing a zero to rename the remaining ones as 10 times as many tenths. Annexing zeroes to continue dividing a whole number results in a **decimal quotient**.

decimal quotient
estimate range
quotients less than 1

Sometimes it is more accurate to express the remainder as a *decimal*, and sometimes it is more accurate to express the remainder as a *fraction*.

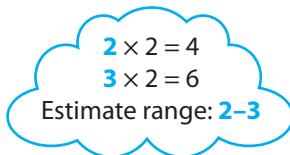
Jack and John are sharing 5 packs of gum. How many packs of gum can each boy have?

$$5 \div 2 = \underline{\quad}$$

$$\begin{array}{r} 2.5 \\ 2) 5.0 \\ -4 \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$



The **estimate range** for both problems is the same.



Each boy will receive 2.5 packs of gum.

$$\begin{array}{r} 2\frac{1}{2} \\ 2) 5 \\ -4 \\ \hline 1 \end{array}$$



Chef Watson has 5 cups of flour. If he divides the flour evenly between 2 bowls, how much will be in each bowl?

$$5 \div 2 = \underline{\quad}$$

There will be $2\frac{1}{2}$ cups of flour in each bowl.

$$41.85 \div 6 = \underline{\quad}$$

$$\begin{array}{l} 6 \times 6 = 36 \\ 7 \times 6 = 42 \\ \text{Estimate range: } 6-7 \end{array}$$

Solve

$$\begin{array}{r} 6.975 \\ 6) 41.850 \\ -36 \\ \hline 58 \\ -54 \\ \hline 45 \\ -42 \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

Check

$$\begin{array}{r} 543 \\ 6.975 \\ \times 6 \\ \hline 41.850 \end{array}$$

Use multiplication to check the answer.

Exercises

Solve. Annex zeros as needed to find a decimal quotient.

1. $\$6 \div 4$
 $\$6.00 \div 4 = \1.50

5. 11.6
 $5) 58.0$

2. $20 \div 8$
 $20.0 \div 8 = 2.5$

6. $2) \$307.00$

3. $25 \div 4$
 $25.00 \div 4 = 6.25$

7. $4) 100.75$

4. $100 \div 8$
 $100.0 \div 8 = 12.5$

8. $8) 5.75$

Write the estimate range.

9. $6) 45$

10. $7) 65$

11. $10) 325$

12. $5) 123$

Solve. Annex zeros as needed.

13. $9) 17.73$

14. $8) 25.568$

15. $4) 47.380$

16. $2) 188.90$

Remember that a division problem can be written in fraction form. You can find the equivalent decimal value of a proper fraction by dividing the numerator by the denominator, annexing zeros as needed. The **quotient** will always be **less than 1**.

$$\begin{array}{r} 0.25 \\ \frac{1}{4} = 1 \div 4 \\ -\underline{8} \\ 20 \\ -\underline{20} \\ 0 \end{array}$$

Exercises

Find the equivalent decimal for the fraction.

17. $\frac{2}{4}$ **0.5**

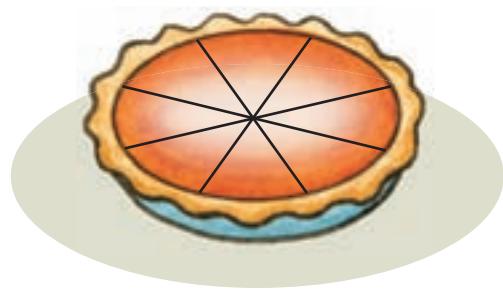
18. $\frac{4}{8}$ **0.5**

19. $\frac{2}{10}$ **0.2**

20. $\frac{1}{8}$ **0.125**

Determine the quotient using estimation. Choose the correct answer. Use multiplication to check your answer.

21.	$17.6 \div 2$	8.8	88.8	0.88
22.	$261.1 \div 5$	52.22	5.222	522.2
23.	$124.92 \div 6$	2.082	208.2	20.82
24.	$84.6 \div 9$	0.94	9.4	94
25.	$734.4 \div 8$	0.918	91.8	9.18
26.	$12.93 \div 3$	4.31	403.1	43.1



Solve. Write the remainder as a fraction.

27. Seventeen candy bars were divided equally among 4 friends. How many candy bars did each friend get?

$17 \div 4 = 4 \frac{1}{4}$ candy bars

Practice & Application

29. One side of a square measures 7 inches. Which expression gives the perimeter of the square?

7^4 7×7 4×7

30. In which number is the value of 9 the same as in 196,342?

900,000 19.634 **90,530**

31. Which two numbers are divisible by 6?

384 **498** 542

32. Choose the product of 100×389 .

3,890 **38,900** 389,000

28. At a dessert station, pies were cut into 8 slices each. Thirty-three slices of pie were served. How many pies were eaten?

$33 \div 8 = 4 \frac{1}{8}$ pies

33. Choose the estimated sum of 63,095 and 29,486 using front-end estimation.

82,000 **92,000** 102,000

34. Write two related multiplication equations and two related division equations for the part-whole model.

186		
62	62	62

$$\begin{aligned} 3 \times 62 &= 186 \\ 62 \times 3 &= 186 \\ 186 \div 62 &= 3 \\ 186 \div 3 &= 62 \end{aligned}$$

Complete **DAILY REVIEW** d on page 411.

Divide a Decimal by 2-Digit Divisors

An **average** is found by adding two or more quantities in a set and then dividing that total by the number of addends. Sometimes the total is given and only the division step is necessary.

When a number is not divisible by the divisor, you can continue dividing by annexing zeros in the dividend and **rounding the quotient** to a given place. The symbol \approx means “**is approximately equal to**” and is used to show that the quotient was rounded.

average
rounding the quotient
 \approx “is approximately equal to”

Mom bought a tin of popcorn on sale. The sale price was 2 tins for \$10.25. How much did she pay for one tin of popcorn if the price was rounded to the nearest hundredth?

$$\$10.25 \div 2 \approx \$5.13$$

$$\begin{array}{r} \$5.125 \\ 2) \$10.250 \\ -10 \\ \hline 02 \\ -2 \\ \hline 05 \\ -4 \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$

Joel made a 35-yard field goal, a 28-yard field goal, and a 41-yard field goal at the Friday night football game. Round to the nearest tenth of a yard to find his average field goal length for the game.

$$104 \div 3 \approx 34.7 \text{ yd}$$

$$\begin{array}{r} 34.66 \\ 3) 104.00 \\ -9 \\ \hline 14 \\ -12 \\ \hline 20 \\ -18 \\ \hline 20 \\ -18 \\ \hline 2 \end{array}$$

It took 16 gallons to fill up the gas tank in Dad’s truck. The cost of the gas was \$51.92. Round to the nearest hundredth to find the price of each gallon of gas.

$$\$51.92 \div 16 \approx \$3.25$$

$$\begin{array}{r} \$3.245 \\ 16) \$51.920 \\ -48 \\ \hline 39 \\ -32 \\ \hline 72 \\ -64 \\ \hline 80 \\ -80 \\ \hline 0 \end{array}$$

Exercises

Solve. Round to the nearest hundredth.

- | | | | | | | | | | |
|------------------------|----------------------|------------------------|------------------------|------------------------|--------------------------|--------------------------|--------------------------|------------------|--------------------------|
| 1. $7) 100.000$ | 2. $37) 60.000$ | 3. $18) 244.000$ | 4. $23) 456.000$ | 5. $19) 864.000$ | 6. $4) \$4.250$ | 7. $17) \$61.300$ | 8. $37) \$34.180$ | 9. $13) \$11.05$ | 10. $40) \$79.350$ |
| $14.285 \approx 14.29$ | $1.621 \approx 1.62$ | $13.555 \approx 13.56$ | $19.826 \approx 19.83$ | $45.473 \approx 45.47$ | $\$1.062 \approx \1.06 | $\$3.605 \approx \3.61 | $\$0.923 \approx \0.92 | $\$0.85$ | $\$1.983 \approx \1.98 |

Solve.

11. Lydia planted 18 seeds in a planter. The planter was 64 centimeters long. If the seeds were equally spaced, how far apart were the seeds placed? Round to the nearest tenth for the answer.

$$64 \div 18 = 3.55; 3.6 \text{ cm}$$

12. It takes 4 yards of fabric to make each angel robe for the Christmas program. How many robes can be made from 39 yards of fabric?

$$39 \div 4 = 9.75; 9 \text{ robes}$$

13. Ava bought a package of 4 batteries for \$2.36. Ethan bought a package of 2 batteries for \$1.48. Find the cost of 1 battery in each package to determine which package is the better buy.

$$\$2.36 \div 4 = \$0.59; \$1.48 \div 2 = \$0.74; \text{The 4-battery pack is the better buy.}$$

14. There are 40 questions on the math review sheet Mr. Watts gave his class. The review is worth 100 points. How many points is each question worth?

$$100 \div 40 = 2.5 \text{ points each}$$

15. Use the answer for problem 14 to answer this question. What would Jacob’s score be if he missed three questions on the math review sheet?

$$3 \times 2.5 = 7.5; 100 - 7.5 = 92.5$$

16. The camera shop had a sale on digital cameras. The sale prices on three different cameras were \$121.95, \$132, and \$149.99. To the nearest hundredth, what was the average cost of the cameras?

$$\begin{aligned} &\$121.95 + \$132.00 + \$149.99 \\ &= \$403.94; \$403.94 \div 3 = \$134.646; \\ &\$134.65 \end{aligned}$$

Write the estimate range.

17. $2 \overline{)93}$ **40–50**

18. $18 \overline{)244}$ **10–20**

19. $34 \overline{)1,789}$ **50–60**

20. $56 \overline{)619}$ **10–20**

Write a division equation to find the missing factor. Solve.

21. $n \times 84 = 420$
 $420 \div 84 = 5$

22. $55 \times n = 605$
 $605 \div 55 = 11$

23. $3,408 = 16 \times n$
 $3,408 \div 16 = 213$

24. $264 = n \times 11$
 $264 \div 11 = 24$

Solve. Annex zeros as needed to find a decimal quotient.

25. $\frac{357}{7} \text{ } 51$

28. $12.3 \div 82 \text{ } 0.15$

31. $16 \overline{)240.560}$
15.035

26. $\frac{624}{12} \text{ } 52$

29. $2,925 \div 18 \text{ } 162.5$

32. $11 \overline{)1,782}$
162
\$39.13

27. $\frac{186}{4} \text{ } 46.5$

30. $390 \div 40 \text{ } 9.75$

33. $3 \overline{)117.39}$

Solve.

34. Pencils come in different bulk amounts.

yellow pencils	520
tie-dye pencils	540
rain forest pencils	560

Which pencils could the principal order and divide evenly among 6 classes?

tie-dye; $540 \div 6 = 90$ pencils

35. If the principal ordered one bulk amount of each kind of pencil, how many pencils would each of the 6 classes receive? **$520 + 540 + 560 = 1,620$; $1,620 \div 6 = 270$ pencils**

Practice & Application

38. Write 1,309,400 in expanded form.

$1,000,000 + 300,000 + 9,000 + 400$

39. Use the Distributive Property to solve 17×30 .

$(10 \times 30) + (7 \times 30) = 300 + 210 = 510$

40. Write the value of 8^3 .

$8 \times 8 \times 8 = 512$

41. How many zeros are in the standard form of 10^6 ?

Write the standard form. **6; 1,000,000**

42. Write *thirty and seven hundredths* in standard form. **30.07**

43. List the numbers that 1,396 is divisible by: 2, 3, 4, 5, or 6. **2 and 4**

36. Find the average number of square miles in the three smallest states. Round to the nearest tenth of a mile.

Rhode Island	1,213 square miles
Delaware	2,026 square miles
Connecticut	5,006 square miles

37. Does Connecticut have more or fewer square miles than Rhode Island and Delaware combined? **$1,213 + 2,026 = 3,239$; $5,006 - 3,239 = 1,767$ square miles more**

44. Complete the division problem by filling in the boxes. Hint: When the divisor is multiplied by the first digit of the quotient, it equals a 3-digit number. When the divisor is multiplied by the 8 in the quotient, it equals a 2-digit number.

$$\begin{array}{r} 9\ 0, 8\ 0\ 9 \\ 1\ 2) 1, 0\ 8\ 9, 7\ 0\ 8 \\ \underline{-1\ 0\ 8} \\ 9\ 7 \\ 9\ 6 \\ \underline{-1\ 0\ 8} \\ 1\ 0\ 8 \\ 1\ 0\ 8 \\ \underline{0} \end{array}$$

36. **$1,213 + 2,026 + 5,006 = 8,245$; $8,245 \div 3 = 2,748.3$ square miles**

Complete **DAILY REVIEW** e on page 412.

Divide by a Power of 10

When dividing a whole number or a decimal by 10, the movement of the decimal point one place to the left renames each digit to the next lesser place, thereby making the quotient $\frac{1}{10}$ of the value of the dividend.

power of 10
estimate the quotient

$$\begin{array}{r} 5 \\ 10 \overline{)50} \end{array}$$

Think 50.

$$\begin{array}{r} 4.12 \\ 10 \overline{)41.20} \end{array}$$

Think 41.2

$$\begin{array}{r} 0.06 \\ 10 \overline{)0.60} \end{array}$$

Think 00.6

$$50 \div 10 = 5$$

$$41.2 \div 10 = 4.12$$

$$0.6 \div 10 = 0.06$$

When dividing by a **power of 10**, move the decimal point one place to the left for each zero in the divisor. Annex zeros as needed.

$$397 \div 10 = 39.7$$

Think 397.

$$397 \div 100 = 3.97$$

Think 397.

$$397 \div 1,000 = 0.397$$

Think 0397.

$$37.51 \div 10 = 3.751$$

Think 37.51

$$37.51 \div 100 = 0.3751$$

Think 037.51

$$37.51 \div 1,000 = 0.03751$$

Think 0037.51

Exercises

Use mental math to solve.

1. $387 \div 10 = 38.7$
2. $42.71 \div 100 = 0.4271$
3. $16.81 \div 10 = 1.681$
4. $21.6 \div 100 = 0.216$
5. $32,581 \div 1,000 = 32.581$
6. $37.04 \div 10 = 3.704$
7. $18 \div 100 = 0.18$
8. $46.21 \div 1,000 = 0.04621$

Solve. Annex zeros as needed.

$$\begin{array}{r} 3.25 \\ 9 \overline{)39.75} \end{array}$$

$$\begin{array}{r} 1.218 \\ 5 \overline{)6.090} \end{array}$$

$$\begin{array}{r} 1.28 \\ 6 \overline{)7.68} \end{array}$$

$$\begin{array}{r} 6.125 \\ 4 \overline{)24.500} \end{array}$$

$$\begin{array}{r} 0.097 \\ 80 \overline{)7.760} \end{array}$$

$$\begin{array}{r} 0.409 \\ 30 \overline{)12.270} \end{array}$$

$$\begin{array}{r} 106.7 \\ 5 \overline{)533.5} \end{array}$$

$$\begin{array}{r} \$4.10 \\ 4 \overline{\$16.40} \end{array}$$

$$\begin{array}{r} \$2.51 \\ 25 \overline{\$62.75} \end{array}$$

Solve.

18. If an average of 1.97 inches of rain fell each hour during a 4-hour storm, what was the total amount of rain?

$$4 \times 1.97 = 7.88 \text{ in.}$$

19. After the blizzard, the meteorologist reported that 18.9 inches of snow fell during 9 hours. What was the average hourly snowfall?

$$18.9 \div 9 = 2.1 \text{ in.}$$



God is our refuge and strength, a very present help in trouble. Therefore will not we fear, though the earth be removed, and though the mountains be carried into the midst of the sea.

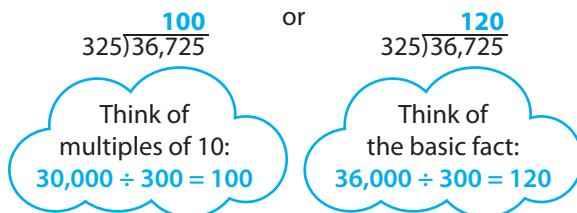
Psalm 46:1-2

A man taking a census counted 325 people each day for a total of 36,725 people. How many days did he work on the census?

Round the divisor to the nearest hundred. Determine the number of digits in the quotient.

$$\begin{array}{r} 300 \quad \text{xxx} \\ 325)36,725 \end{array}$$

Use compatible numbers to **estimate the quotient**.



Solve.

$$\begin{array}{r} 113 \\ 325)36,725 \\ -325 \\ \hline 422 \\ -325 \\ \hline 975 \\ -975 \\ \hline 0 \end{array}$$

Exercises

Round the divisor. Choose the best estimate.

20. $\begin{array}{r} 4 \quad 40 \quad 400 \\ 180)800 \end{array}$

21. $\begin{array}{r} 100 \quad 1,000 \quad 10,000 \\ 522)71,520 \end{array}$

22. $\begin{array}{r} 4 \quad 40 \quad 400 \\ 257)12,120 \end{array}$

23. $\begin{array}{r} 3 \quad 30 \quad 300 \\ 240)6,240 \end{array}$

24. $\begin{array}{r} 10 \quad 100 \quad 1,000 \\ 47)89,063 \end{array}$

25. $\begin{array}{r} 0.02 \quad 0.2 \quad 2 \\ 27)7.75 \end{array}$

Solve. Round decimal quotients to the nearest hundredth.

26. $14 \\ 682)9,548$

27. $0.232 \approx 0.23 \\ 112)26.090$

28. $2.017 \approx 2.02 \\ 180)363.140$

Write a division equation to find the missing factor.

Use multiplication to check your answer.

29. $174 \times n = 2,784$
 $2,784 \div 174 = 16$

30. $n \times 283 = 24,621$
 $24,621 \div 283 = 87$

31. $364 \times n = 37,492$
 $37,492 \div 364 = 103$

Practice & Application

32. $318.9 + 34.06 + 173.008 = \mathbf{525.968}$

36. $(30 \times 20) + (9 \times 30) = \mathbf{870}$

33. $4 \times 160.08 = \mathbf{640.32}$

37. $(17 + 13) + 1,000 = \mathbf{1,030}$

34. $40,000 - 7,950 = \mathbf{32,050}$

38. $12^2 = \mathbf{144}$

35. $16,794 \div 18 = \mathbf{933}$

39. Complete the pattern: **$2, 4, 8, 16, 32$**

J Explain how front-end estimation was used to find an approximate answer in each problem.

$$\begin{array}{r} 39,486 \\ + 19,593 \\ \hline 58,000 \end{array}$$

$$\begin{array}{r} 873,499 \\ - 399,877 \\ \hline 480,000 \end{array}$$

$$\begin{array}{r} 3,728 \\ \times \quad 5 \\ \hline 18,500 \end{array}$$

$$\begin{array}{r} 2,000 \\ 12)25,983 \\ -24 \\ \hline 198 \\ -192 \\ \hline 63 \\ -60 \\ \hline 3 \end{array}$$

Complete **DAILY REVIEW f** on page 412.

Order of Operations

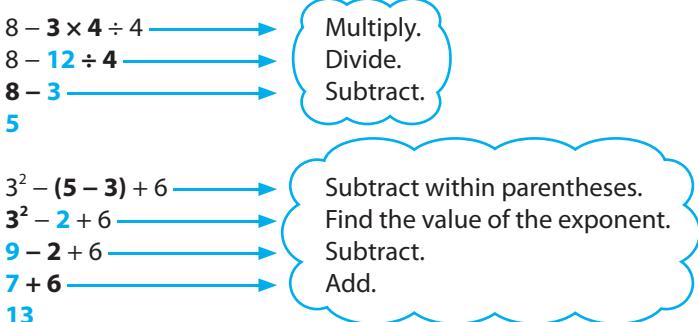
In mathematics there are four operations: addition, subtraction, multiplication, and division. When **simplifying an expression** that contains more than one operation, a process called the **Order of Operations** is used.

**simplifying an expression
Order of Operations**

Order of Operations

1. Do operations in parentheses.
2. Find the value of exponents.
3. Multiply and divide from left to right.
4. Add and subtract from left to right.

To simplify an expression, analyze it and use the necessary steps.



Chapters of the American Red Cross have provided medical care, food, and shelter during countless disasters since 1881.

This sentence can help you remember the order of operations.

Please Excuse My Dear Aunt Sally.
P Parentheses E Exponents M Multiplication D Division A Addition S Subtraction

Exercises

Simplify. Indicate the steps used.

1. $4 + 12 \div 4$ **7**
divide; add

Choose the correct solution.

5. $(7 + 4) \times 5 - 3$

Solution A

$$\begin{aligned}(7 + 4) \times 5 - 3 \\ 11 \times 5 - 3 \\ 11 \times 2 \\ 22\end{aligned}$$

Solution B

$$\begin{aligned}(7 + 4) \times 5 - 3 \\ 7 + 20 - 3 \\ 27 - 3 \\ 24\end{aligned}$$

Solution C

$$\begin{aligned}(7 + 4) \times 5 - 3 \\ 11 \times 5 - 3 \\ 55 - 3 \\ 52\end{aligned}$$

6. $6 - 3 + 5^2$

Solution A

$$\begin{aligned}6 - 3 + 5^2 \\ 3 + 5^2 \\ 3 + 10 \\ 13\end{aligned}$$

Solution B

$$\begin{aligned}6 - 3 + 5^2 \\ 6 - 3 + 25 \\ 3 + 25 \\ 28\end{aligned}$$

Solution C

$$\begin{aligned}6 - 3 + 5^2 \\ 3 + 5^2 \\ 8^2 \\ 64\end{aligned}$$

Simplify.

7. $5 \times (6 + 3)$ **45**

8. $6 \times (18 \div 3) + 4$ **40**

9. $28 + 14 \div 7$ **30**

10. $(20 - 4) \div 2 \times 8$ **64**

11. 6×2^3 **48**

12. $36 - 12 \div 3$ **32**

13. $15 - 5 + 16$ **26**

14. $37 - 4 \times 3 \div 2$ **31**

When more than one operation is in parentheses, follow the order of operations within the parentheses.

$$\begin{aligned}(3 + 7 \times 2) - 6 &\rightarrow \\(3 + 14) - 6 &\rightarrow \\17 - 6 &\rightarrow \\11\end{aligned}$$

Multiply.
Add.
Subtract.

When an exponent is outside parentheses, solve the operation in parentheses first and then find the value of the exponent.

$$\begin{aligned}3 \times (5 - 3)^3 \div 4 &\rightarrow \\3 \times 2^3 \div 4 &\rightarrow \\3 \times 8 \div 4 &\rightarrow \\24 \div 4 &\rightarrow \\6\end{aligned}$$

Subtract within parentheses.
Find the value of the exponent.
Multiply.
Divide.

Exercises

Simplify.

15. $48 \div (2 + 2 \times 2)$ **8** 16. $(25 - 15)^3 \times 8$ **8,000** 17. $4 - 3 + 8 + 3^2$ **18** 18. $5 + 12 \div (2 + 4 - 2)$ **8**
19. $(7 - 4)^2 \times 7$ **63** 20. $2,500 \div 10^2$ **25** 21. $(75 - 70)^2$ **25** 22. $7 + 10 - (18 + 12) \div 5$ **11**

Insert parentheses to make the equation true.

23. $5 - (3 - 1) = 3$ 24. $10 - 24 \div (6 + 2) = 7$ 25. $8 \times (8 + 2) + 5 = 85$ 26. $17 - (4 \times 2) = 9$

Practice & Application

27. Estimate the quotient for $\$324.08 \div 8$. Explain your estimate. **Estimates may vary.**
28. Write three numbers that are divisible by 2, 4, 8, and 10. **Answers will vary but will be multiples of 40.**
29. If there are 725 cots in rows of 25 at the shelter, how many rows of cots are there? **29 rows**
30. Write the value of $4 \cdot 8 + 8 \cdot 7$. **88**
31. If 3,874 is divided into 100 groups, how many are in each group? **38.74**
32. What is the value of $(4 \times 10^4) + (6 \times 10^3) + (8 \times 10^2) + (1 \times 10^1) + (3 \times 10^0)$? **46,813**
33. What is the value of $(n + m) \times p^2$, if $n = 3$, $m = 7$, and $p = 7$? **490**
34. Write a three-step expression that is equal to the value of 75. **Answers will vary;
possible answer: $25 + 10 \times 15 \div 3$.**
35. Write a four-step expression that equals 100. Use one exponent. **Answers will vary;
possible answer: $22 \div 2 \times 3^2 + 1$.**



The American Red Cross encourages people to plan for disasters by having an emergency kit and emergency plan.

Complete **DAILY REVIEW** **g** on page 413.

Multi-Step Problems

The **Order of Operations** demands that the parts of an equation be solved in a specific order; however, often a multi-step problem can have more than one correct equation. The Order of Operations can help you write a correct equation.

A church receives a donation of 100 blankets from a local store. There are 125 blankets in storage that were donated by the church congregation. The church will distribute the blankets evenly among 25 local shelters. How many blankets will each shelter receive?

Order of Operations

1. Do operations in parentheses.
2. Find the value of **exponents**.
3. Multiply and divide from left to right.
4. Add and subtract from left to right.

$$(100 + 125) \div 25 = 225 \div 25 = 9 \text{ blankets}$$

Seth added before dividing, so the addition must be in parentheses.

$$100 \div 25 + 125 \div 25 = 4 + 5 = 9 \text{ blankets}$$

Gianna divided before adding, so no parentheses were needed.

Seth's and Gianna's equations show different ways to solve the same problem.

The Order of Operations allowed them both to write a correct equation.

Exercises

Choose two possible equations. Solve.

1. Aiden will give the 16 disaster victims 3 bottles of water each. There are 12 bottles of water in a package. How many packages will he need?

$$16 \times 3 \div 12 = \underline{\hspace{2cm}}$$

4 packages

$$12 \div 3 + 16 = \underline{\hspace{2cm}}$$

$$(16 \times 3) \div 12 = \underline{\hspace{2cm}}$$

3. Anna earns \$8.00 per hour for baby-sitting. She earns \$5.00 per hour for pet-sitting. If she baby-sat for 4 hours last week and cat-sat for 8 hours, how much did she earn? **\$72.00**

$$(4 \times \$8.00) + (8 \times \$5.00) = \underline{\hspace{2cm}}$$

$$8 \times \$5.00 + 4 \times \$8.00 = \underline{\hspace{2cm}}$$

$$12 \times \$8.00 + \$5.00 = \underline{\hspace{2cm}}$$

Solve. Write one equation for the word problem.

4. The coastal resort saves \$100 per month for new safety and rescue equipment. They have \$600 saved so far. How many more months will they need to save for a four-person raft priced at \$1,364.00?
 $(\$1,364 - \$600) \div \$100 = 7.64 \text{ months} \approx 8 \text{ months; equations may vary but must show the order of operations.}$



Clean drinking water was needed in Haiti after the 2010 earthquake.

Simplify.

5. $5 + 3 \times (6 + 4)$ **35**

8. $24 - 8 \div 4 \times 2$ **20**

11. $10 + 3 \times 8 - 1$ **33**

6. $8 \times 2^2 + 6$ **38**

9. $8 + 8 + 2 \times 4^2$ **48**

12. $12 - 4 \div 2 + 5$ **15**

7. $5 + 4 \times 6$ **29**

10. $(30 - 6) \div 8 + 5^2$ **28**

13. $(9 \times 6) - 2^2 + 6$ **56**

Solve. Write one equation for the word problem.

14. A school lunch ticket costs \$3.75. How much does it cost to eat lunch Monday through Friday?
 $\$3.75 \times 5 = \18.75

15. Miss Robbins needs a border for a bulletin board that has a length of 90 centimeters and a width of 75 centimeters. How many centimeters of border does she need? **$(2 \times 90) + (2 \times 75) = 330 \text{ cm}$**

16. Carlos bought three 8-ounce packages of cheese for a total of \$5.25 including tax. He gave the cashier a ten-dollar bill. How much change did he receive? **$\$10.00 - \$5.25 = \$4.75$**

17. Mike's library had 87 books. He received two new Bible commentary sets with 12 books each. How many books does he now have?

$87 + (2 \times 12) = 111 \text{ books}$

18. Lily's math test scores are 100, 88, 92, and 84. What is her average test score?

$(100 + 88 + 92 + 84) = 364; 364 \div 4 = 91$

19. The restaurant has 16 tables. Each table seats 12 people. Are there enough seats for the 207 people attending a brunch? **no; $16 \times 12 = 192$**

Practice & Application

20. Write a nine-digit number that is *less than* 300,000,000.

Answers will vary.

21. One dozen eggs cost \$1.68. How much is each egg?

$\$1.68 \div 12 = \0.14

22. Complete the pattern: __, __, 18, 24, 30, 36. **6; 12**

23. $4.78 + 27.6 + 18$ **50.38**

24. Write the product of 14 and 20. **280**

25. $0.7 \div 5$ **0.14**

26. Write the three equations related to $1,800 \div 200 = 9$.

$1,800 \div 9 = 200; 200 \times 9 = 1,800; 9 \times 200 = 1,800$



Choose two operations (+, -, ×, ÷) and the three given numbers to write an expression equal to 24. **Answers may vary.**

27.

12 4 2

$12 \div 2 \times 4$

28.

2 18 12

$2 \times 18 - 12$

29.

7 5 2

$(7 + 5) \times 2$

30.

2 17 10

$2 \times 17 - 10$

CHAPTER 3 REVIEW

Identify the parts of the division equation: **divisor**, **dividend**, and **quotient**.

1. 54 **quotient**

2. 486 **dividend**

3. 9 **divisor**

$$\begin{array}{r} 54 \\ 9 \overline{)486} \end{array}$$

Solve the division fact.

4. $35 \div 7$ **5**

7. $\frac{48}{6}$ **8**

10. $42 \div 7$ **6**

5. $\frac{8}{2}$ **4**

8. $16 \div 2$ **8**

11. $\frac{20}{4}$ **5**

6. $81 \div 9$ **9**

9. $\frac{10}{5}$ **2**

12. $21 \div 3$ **7**

Solve.

13. $8\overline{)272}$ **34**

14. $3\overline{)762}$ **254**

15. $7\overline{)553}$ **79**

16. $9\overline{)387}$ **43**

17. $2\overline{)758}$ **379**

Use mental math to solve.

18. $500 \div 50$ **10**

19. $60,000 \div 20$
3,000

20. $4,300 \div 100$ **43**

21. $72.16 \div 10$
7.216

22. $86.2 \div 1,000$
0.0862



Write the estimate range.

23. $21 \overline{)189}$ **9–10**

24. $48 \overline{)1,152}$ **20–30**

25. $73 \overline{)2,263}$ **30–40**

26. $29 \overline{)1,856}$ **60–70**

27. $62 \overline{)930}$ **10–20**

Solve.

28. $8 \overline{)0.96}$ **0.12**

29. $3 \overline{)1.746}$ **0.582**

30. $8 \overline{)45.12}$ **5.64**

Find the equivalent decimal for the fraction.

31. $\frac{1}{4}$ **0.25**

32. $\frac{1}{5}$ **0.2**

Solve.

33. An aluminum canoe can hold up to 3 people plus equipment. How many canoes are needed for 125 campers? **$125 \div 3 = 41 \text{ r}2; 42 \text{ canoes}$**

34. The trip to the skydiving drop zone costs \$170. If 4 people share the cost of the trip, how much will each person pay? **$\$170.00 \div 4 = \42.50**

35. The school sold 181 tickets for Friday night's program and 215 tickets for Saturday night's program. How many more tickets were sold for Saturday than Friday? **$215 - 181 = 34 \text{ tickets}$**

36. Samantha bought 15 yards of fabric to make curtains for 3 windows. If she uses the same amount of fabric for each window curtain, how much fabric does she have for each?

$15 \text{ yd} \div 3 = 5 \text{ yd}$

Follow the Order of Operations to find the answer.

41. $3 + 8 \times 7$ **59**

42. $(6 \times 9) \div 3$ **18**

43. $18 - 15 \div 3$ **13**

44. $24 \div 4 \times 2$ **12**

45. $(8 + 12) \times 5$ **100**

Solve.

46. $53 \overline{)1,771}$ **33 r22**

47. $574 \overline{)13,202}$ **23**

48. $175 \overline{)4,375}$ **25**

Solve. Annex zeros as needed to find a decimal quotient.

49. $4 \overline{)175.00}$ **43.75**

50. $75 \overline{)864.00}$ **11.52**

51. $80 \overline{)9,612.00}$ **120.15**

CUMULATIVE REVIEW

Test Prep

Mark the answer.

1. $7,000 \times 6 = \underline{\hspace{2cm}}$
 A. 42,000 C. 48,000
 B. 46,000 D. none of the above

2. $11 \times 4 \times 15 = \underline{\hspace{2cm}}$
 A. 460 C. 860
 B. 660 D. none of the above

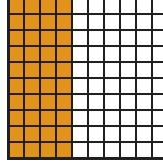
3. $6 \times 6 \times 6 \times 6 = \underline{\hspace{2cm}}$
 A. 6^6 C. 6^4
 B. 6^5 D. none of the above

4. The greatest common factor of 15 and 36 is ____.
 A. 2 C. 64
 B. 3 D. 5

5. The least common multiple of 18 and 45 is ____.
 A. 90 C. 870
 B. 3 D. 9

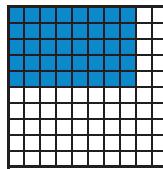
Mark the matching expression.

6. $7^3 = \underline{\hspace{2cm}}$
 A. $3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$
 B. 7×3
 C. $7 \times 7 \times 7$

7. 

 A. 10^4
 B. 10×4
 C. $5 \times 3 \times 4$

8. 
 A. $3 \times 3 = 9$
 B. $5 \times 3 = 15$
 C. $3 \times 5 = 15$

9. 
 A. $40 \div 4$
 B. 10^4
 C. $40 \div 5$

10.

40			
10	10	10	10

 A. $40 \div 4$
 B. 40×4
 C. 10×40

Mark the answer.

11. The value of 3 in 92.473 is ____.

- A. 0.00003 C. 3 thousandths
B. $\frac{3}{100,000}$ D. none of the above

12. sixty-two and seven thousand, one hundred forty-five ten thousandths

- A. 6.2718 C. 62.7145
B. 627.145 D. none of the above

13. 423,294 ○ 423.294

- A. >
B. <
C. =

14. 81,474 ○ 81,431

- A. >
B. <
C. =

15. Which numbers are listed from *least* to *greatest*?

- A. 9.8457 8,241 78,463 19,436
B. 19,436 78,463 8,241 9.8457
C. 9.8457 8,241 19,436 78,463

16. $\frac{2}{5} = \underline{\hspace{1cm}}$

- A. 0.40
B. 0.25
C. 1.25

17. $\$97.36 \div 4 = \underline{\hspace{1cm}}$

- A. \$2.07
B. \$21.17
C. \$24.34

18. $64 \div (6 + 2) + 3 = \underline{\hspace{1cm}}$

- A. 6
B. 8
C. 11

Josh has 375 toy soldiers.

19. If Josh puts the toy soldiers into 25 platoons, how many soldiers will be in each platoon?

- A. 6
B. 15
C. 75

20. If Josh puts the toy soldiers into squads of 5, how many squads will be made?

- A. 79
B. 75
C. 750

Use the data from the line graph to find the answer.



21. How many years of project costs are recorded?

- A. 8
- B. 11
- C. 7

22. What was the project cost for 2008?

- A. \$11,000
- B. \$14,000
- C. \$13,000

23. What is the range of the costs of the projects?

- A. \$12,000
- B. \$14,000
- C. \$30,000

24. Choose the statement that is true about the project costs from 2008–2011.

- A. a two-year increase and a two-year decrease
- B. a three-year decrease
- C. a two-year increase and a one-year decrease

25. What is the average project cost for 2006 and 2007?

- A. \$19,200
- B. \$18,200
- C. \$19,500

Greatest Common Factor

When two or more composite numbers have a factor or factors that are the same, each shared factor is called a **common factor**. The **greatest common factor (GCF)** is the greatest factor common to these numbers. The greatest common factor can be found by **listing factors** of each number.

List the Factors

28: $1 \times 28, 2 \times 14, 4 \times 7$

40: $1 \times 40, 2 \times 20, 4 \times 10, 5 \times 8$

28: **1, 2, 4, 7, 14, 28**

40: **1, 2, 4, 5, 8, 10, 20, 40**

common factors of **28** and **40**: **1, 2, 4**

greatest common factor of **28** and **40**: **4**

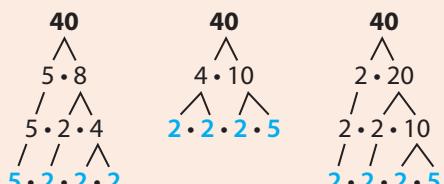
common factor
greatest common factor (GCF)
listing factors
prime factors
factor tree
prime factorization

A composite number can be expressed as the product of a set of **prime factors**. A **factor tree** can be used to find the **prime factorization** of a composite number.

1. Write the number to be factored at the top.
2. Choose any pair of factors.
3. Continue to factor any composite number until all factors are prime.

Every number has only one set of prime factors.

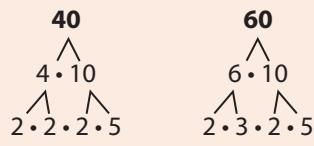
Ways to Factor 40



$$40 = 2 \cdot 2 \cdot 2 \cdot 5$$

Prime factorization can be used to find the greatest common factor (GCF) of two numbers.

1. List the prime factors of each number in ascending order.
2. Select the factors that are common to both lists.
3. Multiply the common factors.



$$\begin{aligned}40: & 2 \cdot 2 \cdot 2 \cdot 5 \\60: & 2 \cdot 2 \cdot 3 \cdot 5\end{aligned}$$

$$\text{GCF of } 40 \text{ and } 60: 2 \cdot 2 \cdot 5 = 20$$

The prime factors of a number can be grouped to show all of the factor pairs or factors of that number.

Prime factors of 40:

$$40 = 2 \cdot 2 \cdot 2 \cdot 5$$

Factors of 40:

$$1, 2, 4, 5, 8, 10, 20, 40$$

$$\begin{aligned}1 \times (2 \times 2 \times 2 \times 5) &= 1 \times 40 \\2 \times (2 \times 2 \times 5) &= 2 \times 20 \\(2 \times 2) \times (2 \times 5) &= 4 \times 10 \\(2 \times 2 \times 2) \times 5 &= 8 \times 5\end{aligned}$$

1 × the prime factorization of a number equals the number.

6. **48:** **1, 2, 3, 4, 6, 8, 12, 16, 24, 48**
72: **1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72**

Exercises

Find the greatest common factor (GCF) by listing the factors of each number.

1. 18 and 24 **GCF: 6**

$$18: 1, 2, 3, 6, 9, 18$$

$$24: 1, 2, 3, 4, 6, 8, 12, 24$$

2. 12 and 20 **GCF: 4**

$$12: 1, 2, 3, 4, 6, 12$$

$$20: 1, 2, 4, 5, 10, 20$$

3. 28 and 42 **GCF: 14**

$$28: 1, 2, 4, 7, 14, 28$$

$$42: 1, 2, 3, 6, 7, 14, 21, 42$$

4. 12 and 21 **GCF: 3**

$$12: 1, 2, 3, 4, 6, 12$$

$$21: 1, 3, 7, 21$$

5. 27 and 54 **GCF: 27**

$$27: 1, 3, 9, 27$$

$$54: 1, 2, 3, 6, 9, 18, 27, 54$$

6. 48 and 72 **GCF: 24**

Use the numbers in the box to complete the statement.

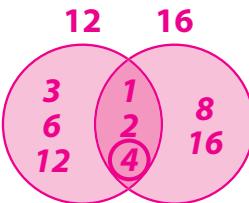
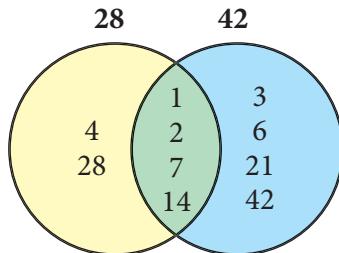
7. The factors 2, 4, and 6 are common factors of 12 and 36
8. The factors 3, 6, and 9 are common factors of 18 and 36
9. The numbers 16 and 24 share the common factors 4 and 8

4 and 8
12 and 36
18 and 36

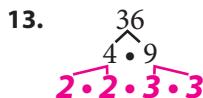
Write the answer.

10. Use the Venn diagram to list the factors of 28 and 42.
Circle the greatest common factor in the list.
28: 1, 2, 4, 7, 14 **28; 42: 1, 2, 3, 6, 7, 14, 21, 42**
11. Create a Venn diagram for the factors of 12 and 16.
Circle the greatest common factor in the diagram.
12: 1, 2, 3, 4, 6, 12
16: 1, 2, 4, 8, 16

Factors of 28 and 42



Complete the factor tree.



Write the answer using the completed factor trees above.

16. Group the prime factors to list facts of 24. **$2 \times 12, 3 \times 8, 4 \times 6$**

17. Group the prime factors to list facts of 36. **$2 \times 18, 3 \times 12, 4 \times 9$**

18. Find the GCF of 24 and 36. **12; $2 \times 2 \times 3$**

19. Explain the difference between a prime number and a composite number.

19. A prime number is greater than 1 and has only 2 different factors—itself and 1; a composite number is greater than 1 and has more than 2 factors.

Practice & Application

20. How many partial products does the problem 12×18 have? What is the product? **2; 216**

21. Estimate the product of 396×420 .

160,000

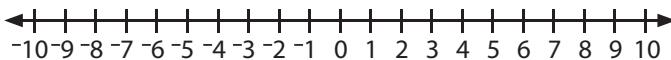
22. Estimate the quotient of $1,584 \div 17$. Round the dividend and the divisor to show compatible numbers.

$1,600 \div 20 = 80$

23. How are the numbers 4 and 16 related?

24. What is the value of the Ten Thousands place when 146 is multiplied by 100? **$100 \times 146 = 14,600$; 10,000**

Use the number line to find the answer.

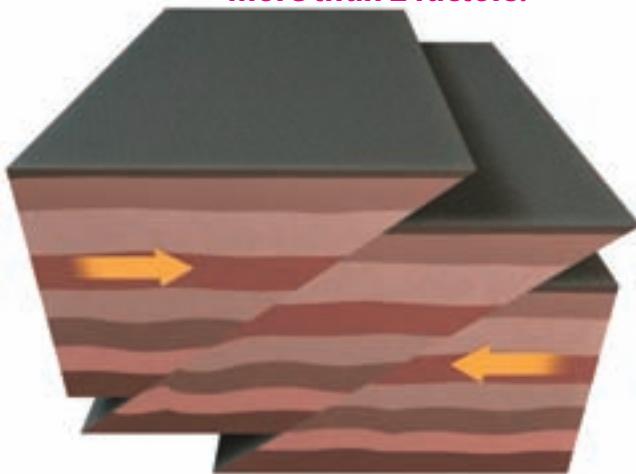


25. $8 + -5 =$ **3**

26. $-3 + 7 =$ **4**

27. $-2 + -8 =$ **-10**

28. $3 + -4 =$ **-1**



A tsunami can result from an earthquake that occurs under the ocean. The effect of one tectonic plate shifting under another causes tons of water to move in giant waves.

23. Both are divisible by 4; 4 is a factor of 16; 16 is a multiple of 4; 4 is $\frac{1}{4}$ of 16.

Complete **DAILY REVIEW** a on page 414.

Least Common Multiple

There are an infinite number of multiples for any given number. A **multiple** is the product of two whole numbers. A **common multiple** of two numbers can always be found by multiplying the two numbers together.

A common multiple of 6 and 9 is **54** because $6 \times 9 = 54$.

The following list shows the nonzero multiples of 6 and 9 *less than 54*.

6: 6, 12, 18, 24, 30, 36, 42, 48

9: 9, 18, 27, 36, 45

The common multiples of 6 and 9 are **18** and **36**.

The **least common multiple (LCM)** of 6 and 9 is **18**.

multiple
common multiple
least common multiple (LCM)
prime factorization with exponents

The LCM of any two numbers is *equal to or greater than* the greater number.

When the greater number is a multiple of the lesser number, the LCM is *equal to* the greater number.

12: 12, **24**, 36, 48, 60, 72

24: **24**, 48, 72, 96

24 is a multiple of 12; the LCM of 12 and 24 is **24**.

When the greater number is *not* a multiple of the lesser number and the two numbers share a common factor, the LCM is *greater than* the greater number and *less than* the product of the two numbers.

12: 12, 24, **36**, 48, 60, 72

18: 18, **36**, 54, 72

18 is not a multiple of 12, but 12 and 18 share the common factor 3; the LCM is *greater than* 18 and *less than* the product of 12×18 (216); the LCM of 12 and 18 is **36**.

Methods for Finding the Least Common Multiple

For smaller numbers or numbers that are easy to count by, list the multiples. (*Hint:* List multiples for the greater number first until you list a number that is also a multiple of the lesser number.)

20: 20, 40, 60

15: 15, 30, 45, 60

LCM of 15 and 20: **60**

For numbers that are not easy to list the multiples of, make factor trees. (*Hint:* Write the **prime factorization with exponents** and then multiply the highest power of each prime factor listed.)



24: $2^3 \cdot 3$

36: $2^2 \cdot 3^2$

LCM of 24 and 36: $2^3 \cdot 3^2 = 72$

1. **4:** 4, 8, 12

6: 6, 12

2. **9:** 9, 18, 27, 36

12: 12, 24, 36

3. **6:** 6, 12, 18, 24, 30, 36, 42

7: 7, 14, 21, 28, 35, 42

Exercises

1. 4 and 6

LCM: **12**

2. 9 and 12

LCM: **36**

3. 6 and 7

LCM: **42**

4. 5 and 12

LCM: **60**

5. 8 and 10

LCM: **40**

6. 3 and 15

LCM: **15**

Make factor trees and write the prime factorization using exponents.

Find the least common multiple (LCM). **Beginning factors may vary.**

7. 16 and 18 **$2^4 \cdot 3^2 =$**

16 • 9; LCM: 144

8. 24 and 56 **$2^3 \cdot 3 \cdot 7 =$**

8 • 21; LCM: 168

9. 14 and 25 **$5^2 \cdot 2 \cdot 7 =$**

25 • 14; LCM: 350

10. 13 and 21 **$3 \cdot 7 \cdot 13 =$**

21 • 13; LCM: 273

Choose the LCM of the numbers.

11. 3 and 7	7	14	21
12. 12 and 36	36	72	432
13. 4, 8, and 10	20	40	80

4. **5:** 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60
12: 12, 24, 36, 48, 60

5. **8:** 8, 16, 24, 32, 40
10: 10, 20, 30, 40
6. **3:** 3, 6, 9, 12, 15
15: 15

Write the composite number represented by the prime factorization.

14. $2^2 \cdot 3 \cdot 5$ **60**

15. $2^2 \cdot 5 \cdot 7$ **140**

16. 5^2 **25**

17. $2 \cdot 3 \cdot 7$ **42**

18. $3 \cdot 5$ **15**

19. $3^2 \cdot 11$ **99**

Make a factor tree for the number. **Beginning factors may vary.**

20. 12

21. 16

22. 56

23. 72

Use the factor trees to find the answer. **The factor 1 is optional.**

24. What factors are common to 12 and 16? **2, 4**

25. GCF of 12 and 16: **4**

26. LCM of 12 and 16: **48**

27. What factors are common to 16 and 56? **2, 4, 8**

28. GCF of 16 and 56: **8**

29. LCM of 16 and 56: **112**

30. What factors are common to 12 and 72? **2, 3, 4, 6, 12**

31. GCF of 12 and 72: **12**

32. LCM of 12 and 72: **72**

Practice & Application

33. Write the value of 8 in 708,316,290 in word form.
eight million

34. Find the product of 23 sets of 896. **20,608**

35. What number does 2×3^3 represent? **54**

36. Write the prime factorization of 210.
 $2 \times 3 \times 5 \times 7$

37. Estimate the difference between 590,600 and 316,900 by rounding each number to its greatest place. **$600,000 - 300,000 = 300,000$**

38. Find the number of sets that could be made if 5,790 play tickets were bundled into sets of 30.
193 sets

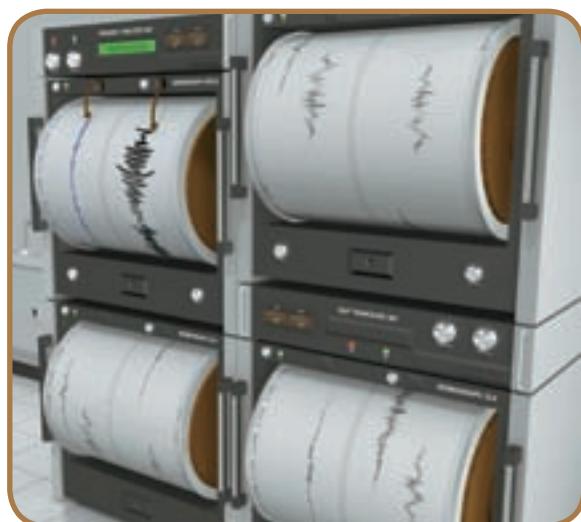
39. The number 1,530 is divisible by which of the following numbers: 2, 3, 4, 5, 10? **2, 3, 5, 10**

40. Is 391 a prime or a composite number? **prime**

41. Is 16 a multiple or a factor of 32?
16 is a factor of 32.

J Explain the pattern used in the sequence 21, 42, 63, 84. What would be the next three numbers in the sequence?

The number 21 was added each time to find the next number; 105, 126, 147.



DID YOU KNOW

A **Richter scale** is used to tell the strength of an earthquake. The scale is a logarithmic scale that measures the strength of earthquakes in powers of 10. An earthquake measuring 3.0 on the Richter scale is 10 times greater than an earthquake measuring 2.0, and one measuring 4.0 is 100 (10×10) times greater than one measuring 2.0.

Proper Fractions

Fractions are used to name part of a whole or part of a set.

The **numerator** and the **denominator** are the **terms** of a fraction.

In the fraction $\frac{3}{5}$, the terms are 3 and 5.

The fraction $\frac{3}{5}$ is a **proper fraction** because it has a value less than 1.

numerator
denominator
terms
proper fraction

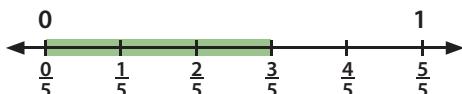
3 ← **numerator:** tells the number of parts selected
5 ← **denominator:** tells the equal parts of the whole

The fraction $\frac{3}{5}$ tells about the relationship between the parts selected and the whole:
the whole has 5 equal parts, and 3 of the parts have been selected.

$\frac{3}{5}$ of the whole is shaded.



$\frac{3}{5}$ is shown on the number line.

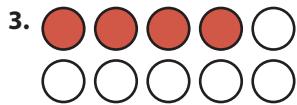
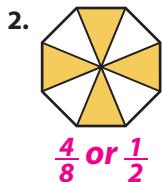
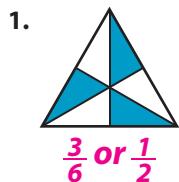


$\frac{3}{5}$ of the set is peppermints.

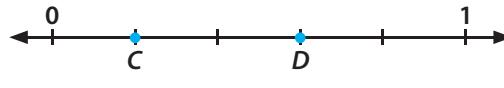
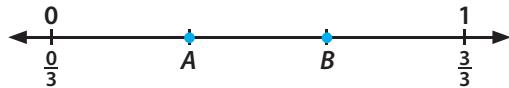


Exercises

Write the fraction for the part that is colored.



Write the fraction representing the point on the number line.



5. Point A $\frac{1}{3}$

6. Point B $\frac{2}{3}$

7. Point C $\frac{1}{5}$

8. Point D $\frac{4}{5}$

Draw a model. **Models will vary.**

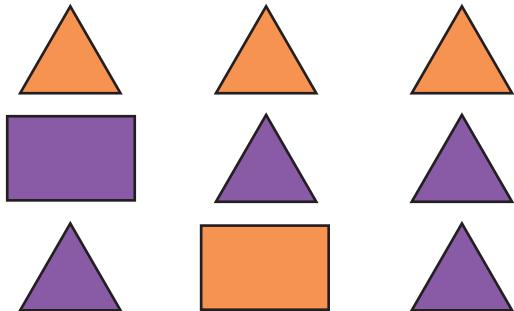
9. a number line to represent $\frac{5}{8}$

10. a circle to represent $\frac{1}{2}$

11. a set of rectangles to represent $\frac{3}{4}$

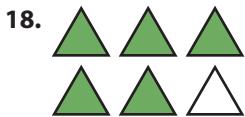
12. a set of triangles to represent $\frac{2}{7}$

Use the set of figures to find the answer.

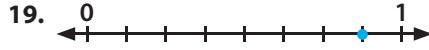


13. The triangles are what part of the set? $\frac{7}{9}$
14. The purple triangles are what part of the set? $\frac{2}{9}$
15. What part of the set are the rectangles? $\frac{2}{9}$
16. What part of the set is purple? $\frac{5}{9}$
17. What part of the set is the orange rectangle? $\frac{1}{9}$

Use the picture to write the value of n .



$$\frac{n}{6} \quad n = \underline{5}$$



$$\frac{7}{n} \quad n = \underline{8}$$



$$\frac{n}{7} \quad n = \underline{4}$$

Write the fraction to answer the question.

Draw a picture if needed.

21. Three children are sharing 2 cookies. If each child gets the same amount, what fraction of a cookie can each child have? **$\frac{2}{3}$ of a cookie**

22. Four people are sharing 3 pies so that each person has a fair share. What fraction of a pie will each person receive? **$\frac{3}{4}$ of a pie**

23. Five people are sharing 1 bottle of juice. What fraction of the bottle of juice will each person receive? **$\frac{1}{5}$ of a bottle**

24. Twenty students read books about earthquakes for a report. Thirteen of the students read about the Alaskan earthquake of 1964. What fraction of the students read about earthquakes other than the Alaskan earthquake? **$\frac{7}{20}$ of the students**

Complete the fraction model. **Models will vary.**

29. This rectangle represents $\frac{1}{2}$ of a whole. Draw a model of the whole.



30. This rectangle represents $\frac{2}{3}$ of a whole. Draw a model of the whole.



31. These 4 positive counters represent $\frac{1}{2}$ of a set. Draw a model of the whole set.



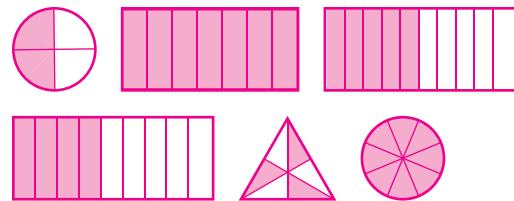
32. These 6 negative counters represent $\frac{3}{4}$ of a set. Draw a model of the whole set.



- J Draw a picture to represent each fraction: $\frac{2}{4}, \frac{7}{7}, \frac{5}{10}, \frac{4}{9}, \frac{3}{6}, \frac{8}{8}$. Identify the fractions that are not proper fractions and the fractions that are equivalent to $\frac{1}{2}$. Explain your answer. **$\frac{7}{7}$ and $\frac{8}{8}$ are not proper fractions. $\frac{2}{4}, \frac{5}{10}$, and $\frac{3}{6}$ are equivalent to $\frac{1}{2}$.**



An earthquake with a 7.0 magnitude occurred in Haiti on January 12, 2010. As part of a relief effort, the United States Air Force dropped bottled water and MREs (Meal, Ready-to-Eat) to Haitian victims.



Complete **DAILY REVIEW** C on page 415.

Improper Fractions & Mixed Numbers

An **improper fraction** has a value *equal to or greater than* 1. $\frac{6}{6}$ $\frac{17}{6}$

An improper fraction is in lowest terms when it is expressed as a **mixed number**.

The improper fraction $\frac{17}{6}$ and the mixed number $2\frac{5}{6}$ represent the same value.

improper fraction
mixed number

$$\frac{17}{6} = 2\frac{5}{6}$$



$$\frac{17}{6} = \frac{6}{6} + \frac{6}{6} + \frac{5}{6} = 1 + 1 + \frac{5}{6} = 2\frac{5}{6}$$

A mixed number is the sum of a whole number and a fraction. $2\frac{5}{6} = 2 + \frac{5}{6}$

Knowing that $\frac{6}{6} = 1$ allows you to use multiples of $\frac{6}{6}$ to estimate the value of the improper fraction $\frac{17}{6}$ as a mixed number.



1 set of 6 parts
 $\frac{6}{6} = 1$



2 sets of 6 parts
 $\frac{12}{6} = 2$



3 sets of 6 parts
 $\frac{18}{6} = 3$

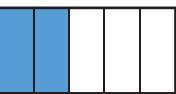
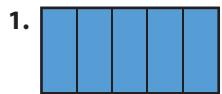
The estimated value of the improper fraction $\frac{17}{6}$ is a mixed number between 2 and 3.

The mixed number $2\frac{5}{6}$ is a reasonable answer.

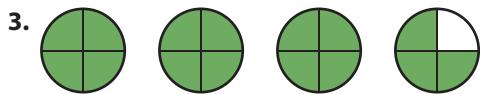
Exercises

Write the improper fraction for the model.

Write an addition equation to rename the improper fraction as a mixed number.



$$\frac{12}{5}; \frac{5}{5} + \frac{5}{5} + \frac{2}{5} = 1 + 1 + \frac{2}{5} = 2\frac{2}{5}$$



$$\frac{15}{4}; \frac{4}{4} + \frac{4}{4} + \frac{4}{4} + \frac{3}{4} = 1 + 1 + 1 + \frac{3}{4} = 3\frac{3}{4}$$



$$\frac{7}{3}; \frac{3}{3} + \frac{3}{3} + \frac{1}{3} = 1 + 1 + \frac{1}{3} = 2\frac{1}{3}$$



$$\frac{16}{6}; \frac{6}{6} + \frac{6}{6} + \frac{4}{6} = 1 + 1 + \frac{4}{6} = 2\frac{4}{6}$$

Draw a model. Write the improper fraction as a mixed number.

5. triangles to represent $\frac{7}{2}$ $3\frac{1}{2}$

6. circles to represent $\frac{19}{8}$ $2\frac{3}{8}$

7. hexagons to represent $\frac{11}{6}$ $1\frac{5}{6}$

8. rectangles to represent $\frac{15}{7}$ $2\frac{1}{7}$

Draw a model. Write the mixed number as an improper fraction.

9. squares to represent $1\frac{3}{4}$ $\frac{7}{4}$

10. rectangles to represent $3\frac{4}{5}$ $\frac{19}{5}$

11. hexagons to represent $2\frac{5}{6}$ $\frac{17}{6}$

12. circles to represent $4\frac{1}{3}$ $\frac{13}{3}$

Multiplication can be used to rename mixed numbers as improper fractions, and division can be used to rename improper fractions as mixed numbers.

Rename a mixed number as an improper fraction.

$$2\frac{3}{8} = \underline{\quad}$$

1. Multiply to find the number of parts in the wholes. $2 \cdot \frac{8}{8} = \frac{16}{8}$
2. Add the additional parts. $\frac{16}{8} + \frac{3}{8} = \frac{19}{8}$

Rename an improper fraction as a mixed number.

$$\frac{19}{8} = \underline{\quad}$$

1. Divide the numerator by the denominator to find the number of wholes.
2. Write the remainder as a fraction to tell how many parts of the next whole there are.

$$\begin{array}{r} 2\frac{3}{8} \\ 8 \overline{) 19} \\ -16 \\ \hline 3 \end{array}$$

Exercises

Use division to rename an improper fraction as a whole number or a mixed number.

Use multiplication to rename a mixed number as an improper fraction.

Show your work. Draw a picture if needed.

13. $\frac{10}{2}$ **5**

14. $\frac{12}{5}$ **$2\frac{2}{5}$**

15. $3\frac{1}{4}$ **$\frac{13}{4}$**

16. $4\frac{1}{5}$ **$\frac{21}{5}$**

17. $1\frac{9}{10}$ **$\frac{19}{10}$**

18. $\frac{31}{4}$ **$7\frac{3}{4}$**

19. $\frac{25}{6}$ **$4\frac{1}{6}$**

20. $5\frac{2}{3}$ **$\frac{17}{3}$**

21. $\frac{27}{3}$ **9**

22. $2\frac{5}{8}$ **$\frac{21}{8}$**

Write an improper fraction to answer the question.

Draw a picture if needed.

23. Two children are sharing 5 brownies so that each child gets an equal amount. How many brownies will each child get? **$\frac{5}{2}$ brownies**

24. Four people are sharing 6 personal pan pizzas so that each person has a fair share. How much pizza will each person eat? **$\frac{6}{4}$ pizzas**

Substitute the value for the variable in the fraction.

Rename improper fractions as a mixed number.

$a = 4$

$b = 7$

$c = 10$

$d = 13$

25. $\frac{a}{b}$ **$\frac{4}{7}$**

26. $\frac{c}{b}$ **$\frac{10}{7} = 1\frac{3}{7}$**

27. $\frac{d}{b}$ **$\frac{13}{7} = 1\frac{6}{7}$**

28. $\frac{a}{d}$ **$\frac{4}{13}$**

29. $\frac{d}{c}$ **$\frac{13}{10} = 1\frac{3}{10}$**

Practice & Application

30. Draw a set to represent $\frac{5}{8}$.
-



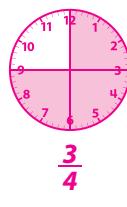
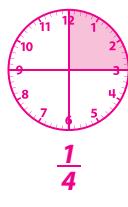
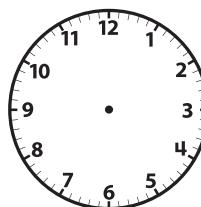
Draw three clocks similar to this clock. On each clock draw a horizontal line from 3 to 9 and a vertical line from 12 to 6. Shade the first clock to show "quarter after," the second clock to show "half past," and the third clock to show "quarter to." Write the fraction represented by each clock.

31. Draw rectangles to represent $\frac{6}{2}$.
-

32. If \triangle represents $\frac{1}{2}$ of a set, what picture represents the whole set?
-

33. Write three fractions that represent 1 whole.

Possible answer: $\frac{2}{2}$, $\frac{3}{3}$, $\frac{4}{4}$



Complete **DAILY REVIEW** d on page 415.

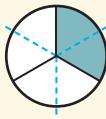
Equivalent Fractions

Equivalent fractions name the same part of a whole or the same part of a set and are equal in value. When a fraction is renamed to **higher terms**, the numerator and denominator (terms) of the new fraction are greater. When a fraction is renamed to **lower terms**, the numerator and denominator (terms) of the new fraction are less.

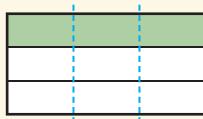
A fraction is in **lowest terms** (or **simplest form**) when 1 is the only common factor of the numerator and the denominator.

equivalent fractions
higher terms
lower terms
lowest terms
simplest form
cancellation

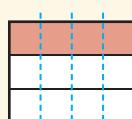
Multiply by a name for 1 to rename a fraction to higher terms.



$$\frac{1 \times 2}{3 \times 2} = \frac{2}{6}$$

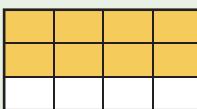


$$\frac{1 \times 3}{3 \times 3} = \frac{3}{9}$$



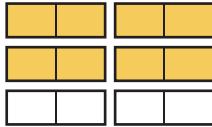
$$\frac{1 \times 4}{3 \times 4} = \frac{4}{12}$$

Divide by a name for 1 to rename a fraction to lower terms.

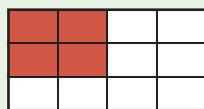


$$\frac{8 \div 2}{12 \div 2} = \frac{4}{6}$$

rename using groups of 2

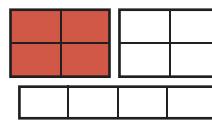


There are 4 colored groups.



$$\frac{4 \div 4}{12 \div 4} = \frac{1}{3}$$

rename using groups of 4



There is 1 colored group.

Use strategies to rename a fraction to lowest terms (simplest form).

Divide by the GCF

30: 1, 2, 3, 5, 6, 10, 15, 30

36: 1, 2, 3, 4, 6, 9, 12, 18, 36

GCF of 30 and 36: 6

$$\frac{30 \div 6}{36 \div 6} = \frac{5}{6}$$

Repeated division

$$\frac{30 \div 2}{36 \div 2} = \frac{15 \div 3}{18 \div 3} = \frac{5}{6}$$

Exercises

Draw the figure to represent the given fraction.

Repartition the figure to find the equivalent fraction in higher terms.

Write the equivalent fraction.

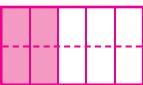
1. circle

$$\frac{1}{2} = \frac{n}{8}$$



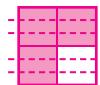
2. rectangle

$$\frac{2}{5} = \frac{n}{10}$$



3. square

$$\frac{3}{4} = \frac{n}{12}$$



Multiply by the name for 1 to find the equivalent fraction in higher terms.

Write the multiplication equation.

$$4. \frac{3}{8} = \frac{n}{24} \quad \frac{3 \times 3}{8 \times 3} = \frac{9}{24}$$

$$5. \frac{4}{10} = \frac{12}{n} \quad \frac{4 \times 3}{10 \times 3} = \frac{12}{30}$$

$$6. \frac{4}{7} = \frac{n}{14} \quad \frac{4 \times 2}{7 \times 2} = \frac{8}{14}$$

$$7. \frac{3}{4} = \frac{18}{n} \quad \frac{3 \times 6}{4 \times 6} = \frac{18}{24}$$

$$8. \frac{5}{12} = \frac{n}{60} \quad \frac{5 \times 5}{12 \times 5} = \frac{25}{60}$$

$$9. \frac{4}{5} = \frac{16}{n} \quad \frac{4 \times 4}{5 \times 4} = \frac{16}{20}$$

$$10. \frac{5}{6} = \frac{n}{18} \quad \frac{5 \times 3}{6 \times 3} = \frac{15}{18}$$

$$11. \frac{3}{8} = \frac{15}{n} \quad \frac{3 \times 5}{8 \times 5} = \frac{15}{40}$$

Draw the figure to represent the given fraction.

Group the figure to find the equivalent fraction in lower terms.

Write the equivalent fraction.

12. a set of circles

$$\frac{4}{10} = \frac{n}{5}$$



13. a circle

$$\frac{2}{8} = \frac{n}{4}$$



14. a set of rectangles

$$\frac{3}{6} = \frac{n}{2}$$



Divide by the name for 1 to find the equivalent fraction in lower terms.

Write the division equation.

15. $\frac{20}{30} = \frac{n}{6}$ $\frac{20 \div 5}{30 \div 5} = \frac{4}{6}$

16. $\frac{12}{54} = \frac{n}{9}$ $\frac{12 \div 6}{54 \div 6} = \frac{2}{9}$

17. $\frac{16}{42} = \frac{n}{21}$ $\frac{16 \div 2}{42 \div 2} = \frac{8}{21}$

Write the fraction in lowest terms. *Process may vary.*

18. $\frac{15}{25}$ $\frac{3}{5}$

19. $\frac{21}{35}$ $\frac{3}{5}$

20. $\frac{10}{28}$ $\frac{5}{14}$

21. $\frac{40}{72}$ $\frac{5}{9}$

22. $\frac{10}{75}$ $\frac{2}{15}$

23. $\frac{12}{36}$ $\frac{1}{3}$

24. $\frac{18}{24}$ $\frac{3}{4}$

25. $\frac{30}{51}$ $\frac{10}{17}$

Cancellation

A fraction can be renamed to lowest terms, or simplified, by a process called **cancellation**. This process cancels out fractional names for 1 from the prime factorization of the numerator and the denominator.

Use these steps to rename $\frac{36}{40}$ to lowest terms using cancellation.

1. Use mental math to list the prime factors of the numerator and the denominator from *least to greatest*.
2. Identify and cancel all the fractional names for 1.
3. The canceled numbers removed the GCF (4). Multiply the remaining factors in the numerator and in the denominator. The result is the simplified fraction.

$$\begin{aligned} & 4 \times 9 \\ \frac{36}{40} &= \frac{2 \cdot 2 \cdot 3 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 5} \\ & 8 \times 5 \\ \frac{36}{40} &= \frac{\cancel{2} \cdot \cancel{2} \cdot 3 \cdot 3}{\cancel{2} \cdot \cancel{2} \cdot 2 \cdot 5} \\ & \quad \quad \quad 1 \quad 1 \\ & \quad \quad \quad 1 \quad 1 \\ & \frac{36}{40} = \frac{9}{10} \end{aligned}$$

Exercises

Use cancellation of the prime factorization to rename the fraction to lowest terms.

26. $\frac{40}{60} = \frac{\cancel{2} \cdot \cancel{2} \cdot 2 \cdot \cancel{5}}{\cancel{2} \cdot \cancel{2} \cdot 3 \cdot \cancel{5}} = \frac{2}{3}$

27. $\frac{25}{45} = \frac{\cancel{5} \cdot 5}{3 \cdot 3 \cdot \cancel{5}} = \frac{5}{9}$

28. $\frac{45}{60} = \frac{\cancel{3} \cdot 3 \cdot \cancel{5}}{2 \cdot 2 \cdot \cancel{3} \cdot \cancel{5}} = \frac{3}{4}$

29. $\frac{18}{48} = \frac{\cancel{2} \cdot \cancel{3} \cdot 3}{\cancel{2} \cdot 2 \cdot 2 \cdot \cancel{3}} = \frac{3}{8}$

30. $\frac{40}{45} = \frac{2 \cdot 2 \cdot 2 \cdot \cancel{5}}{3 \cdot 3 \cdot \cancel{5}} = \frac{8}{9}$

31. $\frac{24}{36} = \frac{\cancel{2} \cdot \cancel{2} \cdot 2 \cdot \cancel{3}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{3} \cdot 3} = \frac{2}{3}$

Compare & Order Fractions

Use Fraction Number Sense to Compare

Compare fractions by choosing a strategy that uses your fraction knowledge.

compare fractions and mixed numbers
order fractions and mixed numbers

A. Same Size Parts

Fractions with the same denominators are *like fractions* and have the same size parts. Compare the number of parts selected (numerators).

$$\frac{5}{8} > \frac{3}{8}$$

5 eighths > 3 eighths

B. Same Number of Parts

Fractions with the same numerator have the same number of selected parts and can be compared by the size of the parts (denominators).

$$\frac{2}{6} < \frac{2}{4}$$

2 sixths < 2 fourths

C. Greater or Less Than $\frac{1}{2}$

Analyze each fraction's relationship to $\frac{1}{2}$. See if one fraction is *greater than* $\frac{1}{2}$ and one fraction is *less than* $\frac{1}{2}$.

$$\frac{7}{8} > \frac{2}{6}$$

$$\frac{7}{8} > \frac{1}{2}$$

$$\frac{2}{6} < \frac{1}{2}$$

D. Closeness to $\frac{1}{2}$ or 1

Analyze each fraction's closeness to $\frac{1}{2}$ or 1. When both fractions are only one part away from $\frac{1}{2}$ or when both fractions are only one part away from 1, compare the size of the parts.

$\frac{1}{8}$ more to make 1 whole

$$\frac{7}{8} > \frac{6}{7}$$

$$\frac{1}{8} < \frac{1}{7}$$

$\frac{1}{7}$ more to make 1 whole

Exercises

Practice Strategies A and B.

Write a comparison sentence using $>$ or $<$.

1. $\frac{4}{12} < \frac{5}{12}$

2. $\frac{3}{8} < \frac{3}{6}$

3. $\frac{6}{9} > \frac{6}{10}$

4. $\frac{9}{15} > \frac{8}{15}$

5. $\frac{3}{10} > \frac{3}{12}$

6. $\frac{8}{14} < \frac{9}{14}$

Practice Strategy C.

Write a comparison sentence using $>$ or $<$.

7. $\frac{5}{12} < \frac{1}{2}$

8. $\frac{7}{10} > \frac{1}{2}$

9. $\frac{3}{8} < \frac{1}{2}$

10. $\frac{5}{6} > \frac{2}{5}$

11. $\frac{8}{20} < \frac{9}{11}$

12. $\frac{9}{16} > \frac{3}{7}$

Practice Strategy D.

Write a comparison sentence using $>$ or $<$.

13. $\frac{7}{8} > \frac{5}{6}$

14. $\frac{6}{10} > \frac{7}{12}$

15. $\frac{4}{10} < \frac{5}{12}$

16. $\frac{2}{3} < \frac{3}{4}$

17. $\frac{14}{15} < \frac{17}{18}$

18. $\frac{3}{8} > \frac{2}{6}$

Write a comparison sentence using $>$ or $<$.

19. $\frac{5}{7} > \frac{5}{8}$

20. $\frac{3}{5} < \frac{4}{5}$

21. $\frac{14}{15} > \frac{12}{13}$

22. $\frac{8}{9} > \frac{7}{8}$

23. $\frac{3}{4} > \frac{3}{8}$

24. $\frac{7}{16} > \frac{4}{10}$



U.S. military and city employees help remove debris during a cleanup effort at the Misawa Fishing Port in Japan after the 2011 earthquake and tsunami.

Rename Fractions to Compare

Compare fractions by finding a common denominator and renaming the fractions.

If $\frac{3}{4}$ of the purple balloons have polka dots and $\frac{7}{8}$ of the red balloons have polka dots, which color has a larger portion of balloons with polka dots?

Rename One Fraction

When the denominator of one fraction is a multiple of the other fraction, rename only one of the fractions.

$$\frac{3}{4} < \frac{7}{8}$$

$$\frac{6}{8} < \frac{7}{8}$$

There are more red balloons with polka dots.

Jared spent $\frac{2}{3}$ of an hour doing chores while Ben spent $\frac{3}{4}$ of an hour. Who spent less time working?

Rename Both Fractions

When the denominators are not related, use the least common multiple (LCM) to rename both fractions.

$$\frac{3}{4} > \frac{2}{3}$$

$$\text{LCM of 3 and 4: } 12$$
$$\frac{9}{12} > \frac{8}{12}$$

Jared spent less time working.

Compare Mixed Numbers

First, compare the whole numbers.

$$2\frac{2}{3} > 1\frac{4}{9}$$

$$2 > 1$$

If the whole numbers are the same, compare the fractions.

$$4\frac{3}{8} < 4\frac{5}{6}$$

$$\frac{3}{8} < \frac{5}{6}$$
$$\frac{9}{24} < \frac{20}{24}$$

Compare a Mixed Number and an Improper Fraction

Rename the mixed number to an improper fraction or rename the improper fraction to a mixed number.

$$2\frac{3}{8} < \frac{32}{9}$$

$$\frac{19}{8} < \frac{32}{9} \text{ or } 2\frac{3}{8} < 3\frac{5}{9}$$

Exercises

Write a comparison sentence using $>$ or $<$. Rename as needed.

$$\frac{19}{6} < \frac{23}{6}$$

25. $\frac{7}{24} \bigcirc \frac{12}{48} \quad \frac{14}{48} > \frac{12}{48}$

29. $\frac{2}{3} \bigcirc \frac{5}{7} \quad \frac{14}{21} < \frac{15}{21}$

33. $\frac{19}{6} \bigcirc 3\frac{5}{6} \quad 3\frac{1}{6} < 3\frac{5}{6} \text{ or}$

26. $\frac{6}{9} \bigcirc \frac{7}{12} \quad \frac{24}{36} > \frac{21}{36}$

30. $\frac{7}{24} \bigcirc \frac{12}{30} \quad \frac{35}{120} < \frac{48}{120}$

34. $2\frac{11}{12} \bigcirc 2\frac{8}{9} \quad 2\frac{33}{36} > 2\frac{32}{36}$

27. $\frac{4}{6} \bigcirc \frac{6}{14} \quad \frac{28}{42} > \frac{18}{42}$

31. $2\frac{7}{9} \bigcirc 3\frac{1}{3} \quad 2\frac{7}{9} < 3\frac{1}{3}$

35. $4\frac{3}{8} \bigcirc 3\frac{4}{8} \quad 4\frac{3}{8} > 3\frac{4}{8}$

28. $\frac{3}{8} \bigcirc \frac{10}{24} \quad \frac{9}{24} < \frac{10}{24}$

32. $3\frac{2}{5} \bigcirc 3\frac{5}{8} \quad 3\frac{16}{40} < 3\frac{25}{40}$

36. $2\frac{3}{10} \bigcirc \frac{14}{5} \quad 2\frac{3}{10} < 2\frac{8}{10} \text{ or}$

$$\frac{23}{10} < \frac{28}{10}$$

Write the fractions from least to greatest.

37. $\frac{2}{3} \quad \frac{7}{8} \quad \frac{5}{6}$

$$\frac{2}{3} \quad \frac{5}{6} \quad \frac{7}{8}$$

38. $\frac{5}{12} \quad \frac{3}{8} \quad \frac{4}{10}$

$$\frac{3}{8} \quad \frac{4}{10} \quad \frac{5}{12}$$

39. $\frac{13}{8} \quad 2\frac{1}{4} \quad 1\frac{3}{5}$

$$1\frac{3}{5} \quad \frac{13}{8} \quad 2\frac{1}{4}$$

Solve.

40.

During the class party, $\frac{1}{3}$ of the students bowled, $\frac{4}{15}$ of the students played miniature golf, and $\frac{2}{5}$ of the students rode on go-carts. Which activity was chosen by the most students? **go-carts**

Complete **DAILY REVIEW** f on page 416.

More Comparing Fractions

Use these strategies to compare and order fractions.
See pages 86–87 for the complete explanation of each strategy.

convert fractions to decimals
cross multiplication

Same Size Parts	$\frac{7}{9} > \frac{6}{9}$	Rename One Fraction	$\frac{2}{8} > \frac{1}{32}$
Same Number of Parts	$\frac{3}{5} < \frac{3}{4}$		$\frac{8}{32} > \frac{1}{32}$
Greater or Less Than $\frac{1}{2}$	$\frac{5}{6} > \frac{3}{8}$	Rename Both Fractions	$\frac{2}{3} < \frac{5}{7}$
Closeness to $\frac{1}{2}$ or 1	$\frac{8}{9} > \frac{5}{6}$		$\frac{14}{21} < \frac{15}{21}$

Rename Fractions as Decimals to Compare

Remember that all fractions can be renamed in decimal form. The decimal form can be used to compare fractions.

- If a denominator is a power of 10, simply write the fraction in decimal form.
- If a denominator is not a power of 10, divide the numerator by the denominator. If a fraction does not have an exact decimal equivalent, round to the nearest hundredth or thousandth.

$$\frac{7}{10} < \frac{11}{15}$$

$$0.7 < 0.73$$

$$\begin{array}{r} 0.733 \\ 15) 11.000 \\ -105 \\ \hline 50 \\ -45 \\ \hline 50 \\ -45 \\ \hline 5 \end{array}$$

$$\frac{0.125}{8} < \frac{1}{10}$$

$$0.13 < 0.17$$

$$\begin{array}{r} 0.125 \\ 8) 1.000 \\ -8 \\ \hline 20 \\ -16 \\ \hline 40 \\ -40 \\ \hline 0 \end{array}$$

$$\frac{0.173}{23} < \frac{4}{23}$$

$$\begin{array}{r} 0.173 \\ 23) 4.000 \\ -23 \\ \hline 170 \\ -161 \\ \hline 90 \\ -69 \\ \hline 21 \end{array}$$

Exercises

Use any strategy to compare the fractions.

Write a comparison sentence using $>$, $<$, or $=$.

1. $\frac{4}{10} < \frac{5}{12}$
2. $\frac{8}{11} > \frac{3}{5}$
3. $\frac{9}{10} > \frac{9}{13}$
4. $\frac{11}{12} < \frac{15}{16}$
5. $\frac{8}{9} < \frac{13}{14}$
6. $\frac{3}{12} = \frac{12}{48}$
7. $\frac{2}{3} < \frac{3}{4}$
8. $\frac{13}{15} > \frac{8}{10}$



Rename each fraction as a decimal.

Round to the nearest thousandth if needed.

Write a comparison sentence using $>$, $<$, or $=$.

9. $\frac{7}{10} < \frac{12}{15}$
(0.7 < 0.8)
10. $\frac{1}{3} < \frac{9}{23}$
(0.333 < 0.391)
11. $\frac{14}{70} = \frac{1}{5}$
(0.2 = 0.2)
12. $\frac{3}{4} < \frac{20}{25}$
(0.75 < 0.8)
13. $\frac{13}{21} > \frac{30}{49}$
(0.619 > 0.612)
14. $\frac{4}{5} > \frac{5}{7}$
(0.8 > 0.714)
15. $\frac{12}{19} > \frac{8}{13}$
(0.632 > 0.615)
16. $\frac{3}{10} < \frac{4}{11}$
(0.3 < 0.364)

Answer the question about the survey.
Explain the processes used for solving.

17. During a recent survey, $\frac{2}{4}$ of the church youth group preferred chocolate milkshakes, $\frac{1}{8}$ preferred vanilla milkshakes, and $\frac{6}{16}$ preferred strawberry milkshakes. What is the favorite milkshake flavor of the youth group? **chocolate**
18. When asked about their favorite animal for a pet, $\frac{2}{5}$ of the children chose dogs, $\frac{1}{3}$ chose cats, and $\frac{4}{15}$ of the children chose other animals. Did more children choose cats or other animals? **cats**

19. Survey results indicate that $\frac{1}{6}$ of adults travel to work by bus, $\frac{3}{4}$ travel by car, and $\frac{1}{12}$ walk to work. Which method of transportation is the least common among adults? **walking**
20. When asked about their favorite subject, $\frac{1}{6}$ of the students preferred science, $\frac{3}{12}$ preferred math, $\frac{1}{3}$ preferred history, and $\frac{1}{4}$ preferred language arts. Which subject was the favorite among the students? **history**

Cross-Multiply to Compare

Two unlike fractions may be compared by using a process called **cross multiplication**.

- Cross-multiply the numerators and denominators.
- Compare the products.

$$\frac{2}{3} \bigcirc \frac{5}{7}$$

$7 \times 2 = 14$ $\frac{2}{3} \times \frac{5}{7}$ $3 \times 5 = 15$

14 < 15

$$\frac{2}{3} < \frac{5}{7}$$

This example shows why cross multiplication works.

- Find the common denominator by multiplying the two denominators.
- Rename the fractions using the common denominator.

$$\frac{2}{3} \bigcirc \frac{5}{7}$$

3 × 7 = 21

$$\frac{2 \times 7}{3 \times 7} = \frac{14}{21} \quad \frac{5 \times 3}{7 \times 3} = \frac{15}{21}$$

$\frac{14}{21} < \frac{15}{21}$

$$\frac{2}{3} < \frac{5}{7}$$

Notice that the renamed numerators in this example are the same as the products in the cross multiplication above.

Exercises

Write a comparison sentence using $>$, $<$, or $=$.

Use cross multiplication.

21. $\frac{2}{9} > \frac{1}{5}$ (**10 > 9**) 22. $\frac{5}{7} < \frac{8}{11}$ (**55 < 56**) 23. $\frac{3}{5} = \frac{9}{15}$ (**45 = 45**) 24. $\frac{9}{12} < \frac{8}{10}$ (**90 < 96**)
25. $\frac{3}{4} < \frac{7}{8}$ (**24 < 28**) 26. $\frac{6}{9} > \frac{5}{8}$ (**48 > 45**) 27. $\frac{12}{34} < \frac{3}{4}$ (**48 < 102**) 28. $\frac{3}{7} > \frac{10}{28}$ (**84 > 70**)

Fractions & Percents

A **percent** is a ratio in which a quantity is compared to 100.

A percent can also be written in fraction form.

The fraction $\frac{1}{100}$ can be written as 1%.

The fraction $\frac{3}{4}$ can be renamed as $\frac{75}{100}$ and written as 75%.

A fraction that names 1 whole, such as $\frac{2}{2}$, $\frac{5}{5}$, $\frac{43}{43}$, and $\frac{100}{100}$, is written as 100%.

If the denominator of a fraction is a factor of 100, the fraction can easily be renamed as a percent.

$$\frac{1}{4} = \frac{25}{100} = 25\%$$

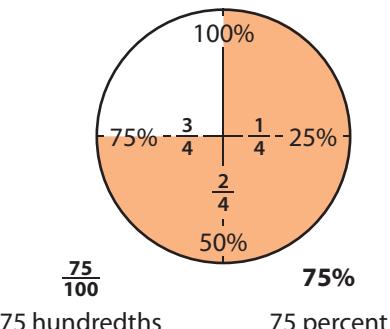
$$\frac{1}{10} = \frac{10}{100} = 10\%$$

$$\frac{1}{2} = \frac{50}{100} = 50\%$$

$$\frac{1}{5} = \frac{20}{100} = 20\%$$

$$\frac{3}{4} = \frac{75}{100} = 75\%$$

percent
circle graph



Exercises

Write the fraction for the shaded part.

Write the fraction as a percent.



$$\frac{3}{3} = 100\%$$



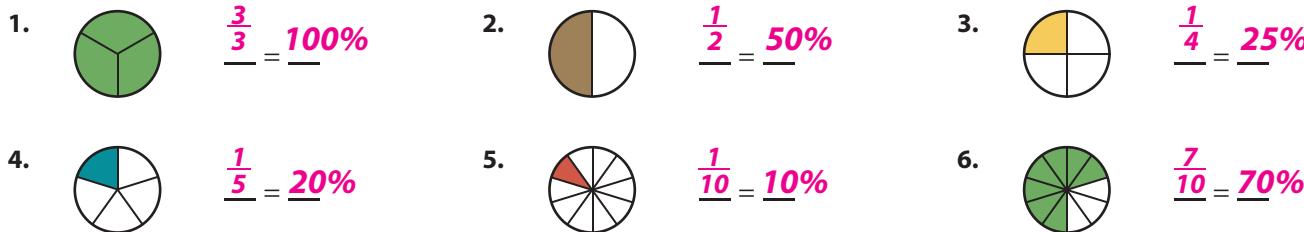
$$\frac{1}{2} = 50\%$$



$$\frac{1}{5} = 20\%$$



$$\frac{1}{10} = 10\%$$



$$\frac{1}{4} = 25\%$$

Write the equivalent fraction with a denominator of 100.

Write the new fraction as a percent.

$$7. \frac{1}{2} = \frac{50}{100} = 50\%$$

$$8. \frac{1}{4} = \frac{25}{100} = 25\%$$

$$9. \frac{3}{10} = \frac{30}{100} = 30\%$$

$$10. \frac{4}{5} = \frac{80}{100} = 80\%$$

$$11. \frac{7}{20} = \frac{35}{100} = 35\%$$

$$12. \frac{6}{25} = \frac{24}{100} = 24\%$$

Write the percent as a fraction in lowest terms.

$$13. 30\% = \frac{30}{100} = \frac{3}{10}$$

$$14. 80\% = \frac{80}{100} = \frac{4}{5}$$

$$15. 15\% = \frac{15}{100} = \frac{3}{20}$$

$$16. 45\% = \frac{45}{100} = \frac{9}{20}$$

$$17. 90\% = \frac{90}{100} = \frac{9}{10}$$

$$18. 25\% = \frac{25}{100} = \frac{1}{4}$$

If the denominator of a fraction is *not* a factor of 100, rename the fraction as a decimal and then as a percent.

- To rename the fraction as a decimal, divide the numerator by the denominator. Round the answer to the nearest hundredth.
- To rename the decimal as a percent, multiply the decimal by 100 by moving the decimal point 2 places to the right and replace the term *hundredths* with the term *percent*.

$\frac{2}{9} \approx 0.22 \approx 22\%$
 $9 \overline{)2}$
 $\frac{5}{7} \approx 0.71 \approx 71\%$
 $7 \overline{)5}$

Exercises

Write the fraction as a percent by renaming as an equivalent fraction or a decimal.

Round to the nearest hundredth.

$$19. \frac{2}{5} = \frac{40}{100} = 40\%$$

$$20. \frac{1}{3} \approx 0.33 \approx 33\%$$

$$21. \frac{3}{7} \approx 0.43 \approx 43\%$$

$$22. \frac{7}{10} = \frac{70}{100} = 70\%$$

$$23. \frac{5}{8} \approx 0.63 \approx 63\%$$

$$24. \frac{1}{6} \approx 0.17 \approx 17\%$$

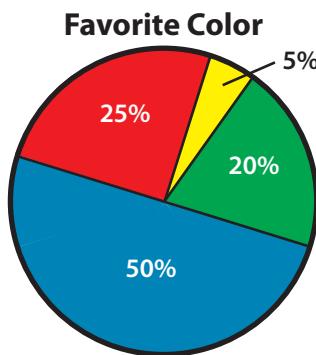
In a **circle graph**, the whole circle represents 100% of the data. The parts of the circle represent parts of the data or a percent of the whole. The parts can also be represented by a fraction.

Exercises

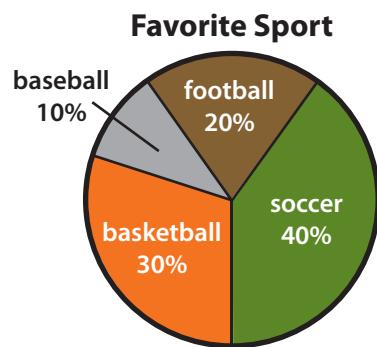
The sixth-grade students attending a state competition participated in a survey about their favorite colors, sports, and subjects. The circle graphs show the results of the survey.

Use the data from the circle graphs to answer the questions.

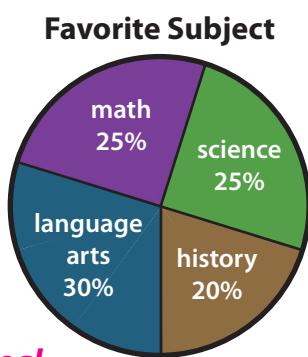
25. Which color do $\frac{1}{2}$ of the students like? **blue**
26. Which color do $\frac{1}{4}$ of the students like? **red**
27. What percent of the students like yellow? **5%**
28. What percent of the students like green or yellow? **25%**



29. What fraction of the students chose football as their favorite sport? $\frac{20}{100} = \frac{1}{5}$
30. What fraction of the students chose soccer as their favorite sport? $\frac{40}{100} = \frac{2}{5}$
31. What percent of the students chose baseball as their favorite sport? **10%**
32. What percent of the students chose a sport other than baseball? **$100\% - 10\% = 90\%$**



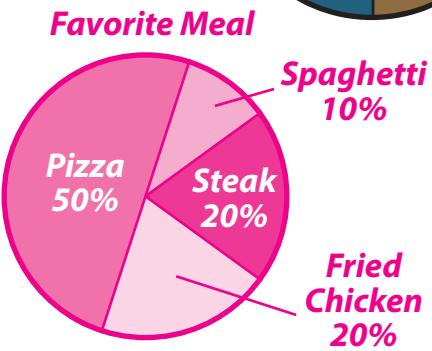
33. What fraction of the students chose math as their favorite subject? $\frac{25}{100} = \frac{1}{4}$
34. What fraction of the students chose language arts as their favorite subject? $\frac{30}{100} = \frac{3}{10}$
35. What percent of the students chose a subject other than science? **$100\% - 25\% = 75\%$**
36. What percent of the students chose history or science? **$20\% + 25\% = 45\%$**



Draw a circle graph to represent the data in the chart.

37. **Favorite Meal**

Pizza	50%
Spaghetti	10%
Steak	20%
Fried Chicken	20%



Complete **DAILY REVIEW** h on page 417.

CHAPTER 4 REVIEW

Draw a model.

1. a number line to represent $\frac{5}{6}$



2. a set to represent $\frac{3}{8}$



3. a figure to represent $\frac{4}{7}$



Draw a model.

Write the improper fraction as a mixed number.

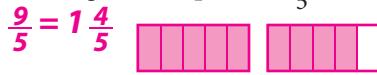
4. triangles to represent $\frac{5}{2}$



5. circles to represent $\frac{7}{4}$



6. rectangles to represent $\frac{9}{5}$



Write the equivalent fraction.

7. $\frac{3}{8} = \frac{n}{24}$ $\frac{3}{8} = \frac{9}{24}$

8. $\frac{4}{7} = \frac{16}{n}$ $\frac{4}{7} = \frac{16}{28}$

9. $\frac{n}{12} = \frac{25}{60}$ $\frac{5}{12} = \frac{25}{60}$

10. $\frac{5}{n} = \frac{15}{18}$ $\frac{5}{6} = \frac{15}{18}$

Rename an improper fraction as a mixed number.

Rename a mixed number as an improper fraction.

11. $\frac{17}{10}$ $1\frac{7}{10}$

12. $\frac{5}{2}$ $2\frac{1}{2}$

13. $\frac{23}{5}$ $4\frac{3}{5}$

14. $4\frac{2}{3}$ $\frac{14}{3}$

15. $3\frac{2}{8}$ $\frac{26}{8}$

16. $1\frac{7}{12}$ $\frac{19}{12}$

Find the greatest common factor using the prime factorization given.

17. 28: $2 \bullet 2 \bullet 7$

35: $5 \bullet 7$

GCF of 28 and 35: **7**

18. 18: $2 \bullet 3 \bullet 3$

27: $3 \bullet 3 \bullet 3$

GCF of 18 and 27: **9**

19. 12: $2 \bullet 2 \bullet 3$

20: $2 \bullet 2 \bullet 5$

GCF of 12 and 20: **4**

Find the least common multiple using the prime factorization given.

20. 28: $2^2 \bullet 7$

35: $5 \bullet 7$

LCM of 28 and 35: **140**

21. 18: $2 \bullet 3^2$

27: 3^3

LCM of 18 and 27: **54**

22. 12: $2^2 \bullet 3$

20: $2^2 \bullet 5$

LCM of 12 and 20: **60**

Make a factor tree for the number.

Write the prime factorization using exponents. **Beginning factors may vary.**

23. 24

$$\begin{array}{c} 3 \cdot 8 \\ \diagdown \quad \diagup \\ 3 \cdot 2 \cdot 4 \\ \diagdown \quad \diagup \\ 3 \cdot 2 \cdot 2 \cdot 2 \\ 24 = 2^3 \cdot 3 \end{array}$$

24. 36

$$\begin{array}{c} 4 \cdot 9 \\ \diagdown \quad \diagup \\ 2 \cdot 2 \cdot 3 \cdot 3 \\ 36 = 2^2 \cdot 3^2 \end{array}$$

25. 40

$$\begin{array}{c} 5 \cdot 8 \\ \diagdown \quad \diagup \\ 5 \cdot 2 \cdot 4 \\ \diagdown \quad \diagup \\ 5 \cdot 2 \cdot 2 \cdot 2 \\ 40 = 2^3 \cdot 5 \end{array}$$



Family Earthquake Survival Kit

Write the fraction in lowest terms. Identify the GCF. **Process and steps used to rename may vary.**

26. $\frac{8}{12}$ **$\frac{2}{3}$; GCF: 4** 27. $\frac{12}{30}$ **$\frac{2}{5}$; GCF: 6** 28. $\frac{28}{35}$ **$\frac{4}{5}$; GCF: 7**

29. $\frac{32}{64}$ **$\frac{1}{2}$; GCF: 32** 30. $\frac{14}{50}$ **$\frac{7}{25}$; GCF: 2** 31. $\frac{18}{27}$ **$\frac{2}{3}$; GCF: 9**

Write a comparison sentence using $>$, $<$, or $=$. **Strategies used to compare may vary.**

32. $\frac{13}{24} > \frac{12}{46}$ 33. $3\frac{2}{8} < 3\frac{5}{8}$ 34. $\frac{4}{5} > \frac{4}{7}$

35. $2\frac{6}{10} = \frac{13}{5}$ 36. $\frac{5}{6} < \frac{13}{14}$ 37. $\frac{3}{7} > \frac{2}{5}$

Write the prime factorization of the numerator and the denominator.

Use cancellation to rename the fraction to lowest terms.

38. $\frac{48}{64}$ **$\frac{1}{1} \frac{1}{2} \frac{1}{2} \frac{1}{2} \frac{1}{3}$** $= \frac{3}{4}$ 39. $\frac{39}{51}$ **$\frac{1}{3} \frac{13}{17}$** $= \frac{13}{17}$

Use the strategy given to compare the fractions.

Write a comparison sentence using $>$ or $<$.

Use the LCM

40. $\frac{5}{6} \bigcirc \frac{3}{8}$ **$\frac{20}{24} > \frac{9}{24}$**

41. $\frac{4}{9} \bigcirc \frac{7}{15}$ **$\frac{20}{45} < \frac{21}{45}$**

Rename
Fractions as
Decimals

42. $\frac{3}{8} \bigcirc \frac{4}{5}$ **$0.375 < 0.8$**

43. $\frac{4}{7} \bigcirc \frac{5}{10}$ **$0.571 > 0.5$**

Cross-multiply

44. $\frac{17}{20} \bigcirc \frac{6}{8}$ **$136 > 120$**

45. $\frac{3}{4} \bigcirc \frac{11}{12}$ **$36 < 44$**

Write the fractions and mixed numbers from *least* to *greatest*.

46. **$\frac{3}{3}$ $\frac{5}{6}$ $\frac{7}{8}$** 47. **$1\frac{5}{12}$ $\frac{3}{2}$ $1\frac{3}{8}$** **$1\frac{3}{8}$ $1\frac{5}{12}$ $\frac{3}{2}$**

Solve.

48. The students voted for the food they wanted served at their party. Pizza received $\frac{1}{3}$ of the votes, sub sandwiches received $\frac{4}{15}$ of the votes, and fried chicken received $\frac{2}{5}$ of the votes. What food received the most votes? **fried chicken**

49. Five people are sharing 3 pizzas so that each person has a fair share. What fraction of a pizza will each person receive? **$\frac{3}{5}$ of a pizza**

50. Five people are sharing 8 brownies. If they each receive the same amount, how many brownies will each person receive? **$1\frac{3}{5}$ brownies**



CUMULATIVE REVIEW

Test Prep

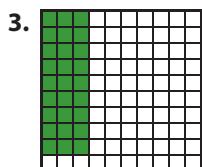
Mark the answer.

				28
7	7	7	7	

- A. $4 + 7$
- B. 4×7
- C. $4 + 4 + 4 + 4$
- D. A and B

						30
5	5	5	5	5	5	

- A. 6×5
- B. $6(5)$
- C. $5 + 5 + 5 + 5 + 5 + 5$
- D. all of the above



- A. $9 \bullet 27$
- B. $27 \div 3$
- C. 9×3
- D. B and C

4. 4 dozen eggs

- A. $12 \div 4$
- B. 4×12
- C. 3×4
- D. A and C

5. 10^2

- A. 10×2
- B. 10×10
- C. 100
- D. B and C

6. $3^2 \times 7$

- A. $2 \times 3 \times 7$
- B. $3 \times 3 \times 7$
- C. 6×7
- D. A and C

7. 3.94

- A. $(3 \times 10^0) + (9 \times \frac{1}{10^1}) + (4 \times \frac{1}{10^2})$
- B. $(3 \times 10) + (9 \times \frac{1}{10}) + (4 \times \frac{1}{10})$
- C. $(3 \times 10) + (9 \times 10) + (4 \times 100)$
- D. all of the above

8. all factors of 36

- A. 2, 4, 6, 8, 10, 12
- B. $36 \div 12$
- C. 1, 2, 3, 4, 6, 9, 12, 18, 36
- D. A and C

9. $(3 \times 4) \times 2$

- A. 24
- B. $3 \times (4 \times 2)$
- C. $(2 \times 4) \times 3$
- D. all of the above

10. Identity Property

- A. $57 \times 0 = 0$
- B. $1 \times 38 = 38$
- C. $a \bullet 1 = a$
- D. B and C

Mark the answer.

11. Which number is not composite?

A. 21

B. 23

C. 25

12. The value of 9 is ninety thousand.

A. 9,348

B. 904,237

C. 295,317

13. Find the quotient of $844 \div 2$.

A. 420

B. 422

C. 424

14. Which numbers are listed from *least* to *greatest*?

A. 1,672 1,673 1,671 1,674

B. 1.31 1.47 1.5 1.52

C. 0.15 0.7 0.29 0.008

15. Which Roman numeral is 29?

A. XXIX

B. XXVIII

C. XXXI

16. Jayden bought 7 tickets at \$4.95 each. About how much money did he spend?

A. \$40

B. \$35

C. \$30

17. Mrs. Owens made 4 dozen cookies. About how many cookies could each person eat at a reception for 20 people?

A. 1 cookie

B. 2 cookies

C. 3 cookies

18. Audrey's cookie recipe calls for 3 eggs. How many batches of cookies can she make with 1 dozen eggs?

A. 4 batches

B. 3 batches

C. 2 batches

19. Find the average of Mia's science test scores: 95, 89, 90, 86.

A. 100

B. 95

C. 90

5K Run for Kids			
Place	Time	Name	Gender
1	21:40	Chris	M
2	22:31	Lucas	M
3	22:35	Kara	F
4	24:40	Brayden	M

Use the data from the chart to find the answer.

20. What was the best time for the 5K run?

- A. 21:40
B. 21:31
C. 22:35
D. 24:40

21. How much faster than Kara did Lucas run?

- A. 4 minutes
B. 4 seconds
C. 55 seconds
D. 1 minute 25 seconds

Age of Participants in 5K Run for Kids	
Stem	Leaf
0	8 8 8 9 9 9
1	1 1 2 2 2 2 3 3

Key | 1|3 = 13

Use the data from the stem-and-leaf- plot to find the answer.

22. How many thirteen-year-olds participated in the 5K run?

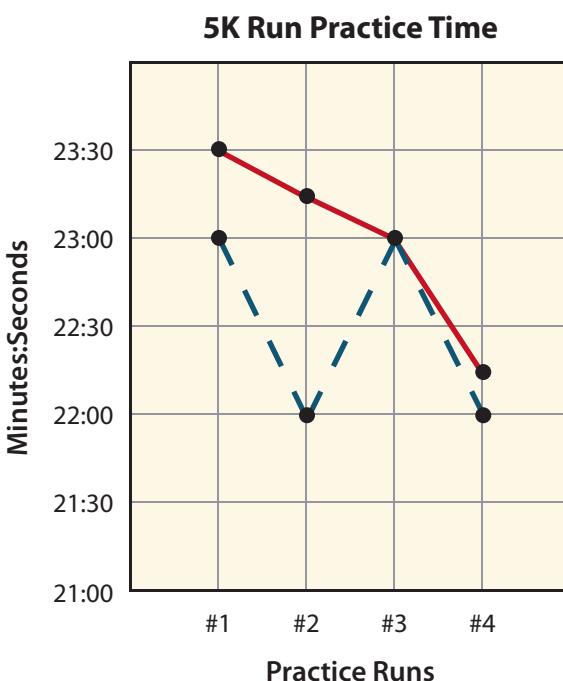
- A. 1
B. 2
C. 8
D. none

23. How many ten-year-olds participated in the 5K run?

- A. 1
B. 2
C. 3
D. none

24. What age was represented the most?

- A. 11
B. 12
C. 18
D. 19



Use the data from the double line graph to find the answer.

25. Which statement is true according to this graph?

- A. Kara's time improved with each practice run.
B. Lucas's time improved with each practice run.
C. Lucas's and Kara's times were the same for practice run #4.
D. Lucas's and Kara's times for practice run #1 had a difference of 1 minute.

Estimate Sums & Differences

To add or subtract fractions, the fractions must have the same denominator. Fractions with the same denominators are *like fractions*.

To **estimate the sum or difference**, think of each fraction's relationship to **0**, $\frac{1}{2}$, or **1** by comparing the fraction's numerator to its denominator. When estimating mixed numbers, round the fractional part to $\frac{1}{2}$ or the nearest whole. Adjust the whole number in the answer as necessary.

estimate sums and differences
round to nearest 0, $\frac{1}{2}$, or 1

If the numerator is very small compared to the denominator, round the fraction to 0.

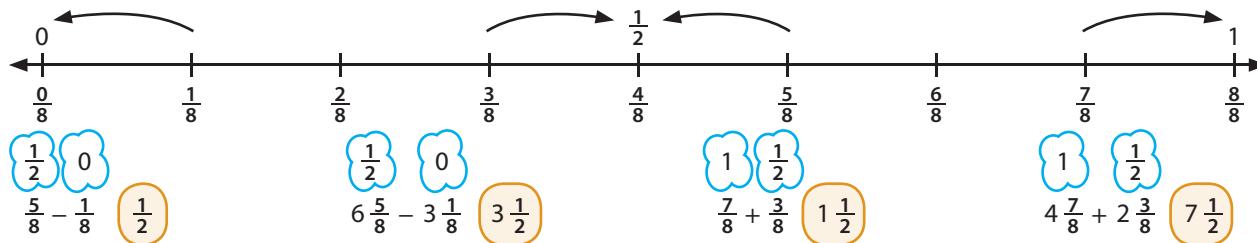
$$\frac{1}{8} \quad \frac{2}{11} \quad \frac{3}{20}$$

If the numerator is about half of the denominator, round the fraction to $\frac{1}{2}$.

$$\frac{3}{8} \quad \frac{6}{10} \quad \frac{5}{12}$$

If the numerator and the denominator are about equal, round the fraction to 1.

$$\frac{7}{8} \quad \frac{11}{12} \quad \frac{19}{20}$$



Exercises

Use the fractions in the box to write the answer.

1. Write the fractions that are equal to 1. $\frac{6}{6}, \frac{2}{2}, \frac{8}{8}$
2. Write the fractions that are equal to $\frac{1}{2}$. $\frac{4}{8}, \frac{3}{6}, \frac{5}{10}, \frac{25}{50}$

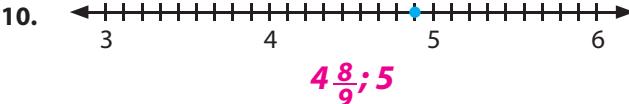
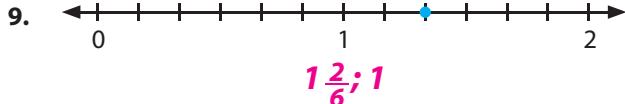
$$\begin{array}{ccccccc} \frac{3}{7} & \frac{4}{8} & \frac{6}{6} & \frac{2}{3} & \frac{12}{10} & \frac{3}{6} \\ \frac{3}{4} & \frac{2}{2} & \frac{3}{9} & \frac{5}{10} & \frac{8}{8} & \frac{25}{50} \end{array}$$

Determine whether the fraction is closest to 0, $\frac{1}{2}$, or 1.

3. $\frac{8}{18} \frac{1}{2}$
4. $\frac{2}{15} 0$
5. $\frac{13}{30} \frac{1}{2}$
6. $\frac{19}{20} 1$
7. $\frac{8}{9} 1$
8. $\frac{5}{43} 0$

Write the mixed number shown on the number line.

Estimate to the nearest whole number.



Round the mixed number to the nearest whole number.

11. $2\frac{6}{7} 3$
12. $3\frac{2}{4} 4$
13. $5\frac{2}{9} 5$
14. $1\frac{3}{8} 1$

Estimate the sum or difference by rounding to the nearest $\frac{1}{2}$ or the nearest whole number.

15. $\frac{11}{12} + \frac{5}{12} 1 + \frac{1}{2} = 1\frac{1}{2}$ or $1 + 0 = 1$
16. $\frac{4}{9} + \frac{8}{9} \frac{1}{2} + 1 = 1\frac{1}{2}$ or $0 + 1 = 1$
17. $\frac{4}{5} - \frac{2}{5} 1 - \frac{1}{2} = \frac{1}{2}$ or $1 - 0 = 1$
18. $\frac{7}{12} - \frac{5}{12} \frac{1}{2} - \frac{1}{2} = 0$ or $1 - 0 = 1$
19. $2\frac{6}{7} + 5\frac{3}{7} 3 + 5\frac{1}{2} = 8\frac{1}{2}$ or $3 + 5 = 8$
20. $3\frac{1}{7} + 2\frac{6}{7} 3 + 3 = 6$
21. $6\frac{5}{8} - 1\frac{1}{8} 6\frac{1}{2} - 1 = 5\frac{1}{2}$ or $7 - 1 = 6$
22. $8\frac{7}{10} - 3\frac{5}{10} 8\frac{1}{2} - 3\frac{1}{2} = 5$ or $9 - 4 = 5$

Fractions with different denominators are *unlike fractions*. The sum or difference of unlike fractions can be estimated by comparing each fraction's numerator to its denominator and **rounding to the nearest 0, $\frac{1}{2}$, or 1**.

$$\frac{3}{4} + \frac{1}{8}$$

$$\frac{8}{9} - \frac{2}{6}$$

$$3\frac{2}{6} + 1\frac{8}{9}$$

$$3\frac{3}{4} - 1\frac{1}{8}$$

Exercises

Round each fraction to the nearest 0, $\frac{1}{2}$, or 1.
Write a comparison sentence using $>$, $<$, or $=$.

23. $\frac{3}{4} > \frac{1}{6}$ ($1 > 0$)

24. $\frac{3}{8} < \frac{8}{10}$ ($\frac{1}{2} < 1$)

25. $\frac{8}{16} = \frac{1}{2}$ ($\frac{1}{2} = \frac{1}{2}$)

26. $\frac{9}{12} > \frac{2}{6}$ ($1 > 0$)

Estimate the sum or difference by rounding to the nearest $\frac{1}{2}$ or the nearest whole number.

27. $\frac{9}{10} + \frac{5}{8}$ $1 + \frac{1}{2} = 1\frac{1}{2}$
or $1 + 1 = 2$

28. $3\frac{9}{20} + 1\frac{1}{9}$ $3\frac{1}{2} + 1 =$
or $4\frac{1}{2}$ **or** $4 + 1 = 5$

29. $\frac{1}{8} + \frac{3}{4}$ $0 + 1 = 1$

30. $2\frac{4}{5} + 2\frac{4}{10}$ $3 + 2\frac{1}{2} =$
or $5\frac{1}{2}$ **or** $3 + 2 = 5$

31. $5\frac{7}{8} - 3\frac{1}{12}$ $6 - 3 = 3$

32. $\frac{1}{3} - \frac{1}{5}$ $0 - 0 = 0$
or $\frac{1}{2} - 0 = \frac{1}{2}$

33. $\frac{5}{6} - \frac{1}{3}$ $1 - 0 = 1$
or $1 - \frac{1}{2} = \frac{1}{2}$

34. $4\frac{5}{10} - 2\frac{11}{12}$ $4\frac{1}{2} - 3 =$
or $1\frac{1}{2}$ **or** $5 - 3 = 2$

Practice & Application

35. $n - 157 = 28$ $n =$ _____

157 + 28 = 185; n = 185

36. $n \times 15 = 210$ $n =$ _____

210 ÷ 15 = 14; n = 14

37. $140 + 310 + n = 686$ $n =$ _____

686 - 450 = 236; n = 236

38. $n \div 15 = 216$ $n =$ _____

15 × 216 = 3,240; n = 3,240

39. Find 15.86 less than 90.5.

90.5 - 15.86 = 74.64

40. What is \$15.75 divided among 3 children?

\$15.75 ÷ 3 = \$5.25

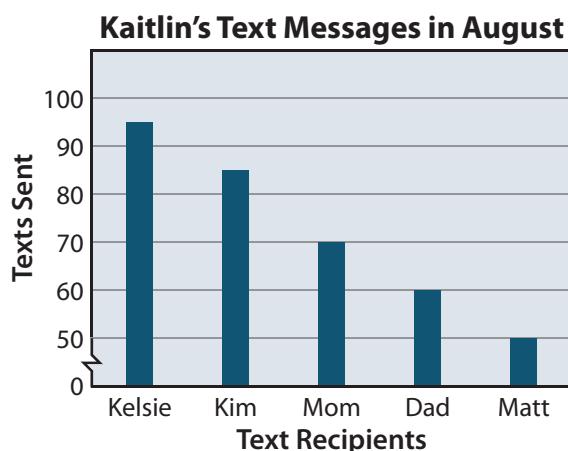
41. What is 20 bags of 2 dozen oranges?

20 × 24 = 480 oranges

42. Find \$90 added to a \$150 savings account.

\$150 + \$90 = \$240

Use the data from the bar graph to find the answer.



43. In what order are the texts listed? **greatest to least**

44. What is the approximate difference in the number of texts Kaitlin sent to Kelsie and Kim? **10 texts**

45. Did Kaitlin text Mom twice as much as Matt? **no**

46. How many texts did Kaitlin send to her dad and Matt combined? **60 + 50 = 110 texts**

47. About how many texts did Kaitlin send? **95 + 85 + 70 + 60 + 50 = 360 texts**

48. Who received about half as many texts as Kelsie? Explain your answer. **Matt; the 50 texts Matt received are about half the number of texts Kelsie received.**

J Mr. Richmond's cell phone minutes totaled 12,641 minutes for the year. To estimate the number of minutes, would you round 12,641 to the Ten Thousands place or the One Thousands place? Why?

One Thousands place; because 13,000 is closer to 12,641 than 10,000 is when you round to the Ten Thousands place.

Complete **DAILY REVIEW** **a** on page 418.

Add & Subtract Like Fractions

Fractions with like denominators can be added or subtracted. Remember to rename the answer to lowest terms. Rename an improper fraction as a mixed number.

**add fractions
subtract fractions
rename answer to lowest terms**

1. Add or subtract the fractions.
2. Add or subtract the whole numbers.
3. Simplify the answer, if needed.

Add or subtract fractions.

$$\frac{2}{8} + \frac{5}{8} = \frac{7}{8}$$

$$\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$$

$$\frac{5}{8} + \frac{2}{8} + \frac{3}{8} = \frac{10}{8} = 1 \frac{2 \div 2}{8 \div 2} = 1 \frac{1}{4}$$

Add or subtract mixed numbers.

$$\begin{array}{r} 3 \frac{5}{8} \\ + 2 \frac{1}{8} \\ \hline 5 \frac{6 \div 2}{8 \div 2} = 5 \frac{3}{4} \end{array}$$

$$\begin{array}{r} 7 \frac{5}{8} \\ - 1 \frac{1}{8} \\ \hline 6 \frac{4 \div 4}{8 \div 4} = 6 \frac{1}{2} \end{array}$$

Rename a whole to subtract.

$$\begin{array}{r} 4 \\ 5 \frac{8}{8} \\ - 1 \frac{3}{8} \\ \hline 3 \frac{5}{8} \end{array}$$

$$\begin{array}{r} 3 \\ 4 \frac{3}{8} = 3 + \frac{8}{8} + \frac{3}{8} = 3 \frac{11}{8} \\ - 1 \frac{5}{8} \\ \hline 2 \frac{6 \div 2}{8 \div 2} = 2 \frac{3}{4} \end{array}$$

Exercises

Add or subtract. Write the answer in lowest terms.

$$1. \frac{1}{8} + \frac{3}{8} \frac{4}{8} = \frac{1}{2}$$

$$2. \frac{5}{9} + \frac{1}{9} \frac{6}{9} = \frac{2}{3}$$

$$3. \frac{3}{10} + \frac{9}{10} \frac{12}{10} = 1 \frac{2}{10} = 1 \frac{1}{5}$$

$$4. \frac{1}{7} + \frac{2}{7} + \frac{3}{7} \frac{6}{7}$$

$$5. \frac{7}{12} - \frac{5}{12} \frac{2}{12} = \frac{1}{6}$$

$$6. \frac{9}{10} - \frac{4}{10} \frac{5}{10} = \frac{1}{2}$$

$$7. \frac{3}{5} - \frac{2}{5} \frac{1}{5}$$

$$8. \frac{7}{8} - \frac{5}{8} \frac{2}{8} = \frac{1}{4}$$

Add or subtract. Rename when necessary. Write the answer in lowest terms.

$$\begin{array}{r} 9. \quad 7 \frac{4}{5} \\ + 6 \frac{1}{5} \\ \hline 13 \frac{5}{5} = 14 \end{array}$$

$$\begin{array}{r} 10. \quad 3 \frac{5}{8} \\ + 2 \frac{7}{8} \\ \hline 5 \frac{12}{8} = 6 \frac{4}{8} = 6 \frac{1}{2} \end{array}$$

$$\begin{array}{r} 11. \quad 1 \frac{3}{7} \\ + 1 \frac{1}{7} \\ \hline 2 \frac{4}{7} \end{array}$$

$$\begin{array}{r} 12. \quad 6 \frac{9}{14} \\ - 1 \frac{3}{14} \\ \hline 5 \frac{6}{14} = 5 \frac{3}{7} \end{array}$$

$$\begin{array}{r} 13. \quad 9 \frac{10}{5} \frac{5}{5} \\ - 3 \frac{4}{5} \\ \hline 6 \frac{1}{5} \end{array}$$

$$\begin{array}{r} 14. \quad 4 \frac{5}{6} \frac{1}{6} \frac{7}{6} \\ - 2 \frac{5}{6} \\ \hline 2 \frac{2}{6} = 2 \frac{1}{3} \end{array}$$

$$\begin{array}{r} 15. \quad 7 \frac{8}{3} \frac{1}{3} \frac{4}{3} \\ - 2 \frac{2}{3} \\ \hline 5 \frac{2}{3} \end{array}$$

$$\begin{array}{r} 16. \quad 4 \frac{5}{12} \\ - 3 \\ \hline 1 \frac{5}{12} \end{array}$$

Round each mixed number to the nearest whole number to estimate.

Solve. Write the answer in lowest terms.

$$\begin{array}{r} 17. \quad 8 \frac{7}{10} \\ - 3 \frac{3}{10} \\ \hline 6; 5 \frac{4}{10} = 5 \frac{2}{5} \end{array}$$

$$\begin{array}{r} 18. \quad 5 \frac{6}{12} \frac{7}{12} \frac{19}{12} \\ - 1 \frac{11}{12} \\ \hline 5; 4 \frac{8}{12} = 4 \frac{2}{3} \end{array}$$

$$\begin{array}{r} 19. \quad 2 \frac{3}{9} \frac{5}{9} \frac{14}{9} \\ - 2 \frac{7}{9} \\ \hline 1; \frac{7}{9} \end{array}$$

$$\begin{array}{r} 20. \quad 12 \frac{3}{4} \\ - 6 \frac{1}{4} \\ \hline 7; 6 \frac{2}{4} = 6 \frac{1}{2} \end{array}$$

$$\begin{array}{r} 21. \quad 2 \frac{2}{3} \\ 3 \frac{2}{3} \\ + 1 \frac{1}{3} \\ \hline 8; 6 \frac{5}{3} = 7 \frac{2}{3} \end{array}$$

$$\begin{array}{r} 22. \quad 3 \frac{7}{9} \\ 1 \frac{1}{9} \\ + 6 \frac{5}{9} \\ \hline 12; 10 \frac{13}{9} = 11 \frac{4}{9} \end{array}$$

$$\begin{array}{r} 23. \quad 5 \frac{1}{2} \\ 4 \\ + 2 \frac{1}{2} \\ \hline 13; 11 \frac{2}{2} = 12 \end{array}$$

$$\begin{array}{r} 24. \quad 6 \frac{1}{8} \\ 2 \frac{5}{8} \\ + 2 \frac{3}{8} \\ \hline 11; 10 \frac{9}{8} = 11 \frac{1}{8} \end{array}$$

Solve. Write the answer in lowest terms.

25. Tara bought $10\frac{1}{4}$ yards of lace. She has $2\frac{3}{4}$ yards left. How much of the lace has she used?

$$10\frac{1}{4} - 2\frac{3}{4} = 9\frac{5}{4} - 2\frac{3}{4} = 7\frac{2}{4} = 7\frac{1}{2} \text{ yards}$$

26. Evan and Tyler build model ships. Evan's ship is $12\frac{1}{4}$ inches long. Tyler's ship is $11\frac{3}{4}$ inches long. The display shelf must be a minimum of how many inches long to hold both ships?

$$12\frac{1}{4} + 11\frac{3}{4} = 23\frac{4}{4} = 24 \text{ inches}$$



Write a comparison sentence using = or ≠.

27. $\frac{2}{5} + \frac{1}{5} = \frac{4}{10} + \frac{2}{10}$

30. $\frac{2}{9} \neq \frac{2}{3}$

33. $\frac{7}{8} \neq \frac{8}{16}$

28. $\frac{3}{4} = \frac{75}{100}$

31. $\frac{3}{9} - \frac{1}{9} \neq \frac{1}{3} + \frac{1}{3}$

34. $\frac{3}{6} = \frac{6}{12}$

29. $\frac{8}{12} - \frac{2}{12} \neq \frac{4}{6} + \frac{1}{6}$

32. $\frac{4}{5} = \frac{8}{10}$

35. $\frac{9}{7} - \frac{4}{7} \neq \frac{13}{14} - \frac{4}{14}$

Practice & Application

36. What whole number does $7\frac{3}{10}$ round to? Why? **7**

37. Which of these numbers does not round to 8:

$$7\frac{2}{4}, 8\frac{1}{6}, 7\frac{2}{5} \text{? Why? } 7\frac{2}{5}$$

38. Which fraction is larger: $\frac{4}{5}$ or $\frac{1}{10}$? **$\frac{4}{5} > \frac{1}{10}$**

39. Write $\frac{1}{2}$, $\frac{6}{8}$, and $\frac{7}{12}$ from least to greatest. **$\frac{1}{2}, \frac{7}{12}, \frac{6}{8}$**

40. Write an equation showing the sum of $\frac{5}{8}$ and $\frac{4}{8}$.

$$\frac{5}{8} + \frac{4}{8} = \frac{9}{8} = 1\frac{1}{8}$$

41. What fraction added to $\frac{7}{10}$ makes 1? **$\frac{3}{10}$**

42. Complete the equation to make a true statement:

$$\frac{4}{?} + \frac{2}{?} = \frac{6}{?} = \frac{3}{4}. \quad \frac{4}{8} + \frac{2}{8} = \frac{6}{8} = \frac{3}{4}$$

43. Which fraction is smaller: $\frac{5}{12}$ or $\frac{7}{8}$? Why?

$$\frac{5}{12}, \frac{10}{24} < \frac{21}{24}$$

36. **7; because when the fraction in a mixed number is less than $\frac{1}{2}$, the number is rounded down.**

44. Which two fractions are equivalent: $\frac{15}{30}$, $\frac{6}{9}$, $\frac{1}{2}$?

$\frac{15}{30}$ and $\frac{1}{2}$

45. Emily needs $7\frac{3}{4}$ inches of ribbon to complete her photo frame. Which two pieces of ribbon will be enough: $(3\frac{1}{4}, 4\frac{1}{8})$; $(2\frac{3}{4}, 4)$; $(1\frac{2}{8}, 6\frac{5}{8})$? **$1\frac{2}{8}, 6\frac{5}{8}$**

46. Hunter needs $7\frac{10}{16}$ inches of rope to finish a project. He has $7\frac{1}{2}$ inches of rope. Does he have enough to finish the project? Why?

No; $7\frac{10}{16} > 7\frac{8}{16}$

47. List three fractions that are equivalent to $\frac{2}{5}$.
Answers may vary.

48. List three fractions with denominators smaller than 12 that are less than $\frac{6}{12}$.
Answers may vary.

49. List three fractions with denominators smaller than 12 that are greater than $\frac{6}{12}$.
Answers may vary.

50. Draw an illustration showing that $\frac{6}{4} = 1\frac{1}{2}$.



37. **$7\frac{2}{5}; \text{the fraction in the mixed number is less than } \frac{1}{2}, \text{ so the number rounds down to 7.}$**

Complete **DAILY REVIEW** b on page 418.

Add & Subtract Related Fractions

Unlike fractions are fractions with different denominators (different parts in the whole). Some unlike fractions are related fractions. **Related fractions** are fractions in which one denominator is a multiple of the other denominator. To add or subtract related fractions, **rename** one fraction so that the fractions have the same denominator. Complete the operation. Write the answer in lowest terms.

unlike fractions
related fractions
rename

$$\begin{array}{r} \frac{8}{10} = \frac{8}{10} \\ + \frac{3 \times 2}{5 \times 2} = \frac{6}{10} \\ \hline \frac{14}{10} = 1 \frac{4}{10} = 1 \frac{2}{5} \end{array}$$

10 is a multiple of 5.

1. Rename. $\frac{3}{5} = \frac{6}{10}$
2. Add.
3. Write the answer in lowest terms.

$$\begin{array}{r} 3 \frac{1 \times 3}{4 \times 3} = 3 \frac{3}{12} = 2 \frac{15}{12} \\ - 1 \frac{11}{12} = 1 \frac{11}{12} \\ \hline 1 \frac{4}{12} = 1 \frac{1}{3} \end{array}$$

12 is a multiple of 4.

1. Rename. $\frac{1}{4} = \frac{3}{12}$
2. Subtract. Rename a whole when necessary. $3 \frac{3}{12} = 2 \frac{15}{12}$
3. Write the answer in lowest terms.

Exercises

Add or subtract. Write the answer in lowest terms.

$$\begin{array}{r} \frac{2}{9} = \frac{2}{9} \\ + \frac{1}{3} = \frac{3}{9} \\ \hline \frac{5}{9} \end{array}$$

$$\begin{array}{r} \frac{9}{16} = \frac{9}{16} \\ + \frac{3}{4} = \frac{12}{16} \\ \hline \frac{21}{16} = 1 \frac{5}{16} \end{array}$$

$$\begin{array}{r} \frac{7}{12} \\ + \frac{5}{12} \\ \hline \frac{12}{12} = 1 \end{array}$$

$$\begin{array}{r} \frac{1}{2} = \frac{4}{8} \\ + \frac{3}{8} = \frac{3}{8} \\ \hline \frac{7}{8} \end{array}$$

$$\begin{array}{r} \frac{2}{3} = \frac{8}{12} \\ + \frac{7}{12} = \frac{7}{12} \\ \hline \frac{15}{12} = 1 \frac{3}{12} = 1 \frac{1}{4} \end{array}$$

$$\begin{array}{r} \frac{6}{7} = \frac{12}{14} \\ + \frac{3}{14} = \frac{3}{14} \\ \hline \frac{15}{14} = 1 \frac{1}{14} \end{array}$$

$$\begin{array}{r} \frac{2}{3} \\ - \frac{1}{3} \\ \hline \frac{1}{3} \end{array}$$

$$\begin{array}{r} \frac{7}{9} = \frac{14}{18} \\ - \frac{5}{18} = \frac{5}{18} \\ \hline \frac{9}{18} = \frac{1}{2} \end{array}$$

$$\begin{array}{r} \frac{3}{4} = \frac{3}{4} \\ - \frac{1}{2} = \frac{2}{4} \\ \hline \frac{1}{4} \end{array}$$

$$\begin{array}{r} \frac{2}{3} = \frac{4}{6} \\ - \frac{1}{6} = \frac{1}{6} \\ \hline \frac{3}{6} = \frac{1}{2} \end{array}$$

Add or subtract. Rename when necessary. Write the answer in lowest terms.

$$\begin{array}{r} 3 \frac{8}{15} = 3 \frac{8}{15} \\ + 1 \frac{4}{5} = 1 \frac{12}{15} \\ \hline 4 \frac{20}{15} = 5 \frac{5}{15} = 5 \frac{1}{3} \end{array}$$

$$\begin{array}{r} 5 \frac{1}{6} = 5 \frac{2}{12} \\ + 2 \frac{1}{12} = 2 \frac{1}{12} \\ \hline 7 \frac{3}{12} = 7 \frac{1}{4} \end{array}$$

$$\begin{array}{r} 2 \frac{9}{10} = 2 \frac{9}{10} \\ - 1 \frac{3}{5} = 1 \frac{6}{10} \\ \hline 1 \frac{3}{10} \end{array}$$

$$\begin{array}{r} 1 \frac{1}{10} = \frac{11}{10} \\ - \frac{1}{5} = \frac{2}{10} \\ \hline \frac{9}{10} \end{array}$$

$$\begin{array}{r} 6 \frac{7}{8} = 6 \frac{14}{16} \\ - 1 \frac{13}{16} = 1 \frac{1}{16} \\ \hline 5 \frac{1}{16} \end{array}$$

Solve. Write the answer in lowest terms.

16. Mr. Peterson has chickens on his farm. Of the chickens, $\frac{1}{6}$ are white and $\frac{1}{2}$ are brown. How many more of the chickens are brown than white?
 $\frac{1}{2} - \frac{1}{6} = \frac{3}{6} - \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$ **more brown chickens**

17. Terence has a coin collection. The collection is made up of $\frac{5}{12}$ U.S. coins and $\frac{1}{4}$ French coins. How much more of the collection is American than French?
 $\frac{5}{12} - \frac{1}{4} = \frac{5}{12} - \frac{3}{12} = \frac{2}{12} = \frac{1}{6}$ **more American**

18. Claire used $\frac{3}{8}$ of a pound of raisins in a cookie recipe. Michelle used $\frac{7}{16}$ of a pound of raisins in a coffee cake. What is the total amount of raisins used in these recipes?

$$\frac{3}{8} + \frac{7}{16} = \frac{6}{16} + \frac{7}{16} = \frac{13}{16} \text{ of a pound}$$

19. Makayla has 2 cups of butter. If she uses $\frac{1}{4}$ cup for cookies, $\frac{1}{2}$ cup for fudge, and $\frac{1}{8}$ cup for the rolls she is making, how much butter will she have left?

$$\frac{1}{4} + \frac{1}{2} + \frac{1}{8} = \frac{2}{8} + \frac{4}{8} + \frac{1}{8} = \frac{7}{8}$$

$$2 - \frac{7}{8} = 1 \frac{8}{8} - \frac{7}{8} = 1 \frac{1}{8} \text{ cups}$$

Round each fraction to the nearest 0, $\frac{1}{2}$, or 1.
Estimate the sum or the difference.

20. $\frac{1}{5} + \frac{7}{8}$

$\frac{1}{2}$

2

1

21. $\frac{5}{12} + \frac{1}{6} + \frac{5}{10}$

0

1

$1\frac{1}{2}$

22. $\frac{9}{10} + \frac{1}{2}$

1

$1\frac{1}{2}$

$\frac{1}{2}$

23. $\frac{4}{5} - \frac{1}{10}$

$\frac{1}{2}$

1

$1\frac{1}{2}$

24. $\frac{8}{16} - \frac{1}{8}$

$\frac{1}{2}$

1

$1\frac{1}{2}$

25. $\frac{7}{9} - \frac{1}{18}$

$\frac{1}{2}$

1

$1\frac{1}{2}$

Add or subtract. Write the answer in lowest terms.

26.
$$\begin{array}{r} \frac{3}{8} \\ + \frac{3}{8} \\ \hline \frac{6}{8} = \frac{3}{4} \end{array}$$

27.
$$\begin{array}{r} 4 5 \frac{3}{10} 13 \\ - 1 \frac{7}{10} \\ \hline 3 \frac{6}{10} = 3 \frac{3}{5} \end{array}$$

28.
$$\begin{array}{r} 1 \frac{3}{10} = \frac{13}{10} \\ - \frac{3}{5} = \frac{6}{10} \\ \hline \frac{7}{10} \end{array}$$

29.
$$\begin{array}{r} 10 \frac{1}{8} = 9 \frac{9}{8} \\ - 4 \frac{3}{4} = 4 \frac{6}{8} \\ \hline 5 \frac{3}{8} \end{array}$$

30.
$$\begin{array}{r} \frac{7}{12} = \frac{7}{12} \\ - \frac{1}{4} = \frac{3}{12} \\ \hline \frac{4}{12} = \frac{1}{3} \end{array}$$

31.
$$\begin{array}{r} \frac{5}{24} = \frac{5}{24} \\ + \frac{3}{4} = \frac{18}{24} \\ \hline \frac{23}{24} \end{array}$$

32.
$$\begin{array}{r} \frac{9}{10} \\ - \frac{3}{10} \\ \hline \frac{6}{10} = \frac{3}{5} \end{array}$$

33.
$$\begin{array}{r} 5 \frac{1}{2} = 5 \frac{2}{4} \\ + 1 \frac{1}{4} = 1 \frac{1}{4} \\ \hline 6 \frac{3}{4} \end{array}$$

34.
$$\begin{array}{r} 8 \frac{2}{3} = 8 \frac{4}{6} \\ + 1 \frac{5}{6} = 1 \frac{5}{6} \\ \hline 9 \frac{9}{6} = 10 \frac{3}{6} = 10 \frac{1}{2} \end{array}$$

35.
$$\begin{array}{r} 1 \frac{3}{5} \\ + 1 \frac{2}{5} \\ \hline 2 \frac{5}{5} = 3 \end{array}$$

36.
$$\begin{array}{r} \frac{1}{2} = \frac{4}{8} \\ + \frac{5}{8} = \frac{5}{8} \\ \hline \frac{9}{8} = 1 \frac{1}{8} \end{array}$$

37.
$$\begin{array}{r} 3 \frac{4}{15} = 3 \frac{4}{15} \\ - 2 \frac{1}{5} = 2 \frac{3}{15} \\ \hline 1 \frac{1}{15} \end{array}$$

38.
$$\begin{array}{r} 1 \frac{3}{4} \\ + 2 \frac{1}{4} \\ \hline 3 \frac{4}{4} = 4 \end{array}$$

39.
$$\begin{array}{r} \frac{14}{15} = \frac{14}{15} \\ - \frac{1}{5} = \frac{3}{15} \\ \hline \frac{11}{15} \end{array}$$

40.
$$\begin{array}{r} 5 \frac{1}{9} = 4 \frac{10}{9} \\ - \frac{1}{3} = \frac{3}{9} \\ \hline 4 \frac{7}{9} \end{array}$$

41.
$$\begin{array}{r} 5 6 \frac{7}{7} \\ - 3 \frac{2}{7} \\ \hline 2 \frac{5}{7} \end{array}$$

Practice & Application

42. Write the numbers that are 100,000 more than and 100,000 less than 85,482,512.

85,582,512 and 85,382,512

43. Find the value of n in $27 \times n = 4,455$.

$4,455 \div 27 = 165$; $n = 165$

44. How many groups of 25 can you make from 875?

$875 \div 25 = 35$

45. Write the prime factors of the composite number 38. **2, 19**

46. There were 120 packages in each of the 16 store displays. How many packages were in the 16 displays? **$16 \times 120 = 1,920$ packages**

47. Find the LCM of 12 and 18. **36**

48. Simplify $(56 + 34) \div 30 + 87$. **90**

49. Simplify $825 \div 25 - 21$. **12**



Write a word problem that includes unlike fractions that are related.

Answers may vary.

48. **$90 \div 30 + 87$**

$3 + 87$

49. **$33 - 21$**

12

90

Add & Subtract Unlike Fractions

When fractions with **unlike** denominators are *not* related, rename both fractions before adding or subtracting. Rename the fractions by finding a **common denominator**. Remember to rename the sum or difference to lowest terms.

unlike fractions
common denominator
least common multiple (LCM)
prime factorization

Multiply the denominators.

$$3 \times 5 = 15$$

$$\begin{array}{r} 6 \frac{2}{5} \times 3 = 6 \frac{6}{15} = 5 \frac{21}{15} \\ - 4 \frac{2}{3} \times 5 = 4 \frac{10}{15} = 4 \frac{10}{15} \\ \hline 1 \frac{11}{15} \end{array}$$

List multiples.

$$4: 4, 8, 12$$

$$6: 6, 12$$

$$\begin{array}{r} 5 \times 2 = 10 \\ 6 \times 2 = 12 \\ - 1 \times 3 = 3 \\ \hline 7 \\ 12 \end{array}$$

LCM of 4 and 6: 12

Use prime factorization.

$$8: 2 \times 2 \times 2 = 2^3$$

$$18: 2 \times 3 \times 3 = 2 \times 3^2$$

$$\begin{array}{r} 5 \times 9 = 45 \\ 8 \times 9 = 72 \\ + 7 \times 4 = 28 \\ \hline 73 \\ 72 \end{array}$$

LCM of 8 and 18:
 $2^3 \times 3^2 = 8 \times 9 = 72$

Exercises

Find the LCM of the denominators. **Method used to find LCM may vary.**

1. $\frac{1}{6}, \frac{2}{11}$ **66**

2. $\frac{6}{10}, \frac{3}{15}$ **30**

3. $\frac{2}{24}, \frac{4}{6}$ **24**

4. $\frac{1}{9}, \frac{2}{15}$ **45**

5. $\frac{5}{20}, \frac{4}{15}$ **60**

Add or subtract. Write the answer in lowest terms.

6. $\frac{8}{9} = \frac{64}{72}$
 $+ \frac{7}{8} = \frac{63}{72}$
 $\frac{127}{72} = 1 \frac{55}{72}$

7. $4 \frac{5}{12} = 4 \frac{15}{36}$
 $+ 3 \frac{5}{9} = 3 \frac{20}{36}$
 $\frac{7 \frac{35}{36}}{36} = 7 \frac{35}{36}$

8. $\frac{5}{6} = \frac{15}{18}$
 $- \frac{1}{9} = \frac{2}{18}$
 $\frac{13}{18}$

9. $5 \frac{1}{10} = 4 \frac{11}{10}$
 $- 2 \frac{3}{5} = 2 \frac{6}{10}$
 $\frac{2 \frac{5}{10}}{10} = 2 \frac{1}{2}$

10. $\frac{2}{3} = \frac{4}{6}$
 $+ \frac{1}{2} = \frac{3}{6}$
 $\frac{7}{6} = 1 \frac{1}{6}$

11. $1 \frac{3}{4} = 1 \frac{15}{20}$
 $+ 8 \frac{7}{10} = 8 \frac{14}{20}$
 $\frac{9 \frac{29}{20}}{20} = 10 \frac{9}{20}$

12. $\frac{4}{5} = \frac{12}{15}$
 $- \frac{2}{3} = \frac{10}{15}$
 $\frac{2}{15}$

13. $4 \frac{3}{5}$
 $- 1 \frac{2}{3}$
 $\frac{3 \frac{1}{3}}{3} = 3 \frac{1}{3}$

14. $\frac{3}{4} = \frac{9}{12}$
 $+ \frac{5}{6} = \frac{10}{12}$
 $\frac{19}{12} = 1 \frac{7}{12}$

15. $3 \frac{5}{8} = 3 \frac{5}{8}$
 $+ 2 \frac{1}{4} = 2 \frac{2}{8}$
 $\frac{5 \frac{7}{8}}{8} = 5 \frac{7}{8}$

16. $\frac{5}{8} = \frac{15}{24}$
 $- \frac{1}{3} = \frac{8}{24}$
 $\frac{7}{24}$

17. $16 \frac{4}{9} = 16 \frac{8}{18}$
 $- 8 \frac{1}{6} = 8 \frac{3}{18}$
 $\frac{8 \frac{5}{18}}{18} = 8 \frac{5}{18}$

Solve.

18. Carter rode his bike $\frac{9}{10}$ of a mile from his house to his grandmother's house. On his way back home, he rode $\frac{3}{8}$ of a mile before the tire on his bike went flat. How much farther must he walk to get home?

$$\frac{9}{10} - \frac{3}{8} = \frac{36}{40} - \frac{15}{40} = \frac{21}{40} \text{ of a mile}$$

19. Lena needs $\frac{3}{4}$ cup of sugar to make brownies. She will need $\frac{2}{3}$ cup for a coffee cake. How much sugar does she need?

$$\frac{3}{4} + \frac{2}{3} = \frac{9}{12} + \frac{8}{12} = \frac{17}{12} = 1 \frac{5}{12} \text{ cups}$$

Add. Write the answer in lowest terms.

20. $2\frac{3}{8}$

$$+ 1\frac{1}{8}$$

$$\underline{3\frac{4}{8} = 3\frac{1}{2}}$$

21. $\frac{7}{8} = \frac{21}{24}$

$$+ \frac{5}{6} = \frac{20}{24}$$

$$\underline{\frac{41}{24} = 1\frac{17}{24}}$$

22. $\frac{2}{3} = \frac{8}{12}$

$$+ \frac{3}{4} = \frac{9}{12}$$

$$\underline{\frac{17}{12} = 1\frac{5}{12}}$$

23. $\frac{4}{9} = \frac{8}{18}$

$$+ \frac{1}{2} = \frac{9}{18}$$

$$\underline{\frac{17}{18}}$$

24. $\frac{4}{9} = \frac{4}{9}$

$$+ \frac{2}{3} = \frac{6}{9}$$

$$\underline{\frac{10}{9} = 1\frac{1}{9}}$$

25. $\frac{1}{7} = \frac{2}{14}$

$$+ \frac{5}{14} = \frac{5}{14}$$

$$\underline{\frac{7}{14} = \frac{1}{2}}$$

26. $\frac{5}{12} = \frac{25}{60}$

$$+ \frac{3}{15} = \frac{12}{60}$$

$$\underline{\frac{37}{60}}$$

27. $6\frac{1}{3}$

$$+ 6\frac{2}{3}$$

$$\underline{12\frac{3}{3} = 13}$$

Subtract. Write the answer in lowest terms.

28. $\frac{7}{8} = \frac{7}{8}$

$$- \frac{1}{4} = \frac{2}{8}$$

$$\underline{\frac{5}{8}}$$

29. $\frac{5}{12} = \frac{10}{24}$

$$- \frac{3}{8} = \frac{9}{24}$$

$$\underline{\frac{1}{24}}$$

30. $\frac{7}{9} = \frac{14}{18}$

$$- \frac{1}{6} = \frac{3}{18}$$

$$\underline{\frac{11}{18}}$$

31. $5\frac{1}{4}$

$$- 2\frac{3}{4}$$

$$\underline{3\frac{2}{4} = 3\frac{1}{2}}$$

32. $\frac{3}{4} = \frac{9}{12}$

$$- \frac{2}{3} = \frac{8}{12}$$

$$\underline{\frac{1}{12}}$$

33. $1\frac{1}{2} = 1\frac{4}{8}$

$$- \frac{7}{8} = \frac{7}{8}$$

$$\underline{\frac{5}{8}}$$

34. $\frac{4}{5} = \frac{12}{15}$

$$- \frac{1}{3} = \frac{5}{15}$$

$$\underline{\frac{7}{15}}$$

35. $\frac{3}{10} = \frac{6}{20}$

$$- \frac{1}{4} = \frac{5}{20}$$

$$\underline{\frac{1}{20}}$$

Practice & Application

36. What number is halfway between 3,000 and 4,000? **3,500**

37. What number is halfway between 20,000 and 30,000? **25,000**

38. What number is halfway between 58 and 100? **79**

39. On a number line 3.5 is marked as the halfway point. Choose the two numbers 3.5 is between.

300 and 400

30 and 40

3 and 4

40. Write the product of 200×600 . **120,000**

41. Write the quotient of $\frac{210}{4}$. Write the remainder as a fraction in lowest terms. **$52\frac{2}{4} = 52\frac{1}{2}$**

- J Explain how you know $\frac{7}{8} < \frac{8}{9}$ is a true statement by comparing both fractions to 1 whole.

Because only one more part of each fraction is needed to make 1 whole, I can compare those parts. $\frac{1}{8} > \frac{1}{9}$, therefore $\frac{7}{8} < \frac{8}{9}$.



Kate Shelley began working as the station agent at the Moingona train station in 1903—approximately 22 years after her heroic trip to save the Midnight Express. The Kate Shelley Railroad Museum marks her place in history.

More Fractions & Mixed Numbers

Exercises

Determine whether the fraction is closest to 0, $\frac{1}{2}$, or 1.

1. $\frac{7}{16} \frac{1}{2}$

4. $\frac{1}{10} 0$

7. $\frac{5}{8} \frac{1}{2}$

2. $\frac{9}{12} 1$

5. $\frac{17}{20} 1$

8. $\frac{7}{14} \frac{1}{2}$

3. $\frac{4}{7} \frac{1}{2}$

6. $\frac{5}{10} \frac{1}{2}$

9. $\frac{3}{25} 0$

Write a comparison sentence using $>$, $<$, or $=$.

10. $\frac{3}{6} = \frac{5}{10}$

13. $\frac{3}{8} < \frac{3}{4}$

16. $2\frac{5}{8} > \frac{5}{2}$

11. $\frac{2}{3} > \frac{1}{9}$

14. $\frac{7}{10} < \frac{11}{12}$

17. $3\frac{6}{18} > 3\frac{2}{9}$

12. $\frac{1}{3} = \frac{4}{12}$

15. $\frac{9}{20} > \frac{3}{8}$

18. $4\frac{2}{3} < 4\frac{5}{6}$

Add or subtract. Write the answer in lowest terms.

19. $10\frac{3}{4} = 10\frac{9}{12}$
+ $6\frac{5}{12} = 6\frac{10}{12}$
 $16\frac{14}{12} = 17\frac{2}{12} = 17\frac{1}{6}$

20. $8\frac{3}{4} = 8\frac{9}{12}$
+ $7\frac{1}{3} = 7\frac{4}{12}$
 $15\frac{13}{12} = 16\frac{1}{12}$

21. $25\frac{5}{8} = 25\frac{15}{24}$
+ $16\frac{7}{12} = 16\frac{14}{24}$
 $41\frac{29}{24} = 42\frac{5}{24}$

22. $9\frac{1}{6} = 9\frac{4}{24}$
+ $4\frac{5}{8} = 4\frac{15}{24}$
 $13\frac{19}{24}$

23. $3\frac{4}{9}$
 $4\frac{5}{9}$
+ $1\frac{3}{9}$
 $8\frac{12}{9} = 9\frac{3}{9} = 9\frac{1}{3}$

24. $1\frac{1}{2} = 1\frac{4}{8}$
 $4\frac{1}{2} = 4\frac{4}{8}$
+ $5\frac{1}{8} = 5\frac{1}{8}$
 $10\frac{9}{8} = 11\frac{1}{8}$

25. $7\frac{1}{2} = 7\frac{4}{8}$
 $1\frac{3}{8} = 1\frac{3}{8}$
+ $3\frac{1}{4} = 3\frac{2}{8}$
 $11\frac{9}{8} = 12\frac{1}{8}$

26. $9\frac{1}{4} = 9\frac{3}{12}$
 $3\frac{5}{6} = 3\frac{10}{12}$
+ $4\frac{2}{3} = 4\frac{8}{12}$
 $16\frac{21}{12} = 17\frac{9}{12} = 17\frac{3}{4}$

27. $20\frac{8}{8}$
- $9\frac{5}{8}$
 $10\frac{3}{8}$

28. $8\frac{9}{6}$
- $3\frac{5}{6}$
 $5\frac{2}{6} = 5\frac{1}{3}$

29. $6\frac{5}{8}$
- $2\frac{7}{8}$
 $4\frac{6}{8} = 4\frac{3}{4}$

30. $20\frac{1}{2} = 20\frac{4}{8}$
- $6\frac{5}{8}$
 $13\frac{7}{8}$

31. $4\frac{5}{6} = 4\frac{10}{12}$
- $2\frac{3}{4} = 2\frac{9}{12}$
 $2\frac{1}{12}$

32. $7\frac{1}{5} = 7\frac{4}{20}$
- $2\frac{3}{4} = 2\frac{15}{20}$
 $4\frac{9}{20}$

33. $23\frac{1}{6} = 23\frac{3}{18}$
- $16\frac{5}{9} = 16\frac{10}{18}$
 $6\frac{11}{18}$

34. $9\frac{7}{12} = 9\frac{7}{12}$
- $2\frac{1}{4} = 2\frac{3}{12}$
 $7\frac{4}{12} = 7\frac{1}{3}$

Round each mixed number to the nearest whole number.

Estimate the sum or the difference.

$$35. \quad 2\frac{3}{4}$$
$$- 1\frac{3}{8}$$
$$\underline{\underline{3 - 1 = 2}}$$

$$36. \quad 8\frac{5}{6}$$
$$- \frac{2}{3}$$
$$\underline{\underline{9 - 1 = 8}}$$

$$37. \quad 3\frac{7}{8}$$
$$- 1\frac{1}{4}$$
$$\underline{\underline{4 - 1 = 3}}$$

$$38. \quad 7\frac{1}{6}$$
$$+ 4\frac{1}{6}$$
$$\underline{\underline{7 + 4 = 11}}$$

$$39. \quad 5\frac{3}{8}$$
$$+ 2\frac{1}{2}$$
$$\underline{\underline{5 + 3 = 8}}$$

Solve.

40. Zachary has three boards in his garage. The lengths of the boards are $7\frac{2}{3}$ feet, $6\frac{1}{3}$ feet, and $4\frac{1}{2}$ feet. What is the combined length of the boards? $7\frac{2}{3} + 6\frac{1}{3} + 4\frac{1}{2} = 7\frac{4}{6} + 6\frac{2}{6} + 4\frac{3}{6} = 17\frac{9}{6} = 18\frac{3}{6} = 18\frac{1}{2}$ feet

41. Ryan ran $\frac{7}{8}$ of a mile and Olivia ran $1\frac{1}{4}$ miles. How much farther did Olivia run than Ryan? $1\frac{1}{4} - \frac{7}{8} = \frac{5}{4} - \frac{7}{8} = \frac{10}{8} - \frac{7}{8} = \frac{3}{8}$ of a mile

Practice & Application

44. $52 + n = 100$ $100 - 52 = 48$; $n = 48$

45. $\frac{2}{3} + n = 1$ $1 - \frac{2}{3} = \frac{3}{3} - \frac{2}{3} = \frac{1}{3}$; $n = \frac{1}{3}$

46. $25 + 50 + n = 100$
 $100 - (25 + 50) = 100 - 75 = 25$; $n = 25$

47. $\frac{2}{6} + \frac{1}{6} + n = 1$ $1 - (\frac{2}{6} + \frac{1}{6}) = \frac{6}{6} - \frac{3}{6} = \frac{3}{6} = \frac{1}{2}$;
 $n = \frac{1}{2}$

48. Find $\frac{1}{2}$ more than $\frac{1}{4}$. $\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$

49. What is $\frac{1}{5}$ less than $\frac{4}{5}$? $\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$

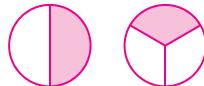
50. What is $\frac{1}{4}$ less than 1? $1 - \frac{1}{4} = \frac{4}{4} - \frac{1}{4} = \frac{3}{4}$

51. Find $\frac{2}{3}$ more than 4. $4 + \frac{2}{3} = 4\frac{2}{3}$

$$1\frac{3}{4} + 2\frac{1}{2} = 1\frac{3}{4} + 2\frac{2}{4} = 3\frac{5}{4} = 4\frac{1}{4}$$
 gallons

42. Sophia needs 5 gallons of juice for the punch she is making. She has $1\frac{3}{4}$ gallons of orange juice and $2\frac{1}{2}$ gallons of pineapple juice. Does she have enough juice? Why? **No, she does not have enough; $4\frac{1}{4} < 5$.**

43. Draw two circles. Use the circles to show $\frac{1}{2} > \frac{1}{3}$.



52. $1 - \frac{2}{3} = \frac{3}{3} - \frac{2}{3} = \frac{1}{3}$

53. $\frac{6}{10} - n = \frac{1}{2}$ $\frac{6}{10} - \frac{1}{2} = \frac{6}{10} - \frac{5}{10} = \frac{1}{10}$; $n = \frac{1}{10}$

54. $\frac{1}{2} + n = 1$ $1 - \frac{1}{2} = \frac{2}{2} - \frac{1}{2} = \frac{1}{2}$; $n = \frac{1}{2}$

55. $\frac{2}{3} - n = 0$ $\frac{2}{3} - 0 = \frac{2}{3}$; $n = \frac{2}{3}$

56. Mrs. Taylor's class does a history report every 4 weeks and a geography project every 6 weeks. Use the least common multiple to find the first week in which both a geography project and a history report will be due. **week 12**

History: 4, 8, 12
Geography: 6, 12, 18

Guess & Check

Guess and check is a problem-solving strategy. **Guess** a method to solve the problem and **check** to see if the answer makes sense. Use the information from each incorrect guess to help you make better guesses until the problem is solved.

Sid has a $22\frac{1}{2}$ -inch long board. He cut the board into 2 pieces. One piece is twice as long as the other piece. What are the lengths of the 2 pieces?

Guess		Check
Piece 1	Piece 2	Total Length
8 in.	16 in.	8 in. + 16 in. = 24 in.
$6\frac{1}{2}$ in.	13 in.	$6\frac{1}{2}$ in. + 13 in. = $19\frac{1}{2}$ in.
$7\frac{1}{2}$ in.	15 in.	$7\frac{1}{2}$ in. + 15 in. = $22\frac{1}{2}$ in.

24 inches is longer than $22\frac{1}{2}$ inches. Choose smaller pieces.

$19\frac{1}{2}$ inches is 3 inches less than $22\frac{1}{2}$ inches. Choose larger pieces.

One piece is $7\frac{1}{2}$ inches long, and the other piece is 15 inches long.



Exercises

Use the guess-and-check method to solve.

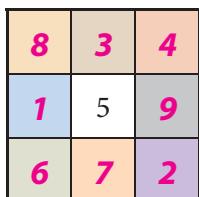
Explain your guesses and checks. **Explanations will vary.**

- The church paid the camp \$5,229.00 for the upcoming church retreat. The family price is \$275.00, and the individual price is \$92.00. How many families and individuals are going to the retreat? **15 families, 12 individuals**
- Mr. and Mrs. Gates walked a total of 18 laps around the walking track at the park. Mr. Gates walked 3 times as far as Mrs. Gates. How many laps did each of them walk?
Mrs. Gates = $4\frac{1}{2}$ laps; Mr. Gates = $13\frac{1}{2}$ laps
- Mom had 5 cups of sugar. After baking a cake and a pie, she had $2\frac{3}{4}$ cups of sugar left. She used $\frac{1}{4}$ cup more of sugar in the cake than in the pie. How much sugar was in the cake? in the pie?
 $5 - 2\frac{3}{4} = 2\frac{1}{4}$; $1\frac{1}{4}$ c in the cake; 1 c in the pie
- A length of rope is 144 cm. The scout leader cut the rope into 3 pieces. One piece is twice as long as the shortest piece. The other piece is three times as long as the shortest piece. What is the length of each piece of rope? **24 cm, 48 cm, 72 cm**
- At the kitchen show, Abby bought three of one of these items and one of each of the other items. She spent a total of \$47.66. Which item did she buy three of? **kitchen towels**



Complete the puzzle.

6. Write a digit from 1 to 9 in each empty space of the magic square. Every row, column, and diagonal must have a sum of 15.

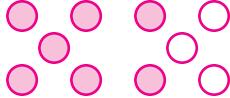


Solve.

8. The sum of two numbers is 100. The difference between the numbers is 6. What are the two numbers? **47, 53**
9. The product of two numbers is 800. The difference between the numbers is 20. What are the two numbers? **20, 40**
10. Conner is 8 years older than Brianna. The sum of their ages is 32. How old are Conner and Brianna? **Conner is 20; Brianna is 12.**

Practice & Application

12. Draw a set to represent $\frac{7}{10}$.



13. Write the prime factors of the composite number 52.

$$2, 13$$

14. Find the difference of $8\frac{3}{12}$ and $2\frac{1}{3}$.

$$8\frac{3}{12} - 2\frac{1}{3} = 7\frac{15}{12} - 2\frac{4}{12} = 5\frac{11}{12}$$

15. Find $\frac{5}{8}$ more than $\frac{2}{3}$.

$$\frac{2}{3} + \frac{5}{8} = \frac{16}{24} + \frac{15}{24} = \frac{31}{24} = 1\frac{7}{24}$$

16. $5\overline{)3}$ **0.6**

17. $1 + -4$ **-3**

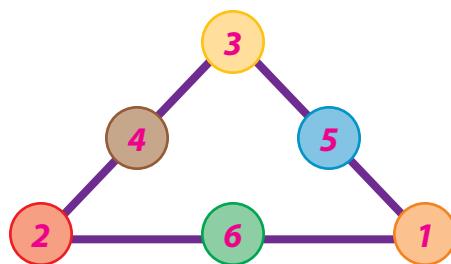
18. $(7 \times 10) + (6 \times 1) + (4 \times 0.1) + (3 \times 0.01)$

$$(70 + 6) + (0.4 + 0.03)$$

$$76 + 0.43$$

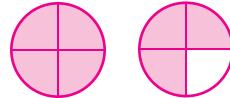
$$76.43$$

7. Write a digit from 1 to 9 in each circle. The sum of the digits on each side should be 9.



11. The bookstore sold a total of 18 devotional books. The bookstore was selling a family devotional book for \$12.00 and a youth devotional book for \$17.00. The customers paid \$271.00 for the books. How many family devotional books and youth devotional books were sold?
7 family devotionals and 11 youth devotionals

19. Draw circles to show $\frac{7}{4}$.



20. Find the sum of $\frac{5}{8}$ and $\frac{3}{4}$.

$$\frac{5}{8} + \frac{3}{4} = \frac{5}{8} + \frac{6}{8} = \frac{11}{8} = 1\frac{3}{8}$$

21. Write the mixed number that is equal to $\frac{17}{8}$.

$$2\frac{1}{8}$$

22. $18 - n = 12\frac{3}{4}$

$$18 - 12\frac{3}{4} = 17\frac{4}{4} - 12\frac{3}{4} = 5\frac{1}{4}; n = 5\frac{1}{4}$$

23. What is 27 sets of 2.5?

$$27 \times 2.5 = 67.5$$

24. $-7 + -6$ **-13**

25. Write three related equations for $225 \div 45 = 5$.

$$225 \div 5 = 45;$$

$$5 \times 45 = 225;$$

$$45 \times 5 = 225$$

CHAPTER 5 REVIEW

Add or subtract. Write the answer in lowest terms.

1.
$$\begin{array}{r} \frac{7}{10} \\ + \frac{9}{10} \\ \hline \frac{16}{10} = 1\frac{6}{10} = 1\frac{3}{5} \end{array}$$

2.
$$\begin{array}{r} \frac{3}{8} \\ + \frac{7}{8} \\ \hline \frac{10}{8} = 1\frac{2}{8} = 1\frac{1}{4} \end{array}$$

3.
$$\begin{array}{r} 21\frac{5}{6} \\ + 7\frac{1}{6} \\ \hline 28\frac{6}{6} = 29 \end{array}$$

4.
$$\begin{array}{r} \frac{11}{24} \\ - \frac{5}{24} \\ \hline \frac{6}{24} = \frac{1}{4} \end{array}$$

5.
$$\begin{array}{r} 2\frac{5}{12} \\ - 1\frac{11}{12} \\ \hline 1\frac{6}{12} = 1\frac{1}{2} \end{array}$$

Determine whether the fraction is closest to 0, $\frac{1}{2}$, or 1.

6. $\frac{13}{30} \frac{1}{2}$

7. $\frac{9}{10} 1$

8. $\frac{3}{20} 0$

9. $\frac{7}{8} 1$

10. $\frac{7}{16} \frac{1}{2}$

Round each fraction to 0, $\frac{1}{2}$, or 1.

Estimate the sum or the difference. **Estimates may vary.**

11. $\frac{7}{8} + \frac{1}{5} + \frac{1}{2}$

12. $\frac{4}{7} + \frac{5}{12} + \frac{1}{15}$

13. $\frac{8}{9} - \frac{1}{4}$

14. $\frac{14}{15} - \frac{3}{8}$

$1 + 0 + \frac{1}{2} = 1\frac{1}{2}$

$\frac{1}{2} + \frac{1}{2} + 0 = 1$

$1 - 0 = 1$

$1 - \frac{1}{2} = \frac{1}{2}$

Round each mixed number to the nearest whole number.

Estimate the sum or the difference.

15. $1\frac{3}{14} + 2\frac{7}{12}$

16. $14\frac{1}{2} + 6\frac{3}{4}$

17. $7\frac{9}{10} - 5\frac{3}{4}$

18. $10\frac{2}{11} - 3\frac{11}{12}$

$1 + 3 = 4$

$15 + 7 = 22$

$8 - 6 = 2$

$10 - 4 = 6$

Add or subtract. Write the answer in lowest terms.

19.
$$\begin{array}{r} \frac{3}{10} = \frac{3}{10} \\ + \frac{2}{5} = \frac{4}{10} \\ \hline \frac{7}{10} \end{array}$$

20.
$$\begin{array}{r} \frac{7}{8} = \frac{21}{24} \\ + \frac{2}{3} = \frac{16}{24} \\ \hline \frac{37}{24} = 1\frac{13}{24} \end{array}$$

21.
$$\begin{array}{r} 5\frac{3}{4} = 5\frac{21}{28} \\ + 2\frac{2}{7} = 2\frac{8}{28} \\ \hline 7\frac{29}{28} = 8\frac{1}{28} \end{array}$$

22.
$$\begin{array}{r} 8\frac{7}{16} = 8\frac{21}{48} \\ + 9\frac{1}{12} = 9\frac{4}{48} \\ \hline 17\frac{25}{48} \end{array}$$

23.
$$\begin{array}{r} 6\frac{1}{3} = 6\frac{7}{21} \\ + 5\frac{4}{7} = 5\frac{12}{21} \\ \hline 11\frac{19}{21} \end{array}$$

24.
$$\begin{array}{r} \frac{8}{9} = \frac{8}{9} \\ - \frac{2}{3} = \frac{6}{9} \\ \hline \frac{2}{9} \end{array}$$

25.
$$\begin{array}{r} \frac{5}{6} = \frac{20}{24} \\ - \frac{5}{8} = \frac{15}{24} \\ \hline \frac{5}{24} \end{array}$$

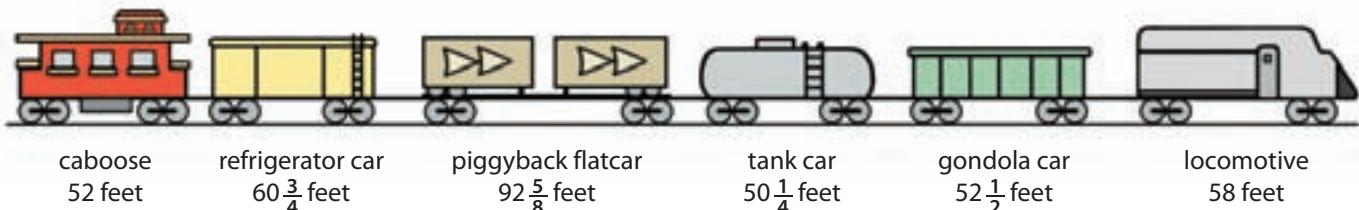
26.
$$\begin{array}{r} 5\frac{14}{14} \\ - 1\frac{5}{14} \\ \hline 4\frac{9}{14} \end{array}$$

27.
$$\begin{array}{r} 11\frac{1}{2} = 11\frac{10}{4} \\ - 5\frac{3}{4} = 5\frac{3}{4} \\ \hline 5\frac{3}{4} \end{array}$$

28.
$$\begin{array}{r} 8\frac{5}{6} = 8\frac{25}{30} \\ - 1\frac{11}{15} = 1\frac{22}{30} \\ \hline 7\frac{3}{30} = 7\frac{1}{10} \end{array}$$



Use the picture to find the answer.



29. How much longer is the locomotive than the gondola car?

$$58 - 52\frac{1}{2} = 57\frac{2}{2} - 52\frac{1}{2} = 5\frac{1}{2} \text{ ft}$$

30. What is the difference in the length of the piggyback flatcar and the refrigerator car?

$$92\frac{5}{8} - 60\frac{3}{4} = 92\frac{5}{8} - 60\frac{6}{8} = 91\frac{13}{8} - 60\frac{6}{8} = 31\frac{7}{8} \text{ ft}$$

31. What is the combined length of the tank car and the gondola car?

$$50\frac{1}{4} + 52\frac{1}{2} = 50\frac{1}{4} + 52\frac{2}{4} = 102\frac{3}{4} \text{ ft}$$

Solve.

35. The classroom that collected $197\frac{5}{8}$ pounds of canned food for a food drive last year has collected $72\frac{3}{4}$ pounds so far this year. How many more pounds of food must they collect to match the amount from last year?

$$197\frac{5}{8} - 72\frac{3}{4} = 197\frac{5}{8} - 72\frac{6}{8} = 196\frac{13}{8} - 72\frac{6}{8} = 124\frac{7}{8} \text{ lb}$$

36. The class made windsocks for a science project. Jon cut nylon strips that measured $2\frac{3}{4}$ feet long. Sara's windsock measured $2\frac{7}{8}$ feet long, and Kate's measured $2\frac{1}{2}$ feet long. Write the windsock lengths in order from least to greatest.

$$2\frac{1}{2} \text{ ft}, 2\frac{3}{4} \text{ ft}, 2\frac{7}{8} \text{ ft}$$

Write a comparison sentence using $>$, $<$, or $=$.

39. $\frac{7}{8} > \frac{5}{6}$

40. $\frac{3}{9} < \frac{5}{7}$

41. $\frac{5}{10} = \frac{3}{6}$

42. $7\frac{10}{12} > 7\frac{3}{8}$

43. $\frac{16}{8} < 2\frac{1}{4}$

44. $1\frac{5}{20} = 1\frac{1}{4}$

45. $\frac{2}{10} > \frac{2}{11}$

46. $\frac{5}{9} < \frac{7}{9}$

Find the LCM of the denominators.

47. $\frac{1}{8}, \frac{1}{16}$ **16**

48. $\frac{4}{9}, \frac{5}{12}$ **36**

49. $\frac{2}{3}, \frac{1}{6}, \frac{5}{18}$ **18**

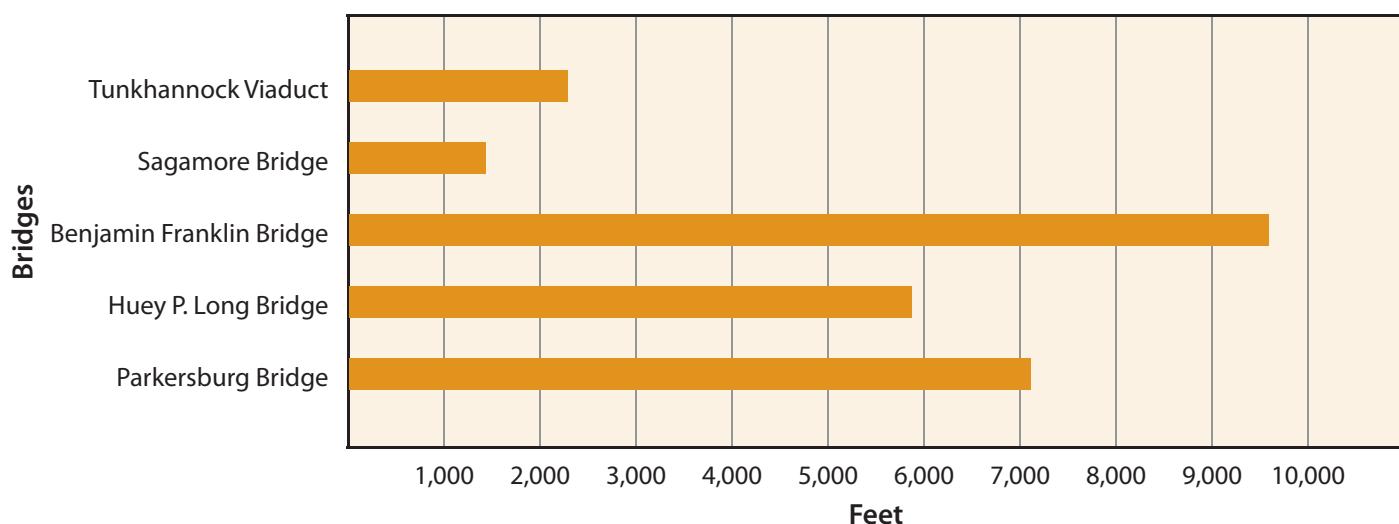
50. $\frac{3}{8}, \frac{3}{4}, \frac{3}{12}$ **24**

37. *The second burger is larger. Explanations may vary. $\frac{2}{3}$ is only $\frac{1}{3}$ away from 1 whole pound; $\frac{3}{8}$ is $\frac{1}{8}$ away from $\frac{1}{2}$ of a pound.*

Test Prep

Use the data from the bar graph to find the answer.

Lengths of 5 U.S. Bridges



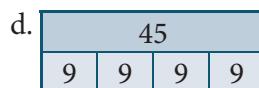
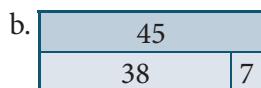
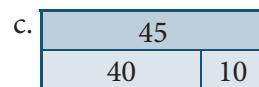
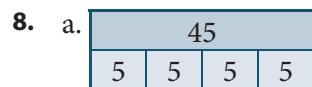
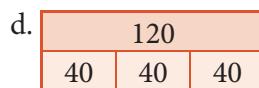
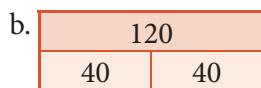
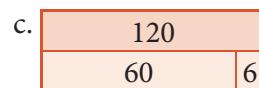
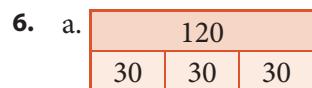
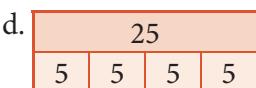
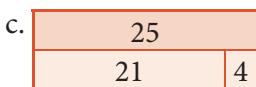
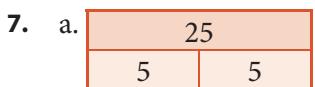
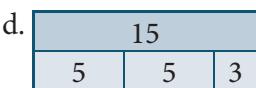
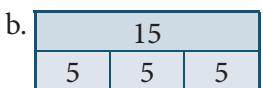
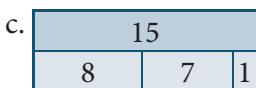
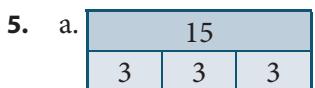
1. The approximate difference in length of the Tunkhannock Viaduct and the Benjamin Franklin Bridge is ____.
 - 9,000 ft
 - 7,000 ft
 - 12,000 ft

2. The approximate length of the Sagamore Bridge is ____.
 - 1,750 ft
 - 1,100 ft
 - 1,500 ft

3. The approximate sum of the lengths of the Parkersburg Bridge and the Huey P. Long Bridge is ____.
 - 13,000 ft
 - 1,000 ft
 - 14,500 ft

4. The approximate sum of the lengths of all five bridges is ____.
 - 37,000 ft
 - 26,500 ft
 - 22,000 ft

Mark the correct part-whole model.



Mark the property that is illustrated.

9. $(\frac{3}{4} + \frac{1}{3}) + \frac{2}{3} = \frac{3}{4} + (\frac{1}{3} + \frac{2}{3})$

- A. Associative Property
- B. Commutative Property
- C. Identity Property

10. $149.9 + 13.03 = 13.03 + 149.9$

- A. Associative Property
- B. Commutative Property
- C. Identity Property

11. $49 \times 270 = (40 \times 270) + (9 \times 270)$

- A. Identity Property
- B. Distributive Property
- C. Commutative Property

12. $20 \times 17 \times 10 = (20 \times 10) \times 17$

- A. Identity Property
- B. Distributive Property
- C. Associative Property

Mark the matching expression.

13. 10 packages of 50 marshmallows added to 25 marshmallows

- A. $(10 + 50) + 25$
- C. $(10 + 50) \times 25$
- B. $25 + (10 \times 50)$
- D. $10 \times (50 + 25)$

14. a deck extended $2\frac{1}{2}$ feet

- A. $d + 2\frac{1}{2}$ ft
- C. $d \times 2\frac{1}{2}$ ft
- B. $d - 2\frac{1}{2}$ ft
- D. $d \div 2\frac{1}{2}$ ft

15. 17 team shirts cost \$159 plus \$13.70 for shipping

- A. $(\$159 \div 17) + \13.70
- B. $(\$159 - \$13.70) \div 17$
- C. $(\$159 + \$13.70) \times 17$
- D. $(\$159 + \$13.70) \div 17$

Mark the matching expression.

16. 18 books placed on 3 shelves

- A. $18 \div 9$
- B. 3×18
- C. $18 \div 3$

17. 16 groups of 12 volunteers

- A. $12 \div 16$
- B. 16×12
- C. $12 + 16$

18. 24 blueberry bagels on a plate with 12 plain bagels

- A. $24 + 12$
- B. $24 - 10$
- C. $24 \div 12$

19. 14 stickers removed from a sheet of 24

- A. $38 - 24$
- B. $24 - 14$
- C. $14 + 24$

Mark the answer.

20. Which number is a multiple of 10?

- A. 5,281
- B. 1,290
- C. 5
- D. all of the above

21. Which number is a multiple of 8?

- A. 96
- B. 56
- C. 64
- D. all of the above

22. Which number is a prime number?

- A. 27
- B. 36
- C. 43
- D. all of the above

23. Which number is a composite number?

- A. 72
- B. 41
- C. 53
- D. all of the above

24.

$$2\frac{3}{11} = \underline{\hspace{2cm}}$$

- A. $\frac{25}{11}$
- B. $\frac{22}{11}$
- C. $\frac{6}{11}$
- D. none of the above

25.

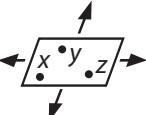
$$\frac{27}{3} = \underline{\hspace{2cm}}$$

- A. $\frac{9}{3}$
- B. $1\frac{1}{3}$
- C. 9
- D. none of the above

Basic Geometric Figures

Geometry is the study of shapes formed by points in a plane or in space. The word *geometry* comes from two Greek words: *geo*, meaning “earth,” and *metria*, meaning “to measure.” God spoke the world into existence, creating it out of nothing. Men use the abstract ideas of geometric figures to describe the many forms observed throughout God’s creation.

geometry
point, line, plane
collinear, noncollinear
coordinate plane
origin, quadrant
ordered pair

Figure Description	Representation	Symbol
A point is an exact location in space. It has no length, width, or thickness. The location is described using coordinates.	• <i>W</i>	point <i>W</i> <i>W</i>
A line is a straight path connecting two points and extending endlessly in both directions.		\overleftrightarrow{AB} or \overleftrightarrow{BA} line <i>AB</i> or line <i>BA</i>
A plane is a flat surface extending endlessly in all directions. A plane is named by three noncollinear points in the plane.		plane <i>XYZ</i> plane <i>YZX</i> plane <i>ZYX</i>

Collinear means “together on a line.” A set of points is **collinear** when one line can be drawn through all the points.



Noncollinear means “not together on a line.” A set of points is **noncollinear** when no one line can be drawn through all the points.

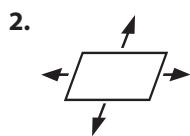


Exercises

Identify the geometric figure. Write the name.



line



plane



point

Name the geometric figure that best illustrates the object.

4. a wall
plane

5. a speck of dust
point

6. where the wall meets the floor
line

Use the diagram to name the geometric figure.

7. two collinear points **Answers will vary.**

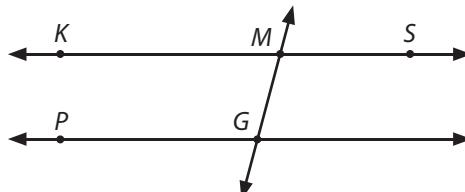
8. three noncollinear points **Answers will vary.**

9. three lines \overleftrightarrow{KS} , \overleftrightarrow{PG} , \overleftrightarrow{MG}

10. a point shared by two lines **M or G**

11. two different names for \overleftrightarrow{KS} **\overleftrightarrow{SK} , \overleftrightarrow{KM} , \overleftrightarrow{MK} , \overleftrightarrow{MS} , or \overleftrightarrow{SM}**

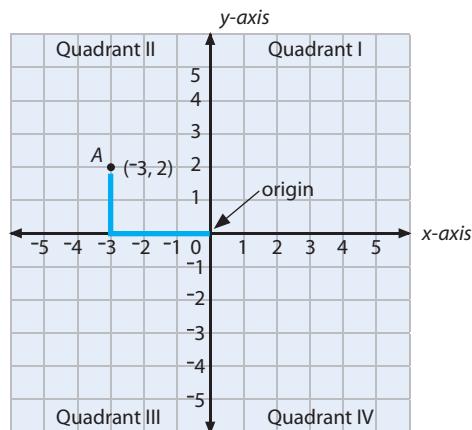
12. a plane **any 3 noncollinear points in the figure**



A **coordinate plane** is formed by two number lines intersecting at right angles. The **x-axis** is the horizontal number line. The **y-axis** is the vertical number line. The point of intersection, called the **origin**, is 0 on both number lines. The two axes divide the coordinate plane into four sections called **quadrants**. The quadrants are numbered I, II, III, and IV.

An **ordered pair** describes the location of every point on a coordinate plane. The **x-coordinate** (first coordinate) tells the distance of the point along the x-axis—how far to move to the right or the left from the origin. The **y-coordinate** (second coordinate) tells the distance of the point along the y-axis—how far to move up or down from the origin.

When you move left or down from the origin, you encounter **negative** coordinates. Sometimes only Quadrant I of a coordinate plane is shown because only positive numbers are being graphed.



Point A (-3, 2) From the origin move 3 units to the left, since the 3 is negative. Then move 2 units up, since the 2 is positive.

Exercises

Name the quadrant in which the point is located.

13. A **Quadrant II**

16. B **Quadrant I**

14. C **Quadrant IV**

17. D **Quadrant III**

15. E **Quadrant II**

18. F **Quadrant IV**

Write the ordered pair for the point.

19. A **(-4, 4)**

22. B **(4, 2)**

20. C **(1, -5)**

23. D **(-3, -2)**

21. E **(-1, 2)**

24. F **(3, -2)**

Draw a four-quadrant coordinate plane.

Graph and label the points.

25. G **(5, 3)**

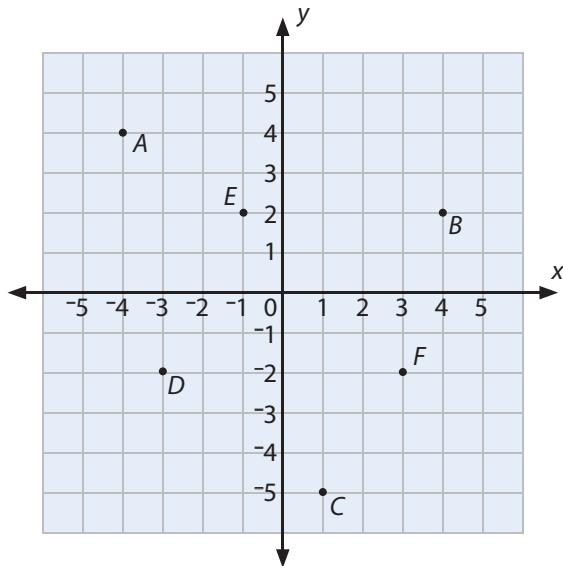
26. I **(-2, 5)**

27. K **(2, 6)**

28. H **(-4, -6)**

29. J **(-6, 1)**

30. L **(-1, -3)**



Practice & Application

31. List the fractions $\frac{3}{8}$, $\frac{1}{4}$, and $\frac{5}{12}$ from *least* to *greatest*. **$\frac{1}{4} \frac{3}{8} \frac{5}{12}$**

32. Which fraction is not equivalent?

$$\frac{3}{7}, \frac{5}{14}, \frac{9}{21}, \frac{36}{84}, \frac{5}{14}$$

33. How many of 8 pies are left if $5\frac{3}{4}$ pies were sold?

$$8 - 5\frac{3}{4} = 2\frac{1}{4} \text{ pies}$$

34. Which amount is greater?

Rotisserie chicken **$3\frac{1}{4}$ lb**

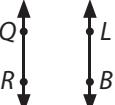
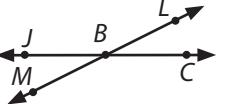
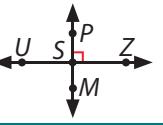
Hot wing bucket **3.3 lb**



Explain how graphing the point $(3, -6)$ is similar to graphing the point $(3, 6)$ and how it is different.

Complete **DAILY REVIEW** a on page 421.

Types of Lines

Line Description	Representation	Symbol
Parallel lines are in the same plane and never intersect. A pair of parallel lines has no common points.		$\overleftrightarrow{QR} \parallel \overleftrightarrow{LB}$ \parallel means "is parallel to"
Intersecting lines share a common point. They may not actually cross on the page, but if extended, they will cross.		\overleftrightarrow{JC} intersects \overleftrightarrow{ML}
Perpendicular lines are lines that intersect to form 90° angles, or right angles.		$\overleftrightarrow{PM} \perp \overleftrightarrow{UZ}$ \perp means "is perpendicular to"

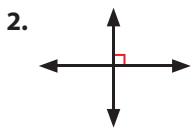
parallel lines
intersecting lines
perpendicular lines

Exercises

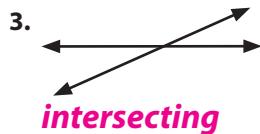
Identify the pair of lines as **parallel**, **intersecting**, or **perpendicular**.



parallel

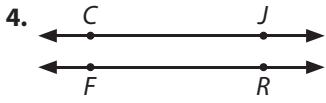


perpendicular



intersecting

Use symbols to write a statement describing the pair of lines.



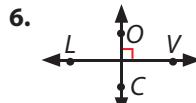
$\overleftrightarrow{CJ} \parallel \overleftrightarrow{FR}$

Write true or false.

7. Intersecting lines are sometimes perpendicular.
true
9. Two lines that are parallel are always separated by the same distance. **true**



\overleftrightarrow{BH} intersects \overleftrightarrow{SR}



$\overleftrightarrow{LV} \perp \overleftrightarrow{OC}$

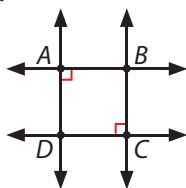
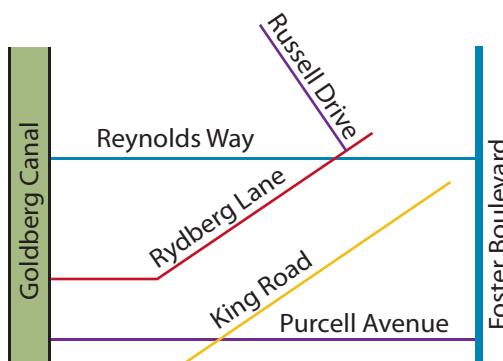
8. Two points in the same plane are always collinear.
true
10. Three points in the same plane are always collinear. **false**

Use the map to find the answer.

11. What street is parallel to Reynolds Way? **Purcell Avenue**
12. What street is perpendicular to Purcell Avenue? **Foster Boulevard**
13. What street intersects Rydberg Lane but is not perpendicular to it? **Reynolds Way**
14. Describe the relationship of Reynolds Way and Foster Boulevard. **Reynolds Way is perpendicular to Foster Boulevard.**

ABCD is a square. Insert the symbol for parallel (\parallel) or perpendicular (\perp) to tell the relationship of the lines.

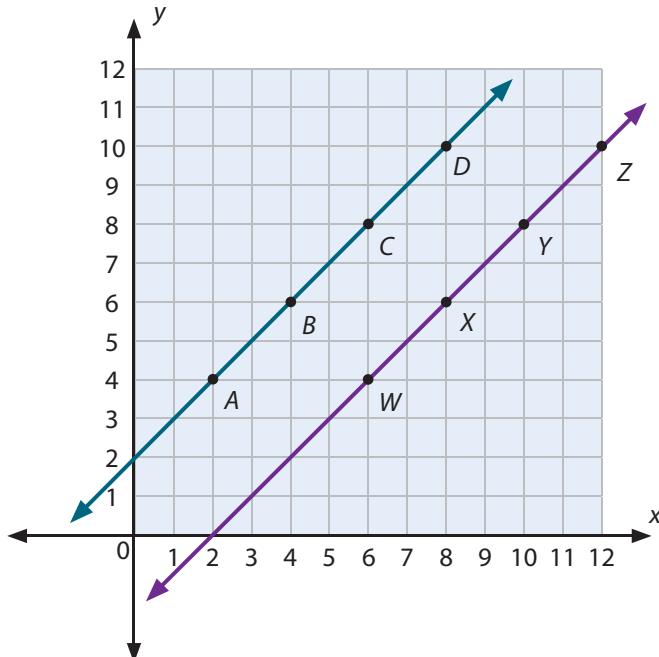
15. $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$ and $\overleftrightarrow{AD} \parallel \overleftrightarrow{BC}$
16. $\overleftrightarrow{AD} \perp \overleftrightarrow{CD}$ and $\overleftrightarrow{BC} \perp \overleftrightarrow{CD}$
17. $\overleftrightarrow{AB} \perp \overleftrightarrow{AD}$ and $\overleftrightarrow{AB} \perp \overleftrightarrow{BC}$



The pairs of positive numbers in these tables can be graphed in Quadrant I of a *coordinate plane*. Each ordered pair has an *x*-coordinate and a *y*-coordinate that describes the location of a point. All the points can be connected to form a line. The line illustrates the solutions for the equation that is the rule for the given table.

$x + 2 = y$	
<i>x</i>	<i>y</i>
2	4
4	6
6	
8	

$x - 2 = y$	
<i>x</i>	<i>y</i>
6	4
8	6
10	
12	



Exercises

Use the tables and the coordinate plane above to answer the questions.

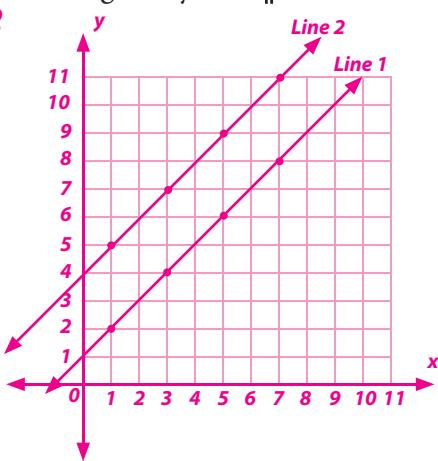
18. What is the *y*-coordinate for point C? **8**
19. What is the *y*-coordinate for point D? **10**
20. What is the *y*-coordinate for point Y? **8**
21. What is the *y*-coordinate for point Z? **10**
22. Will \overleftrightarrow{AD} intersect with \overleftrightarrow{WZ} ? **no**

23. What type of lines would you classify \overleftrightarrow{AD} and \overleftrightarrow{WZ} as? **parallel lines**
24. Which line does a point with the coordinates $(3, 1)$ lie on? **\overleftrightarrow{WZ} ; Answers will vary.**
25. Which line does a point with the coordinates $(0, 2)$ lie on? **\overleftrightarrow{AD} ; Answers will vary.**



Write the equation that is the rule and complete the table. Graph and label Line 1 and Line 2 on the same coordinate plane. Write a statement describing the lines using the symbol \parallel or \perp .

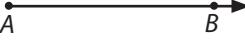
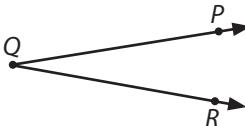
Line 1 \parallel Line 2



Line 1	
$x + 1 = y$	
<i>x</i>	<i>y</i>
1	2
3	4
5	6
7	8

Line 2	
$x + 4 = y$	
<i>x</i>	<i>y</i>
1	5
3	7
5	9
7	11

Classifying & Measuring Angles

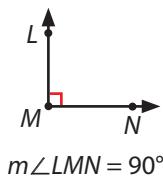
Figure Description	Representation	Symbol
A ray is a part of a line that extends endlessly in one direction. A ray has one endpoint. The endpoint is named first.		\overrightarrow{AB} ray AB
An angle has two rays sharing a common endpoint. The vertex of an angle is the common endpoint shared by the two rays.		$\angle PQR$ or $\angle RQP$ $\angle Q$

ray
angle
 • right
 • acute
 • obtuse
 • straight

Angles are measured in degrees ($^\circ$) using a tool called a **protractor**.

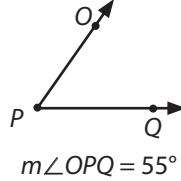
Angles are classified according to their measure.

A **right angle** measures 90° . Perpendicular lines intersect and form a right angle.



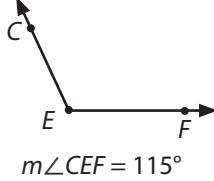
$$m\angle LMN = 90^\circ$$

An **acute angle** measures less than 90° .



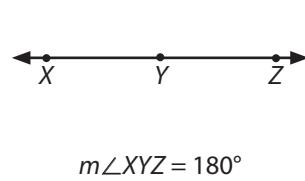
$$m\angle OPQ = 55^\circ$$

An **obtuse angle** measures greater than 90° and less than 180° .



$$m\angle CEF = 115^\circ$$

A **straight angle** measures 180° .



$$m\angle XYZ = 180^\circ$$

Exercises

Draw and label the figure.

1. $\angle STU$

2. \overrightarrow{CD}

3. \overleftrightarrow{FG}

4. point M

5. plane BSR

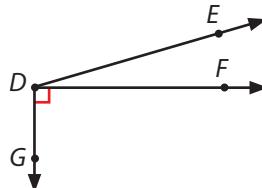
6. $\overleftrightarrow{JK} \parallel \overleftrightarrow{XY}$

Use the figure to find the answer.

7. Name three rays. $\overrightarrow{DE}, \overrightarrow{DF}, \overrightarrow{DG}$

8. Name the vertex. **point D**

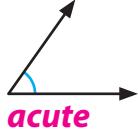
9. Write the names of three different angles using three points. $\angle EDF, \angle FDG, \angle EDG$



Classify the angle as **right**, **acute**, **obtuse**, or **straight**.

10. 45°

acute



11. 106°

obtuse

15.



12. 93°

obtuse

16.



13. 180°

straight

17.



Name the geometric figure that best illustrates the object.

18. a flashlight beam
ray

19. a pair of train tracks
parallel lines

20. a glass window
plane

Name the type of angle that best illustrates the description.

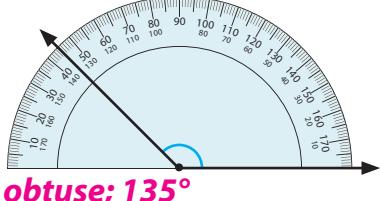
21. the corner of a photograph
right

22. a door partially open
acute

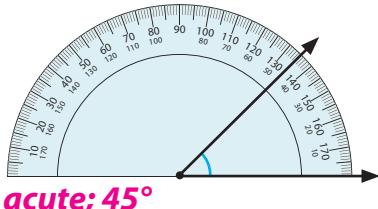
23. an open book lying flat on a desk
straight

Classify the angle as right, acute, obtuse, or straight.
Write the measure of the angle.

24.

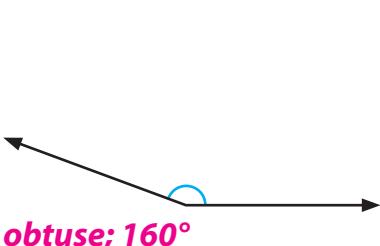


25.

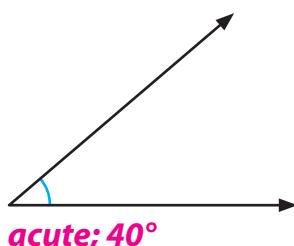


Classify the angle as right, acute, obtuse, or straight.
Use a protractor to measure the angle. Write the measurement.

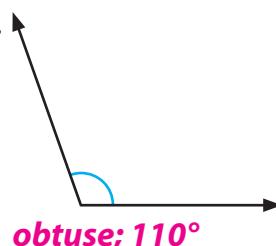
26.



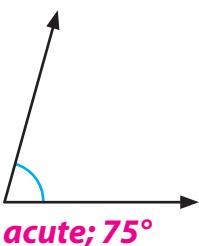
27.



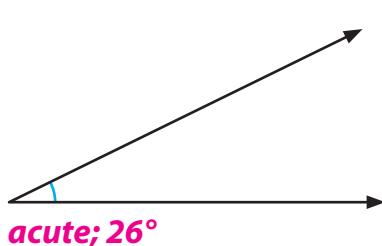
28.



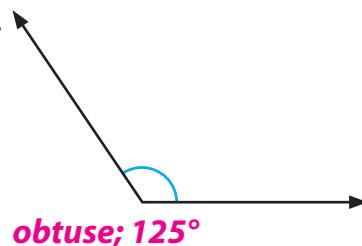
29.



30.



31.



Use a protractor to draw the angle for the measure.

32. 35°



33. 86°



34. 144°



35. 90°

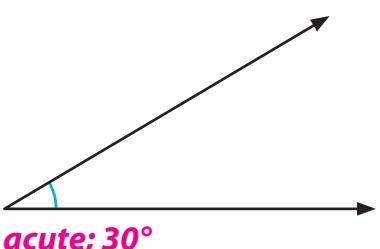


Classify the angle as right, acute, obtuse, or straight.

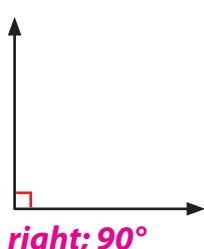
Estimate the best measure of the angle: 30°, 60°, 90°, 120°, or 150°.

Use a protractor to check your estimate.

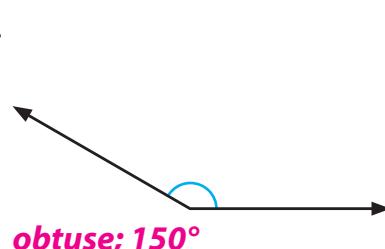
36.



37.



38.



Practice & Application

39. How many partial products does the problem 215×12 have? What is the product? **2; 2,580**

40. Find the sum of $3\frac{2}{3}$ and $\frac{18}{9}$.

41. What is the value of $30,000 + 800 + 70 + 1 + 0.4$?
30,871.4

40. possible solution: $\frac{18}{9} = 2$; $3\frac{2}{3} + 2 = 5\frac{2}{3}$



Which pairs of angles must have the same measure: 2 acute angles, 2 right angles, 2 obtuse angles, or 2 straight angles? Explain.

2 right angles; a right angle always measures 90°.

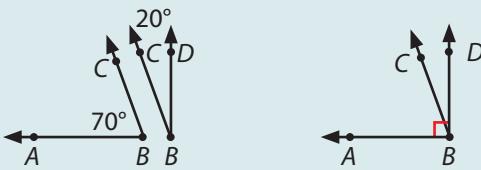
2 straight angles; a straight angle always measures 180°.

Angle Relationships

The measures of **complementary angles** have a sum of 90° . When placed side by side, complementary angles form a right angle.

$$70^\circ + 20^\circ = 90^\circ$$

Since $m\angle ABC = 70^\circ$ and $m\angle CBD = 20^\circ$, $m\angle ABD = 90^\circ$.

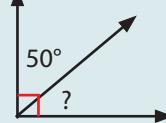


angles
• complementary
• supplementary

Since the sum of complementary angles equals 90° , you can subtract to find the unknown angle measure.

$$\begin{aligned} 50^\circ + n &= 90^\circ \\ n &= 90^\circ - 50^\circ \\ n &= 40^\circ \end{aligned}$$

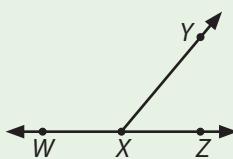
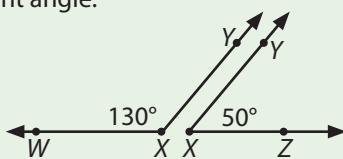
The unknown measure of the angle is 40° .



The measures of **supplementary angles** have a sum of 180° . When placed side by side, supplementary angles form a straight angle.

$$130^\circ + 50^\circ = 180^\circ$$

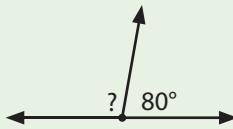
Since $m\angle WXY = 130^\circ$ and $m\angle YXZ = 50^\circ$, $m\angle WXZ = 180^\circ$.



Since the sum of supplementary angles equals 180° , you can subtract to find the unknown angle measure.

$$\begin{aligned} 80^\circ + n &= 180^\circ \\ n &= 180^\circ - 80^\circ \\ n &= 100^\circ \end{aligned}$$

The unknown measure of the angle is 100° .



Exercises

Write an equation to find the measure of the unknown angle.

1.
 $90^\circ - 65^\circ = 25^\circ$

2.
 $180^\circ - 35^\circ = 145^\circ$

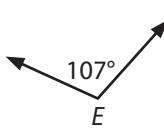
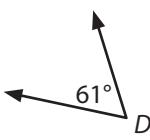
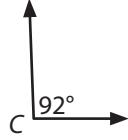
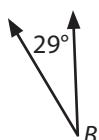
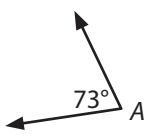
3.
 $180^\circ - 90^\circ = 90^\circ$

4.
 $90^\circ - 45^\circ = 45^\circ$

5.
 $90^\circ - 58^\circ = 32^\circ$

6.
 $180^\circ - 123^\circ = 57^\circ$

Use the angles to answer the question.
Write an equation to prove the answer.



7. Which two angles are complementary?
 $\angle B$ and $\angle D$; $29^\circ + 61^\circ = 90^\circ$

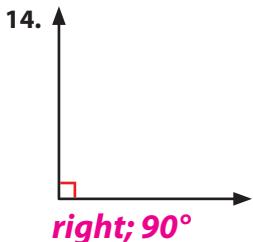
8. Which two angles are supplementary?
 $\angle A$ and $\angle E$; $73^\circ + 107^\circ = 180^\circ$

Answer the question.

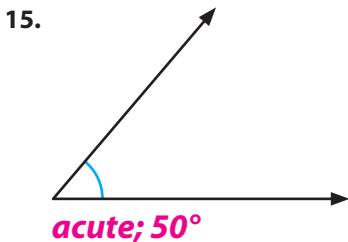
9. Are two acute angles always complementary? Why?
10. Why are two obtuse angles never complementary?
11. Why are two right angles always supplementary?
12. Can two obtuse angles be supplementary? Why?
13. Are the angles formed by perpendicular lines complementary or supplementary? Why?

Classify the angle as right, acute, obtuse, or straight.

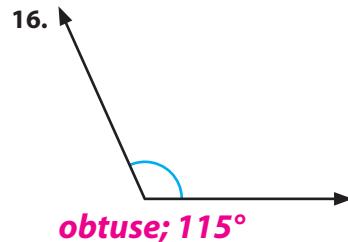
Use a protractor to measure the angle. Write the measurement.



right; 90°



acute; 50°



obtuse; 115°

Use a protractor to draw the angle for the measure.



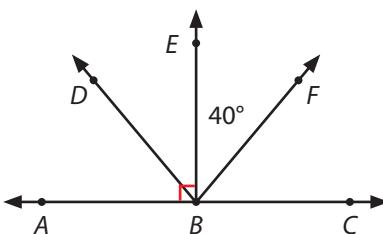
Find the measure of the angles in the figure.

21. $\angle ABC$ 180°

22. $\angle ABE$ 90°

23. $\angle ABF$ 130°

24. $\angle CBF$ 50°



Use the figure to find the answer.

25. List all the obtuse angles. $\angle ABF, \angle CBD$

26. List all the acute angles. $\angle ABD, \angle DBF, \angle DBE, \angle EBF, \angle FBC$

27. List all the right angles. $\angle ABE, \angle CBE$

28. List two pairs of complementary angles that form right angles.

$\angle CBF, \angle EBF$ and $\angle ABD, \angle DBE$

29. List three pairs of supplementary angles that form straight angles.

$\angle ABF, \angle CBF$ and $\angle ABD, \angle DBC$, and $\angle ABE, \angle CBE$

Practice & Application

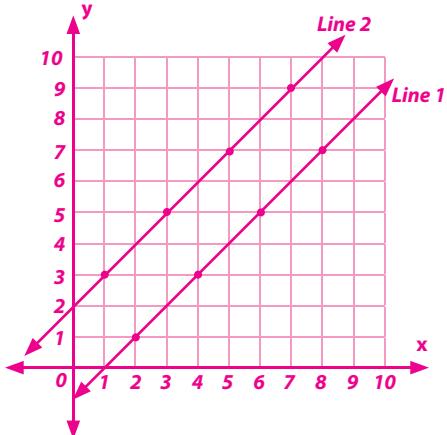
30. Is 75 a factor or a multiple of 25? **multiple**

31. Find the difference between $8\frac{4}{5}$ and $6\frac{3}{15}$.

$$8\frac{4}{5} - 6\frac{1}{5} = 2\frac{3}{5}$$

32. Draw a picture to show $\frac{10}{6}$. **Answers will vary.**

J



J If you extend the length of the rays forming an angle, does the angle measure change? Explain.

No; the angle would be affected only if one of the rays were moved to a different position.

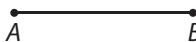
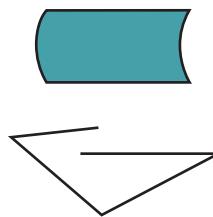
J Write the equation that is the rule and complete the table. Graph and label Line 1 and Line 2 on the same coordinate plane. Write a statement describing the lines using the symbol \parallel or \perp .

Line 1 \parallel Line 2

Line 1	
x	y
8	7
6	5
4	3
2	1

Line 2	
x	y
1	3
3	5
5	7
7	9

Polygons

Description	Representation	Symbol	
A line segment is a part of a line having two endpoints.		\overline{AB} or \overline{BA}	line segment polygon • regular • irregular vertex interior angle
A polygon is a closed figure made of line segments. Polygons are classified by the number of sides. A vertex is the common endpoint of a pair of sides. An interior angle is formed by two sides that share a vertex.	Regular Polygon  Irregular Polygon  NOT a Polygon 	All sides are the same length, and all angles are the same measure. Sides have different lengths, and/or the angles have different measures.	

Exercises

Classify the polygon as **regular** or **irregular**.

Write **no** if the figure is *not* a polygon and explain why.



irregular



regular



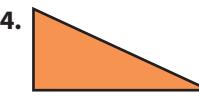
regular



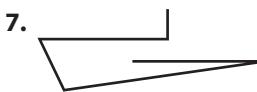
no; curved sides



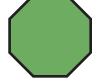
irregular



irregular



no; curved side

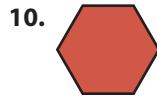
	Triangle	Quadrilateral	Pentagon	Hexagon	Heptagon	Octagon
Prefix	tri-	quad-	penta-	hexa-	hepta-	octa-
Sides	3	4	5	6	7	8
Regular						

Exercises

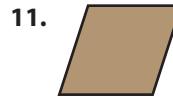
Name the polygon. Write the number of interior angles.



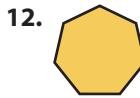
triangle; 3



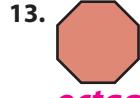
hexagon; 6



quadrilateral; 4



heptagon; 7



octagon; 8



quadrilateral; 4



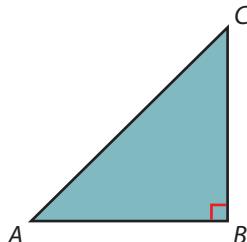
pentagon; 5



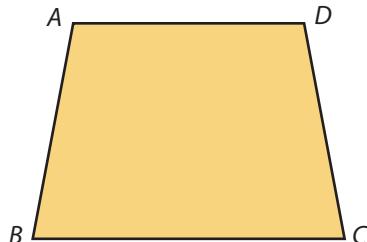
hexagon; 6

Classify each interior angle as **right**, **acute**, or **obtuse**.
Use a protractor to measure angle A in each figure.

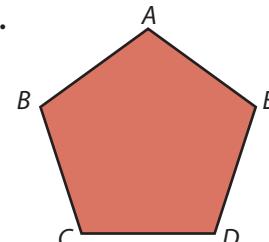
17.



18.



19.



$\angle A = \underline{\hspace{2cm}} \text{acute; } 45^\circ$
 $\angle B = \underline{\hspace{2cm}} \text{right}$
 $\angle C = \underline{\hspace{2cm}} \text{acute}$

$\angle A = \underline{\hspace{2cm}} \text{obtuse; } 101^\circ$
 $\angle B = \underline{\hspace{2cm}} \text{acute}$
 $\angle C = \underline{\hspace{2cm}} \text{acute}$
 $\angle D = \underline{\hspace{2cm}} \text{obtuse}$

$\angle A = \underline{\hspace{2cm}} \text{obtuse; } 108^\circ$
 $\angle B = \underline{\hspace{2cm}} \text{obtuse}$
 $\angle C = \underline{\hspace{2cm}} \text{obtuse}$
 $\angle D = \underline{\hspace{2cm}} \text{obtuse}$
 $\angle E = \underline{\hspace{2cm}} \text{obtuse}$

Graph each point on a four-quadrant coordinate plane.

Draw line segments connecting the points in order.

Connect the last point to the first point. Name the figure.

Label the length in units for the last side.

20. $(4, 8) \rightarrow (1, 5) \rightarrow (4, 2) \rightarrow (7, 2) \rightarrow (10, 5) \rightarrow (7, 8)$ **hexagon; 3 units**

21. $(-4, -4) \rightarrow (-9, -4) \rightarrow (-4, -8)$ **triangle; 4 units**

22. $(2, -3) \rightarrow (5, -4) \rightarrow (9, -4) \rightarrow (9, -8) \rightarrow (2, -8)$ **pentagon; 5 units**

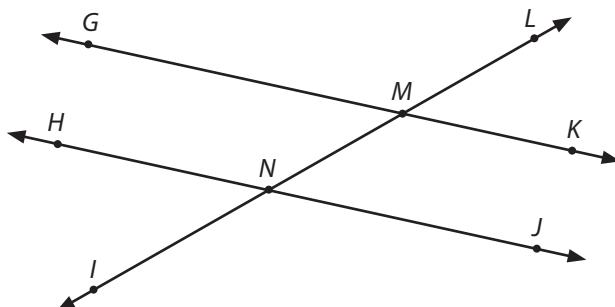
Use the figure to find the answer.

23. Name three rays. **Answers will vary.**

24. Name three line segments. **Answers will vary.**

25. Name two parallel lines. **\overleftrightarrow{GK} and \overleftrightarrow{HJ}**

26. Write the names of four different acute angles using three points. **$\angle INH, \angle JNM, \angle NMG, \angle KML$**



Practice & Application

27. Draw a pair of supplementary angles side by side so that they form a straight angle. Use a protractor to measure one angle. Write an equation to find the measure of the other angle.
Answers will vary.

28. Find the quotient of $81,000 \div 900$. **90**

29. Draw a number line to represent $\frac{3}{10}$.

30. Six of the fourteen people on the plane are parachutists. What fraction of the people on the plane are not parachutists? **$\frac{8}{14}$ or $\frac{4}{7}$**

31. Write the factors for the composite number 60.

1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

32. Simplify $27 \div 9 + 3 \times 4$. **$3 + 12$**

15

33. What is the value of the 6 in 24.76?

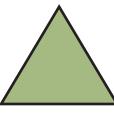
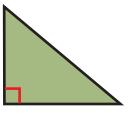
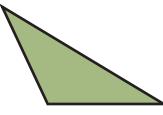
0.06 or 6 hundredths



Explain the relationship between the number of interior angles in a polygon and the number of sides. **The number of interior angles in a polygon is the same as the number of sides.**

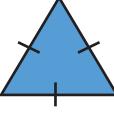
Triangles

Triangles are polygons with 3 sides, 3 vertices, and 3 angles. A triangle can be classified by the measures of its angles.

Acute Triangle	Right Triangle	Obtuse Triangle
 3 acute angles	 1 right angle	 1 obtuse angle

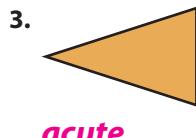
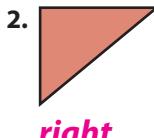
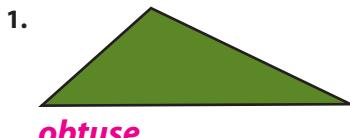
- triangles
 - acute
 - right
 - obtuse
 - equilateral
 - isosceles
 - scalene

A triangle can also be classified by the lengths of its sides.

Equilateral Triangle	Isosceles Triangle	Scalene Triangle
 3 congruent sides	 2 congruent sides	 no congruent sides

Exercises

Classify the triangle according to the measure of its angles.

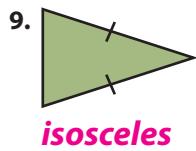
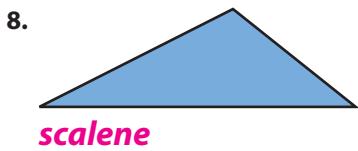
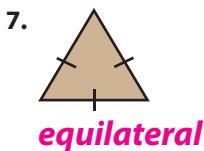


4. a triangle with angle measures 90°, 40°, 50° **right**

5. a triangle with angle measures 60°, 45°, 75° **acute**

6. a triangle with angle measures 25°, 125°, 30° **obtuse**

Classify the triangle according to the length of its sides.

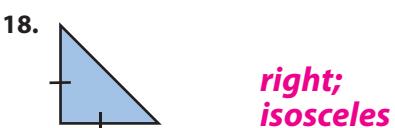
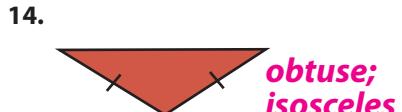


10. a triangle with sides measuring 3 m, 4 m, 5 m **scalene**

11. a triangle with sides measuring 10 cm, 12 cm, 10 cm **isosceles**

12. a triangle with sides measuring 7 m, 7 m, 7 m **equilateral**

Classify the triangle according to its angles and its sides.



Use a protractor to draw the triangle. Write the measurement by each angle. **Figures will vary.**

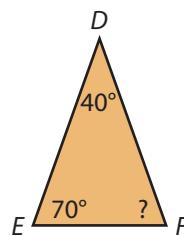
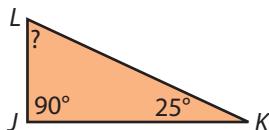
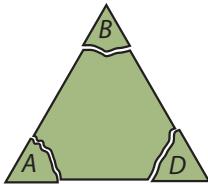
19. acute triangle

20. right triangle

21. obtuse triangle

The 3 line segments of a triangle meet at 3 vertices to form 3 angles. The sum of these interior angles is 180° . When you know the measures of 2 angles in a triangle, you can find the measure of the third angle.

If the angles are removed from the triangle and arranged side by side, they form a straight angle.



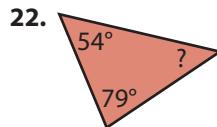
$$\begin{aligned}m\angle J + m\angle K + m\angle L &= 180^\circ \\90^\circ + 25^\circ + m\angle L &= 180^\circ \\115^\circ + m\angle L &= 180^\circ \\m\angle L &= 180^\circ - 115^\circ \\m\angle L &= 65^\circ\end{aligned}$$

$$\begin{aligned}180^\circ - (m\angle D + m\angle E) &= m\angle F \\180^\circ - (40^\circ + 70^\circ) &= m\angle F \\180^\circ - 110^\circ &= m\angle F \\70^\circ &= m\angle F\end{aligned}$$

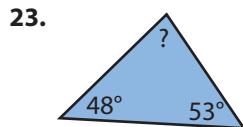
Exercises

Find the unknown angle measure in the triangle.

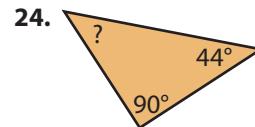
Write the equation you use. **Equations may vary.**



$$180^\circ - 133^\circ = 47^\circ$$



$$180^\circ - 101^\circ = 79^\circ$$



$$180^\circ - 134^\circ = 46^\circ$$

25. $52^\circ, 38^\circ, \underline{\hspace{1cm}}$

$$180^\circ - 90^\circ = 90^\circ$$

26. $135^\circ, 25^\circ, \underline{\hspace{1cm}}$

$$180^\circ - 160^\circ = 20^\circ$$

27. $48^\circ, 25^\circ, \underline{\hspace{1cm}}$

$$180^\circ - 73^\circ = 107^\circ$$

Write yes or no to indicate whether these angles can form a triangle. If they can, classify the triangle according to the measure of its angles.

28. $90^\circ, 35^\circ, 60^\circ$ **no**

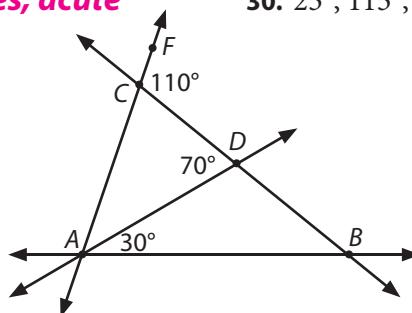
29. $50^\circ, 55^\circ, 75^\circ$ **yes; acute**

30. $25^\circ, 115^\circ, 40^\circ$ **yes; obtuse**

Use the diagram to find the angle measure.

31. $\angle ADB$ **110°**

32. $\angle ACD$ **70°**

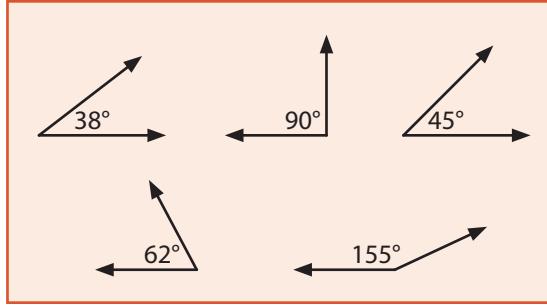


33. $\angle ABD$ **40°**

34. $\angle CAD$ **40°**

Use the angles to find the angle measurement.

35. complement of a 45° angle **45°**



36. complement of a 52° angle **38°**

37. complement of a 28° angle **62°**

38. supplement of a 25° angle **155°**

39. supplement of a 90° angle **90°**

40. supplement of a 135° angle **45°**



J Explain why a triangle cannot contain two right angles or two obtuse angles.

Two right angles measure 180° , leaving no measurement for the third angle. Two obtuse angles measure more than 180° .

Complete **DAILY REVIEW** f on page 423.

Quadrilaterals

Quadrilaterals are polygons with 4 sides, 4 vertices, and 4 angles.

Description	Representation	Hierarchy of Quadrilaterals
A trapezoid has at least 1 pair of opposite sides that are parallel.		<pre> graph TD quadrilateral[quadrilateral] --> trapezoid[trapezoid] trapezoid --> parallelogram[parallelogram] parallelogram --> rectangle[rectangle] parallelogram --> rhombus[rhombus] rectangle --> square[square] rhombus --> square </pre>
A parallelogram has 2 pairs of opposite sides that are parallel. Opposite sides are congruent. Opposite angles are congruent.		
A rhombus has 2 pairs of opposite sides that are parallel. All sides are congruent. Opposite angles are congruent.		
A rectangle has 2 pairs of opposite sides that are parallel. Opposite sides are congruent. All angles are right angles.		
A square has 2 pairs of opposite sides that are parallel. All sides are congruent. All angles are right angles.		

- quadrilaterals**
 - trapezoid
 - parallelogram
 - rhombus
 - rectangle
 - square
- diagonals

Exercises

List the properties of the quadrilateral.

Identify the quadrilateral by its most specific name.



1. **parallelogram**



2. **trapezoid**



4. **square**



5. **quadrilateral**



3. **rectangle**



6. **rhombus**

Complete the sentence with the best answer.

7. A quadrilateral is a ___ with 4 sides. **polygon**

8. A square is a rhombus with 4 ___ angles. **right**

9. A square is a rectangle with 4 ___ sides.
congruent/equal

10. A rectangle is a ___ with 4 right angles.

parallelogram

11. A trapezoid has ___ pair of opposite sides parallel.
at least one

Answer the question.

12. Why is a square always a rectangle?

13. Is a rectangle always a square? Why?

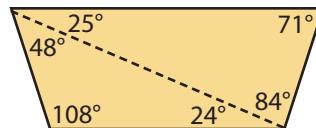
14. Is a trapezoid always a square? Why?

15. Why is a rectangle always a parallelogram?

16. Is a parallelogram always a rhombus? Why?

17. Which quadrilateral has all the properties of all the other quadrilaterals? **square**

A **diagonal** is a line segment that connects two nonadjacent vertices of a polygon. A diagonal divides a quadrilateral into 2 triangles. Since the sum of the angles in a triangle equals 180° , the sum of the angles in a quadrilateral is 2 times 180° , or 360° .

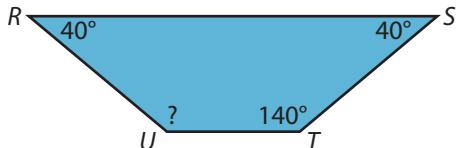


$$(48^\circ + 108^\circ + 24^\circ) + (25^\circ + 84^\circ + 71^\circ)$$

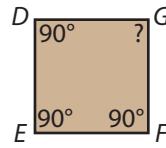
$$180^\circ + 180^\circ$$

$$360^\circ$$

The 4 line segments of a quadrilateral meet at 4 vertices to form 4 angles. The sum of these interior angles is 360° . When you know the measures of 3 angles in a quadrilateral, you can find the measure of the fourth angle.



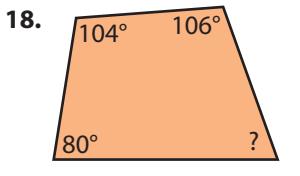
$$\begin{aligned} m\angle R + m\angle S + m\angle T + m\angle U &= 360^\circ \\ 40^\circ + 40^\circ + 140^\circ + m\angle U &= 360^\circ \\ 220^\circ + m\angle U &= 360^\circ \\ m\angle U &= 360^\circ - 220^\circ \\ m\angle U &= 140^\circ \end{aligned}$$



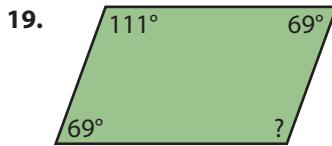
$$\begin{aligned} 360^\circ - (m\angle D + m\angle E + m\angle F) &= m\angle G \\ 360^\circ - (90^\circ + 90^\circ + 90^\circ) &= m\angle G \\ 360^\circ - 270^\circ &= m\angle G \\ 90^\circ &= m\angle G \end{aligned}$$

Exercises

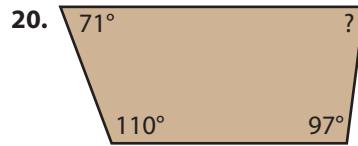
Find the unknown angle measure in the quadrilateral. Write the equations you use. **Equations may vary.**



$$360^\circ - 290^\circ = 70^\circ$$



$$360^\circ - 249^\circ = 111^\circ$$



$$360^\circ - 278^\circ = 82^\circ$$

21. $135^\circ, 75^\circ, 105^\circ, \underline{\quad}$
 $360^\circ - 315^\circ = 45^\circ$

22. $62^\circ, 86^\circ, 114^\circ, \underline{\quad}$
 $360^\circ - 262^\circ = 98^\circ$

23. $49^\circ, 97^\circ, 97^\circ, \underline{\quad}$
 $360^\circ - 243^\circ = 117^\circ$

Write **yes** or **no** to indicate whether these angles can form a quadrilateral.

24. $60^\circ, 60^\circ, 120^\circ, 120^\circ$ **yes**

25. $50^\circ, 80^\circ, 80^\circ, 120^\circ$ **no**

26. $115^\circ, 115^\circ, 100^\circ, 30^\circ$ **yes**

Graph the points on a four-quadrant coordinate plane. Draw line segments connecting the points in order. Connect the last point to the first point. Identify the quadrilateral by its most specific name.

27. $(3, 3) \rightarrow (8, 3) \rightarrow (8, 8) \rightarrow (3, 8)$ **square**

28. $(-7, 7) \rightarrow (-9, 3) \rightarrow (-2, 3) \rightarrow (-4, 7)$ **trapezoid**

29. $(-8, -3) \rightarrow (-8, -7) \rightarrow (-2, -7) \rightarrow (-2, -3)$ **rectangle**

30. $(4, -5) \rightarrow (9, -5) \rightarrow (6, -8) \rightarrow (1, -8)$ **parallelogram**

Explain why these statements are true.

31. If a figure is a quadrilateral, then the sum of its angles is 360° .

A quadrilateral is a 4-sided figure. The sum of the angles equals 360° .

32. If a figure is a square, then it is also a rhombus.

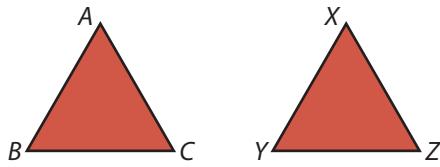
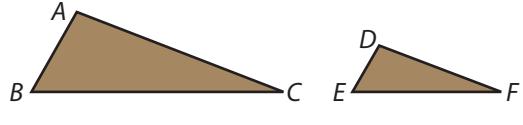
Both a square and a rhombus have 4 sides of equal length.

33. If a figure is a trapezoid, then it is also a quadrilateral.

A trapezoid has 4 sides, 4 vertices, and 4 angles.

Complete **DAILY REVIEW** **g** on page 424.

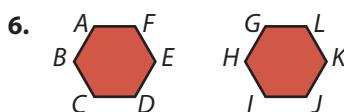
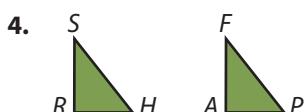
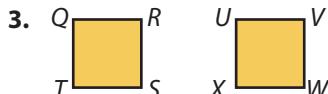
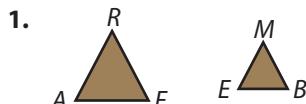
Congruent & Similar Figures

Congruent Figures	Similar Figures
<p>Congruent figures are two geometric figures with the same size and the same shape. Figures can be congruent even if they have been turned or flipped. The symbol for congruent is \cong.</p> <p>Congruent polygons have <i>corresponding angles</i> of equal measure and <i>corresponding sides</i> of equal length. The lengths must form a ratio of 1 to 1.</p>  <p>$\triangle ABC \cong \triangle XYZ$</p> <p>$\angle A \cong \angle X \quad \angle B \cong \angle Y \quad \angle C \cong \angle Z$</p> <p>$\overline{AB} \cong \overline{XY} \quad \overline{BC} \cong \overline{YZ} \quad \overline{AC} \cong \overline{XZ}$</p> <p>If $\angle C = 35^\circ$, then $\angle Z = 35^\circ$. If $\overline{AB} = 4$ cm, then $\overline{XY} = 4$ cm. The ratio of side lengths is $\frac{4}{4}$ or $\frac{1}{1}$.</p>	<p>Similar figures are two geometric figures with the same shape but not necessarily the same size. The figure was enlarged or reduced to form a similar figure. The symbol for similar is \sim.</p> <p>Similar polygons have <i>corresponding angles</i> of equal measure. The lengths of the <i>corresponding sides</i> must be proportional (form equal ratios).</p>  <p>$\triangle ABC \sim \triangle DEF$</p> <p>$\angle A \cong \angle D \quad \angle B \cong \angle E \quad \angle C \cong \angle F$</p> <p>$\overline{AB} \sim \overline{DE} \quad \overline{BC} \sim \overline{EF} \quad \overline{AC} \sim \overline{DF}$</p> <p>If $\angle C = 35^\circ$, then $\angle F = 35^\circ$. If $\overline{AB} = 4$ cm and $\overline{DE} = 2$ cm, the ratio of the side lengths is $\frac{4}{2}$ or $\frac{2}{1}$.</p>

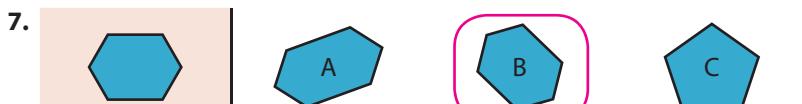
congruent \cong
similar \sim

Exercises

Write a statement describing whether the pair of figures is congruent or similar.



Identify the figure that appears to be congruent to the first figure.



1. $\triangle RAF \sim \triangle MEB$



2. $\odot L \sim \odot M$



3. $QRST \cong UVWX$

4. $\triangle SRH \cong \triangle FAP$

5. $AEIO \sim BCDF$

6. $ABCDEF \cong GHIJKL$

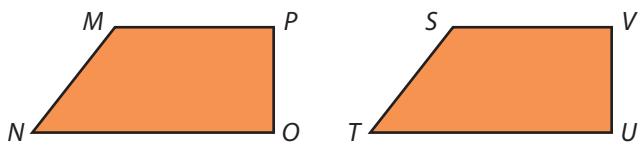
MNOP \cong STUV. Complete the sentence.

10. $\overline{OP} \cong \underline{\quad} \overline{UV}$ 14. If $\overline{NO} = 6$ cm, then $\underline{\quad} = 6$ cm. \overline{TU}

11. $\angle M \cong \underline{\quad} \angle S$ 15. If $\overline{MP} = 4$ cm, then $\underline{\quad} = 4$ cm. \overline{SV}

12. $\overline{MN} \cong \underline{\quad} \overline{ST}$ 16. If $\angle O = 90^\circ$, then $\underline{\quad} = 90^\circ$. $\angle U$

13. $\angle P \cong \underline{\quad} \angle V$ 17. If $\angle N = 50^\circ$, then $\underline{\quad} = 50^\circ$. $\angle T$

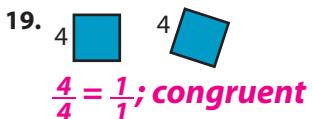


Write the ratio of the labeled sides and rename in lowest terms.

Identify the shapes as congruent or similar.



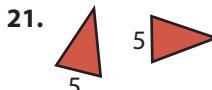
$$\frac{3}{6} = \frac{1}{2}; \text{similar}$$



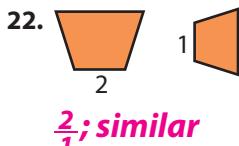
$$\frac{4}{4} = \frac{1}{1}; \text{congruent}$$



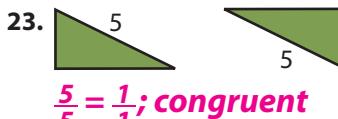
$$\frac{8}{2} = \frac{4}{1}; \text{similar}$$



$$\frac{5}{5} = \frac{1}{1}; \text{congruent}$$



$$\frac{2}{1}; \text{similar}$$

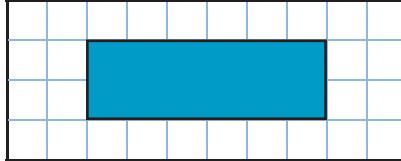
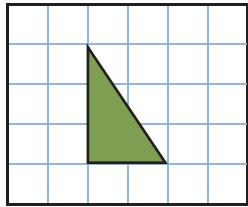


$$\frac{5}{5} = \frac{1}{1}; \text{congruent}$$

29. $(20 + 1) \times 60$
 $(20 \times 60) + (1 \times 60)$
 $1,200 + 60$
 $1,260$

Draw the pictured figures on graph paper.

Draw the other figures. **Similar figures may vary.**



24. Draw a congruent triangle.

26. Draw a congruent rectangle.

25. Draw a similar triangle that is larger.

27. Draw a similar rectangle that is smaller.

Practice & Application

28. Find the product of 24 and 3.78. **90.72**

33. **The replacement door should be congruent: the exact shape and size of the original door.**

29. Use the Distributive Property to solve 21×60 .

32. Rename $\frac{23}{14}$ to a mixed number. **1 $\frac{9}{14}$**

30. Write an equation using multiplication for $16 + 16 + 24 + 24 = 96$. **$(3 \times 16) + (2 \times 24) = 48 + 48 = 96$**

33. If you are replacing the front door on your house, should the replacement door be congruent or similar to the original door? Explain.

31. Estimate the answer by rounding to the greatest place.

J Explain how a pair of similar figures could also be classified as congruent figures.

$$376,243 - 149,496 = \underline{\quad} \mathbf{400,000} - 100,000 = 300,000$$

$$68.4 + 35.7 = \underline{\quad} \mathbf{70 + 40 = 110}$$

Complete **DAILY REVIEW** **h** on page 424.

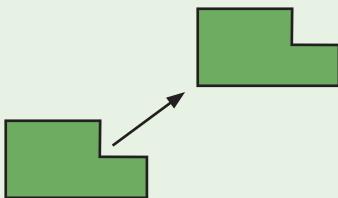
Transformations & Symmetry

Translations, rotations, and reflections are *transformations*. They change the location, the position, or both the location and the position of a figure. The original figure moves from one place to another place. The *transformed figure* or *image* is congruent to the original figure.

translation
rotation
reflection
line of symmetry

Translation (slide)

A *translation* changes only the location of a figure. It moves every point of the figure the same distance in a straight line.

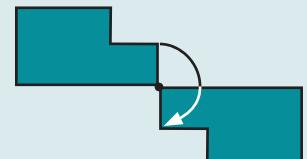


Rotation (turn)

A *rotation* can change the location and position of a figure. It moves the figure clockwise or counterclockwise around a specific point. A figure is usually rotated a fraction of one complete turn or a specific number of degrees.

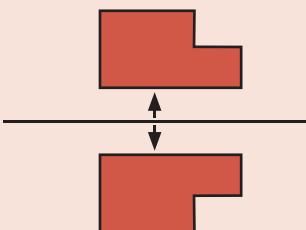
$$\frac{1}{4} \text{ turn} = 90^\circ \quad \frac{3}{4} \text{ turn} = 270^\circ$$

$$\frac{1}{2} \text{ turn} = 180^\circ \quad 1 \text{ full turn} = 360^\circ$$



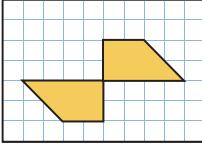
Reflection (flip)

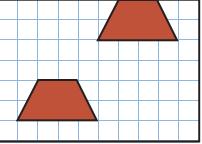
A *reflection* changes both the location and the position of a figure. When a figure flips over the *line of reflection*, a reversal or a mirror image of the figure is formed. Every point on the image is the same distance from the line of reflection as its corresponding point on the original figure.

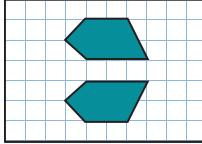


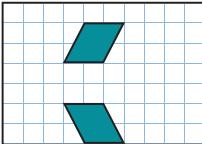
Exercises

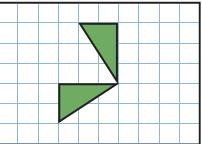
Identify the type of transformation: **translation**, **rotation**, or **reflection**.

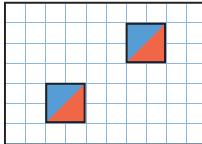
1.  **rotation**

2.  **translation**

3.  **reflection**

4.  **reflection**

5.  **rotation**

6.  **translation**

Draw the transformed figure.

7. 90° counterclockwise rotation



8. $\frac{1}{2}$ clockwise rotation



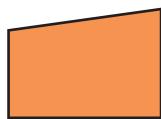
Graph on a four-quadrant coordinate plane $\triangle ABC$ with coordinates $(1, 1)$, $(4, 1)$, and $(1, 4)$. Transform the figure according to the directions. Name the new coordinates.

9. Translate the triangle 6 units down.
 $(1, -5), (4, -5), (1, -2)$

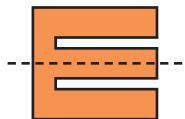
10. Reflect the new triangle across the y -axis.
 $(-1, -2), (-4, -5), (-1, -5)$

A figure that has line symmetry (is symmetrical) can be divided into congruent halves by folding or by drawing a line. These halves are mirror images or reflections. They look alike but face in the opposite direction.

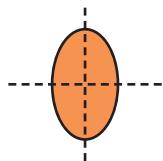
A **line of symmetry** is the line dividing a figure into congruent halves. The points in one half are the same distance from the line of symmetry as the corresponding points in the other half. A figure may have more than one line of symmetry or a figure may have no lines of symmetry.



no lines of symmetry



1 line of symmetry

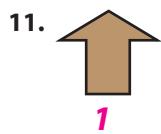


2 lines of symmetry



Exercises

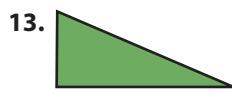
Write the number of lines of symmetry for the figures that are symmetrical.



1



6



0



0



5



1

Write the letters in the word that are symmetrical.

17. GOD O, D

18. LOVES O, V, E

19. ME M, E

Draw three types of triangles: **equilateral**, **scalene**, and **isosceles**. Draw all the lines of symmetry for each triangle. Answer the questions about your triangles. **Figures may vary.**

20. Which type of triangle has only one line of symmetry? Why? **isosceles**

21. Which type of triangle has more than one line of symmetry? Why? **equilateral**

22. Which type of triangle has no lines of symmetry? Why? **scalene**

Graph each point on a four-quadrant coordinate plane.

Draw line segments connecting the points in order.

Complete the figure so the y-axis is the line of symmetry.

23. $(0, 2) \rightarrow (6, 2) \rightarrow (6, 6) \rightarrow (4, 4) \rightarrow (0, 4)$

24. $(0, -2) \rightarrow (-1, -2) \rightarrow (-1, -4) \rightarrow (-3, -4) \rightarrow (-3, -1) \rightarrow (-5, -1) \rightarrow (-5, -6) \rightarrow (0, -6)$

J Draw the trapezoid. Transform the trapezoid to show a reflection.

Answers may vary.

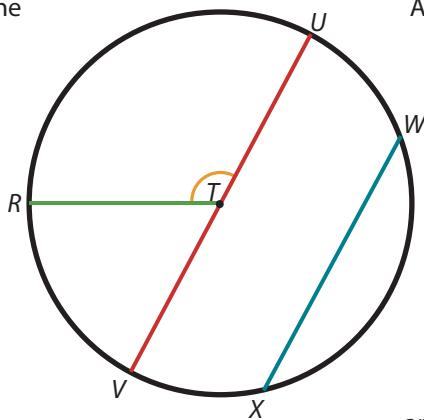


Circles

A **circle** consists of all the points in a plane that are the same distance from a given point, the *center*. A circle is named by its center as in $\odot T$.

A **radius** is a line segment from the center of the circle to a point on the circle. \overline{TR} , \overline{TU} , and \overline{TV} are radii of $\odot T$. All radii of a circle are the same length.

A **chord** is a line segment with endpoints on the circle. \overline{VW} and \overline{VU} are chords of $\odot T$.



A **diameter** is a chord that passes through the center of the circle. \overline{VU} is the diameter of $\odot T$. The length of the diameter (d) is twice the length of the radius (r); $d = 2r$.

A **central angle** is an angle with its vertex at the center of the circle. $\angle RTU$ and $\angle RTV$ are central angles of $\odot T$. $\angle RTU$ and $\angle RTV$ are supplementary angles because they are adjacent and form a straight line.

circle
radius (radii)
chord
diameter
central angle

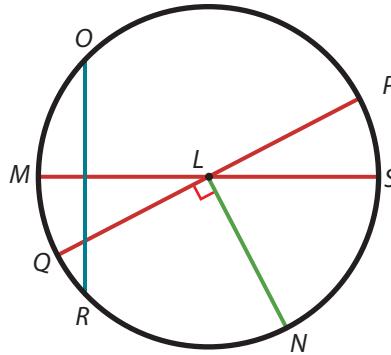
Exercises

Identify the figure related to $\odot L$.

1. the center **L**
2. two diameters **MS, QP**
3. three chords **MS, QP, OR**
4. five radii **LM, LP, LS, LN, LQ**
5. complementary central angles **$\angle PLS, \angle SLN$**
6. supplementary central angles **Answers may vary.**

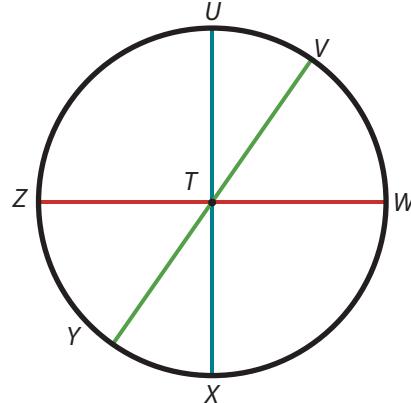
Use $\odot L$ to answer the question.

7. What is the measure of $\angle MLP$ if $\angle QLM$ is 30° ? **150°**
8. What is the measure of $\angle PLS$ if $\angle SLN$ is 60° ? **30°**
9. How long is \overline{LQ} if the length of \overline{LP} is 3 cm? **3 cm**
10. How long is \overline{LS} if the length of \overline{MS} is 12 cm? **6 cm**



Use a protractor to measure the central angle in $\odot T$. Write the measure of the angle.

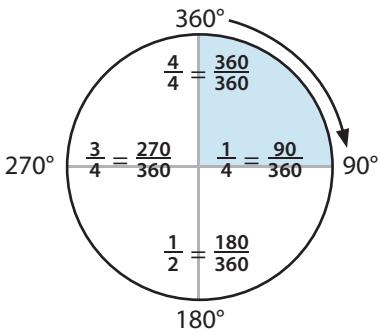
11. $\angle UTZ$ **90°**
12. $\angle VTW$ **55°**
13. $\angle XTY$ **35°**
14. $\angle UTV$ **35°**
15. $\angle XTW$ **90°**
16. $\angle YTZ$ **55°**
17. What is the sum of the measurements of all the central angles? **360°**



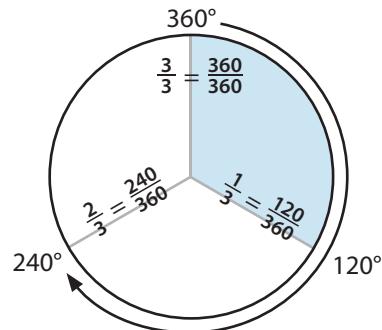
Complete the sentence.

18. If $\overline{TW} = 8$ in., then $\overline{ZW} = \underline{\hspace{2cm}}$. **16 in.**
19. If $\overline{UX} = 6.48$ mm, then $\overline{TU} = \underline{\hspace{2cm}}$. **3.24 mm**
20. If $\overline{TV} = 4.5$ cm, then $\overline{YV} = \underline{\hspace{2cm}}$. **9 cm**

A circle can be partitioned into fractions using central angles. There are 360° in a whole circle. By renaming $\frac{90}{360}$ to lowest terms, you can find what fraction of a circle 90° represents. By renaming $\frac{120}{360}$ to lowest terms, you can find what fraction of a circle 120° represents.



$$90^\circ = \frac{90}{360} = \frac{1}{4}$$



$$120^\circ = \frac{120}{360} = \frac{1}{3}$$

Exercises

Write the degree measure over 360 to find the fraction of a circle. Rename the fraction to lowest terms.

21. 72°

$$\frac{72}{360} = \frac{1}{5}$$

22. 120°

$$\frac{120}{360} = \frac{1}{3}$$

23. 36°

$$\frac{36}{360} = \frac{1}{10}$$

24. 270°

$$\frac{270}{360} = \frac{3}{4}$$

25. 240°

$$\frac{240}{360} = \frac{2}{3}$$

26. 45°

$$\frac{45}{360} = \frac{1}{8}$$

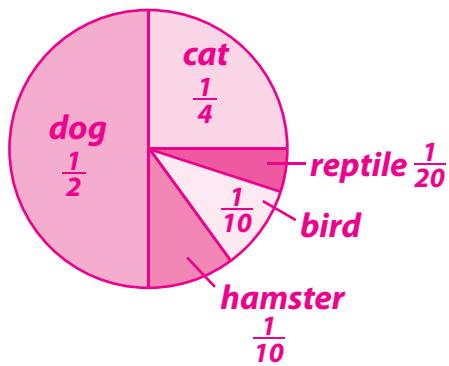
Follow the directions to make a circle graph.

27. Find the angle measure for the fraction and complete the table.

28. Graph the data and label the graph sections using the “Pet” and “Fraction” data.

Favorite Pets		
Pet	Fraction	Angle Measure
Dog	$\frac{1}{2}$	180°
Cat	$\frac{1}{4}$	90°
Hamster	$\frac{1}{10}$	36°
Bird	$\frac{1}{10}$	36°
Reptile	$\frac{1}{20}$	18°

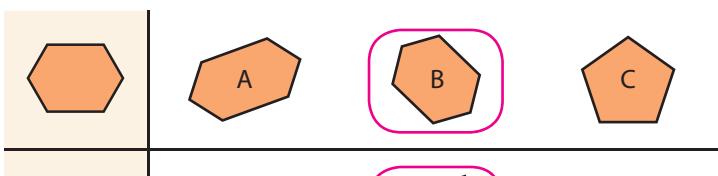
28.



Practice & Application

Identify the hexagon that appears to be **congruent** to the first figure. Identify the quadrilateral that appears to be **similar** to the first figure.

29.



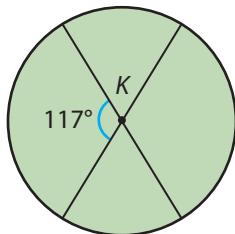
30.



J

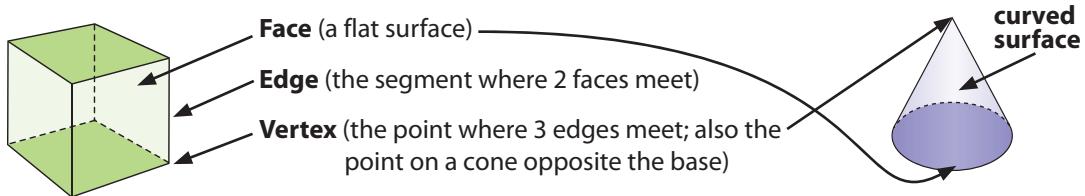
- Without using a protractor, find the measurement of the three unknown angles in $\odot K$. Explain your answers. $63^\circ, 117^\circ, 63^\circ$

Each smaller angle measures 63° because they each form a straight line with the angle labeled 117° , so the remaining angle must measure 117° .



Complete **DAILY REVIEW** J on page 425.

3-Dimensional Figures



The points of a **three-dimensional figure** do not lie in the same plane. A three-dimensional figure has length, width, and height.

Polyhedrons are three-dimensional figures enclosed by flat surfaces that are polygons. Pyramids and prisms are named by the shape of their bases; they are polyhedrons. Polyhedrons have no curved surfaces.

face, edge, vertex
curved surface
3-dimensional
polyhedron
sphere
conical figures
pyramid
cylindrical figures
prism

Curved-Surface Figures	Polyhedrons		
<p>sphere (0 bases) cylinder (2 bases) cone (1 base)</p> <p>Circular figures with curved surfaces are <i>not</i> polyhedrons.</p>	Conical Figures (1 base) triangular pyramid pentagonal pyramid	Cylindrical Figures (2 bases) triangular prism rectangular prism	Polyhedrons square prism (cube)

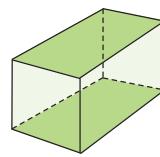
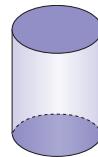
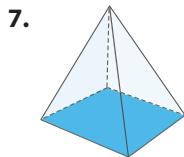
Exercises

Classify the object as **spherical**, **conical**, or **cylindrical**.

1. party hat **conical**
2. baseball **spherical**
3. cereal box **cylindrical**
4. soda can **cylindrical**
5. pyramid **conical**
6. basketball **spherical**

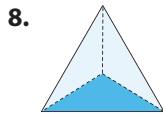
Name the figure that is *not* a polyhedron.

Explain your answer.

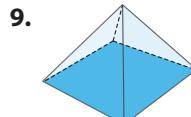


Cylinder; a polyhedron has no curved surfaces.

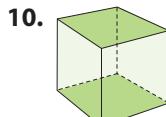
Write the name of the polyhedron.



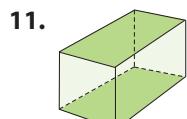
triangular pyramid



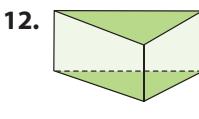
square pyramid



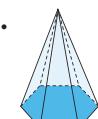
cube



rectangular prism

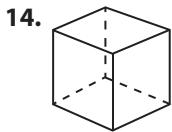


triangular prism



hexagonal pyramid

Write the number of faces, vertices, and edges in the polyhedron.



6 faces
8 vertices
12 edges

Identify the correct transformed letter.

14. counter-clockwise rotation 90°

E

A
E

B

C

16. reflection

R

A

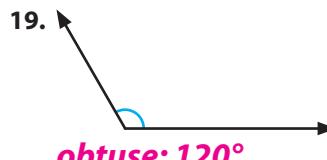
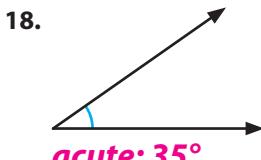
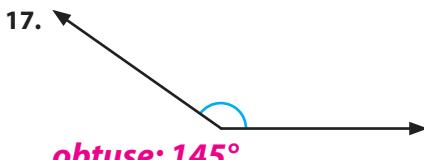
R

C

R

Classify the angle as **right**, **acute**, **obtuse**, or **straight**.

Use a protractor to measure the angle. Write the measurement.



Use the angles to find the angle measurement.

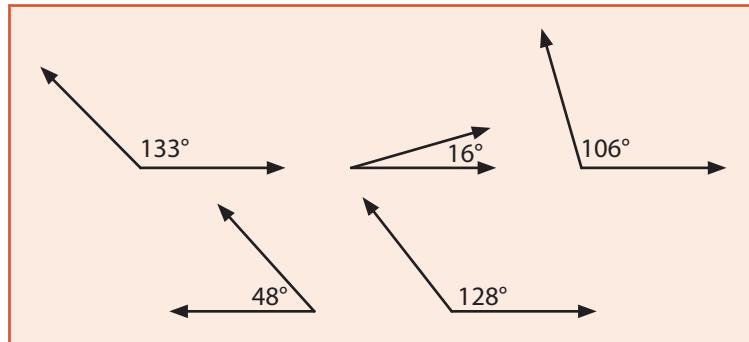
20. complement of a 42° angle **48°**

21. complement of a 74° angle **16°**

22. supplement of a 52° angle **128°**

23. supplement of a 47° angle **133°**

24. supplement of a 164° angle **16°**



Practice & Application

25. What is the total angle measure in a triangle?

180°

26. What is the total angle measure in a quadrilateral?

360°

27. What is the total angle measure in a circle?

360°

28. Write a mathematical statement to compare $\frac{21}{24}$ and $\frac{6}{8}$. **$\frac{21}{24} > \frac{6}{8}$**

29. Write three fractions that are equal to $\frac{1}{2}$.

Answers will vary.

30. Rename $\frac{4}{5}$ to higher terms. **Answers will vary.**

31. Write $\frac{1}{2}$, $\frac{2}{7}$, $\frac{10}{18}$, and $\frac{4}{5}$ from least to greatest.



Explain how prisms and pyramids are alike and how they are different. **A prism is a cylindrical figure with 2 congruent polygons as bases; all other faces are parallelograms. A pyramid is a conical figure with 1 polygon as its base; all other faces are triangles.**

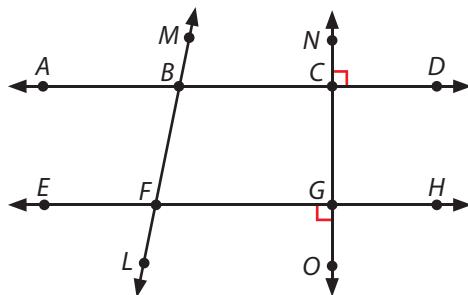
31. **$\frac{2}{7}, \frac{1}{2}, \frac{10}{18}, \frac{4}{5}$**

Complete **DAILY REVIEW** k on page 426.

CHAPTER 6 REVIEW

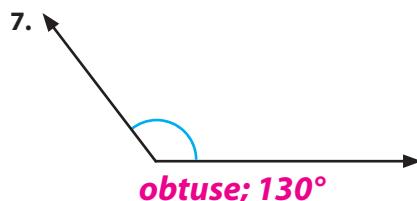
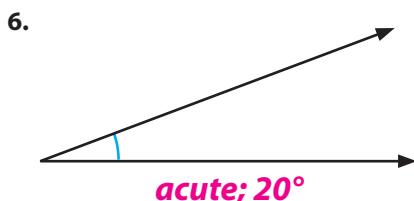
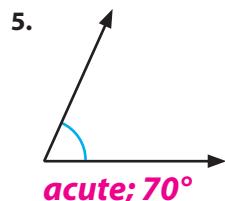
Use the diagram to name the geometric figure.

- one pair of parallel lines $\overleftrightarrow{AD} \parallel \overleftrightarrow{EH}$; **Answers will vary.**
- two pairs of perpendicular lines $\overleftrightarrow{NO} \perp \overleftrightarrow{AD}$; **Answers will vary.**
- a point shared by \overline{BD} and \overline{NG} **point C**
- a plane **any 3 points (2 must be noncollinear)**

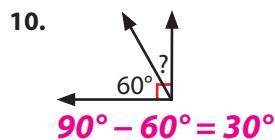
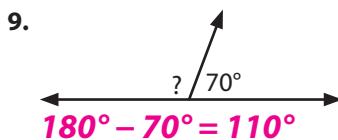
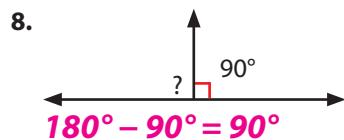


Classify the angle as **right**, **acute**, **obtuse**, or **straight**.

Use a protractor to measure the angle. Write the measurement.

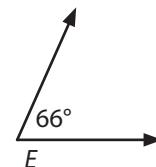
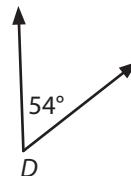
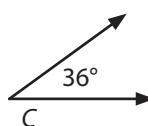
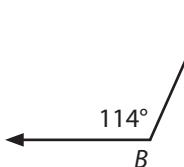
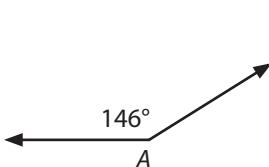


Write an equation to find the measure of the unknown angle.



Use the angles to answer the question.

Write an equation to prove the answer.



11. Which two angles are complementary?

$\angle C$ and $\angle D$; $36^\circ + 54^\circ = 90^\circ$

12. Which two angles are supplementary?

$\angle B$ and $\angle E$; $114^\circ + 66^\circ = 180^\circ$

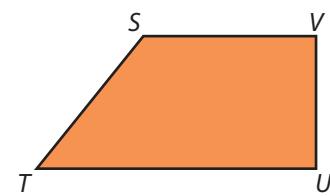
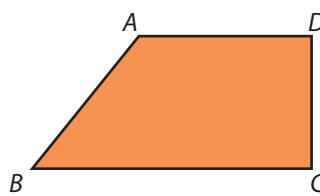
ABCD \cong STUV. Complete the sentence.

13. $\overline{DC} \cong \underline{\hspace{1cm}}$ **VU**

14. $\overline{AB} \cong \underline{\hspace{1cm}}$ **ST**

15. $\angle A \cong \underline{\hspace{1cm}}$ **S**

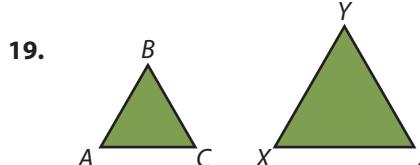
16. $\angle D \cong \underline{\hspace{1cm}}$ **V**



17. If $\overline{BC} = 8$ cm, then $\underline{\hspace{1cm}} = 8$ cm. **TU**

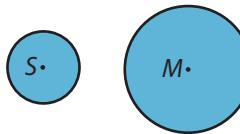
18. If $\angle C = 90^\circ$, then $\underline{\hspace{1cm}} = 90^\circ$. **U**

Write a statement describing whether the pair of figures is **congruent** or **similar**.



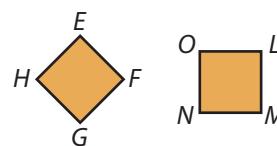
$\Delta ABC \sim \Delta XYZ$

20.



$\odot S \sim \odot M$

21.



$EFGH \cong LMNO$

Identify the figures related to $\odot O$. Answer the question.

22. the center **O**

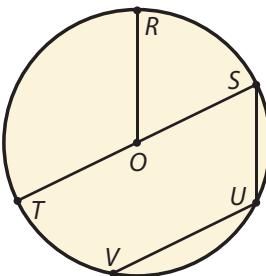
23. three chords **TS, SU, VU**

24. the diameter **TS**

25. three radii **OR, OT, OS**

26. What is the measure of $\angle ROS$ if $\angle TOR$ is 115° ? **65°**

27. How long is \overline{ST} if the length of \overline{OS} is 4 cm? **8 cm**



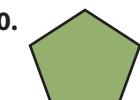
Name the polygon. Write the number of interior angles.



octagon; 8

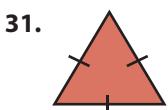


hexagon; 6

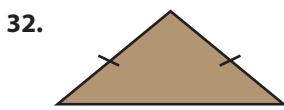


pentagon; 5

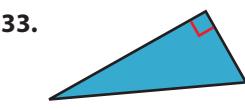
Classify the triangle according to the measure of its angles (acute, right, obtuse) and the length of its sides (equilateral, isosceles, scalene).



acute; equilateral



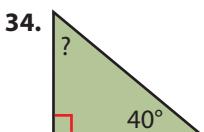
obtuse; isosceles



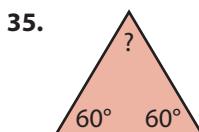
right; scalene

Find the unknown angle measure in the triangle.

Write the equations you use. **Equations may vary.**



$$180^\circ - (90^\circ + 40^\circ) = 50^\circ$$



$$180^\circ - (60^\circ + 60^\circ) = 60^\circ$$

Write yes or no to indicate whether these angles can form a triangle.

If they can, classify the triangle according to the measure of its angles.

36. $25^\circ, 15^\circ, 140^\circ$ **yes; obtuse**

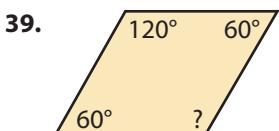
37. $40^\circ, 65^\circ, 75^\circ$ **yes; acute**

38. $100^\circ, 35^\circ, 60^\circ$ **no**

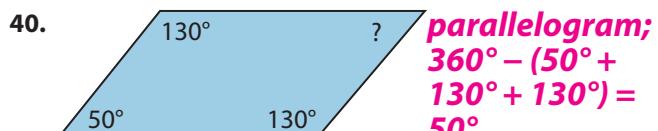
Name the quadrilateral by its most specific name.

Find the unknown angle measure in the quadrilateral.

Write the equations you use. **Equations may vary.**

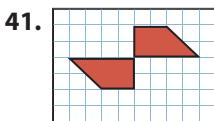


$$360^\circ - (60^\circ + 120^\circ + 60^\circ) = 120^\circ$$

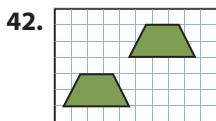


$$360^\circ - (50^\circ + 130^\circ + 130^\circ) = 50^\circ$$

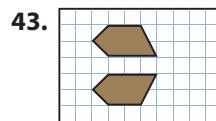
Identify the type of transformation: translation, rotation, or reflection.



rotation



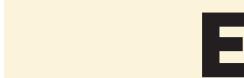
translation



reflection

Identify the correct transformed letter.

44. counterclockwise rotation 180°



A

B

C



CUMULATIVE REVIEW

Test Prep

Mark the answer.

1. $\frac{3}{4}$ ○ $\frac{13}{16}$

A. >

B. <

C. =

2. $\frac{15}{49}$ ○ $\frac{4}{16}$

A. >

B. <

C. =

3. $\frac{2}{8}$ ○ $\frac{5}{15}$

A. >

B. <

C. =

4. $\frac{3}{10}$ ○ $\frac{10}{35}$

A. >

B. <

C. =

5. $10 \times 34.21 = \underline{\hspace{2cm}}$

A. 3,421

B. 34.21

C. 342.1

6. $16.2 \div 1,000 = \underline{\hspace{2cm}}$

A. 16,200

B. 0.162

C. 0.0162

7. $865.3 \div 10 = \underline{\hspace{2cm}}$

A. 86.53

B. 8.653

C. 0.8653

8. $29.64 \times 1,000 = \underline{\hspace{2cm}}$

A. 0.02964

B. 29,640

C. 2,964,000

9. The Smiths took $3\frac{1}{2}$ pounds of hamburgers to the barbecue. They had $1\frac{1}{4}$ pounds left over. How many pounds of hamburgers were eaten?

A. $2\frac{1}{2}$ lb

C. $2\frac{1}{4}$ lb

B. 2 lb

D. none of the above

10. Paige practiced piano for $\frac{1}{2}$ hour each day for a total of 2 hours. How many days did she practice?

A. 5 days

C. 3 days

B. $4\frac{1}{2}$ days

D. none of the above

11. $\frac{8}{9} - \frac{1}{18} = \underline{\hspace{2cm}}$

A. $\frac{12}{18}$

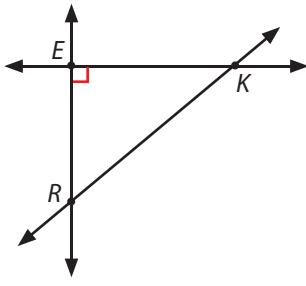
C. $\frac{5}{6}$

B. $\frac{7}{18}$

D. none of the above

Mark the answer.

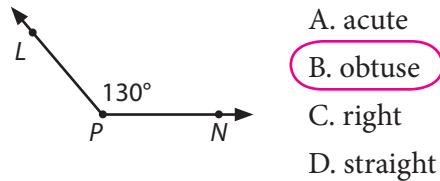
12.



$\angle EKR$ is ____.

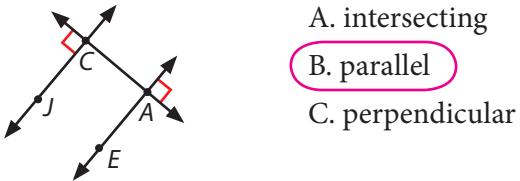
- A. acute
- B. obtuse
- C. right
- D. straight

13. $\angle LPN$ is ____.



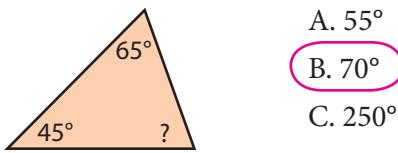
- A. acute
- B. obtuse
- C. right
- D. straight

14. \overleftrightarrow{JC} and \overleftrightarrow{EA} are ____ lines.



- A. intersecting
- B. parallel
- C. perpendicular

15. The unknown angle measure is ____.



- A. 55°
- B. 70°
- C. 250°

16.

$$27 \times 36 = \underline{\hspace{2cm}}$$

- A. 652
- B. 1,972
- C. 972
- D. none of the above

17. Which number is a prime number?

- A. 26
- B. 17
- C. 33
- D. none of the above

18. What factor is common to 42 and 56?

- A. 3
- B. 7
- C. 6
- D. none of the above

19.

$$3,200 - n = 2,700$$

- A. 420
- B. 50
- C. 500
- D. none of the above

20.

$$14.6 + 26.4 + 40 = \underline{\hspace{2cm}}$$

- A. 81.4
- B. 81
- C. 210
- D. none of the above

21. $4^{\circ} \text{ } \underline{\hspace{1cm}}^{-18}$

- A. >

- B. <

- C. =

Use the data from the chart to find the answer.

Jona's Math Test Grades	
Test	Grade
1	78
2	80
3	94
4	79
5	93
6	89

22. On which three tests did Jona receive the lowest grades?

A. test 1, test 2, test 6
B. test 1, test 2, test 4
C. none of the above

24. What is the difference between Jona's lowest and highest test grades?

A. 15
B. 16
C. none of the above

23. What is Jona's average grade for tests 1–3?

A. 84
B. 85
C. none of the above

25. How many math tests did Jona take?

A. 6
B. 3
C. none of the above

Multiply Fractions

Multiplication of whole numbers is the same as repeated addition.

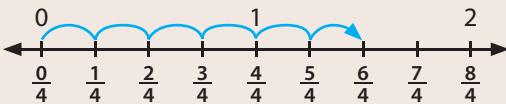
4 sets of 16
 $4 \times 16 = 64$ or $16 + 16 + 16 + 16 = 64$

When multiplying fractions, the multiplication sign is usually read as "sets of" or "of."

Multiplying a fraction by a whole number follows the pattern of whole number multiplication. It can be solved using repeated addition. Remember to write the answer in lowest terms.

$6 \times \frac{1}{4}$ is 6 sets of $\frac{1}{4}$.

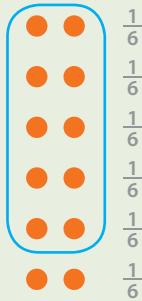
$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$$



Multiplying a whole number by a fraction can be solved by drawing an array. The denominator tells how many equal sets to make. The numerator tells how many sets to select to find the answer.

$\frac{5}{6} \times 12$ is $\frac{5}{6}$ of 12.

$$\frac{5}{6} \times 12 = 10$$



When a multiplication equation includes a whole number and a fraction, rename the whole number as an improper fraction. Multiply the numerators and multiply the denominators.

$$6 \times \frac{1}{4} = \frac{6}{1} \times \frac{1}{4} = \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$$

$$\frac{5}{6} \times 12 = \frac{5}{6} \times \frac{12}{1} = \frac{60}{6} = 10$$

The denominator of a whole number is 1.

$$6 = \frac{6}{1} \quad 12 = \frac{12}{1}$$

Exercises

Solve by writing an addition equation.

Write the answer in lowest terms.

1. $5 \times \frac{1}{4} \quad 1\frac{1}{4}$

2. $4 \times \frac{1}{8} \quad \frac{1}{2}$

3. $3 \times \frac{4}{7} \quad 1\frac{5}{7}$

4. $2 \times \frac{5}{8} \quad 1\frac{1}{4}$

5. $4 \times \frac{2}{9} \quad \frac{8}{9}$

Write a multiplication equation and solve. Write the answer in lowest terms.

Draw a picture to show the solution.

6. $\frac{1}{5}$ of 10 stamps

2 stamps

7. $\frac{2}{3}$ of 12 marbles

8 marbles

8. $\frac{1}{2}$ of 9 squares

$4\frac{1}{2}$ squares

Solve. Write the answer in lowest terms.

9. $9 \times \frac{1}{18} \quad \frac{9}{18} = \frac{1}{2}$

13. $2 \times \frac{3}{7} \quad \frac{6}{7}$

17. $\frac{2}{9} \times 9 \quad \frac{18}{9} = 2$

10. $3 \times \frac{2}{9} \quad \frac{6}{9} = \frac{2}{3}$

14. $7 \times \frac{1}{2} \quad \frac{7}{2} = 3\frac{1}{2}$

18. $\frac{1}{8} \times 40 \quad \frac{40}{8} = 5$

11. $6 \times \frac{2}{3} \quad \frac{12}{3} = 4$

15. $\frac{1}{7} \times 28 \quad \frac{28}{7} = 4$

19. $\frac{5}{6} \times 9 \quad \frac{45}{6} = 7\frac{1}{2}$

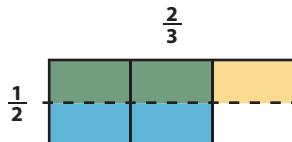
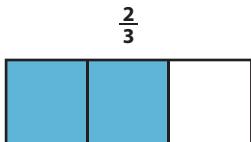
12. $10 \times \frac{3}{5} \quad \frac{30}{5} = 6$

16. $\frac{3}{8} \times 16 \quad \frac{48}{8} = 6$

20. $\frac{3}{18} \times 8 \quad \frac{24}{18} = 1\frac{1}{3}$

Multiplying a fraction by a fraction is finding *a part of a part*. The product will be smaller than either factor because the answer is only a part of the original unit.

A picture can be drawn to show the product of two fractions. Find $\frac{1}{2}$ of $\frac{2}{3}$.



$$\frac{1}{2} \text{ of } \frac{2}{3} = \frac{1}{2} \times \frac{2}{3} = \frac{2}{6} = \frac{1}{3}$$

Draw a figure. Color two-thirds.

Draw a line the other way to show $\frac{1}{2}$ of the figure. Color one-half.

The double shaded area represents the product.

The product of two fractions can also be found by multiplying the numerators and multiplying the denominators.

$$\frac{1}{2} \text{ of } \frac{2}{3} = \frac{1}{2} \times \frac{2}{3} = \frac{2}{6} = \frac{1}{3}$$

Exercises

Solve. Draw a picture to show the solution.

21. A banana bread recipe calls for $\frac{3}{4}$ of a cup of sugar. If the baker uses only $\frac{1}{2}$ of the amount of sugar called for, how much sugar is needed? $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$

Draw a picture to show the product.

Write an equation to solve. Write the answer in lowest terms.

22. $\frac{1}{2}$ of $\frac{1}{4}$ $\frac{1}{8}$ 23. $\frac{1}{2}$ of $\frac{4}{7}$ $\frac{2}{7}$ 24. $\frac{2}{3}$ of $\frac{3}{5}$ $\frac{2}{5}$ 25. $\frac{3}{4}$ of $\frac{1}{2}$ $\frac{3}{8}$



Solve. Write the answer in lowest terms.

26. $\frac{5}{6} \times \frac{2}{3}$ $\frac{10}{18} = \frac{5}{9}$ 27. $\frac{1}{4} \times \frac{3}{5}$ $\frac{3}{20}$ 28. $\frac{1}{6} \times \frac{6}{7}$ $\frac{6}{42} = \frac{1}{7}$ 29. $\frac{5}{6} \times \frac{3}{10}$ $\frac{15}{60} = \frac{1}{4}$
30. $\frac{2}{9} \times \frac{3}{5}$ $\frac{6}{45} = \frac{2}{15}$ 31. $\frac{2}{3} \times \frac{2}{3}$ $\frac{4}{9}$ 32. $\frac{1}{4} \times \frac{1}{2}$ $\frac{1}{8}$ 33. $\frac{8}{9} \times \frac{6}{7}$ $\frac{48}{63} = \frac{16}{21}$

Solve. Write the answer in lowest terms.

34. Andrew ran $\frac{7}{10}$ of a mile each day for 5 days. How far did he run? $\frac{1}{10} \times \frac{7}{10} = \frac{35}{100} = 3\frac{5}{10} = 3\frac{1}{2}$ miles

35. Miranda has $\frac{5}{8}$ of a yard of ribbon. If she used $\frac{1}{3}$ of it to make a hair bow, how much ribbon is left?
 $\frac{1}{3} \times \frac{5}{8} = \frac{5}{24}; \frac{5}{8} - \frac{5}{24} = \frac{15}{24} - \frac{5}{24} = \frac{10}{24} = \frac{5}{12}$ of a yard

Practice & Application

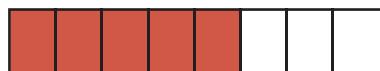
36. Use front-end estimation to find the sum of 78,356; 39,785; and 35,609.
78,000 + 39,000 + 35,000 = 152,000
37. Use front-end estimation to find the difference of 53,486 and 38,750.
53,000 - 38,000 = 15,000
38. Estimate the quotient. $49,317 \div 73$
49,000 ÷ 70 = 700
39. Find the LCM of the denominators in $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{6}$.
12
40. Which fraction is *not* equivalent to the others?

$\frac{1}{3}$	$\frac{3}{6}$	$\frac{4}{12}$	$\frac{5}{15}$	$\frac{3}{6}$
---------------	---------------	----------------	----------------	---------------

41. In which pair of fractions are the denominators related?

$\frac{3}{4}, \frac{5}{10}$	$\frac{4}{5}, \frac{3}{15}$	$\frac{2}{3}, \frac{2}{7}$	$\frac{4}{5}, \frac{3}{15}$
-----------------------------	-----------------------------	----------------------------	-----------------------------

- J Explain how you could use the picture to find $\frac{3}{4}$ of $\frac{5}{8}$.



Simplify

Cancellation can be used to simplify fraction factors before multiplying. Cancelling fractional names for 1 in the numerator and denominator before multiplying allows you to multiply smaller numbers and gives a product in lower terms.

cancellation reciprocal

Use Prime Factorization

- List the prime factors of each term.
- Cancel fractional names for 1.
- Multiply the simplified numerators and the simplified denominators.

$$\frac{3}{4} \times \frac{8}{9} = \frac{\cancel{3}^1 \cdot \cancel{2}^1 \cdot \cancel{2}^1}{\cancel{2}^1 \cdot \cancel{2}^1 \cdot \cancel{3}^1 \cdot \cancel{3}^1} \times \frac{\cancel{2}^2}{\cancel{3}^1} = \frac{2}{3}$$

Find a Common Factor

- Divide a numerator and a denominator by a common factor.
- Multiply the simplified numerators and the simplified denominators.

$$\frac{\cancel{1}^1}{\cancel{4}^1} \times \frac{\cancel{8}^2}{\cancel{9}^3} = \frac{2}{3}$$

GCF of 3 and 9: 3
GCF of 4 and 8: 4

Exercises

Write the prime factorization for each factor.

Use cancellation to simplify. Write the product.

1. $\frac{3}{8} \times \frac{4}{5} \quad \frac{3}{10}$

2. $\frac{5}{7} \times \frac{3}{10} \quad \frac{3}{14}$

3. $\frac{2}{3} \times \frac{3}{4} \quad \frac{1}{2}$

4. $\frac{9}{10} \times \frac{5}{18} \quad \frac{1}{4}$

Use the GCF to cancel. Write the simplified product.

5. $\frac{5}{24} \times \frac{16}{17} = \frac{\boxed{2}}{\boxed{3}} \frac{\boxed{10}}{\boxed{51}}$

6. $\frac{8}{9} \times \frac{7}{12} = \frac{\boxed{2}}{\boxed{3}} \frac{\boxed{14}}{\boxed{27}}$

7. $\frac{18}{25} \times \frac{5}{36} = \frac{\boxed{1}}{\boxed{5}} \frac{\boxed{1}}{\boxed{10}}$

8. $3 \times \frac{2}{3} = \frac{\boxed{1}}{\boxed{1}} \quad \frac{2}{1}$

Multiply. Use cancellation if possible.

Write the answer in lowest terms. **Cancellation steps may vary.**

9. $\frac{8}{9} \times \frac{3}{10} \quad \frac{4}{15}$

17. $\frac{1}{8} \times \frac{3}{5} \quad \frac{3}{40}$

10. $\frac{5}{7} \times \frac{14}{15} \quad \frac{2}{3}$

18. $\frac{1}{3} \times 6 \quad 2$

11. $\frac{8}{9} \times \frac{6}{7} \quad \frac{16}{21}$

19. $\frac{7}{10} \times \frac{2}{9} \quad \frac{7}{45}$

12. $\frac{4}{5} \times 10 \quad 8$

20. $\frac{7}{15} \times \frac{15}{32} \quad \frac{7}{32}$

13. $\frac{5}{12} \times 15 \quad \frac{6}{14}$

21. $\frac{1}{2} \times \frac{4}{5} \quad \frac{2}{5}$

14. $\frac{15}{28} \times \frac{12}{35} \quad \frac{9}{49}$

22. $\frac{1}{8} \times \frac{2}{3} \quad \frac{1}{12}$

15. $\frac{1}{4} \times \frac{4}{9} \quad \frac{1}{9}$

23. $8 \times \frac{5}{12} \quad \frac{3}{1}$

16. $\frac{2}{3} \times \frac{4}{17} \quad \frac{8}{51}$

24. $\frac{2}{9} \times \frac{1}{3} \quad \frac{2}{27}$



The Alaskan Iditarod Trail Sled Dog Race covers over 1,150 miles. The mushers retrace the path used to carry diphtheria serum from Anchorage to Nome in 1925.

Two numbers are **reciprocals** if their product equals 1.

The reciprocal of a fraction (not equal to 0) is found by inverting the numerator and the denominator.

The reciprocal of $\frac{3}{5}$ is $\frac{5}{3}$.

$$\frac{3}{5} \times \frac{5}{3} = \frac{15}{15} = 1$$

Whole numbers have a denominator of 1.

$$8 = \frac{8}{1}$$

The reciprocal of 8 is $\frac{1}{8}$.

$$8 \times \frac{1}{8} = \frac{8}{8} = 1$$

Exercises

Write the reciprocal to complete the equation.

25. $\frac{3}{9} \times \frac{\square}{\square} = 1$ $\frac{9}{3}$

26. $\frac{7}{16} \times \frac{\square}{\square} = 1$ $\frac{16}{7}$

27. $5 \times \frac{\square}{\square} = 1$ $\frac{1}{5}$

28. $\frac{7}{8} \times \frac{\square}{\square} = 1$ $\frac{8}{7}$

29. $2 \times \frac{\square}{\square} = 1$ $\frac{1}{2}$

Solve. Write the answer in lowest terms.

30. $4 \times \frac{3}{5}$

$$\frac{4}{1} \times \frac{3}{5} = \frac{12}{5} = 2\frac{2}{5}$$

31. $\frac{1}{4} \times 12$

$$\frac{1}{4} \times \frac{12}{1} = 3$$

32. $8 \times \frac{2}{3}$

$$\frac{8}{1} \times \frac{2}{3} = \frac{16}{3} = 5\frac{1}{3}$$

33. $\frac{3}{8} \times 24$

$$\frac{3}{8} \times \frac{24}{1} = 9$$

Use the chart to write an equation and solve. **Answers are shown using cancellation.**

Write the answer in lowest terms.

34. The fourth-, fifth-, and sixth-grade classes participated in the community walk-a-thon. If $\frac{4}{5}$ of the sixth-grade students walked, how many sixth-grade students walked?

$$\frac{4}{5} \times 35 = 28 \text{ students}$$

35. Three-sevenths of the sixth-grade students who walked in the walk-a-thon stayed to clean up afterward. How many of the walkers stayed to clean up? $\frac{3}{7} \times 28 = 12 \text{ students}$

36. Use the solution for problem 35 to write a fraction showing what part of the sixth-grade class stayed to clean up. $\frac{12}{35}$

37. Two-thirds of the fifth-grade students worked at the concession booths. How many fifth-grade students worked at the concession booths? $\frac{2}{3} \times 33 = 22 \text{ students}$

- J** David made 5 pots of coffee at the concession booth. For each pot he used $\frac{2}{3}$ of a cup of ground coffee. How much ground coffee was used in all? Solve by writing an addition equation and a multiplication equation.

$$\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{10}{3} = 3\frac{1}{3} \text{ cups of ground coffee}$$

$$\frac{5}{1} \times \frac{2}{3} = \frac{10}{3} = 3\frac{1}{3} \text{ cups of ground coffee}$$

Hunter Christian School Enrollment

Grade 4	28 students
Grade 5	33 students
Grade 6	35 students



Complete **DAILY REVIEW** b on page 427.

Multiply Mixed Numbers

You can **multiply mixed numbers** by renaming them as improper fractions or by using the **Distributive Property**.

**multiply mixed numbers
Distributive Property**

Rename a mixed number as an improper fraction to multiply.

- Multiply the numerators and then multiply the denominators.
- Simplify the fractions using cancellation when possible.

$$5 \times 9\frac{3}{10} = \frac{5}{1} \times \frac{93}{10} = \frac{93}{2} = 46\frac{1}{2}$$

$$\begin{array}{r} 46\frac{1}{2} \\ 2) 93 \\ -8 \\ \hline 13 \\ -12 \\ \hline 1 \end{array}$$

Use the Distributive Property to multiply.

- Multiply each part of the mixed number by the whole number.
- Simplify. Write the answer in lowest terms.

$$5 \times 9\frac{3}{10} =$$

$$5 \times (9 + \frac{3}{10}) =$$

$$(5 \times 9) + (\frac{5}{1} \times \frac{3}{10}) =$$

$$45 + \frac{3}{2} =$$

$$45 + 1\frac{1}{2} = 46\frac{1}{2}$$

$$\begin{array}{r} 1\frac{1}{2} \\ 2) 3 \\ -2 \\ \hline 1 \end{array}$$

Exercises

Write the mixed number as an improper fraction and the improper fraction as a mixed number in lowest terms.

1. $5\frac{3}{4}$ **$\frac{23}{4}$**

2. $3\frac{1}{4}$ **$\frac{13}{4}$**

3. $7\frac{5}{16}$ **$\frac{117}{16}$**

4. $\frac{17}{8}$ **$2\frac{1}{8}$**

5. $\frac{15}{5}$ **3**

6. $\frac{6}{4}$ **$1\frac{1}{2}$**

Multiply. Use cancellation if possible.

Write the answer in lowest terms. **Cancellation steps may vary.**

7. $4\frac{1}{10} \times \frac{5}{6}$ **$3\frac{5}{12}$**

10. $\frac{1}{2} \times 8\frac{2}{9}$ **$4\frac{1}{9}$**

13. $2\frac{1}{5} \times 6\frac{2}{3}$ **$14\frac{2}{3}$**

8. $1\frac{1}{4} \times 3\frac{1}{3}$ **$4\frac{1}{6}$**

11. $2\frac{1}{4} \times \frac{2}{3}$ **$1\frac{1}{2}$**

14. $5\frac{3}{5} \times 4$ **$22\frac{2}{5}$**

9. $\frac{3}{8} \times 7\frac{1}{4}$ **$2\frac{23}{32}$**

12. $\frac{6}{7} \times 8\frac{2}{5}$ **$7\frac{1}{5}$**

15. $\frac{7}{8} \times 7\frac{3}{7}$ **$6\frac{1}{2}$**

Multiply *length × width* to find the area of the rectangle.

Label the answer as **square feet** or **square yards**.

16. 
 $7\frac{3}{10}$ ft $1\frac{1}{2}$ ft

$10\frac{19}{20}$ square feet

17. 
 $2\frac{1}{5}$ yd $1\frac{9}{16}$ yd

$3\frac{7}{16}$ square yards

Use the Distributive Property to solve. **Steps used to solve may vary.**

18. $3 \times 5\frac{1}{2}$ **$16\frac{1}{2}$**

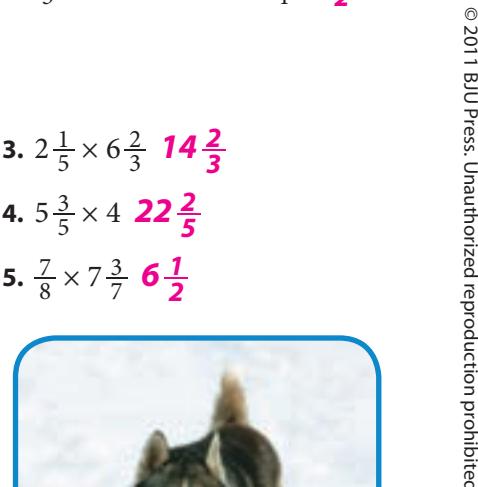
19. $\frac{3}{4} \times 4\frac{5}{8}$ **$3\frac{15}{32}$**

20. $16\frac{4}{5} \times 10$ **168**

21. $9 \times 12\frac{2}{3}$ **114**

22. $2\frac{1}{3} \times \frac{5}{8}$ **$1\frac{11}{24}$**

23. $7\frac{1}{2} \times \frac{6}{7}$ **$6\frac{3}{7}$**



Sled dogs are selected according to their endurance, strength, and speed.

Estimate the product by rounding each factor and multiplying.

Round factors *less than* 1 to $\frac{1}{2}$ or 1.

Round mixed numbers to the nearest whole number by determining if the fractional part is *greater than*, *less than*, or *equal to* $\frac{1}{2}$.

- If the fraction is *less than* $\frac{1}{2}$, the whole number stays the same.
- If the fraction is *greater than* or *equal to* $\frac{1}{2}$, the whole number increases by 1.

$$\frac{1}{2} \quad 1$$
$$\frac{3}{8} \times 3\frac{10}{16} = \underline{\quad}$$
$$\frac{1}{2} \times 4 = 2$$

$$1 \quad \frac{1}{4} < \frac{1}{2}$$
$$6\frac{1}{2} \times 5\frac{1}{4} = \underline{\quad}$$
$$7 \times 5 = 35$$



Exercises

Estimate the product.

24. $\frac{4}{10} \times 9\frac{7}{8} \quad \frac{1}{2} \times 10 = 5$

25. $\frac{2}{5} \times 6\frac{1}{2} \quad \frac{1}{2} \times 7 = 3\frac{1}{2}$

26. $2\frac{3}{4} \times 5\frac{2}{8} \quad 3 \times 5 = 15$

27. $6\frac{5}{7} \times 2\frac{1}{4} \quad 7 \times 2 = 14$

Solve. **Answers are shown using cancellation.**

28. Taylor took $3\frac{1}{2}$ quarts of chocolate milk to the class party. The students drank $\frac{4}{5}$ of the milk.

How many quarts of chocolate milk did the class drink? $\frac{4}{5} \times 3\frac{1}{2} = \frac{4}{5} \times \frac{7}{2} = \frac{14}{5} = 2\frac{4}{5}$ qt

29. The distance from home to school is $1\frac{2}{3}$ miles. Heather walked this distance 4 times today. How far did she walk? $4 \times 1\frac{2}{3} = \frac{4}{1} \times \frac{5}{3} = \frac{20}{3} = 6\frac{2}{3}$ mi

$$8\frac{2}{3} \times 4\frac{1}{2} = \frac{26}{3} \times \frac{9}{2} = 39 \text{ square yards}$$

30. Nate plowed a garden plot that measured $8\frac{2}{3}$ yards long and $4\frac{1}{2}$ yards wide. What is the area of his garden plot? Label the answer as *square yards*.

31. Nate is installing trellis fencing along one long side of his garden. He was able to complete $\frac{3}{4}$ of the fence on Saturday. How many yards of fence did he install? $\frac{3}{4} \times 8\frac{2}{3} = \frac{3}{4} \times \frac{26}{3} = 6\frac{1}{2}$ yd

Practice & Application

32. $3\frac{7}{9} + 4\frac{5}{9} \quad 7\frac{12}{9} = 8\frac{1}{3}$

33. $4\frac{5}{8} + 6\frac{1}{2} \quad 4\frac{5}{8} + 6\frac{4}{8} = 10\frac{9}{8} = 11\frac{1}{8}$

34. $\frac{5}{9} - \frac{1}{3} \quad \frac{5}{9} - \frac{3}{9} = \frac{2}{9}$

35. $2\frac{1}{2} - \frac{3}{4} \quad 2\frac{2}{4} - \frac{3}{4} = 1\frac{6}{4} - \frac{3}{4} = 1\frac{3}{4}$

36. $5\frac{1}{8} - 1\frac{2}{3} \quad 5\frac{3}{24} - 1\frac{16}{24} = 4\frac{27}{24} - 1\frac{16}{24} = 3\frac{11}{24}$

37. $17 \times 2.81 \quad 47.77$

38. $16.5 \times 407 \quad 6,715.5$

39. $174.62 \div 5 \quad 34.924$

40. One side of a square measures $23\frac{3}{4}$ inches. Find the perimeter using multiplication.



Draw a picture to represent each phrase. Which phrase can be solved using repeated addition?

8 sets of $1\frac{1}{2}$

$1\frac{1}{2}$ sets of 8

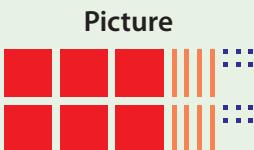
Multiply Decimals

Estimate the product of decimal factors by rounding each decimal to the greatest place. Multiply the factors.

Multiply a decimal by a whole number using repeated addition or the **Distributive Property**. The number of decimal places in the product is the same as the number of decimals represented in both factors.

estimate the product
multiply decimals
Distributive Property
powers of 10

2 sets of 3.46



Estimate

$$\begin{array}{r} 3 \\ \times 2 \\ \hline 6 \end{array}$$

Add

$$\begin{array}{r} 3.46 \\ + 3.46 \\ \hline 6.92 \end{array}$$

Multiply

$$\begin{array}{r} 3.46 \\ \times 2 \\ \hline 6.92 \end{array}$$

Distributive Property

$$\begin{aligned} 2 \times 3.46 &= \\ 2 \times (3 + 0.46) &= \\ (2 \times 3) + (2 \times 0.46) &= \\ 6 + 0.92 &= 6.92 \end{aligned}$$

What you have learned about multiplication of fractions can be applied to multiplying a decimal by a decimal.

0.5 of 3.46

Estimate

$$\begin{array}{r} 3 \\ \times 1 \\ \hline 3 \end{array}$$

Multiply

$$\begin{array}{r} 3.46 \\ \times 0.5 \\ \hline 1.730 \end{array}$$

Distributive Property

$$\begin{aligned} 0.5 \times 3.46 &= \\ 0.5 \times (3 + 0.46) &= \\ (0.5 \times 3) + (0.5 \times 0.46) &= \\ 1.5 + 0.23 &= 1.73 \end{aligned}$$

Read the multiplication sign as "sets of" or "of" to remind you that you are finding *a part of the other factor* or *sets of the other factor*.

2.5 sets of 3.46

Estimate

$$\begin{array}{r} 3 \\ \times 3 \\ \hline 9 \end{array}$$

Multiply

$$\begin{array}{r} 3.46 \\ \times 2.5 \\ \hline 1730 \\ + 6920 \\ \hline 8.650 \end{array}$$

Fraction Form

$$\begin{aligned} 2\frac{5}{10} \times 3\frac{46}{100} &= \\ \frac{25}{10} \times \frac{346}{100} &= \frac{173}{4} \\ \frac{173}{20} &= 8\frac{13}{20} \end{aligned}$$

Remember that a decimal can be renamed as a fraction or a mixed number. Thinking of the fraction form of the decimal can help you determine the decimal placement.

Exercises

Estimate the product.

1. 6.135×3
 $3 \times 6 = 18$

2. 25×0.8
 $1 \times 25 = 25$

3. 2.6×1.3
 $1 \times 3 = 3$

4. 0.69×31
 $31 \times 1 = 31$

5. 65×1.7
 $2 \times 65 = 130$

Solve.

6. 6.3×7
 44.1

7. 3.25×2
 6.50

8. $\$1.15 \times 3$
 $\$3.45$

9. $\$0.59 \times 18$
 $\$10.62$

10. 79.2×6
 475.2

11. 2.68×9.4
 25.192

12. 23.4×3.2
 74.88

13. 32.6×0.8
 26.08

14. 7.05×1.56
 10.998

15. 6.56×3.25
 21.32

Use the Distributive Property to solve.

16. 3×13.25 **39.75**

17. 8×32.6 **260.8**

18. 0.8×10.3 **8.24**

19. 0.5×50.2 **25.1**

Use Mental Math to Multiply a Decimal by Powers of 10

Write the digits of the decimal factor in the answer. Move the decimal point from its placement in the decimal factor one place to the right for each 0 in the **power of 10**. Annex zeros as needed.

$$\begin{array}{r} 5.68 \\ \times 10 \\ \hline 5.68 \end{array}$$

$$10 \times 5.68 = 56.8$$

The decimal moves 1 place to the right.

$$\begin{array}{r} 5.68 \\ \times 100 \\ \hline 5.68 \end{array}$$

$$100 \times 5.68 = 568$$

The decimal moves 2 places to the right.

$$\begin{array}{r} 5.68 \\ \times 1,000 \\ \hline 5.680 \end{array}$$

$$1,000 \times 5.68 = 5,680$$

The decimal moves 3 places to the right. Annex a 0.

When powers of 10 are written with exponents, the exponent tells how many places to move the decimal point.

$$2.376 \times 10^1 = 23.76$$

The decimal moves 1 place to the right.

$$2.376 \times 10^2 = 237.6$$

The decimal moves 2 places to the right.

$$2.376 \times 10^3 = 2,376$$

The decimal moves 3 places to the right.

Exercises

Use mental math to solve.

20. 10×14.9 **149**

23. $10^2 \times 6.259$ **625.9**

26. 10×0.012 **0.12**

21. 100×65.7 **6,570**

24. $10^1 \times 54.31$ **543.1**

27. $10^2 \times 12.314$ **1,231.4**

22. $1,000 \times 2.127$ **2,127**

25. 1.868×10^3 **1,868**

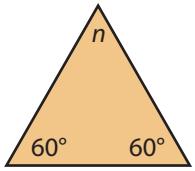
28. $1,000 \times 3.078$ **3,078**

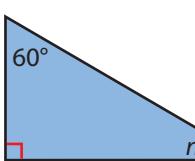
Solve.

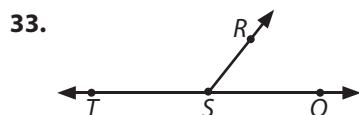
29. The grocery store put its holiday candy on sale. The 1.69-ounce bags are priced at 3 bags for \$3.00. The 2.48-ounce bags are priced at 2 bags for \$3.00. Which is the better deal?

1.69-oz bags

Practice & Application

31.  $n = \underline{\hspace{2cm}}$ **60°**

32.  $n = \underline{\hspace{2cm}}$ **30°**



$$\angle RST = 100^\circ, \angle RSQ = \underline{\hspace{2cm}} \text{ } \mathbf{80^\circ}$$

30. Mrs. Ray bought a shirt for her husband and a shirt for each of her 2 sons. The shirts cost \$24.95 each. She had a coupon for \$10.00 off. What was the cost of the shirts? **\$64.85**

34. If the angles of a triangle measure 115° , 25° , and 40° , would the triangle be classified as obtuse or acute? **obtuse**

35. On graph paper draw 2 congruent triangles and 2 similar rectangles. **Pictures will vary.**

36. On graph paper draw circle B. Label the diameter \overline{CE} . If the diameter measures 8 centimeters, what is the measure of \overline{BE} ? **4 cm**
Pictures will vary.

- J Explain how you know that the product of 0.6×45 is less than 45. Will the product be *greater than* or *less than* 20?

More Multiplying Decimals

When multiplying decimals, you may need to annex zeros in order to place the decimal point.

0.04 tenths \times hundredths = thousandths
 $\times 0.6$ 3 decimal places are needed for thousandths.
0.024 Annex zeros to the left of the digits to show 24 thousandths.

Think of the equivalent fractions to make sense of the answer.
 $\frac{6}{10} \times \frac{4}{100} = \frac{24}{1,000}$
tenths \times hundredths = thousandths

Exercises

Write the fraction equivalent for each decimal. Multiply.

1. 0.09×0.2 **0.018**
 $\frac{9}{100} \times \frac{2}{10} = \frac{18}{1,000}$

2. 0.03×0.07 **0.0021**
 $\frac{3}{100} \times \frac{7}{100} = \frac{21}{10,000}$

3. 0.2×0.76 **0.152**
 $\frac{2}{10} \times \frac{76}{100} = \frac{152}{1,000}$

4. 0.5×0.017 **0.0085**
 $\frac{5}{10} \times \frac{17}{1,000} = \frac{85}{10,000}$

Solve.

5. 0.02
 $\times 0.03$
0.0006

8. 0.02
 $\times 0.4$
0.008

11. 6.1
 $\times 0.03$
0.183

14. 3.29
 $\times 0.03$
0.0987

6. 23.4
 $\times 3.2$
74.88

9. 4.9
 $\times 0.5$
2.45

12. 32.6
 $\times 0.8$
26.08

15. 10.01
 $\times 2.1$
21.021

7. 0.07
 $\times 0.8$
0.056

10. 2.68
 $\times 9.4$
25.192

13. $\$7.05$
 $\times 6$
\\$42.30

16. $\$1.15$
 $\times 3.4$
\\$3.91

Write the decimal equivalent for each fraction to solve.

Round to the nearest hundredth.

17. How much will $\frac{3}{4}$ of a pound of roast beef cost at today's special price? **$0.75 \times \$6.49 = \4.87**

18. Chloe bought 2 pounds of roast beef and $1\frac{1}{2}$ pounds of ham. How much did she spend on sandwich meat? **$2 \times \$6.49 = \12.98 ; $1.5 \times \$3.79 \approx \5.69 ; $\$12.98 + \$5.69 = \$18.67$**

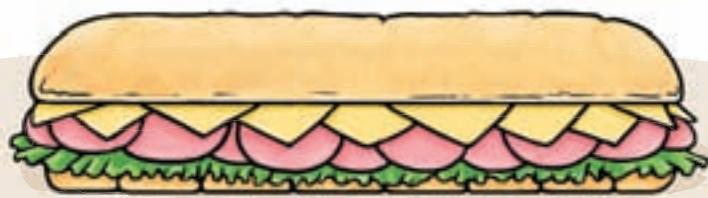
19. How much cheaper is it to buy $1\frac{1}{2}$ pounds of ham than 1 pound of roast beef? **$\$6.49 - \$5.69 = \$0.80$**

20. Mrs. Hodge bought enough sandwich meat for her family's lunch. She bought $3\frac{1}{4}$ pounds of roast beef, $2\frac{1}{2}$ pounds of ham, and $1\frac{3}{4}$ pounds of salami. How much change will she receive from \$50.00?

$3.25 \times \$6.49 \approx \21.09 ; $2.5 \times \$3.79 \approx \9.48 ; $1.75 \times \$4.19 \approx \7.33 ; $\$21.09 + \$9.48 + \$7.33 = \37.90 ; $\$50.00 - \$37.90 = \$12.10$

Dean's Deli Specials

Roast Beef	\$6.49/lb
Ham	\$3.79/lb
Salami	\$4.19/lb



Use the Distributive Property to solve.

21. 0.8×3.8 **3.04**

22. 5×27.2 **136**

23. 12×0.08 **0.96**

24. 6.8×10^2 **680**

Solve.

25. $\begin{array}{r} 2.39 \\ \times \quad 2 \\ \hline 4.78 \end{array}$

26. $\begin{array}{r} 0.03 \\ \times \quad 0.8 \\ \hline 0.024 \end{array}$

27. $\begin{array}{r} 23.28 \\ \times \quad 0.7 \\ \hline 16.296 \end{array}$

28. $\begin{array}{r} 0.09 \\ \times 0.08 \\ \hline 0.0072 \end{array}$

Solve. Write the answer in lowest terms.

29. $\frac{6}{7} \times 8 = \frac{48}{7} = 6\frac{6}{7}$

30. $23 \times \frac{3}{4} = \frac{69}{4} = 17\frac{1}{4}$

31. $\frac{14}{15} \times \frac{2}{3} = \frac{28}{45}$

32. $2\frac{7}{8} \times 5\frac{4}{5} = \frac{23}{8} \times \frac{29}{5} = \frac{667}{40} = 16\frac{27}{40}$

Use mental math to solve.

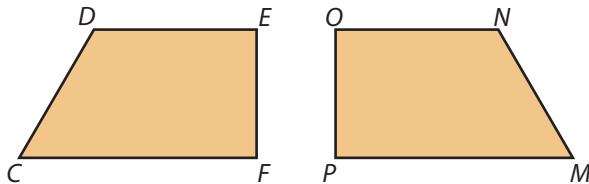
33. $6.12 \times 1,000$ **6,120**

34. 12.13×10^2 **1,213**

35. 0.78×10 **7.8**

36. 0.521×10^2 **52.1**

Practice & Application



Trapezoid $CDEF \cong$ Trapezoid $MNOP$

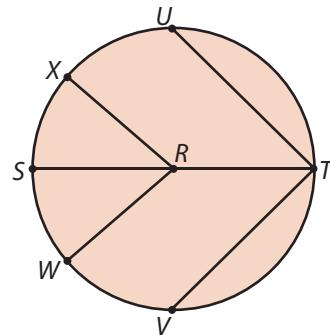
37. Name the corresponding congruent line segment to \overline{CD} . **\overline{MN}**

38. Name the corresponding congruent angle to $\angle D$. **$\angle N$**

39. If $\overline{EF} = 12$ mm, then $\underline{\hspace{1cm}}$ = 12 mm. **\overline{OP}**

40. If $\angle P = 90^\circ$, then $\underline{\hspace{1cm}} = 90^\circ$. **$\angle F$**

41. Does Trapezoid $MNOP$ show a translation, reflection, or rotation of Trapezoid $CDEF$? **reflection**



42. Name the diameter of circle R. **\overline{ST}**

43. Name the 4 radii of circle R. **\overline{RT} , \overline{RX} , \overline{RS} , \overline{RW}**

44. Name 3 chords shown on circle R. **\overline{ST} , \overline{UT} , \overline{TV}**

45. If $\angle SRX$ measures 45° , what does $\angle XRT$ measure? **135°**

46. If \overline{XW} were drawn, would it represent a chord or a radius? Explain your answer. **A chord; a chord connects any two points on a circle.**

21. $(0.8 \times 3) + (0.8 \times 0.8) =$
 $2.4 + 0.64 = 3.04$

22. $(5 \times 27) + (5 \times 0.2) =$
 $135 + 1 = 136$

23. $(10 \times 0.08) + (2 \times 0.08) =$
 $0.8 + 0.16 = 0.96$

24. $6.8 \times 100 =$
 $(6 \times 100) + (0.8 \times 100) =$
 $600 + 80 = 680$

Complete **DAILY REVIEW** e on page 428.



Solve the problem $\frac{3}{4} \times 1.5 = \underline{\hspace{1cm}}$. Explain your reasoning.

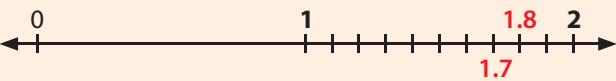
$1\frac{1}{8}$ or 1.125; Explanations may vary but should include something like the following: Rename

1.5 as $1\frac{1}{2}$, or rename $\frac{3}{4}$ as 0.75.

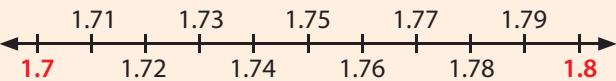
$$\begin{array}{r} 0.75 \\ \times \quad 1.5 \\ \hline 375 \\ +750 \\ \hline 1.125 \end{array}$$

Between Numbers

Any two numbers have an infinite number of numbers between them. These “in-between” numbers are found by partitioning the space between two numbers into fractions or decimals.



The space between **1** and **2** can be partitioned into tenths. **1.1**, **1.2**, **1.3**, **1.4**, **1.5**, **1.6**, **1.7**, **1.8**, and **1.9** are between the whole numbers 1 and 2.



Tenths can be partitioned into hundredths. **1.71**, **1.72**, **1.73**, **1.74**, **1.75**, **1.76**, **1.77**, **1.78**, and **1.79** are between 1.7 and 1.8.



The space between **1** and **2** can be partitioned into eighths. **1 1/8**, **1 2/8**, **1 3/8**, **1 4/8**, **1 5/8**, **1 6/8**, and **1 7/8** are between the whole numbers 1 and 2.



Eighths can be partitioned into sixteenths. **1 13/16** is between **1 6/8** and **1 7/8**.

Exercises

Choose the number that is between the given numbers.

1. $0.10, \underline{\quad}, 0.20$

2. $\$1.00, \underline{\quad}, \1.05

3. $35, \underline{\quad}, 36$

0.11 0.21 0.003

\$1.03 \$1.10 \$1.06

34.9 35.08 36.3

4. $\frac{1}{2}, \underline{\quad}, \frac{3}{4}$

5. $-4, \underline{\quad}, -3$

6. $7.8, \underline{\quad}, 7.9$

$\frac{5}{8}$ $\frac{6}{8}$ $\frac{7}{8}$

$3\frac{1}{2}$ $-4\frac{1}{2}$ $-3\frac{1}{2}$

7.81 7.08 7.91

7. $\frac{5}{6}, \underline{\quad}, \frac{6}{6}$

8. $5, \underline{\quad}, 5\frac{1}{2}$

9. $\frac{11}{4}, \underline{\quad}, \frac{12}{4}$

$\frac{4}{6}$ $\frac{11}{12}$ $\frac{2}{3}$

$\frac{9}{2}$ $\frac{10}{3}$ $\frac{21}{4}$

$2\frac{3}{4}$ $2\frac{7}{8}$ $3\frac{1}{4}$

Write the missing numbers.

10. $0.84, \underline{\quad}, \underline{\quad}, 0.843$ **0.841, 0.842**

16. $52.3, \underline{\quad}, \underline{\quad}, 52.33$ **52.31, 52.32**

11. $0.012, \underline{\quad}, \underline{\quad}, 0.0123$ **0.0121, 0.0122**

17. $817.06, \underline{\quad}, \underline{\quad}, 817.063$ **817.061, 817.062**

12. $1.726, \underline{\quad}, \underline{\quad}, 1.729$ **1.727, 1.728**

18. $21.07, \underline{\quad}, 21.09, \underline{\quad}$ **21.08, 21.10**

13. $\$90.99, \underline{\quad}, \underline{\quad}, \91.02 **\$91.00, \$91.01**

19. $\frac{1}{2}, \underline{\quad}, \frac{5}{8}$ **$\frac{9}{16}$**

14. $0.2, \underline{\quad}, \underline{\quad}, 0.23$ **0.21, 0.22**

20. $\frac{1}{8}, \underline{\quad}, \underline{\quad}, \frac{1}{2}$ **$\frac{1}{4}, \frac{3}{8}$**

15. $\underline{\quad}, 3.001, \underline{\quad}, 3.003$ **3.000, 3.002**

21. $-\frac{2}{3}, \underline{\quad}, \underline{\quad}, -\frac{1}{3}$ **$-\frac{5}{9}, -\frac{4}{9}$**

Solve. **Equations may vary.**

22. Max had 2 boxes of nails. One box weighed $\frac{3}{4}$ of a pound, and the other box weighed $\frac{2}{3}$ of a pound. How many pounds of nails did Max have after using $\frac{1}{2}$ of a pound of nails? $(\frac{3}{4} + \frac{2}{3}) - \frac{1}{2} = (\frac{9}{12} + \frac{8}{12}) - \frac{6}{12} = \frac{17}{12} - \frac{6}{12} = \frac{11}{12}$ of a pound of nails
23. Mrs. Elmer is collecting money for her students' school pictures. Each package costs \$8.50. Eighteen students have already paid. Nine students still need to pay. How much money will be collected when all the students have paid? $(18 + 9) \times \$8.50 = 27 \times \$8.50 = \$229.50$
24. Mother had 5 cups of sugar. She used $1\frac{1}{2}$ cups of sugar to make a cake and $\frac{3}{4}$ of a cup to make a pie. How much sugar did Mother have left? $5 - (1\frac{1}{2} + \frac{3}{4}) = 5 - 2\frac{1}{4} = 2\frac{3}{4}$ cups of sugar
25. Jeffrey made a square table with a perimeter of 396 cm. Lou made a square table with a perimeter of 332 cm. What is the measurement of each side of Jeffrey's table? Of Lou's table?
Jeffrey's table: $396 \div 4 = 99$ cm
Lou's table: $332 \div 4 = 83$ cm
26. An average twelve-year-old's heart beats about 9,600 times in 2 hours. At this rate, how many times does the average twelve-year-old's heart beat in 1 minute? $9,600 \div (2 \times 60) = 9,600 \div 120 = 80$ times
27. Janet's 50-yard dash times were 8.4 seconds, 9.3 seconds, and 9 seconds. What is her average time? $(8.4 + 9.3 + 9) \div 3 = 26.7 \div 3 = 8.9$ seconds
28. According to the doctor, Mr. Gates should eat 3 servings of vegetables each day. Mr. Gates made a vegetable tray with $\frac{3}{4}$ of a serving of cherry tomatoes, $1\frac{1}{2}$ servings of carrots, and 1 serving of celery. How many servings of vegetables did Mr. Gates prepare? $\frac{3}{4} + 1\frac{1}{2} + 1 = 3\frac{1}{4}$ servings
29. The doctor also recommended that Mr. Gates walk 2 miles a day, five days each week. If 4 laps around his school track is 1 mile, how many laps must Mr. Gates walk in 5 days?
 $5 \times (2 \times 4) = 5 \times 8 = 40$ laps



CHAPTER 7 REVIEW

Solve by writing an addition equation.

1. $3 \times \frac{2}{3}$

$$\frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{6}{3} = 2$$

2. $5 \times \frac{1}{4}$

$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{5}{4} = 1\frac{1}{4}$$

3. $4 \times \frac{8}{9}$

$$\frac{8}{9} + \frac{8}{9} + \frac{8}{9} + \frac{8}{9} = \frac{32}{9} = 3\frac{5}{9}$$

4. $6 \times \frac{3}{9}$

$$\frac{3}{9} + \frac{3}{9} + \frac{3}{9} + \frac{3}{9} + \frac{3}{9} + \frac{3}{9} = \frac{18}{9} = 2$$

Multiply. Use cancellation if possible.

Write the answer in lowest terms. **Cancellation steps may vary.**

5. $\frac{4}{5} \times \frac{8}{12}$

$$\frac{8}{15}$$

8. $\frac{2}{9} \times 7$

$$1\frac{5}{9}$$

11. $\frac{3}{4} \times 20$

$$15$$

14. $\frac{3}{10} \times \frac{5}{9}$

$$\frac{1}{6}$$

6. $5 \times \frac{14}{15}$

$$4\frac{2}{3}$$

9. $\frac{1}{8} \times \frac{4}{5}$

$$\frac{1}{10}$$

12. $8 \times 3\frac{1}{2}$

$$28$$

15. $2\frac{3}{4} \times 7$

$$19\frac{1}{4}$$

7. $5\frac{2}{10} \times 6\frac{2}{8}$

$$32\frac{1}{2}$$

10. $5\frac{2}{8} \times 6\frac{1}{3}$

$$33\frac{1}{4}$$

13. $3\frac{1}{3} \times 4\frac{3}{4}$

$$15\frac{5}{6}$$

16. $\frac{6}{8} \times \frac{1}{2}$

$$\frac{3}{8}$$

Write the reciprocal to complete the equation.

17. $\frac{8}{9} \times \frac{\square}{\square} = 1$

$$\frac{9}{8}$$

18. $3 \times \frac{\square}{\square} = 1$

$$\frac{1}{3}$$

19. $\frac{16}{7} \times \frac{\square}{\square} = 1$

$$\frac{7}{16}$$

20. $8 \times \frac{\square}{\square} = 1$

$$\frac{1}{8}$$

Use the Distributive Property to solve.

21. $6 \times 3\frac{1}{4}$

$$(6 \times 3) + (6 \times \frac{1}{4}) = \\ 18 + 1\frac{1}{2} = 19\frac{1}{2}$$

22. $8\frac{2}{3} \times 2$

$$(8 \times 2) + (\frac{2}{3} \times 2) = \\ 16 + 1\frac{1}{3} = 17\frac{1}{3}$$

23. 36×0.2

$$(30 \times 0.2) + \\ (6 \times 0.2) = \\ 6 + 1.2 = 7.2$$

24. 0.3×5.2

$$(0.3 \times 5) + \\ (0.3 \times 0.2) = \\ 1.5 + 0.06 = 1.56$$

Estimate the product.

25. $2\frac{3}{8} \times 8\frac{5}{6}$

$$2 \times 9 = 18$$

26. $4 \times \$3.32$

$$4 \times \$3 = \$12$$

27. 3×2.791

$$3 \times 3 = 9$$

28. $16\frac{15}{16} \times 2\frac{1}{4}$

$$17 \times 2 = 34$$



Solve.

29.
$$\begin{array}{r} 2.315 \\ \times \quad 4 \\ \hline 9.26 \text{ or} \\ 9.260 \end{array}$$

30.
$$\begin{array}{r} 7.3 \\ \times 0.05 \\ \hline 0.365 \end{array}$$

31.
$$\begin{array}{r} 3.178 \\ \times \quad 2.3 \\ \hline 7.3094 \end{array}$$

32.
$$\begin{array}{r} 2.37 \\ \times \quad 0.4 \\ \hline 0.948 \end{array}$$

33.
$$\begin{array}{r} 0.08 \\ \times \quad 0.4 \\ \hline 0.032 \end{array}$$

Use mental math to solve.

34. 2.482×10^3 **2,482**

35. 27.314×100 **2,731.4**

36. 65.72×10^1 **657.2**

Solve. Write the answer in lowest terms. **Equations may vary.**

37. Roland runs $4\frac{7}{10}$ miles each day. How many miles does he run in 4 days?

$$4 \times 4\frac{7}{10} = 4 \times \frac{47}{10} = \frac{94}{5} = 18\frac{4}{5} \text{ mi}$$

38. Karis ran $3\frac{2}{3}$ miles on Monday. Benita ran $\frac{1}{2}$ of the distance that Karis ran. How far did Benita run? $\frac{1}{2} \times \frac{11}{3} = \frac{11}{6} = 1\frac{5}{6} \text{ mi}$

39. What was the total number of miles run by Karis and Roland on Monday?

$$4\frac{7}{10} + 3\frac{2}{3} = 4\frac{21}{30} + 3\frac{20}{30} = 7\frac{41}{30} = 8\frac{11}{30} \text{ mi}$$

40. William bought 12.7 gallons of gasoline for \$3.89 per gallon. How much did he pay for the gasoline? **$12.7 \times \$3.89 = \49.40**

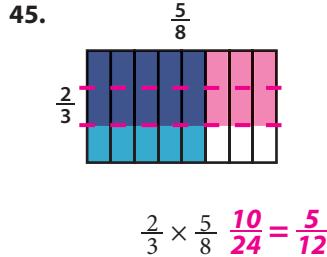
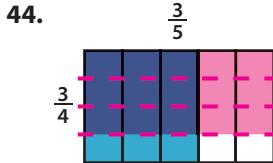
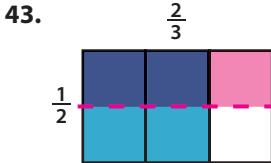
41. A recipe calls for $\frac{3}{4}$ cup butter and $\frac{1}{3}$ cup milk. If only $\frac{1}{2}$ of the recipe is made, how much butter and milk is needed?

$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8} \text{ c butter}; \frac{1}{2} \times \frac{1}{3} = \frac{1}{6} \text{ c milk}$$

42. Mrs. O'Malley found background fabric for her bulletin board on sale for \$3.75 per yard. How much would $4\frac{1}{4}$ yards cost?

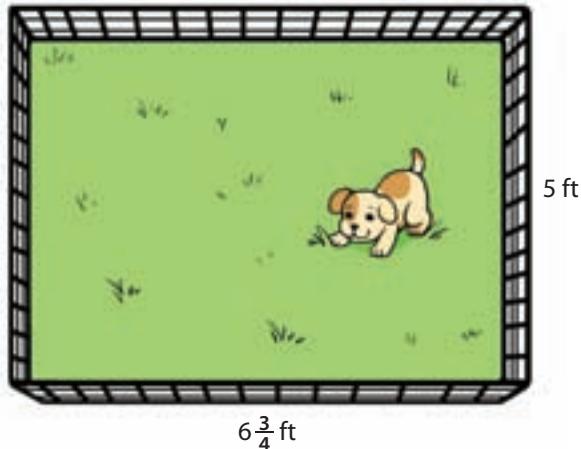
$$\mathbf{4.25 \times \$3.75 = \$15.94}$$

Solve. Complete the picture to show the product.



Solve.

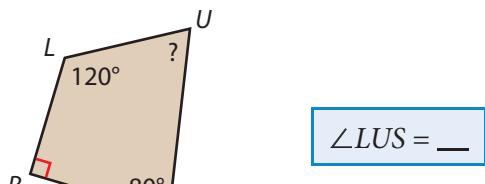
46. The dog pen measures $6\frac{3}{4}$ feet long by 5 feet wide. Lucas used the Commutative Property to estimate the area of the dog pen. Write the equation he wrote. Estimate the area. Write the label as *square feet*. **$5 \times 7 = 35 \text{ square feet}$**



Test Prep

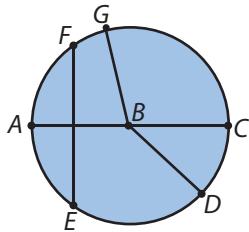
Mark the answer.

1.



$$\angle LUS = \underline{\hspace{2cm}}$$

- A. 20°
B. 60°
C. 70°
D. none of the above

2. \overline{BG} is a ____.

- A. radius
B. diameter
C. chord

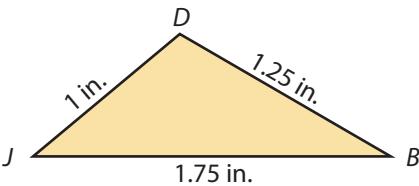
3. \overline{FE} is a ____.

- A. radius
B. diameter
C. chord

4. The diameter of circle B is ____.

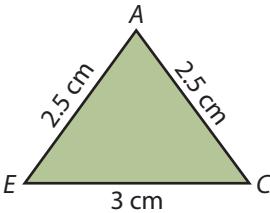
- A. \overline{FE}
B. \overline{AC}
C. \overline{BD}

5.

 $\triangle JDB$ is a(n) ____ triangle.

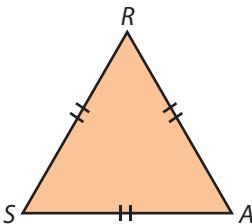
- A. scalene
B. equilateral
C. isosceles

6.

 $\triangle EAC$ is a(n) ____ triangle.

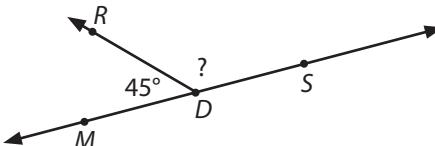
- A. scalene
B. equilateral
C. isosceles

7.

 $\triangle SRA$ is a(n) ____ triangle.

- A. scalene
B. equilateral
C. isosceles

8.



$$\angle RDS = \underline{\hspace{2cm}}$$

- A. 315°
B. 135°
C. 45°
D. none of the above

Mark the answer.

9. Sunflower seeds cost \$3.69 per pound. How much do 2 pounds of seeds cost?

- A. \$7.38
- B. \$1.85
- C. \$11.07

10. Micah paid \$7.12 for 8 pounds of jellybeans. What is the price of the jellybeans per pound?

- A. \$0.65
- B. \$56.96
- C. \$0.89

11. $2\frac{2}{3} + 7\frac{2}{5} = \underline{\hspace{2cm}}$

- A. $9\frac{4}{5}$
- B. $10\frac{1}{15}$
- C. $10\frac{1}{6}$

12. $8\frac{2}{9} - 1\frac{5}{6} = \underline{\hspace{2cm}}$

- A. $6\frac{7}{18}$
- B. $6\frac{11}{18}$
- C. $6\frac{1}{3}$

13. $1\frac{2}{12} + 1\frac{4}{7} = \underline{\hspace{2cm}}$

- A. $3\frac{1}{2}$
- B. $2\frac{31}{42}$
- C. $2\frac{18}{84}$

1,865.709

14. number of hundredths

- A. 0
- B. 9
- C. 8

15. number of one thousands

- A. 9
- B. 1
- C. 5

16. value of the Tenths place

- A. 60
- B. 0.7
- C. 0.07

17. value of the Hundreds place

- A. 0.009
- B. 800
- C. 1,800

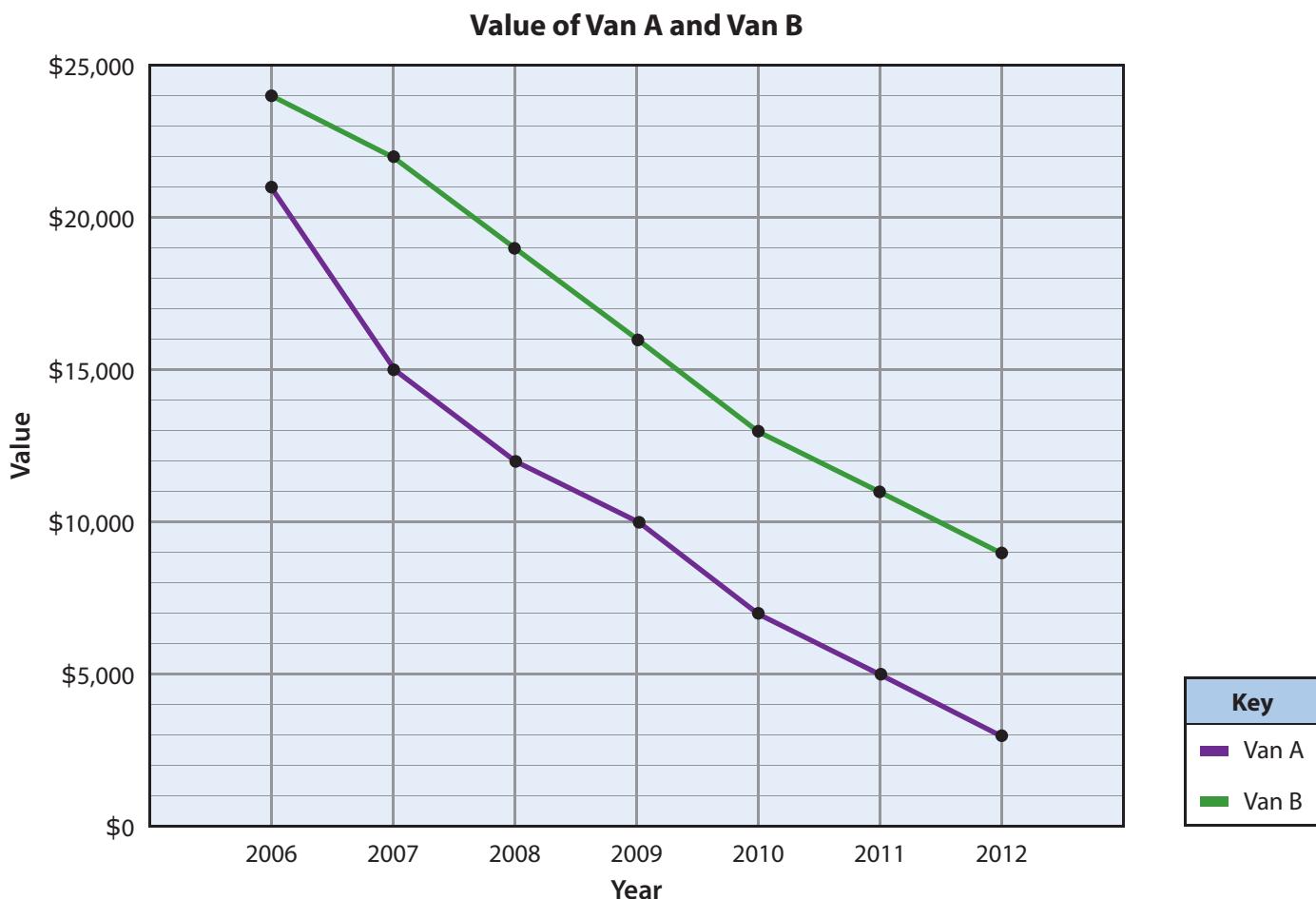
18. $\frac{2}{3} \times \frac{3}{4} = \underline{\hspace{2cm}}$

- A. $\frac{1}{2}$
- B. $1\frac{5}{12}$
- C. $\frac{7}{12}$
- D. none of the above

19. $8.2 \times 0.03 = \underline{\hspace{2cm}}$

- A. 0.246
- B. 2.46
- C. 0.0246
- D. none of the above

Use the data from the line graph to find the answer.



20. Which van would be cheaper to purchase?

- A. Van A
- B. Van B

21. By how much did the value of Van B decrease between 2006 and 2007?

- A. \$6,000
- B. \$3,000
- C. \$2,000

22. What is the difference between the values of the two vans in 2006?

- A. \$3,000
- B. \$5,000
- C. \$4,000

23. What is the difference between the values of the two vans in 2012?

- A. \$6,000
- B. \$3,000
- C. \$12,000

24. What is the value of Van A in 2010?

- A. \$7,000
- B. \$5,000
- C. \$13,000

Divide by a Fraction

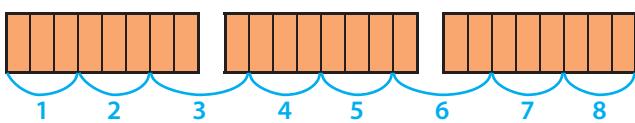
Divide a Whole Number by a Fraction

Dividing a whole number by a fraction is finding the number of fractional units in the whole.

$3 \div \frac{3}{8}$ is finding how many $\frac{3}{8}$ units are in 3.

Mom's cranberry-orange bread recipe calls for $\frac{3}{8}$ of a cup of orange juice. If the recipe yields one loaf of bread, how many loaves can she make with 3 cups of orange juice?

Draw a picture or a number line to help solve the problem. Partition each whole into equal parts.



There are 8 sets of $\frac{3}{8}$.

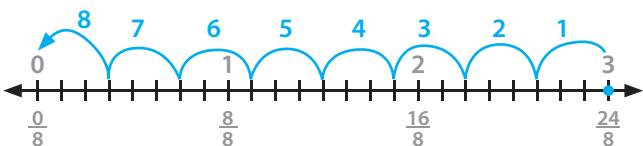
Solve the division equation.

$$3 \div \frac{3}{8} = \frac{24}{8} \div \frac{3}{8} = 8$$

Check using multiplication.

$$8 \times \frac{3}{8} = \frac{8 \times 3}{1 \times 8} = \frac{24}{8} = 3$$

Rename each whole.
1 whole = $\frac{8}{8}$
2 wholes = $\frac{16}{8}$
3 wholes = $\frac{24}{8}$



There are 8 jumps of $\frac{3}{8}$.

Exercises

Draw a picture to help you solve. **Pictures may vary.**

1. $2 \div \frac{1}{4}$ **8**

2. $4 \div \frac{2}{3}$ **6**

3. $3 \div \frac{3}{4}$ **4**

4. $6 \div \frac{3}{7}$ **14**

Draw a number line to help you solve.

5. $1 \div \frac{1}{5}$ **5**

6. $3 \div \frac{3}{5}$ **5**

7. $2 \div \frac{2}{3}$ **3**

8. $2 \div \frac{2}{9}$ **9**

Solve. Draw a picture if needed. **Pictures may vary.**

9. $6 \div \frac{1}{2}$ **$\frac{12}{2} \div \frac{1}{2} = 12$**

10. $5 \div \frac{5}{6}$ **$\frac{30}{6} \div \frac{5}{6} = 6$**

11. $4 \div \frac{2}{5}$ **$\frac{20}{5} \div \frac{2}{5} = 10$**

12. $8 \div \frac{4}{5}$ **$\frac{40}{5} \div \frac{4}{5} = 10$**

13. $1 \div \frac{2}{6}$ **$\frac{6}{6} \div \frac{2}{6} = 3$**

14. $7 \div \frac{1}{9}$ **$\frac{63}{9} \div \frac{1}{9} = 63$**

15. $6 \div \frac{3}{8}$ **$\frac{48}{8} \div \frac{3}{8} = 16$**

16. $9 \div \frac{3}{7}$ **$\frac{63}{7} \div \frac{3}{7} = 21$**

Solve. **Steps used to solve may vary.**

17. Mr. Carson is putting a brick border around a flower bed. If the perimeter is 12 feet and each brick is $\frac{2}{3}$ of a foot long, how many bricks will it take to make the border? **$12 \div \frac{2}{3} = 18$ bricks**

18. Gavin lives $\frac{3}{10}$ of a mile from school. He walks to and from school every day. How far does he walk in 5 days?

$5 \times (2 \times \frac{3}{10}) = 5 \times \frac{6}{10} = \frac{30}{10} = 3$ miles



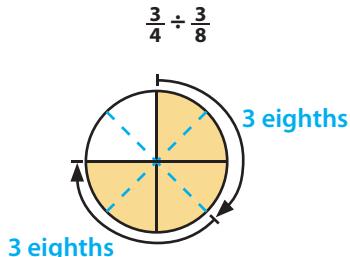
Divide a Fraction by a Fraction

$\frac{3}{4} \div \frac{3}{8}$ is finding how many $\frac{3}{8}$ units are in $\frac{3}{4}$.

Rename the fractions being divided using a common denominator. Divide the numerators. Rename mixed numbers as improper fractions. Then find the common denominator and divide the numerators.

A picture or a number line can be drawn to help solve the problem. Repartition the parts to show the common denominator.

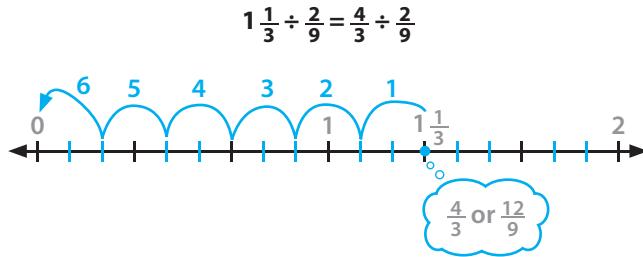
Dividing the common denominators gives a quotient of 1.



$$\frac{3}{4} \div \frac{3}{8} =$$

$$\frac{6}{8} \div \frac{3}{8} = \frac{6}{3} = 2$$

$$\frac{6 \div 3}{8 \div 8} = \frac{6 \div 3}{1} = \frac{2}{1}$$



$$1\frac{1}{3} \div \frac{2}{9} =$$

$$\frac{4}{3} \div \frac{2}{9} =$$

$$\frac{12}{9} \div \frac{2}{9} = \frac{12}{2} = 6$$

$$\frac{12 \div 2}{9 \div 9} = \frac{12 \div 2}{1} = \frac{6}{1}$$

Exercises

Rename fractions using the common denominator.

Write a division equation. Solve. **Pictures may vary.**

19. Draw rectangles to show how many $\frac{3}{4}$ -cup servings can be made from $4\frac{1}{2}$ cups of berries.
 $4\frac{1}{2} \div \frac{3}{4} = \frac{9}{2} \div \frac{3}{4} = \frac{18}{4} \div \frac{3}{4} = 6 \text{ servings}$

20. Draw a number line to show how many $\frac{9}{16}$ -inch blocks can be cut from a $5\frac{5}{8}$ -inch block of wood.
 $5\frac{5}{8} \div \frac{9}{16} = \frac{45}{8} \div \frac{9}{16} = \frac{90}{16} \div \frac{9}{16} = 10 \text{ blocks}$

Rename fractions using the common denominator.

Draw a picture or a number line if needed to help you solve. **Pictures may vary.**

21. $\frac{2}{3} \div \frac{1}{6}$ $\frac{4}{6} \div \frac{1}{6} = 4$ 22. $\frac{4}{5} \div \frac{1}{5}$ 4
 25. $\frac{5}{6} \div \frac{5}{12}$ $\frac{10}{12} \div \frac{5}{12} = 2$ 26. $3 \div \frac{1}{2}$ $\frac{6}{2} \div \frac{1}{2} = 6$

23. $\frac{1}{2} \div \frac{1}{8}$ $\frac{4}{8} \div \frac{1}{8} = 4$ 24. $\frac{1}{3} \div \frac{1}{6}$ $\frac{2}{6} \div \frac{1}{6} = 2$
 27. $\frac{2}{3} \div \frac{1}{12}$ $\frac{8}{12} \div \frac{1}{12} = 8$ 28. $\frac{3}{7} \div \frac{1}{7}$ 3

Rename the mixed number as an improper fraction. Solve.

29. $3\frac{1}{8} \div \frac{5}{8}$ 30. $1\frac{3}{7} \div \frac{2}{7}$
 $\frac{25}{8} \div \frac{5}{8} = 5$ $\frac{10}{7} \div \frac{2}{7} = 5$

31. $3\frac{1}{3} \div \frac{5}{6}$ 32. $3\frac{2}{3} \div 1\frac{2}{9}$
 $\frac{10}{3} \div \frac{5}{6} = \frac{20}{6} \div \frac{5}{6} = 4$ $\frac{11}{3} \div \frac{11}{9} = \frac{33}{9} \div \frac{11}{9} = \frac{33}{11} = 3$

Practice & Application

33. $6\frac{5}{7} + 2\frac{1}{2}$ $9\frac{3}{14}$

34. $5\frac{1}{3} - 3\frac{5}{8}$ $1\frac{17}{24}$

35. $4\frac{1}{2} \times 6$ 27

36. $3\frac{1}{2} + 0.75$ $4\frac{1}{4}$

J Explain why you can use multiplication to check the quotient for $\frac{1}{3} \div \frac{1}{12}$. Solve and check.

Multiplication is the inverse of division.

$$\frac{1}{3} \div \frac{1}{12} = \frac{4}{12} \div \frac{1}{12} = 4; 4 \times \frac{1}{12} = \frac{4}{12} = \frac{1}{3}$$

Divide Fractions

When renaming fractions using a common denominator, it is not always possible to divide the numerators evenly. If the numerators are not compatible, the quotient will be a fraction or a mixed number. Drawing a picture can help you solve the equation. Remember to write the final answer in lowest terms.

$$1\frac{4}{5} \div \frac{1}{2} =$$

$$\frac{9}{5} \div \frac{1}{2} =$$

$$\frac{18}{10} \div \frac{5}{10} = \frac{18}{5} = 3\frac{3}{5}$$



$$1\frac{4}{5} = \frac{9}{5}$$

There are $3\frac{3}{5}$ sets of $\frac{1}{2}$ in $1\frac{4}{5}$.

$$5) 18 \overline{) - 15} \\ \underline{- 15} \\ 3$$



$$\frac{18}{10} \div \frac{5}{10}$$

1 set of $\frac{5}{10}$

1 set of $\frac{5}{10}$

1 set of $\frac{5}{10}$

3 of the next set of 5 ($\frac{3}{5}$)

$$\frac{2}{3} \div \frac{3}{4} =$$

$$\frac{8}{12} \div \frac{9}{12} = \frac{8}{9}$$



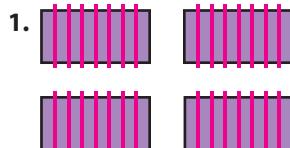
$$\frac{2}{3} = \frac{8}{12}$$

There is $\frac{8}{9}$ of a set.

There are only 8 of the 9 parts needed to make 1 whole set.
There is only part of a set of $\frac{3}{4}$ in $\frac{2}{3}$.

Exercises

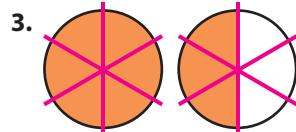
Partition the figures to help you find the quotient.



$$4 \div \frac{3}{8} \quad \frac{32}{3} = 10\frac{2}{3}$$

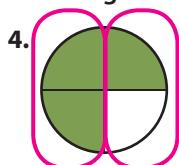


$$2\frac{1}{3} \div \frac{2}{3} \quad \frac{7}{2} = 3\frac{1}{2}$$

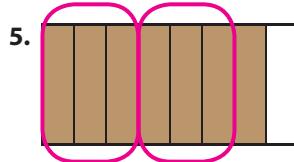


$$1\frac{1}{2} \div \frac{5}{6} \quad \frac{9}{5} = 1\frac{4}{5}$$

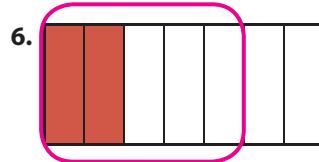
Use the figure to find the quotient.



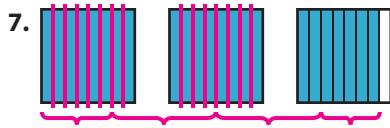
$$\frac{3}{4} \div \frac{1}{2} = \frac{3}{4} \div \frac{2}{4} = \frac{3}{2} = 1\frac{1}{2}$$



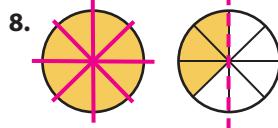
$$\frac{7}{8} \div \frac{3}{8} = \frac{7}{3} = 2\frac{1}{3}$$



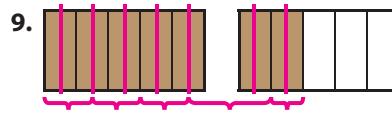
$$\frac{2}{7} \div \frac{5}{7} = \frac{2}{5}$$



$$2\frac{7}{8} \div \frac{3}{4}$$



$$1\frac{3}{8} \div 1\frac{1}{2}$$



$$1\frac{2}{5} \div \frac{3}{10}$$

$$\frac{23}{8} \div \frac{3}{4} = \frac{23}{8} \div \frac{6}{8} = 3\frac{5}{6}$$

$$\frac{11}{8} \div \frac{3}{2} = \frac{11}{8} \div \frac{12}{8} = \frac{11}{12}$$

$$\frac{7}{5} \div \frac{3}{10} = \frac{14}{10} \div \frac{3}{10} = \frac{14}{3} = 4\frac{2}{3}$$

Answers on the page are shown using cancellation.

Find the quotient. Multiply to check your answer.
Draw a picture if needed. **Pictures may vary.**

10. $\frac{9}{10} \div \frac{3}{10}$ **3; $3 \times \frac{3}{10} = \frac{9}{10}$**

13. $\frac{4}{5} \div \frac{4}{5}$ **1; $1 \times \frac{4}{5} = \frac{4}{5}$**

16. $6 \div \frac{3}{7}$ **14; $14 \times \frac{3}{7} = 6$**

11. $4\frac{1}{4} \div \frac{3}{4}$ **$5\frac{2}{3}; 5\frac{2}{3} \times \frac{3}{4} = \frac{17}{3} \times \frac{3}{4} = 4\frac{1}{4}$**

14. $\frac{9}{8} \div \frac{1}{2}$ **$2\frac{1}{4}; 2\frac{1}{4} \times \frac{1}{2} = \frac{9}{4} \times \frac{1}{2} = \frac{9}{8}$**

17. $3\frac{1}{7} \div \frac{4}{7}$ **$5\frac{1}{2}; 5\frac{1}{2} \times \frac{4}{7} = \frac{11}{2} \times \frac{4}{7} = 3\frac{1}{7}$**

12. $\frac{5}{6} \div \frac{2}{3}$ **$1\frac{1}{4}; 1\frac{1}{4} \times \frac{2}{3} = \frac{5}{4} \times \frac{2}{3} = \frac{5}{6}$**

15. $\frac{2}{9} \div \frac{5}{9}$ **$\frac{2}{5}; \frac{2}{5} \times \frac{5}{9} = \frac{2}{9}$**

18. $\frac{1}{3} \div \frac{1}{2}$ **$\frac{2}{3}; \frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$**

Solve.

19. One-third of Mia's birthday cake is left. If $\frac{1}{12}$ of the cake is a serving, how many servings are left?

$$\frac{1}{3} \div \frac{1}{12} = \frac{4}{12} \div \frac{1}{12} = 4 \text{ servings}$$

20. Mrs. Korver teaches piano lessons for $3\frac{1}{2}$ hours on Tuesday afternoon. Each lesson is $\frac{1}{2}$ of an hour long. How many students does she teach on Tuesday? $3\frac{1}{2} \div \frac{1}{2} = \frac{7}{2} \div \frac{1}{2} = \frac{7}{1} = 7 \text{ students}$

21. Two-thirds of the pizza was left from the Super Bowl party. If $\frac{1}{6}$ of a pizza is a serving, how many servings will the leftover pizza provide?

$$\frac{2}{3} \div \frac{1}{6} = \frac{4}{6} \div \frac{1}{6} = 4 \text{ servings}$$

22. Jocelyn had 3 yards of fabric. She cut it into pieces that are $\frac{3}{8}$ of a yard long. How many pieces does she have? $3 \div \frac{3}{8} = \frac{24}{8} \div \frac{3}{8} = 8 \text{ pieces}$

Practice & Application

23. How many sets of $\frac{1}{4}$ are in $\frac{1}{2}$? Write a division equation. $\frac{1}{2} \div \frac{1}{4} = \frac{2}{4} \div \frac{1}{4} = 2$

24. Write a repeated addition problem for $6 \times \frac{3}{8}$. Solve. $\frac{3}{8} + \frac{3}{8} + \frac{3}{8} + \frac{3}{8} + \frac{3}{8} + \frac{3}{8} = \frac{18}{8} = \frac{9}{4} = 2\frac{1}{4}$

25. Use the Distributive Property to solve $3\frac{1}{2} \times \frac{5}{12}$.

26. Estimate the product of $4\frac{1}{9} \times 17\frac{1}{2}$. **$4 \times 18 = 72$**

27. Write 0.3×0.14 in fraction form. Solve.

$$\frac{3}{10} \times \frac{14}{100} = \frac{42}{1000} = \frac{21}{500}$$

28. The paving crew planned to pave $\frac{4}{5}$ of the road on Saturday. By noon on Saturday they had completed $\frac{1}{2}$ of the job. What part of the paving was done by noon?

$$\frac{1}{2} \times \frac{4}{5} = \frac{2}{5} \text{ paved}$$

29. An equilateral triangle has a perimeter of 29 inches. What is the length of each side?

$$\frac{29}{3} = 9\frac{2}{3} \text{ inches or } 29 \div 3 = 9\frac{2}{3}$$

30. Angle F measures 45° . Is the angle acute or obtuse? **acute**

31. How many sides are in a quadrilateral? **4 sides**

32. Draw Circle A. Draw and label radius \overline{AB} .

33. On Circle A, draw and label a chord \overline{BE} that is not a diameter.

34.			
2			
$\frac{1}{4}$	$\frac{2}{3}$	$\frac{1}{2}$	n

$$n = \underline{\underline{\frac{7}{12}}}$$



- Find the quotient for $8 \div \frac{4}{5}$. Explain why the quotient is always equal to or larger than the dividend when dividing a whole number by a fraction.

$$8 \div \frac{4}{5} = \frac{40}{5} \div \frac{4}{5} = 10$$

When dividing a whole number by a fraction, there will be at least 1 fractional part in each whole of the dividend. There will also be some part remaining.

Multiply by the Reciprocal

Dividing by a fraction is the same as multiplying by the reciprocal of the divisor. The **reciprocal** of the divisor is found by **inverting** the numerator and the denominator.

$$\frac{3}{4} \div \frac{3}{4} = 1 \quad \frac{3}{4} \times \frac{4}{3} = \frac{12}{12} = 1$$

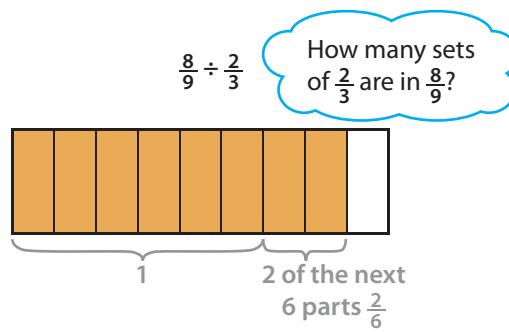
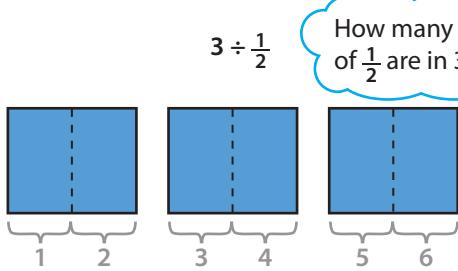
When a fraction is multiplied by its reciprocal, the product is 1.

**reciprocal
invert fractions**

The example below shows that dividing by a number and multiplying by the reciprocal gives the same result.

$$15 \div 3 = 5 \quad 15 \times \frac{1}{3} = \frac{15}{3} = 5$$

The reciprocal for 3 is $\frac{1}{3}$.



Divide

$$3 \div \frac{1}{2} = \frac{6}{2} \div \frac{1}{2} = 6$$

There are 6 halves in 3.

Multiply

$$3 \times \frac{2}{1} = \frac{3 \times 2}{1} = 6$$

3 sets of 2 is 6.

Divide

$$\frac{8}{9} \div \frac{6}{9} = \frac{8}{6} = 1 \frac{2}{6} = 1 \frac{1}{3}$$

Multiply

$$\frac{4}{3} \times \frac{1}{2} = \frac{4}{3} = 1 \frac{1}{3}$$

Exercises

Write the reciprocal to complete the equation.

1. $\frac{2}{3} \times \underline{\hspace{1cm}} = 1 \frac{3}{2}$

2. $6 \times \underline{\hspace{1cm}} = 1 \frac{1}{6}$

3. $\frac{3}{5} \times \underline{\hspace{1cm}} = 1 \frac{5}{3}$

4. $12 \times \underline{\hspace{1cm}} = 1 \frac{1}{12}$

Find the quotient by multiplying by the reciprocal.

Write the answer in lowest terms. **Answers are shown using cancellation.**

5. $\frac{6}{8} \div \frac{1}{3}$

9. $\frac{1}{4} \div \frac{1}{8}$

13. $6 \div \frac{2}{3}$

17. $\frac{8}{9} \div 4$

$\frac{6}{8} \times \frac{3}{1} = \frac{18}{8} = \frac{9}{4} = 2 \frac{1}{4}$

$\frac{1}{4} \times \frac{8}{1} = \frac{2}{1} = 2$

$\frac{6}{1} \times \frac{3}{2} = \frac{9}{1} = 9$

$\frac{8}{9} \times \frac{1}{4} = \frac{2}{9}$

6. $\frac{5}{6} \div \frac{1}{2}$

10. $\frac{4}{9} \div 2$

14. $7 \div \frac{1}{5}$

18. $\frac{1}{2} \div \frac{1}{2}$

$\frac{5}{6} \times \frac{2}{1} = \frac{5}{3} = 1 \frac{2}{3}$

$\frac{4}{9} \times \frac{1}{2} = \frac{2}{9}$

$\frac{7}{1} \times \frac{5}{1} = 35$

$\frac{1}{2} \times \frac{2}{1} = \frac{1}{1} = 1$

7. $\frac{3}{4} \div 3$

11. $\frac{1}{6} \div \frac{1}{3}$

15. $\frac{4}{5} \div \frac{1}{5}$

19. $\frac{2}{3} \div 5$

$\frac{3}{4} \times \frac{1}{3} = \frac{1}{4}$

$\frac{1}{6} \times \frac{3}{1} = \frac{1}{2}$

$\frac{4}{5} \times \frac{5}{1} = \frac{4}{1} = 4$

$\frac{2}{3} \times \frac{1}{5} = \frac{2}{15}$

8. $\frac{3}{9} \div \frac{3}{4}$

12. $4 \div \frac{1}{8}$

16. $\frac{1}{5} \div \frac{1}{10}$

20. $\frac{5}{6} \div \frac{2}{8}$

$\frac{3}{9} \times \frac{4}{3} = \frac{4}{9}$

$\frac{4}{1} \times \frac{8}{1} = 32$

$\frac{1}{5} \times \frac{10}{1} = \frac{2}{1} = 2$

$\frac{5}{6} \times \frac{8}{2} = \frac{20}{6} = 3 \frac{1}{3}$

Use the inverse relationship between multiplication and division to write related equations for the given fraction.

$$2 \times \frac{3}{8} = \frac{6}{8} = \frac{3}{4}$$

$$2 \times \frac{3}{8} = \frac{3}{4}$$

$$\frac{3}{4} \div \frac{3}{8} = 2$$

$$\frac{3}{8} \times 2 = \frac{3}{4}$$

$$\frac{3}{4} \div 2 = \frac{3}{8}$$

Exercises

Use the given equation to write the related multiplication equation.
Write two related division equations.

21. $5 \times \frac{2}{15} = \frac{2}{3}$

22. $\frac{2}{5} \times \frac{3}{4} = \frac{3}{10}$

23. $\frac{1}{4} \times \frac{3}{5} = \frac{3}{20}$

Solve. **Answers are shown using cancellation.**

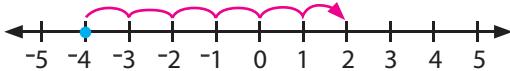
24. Mr. Whitemount bought a 15-pound bag of high-protein dog food for his dog, Bruno. How many feedings can he get from the bag if Bruno eats $\frac{3}{4}$ of a pound per feeding? $15 \div \frac{3}{4} = \frac{15}{1} \times \frac{4}{3} = \frac{20}{1} = 20$ feedings

Practice & Application

26.

What fraction of the counters are negative? $\frac{4}{7}$

27. Use the number line to find the sum of $-4 + 6$. 2



28. Draw a number line to show the quotient of $3 \div \frac{1}{8}$.

29. Draw a picture to show the quotient of $\frac{1}{3} \div \frac{1}{12}$.
Picture may vary.

30. Solve. Find the difference between the two answers.

$$(2 \times 9) + (2 \times 6)$$

30

$$2 \times 9 \times 2 \times 6$$

216

$$216 - 30 = 186$$

31. Use the addition properties to group the addends and solve. **Equations will vary.**

$$\frac{3}{8} + \frac{1}{2} + \frac{5}{6} + \frac{5}{8} + \frac{4}{9} = \underline{\quad} \underline{\frac{7}{9}}$$

32. Solve the expression that shows that Cole had 4 sets of 24 colored pencils but lost 3 of the pencils.

$$(4 \times 24) - 3$$

$$4 \times (24 - 3)$$

$$(4 \times 24) - 3 = 96 - 3 = 93 \text{ colored pencils}$$

25. Mr. Whitemount feeds his dog $1\frac{1}{2}$ pounds of food per day while Bruno is training for search-and-rescue work. How much food does Bruno eat in one week? $7 \times 1\frac{1}{2} = \frac{7}{1} \times \frac{3}{2} = \frac{21}{2} = 10\frac{1}{2}$ pounds
 $\frac{1}{4} \times 5,280 = 1,320$ feet

33. One condition of a blizzard is visibility of less than $\frac{1}{4}$ of a mile for more than 3 hours. How many feet is $\frac{1}{4}$ of a mile? (1 mile = 5,280 feet)

34. If the decimal point moves 1 place to the right when a number is multiplied by 10, what is the product of 10×986.39 ? **9,863.9**



Complete the table.

Steps used to solve may vary.

x	$x \div \frac{1}{4}$
1	4
2	8
3	12
4	16
5	20
10	40

x	$x \div \frac{2}{3}$
1	$1\frac{1}{2}$
2	3
3	$4\frac{1}{2}$
4	6
5	$7\frac{1}{2}$
10	15

Mixed Numbers & Reciprocals

Rename mixed numbers as improper fractions.
Multiply by the reciprocal of the divisor to solve.

Jordan wants the streamers for his windsock to measure $1\frac{2}{3}$ feet long. He has $8\frac{1}{3}$ feet of nylon fabric. How many streamers can he make?

$$8\frac{1}{3} \div 1\frac{2}{3} = 5 \text{ streamers}$$

$$8\frac{1}{3} \div 1\frac{2}{3} =$$

$$\frac{25}{3} \div \frac{5}{3} =$$

$$\frac{5}{3} \times \frac{1}{1} =$$

$$\frac{25}{3} \times \frac{1}{1} = \frac{25}{3} = 5$$

Exercises

Rename the mixed number as an improper fraction.
Write the reciprocal.

$$1. 2\frac{3}{8} \frac{19}{8}, \frac{8}{19}$$

$$4. 4\frac{1}{3} \frac{13}{3}, \frac{3}{13}$$

$$7. 3\frac{2}{8} \frac{26}{8}, \frac{8}{26}$$

$$10. 6\frac{1}{3} \frac{19}{3}, \frac{3}{19}$$

$$2. 5\frac{3}{4} \frac{23}{4}, \frac{4}{23}$$

$$5. 2 \frac{1}{2}$$

$$8. 8\frac{1}{2} \frac{17}{2}, \frac{2}{17}$$

$$11. 5\frac{1}{4} \frac{21}{4}, \frac{4}{21}$$

$$3. 26 \frac{1}{26}$$

$$6. 6\frac{5}{6} \frac{41}{6}, \frac{6}{41}$$

$$9. 10\frac{3}{10} \frac{103}{10}, \frac{10}{103}$$

$$12. 11\frac{5}{9} \frac{104}{9}, \frac{9}{104}$$

Find the quotient by multiplying by the reciprocal.

Write the answer in lowest terms. **Answers are shown using cancellation.**

$$13. 3\frac{1}{4} \div \frac{1}{2} \frac{13}{4} \times \frac{2}{1} = \frac{13}{2} = 6\frac{1}{2}$$

$$17. 8 \div 3\frac{3}{4} \frac{8}{1} \times \frac{4}{15} = \frac{32}{15} = 2\frac{2}{15}$$

$$21. 2\frac{3}{5} \div 5 \frac{13}{5} \times \frac{1}{5} = \frac{13}{25}$$

$$14. 9 \div 4\frac{1}{2} \frac{9}{1} \times \frac{2}{9} = \frac{2}{1} = 2$$

$$18. 1\frac{1}{6} \div 4 \frac{7}{6} \times \frac{1}{4} = \frac{7}{24}$$

$$22. 6 \div 3\frac{1}{2} \frac{6}{1} \times \frac{2}{7} = \frac{12}{7} = 1\frac{5}{7}$$

$$15. 5\frac{1}{2} \div 2\frac{1}{4} \frac{11}{2} \times \frac{4}{9} = \frac{22}{9} = 2\frac{4}{9}$$

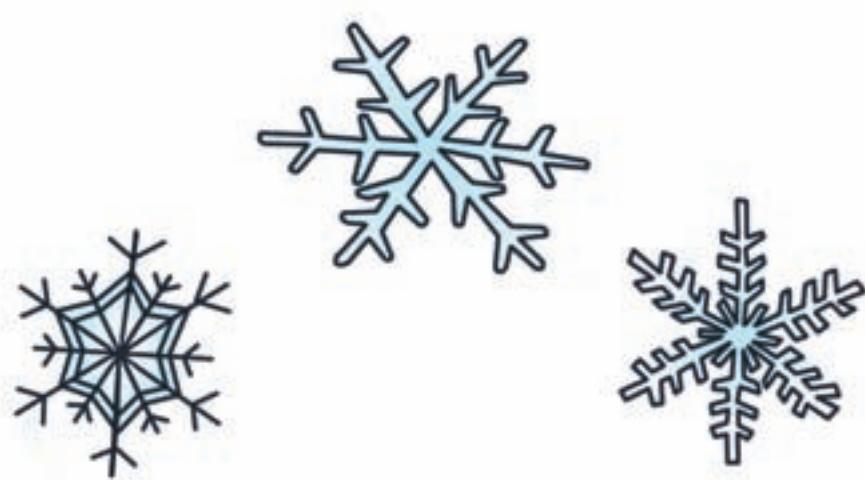
$$19. 6\frac{1}{2} \div \frac{3}{4} \frac{13}{2} \times \frac{4}{3} = \frac{26}{3} = 8\frac{2}{3}$$

$$23. 3\frac{3}{8} \div 1\frac{3}{4} \frac{27}{8} \times \frac{4}{7} = \frac{27}{14} = 1\frac{13}{14}$$

$$16. 4\frac{2}{5} \div \frac{2}{3} \frac{22}{5} \times \frac{3}{2} = \frac{33}{5} = 6\frac{3}{5}$$

$$20. 2\frac{3}{4} \div 1\frac{1}{4} \frac{11}{4} \times \frac{4}{5} = \frac{11}{5} = 2\frac{1}{5}$$

$$24. 6\frac{1}{8} \div 3 \frac{49}{8} \times \frac{1}{3} = \frac{49}{24} = 2\frac{1}{24}$$



"No two snowflakes are alike."
—Wilson Bentley

Solve.

25. Ella spends $2\frac{1}{2}$ hours on homework, practicing the flute, and practicing the piano. She spends an equal amount of time on homework and practice. How much time does she spend doing homework?

$$2\frac{1}{2} \div 2 = \frac{5}{2} \div \frac{2}{1} = \frac{5}{2} \times \frac{1}{2} = \frac{5}{4} = 1\frac{1}{4} \text{ hr}$$

26. Use the information from problem 25 to find the amount of time Ella practiced each instrument if she divided her time equally.

$$2\frac{1}{2} - 1\frac{1}{4} = 1\frac{1}{4} \text{ hr for practice;}$$

$$1\frac{1}{4} \div 2 = \frac{5}{4} \div \frac{2}{1} = \frac{5}{4} \times \frac{1}{2} = \frac{5}{8} \text{ hr}$$

Answers are shown using cancellation.

Multiply to check the answer. Write true or false. Write the correct quotient if the answer is false.

29. $8 \div \frac{2}{3} = 12$ **true**

$$\frac{12}{1} \times \frac{2}{3} = \frac{8}{1} = 8$$

32. $\frac{8}{9} \div \frac{1}{3} = 1\frac{1}{3}$ **false; $2\frac{2}{3}$**

30. $2\frac{1}{5} \div 3 = \frac{11}{15}$ **true**

$$\frac{11}{15} \times \frac{3}{1} = \frac{11}{5} = 2\frac{1}{5}$$

33. $2\frac{5}{8} \div 1\frac{1}{4} = 2\frac{1}{5}$ **false; $2\frac{1}{10}$**

31. $8 \div 2\frac{4}{5} = 1\frac{6}{7}$ **false; $2\frac{6}{7}$**

34. $2\frac{1}{2} \div \frac{1}{8} = 20$ **true**

$$\frac{20}{1} \times \frac{1}{8} = \frac{5}{2} = 2\frac{1}{2}$$

Practice & Application Answers are shown using cancellation.

35. Jane read $\frac{1}{3}$ of a 390-page book. How many pages are left to read? $\frac{1}{3} \times \frac{390}{1} = \frac{130}{1} = 130$; **390 - 130 = 260 pages**

36. $3\frac{7}{8} + 4\frac{3}{4} + 2\frac{1}{2} = 3\frac{7}{8} + 4\frac{6}{8} + 2\frac{4}{8} = 9\frac{17}{8} = 11\frac{1}{8}$

37. What is the square root of 100?

$$\sqrt{100} = \underline{\quad} \quad \underline{10}$$

38. How many $\frac{1}{2}$ cups of juice are in $3\frac{3}{4}$ cups?

$$3\frac{3}{4} \div \frac{1}{2} = \frac{15}{4} \div \frac{1}{2} = \frac{15}{4} \times \frac{2}{1} = \frac{15}{2} = 7\frac{1}{2} \text{ cups}$$

39. Draw and label an acute, an obtuse, and a right angle.

40. Draw a picture of a 4×4 pan of brownies. If 5 brownies were eaten, what fraction of the brownies is left? **$\frac{11}{16}$ brownies left; $\frac{5}{16}$ were eaten**

41. Find the quotient for $3,896 \div 42$. Write the remainder in fraction form in lowest terms.

$$3,896 \div 42 = 92\frac{16}{21}$$

42. Write 190,347 in expanded form.

$$100,000 + 90,000 + 300 + 40 + 7$$

27. To help Ella stay organized, Mr. Evans built shelves above her desk. The shelf for homework items measures $3\frac{1}{3}$ feet long. The shelf for her flute and music books measures $2\frac{5}{12}$ feet long. How much longer is the homework shelf than the music shelf?

$$3\frac{1}{3} - 2\frac{5}{12} = 3\frac{4}{12} - 2\frac{5}{12} = 2\frac{16}{12} - 2\frac{5}{12} = \frac{11}{12} \text{ ft}$$

28. Estimate the measurements in problem 27. Explain how Mr. Evans could determine that his 6-foot board would be long enough to build both shelves. **$3 + 2 = 5 \text{ ft}; 5 \text{ ft} < 6 \text{ ft}; \text{the fractions}$**

$\frac{1}{3}$ and $\frac{5}{12}$ are both less than $\frac{1}{2}$, so when added together they would not make another foot.



Write and solve a word problem for $20 \text{ feet} \div 2\frac{1}{2}$ feet. Use the idea of shelving board for a storage building.

Answers may vary.

Dad has boards that have a total measure of 20 feet in length. How many $2\frac{1}{2}$ -foot shelves can he make for the storage building using one board?

$$20 \div 2\frac{1}{2} = 20 \times \frac{2}{5} \text{ ft} = 8 \text{ shelves}$$



Wilson Bentley was known as the "Snowflake Man." He devoted his life to capturing photomicrographs of snowflakes at his farm in Jericho, Vermont.

Multi-Step Equations

Exercises

Solve. Write a statement to explain the solution. **Steps used to solve may vary.**

The sixth-grade Sunday school class at Calvary Baptist Church is finding ways to help people in their church and community.

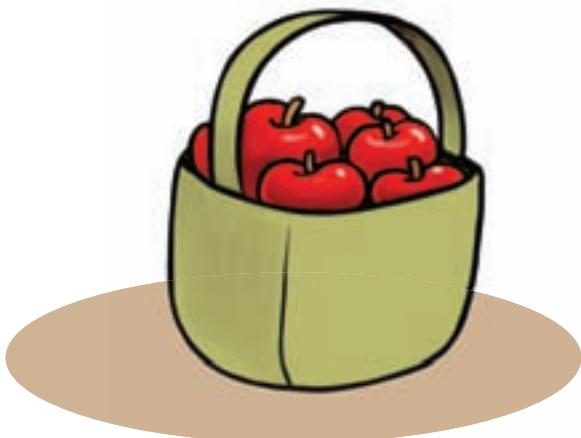
1. Mr. Casey took a group of boys to pick apples for the senior citizens in their church. They picked 75 bags of apples. The boys delivered $\frac{1}{5}$ of the bags on Monday. On Tuesday they delivered $\frac{1}{3}$ of the bags left from Monday. How many bags of apples do they have left to deliver on Wednesday?

There are 40 bags of apples left to deliver on Wednesday.

2. Landon picked $2\frac{1}{2}$ boxes of apples. Each box contains $1\frac{1}{2}$ bushels. Drew picked 4 bushels of apples. How many bushels of apples did the two boys pick in all? **Together the boys picked $7\frac{3}{4}$ bushels of apples.**

3. Mr. Casey and Anthony put up new shelving in Mrs. Bryant's pantry. How many $2\frac{1}{4}$ -foot shelves can be cut from two boards that measure $8\frac{7}{8}$ feet each? **Six shelves can be built for the pantry.**

4. On Saturday Daniel raked leaves for Mrs. Gulley for $1\frac{3}{4}$ hours. He painted fencing at Mr. Henry's for $2\frac{1}{2}$ hours. How many hours did Daniel work on Saturday? **Daniel worked $4\frac{1}{4}$ hours on Saturday.**



5. Mrs. Casey and a group of girls made cheer packages for families with illness. Each package had $\frac{1}{2}$ of a pound of mints, $\frac{3}{4}$ of a pound of Crackle Crunch, and $2\frac{7}{8}$ pounds of apples. What is the weight of the food in each cheer package?

Each cheer package weighs $4\frac{1}{8}$ pounds.

6. Natalie brought $2\frac{1}{2}$ pounds of mixed nuts for some gift baskets. Leah brought $4\frac{1}{4}$ pounds of mixed nuts. All the nuts were distributed equally among 3 gift baskets. How many pounds of nuts were put in each basket? **Each gift basket will have $2\frac{1}{4}$ pounds of nuts.**

7. Hannah is making roses out of ribbon to put in each package. She has $10\frac{1}{3}$ yards of red ribbon and $2\frac{2}{3}$ yards of peach ribbon. How many roses can she make if each rose takes $\frac{2}{3}$ of a yard?

Hannah can make 19 roses.

8. A family donated sandwich meat for two needy families. There are $5\frac{1}{4}$ pounds of chicken and $6\frac{1}{2}$ pounds of ham. Alexis divided each kind of meat into two equal portions. How much chicken and ham will each family receive?

Each family will receive $2\frac{5}{8}$ pounds of chicken and $3\frac{1}{4}$ pounds of ham.



Solve. *Steps used to solve may vary.*

9. Nicole and Riley invited the 8 new girls in their Sunday school class to a pizza party. If they expect to serve $\frac{3}{8}$ of a pizza to each person at the party, how many pizzas will they need? (Each pizza will be cut into 8 slices.)

$$10 \times \frac{3}{8} = \frac{10}{1} \times \frac{3}{8} = \frac{30}{8} = 3\frac{3}{4} = 4 \text{ pizzas}$$

10. On Saturday Victoria played her violin for $3\frac{3}{4}$ hours in 5 local nursing homes. How long did she play at each home if she divided her time equally?

$$3\frac{3}{4} \div 5 = \frac{15}{4} \div 5 = \frac{15}{4} \times \frac{1}{5} = \frac{3}{4} \text{ of an hour}$$

11. After the snowstorm, Marcus cleared snow from sidewalks in town for $2\frac{1}{2}$ hours on Saturday and $2\frac{1}{2}$ hours on Sunday. He worked an extra $\frac{3}{4}$ of an hour getting wood for Mrs. Carter's wood stove. How much time did Marcus spend this weekend helping others?

$$(2 \times 2\frac{1}{2}) + \frac{3}{4} = (2 \times \frac{5}{2}) + \frac{3}{4} = 5 + \frac{3}{4} = 5\frac{3}{4} \text{ hr}$$

12. Jackson shoveled snow from 4 walkways at Mr. Kauffman's home. Each walkway was $4\frac{2}{3}$ yards long. What was the total length of walkways shoveled? $4 \times 4\frac{2}{3} = \frac{4}{1} \times \frac{14}{3} = \frac{56}{3} = 18\frac{2}{3} \text{ yd}$

Solve. Write the answer in lowest terms. *Steps to lowest terms may vary.*

13. $\frac{5}{6} \div \frac{1}{8}$

$$\frac{5}{6} \times \frac{8}{1} = \frac{20}{3} = 6\frac{2}{3}$$

14. $8\frac{3}{4} \div \frac{1}{3}$

$$\frac{35}{4} \times \frac{3}{1} = \frac{105}{4} = 26\frac{1}{4}$$

15. $4 \div \frac{4}{5}$

$$\frac{4}{1} \times \frac{5}{4} = \frac{5}{1} = 5$$

16. $\frac{3}{8} \div \frac{1}{4}$

$$\frac{3}{8} \times \frac{4}{1} = \frac{3}{2} = 1\frac{1}{2}$$

17. $\frac{3}{4} \div 3$

$$\frac{3}{4} \times \frac{1}{3} = \frac{1}{4}$$

18. $2\frac{2}{5} \div 5$

$$\frac{12}{5} \times \frac{1}{5} = \frac{12}{25}$$

19. $5 \div \frac{2}{5}$

$$\frac{5}{1} \times \frac{5}{2} = \frac{25}{2} = 12\frac{1}{2}$$

20. $1\frac{5}{6} \div 3$

$$\frac{11}{6} \times \frac{1}{3} = \frac{11}{18}$$

21. $7 \div \frac{3}{10}$

$$\frac{7}{1} \times \frac{10}{3} = \frac{70}{3} = 23\frac{1}{3}$$

22. $6\frac{2}{3} \div 1\frac{5}{8}$

$$\frac{20}{3} \times \frac{8}{13} = \frac{160}{39} = 4\frac{4}{39}$$

23. $\frac{1}{4} \div \frac{1}{12}$

$$\frac{1}{4} \times \frac{12}{1} = \frac{3}{1} = 3$$

24. $9 \div 3\frac{1}{2}$

$$\frac{9}{1} \times \frac{2}{7} = \frac{18}{7} = 2\frac{4}{7}$$

25. $2\frac{1}{8} \div \frac{2}{3}$

$$\frac{17}{8} \times \frac{3}{2} = \frac{51}{16} = 3\frac{3}{16}$$

26. $1 \div \frac{1}{4}$

$$\frac{1}{1} \times \frac{4}{1} = \frac{4}{1} = 4 \text{ or } 1 \times 4 = 4$$

27. $\frac{2}{3} \div \frac{1}{6}$

$$\frac{2}{3} \times \frac{6}{1} = \frac{4}{1} = 4$$

28. $\frac{6}{7} \div \frac{1}{2}$

$$\frac{6}{7} \times \frac{2}{1} = \frac{12}{7} = 1\frac{5}{7}$$

29. $\frac{4}{9} \div \frac{3}{7}$

$$\frac{4}{9} \times \frac{7}{3} = \frac{28}{27} = 1\frac{1}{27}$$

30. $3\frac{1}{7} \div \frac{1}{3}$

$$\frac{22}{7} \times \frac{3}{1} = \frac{66}{7} = 9\frac{3}{7}$$

- J Write a multi-step word problem using 3 cups of sugar, $1\frac{1}{2}$ cups of sugar, and $1\frac{1}{4}$ cups of sugar. Solve.

Alyssa and Bryson need $1\frac{1}{2}$ cups of sugar for a cake and $1\frac{1}{4}$ cups of sugar for a batch of cookies. How much sugar will be left from the 3 cups of sugar that they have?

$$1\frac{1}{2} + 1\frac{1}{4} = 1\frac{2}{4} + 1\frac{1}{4} = 2\frac{3}{4}$$

$$3 - 2\frac{3}{4} = 2\frac{4}{4} - 2\frac{3}{4} = \frac{1}{4} \text{ cup}$$

Answers may vary.



Complete **DAILY REVIEW** e on page 431.

Properties

Mathematical Properties

Commutative Property of Addition

$$\frac{1}{6} + \frac{2}{6} = \frac{2}{6} + \frac{1}{6}$$

$$\frac{3}{6} = \frac{3}{6}$$

The order of addends or factors can be changed without changing the sum or product.

Commutative Property of Multiplication

$$\frac{2}{3} \times \frac{2}{5} = \frac{2}{5} \times \frac{2}{3}$$

$$\frac{4}{15} = \frac{4}{15}$$

Associative Property of Addition

$$(\frac{2}{8} + \frac{1}{8}) + \frac{4}{8} = \frac{2}{8} + (\frac{1}{8} + \frac{4}{8})$$

$$\frac{7}{8} = \frac{7}{8}$$

The grouping of addends or factors may be changed without changing the sum or product.

Associative Property of Multiplication

$$\frac{1}{5} \times (\frac{2}{5} \times \frac{3}{5}) = (\frac{1}{5} \times \frac{2}{5}) \times \frac{3}{5}$$

$$\frac{6}{125} = \frac{6}{125}$$

Distributive Property of Multiplication over Addition

$$2 \times 1\frac{2}{3} = (2 \times 1) + (2 \times \frac{2}{3})$$

$$3\frac{1}{3} = 3\frac{1}{3}$$

The product of any two factors can be found by separating one factor into parts, multiplying each part by the other factor, and adding the partial products.

Identity Property of Addition

$$\frac{2}{7} + 0 = \frac{2}{7}$$

When 0 is an addend, the sum is the other addend.

Identity Property of Multiplication

$$1 \times \frac{4}{9} = \frac{4}{9}$$

When 1 is a factor, the product is the other factor.

Zero Principle of Subtraction

$$\frac{7}{12} - 0 = \frac{7}{12}$$

When 0 is subtracted from a number (the minuend), the answer is that number.

Zero Property of Multiplication

$$\frac{5}{6} \times 0 = 0$$

When 0 is a factor, the product is 0.

Exercises

Write the missing number or fraction in the equation.

Write the name of the property illustrated.

1. $\frac{3}{8} \times \underline{\quad} = 0$ **0**

Zero Property of Multiplication

2. $7 \times 2\frac{3}{5} = (7 \times 2) + (7 \times \underline{\quad})$ **$\frac{3}{5}$**

Distributive Property of Multiplication

3. $\frac{2}{9} + \underline{\quad} = \frac{1}{3} + \frac{2}{9}$ **$\frac{1}{3}$**

Commutative Property of Addition

4. $(\frac{5}{6} + \frac{2}{3}) + \underline{\quad} = \frac{5}{6} + (\frac{2}{3} + \frac{1}{6})$ **$\frac{1}{6}$**

Associative Property of Addition

5. $\frac{9}{10} + 0 = \underline{\quad}$ **$\frac{9}{10}$**

Identity Property of Addition

6. $\frac{1}{4} \times (\frac{1}{2} \times \frac{3}{4}) = (\frac{1}{4} \times \frac{1}{2}) \times \underline{\quad}$ **$\frac{3}{4}$**

Associative Property of Multiplication

7. $\frac{1}{4} \times \frac{3}{4} = \underline{\quad} \times \frac{1}{4}$ **$\frac{3}{4}$**

Commutative Property of Multiplication

8. $1 \times \underline{\quad} = \frac{3}{7}$ **$\frac{3}{7}$**

Identity Property of Multiplication

9. $\frac{7}{8} - 0 = \underline{\quad}$ **$\frac{7}{8}$**

Zero Principle of Subtraction

Evaluate Expressions

A variable is a letter used to represent a number.

An expression can be evaluated (solved) by substituting a known value for the variable.

$$2 + \left(\frac{1}{4} \times a\right) - 1 \text{ if } a = \frac{1}{3}$$

$$2 + \left(\frac{1}{4} \times \frac{1}{3}\right) - 1$$

$$= 2 + \frac{1}{12} - 1$$

$$= 2 \frac{1}{12} - 1$$

$$= 1 \frac{1}{12}$$

Substitute $\frac{1}{3}$ for a .

Exercises

Evaluate the expression if $a = \frac{1}{4}$. Write the answer in lowest terms. **Steps used to solve may vary.**

10. $\frac{2}{3} \times a \times \frac{1}{2}$ **$1 \frac{1}{12}$**

11. $a \times \frac{4}{9} + \frac{5}{9}$ **$\frac{2}{3}$**

12. $5 + (a \times \frac{1}{5}) - a$ **$4 \frac{4}{5}$**

13. $\frac{7}{8} \div a + \frac{3}{4}$ **$4 \frac{1}{4}$**

14. $4 - (\frac{3}{4} \div a) \times \frac{1}{2}$ **$2 \frac{1}{2}$**

15. $(a + \frac{1}{5}) \times (\frac{3}{4} - a)$ **$\frac{9}{40}$**

Evaluate the expression.

16. $\frac{2}{3} + \frac{1}{2} \times \frac{3}{4}$ **$1 \frac{1}{24}$**

19. $(\frac{1}{3} + \frac{1}{5}) \div (\frac{5}{8} - \frac{1}{4})$ **$1 \frac{19}{45}$**

22. $2 \frac{3}{4} \div (\frac{6}{8} - \frac{1}{4}) + 1 \frac{1}{2}$ **7**

17. $5 - \frac{3}{4} \times \frac{1}{2}$ **$4 \frac{5}{8}$**

20. $(\frac{1}{8} + \frac{2}{3}) \times (\frac{1}{2} - \frac{1}{4})$ **$\frac{19}{96}$**

23. $1 \frac{1}{2} \div (\frac{1}{3} + \frac{5}{6}) + 2$ **$3 \frac{2}{7}$**

18. $\frac{1}{4} + \frac{1}{4} \div \frac{1}{8}$ **$2 \frac{1}{4}$**

21. $2 \frac{1}{2} \div (\frac{5}{6} - \frac{1}{3}) + 1$ **6**

24. $\frac{1}{5} + (\frac{2}{3} \times \frac{2}{3}) \div \frac{5}{8}$ **$\frac{41}{45}$**

Solve. Write the answer in lowest terms. **Steps used to solve may vary.**

25. $\frac{7}{8} \div \frac{1}{2}$ **$1 \frac{3}{4}$**

28. $3 \frac{5}{8} \div \frac{3}{4}$ **$4 \frac{5}{6}$**

31. $5 \frac{3}{4} \div 2$ **$2 \frac{7}{8}$**

26. $3 \div \frac{1}{6}$ **18**

29. $\frac{11}{12} \div \frac{1}{6}$ **$5 \frac{1}{2}$**

32. $9 \frac{2}{3} \div 4 \frac{3}{8}$ **$2 \frac{22}{105}$**

27. $\frac{8}{9} \div 2$ **$\frac{4}{9}$**

30. $7 \div 2 \frac{3}{5}$ **$2 \frac{9}{13}$**

33. $\frac{5}{9} \div \frac{8}{9}$ **$\frac{5}{8}$**



More Multi-Step Word Problems

Exercises

Solve. Explain what information is needed to solve the problems with *too little information*.

1. A sporting goods store donated 2 new basketball backboards that cost \$128.00 each and 8 new basketball shirts that cost \$18.75 each to Emmanuel Christian School. What was the value of the donations?

$$(2 \times \$128.00) + (8 \times \$18.75) = \$406.00$$

2. To raise money for their school, the sixth- and seventh-graders collected 2,136 pounds of paper and aluminum. If the current price for recycled aluminum is \$0.90 per pound, how much money will they make on the aluminum products?

The weight of the aluminum products is needed to solve.

3. In 1972 a record 1,122 inches of snow fell at Mt. Rainier, Washington. During the 1998–1999 winter season, a new snowfall record was set at Mt. Baker. The new record was 18 inches more than the previous record. What is the new snowfall record? $1,122 + 18 = 1,140$ in.

4. Troy weeded 4 rows of vegetables that were each $4\frac{2}{3}$ yards long. Todd weeded 6 rows that were each $2\frac{3}{4}$ yards long. Who weeded more? How much more?

$$\text{Troy: } 4 \times 4\frac{2}{3} = 4 \times \frac{14}{3} = \frac{56}{3} = 18\frac{2}{3}$$

$$\text{Todd: } 6 \times 2\frac{3}{4} = 6 \times \frac{11}{4} = \frac{66}{4} = 16\frac{1}{2}$$

$$18\frac{2}{3} - 16\frac{1}{2} = 2\frac{1}{6}$$

Troy weeded $2\frac{1}{6}$ yards more.

5. The soccer game photographer took 38 photos of the game. He has one photo of each player and some photos of the game. How much will he make if he sells all the photos he took? *The cost of each photo is needed to solve.*

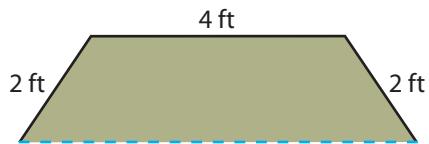
6. Joshua saved \$7.25 of his allowance for 6 weeks. How much more money does he need to purchase a 3-game ticket package that costs \$89.00 for his favorite baseball team?

$$\$89.00 - (6 \times \$7.25) = \$45.50$$

7. Polly's Pet Care ordered 16 pounds of sunflower seeds and $8\frac{1}{2}$ pounds of cracked corn. If these items are divided equally among 4 customers, how many pounds of bird food will each customer receive?

$$(16 \div 4) + (8\frac{1}{2} \div 4) = 4 + 2\frac{1}{8} = 6\frac{1}{8} \text{ lb}$$

8. The shape below represents $\frac{1}{2}$ of a symmetrical figure (both halves of the figure match when folded on the blue line). Find the perimeter of the figure.



$$(2 \times 2) + (2 \times 4) + (2 \times 2) = 16 \text{ ft}$$



Solve.

9. Kyle's grandparents live 984 miles away. Kyle's family is driving to visit them. They traveled $\frac{1}{3}$ of the distance the first day. How many more miles do they need to travel before they arrive?

$$984 - \left(\frac{1}{3} \times 984\right) = 984 - 328 = 656 \text{ miles}$$

10. On day 2 of the trip, Kyle's family decided to travel 1.5 times farther than they did on day 1. How many more miles must they travel to arrive at their destination?

$$656 - (1.5 \times 328) = 656 - 492 = 164 \text{ miles}$$

11. Kyle's family stopped for dinner. They purchased one meal for \$6.39, two meals for \$4.79 each, and two other meals that were \$2.98 each. What was the total cost of the dinner for the family?

$$\begin{aligned} \$6.39 + (2 \times \$4.79) + (2 \times \$2.98) &= \$6.39 \\ + \$9.58 + \$5.96 &= \$21.93 \end{aligned}$$



Evaluate the expression. **Answers are shown using cancellation.**

12. $6 + (4 \times \frac{5}{8}) \div 2$
 $6 + \frac{5}{2} \times \frac{1}{2} = 6 + \frac{5}{4} = 7\frac{1}{4}$

13. $\frac{2}{3} \times \frac{1}{2} - \frac{1}{8}$
 $\frac{2}{6} - \frac{1}{8} = \frac{8}{24} - \frac{3}{24} = \frac{5}{24}$

14. $\frac{1}{5} \times 2 \times \frac{3}{4}$
 $\frac{2}{5} \times \frac{3}{4} = \frac{3}{10}$

15. $1\frac{1}{3} \times 5 \div \frac{2}{3}$
 $\frac{4}{3} \times 5 \div \frac{2}{3} = \frac{20}{3} \times \frac{3}{2} = \frac{10}{1} = 10$

16. $(\frac{4}{5} + \frac{2}{3}) \times (\frac{7}{8} - \frac{2}{8})$
 $\frac{5}{8} = \frac{22}{15} \times \frac{5}{8} = \frac{11}{12}$

17. $(2\frac{4}{9} + 1\frac{2}{3}) \div \frac{1}{2}$
 $\frac{1}{2} = 3\frac{10}{9} \times \frac{2}{1} = \frac{37}{9} \times \frac{2}{1} = \frac{74}{9} = 8\frac{2}{9}$

Evaluate the expression if $b = \frac{2}{3}$. **Answers are shown using cancellation.**

18. $b \times \frac{9}{12} + 8$
 $\frac{2}{3} \times \frac{9}{12} + 8 = \frac{3}{6} + 8 = 8\frac{1}{2}$

19. $\frac{8}{9} \div \frac{1}{3} + b$
 $\frac{2}{3} = \frac{10}{3} = 3\frac{1}{3}$

20. $7\frac{6}{7} \div b + 4$
 $\frac{3}{2} + 4 = \frac{165}{14} + 4 = 11\frac{11}{14} + 4 = 15\frac{11}{14}$

21. $8 - (b \div \frac{1}{6}) \times 1\frac{1}{3}$
 $8 - (\frac{2}{3} \times \frac{6}{1}) \times \frac{4}{3} = 8 - \frac{4}{1} \times \frac{4}{3} = 8 - \frac{16}{3} = 8 - 5\frac{1}{3} = 2\frac{2}{3}$

22. $3\frac{4}{8} + 1\frac{1}{2} \times b$
 $3\frac{4}{8} + \frac{3}{2} \times \frac{2}{3} = 3\frac{4}{8} + 1 = 4\frac{4}{8} = 4\frac{1}{2}$

23. $3 + (\frac{5}{6} - b) \times \frac{3}{5}$
 $\frac{3}{5} = 3 + \frac{1}{6} \times \frac{3}{5} = 3 + \frac{1}{10} = 3\frac{1}{10}$

Solve. Write the answer in lowest terms. **Answers are shown using cancellation.**

24. $5\frac{6}{10} \div 2\frac{1}{3}$
 $\frac{56}{10} \times \frac{3}{7} = \frac{24}{10} = 2\frac{4}{10} = 2\frac{2}{5}$

25. $2\frac{6}{7} \div 1\frac{1}{2}$
 $\frac{20}{7} \times \frac{2}{3} = \frac{40}{21} = 1\frac{19}{21}$

26. $\frac{9}{10} \div \frac{1}{5}$
 $\frac{9}{10} \times \frac{5}{1} = \frac{9}{2} = 4\frac{1}{2}$

27. $1\frac{2}{6} \div \frac{1}{12}$
 $\frac{8}{6} \times \frac{12}{1} = \frac{16}{1} = 16$

28. $4 \div \frac{1}{2}$
 $\frac{4}{1} \times \frac{2}{1} = \frac{8}{1} = 8$

29. $\frac{1}{15} \div \frac{1}{20}$
 $\frac{1}{15} \times \frac{20}{1} = \frac{4}{3} = 1\frac{1}{3}$

Write two different equations to solve the problem.

Explain the two solutions.

- J Levi has a board that is $8\frac{1}{2}$ feet long. He wants to cut it into 4-inch pieces. How many pieces can he cut?

$(8\frac{1}{2} \times 12) \div 4 = 25\frac{1}{2}$ pieces; rename feet as inches; divide into 4-inch pieces. $8\frac{1}{2} \div \frac{1}{3} = 25\frac{1}{2}$ pieces; rename 4 inches as part of a foot and then divide. The solution to both equations is the same.

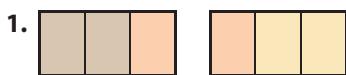
CHAPTER 8 REVIEW

Write the equation that matches the illustration. Solve.

$$\frac{2}{3} \div \frac{1}{6}$$

$$2 \div \frac{1}{3}$$

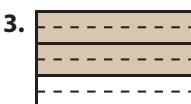
$$2 \div \frac{2}{3}$$



$$2 \div \frac{2}{3} = 3$$



$$2 \div \frac{1}{3} = 6$$



$$\frac{2}{3} \div \frac{1}{6} = 4$$

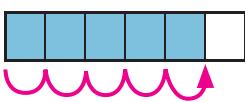
Write a division equation. Solve.

Rename fractions if needed using a common denominator.

Complete the picture to illustrate the answer.

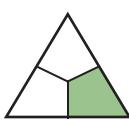
Answers are shown using cancellation.

4. How many sets of $\frac{1}{6}$ are in $\frac{5}{6}$?



$$\frac{5}{6} \div \frac{1}{6} = 5$$

5. How many sets of $\frac{1}{3}$ are in $\frac{1}{3}$?



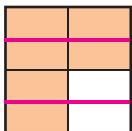
$$\frac{1}{3} \div \frac{1}{3} = 1$$

6. How many sets of $\frac{3}{16}$ are in $\frac{3}{8}$?



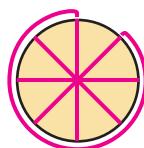
$$\frac{3}{8} \div \frac{3}{16} = \frac{6}{16} \div \frac{3}{16} = 2$$

7. How many sets of $\frac{1}{8}$ are in $\frac{3}{4}$?



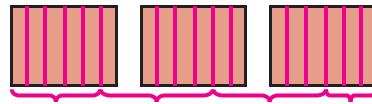
$$\frac{3}{4} \div \frac{1}{8} = \frac{6}{8} \div \frac{1}{8} = 6$$

8. How many sets of $\frac{7}{8}$ are in 1 whole?



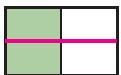
$$1 \div \frac{7}{8} = \frac{8}{8} \div \frac{7}{8} = \frac{8}{7} = 1\frac{1}{7}$$

9. How many sets of $\frac{5}{6}$ are in 3 wholes?



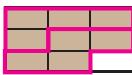
$$3 \div \frac{5}{6} = \frac{18}{6} \div \frac{5}{6} = \frac{18}{5} = 3\frac{3}{5}$$

10. If $\frac{1}{2}$ is divided into 2 sets, what fraction names each set?



$$\frac{1}{2} \div 2 = \frac{1}{4}$$

11. If $\frac{8}{9}$ is divided into 2 sets, what fraction names each set?



$$\frac{8}{9} \div 2 = \frac{4}{9}$$

12. If $\frac{6}{7}$ is divided into 3 sets, what fraction names each set?



$$\frac{6}{7} \div 3 = \frac{2}{7}$$

Solve by multiplying by the reciprocal.

Use cancellation if possible. Write the answer in lowest terms. **Answers are shown using cancellation.**

13. $4\frac{9}{10} \div 7$

$$\frac{49}{10} \times \frac{1}{7} = \frac{7}{10}$$

14. $1\frac{1}{3} \div \frac{2}{3}$

$$\frac{4}{3} \times \frac{3}{2} = \frac{2}{1} = 2$$

15. $8\frac{1}{4} \div \frac{5}{8}$

$$\frac{33}{4} \times \frac{8}{5} = \frac{66}{5} = 13\frac{1}{5}$$

16. $2\frac{1}{6} \div 3$

$$\frac{13}{6} \times \frac{1}{3} = \frac{13}{18}$$

17. $2\frac{4}{7} \div \frac{3}{4}$

$$\frac{18}{7} \times \frac{4}{3} = \frac{24}{7} = 3\frac{3}{7}$$

18. $6 \div 2\frac{1}{2}$

$$6 \times \frac{2}{5} = \frac{12}{5} = 2\frac{2}{5}$$

19. $7\frac{1}{2} \div 3\frac{3}{8}$

$$\frac{15}{2} \times \frac{8}{27} = \frac{20}{9} = 2\frac{2}{9}$$

20. $3\frac{1}{5} \div 3\frac{1}{3}$

$$\frac{16}{5} \times \frac{3}{10} = \frac{24}{25}$$

Write the reciprocal.

21. $5\frac{3}{5}$ $\frac{5}{28}$

22. 2 $\frac{1}{2}$

23. $8\frac{1}{8}$ $\frac{8}{65}$

24. $\frac{2}{3}$ $\frac{3}{2}$

25. 11 $\frac{1}{11}$

Multiply to check the answer. Write true or false.

Write the correct quotient if the answer is false. **Answers are shown using cancellation.**

26. $6 \div \frac{5}{6} = 6\frac{2}{3}$ **false; $7\frac{1}{5}$**

$$\frac{20}{3} \times \frac{5}{6} = \frac{50}{18} = 5\frac{5}{9}$$

$$6 \times \frac{6}{5} = \frac{36}{5} = 7\frac{1}{5}$$

Solve.

27. $\frac{7}{8} \div \frac{1}{6} = 5\frac{1}{4}$ **true**

$$\frac{21}{4} \times \frac{1}{6} = \frac{7}{8}$$

28. $3\frac{1}{8} \div 2\frac{1}{4} = 1\frac{1}{9}$ **false; $1\frac{7}{18}$**

$$\frac{10}{9} \times \frac{9}{4} = \frac{5}{2} = 2\frac{1}{2}$$

$$\frac{25}{8} \times \frac{4}{9} = \frac{25}{18} = 1\frac{7}{18}$$

29. Mrs. Stanley has a square flower garden that is $8\frac{1}{2}$ feet on each side. She has $10\frac{3}{4}$ feet of landscape edging. How much more edging does she need for the perimeter of her garden?

$$(4 \times 8\frac{1}{2}) - 10\frac{3}{4} = (4 \times \frac{17}{2}) - 10\frac{3}{4} =$$

$$34 - 10\frac{3}{4} = 33\frac{4}{4} - 10\frac{3}{4} = 23\frac{1}{4} \text{ ft}$$

Answers are shown using cancellation.

Evaluate the expression.

31. $2\frac{3}{4} \div (\frac{1}{8} + \frac{2}{8})$

$$\frac{11}{4} \times \frac{8}{3} = \frac{22}{3} = 7\frac{1}{3}$$

32. $6 - \frac{3}{9} \times \frac{1}{3}$

$$6 - \frac{1}{9} = 5\frac{9}{9} - \frac{1}{9} = 5\frac{8}{9}$$

33. $(\frac{1}{3} - \frac{1}{6}) \times (\frac{2}{12} + \frac{1}{12})$

$$(\frac{2}{6} - \frac{1}{6}) \times \frac{3}{12} = \frac{1}{6} \times \frac{3}{12} = \frac{1}{24}$$

Evaluate the expression if $a = \frac{1}{3}$. **Answers are shown using cancellation.**

34. $\frac{1}{5} \times a \times 2$ $\frac{1}{5} \times \frac{1}{3} \times \frac{2}{1} = \frac{2}{15}$

35. $\frac{3}{4} \div a \times 3$ $\frac{3}{4} \div \frac{1}{3} \times \frac{3}{1} =$

$$\frac{3}{4} \times \frac{3}{1} \times \frac{3}{1} = \frac{27}{4} = 6\frac{3}{4}$$

36. $6 \times (3 - a)$ $6 \times (3 - \frac{1}{3}) =$

$$6 \times 2\frac{2}{3} = 6 \times \frac{8}{3} = 16$$

Write the missing number or fraction that illustrates a mathematical property.

Write the property.

37. $\frac{2}{8} \times (\frac{3}{8} \times \frac{1}{8}) = (\underline{\quad} \times \frac{3}{8}) \times \frac{1}{8}$ $\frac{2}{8}$

Associative Property

38. $\frac{3}{4} \times \underline{\quad} = 0$ **0**

Zero Property of Multiplication

39. $\frac{2}{5} \times \frac{4}{5} = \underline{\quad} \times \frac{2}{5}$ $\frac{4}{5}$

Commutative Property

40. $3 \times 1\frac{1}{6} = (\underline{\quad} \times 1) + (3 \times \underline{\quad})$ **$3; \frac{1}{6}$**

Distributive Property

41. $\frac{1}{3} \times \underline{\quad} = \frac{1}{3}$ **1**

Identity Property of Multiplication

Associative Property

Commutative Property

Distributive Property

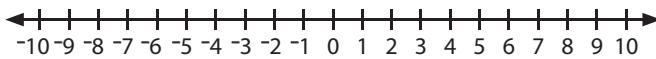
Identity Property of Multiplication

Zero Property of Multiplication



Test Prep

Use the number line to find the answer.



1. $-5 + 2 = \underline{\hspace{1cm}}$

- A. -1
- B. -2
- C. -3

2. $-4 + -1 = \underline{\hspace{1cm}}$

- A. 0
- B. -5
- C. 5

3. $8 + -7 = \underline{\hspace{1cm}}$

- A. 1
- B. -1
- C. 15

4. $-3 + 4 = \underline{\hspace{1cm}}$

- A. 0
- B. 1
- C. 2

5. $5 + -5 = \underline{\hspace{1cm}}$

- A. 10
- B. 1
- C. 0

Complete the sequence.

6. $2, 4, 6, \underline{\hspace{1cm}}$

- A. 12
- B. 10
- C. 8

7. $3, 9, 27, 81, \underline{\hspace{1cm}}$

- A. 243
- B. 162
- C. 84

8. $-5, -3, -1, 1, \underline{\hspace{1cm}}$

- A. 5
- B. 3
- C. 1

9. $\frac{1}{2}, 1, 1\frac{1}{2}, \underline{\hspace{1cm}}$

- A. $\frac{3}{4}$
- B. $2\frac{1}{2}$
- C. 2

10. $0.25, 0.50, 0.75, \underline{\hspace{1cm}}$

- A. 100
- B. 10
- C. 1

Mark the answer.

11.
$$\begin{array}{cccc} & 48 \\ \hline 12 & 12 & 12 & 12 \end{array}$$

- A. $48 - 12$
B. 4×12
C. $4 + 12$

12.
$$6^3$$

- A. $6 \cdot 6 \cdot 6$
B. 6×3
C. $3 \cdot 6$

13.
$$\frac{1}{5} = \underline{\quad}$$

- A. 5×1
B. $1 \div 5$
C. $5 \div 1$

14.
$$\frac{3}{8} = \frac{n}{24}$$

- A. $n = 6$
B. $n = 9$
C. $n = 12$

15.
$$\frac{5}{2} = \underline{\quad}$$

- A. $5\frac{1}{2}$
B. $2\frac{1}{2}$
C. $1\frac{1}{2}$

16.
$$7 + 8 \times 3$$

- A. 29
B. 30
C. 31

17.
$$2 \times 3 + 16 \div 4$$

- A. 5
B. 10
C. 15

18.
$$4 + 6 \times (3 + 2)$$

- A. 34
B. 36
C. 38

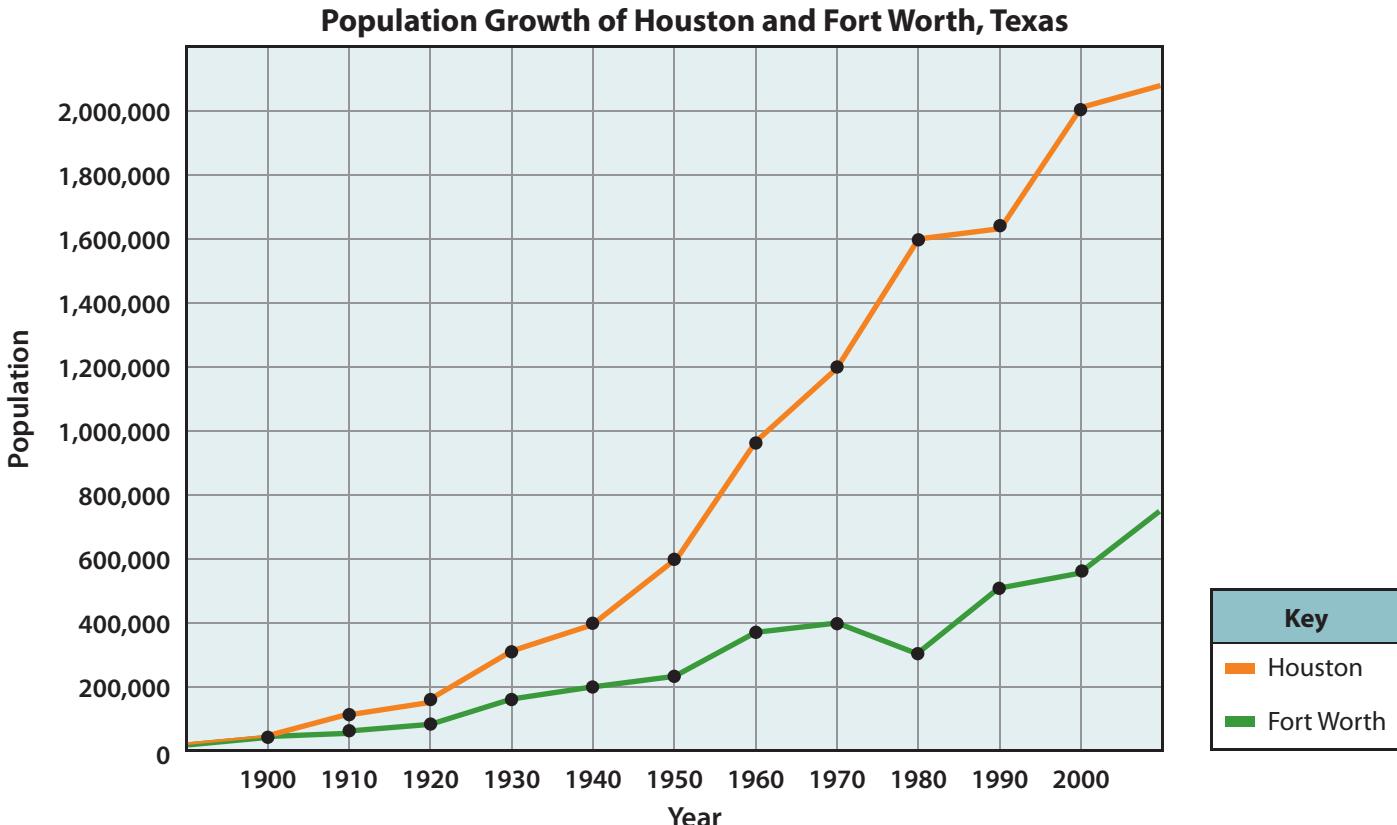
19.
$$9 \times 4 - 2^2$$

- A. 52
B. 42
C. 32

20.
$$27 - 4 \times 3 \div 6$$

- A. 25
B. 20
C. 15

Use the data from the line graph to find the answer.



21. What was Houston's population in 1950?

- A. 500,000
- B. 600,000**
- C. 700,000

22. How much greater was the population of Houston than that of Fort Worth in 1970?

- A. 400,000
- B. 600,000
- C. 800,000**

23. Which city's population decreased from 1970 to 1980?

- A. Houston
- B. Fort Worth**
- C. both cities

24. Which city grew at a faster rate?

- A. Houston**
- B. Fort Worth
- C. both cities

25. The lines for Houston and Fort Worth show

- A. a decline in population.
- B. no change in population.
- C. a steady growth in population.**



Divide Decimals

When **dividing decimals** by a whole number, annex zeros to continue renaming to find a more accurate answer. Remember to place the decimal point in the quotient. Use compatible numbers to find an estimate range for the quotient.

divide decimals
estimate
check
powers of 10

A family found a bargain on a weekday ski pass. The cost was \$325 for 6 passes. What was the cost of each pass? Round to the nearest hundredth (nearest cent).

$$\$325 \div 6 = \$54.17$$

Estimate

$$6 \times 50 = 300$$

$$6 \times 60 = 360$$

Estimate range: **\$50–\$60**

Solve

$$\$54.166 \approx \$54.17$$

$$\begin{array}{r} \$54.166 \\ 6) \$325.000 \\ -30 \\ \hline 25 \\ -24 \\ \hline 10 \\ -6 \\ \hline 40 \\ -36 \\ \hline 40 \\ -36 \\ \hline 4 \end{array}$$

≈ means “is approximately equal to”

Check

$$\begin{array}{r} 214 \\ \times 54.17 \\ \hline \$325.02 \end{array}$$

Since \$54.166 was rounded to \$54.17, the product of \$54.17 and 6 will be a little more than the dividend \$325.

Exercises

Solve. Use multiplication to check the answer.

1. $3\overline{)9.75}$

2. $7\overline{)489.3}$

3. $6\overline{)70.68}$

4. $5\overline{)204.5}$

Solve. Annex zeros as needed.

5. $6\overline{)236.4}$

6. $3\overline{)22.26}$

7. $5\overline{)233.5}$

8. $4\overline{)16.420}$

9. $6\overline{)457.50}$

10. $5\overline{)24.320}$

11. $3\overline{)416.07}$

12. $4\overline{)152.20}$

Use compatible numbers to find the estimate range.

13. $38.96 \div 4$ **9–10**

14. $17.3 \div 3$ **5–6**

15. $694.29 \div 9$ **70–80**

16. $97.006 \div 5$ **10–20**

Round to the greatest place.

Choose the best estimate.

17.	2×157.02	200	400	600
18.	8×709.6	5,000	5,400	5,600
19.	6×0.956	6	60	66



Chairlifts are the primary transportation to ski slopes at most ski areas. A lift with four-person chairs can transport about 2,400 people per hour.

Dividing by Powers of 10

The decimal point moves 1 place to the left for each 0 in the **power of 10** divisor. Understanding this can help you to divide by powers of 10 using mental math.

$$\begin{array}{r} 3.751 \\ 10 \overline{)37.510} \\ -30 \\ \hline 75 \\ -70 \\ \hline 51 \\ -50 \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 0.3751 \\ 100 \overline{)37.5100} \\ -300 \\ \hline 751 \\ -700 \\ \hline 510 \\ -500 \\ \hline 100 \\ -100 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 0.03751 \\ 1,000 \overline{)37.51000} \\ -3000 \\ \hline 7510 \\ -7000 \\ \hline 5100 \\ -5000 \\ \hline 1000 \\ -1000 \\ \hline 0 \end{array}$$

Annex zeros as needed to complete the division.

$$37.51 \div 10^1 = 3.751$$

Think: 3.751

$$37.51 \div 10^2 = 0.3751$$

Think: 0.3751

$$37.51 \div 10^3 = 0.03751$$

Think: 0.03751

Exercises

Use mental math to solve. Annex zeros as needed.

20. $387 \div 10$ **38.7**

23. $42.71 \div 100$ **0.4271**

26. $16.81 \div 10$ **1.681**

29. $325.81 \div 1,000$ **0.32581**

21. $21.6 \div 100$ **0.216**

24. $37.04 \div 1,000$ **0.03704**

27. $0.793 \div 10$ **0.0793**

30. $46.21 \div 100$ **0.4621**

22. $53.2 \div 10^3$ **0.0532**

25. $316 \div 10^2$ **3.16**

28. $0.24 \div 10^1$ **0.024**

31. $273.81 \div 10^2$ **2.7381**

Solve.

32. Mason put 10 gallons of gas in his car. If he paid \$29.95 for the gas, how much did he pay for each gallon? (Round to the nearest hundredth.)
 $\$29.95 \div 10 = \$2.995 \approx \$3.00$

33. A snowstorm left 20.8 inches of snow in 9 hours. What was the average hourly snowfall? (Round to the nearest tenth of an inch.)
 $20.8 \div 9 = 2.31 \approx 2.3$ inches

Practice & Application *Answers are shown using cancellation.*

34. $\frac{1}{3} \times 3$ **1**

40. $(1 \times 800) + (1 \times 40) + (1 \times 5) = 1 \times \underline{\quad}$
845

35. $5 \times 2\frac{1}{8}$ **$\frac{5}{1} \times \frac{17}{8} = \frac{85}{8} = 10\frac{5}{8}$**

41. $n + 34.62 = 59$ **$59 - 34.62 = 24.38$;
 $n = 24.38$**

36. $11 \div \frac{1}{2}$ **$\frac{11}{1} \times \frac{2}{1} = \frac{22}{1} = 22$**

42. $\frac{1}{4} + \frac{2}{3} + n = 1$ **$(\frac{3}{12} + \frac{8}{12}) + n = 1$; $\frac{11}{12} + n = 1$;**

37. $\frac{1}{2} \div \frac{1}{4}$ **$\frac{1}{2} \times \frac{4}{1} = \frac{2}{1} = 2$**

43. 3.04×4.15 **12.616** **$\frac{12}{12} - \frac{11}{12} = \frac{1}{12}$; $n = \frac{1}{12}$**

38. $4\frac{1}{8} \div 2\frac{3}{4}$ **$\frac{33}{8} \times \frac{4}{11} = \frac{3}{2} = 1\frac{1}{2}$**

- J Without dividing the problem, explain how you know that the quotient of $5.6 \div 39$ is less than 1.
The divisor is larger than the dividend.

39. $(5 \times 10^3) + (6 \times 10^2) + (3 \times 10^1) + (4 \times 0.10^1)$
5,630.4

Estimate

Estimating the quotient of problems with decimal dividends is similar to estimating the quotient of problems with whole number dividends.

- Round the divisor to the greatest place.
- Determine the number of digits in the estimated quotient.
- Think of compatible numbers.

estimate quotients
check using multiplication

Solve the problem by dividing each place, annexing zeros as necessary to get the most accurate quotient. **Check** the solution using multiplication.

$$641.6 \div 32 = \underline{\quad}$$

Estimate

$$\begin{array}{r} 30 \\ \times 20 \\ \hline 600 \end{array}$$

$$30 \times 20 = 600$$

$$\begin{array}{r} 20.05 \\ 32 \overline{)641.60} \\ -64 \\ \hline 0160 \\ -160 \\ \hline 0 \end{array}$$

Check

$$\begin{array}{r} 20.05 \\ \times 32 \\ \hline 4010 \\ +60150 \\ \hline 641.60 \end{array}$$

Some estimates will be less than 1.

$$3 \div 4 = \underline{\quad}$$

$$\begin{array}{r} 0.7 \\ 4 \overline{)3.0} \\ -32 \\ \hline 80 \\ -80 \\ \hline 0 \end{array}$$

$$4 \times 0.7 = 2.8$$

Exercises

Estimate the quotient.

$$1. \ 6 \overline{)607.38}$$

$$2. \ 4 \overline{)248.4}$$

$$3. \ 18 \overline{)257.04}$$

$$4. \ 27 \overline{)130.95}$$

Solve. Use multiplication to check.

$$5. \ 9 \overline{)11.07}$$

$$6. \ 5 \overline{)1.545}$$

$$7. \ 3 \overline{)1.98}$$

$$8. \ 12 \overline{)66.0}$$

Solve.

$$9. \ 49 \overline{)22.491}$$

$$10. \ 8 \overline{)3.000}$$

$$11. \ 68 \overline{)4.488}$$

$$12. \ 12 \overline{)92.04}$$

$$13. \ 50 \overline{)8.00}$$

$$14. \ 2 \overline{)23.26}$$

$$15. \ 18 \overline{)14.94}$$

$$16. \ 14 \overline{)44.38}$$

17. Mr. Newton volunteers for search-and-rescue missions. Last week he drove 316.8 miles for a training class. He used 12 gallons of gas for the trip. How many miles per gallon did he average?
 $316.8 \div 12 = 26.4$ miles per gallon



Choose the best estimate. Write the equation using \approx .

18.	$161.39 \div 20$	0.8	8	80
19.	$5.8 \div 10$	0.6	6	60
20.	$4.086 \div 49$	8	0.8	0.08

$$161.39 \div 20 \approx 8$$

$$5.8 \div 10 \approx 0.6$$

$$4.086 \div 49 \approx 0.08$$



Estimate to determine the correct quotient. Write the equation.

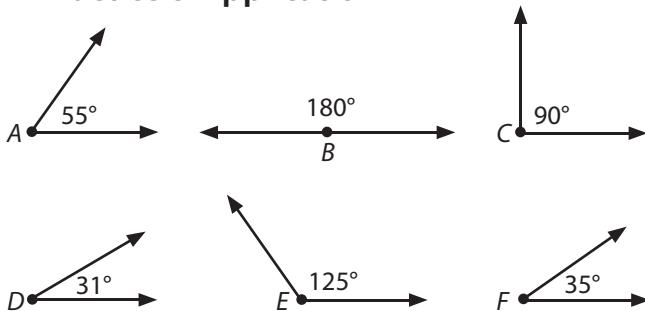
21.	$115.92 \div 56$	0.207	20.7	2.07
22.	$9.108 \div 36$	2.53	0.253	25.3
23.	$1 \div 4$	25	2.5	0.25

$$115.92 \div 56 = 2.07$$

$$9.108 \div 36 = 0.253$$

$$1 \div 4 = 0.25$$

Practice & Application



24. Which angle is a right angle? **C**

25. Name the measures of the acute angles.

55°, 31°, 35°

26. Name the measure of the obtuse angle. **125°**

27. What type of angle is angle B? **straight**

28. Supplementary angles equal 180°. Which two angles are supplementary? **A and E**

29. Complementary angles equal 90°. Which two angles are complementary? **A and F**

$$30. 7 - 3\frac{1}{8} \quad 6\frac{8}{8} - 3\frac{1}{8} = 3\frac{7}{8}$$

$$31. 9\frac{1}{8} - 5\frac{7}{8} \quad \frac{73}{8} - \frac{47}{8} = \frac{26}{8} = 3\frac{1}{4}$$

$$32. 7\frac{1}{2} - 1\frac{3}{4} \quad 6\frac{6}{4} - 1\frac{3}{4} = 5\frac{3}{4}$$

$$33. \frac{1}{2} + \frac{3}{8} + \frac{3}{4} \quad \frac{4}{8} + \frac{3}{8} + \frac{6}{8} = \frac{13}{8} = 1\frac{5}{8}$$

$$34. \frac{5}{12} + \frac{5}{6} + \frac{2}{3} \quad \frac{5}{12} + \frac{10}{12} + \frac{8}{12} = \frac{23}{12} = 1\frac{11}{12}$$

$$35. \frac{15}{16} \times \frac{8}{21} \quad \frac{5}{14}$$

$$36. \frac{12}{17} \times \frac{7}{20} \quad \frac{21}{85}$$

$$37. 2 \times (3.14 + 2.89) \quad 12.06$$

$$38. (7.83 - 2.59) \div 8 \quad 5.24 \div 8 = 0.655$$

$$39. 3.9 \times 2^3 \times 7 \quad 3.9 \times 8 \times 7 = 218.4$$

$$40. 5 \div \frac{3}{8} \quad 5 \times \frac{8}{3} = \frac{40}{3} = 13\frac{1}{3}$$

$$41. \text{Draw a picture to solve } 3\frac{3}{8} \div 1\frac{1}{8}.$$



$$\frac{27}{8} \div \frac{9}{8} = 3$$

Repeating Decimals

It is not always possible to find an exact quotient. Decimal quotients with one or more digits that repeat endlessly are **repeating decimals**. The repeating digits are identified by the bar above them.

repeating decimals

Any decimal quotient can be rounded to a given decimal place, such as the One Thousandths place. Use the approximate symbol (\approx) when writing rounded answers.

$$\begin{array}{r} 0.88 \\ 9 \overline{)8.00} \\ -72 \\ \hline 80 \\ -72 \\ \hline 8 \end{array}$$

$$8 \div 9 = 0.\overline{8}$$

$$8 \div 9 \approx 0.9$$

$$\begin{array}{r} 1.4285\dots \\ 14 \overline{)20.0000} \\ -14 \\ \hline 60 \\ -56 \\ \hline 40 \\ -28 \\ \hline 120 \\ -112 \\ \hline 80 \\ -70 \\ \hline 10 \end{array}$$

$$20 \div 14 \approx 1.429$$

Exercises

Divide. Mark the repeating digits.

$$1. 15 \overline{)49.00} \quad 3.2\overline{6}$$

$$2. 12 \overline{)101.000} \quad 8.41\overline{6}$$

$$3. 24 \overline{)80.0} \quad 3.\overline{3}$$

$$4. 6 \overline{)50.0} \quad 8.\overline{3}$$

$$5. 12 \overline{)25.000} \quad 2.08\overline{3}$$

$$6. 9 \overline{)39.70} \quad 4.4\overline{1}$$

$$7. 3 \overline{)17.90} \quad 5.9\overline{6}$$

$$8. 11 \overline{)4.025} \quad 0.365\overline{90}$$

Divide. Round the answer to the nearest one thousandth.

$$9. 14 \overline{)64.5000} \quad 4.6071 \approx 4.607 \quad 10. 8 \overline{)14.7000} \quad 1.8375 \approx 1.838 \quad 11. 23 \overline{)45.000} \quad 1.9565 \approx 1.957 \quad 12. 14 \overline{)27.000} \quad 1.9285 \approx 1.929$$

Solve.

13. Charlotte invited a new girl in her class to go cross-country skiing with her family. They skied 5.33 kilometers on Thursday and 4.75 kilometers on Friday. What was their average distance for the two days?

$$(5.33 + 4.75) \div 2 = 10.08 \div 2 = 5.04 \text{ km}$$

14. It took the girls about 2 hours to ski the 4.75 kilometers on Friday. About how many kilometers did they travel per hour? $4.75 \div 2 = 2.375 \text{ kilometers per hour}$

15. How many more kilometers did they travel on Thursday than on Friday? $5.33 - 4.75 = 0.58 \text{ of a kilometer}$



Solve.

16. The Jensens' power bills totaled \$1,650.24 for the year. What was the average cost per month?
 $\$1,650.24 \div 12 = \137.52

Solve. Use multiplication to check.

18. $21 \overline{) 98.28}$

19. $48 \overline{) 17.376}$

20. $39 \overline{) 104.13}$

Divide. Mark the repeating digits.

Round the non-repeating decimals to the nearest thousandth.

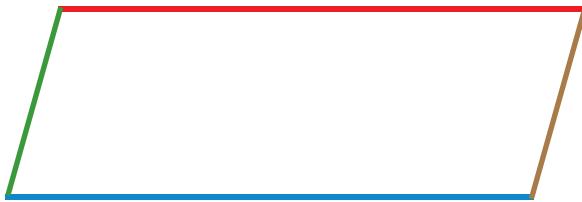
21. $55 \overline{) 350.000}$

22. $17 \overline{) 95.17000}$

23. $9 \overline{) 39.70}$

24. $\frac{13}{20} 0.65$

Practice & Application



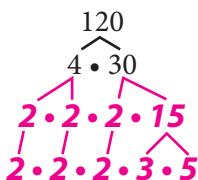
25. Name the figure. **parallelogram**

26. Name the parallel lines using the symbol \parallel .
red \parallel blue; green \parallel brown

27. Explain why this figure has no right angles.
There are no perpendicular lines.

28. If 3 angles in the figure above measure 114° , 66° , and 114° , what is the unknown measure of the fourth angle? $360^\circ - (114^\circ + 114^\circ + 66^\circ) = 360^\circ - 294^\circ = 66^\circ$

29. Complete the factor tree. Write the prime factorization using exponents. $2^3 \cdot 3 \cdot 5$



30. What factor does n represent in $4n = 88$?

$n = 22$

31. What factor does n represent in $40 \times 176 = (40 \times n) + (40 \times 70) + (40 \times 6)$? **$n = 100$**

32. Draw and label circle B . Draw a chord that is *not* a diameter. Label the chord \overline{AC} .

33. $13\frac{1}{2} \times 7\frac{1}{2} \quad \frac{27}{2} \times \frac{15}{2} = \frac{405}{4} = 101\frac{1}{4}$

34. $172.26 \div 18 \quad 9.57$

35. Write the decimal equivalent for $\frac{5}{8}$. **0.625**

36. Simplify $\frac{129}{21}$ as a mixed number. **$6\frac{1}{7}$**

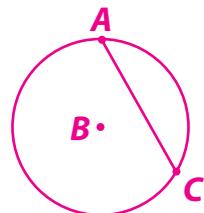
37. Solve $2^3 \cdot 3^2 \cdot 10^4$. **720,000**



Explain which number is more exact: $\frac{1}{12}$ or $0.08\bar{3}$.

$\frac{1}{12}$ is more exact; $0.08\bar{3}$ divides endlessly; it is a repeating decimal.

32.



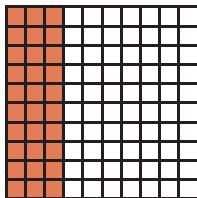
Complete **DAILY REVIEW C** on page 434.

Fractions as Decimals

Some fractions have an exact equivalent decimal. Other fractions result in a repeating decimal that divides endlessly. All decimals can be rounded to a given place.

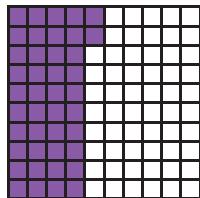
rename a fraction as a decimal

If the denominator is a power of 10, the fraction names the decimal.



$$\frac{3}{10} = 0.3$$

three tenths



$$\frac{42}{100} = 0.42$$

forty-two hundredths

If the denominator is a factor of a power of 10, rename the fraction. The fraction will name the decimal.

5 is a factor of 10.

$$\begin{array}{r} \times 2 \\ \frac{3}{5} = \frac{6}{10} = 0.6 \\ \times 2 \end{array}$$

six tenths

4 is a factor of 100.

$$\begin{array}{r} \times 25 \\ \frac{3}{4} = \frac{75}{100} = 0.75 \\ \times 25 \end{array}$$

seventy-five hundredths

If the denominator is not a power of 10 or a factor of a power of 10, divide the numerator by the denominator. The quotient is the equivalent decimal.

$$\begin{array}{r} \frac{1}{6} = 1 \div 6 = 0.\overline{16} \\ 1 \approx 0.17 \end{array}$$

$$\begin{array}{r} 0.166 \\ 6 \overline{)1.000} \\ -6 \\ \hline 40 \\ -36 \\ \hline 4 \\ -36 \\ \hline 4 \end{array}$$

$$\frac{9}{23} = 9 \div 23 \approx 0.391$$

$$\begin{array}{r} 0.3913\dots \\ 23 \overline{)9.00000} \\ -69 \\ \hline 210 \\ -207 \\ \hline 30 \\ -23 \\ \hline 70 \\ -69 \\ \hline 10 \end{array}$$

Exercises

Write the fraction as a decimal.

1. $\frac{7}{10}$ **0.7** 2. $\frac{19}{100}$ **0.19** 3. $\frac{3}{100}$ **0.03** 4. $\frac{5}{1,000}$ **0.005** 5. $\frac{8}{10}$ **0.8** 6. $\frac{27}{1,000}$ **0.027**

Rename the denominator as a power of 10.

Write the fraction as a decimal.

7. $\frac{1}{2} \frac{5}{10} = 0.5$ 8. $\frac{2}{5} \frac{4}{10} = 0.4$ 9. $\frac{7}{25} \frac{28}{100} = 0.28$ 10. $\frac{1}{4} \frac{25}{100} = 0.25$ 11. $\frac{7}{20} \frac{35}{100} = 0.35$ 12. $\frac{37}{50} \frac{74}{100} = 0.74$

Divide. Write the fraction as a decimal.

Mark the repeating digits with a bar (—).

Round the non-repeating decimals to the nearest thousandth.

13. $\frac{5}{6}$ **0.83** 14. $\frac{4}{15}$ **0.26** 15. $\frac{7}{11}$ **0.63** 16. $\frac{21}{40}$ **0.525** 17. $\frac{3}{8}$ **0.375** 18. $\frac{3}{19}$ **0.1578 \approx 0.158** 19. $\frac{5}{9}$ **0.5** 20. $\frac{2}{7}$ **0.2857 \approx 0.286** 21. $\frac{3}{5}$ **0.6** 22. $\frac{11}{15}$ **0.73** 23. $\frac{7}{12}$ **0.583** 24. $\frac{18}{25}$ **0.72**

Write the equivalent decimal of the fraction.

25. $\frac{1}{3}$ **0.3**

0.25

26. $\frac{2}{3}$ **0.6**

0.5

27. $\frac{1}{2}$ **0.5**

0.6

28. $\frac{1}{4}$ **0.25**

0.75

29. $\frac{3}{4}$ **0.75**

0.3

Solve. Use multiplication to check.

35. $20 \overline{) 19.00}$

0.95

36. $5 \overline{) 294.30}$

58.86

37. $2 \overline{) 3.0}$

1.5

38. $34 \overline{) 27.098}$

0.797

Practice & Application *Answers are shown using cancellation.*

39. Which fractions are equivalent to $\frac{1}{3}$?

$\frac{2}{7}, \frac{3}{9}, \frac{4}{12}$

51. $\frac{3}{8} + \frac{3}{4} = \frac{3}{8} + \frac{6}{8} = \frac{9}{8} = 1\frac{1}{8}$

40. What is the greatest common factor of 18 and 45? **9**

52. $5\frac{1}{2} - \frac{7}{8} = 5\frac{4}{8} - \frac{7}{8} = 4\frac{12}{8} - \frac{7}{8} = 4\frac{5}{8}$

41. What is the value of $2^3 \cdot 3^2 \cdot 5$?

$(2 \cdot 2 \cdot 2) \cdot (3 \cdot 3) \cdot 5 = 8 \cdot 9 \cdot 5 = 360$

42. $17,000 - 12,570$ **4,430**

53. $\underline{\quad} \div 2 = 26.5$ **$26.5 \times 2 = 53$**

43. $245 - 40.87$ **204.13**

54. Mark the repeating digits.

44. 21×583 **12,243**

0.32999... **0.32̄9**

0.12323... **0.12̄3**

45. 37.84×8 **302.72**

J The improper fraction $\frac{22}{7}$ can be used to determine pi (π). Pi is used to find the circumference of a circle. Rename $\frac{22}{7}$ as a decimal. Round to the nearest hundredth. **$\frac{22}{7} = 3.142 \approx 3.14$**

46. $5,000 \div 25$ **200**

47. Write and solve an addition equation for $6 \times \frac{7}{8}$.

48. $\frac{3}{4} \times 15 = \frac{3}{4} \times \frac{15}{1} = \frac{45}{4} = 11\frac{1}{4}$

49. $\frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1} = \frac{2}{1} = 2$

50. $\frac{6}{7} \div 2 = \frac{6}{7} \times \frac{1}{2} = \frac{3}{7}$

40. **18: 1, 2, 3, 6, 9, 18**

45: 1, 3, 5, 9, 15, 45

47. $\frac{7}{8} + \frac{7}{8} + \frac{7}{8} + \frac{7}{8} + \frac{7}{8} = \frac{42}{8} = 5\frac{2}{8} = 5\frac{1}{4}$



Write a comparison sentence using **>** or **<**.

30. $0.25 < \frac{1}{3}$

31. $\frac{1}{2} > 0.\bar{3}$

32. $\frac{7}{20} < 0.75$

33. $0.975 > \frac{7}{8}$

34. $\frac{3}{5} > 0.59$

Divide by a Decimal

Multiplying the divisor and the dividend by the same power of 10 does not change the quotient.

decimal divisors

$$32 \div 4 = 8$$

Multiply the dividend and the divisor by 10.

$$320 \div 40 = 8$$

$$3,200 \div 400 = 8$$

Multiply the dividend and the divisor by 100.

When the divisor is a decimal, multiply the divisor by the power of 10 that will make the divisor a whole number. Multiply the dividend by the same power of 10. Divide to find the quotient.

$$\begin{array}{r} \times 10 \quad \times 10 \\ 12.5 \overline{)175.0} \\ \hline \end{array}$$

$$\begin{array}{r} 14 \\ 125 \overline{)1,750} \\ -125 \\ \hline 500 \\ -500 \\ \hline 0 \end{array}$$

$$175 \div 12.5 = 14$$

Multiply 12.5 by 10 to make a whole-number divisor.

$$10 \times 12.5 = 125$$

Multiply the dividend, 175, by 10 also.

$$10 \times 175 = 1,750$$

Exercises

Divide. Mark the repeating digits.

Round the non-repeating decimals to the nearest thousandth.

- | | | | | |
|--|---|--|---|---|
| 1. $0.\overline{3}\overline{9}0$ | 5. $0.\overline{5}\overline{1}\overline{6}0$ | 9. $0.\overline{9}\overline{6}\overline{7}7 \approx 0.968$ | 13. $3.\overline{2}\overline{8}0\overline{0}$ | 17. $0.1\overline{2}\overline{4}0\overline{0}$ |
| 2. $0.1\overline{5}\overline{7}5\overline{00}$ | 6. $3.\overline{5}\overline{8}0\overline{0000}$ | 10. $0.\overline{4}\overline{3}\overline{00}$ | 14. $0.0\overline{5}\overline{3}\overline{9}0\overline{00}$ | 18. $3.\overline{5}\overline{4}\overline{2}0\overline{0}$ |
| 3. $1.\overline{2}\overline{3}0\overline{0}$ | 7. $0.\overline{7}\overline{1}\overline{3}0\overline{0000}$ | 11. $0.0\overline{9}\overline{8}\overline{000}$ | 15. $5.\overline{2}\overline{1}\overline{4}\overline{2}0\overline{00000}$ | 19. $0.3\overline{8}\overline{00}$ |
| 4. $1.\overline{6}\overline{9}0\overline{000}$ | 8. $0.3\overline{2}\overline{6}\overline{4}0\overline{0}$ | 12. $2.\overline{5}\overline{1}\overline{5}0\overline{0}$ | 16. $12.\overline{4}\overline{4}\overline{9}\overline{6}0\overline{0}$ | 20. $0.3\overline{2}\overline{7}\overline{6}0$ |



Solve.

21. Mr. Griffin is teaching a class on how to tie knots. The rope he plans to purchase is 8 meters long. He will cut the rope into 0.4-meter pieces so that his 28 students can practice. Will 8 meters of rope be enough? Explain your answer.

$$\text{No; } 8 \div 0.4 = 20$$

22. Mrs. Griffin is preparing snacks for the class. She can get $2\frac{1}{2}$ servings out of each bag of popcorn. How many bags of popcorn will she need to pop to serve the 28 students?

$$28 \div 2\frac{1}{2} = 28 \times \frac{2}{5} = \frac{56}{5} = 11\frac{1}{5}; \\ \text{12 bags of popcorn are needed.}$$

23. Find the average amount of snowfall for the 3 days listed in the chart. Rename the fractions as decimals. Round the quotient to the nearest hundredth of an inch. $(0.75 + 1.5 + 2.125) \div 3 = 4.375 \div 3 = 1.4583 \approx 1.46 \text{ in.}$

Day	Snowfall
Sunday	$\frac{3}{4}$ in.
Monday	$1\frac{1}{2}$ in.
Tuesday	$2\frac{1}{8}$ in.

Practice & Application

24. $253 \div 10^3$ **0.253**

$$\underline{2.2575}$$

25. $16 \overline{)36.12}$ **00**

26. $42 \div 3.9$ (Round to the nearest thousandth.)

$$\underline{10.769}$$

27. $278 \div 0.4$ **695**

28. $\frac{10}{13} \times \frac{5}{16}$ **25**

$$\underline{104}$$

29. What is the decimal equivalent for $\frac{3}{5}$? **0.6**

30. Write 100,942,067 in expanded form.

31. Write the value of 3 in 103,295,100 in standard form. **3,000,000**

32. Write the number that is 10,000 more than 5,293,600. **5,303,600**

33. What is 15 more than 129? **129 + 15 = 144**

34. Write 3 related equations for $17.8 + 16.04 = 33.84$.

35. What is 3,000 less than 42,900?

$$\underline{42,900 - 3,000 = 39,900}$$

36. Find the estimate range for the quotient of 1,687 miles traveled in 3 days. **500 – 600**

37. Solve problem 36 to find the average miles traveled in 3 days. **562.3 miles**

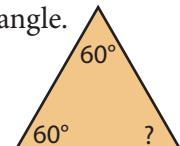
30. **$100,000,000 + 900,000 + 40,000 + 2,000 + 60 + 7$**

34. **$16.04 + 17.8 = 33.84; 33.84 - 16.04 = 17.8; 33.84 - 17.8 = 16.04$**

38. What is the cost of 2 pounds of grapes at \$1.89 per pound? **$2 \times \$1.89 = \$3.78$**

39. Find the measure of the unknown angle.

$$180^\circ - (60^\circ + 60^\circ) = 60^\circ$$



40. Draw two lines that are parallel.

41. What type of angle is formed at the intersection of perpendicular lines? **right angle**



If the divisor of a division problem or the denominator of a fraction is 2, 5, or 10, will the quotient be a repeating decimal? Solve these problems to help you explain your answer.

4.85

$2 \overline{)9.70}$

$23 \div 5$

4.6

$\frac{9}{10}$

No, because you can annex zeros to solve division problems, and all numbers ending in zero are multiples of 2, 5, and 10.

More Dividing Decimals

Multiply the divisor and the dividend by the same power of 10 to make a whole number divisor. Annex zeros as needed to solve.

Multiply the divisor and the dividend by 100.

$$\begin{array}{r} \times 100 \\ 0.12 \overline{)1.32} \\ \underline{-12} \\ -12 \\ 0 \end{array} \quad 1.32 \div 0.12 = 11$$

Multiply the divisor and the dividend by 10.

$$\begin{array}{r} \times 10 \\ 2.5 \overline{)26.00} \\ \underline{-25} \\ -100 \\ -100 \\ 0 \end{array} \quad 26 \div 2.5 = 10.4$$

Exercises

Solve. Mark the repeating digits.

1. $15\overline{)3.0}$ **0.2**

4. $0.3\overline{)2.7}$ **9**

7. $5\overline{)0.95}$ **\$0.19**

10. $0.6\overline{)0.18}$ **0.3**

2. $12\overline{)75.00}$ **\$6.25**

5. $8\overline{)27.400}$ **3.425**

8. $1.1\overline{)6.82}$ **6.2**

11. $1.6\overline{)3.400}$ **2.125**

3. $3.6\overline{)7.680}$ **2.13**

6. $5\overline{)6.0}$ **1.2**

9. $0.24\overline{)9.280}$ **38.6**

12. $1.8\overline{)7.4500}$ **4.138**

Complete the table.

Rule: $\div 4$	
Input	Output
1.84	0.46
8.4	2.1
12.6	3.15

Rule: $\div 1.5$	
Input	Output
1.05	0.7
1.2	0.8
1.35	0.9

Rule: $\div 4.2$	
Input	Output
9.66	2.3
10.5	2.5
16.8	4

Solve. Round to the nearest thousandth.

16. $2.3\overline{)0.31000}$ **0.1347** \approx **0.135**

17. $2.1\overline{)8.30000}$ **3.9523** \approx **3.952**

18. $7.7\overline{)2.57000}$ **0.3337** \approx **0.334**

19. $0.17\overline{)49.000}$ **288.2352** \approx **288.235**

Solve.

Round the answer to the nearest hundredth (nearest cent).

20. If a 2-pound roast costs \$9.35, what is the price per pound? $\$9.35 \div 2 = \$4.675 \approx \$4.68$
21. If a bag of 8 apples costs \$3.79, what is the price per apple? $\$3.79 \div 8 = \$0.473 \approx \$0.47$
22. If 16 ounces of peanut butter cost \$2.98, what is the price per ounce? $\$2.98 \div 16 = \$0.186 \approx \$0.19$

Write a comparison sentence using $>$, $<$, or $=$.

23. $0.864 \div 2 < 8.64 \div 2$
24. $3,200 \div 400 = 32 \div 4$
25. $176 \div 8 > 17.6 \div 8$
26. $13.55 \div 5 < 135.5 \div 5$

Solve.

27. Mr. and Mrs. Carlton are taking Jeremiah and Mr. Carlton's parents on a 3-day Colorado ski trip. They will travel 1,000 miles in Mr. Carlton's car, which gets 30 miles per gallon of gasoline. How many gallons of gasoline will he need to purchase during the trip? (Round the quotient to the nearest hundredth.)

$$1,000 \div 30 = 33.333 \approx 33.33 \text{ gallons}$$

28. The cost of the daily pass if purchased at the resort is \$94 for Dad, \$84 for Grandfather, and \$64 for Jeremiah. What will the cost be for 3 days?

$$3 \times (\$94 + \$84 + \$64) = 3 \times \$242 = \$726$$

Practice & Application

31. $2.359 \div 1,000$ **0.002359**

$$\underline{1.216}$$

32. $0.6 \overline{)0.73} \underline{00}$

33. 2.48×100 **248**

34. Draw a picture to show $\frac{1}{4} \times 20$.



29. Mom and Grandmother budgeted \$300 for meals on the trip. Dad, Jeremiah, and Grandfather will each take \$10 a day for lunches on their 3 ski trips. How much money is left for Mom and Grandmother to spend for groceries?

$$\$300 - 3 \times (3 \times \$10) = \$300 - \$90 = \$210$$

30. Mom found a bargain on 3-day passes on the Internet. The cost for Dad is \$267, the cost for Grandfather is \$237, and the cost for Jeremiah is \$168. How much will the Carltons save by purchasing tickets online? $\$726 - (\$267 + \$237 + \$168) = \$726 - \$672 = \$54$

35. Draw 2 congruent quadrilaterals with 4 right angles. **Answers will vary.**

36. Draw 2 similar triangles. **Answers will vary.**



Explain how to solve the division problems below. Solve. What basic fact solved both problems?

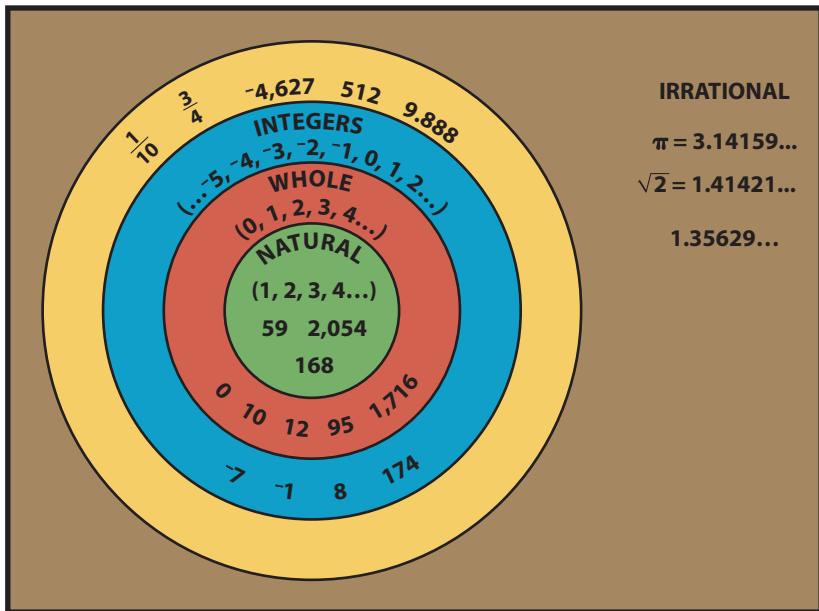
$5.6 \div 0.8$ **7**

$0.56 \div 0.08$ **7**

Multiply the divisor and dividend by the same power of 10. $56 \div 8 = 7$

Real Numbers

Real Numbers



- **Real numbers** include all rational and irrational numbers.

- **Irrational numbers** are decimals that do not repeat or terminate.

- **Rational numbers** include all integers, fractions, and decimals that repeat or terminate.

- **Integers** include all whole numbers and their negative opposites.

- **Whole numbers** include all natural numbers and zero.

- **Natural numbers** are the counting numbers.

Exercises

Draw and label a real-number diagram like the one above.
Write the given number in the most precise category on the chart.

1. $\frac{1}{12}$

4. 92

7. 0.275

10. 0

2. $0.\overline{2}$

5. 0.8333

8. -11

11. $\frac{4}{8}$

3. $-\frac{8}{10}$

6. $0.\overline{96}$

9. 3

12. 0.354354435444...

Write true or false.

13. -17 is an integer and a whole number. **false**

17. The sum of 15 and -6 is an integer. **true**

14. 5,267 is a whole number. **true**

18. The sum of 8 and -8 is a whole number. **true**

15. $\frac{1}{5}$ is an irrational number. **false**

19. The sum of $\frac{1}{4}$ and $\frac{9}{12}$ is a whole number. **true**

16. 37 is an integer. **true**

20. Explain your answers for statements 13 and 15.

MEET THE MATHEMATICIAN

Sophie Germain (1776–1831) had to overcome several hurdles in her study of mathematics. First, her parents did not think mathematics was a suitable study for girls. After they realized how much mathematics meant to her, they changed their minds and supported her efforts.

Also, because she was a woman, Sophie was denied entrance to the university in France; so she studied the notes made available to her from the classes. She even submitted a paper to the professor under the name M. Leblanc and received excellent marks on it. In 1816, Sophie won a distinguished French award for her work in the field of the mathematics of elasticity and became a recognized leader in mathematical thought.



Addition and Multiplication Properties can be used with all real numbers.

Addition Properties

Commutative

$$a + b = b + a$$
$$\frac{1}{2} + \frac{4}{6} = \frac{4}{6} + \frac{1}{2}$$

Associative

$$(a + b) + c = a + (b + c)$$
$$(1.76 + 3.2) + 5 = 1.76 + (3.2 + 5)$$

Identity

$$a + 0 = a$$
$$\frac{18}{25} + 0 = \frac{18}{25}$$

Multiplication Properties

Commutative

$$a \times b = b \times a$$
$$-2 \times 5 = 5 \times -2$$

Associative

$$(a \times b) \times c = a \times (b \times c)$$
$$(1.3 \times -4) \times 10 = 1.3 \times (-4 \times 10)$$

Identity

$$a \times 1 = a$$
$$6.735 \times 1 = 6.735$$

Zero

$$a \times 0 = 0$$
$$-\frac{15}{32} \times 0 = 0$$

Distributive

$$a(b + c) = (a \times b) + (a \times c)$$
$$-3(5 + 6) = (-3 \times 5) + (-3 \times 6)$$

Exercises

Use a property to complete the equation.

Name the property used.

21. $\frac{17}{2} + 4 = 4 + \underline{\quad} \frac{17}{2}$

Commutative Property of Addition

22. $-5.6 \times 0 = \underline{\quad} 0$

Zero Property of Multiplication

23. $\frac{15}{4}(87 + 56) = (\underline{\quad} \times 87) + (\frac{15}{4} \times 56) \frac{15}{4}$

Distributive Property

24. $\frac{8}{13} \times -\frac{7}{12} = \underline{\quad} \times \frac{8}{13} - \frac{7}{12}$

Commutative Property of Multiplication

25. $(0.769 + 4.9) + 37 = 0.769 + (\underline{\quad} + \underline{\quad}) 4.9; 37$

Associative Property of Addition

26. $(-300 \times 40) \times -20 = \underline{\quad} \times (\underline{\quad} \times -20) -300; 40$

Associative Property of Multiplication

Practice & Application *Answers are shown using cancellation.*

27. Adam had $\frac{3}{4}$ of a ton of gravel. He separated it into piles that were $\frac{1}{16}$ of a ton each. How many piles of gravel did he have?

$$\frac{3}{4} \div \frac{1}{16} = \frac{3}{4} \times \frac{16}{1} = \frac{12}{1} = 12 \text{ piles}$$

28. A basketball team bought 3 basketballs at a cost of \$23.95 each. If 5 boys shared the cost equally, how much did each boy pay?

$$(3 \times \$23.95) \div 5 = \$71.85 \div 5 = \$14.37$$

29. Keira bought 10.7 pounds of ground turkey. She decided to divide it by putting 0.75 of a pound of meat into each freezer bag. How many bags will she use? $10.7 \div 0.75 = 14.26; 15 \text{ bags}$

30. For lunch, Eden ate a 300-calorie cheeseburger, a 165-calorie salad, and an 85-calorie apple. How many total calories were in her lunch?

$$300 + 165 + 85 = 550 \text{ calories}$$

31. Mr. Hall had 100 cards to be put into envelopes. Six cards were to be put into each envelope, and the extra cards were to be returned to the school office. How many cards were returned to the office?

$$100 \div 6 = 16 \text{ r}4 \text{ or } 16 \frac{4}{6}; 4 \text{ cards were returned.}$$

CHAPTER 9 REVIEW

Use mental math to solve.

1. $47.6 \div 1,000$ **0.0476**

4. $61.43 \div 100$ **0.6143**

7. $258.4 \div 10^2$ = **2.584**

2. $75.9 \div 100$ **0.759**

5. $784.14 \div 10$ **78.414**

8. $26.3 \div 10^1$ **2.63**

3. $213.4 \div 1,000$ **0.2134**

6. $566 \div 10^3$ **0.566**

9. $141.3 \div 10^2$ **1.413**

Rename the denominator as a power of 10.

Write the fraction as a decimal.

10. $\frac{4}{5}$ **$\frac{8}{10} = 0.8$**

11. $\frac{3}{20}$ **$\frac{15}{100} = 0.15$**

12. $\frac{1}{2}$ **$\frac{5}{10} = 0.5$**

13. $\frac{15}{25}$ **$\frac{60}{100} = 0.60$**

Solve. Mark the repeating digits.

63.23

14. $6\overline{)379.38}$

4.3
17. $1.5\overline{)6.50}$

24
20. $0.5\overline{)120}$

\$0.37

15. $4\overline{)\$1.48}$

17.3
18. $0.3\overline{)5.20}$

13.16
21. $0.12\overline{)1.5800}$

45

16. $0.2\overline{)90}$

25
19. $0.28\overline{)700}$

\$0.54
22. $27\overline{)14.58}$

Solve. Round to the nearest thousandth.

3.65

23. $14\overline{)51.10}$

0.4228 \approx **0.423**

24. $76\overline{)32.1400}$

1.3437 \approx **1.344**

25. $16\overline{)21.5000}$



Ski areas sometimes use snow-making machines to resurface their ski trails.

Divide. Write the fraction as a decimal.
Mark the repeating digits.

26. $\frac{8}{9}$ **0.8**

27. $\frac{7}{10}$ **0.7**

28. $\frac{2}{3}$ **0.6**

29. $\frac{5}{6}$ **0.83**

Write a comparison sentence using **>** or **<**.

30. $\frac{1}{2} < 0.\overline{6}$

31. $\frac{95}{100} > 0.75$

32. $\frac{2}{3} > 0.\overline{3}$

33. $0.125 < \frac{5}{8}$

Estimate the quotient.

34. $7.7\overline{)25.6}$

35. $0.6\overline{)73.5}$

36. $1.8\overline{)20.44}$

37. $5.9\overline{)418.6}$

Solve. **Answers are shown using cancellation.**

38. Mrs. McKenzie bought canned food for the food bank. She bought 10 cans of green beans that cost \$0.96 each and 10 cans of corn that cost \$0.78 each. How much did she spend for canned vegetables? $(10 \times \$0.96) + (10 \times \$0.78) = \$9.60 + \$7.80 = \$17.40$

39. Brandon ordered a set of 4 books about mountain climbing. The books weighed 9.2 pounds. What was the average weight of each book?
 $9.2 \div 4 = 2.3$ pounds

40. The cost of snow tubing on the mountain is \$20 per hour for each person. How much would it cost for Brody and Chase to snow tube for $1\frac{1}{2}$ hours?

$2 \times (1\frac{1}{2} \times \$20) = 2 \times (\frac{3}{2} \times \$20) = 2 \times \$30 = \60

41. Mrs. Thomas brought $2\frac{1}{2}$ cases of juice boxes for the class party. There are 10 juice boxes in each case. How many drinks does she have for her class?

$2\frac{1}{2} \times 10 = \frac{5}{2} \times \frac{10}{1} = 25$ drinks

42. Mr. Jackson bought lunch for his 4 children. Two of the children each ordered a meal that cost \$4.95. The third child ordered a meal that cost \$3.75, and the fourth child ordered a meal that cost \$2.79. What was the total cost of the meals?

43. Peter stops for a cup of coffee every 200 miles that he travels. If coffee costs about \$1.60 a cup, about how much will he spend on coffee during an 800-mile trip?

$(800 \div 200) \times \$1.60 = 4 \times \$1.60 = \$6.40$

42. **$(2 \times \$4.95) + \$3.75 + \$2.79 = \16.44 or
 $\$4.95 + \$4.95 + \$3.75 + \$2.79 = \$16.44$**

Test Prep

Mark the answer.

1. The holiday candy bars are specially priced: 4 for \$1.00. How many can Brooklyn buy if she has \$17.25?

A. 57 C. 85
 B. 69 D. 100

2. A flat of 10 tomato plants costs \$5.50. Individual plants cost \$0.75. How much would it cost to purchase 35 plants?

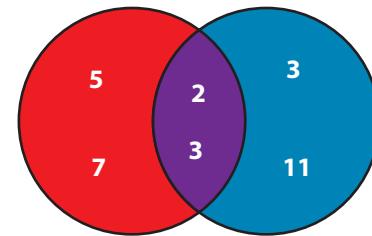
A. \$9.25 C. \$13.25
 B. \$11.00 D. \$20.25

3. Mr. Hudson needs $190\frac{1}{2}$ feet of fencing to put around the perimeter of his square garden. What is the measure of each side?

A. $47\frac{1}{2}$ feet C. $48\frac{3}{8}$ feet
 B. $47\frac{5}{8}$ feet D. $49\frac{1}{4}$ feet

4. The mountain rescue team responded to 6 calls in April. They responded to $3\frac{1}{2}$ times as many calls in July. How many calls did the team respond to in July?

A. 21 C. 36
 B. 25 D. 42



5. What product is represented by the factors in the blue circle?

A. 33 C. 280
 B. 198 D. 330

6. What product is represented by the factors in the red circle?

A. 35 C. 297
 B. 210 D. 310

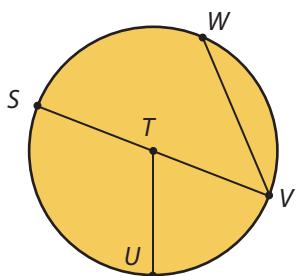
7. What is the greatest common factor of the two products?

A. 6 C. 14
 B. 12 D. 35

8. What statement is true of the numbers in the red and blue circles?

A. They are prime numbers.
 B. They are multiples of the number they represent.
 C. They have a product of 35.
 D. The product of the factors is a prime number.

Use the circle to find the answer.



9. Name the diameter.

- A. \overline{WV} C. \overline{SV}
B. \overline{TU} D. \overline{TV}

10. If $\overline{TU} = 8$ cm, then ____.

- A. $\overline{WV} = 8$ cm C. $\overline{TV} = 16$ cm
B. $\overline{TS} = 16$ cm D. $\overline{SV} = 16$ cm

11. $\angle UTV$

- A. acute angle C. straight angle
B. obtuse angle D. complementary angles

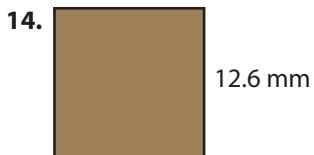
12. Which angle measures 180° ?

- A. $\angle STU$ C. $\angle SVW$
B. $\angle STV$ D. $\angle UTV$

13. What is \overline{WV} ?

- A. chord C. diameter
B. radius D. supplementary

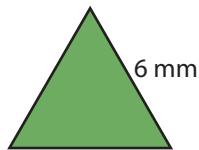
Use the figure to find the answer.



The perimeter of the square is ____.

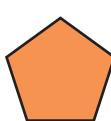
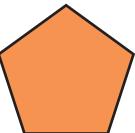
- A. 12.6 mm C. 37.8 mm
B. 25.2 mm D. 50.4 mm

15.



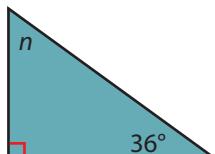
- A. similar C. scalene
B. congruent D. obtuse

16.



- A. similar C. octagon
B. congruent D. parallel

17.



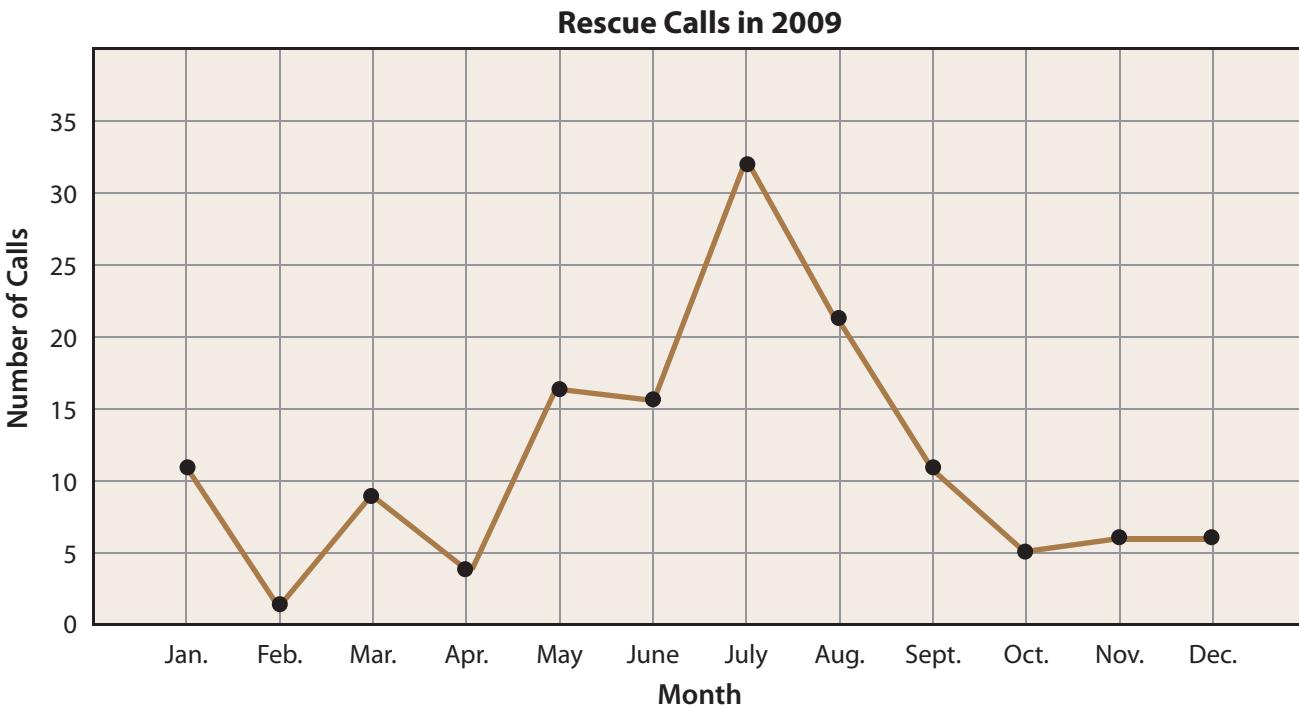
- A. $n = 30^\circ$ C. $n = 50^\circ$
B. $n = 45^\circ$ D. $n = 54^\circ$

18.



- A. right triangle C. acute triangle
B. obtuse triangle D. equilateral triangle

Use the data from the line graph to find the answer.



19. Which month had the fewest calls?

- A. February
- B. April
- C. October

20. Which statement is true of the months of July to October?

- A. The number of calls increased.
- B. The number of calls decreased.
- C. The number of calls was about the same.

21. How many rescue calls were made in November and December?

- A. 5
- B. 12
- C. 20

22. Where is the greatest increase of calls shown?

- A. from April to May
- B. from June to July
- C. from July to August

23. Which two months together had about the same number of calls as the month of July?

- A. November and December
- B. February and August
- C. May and June

24. Estimate the number of calls for the year.

- A. greater than 200, but less than 300
- B. less than 100, but greater than 50
- C. greater than 100, but less than 200



LOGIC

Using Logic to Solve a Problem

1. Read the problem to find clues.
2. Examine each clue.
3. Draw a chart to help solve the problem.

Use logic to solve the problems. Copy the chart.

Read the clue and write yes or no in each box to solve.

- 1.** A post office, a grocery store, a park, and a school are all in a row. Complete the chart to find the position of each place.

- The school is not first.
- The grocery store is between the post office and the park.
- The post office is between the school and the grocery store.

	1	2	3	4
post office	no	no	yes	no
grocery store	no	yes	no	no
park	yes	no	no	no
school	no	no	no	yes

- 2.** Lauren, Kayla, Ian, and Blake are 9, 10, 12, and 14 years old. Complete the chart to find each person's age.

- Ian is older than Blake and younger than Lauren.
- Kayla is younger than Ian and older than Blake.

	9	10	12	14
Lauren	no	no	no	yes
Kayla	no	yes	no	no
Ian	no	no	yes	no
Blake	yes	no	no	no

- 3.** The last names of Ava, Isaac, Bella, and Wyatt are Candler, Miller, Beals, and Buckley. Complete the chart to match up the first and last names.

- Beals is Buckley's grandfather. He is not related to Ava.
- Isaac is eight years old.
- Isaac is not related to Wyatt or Miller.

	Candler	Miller	Beals	Buckley
Ava	no	yes	no	no
Isaac	yes	no	no	no
Bella	no	no	no	yes
Wyatt	no	no	yes	no

Expressions

An **expression** is a mathematical phrase made up of numbers, operation signs, and sometimes variables. A **variable** is a letter used to represent an unknown value. An expression can be written by interpreting a word phrase.

Two added to thirty: $30 + 2$

A number divided by 3: $n \div 3$

An **algebraic expression** always uses a variable. When the operation is multiplication, an algebraic expression is written using a **coefficient** (number) before the variable. A multiplication sign is *not* needed.

The product of a number and 12: $12n$

$12n = 12 \times n$
12 is the coefficient of the variable n .

Expressions can be evaluated by **substituting** a value for the variable.

Calculate to find a numerical value for the expression.

Home Zone offers a discount to customers who purchase 4 or more gallons of paint. Mr. Lehman purchased 4 gallons of paint for his music studio. Write an algebraic expression to show the cost of paint for Mr. Lehman. Find the cost if the discounted price is \$13.00 for each gallon.

4g

$4(\$13.00) = \52.00

The cost of 4 gallons of paint is \$52.00.



expression
variable
algebraic expression
coefficient
substitution

Exercises

Complete the word phrase for the expression. **Answers may vary.**

1. $15 + 32$: ___ added to ___ **32; 15**
2. $14\frac{1}{2} \div 4 + 3$: ___ divided by ___ **$3; 14\frac{1}{2}; 4$**
3. $6c$: ___ times ___ **6; a number**
4. $8x - 2$: ___ less than ___ times ___ **2; 8; a number**

Write the numerical expression for the word phrase.

5. 52 less than 96 **$96 - 52$**
6. the product of 4 and 6 **4×6**
7. 12 decreased by 1.7 **$12 - 1.7$**
8. 3 to the second power added to 9 **$9 + 3^2$**
9. 8 multiplied by 2 **2×8**
10. 0.9 more than 1.06 **$1.06 + 0.9$**
11. the quotient of 32 and 4 **$32 \div 4$**
12. 17.3 increased by three-tenths **$17.3 + 0.3$**



Write the algebraic expression for the word phrase.

13. a number divided by 7 $n \div 7$

14. 9 times a number $9n$

15. 0.2 less than a number $n - 0.2$

16. 16.8 more than n $n + 16.8$

17. $\frac{3}{4}$ of a number $\frac{3}{4}n$

Write the algebraic expression.

Identify what the variable represents in the expression.

18. 1.5 less than n $n - 1.5$

19. n divided by 8, decreased by 4 $n \div 8 - 4$

20. 2 less than 3 times n $3n - 2$

21. the sum of 6 and a number, divided by 3
 $(6 + n) \div 3$

22. $\frac{2}{3}$ of a number divided by 12
 $\frac{2}{3} \times (n \div 12)$ or $(\frac{2}{3} \times n) \div 12$

Variables and explanations may vary.

23. The pet shop sold 3 of the parakeets. $p - 3$; ***p represents the number of parakeets.***

24. Jillian grew 3 inches.
s + 3; s represents the height of Jillian.

25. Cameron read $2\frac{1}{2}$ times as many books as Joseph.

26. Matthew scored 10 fewer points than Alexa on the math test. $a - 10$; ***a represents Alexa's math test score.***

Evaluate the expression. Let $x = 3$.

29. $2x - 5$
 $(2 \times 3) - 5 = 1$

30. $15 \div x + 4$
 $15 \div 3 + 4 = 9$

31. $x + 7 \times 3$
 $3 + 7 \times 3 = 24$

32. $12 - x + 2$
 $12 - 3 + 2 = 11$

Practice & Application

33. List the factors for 36 and 72. What is the greatest common factor? **GCF = 36**

34. Write an equation showing that 42 is a multiple of 6. **$7 \times 6 = 42$**

35. Rename $\frac{5}{6}$ and $\frac{7}{8}$ using a common denominator. Write a comparison statement using the *greater than* sign ($>$). **$\frac{5}{6} = \frac{20}{24}; \frac{7}{8} = \frac{21}{24}; \frac{21}{24} > \frac{20}{24}$ or $\frac{7}{8} > \frac{5}{6}$**

36. Explain how the fractions $\frac{6}{16}$, $\frac{9}{24}$, and $\frac{12}{32}$ are related to $\frac{3}{8}$.

37. Write the next three numbers in the pattern:
24, 48, 96. **192, 384, 768**



41. $3.8 + 2.05 = 5.85$ $5.85 - 2.05 = 3.8$
 $2.05 + 3.8 = 5.85$ $5.85 - 3.8 = 2.05$

38. Draw and name two quadrilaterals with no right angles. **Answers will vary.**

39. How many cookies are in $3\frac{1}{2}$ dozen?
 $(3 \times 12) + 6 = 42$ cookies

40. Evaluate the expression if $b = 6$. $7(b) + 3.5$
 $7(6) + 3.5 = 42 + 3.5 = 45.5$

41. Write two related addition equations and two related subtraction equations using 3.8, 2.05, and 5.85.

42. Write $\frac{3}{4}$ as a decimal. **$\frac{3}{4} = 0.75$**

J Explain why it is important to use the order of operations to solve the problem $3x + 24 \div 3 - 2$ if $x = 10$.

**$(3 \times 10) + (24 \div 3) - 2 = 30 + 8 - 2 = 36$;
Following the order of operations is the only way to get the correct answer.**

Equations

An **equation** is a mathematical sentence stating that two expressions are equal.
An equation can be written with or without variables.

equation

25 added to 75 is 100.	$75 + 25 = 100$
Two less than y is 12.	$y - 2 = 12$
Dividing c by 4 equals 9.	$c \div 4 = 9$

Exercises

Complete the sentence for the equation.

- $\frac{30}{y} = 15$: 30 divided by y equals 15 .
- $3x + 8 = 20$: the sum of 3 times x and 8 is 20 .
- $n + 7 = 25$: a number increased by 7 equals 25 .
- $6p - 4 = 32$: 4 less than 6 times p equals 32 .
- $9s = 63$: the product of 9 and s is 63 .
- $\frac{m}{2} - 2 = 3$: the quotient of m and 2 decreased by 2 equals 3 .



Write an equation for the sentence.

- 5 less than a number is 17. $n - 5 = 17$
- 8 less than 6 times r equals 4. $6r - 8 = 4$
- A number divided by 7 is 6. $\frac{n}{7} = 6$
- 3 times s equals 27. $3s = 27$
- A number decreased by 2 is 27. $n - 2 = 27$
- 9 added to a number equals 21. $n + 9 = 21$

Evaluate the expression. Let $s = 8$.

Write a comparison sentence using $>$, $<$, or $=$.

- $2 + s < 15 - 3$ $10 < 12$
- $\frac{24}{s} < 2^2$ $3 < 4$
- $12 - s = 2 \cdot 2$ $4 = 4$
- $\frac{s}{4} > 2 - 1$ $2 > 1$
- $4s > 30$ $32 > 30$
- $s^2 = 60 + 4$ $64 = 64$

Complete the table using the given values to evaluate the expression.

x	$\frac{x}{4} - 3$
12	0
16	1
20	2
24	3

x	$5x + 2$
2	12
3	17
5	27
7	37

x	$6 + x^2$
2	10
3	15
4	22
5	31

Write an addition and a subtraction equation for each word problem.
Use a variable for the unknown part.

22. Nine pieces of pizza were left after the family ate 7 pieces. How many pieces of pizza did the family begin with? $9 + 7 = p$; $p - 7 = 9$

23. The basketball team won 8 of its 12 basketball games. How many games were lost?
 $8 + g = 12$; $12 - g = 8$ or $12 - 8 = g$

Evaluate the expression. Let $m = 6$.

24. $30 \div m - 3$

$$\begin{aligned}30 \div 6 - 3 &= \\5 - 3 &= 2\end{aligned}$$

25. $m + 8 \times 3$

$$\begin{aligned}6 + 8 \times 3 &= \\6 + 24 &= 30\end{aligned}$$

26. $2(m + 1) \div 2$

$$\begin{aligned}2(6 + 1) \div 2 &= \\2(7) \div 2 &= \\14 \div 2 &= 7\end{aligned}$$

Write the algebraic expression for the word phrase.

27. 4 times a number divided by 3 $4n \div 3$ or $4(n \div 3)$

28. x divided by 8, decreased by 2 $\frac{x}{8} - 2$

Practice & Application

The Hagan twins are planning a deep-sea fishing trip. The cost of the tickets is \$40 for each person. The Hagan twins figured the cost of the fishing trip and the cost of getting to the dock to be \$90.

29. Write an equation using c for the unknown cost of getting to the boat dock. Solve for the value of c .
 $\$90 - (2 \times \$40) = c$; $\$90 - \$80 = \$10$; $c = \$10$
30. Write an equation to show the cost of the deep-sea fishing trip for the boys if they split the cost evenly. $\$90 \div 2 = \45

31. If Mr. Hagan goes with the boys on the trip, what will be the total cost of the trip?
 $(3 \times \$40) + \$10 = \$120 + \$10 = \$130$

J

Explain the difference between an expression and an equation.

An expression is a mathematical phrase made up of numbers and operation signs but not an equal sign; an equation is a mathematical sentence stating that 2 expressions are equal. Both expressions and equations can use variables.



Simplify Expressions

Simplify expressions by combining **like terms**. The Commutative and Associative Properties of Addition or Multiplication allow you to rewrite the expression to organize the *like terms*.

simplify expressions
like terms

$$n + \text{○○○○} + n$$

$$\begin{aligned} n + 6 + n &= \\ n + n + 6 &= \\ 2n + 6 \end{aligned}$$

Commutative Property:
Change the order of addends.

Associative Property:
Group like terms.

$$\text{○○} + x + \text{○○}$$

$$\begin{aligned} 4 + x + 3 &= \\ x + 4 + 3 &= \\ x + 7 \end{aligned}$$

Repeated addends are combined using multiplication.

$$x \quad x \quad x \quad x$$

$$\begin{aligned} x + x + x + x &= \\ 4x \end{aligned}$$

$$x \quad x \quad x \quad x$$

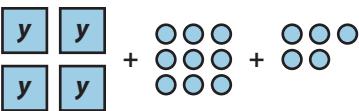
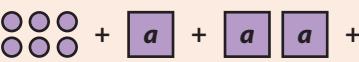
$$\begin{aligned} 2x + 2x + 2x + 2x &= \\ 4(2x) &= \\ 8x \end{aligned}$$

Exercises

Write the missing number or variable. Name the property used.

1. $(p + \underline{\hspace{1cm}}) + r = p + (q + r)$
q; Associative Property
2. $4 \cdot 9 = \underline{\hspace{1cm}} \cdot 4$
9; Commutative Property
3. $m + n = n + \underline{\hspace{1cm}}$
m; Commutative Property
4. $5 \cdot (7 \cdot 4) = (\underline{\hspace{1cm}} \cdot 7) \cdot 4$
5; Associative Property
5. $45 + (29 + 80) = (45 + 29) + \underline{\hspace{1cm}}$
80; Associative Property
6. $2a + (a + 8) = (2a + \underline{\hspace{1cm}}) + 8$
a; Associative Property
7. $(5 + 7x) + 8x = 5 + (7x + \underline{\hspace{1cm}})$
8x; Associative Property
8. $3s \times 4 \times 7s = \underline{\hspace{1cm}} \times 3s \times 7s$
4; Commutative Property

Write the simplified expression for the picture.

<p>9. </p>	$\begin{aligned} 4y + 9 + 5 \\ 4y + 14 \\ y + y + y + y + 14 \end{aligned}$
<p>10. </p>	$\begin{aligned} 6 + a + 2a + 2 \\ 8 + a + 2a \\ 8 + 3a \end{aligned}$
<p>11. </p>	$\begin{aligned} 2(2c) + 8 \\ 2c + 2c + 8 \\ c + c + c + c + 8 \end{aligned}$
<p>12. </p>	$\begin{aligned} x + x + 6 \\ 2x + 6 \\ x + x + 3 + 3 \end{aligned}$

Simplify the expression.

13. $6 + 4x + 2$ **$4x + 8$**
Order of terms in the expression may vary.
14. $x + 4x$ **$5x$**
15. $2x + 3x$ **$5x$**
16. $x + 5 + x$ **$2x + 5$**
17. $3 + x + 6$ **$x + 9$**
18. $x + 2x + 3$ **$3x + 3$**
19. $2x + 1 + x$ **$3x + 1$**
20. $5x + 2x + 3$ **$7x + 3$**
21. $4 \cdot 2 \cdot x$ **$8x$**

Simplify the expression.

Show each step used to combine the *like* terms in the expression.

Name the property used in each step. **Order of terms in the expression may vary.**

22. $8x + (2 + 4x)$ **$12x + 2$**

25. $3(7x)$ **$21x$**

28. $(6 + 5x) + 7$ **$5x + 13$**

23. $5 \cdot x$ **$5x$**

26. $8 + (2 + x)$ **$x + 10$**

29. $(x \cdot 5) \cdot 6$ **$30x$**

24. $2 + (3 + x)$ **$x + 5$**

27. $x \cdot 8 \cdot 9$ **$72x$**

30. $12(2x)$ **$24x$**

Write an equation for the sentence.

31. 5 added to y equals 18. **$y + 5 = 18$**

34. A number divided by 3 is 7. **$n \div 3 = 7$**

32. 12 decreased by 7 is 5. **$12 - 7 = 5$**

35. 58 more than n is 134. **$n + 58 = 134$**

33. The product of 9 and n is 36. **$9n = 36$**

36. The sum of b and 8 equals 25. **$b + 8 = 25$**

Evaluate the expression. Let $y = 4$.

37. $40 \div y \times 3$

**$40 \div 4 \times 3 =$
 $10 \times 3 = 30$**

38. $y + 7 - 6$

**$4 + 7 - 6 =$
 $11 - 6 = 5$**

39. $(36 - y) \div 4$

**$(36 - 4) \div 4 =$
 $32 \div 4 = 8$**

40. $2 + y - 3$

**$2 + 4 - 3 =$
 $6 - 3 = 3$**

Practice & Application

41. Write an addition equation and a multiplication equation for the part-whole model.

15.2			
3.8	3.8	3.8	3.8

$3.8 + 3.8 + 3.8 + 3.8 = 15.2; 4 \times 3.8 = 15.2$

42. The diameter of one of the largest Ferris wheels in the world is 492 feet. What is the length of any radius? **$492 \div 2 = 246$ ft**

Use the equation $x \div 45 = \$27$ for problems 43–45.

43. Solve to find the value of x . Write the related multiplication equation to solve.

$x = 45 \times \$27; x = \$1,215$

44. If x represents the amount paid to the amusement park for entrance fees for 45 students, what does the quotient represent? ***the cost for each student to get into the park***

45. Each student paid the entrance fee and took an additional \$5 for gas and \$30 for food and games. How much money did each person take?

$\$27 + \$5 + \$30 = \62

- J Write a word problem showing how Jake spent his food and game money at the amusement park. ***Answers will vary.***



The Singapore Flyer is 165 meters tall. The passengers ride in air-conditioned capsules that take about 37 minutes to make one full rotation on the wheel.

Addition & Subtraction Equations

An equation with a variable is solved by finding the value of the variable. The value must make the sentence true to be called a **solution**.

solution
inverse operations
balanced

Solve

Isolate the variable on one side of the equal sign by using the **inverse operation**. Keep the equation **balanced** by performing the exact same operation on both sides of the equation.

Check

Substitute (replace) the variable with the solution and evaluate.

$$n + 6 = 10$$

$n + 6 - 6 = 10 - 6$ Isolate the variable using the inverse operation.

$$n = 4$$

$$4 + 6 = 10$$

Check using substitution.

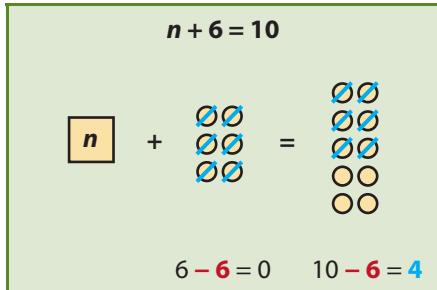
$$n - 3 = 8$$

$$n - 3 + 3 = 8 + 3$$

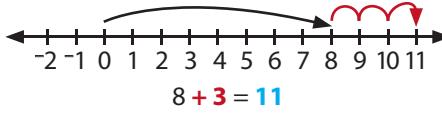
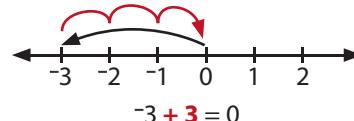
$$n = 11$$

$$11 - 3 = 8$$

The equation mat shows the result of subtracting 6 from both sides of the equation.



The number lines show the result of adding 3 to both sides of the equation.



Exercises

Solve the equation using the inverse operation.

Check the solution.

1. $n + 5 = 21$ **n = 16**

5. $d + 45 = 90$ **d = 45**

9. $d + 43 + 17 = 85$ **d = 25**

2. $x + 12 = 40$ **x = 28**

6. $16 + f = 35$ **f = 19**

10. $s + 14 - 3 + 0.5 = 20$ **s = 8.5**

3. $c - 6 = 17$ **c = 23**

7. $s - 39 = 61$ **s = 100**

11. $3.8 + 16 + b = 29$ **b = 9.2**

4. $a - 4 = 36$ **a = 40**

8. $24 + n = 100$ **n = 76**

12. $\frac{3}{4} + \frac{1}{2} + f = 1\frac{1}{2}$ **f = $\frac{1}{4}$**

Determine whether the given value is the solution to the equation.

Write **yes** or **no**. Solve the problems with incorrect values.

$a - 8 = 6$	$a = 14$
$x + 13 = 40$	$x = 17$
$f - 17 = 9$	$f = 2.6$

yes

no; x = 27

no; f = 26

$n + 0.8 = 1.7$	$n = 0.8$	no; n = 0.9
$a - 1\frac{1}{2} = 6\frac{1}{2}$	$a = 8$	yes
$b + 17 + 3.5 = 40.7$	$b = 20.2$	yes

Evaluate the expression. Let $x = 3$.

19. $15 \div x - 4$

$15 \div 3 - 4 =$

$5 - 4 = 1$

20. $4 + x - 2$

$4 + 3 - 2 =$

$7 - 2 = 5$

21. $(18 - x) \div 5$

$(18 - 3) \div 5 =$

$15 \div 5 = 3$

22. $(x + 15) \div 2$

$(3 + 15) \div 2 =$

$18 \div 2 = 9$

23. $x(2.3)$

$3(2.3) = 6.9$

24. $2x + 3x$

$2(3) + 3(3) =$

$6 + 9 = 15$

25. $3^2 + 7 - x$

$9 + 7 - 3 =$

$16 - 3 = 13$

26. $x(2^3) - 6$

$3(8) - 6$

$24 - 6 = 18$

27.

$\sqrt{49} + 6x$

$7 + 6(3) =$

$7 + 18 = 25$

Write an equation for the sentence.

Solve the equation using the inverse operation.

Check the solution.

28. 5 more than n equals 12.

$n + 5 = 12; n = 7$

29. 8 less than n is 3.

$n - 8 = 3; n = 11$

30. The sum of 10 and a number is 17.

$10 + n = 17; n = 7$

31. The difference of a number and 2 equals 5.

$n - 2 = 5; n = 7$

32. 6 subtracted from a number is 12.

$n - 6 = 12; n = 18$

33. A number increased by 3 equals 16.

$n + 3 = 16; n = 13$

34. A number decreased by 7 is 9.

$n - 7 = 9; n = 16$

35. 7 and a number equals 10.

$7 + n = 10; n = 3$

Practice & Application

36. Find the product of 113 and 609 using only two partial products. **68,817**

37. Write equations to show that 468 is divisible by 2, 3, 4, and 6. **$468 \div 2 = 234; 468 \div 3 = 156; 468 \div 4 = 117; 468 \div 6 = 78$**

38. Explain how you know that 317 is *not* divisible by 5 without dividing.

There is not a 5 or a 0 in the Ones place.

39. Use front-end estimation to estimate the sum of 398,640 and 954,207.

$390,000 + 950,000 = 1,340,000$

40. What is the value of x in $x + 5 = 14$?

$x + 5 - 5 = 14 - 5; x = 9$

41. What is the value of n in $17.3 + 16.8 + n = 35$?

$34.1 - 34.1 + n = 35 - 34.1; n = 0.9$

42. What whole number is equivalent to $\frac{51}{3}$? **17**

43. Three triangles represent $\frac{1}{2}$ of a set. How many triangles are in the whole set? **6 triangles**

44. Draw a number line to show the sum for $-9 + 13$.

45. Round each factor to the greatest place to estimate the product of 17.8 and 21.03.

$20 \times 20 = 400$

J Explain how the inverse operation helps you find the value of n in $n + 3\frac{1}{2} = 6\frac{3}{4}$. Solve.

Subtraction is used to cancel the value that is added to the variable. Keep the equation balanced by subtracting the same value from the other side of the equation.

$n + 3\frac{1}{2} - 3\frac{1}{2} = 6\frac{3}{4} - 3\frac{1}{2}; n = 3\frac{1}{4}$

44.



Multiplication Equations

Solving Multiplication Equations

$$3n = 12$$
$$\boxed{n \quad n \quad n} = \boxed{\begin{array}{|c|c|c|c|}\hline \bullet & \bullet & \bullet & \bullet \\ \hline \bullet & \bullet & \bullet & \bullet \\ \hline \bullet & \bullet & \bullet & \bullet \\ \hline \end{array}}$$

- Identify the operation that has been performed on the variable:
 n is multiplied by 3.
 $3n = 3 \cdot n$
- Apply the inverse operation to isolate the variable:
divide both sides of the equation by 3.
$$\frac{3n}{3} = \frac{12}{3}$$
- Check the solution by substituting the value of the variable into the original equation.
 $n = 4$
 $3 \cdot 4 = 12$

Exercises

Solve. Check the solution. *Answers are shown using cancellation.*

- | | | |
|--|--|--|
| 1. $a \times 5 = 30$ $a = 6$ | 5. $9p = 54$ $p = 6$ | 9. $c \cdot 7 = 49$ $c = 7$ |
| 2. $2m = 18$ $m = 9$ | 6. $8 \times p = 64$ $p = 8$ | 10. $d \times 2^2 = 48$ $d = 12$ |
| 3. $f \cdot 3 = 24$ $f = 8$ | 7. $4n = 32$ $n = 8$ | 11. $a \cdot 0.9 = 3.6$ $a = 4$ |
| 4. $12 \cdot b = 36$ $b = 3$ | 8. $7n = 56$ $n = 8$ | 12. $1.8 \times a = 36$ $a = 20$ |

Write an equation for the sentence. Solve.

- The product of a and 7 equals 21.
 $a = 3$
- y times 9 is 54.
 $y = 6$
- b multiplied by 8 equals 48.
 $b = 6$
- 3 times a number is 36.
 $n = 12$
- The product of x and 7 equals 35.
 $x = 5$

This is the radio tower of Harbour Light of the Windwards, a Christian radio station that presents the gospel to Carriacou and surrounding islands.



Evaluate the expression. Let $a = 4$.

Write a comparison sentence using $>$, $<$, or $=$.

18. $a + 8 > 20 \div 2$ **12 > 10**

19. $\frac{32}{a} = a \cdot 2$ **8 = 8**

20. $16 - a < 15 - 2$ **12 < 13**

21. $9a > 5 \cdot 7$ **36 > 35**

22. $\frac{a}{2} < 2 \cdot 2$ **2 < 4**

23. $28 \div a < 2^3$ **7 < 8**

Solve. **Steps to solve may vary.**

24. $8 = x + 2$ **x = 6**

28. $16 = 9 + x$ **x = 7**

32. $3 \cdot m = 30$ **m = 10**

25. $x - 5 = 8$ **x = 13**

29. $a - 9 = 25$ **a = 34**

33. $b - 3 = 12$ **b = 15**

26. $b \times 8 = 48$ **b = 6**

30. $a + 9 = 20$ **a = 11**

34. $x + 2 = 25$ **x = 23**

27. $5m = 40$ **m = 8**

31. $6n = 36$ **n = 6**

35. $24 = 4x$ **x = 6**

Practice & Application

36. Write an equation showing that Lyla is 6 years younger than her brother.

$| = b - 6$

37. Write an equation showing that Liam's science test score was 6 points more than Zoe's.

$| = z + 6$

38. Write an equation to show 58 boys divided evenly among 4 baseball teams. Explain your answer.

39. What terms can be combined in the expression

$2s + \frac{1}{4} + \frac{2}{3}$? $\frac{1}{4}$ and $\frac{2}{3}$

40. If $a = 4$ and $b = 6$, is $\frac{24}{a} = b$ a true statement? **yes;**
 $\frac{24}{4} = 6$

41. Write and solve the multiplication equation that can be used to find the value of c in $c \div 2.3 = 17$.
 $c = 17 \times 2.3$; $c = 39.1$

42. Find the product of $\frac{12}{25}$ and $\frac{5}{8}$ in lowest terms.
 $\frac{12}{25} \times \frac{5}{8} = \frac{3}{10}$

Answer is shown using cancellation.

38. **58 is not evenly divisible by 4; there is a remainder of 2. All 4 teams will have 14 boys. Two of the teams will have an extra player.**

43. Find the least common denominator for $\frac{1}{8}$ and $\frac{1}{12}$. What is the sum of these fractions in lowest terms? **$LCD = 24$; $\frac{3}{24} + \frac{2}{24} = \frac{5}{24}$**

44. Write an equation to show that factors r and s equal 36. **$r \times s = 36$**

45. Write an equation with numbers for problem 44. Explain why 6 cannot be a factor in this problem.
 $9 \times 4 = 36$; 6 cannot represent both r and s in the same equation.



A student solved the following equations incorrectly. Find the mistakes and correct them. Explain how to solve the problem correctly.

$4x = 36$

$\frac{4x}{2} = \frac{36}{2}$

$2x = 18$

$\frac{4x}{4} = \frac{36}{4}$

$x = 9$

Since x is multiplied by 4, both sides of the equation must be divided by 4.

$8m = 24$

$\frac{8m}{8} = \frac{24}{8}$

$m = 6$

$\frac{8m}{4} = \frac{24}{4}$

$m = 3$

Since m is multiplied by 8, both sides of the equation must be divided by 8.

Multiplication & Division Equations

Multiplication and division are inverse operations.

$$36 \div 4 \times 4 = 36$$

$$\frac{36}{4} \times 4 = 36$$

$$8 \cdot 2 \div 2 = 8$$

$$\frac{8 \cdot 2}{2} = 8$$

inequality

Isolate the variable on one side of the equal sign using the inverse operation. An equation is much like a balanced scale: when you perform an operation on the left side of the equation, you must perform the exact same operation on the right side of the equation.



The inverse of multiplying by 5 is dividing by 5.

$$5x = 35$$

$$\frac{5x}{5} = \frac{35}{5}$$

$$x = 7$$

$$5 \cdot 7 = 35$$

The inverse of dividing by 8 is multiplying by 8.

$$n \div 8 = 4$$

$$\frac{n}{8} \cdot \frac{1}{8} = 4 \cdot 8$$

$$n = 32$$

$$\frac{32}{8} = 4$$

Exercises

Solve. Check the solution.

1. $n \div 7 = 63$ **$n = 441$**

5. $\frac{m}{4} = 3$ **$m = 12$**

9. $x \div 8 = 14.5$ **$x = 116$**

2. $3 \cdot x = 15$ **$x = 5$**

6. $n \cdot \frac{1}{5} = 9$ **$n = 45$**

10. $r \div 0.3 = 57.5$ **$r = 17.25$**

3. $\frac{2}{3} \cdot x = 15$ **$x = 22\frac{1}{2}$**

7. $\frac{x}{9} = 18$ **$x = 162$**

11. $4 \cdot c = 32$ **$c = 8$**

4. $\frac{1}{2}p = 45$ **$p = 90$**

8. $3n = 78.12$ **$n = 26.04$**

12. $p \cdot \frac{3}{5} = 5$ **$p = 8\frac{1}{3}$**

Write an equation for the sentence.

Solve the equation using the inverse operation.

Check the solution.

13. The quotient of a number divided by 12 is 3.

$n \div 12 = 3$ or $\frac{n}{12} = 3; n = 36$

17. The quotient of y and 7 equals 2.

$y \div 7 = 2$ or $\frac{y}{7} = 2; y = 14$

14. The product of x and 7 is 35.

$x \cdot 7 = 35$ or $7x = 35; x = 5$

18. A number divided by 20 equals 3.

$n \div 20 = 3$ or $\frac{n}{20} = 3; n = 60$

15. A number divided by 5 equals 11.

$n \div 5 = 11$ or $\frac{n}{5} = 11; n = 55$

19. Twice a number is 18.

$2n = 18$ or $2 \cdot n = 18; n = 9$

16. 6 times a number is 54.

$6n = 54$ or $6 \cdot n = 54; n = 9$

20. The product of a number and 5 is 10.

$n \cdot 5 = 10$ or $5n = 10; n = 2$

Complete the table.

x	$2x + 3$
11	25
13	29
15	33
17	37

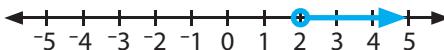
x	$x^2 + 5$
8	69
10	105
12	149
14	201

x	$4(x)$
25	100
35	140
45	180
55	220

An **inequality** is a mathematical sentence in which two expressions are not equal. The *greater than* ($>$) and *less than* ($<$) symbols can be used to express the inequality. A number line shows all solutions for the inequality.

The open circle on the number line indicates that the circled number is *not included* in the solution.

$$x > 2$$



The number line shows that x is any value *greater than* 2.

$$x < 3 - 1$$



The number line shows that x is any value *less than* 2.

Exercises

Draw a number line to illustrate the inequality. **Figures may vary.**

24. $x < 3$

25. $b > -2$

26. $y > 15 \div 3$

27. $c < 5 - 4$

Determine whether the given value is a solution to the inequality.

Write **yes** or **no**.

28. $x < 12$ if $x = 10$ **yes**

29. $y > 3$ if $y = 2$ **no**

30. $n < -2$ if $n = -1$ **no**

31. $b > 10$ if $b = 3^2$ **no**

32. $m < 5$ if $m = \frac{19}{4}$ **yes**

33. $s > 7$ if $s = \sqrt{9}$ **no**

Practice & Application **Equations may vary.**

34. There will be 23 people at Josiah and Jacob's birthday party. How many packages of hot dogs will need to be purchased if 2 hot dogs are cooked for each person at the party? (There are 10 hot dogs in each package.) $(23 \times 2) \div 10 = 46 \div 10 = 4.6$; **5 packages**

35. There are 8 hot dog buns in each package. How many packages of buns will need to be purchased for the number of hot dogs cooked? $46 \div 8 = 5.75$; **6 packages**

36. Two ice-cream cakes were made for the party. Each cake was cut into 12 equal pieces. There were 8 pieces of cake left at the end of the day. What fraction of the cake was left?

$$2 \times 12 = 24; \frac{8}{24} = \frac{1}{3} \text{ of the cake}$$

37. Four hundred water balloons were filled. Jacob figured that each guest that was not an adult would have 26 balloons to throw. How many extra water balloons were there? (There were 8 adults at the party.) $23 - 8 = 15 \text{ guests}$;
 $400 - (15 \times 26) = 400 - 390 = 10 \text{ extra water balloons}$



Write an equation for the water balloon purchase. Use the variable t for the unknown amount.

Solve to find the amount of tax paid.

2 packages of balloons: \$2.94 each

2 balloon launchers: \$11.99 each

Shipping: \$5.00

Tax:

Total: \$36.65

$$(2 \times \$2.94) + (2 \times \$11.99) + \$5.00 + t = \$36.65$$

$$\$5.88 + \$23.98 + \$5.00 + t = \$36.65$$

$$\$34.86 + t = \$36.65$$

$$\$36.65 - \$34.86 = \$1.79$$

$$t = \$1.79$$



Equivalent Expressions

The **Associative and Commutative Properties of Addition or Multiplication** are used to simplify expressions by reordering and regrouping like terms.

$$4 + (n + 5) =$$

$4 + (5 + n) =$ Commutative Property: order was changed

$(4 + 5) + n =$ Associative Property: grouped differently

$$9 + n$$

$$6 \cdot (n \cdot 9) =$$

$6 \cdot (9 \cdot n) =$

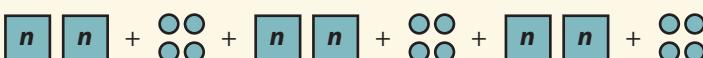
$(6 \cdot 9) \cdot n =$

$$54n$$

Addition & Multiplication Properties

The **Distributive Property of Multiplication over Addition** can also be used to simplify expressions. Or it can be used to find an equivalent expression by finding a common factor in the terms of the equation.

Simplify



$$3(2n + 4) =$$

There are 3 sets of each addend.

$$3(2n) + 3(4) =$$

Multiply each addend by the multiplier, 3.

$$6n + 12$$

Write the simplified expression.

Equivalent Expression

$$9 + 15b$$

3 is a common factor of 9 and 15.

$$9 + 15b = 3(3 + 5b)$$

Exercises

Apply the Distributive Property to write an equivalent expression.

1. $9(2 + x)$

$$\textcolor{magenta}{9(2) + 9(x)} =$$

$$\textcolor{magenta}{18 + 9x}$$

5. $16(5 + 3a)$

$$\textcolor{magenta}{16(5) + 16(3a)} =$$

$$\textcolor{magenta}{80 + 48a}$$

2. $5(n + 21)$

$$\textcolor{magenta}{5(n) + 5(21)} =$$

$$\textcolor{magenta}{5n + 105}$$

6. $3(3x + 0.8)$

$$\textcolor{magenta}{3(3x) + 3(0.8)} =$$

$$\textcolor{magenta}{9x + 2.4}$$

3. $7(3 + 4y)$

$$\textcolor{magenta}{7(3) + 7(4y)} =$$

$$\textcolor{magenta}{21 + 28y}$$

7. $4(y + \frac{1}{8})$

$$\textcolor{magenta}{4(y) + 4(\frac{1}{8})} =$$

$$\textcolor{magenta}{4y + \frac{1}{2}}$$

4. $2(5x + 3.5)$

$$\textcolor{magenta}{2(5x) + 2(3.5)} =$$

$$\textcolor{magenta}{10x + 7}$$

8. $6(n + \frac{1}{4})$

$$\textcolor{magenta}{6(n) + 6(\frac{1}{4})} =$$

$$\textcolor{magenta}{6n + 1\frac{1}{2}}$$

Choose the expression with an equivalent value.

9. $6x + 18$	$3(2x + 6)$	$3(x + 9)$	$2(3x) + 2(6)$
10. $4(7 + 3a)$	$11 + 7a$	$28 + 12a$	$\frac{7}{4} + \frac{3}{4}a$
11. $12(y) + 3$	$12 + 3y$	$15y$	$12y + 3$

Choose the inverse operation that would be used to solve the equation.

12. $5 + y = 25$	addition	$\textcolor{magenta}{\text{subtraction}}$	multiplication
13. $\frac{x}{7} = 7$	$\textcolor{magenta}{\text{multiplication}}$	division	addition
14. $3y = 48$	addition	multiplication	$\textcolor{magenta}{\text{division}}$

Determine whether the given value is the solution to the equation. **Steps to solve may vary.**

Write yes or no.

15. $r - 42 = 59$ if $r = 17$ **no;**

$$\textcolor{magenta}{17 - 42 \neq 59}$$

18. $156 \div h = 12$ if $h = 12$ **no**

16. $3.5 + w = 17.9$ if $w = 14.4$ **yes;**

$$\textcolor{magenta}{3.5 + 14.4 = 17.9}$$

19. $\frac{1}{8}x = 6$ if $x = 50$ **no**

19. $\frac{1}{8}(50)$

$$\textcolor{magenta}{\frac{50}{8} = 6.25}$$

17. $16.08n = 1,608$ if $n = 100$ **yes;**

$$\textcolor{magenta}{16.08 \times 100 = 1,608}$$

20. $\frac{x}{3} = 13$ if $x = 39$ **yes;** $\textcolor{magenta}{\frac{39}{3} = 13}$

Solve. Check the solution.

21. $a + 5 = 33$ **a = 28**

26. $8x = 480$ **x = 60**

31. $1.5w = 30$ **w = 20**

22. $x - 1.2 = 10$ **x = 11.2**

27. $y - 43 = 129$ **y = 172**

32. $3.8p = 64.6$ **p = 17**

23. $\frac{a}{12} = 3$ **a = 36**

28. $\frac{3}{4}x = 6$ **x = 8**

33. $\frac{x}{9} = 4$ **x = 36**

24. $8x = 1$ **x = $\frac{1}{8}$**

29. $2x = 14.8$ **x = 7.4**

34. $a + 1.7 = 1.9$ **a = 0.2**

25. $n - 16 = 140$ **n = 156**

30. $x - 6 = 1.4$ **x = 7.4**

35. $x \div 12 = 62$ **x = 744**

Determine whether the given value is a solution to the inequality.

Write yes or no.

36. $y > 3$ if $y = 2$ **no**

37. $x < 2$ if $x = -1$ **yes**

38. $a > 7$ if $a = 3^2$ **yes**

Solve. **Equations may vary.**

39. How many pizzas will be ordered for the Sunday school picnic if each pizza is cut into 8 slices and 200 slices are needed?

25 pizzas

40. On Monday Forrest found 9 more insects for his science project. Now he can make a display of all 20 insects. How many insects did he have before Monday? **11 insects**

Practice & Application

41. Simplify the expression $(2n + 4) + (3n + 6)$.

$2n + 3n + 4 + 6 = 5n + 10$

42. What operation will always undo addition?

subtraction

43. What is the product of $3n$ if $n = 36$?

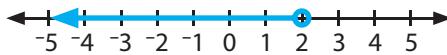
$3 \cdot 36 = 108$

44. If $\frac{1}{2}n = 118$, what is the value of n ?

n = 236

45. Write an expression for a number plus 3, multiplied by 6. **(n + 3) × 6**

46. $y < \underline{2}$



47. Write true or false: $3(8 + 12) = 24 + 36$. **true;**

$3(8) + 3(12) = 24 + 36$

$24 + 36 = 24 + 36$

48. Which expression has a greater value:

$30 \times \frac{1}{5}$ or $\frac{1}{3} \times 39$? **$30 \times \frac{1}{5} = 6$** ;

$\frac{1}{3} \times 39 = 13$; $\frac{1}{3} \times 39$ has a greater value.



Identify the steps shown as the Associative, the Commutative, and/or the Distributive Property. Simplify the expression.

$3x + 4 + 2x$

$3x + 2x + 4$

Commutative

$5x + 4$

$n + (3 + 5n)$

$n + (5n + 3)$

$(n + 5n) + 3$

Commutative

Associative

$6n + 3$

$7(y + 3y)$

$(7 \cdot y) + (7 \cdot 3y)$

Distributive

$7y + 21y$

$28y$

Distance = Rate × Time

Scientists and mathematicians have discovered many formulas (a type of pattern for something that works the same way every time). A formula allows you to substitute known information into an equation to solve for an unknown part.

$$\text{distance} = \text{rate} \times \text{time}$$
$$d = r \times t$$

$$\text{distance} = \text{rate} \times \text{time} \quad \text{or} \quad d = r \times t$$

d (distance) is how far **r (rate of speed) is how fast** **t (time) is how long**

When finding the rate of speed, two different units are being compared.

The label will use both units of measurement.

$$\frac{100 \text{ mi}}{2 \text{ hr}} = 50 \text{ miles per hour (mph)}$$

1. Read the question carefully to find the unknown.
2. Substitute the known information for the variables in the formula.
3. Solve for the unknown variable.
4. Label your answer appropriately.

Use related facts to solve for the unknown.

$$\text{product} = \text{factor} \times \text{factor}$$

$$\text{product} \div \text{factor} = \text{factor}$$

How many miles would a truck travel in 6 hours at an average speed of 55 mph?

$$d = r \times t$$

$$d = \underline{\hspace{2cm}}$$

$$r = 55 \text{ mph}$$

$$t = 6 \text{ hr}$$

$$d = 55 \times 6$$

$$d = 330$$

The truck would travel

330 miles.

What is the average speed if a truck traveled 330 miles in 6 hours?

$$d = r \times t$$

$$d = 330 \text{ mi}$$

$$r = \underline{\hspace{2cm}}$$

$$t = 6 \text{ hr}$$

$$330 = r \times 6$$

$$330 \div 6 = 55$$

$$r = 55$$

The truck would travel

55 miles per hour (mph).

How many hours would it take a truck to travel 330 miles at an average speed of 55 mph?

$$d = r \times t$$

$$d = 330 \text{ mi}$$

$$r = 55 \text{ mph}$$

$$t = \underline{\hspace{2cm}}$$

$$330 = 55 \times t$$

$$330 \div 55 = 6$$

$$t = 6$$

It would take **6 hours.**

Exercises

Solve. **Equations may vary.**

1. In 1929 a Zeppelin airship flew 11247 kilometers from Germany to Japan in just under 102 hours. At what speed was it traveling? **approximately 110 kilometers per hour**
2. A family took a bicycle trip through the Roosevelt National Forest on their vacation. They cycled a total of 96 miles in 4 days. What is the average number of miles they cycled each day? **24 miles per day**
3. If an airship flew for 52 hours at an average speed of 93 kilometers per hour, how many kilometers would it travel? **4836 kilometers**
4. A train traveled 380 miles at an average speed of 95 mph. How long did it take to travel the 380 miles? **4 hours**
5. The Carson family drove at an average speed of 85 kilometers per hour for 4 hours. How many kilometers did they travel? **340 kilometers**
6. Grant and his friend Derek biked 33 miles at an average speed of 11 miles per hour. About how long did it take to bike that distance? **3 hours**
7. Austin's remote-control car can travel at a speed of 22 yards per minute. How far could the car travel in 15 minutes? **330 yards**
8. Use the information from problem 7 to find how long it would take the remote-control car to travel 1 mile if it continued at the same rate. **80 minutes or 1 hour 20 minutes**

There are many forms of transportation. Some are fast, and some are slow. Draw a diagram to show the relationship of the *number of miles traveled* to the *amount of time traveled*.

100 mi															
1 hr															

If you travel a distance of 1,500 miles at a speed of 100 miles per hour, how many hours will you have traveled? **15 hours**

Use the formula for distance to find an unknown rate (speed) or time. Substitute the known information into the formula to make an equation. Use your knowledge of inverse operations to find an unknown part.

$$d = r \times t$$

$$t = \underline{\hspace{2cm}}$$

$$r = 100 \text{ mph}$$

$$d = 1,500 \text{ mi}$$

$$1,500 = 100 \times t$$

$$\frac{1,500}{100} = \frac{100t}{100}$$

$$15 = t$$

t is multiplied by 100.

Use the inverse operation to solve.

It will take **15 hours**.

Exercises

Complete the table. Find the number of hours it will take to travel a distance of 1,500 miles at the indicated rate of speed.

9.

rate (mph)	100	200	300	400	500	600
time (hours)	15	7.5	5	3.75	3	2.5

Use the data from the table to complete the line graph.

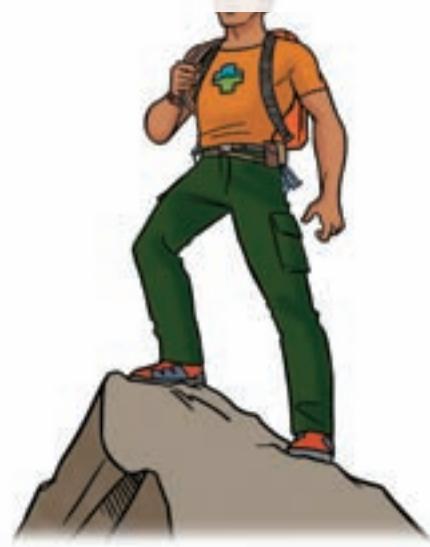
10.

Traveling 1,500 miles



11. Make a statement to summarize your findings.

As the rate of speed increases, the time required to travel a given distance decreases.



CHAPTER 10 REVIEW

Write the algebraic expression.

Identify what the variable represents in the expression.

- Eli read 3 times as many books as Nolan. **$3b$; b represents the number of books Nolan read.**
- Brynn broke 4 water glasses. **$g - 4$; g represents the total number of glasses.**
- The florist divided the roses among 5 vases. **$r \div 5$; r represents the total number of roses.**
- The product of a number and 5. **$5n$**
- Two less than 20 times n . **$20n - 2$**
- Sixty more than n , divided by 3. **$(n + 60) \div 3$**

Evaluate the expression. Let $n = 4$.

7. $n + 7 - 3$
 $4 + 7 - 3 =$
 $11 - 3 = 8$

10. $3n + 5$
 $(3 \cdot 4) + 5 =$
 $12 + 5 = 17$

8. $5n \div 2$
 $(5 \cdot 4) \div 2 =$
 $20 \div 2 = 10$

11. $(2.7 \cdot n) - 3$
 $(2.7 \cdot 4) - 3 =$
 $10.8 - 3 = 7.8$

9. $3 + (n \div 2)$
 $3 + (4 \div 2) =$
 $3 + 2 = 5$

12. $100 - 12n$
 $100 - (12 \cdot 4) =$
 $100 - 48 = 52$

Simplify the expression. *Order of terms in the expression may vary.*

13. $3(6x)$
 $18x$

14. $8x + (3 + 7x)$
 $8x + 7x + 3 =$
 $15x + 3$

17. $y + y + y$
 $3y$

15. $3 + x + 6$
 $x + 3 + 6 =$
 $x + 9$

18. $2(8x)$
 $16x$

Simplify the expression using the Distributive Property. *Order of terms in the expression may vary.*

19. $3(8 + 2a)$
 $3(8) + 3(2a) =$
 $24 + 6a$

20. $6(n + 2)$
 $6(n) + 6(2) =$
 $6n + 12$

21. $5(7x + 5.1)$
 $5(7x) + 5(5.1) =$
 $35x + 25.5$

Complete the table using the given values to evaluate the expression.

22.

b	$2b + 5$
6	17
12	29
25	55
49	103

23.

x	$\frac{x}{3} - 2$
9	1
15	3
21	5
33	9

24.

n	$n^2 + 9$
5	34
9	90
12	153
20	409

Write an equation for the sentence.

25. 8 less than a number is 14. $n - 8 = 14$

26. The quotient of a number divided by 2 equals 9. $n \div 2 = 9$

27. The sum of 2 times a number and 8 is 14. $2n + 8 = 14$

Determine whether the given value is the solution to the equation.

Write yes or no.

28. $n - 12 = 5$ if $n = 15$ **no**

29. $\frac{x}{6} = 7$ if $x = 42$ **yes**

30. $8a = 56$ if $a = 7$ **yes**

31. $9 + n = 14$ if $n = 4$ **no**

32. $m \div 8 = 2$ if $m = 16$ **yes**

33. $5 \cdot a = 50$ if $a = 10$ **yes**

Solve. Write the inverse operation used to solve.

Check the solution.

34. $\frac{x}{4} = 9$ **x = 36;**
multiplication

35. $n - 8 = 61$ **n = 69;**
addition

36. $4a = 56$ **a = 14;**
division

37. $n + 3 = 32$ **n = 29;**
subtraction

38. $x - 1.6 = 1.4$ **x = 3;**
addition

39. $y \div 5 = 25$ **y = 125;**
multiplication

40. $b + 5 = 48$ **b = 43;**
subtraction

41. $7n = 85.4$ **n = 12.2;**
division

Determine whether the given value is a solution to the inequality.

Write yes or no.

42. $y < -1$ if $y = -2$ **yes**

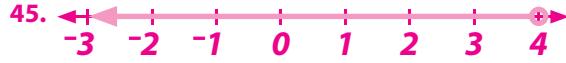
43. $x > 2$ if $x = 1$ **no**

44. $y < 5$ if $y = 2$ **yes**

Draw a number line to illustrate the inequality.

45. $b < 4$

46. $w > 1$



Write an equation with a variable. Solve. **Equations may vary.**

47. One-third of the rancher's cattle are calves. If he puts 2 calves in each of his 20 stalls, how many head of cattle does the rancher have?

$$\frac{1}{3}x = 2 \cdot 20$$

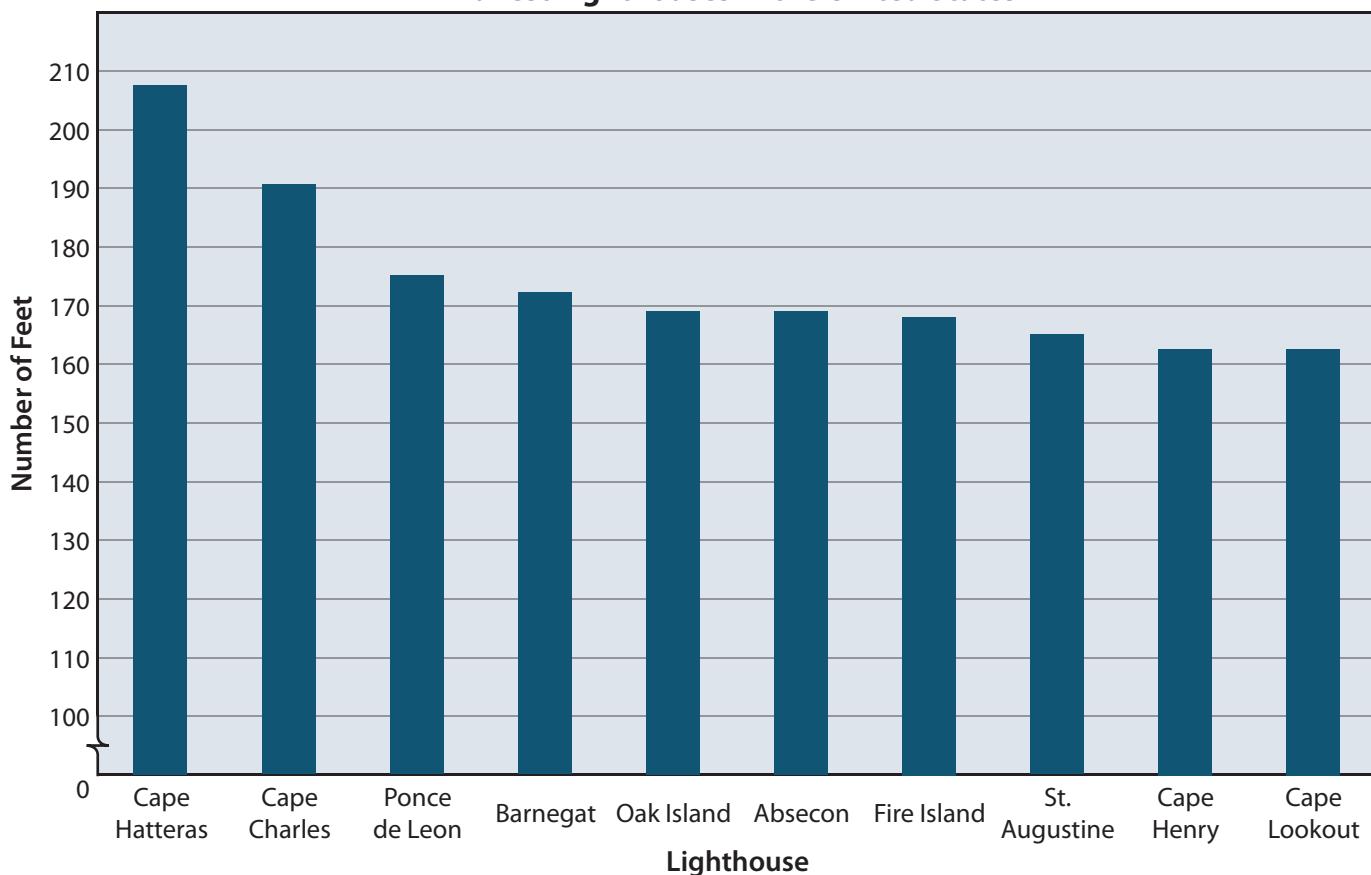
$$3 \cdot \frac{1}{3}x = 2 \cdot 20 \cdot 3$$

$$x = 120$$

The rancher has 120 head of cattle.



Tallest Lighthouses in the United States



Use the data from the bar graph to find the answer.

- This bar graph displays
 - the amount of material used to construct each lighthouse.
 - the height of 10 lighthouses.**
 - the number of tourists that visit lighthouses.
 - the number of ships saved by each lighthouse.
- Estimate the difference in height between the tallest and shortest lighthouses on the graph.

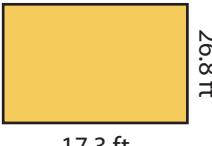
A. 10 ft	C. 30 ft
B. 20 ft	D. 40 ft
- Which expression shows the height of the Ponce de Leon lighthouse?

A. 1.75×10^1 ft	C. 17×10^2 ft
B. 1.75×10^2 ft	D. 1.7×10^3 ft
- According to the graph, Cape Henry is
 - approximately 180 feet tall.
 - taller than the Oak Island lighthouse.
 - the same height as the Cape Lookout lighthouse.**
 - the tallest lighthouse in the United States.
- About how much taller is Barnegat than Absecon?

A. less than 10 ft	C. more than 20 ft
B. about 10 ft	D. about 20 ft
- Which lighthouse measures 165 feet?

A. Barnegat	C. Cape Charles
B. Ponce de Leon	D. St. Augustine

Mark the answer.

7. The Cape Henry lighthouse tower has an octagonal shape. How many sides does the lighthouse have?
- A. 4 C. 6
B. 5 D. 8
8. What specific name is given to a quadrilateral with 4 congruent sides and 4 right angles?
- A. rhombus C. square
B. rectangle D. parallelogram
9. 
- What is the perimeter of the figure?
- A. 44.1 ft C. 100.3 ft
B. 88.2 ft D. 122.4 ft
10. What shapes are created when a diagonal line is drawn in a rectangle?
- A. congruent equilateral triangles
B. congruent right triangles
C. congruent squares
D. similar rectangles
11. Three pizzas were ordered for family night. Each pizza had 8 slices. Three-fourths of the pizza was eaten. How many slices of pizza were left?
- A. 6 C. 10
B. 8 D. 12
12. Which statement is true?
- A. $1\frac{1}{2} = \frac{3}{4} + \frac{3}{4}$ C. $1\frac{1}{2} = \frac{3}{4} \times \frac{3}{4}$
B. $1\frac{1}{2} = \frac{3}{4} - \frac{3}{4}$ D. $1\frac{1}{2} = \frac{3}{4} \div \frac{3}{4}$
13. $7 \times n = 469$
- A. $n = 64$ C. $n = 66$
B. $n = 65$ D. $n = 67$
14. $7\overline{)64}$
- A. $8\frac{6}{7}$ C. $9\frac{5}{7}$
B. $9\frac{1}{7}$ D. $10\frac{1}{7}$



Come unto me, all ye that labour and are heavy laden, and I will give you rest.

Matthew 11:28

Mark the answer.

15. $3\frac{7}{8} + 4\frac{2}{3}$

A. $7\frac{9}{11}$

B. $8\frac{1}{8}$

C. $8\frac{13}{24}$

D. 9

16. $\frac{3}{9} \times \underline{\quad} = 1$

A. $\frac{3}{9}$

B. $\frac{3}{3}$

C. $\frac{9}{3}$

D. $\frac{9}{9}$

17. $\frac{1}{3} \div \frac{1}{2}$

A. $\frac{2}{3}$

B. $\frac{1}{6}$

C. $1\frac{1}{2}$

D. 2

18. 1.63×100

A. 0.0163

B. 0.163

C. 16.3

D. 163

19. $1.5\overline{)4.05}$

A. 0.27

B. 2.7

C. 27

D. 270

20. $3^2 + 2^3$

A. 12

B. 17

C. 36

D. 72

21. $3 + 7 \times 4 - 8$

A. 23

B. 30

C. 45

D. 80

22. $4 \times (7.8 - 3.3) \div 2$

A. 4

B. 9

C. 9.8

D. 12

23. Rename $17\frac{15}{10}$ to lowest terms.

A. $17\frac{1}{2}$

C. $18\frac{3}{4}$

B. $18\frac{1}{2}$

D. 19

24. Which fraction is in lowest terms?

A. $\frac{4}{10}$

B. $\frac{6}{8}$

C. $\frac{7}{14}$

D. $\frac{9}{16}$

25. What is the sum of $\frac{3}{4}$, $\frac{5}{8}$, and $\frac{1}{2}$?

A. 1

C. $1\frac{7}{8}$

B. $1\frac{1}{2}$

D. $2\frac{1}{4}$



BIBLE MEASUREMENT

The chart shows the approximate values of some of the measurements found in the Bible. Use the data from the chart to find the answer.

- Noah's ark was 30 cubits high (Genesis 6:15). What was the height of the ark in inches? **$30 \times 17.5 = 525 \text{ inches}$**
- King Og of Bashan slept in a bed that was 9 cubits long and 4 cubits wide (Deuteronomy 3:11). How long and wide was his bed in inches? **$9 \times 17.5 = 157.5 \text{ inches long}$** ; **$4 \times 17.5 = 70 \text{ inches wide}$**
- Read 1 Samuel 17:7 to find the weight of the head of Goliath's spear. How much did the head of his spear weigh in pounds? **$600 \times 0.4 = 240 \text{ ounces}$** ; **$240 \div 16 = 15 \text{ pounds}$**
- Read Numbers 11:32 to find how much quail was gathered by the person who gathered the least amount. How many bushels did this person gather? **$10 \times 5.2 = 52 \text{ bushels}$**
- Read 1 Kings 10:14 to find how much gold King Solomon collected in a year. How many pounds of gold is this? (*Hint:* A score equals 20.) **$666 \times 75.6 = 50,349.6 \text{ pounds}$**
- Read Ruth 2:17 to find how much barley Ruth gleaned from Boaz's field the first day. If she gathered about the same amount each day, how many bushels of barley did she gather in 6 days?
 $6 \times \frac{3}{8} = 2\frac{1}{4} \text{ bushels}$

Modern Equivalents

cubit	17.5 inches
shekel	0.4 ounces
homer.....	5.2 bushels
talent.....	75.6 pounds
ephah	$\frac{3}{8}$ bushel

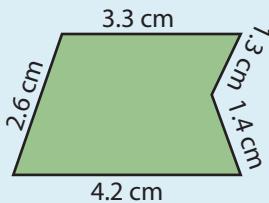
Perimeter

Perimeter is the distance around a geometric figure and is represented by P .

perimeter

Any Polygon

Add the lengths of the sides.



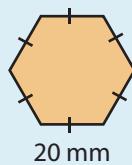
$$P = a + b + c + d + e$$

$$P = 2.6 \text{ cm} + 4.2 \text{ cm} + 1.4 \text{ cm} + 1.3 \text{ cm} + 3.3 \text{ cm}$$

$$P = 12.8 \text{ cm}$$

Regular Polygon

Multiply:
number of sides • length of side



$$P = n \cdot s$$

$$P = 6 \cdot 20 \text{ mm}$$

$$P = 120 \text{ mm}$$

Rectangle

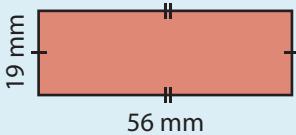
Multiply the length by 2 and the width by 2; add the products.

$$P = (2 \cdot l) + (2 \cdot w)$$

$$P = (2 \cdot 56 \text{ mm}) + (2 \cdot 19 \text{ mm})$$

$$P = 112 \text{ mm} + 38 \text{ mm}$$

$$P = 150 \text{ mm}$$



Multiply the sum of the length and the width by 2.

$$P = 2(l + w)$$

$$P = 2(56 \text{ mm} + 19 \text{ mm})$$

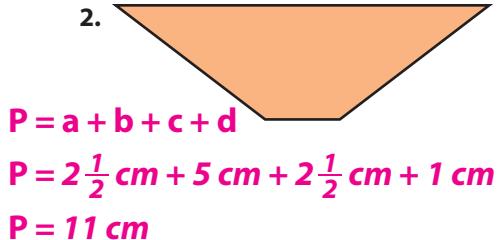
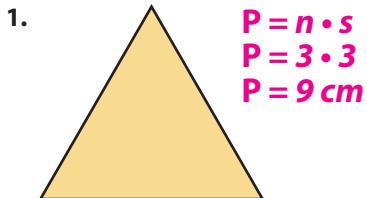
$$P = 2 \cdot 75 \text{ mm}$$

$$P = 150 \text{ mm}$$

Exercises

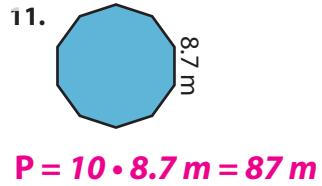
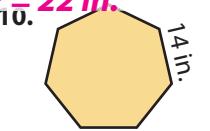
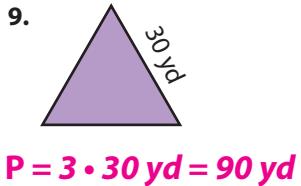
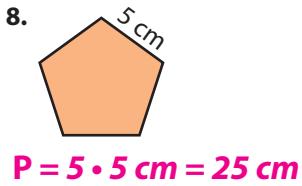
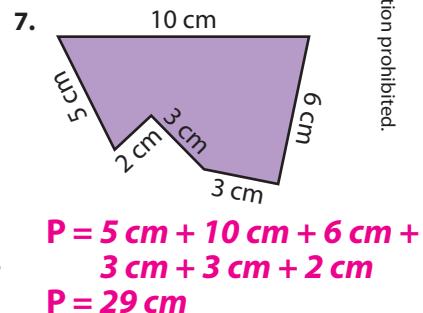
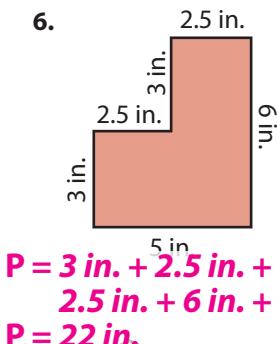
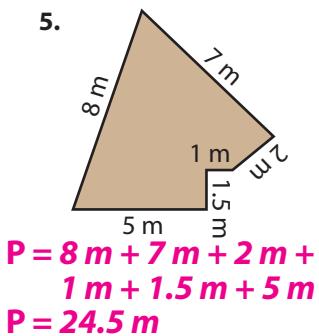
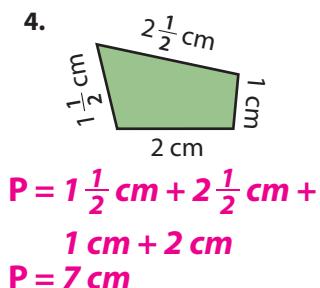
Measure the length of each side to the nearest centimeter.

Find the perimeter by adding the lengths of the sides.

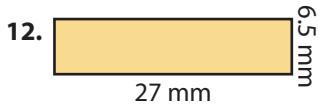


$$P = (2 \cdot l) + (2 \cdot w)$$
$$P = (2 \cdot 5 \text{ cm}) + (2 \cdot 2 \text{ cm})$$
$$P = 10 \text{ cm} + 4 \text{ cm} = 14 \text{ cm}$$

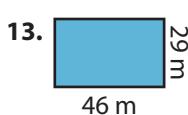
Write an equation to find the perimeter of the figure.
Use multiplication if possible. **Equations may vary.**



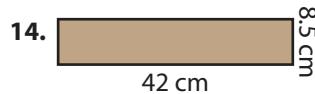
Write an equation to find the perimeter of the rectangle. **Equations may vary.**



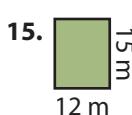
$$P = 67 \text{ mm}$$



$$P = 150 \text{ m}$$



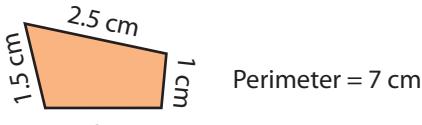
$$P = 101 \text{ cm}$$



$$P = 54 \text{ m}$$

Find an Unknown Side Measurement Given the Perimeter

Find the sum of the known sides. Subtract the sum from the perimeter to find the measurement of the unknown side.



Perimeter = 7 cm

$$P = s + s + s + s$$

$$7 \text{ cm} = (1.5 \text{ cm} + 2.5 \text{ cm} + 1 \text{ cm}) + s$$

$$7 \text{ cm} = 5 \text{ cm} + s$$

$$7 \text{ cm} - 5 \text{ cm} = 5 \text{ cm} - 5 \text{ cm} + s$$

$$2 \text{ cm} = s$$

The length of the unknown side is **2 cm**.

Algebraic Expressions

Find the perimeter of the rectangle if the width is 5 cm.



The length of the rectangle is 3 times the width ($3w$).
 $l = 3 \cdot 5 \text{ cm} = 15 \text{ cm}$

$$P = (2 \cdot l) + (2 \cdot w)$$

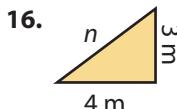
$$P = (2 \cdot 15 \text{ cm}) + (2 \cdot 5 \text{ cm})$$

$$P = 30 \text{ cm} + 10 \text{ cm}$$

$$P = 40 \text{ cm}$$

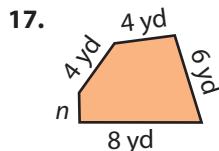
Exercises

Use the perimeter given to find the length of the unknown side.



$$\text{Perimeter} = 12 \text{ m}$$

$$n = 5 \text{ m}$$



$$\text{Perimeter} = 24 \text{ yd}$$

$$n = 2 \text{ yd}$$

Solve. **Equations may vary.**

20. Dad plans to place molding around the ceiling of the living room. If the length of the living room is 18 feet and the width is 12 feet, how many feet of molding will he use?

$$(2 \cdot 18 \text{ ft}) + (2 \cdot 12 \text{ ft}) = 60 \text{ ft}$$

Practice & Application **Equations may vary.**

22. What is the perimeter of the field? **P = 300 yd**

23. What is the perimeter of the parking lot?

$$P = 140 \text{ yd}$$

24. What is the perimeter of the high school building?

$$P = 210 \text{ yd}$$

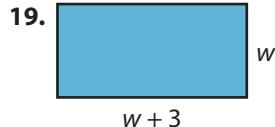
25. What is the perimeter of the elementary school building? **P = 180 yd**

26. What is the perimeter of the entire school property? **P = 550 yd**

Find the perimeter of the rectangle if the width is 4 cm.



$$P = 24 \text{ cm}$$

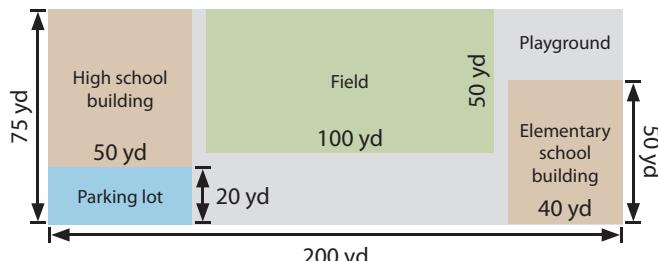


$$w + 3$$

$$P = 22 \text{ cm}$$

21. Mr. Franklin is fencing in a dog kennel in his backyard. The kennel dimensions are 12 feet, 20 feet, 10 feet, and 14 feet. How many feet of fencing does he need?

$$12 \text{ ft} + 20 \text{ ft} + 10 \text{ ft} + 14 \text{ ft} = 56 \text{ ft}$$



Circumference

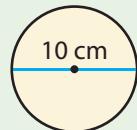
The **circumference** of a circle is a little more than 3 times its diameter. The ratio $\frac{C}{d}$ has a value of π (**pi**). Pi is a non-repeating and non-terminating decimal with an approximate value of 3.14 or $\frac{22}{7}$. Use the approximate value of pi to find an unknown circumference or diameter.

circumference
 π (**pi**) \approx 3.14
 $C = \pi d$
 $C = 2\pi r$

Find the Circumference Given the Diameter

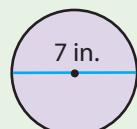
$$C = \pi d$$

$$\begin{aligned} C &= \pi d \\ C &= 3.14 \times 10 \\ C &= 31.4 \text{ cm} \end{aligned}$$



$$C = \pi d$$

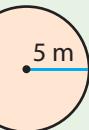
$$\begin{aligned} C &= \frac{22}{7} \times 7 \\ C &= \frac{22}{7} \times \frac{7}{1} \\ C &= 22 \text{ in.} \end{aligned}$$



Find the Circumference Given the Radius

$$C = 2\pi r$$

$$\begin{aligned} C &= 2\pi r \\ C &= 2 \times 3.14 \times 5 \\ C &= 31.4 \text{ m} \end{aligned}$$



$$C = 2\pi r$$

$$\begin{aligned} C &= 2 \times \frac{22}{7} \times 3\frac{1}{2} \\ C &= 2 \times \frac{22}{7} \times \frac{7}{2} \\ C &= 22 \text{ in.} \end{aligned}$$



Find the Diameter Given the Circumference

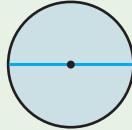
Since $C = \pi d$, then $\frac{C}{\pi} = d$.

$$\frac{C}{\pi} = d$$

$$C = 28.26$$

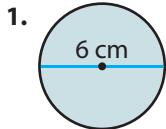
$$\frac{28.26}{3.14} = d$$

$$d = 9 \text{ cm}$$

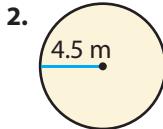


Exercises

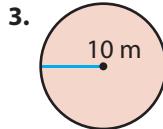
Find the circumference of the circle using 3.14 for π .



$$\begin{aligned} C &= \pi d \\ C &= 3.14 \cdot 6 \text{ cm} \\ C &= 18.84 \text{ cm} \end{aligned}$$

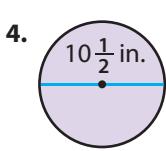


$$\begin{aligned} C &= 2\pi r \\ C &= 2 \cdot 3.14 \cdot 4.5 \text{ m} \\ C &= 28.26 \text{ m} \end{aligned}$$

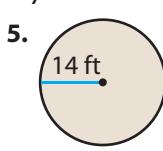


$$\begin{aligned} C &= 2\pi r \\ C &= 2 \cdot 3.14 \cdot 10 \text{ m} \\ C &= 62.8 \text{ m} \end{aligned}$$

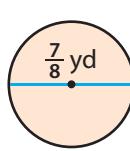
Find the circumference of the circle using $\frac{22}{7}$ for π .



$$\begin{aligned} C &= \pi d \\ C &= \frac{22}{7} \cdot 10\frac{1}{2} \text{ in.} \\ C &= \frac{22}{7} \cdot \frac{21}{2} \text{ in.} \\ C &= 33 \text{ in.} \end{aligned}$$



$$\begin{aligned} C &= 2\pi r \\ C &= 2 \cdot \frac{22}{7} \cdot 14 \text{ ft} \\ C &= 88 \text{ ft} \end{aligned}$$



$$\begin{aligned} C &= \pi d \\ C &= \frac{22}{7} \cdot \frac{7}{8} \text{ yd} \\ C &= \frac{11}{4} \text{ yd} \\ C &\approx 2.75 \text{ yd or } 2\frac{3}{4} \text{ yd} \end{aligned}$$

Find the diameter using the circumference.

7. If the circumference is 23.55 cm, then the diameter is ___ cm.

$$\begin{aligned} \frac{C}{\pi} &= d \\ d &= \frac{23.55}{3.14} \text{ cm} \end{aligned}$$

8. If the circumference is 47.1 cm, then the diameter is ___ cm.

$$\begin{aligned} \frac{C}{\pi} &= d \\ d &= \frac{47.1}{3.14} \text{ cm} \\ d &= 15 \text{ cm} \end{aligned}$$

DID YOU KNOW



$$d = 7.5 \text{ cm}$$

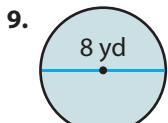
The Bible indicates that the circumference of a circle is about three times greater than the diameter.

And he made a molten sea, ten cubits from the one brim to the other . . . and a line of thirty cubits did compass it round about.

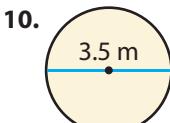
1 Kings 7:23



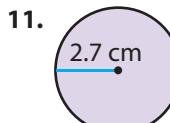
Find the circumference or the perimeter of the figure. Use 3.14 for π . Round a decimal answer to the nearest hundredth.



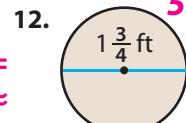
$$C = 25.12 \text{ yd}$$



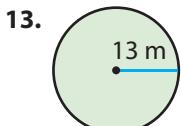
$$C = 10.99 \text{ m}$$



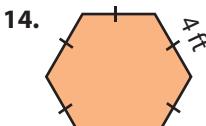
$$C = 16.956 \text{ cm} \approx 16.96 \text{ cm}$$



$$C = 5.495 \text{ ft} \approx 5.50 \text{ ft} \text{ or } 5.5 \text{ ft}$$



$$C = 81.64 \text{ m}$$



$$P = 24 \text{ ft}$$

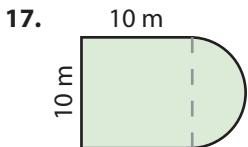


$$P = 16 \text{ cm}$$

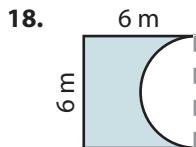


$$P = 125 \text{ m}$$

Find the perimeter of the unique figure. (Hint: Find the circumference of the whole circle to determine the distance around the half circle. Use 3.14 for π .)



$$\begin{aligned} 3 \cdot 10 &= 30 \text{ m} \\ \frac{1}{2}(3.14 \cdot 10) &= 15.7 \text{ m} \\ 30 + 15.7 &= 45.7 \text{ m} \end{aligned}$$



$$\begin{aligned} 3 \cdot 6 &= 18 \text{ m} \\ \frac{1}{2}(3.14 \cdot 6) &= 9.42 \text{ m} \\ 18 + 9.42 &= 27.42 \text{ m} \end{aligned}$$

Practice & Application Equations may vary.

19. Molly made a circular braided rug. The radius of the rug is 4 feet. What is the circumference of the rug? $C = 25.12 \text{ ft}$

20. Mom is hemming a circular tablecloth. How many inches will she hem if the diameter of the tablecloth measures 60 inches?

$$C = 188.4 \text{ in.}$$

21. Mr. Byers is placing edging around a rectangular fishpond. The length of the fishpond is 10 feet and the width is 5 feet. If the edging costs \$4.50 per foot, how much will Mr. Byers spend?

$$P = 30 \text{ ft}; 30 \cdot \$4.50 = \$135.00$$

22. The Ferris wheel at the Texas State Fair has a diameter of 212 feet. What is the circumference of the Ferris wheel? $C = 665.68 \text{ ft}$

23. Noah wants to know how far his bicycle wheel travels when it goes all the way around one time. The wheel is 20 inches across. How far does his bicycle wheel travel in one turn? $C = 62.8 \text{ in.}$

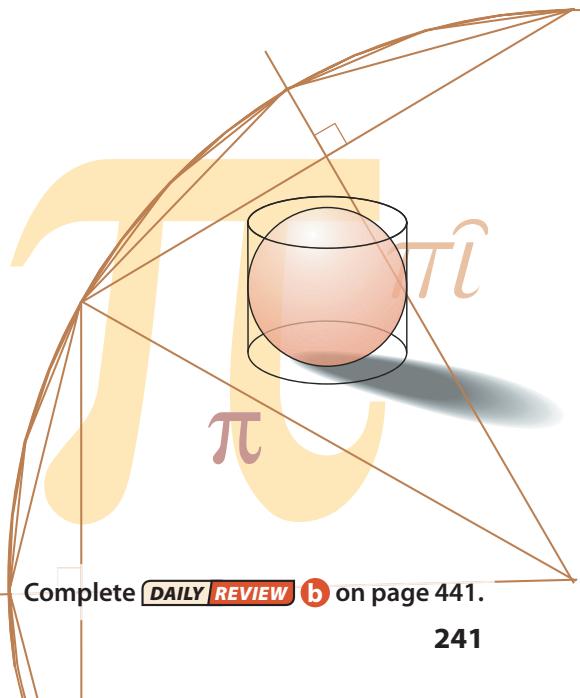
24. Mrs. Kwan is putting wallpaper border up in the twins' bedroom. The length of the bedroom is 12 feet and the width is 8 feet. Each roll of border is 15 feet. How many rolls will Mrs. Kwan need?

$$P = 40 \text{ ft}; 40 \div 15 = 2.\bar{6} \text{ rolls; } 3 \text{ rolls}$$

MEET THE MATHEMATICIAN

Archimedes (287–212 BC) was the greatest mathematician of the ancient world. He lived in Greece over 200 years before Jesus was born. Archimedes developed the first law of hydrostatics and worked out the approximate value of π . Putting mathematics into action, Archimedes was also an inventor. His military inventions included a catapult, a device for dropping heavy objects on ships to sink them, and a machine that picked up ships in the harbor and turned them over! Because of these inventions, the city of Syracuse was able to fend off the Romans for over two years. Archimedes' tomb was engraved with a sphere inside a cylinder to memorialize his great contributions to the study of geometry.

Computers have calculated π to over a trillion decimal places but have not arrived at its exact value. We may never know the exact value of π , but we do know that it is constant for every circle.



Complete **DAILY REVIEW** b on page 441.

Area of Rectangles, Squares & Parallelograms

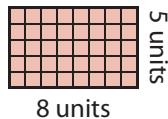
Area is the space within a region. The area of a region is the number of square units needed to cover its surface.

Area of a Rectangle

$$A = l \cdot w$$

$$A = 8 \cdot 5$$

$$A = 40 \text{ units}^2$$

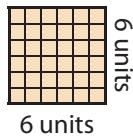


Area of a Square

$$A = l \cdot w \text{ or } A = s^2$$

$$A = 6 \times 6 \text{ or } 6^2$$

$$A = 36 \text{ units}^2$$



area

$$A = l \cdot w$$

$$A = b \cdot h$$

$$A = l \cdot w \text{ or } A = s^2$$

$$A = (l \cdot w) + (b \cdot h)$$

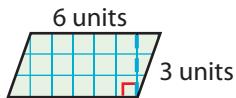
Area of a Parallelogram

When a parallelogram does not have right angles, its area is still determined by multiplying the length of its base (b) and the length of its height (h). The height is the length of a line segment that is perpendicular to both bases; it is the shortest distance between the bases.

$$A = b \cdot h$$

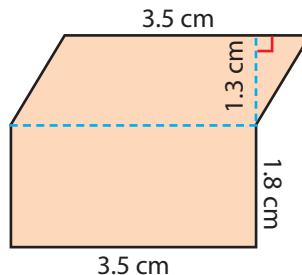
$$A = 6 \cdot 3$$

$$A = 18 \text{ units}^2$$



Area of a Complex Figure

The area of an irregular polygon is determined by finding the area of each smaller region in the figure and then adding the areas.



$$A = (l \cdot w) + (b \cdot h)$$

$$A = (3.5 \cdot 1.8) + (3.5 \cdot 1.3)$$

$$A = 6.3 + 4.55$$

$$A = 10.85 \text{ cm}^2$$

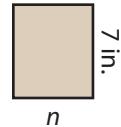
Find the Measurement of an Unknown Side Given the Area

Divide the given area by the measurement of the known side.

$$n = A \div s$$

$$n = 42 \div 7$$

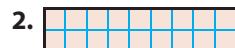
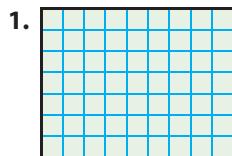
$$n = 6 \text{ in.}$$



$$\text{Area} = 42 \text{ in.}^2$$

Exercises

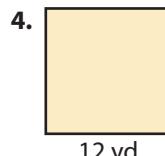
Use the formula $l \cdot w$ to find the area of the figure.



$$A = 9 \cdot 2 = 18 \text{ units}^2$$

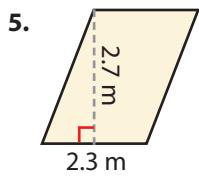


$$A = 5.6 \text{ m} \cdot 2 \text{ m} = 11.2 \text{ m}^2$$

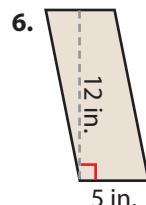


$$A = 12 \text{ yd} \cdot 12 \text{ yd} = 144 \text{ yd}^2$$

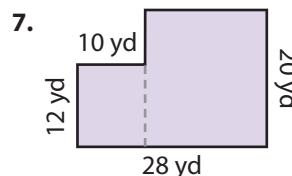
Find the area of the figure.



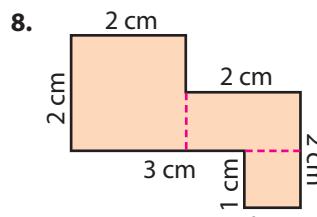
$$A = 9 \cdot 7 = 63 \text{ units}^2$$



$$A = 60 \text{ in.}^2$$

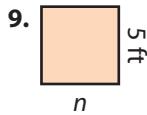


$$A = 480 \text{ yd}^2$$



$$A = 7 \text{ cm}^2$$

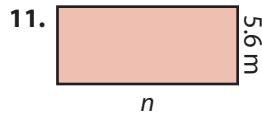
Find the unknown measurement of the figure using the given area.



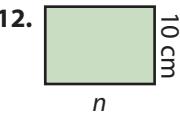
$$A = 25 \text{ ft}^2 \quad 5 \text{ ft}$$



$$A = 136 \text{ yd}^2 \quad 8 \text{ yd}$$

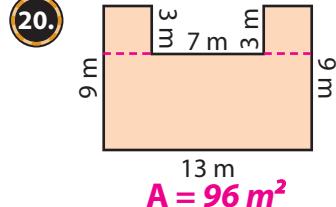
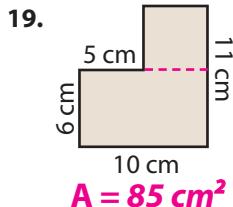
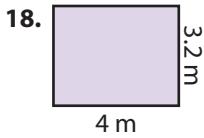
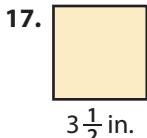
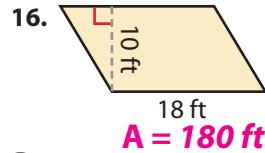
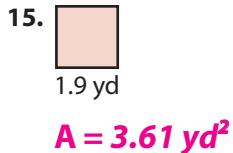
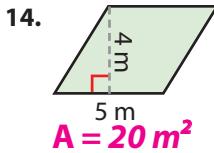
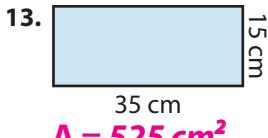


$$A = 70 \text{ m}^2 \quad 12.5 \text{ m}$$



$$A = 140 \text{ cm}^2 \quad 14 \text{ cm}$$

Find the area of the figure.



Use the dimensions given to find the area.

21. $l = 4 \text{ in.}$

$w = 8 \text{ in.}$

$A = \underline{\hspace{2cm}} 32 \text{ in.}^2$

22. $b = 15 \text{ ft}$

$h = 24 \text{ ft}$

$A = \underline{\hspace{2cm}} 360 \text{ ft}^2$

23. $b = 4.5 \text{ m}$

$h = 7.5 \text{ m}$

$A = \underline{\hspace{2cm}} 33.75 \text{ m}^2$

Use the area given to find the unknown measurement of the rectangle or the square.

24. $l = 7 \text{ yd}$

$w = \underline{\hspace{2cm}} 12 \text{ yd}$

$A = 84 \text{ yd}^2$

25. $l = \underline{\hspace{2cm}} 9 \text{ m}$

$w = 5.5 \text{ m}$

$A = 49.5 \text{ m}^2$

26. $l = \underline{\hspace{2cm}} 10 \text{ ft}$

$w = 10 \text{ ft}$

$A = 100 \text{ ft}^2$

Practice & Application Equations may vary.

27. Luke built a table with a square top. The tabletop measures 30 inches on each side. How many square-inch tiles are needed to cover the whole tabletop? $A = s^2$; $30 \text{ in.} \cdot 30 \text{ in.} = 900 \text{ in.}^2$
tiles

28. Owen's family has a rectangular-shaped swimming pool in their backyard. The swimming pool is 30 feet long and 15 feet wide. What is the area of the swimming pool?
 $A = l \cdot w$; $30 \text{ ft} \cdot 15 \text{ ft} = 450 \text{ ft}^2$

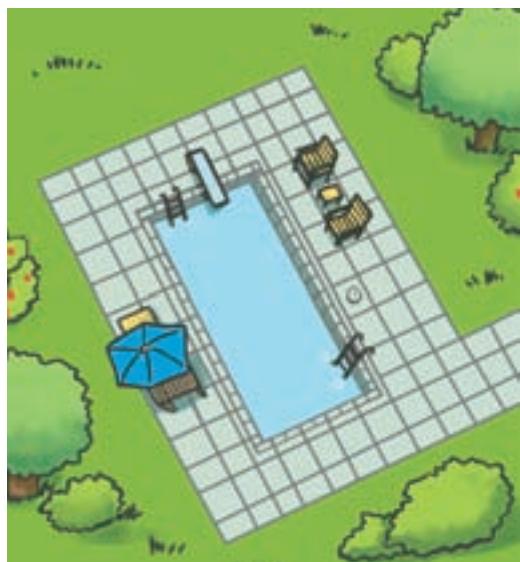
29. Owen's backyard has the shape of a rectangle. It is 75 feet long and 50 feet wide. What is the area of the backyard that is *not* part of the swimming pool? $A = 3,300 \text{ ft}^2$

30. Mr. Martinez is placing edging around 2 trees in the front yard. The diameter of each circle will be 3 feet. What is the total amount of edging he needs for these trees? $C = 18.84 \text{ ft}$

31. Mrs. Anderson is putting a frame around an octagonal mirror. Each side of the mirror is 12 inches. How much molding will Mrs. Anderson use to frame the mirror? $P = 96 \text{ in.}$

32. Explain where to draw a line segment to measure the height of a parallelogram. **perpendicular to the two bases**

- J** Why is area measured in square units and perimeter measured in units? **Perimeter is a 1-dimensional measurement—length (in., cm, ft). Area is a 2-dimensional measurement—length × width or base × height (in. × in. = in.²; cm × cm = cm²; ft × ft = ft²).**



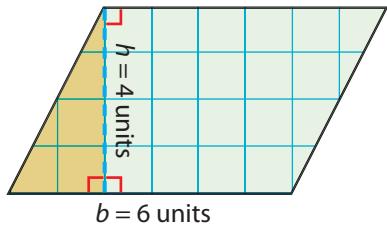
Complete **DAILY REVIEW** C on page 441.

Area of Triangles

Area of a Parallelogram

$$A = b \cdot h$$

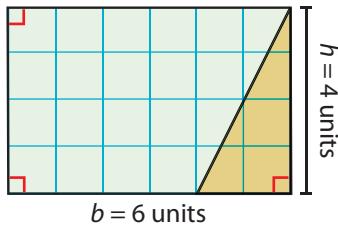
To change a parallelogram to a rectangle, you can remove a triangle from one side of the parallelogram and connect it to the other side.



$$\begin{aligned} A &= b \cdot h \\ A &= 6 \cdot 4 \\ A &= 24 \text{ units}^2 \end{aligned}$$

Area of a Rectangle

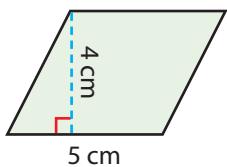
$$A = l \cdot w$$



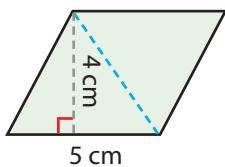
$$\begin{aligned} A &= b \cdot h \\ A &= l \cdot w \\ A &= \frac{1}{2}(b \cdot h) \end{aligned}$$

Area of a Triangle

A diagonal divides a parallelogram into two congruent triangles. The area of each triangle is $\frac{1}{2}$ of the area of the parallelogram.

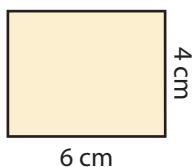


$$\begin{aligned} A &= b \cdot h \\ A &= 5 \cdot 4 \\ A &= 20 \text{ cm}^2 \end{aligned}$$

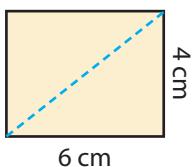


$$\begin{aligned} A &= \frac{1}{2}(b \cdot h) \\ A &= \frac{1}{2}(5 \cdot 4) \\ A &= \frac{1}{2}(20) \\ A &= 10 \text{ cm}^2 \end{aligned}$$

Each triangle has an area of 10 cm^2 .



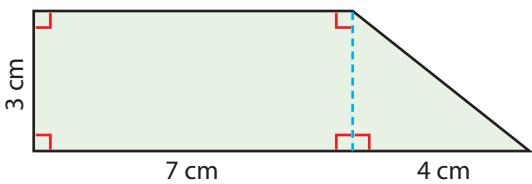
$$\begin{aligned} A &= l \cdot w \\ A &= 6 \cdot 4 \\ A &= 24 \text{ cm}^2 \end{aligned}$$



$$\begin{aligned} A &= \frac{1}{2}(b \cdot h) \\ A &= \frac{1}{2}(6 \cdot 4) \\ A &= \frac{1}{2}(24) \\ A &= 12 \text{ cm}^2 \end{aligned}$$

Each triangle has an area of 12 cm^2 .

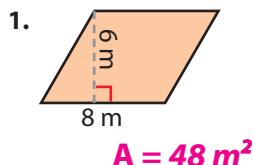
Area of a Complex Figure



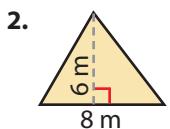
$$\begin{aligned} A &= (7 \cdot 3) + \frac{1}{2}(4 \cdot 3) \\ A &= 21 + \frac{1}{2}(12) \\ A &= 21 + 6 \\ A &= 27 \text{ cm}^2 \end{aligned}$$

Exercises

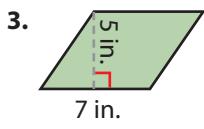
Find the area of the figure.



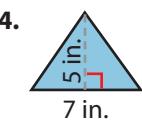
$$A = 48 \text{ m}^2$$



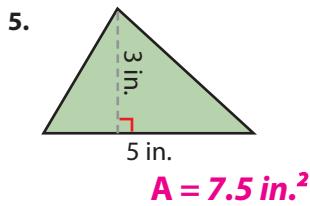
$$A = 24 \text{ m}^2$$



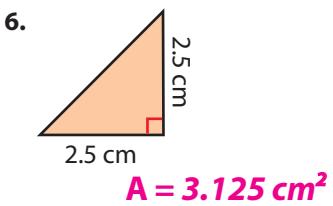
$$A = 35 \text{ in.}^2$$



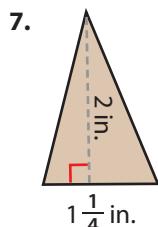
$$A = 17.5 \text{ in.}^2$$



$$A = 7.5 \text{ in.}^2$$

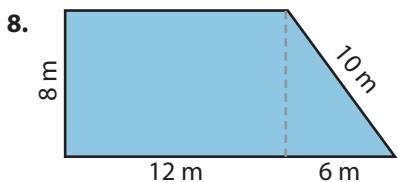


$$A = 3.125 \text{ cm}^2$$



$$A = 1\frac{1}{4} \text{ in.}^2$$

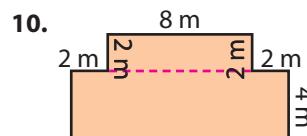
Find the perimeter and the area of the complex figure.



$$P = 48 \text{ m}; A = 120 \text{ m}^2$$



$$P = 42 \text{ ft}; A = 68 \text{ ft}^2$$



$$P = 36 \text{ m}; A = 64 \text{ m}^2$$

Find an Unknown Measurement

Substitute the known measures into the formula and then solve for the unknown.

$$A = \frac{1}{2}(b \cdot h)$$

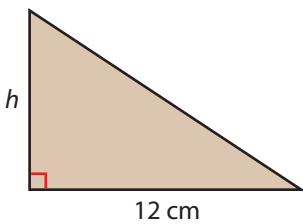
$$48 = \frac{1}{2}(12 \cdot h)$$

$$48 = \frac{1}{2}(12h)$$

$$48 = 6h$$

$$\frac{48}{6} = \frac{6h}{6}$$

$$8 = h$$



$$\text{Area} = 48 \text{ cm}^2$$

$$A = \frac{1}{2}(b \cdot h)$$

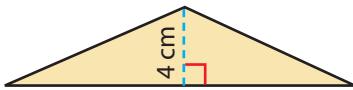
$$36 = \frac{1}{2}(b \cdot 4)$$

$$36 = \frac{1}{2}(4b)$$

$$36 = 2b$$

$$\frac{36}{2} = \frac{2b}{2}$$

$$18 = b$$



$$\text{Area} = 36 \text{ cm}^2$$

Exercises

Find the unknown measurement of the triangle.

11. Area = 30 ft²

base = 10 ft

height = 6 ft

12. Area = 15 m²

base = 3 m

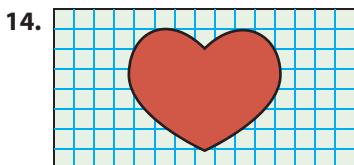
height = 10 m

13. Area = 24 yd²

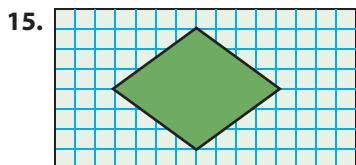
base = 6 yd

height = 8 yd

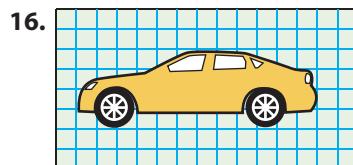
Estimate the area of the figure. Each square on the grid represents 1 cm².



$$42 \text{ cm}^2$$



$$24 \text{ cm}^2$$



$$48 \text{ cm}^2$$

Solve. Round to the nearest whole number if needed. **Equations may vary.**

17. The “Welcome Home, Soldiers!” banner over the church entrance is a rectangle with a length that is 2 times the width measurement. The width of the banner is 6 feet. What is the area of the banner? **A = 72 ft²**

18. Ani made a circular clay pot with a diameter of 8.6 inches. She wants to glue beads around the rim of the pot. How many beads will she use if she glues 1-inch beads around the pot?

$$27 \text{ beads}$$

19. Parker is making felt pennants for the school soccer team. Each pennant will be 18 inches long and have a height of 8 inches. How many square inches of felt does he need for each triangular pennant? **A = $\frac{1}{2}(b \cdot h)$; $\frac{1}{2}(18 \text{ in.} \cdot 8 \text{ in.}) = 72 \text{ in.}^2$**

20. A builder plans to place ceramic tile in a bathroom that is 10 feet long and 6 feet wide. The tiles are 12 inches by 12 inches. How many tiles will the builder need to cover the entire floor?

$$A = l \cdot w; 10 \text{ ft} \cdot 6 \text{ ft} = 60 \text{ ft}^2;$$

$$60 \div 1 = 60 \text{ tiles}$$

21. Mr. Jeffrey is placing a small fence around his garden to keep the rabbits out. His square garden is 15 feet on each side. How much fencing does he need to go around the garden?

$$P = n \cdot s; 4 \text{ ft} \cdot 15 \text{ ft} = 60 \text{ ft}$$

22. On Saturday Colin painted a wall in his bedroom. The wall is 12 feet long and 8 feet high. What is the area of the wall?

$$A = l \cdot w; 12 \text{ ft} \cdot 8 \text{ ft} = 96 \text{ ft}^2$$

Complete **DAILY REVIEW** d on page 442.

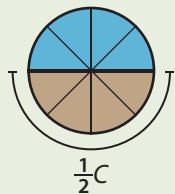
Area of Circles

The **area of a circle** can be discovered by using the formula for the area of a parallelogram ($A = b \cdot h$) and the formula for the circumference of a circle ($C = \pi d$).

area of a circle
 $A = \pi r^2$

Divide a circle into 8 congruent wedges.
Shade each half circle.

Since $C = \pi d$,
then $C = 2\pi r$, or $\frac{1}{2}C = \pi r$.

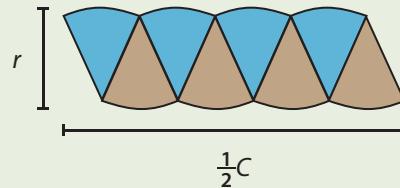


Arrange the wedges to form a figure that is similar to a parallelogram.

- The base of the figure is half the circumference.
- The height of the figure is the radius of the circle.

Area of a circle = base • height

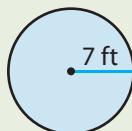
$$\begin{aligned} &= (\frac{1}{2}C)(r) \\ &= \frac{1}{2}(2\pi r)r \\ &= (\frac{1}{2} \cdot 2)\pi(r \cdot r) \\ &= \pi r^2 \end{aligned}$$



The area of a circle is π times the radius squared: $A = \pi r^2$.

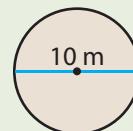
Substitute the length of the radius for r and 3.14 for π .

$$\begin{aligned} r &= 7 \text{ ft} \\ A &= \pi r^2 \\ A &= 3.14(7^2) \\ A &= 3.14(49) \\ \mathbf{A} &= 153.86 \text{ ft}^2 \end{aligned}$$



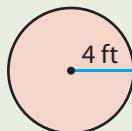
Remember that the radius is half the length of the diameter.

$$\begin{aligned} \text{If } d = 10 \text{ m, then } r = 5 \text{ m.} \\ A &= \pi r^2 \\ A &= 3.14(5^2) \\ A &= 3.14(25) \\ \mathbf{A} &= 78.5 \text{ m}^2 \end{aligned}$$

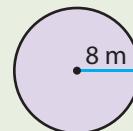


To estimate the area of a circle, round π to 3.

$$\begin{aligned} A &= \pi r^2 \\ A &= 3(4^2) \\ A &= 3(16) \\ \mathbf{A} &= 48 \text{ ft}^2 \end{aligned}$$

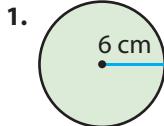


$$\begin{aligned} A &= \pi r^2 \\ A &= 3(8^2) \\ A &= 3(64) \\ \mathbf{A} &= 192 \text{ m}^2 \end{aligned}$$

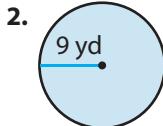


Exercises

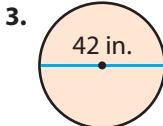
Find the area of the circle. Use 3.14 for π .



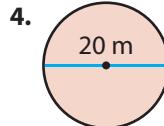
$$\mathbf{A = 113.04 \text{ cm}^2}$$



$$\mathbf{A = 254.34 \text{ yd}^2}$$

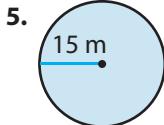


$$\mathbf{A = 1,384.74 \text{ in.}^2}$$

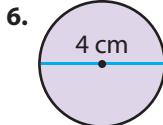


$$\mathbf{A = 314 \text{ m}^2}$$

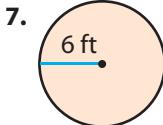
Estimate the area of the circle. Round π to 3.



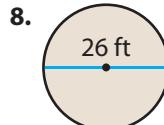
$$\mathbf{A = 675 \text{ m}^2}$$



$$\mathbf{A = 12 \text{ cm}^2}$$



$$\mathbf{A = 108 \text{ ft}^2}$$

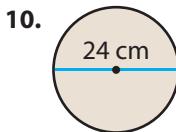


$$\mathbf{A = 507 \text{ ft}^2}$$

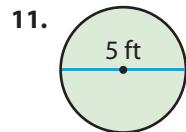
Write the number that is needed to find the area of the circle.



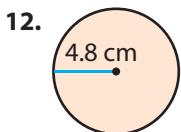
$$A = 3.14 \cdot \underline{\quad} 16^2$$



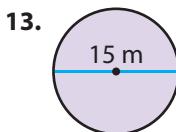
$$A = 3.14 \cdot \underline{\quad} 12^2$$



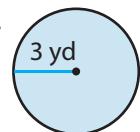
$$A = 3.14 \cdot \underline{\quad} 2.5^2$$



$$A = 3.14 \cdot \underline{\quad} 4.8^2$$

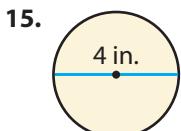


$$A = 3.14 \cdot \underline{\quad} 7.5^2$$

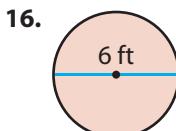


$$A = 3.14 \cdot \underline{\quad} 3^2$$

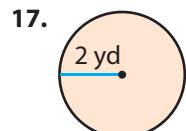
Find the area and the circumference of the circle.



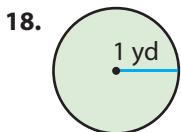
$$A = 12.56 \text{ in.}^2; C = 12.56 \text{ in.}$$



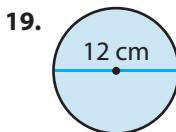
$$A = 28.26 \text{ ft}^2; C = 18.84 \text{ ft}$$



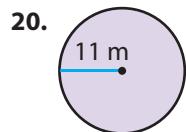
$$A = 12.56 \text{ yd}^2; C = 12.56 \text{ yd}$$



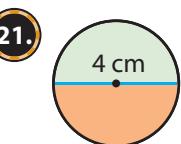
$$A = 3.14 \text{ yd}^2; C = 6.28 \text{ yd}$$



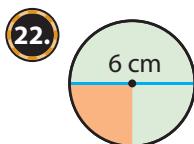
$$A = 113.04 \text{ cm}^2; C = 37.68 \text{ cm}$$



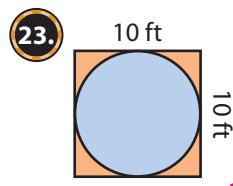
$$A = 379.94 \text{ m}^2; C = 69.08 \text{ m}$$



$$A = 6.28 \text{ cm}^2$$



$$A = 7.065 \text{ cm}^2$$



$$A = 21.5 \text{ ft}^2$$

Practice & Application *Equations may vary.*

24. Julia designed a circular flower bed. The radius of the flower bed is 8 feet. What is the area of the flower bed?

$$A = 200.96 \text{ ft}^2$$

25. Mrs. Davenport found a round tablecloth with an area of 11 square feet. Will this tablecloth cover her table that has a diameter of 4 feet? $A = 12.56 \text{ ft}^2$; no

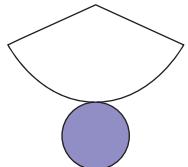
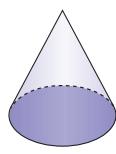
26. Mr. King built a circular sandbox for the playground. The radius of the sandbox is 6 feet. What is the area of the sandbox? $A = 113.04 \text{ ft}^2$



Complete **DAILY REVIEW** e on page 442.

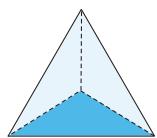
Surface Area of Prisms

A **net** is a flat pattern of 2-dimensional surfaces that can be shaped into a 3-dimensional figure.

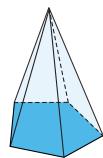


A **cone** has 1 base and an opposite vertex.

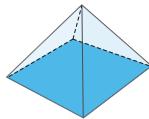
A **pyramid** is a cone with a polygon instead of a circle as a base. A pyramid is named for the shape of its base. All other faces of a pyramid are triangles.



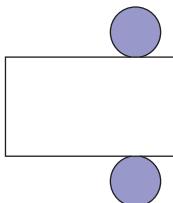
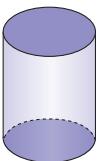
Triangular pyramid



Pentagonal pyramid

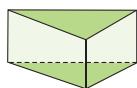


Square pyramid

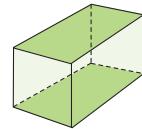


A **cylinder** has 2 congruent circular bases.

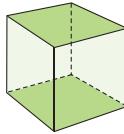
A **prism** is a type of cylinder with 2 congruent polygon bases that are parallel. A prism is named for the shape of its bases. All other faces of a prism are parallelograms.



Triangular prism



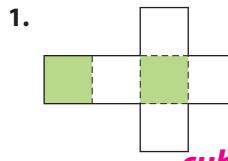
Rectangular prism



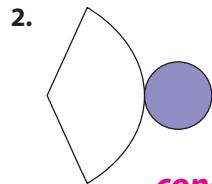
Cube (square prism)

Exercises

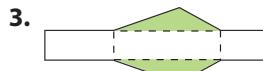
Write the name of the figure that the net will make. The bases of the nets are shaded.



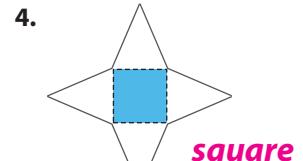
cube or square prism



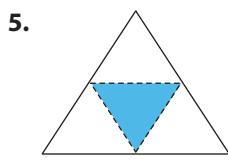
cone



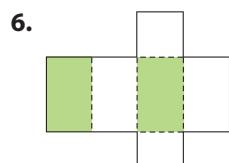
triangular prism



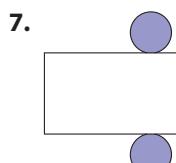
square pyramid



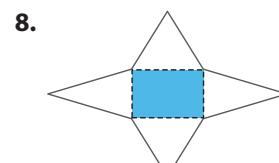
triangular pyramid



rectangular prism

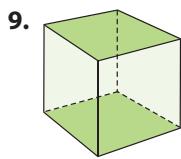


cylinder

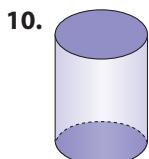


rectangular pyramid

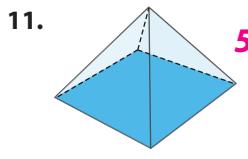
Write the number of surfaces for the figure.



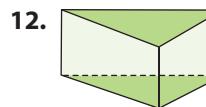
6



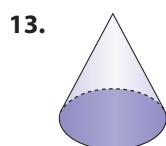
3



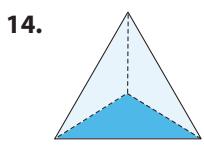
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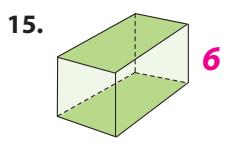
5



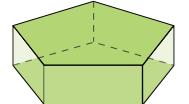
2



4



6



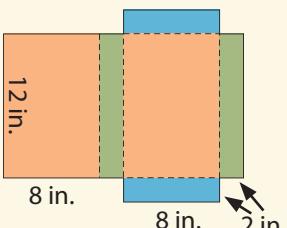
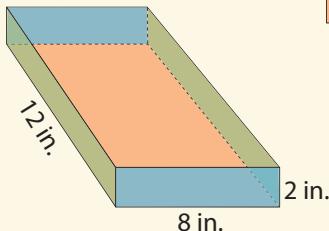
7

Use the Given Formula to Find the Surface Area of Prisms

The **surface area** of a 3-dimensional figure is the sum of the areas of all its surfaces.

A **rectangular prism** has 3 sets of congruent faces.

$$S = 2(l \cdot w) + 2(w \cdot h) + 2(l \cdot h)$$



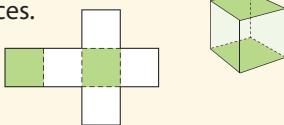
**top and bottom
front and back
sides**

$$\begin{aligned} 2(12 \cdot 8) &= 192 \text{ in.}^2 \\ 2(12 \cdot 2) &= 48 \text{ in.}^2 \\ 2(8 \cdot 2) &= 32 \text{ in.}^2 \end{aligned}$$

$$\text{Total Surface Area} = 272 \text{ in.}^2$$

A **cube** has 6 congruent faces.

$$S = 6(l \cdot w) \text{ or } S = 6s^2$$



A **triangular prism** has 5 faces.

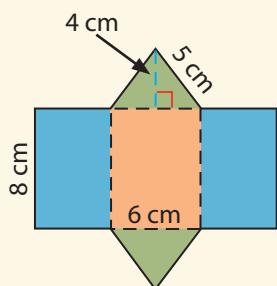
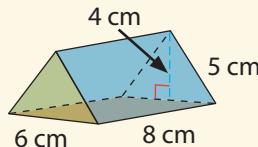
Calculate the area of the 3 rectangular faces.

$$A = l \cdot w$$

Calculate the area of the 2 triangular bases.

$$A = \frac{1}{2}(b \cdot h)$$

Add the areas of the 5 faces.



**bottom face
slanted sides
triangular bases**

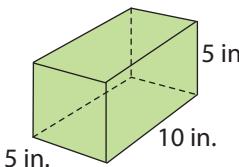
$$\begin{aligned} 8 \cdot 6 &= 48 \text{ cm}^2 \\ 2(8 \cdot 5) &= 80 \text{ cm}^2 \\ 2[\frac{1}{2}(4 \cdot 6)] &= 24 \text{ cm}^2 \end{aligned}$$

$$\text{Total Surface Area} = 152 \text{ cm}^2$$

Exercises

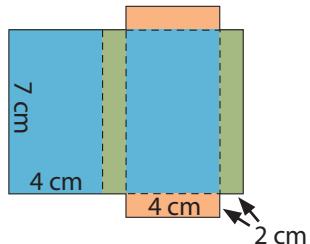
Find the surface area of the prism.

17.



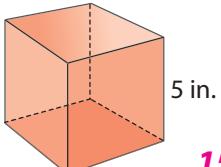
$$250 \text{ in.}^2$$

20.



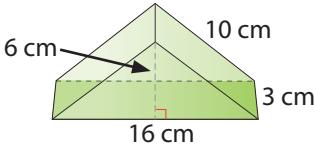
$$100 \text{ cm}^2$$

18.



$$150 \text{ in.}^2$$

19.



$$204 \text{ cm}^2$$



Explain why a cube and a rectangular prism have 6 faces, but a triangular prism has only 5 faces.

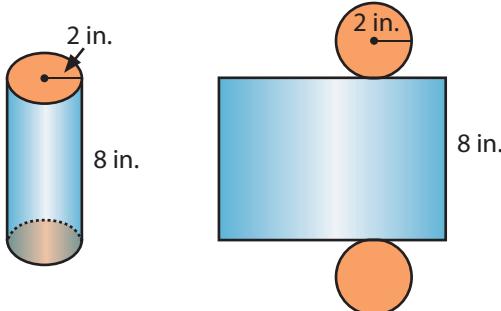
A rectangle has 4 sides plus the 2 bases, giving the prism 6 faces; a triangle has 3 sides plus the 2 bases, giving the prism 5 faces.

Surface Area of Cylinders

A **cylinder** has 2 congruent circular bases and 1 curved surface.

- Calculate the area of one circle using $A = \pi r^2$. Multiply by 2 to find the area of both circular bases.
- Calculate the area of the curved surface. The curved surface is a rectangle when lying flat. Use $A = l \cdot w$. The width of the rectangle is the height of the cylinder. The length of the rectangle is the circumference of the circular bases.

cylinder



circular bases
curved surface

$$2(3.14 \cdot 2^2) = 25.12 \text{ in.}^2$$
$$(3.14 \cdot 4)8 = 100.48 \text{ in.}^2$$

$$\text{Total Surface Area} = 125.60 \text{ in.}^2$$

Exercises

Find the surface area of the cylinder.

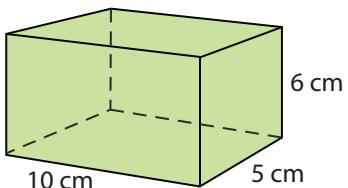
- 345.4 cm^2
- 150.72 cm^2
- 100.48 in.^2
- 188.4 in.^2
- 131.88 in.^2
- 226.08 cm^2
- 169.56 in.^2
- 414.48 cm^2

Write the answer.

9. The bases of cylinders in problem 5 and problem 7 are congruent, but the heights are not. How will the nets differ? **The rectangles will be wider (taller).**

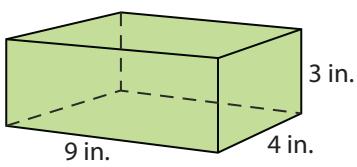
Find the surface area of the prism.

11.



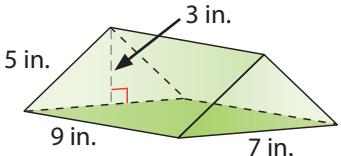
$$280 \text{ cm}^2$$

12.



$$150 \text{ in.}^2$$

13.



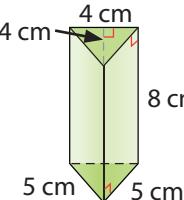
$$174 \text{ in.}^2$$

Solve. Draw a picture if needed.

17. Emma plans to cover a box with colorful adhesive paper. The box is 8 inches long, 6 inches wide, and 5 inches high. Will 225 square inches of adhesive paper cover the box? **$2(8 \cdot 6) + 2(8 \cdot 5) + 2(6 \cdot 5) = 236 \text{ in.}^2$; no**
18. Grace made a pillow in the shape of an octagon. Each side is 12 inches long. Will 100 inches of fringe be enough to go around the entire pillow? **$8 \cdot 12 = 96 \text{ in.}$; yes**
19. Mr. Watkins painted a dodge ball circle on the playground. The circle has a diameter of 18 feet. What is the circumference of the circle? **$3.14 \cdot 18 = 56.52 \text{ ft}$**

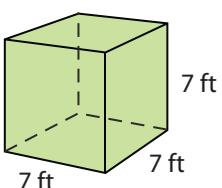
10. The height of cylinders in problem 6 and problem 8 is the same, but the bases are not congruent. How will the nets differ? **The rectangles will be longer.**

14.



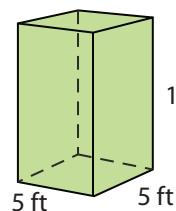
$$128 \text{ cm}^2$$

15.



$$294 \text{ ft}^2$$

16.



$$250 \text{ ft}^2$$

20. Pedro wants to paint 3 walls in his bedroom. His bedroom is 10 feet long and 10 feet wide, and the ceiling is 10 feet high. How much surface area is he going to paint? **$3(10 \cdot 10) = 300 \text{ ft}^2$**



Why would you measure the perimeter of a rectangle in centimeters and the area of that same rectangle in square centimeters?



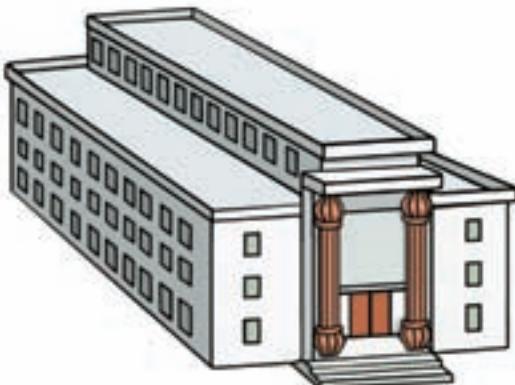
Can a cylinder have circular bases with areas that are different? Why? **No, a cylinder is defined as having 2 congruent circular bases and 1 curved surface.**

DID YOU KNOW

Solomon had the interior of the temple in Jerusalem overlaid with gold. Workers had to figure the area of each surface to be covered in order to prepare the gold overlays.

So Solomon overlaid the house within with pure gold; and he made a partition by the chains of gold before the oracle; and he overlaid it with gold.

1 Kings 6:21



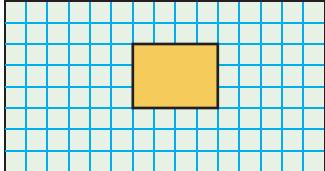
Complete **DAILY REVIEW** g on page 443.

Fixed Areas

Perimeter is the distance around a geometric figure. **Area** is the space within a region. Geometric figures can have the same area but different perimeters.

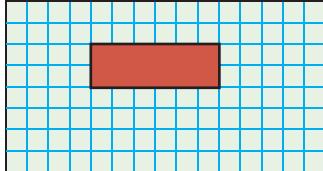
Area can be found by counting the number of square units needed to cover the surface. The perimeter of any polygon can be found by adding the lengths of the sides.

perimeter
$P = (2 \cdot l) + (2 \cdot w)$
area
$A = l \cdot w$



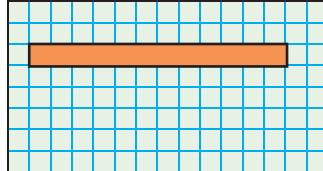
$$A = 3 \times 4 = 12 \text{ units}^2$$

$$P = 4 + 3 + 4 + 3 = 14 \text{ units}$$



$$A = 2 \times 6 = 12 \text{ units}^2$$

$$P = 6 + 2 + 6 + 2 = 16 \text{ units}$$



$$A = 1 \times 12 = 12 \text{ units}^2$$

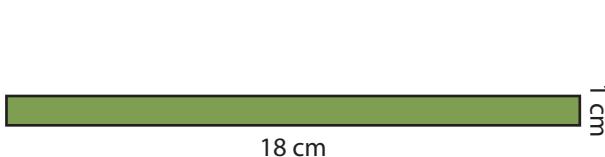
$$P = 12 + 1 + 12 + 1 = 26 \text{ units}$$

The formula used to calculate the area of a rectangle is length (l) times width (w). $A = l \cdot w$

The formula used to calculate the perimeter of a rectangle is 2 times the length plus 2 times the width. $P = (2 \cdot l) + (2 \cdot w)$

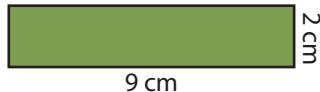
Use factor pairs of 18 as the dimensions of figures with an area of 18 cm^2 .

18: 1×18 2×9 3×6



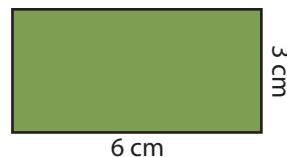
$$A = 18 \cdot 1 = 18 \text{ cm}^2$$

$$P = (2 \cdot 18) + (2 \cdot 1) = 38 \text{ cm}$$



$$A = 9 \cdot 2 = 18 \text{ cm}^2$$

$$P = (2 \cdot 9) + (2 \cdot 2) = 22 \text{ cm}$$



$$A = 6 \cdot 3 = 18 \text{ cm}^2$$

$$P = (2 \cdot 6) + (2 \cdot 3) = 18 \text{ cm}$$

Exercises

Write factor pairs for the given area. Use the factor pairs for the dimension of a figure to find the perimeter. Draw diagrams if needed. **Answers may vary.**

1. 6 m^2

2. 10 in.^2

3. 16 ft^2

Write the two perimeter equations for the given area.

4.	16 cm^2	$P = (2 \cdot 6) + (2 \cdot 2)$	$P = (2 \cdot 4) + (2 \cdot 4)$	$P = (2 \cdot 16) + (2 \cdot 16)$
5.	21 cm^2	$P = (2 \cdot 1) + (2 \cdot 21)$	$P = (2 \cdot 11) + (2 \cdot 10)$	$P = (2 \cdot 3) + (2 \cdot 7)$
6.	28 cm^2	$P = (2 \cdot 4) + (2 \cdot 7)$	$P = (2 \cdot 3) + (2 \cdot 7)$	$P = (2 \cdot 14) + (2 \cdot 2)$

1. $A = 1 \text{ m} \cdot 6 \text{ m}$
 $P = 2(1 \text{ m}) + 2(6 \text{ m})$
 $P = 14 \text{ m}$

$A = 2 \text{ m} \cdot 3 \text{ m}$
 $P = 2(2 \text{ m}) + 2(3 \text{ m})$
 $P = 10 \text{ m}$

2. $A = 1 \text{ in.} \cdot 10 \text{ in.}$
 $P = 2(1 \text{ in.}) + 2(10 \text{ in.})$
 $P = 22 \text{ in.}$

$A = 2 \text{ in.} \cdot 5 \text{ in.}$
 $P = 2(2 \text{ in.}) + 2(5 \text{ in.})$
 $P = 14 \text{ in.}$

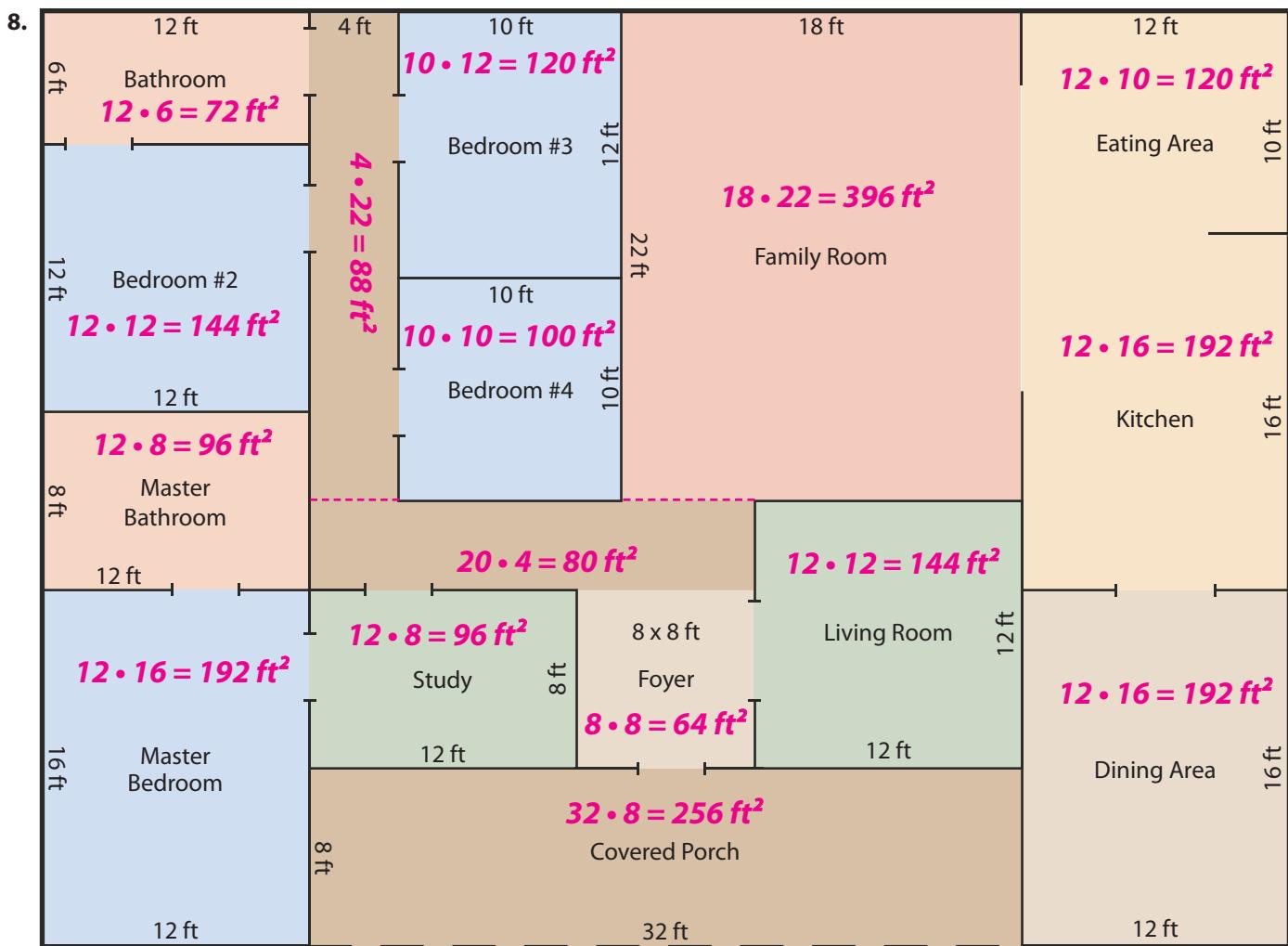
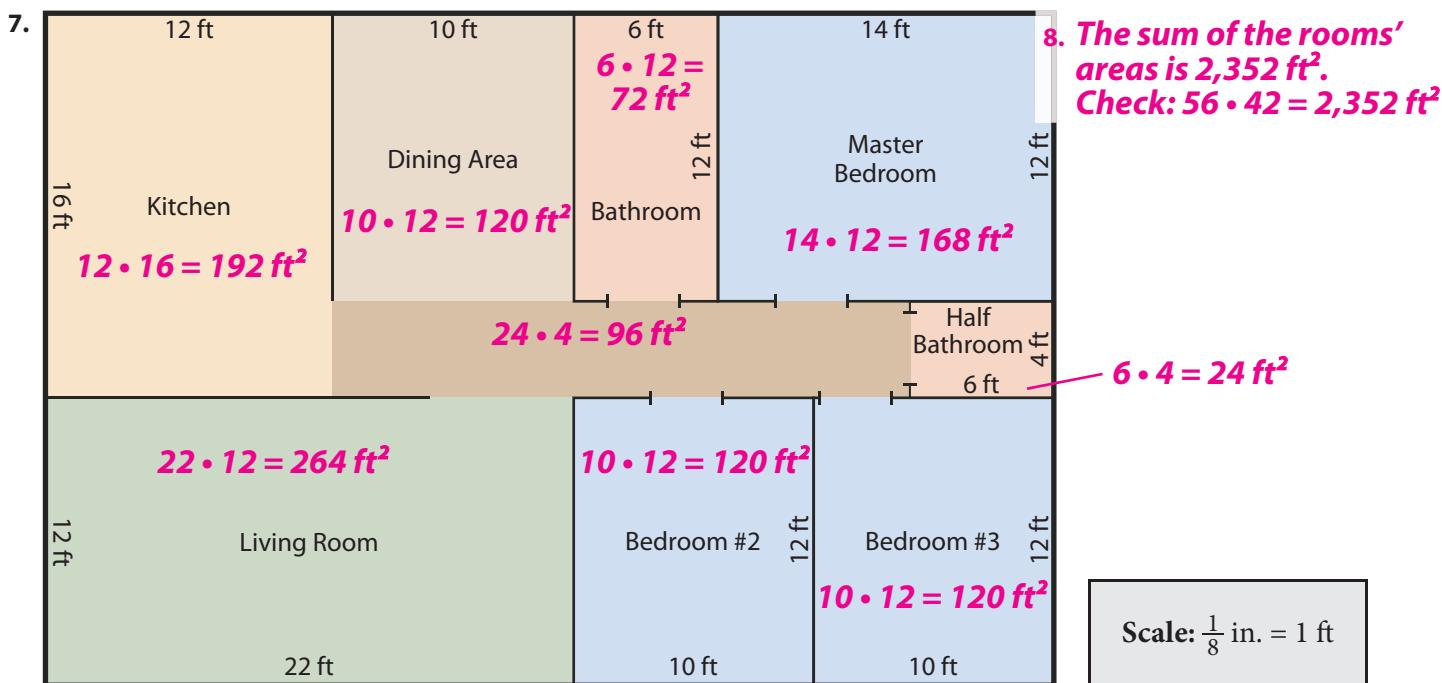
3. $A = 1 \text{ ft} \cdot 16 \text{ ft}$
 $P = 2(1 \text{ ft}) + 2(16 \text{ ft})$
 $P = 34 \text{ ft}$

$A = 2 \text{ ft} \cdot 8 \text{ ft}$
 $P = 2(2 \text{ ft}) + 2(8 \text{ ft})$
 $P = 20 \text{ ft}$

$A = 4 \text{ ft} \cdot 4 \text{ ft}$
 $P = 2(4 \text{ ft}) + 2(4 \text{ ft})$
 $P = 16 \text{ ft}$

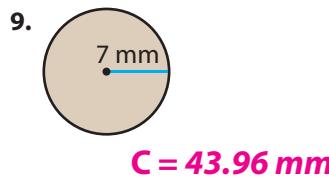
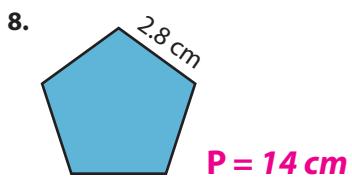
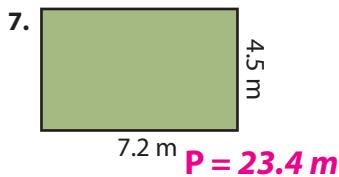
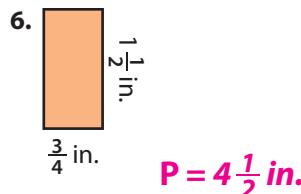
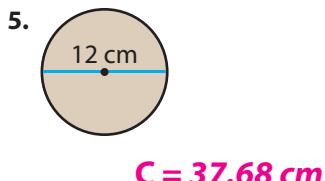
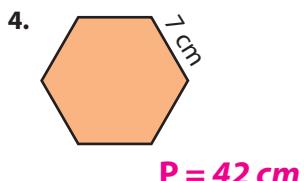
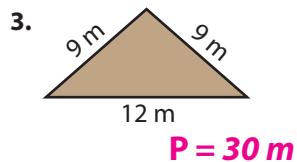
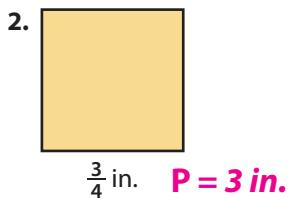
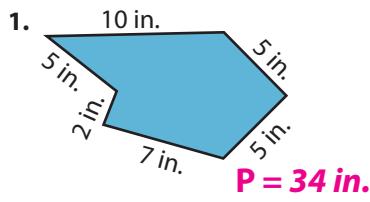
Add the area of each room to find the total area. **Order of addends may vary.**
Check by multiplying $l \times w$ of the floor plan.

7. **The sum of the rooms' areas is $1,176 \text{ ft}^2$.**
Check: $42 \cdot 28 = 1,176 \text{ ft}^2$

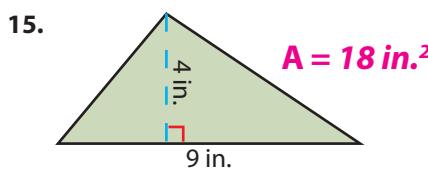
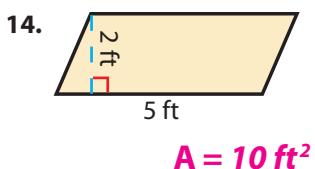
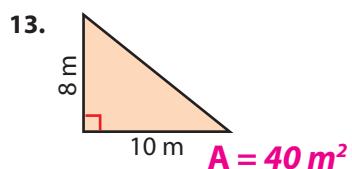
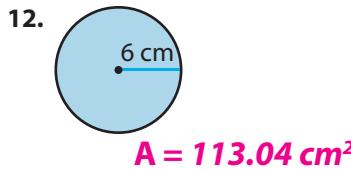
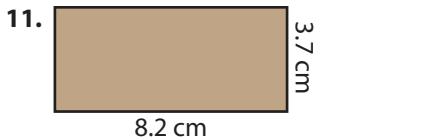
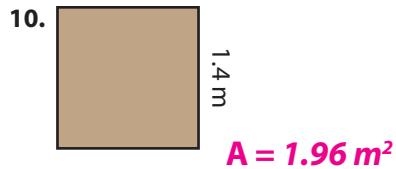


CHAPTER 11 REVIEW

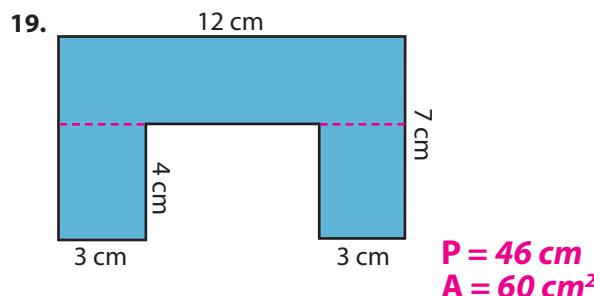
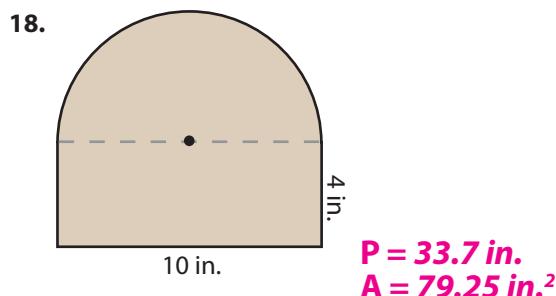
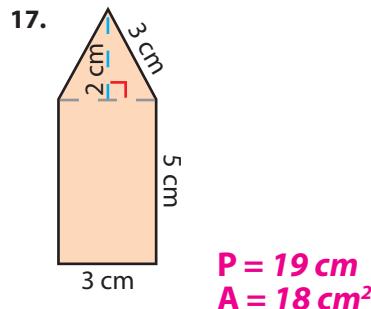
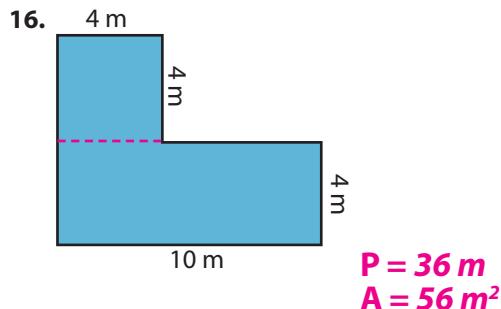
Find the circumference or the perimeter of the figure.
Use 3.14 for π . Round a decimal answer to the nearest hundredth.



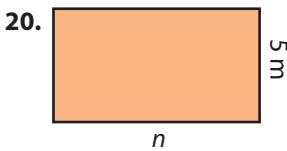
Find the area of the figure.



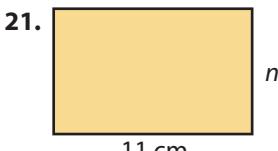
Find the perimeter and the area of the complex figure.



Use the area or the perimeter given to find the unknown measurement of the figure.



$$A = 45 \text{ m}^2 \quad n = 9 \text{ m}$$

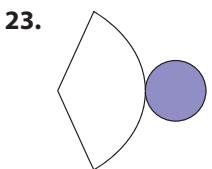


$$A = 77 \text{ cm}^2 \quad n = 7 \text{ cm}$$

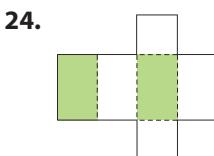


$$P = 20 \text{ in.} \quad n = 5 \text{ in.}$$

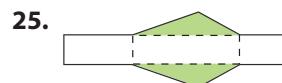
Write the name of the figure that the net will make. The bases of the nets are shaded.



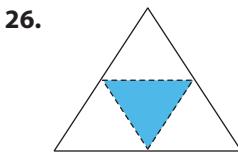
cone



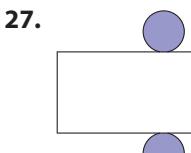
rectangular prism



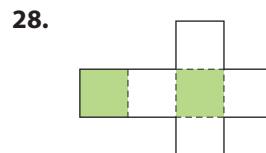
triangular prism



triangular pyramid

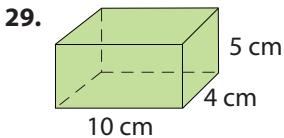


cylinder

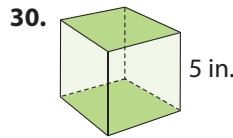


cube or square prism

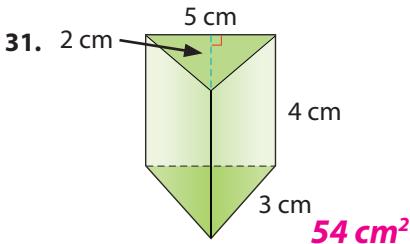
Find the surface area of the figure.



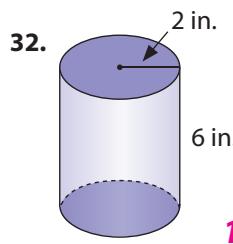
$$220 \text{ cm}^2$$



$$150 \text{ in.}^2$$



$$54 \text{ cm}^2$$



$$100.48 \text{ in.}^2$$

Solve. Equations may vary.

33. Mr. Franz is placing molding around the ceiling in the family room. If the length of the room is 12 feet and the width is 14 feet, how much molding will he use? $(2 \times 12) + (2 \times 14) = 52 \text{ ft}$

34. Mr. Franz is laying new carpet in the family room. If the length of the room is 12 feet and the width is 14 feet, how much carpet will he use?

$$12 \times 14 = 168 \text{ ft}^2$$

35. Mr. Franz built a wooden cube. Mrs. Franz is going to cover the cube with carpet. The faces on the cube are 2 feet by 2 feet. How much carpet will she need to cover all the sides? $6(2 \times 2) = 24 \text{ ft}^2$

$$\begin{aligned} 36. \quad & 2(3.14 \cdot 1^2) = 6.28 \text{ ft}^2; (3.14 \cdot 2) \cdot 2 = 12.56 \text{ ft}^2; \\ & 6.28 + 12.56 = 18.84 \text{ ft}^2 \end{aligned}$$

36. Mrs. Franz had some leftover carpet, so she asked her husband to build a wooden cylinder about the same size as the wooden cube. The height of the cylinder is 2 feet and the radius of each circular base is 1 foot. How much carpet will she need to cover the cylinder?

37. Mrs. Franz is making a circular wall hanging for the family room. If the radius of the wall hanging is 3 feet, what is the area of the wall hanging?

$$3.14 \times 3^2 = 28.26 \text{ ft}^2$$

38. Mrs. Franz decided to attach fringe around the outside edge of the circular wall hanging. How much fringe will she need?

$$2(3.14 \times 3) = 18.84 \text{ ft}$$

Test Prep

Mark the answer.

1. What two prime numbers are between 20 and 30?

- A. 21 and 23
 B. 23 and 29
 C. 25 and 27
 D. none of the above

2. Two addends have a sum of 30. The second addend is 2 times the amount of the first addend.

- A. $14 + 16$
 B. $10 + 20$
 C. $5 + 25$
 D. all of the above

3. $300 = \underline{\hspace{2cm}}$
 A. 3×10^2
 B. 2×30
 C. 30×100
 D. none of the above

4. $400 = \underline{\hspace{2cm}}$
 A. $1,000 \div 2.5$
 B. $8,000 \div 20$
 C. $2\frac{2}{3} \times 150$
 D. all of the above

5. $(15 \times 200) \div 60 + 90 = \underline{\hspace{2cm}}$
 A. 20
 B. 100
 C. 140
 D. none of the above

6. Estimate the product of 726×398 .

- A. 21,000
 B. 28,000
 C. 200,000
 D. 280,000

7. Use front-end estimation for $189,786 + 346,398$.

- A. 300,000
 B. 520,000
 C. 600,000
 D. 720,000

8. Estimate the inventory of 169,387 nails to the nearest one thousand.

- A. 169,000
 B. 170,000
 C. 200,000
 D. 201,000

9. Which list shows all the factors of 72?

- A. 8, 9
 B. 2, 3, 6, 8, 9
 C. 1, 2, 3, 8, 9, 12
 D. 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

10. $\frac{3}{4} + \frac{5}{6} = \underline{\hspace{2cm}}$

- A. The estimated sum is 2.
 B. The estimated sum is 1.
 C. The sum is less than 1.
 D. The sum is greater than 2.

Use the number cards to find the answer.

0.987

0.087

0.7

11. Mark the numbers from *least* to *greatest*.

- A. 0.7, 0.087, 0.987
- B. 0.087, 0.7, 0.987**
- C. 0.987, 0.7, 0.087
- D. 0.987, 0.087, 0.7

12. Mark the sum of the numbers.

- A. 1.081
- B. 1.774**
- C. 2.557
- D. 25.57

13.  ×  =

- A. 609
- B. 6.09
- C. 0.609
- D. 0.0609**

14.  +  × 

- A. 0.07
- B. 0.7518**
- C. 7.518
- D. 8

15.  + n = 

- A. 0.9**
- B. 0.09
- C. 0.009
- D. 9

Mark the answer.

16.  $x > 2$

- A. $x = 16$
- B. $x = 2.3$
- C. $x = \frac{15}{3}$
- D. all of the above**

17.  $x + 10 - 3 = 29.8$

- A. $x = 19.8$
- B. $x = 20.5$
- C. $x = 22.8$**
- D. all of the above

18.  $17(n) = 68$

- A. $n = 2$
- B. $n = 3$
- C. $n = 4$**
- D. $n = 5$

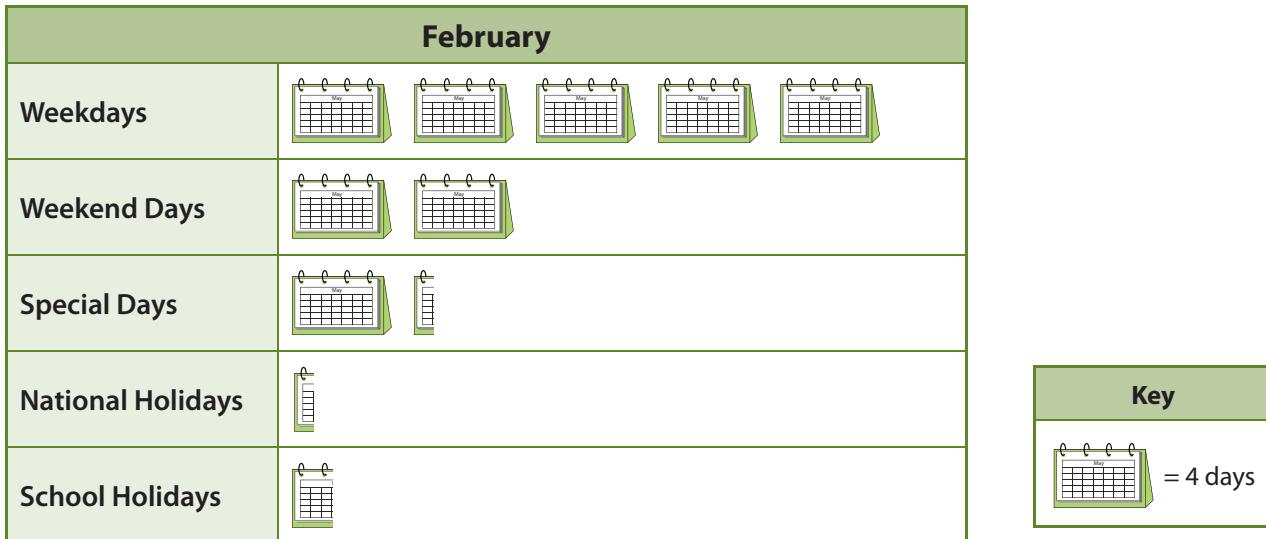
19.  $\frac{n}{8} = 7$

- A. $n = 48$
- B. $n = 56$**
- C. $n = 64$
- D. $n = 77$

20. Write an equivalent expression for 8×9 using prime numbers and exponents.

- A. $2^3 \times 3^2$**
- B. $2^2 \times 3^2$
- C. $2^2 \times 3^3$
- D. none of the above

Use the data from the pictograph to find the answer.



21. Which two lines of the pictograph give the total number of days in February?

- A. weekdays + special days
- B. national holidays + weekdays
- C. weekdays + weekend days
- D. none of the above

22. How many special days are in February?

- A. 3
- B. 4
- C. 5
- D. 6

23. How many more weekdays are there than weekend days?

- A. 2 times as many weekdays
- B. $2\frac{1}{2}$ times as many weekdays
- C. 15 more weekdays
- D. 20 more weekdays

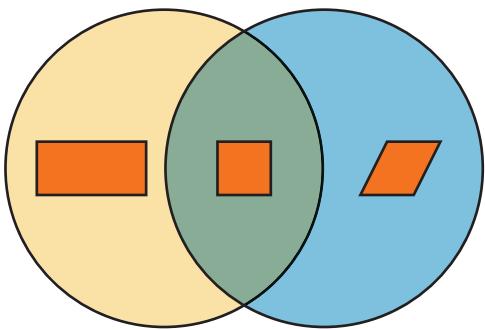
24. If school closes for national holidays and school holidays, how many vacation days will there be?

- A. $1 + 2 = 3$ days
- B. $4 + 2 = 6$ days
- C. $4 + 1 = 5$ days
- D. none of the above

Use the Venn diagram to find the true statement.

25.

Quadrilaterals



- A. A square can be classified as a rectangle and a rhombus.
- B. A rectangle is a rhombus.
- C. A rhombus is not a quadrilateral.
- D. A rectangle, a square, and a rhombus are not related at all.

PRIME NUMBER CALCULATIONS

Find the 45 prime numbers between 1 and 200 using the Sieve of Eratosthenes.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200

Step 1: Make a chart with the numbers 1 through 200.

Step 2: Cross out 1.

Step 3: Circle the first six prime numbers. **2, 3, 5, 7, 11, 13**

Step 4: Cross out the multiples of the first six prime numbers.

Step 5: The remaining numbers are prime. List them.

17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199

Christian Goldbach, an eighteenth-century mathematician, devised the theory that every even number greater than 4 can be expressed as the sum of two prime numbers. This theory has never been proved or disproved. Some examples are shown below.

$$10 = 3 + 7 \quad 56 = 43 + 13 \quad 100 = 97 + 3$$

Look at the list of prime numbers you made. Find which two prime numbers greater than 2 can be added together to equal each of the following numbers.

- | | | | |
|---|--|---|---|
| 1. 78 73 + 5; 71 + 7;
67 + 11; 61 + 17;
59 + 19; 47 + 31;
or 41 + 37 | 2. 116 113 + 3; 109
+ 7; 103 + 13; 97
+ 19; 79 + 37; or
73 + 43 | 3. 164 157 + 7; 151
+ 13; 127 + 37;
103 + 61; or 97
+ 67 | 4. 128 109 + 19; 97
+ 31; or 67 + 61 |
|---|--|---|---|

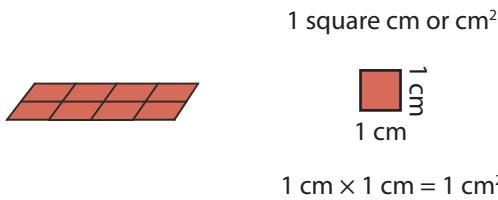
Every composite number can be illustrated as an array of dots. No prime number greater than 2 can be illustrated this way. Try this idea with several prime and composite numbers.

Number	Array	Explanation	Type of Number
39		This array is 3 equal rows of 13 dots.	composite
7		Equal rows cannot be made with 7 dots.	prime

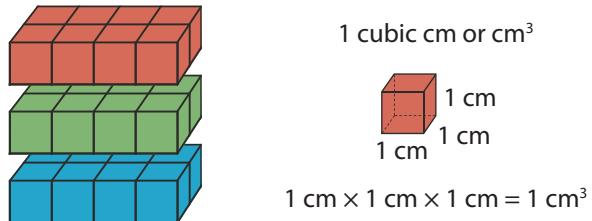
Volume of Rectangular Prisms

The area of a figure is the number of square units a flat space covers. **Volume** builds on the area of a figure. Multiply the area of the **base** ($B = l \times w$) by the number of cubic unit layers (**height**) of the three-dimensional figure. Volume is the number of cubic units a figure contains. The formula is $V = Bh$.

Area is measured using square units. units^2

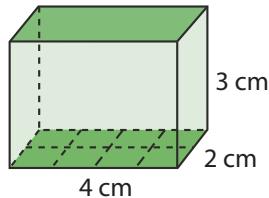
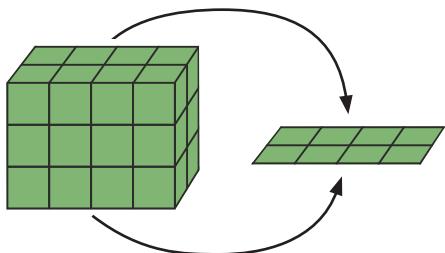


Volume is measured using cubic units. units^3



volume
base
height
 $V = Bh$

The volume of any prism can be found using the volume formula. Because prism bases are parallel and congruent, opposite bases will have the same area.



$$V = Bh$$

$$V = (l \times w) \times h$$

$$V = (\text{4 rows of 2 cubes}) \times 3 \text{ layers}$$

$$V = 8 \text{ cubes} \times 3 \text{ layers}$$

$$V = 24 \text{ cubes or } 24 \text{ cubic units}$$

B (base) is found using the area formula $l \times w$.

$$V = Bh$$

$$V = (l \times w) \times h$$

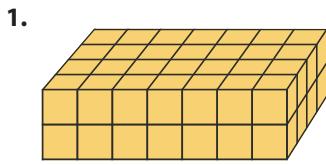
$$V = (4 \times 2) \times 3$$

$$V = 8 \times 3$$

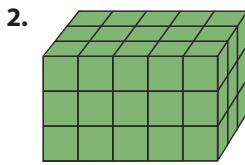
$$V = 24 \text{ cm}^3$$

Exercises

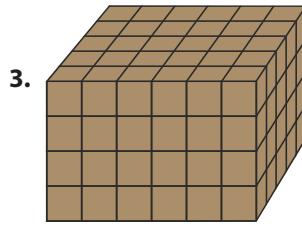
Write an equation to find the volume of the model. Use **cubic units** as the label.



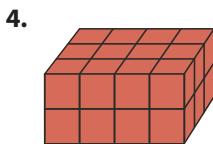
56 cubic units



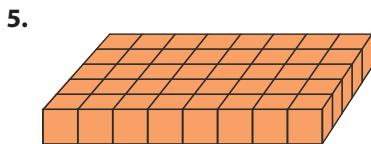
45 cubic units



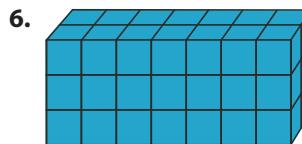
120 cubic units



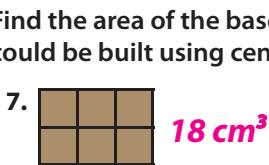
24 cubic units



40 cubic units



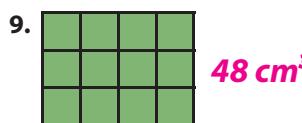
42 cubic units



18 cm²

$$8 \text{ cm}^3$$

height = 3 cm

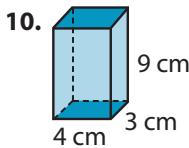


48 cm²

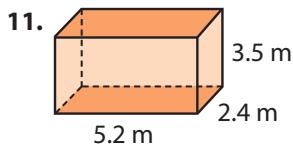
height = 4 cm

Write an equation to find the volume.

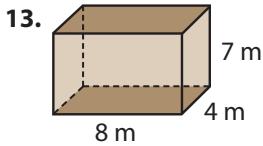
Round a decimal answer to the nearest tenth.



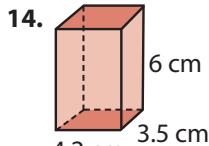
$$108 \text{ cm}^3$$



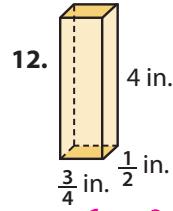
$$43.7 \text{ m}^3$$



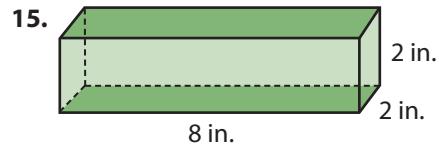
$$224 \text{ m}^3$$



$$88.2 \text{ cm}^3$$



$$1\frac{1}{2} \text{ in.}^3$$



$$32 \text{ in.}^3$$

Find the volume of a prism with the given dimensions.

16. $l = 5 \text{ in.}$, $w = 7 \text{ in.}$, $h = 2 \text{ in.}$

$$70 \text{ in.}^3$$

17. $l = 12 \text{ cm}$, $w = 8 \text{ cm}$, $h = 10 \text{ cm}$

$$960 \text{ cm}^3$$

18. $l = \frac{3}{8} \text{ in.}$, $w = \frac{2}{3} \text{ in.}$, $h = \frac{1}{2} \text{ in.}$

$$\frac{1}{8} \text{ in.}^3$$

19. $B = 15 \text{ ft}^2$, $h = 2 \text{ ft}$

$$30 \text{ ft}^3$$

20. $B = 25 \text{ m}^2$, $h = 8 \text{ m}$

$$200 \text{ m}^3$$

21. $B = 46 \text{ cm}^2$, $h = 5.2 \text{ cm}$

$$239.2 \text{ cm}^3$$

Practice & Application Equations may vary.

On Memorial Day weekend, Carmen and her family attended a hot air balloon festival.

22. Carmen selected a box in which she will store her souvenirs. The box is 24 inches long, 18 inches wide, and 12 inches high. What is the volume of the box? $5,184 \text{ in.}^3$

23. Carmen wants to cover the outside of her box with decorative contact paper. What is the least amount of contact paper Carmen will need? $1,872 \text{ in.}^2$

24. Mr. Fields has 4 feet of molding to make a rectangular frame for a photo he took at the festival. Does he have enough to make a 9-inch by 12-inch frame? Explain. $\text{yes; } (2 \cdot 9 \text{ in.}) + (2 \cdot 12 \text{ in.}) = 42 \text{ in. needed; } 4 \times 12 = 48 \text{ in. available}$

25. Mr. Fields purchased a 9-inch by 12-inch piece of glass for the frame. What is the area of the glass? $9 \text{ in.} \times 12 \text{ in.} = 108 \text{ in.}^2$

26. Mrs. Fields wants to move the shadow box displaying her new balloon figurines. How much space does a shadow box that measures 2 feet long, 1 foot wide, and $\frac{1}{2}$ of a foot high take up? $2 \text{ ft} \times 1 \text{ ft} \times \frac{1}{2} \text{ ft} = 1 \text{ ft}^3$



Write which math concept, *perimeter*, *area*, or *volume*, would be used to solve these problems. Explain your answer.

- the amount of air to fill a balloon
- the amount of material needed to make a balloon
- the amount of space in a basket
- the amount of cushioned edging to go around a basket

a. **volume; find the amount of cubic units within a figure**

b. **area; find the square units in a figure**

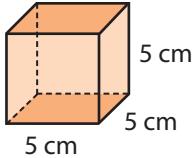
c. **volume; find the amount of cubic space within a figure**

d. **perimeter; find the distance around a figure**

Volume of Cubes

A cube or square prism is a special rectangular prism where all six faces are congruent squares and all sides measure the same.

The formula for volume, $V = Bh$, can be modified for a cube.



Base height
Volume of a cube = (side × side) × side
 $V = s^3$

$$\begin{aligned}V &= (s \times s) \times s \\V &= (5 \times 5) \times 5 \\V &= 25 \times 5 \\V &= \mathbf{125 \text{ cm}^3}\end{aligned}$$

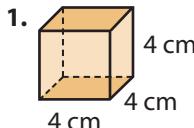
$$\begin{aligned}V &= s^3 \\V &= 5^3 \\V &= 5 \times 5 \times 5 \\V &= \mathbf{125 \text{ cm}^3}\end{aligned}$$

volume of a cube
 $V = s^3$

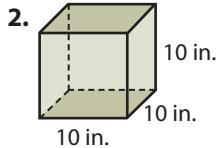
Exercises

Write an equation to find the volume of the cube.

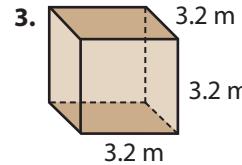
Round a decimal answer to the nearest tenth. **Formula used may vary.**



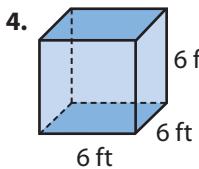
$$\mathbf{64 \text{ cm}^3}$$



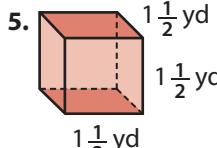
$$\mathbf{1,000 \text{ in.}^3}$$



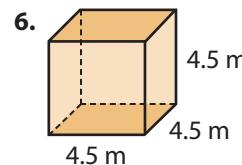
$$\mathbf{32.8 \text{ m}^3}$$



$$\mathbf{216 \text{ ft}^3}$$



$$\mathbf{3 \frac{3}{8} \text{ yd}^3}$$



$$\mathbf{91.1 \text{ m}^3}$$

Find the volume of a prism with the given dimensions. **Equations may vary.**

7. rectangular prism: $l = 5 \text{ in.}$, $w = 2 \text{ in.}$, $h = 4 \text{ in.}$ $(5 \text{ in.} \times 2 \text{ in.}) \times 4 \text{ in.} = 40 \text{ in.}^3$

8. rectangular prism: $B = 12 \text{ ft}^2$, $h = 3 \text{ ft}$ $12 \text{ ft}^2 \times 3 \text{ ft} = 36 \text{ ft}^3$

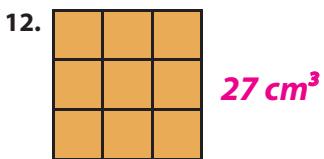
9. cube (square prism): $s = 7 \text{ m}$ $(7 \text{ m})^3$ or $(7 \text{ m} \times 7 \text{ m}) \times 7 \text{ m} = 343 \text{ m}^3$

10. cube (square prism): $B = 100 \text{ cm}^2$, $h = 10 \text{ cm}$ $100 \text{ cm}^2 \times 10 \text{ cm} = 1000 \text{ cm}^3$

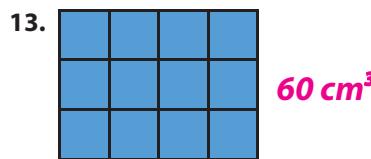
Find the area of the base: $B = l \times w$. Find the volume of the prism that could be built using centimeter cubes for the given height.



$$\mathbf{8 \text{ cm}^3}$$



$$\mathbf{27 \text{ cm}^3}$$



$$\mathbf{60 \text{ cm}^3}$$

height = 2 cm

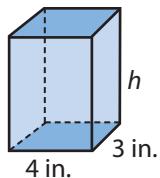
height = 3 cm

height = 5 cm

Find an Unknown Measurement

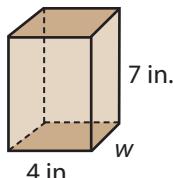
The formula for volume of a prism is $V = Bh$. Since the bases of the figure are rectangles, use $V = (l \cdot w) \cdot h$.

When the volume is given and any two of the volume dimensions are known, you can find the unknown third dimension of a figure.



$$\begin{aligned}V &= Bh \\V &= (l \cdot w) \cdot h \\V &= 84 \text{ in.}^3 \\l &= 4 \text{ in.} \\w &= 3 \text{ in.} \\h &= \underline{\hspace{1cm}} \text{ in.}\end{aligned}$$

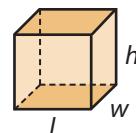
$$\begin{aligned}84 \text{ in.}^3 &= (4 \cdot 3) \cdot h \\84 \text{ in.}^3 &= 12 \cdot h \\84 \text{ in.}^3 &= 12h \\12h &= 84 \text{ in.}^3 \\h &= 84 \text{ in.}^3 / 12 \\h &= 7 \text{ in.}\end{aligned}$$



$$\begin{aligned}V &= Bh \\V &= (l \cdot w) \cdot h \\V &= 84 \text{ in.}^3 \\l &= 4 \text{ in.} \\w &= \underline{\hspace{1cm}} \text{ in.} \\h &= 7 \text{ in.}\end{aligned}$$

$$\begin{aligned}84 \text{ in.}^3 &= (4 \cdot w) \cdot 7 \\84 \text{ in.}^3 &= 4 \cdot w \cdot 7 \\84 \text{ in.}^3 &= 4 \cdot 7 \cdot w \\84 \text{ in.}^3 &= 28 \cdot w \\28w &= 84 \text{ in.}^3 \\w &= 84 \text{ in.}^3 / 28 \\w &= 3 \text{ in.}\end{aligned}$$

What is the measure of the length, the width, and the height of a cube whose volume is 27 units?



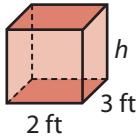
$$\begin{aligned}V(\text{of a cube}) &= s^3 \\27 &= s \cdot s \cdot s\end{aligned}$$

If $s = 2$: $2 \cdot 2 \cdot 2 = 8$
If $s = 3$: $3 \cdot 3 \cdot 3 = 27$
Each side is 3 units.

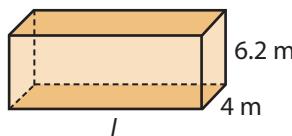
Exercises

Find the unknown measurement of the rectangular prism.

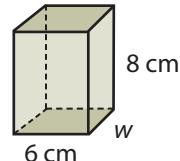
14. $V = 24 \text{ ft}^3$ **$h = 4 \text{ ft}$**



15. $V = 248 \text{ m}^3$ **$l = 10 \text{ m}$**



16. $V = 144 \text{ cm}^3$ **$w = 3 \text{ cm}$**



17. $l = 5 \text{ in.}$, $w = 3 \text{ in.}$, $h = \underline{\hspace{1cm}}$ in., $V = 75 \text{ in.}^3$ **$h = 5$**

18. $l = 2 \text{ cm}$, $w = \underline{\hspace{1cm}}$ cm, $h = 4 \text{ cm}$, $V = 48 \text{ cm}^3$ **$w = 6$**

19. $B = 6 \text{ in.}^2$, $h = \underline{\hspace{1cm}}$ in., $V = 90 \text{ in.}^3$ **$h = 15$**

20. $B = 5.7 \text{ cm}^2$, $h = \underline{\hspace{1cm}}$ cm, $V = 51.3 \text{ cm}^3$ **$h = 9$**

Practice & Application Equations may vary.

21. Mr. Cole is making a small rectangular pond in his backyard. The pond will be 7 meters long, 5 meters wide, and 1 meter deep. What is the volume of the pond?

$7 \text{ m} \times 5 \text{ m} \times 1 \text{ m} = 35 \text{ m}^3$

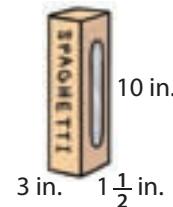
22. One cubic meter can hold about 264 gallons of water. Approximately how many gallons of water will the pond hold? **$35 \times 264 \text{ gal} = 9,240 \text{ gal}$**

23. Mr. Cole is placing stones along the 4 sides of the pond. What is the distance around the pond's edge? **$(2 \times 7 \text{ m}) + (2 \times 5 \text{ m}) = 24 \text{ m}$**

24. Mrs. Cole wants to purchase a tarp to cover the pond during the winter. What is the area of the pond? **$7 \text{ m} \times 5 \text{ m} = 35 \text{ m}^2$**



Find the surface area and the volume of the prisms.



Volume of Other 3-D Figures

Volume of an Irregular Prism

Count the square units to find the area of an irregular base. Multiply the base by the height to find the volume of the irregular prism.

volume of an irregular prism
volume of a triangular prism
volume of a cylinder

1. Count the square units in the base.

$$B = 6 \text{ square units}$$

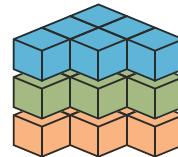
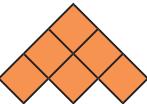
2. Substitute the area of the base for B in the volume formula.

$$V = Bh$$

$$V = (6)(3)$$

$$V = 18 \text{ units}^3$$

The base of the irregular prism.



Volume of a Triangular Prism

1. Find the area of the triangular base.

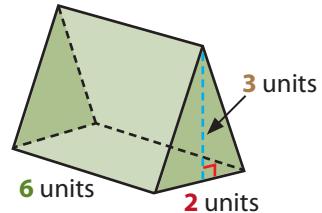
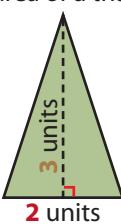
$$B = \frac{1}{2}bh$$

$$B = \frac{1}{2}(2 \cdot 3)$$

$$B = \frac{1}{2}(6)$$

$$B = 3 \text{ units}^2$$

Use $A = \frac{1}{2}bh$ to find the area of a triangle.



2. Substitute the area of the base for B in the volume formula.

$$V = Bh \text{ or } (\frac{1}{2}bh_1)h_2$$

$$V = (3)(6)$$

$$V = 18 \text{ units}^3$$

Volume of a Cylinder

1. Find the area of the circular base given the radius. (Remember that $r = \frac{1}{2}d$ if a diameter is given.)

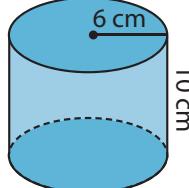
$$B = \pi r^2$$

$$B = (3.14)(6^2)$$

$$B = (3.14)(36)$$

$$B = 113.04 \text{ cm}^2$$

Use $A = \pi r^2$ to find the area of a circular base.



2. Substitute the area of the circular base for B in the volume formula.

$$V = Bh \text{ or } (\pi r^2)h$$

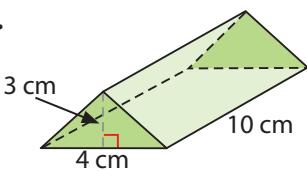
$$V = 113.04 \cdot 10$$

$$V = 1130.4 \text{ cm}^3$$

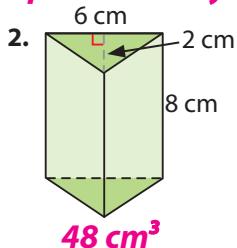
Exercises

Find the volume of the triangular prism. **Equations may vary.**

1.

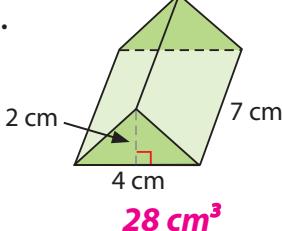


$$60 \text{ cm}^3$$



$$48 \text{ cm}^3$$

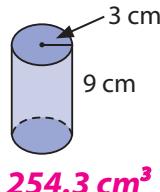
3.



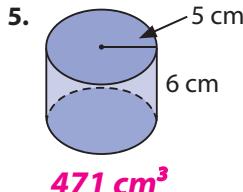
$$28 \text{ cm}^3$$

Find the volume of the cylinder. Round a decimal answer to the nearest tenth. **Equations may vary.**

4.

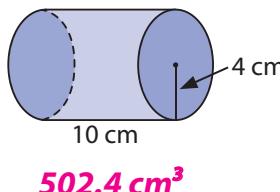


$$254.3 \text{ cm}^3$$



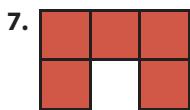
$$471 \text{ cm}^3$$

6.

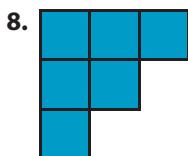


$$502.4 \text{ cm}^3$$

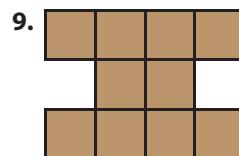
Count the squares to find the area of the base. Find the volume of the prism that could be built using centimeter cubes for the given height.



$$\text{height} = 2 \text{ cm } 10 \text{ cm}^3$$



$$\text{height} = 5 \text{ cm } 30 \text{ cm}^3$$



$$\text{height} = 4 \text{ cm } 40 \text{ cm}^3$$

Find the volume of a figure with the given dimensions. *Equations may vary.*

10. rectangular prism: $l = 7 \text{ in.}$, $w = 3 \text{ in.}$, $h = 4 \text{ in.}$

$$7 \text{ in.} \times 3 \text{ in.} \times 4 \text{ in.} = 84 \text{ in.}^3$$

11. rectangular prism: $B = 8 \text{ ft}^2$, $h = 5 \text{ ft}$

$$8 \text{ ft}^2 \times 5 \text{ ft} = 40 \text{ ft}^3$$

12. triangular prism: $B = 12 \text{ ft}^2$, $h = 3 \text{ ft}$

$$12 \text{ ft}^2 \times 3 \text{ ft} = 36 \text{ ft}^3$$

13. triangular prism: $b = 5 \text{ in.}$, $h = 2 \text{ in.}$, h (prism) = 4 in.

$$\frac{1}{2}(5 \text{ in.} \times 2 \text{ in.}) \times 4 \text{ in.} = 20 \text{ in.}^3$$

14. square prism: $s = 2 \text{ m}$

$$(2 \text{ m})^3 = 8 \text{ m}^3$$

15. square prism: $B = 16 \text{ cm}^2$, $h = 4 \text{ cm}$

$$16 \text{ cm}^2 \times 4 \text{ cm} = 64 \text{ cm}^3$$

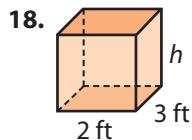
16. cylinder: $r = 2 \text{ m}$, $h = 5 \text{ m}$

$$3.14 \times (2 \text{ m})^2 \times 5 \text{ m} = 62.8 \text{ m}^3$$

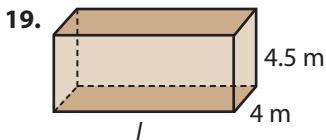
17. cylinder: $B = 78.5 \text{ cm}^2$, $h = 4 \text{ cm}$

$$78.5 \text{ cm}^2 \times 4 \text{ cm} = 314 \text{ cm}^3$$

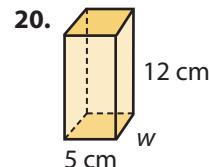
Find the unknown measurement of the rectangular prism.



$$V = 36 \text{ ft}^3 \quad h = 6 \text{ ft}$$



$$V = 162 \text{ m}^3 \quad l = 9 \text{ m}$$

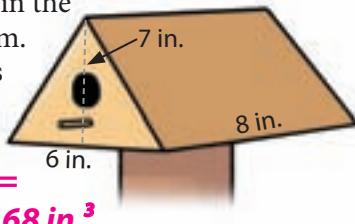


$$V = 240 \text{ cm}^3 \quad w = 4 \text{ cm}$$

Practice & Application *Equations may vary.*

21. Samuel built a birdhouse in the shape of a triangular prism. Use the given dimensions to find the volume of the birdhouse.

$$\frac{1}{2}(6 \text{ in.} \times 7 \text{ in.}) \times 8 \text{ in.} = 168 \text{ in.}^3$$



22. Thomas filled a rectangular planter with potting soil. His planter is 2 feet long, $1\frac{1}{2}$ feet wide, and $\frac{1}{2}$ of a foot high. How much potting soil did it take to fill his planter?

$$2 \text{ ft} \times \frac{3}{2} \text{ ft} \times \frac{1}{2} \text{ ft} = \frac{6}{4} \text{ ft}^3 = 1\frac{1}{2} \text{ ft}^3$$

23. Rebecca filled a cylindrical planter with potting soil. Her planter is 1 foot tall and has a diameter of 2 feet. How much potting soil did it take to fill her planter? Remember: $r = \frac{1}{2}d$.

$$3.14 \times (1 \text{ ft})^2 \times 1 \text{ ft} = 3.14 \text{ ft}^3$$

24. Maya just purchased an above-ground swimming pool. The swimming pool is 4 feet high and has a diameter of 18 feet. What is the volume of her new swimming pool? Remember: $r = \frac{1}{2}d$.

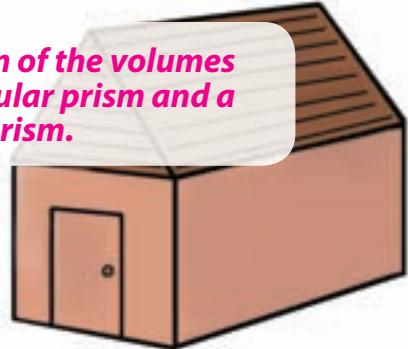
$$3.14 \times (9 \text{ ft})^2 \times 4 \text{ ft} = 1,017.36 \text{ ft}^3$$

25. One cubic foot can hold about 7.5 gallons of water. Approximately how many gallons of water are needed to fill Maya's swimming pool?

$$\text{Estimate: } 1,017 \times 8 \text{ gal} = 8,136 \text{ gal}$$

- J Explain how you could find the volume of the shed.

Find the sum of the volumes of a rectangular prism and a triangular prism.



Complete **DAILY REVIEW C** on page 445.

Fixed Volumes & Fixed Lateral Surfaces

Geometric figures can have the same volume but different shapes. *Volume* is the number of cubic units an object holds. *Surface area* is the sum of the areas of all the surfaces.

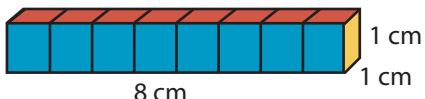
lateral surface area

Shapes with a Volume of 8 cm³

$$V = 8 \text{ cm}^3$$

$$V = 8 \cdot 1 \cdot 1$$

$$l \cdot w \cdot h$$



top and bottom
front and back
left and right sides

$$2 \cdot (8 \cdot 1) = 16 \text{ cm}^2$$

$$2 \cdot (8 \cdot 1) = 16 \text{ cm}^2$$

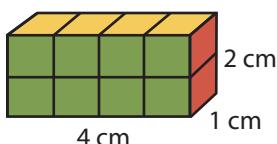
$$2 \cdot (1 \cdot 1) = 2 \text{ cm}^2$$

Total surface area = **34 cm²**

$$V = 8 \text{ cm}^3$$

$$V = 4 \cdot 1 \cdot 2$$

$$l \cdot w \cdot h$$



top and bottom
front and back
left and right sides

$$2 \cdot (4 \cdot 1) = 8 \text{ cm}^2$$

$$2 \cdot (4 \cdot 2) = 16 \text{ cm}^2$$

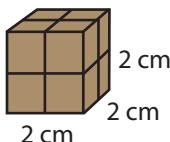
$$2 \cdot (1 \cdot 2) = 4 \text{ cm}^2$$

Total surface area = **28 cm²**

$$V = 8 \text{ cm}^3$$

$$V = 2 \cdot 2 \cdot 2$$

$$l \cdot w \cdot h$$



All sides

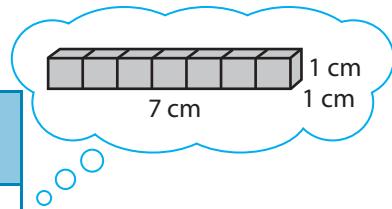
$$6 \cdot (2 \cdot 2) = 24 \text{ cm}^2$$

Total surface area = **24 cm²**

Exercises Order of dimensions may vary within a row.

The volume and the length of a rectangular prism are given.

Use the given dimensions to arrange cubes to find the unknown values for the width and the height: $V = l \cdot w \cdot h$. Find the surface area using the 3 dimensions.

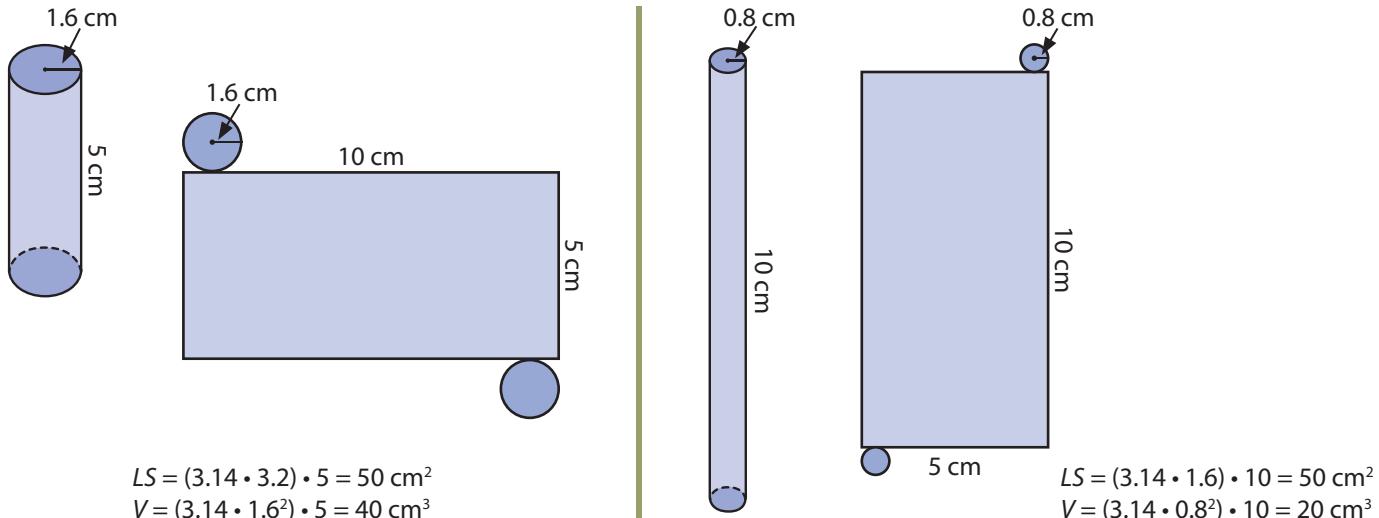


	Volume (cm ³)	Length (cm)	Width (cm)	Height (cm)	Surface Area (cm ²)
1.	7 cm ³	7 cm	1 cm	1 cm	30 cm ²
2.	10 cm ³	10 cm	1 cm	1 cm	42 cm ²
		5 cm	2 cm	1 cm	34 cm ²
3.	12 cm ³	12 cm	1 cm	1 cm	50 cm ²
		6 cm	2 cm	1 cm	40 cm ²
		4 cm	3 cm	1 cm	38 cm ²
		3 cm	2 cm	2 cm	32 cm ²
4.	16 cm ³	16 cm	1 cm	1 cm	66 cm ²
		8 cm	2 cm	1 cm	52 cm ²
		4 cm	2 cm	2 cm	40 cm ²
5.	24 cm ³	24 cm	1 cm	1 cm	98 cm ²
		12 cm	2 cm	1 cm	76 cm ²
		8 cm	3 cm	1 cm	70 cm ²
		6 cm	4 cm	1 cm	68 cm ²
		6 cm	2 cm	2 cm	56 cm ²
		4 cm	3 cm	2 cm	52 cm ²

To find **lateral surface area**, find the surface area of all faces except the bases. Two geometric figures with different base areas and different heights can have the same lateral surface area but different volumes.

Lateral Surface Area of a Cylinder

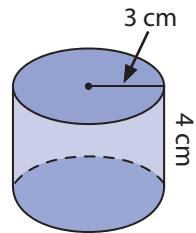
$$LS = \text{circumference } (2\pi r) \times \text{base } (h); V = \text{Base } (B) \times \text{height } (h)$$



Exercises

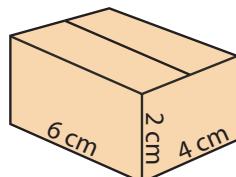
Find the lateral surface area and the volume of a cylinder using the given radius and height. Draw the shape if needed. Round the answer to the nearest unit.

Lateral Surface Area (nearest cm^2)	Radius (cm)	Height (cm)	Volume (nearest cm^3)
6. 75 cm^2	3 cm	4 cm	113 cm^3
	1 cm	12 cm	38 cm^3
7. 132 cm^2	1.5 cm	14 cm	99 cm^3
	1 cm	21 cm	66 cm^3



Find the lateral surface area ($LS = \text{Area of side faces}$) and the volume ($V = [l \cdot w] \cdot h$) of a rectangular prism using the given dimensions.

Lateral Surface Area (cm^2)	Length (cm)	Width (cm)	Height (cm)	Volume (cm^3)
8. 40 cm^2	6 cm	4 cm	2 cm	48 cm^3
	5 cm	5 cm	2 cm	50 cm^3



J

A toy manufacturer makes wooden blocks that are 1-inch cubes and packages them in sets. A box with the smallest surface area is the least expensive to produce. Find the length, width, and height for a box that gives the least surface area for each set of blocks.

Order of dimensions may vary.

a small set of 16 blocks

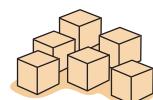
I = 4 in., w = 2 in., h = 2 in.

a medium set of 24 blocks

I = 4 in., w = 3 in., h = 2 in.

a large set of 36 blocks

I = 6 in., w = 3 in., h = 2 in.



Complete **DAILY REVIEW** **d** on page 446.

CHAPTER 12 REVIEW

Write the formula for calculating the volume of the figure.

1. volume of a cube $V = s^3$

2. volume of a triangular prism $V = (\frac{1}{2}bh_1)h_2$

3. volume of a cylinder $V = (\pi r^2)h$

4. volume of a rectangular prism $V = (lw)h$

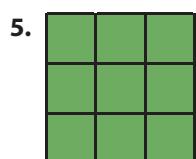
$$V = (lw)h$$

$$V = (\pi r^2)h$$

$$V = s^3$$

$$V = (\frac{1}{2}bh_1)h_2$$

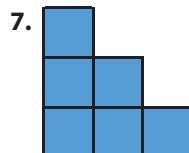
Find the area of the base. Find the volume of the prism that could be built using centimeter cubes for the given height.



height = 3 cm **27 cm^3**

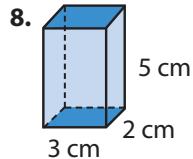


height = 5 cm **20 cm^3**

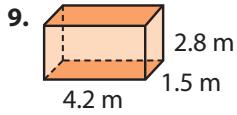


height = 2 cm **12 cm^3**

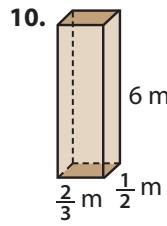
Find the volume of the figure. Round a decimal answer to the nearest tenth. **Equations may vary.**



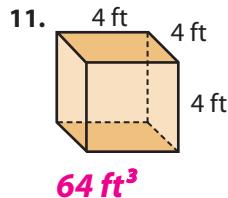
30 cm^3



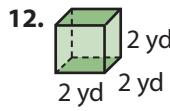
17.6 m^3



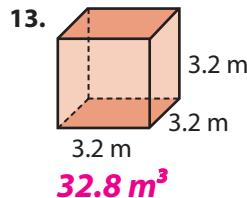
2 m^3



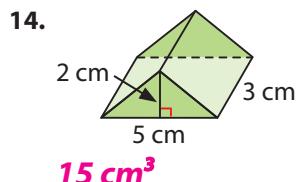
64 ft^3



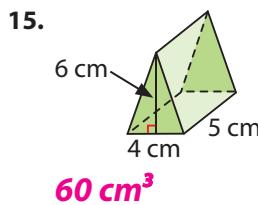
8 yd^3



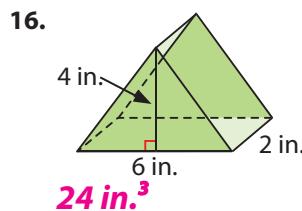
32.8 m^3



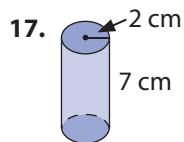
15 cm^3



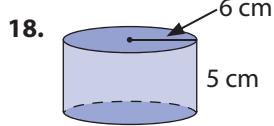
60 cm^3



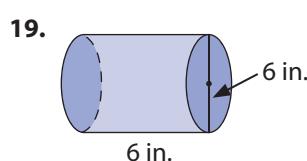
24 in.^3



87.9 cm^3



565.2 cm^3



169.6 in.^3

Find the volume of a figure with the given dimensions.

Round a decimal answer to the nearest tenth. **Equations may vary.**

20. rectangular prism: $l = 5.3$ in., $w = 4$ in., $h = 6$ in. $V = 5.3 \text{ in.} \times 4 \text{ in.} \times 6 \text{ in.}; V = 127.2 \text{ in.}^3$

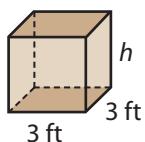
21. cube: $s = 10$ m $V = (10 \text{ m})^3; V = 1000 \text{ m}^3$

22. triangular prism: $b = 4$ in., $h = 3$ in., h (prism) = 5 in. $V = \frac{1}{2}(4 \text{ in.} \times 3 \text{ in.}) \times 5 \text{ in.}; V = 30 \text{ in.}^3$

23. cylinder: $r = 3$ m, $h = 2$ m $V = 3.14 \times (3 \text{ m})^2 \times 2 \text{ m}; V \approx 56.5 \text{ m}^3$

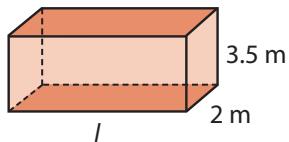
Find the unknown measurement of the rectangular prism.

24. $V = 36 \text{ ft}^3$



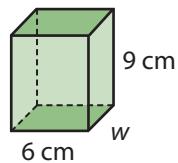
$$h = 4 \text{ ft}$$

25. $V = 70 \text{ m}^3$



$$l = 10 \text{ m}$$

26. $V = 216 \text{ cm}^3$



$$w = 4 \text{ cm}$$

27. $l = 5$ in., $w = 2$ in., $h = \underline{\hspace{2cm}}$ in., $V = 80$ in.³ $\underline{\hspace{2cm}} = 8 \text{ in.}$ 28. $l = 6$ cm, $w = \underline{\hspace{2cm}}$ cm, $h = 4$ cm, $V = 144$ cm³ $\underline{\hspace{2cm}} = 6 \text{ cm}$

Solve.

Round a decimal answer to the nearest tenth. **Equations may vary.**

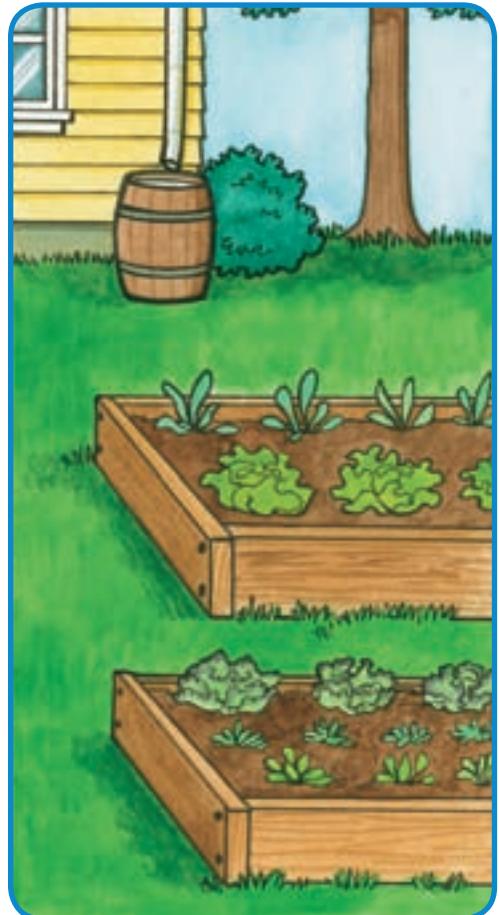
29. The Fernandez family is building raised garden beds to grow vegetables. The largest bed is 9 feet long, 4 feet wide, and 1.5 feet high. How many cubic feet of soil will it take to fill the largest bed? **54 ft³**

30. The smallest bed the Fernandez family will build is 4 feet long, 4 feet wide, and 1.5 feet high. How many cubic feet of soil will it take to fill the smallest bed? **24 ft³**

31. Mr. Fernandez wants to use rainwater to water his garden. He purchased a rain barrel that is 37 inches tall and has a 20-inch diameter. What is the volume of the rain barrel? **11,618 in.³**

32. There are 1,728 cubic inches in 1 cubic foot. What is the volume of the rain barrel in cubic feet?
 $11,618 \text{ in.}^3 \div 1,728 \text{ in.}^3 = 6.7 \text{ ft}^3$

33. Since 1 cubic foot can hold about 7.5 gallons of water, approximately how many gallons of water will the rain barrel hold? **$6.7 \cdot 7.5 \text{ gal} = 50.3 \text{ gal}$**



CUMULATIVE REVIEW

Test Prep

Mark the answer.

1.
$$\begin{array}{r} 36,903 \\ 14,772 \\ + 21,187 \\ \hline \end{array}$$

- A. 71,682 C. 72,862
 B. 72,753 D. 72,992

2.
$$3 \times 26 \times 16 = \underline{\quad}$$

- A. 1,221 C. 1,336
 B. 1,248 D. 1,428

3.
$$\begin{array}{r} 17.34 \\ - 8.9286 \\ \hline \end{array}$$

- A. 8.4114 C. 9.4114
 B. 8.6286 D. 9.4214

4.
$$3\frac{3}{16} + 7\frac{1}{4} = \underline{\quad}$$

- A. $10\frac{7}{16}$ C. $10\frac{3}{16}$
 B. $10\frac{1}{4}$ D. 11

5.
$$10 - 3\frac{6}{7} = \underline{\quad}$$

- A. $7\frac{3}{7}$ C. $6\frac{4}{7}$
 B. 7 D. $6\frac{1}{7}$

6. Round to the nearest hundredth.

$$112\overline{)4,318}$$

- A. 38.55 C. 40.51
 B. 39.52 D. 45.01

7.
$$\frac{3}{4} \div \frac{1}{2} = \underline{\quad}$$

- A. 1 C. 2
 B. $1\frac{1}{2}$ D. $2\frac{1}{2}$

8.
$$\frac{4}{9} \times \frac{11}{12} = \underline{\quad}$$

- A. $\frac{1}{3}$ C. $\frac{11}{108}$
 B. $\frac{5}{7}$ D. $\frac{11}{27}$

9. Rename $\frac{5}{6}$ as a decimal.
 Round to the nearest thousandth.

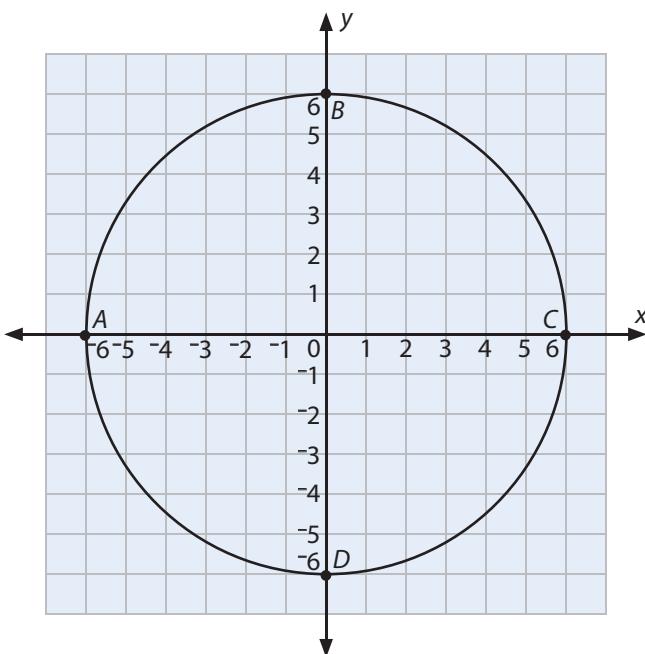
- A. 0.822 C. 0.932
 B. 0.833 D. 0.983

10. Estimate the difference.

$$\frac{8}{9} - \frac{3}{4} = \underline{\quad}$$

- A. 0 C. 1
 B. $\frac{1}{2}$ D. $1\frac{1}{2}$

Use the coordinate plane to find the answer.



11. What are the coordinates for point C?

A. $(0, 6)$
B. $(-6, 0)$
C. $(0, -6)$
D. $(6, 0)$

12. The diameter of the circle is ___ units.

A. 6
B. 12
C. 18
D. 24

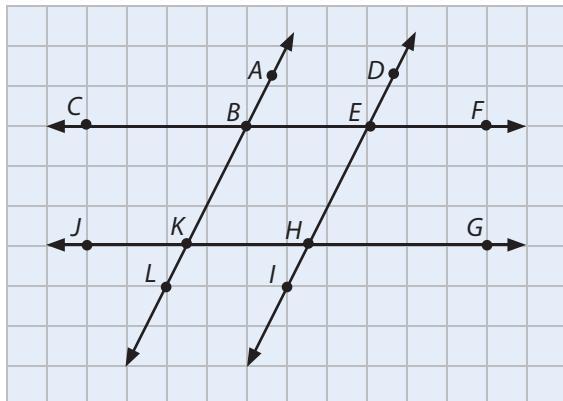
13. The radius is ___ units.

A. 6
B. 12
C. 18
D. 24

14. Which formula could be used to find the area of the circle?

A. $A = l \times w$
B. $A = \frac{1}{2}bh$
C. $A = \pi r^2$
D. $A = bh$

Use the figure to find the answer.



15. What figure is enclosed by the lines?

A. square
B. trapezoid
C. parallelogram
D. hexagon

16. Describe the relationship between \overleftrightarrow{AL} and \overleftrightarrow{DI} .

A. intersecting lines
B. parallel lines
C. perpendicular lines
D. none of the above

17. Describe $\angle BKH$.

A. acute
B. obtuse
C. right
D. all of the above

18. Mark the true statement.

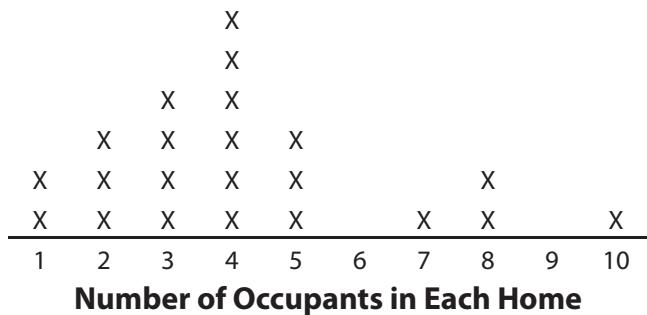
A. $\angle GHI = 90^\circ$
B. $\angle GHI > 90^\circ$
C. $\angle GHI < 90^\circ$
D. $\angle GHI > 180^\circ$

19. Which line is perpendicular to \overleftrightarrow{CF} ?

A. \overleftrightarrow{AL}
B. \overleftrightarrow{JG}
C. \overleftrightarrow{DI}
D. none of the above

Use the data from the line plot to find the answer.

Scott asked this survey question:
“How many people live in your home?”
He recorded the survey responses on a line plot.



20. According to the survey, how many people lived alone?

A. 1
B. 2
C. 6
D. 10

21. How many people did Scott survey?

A. 10
B. 15
D. 22

22. The largest group of responses was for how many occupants?

A. 2
B. 3
C. 4
D. 5

23. How many homes had 10 occupants?

A. 1
B. 2
C. 3
D. 4

24. Can you tell from this graph how many homes have school-age children?

A. yes
B. no



Ratios & Rates

A **ratio** is a mathematical comparison of two quantities. The **terms** represent the items being compared. A ratio is read using the word *to*.

There are 4 girls to every 6 boys that play in the county soccer league. The ratio of girls to boys can be written three ways: **4 to 6**, **4:6**, or $\frac{4}{6}$.

ratio
terms
equivalent ratios
rate
unit rate

Quantities can be compared differently; therefore, the order of the terms must match the order of the quantities being compared in the written statement.

Quantities	Ratio	Word Form	Ratio Form	Fraction Form
part to part	girls to boys	4 to 6	4:6	$\frac{4}{6}$
part to whole	girls to players	4 to 10	4:10	$\frac{4}{10}$
whole to part	players to girls	10 to 4	10:4	$\frac{10}{4}$

Equivalent ratios can be found by multiplying or dividing both terms of the ratio by the same nonzero number (a form of 1). It is similar to renaming a fraction into higher or lower terms. To simplify a ratio, rename it to lowest terms.

$$\begin{array}{c} \times 2 \\ 4 \text{ to } 6 = 8 \text{ to } 12 \\ \times 2 \end{array}$$

$$\begin{array}{c} \div 2 \\ 4 \text{ to } 6 = 2 \text{ to } 3 \\ \div 2 \end{array}$$

$$\begin{array}{c} \times 3 \\ 4:10 = 12:30 \\ \times 3 \end{array}$$

$$\begin{array}{c} \div 2 \\ 4:10 = 2:5 \\ \div 2 \end{array}$$

$$\begin{array}{c} \times 4 \\ \frac{10}{4} = \frac{40}{16} \\ \times 4 \end{array}$$

$$\begin{array}{c} \div 2 \\ \frac{10}{4} = \frac{5}{2} \\ \div 2 \end{array}$$

Exercises

Use the data from the chart to write the ratio.

- volcanoes in Washington to volcanoes in California (ratio form) **5:3**
- volcanoes in California to volcanoes in Oregon (word form) **3 to 5**
- volcanoes in Washington to total volcanoes (fraction form) **$\frac{5}{13}$**
- volcanoes in Washington and Oregon to total volcanoes (ratio form) **10:13**

Number of Volcanoes Per State	
State	Volcanoes
Washington	5
Oregon	5
California	3

Answers will vary.

Write an equivalent ratio in higher terms.

- 3 to 4 **6 to 8**
- 4:5 **12:15**
- $\frac{7}{15}$ **$\frac{28}{60}$**

Answers will vary.

Write an equivalent ratio in lower terms.

- 12 to 20 **3 to 5**
- 27:45 **3:5**
- $\frac{150}{10}$ **$\frac{15}{1}$**

Find the missing term that completes the equivalent ratio.

$$\begin{array}{lll} 11. \frac{6}{9} = \frac{n}{3} & 12. \frac{5}{8} = \frac{n}{64} & 13. \frac{3}{4} = \frac{n}{100} \\ \mathbf{n=2} & \mathbf{n=40} & \mathbf{n=75} \end{array}$$

$$\begin{array}{lll} 14. \frac{21}{30} = \frac{7}{n} & 15. \frac{5}{6} = \frac{30}{n} & 16. \frac{24}{42} = \frac{4}{n} \\ \mathbf{n=10} & \mathbf{n=36} & \mathbf{n=7} \end{array}$$

Write the ratio as a fraction in lowest terms.

$$17. 6 \text{ parakeets to } 36 \text{ dogs} \quad \frac{6}{36} = \frac{1}{6}$$

$$18. 18 \text{ right-handed students to } 4 \text{ left-handed students}$$

$$19. 2 \text{ cups of sugar to } 10 \text{ cups of water} \quad \frac{2}{10} = \frac{1}{5}$$

$$20. 15 \text{ red candies to } 10 \text{ green candies} \quad \frac{15}{10} = \frac{3}{2}$$

Write a ratio in fraction form.

The school's soccer team won 7 games and lost 5 games during the fall soccer season.

$$21. \text{wins to games played} \quad \frac{7}{12}$$

$$22. \text{wins to losses} \quad \frac{7}{5}$$

$$23. \text{games played to losses} \quad \frac{12}{5}$$

A **rate** is a special ratio comparing two quantities having different measuring units. The **unit rate** tells how many of a quantity there are *per* one unit of another quantity.

Gasoline is purchased by a *per-gallon rate*.

\$3.00 per 1 gallon = \$3/gal

A babysitter is paid by a *per-hour rate*.

\$6.50 per 1 hour = \$6.50/hr

Calories are reported in a *per-serving rate*.

180 calories per 1 serving = 180 calories/serving

Speed is calculated as *miles per hour*.

60 miles per 1 hour = 60 mph or 60 mi/hr

To find the unit rate, rename the ratio using a denominator of 1.

Mom spent \$11.00 for 4 packages of cookies.
What is the unit rate (cost per package)?

$$\frac{\text{cost}}{\text{pkg}} = \frac{11}{4} = \frac{2.75}{1}$$

$\div 4$
 $\div 4$

The cookies cost \$2.75 per package.

Multiply the terms of the unit rate to find an equivalent ratio.

Each package contains 12 cookies. How many cookies are in 4 packages?

$$\frac{\text{cookies}}{\text{packages}} = \frac{12}{1} = \frac{48}{4}$$

$\times 4$
 $\times 4$

There are 48 cookies in 4 packages.

What distance will a car travel in 3 hours at an average speed of 50 miles per hour?

$$\frac{\text{miles}}{\text{hour}} = \frac{50}{1} = \frac{150}{3}$$

$\times 3$
 $\times 3$

The car will travel 150 miles in 3 hours.

Exercises

Find the unit rate.

24. Kevin drove 480 miles on 16 gallons of gasoline.

30 mi/gal

25. Elizabeth earned \$48 in 8 hours.

\$6/hr

26. Mr. Monroe drove 2,250 miles in 3 days.

750 mi/day

0.5 page/min or

27. Juliet read 30 pages in 60 minutes.

$\frac{1}{2}$ page/min

28. Mom paid \$3.16 for 4 pounds of apples.

\$0.79/lb

29. The office assistant can type 165 words in 3 minutes.

55 words/min

Use the unit rate to find the answer.

30. 5 gallons at \$3.15/gallon **\$15.75**

33. 9 days at 230 mi/day **2,070 mi**

31. 4 hours at \$7/hr **\$28**

34. 0.5 hour at 7 km/hr **3.5 km**

32. 6 hours at 60 mph **360 mi**

35. 3.5 hours at \$10/hr **\$35**

Solve.

36. Eva is traveling by train. She has traveled 180 miles in 2 hours. At this rate, her trip will take 6 hours. How far will she travel in all?
540 miles

38. Bethany drove 300 miles on 12 gallons of gasoline. At this rate, how many gallons of gasoline will she need to travel 1,000 miles?
40 gallons

37. Madison is traveling by plane. She has traveled 420 miles in 2 hours. At this rate, her trip will take 4 hours. How far will she travel in all?
840 miles

Ratio Tables

A **ratio table** is a method for organizing equivalent ratios. The table extends the pattern between the terms by multiplying or dividing both terms of the ratio by the same nonzero number (a name for 1).

	$\times 2$	$\times 3$	$\times 4$	$\times 5$
nickels	5	10	15	20
quarters	1	2	3	4

$$\frac{5}{1} = \frac{10}{2} = \frac{15}{3} = \frac{20}{4} = \frac{25}{5}$$

	$\div 2$	$\div 4$	$\div 8$
pennies	80	40	20
dimes	8	4	2

$$\frac{80}{8} = \frac{40}{4} = \frac{20}{2} = \frac{10}{1}$$

Exercises

Complete the ratio table. Use the ratios to answer the question.

- What is the unit rate of inches to feet? **12:1**
- How many inches are in 3 feet? **36 in.**
- How many inches are in 4 feet? **48 in.**
- Sixty inches make up how many feet? **5 ft**
- How many quarts can be made from 20 cups? **5 qt**
- How many cups are in 2.5 quarts? **10 c**
- What is the unit rate of cups to quarts? **4:1**

inches	12	24			60
feet	1	2	3	4	

cups	40	20		
quarts	10		2.5	1

Complete the ratio table.

cm	2.54	5.08	10.16	20.32	40.64
in.	1	2	4	8	16

km	1.61	3.22	4.83	6.44	8.05
mi	1	2	3	4	5

Use the unit rate 5,280 ft/mi to make a ratio table. Answer the question.

- How many feet are in 2 miles? **$2 \times 5,280 \text{ ft} = 10,560 \text{ ft}$**
- How many feet are in 5 miles? **$5 \times 5,280 \text{ ft} = 26,400 \text{ ft}$**
- How many miles are 21,120 feet? **$21,120 \text{ ft} \div 5,280 \text{ ft} = 4 \text{ mi}$**

Write **yes** if the ratio could be in a ratio table with $\frac{5}{7}$. Write **no** if the ratio could not be in a ratio table with $\frac{5}{7}$.

- $\frac{25}{35}$ **yes**
- $\frac{50}{60}$ **no**
- $\frac{60}{84}$ **yes**

Write **yes** if the ratio could be in a ratio table with $\frac{3}{4}$. Write **no** if the ratio could not be in a ratio table with $\frac{3}{4}$.

- $\frac{27}{32}$ **no**
- $\frac{33}{44}$ **yes**
- $\frac{42}{56}$ **yes**

Write the ratio that could *not* be in a ratio table with the given ratio.

19. 5 to 10

$\frac{30}{60}$	$\frac{45}{90}$	$\frac{25}{100}$
-----------------	-----------------	------------------

20. 18:12

6:4	72:36	36:24
-----	--------------	-------

Make a ratio table to solve problems. Extend the pattern by making equivalent ratios, or use combinations of the ratios.

A gallon of paint can cover a wall area of about 350 ft². How much area can 6 gallons of paint cover? How much area can 15 gallons cover?

$$\frac{350 \text{ ft}^2}{1 \text{ gal}} \times \frac{6}{6} = \frac{2,100 \text{ ft}^2}{6 \text{ gal}}$$

feet ²	350	700	1,050	1,400	1,750	2,100
gallon	1	2	3	4	5	6

Use the ratios in the table to find the area for 15 gallons.

15:n

15 gal:5,250 ft²

15 = 6 + 4 + 5

15:2,100 + 1,400 + 1,750

The sales tax on a purchase of \$20 is \$1.30. What will the tax be on a purchase of \$70?

70 is not a multiple of 20 and would not extend this pattern.
70 = 60 + 10 or 70 = 80 - 10

tax	\$1.30	\$2.60	\$3.90	\$5.20	\$0.65	\$4.55
purchase	\$20	\$40	\$60	\$80	\$10	\$70

If \$20:\$1.30, then \$10:\$0.65.

\$70:n

\$70:\$4.55

70 = 60 + 10
70:\$3.90 + \$0.65

Exercises

Use the ratio table to answer the question. **Steps to solve may vary.**

A group of students is visiting the history museum. The table shows the price of admission that different groups will pay.

21. How much will a group of 20 students pay? **\$130.00**
22. How much will a group of 24 students pay? **\$156.00**
23. How much will a group of 27 students pay? **\$175.50**

students	3	5	6	12
admission	\$19.50	\$32.50	\$39.00	\$78.00

The gasoline tank in Rachel's car holds 15 gallons. Her car can travel 420 miles on a tank of gas.

24. How far can the car travel on 40 gallons? **1,120 mi**
25. How far can the car travel on 50 gallons? **1,400 mi**
26. How far can the car travel on 4 gallons? **112 mi**

gallons	15	20	24	30
miles	420	560	672	840

There is less gravity on the moon than on the earth. A person weighing 120 pounds on the earth would weigh approximately 20 pounds on the moon.

27. About how much would a 200-pound person weigh on the moon? **34 lb**
28. About how much would a 160-pound person weigh on the moon? **27 lb**

earth	120	100	60	40
moon	20	17	10	7

- J** Graph the earth and moon ratio table on a coordinate plane. Use the moon as the x-coordinate and the earth as the y-coordinate. Draw a line to connect the points. Locate your weight on the graph and find your approximate weight on the moon.

Complete **DAILY REVIEW** b on page 447.

Solving Proportions

A **proportion** is an equation stating that two ratios are equivalent. Ratios are proportional when they are equivalent. The terms can be compared vertically, horizontally, or diagonally to test for equivalency.

proportion

Use Number Sense

$$\frac{1}{2} \bigcirc \frac{3}{6}$$

This proportion can be read "1 is to 2 like 3 is to 6." Compare the relationship of the numerator to the denominator of each ratio.

1:2 1 is one-half of 2.

3:6 3 is one-half of 6.

$\frac{1}{2}$ is proportional to $\frac{3}{6}$.

$$\frac{1}{2} = \frac{3}{6}$$

These ratios are equivalent and form a proportion.

Test for Equivalent Ratios

The same operation must be performed on both terms.

$$\begin{array}{c} \times 3 \\ \frac{1}{2} = \frac{3}{6} \\ \times 3 \end{array}$$

$\frac{1}{2}$ is proportional to $\frac{3}{6}$.

$$\begin{array}{c} \times 4 \\ \frac{2}{3} \neq \frac{8}{10} \\ \times 4 \end{array}$$

$\frac{2}{3}$ is not proportional to $\frac{8}{10}$.

Use Cross Multiplication

Cross-multiply to compare the numerators of like fractions.

$$\begin{array}{ccccc} \frac{1}{2} & \bigcirc & \frac{3}{6} & & \\ 6 \times 1 = 6 & & 1 \times 3 = 3 & & 2 \times 3 = 6 \\ \frac{1}{2} = \frac{3}{6} & & & & \end{array}$$

$$\begin{array}{ccccc} \frac{2}{3} & \bigcirc & \frac{8}{10} & & \\ 10 \times 2 = 20 & & 2 \times 8 = 16 & & 3 \times 8 = 24 \\ \frac{2}{3} \neq \frac{8}{10} & & & & \end{array}$$

Compare Lowest Terms

$$\frac{1}{2} = \frac{3}{6} \quad \frac{3}{6} = \frac{1}{2}$$

$$\frac{2}{3} \neq \frac{8}{10} \quad \frac{8}{10} = \frac{4}{5}$$

Equivalent ratios will have the same lowest terms.

Use Division

$$\frac{2}{3} \bigcirc \frac{8}{10}$$

$$2 \div 3 \bigcirc 8 \div 10$$

$$0.\overline{6} \neq 0.8$$

$\frac{2}{3}$ is not proportional to $\frac{8}{10}$.

Exercises

Write the ratios in lowest terms to compare.

Write a fraction comparison using = or ≠.

1. $\frac{12}{14}$ and $\frac{36}{42}$ $\frac{6}{7} = \frac{6}{7}$

2. $\frac{9}{27}$ and $\frac{7}{21}$ $\frac{1}{3} = \frac{1}{3}$

3. $\frac{22}{54}$ and $\frac{20}{26}$ $\frac{11}{27} \neq \frac{10}{13}$

4. $\frac{9}{15}$ and $\frac{6}{10}$ $\frac{3}{5} = \frac{3}{5}$

Use cross multiplication to prove that the ratios are proportional.

9. $\frac{15}{20} = \frac{6}{8}$ $120 = 120$

10. $\frac{2}{3} = \frac{12}{18}$ $36 = 36$

11. $\frac{30}{12} = \frac{20}{8}$ $240 = 240$

12. $\frac{5}{7} = \frac{40}{56}$ $280 = 280$

Write the operation that was performed on both terms.

5. $\frac{9}{14} = \frac{27}{42} \times \frac{3}{3}$

6. $\frac{32}{80} = \frac{4}{10} \div \frac{8}{8}$

7. $\frac{9}{11} = \frac{81}{99} \times \frac{9}{9}$

8. $\frac{7}{12} = \frac{56}{96} \times \frac{8}{8}$

Use division to find whether the ratios are proportional. Write a decimal comparison using = or ≠.

13. $\frac{2}{4}$ and $\frac{15}{30}$ $0.5 = 0.5$

14. $\frac{3}{8}$ and $\frac{4}{16}$ $0.375 \neq 0.25$

15. $\frac{2}{3}$ and $\frac{3}{5}$ $0.\overline{6} \neq 0.6$

16. $\frac{9}{72}$ and $\frac{6}{48}$ $0.125 = 0.125$

Solve Proportions to Find Equal Ratios

Compare Unit Rates

Isabella earned \$11 for 2 hours of babysitting. Felicia earned \$14 for 3 hours of babysitting. Were the girls paid the same hourly rate?

$$\text{unit rate} = \frac{\text{pay}}{1 \text{ hour}}$$

Isabella

$$\frac{\$11}{2 \text{ hr}} = \frac{n}{1 \text{ hr}}$$
$$n = \$11 \div 2$$
$$n = \$5.50$$

Felicia

$$\frac{\$14}{3 \text{ hr}} = \frac{n}{1 \text{ hr}}$$
$$n = \$14 \div 3$$
$$n = \$4.67$$

Isabella earned more per hour than Felicia.

Find the Equivalent Fraction

The coffee shop sells 4 doughnuts for \$2. At this price, how much will 8 doughnuts cost?

$$\frac{\text{doughnuts}}{\text{cost}} = \frac{4}{2}$$

$\times 2$

$$\frac{4 \times 2}{2 \times 2} = \frac{8}{c}$$
$$4 \times 2 = 8$$
$$2 \times 2 = c$$
$$c = 4$$

8 doughnuts will cost \$4.

This strategy works well when the terms are related.

Cross-Multiply

The coffee shop sells 3 muffins for \$6. At this price, how much will 8 muffins cost?

muffins

cost

$$\frac{3}{6} = \frac{8}{c}$$

$$c \times 3 = 3c \quad \frac{3}{6} \times 8 = \frac{8}{c}$$

$$3c = 48$$

$$\frac{3c}{3} = \frac{48}{3}$$

$$c = 16$$

8 muffins will cost \$16.

Steps to solve may vary.

Exercises

Solve the proportion.

17. $\frac{a}{24} = \frac{9}{36}$ **a = 6**

18. $\frac{14}{1} = \frac{b}{2}$ **b = 28**

19. $\frac{4}{16} = \frac{c}{12}$ **c = 3**

20. $\frac{33}{6} = \frac{d}{10}$ **d = 55**

21. $\frac{h}{2} = \frac{120}{80}$ **h = 3**

22. $\frac{6}{m} = \frac{18}{42}$ **m = 14**

Write a possible proportion for the situation. Write **yes** if the prices are equivalent.

Write **no** if one price is a better buy.

23. 4 pounds of apples for \$6 or 10 pounds of apples for \$15 **yes**

26. A 12 oz can of corn for 55¢ or a 20 oz can of corn for 95¢ **no**

24. 12 eggs for \$2 or 18 eggs for \$3

yes

27. 1 quart of milk for \$1 or 1 gallon of milk for \$4

yes

25. 5 bottles of soda for \$7 or 6 bottles of soda for \$8

no

28. A 5 oz candy bar for 50¢ or an 8 oz candy bar for 75¢ **no**

Solve the proportion to find an equivalent ratio.

29. Gabriel shoveled snow from 2 driveways in 3 hours. At this rate, how long will it take him to shovel 5 driveways? **7.5 hours**

33. During the election for class president, Colton received 3 votes for every vote cast for Bryce. Bryce received 5 votes. How many votes did Colton receive? **15 votes**

30. During the race, Driver 1 traveled 480 miles in 3 hours. At this rate, how far will Driver 1 travel in 5 hours? **800 miles**

34. Three servings of yogurt are 24 ounces. How many ounces are in 4 servings? **32 ounces**

31. Two pizzas cost \$15. At this rate, how much would 7 pizzas cost? **\$52.50**

35. A survey of middle school students revealed that 36 out of 120 students have green eyes. How many students with green eyes would you expect to find out of 10 of these students? **3 students**

32. Factory workers can produce 25 items in 30 hours. How many hours will it take them to produce 60 items at this rate? **72 hours**

Complete **DAILY REVIEW** C on page 447.

Similar Figures

Similar figures are geometric figures with the same shape but not necessarily the same size. Figures are similar when the corresponding angle measurements are equal *and* the ratios of corresponding side lengths are proportionate.

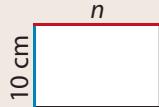
similar figures
indirect measurement

Finding the Unknown Measure

Solve a proportion to find an unknown measure in similar figures.

Ratios Between Figures

Write a ratio for the corresponding sides of the two figures.



$$6 \cdot 10 \quad \frac{10}{4} = \frac{n}{6} \quad 4 \cdot n$$

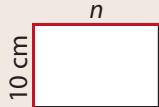


$$60 = 4n \quad \frac{60}{4} = \frac{1}{4}n \quad 15 = n$$

$$15 \text{ cm} = n$$

Ratios Within a Figure

Write a ratio for the sides *within* the same figure.



$$6 \cdot 10 \quad \frac{10}{n} = \frac{4}{6} \quad n \cdot 4$$

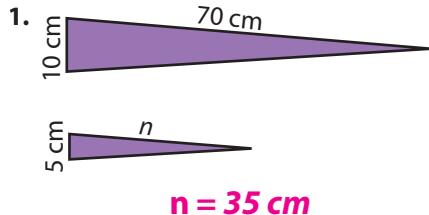


$$60 = 4n \quad \frac{60}{4} = \frac{1}{4}n \quad 15 = n$$

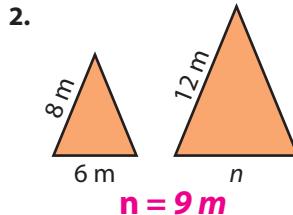
$$15 \text{ cm} = n$$

Exercises

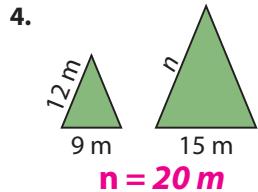
Write a proportion to find the unknown measure for the pair of similar figures. **Steps to solve may vary.**



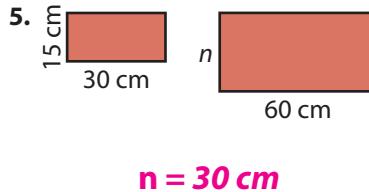
$$n = 35 \text{ cm}$$



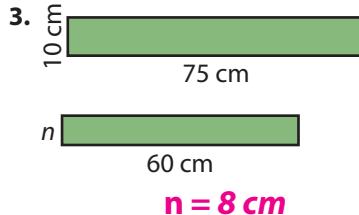
$$n = 9 \text{ m}$$



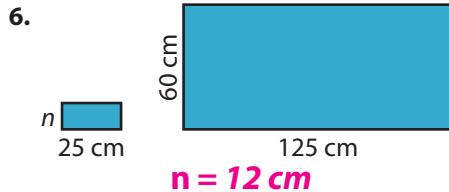
$$n = 20 \text{ m}$$



$$n = 30 \text{ cm}$$



$$n = 8 \text{ cm}$$



$$n = 12 \text{ cm}$$

Solve. **Steps to solve may vary.**

7. Sydney enlarged a picture to be 3 times larger than the original. The original picture was 2 inches long by 4 inches wide. The enlarged picture has a length of 6 inches. What is the width? $\frac{2}{4} = \frac{6}{n}; n = 12 \text{ in.}$

8. The school photographs given in Ami's package are not similar in size. The larger photographs are 9 inches \times 12 inches and 8 inches \times 10 inches. If the smaller of these photos remained 10 inches wide, what would the length need to be so the photos would be similar? $\frac{9}{12} = \frac{n}{10}; n = 7.5 \text{ in.}$

9. If 3 balloons cost 48¢, how much will 20 balloons cost? $\frac{\$0.48}{3 \text{ balloons}} = \frac{n}{20 \text{ balloons}}; n = \3.20

10. A salmon swam 126 miles in 4.5 hours. At this rate, how far could it travel in 8 hours? $\frac{126 \text{ mi}}{4.5 \text{ hr}} = \frac{n}{8 \text{ hr}}; n = 224 \text{ miles}$

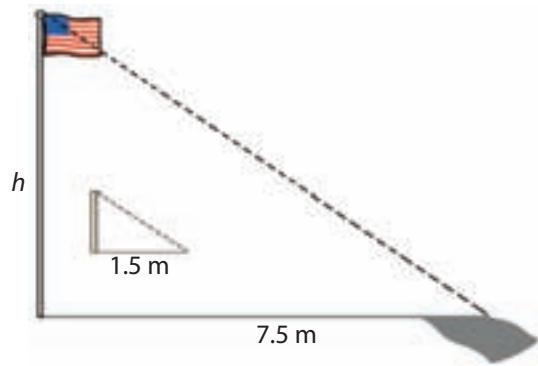
11. The office has two sizes of envelopes. One size is 9 cm \times 16.5 cm. The other size is 10.5 cm \times 24 cm. Are these envelopes similar? **no;** $\frac{9}{16.5} \neq \frac{10.5}{24}$

12. A family wants to build a swimming pool that is similar in size to the standard Olympic pool. An Olympic pool is 50 meters long by 25 meters wide. If their pool will be 20 meters long, how wide will it be?

$$\frac{50}{20} = \frac{25}{n}; n = 10 \text{ m}$$

Indirect measurement uses similar objects to find the measurement of an object difficult to measure. Solve a proportion to find the unknown measurement.

The sixth-grade class wanted to know the height of the flagpole in the schoolyard. The teacher taught them how to determine the height of the flagpole without measuring it using the length of the flagpole's shadow and the length of a meter stick's shadow.



Ratios Between Figures

$$\frac{\text{flagpole } h}{\text{meter } h} = \frac{\text{flagpole } s}{\text{meter } s}$$

$$1.5 \cdot h \quad h = \frac{7.5}{1.5} \quad 1 \cdot 7.5$$

$$1.5h = 7.5$$

$$\cancel{1.5}h = \cancel{1.5} \frac{7.5}{1.5}$$

$$h = 5 \text{ m}$$

Ratios Within a Figure

$$\frac{\text{flagpole } h}{\text{flagpole } s} = \frac{\text{meter } h}{\text{meter } s}$$

$$1.5 \cdot h \quad h = \frac{1}{7.5} \quad 7.5 \cdot 1$$

$$1.5h = 7.5$$

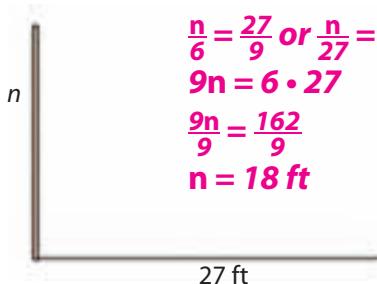
$$\cancel{1.5}h = \cancel{1.5} \frac{7.5}{1.5}$$

$$h = 5 \text{ m}$$

Exercises

Write and solve a proportion to find the unknown height. **Steps to solve may vary.**

13.



$$\frac{n}{6} = \frac{27}{9} \text{ or } \frac{n}{27} = \frac{6}{9}$$

$$9n = 6 \cdot 27$$

$$\frac{9n}{9} = \frac{162}{9}$$

$$n = 18 \text{ ft}$$



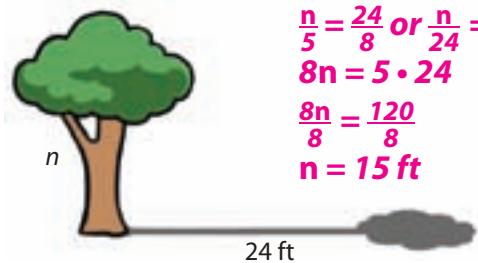
$$15. \frac{n}{5} = \frac{5}{2}$$

$$2n = 5 \cdot 5$$

$$\frac{2n}{2} = \frac{25}{2}$$

$$n = 12.5 \text{ m}$$

14.

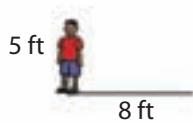


$$\frac{n}{5} = \frac{24}{8} \text{ or } \frac{n}{24} = \frac{5}{8}$$

$$8n = 5 \cdot 24$$

$$\frac{8n}{8} = \frac{120}{8}$$

$$n = 15 \text{ ft}$$



$$16. \frac{n}{10} = \frac{1}{4}$$

$$\frac{10}{4} = \frac{4n}{4}$$

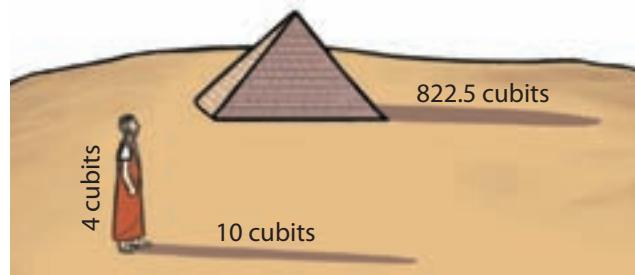
$$n = 2.5 \text{ m}$$

15. A barn casts a shadow that is 5 meters long. A house is 5 meters high and casts a shadow that is 2 meters long. How high is the barn?

16. A meter stick casts a shadow that is 4 meters long. A tree casts a shadow that is 10 meters long. How tall is the tree?

MEET THE MATHEMATICIAN

The Greek mathematician **Thales**, who lived about 600 years before Jesus was born, devised the system for finding the height of something that cannot be measured. He discovered the height of the Egyptian pyramid Cheops using his height, the length of his shadow, and the length of the pyramid's shadow. Solve a proportion to find the height of Cheops. $\frac{4}{10} = \frac{n}{822.5}$; $n = 329 \text{ cubits}$



Scale

A **scale** is a ratio of measurements that compares the size of a drawing, a map, or a model with the size of the actual object. A **scale drawing** has dimensions proportionate to the size of the actual object. Maps and house plans are drawn smaller than the actual object. Illustrations of microscopic objects are drawn larger than the actual object. A **scale model** is a three-dimensional model that is proportionate to the size of the actual object.

scale
scale drawing
scale model

Actual Measurement

The distance between two cities on a map is 2.5 centimeters. Given a map scale of 1 cm : 100 km, what is the actual distance?

$$\frac{\text{map distance (cm)}}{\text{actual distance (km)}} = \frac{1}{100} \rightarrow \frac{2.5}{n}$$
$$n = 250 \text{ km}$$



Drawing or Model Measurement

The length of a car is 156 inches. Find the length of a model car using the scale 1 in.:52 in.

$$\frac{\text{model length}}{\text{actual length}} = \frac{1}{52} \rightarrow \frac{n}{156}$$
$$156 = 52n$$
$$3 \text{ in.} = n$$

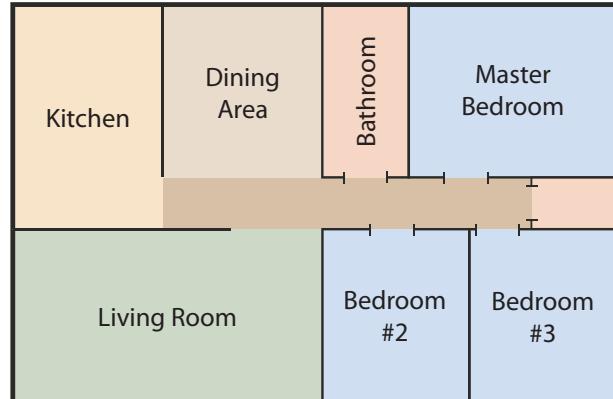


1 in.:52 in.

Exercises

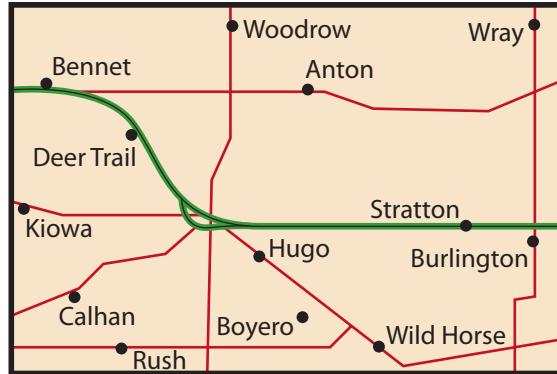
Write a proportion using the scale 1 in.:12 ft to find the answer.

- If the length of the master bedroom is 1.2 inches, what is the actual length? **14.4 ft**
- If the outside wall from the kitchen to the master bedroom is 3.5 inches, what is the actual length? **42 ft**
- If the outside wall from the kitchen to the living room is 2.3 inches, what is the actual length? **27.6 ft**
- If the bathroom has a length of 0.5 inch and a width of 1 inch, what are the actual dimensions? **6 ft long and 12 ft wide**



Measure the **road distance** between cities to the nearest $\frac{1}{2}$ cm. Write a proportion using the scale 1 cm:32 km to find the approximate distance.

- Wray to Burlington $\frac{1}{32} = \frac{3}{n}; n = 96 \text{ km}$
- Deer Trail to Wild Horse $\frac{1}{32} = \frac{4.5}{n}; n = 144 \text{ km}$
- Kiowa to Burlington $\frac{1}{32} = \frac{7}{n}; n = 224 \text{ km}$
- Calhan to Stratton $\frac{1}{32} = \frac{5.5}{n}; n = 176 \text{ km}$
- Rush to Wild Horse $\frac{1}{32} = \frac{3.5}{n}; n = 112 \text{ km}$
- Deer Trail to Burlington $\frac{1}{32} = \frac{6}{n}; n = 192 \text{ km}$
- Calhan to Wild Horse $\frac{1}{32} = \frac{5}{n}; n = 160 \text{ km}$



Write a proportion using the scale factor 1 cm : 35 cm to find the answer.

12. The height of the model Shetland pony is 2.6 cm.

What is the actual height of this pony?

$$\frac{1}{35} = \frac{2.6}{n}; n = 35 \cdot 2.6; n = 91 \text{ cm}$$

13. The height of the model Hackney pony is 3.6 cm.

What is the actual height of this pony?

$$\frac{1}{35} = \frac{3.6}{n}; n = 35 \cdot 3.6; n = 126 \text{ cm}$$

14. The height of a Palomino is 168 cm.

What should the height of the model Palomino be?

$$\frac{1}{35} = \frac{n}{168}; \frac{168}{35} = \frac{35n}{35}; n = 4.8 \text{ cm}$$

Write a proportion using the map scale 1 in.:150 mi to find the actual distance represented by the measurement.

15. 4 in. **600 mi**

16. 9 in. **1,350 mi**

17. 3.6 in. **540 mi**

18. 0.6 in. **90 mi**

19. 5.8 in. **870 mi**

20. 13 in. **1,950 mi**

Write a proportion using the map scale 1 in.:16 mi to find the map measurement equal to the actual distance.

21. 80 mi **5 in.**

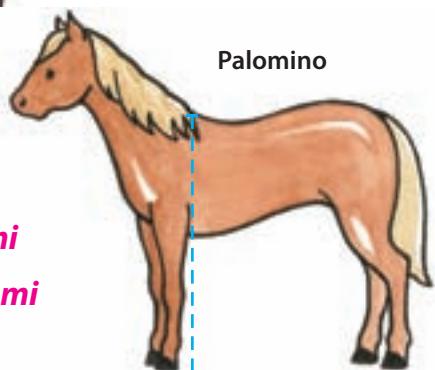
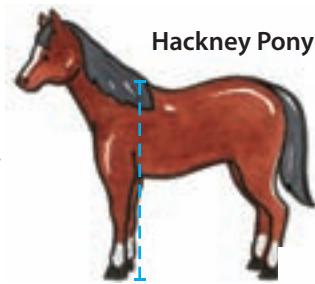
22. 160 mi **10 in.**

23. 120 mi **7.5 in.**

24. 48 mi **3 in.**

25. 8 mi **0.5 in.**

26. 67.2 mi **4.2 in.**



Practice & Application

27. A playground is 72 feet wide. How wide would a scale drawing of the playground be in which 3 inches represents 12 feet?

28. A scale drawing of a plant cell is 2.4 cm in length. What is the actual length of the cell if the drawing uses a scale of 8 cm:1 mm?

29. A model car is 12 inches long. How long is the actual car if it was made with a scale factor of 1 in.:16 in.? $\frac{1}{16} = \frac{12}{n}; n = 16 \cdot 12; n = 192 \text{ in.}$

30. A dollhouse was built with a scale factor of 1 in.:12 in. The dollhouse is 48 inches long. What is the actual length of the house it represents? $\frac{1}{12} = \frac{48}{n}; n = 12 \cdot 48; n = 576 \text{ in.}$

27. $\frac{3}{12} = \frac{n}{72}$
 $72 \cdot 3 = 12n$
 $\frac{216}{12} = \frac{12n}{12}$
 $n = 18 \text{ in.}$

31. $\frac{2}{75} = \frac{n}{225}$
 $225 \cdot 2 = 75n$
 $\frac{450}{75} = \frac{75n}{75}$
 $n = 6 \text{ in.}$

28. $\frac{8}{1} = \frac{2.4}{n}$
 $\frac{8n}{8} = \frac{2.4}{8}$
 $n = 0.3 \text{ mm}$

31. The length of a highway is 225 miles long. How long would the highway be on a map with a scale of 2 in.:75 mi?

32. A model train was made with a scale factor of 1 in.:96 in. The model railroad car is 5.5 inches long. What is the actual length of the railroad car? $\frac{1}{96} = \frac{5.5}{n}; n = 96 \cdot 5.5; n = 528 \text{ in.}$

- J A square microchip has an actual measure of 0.8 mm per side. Make a scale drawing of the microchip using the given scale.

scale = 1 cm:0.1 mm **8 cm each side**
scale = 5 mm:0.2 mm **20 mm each side**

$$\begin{aligned}\frac{1}{0.1} &= \frac{n}{0.8} \\ 0.8 &= 0.1n \\ 0.1 &= \frac{0.8}{0.1} \\ n &= 8 \text{ cm} \\ \frac{5}{0.2} &= \frac{n}{0.8} \\ 0.8 \cdot 5 &= 0.2n \\ \frac{4}{0.2} &= \frac{0.2n}{0.2} \\ n &= 20 \text{ mm}\end{aligned}$$

Percent

Percent is a ratio in which a quantity is compared to 100. The symbol for percent is %.
Percent means “out of 100,” “per 100,” or “÷ 100.”

percent (%)

1 whole

$$100\% = \frac{100}{100} = 1.0$$

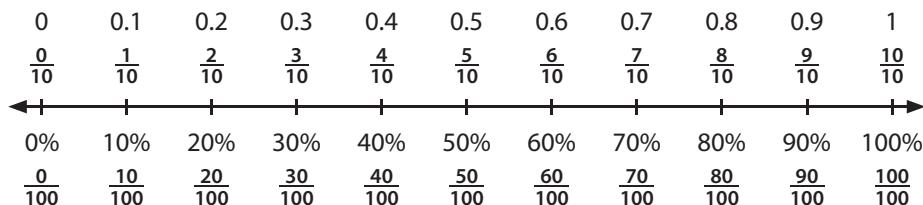
32 out of a hundred

$$\frac{32}{100}$$
 fraction 0.32 decimal 32% percent

Divide by 100

$$50\% = \frac{50}{100} = 50 \div 100 = 0.5$$

This number line shows equivalent fractions, decimals, and percents.



Exercises

Draw a number line. Divide the number line into ten equal parts.

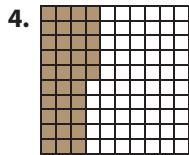
Graph a point on the number line to represent the percent.

1. 40%

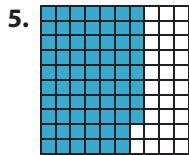
2. 70%

3. 85%

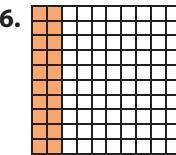
Write the decimal for the shaded part of the grid. Write the decimal as a percent.



$$0.35 = 35\%$$

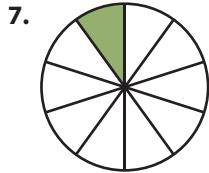


$$0.68 = 68\%$$

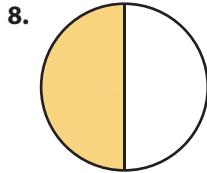


$$0.2 = 20\%$$

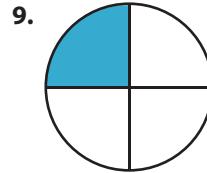
Write the fraction for the shaded part of the circle. Write the percent of the whole.



$$\frac{1}{10} = 10\%$$



$$\frac{1}{2} = 50\%$$



$$\frac{1}{4} = 25\%$$

Estimate the percent shaded of the rectangle.

10.		10%	25%	50% (circled)	75%
11.		2%	36%	68% (circled)	95%
12.		33% (circled)	50%	75%	95%

Draw a rectangle. Shade the rectangle to represent an approximation of the percent.

13. 25%

14. 48%

15. 90%

Change a Decimal to a Percent

Use mental math: move the decimal point two places to the right when multiplying by 100.

$$0.71 \times 100 = 71\%$$

$$0.2 \times 100 = 20\%$$

Change a Percent to a Decimal

Use mental math: move the decimal point two places to the left when dividing by 100.

$$60\% = \frac{60}{100} = 60 \div 100 = 0.6$$

$$4\% = \frac{4}{100} = 4 \div 100 = 0.04$$

Change a Fraction to a Percent

- Divide. Round the answer to the nearest hundredth.
- Change the decimal to a percent.

$$\frac{3}{5} = 3 \div 5 = 0.6 = 60\%$$

Change a Percent to a Fraction

- Rename the percent as a fraction with 100 as the denominator.
- Simplify the fraction by renaming to lowest terms.

$$40\% = \frac{40}{100} = \frac{2}{5}$$

Exercises

Write the percent in **decimal form**. Write the decimal in **percent form**.

16. 52% **0.52**

17. 89% **0.89**

18. 2% **0.02**

19. 0.07 **7%**

20. 0.54 **54%**

21. 23% **0.23**

Write the percent as a fraction in lowest terms.

Write the fraction as a percent. Round to the nearest percent.

22. 30% $\frac{30}{100} = \frac{3}{10}$

23. 80% $\frac{80}{100} = \frac{4}{5}$

24. 15% $\frac{15}{100} = \frac{3}{20}$

25. $\frac{2}{5} \quad 2 \div 5 = 0.4 = 40\%$

26. $\frac{3}{4} \quad 3 \div 4 = 0.75 = 75\%$

27. $\frac{3}{8} \quad 3 \div 8 = 0.375 \approx 38\%$

Write a comparison sentence using $>$, $<$, or $=$.

Steps to solve may vary.

28. $\frac{5}{6} > 60\%$

29. $0.73 = 73\%$

30. $\frac{3}{10} > 3\%$

31. $0.4 > 4\%$

32. $0.48 > 5\%$

33. $\frac{2}{3} < 85\%$

34. $0.7 < 75\%$

35. $0.8 = 80\%$

Use the data from the circle graph to find the answer.

36. What fraction of those surveyed chose cats as their favorite pet? $\frac{1}{4}$

37. What fraction chose an animal other than cats as their favorite pet? $\frac{3}{4}$

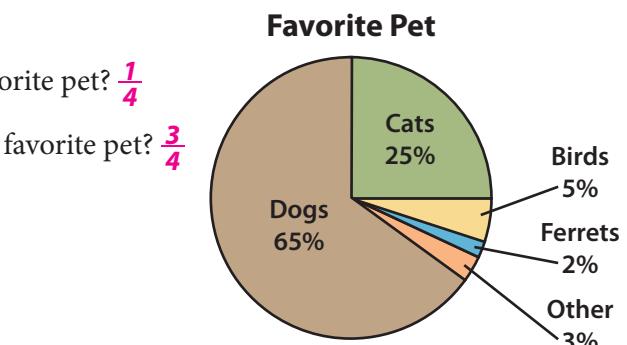
38. What percent chose dogs as their favorite pet? **65%**

39. What percent chose a pet other than dogs? **35%**

40. What percent represents the whole graph? **100%**

Solve.

41. The art teacher took 50 students on a field trip to the museum. Thirty of the students bought a post card while there. What percent of the students bought a post card? $\frac{30}{50} = \frac{60}{100} = 60\%$



42. Dillon spelled 24 words correctly out of 25 on a spelling test. What percent of the words did he spell correctly? $\frac{24}{25} = \frac{96}{100} = 96\%$

Complete **DAILY REVIEW** f on page 449.

Finding Percent of a Number

Percents are used to find the discount of a sale item, the sales tax on a purchase, or an appropriate tip for the cost of a meal at a restaurant. 100% represents all of a given number. Less than 100% of a number represents part of that number. Use the formula to find the percentage of a number. $n\% \text{ of a number} = \frac{n}{100} \times \text{the number}$

Rename the percent as a fraction or a decimal to solve an equation.

Elise wanted a sweater that cost \$50. She saved \$27 towards the purchase and waited for a sale. The first sale was 25% off the original price. Does Elise have enough money to buy the sweater with the discount of 25%?

What is 25% of \$50?

$$\frac{25}{100} \times 50 = \underline{\quad}$$

$$\frac{25}{100} \times \frac{50}{1} = \frac{25}{2} = 12\frac{1}{2} \quad \text{discount} = \$12.50$$

$$\text{Sale Price: } \$50.00 - \$12.50 = \$37.50$$

Elise does *not* have enough money to buy the sweater with a discount of 25%.

Near the end of the season, the sale increased to 60% off the original price. Does Elise have enough money to buy the sweater with the discount of 60%?

What is 60% of \$50?

$$0.60 \times 50 = \underline{\quad}$$

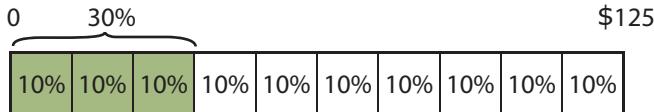
$$0.60 \times 50 = 30.00 \quad \text{discount} = \$30.00$$

$$\text{Sale Price: } \$50.00 - \$30.00 = \$20.00$$

Elise has enough money to buy the sweater with a discount of 60%.

Make a Model

Garrett wanted basketball shoes that cost \$125. The first sale price was 30% off. Then the shoes went on sale for 60% off. What was the discount of the shoes during each sale?



Each section represents 10% of 125.

$$10\% \text{ of } 125 = \$12.50$$

$$30\%: 3 \times \$12.50 = \$37.50$$

$$30\% \text{ discount} = \$37.50$$

$$60\%: 6 \times \$12.50 = \$75.00$$

$$60\% \text{ discount} = \$75.00$$

Exercises

Cancellation steps may vary.

- Find the percent of the number. Solve by writing a fraction for the percent.
1. 50% of 78 **39**
 2. 30% of 80 **24**
 3. 40% of 200 **80**
 4. 25% of 48 **12**
 5. 60% of 25 **15**
 6. 75% of 52 **39**
 7. 20% of 85 **17**
 8. 33% of 100 **33**
 9. 10% of 250 **25**
 10. 70% of 15 **10 $\frac{1}{2}$**

Find the percent of the number. Use a decimal for the percent if needed.

11. 15% of 80 **12**
12. 35% of 120 **42**
13. 24% of 400 **96**
14. 5% of 64 **3.2**
15. 100% of 25 **25**
16. 18% of 65 **11.7**
17. 52% of 65 **33.8**
18. 39% of 200 **78**
19. 99% of 50 **49.5**
20. 45% of 20 **9**

Make a model to find the percent of the number.

21.	10% of 70	20% of 70	80% of 70
22.	10% of 50	40% of 50	90% of 50
23.	10% of 85	30% of 85	70% of 85

7; 14; 56

5; 20; 45

8.5; 25.5; 59.5

Problems involving percents can be solved by setting up a proportion. An unknown in a proportion can be found by cross-multiplying or by finding the equivalent ratios.

$$\frac{\text{part}}{100} = \frac{\text{part}}{\text{whole}}$$

A survey showed that 6 of 23 sixth-grade students preferred Gooey Cluster candy bars over Nutty Crunch. What percent of students preferred Gooey Cluster?

$$\frac{n}{100} = \frac{6 \text{ (part liking Gooey Cluster)}}{23 \text{ (whole class)}}$$

Cross-Multiply

1. Write the proportion.
2. Multiply to find the cross products.
3. Solve the equation.

$$\begin{aligned}\frac{n}{100} &= \frac{6}{23} \\ 23 \cdot n &= 100 \cdot 6 \\ 23n &= 600 \\ \cancel{23} \cancel{1} \frac{n}{1} &= \cancel{23} \cancel{1} \frac{600}{23} \\ n &= 26.09\end{aligned}$$

About 26% of the sixth-grade class preferred Gooey Cluster bars.

The survey was given to 25 fifth-graders. Eight students preferred Gooey Cluster. What percent of the class preferred Gooey Cluster?

$$\frac{n}{100} = \frac{8 \text{ (part liking Gooey Cluster)}}{25 \text{ (whole class)}}$$

Equivalent Ratios

1. Write the proportion.
2. Multiply or divide by a form of 1.
3. Solve the equation.

$$\begin{aligned}\frac{n}{100} &= \frac{8}{25} \\ \frac{n}{100} &= \frac{8}{25} \cdot \frac{4}{4} \\ \frac{n}{100} &= \frac{32}{100} \\ n &= 32\end{aligned}$$

32% of the fifth-grade class preferred Gooey Cluster bars.

Exercises

Write a proportion to find the percent of the number.

24. 55% of 80 $\frac{55}{100} = \frac{n}{80}; n = 44$

25. 60% of 95 $\frac{60}{100} = \frac{n}{95}; n = 57$

26. 80% of 60 $\frac{80}{100} = \frac{n}{60}; n = 48$

27. 48% of 20 $\frac{48}{100} = \frac{n}{20}; n = 9.6$

28. 2% of 100 $\frac{2}{100} = \frac{n}{100}; n = 2$

29. 35% of 50 $\frac{35}{100} = \frac{n}{50}; n = 17.5$

30. 16% of 45 $\frac{16}{100} = \frac{n}{45}; n = 7.2$

31. 25% of 25 $\frac{25}{100} = \frac{n}{25}; n = 6.25$

32. 10% of 300 $\frac{10}{100} = \frac{n}{300}; n = 30$

Practice & Application

33. Miles spends 5% of his day practicing basketball. How many hours does he practice each day?

1.2 hours

34. Miles made 35% of his 40 free-throw shots during the basketball season. How many free-throw shots did he make? **14 shots**

35. Mr. Callahan bought a cordless screwdriver during a $\frac{1}{4}$ -off sale. The original price was \$64. What was the discount? What was the sale price? **\$16; \$48**

36. If sales tax is 8%, how much tax would Evelyn pay on a purchase of \$37.50? **\$3.00**

37. The cost of dinner at a restaurant was \$60. If Charles gave a 20% tip to the server, how much was the tip? **\$12**

Method used to solve may vary.

38. Maggie baby-sat and made \$80 during the week. She plans to give 10% to the church on Sunday and to save 40%. How much will she give to the church and how much will she save? **\$8; \$32**

39. Alicia deposited \$150 in a simple savings account that earns 2% each year. If she does not deposit or withdraw any money, how much interest will it earn in one year? **\$3**

40. On a survey, 65% of the respondents said they prefer dogs over cats as pets. If 200 people completed the survey, how many people prefer dogs? **130 people**

41. Manuel is 80% of the height of his father. If his father is 6 feet tall, how tall is Manuel? **4.8 feet**

Finding the Unknown Whole

Simon spent \$24 in the sporting goods store. This is 30% of his birthday money. How much birthday money did Simon have to begin with?

Write an Equation

Substitute known information into the formula to find an unknown.

$$\text{percent} \times \text{whole} = \text{part}$$

$$30\% \times n = \$24$$

$$0.3n = \$24$$

$$\frac{0.3n}{0.3} = \$24 \div 0.3$$

$$n = \$80$$

$$\text{whole} = \text{part} \div \text{percent}$$

$$n = \$24 \div 30\%$$

$$n = \$24 \div 0.3$$

$$n = \$80$$

The original amount was \$80.

Write a Proportion

Find the unknown whole by solving a proportion. Cross-multiply or find the equivalent ratio to solve.

$$\frac{\text{part}}{100} = \frac{\text{part}}{\text{whole}}$$

$$\frac{30}{100} = \frac{\$24}{n}$$

$$30n = \$2,400$$

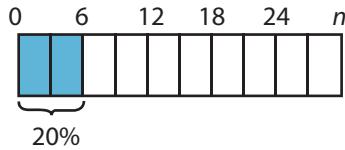
$$\frac{30n}{30} = \frac{\$2,400}{30}$$

$$n = \$80$$

The original amount was \$80.

Make a Model

Allison scored 20% of the Blue Jays' points during the basketball game. If she scored 6 points, what was her team's score?



Each section represents 3 points.

20% of the Blue Jays' score = 6 points

$$100\% = 5 \times 20\%$$

$$5 \times 6 \text{ points} = 30 \text{ points}$$

$$100\% \text{ of the Blue Jays' score} = 30 \text{ points}$$

Exercises

Write an equation to find the unknown whole.

1. 15% of what number is 12? **n = 80**
2. 20% of what number is 50? **n = 250**
3. 60% of what number is 15? **n = 25**

4. 75% of what number is 9? **n = 12**
5. 16 is 25% of what number? **n = 64**
6. 14 is 35% of what number? **n = 40**

Write a proportion to find the unknown whole. **Proportions may vary.**

7. 35% of what number is 42? **120**
8. 60% of what number is 24? **40**
9. 52% of what number is 78? **150**

10. 3% of what number is 6? **200**
11. 7 is 14% of what number? **50**
12. 36 is 45% of what number? **80**

Make a model to find the unknown whole.

13. 40% of what number is 8? **20**
14. 80% of what number is 56? **70**
15. 50% of what number is 75? **150**

16. 70% of what number is 84? **120**
17. 117 is 90% of what number? **130**
18. 15 is 25% of what number? **60**

Find the percent of the number.

19. 10% of 75 **7.5**

22. 5% of 60 **3**

25. 40% of 120 **48**

20. 20% of 75 **15**

23. 40% of 9 **3.6**

26. 63% of 200 **126**

21. 40% of 75 **30**

24. 18% of 50 **9**

27. 96% of 40 **38.4**

Write the fraction as a percent.

28. $\frac{3}{4}$ **75%**

29. $\frac{3}{50}$ **6%**

30. $\frac{7}{10}$ **70%**

31. $\frac{1}{2}$ **50%**

32. $\frac{2}{5}$ **40%**

33. $\frac{4}{25}$ **16%**

Practice & Application

34. Caden mowed 4 lawns in 6 hours. At this rate, how long will it take him to mow 5 lawns? **7.5 hr**

35. During the race, Car 14 traveled 240 miles in 2 hours. At this rate, what distance will the car travel in 5 hours? **600 mi**

36. Aubrey bought a skirt during a $\frac{1}{3}$ -off sale. The original price was \$45. What was the discount? What was the sale price? **\$15; \$30**

37. If sales tax is 8%, how much tax would be charged on a purchase of \$6.50? **\$0.52**

38. Catherine spends 35% of her day at work. How many hours does she spend at work each day? **8.4 hr**

39. All items in the sports department were on sale for 30% off. Weston received a discount of \$12 on the basketball he purchased. What was the original price of the basketball? **\$40**

40. Nicholas scored 20% of his team's goals during a soccer game. He scored 2 goals. How many goals did his team score? **10 goals**

41. During the election for class representative, Stella received 2 votes for every vote cast for her opponent. Since her opponent received 8 votes, how many votes did Stella receive? **16 votes**

42. A house casts a shadow 28 feet long. A 6-foot man casts a shadow that is 8 feet long. How high is the house? **21 ft**

43. A meter stick casts a shadow that is 3 meters long. A tree casts a shadow that is 12 meters long. How tall is the tree? **4 m**

44. Brad got 29 answers correct out of 33 problems on a math test. About what percent of the problems did he get right? **88%**

45. Caiti wanted a pair of shoes that cost \$65. She watched for them to go on sale. At first, the sale price was 20% off the original price. Caiti bought the shoes when they went on sale for 45% off. What was the discount of the shoes during each sale? What did she pay for the shoes? **\$13.00; \$29.25; \$35.75**

MEET THE MATHEMATICIAN

John Napier (1550–1617) was a Scotsman who fervently defended the great Protestant reformer John Knox. As a Christian, he was deeply involved in political and religious struggles and turned to mathematics for relaxation. Although he hoped to be remembered for a commentary he wrote on the book of Revelation, he is chiefly remembered as the man who invented “Napier’s bones,” a multiplication table which was made from bone or ivory. This was one of the earliest forms of calculators used to do multiplication and division! John Napier also introduced the idea of a point to separate the whole number part of a number from its fraction part. This point is the decimal point.



Complete **DAILY REVIEW** h on page 450.

Speed, Distance & Time

Speed is a **rate**, a special ratio which compares distance to time and is usually written as a unit: miles per hour, kilometers per hour, or meters per second. A known rate of speed can be used to find an unknown distance or time traveled at the same rate of speed. Make a proportion to find the unknown distance or time.

speed
rate
distance
time

r (rate of speed) is how fast

d (distance) is how far

t (time) is how long

How many hours will it take to travel a distance of 1,500 miles at a speed of 100 miles per hour?

$$\frac{\text{distance}}{\text{time}} = \frac{100 \text{ mi}}{1 \text{ hr}} = \frac{1,500 \text{ mi}}{n \text{ hr}}$$

$$n = 15 \text{ hr}$$

It will take 15 hours to travel 1,500 miles.

Or cross-multiply

$$100n = 1,500$$
$$\frac{100n}{100} = \frac{1,500}{100}$$
$$15$$



Exercises Steps to solve may vary.

Find the distance traveled.

1. How many miles can you walk in 2 hours if your average speed is 4 mi/hr? **8 mi**
2. How many kilometers can you drive in 5 hours if your car's average speed is 52 km/hr? **260 km**
3. How many feet can you run in 12 seconds at a speed of 7 ft/sec? **84 ft**

Find the average speed (unit rate).

7. What is the average speed if a car traveled 224 kilometers in 3.5 hours? **64 km/hr**
8. What is the average speed if a car traveled 140 miles in 4 hours? **35 mi/hr**
9. What is the average speed if a train traveled 270 miles in 3 hours? **90 mi/hr**

Solve.

10. Anderson's airplane trip was $2\frac{1}{4}$ hours long. If the plane averaged 350 mi/hr, how far did Anderson travel? **787.5 mi**
11. Justin is flying 1,190 miles in a cross-country flight. If the plane averages 340 mi/hr, how long will the flight take? **3.5 hr**
12. Sean and his friend Tristan biked 24 miles at an average speed of 12 miles per hour. How many hours did they bike? **2 hr**

Find the time traveled.

4. How many hours would it take to walk 5 miles at 3 mi/hr? **1.67 hr**
5. How many hours would it take to drive 200 miles at 50 mi/hr? **4 hr**
6. How many hours would it take to fly 165 miles at 330 mi/hr? **0.5 hr**



13. The average speed of a truck was 50 mi/hr, and the average speed of a car was 60 mi/hr. How many fewer hours did it take the car than the truck to travel 600 miles? **2 hr**
14. During a race, Lorie's horse averaged 30 mi/hr and Sadie's horse averaged 25 mi/hr. About how many fewer minutes did it take Lorie's horse than Sadie's horse to go 5 miles? **2 min**

Rename to Make a Proportion

A proportion compares *like* units. Use equivalent times and distances to rename when units are *not* alike.

Caitlyn's grandmother lives 10 miles from her house. If Caitlyn travels at an average speed of 60 mi/hr, how many minutes will it take her to travel to Grandmother's house?

$$\begin{aligned}r &= 60 \text{ mi/hr} \\d &= 10 \text{ mi} \\t &= \underline{\hspace{1cm}}\end{aligned}$$

Minutes are needed to measure the time it takes to travel to Grandmother's house, but the known rate of speed is per hour.

$$1 \text{ hour} = 60 \text{ minutes}$$

$$\frac{60 \text{ mi}}{1 \text{ hr}} = \frac{60 \text{ mi}}{60 \text{ min}}$$

Write a proportion using the renamed units of speed.

$$\frac{\text{distance}}{\text{time}} = \frac{\text{mi}}{\text{min}} = \frac{60}{60} = \frac{10}{n}; n = \text{10 minutes}$$

If Caitlyn travels at a speed (rate) of 60 mi/hr (or 60 mi/60 min), she will travel 10 miles in 10 minutes.

The packaging from Jeffrey's rocket boasts an average rocket speed of 195 ft/sec. If his rocket flies upward for 8.2 seconds, how many yards high will it fly?

$$\begin{aligned}r &= 195 \text{ ft/sec} \\d &= \underline{\hspace{1cm}} \\t &= 8.2 \text{ sec}\end{aligned}$$

A distance in yards is needed to measure the flight, but the known rate of speed is feet per second.

$$1 \text{ yard} = 3 \text{ ft}$$

$$\frac{195 \text{ ft}}{1 \text{ sec}} = \frac{65 \text{ yd}}{1 \text{ sec}}$$

Write a proportion using the renamed units of speed.

$$\frac{\text{distance}}{\text{time}} = \frac{\text{yd}}{\text{sec}} = \frac{65}{1} = \frac{n}{8.2 \text{ sec}}; n = \text{533 yd}$$

If the rocket travels at a speed (rate) of 195 ft/sec (or 65 yd/sec), it will travel 533 yards in 8.2 seconds.

Exercises

Find the rate (r), distance (d), or time (t).

15. $r = 50 \text{ mi/hr}$
 $d = \underline{\hspace{1cm}} \textbf{50 mi}$
 $t = 60 \text{ min}$

16. $r = 5 \text{ ft/min}$
 $d = 20 \text{ yd}$
 $t = \underline{\hspace{1cm}} \textbf{12 min}$

17. $r = \frac{1}{2} \text{ mi/hr}$
 $d = \underline{\hspace{1cm}} \textbf{2 \frac{1}{2} mi}$
 $t = 5 \text{ hr}$

18. $r = \underline{\hspace{1cm}} \text{ mi/min}$ **0.1 mi/min**
 $d = 0.5 \text{ mi}$
 $t = 5 \text{ min}$

19. $r = 250 \text{ m/min}$
 $d = 3 \text{ km}$
 $t = \underline{\hspace{1cm}} \textbf{12 min}$

20. $r = \underline{\hspace{1cm}} \text{ mi/hr}$ **45 mi/hr**
 $d = 540 \text{ mi}$
 $t = \frac{1}{2} \text{ day}$

21. $r = 21 \text{ ft/sec}$
 $d = \underline{\hspace{1cm}} \textbf{315 ft}$
 $t = 15 \text{ sec}$

22. $r = \underline{\hspace{1cm}} \text{ mi/hr}$ **25 mi/hr**
 $d = 600 \text{ mi}$
 $t = 1 \text{ day}$

23. $r = 40 \text{ ft/sec}$
 $d = 1 \text{ mi}$
 $t = \underline{\hspace{1cm}} \textbf{132 sec}$

24. $r = 70 \text{ km/hr}$
 $d = \underline{\hspace{1cm}} \textbf{35 km}$
 $t = 30 \text{ min}$

25. Robert's remote-control car can travel at a rate of 66 feet per minute. How far could the car travel in 15 minutes? At this rate, how long would it take the car to travel 1 mile?

$$\begin{aligned}\frac{66 \text{ ft}}{1 \text{ min}} &= \frac{d}{15 \text{ min}}; d = 990 \text{ ft}; \\ \frac{66 \text{ ft}}{1 \text{ min}} &= \frac{5,280 \text{ ft}}{t}; t = 80 \text{ min}\end{aligned}$$

Complete **DAILY REVIEW** i on page 450.

CHAPTER 13 REVIEW

Complete the ratio table.

1. centimeters	2.54	5.08	7.62	10.16	12.7
inches	1	2	3	4	5

Write yes if the ratio could be in a ratio table with $\frac{4}{7}$.

Write no if the ratio could not be in a ratio table with $\frac{4}{7}$.

2. $\frac{16}{28}$ **yes**

3. $\frac{48}{80}$ **no**

4. $\frac{56}{98}$ **yes**

Find the unit rate.

5. Reese used 17 gallons of gas to drive 510 miles.

30 mi/gal

7. Allie read 30 pages in 20 minutes.

1.5 pg/min

6. Jonah earned \$56.00 in 8 hours.

\$7.00/hr

8. Sarah bought 5 pounds of apples for \$4.25.

\$0.85/lb

Find the distance traveled.

9. 4 minutes at 15 yd/min **60 yd**

10. 3.5 hours at 50 mi/hr **175 mi**

11. 18 seconds at 20 ft/sec **360 ft**

12. 6 days at 21 mi/day **126 mi**

Write a possible proportion for the situation.

Write yes if the prices are equivalent. Write no if one price is a better buy. **Steps to solve may vary.**

13. 8 ears of corn for \$1 or 15 ears of corn for \$2

$\frac{\$1}{8} \neq \frac{\$2}{15}; \text{no}$

14. 4 pencils for \$2 or 12 pencils for \$6

$\frac{\$2}{4} = \frac{\$6}{12}; \text{yes}$

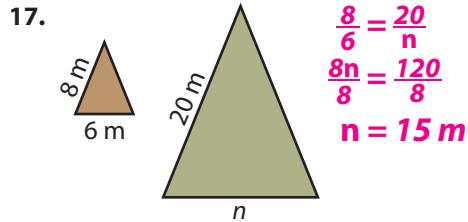
15. 22 oz drink for \$1.50 or 28 oz drink for \$1.75

$\frac{\$1.50}{22} \neq \frac{\$1.75}{28}; \text{no}$

16. 12 eggs for \$2 or 18 eggs for \$3

$\frac{\$2}{12} = \frac{\$3}{18}; \text{yes}$

Write a proportion to find the unknown measure for the pair of similar figures. **Proportions may vary.**

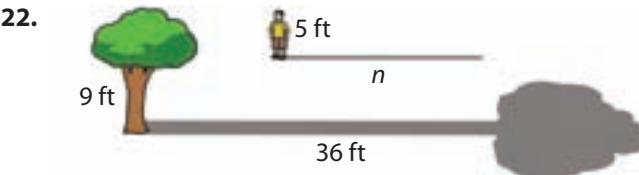
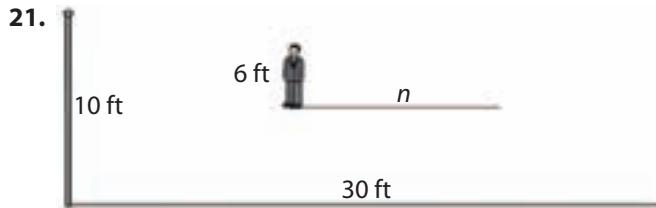


Use a map scale of 1 in.:75 mi to find the actual distance represented by the measurement.

19. 4 in. $\frac{1 \text{ in.}}{75 \text{ mi}} = \frac{4 \text{ in.}}{d}; d = 4 \cdot 75 \text{ mi}; d = 300 \text{ mi}$

20. 2.6 in. $\frac{1 \text{ in.}}{75 \text{ mi}} = \frac{2.6 \text{ in.}}{d}; d = 2.6 \cdot 75 \text{ mi}; d = 195 \text{ mi}$

Write a proportion to find the unknown height.



Write the percent in decimal form. Write the decimal in percent form.

23. 64% **0.64**

24. 4% **0.04**

25. 0.09 **9%**

26. 0.83 **83%**

Write the percent as a fraction in lowest terms. Write the fraction as a percent.

27. 40% **$\frac{2}{5}$**

28. 10% **$\frac{1}{10}$**

29. **$\frac{3}{5}$ 60%**

30. **$\frac{5}{10}$ 50%**

Find the percent of the number.

31. 30% of 70

$0.30 \cdot 70 = 21$

32. 42% of 75

$0.42 \cdot 75 = 31.5$

33. 25% of 64

$0.25 \cdot 64 = 16$

34. 60% of 30

$0.60 \cdot 30 = 18$

Find the unknown whole.

35. 5% of what number is 3? **60**

36. 40% of what number is 32? **80**

37. 25% of what number is 5? **20**

Solve. **Steps to solve may vary.**

38. During a survey, it was discovered that 84 out of 124 students have brown eyes. About how many students with brown eyes would you expect to find out of 10 of these students? **7 students**

39. Factory workers can produce 18 items in 15 hours. How many hours will it take them to produce 12 items at this rate? **10 hr**

40. A playground is 144 feet wide. How wide would a scale drawing of the playground be in which 2 inches represents 12 feet? **24 in.**

41. Jenna made \$200 during the week. She plans to give 10% to the church and to put 40% in her savings account. How much will she give to the church and how much will she save? **\$20; \$80**

42. Alicia deposited \$500 in a simple savings account that earns 3% each year. If she does not deposit or withdraw any money, how much interest will she earn in one year? **\$15**

43. On a survey, 85% of the respondents said there are 2 vehicles in their households. If 200 people completed the survey, how many people own 2 vehicles? **170 people**

44. Sienna enlarged a picture to be 5 times larger than the original. The original picture was 2 inches long by 4 inches wide. The enlarged picture has a length of 10 inches. What is the width? **20 in.**

45. Zane answered 42 out of 50 questions correctly on a science test. What percent of the questions did he answer correctly? **84%**

46. Erin bought a purse during a 25%-off sale. The original price was \$45. What was the discount? What was the sale price? **\$11.25; \$33.75**

47. If sales tax is 7%, how much tax would be charged on a purchase of \$11? **\$0.77**

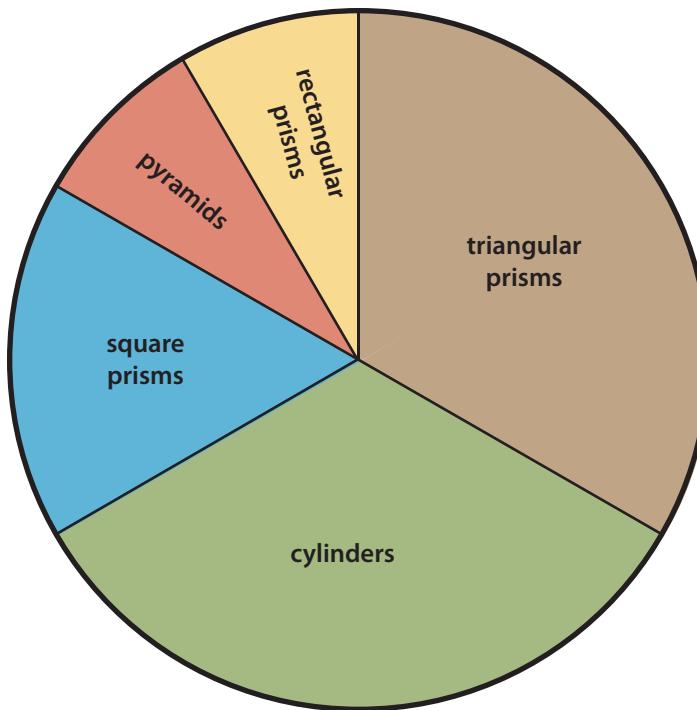
48. All items in the store were marked 30% off. Tucker received a discount of \$21 on a soccer ball he bought. What was the original price of the ball? **\$70**

49. Elliot scored 60% of his free-throw attempts. If he made 3 free throws during the game, how many attempts did he make? **5 attempts**

Test Prep

Use the data from the circle graph to find the answer.

The circle graph represents examples of three-dimensional figures found at home.



- What categories are least represented?
 - pyramids and triangular prisms
 - cylinders and rectangular prisms
 - square prisms and pyramids
 - pyramids and rectangular prisms**
- Cylinders represent what part of the graph?
 - $\frac{1}{3}$**
 - $\frac{1}{2}$
 - $\frac{1}{6}$
 - $\frac{1}{9}$
- Square prisms represent what part of the graph?
 - $\frac{1}{3}$
 - $\frac{1}{6}$**
 - $\frac{1}{2}$
 - $\frac{1}{9}$
- What part of the graph is made up of cylinders and square prisms?
 - $\frac{1}{2}$
 - $\frac{2}{3}$
 - $\frac{3}{4}$**
 - $\frac{5}{6}$
- What type of figure is as equally represented as cylinders?
 - pyramids
 - triangular prisms**
 - square prisms
 - rectangular prisms

Mark the answer.

6. A roll of quarters has a value of \$10.00. Ana has $16\frac{3}{4}$ rolls of quarters. How much money does she have?

A. \$165.75 C. \$170.25
B. \$167.50 D. \$175

7. Dad bought grass seed for the lawn. Each bag covers 1,000 square feet. How many bags did he buy if the yard is 120 feet \times 60 feet and the house takes up about $\frac{1}{2}$ of the area?

A. 3 bags C. 6 bags
B. 4 bags D. 8 bags

8. Mariah collected 1 dozen eggs on Monday and twice as many on Tuesday. How many eggs did she collect in all?

A. 2 dozen C. 36 eggs
B. 30 eggs D. $1\frac{1}{2}$ dozen

9. Jude learned 15 Bible verses for the Bible quiz team. Dylan learned 3 times as many verses as Jude. How many verses did the two boys learn altogether?

A. $15 + 15 + 15 = 45$ verses
B. $15 + (15 + 3) = 33$ verses
C. $15 + (3 \cdot 15) = 60$ verses
D. none of the above

10. Working together, it takes Jace and Spencer $2\frac{1}{2}$ hours to mow and trim the Allens' lawn. It takes them $3\frac{3}{4}$ hours to mow and trim the Reas' lawn. How many hours will it take them on Saturday to mow and trim both lawns?

A. 5 hr C. $5\frac{1}{2}$ hr
B. $5\frac{1}{4}$ hr D. $6\frac{1}{4}$ hr

11. $\sqrt{121}$

A. 10 C. 12
B. 11 D. 13

12. 5^4

A. 125 C. 500
B. 200 D. 625

13. $3 + 5 \times 8 - 2$

A. 23 C. 41
B. 32 D. 43

14. $-2 + 6$

A. -4 C. 4
B. 0 D. 8

15. 31×15

A. 375 C. 455
B. 405 D. 465

16. $590 \div 14$

A. $42.\bar{1}$ C. 42.14
B. 42.04 D. 42.4

17. $600 \div 0.25$

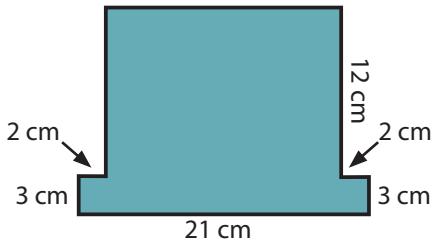
A. 2.4 C. 240
B. 24 D. 2,400

18. $\frac{3}{11} = \frac{n}{44}$

A. $n = 12$ C. $n = 18$
B. $n = 15$ D. $n = 33$

Mark the answer.

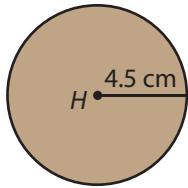
19.



Area is found using the formula $l \cdot w$. What is the area of the figure?

- A. 267 cm^2
- B. 303 cm^2
- C. 258 cm^2
- D. 315 cm^2

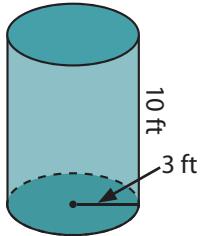
20.



The circumference of a circle is found using the formula πd . What is the circumference of circle H?

- A. 63.59 cm
- B. 14.13 cm
- C. 28.26 cm
- D. 7.07 cm

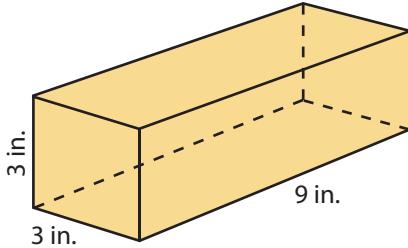
21.



The formula for the volume of a cylinder is $(\pi r^2) \times h$. What is the volume of this cylinder?

- A. 28.26 ft^3
- B. 94.2 ft^3
- C. 124.2 ft^3
- D. 282.6 ft^3

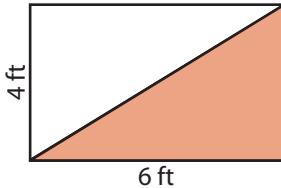
22.



Which equation shows the volume of the rectangular prism?

- A. $3 \times 9 = 27 \text{ in.}^2$
- B. $(3 \cdot 9) + (3 \cdot 3) = 36 \text{ in.}^2$
- C. $2(3 \cdot 3) + 2(3 \cdot 9) = 72 \text{ in.}^2$
- D. $3 \times 3 \times 9 = 81 \text{ in.}^3$

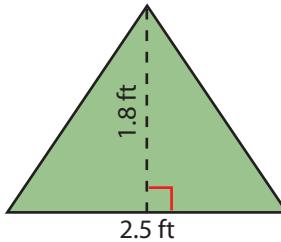
23.



Which equation can be used to find the area of the shaded part?

- A. $4 \text{ ft} \times 6 \text{ ft} = 24 \text{ ft}^2$
- B. $\frac{1}{2}(6 \text{ ft} \times 4 \text{ ft}) = 12 \text{ ft}^2$
- C. $(2 \cdot 4 \text{ ft}) + (2 \cdot 6 \text{ ft}) = 20 \text{ ft}^2$
- D. $\frac{1}{3}(4 \text{ ft} + 6 \text{ ft}) = 3.3 \text{ ft}^2$

24.

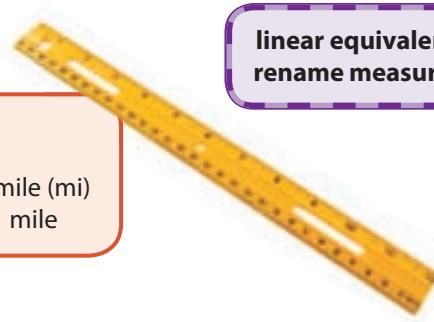


Which equation can be used to find the area of the triangle?

- A. $\frac{1}{2}(2.5 \times 1.8) = 2.25 \text{ ft}^2$
- B. $2.5 \times 1.8 = 4.5 \text{ ft}^2$
- C. $2(2.5 \times 1.8) = 9 \text{ ft}^2$
- D. $(2 \cdot 2.5) + (2 \cdot 1.8) = 8.6 \text{ ft}^2$

Linear Measurement

Knowing linear equivalents allows any measurement to be renamed as larger or smaller units.



linear equivalents
rename measurements

Linear Equivalents

$$12 \text{ inches (in.)} = 1 \text{ foot (ft)}$$

$$36 \text{ inches} = 1 \text{ yard (yd)}$$

$$3 \text{ feet} = 1 \text{ yard}$$

$$5,280 \text{ feet} = 1 \text{ mile (mi)}$$

$$1,760 \text{ yards} = 1 \text{ mile}$$

Rename Measurements

Rename larger units as smaller units. Determine the equivalency and then *multiply*.

$$\begin{array}{rcl} 3 \text{ yd} & = & \underline{\quad \text{in.} \quad} \\ 1 \text{ yd} & = & 36 \text{ in.} \\ \times & & \frac{3}{108} \\ \hline 3 \times 36 & = & 108 \\ 3 \text{ yd} & = & 108 \text{ in.} \end{array}$$

Rename smaller units as larger units. Determine the equivalency and then *divide*.

$$\begin{array}{rcl} 50 \text{ in.} & = & \underline{\quad \text{ft} \quad} \\ 12 \text{ in.} & = & 1 \text{ ft} \\ 50 \div 12 & = & 4 \text{ r}2 \\ 50 \text{ in.} & = & 4\frac{2}{12} \text{ ft} = 4\frac{1}{6} \text{ ft} \\ \text{or} \\ 50 \text{ in.} & = & 4 \text{ ft } 2 \text{ in.} \end{array}$$

$$\begin{array}{r} 4\frac{2}{12} \\ 12 \overline{) 50} \\ -48 \\ \hline 2 \end{array}$$

50 is not divisible by 12.

Determine the equivalency and solve.

$$\begin{array}{rcl} \frac{3}{4} \text{ of a mile} & = & \underline{\quad \text{ft} \quad} \\ 1 \text{ mi} & = & 5,280 \text{ ft} \\ \times & & \frac{3}{3,960} \\ \hline \frac{3}{4} \times 5,280 \text{ ft} & = & \\ \frac{3}{4} \text{ mi} & = & 3,960 \text{ ft} \end{array}$$

Exercises

Measure the coin. Use the most precise measurement.



1 in.



$\frac{3}{4}$ in. (or $\frac{6}{8}$ in.)



$\frac{7}{8}$ in. (or $\frac{14}{16}$ in.)

Write the best unit of measurement: in., ft, yd, or mi.

4. height of a cell phone tower **ft or yd**

5. distance from New York to Florida **mi**

6. length of a football field **yd**

7. length of a robin **in.**

Rename to the given unit of measurement.

8. $5 \text{ yd} = \underline{\quad} \text{ in.}$

13. $117 \text{ in.} = \underline{\quad} \text{ yd } \frac{3\frac{1}{4}}{4}$

18. $\frac{3}{4} \text{ of a yard} = \underline{\quad} \text{ in.}$

23. $\frac{1}{9} \text{ of a yard} = \underline{\quad} \text{ in.}$

9. $12 \text{ ft} = \underline{\quad} \text{ yd}$
10,560

14. $30 \text{ in.} = \underline{\quad} \text{ ft } \frac{2\frac{1}{2}}{2}$

19. $\frac{2}{3} \text{ of a foot} = \underline{\quad} \text{ in.}$

24. $\frac{1}{2} \text{ of a yard} = \underline{\quad} \text{ in.}$

10. $2 \text{ mi} = \underline{\quad} \text{ ft}$

15. $7 \text{ ft} = \underline{\quad} \text{ yd } \underline{\quad} \text{ ft}$

20. $\frac{1}{4} \text{ of a mile} = \underline{\quad} \text{ ft}$

25. $\frac{1}{2} \text{ of a mile} = \underline{\quad} \text{ ft}$

11. $108 \text{ in.} = \underline{\quad} \text{ yd}$

16. $6 \text{ ft } 6 \text{ in.} = \underline{\quad} \text{ in.}$

21. $\frac{3}{4} \text{ of a foot} = \underline{\quad} \text{ in.}$

26. $2,640 \text{ yd} = \underline{\quad} \text{ mi } \frac{1\frac{1}{2}}{2}$

12. $1\frac{2}{3} \text{ yd} = \underline{\quad} \text{ ft}$

17. $5,290 \text{ ft} = \underline{\quad} \text{ mi } \underline{\quad} \text{ ft}$

22. $\frac{2}{3} \text{ of a mile} = \underline{\quad} \text{ ft}$

27. $82 \text{ in.} = \underline{\quad} \text{ ft } \frac{6\frac{5}{6}}{6}$

Measurement Problems

Add

$$\begin{array}{r} 3 \text{ yd } 22 \text{ in.} \\ + 2 \text{ yd } 16 \text{ in.} \\ \hline 5 \text{ yd } 38 \text{ in.} \\ - 6 \text{ yd } 2 \text{ in.} \end{array}$$

1 yd = 36 in.

- Add or subtract smaller units. When subtracting, rename a larger unit as a smaller unit if needed.
- Add or subtract the larger units.
- Simplify the answer. Rename smaller units as larger units if possible.

Subtract

$$\begin{array}{r} 3 \text{ ft } 18 \text{ in.} \\ - 1 \text{ ft } 8 \text{ in.} \\ \hline 2 \text{ ft } 10 \text{ in.} \end{array}$$

1 ft = 12 in.

Add or subtract.

28. $3 \text{ ft } 6 \text{ in.}$
 $+ 2 \text{ ft } 3 \text{ in.}$
 $\hline 5 \text{ ft } 9 \text{ in.}$

29. $5 \text{ yd } 2 \text{ ft}$
 $+ 1 \text{ yd } 1 \text{ ft}$
 $\hline 6 \text{ yd } 3 \text{ ft} = 7 \text{ yd}$

30. $47 \text{ ft } 8 \text{ in.}$
 $+ 21 \text{ ft } 9 \text{ in.}$
 $\hline 68 \text{ ft } 17 \text{ in.} = 69 \text{ ft } 5 \text{ in.}$

31. $8 \text{ yd } 2 \text{ ft}$
 $- 3 \text{ yd } 1 \text{ ft}$
 $\hline 5 \text{ yd } 1 \text{ ft}$

32. $11 \text{ ft } 7 \text{ in.}$
 $- 5 \text{ ft } 9 \text{ in.}$
 $\hline 5 \text{ ft } 10 \text{ in.}$

Complete the table.

feet	3	5	8	10
inches	36	60	96	120

inches	36	54	72	90
yards	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$

feet	6	7	8	9
yards	2	$2\frac{1}{3}$	$2\frac{2}{3}$	3

yards	880	1,760	2,640	3,520
miles	$\frac{1}{2}$	1	$1\frac{1}{2}$	2

Practice & Application *Process used to solve may vary.*

37. Christian jogged $\frac{2}{3}$ of a mile. How many feet did he jog? $\frac{2}{3} \cdot 5,280 = 3,520 \text{ ft}$

38. Syrie used $2\frac{3}{4}$ yards of material to make a skirt. How many inches did she use? $2\frac{3}{4} \cdot 36 = \frac{11}{4} \cdot 36 = 99 \text{ in.}$

39. Terra ran $\frac{3}{4}$ of a mile. Sawyer ran 900 yards. Who ran farther? $Terra: \frac{3}{4} \cdot 1,760 = 1,320; 1,320 \text{ yd} > 900 \text{ yd}$

40. The height of the wall from the ceiling to the light switch is 2 yards. The height from the floor to the light switch is 36 inches. What is the measurement of the wall from the floor to the ceiling in feet? $2 \text{ yd} + 36 \text{ in.} = (2 \cdot 3) + (36 \div 12) = 6 + 3 = 9 \text{ ft}$

41. Write a comparison statement using $>$ or $<$ to compare the measurements of a 3-foot-wide desk and a $1\frac{1}{2}$ -yard-wide table. $1\frac{1}{2} \cdot 3 = \frac{3}{2} \cdot 3 = \frac{9}{2} = 4\frac{1}{2} \text{ ft}; 3 \text{ ft} < 4\frac{1}{2} \text{ ft}$

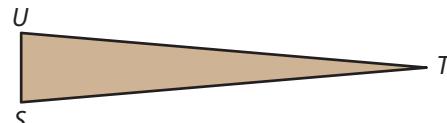
42. Draw a line segment $2\frac{3}{4}$ inches long. Write equivalent measurements using eighths and sixteenths. $2\frac{3}{4} = 2\frac{6}{8} = 2\frac{12}{16}$

43. Write a comparison statement using $>$ or $<$ to compare the measurements of a $10\frac{1}{2}$ -inch-wide book and a $10\frac{3}{16}$ -inch-wide book.
 $10\frac{1}{2} = 10\frac{8}{16}; 10\frac{1}{2} \text{ in.} > 10\frac{3}{16} \text{ in.}$

44. Write a comparison statement using $>$ or $<$ to compare the distances of 1,500 yards and 1 mile.
 $1,500 \text{ yd} < 1,760 \text{ yd}$

45. Write a comparison statement using $>$ or $<$ to compare the wingspans of 2 butterflies. One measures $1\frac{1}{2}$ inches and the other measures $\frac{7}{4}$ of an inch. $\frac{7}{4} = 1\frac{3}{4}; 1\frac{1}{2} \text{ in.} < \frac{7}{4} \text{ in.}$

J Find the measurements of \overline{ST} , \overline{TU} , and \overline{US} .
Find the perimeter of $\triangle STU$.



$\overline{ST} = 2\frac{1}{8} \text{ in.}, \overline{TU} = 2\frac{1}{8} \text{ in.}, \overline{US} = \frac{3}{8} \text{ in.}$

$P = 2\frac{1}{8} \text{ in.} + 2\frac{1}{8} \text{ in.} + \frac{3}{8} \text{ in.} = 4\frac{5}{8} \text{ in.}$

Complete **DAILY REVIEW** a on page 451.

Weight & Capacity

Knowing **weight** and **capacity** equivalents allows measurements to be renamed into larger or smaller units.

weight capacity

Weight Equivalents

1 pound (lb) = 16 ounces (oz)
1 ton (tn) = 2,000 pounds



Capacity Equivalents

1 cup (c) = 8 fluid ounces (fl oz)
1 pint (pt) = 2 cups
1 quart (qt) = 2 pints
1 gallon (gal) = 4 quarts



Rename Measurements

Rename larger units as smaller units.
Determine the equivalency and then *multiply*.

$$\begin{array}{r} 30 \text{ lb} = \underline{\quad} \text{ oz} \\ 1 \text{ lb} = 16 \text{ oz} \\ \hline 30 \times 16 = 480 \\ 30 \text{ lb} = 480 \text{ oz} \end{array}$$

$$\begin{array}{r} 30 \\ \times 16 \\ \hline 480 \end{array}$$

Rename smaller units as larger units.
Determine the equivalency and then *divide*.

$$\begin{array}{r} 19 \text{ qt} = \underline{\quad} \text{ gal} \\ 4 \text{ qt} = 1 \text{ gal} \\ \hline 19 \div 4 = 4 \text{ r}3 \\ 19 \text{ qt} = 4\frac{3}{4} \text{ gal} \\ \text{or} \\ 19 \text{ qt} = 4 \text{ gal } 3 \text{ qt} \end{array}$$

$$\begin{array}{r} 4\frac{3}{4} \\ 4 \overline{) 19} \\ -16 \\ \hline 3 \end{array}$$

Patrick's pickup truck has a curb weight of $2\frac{1}{4}$ tons.
How many pounds does his truck weigh?

$$\begin{array}{r} 2\frac{1}{4} \times 2,000 = \underline{\quad} \text{ lb} \\ 1 \text{ tn} = 2,000 \text{ lb} \\ \hline \frac{9}{4} \times 2,000 = 4,500 \\ 1 \\ 2\frac{1}{4} \text{ tn} = 4,500 \text{ lb} \end{array}$$

Claire drank $\frac{1}{4}$ of a gallon of milk. How many quarts did she drink?

$$\begin{array}{r} \frac{1}{4} \times 4 = \underline{\quad} \text{ qt} \\ 1 \text{ gal} = 4 \text{ qt} \\ \hline \frac{1}{4} \times 4 = 1 \\ 1 \\ \frac{1}{4} \text{ gal} = 1 \text{ qt} \end{array}$$

Exercises

Write the best unit of measurement: **oz, lb, tn, fl oz, c, pt, qt, or gal**.

1. glass of milk **fl oz or c**
2. pitcher of punch **qt or gal**
3. yogurt for family **pt or qt**
4. bag of potatoes **lb**
5. truckload of bricks **lb or tn**
6. water in bathtub **gal**

Complete the table.

7.	pounds	1	2	$2\frac{1}{2}$	3
	ounces	16	32	40	48

8.	cups	2	4	5	6
	pints	1	2	$2\frac{1}{2}$	3

Rename to the given unit of measurement.

9. $6 \text{ lb} = \underline{96} \text{ oz}$
10. $6 \text{ lb } 9 \text{ oz} = \underline{105} \text{ oz}$
11. $2 \text{ tn } 25 \text{ lb} = \underline{4,025} \text{ lb}$
12. $3 \text{ tn} = \underline{6,000} \text{ lb}$
13. $12 \text{ lb } 9 \text{ oz} = \underline{201} \text{ oz}$
14. $9 \text{ c} = \underline{4} \text{ pt } \underline{1} \text{ c}$
15. $4 \text{ lb } 2 \text{ oz} = \underline{66} \text{ oz}$
16. $10 \text{ qt} = \underline{2} \text{ gal } \underline{2} \text{ qt}$

Rename to the given unit of measurement.

17. $\frac{1}{2}$ of a ton = 1,000 lb

18. $\frac{5}{8}$ of a pound = 10 oz

19. $\frac{3}{4}$ of a gallon = 3 qt

20. $\frac{3}{8}$ of a cup = 3 oz

21. $\frac{1}{2}$ of a pound = 8 oz

22. $\frac{1}{4}$ of a ton = 500 lb

23. $\frac{3}{4}$ of a cup = 6 oz

24. $\frac{1}{2}$ of a gallon = 2 qt

25. $3\frac{1}{2}$ qt = 7 pt

26. $1\frac{1}{2}$ lb = 24 oz

27. $10\frac{1}{4}$ tn = 20,500 lb

28. $3\frac{1}{2}$ gal = 14 qt

Add or subtract. Simplify the answer.

29. $2 \text{ tn } 345 \text{ lb}$
+ 4 tn 536 lb
6 tn 881 lb

30. $3 \text{ gal } 2 \text{ qt}$
+ 4 gal 3 qt
7 gal 5 qt =

31. $2 \text{ qt } 1 \text{ pt}$
+ 1 qt 1 pt
3 qt 2 pt =

32. $2 \text{ lb } 2 \text{ oz}$
- 1 lb 4 oz
14 oz

33. $3 \text{ qt } 2 \text{ pt}$
- 1 qt 1 pt
2 qt 1 pt

Practice & Application

34. What fraction of a gallon is a quart? **$\frac{1}{4}$**

35. Which has the greater capacity: 6 ounces or $\frac{1}{2}$ cup? **6 oz**

36. Which hamburger weighs more: $\frac{1}{4}$ of a pound or 8 ounces? **8 oz**

37. What fraction of a quart is a pint? **$\frac{1}{2}$**

38. Which is larger: 2 pints or 3 cups? **2 pt**

39. Ben measured the game area by walking heel-to-toe 9 steps. Did he measure 9 inches, 9 feet, or 9 yards? **9 ft**

40. Anna measured the ribbon from her nose to her fingertips twice. Did Anna measure 2 inches, 2 feet, or 2 yards? **2 yd**

41. Coach Willis had the team walk around the track for 20 minutes. Did the team walk 1 mile, 2 miles, or 3 miles? **1 mi**

42. Kaylee needs a bowl for two 12-ounce cans of corn. Did she use a bowl that held 1 cup, 1 pint, or 1 quart? **1 qt**

43. Jamile knows that 1 pound equals sixteen ounces. Which ratio shows the relationship of pounds to ounces: 16:16, 1:16, or 16:1? **1:16**

44. Mother needed $\frac{3}{4}$ of a pound of hamburger for her meat pie. Did she use 4 ounces, 8 ounces, or 12 ounces? **12 oz**

45. Mr. Pennington had a board $2\frac{1}{4}$ feet long. He used 21 inches. How much of the board did he have left: $\frac{1}{4}$ foot, $\frac{1}{2}$ foot, or $\frac{3}{4}$ foot? **6 in. = $\frac{1}{2}$ ft**

DID YOU KNOW

Weight is a measure of the pull of gravity on an object. *Gravity* is the force of one object pulling on another object. Lunar gravity is $\frac{1}{6}$ of the earth's gravity, so the average astronaut in a lunar suit weighs only 60 pounds on the moon.

Mass is the measurement of the amount of matter an object has. Although the astronaut's weight is different on the moon from what it is on the earth, his mass—the amount of matter making up his body—does not change.

Even though some people use the terms *weight* and *mass* interchangeably, scientists are careful to make a distinction between the words. A scientist uses the terms *gram* and *kilogram* as units of mass, but for weight he uses the term *newton*.



Complete **DAILY REVIEW b** on page 451.

Metric Linear Measurement

Knowing metric equivalents allows measurements to be renamed into larger or smaller units. The **meter** (m) is the basic unit of length in the metric system.

Metric Equivalents

$$\begin{aligned}1 \text{ kilometer (km)} &= 1000 \text{ m} \\1 \text{ m} &= 100 \text{ centimeters (cm)} \\1 \text{ m} &= 1000 \text{ millimeters (mm)}\end{aligned}$$

Decimal Equivalents

$$\begin{aligned}1 \text{ kilometer (km)} &= 1000 \text{ m} \\1 \text{ centimeter (cm)} &= 0.01 \text{ m} \\1 \text{ millimeter (mm)} &= 0.001 \text{ m}\end{aligned}$$

millimeter
centimeter
meter
kilometer

Rename Metric Measurements

Rename larger units as smaller units.
Determine the equivalency and then multiply.

$$\begin{aligned}4 \text{ km} &= \underline{\hspace{2cm}} \text{ m} \\1 \text{ km} &= 1000 \text{ m} \\4 \times 1000 &= 4000 \\4 \text{ km} &= \underline{\hspace{2cm}} \text{ m}\end{aligned}$$

$$\begin{array}{r}1000 \\ \times \quad 4 \\ \hline 4000\end{array}$$

Rename smaller units as larger units.
Determine the equivalency and then divide.

$$\begin{aligned}150 \text{ cm} &= \underline{\hspace{2cm}} \text{ m} \\100 \text{ cm} &= 1 \text{ m} \\150 \div 100 &= 1.5 \\150 \text{ cm} &= \underline{\hspace{2cm}} \text{ m}\end{aligned}$$

$$\begin{array}{r}1.5 \\100 \overline{)150.0} \\-100 \\500 \\-500 \\0\end{array}$$

Determine the equivalency and solve.

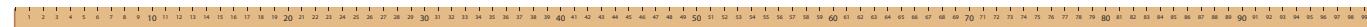
$$\begin{aligned}\frac{3}{4} \text{ km} &= \underline{\hspace{2cm}} \text{ m} \\1 \text{ km} &= 1000 \text{ m} \\\frac{3}{4} \times 1000 &= 750 \\\frac{3}{4} \text{ km} &= \underline{\hspace{2cm}} \text{ m}\end{aligned}$$

$$\begin{array}{r}250 \\ \times \quad 3 \\ \hline 750\end{array}$$

Exercises

Write the measurement of the line segment using the given unit.

1.		<u>8</u> cm
2.		<u>85</u> mm
3.		<u>57</u> mm



Write the best unit of measurement: **km**, **m**, **cm**, or **mm**.

4. distance to the ocean **km**
5. length of an umbrella **cm or m**
6. length of an ant **mm**
7. width of a wedding ring **mm**
8. height of a door **cm or m**
9. distance of a bike-a-thon **km**

Write a comparison sentence using **>** or **<**.

10. $99 \text{ cm} < 1 \text{ m}$
11. $2 \text{ km} < 2410 \text{ m}$
12. $89 \text{ m} > 9 \text{ cm}$
13. $56 \text{ cm} > 75 \text{ mm}$
14. $3 \text{ m} < 420 \text{ cm}$
15. $100 \text{ cm} < 1 \text{ km}$

Rename to the given unit of measurement.

16. $2 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$
17. $423 \text{ cm} = \underline{\hspace{2cm}} \text{ m}$
18. $\frac{1}{2} \text{ km} = \underline{\hspace{2cm}} \text{ m}$
19. $780 \text{ cm} = \underline{\hspace{2cm}} \text{ m}$
20. $3000 \text{ m} = \underline{\hspace{2cm}} \text{ km}$
21. $\frac{1}{4} \text{ m} = \underline{\hspace{2cm}} \text{ cm}$
22. $5 \text{ m} = \underline{\hspace{2cm}} \text{ mm}$
23. $6500 \text{ m} = \underline{\hspace{2cm}} \text{ km}$
24. $\frac{2}{5} \text{ cm} = \underline{\hspace{2cm}} \text{ mm}$
25. $2100 \text{ mm} = \underline{\hspace{2cm}} \text{ m}$
26. $3.76 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$
27. $\frac{3}{4} \text{ m} = \underline{\hspace{2cm}} \text{ cm}$

Add or subtract.

28. 25 m
+ 8 m
33 m

29. 4.7 m
- 3.2 m
1.5 m

30. 10.5 km
+ 2.1 km
12.6 km

31. 981 mm
- 245 mm
736 mm

32. 795 m
+ 349 m
1144 m

Complete the table.

m	1000	1500	2000
km	1	1.5	2

cm	300	350	400
m	3	3.5	4

m	1	1.5	2
mm	1000	1500	2000

Place a decimal point in the answer to make a reasonable measurement.

36. height of a doghouse = 082 m **0.82 m**

37. width of a bracelet = 12 cm **1.2 cm**

Find the length in millimeters and centimeters.



80 mm or **8** cm



53 mm or **5.3** cm

Practice & Application

40. Is the length of a cell phone closer to 10 mm or 10 cm? **10 cm**

41. Which trail is shorter: River Trail at 1.2 km or Mountain Trail at 958 m? **Mountain Trail**

42. Would the length of a minivan be closer to 2 m or 5 m? **5 m**

43. Is the wingspan of a butterfly about 55 mm or 55 cm? **55 mm**

44. Mrs. Poole planted a square flower bed 100 cm long. Is each side of the flower bed *greater than, less than, or equal to* a meter?
equal to a meter

45. Preston scribbled the number 25 when he measured the length of his computer. What metric unit of measurement did he use to measure the computer? **cm**

46. The Haas family visited Canada on vacation. What metric unit would complete the speed limit sign that reads 60 ? **km/h or kilometers per hour**

47. Jade went to the eye doctor to get contacts. The doctor measured her pupil at 4. What metric unit of measure did he use to measure her pupil? **mm**

48. Megan trained for a 5K race. How many meters are in 5 kilometers? **5000 m**



Complete **DAILY REVIEW C** on page 452.

Metric Capacity & Mass

Capacity is the amount of liquid a container will hold. The **liter** (L) is the basic unit of capacity in the metric system.



$$1 \text{ L} = 1000 \text{ milliliters (mL)}$$
$$1 \text{ mL} = 0.001 \text{ L}$$

Mass is the amount of matter an object has. The **gram** (g) is a basic unit of mass.



$$1000 \text{ g} = 1 \text{ kilogram (kg)}$$
$$1 \text{ g} = 0.001 \text{ kg}$$
$$1 \text{ g} = 1000 \text{ milligrams (mg)}$$

capacity
liter
milliliter
mass
gram
milligram

Rename Metric Units

Rename larger units as smaller units. Determine the equivalency and then *multiply*.

$$3.25 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$$

1 L = 1000 mL

$$3.25 \times \underline{\hspace{2cm}} = 3250$$
$$3.25 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$$

Rename smaller units as larger units. Determine the equivalency and then *divide*.

$$2500 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$$

1000 g = 1 kg

$$2500 \div \underline{\hspace{2cm}} = 2.5 \text{ kg}$$
$$2500 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$$

Use Mental Math to Rename

$$1 \text{ L} = 1000 \text{ mL}$$

× 1000

$$3.25 \text{ L} = 3250 \text{ L}$$

$$1000 \text{ g} = 1 \text{ kg}$$

÷ 1000

$$2500 \text{ g} = 2.5 \text{ kg}$$

Exercises

Write the best unit of mass: **mg**, **g**, or **kg**.

- | | | | |
|------------------|-----------|--------------------|-----------|
| 1. box of books | kg | 4. mouse | g |
| 2. grain of salt | mg | 5. snowflake | mg |
| 3. child | kg | 6. bag of potatoes | kg |

Write the better unit of capacity: **mL** or **L**.

- | | | | |
|---------------------|-----------|--------------------------|-----------|
| 7. fish aquarium | L | 10. spoonful of medicine | mL |
| 8. pitcher of punch | L | 11. mug of hot cocoa | mL |
| 9. glass of milk | mL | 12. cooler of water | L |

Use the data from the chart to find the answer.

13. Which owl is the smallest? **Elf Owl**
14. Which owl has a mass of 1.7 kg? **Great Horned Owl**
15. Which owl is the largest? **Snow Owl**
16. How much larger is the Spotted Owl than the Barn Owl? **125 g**
17. What is the difference between the smallest owl and the largest owl?
2257.5 g

Rename to the given unit of measurement.

- | | | |
|--|--|--|
| 18. $3 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$ | 21. $5700 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$ | 24. $4.5 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$ |
| 19. $2000 \text{ mg} = \underline{\hspace{2cm}} \text{ g}$ | 22. $7.1 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$ | 25. $2430 \text{ mg} = \underline{\hspace{2cm}} \text{ g}$ |
| 20. $8000 \text{ mL} = \underline{\hspace{2cm}} \text{ L}$ | 23. $9500 \text{ mL} = \underline{\hspace{2cm}} \text{ L}$ | 26. $2.75 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$ |

Owls	
Elf Owl	42.5 g
Barn Owl	470 g
Spotted Owl	595 g
Great Horned Owl	1700 g
Snow Owl	2.3 kg



Add or subtract.

27. $2.5 \text{ kg} + 1.4 \text{ kg}$
3.9 kg

28. $4271 \text{ g} - 1 \text{ kg}$
3271 g or 3.271 kg

29. $3 \text{ L} - 2500 \text{ mL}$
500 mL or 0.5 L

Use the data from the chart to find the answer.

30. Which has the greater mass: a cock or a hen? **cock**
31. What is the difference between the weight of a cock and the weight of a cockerel? **0.45 kg**
32. What is the pullet's weight in kilograms? **2.7 kg**
33. A Cornish cockerel weighs 3.86 kg. Which is larger: the Plymouth Rock cockerel or the Cornish cockerel? **Cornish cockerel**
34. A farmer ordered 15 pullets. Give the mass of the shipment in kilograms. **$15 \times 2700 = 40500 \text{ g} = 40.5 \text{ kg}$**

Weight of Plymouth Rock Chickens	
Pullet	2700 g
Hen	3.4 kg
Cockerel	3.65 kg
Cock	4.1 kg



Complete the table.

m	cm
9	900
10	1000
11	1100

mL	L
2000	2
3500	3.5
4200	4.2

g	kg
7000	7
9500	9.5
1500	1.5

m	km
4000	4
6500	6.5
1500	1.5

Practice & Application

39. Would a math book have a mass of 15 kg or 1.5 kg? **1.5 kg**
40. Would Alexander drink 1 L or 100 mL during a hike? **1 L**
41. Would a man walk 25 m or 1 km in 20 minutes? **1 km**
42. Would a basketball player be 150 cm tall or 2 m tall? **2 m**
43. Would the most precise measurement of the width of a penny be in centimeters or millimeters? **millimeters**
44. Would an aquarium hold 20 mL or 20 L of water? **20 L**
45. Would a bag of 1,000 small candies have a mass of 1 g or 1 kg? **1 kg**
46. Would the average sixth-grader weigh 40 g or 40 kg? **40 kg**

DID YOU KNOW

Capacity is the amount of liquid that a container can hold. The capacity of this container is 1 liter.

Mass is measurement of the amount of matter an object has. The mass of this container filled with water is 1 kilogram.



Volume is the number of cubic units within a three-dimensional figure. The volume of this container is 1000 cm^3 .

Capacity = 1 L
Mass = 1 kg
Volume = 1000 cm^3
Length = 10 cm
Width = 10 cm
Height = 10 cm

Customary & Metric

	Addition	Subtraction	Multiplication	Division
Customary	$ \begin{array}{r} 11 \text{ in.} \\ + 1 \text{ ft } 7 \text{ in.} \\ \hline 1 \text{ ft } 18 \text{ in.} = \\ 2 \text{ ft } 6 \text{ in.} \end{array} $ <p>Simplify the answer when 2 units of measure are used.</p>	$ \begin{array}{r} 1 \text{ lb} = 16 \text{ oz} \\ 16 + 8 = 24 \end{array} $ $ \begin{array}{r} 34 \quad 24 \\ 35 \text{ lb } 8 \text{ oz} \\ - 1 \text{ lb } 13 \text{ oz} \\ \hline 33 \text{ lb } 11 \text{ oz} \end{array} $	$ \begin{array}{r} 1 \text{ lb } 4 \text{ oz} \\ \times \quad 7 \\ \hline 7 \text{ lb } 28 \text{ oz} \\ \hline 8 \text{ lb } 12 \text{ oz} \end{array} $	$12 \text{ ft } 4 \text{ in.} \div 4 = \underline{\hspace{2cm}}$ $ \begin{array}{r} 3 \text{ ft } 1 \text{ in.} \\ 4) 12 \text{ ft } 4 \text{ in.} \\ - 12 \\ \hline 0 \text{ ft } 4 \text{ in.} \\ - 4 \\ \hline 0 \end{array} $ $3 \text{ ft } 1 \text{ in.}$
Metric	$ \begin{array}{r} 1.8 \text{ kg} + 1500 \text{ g} = \underline{\hspace{2cm}} \end{array} $ $ \begin{array}{r} 1.8 \text{ kg} \quad \text{or} \quad 1800 \text{ g} \\ + 1.5 \text{ kg} \quad \quad \quad + 1500 \text{ g} \\ \hline 3.3 \text{ kg} \quad \quad \quad 3300 \text{ g} \end{array} $	$ \begin{array}{r} 7000 \text{ mg} - 3 \text{ g} = \underline{\hspace{2cm}} \end{array} $ $ \begin{array}{r} 7 \text{ g} \quad \text{or} \quad 7000 \text{ mg} \\ - 3 \text{ g} \quad \quad \quad - 3000 \text{ mg} \\ \hline 4 \text{ g} \quad \quad \quad 4000 \text{ mg} \end{array} $	$ \begin{array}{r} 3.61 \text{ L} \\ \times \quad 7 \\ \hline 25.27 \text{ L} \end{array} $	$72.48 \text{ m} \div 8 = \underline{\hspace{2cm}}$ $ \begin{array}{r} 9.06 \text{ m} \\ 8) 72.48 \text{ m} \\ - 72 \\ \hline 048 \\ - 48 \\ \hline 0 \end{array} $

Exercises

Solve. Simplify the answer.

1.
$$\begin{array}{r}
 10 \text{ ft } 4 \text{ in.} \\
 + 5 \text{ ft } 6 \text{ in.} \\
 \hline
 15 \text{ ft } 10 \text{ in.}
 \end{array}$$

2.
$$\begin{array}{r}
 3 \text{ gal } 2 \text{ qt} \\
 + 7 \text{ gal } 3 \text{ qt} \\
 \hline
 10 \text{ gal } 5 \text{ qt} = \\
 11 \text{ gal } 1 \text{ qt}
 \end{array}$$

3.
$$\begin{array}{r}
 6 \text{ yd } 2 \text{ ft} \\
 + 8 \text{ yd } 2 \text{ ft} \\
 \hline
 14 \text{ yd } 4 \text{ ft} = \\
 15 \text{ yd } 1 \text{ ft}
 \end{array}$$

4.
$$\begin{array}{r}
 9 \text{ ft } 9 \text{ in.} \\
 + 8 \text{ ft } 7 \text{ in.} \\
 \hline
 17 \text{ ft } 16 \text{ in.} = \\
 18 \text{ ft } 4 \text{ in.}
 \end{array}$$

5.
$$\begin{array}{r}
 12 \text{ lb } 4 \text{ oz} \\
 - 7 \text{ lb } 9 \text{ oz} \\
 \hline
 4 \text{ lb } 11 \text{ oz}
 \end{array}$$

6.
$$\begin{array}{r}
 23 \text{ ft } 7 \text{ in.} \\
 - 8 \text{ ft } 10 \text{ in.} \\
 \hline
 14 \text{ ft } 9 \text{ in.}
 \end{array}$$

7.
$$\begin{array}{r}
 6000 \text{ mL} \\
 - 1500 \text{ mL} \\
 \hline
 4500 \text{ mL}
 \end{array}$$

8.
$$\begin{array}{r}
 3906 \text{ L} \\
 - 2879 \text{ L} \\
 \hline
 1027 \text{ L}
 \end{array}$$

9.
$$\begin{array}{r}
 8 \text{ L} + 14 \text{ L} + 72 \text{ mL} \\
 22,072 \text{ mL or} \\
 22.072 \text{ L}
 \end{array}$$

10.
$$\begin{array}{r}
 703 \text{ g} + 4 \text{ kg} + 65 \text{ g} \\
 4768 \text{ g or } 4.768 \text{ kg}
 \end{array}$$

11.
$$\begin{array}{r}
 6 \text{ qt} - 5 \text{ pt} \quad 3 \text{ qt } 1 \text{ pt}
 \end{array}$$

12.
$$\begin{array}{r}
 4 \text{ yd} - 5 \text{ ft} \quad 2 \text{ yd } 1 \text{ ft}
 \end{array}$$

13.
$$\begin{array}{r}
 1.47 \text{ g} \\
 \times \quad 6 \\
 \hline
 8.82 \text{ g}
 \end{array}$$

14.
$$\begin{array}{r}
 4 \text{ pt } 3 \text{ c} \\
 \times \quad 3 \\
 \hline
 12 \text{ pt } 9 \text{ c} = \\
 16 \text{ pt } 1 \text{ c}
 \end{array}$$

15.
$$\begin{array}{r}
 6 \text{ ft } 6 \text{ in.} \\
 \times \quad 4 \\
 \hline
 24 \text{ ft } 24 \text{ in.} = \\
 26 \text{ ft}
 \end{array}$$

16.
$$\begin{array}{r}
 16 \text{ gal } 2 \text{ qt} \\
 \times \quad 8 \\
 \hline
 128 \text{ gal } 16 \text{ qt} = \\
 132 \text{ gal}
 \end{array}$$

17. $48.6 \text{ m} \div 3 \quad 16.2 \text{ m}$

18.
$$\begin{array}{r}
 4 \overline{) 16 \text{ ft } 8 \text{ in.}} \\
 4 \text{ ft } 2 \text{ in.}
 \end{array}$$

19.
$$\begin{array}{r}
 2 \overline{) 6 \text{ tn } 210 \text{ lb}} \\
 3 \text{ tn } 105 \text{ lb}
 \end{array}$$

20.
$$\begin{array}{r}
 3 \overline{) 18 \text{ gal } 9 \text{ pt}} \\
 6 \text{ gal } 3 \text{ pt}
 \end{array}$$

21. Mrs. DeYoung used a long roll of paper to cover 9 tables for the neighborhood picnic. Each table cover was 5 ft 3 in. long. What was the total length of paper she used?
 $9 \cdot 5 \text{ ft } 3 \text{ in.} = 45 \text{ ft } 27 \text{ in.} = 47 \text{ ft } 3 \text{ in.}$

22. The church shipped a garden tiller and a garden seeder to a missionary in South America. The tiller weighed 75 lb, and the seeder weighed 7 lb 11 oz. How much more did the tiller weigh than the seeder? $75 \text{ lb} - 7 \text{ lb } 11 \text{ oz} = 67 \text{ lb } 5 \text{ oz}$

■ Practice & Application *Steps to solve may vary.*

23. The average dairy cow produces 7 gallons of milk per day. How many 8-ounce glasses are in 7 gallons of milk?
24. Dairy cows need to drink 200 L of water to produce 30 L of milk. How many liters of water would a cow need to drink to produce 300 L of milk? $\frac{200 \text{ L}}{30 \text{ L}} = \frac{x}{300 \text{ L}}$; **2000 L of water**
25. The average Holstein cow needs 22 kg of feed to produce 30 L of milk. If a cow received 10 kg of hay, how many kilograms of corn would she need to produce 30 L of milk? $22 \text{ kg} - 10 \text{ kg} = 12 \text{ kg of corn}$
26. The average Holstein cow produces 7 gallons of milk per day. How many cows would it take to fill a 1,000-gallon milk tank in one day? $1,000 \div 7 \approx 143 \text{ cows}$
27. Mr. Well's prized Holstein weighs 1,598 pounds. Mr. Bradstreet's top Jersey weighs 987 pounds. What is the difference in the weight of the two cows? $1,598 \text{ lb} - 987 \text{ lb} = 611 \text{ lb}$
28. The Hayner Dairy Farm houses 1,500 cows in a barn that is 200 ft wide and 750 ft long. What is the perimeter and the area of the barn?
29. If a sixth-grader drank 8 ounces of milk at each meal, how many ounces would he consume in a day? $3 \cdot 8 \text{ oz} = 24 \text{ oz}$
30. Everett drinks 3 quarts of milk each week. Wesley drinks 13 cups of milk each week. Who drinks more milk? $4 \text{ c} = 1 \text{ qt}; 3 \text{ qt} \cdot 4 \text{ c} = 12 \text{ c}$; **Wesley; $13 \text{ c} > 12 \text{ c}$**
31. Adriana bought 36 ounces of cheese. Did she purchase 4 eight-ounce bags or 3 twelve-ounce bags? $3 \cdot 12 \text{ oz} = 36 \text{ oz}$; **3 twelve-ounce bags**
32. The menu offered 1 L of chocolate milk and 750 mL of chocolate milk. Which choice offered more milk? $1 \text{ L}; 1 \text{ L} = 1000 \text{ mL}$
33. The total amount of milk produced in one day on the Belmont Farm is 2250 L. There are 75 cows on the farm. What is the average amount of milk each cow produces per day? $2250 \div 75 = 30 \text{ L of milk}$
34. A cow needs 0.92 meters of space while eating. How many meters of space are needed for 50 cows? $50 \cdot 0.92 = 46 \text{ m}$

J

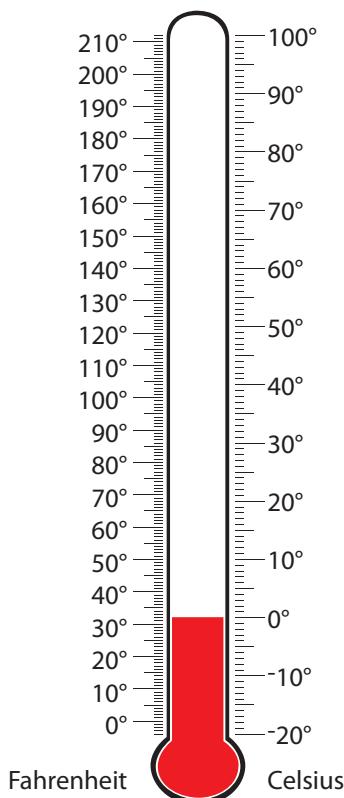
The Carson family drinks 2 gallons of milk each week. How many quarts of milk do they drink? Use the number of quarts to find an equivalent number of pints and cups. $2 \text{ gal} \cdot 4 \text{ qt} = 8 \text{ qt}$; $8 \text{ qt} \cdot 2 \text{ pt} = 16 \text{ pt}$; $16 \text{ pt} \cdot 2 \text{ c} = 32 \text{ c}$

23. $8 \text{ oz} = 1 \text{ c}$
 $2 \text{ c} = 1 \text{ pt}$
 $2 \text{ pt} = 1 \text{ qt}$
 $4 \text{ qt} = 1 \text{ gal}$
 $16 \text{ c} = 1 \text{ gal}$
 $7 \cdot 16 = 112 \text{ eight-ounce glasses}$
28. $P = (2 \cdot 200 \text{ ft}) + (2 \cdot 750 \text{ ft}) = 400 + 1,500 = 1,900 \text{ ft}$
 $A = 200 \text{ ft} \cdot 750 \text{ ft} = 150,000 \text{ ft}^2$



Fahrenheit & Celsius

Use the facts for temperature to convert between **Fahrenheit** and **Celsius**.



Temperature Equivalents

Boiling point of water	212°F	100°C
Normal body temperature	98.6°F	37°C
Freezing point of water	32°F	0°C

Fahrenheit
Celsius

Convert Temperature

Celsius to Fahrenheit

$$F = \left(\frac{9}{5} \times C\right) + 32$$

$$—^{\circ}\text{F} = 25^{\circ}\text{C}$$

$$F = \left(\frac{9}{5} \times 25\right) + 32$$

$$F = \left(\frac{9}{5} \times \frac{25}{1}\right) + 32$$

$$F = 45 + 32$$

$$F = 77^{\circ}$$

Fahrenheit to Celsius

$$C = \frac{5}{9} \times (F - 32)$$

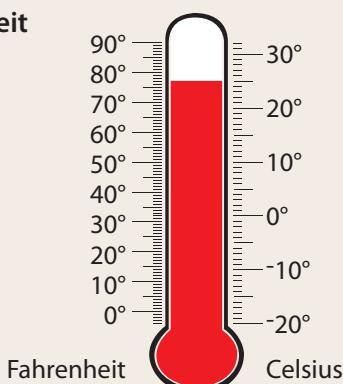
$$—^{\circ}\text{C} = 77^{\circ}\text{F}$$

$$C = \frac{5}{9} \times (77 - 32)$$

$$C = \frac{5}{9} \times 45$$

$$C = \frac{5}{9} \times \frac{45}{1}$$

$$C = 25^{\circ}$$



$$77^{\circ}\text{F} = 25^{\circ}\text{C}$$

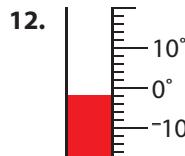
Exercises

Choose the more reasonable temperature.

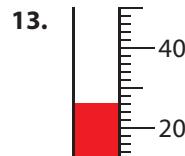
1. bowl of ice cream	32°F	32°C
2. day at the beach	50°F	38°C
3. room temperature	20°F	20°C
4. water for boiling eggs	212°F	50°C
5. sick child	98.6°F	103°F
6. snowy day	-3°C	30°C
7. fall day	65°F	25°F
8. normal body temperature	30°C	37°C
9. mowing the yard	25°C	80°C
10. ice skating	40°F	30°F
11. boiling water	100°C	200°C

Determine the scale of the thermometer.

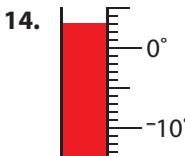
Write the temperature.



$$-2^{\circ}\text{F}$$



$$26^{\circ}\text{C}$$



$$3^{\circ}\text{C}$$

Answers based on cancellation.

Use the formula to convert the temperature.

$$15. 59^{\circ}\text{F} = \underline{\hspace{2cm}}^{\circ}\text{C} \quad \underline{\hspace{2cm}} \quad 18. 10^{\circ}\text{C} = \underline{\hspace{2cm}}^{\circ}\text{F} \quad \underline{\hspace{2cm}}$$

$$16. 41^{\circ}\text{F} = \underline{\hspace{2cm}}^{\circ}\text{C} \quad \underline{\hspace{2cm}} \quad 19. 20^{\circ}\text{C} = \underline{\hspace{2cm}}^{\circ}\text{F} \quad \underline{\hspace{2cm}}$$

$$17. 95^{\circ}\text{F} = \underline{\hspace{2cm}}^{\circ}\text{C} \quad \underline{\hspace{2cm}} \quad 20. 50^{\circ}\text{C} = \underline{\hspace{2cm}}^{\circ}\text{F} \quad \underline{\hspace{2cm}}$$

Aaron's journal while climbing Mount McKinley in Alaska

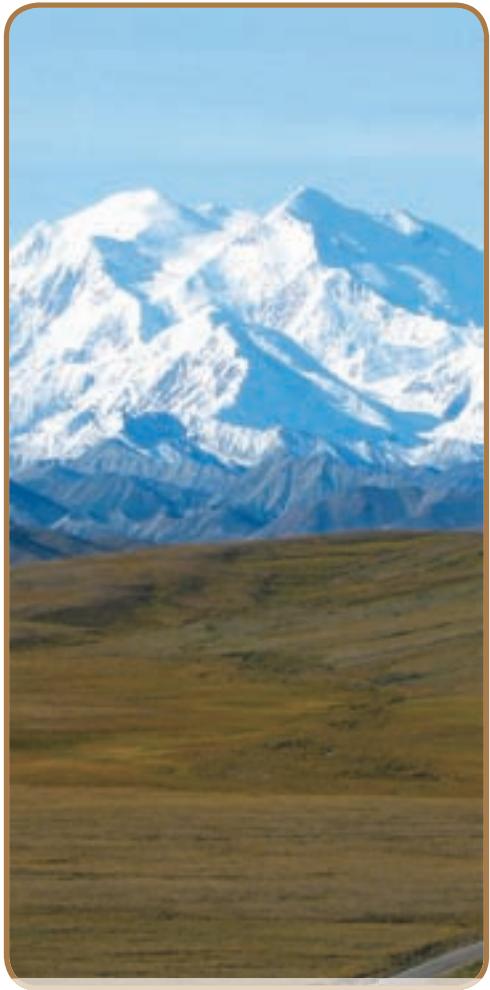
Day 1: Today, June 11, I packed about 8 kg of food on my sled for the climb up Mount McKinley. Tomorrow we will hike from the Base Camp to Camp 1. The elevation at **Camp 1** is **7,999 ft (2438 m)** above sea level. The temperature is a warm **15°C**.

Day 6: It has taken 3 days to hike from **Camp 2** (elev. 7,770 ft) to **Camp 3** (elev. 11,500 ft). The temperature is a warm **14°C** in the sun. I dragged a 30 kg sled and carried a 25 kg backpack while hiking up the 4-mile slope. At camp I melted 2.5 L of snow for drinking water.

Day 9: Praise the Lord! Today our team safely climbed to **Camp 4** (elev. **14,400 ft**). The temperature is **-10°C** with a cold wind blowing off the mountain. Inside the tent it is above freezing. We are safe and will rest here tonight.

Day 12: Today the guide said, "The snowstorm is over. We will climb to **Camp 5** (elev. **17,200 ft**)." Leaving Camp 4 at 9:20 AM, we began the long hike (14,400 ft to 17,200 ft). My backpack weighed over 30 kg. A 700 m long ice slope slowed our climb. About 5:00 PM we trudged into camp and set up tents. It started to snow, and the temperature dropped to **-20°C**. We were only 3,120 feet below the summit!

Day 16: The Summit! The temperature was **-18°C** as we began our climb. When we reached a place only 330 feet below the summit, I looked up and saw clearly that the route was on a steep ridge. I kept moving slowly upward to the summit (elev. **20,320 ft, 6194 m**). On June 27, I was at the top of the world, and the view was breathtaking! The cliffs around me dropped thousands of feet. I was overcome with the power and the greatness of my Creator. "Be thou exalted, O God, above the heavens: let thy glory be above all the earth" (Psalm 57:11).



Exercises

Use the journal entries above to find the answer. **Steps to solve may vary.**

21. What was the temperature in Fahrenheit on Day 1? **15°C = 59°F**
22. How many grams of food did Aaron take on his hike? **8 × 1000 = 8000; 8 kg = 8000 g**
23. How many kilometers is Camp 1 above sea level? **2438 ÷ 1000 = 2.438; 2438 m = 2.438 km**
24. What is a mild temperature for this part of Alaska? **14°C or 15°C**
25. What is the total mass of the sled and the backpack that Aaron took from Camp 2 to Camp 3? **30 kg + 25 kg = 55 kg**
26. What is the difference in elevation from Camp 2 to Camp 3? **11,500 – 7,770 = 3,730 ft**
27. If the ratio of melted snow to water is 10:1, how many milliliters of water did Aaron prepare for drinking on Day 6? **$\frac{10}{1} = \frac{2.5 L}{0.25 L}$; n = 0.25 L or 250 mL**
28. How many degrees warmer was it on Day 6 than it was on Day 9? **10 + 14 = 24 degrees**
29. On Day 9 what was the temperature inside the tent? **Answers may vary, but should be above 0°C.**
30. How much elevation did they gain on the hike on Day 12? **17,200 – 14,400 = 2,800 ft**
31. On Day 12 the team encountered a long ice slope. Was the ice slope a kilometer long? Explain. **no; 700 m = 0.7 km**
32. On Day 16 Aaron looked up from the trail and saw the summit. About how many meters was the summit above him at that point? **330 ft ÷ 3 ≈ 100 yd; approximately 100 m**
33. How many meters higher is the summit than Camp 1? **6194 – 2438 = 3756 m**

Relate Customary & Metric Units

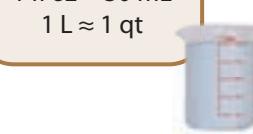
Approximate Customary and Metric Conversions

Length

1 in. \approx 2.5 cm
1 ft \approx 30 cm
1 mi \approx 1.6 km
1 m \approx 39 in.

Capacity

1 fl oz \approx 30 mL
1 L \approx 1 qt



Weight or Mass

1 oz \approx 30 g
1 kg \approx 2.2 lb



Estimate Approximate Conversions Between Customary and Metric Units

Rename larger units as smaller units.

Determine the approximate equivalency and then *multiply*.

$$3 \text{ ft} \approx \underline{\hspace{1cm}} \text{ cm}$$

$$1 \text{ ft} \approx 30 \text{ cm}$$

$$3 \times 30 = 90$$

3 ft \approx 90 cm

Rename smaller units as larger units.

Determine the approximate equivalency and then *divide*.

$$11 \text{ lb} \approx \underline{\hspace{1cm}} \text{ kg}$$

$$1 \text{ kg} \approx 2.2 \text{ lb}$$

$$11 \div 2.2 = 5$$

11 lb \approx 5 kg

Exercises

Write the approximate measurement.

- Vivian's umbrella is 1 yard long. About how many meters long is it? **1 m**
- Laura drank 1 quart of water. About how many liters of water did she drink? **1 L**
- Mom bought 2 pounds of chocolates. About how many kilograms of chocolates did she purchase? **1 kg**

Write a comparison sentence using $>$, $<$, or \approx .

7. 4 in. **$>$** 4 cm

8. 3 kg **$>$** 3 lb

9. 1 qt **\approx** 1 L

10. 2 m **\approx** 2 yd

11. 2 ft **$>$** 30 cm

12. 30 mL **$<$** 5 fl oz

13. 2 lb **$<$** 4 kg

14. 3 m **$<$** 3 km

Use the conversion facts above to find an approximate equivalency.

15. 3 in. \approx cm **$3 \times 2.5 = 7.5$**

18. 2 fl oz \approx mL **$2 \times 30 = 60$**

21. 6 ft \approx cm **$6 \times 30 = 180$**

16. 4 m \approx in. **$4 \times 39 = 156$**

19. 7 L \approx qt **$7 \times 1 = 7$**

22. 60 mL \approx fl oz **$60 \div 30 = 2$**

17. 78 in. \approx m **$78 \div 39 = 2$**

20. 120 cm \approx ft **$120 \div 30 = 4$**

23. 8.8 lb \approx kg **$8.8 \div 2.2 = 4$**

Write the answer. **Steps to solve may vary.**

- When you convert kilograms to pounds, do you get a higher or lower number of pounds? **higher**
- The Colemans traveled 160 kilometers. How many miles did they travel? **$160 \text{ km} \div 1.6 = 100 \text{ miles}$**

26. Sara's kitten weighed 3 pounds. Mira's kitten was 2 kilograms. Who had the smaller kitten?

$2 \cdot 2.2 \text{ lb} = 4.4 \text{ lb}; 3 \text{ lb} < 4.4 \text{ lb}; \text{Sara}$

27. Brady's rope measured 2 meters. Rory's rope measured 80 inches. Whose rope was longer?

$2 \cdot 39 \text{ in.} = 78 \text{ in.}; 78 \text{ in.} < 80 \text{ in.}; \text{Rory's rope}$

Rename to the given unit of measurement.

28. $1 \text{ ft} = \underline{12} \text{ in.}$
 $1 \text{ yd} = \underline{3} \text{ ft}$
 $1 \text{ mi} = \underline{1,760} \text{ yd}$

29. $1 \text{ c} = \underline{8} \text{ fl oz}$
 $1 \text{ pt} = \underline{2} \text{ c}$
 $1 \text{ gal} = \underline{4} \text{ qt}$

30. $1 \text{ lb} = \underline{16} \text{ oz}$
 $1 \text{ tn} = \underline{2,000} \text{ lb}$

31. $1 \text{ L} = \underline{1000} \text{ mL}$
 $1 \text{ m} = \underline{100} \text{ cm}$
 $1 \text{ kg} = \underline{1000} \text{ g}$

32. $\frac{1}{3}$ of a yard
 $\underline{12 \text{ in. or } 1 \text{ ft}}$

33. $\frac{3}{4}$ of a foot
 $\underline{9 \text{ in.}}$

34. $\frac{1}{2}$ of a meter
 $\underline{50 \text{ cm}}$

35. $\frac{1}{4}$ of a kilometer
 $\underline{250 \text{ m}}$

Complete the table.

ounces	16	48	80
pounds	1	3	5

grams	2,000	7,000	10,000
kilograms	2	7	10

Add or subtract. Simplify the answer.

38. $3 \text{ ft } 8 \text{ in.}$
 $+ 1 \text{ ft } 9 \text{ in.}$
 $\underline{4 \text{ ft } 17 \text{ in.} = }$
 $5 \text{ ft } 5 \text{ in.}$

39. $6 \text{ gal } 3 \text{ qt}$
 $+ 2 \text{ gal } 2 \text{ qt}$
 $\underline{8 \text{ gal } 5 \text{ qt} = }$
 $9 \text{ gal } 1 \text{ qt}$

40. $9 \text{ lb } 8 \text{ oz}$
 $- 3 \text{ lb } 10 \text{ oz}$
 $\underline{5 \text{ lb } 14 \text{ oz}}$

41. $3 \text{ kg } 760 \text{ g}$
 $- 1 \text{ kg } 820 \text{ g}$
 $\underline{1 \text{ kg } 940 \text{ g}}$

Practice & Application

42. Andre needed $\frac{2}{3}$ of a yard of rope for his project. How many feet did he use? $\frac{2}{3} \cdot 3 \text{ ft} = \underline{2 \text{ ft}}$

43. Marco ate $\frac{1}{4}$ of a gallon of ice cream. How many quarts did he eat? $\frac{1}{4} \cdot 4 \text{ qt} = \underline{1 \text{ qt}}$

44. Dad grilled 6 quarter-pound hamburgers. How many ounces of hamburger did he grill? $6 \cdot (\frac{1}{4} \cdot 16) = 6 \cdot 4 \text{ oz} = \underline{24 \text{ oz}}$

45. Kendra measured the width of her bracelet as 13. What would be a reasonable metric unit? $\underline{\text{mm}}$

46. Mom needed half of a foot of ribbon for a craft project. How many inches did she need?

47. Kristen drank half of a liter of water. How many milliliters did she drink? $\frac{1}{2} \cdot 1000 \text{ mL} = \underline{500 \text{ mL}}$

48. Mr. Lehman biked $1\frac{3}{4}$ kilometers. How many meters did he bike? $1\frac{3}{4} \cdot 1000 \text{ m} = \frac{7}{4} \cdot 1000 \text{ m} = \underline{1750 \text{ m}}$

49. Miss Cherie used 6 feet 8 inches of border for a bulletin board. How many inches did she use?
 $(6 \cdot 12 \text{ in.}) + 8 \text{ in.} = \underline{72 \text{ in.} + 8 \text{ in.} = 80 \text{ in.}}$

50. Nathaniel measured his foot as 28. What would be a reasonable metric unit? $\underline{\text{cm}}$

51. A box that weighs 1 kg holds 1,000 paper clips. What is the mass of 5 paper clips?
 $5 \times (1000 \text{ g} \div 1000) = \underline{5 \text{ g}}$

52. The printing company ordered $2\frac{1}{4}$ tons of paper. How many pounds did it order?

53. Devon compared his body mass to 40, the body mass of an average sixth-grader. What would be a reasonable metric unit? $\underline{\text{kg}}$

54. Josie prepared a quart of punch. How many ounces did she prepare?

$$\begin{aligned} 1 \text{ qt} &= 2 \text{ pt;} \\ 2 \text{ pt} &= 4 \text{ c;} \\ 4 \text{ c} &= 32 \text{ oz} \end{aligned}$$

46. $\frac{1}{2} \cdot 12 \text{ in.} = \underline{6 \text{ in.}}$

52. $2\frac{1}{4} \cdot 2,000 \text{ lb} = \frac{9}{4} \cdot 2,000 = \underline{4,500 \text{ lb}}$

Complete **DAILY REVIEW** **g** on page 454.

Telling & Renaming Time

Time Equivalents

1 minute (min) = 60 seconds (sec)

1 hour (hr) = 60 min

1 day (d) = 24 hr

second
minute
hour
day

Rename Time

Rename larger units as smaller units.

Determine the equivalency and then *multiply*.

$$7 \text{ hr} = \underline{\hspace{2cm}} \text{ min}$$

$$1 \text{ hr} = \underline{\hspace{2cm}} \text{ min}$$

$$7 \times \underline{\hspace{2cm}} = 420$$

$$7 \text{ hr} = \underline{\hspace{2cm}} \text{ min}$$

Rename smaller units as larger units.

Determine the equivalency and then *divide*.

$$72 \text{ hr} = \underline{\hspace{2cm}} \text{ d}$$

$$24 \text{ hr} = \underline{\hspace{2cm}} \text{ d}$$

$$72 \div \underline{\hspace{2cm}} = 3$$

$$72 \text{ hr} = \underline{\hspace{2cm}} \text{ d}$$

Add or Subtract Time

Hailey spent 3 hr 25 min working at her job before her break. After her break she worked 4 hr 50 min. How long did she work?

$$\begin{array}{r} 3 \text{ hr } 25 \text{ min} \\ + 4 \text{ hr } 50 \text{ min} \\ \hline \underline{7 \text{ hr } 75 \text{ min}} \\ 8 \text{ hr } 15 \text{ min} \end{array}$$

Add the minutes.
Add the hours.
Rename the answer if possible.

Hailey's work hours totaled 16 hr 40 min on Tuesday. On Wednesday her work hours totaled 23 hr 30 min. How many hours did she work on Wednesday?

$$\begin{array}{r} 22 \quad 90 \\ 23 \text{ hr } 30 \text{ min} \\ - 16 \text{ hr } 40 \text{ min} \\ \hline \underline{6 \text{ hr } 50 \text{ min}} \end{array}$$

Subtract the minutes.
Rename if needed.
Subtract the hours.

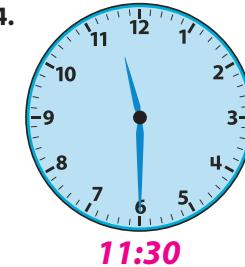
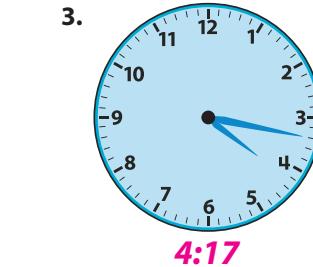
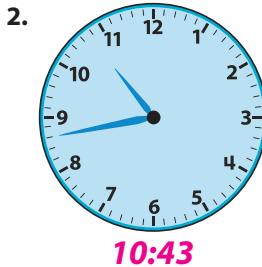
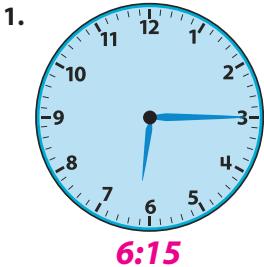
A Fraction of Time

Hailey spent $\frac{1}{4}$ of an hour helping her dad in the garden. How many minutes did she spend helping her dad?

$$\begin{array}{r} \frac{1}{4} = \underline{\hspace{2cm}} \text{ min} \\ 1 \text{ hr} = \underline{\hspace{2cm}} \text{ min} \\ \frac{1}{4} \times 60 = 15 \text{ min} \end{array}$$

Exercises

Write the time.



$$17. \frac{1}{2} \cdot 60 = 30$$

$$18. \frac{3}{4} \cdot 60 = 45$$

$$19. \frac{1}{10} \cdot 60 = 6$$

$$20. \frac{1}{4} \cdot 24 = 6$$

$$21. \frac{1}{8} \cdot 24 = 3$$

$$22. \frac{1}{4} \cdot 60 = 15$$

Rename the time.

$$5. 3 \text{ d} = \underline{\hspace{2cm}} \text{ hr} \quad 3 \cdot 24 = 72$$

$$8. 480 \text{ min} = \underline{\hspace{2cm}} \text{ hr} \quad 480 \div 60 = 8$$

$$6. 10 \text{ d} = \underline{\hspace{2cm}} \text{ hr} \quad 10 \cdot 24 = 240$$

$$11. 7 \text{ hr} = \underline{\hspace{2cm}} \text{ min} \quad 7 \cdot 60 = 420$$

$$7. 9 \text{ min} = \underline{\hspace{2cm}} \text{ sec} \quad 9 \cdot 60 = 540$$

$$10. 264 \text{ hr} = \underline{\hspace{2cm}} \text{ d} \quad 264 \div 24 = 11$$

Write the equivalent unit of time.

$$14. 1 \text{ day} = \underline{\hspace{2cm}} \text{ hours}$$

Rename the time.

$$15. 1 \text{ hour} = \underline{\hspace{2cm}} \text{ minutes}$$

$$20. \frac{1}{4} \text{ of a day} = \underline{\hspace{2cm}} \text{ hr}$$

$$16. 1 \text{ minute} = \underline{\hspace{2cm}} \text{ seconds}$$

$$17. \frac{1}{2} \text{ of an hour} = \underline{\hspace{2cm}} \text{ min}$$

$$21. \frac{1}{8} \text{ of a day} = \underline{\hspace{2cm}} \text{ hr}$$

$$18. \frac{3}{4} \text{ of an hour} = \underline{\hspace{2cm}} \text{ min}$$

$$22. \frac{1}{4} \text{ of a minute} = \underline{\hspace{2cm}} \text{ sec}$$

$$19. \frac{1}{10} \text{ of a minute} = \underline{\hspace{2cm}} \text{ sec}$$

Add or subtract.

23. $5 \text{ hr } 15 \text{ min}$
+ $5 \text{ hr } 26 \text{ min}$
10 hr 41 min

24. $7 \text{ hr } 45 \text{ min } 20 \text{ sec}$
+ $6 \text{ hr } 39 \text{ min } 15 \text{ sec}$
13 hr 84 min 35 sec =
14 hr 24 min 35 sec

27. $15 \text{ hr } 43 \text{ min}$
- $8 \text{ hr } 50 \text{ min}$
6 hr 53 min

28. $18 \text{ hr } 17 \text{ min } 45 \text{ sec}$
- $9 \text{ hr } 46 \text{ min } 21 \text{ sec}$
8 hr 31 min 24 sec

25. $10 \text{ hr } 35 \text{ min } 15 \text{ sec}$
+ $6 \text{ hr } 29 \text{ min } 45 \text{ sec}$
16 hr 64 min 60 sec =
17 hr 5 min

29. $23 \text{ hr } 32 \text{ min } 10 \text{ sec}$
- $20 \text{ hr } 40 \text{ min } 30 \text{ sec}$
2 hr 51 min 40 sec

26. $3 \text{ min } 15 \text{ sec}$
+ $4 \text{ min } 49 \text{ sec}$
7 min 64 sec =
8 min 4 sec

30. $15 \text{ min } 10 \text{ sec}$
- $8 \text{ min } 21 \text{ sec}$
6 min 49 sec

Write the best unit of measurement: **hours**, **minutes**, or **seconds**.

31. to use speed dial **seconds**

35. to take a trip **hours**

32. to bake cookies **minutes**

36. to finish math homework **minutes**

33. to run a mile **minutes**

37. to open a door **seconds**

34. to read a chapter book **hours**

38. to ride to the store **minutes**

Practice & Application

39. The temperature inside the room was 71° **F**

48. Mom worked in her garden for $\frac{1}{4}$ of an hour; she worked **15** minutes.

40. The pair of shoes had a mass of 1 **kg**

49. Paul needed $\frac{3}{4}$ of a foot of rope; he needed **9** inches.

41. The ballplayer drank 1 **L or qt** of a sports drink.

50. Dad cut $\frac{2}{3}$ of a yard from a board; he cut **24** inches.

42. The width of the wedding ring was 4 **mm**



Use the information below about the 24-hour clock to convert 6:00 PM, 10:00 PM, and 9:00 PM to 24-hour time. **18:00; 22:00; 21:00**

43. The boiling water was 212° **F**

44. The football game lasted about 2 **hr**

45. The backpack weighed about 4 **lb or kg**

46. Hayden ate 1 **c or pt** of ice cream.

47. Eleanor walked 1 **mi** in 20 minutes.



DID YOU KNOW

Time begins at the **Prime Meridian** (0° longitude) in Greenwich, England. There a 24-hour clock runs from midnight to midnight. The last hour of the day is 24 o'clock, or is that the first hour? It can be both times!

On a 24-hour clock, the first 12 hours of the day are numbered from 1 to 12. Then 1 in the afternoon is numbered 13, 2 is numbered 14, and so on. To convert 12-hour time to 24-hour time, add 12 to the afternoon time. If it is 3 PM, add 12. On a 24-hour clock, 3 PM is 15 o'clock in the afternoon. The 24-hour clock is used in many countries. In the United States, the military uses the 24-hour clock, and it is commonly called "military time."

Shepherd Gate Clock, Greenwich, England

Complete **DAILY REVIEW** h on page 454.

Elapsed Time & Time Zones

Elapsed time is the amount of time that passes as an event takes place.

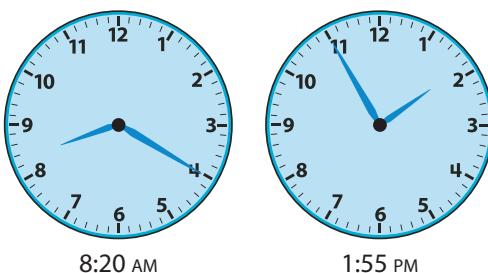
How much time passes between 8:20 AM and 1:55 PM?

Count the hours first and then count the minutes.

Count the hours: 8:20 AM to 1:20 PM = **5 hr**

Count the minutes: 1:20 AM to 1:55 PM = **35 min**

Elapsed time: **5 hr 35 min**



elapsed time
time zones

Exercises

Write the elapsed time.

1. 9:15 AM to 9:45 AM

30 min

2. 8:20 AM to 9:00 AM

40 min

3. 4:17 PM to 4:59 PM

42 min

4. 6:25 PM to 6:51 PM

26 min

5. 3:20 AM to 5:20 PM

14 hr

6. 11:45 PM to 12:30 AM

45 min

7. 2:18 AM to 5:42 AM

3 hr 24 min

8. 10:11 AM to 1:31 PM

3 hr 20 min

9. 7:30 AM to 4:45 PM

9 hr 15 min

10. 8:10 AM to 12:35 PM

4 hr 25 min

11. 1:50 PM to 12:10 AM

10 hr 20 min

12. 5:30 PM to 7:45 PM

2 hr 15 min

Write the time.

13. 2 hr 15 min after 3:00

5:15

16. 1 hr 50 min before 5:00

3:10

14. 3 hr 20 min after 12:00

3:20

17. 45 min before 3:15

2:30

15. 25 min after 2:45

3:10

18. 3 hr before 7:00

4:00

Complete the elapsed time on the schedule.

Use the data from the chart to find the answer.

19. Which bus trip is the longest? **#1**

20. Which bus trip is the shortest? **#2**

21. Which bus trip begins in the afternoon and ends before midnight? **#4**

22. The four bus trips depart from San Diego and arrive at San Francisco. What accounts for the difference in elapsed times? **Answers may vary.**

Possible answers include heavy traffic times, different routes, and extra stops.

Bus Schedule			
Bus	Departure San Diego	Arrival San Francisco	Elapsed Time
#1	1:30 AM	2:40 PM	13 hr 10 min
#2	8:15 PM	7:15 AM	11 hr
#3	10:15 PM	10:50 AM	12 hr 35 min
#4	12:15 PM	11:35 PM	11 hr 20 min

Add or subtract.

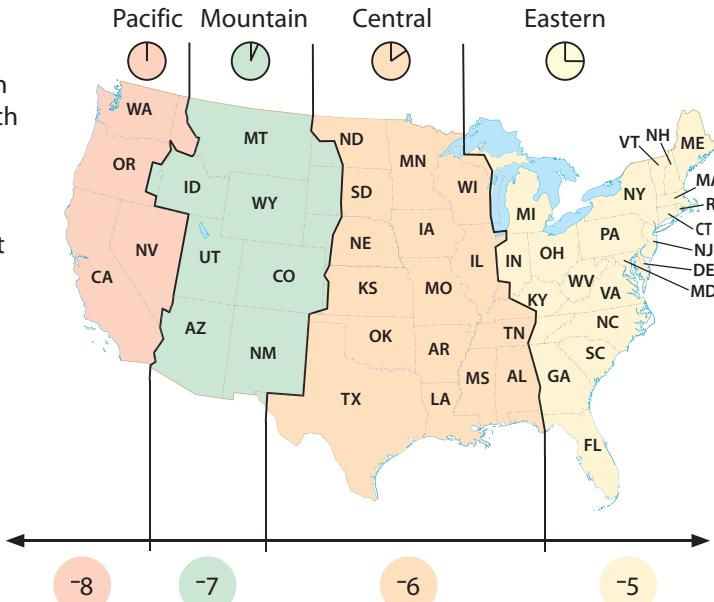
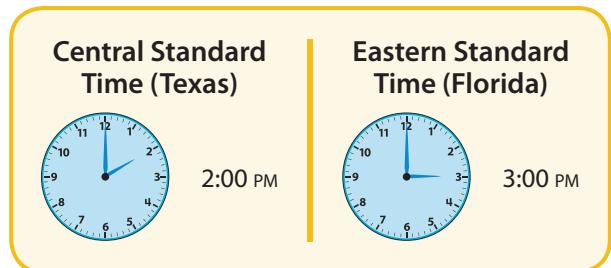
$$\begin{array}{r} 23. \quad 6 \text{ hr } 21 \text{ min } 50 \text{ sec} \\ + 1 \text{ hr } 45 \text{ min } 20 \text{ sec} \\ \hline 7 \text{ hr } 66 \text{ min } 70 \text{ sec} = \\ 8 \text{ hr } 7 \text{ min } 10 \text{ sec} \end{array}$$

$$\begin{array}{r} 24. \quad 8 \text{ hr } 29 \text{ min} \\ + 3 \text{ hr } 50 \text{ min} \\ \hline 11 \text{ hr } 79 \text{ min} = \\ 12 \text{ hr } 19 \text{ min} \end{array}$$

$$\begin{array}{r} 25. \quad 4 \text{ hr} \\ - 2 \text{ hr } 17 \text{ min} \\ \hline 1 \text{ hr } 43 \text{ min} \end{array}$$

$$\begin{array}{r} 26. \quad 7 \text{ hr } 0 \text{ min } 50 \text{ sec} \\ - 2 \text{ hr } 30 \text{ min } 15 \text{ sec} \\ \hline 4 \text{ hr } 30 \text{ min } 35 \text{ sec} \end{array}$$

Time zones help the world identify the same time of day. They were created so that noon is the middle of the day in each time zone. The zones make a number line starting with zero at Greenwich, England. To the east or right of Greenwich (0), the numbers *increase* by one up to 12. To the left of Greenwich (0), the numbers *decrease* by one down to -12. There are twenty-four time zones around the world; six of these are in the United States. When it is 3:00 PM in Florida, it is 2:00 PM in Texas.



Exercises

Use a time zone map to find the answer.

27. What time zone is represented by 0° longitude, the Prime Meridian? **0 or Greenwich mean time**
28. What is the time in the middle of the day in each time zone? **12:00 PM or noon**
29. What time zone is 1 hour earlier than eastern standard time? **central standard time**
30. The eastern standard time zone is -5 on the number line. How many time zones is the eastern standard time zone from Greenwich (0°)? **5 time zones**
31. Why is the Pacific standard time zone represented by -8? **because it is 8 time zones west of 0 or Greenwich mean time**

32. If Greenwich mean time is 12:00, what time is it in eastern standard time? Mountain standard time? **5:00; 7:00**

33. If it is 5:00 Pacific standard time, then it is 6:00 mountain standard time. What time would it be in central standard time? **7:00**

34. If it is 6:00 in eastern standard time, what time is it in the following places?

New York City, NY	6:00
Chicago, IL	5:00
Denver, CO	4:00
Portland, OR	3:00

Practice & Application

35. Mrs. Alier placed a pie in the oven at 1:45 PM. The pie needed to bake 50 minutes. What time will the pie be finished? **2:35 PM**
36. Dominic left school at 10:20 AM for a dentist appointment. The drive to the dentist took 10 minutes. The appointment lasted 1 hour 15 minutes. The drive back to school took 15 minutes. What time did Dominic return to school? **12:00 PM**

37. Hudson starts school at 8:00 AM. His first class is reading, which lasts 45 minutes. Next he has a 50-minute math class. Then he has a break. What time is Hudson's break? **9:35 AM**

38. Macy practiced her flute for 20 minutes on Monday. She practiced from 3:30 PM to 4:15 PM on Wednesday. She got in an extra hour of practice on Friday. What was Macy's total practice time? **2 hr 5 min**

Complete **DAILY REVIEW** i on page 455.

Rename Units of Measure

Write the equivalent unit of measurement.

Linear
1 cm = 10 mm
1 mi = 1,760 yd
1 m = 100 cm
1 yd = 3 ft

Capacity
1 c = 8 oz
1 L = 1000 mL
1 gal = 4 qt
1 pt = 2 c

Weight/Mass
1 lb = 16 oz
1 kg = 1000 g
1 tn = 2,000 lb
1 g = 0.001 kg

Part of a Unit
$\frac{2}{3}$ of a yard = ft
$\frac{1}{2}$ of a kilometer = m
$\frac{1}{4}$ of a meter = cm
$\frac{1}{3}$ of a foot = in.

Choose the best unit of measurement.

5. a baseball bat	1 ft	1 yd	1 km
6. the mass of a paper clip	1 lb	1 kg	1 g
7. a large jug of milk	1 gal	1 oz	1 L
8. a twenty-minute walk	1 ft	1 m	1 km

Part of a Unit
2 ft
500 m
25 cm
4 in.

Solve.

$$\begin{array}{r} 9. \quad 4 \text{ hr } 23 \text{ min} \\ + 2 \text{ hr } 59 \text{ min} \\ \hline \text{6 hr } 82 \text{ min} = \\ \text{7 hr } 22 \text{ min} \end{array}$$

$$\begin{array}{r} 12. \quad 3 \text{ gal } 1 \text{ qt } 1 \text{ pt} \\ + 4 \text{ gal } 2 \text{ qt } 1 \text{ pt} \\ \hline \text{7 gal } 3 \text{ qt } 2 \text{ pt} = \\ \text{8 gal} \end{array}$$

$$\begin{array}{r} 15. \quad 3 \text{ hr } 25 \text{ min } 40 \text{ sec} \\ + 2 \text{ hr } 45 \text{ min } 35 \text{ sec} \\ \hline \text{5 hr } 70 \text{ min } 75 \text{ sec} = \\ \text{6 hr } 11 \text{ min } 15 \text{ sec} \end{array}$$

$$\begin{array}{r} 10. \quad 6 \text{ yd } 2 \text{ ft } 8 \text{ in.} \\ - 1 \text{ yd } 2 \text{ ft } 9 \text{ in.} \\ \hline \text{4 yd } 2 \text{ ft } 11 \text{ in.} \end{array}$$

$$\begin{array}{r} 13. \quad 9 \text{ m} \\ - 3 \text{ m } 87 \text{ cm} \\ \hline \text{5 m } 13 \text{ cm} \end{array}$$

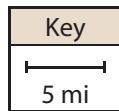
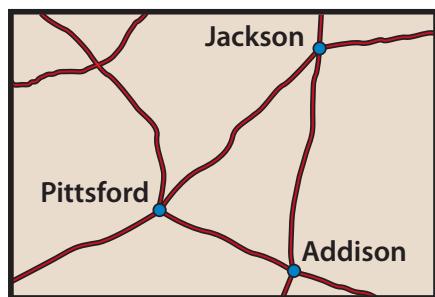
$$\begin{array}{r} 16. \quad 7 \text{ hr } 30 \text{ min } 5 \text{ sec} \\ - 2 \text{ hr } 45 \text{ min } 10 \text{ sec} \\ \hline \text{4 hr } 44 \text{ min } 55 \text{ sec} \end{array}$$

$$\begin{array}{r} 11. \quad 3.7 \text{ L} \\ \times 4 \\ \hline \text{14.8 L} \end{array}$$

$$\begin{array}{r} 14. \quad 1.760 \text{ yd} \\ \times 2 \\ \hline \text{3.52 yd} \end{array}$$

$$\begin{array}{r} 17. \quad 3 \text{ ft } 8 \text{ in.} \\ \times 5 \\ \hline \text{15 ft } 40 \text{ in.} = \\ \text{18 ft } 4 \text{ in.} \end{array}$$

Use a centimeter ruler and the map to find the answer.



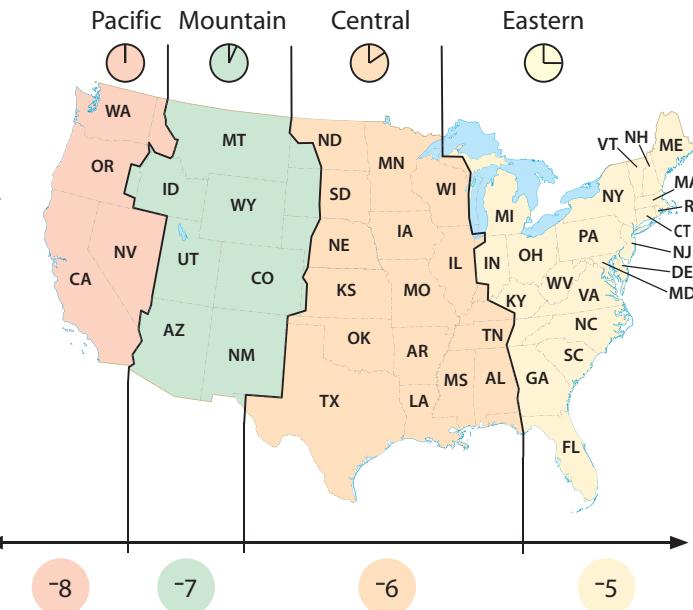
18. What is the mileage from Jackson to Addison?
15 mi

19. The Brickmans live in Jackson. Last week they traveled to Addison for piano lessons and then went shopping in Pittsford. They returned home by the shortest route. How many miles did they travel? **40 mi**

Use the time zone map to find the answer.

20. At noon Pacific standard time, Sebastian called his sister Tory in South Carolina. What time was it at Tory's house? **3:00 PM**

21. Callie lives in Virginia. She made a video call over the Internet to her family in Colorado. She placed the call at 4:00 PM eastern standard time. At what time of day did her family receive the video call?
2:00 PM



Solve.

22. $6 \text{ yd} = \underline{\quad} \text{ in. } 6 \cdot 36 = 216$

23. $8 \text{ ft} = \underline{2} \text{ yd } \underline{2} \text{ ft } 8 \div 3 = 2 \text{ r}2$

24. $26 \text{ in.} = \underline{2} \text{ ft } \underline{2} \text{ in.}$

25. $48 \text{ in.} = \underline{\quad} \text{ yd } \underline{1 \frac{1}{3}}$

26. $6 \text{ qt} = \underline{1} \text{ gal } \underline{2} \text{ qt } 6 \div 4 = 1 \text{ r}2$

27. $2 \text{ m} = \underline{\quad} \text{ cm } 2 \cdot 100 = 200$

28. $2 \frac{1}{2} \text{ gal} = \underline{\quad} \text{ qt } \frac{5}{2} \cdot 4 = 10$

29. $3.51 \text{ m} = \underline{\quad} \text{ cm } 351$

30. $3500 \text{ mL} = \underline{\quad} \text{ L } 3.5$

31. $4.1 \text{ kg} = \underline{\quad} \text{ g } 4100$

32. $68^\circ\text{F} = \underline{\quad}^\circ\text{C } 20$
 $C = \frac{5}{9} \times (F - 32)$

33. $95^\circ\text{C} = \underline{\quad}^\circ\text{F } 203$

$$F = (\frac{9}{5} \times C) + 32$$

34. $213 \text{ cm} \div 3 \text{ } 71 \text{ cm}$

35. $8 \text{ gal } 4 \text{ qt} \div 4 \text{ } 2 \text{ gal } 1 \text{ qt}$

36. $12 \text{ ft } 6 \text{ in.} \div 2 \text{ } 6 \text{ ft } 3 \text{ in.}$

Practice & Application

37. Mrs. Lynch needs a quart of milk. She could only find milk in liter containers. Would she have enough milk if she purchased a liter? **yes;
1 qt \approx 1 L**

38. The nurse took Autumn's temperature and found that she had a fever. The thermometer read 39° . What scale was the thermometer? **Celsius**

39. Dad bought 1 kilogram of hamburger from the store. Would that be enough meat to feed a family of 5? **yes; $1 \text{ kg} \approx 2.2 \text{ lb}$**

40. Travis had a yardstick that was 36 inches. He measured his dad's desk at $1 \frac{1}{2}$ yards. Is Travis's measurement of $1 \frac{1}{2}$ yards precise? What is more precise? **no; 54 inches or 4 feet 6 inches**

24. $26 \div 12 = 2 \text{ r}2$

25. $48 \div 36 = 1 \frac{12}{36} = 1 \frac{1}{3}$

29. $3.51 \times 100 = 351$

30. $3500 \div 1000 = 3.5$

31. $4.1 \times 1000 = 4100$

32. $C = \frac{5}{9} \times (68^\circ - 32^\circ)$

$C = \frac{5}{9} \times 36^\circ$

$C = \frac{5}{9} \cdot \frac{36^\circ}{1}$

$C = 20^\circ$

33. $F = (\frac{9}{5} \times 95^\circ) + 32^\circ$

$F = (\frac{9}{5} \cdot \frac{95^\circ}{1}) + 32^\circ$

$F = 171^\circ + 32^\circ$

$F = 203^\circ$

Unit Multipliers

Transformer means “one that transforms.” In math we transform units of measure when we “convert” from one unit to another to find the equivalent value. We can convert inches to feet or grams to kilograms without changing the original value.

transformer
unit multiplier

12 inches = 1 foot and 1 foot = 12 inches
The value is the same; the units are different.

Equivalencies written in fraction form are called unit multipliers. A **unit multiplier** is a fraction with two different units that equal 1.

$$1 \text{ ft} = 12 \text{ in.}; \frac{1 \text{ ft}}{12 \text{ in.}} \text{ or } \frac{12 \text{ in.}}{1 \text{ ft}}$$

Twelve inches and 1 foot are equivalent.

Exercises

Complete the unit multiplier.

Write the equal unit multiplier.

1. $\frac{8 \text{ oz}}{1 \text{ c}}$ or $\frac{1 \text{ c}}{8 \text{ oz}}$

2. $\frac{1000 \text{ mL}}{1 \text{ L}}$ or $\frac{1 \text{ L}}{1000 \text{ mL}}$

3. $\frac{36 \text{ in.}}{1 \text{ yd}}$ or $\frac{1 \text{ yd}}{36 \text{ in.}}$

4. $\frac{1 \text{ mi}}{1,760 \text{ yd}}$ or $\frac{1,760 \text{ yd}}{1 \text{ mi}}$

5. $\frac{2 \text{ c}}{1 \text{ pt}}$ or $\frac{1 \text{ pt}}{2 \text{ c}}$

6. $\frac{60 \text{ sec}}{1 \text{ min}}$ or $\frac{1 \text{ min}}{60 \text{ sec}}$

Use the pattern above to write the unit multiplier 2 ways in fraction form.

7. $1 \text{ yd} = 3 \text{ ft}$

12. $1 \text{ hr} = 60 \text{ min}$

8. $1 \text{ kg} = 1000 \text{ g}$

13. $1 \text{ gal} = 4 \text{ qt}$

9. $1 \text{ mi} = 5,280 \text{ ft}$

14. $1 \text{ m} = 100 \text{ cm}$

10. $1 \text{ lb} = 16 \text{ oz}$

15. $1 \text{ g} = 1000 \text{ mg}$

11. $1 \text{ yd} = 36 \text{ in.}$

16. $1 \text{ tn} = 2,000 \text{ lb}$

7. $\frac{1 \text{ yd}}{3 \text{ ft}}; \frac{3 \text{ ft}}{1 \text{ yd}}$

12. $\frac{1 \text{ hr}}{60 \text{ min}}; \frac{60 \text{ min}}{1 \text{ hr}}$

8. $\frac{1 \text{ kg}}{1000 \text{ g}}; \frac{1000 \text{ g}}{1 \text{ kg}}$

13. $\frac{1 \text{ gal}}{4 \text{ qt}}; \frac{4 \text{ qt}}{1 \text{ gal}}$

9. $\frac{1 \text{ mi}}{5,280 \text{ ft}}; \frac{5,280 \text{ ft}}{1 \text{ mi}}$

14. $\frac{1 \text{ m}}{100 \text{ cm}}; \frac{100 \text{ cm}}{1 \text{ m}}$

10. $\frac{1 \text{ lb}}{16 \text{ oz}}; \frac{16 \text{ oz}}{1 \text{ lb}}$

15. $\frac{1 \text{ g}}{1000 \text{ mg}}; \frac{1000 \text{ mg}}{1 \text{ g}}$

11. $\frac{1 \text{ yd}}{36 \text{ in.}}; \frac{36 \text{ in.}}{1 \text{ yd}}$

16. $\frac{1 \text{ tn}}{2,000 \text{ lb}}; \frac{2,000 \text{ lb}}{1 \text{ tn}}$



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Measurements can be transformed to different units. Some animals, such as a frog, also transform or change as they develop through the process of metamorphosis.

The unit multiplier is used to *transform* one unit to another unit.

Transform 4.5 feet into inches.

$$4.5 \text{ ft} = \underline{\hspace{1cm}} \text{ in.}$$

1. Write 4.5 feet as a fraction.

$$\frac{4.5 \text{ ft}}{1}$$

2. Find a unit multiplier.

$$1 \text{ ft} = 12 \text{ in.}$$

$$\frac{1 \text{ ft}}{12 \text{ in.}} \text{ or } \frac{12 \text{ in.}}{1 \text{ ft}}$$

3. Choose the unit multiplier form that has the unit being transformed in the denominator.

$$\frac{12 \text{ in.}}{1 \text{ ft}}$$

4. Write a multiplication equation.

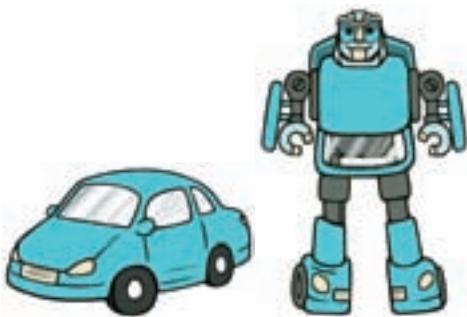
Solve. Use cancellation if possible.

$$\frac{4.5 \text{ ft}}{1} \times \frac{12 \text{ in.}}{1 \text{ ft}} = \frac{54.0 \text{ in.}}{1}$$

In this problem only the labels cancel.

$$4.5 \text{ ft} = 54 \text{ in.}$$

The car is transformed into a robot.



Exercises

Write the unit multiplier 2 ways in **fraction form**.

Choose the unit multiplier needed.

Convert the unit.

17. $7 \text{ yd} = \underline{\hspace{1cm}}$ in. **252**

18. $64 \text{ oz} = \underline{\hspace{1cm}}$ lb **4**

19. $8 \text{ gal} = \underline{\hspace{1cm}}$ qt **32**

20. $3 \text{ hr} = \underline{\hspace{1cm}}$ min **180**

21. $3 \text{ kg} = \underline{\hspace{1cm}}$ g **3000**

22. $2500 \text{ mL} = \underline{\hspace{1cm}}$ L **2.5**

23. $450 \text{ cm} = \underline{\hspace{1cm}}$ m **4.5**

24. $3 \text{ c} = \underline{\hspace{1cm}}$ oz **24**

Use a unit multiplier to change the unit.

25. $5 \text{ tn} = \underline{\hspace{1cm}}$ lb **10,000**

(33) Use cancellation to convert.

$$2 \text{ mi} = \underline{\hspace{1cm}} \text{ in.}$$

$$\frac{2 \text{ mi}}{1} \times \frac{5,280 \text{ ft}}{1 \text{ mi}} \times \frac{12 \text{ in.}}{1 \text{ ft}} = \underline{\hspace{1cm}} \text{ in.} \quad \text{126,720}$$

26. $13 \text{ gal} = \underline{\hspace{1cm}}$ qt **52**

27. $20 \text{ c} = \underline{\hspace{1cm}}$ pt **10**

28. $8 \text{ mi} = \underline{\hspace{1cm}}$ yd **14,080**

29. $108 \text{ in.} = \underline{\hspace{1cm}}$ ft **9**

30. $120 \text{ oz} = \underline{\hspace{1cm}}$ c **15**

31. $4 \text{ yd} = \underline{\hspace{1cm}}$ in. **144**

32. $128 \text{ oz} = \underline{\hspace{1cm}}$ lb **8**

$$12 \text{ gal} = \underline{\hspace{1cm}} \text{ c}$$

$$\frac{12 \text{ gal}}{1} \times \frac{4 \text{ qt}}{1 \text{ gal}} \times \frac{2 \text{ pt}}{1 \text{ qt}} \times \frac{2 \text{ c}}{1 \text{ pt}} = \frac{192 \text{ c}}{1} = \underline{\hspace{1cm}} \text{ c} \quad \text{192}$$



Complete **DAILY REVIEW** k on page 456.

CHAPTER 14 REVIEW

Write the equivalent unit of measurement.

1. $1 \text{ yd} = \underline{3} \text{ ft}$

$$1 \text{ mi} = \underline{1,760} \text{ yd}$$

$$1 \text{ m} = \underline{100} \text{ cm}$$

2. $1 \text{ gal} = \underline{4} \text{ qt}$

$$1 \text{ c} = \underline{8} \text{ fl oz}$$

$$1 \text{ L} = \underline{1000} \text{ mL}$$

3. $1 \text{ lb} = \underline{16} \text{ oz}$

$$1 \text{ tn} = \underline{2,000} \text{ lb}$$

$$1 \text{ kg} = \underline{1000} \text{ g}$$

4. $1 \text{ hr} = \underline{60} \text{ min}$

$$1 \text{ d} = \underline{24} \text{ hr}$$

$$1 \text{ min} = \underline{60} \text{ sec}$$

5. $\frac{1}{2} \text{ of a mile} = \underline{\quad} \text{ ft}$

$$\frac{1}{5} \text{ of a kilometer} = \underline{\quad} \text{ m}$$

$$\frac{1}{4} \text{ of a meter} = \underline{\quad} \text{ cm}$$

6. $\frac{1}{6} \text{ of an hour} = \underline{\quad} \text{ min}$

$$\frac{1}{3} \text{ of a yard} = \underline{\quad} \text{ ft}$$

$$\frac{1}{8} \text{ of a pound} = \underline{\quad} \text{ oz}$$

Choose the best unit of measurement.

7. length of a pencil	liter	meter	centimeter	kilometer
8. amount of liquid in a glass	meter	milliliter	gram	liter
9. mass of a bunch of bananas	liter	centimeter	meter	kilogram
10. distance to town	inches	gallons	miles	feet
11. weight of a baby	ounces	feet	cups	pounds
12. amount of sports drink for a team	cups	gallons	yards	tons

Rename to the given unit of measurement.

13. $120 \text{ min} = \underline{2} \text{ hr } 120 \div 60 = 2$ 18. $2\frac{1}{2} \text{ hr} = \underline{150} \text{ min}$

$$10,560$$

$$14. 2 \text{ mi} = \underline{\quad} \text{ ft}$$

$$19. 1\frac{1}{2} \text{ yd} = \underline{4} \text{ ft } \underline{6} \text{ in.}$$

$$23. 1 \text{ hr } 45 \text{ min} = \underline{105} \text{ min}$$

$$15. 15 \text{ qt} = \underline{3} \text{ gal } \underline{3} \text{ qt}$$

$$20. 10 \text{ gal} = \underline{40} \text{ qt } 10 \cdot 4 = 40$$

$$24. 30 \text{ in.} = \underline{2} \text{ ft } \underline{6} \text{ in.}$$

$$16. 3,000 \text{ lb} = \underline{1} \text{ tn } \underline{1,000} \text{ lb}$$

$$21. 1\frac{1}{4} \text{ lb} = \underline{20} \text{ oz } \frac{5}{4} \cdot 16 = 20$$

$$25. 32 \text{ oz} = \underline{2} \text{ lb } 32 \div 16 = 2$$

$$17. 250 \text{ cm} = \underline{2.5} \text{ m}$$

$$22. 3.5 \text{ kg} = \underline{3500} \text{ g}$$

$$26. 10 \text{ pt} = \underline{1} \text{ gal } \underline{1} \text{ qt}$$

5. $2,640 \text{ ft}$

14. $2 \times 5,280 \text{ ft} = 10,560 \text{ ft}$

22. $3.5 \text{ kg} \cdot 1000 = 3500 \text{ g}$

200 m

15. $15 \text{ qt} \div 4 = 3 \text{ gal } r 3 \text{ qt}$

23. $60 \text{ min} + 45 \text{ min} = 105 \text{ min}$

25 cm

16. $3,000 \text{ lb} \div 2,000 = 1 \text{ tn } r 1,000 \text{ lb}$

24. $30 \text{ in.} \div 12 = 2 \text{ ft } r 6 \text{ in.}$

6. 10 min

17. $250 \text{ cm} \div 100 = 2.5 \text{ m}$

26. $10 \text{ pt} \div 2 = 5 \text{ qt}; 5 \text{ qt} \div 4 = 1 \text{ gal } r 1 \text{ qt}$

1 ft

18. $\frac{5}{2} \text{ hr} \cdot 60 = 150 \text{ min}$

27. $4000 \text{ mL} \div 1000 = 4 \text{ L}$

2 oz

19. $\frac{3}{2} \text{ yd} \cdot 3 = \frac{9}{2} \text{ ft} = 4\frac{1}{2} \text{ ft}$

Choose the more reasonable temperature.

28. a child with a fever

100°F

100°C

29. a cup of boiling soup

95°F

100°C

30. a glass of ice water

50°F

0°C

31. a comfortable room

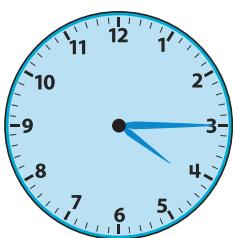
70°F

40°C

Write the time.

Write the elapsed time.

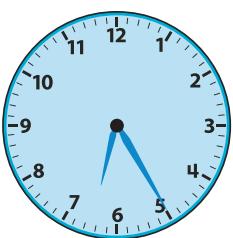
- 32.



Write the time
2 hours later.

4:15; 6:15

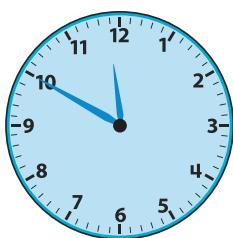
- 33.



Write the time
45 minutes later.

6:25; 7:10

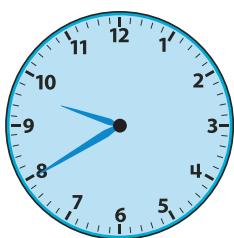
- 34.



Write the time
 $3\frac{1}{2}$ hours later.

11:50; 3:20

- 35.



Write the time 1 hour
20 minutes later.

9:40; 11:00

Solve.

36. $10 \text{ hr } 25 \text{ min } 20 \text{ sec}$
 $+ 4 \text{ hr } 35 \text{ min } 52 \text{ sec}$
14 \text{ hr } 60 \text{ min } 72 \text{ sec} =
15 \text{ hr } 1 \text{ min } 12 \text{ sec}

37. $12 \text{ ft } 10 \text{ in.}$
 $+ 3 \text{ ft } 8 \text{ in.}$
15 \text{ ft } 18 \text{ in.} =
16 \text{ ft } 6 \text{ in.}

38. $8 \text{ m } 20 \text{ cm}$
 $+ 3 \text{ m } 45 \text{ cm}$
11 \text{ m } 65 \text{ cm}

39. 8 hr
 $- 3 \text{ hr } 25 \text{ min}$
4 \text{ hr } 35 \text{ min}

40. $15 \text{ gal } 2 \text{ qt}$
 $- 4 \text{ gal } 3 \text{ qt}$
10 \text{ gal } 3 \text{ qt}

41. $9 \text{ lb } 7 \text{ oz}$
 $+ 3 \text{ lb } 10 \text{ oz}$
12 \text{ lb } 17 \text{ oz} =
13 \text{ lb } 1 \text{ oz}

42. 23.5 L
 $\times \quad 4$
94.0 L

43. 3457 kg
 $- 2149 \text{ kg}$
1308 \text{ kg}

44. 4 lb
 $- 2 \text{ lb } 10 \text{ oz}$
1 \text{ lb } 6 \text{ oz}

Rename to the given unit of measurement.

45. $54 \text{ in.} = \underline{\hspace{2cm}} \text{ ft } 4\frac{1}{2}$
 $54 \div 12 = 4\frac{1}{2}$

46. $1\frac{1}{2} \text{ gal} = \underline{\hspace{2cm}} \text{ qt } 6$
 $\frac{3}{2} \cdot 4 = 6$

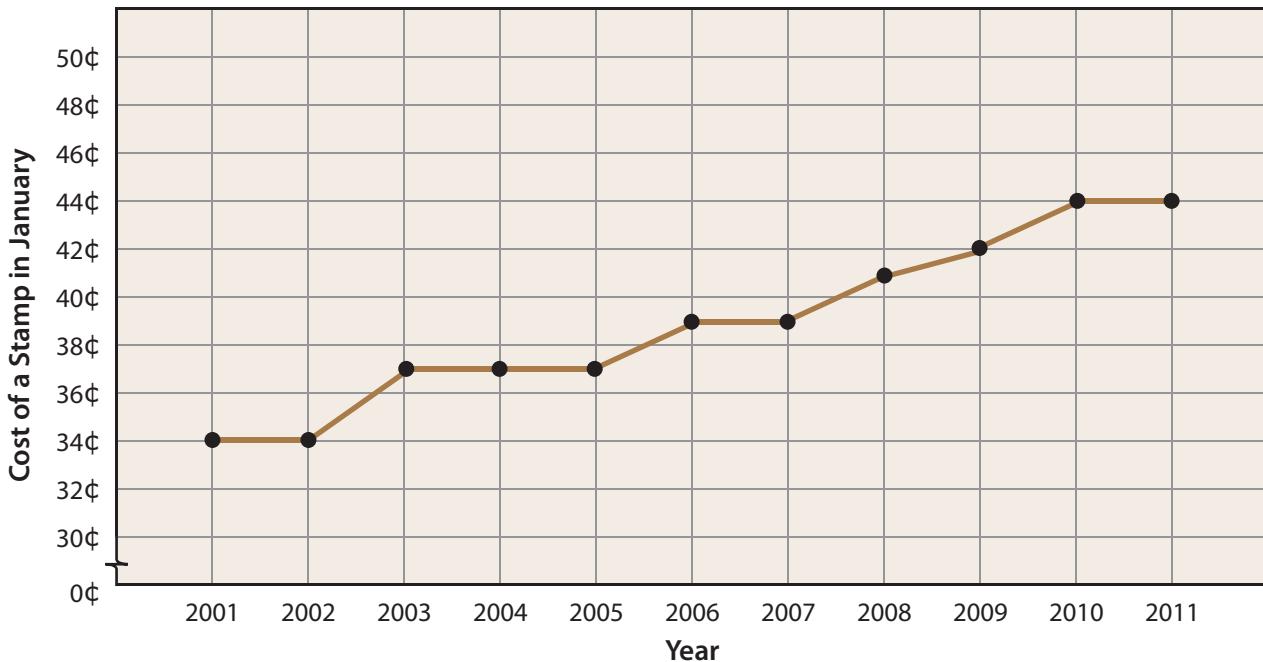
47. $3.5 \text{ m} = \underline{\hspace{2cm}} \text{ cm } 350$
 $3.5 \cdot 100 = 350$

Test Prep

Use the data from the line graph to find the answer.

The line graph shows the cost of a first-class postage stamp in January of the given year.

Cost of a Postage Stamp



- What is the difference in the cost of the 2001 and the 2011 stamps?
 - 10 cents
 - 15 cents
 - 20 cents
 - 25 cents
- How many times is a price increase shown between 2001 and 2011?
 - 0 times
 - 2 times
 - 5 times
 - 10 times
- How many times is a price decrease shown between 2001 and 2011?
 - 0 times
 - 2 times
 - 5 times
 - 10 times
- Between which two years was the greatest increase in the cost of a stamp?
 - 2002 to 2003
 - 2005 to 2006
 - 2008 to 2009
 - 2010 to 2011
- In which three years was the price of stamps the same?
 - 2001, 2002, 2003
 - 2003, 2004, 2005
 - 2006, 2007, 2008
 - 2009, 2010, 2011
- What does this graph indicate about the cost of a postage stamp?
 - The cost stayed the same.
 - The cost steadily decreased.
 - The cost steadily increased.
 - There is not enough data represented.

Mark the answer.

7. Round 13.43 to the nearest whole number.

A. 10 C. 14
B. 13 D. 15

8. Estimate the quotient for $3,625 \div 43$.

A. 80 C. 90
B. 85 D. 900

9. Use front-end estimation to find the sum.

$$283,498 + 690,785$$

A. 500,000 C. 873,000
B. 600,000 D. 970,000

10. Round 987,642 to the nearest one thousand.

A. 987,600 C. 990,000
B. 988,000 D. 1,000,000

11. If $\frac{1}{4}$ of 60 is 15, what is $\frac{3}{4}$ of 60?

A. 20 C. 45
B. 30 D. 90

12. What is the price of 10 pounds of grapes if they cost \$1.79 a pound?

A. \$17.90 C. \$34.00
B. \$28.40 D. \$179

13. $3n + 8$ if $n = 1.6$

A. 5.6 C. 32.4
B. 12.8 D. 40

14. $9.83 \div n$ if $n = 10$

A. 0.983 C. 983
B. 98.3 D. 9,830

15. $n - 56 = 49$

A. 7 C. 99
B. 13 D. 105

16. $3y = 108$

A. 25 C. 36
B. 30 D. 105

17. $y + y + y + y$

A. $y + 4$ C. $4 - y$
B. $4y$ D. $y \div 4$

18. $4.99 + m = 5$

A. 0.1 C. 0.001
B. 0.01 D. 1

Mark the answer.

19. What factors are common to 18 and 24?

- A. 3, 6, 9 C. 3, 4, 6
B. 2, 3, 6 D. 2, 4, 6

20. What is the least common multiple of 6 and 4?

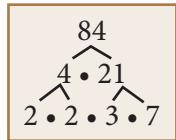
- A. 6 C. 18
B. 12 D. 24

21.

n		
3.8	6.7	0.4

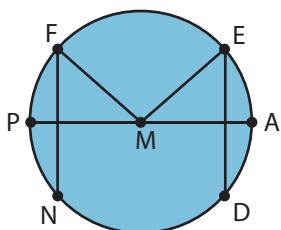
- A. $n = 1.8$ C. $n = 9.9$
B. $n = 7.2$ D. $n = 10.9$

22. Use the factor tree to choose the prime factorization.



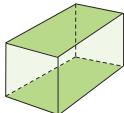
- A. $2 \cdot 3 \cdot 7$
B. $4 \cdot 7$
C. $2^2 \cdot 3 \cdot 7$
D. $2 \cdot 3^2 \cdot 7$

23. Mark the true statement about circle M.



- A. The diameter is \overline{PA} .
B. $\overline{MA} = \overline{MF}$
C. \overline{FN} and \overline{ED} are chords.
D. all of the above

24. Name the figure.



- A. rectangular pyramid
B. square prism
C. rectangular prism
D. none of the above

25. Choose the inequality statement for the number line.



- A. $x > 2$
B. $x < 2$
C. $x = 2$
D. $x > 3$

Statistics

Statistics is the branch of mathematics that deals with the collection, organization, analysis, and interpretation of data. The data is more easily interpreted when displayed in a table, a chart, or a graph.

Brooke organized her math test scores from *least* to *greatest* in a **frequency table**. From this table she can find the range, the mean, the median, and the mode of test scores.

Test Scores: 90, 84, 78, 82, 90, 87, 82, 93, 90

statistics
frequency table
data
range
mean
median
mode

Math Test Scores		
Score	Tally	Frequency
78		1
82		2
84		1
87		1
90		3
93		1

Range: $93 - 78 = 15$

Mean: $78 + 82 + 82 + 84 + 87 + 90 + 90 + 90 + 93 = 776; 776 \div 9 = 86.2$

Median: 78 82 82 84 87 90 90 90 93 87

Mode: 90

Data: collected information or facts

Range: the difference between the greatest value (number) and the least value

Mean (average): the sum of the data divided by the number of addends

Median: the middle value (or an average of the two middle values) of a set of data when ordered from least to greatest

Mode: the value that occurs most often or has the greatest frequency. Some sets may have more than one mode, and some sets may not have a mode.

Exercises

Use the data from the frequency table to find the answer.

- How many campers are represented on the frequency table?
13 campers
- What is the range in ages of the campers? **$14 - 10 = 4$**
- How many of the campers are 11? **4 campers**
- What age groups have the same frequency? **10, 13, and 14**
- What age has the greatest frequency (mode)? **11**
- Find the mean and the median for this data. Round the mean to the nearest tenth. **mean: 11.8; median: 12**

Campers		
Age	Tally	Frequency
10		2
11		4
12		3
13		2
14		2

Make a frequency table showing the high temperatures during spring vacation. Use the data to find the answer.

- What is the range in temperature? **$88^\circ - 80^\circ = 8^\circ$**
- What is the mean? Round to the nearest tenth. **83.6°**
- What is the median? Use the *less than* sign to write a mathematical sentence comparing the median to the mean.
median: 83°; $83^\circ < 83.6^\circ$
- Why does this data not have a mode? **because each number appears only once**

High Temperatures During Spring Vacation

83° 81° 86° 88° 80° 82° 85°

Find the range and the mode(s) for the set of data.

3	8	2	6	5	2	4	2
---	---	---	---	---	---	---	---

range: $8 - 2 = 6$; mode: 2

33	35	31	30	33	33	35
----	----	----	----	----	----	----

range: $35 - 30 = 5$; mode: 33

18	17	14	16	17	15	13	18
----	----	----	----	----	----	----	----

range: $18 - 13 = 5$;
mode: 17 and 18

- Find the mean and the median for the set of data. *Process to find median may vary.*
14. 82 85 79 81 85 87 15. 48 52 41 51 40
mean: 83.2; median: 83.5 mean: 46.4; median: 48
16. 17 12 15 10 12 18 19 12
mean: 14.4; median: 13.5

Practice & Application

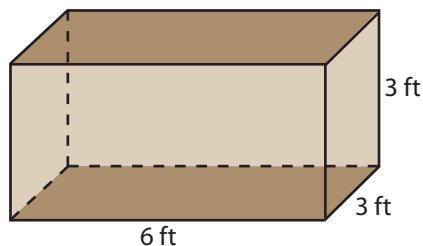
The Franseens have started a new church. The frequency table shows the attendance for the first Sunday. Use the data to find the answers for questions 17 through 21.

Age Group	Tally	Frequency
0–5		7
6–12		14
13–17		11
18–25		10
26 and over		24

17. What is the least number of chairs that could have been set up for ages 6 and up? **59 chairs**
18. The church uses a ratio of 1 teacher to 4 students in the 0–5 age group. How many workers were needed? **2 workers**
19. How many of the people that attended the new church were 26 or older? **24 people**
20. What ratio can be written comparing people 18 and older to those under 18? **34:32**
21. Write the frequency for the table from *least* to *greatest*. **7, 10, 11, 14, 24**
- Use the rectangular prism to find the answer.
22. How many faces does a rectangular prism have? **6**
23. How many faces have an area of 9 ft^2 ? **2**
24. How many faces have an area of 6 feet \times 3 feet? **4**
25. What is the total surface area of the rectangular prism? **90 ft²**
26. What is the volume of the rectangular prism? **54 ft³**



So then faith cometh by hearing,
and hearing by the word of God.
—Romans 10:17



Complete **DAILY REVIEW** a on page 456.

Double Bar & Double Line Graphs

Graphs are pictorial forms used to summarize data. Bar graphs and line graphs are used to compare or to observe changes in data. The horizontal and vertical axes are reference lines that are labeled with units that use equal **intervals**.

A **double bar graph** compares two sets of related data. The bars can be drawn either horizontally or vertically.

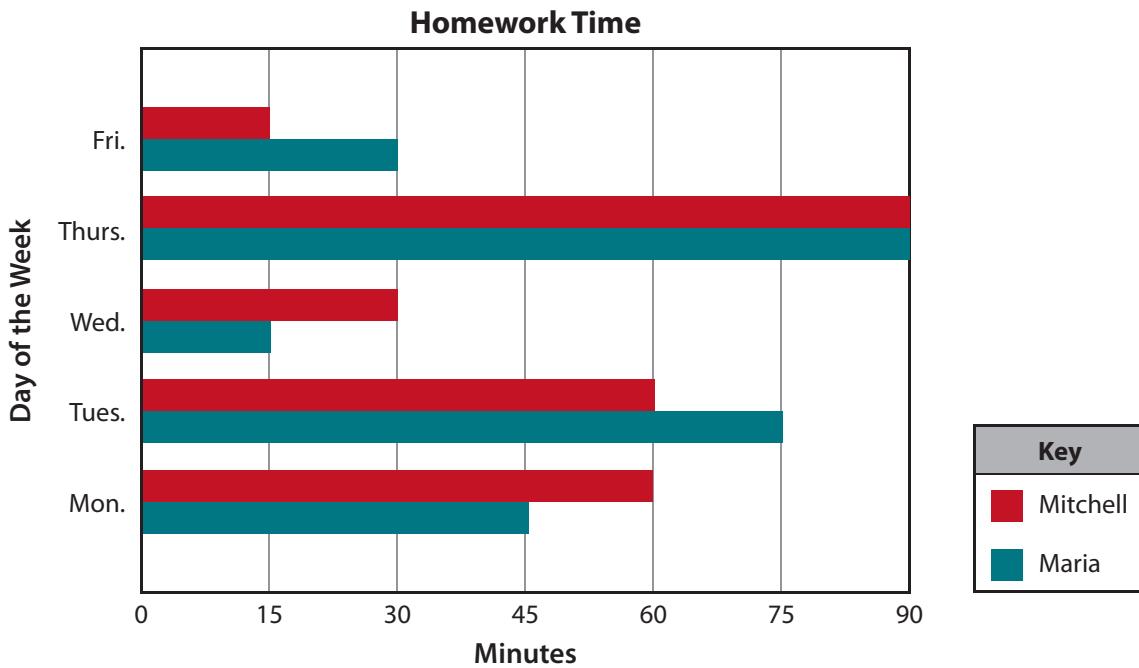
A **double line graph** shows changes over time for two sets of related data.

graphs
intervals
double bar graph
double line graph
key

A **key** shows the data that each bar or line represents. The range, the mean, the median, and the mode are found using the graph data.

Exercises

Use the data from the bar graph to find the answer.

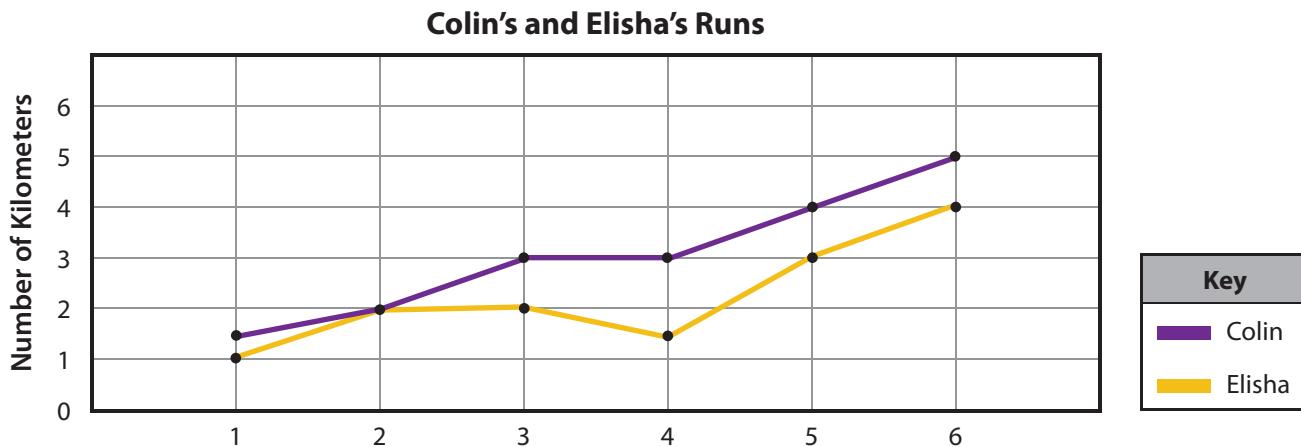


- What is being compared in this graph?
the amount of time that Mitchell and Maria each spend doing homework
- Explain the categories listed on the vertical and horizontal axes of the graph. **vertical: days of the week homework is done; horizontal: minutes spent on homework**
- On which day did Maria and Mitchell spend the most amount of time doing homework?
Thursday
- Find the range of homework time for Maria.
 $90 - 15 = 75$
- Compare the range of homework time for Maria and Mitchell. **range for Mitchell: $90 - 15 = 75$; the range is the same.**
- What interval is used for tracking homework time? **15 minutes**
- What is the average (mean) amount of time spent on homework for Maria? For Mitchell?
51 minutes for both
- Does the data show a mode for either Mitchell or Maria? If so, what is it? **yes; Mitchell: 60**
- Find the median for Mitchell and for Maria.
Mitchell: 60; Maria: 45
- What days of the week are not shown on the graph? **Saturday and Sunday**

Use the data from the line graph to find the answer.

Process to find median may vary.

Colin and Elisha began preparing for a 5K run. They recorded their progress and placed the number of kilometers they ran each week on a line graph. The double line graph shows the change in the number of kilometers they ran in a 6-week period.



11. the kilometers run each week by Colin and Elisha

11. What information is recorded on this graph?
12. Over how much time was the data collected? **6 weeks**
13. During which week did the two boys run the same number of kilometers? **Week 2**
14. Where is the decrease shown in the number of kilometers run by Elisha? **from Week 3 to Week 4**

15. Which week shows the greatest difference in kilometers run? What is the difference?

Week 4; 1.5 km

16. How many weeks show only a 1-kilometer difference between the two runners? **3 weeks**

17. Find the range, the mean, the median, and the mode for the kilometers run by Colin. Round the mean to the nearest tenth.

18. Find the range, the mean, the median, and the mode for the kilometers run by Elisha. Round the mean to the nearest tenth.

Practice & Application

Church Attendance		
Date	Morning	Evening
March 1	212	184
March 8	203	180
March 15	225	190
March 22	240	196
March 29	240	183

17. range: 3.5 km; mean: 3.1 km; median: 3 km; mode: 3 km

18. range: 3 km; mean: 2.3 km; median: 2 km; mode: 2 km

J *The bars compare the morning service to the evening service.*

19. Make a double line graph showing church attendance for the month of March. Begin the numerical data with 175 and use intervals of 10. Use the data from the line graph to find the answers for questions 20 through 28.

20. What is the range for the evening attendance?

$196 - 180 = 16$

21. What is the mean for the morning attendance? **224**

22. Write the data for the morning attendance from *least* to *greatest*. What is the median? **203, 212, 225, 240, 240; median: 225**

23. What is the mode for the morning attendance? **240**

- J** Make a double bar graph using the same data. Explain the comparison being made between each set of bars.

Complete **DAILY REVIEW** b on page 457.

Stem-and-Leaf Plots

Another way to display data is on a **stem-and-leaf plot**. Each piece of data is displayed using the tens digits of the data as its stems and the ones digits of the data as its leaves. The leaves indicate the number of items in the data. A title and a key are provided to give guidance for reading and understanding the graph.

stem-and-leaf plot
stem: tens
leaf: ones

Juan recorded his math test scores to evaluate his progress: 89, 92, 87, 95, 79, 98, 94, 92, 89, and 92. He ordered the scores from *least* to *greatest* and put them in the stem-and-leaf plot. Then he found the range, the mean, the median, and the mode.
79, 87, 89, 89, 92, 92, 92, 94, 95, 98

Math Test Scores	
Stem	Leaf
7	9
8	7 9 9
9	2 2 2 4 5 8

There are 10 leaves or 10 pieces of data.

Key 8|7 = 87

Range 98 – 79 = **19** **Mean** $907 \div 10 = 90.7$ **Median** **92** **Mode** **92**

Exercises

Process to find median may vary.

1. Write the title and the key for the stem-and-leaf plot.
Answers may vary.
2. How many days are represented? **12**
3. Write the number of books sold from *least* to *greatest*.
9, 10, 12, 14, 15, 18, 19, 20, 21, 21, 23, 30
4. What is the range of the data?
30 – 9 = 21
5. Find the mean of the data. Round to the nearest tenth.
The sum of the data is 212; $212 \div 12 \approx 17.7$
6. What is the median? **18.5**
7. What is the mode? **21**

The store manager recorded the number of books sold in his Christian bookstore for a time period of two weeks. The store is closed on Sundays.

Books Sold: 12, 21, 30, 14, 10, 9, 15, 18, 23, 20, 21, 19

Make a stem-and-leaf plot showing the ages of missionaries. Use the data from the plot to find the answer.

8. Write the title and the key for the stem-and-leaf plot.
Answers may vary.
9. Write the ages of the missionaries from *least* to *greatest*.
10. What is the range of the data? **61 – 28 = 33**
11. Find the mean. Round to the nearest tenth. **40.9**
12. What is the median? **39**
13. What is the mode? **30**
14. Which stem has the most leaves? **3**
15. What ages are represented by stem 4? **40, 41, 43, and 44**

The Community Bible Chapel compiled a list of the ages of the missionaries it supports. The data represents the oldest person in each missionary family.

Ages of Missionaries: 44, 53, 41, 37, 39, 44, 30, 40, 60, 32, 43, 28, 30, 61, 35, 57, 35, 30, 38

9. **28, 30, 30, 30, 32, 35, 35, 37, 38, 39, 40, 41, 43, 44, 44, 53, 57, 60, 61**
11. **mean: The sum of the data is 777; $777 \div 19 \approx 40.9$**

Use the data from the stem-and-leaf plot to find the answer.

Process to find median may vary.

Many missionaries go on deputation, which is a time of visiting churches to raise prayer and financial support. This stem-and-leaf plot shows the number of months some missionaries have been on deputation.

16. What is the greatest amount of time spent on deputation? **63 months**

17. What is the least amount of time spent on deputation? **13 months**

18. What is the range of the data? **63 – 13 = 50**

19. A total of 584 months are represented on the stem-and-leaf plot.

Round to the nearest tenth to find the mean for this data.

$$584 \div 19 \approx 30.7$$

20. What is the median? **27**

21. What is the mode? **25**

Months of Deputation

Stem	Leaf
1	3 5 6 7 7
2	4 5 5 5 7 9 9
3	0 6 7
4	4
5	5 7
6	3

Key | 1|3 = 13

Practice & Application

Emergency Service Calls		
Year	Fox Hills Squad	Cool Springs Squad
2006	515	589
2007	522	513
2008	533	506
2009	516	533
2010	559	509

22. Make a double line graph showing the service calls for each emergency squad. Begin the numerical data with 500 and use intervals of 10. Use the data from the line graph to find the answers for questions 23 and 24.

23. What is the range, the mean, and the median for the Fox Hills Squad? **range: 559 – 515 = 44; mean: 529; median: 522**

24. What is the range, the mean, and the median for the Cool Springs Squad? **range: 589 – 506 = 83; mean: 530; median: 513**

25. 14.86×27 **401.22**

26. 3.79×5.2 **19.708**

27. Round to the nearest hundredth to find the quotient of $495 \div 0.34$. **1,455.88**

28. Round to the nearest thousandth to find the quotient of $733 \div 6.4$. **114.531**

Answers are shown using cancellation.

$$29. 1\frac{3}{4} \times \frac{5}{8} \quad \frac{7}{4} \times \frac{5}{8} = \frac{35}{32} = 1\frac{3}{32}$$

$$30. \frac{2}{3} \times 3\frac{1}{2} \quad \frac{2}{3} \times \frac{7}{2} = \frac{7}{3} = 2\frac{1}{3}$$

$$31. \frac{5}{8} \div \frac{1}{2} \quad \frac{5}{8} \times \frac{2}{1} = \frac{5}{4} = 1\frac{1}{4}$$

$$32. 5\frac{1}{6} \div \frac{5}{12} \quad \frac{31}{6} \times \frac{12}{5} = \frac{62}{5} = 12\frac{2}{5}$$



Write the definitions for the terms *mean*, *median*, and *mode*. List your math test grades for this quarter. Find the mean, the median, and the mode of your test grades. **Answers will vary.**



Tornadoes begin in severe thunderstorms called *supercells*. As the wind sweeps into the storm, it forms a funnel.

Line Plots

A **line plot** uses the range of data as its **scale**. Each piece of data is indicated by an **X** above the number it represents.

Katie jogged 1 mile on two days.

A **cluster** is a tight grouping of data on the line plot.

There is a cluster from 1 to 5.

A **gap** is an empty space with no data on the line plot.

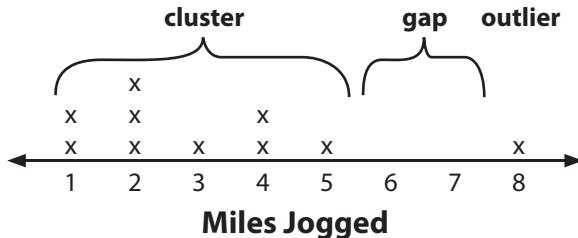
There is a gap from 6 to 7.

An **outlier** is a piece of data that is much greater or much less than the other data.

The outlier is 8 miles jogged.

Katie kept a record of the miles she jogged for 10 days.

1, 3, 2, 2, 5, 4, 1, 2, 4, 8

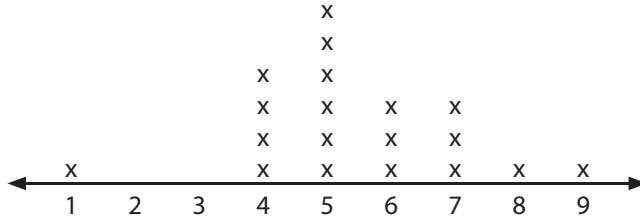


Exercises

Use the data from the line plot to find the answer.

Each track team member kept a record of how many cups of water he drank daily. Jeremy collected the data and made this line plot.

Process to find median may vary.



- How many members are on the team? **19 members**
- How many members drank 6 cups of water per day? **3 members**
- Name and explain the outlier. **1; 1 is much less than the other data.**
- How do you determine the range of the data? **find the difference between the greatest value (number) and the least value**
- What is the range of the data? **$9 - 1 = 8$**
- What is the mode? **5**
- What is the median? **5**
- Find the mean. Round to the nearest tenth. **The sum of the data is 103; $103 \div 19 \approx 5.4$**

Find the statistics without the outlier. Round the mean and the median to the nearest tenth.

9. range **$9 - 4 = 5$**

10. mode **5**

11. median **5**

12. mean **The sum of the data is 102; $102 \div 18 \approx 5.7$**

13. Analyze how the range, the mode, the median, and the mean were affected without the outlier. **Without the outlier, the median and the mode remained the same, the range was less, and the mean was greater.**

Make a line plot showing the number of museum visitors.
Use the data from the line plot to find the answer.

Museum Visitors

16, 17, 19, 21, 20, 25, 20, 21, 20, 18, 20, 21, 21, 19, 18, 21,
16, 18, 19

14. How many days had 21 visitors? **5**
15. Where is the cluster on the line plot? **16 to 21**
16. Which number is the outlier? **25**
17. Where is the gap on the line plot? **22 to 24**
18. What is the range of the data? **25 – 16 = 9**

Practice & Application

Complete the table. Use the data from the table to find the answer.

Sports activities, such as baseball, soccer, swimming, and tennis, all use math in some way. Information such as scores, time, or distance is recorded. These statistics can be analyzed to evaluate individual or team performance.

23. In which season did the soccer team have its best record? **2008**
24. In which season did it have its worst record? **2010**

Solve.

25. Write a ratio that shows that Jasper made 9 of 15 attempted field goals. What percentage of field goals did Jasper make? $\frac{9}{15} = 0.6$; $0.6 \times 100 = 60\%$
26. C. J. made 12 of his 19 field goal attempts. Who has a better success percentage, Jasper or C.J.? $\frac{12}{19} = 63\%$; $63\% > 60\%$; **C.J.**
27. Sherman High scored 9 points in the first half of the football game. Use the chart to list all the possible ways the team could score 9 points. An extra point can be scored only immediately after a touchdown.

Football Points			
touchdown	6	field goal	3
extra point	1	safety	2

27. **Answers may vary;** touchdown + field goal;
touchdown + extra point + safety;
field goal + field goal + field goal.

Process to find median may vary.

19. What is the mode? **21**
20. Find the mean of the data. Round to the nearest tenth. **19.5**
21. What is the median? **20**
22. Find the range, the mean, the median, and the mode without the outlier. Round the mean and the median to the nearest tenth. **range: 21 – 16 = 5; mean: the sum of the data is 345; $345 \div 18 \approx 19.2$; median: 19.5; mode: 21**

Soccer Team Records			
Season	Games Won	Games Lost	Percent Won
2005	10	5	67%
2007	8	6	57%
2008	12	5	71%
2009	11	6	65%
2010	10	8	56%

The line graph shows change over time.

- J** Make a line plot and a line graph to show the consecutive science test scores for Rico. Explain which graph allows you to better visualize how his grade changes with each test.

Test scores: 100, 98, 96, 92, 95, 89, 90, 95, 80, 93, 91



Complete **DAILY REVIEW** **d** on page 458.

Histograms

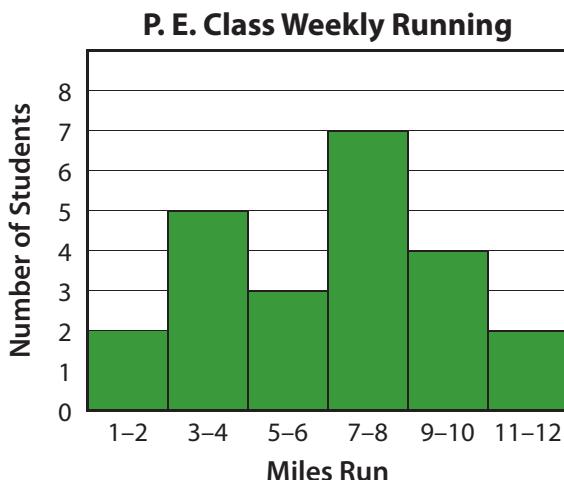
When there is a greater amount of data to graph, **histograms** are used instead of the typical bar graph. The data is separated into equal **intervals** on the horizontal axis. The vertical axis is used to show the frequency. A histogram always uses vertical bars with no spaces between them. A frequency table helps to organize the data before the histogram is constructed.

histograms
interval

Since 1983, May has been declared as Fitness Month. To encourage physical fitness, Mr. Hawkins assigned the students in his physical education class to keep track of the number of miles they ran during the first week of May. He posted each student's results at the end of the week.

Miles Run: 8, 7, 12, 7, 1, 5, 10, 2, 3, 10, 12, 9, 4, 6, 9, 4, 3, 7, 8, 5, 7, 4, 8

Interval	Tally	Frequency
1–2		2
3–4		5
5–6		3
7–8		7
9–10		4
11–12		2



Exercises

Use the data from the frequency table and the histogram to find the answer.

- What data is represented on the frequency table and the histogram? **weekly running totals**
- How many students are in the physical education class? **23 students**
- What is the range of miles run? **$12 - 1 = 11$**
- How many students ran 3–4 miles in the first week of May? **5 students**
- How many more students ran in the 7–8 mile interval than in the 1–2 mile interval? **5 more students**
- How many students ran 9 miles or more? **6 students**
- The largest group of runners is represented in which interval? **7–8**
- What interval is the mode for this set of data? **7–8**
- Brodie ran $9\frac{1}{4}$ miles. Which interval is he in? **9–10**

Use the set of data to complete the frequency table.

Use the table to make a histogram.

Use the data from the frequency table and the histogram to find the answer.

History Test Scores

79, 82, 86, 91, 97, 80, 87, 93, 91, 90, 89, 81, 83, 95,
92, 88, 85, 73, 68, 81, 76, 70, 85, 73, 83, 79

History Test Scores		
Interval	Tally	Frequency
60–69		1
70–79		6
80–89		12
90–99		7

11. How many students took the history exam?

26 students

12. What is the range of test scores? **97 – 68 = 29**

13. How many test intervals are on the histogram? **4**

14. How many students scored 80 or above?

19 students

15. How many students scored 79 or less? **7 students**

16. Ashton made a 90.3 on the test. In which interval is his test grade? **90–99**

17. Which interval has the highest frequency?
80–89

18. What interval is the mode? **80–89**

19. Mrs. Clater allowed any student who made lower than a 70 to retake the test. How many students took the test again? **1 student**

Practice & Application

Use the data from the frequency table to find the percent for the set of data.

Tanner surveyed his class to find which after-school activity his classmates preferred most.

20. percentage of students that ride bikes $\frac{6}{25} = \frac{n}{100}$; **n = 24; 24%**

21. percentage of students that skateboard $\frac{8}{25} = \frac{n}{100}$; **n = 32; 32%**

22. percentage of students that play sports $\frac{11}{25} = \frac{n}{100}$; **n = 44; 44%**

Activity	Tally	Frequency
bike riding		6
skateboarding		8
playing sports		11

Use the data from the chart to find the answer.

23. Which country has the largest urban population? **Iceland**

24. Which country has the largest rural population?
South Africa

25. Write the percentages of rural population from *least* to *greatest*.
What is the median? **7, 14, 21, 25, 48; median: 21**
Process to find median may vary.

26. Find the mean of the rural population. **The sum of the data is 115; $115 \div 5 = 23$**

27. Is there a mode for this data? **no**

28. Create a double bar graph for the table. Use intervals of 10.

% of Population Distribution		
Country	Urban	Rural
United States	79	21
Iceland	93	7
South Africa	52	48
Colombia	75	25
Japan	86	14



Explain how a frequency table can help you construct a histogram.

The frequency table helps determine the intervals and organize the data.

Complete **DAILY REVIEW** e on page 458.

Box-and-Whisker Plot

A **box-and-whisker plot** summarizes data on a number line using a list that is organized from *least* to *greatest*.

Use the least value of the data as the beginning point of the number line and the greatest value of the data as the ending point.

Find the median of the whole set of data and plot that point on the number line. This is the **middle quartile**. The median separates the data into two sets.

Plot the **lower quartile** by finding the median for the lower half of the data.

Plot the **upper quartile** by finding the median for the upper half of the data.

Draw a box from the lower quartile to the upper quartile. The whiskers are the lines that extend from the box to the least value and the greatest value of the data.

box-and-whisker plot
middle quartile
lower quartile
upper quartile

Remember to average the two middle numbers to find the median.

Number of points scored by the boys' basketball team: 72, 85, 91, 87, 79, 78, 93

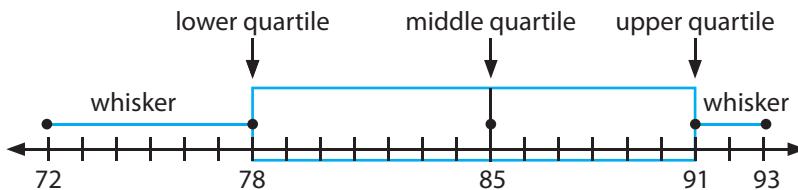
Plot the middle, upper, and lower quartiles.

72, 78, 79, 85, 87, 91, 93

Median of data: 85

Lower quartile: 72 78 79 78

Upper quartile: 87 91 93 91



Exercises

Make a box-and-whisker plot.

Use the data from the plot to find the answer.

Process to find median may vary.

Ages of the children who attended Jesse's birthday party

3, 7, 7, 9, 11, 11, 12, 12, 12, 13, 15

1. In what order is the data? **least to greatest**
2. What is the median of the data? **11**
3. What is the lower quartile? **7**
4. What is the upper quartile? **12**
5. Which side has the longer whisker? **lower whisker**
6. Which box shows the smaller amount of data? **upper quartile**
7. What is the range of the data? **$15 - 3 = 12$**

Math test scores listed by Mrs. Peyton on the board

83, 91, 95, 80, 100, 100, 88, 92, 98, 100, 85, 93, 90, 75, 92, 85

8. Write the data from *least* to *greatest*.
9. What is the median of the data? **91**
10. What is the lower quartile? **85**
11. What is the upper quartile? **95**
12. What is the range of the data?
 $100 - 75 = 25$
13. Describe the length of the whiskers. **lower: 75–85; upper: 95–100**
14. What part of the diagram shows the smaller amount of data? **upper quartile**
15. Is the median in the center of the box? **no**
16. **75, 80, 83, 85, 85, 88, 90, 91, 92, 92, 93, 95, 98, 100, 100**

Use the data from the box-and-whisker plot to find the answer.

The box-and-whisker plot shows the number of miles Taylor biked this month.



16. What is the greatest number of miles traveled?

46 miles

17. What is the least number of miles traveled?

10 miles

18. Find the median of the data. **25**

Use the data to find the **middle**, **lower**, and **upper** quartiles.

Round decimal answers to the nearest tenth.

Make a box-and-whisker plot to display the set of data.

22. Data: 5, 8, 19, 21, 23, 27, 30, 31, 33

middle quartile: 23

lower quartile:

$$(8 + 19) \div 2 = 13.5$$

upper quartile:

$$(30 + 31) \div 2 = 30.5$$

23. Data: 71, 72, 75, 79, 80, 81, 82

middle quartile: 79

lower quartile: 72

upper quartile: 81

Practice & Application

24. Make a stem-and-leaf plot to show the number of pages read by the students.

52, 45, 60, 65, 30, 48, 41, 37, 62, 43

25. Find the mean of the data. Round to the nearest tenth. **The sum of the data is 483;**

$$483 \div 10 = 48.3$$

26. Use the stem-and-leaf plot to find the median.

$$(45 + 48) \div 2 = 46.5$$

27. What is the range? **65 – 30 = 35**

28. Use intervals of 5 to make a frequency table and a histogram to show the number of miles traveled by families to church. Use the data from the table or the histogram to find the answers for 29 through 31.

17, 5, 3, 10, 24, 2, 14, 7, 15, 7, 30, 8, 16, 20, 10, 20, 33, 11

Pages Read	
Stem	Leaf
3	0 7
4	1 3 5 8
5	2
6	0 2 5

Key | 3|0 = 30

19. What are the upper and lower quartiles?

upper: 40; lower: 18

20. What is the range of the data?

$$46 - 10 = 36$$

21. What is true about the length of the whiskers?

The lower whisker is longer than the upper whisker.

29. What mile interval shows the mode? **6–10**

30. The Chapin family walks $\frac{1}{4}$ of a mile to church. In which interval are the Chapins? **0–5**

31. How many families drive more than 10 miles? **10**

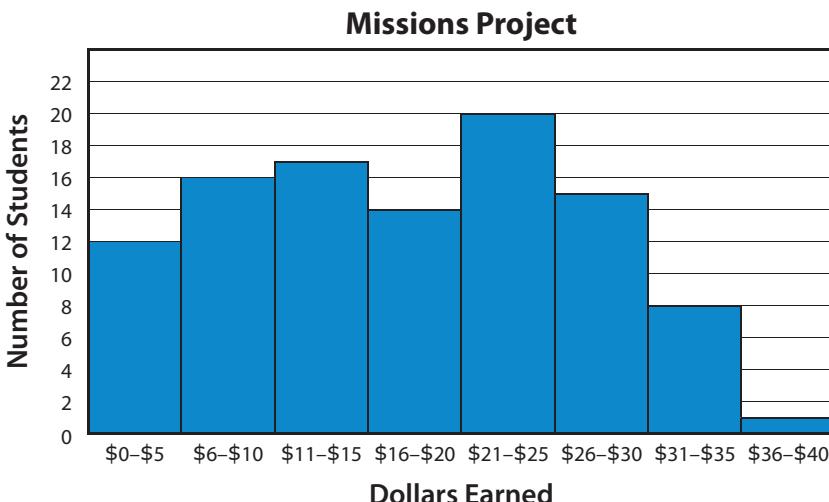
Miles Traveled to Church		
Miles	Tally	Frequency
0–5		3
6–10		5
11–15		3
16–20		4
21–25		1
26–30		1
31–35		1

Graph Review

Exercises

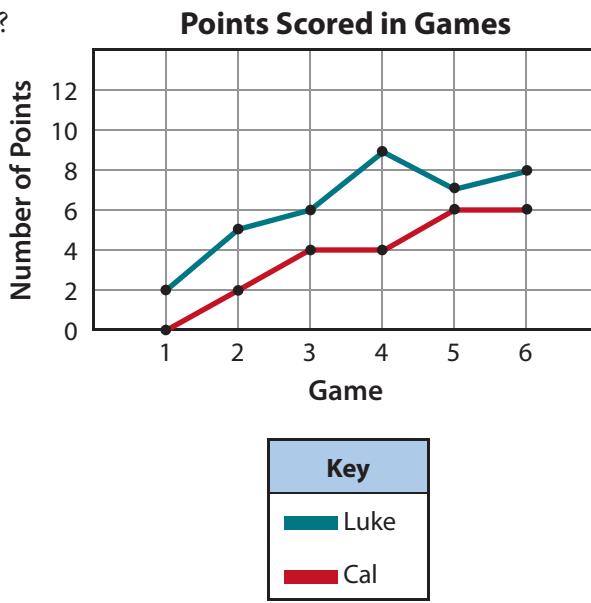
Use the data from the histogram to find the answer.

- How many students helped to earn money for the mission project? **103 students**
- How many students earned \$26–\$30? **15 students**
- What is the mode for the amount earned? **\$21–\$25**
- In which interval was the greatest amount of money earned by a student for the mission project? **\$36–\$40**
- Explain the data shown on the graph.
The data shows the amount of money earned by 103 students for a missions project.



Use the data from the double line graph to find the answer.

- In which game did Luke score his highest number of points? **Game 4**
- In which game did Cal *not* score? **Game 1**
- What is the range of Luke's scores? **$9 - 2 = 7$**
- What is the range of Cal's scores? **$6 - 0 = 6$**
- In which game did Luke score only one more point than Cal? **Game 5**
- What was the mean of Cal's scores? Round to the nearest hundredth. **The sum of the data is 22; $22 \div 6 \approx 3.67$**
- What was the mean of Luke's scores? Round to the nearest hundredth. **The sum of the data is 37; $37 \div 6 \approx 6.17$**
- What trend do you see in Luke's and Cal's games? **The number of points scored improved as more games were played.**



Use the data from the stem-and-leaf plot to find the answer.

- How many children attended vacation Bible school? **21 children**
- What is the range in ages of the children at VBS? **$12 - 6 = 6$**
- What is the mode? **11**
- What is the median? **10**

Age of Children at VBS	
Stem	Leaf
0	6 6 6 7 7 8 8 8 9 9
1	0 0 0 0 1 1 1 1 1 2 2

Key | 1|0 = 10

Use the data from the double bar graph to find the answer.

18. What is being compared in the graph?

math test scores

19. On which test did Joel and Emma receive the same score? **Test 3**

20. What is the range of the test scores for Joel?

For Emma? **Joel: $98 - 88 = 10$;**

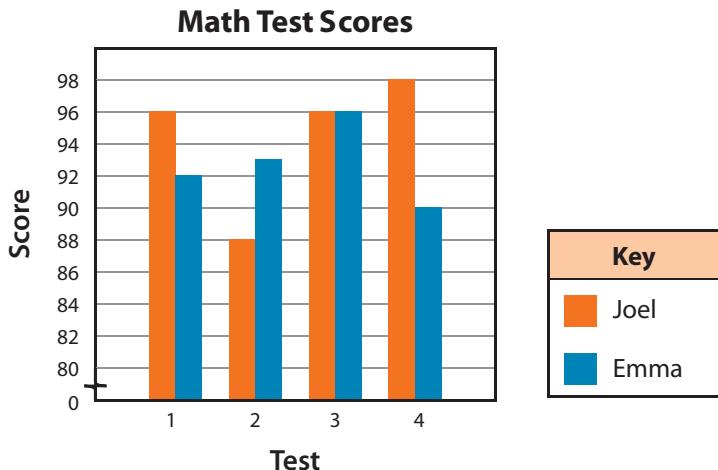
Emma: $96 - 90 = 6$

21. Which student had the highest test score?

Joel; he had a score of 98.

22. What is the mean of Emma's test scores? Of Joel's test scores? **Emma: The sum of the data is 371; $371 \div 4 = 92.75$;**

Joel: The sum of the data is 378; $378 \div 4 = 94.5$



Use the data from the line plot to find the answer.

23. What is the range in the miles walked? **$9 - 1 = 8$**

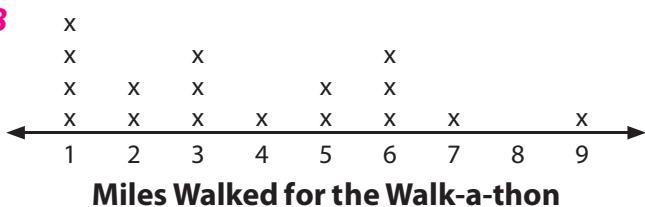
24. What is the mode? **1**

25. How many people walked 3 or fewer miles?

9 people

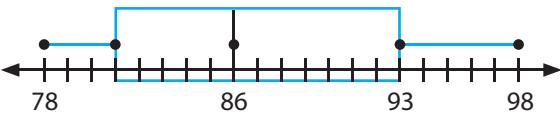
26. What is the median of the data? **3**

Process to find median may vary.



Use the data from the box-and-whisker plot to find the answer. **Process to find median may vary.**

Mrs. Alier used history test data for her box-and-whisker plot.



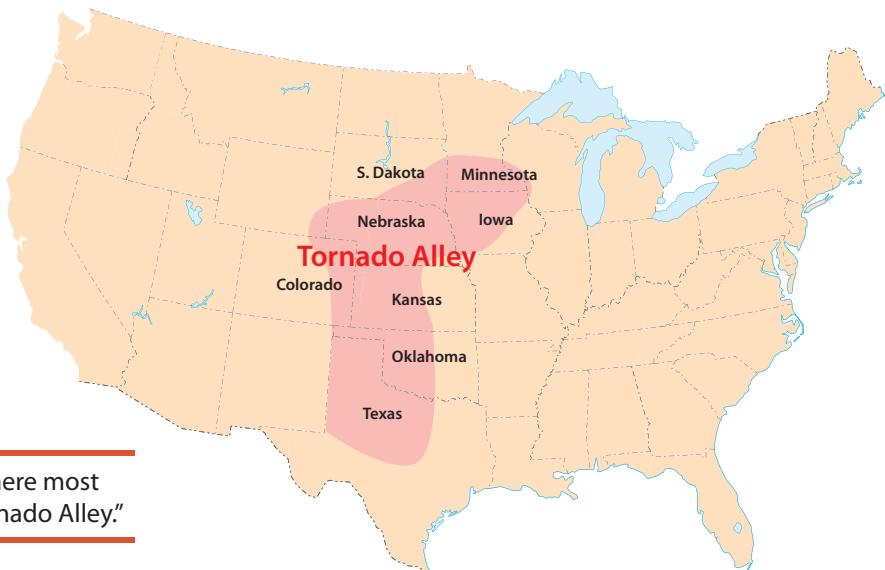
27. What is the lowest test score? **78**

28. What is the highest test score? **98**

29. What is the median test score? **86**

30. What is the lower quartile? **81**

31. What is the upper quartile? **93**



The area of the United States where most tornadoes develop is called "Tornado Alley."

Compare Graphs

Exercises *Answers may vary.*

Use the data from the chart to find the answer.

Chase and Chloe recorded the amount of savings they have on the first day of each month.

	Jan.	Feb.	Mar.	April	May	June
Chase	\$100	\$140	\$115	\$125	\$135	\$145
Chloe	\$100	\$110	\$120	\$130	\$140	\$150

1. Which type of graph is used to compare how Chase's and Chloe's savings totals change over a 6-month span? **double line graph**
2. Which type of graph is used to compare their monthly totals? **double bar graph**
3. Make the graph you choose for problem 1 or 2. **Answers will vary.**

Ages of the first 15 presidents of the United States on the day of their inauguration

57, 61, 57, 57, 58, 57, 61, 54, 68, 51, 49, 64, 50, 48, 65

4. Which type of graph would you use to show the number of ages that repeat? **stem-and-leaf plot**
5. How is the data listed in this type of graph? **by digits (tens, ones) in numerical order**
6. Make the graph you choose for problem 4. **Answers will vary.**

Cameron pitched 7 innings in Saturday's game. He faced the following number of batters.

3, 5, 4, 7, 4, 3, 3

7. Which type of graph would you use to show the number of batters in each inning? **a line plot or a bar graph**
8. Make the graph you choose for problem 7.
9. What is the mode of the data? Does this graph easily depict the mode? **3; yes**



Use the set of data to find the **middle**, **lower**, and **upper** quartiles.

Make a box-and-whisker plot to display the data.

10. Data: 4, 6, 6, 7, 8, 12, 13

middle quartile: 7
lower quartile: 6
upper quartile: 12

Find the range and the mean for the set of data.

Round decimal answers to the nearest tenth.

12. 16, 12, 9, 8, 2

range: $16 - 2 = 14$; **mean:** the sum of the data is 47; $47 \div 5 = 9.4$

14. 56, 42, 50, 48, 42, 40

range: $56 - 40 = 16$; **mean:** the sum of the data is 278; $278 \div 6 \approx 46.3$

Use the data from the frequency table to make a histogram.

16. **Ages Enrolled in Summer Swimming Lessons**

Interval	Tally	Frequency
3–5		3
6–9		17
10–12		12
13–15		8

11. Data: 16, 18, 19, 23, 24, 25

middle quartile: $(19 + 23) \div 2 = 21$
lower quartile: $(16 + 18) \div 2 = 17$
upper quartile: $(24 + 25) \div 2 = 24.5$

13. 24, 20, 16, 18, 23, 25, 21

range: $25 - 16 = 9$; **mean:** the sum of the data is 147; $147 \div 7 = 21$

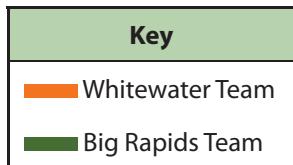
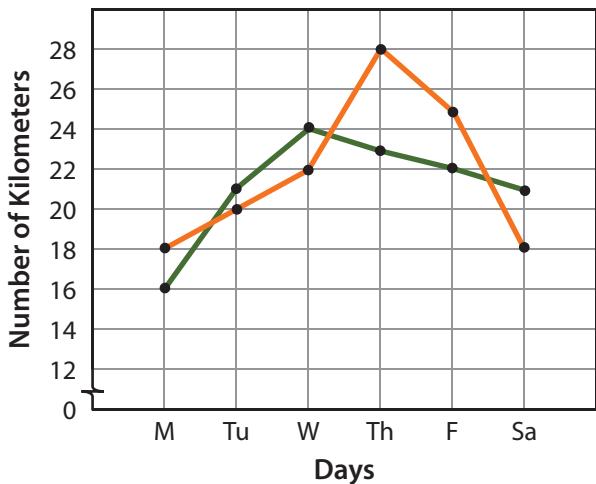
15. 8, 3, 9, 5, 7, 1, 8, 4

range: $9 - 1 = 8$; **mean:** the sum of the data is 45; $45 \div 8 \approx 5.6$

The frequency table shows the ages of children taking summer swimming lessons.

Use data from the line graph to find the answer.

Canoe Race



17. On which days did the Big Rapids team paddle the greater distance? **Tuesday, Wednesday, and Saturday**
18. How far did the Whitewater team paddle on Monday? **18 km**
19. On which 2 days did the Whitewater team paddle the same distance? **Monday and Saturday**
20. About how many kilometers did the Big Rapids team paddle for the week? **$16 + 21 + 24 + 23 + 22 + 21 = 127$ km**
21. Which team paddled the greater distance?
The Whitewater Team
 $18 + 20 + 22 + 28 + 25 + 18 = 131$;
 $131 > 127$

CHAPTER 15 REVIEW

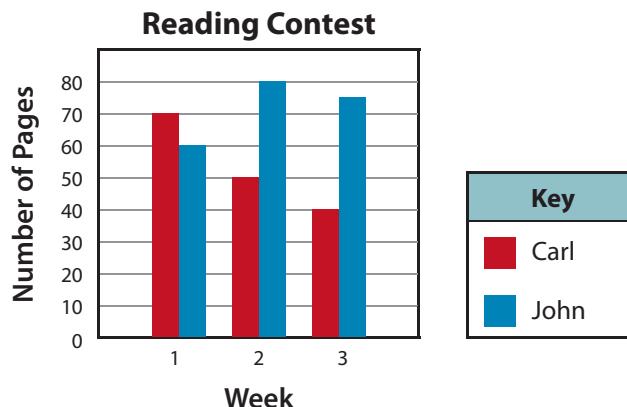
Use the set of data to make a frequency table.

Process to find median may vary.

1. Basketball Game Scores: 63, 72, 59, 52, 69, 62, 59, 58, 60
2. Find the mean game score. Round to the nearest tenth. **The sum of the data is 554; $554 \div 9 \approx 61.6$**
3. Find the median of the scores. **60**
4. What is the range of the game scores? **$72 - 52 = 20$**
5. What is the mode? **59**

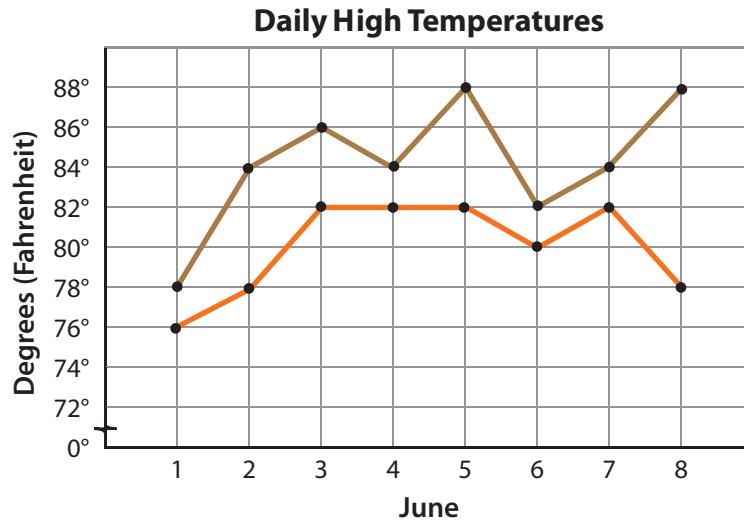
Use the data from the double bar graph to find the answer.

6. Which week shows the greatest difference in the number of pages read? **Week 3**
7. What is the mean of pages read by Carl? Round to the nearest tenth. **The sum of the data is 160; $160 \div 3 \approx 53.3$ pages**
8. Who read the most pages? **John**
9. How many pages did John read? **215 pages**
 $60 + 80 + 75 = 215$



Use the data from the double line graph to find the answer.

10. On which days were the temperature differences between the cities two degrees? **June 1, 4, 6, and 7**
11. What day shows the greatest temperature difference between the two cities? **June 8**
12. What is the range in temperatures for Sunnyville? **$88 - 78 = 10$**
13. What is the mode for Peaceful Valley? **82°F**
14. What is the mean temperature for Sunnyville? Round to the nearest tenth. **The sum of the data is 674; $674 \div 8 \approx 84.3^\circ\text{F}$**



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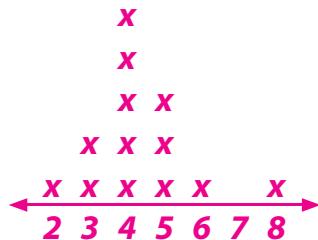
Use the set of data to make a line plot.

15. Pages of Term Paper: 8, 4, 6, 3, 4, 3, 5, 5, 4, 5, 4, 2, 4

16. What is the mode for the number of pages? **4**

17. What is the range? **$8 - 2 = 6$**

18. What is the median? **4**



Use the set of data to make a stem-and-leaf plot.

19. Hours Worked: 8, 15, 20, 20, 20, 25, 30, 30, 35, 35, 35, 40, 40, 42

20. What is the range of hours worked? **$42 - 8 = 34$**

21. Find the mean. Round to the nearest tenth.
The sum of the data is 395; $395 \div 14 \approx 28.2$

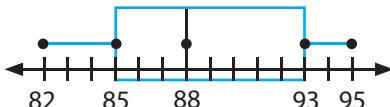
22. What is the median? **30**

Hours Worked	
Stem	Leaf
0	8
1	5
2	0 0 0 5
3	0 0 5 5 5
4	0 0 2

Key | 1|5 = 15

Use the data from the box-and-whisker plot to find the answer.

Mr. Darsey used the math test scores as data for his box-and-whisker plot.

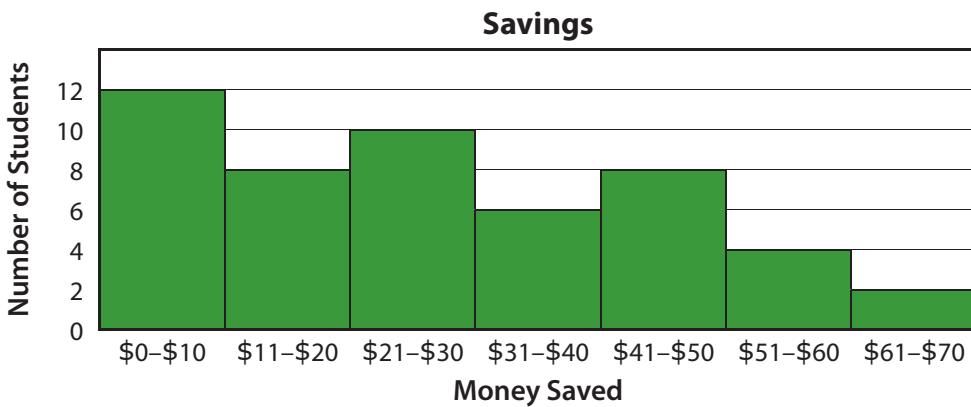


23. What is the highest score? **95**

24. What is the median score? **88**

25. What is the lower quartile? **85**

Use the data from the histogram to find the answer.



26. What is the range of the data? **$70 - 0 = 70$**

27. Is this statement true or false? More than half of the students have \$30 or less in their savings. Explain your answer. **True; of the 50 students represented in the graph, 30 students are in the ranges \$0 to \$30.**

28. What is the mode? **\$0-\$10**

CUMULATIVE REVIEW

Test Prep

Mark the answer.

1.
$$\begin{array}{r} 58.509 \\ - 49.932 \\ \hline \end{array}$$

- A. 7.437 C. 9.437
 B. 8.577 D. 18.437

2.
$$\begin{array}{r} 4.6897 \\ + 68.3974 \\ \hline \end{array}$$

- A. 74.3071 C. 73.0121
 B. 73.0871 D. 72.0971

3.
$$\begin{array}{r} \$37.24 \\ \times 342 \\ \hline \end{array}$$

- A. \$12,736.08 C. \$12,068.80
 B. \$12,638.08 D. \$11,763.08

4.
$$8\overline{)783}$$

- A. $95\frac{7}{8}$ C. $97\frac{7}{8}$
 B. $96\frac{5}{8}$ D. $98\frac{1}{8}$

5. $76.3 \div 100$

- A. 0.0763 C. 7.63
 B. 0.763 D. none of the above

6.
$$\frac{5}{8} - \frac{7}{32}$$

- A. $\frac{2}{32}$ C. $\frac{13}{32}$
 B. $\frac{7}{32}$ D. $\frac{15}{32}$

7.
$$6\frac{1}{10} - 3\frac{3}{5}$$

- A. $3\frac{4}{5}$ C. $2\frac{7}{10}$
 B. $3\frac{2}{5}$ D. $2\frac{1}{2}$

8.
$$\frac{2}{7} + \frac{1}{4}$$

- A. $\frac{5}{7}$ C. $\frac{11}{14}$
 B. $\frac{3}{28}$ D. $\frac{15}{28}$

9.
$$\frac{5}{8} \div \frac{2}{3}$$

- A. $\frac{5}{6}$ C. $\frac{5}{16}$
 B. $\frac{5}{8}$ D. $\frac{15}{16}$

10.
$$\frac{5}{8} \times 6$$

- A. $3\frac{3}{4}$ C. 3
 B. $3\frac{1}{2}$ D. $2\frac{7}{8}$

Mark the answer.

11. $5,177 = 31 \times n$

- A. $n = 166$
B. $n = 167$
C. $n = 169$
D. $n = 170$

12. $n \div 251 = 36$

- A. $n = 9,036$
B. $n = 8,306$
C. $n = 8,936$
D. $n = 1,036$

13.
$$\begin{array}{r} 16 \text{ lb } 10 \text{ oz} \\ + 18 \text{ lb } 6 \text{ oz} \\ \hline \end{array}$$

- A. 35 lb
B. 35 lb 4 oz
C. 36 lb 2 oz
D. 37 lb

14. Twenty quarts can make how many gallons?

- A. 4 gal
B. 6 gal
C. 5 gal
D. 7 gal

15. What is 15% as a common fraction in lowest terms?

- A. $\frac{1}{4}$
B. $\frac{1}{5}$
C. $\frac{3}{20}$
D. $\frac{5}{17}$

16. What is the value of $\frac{1}{7}$ in decimal form?
Round to the nearest thousandth.

- A. 0.143
B. 1.429
C. 1.144
D. 7.1

17. What is the value of 4 in 649,782,163.51?

- A. 40 thousand
B. 4 million
C. 40 million
D. 4 billion

18. Round to the greatest place value to estimate the answer.

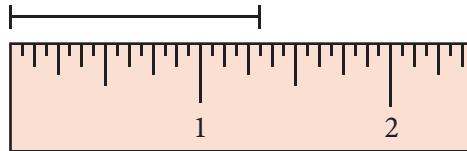
$$7.014 - 4.38$$

- A. 3
B. 2
C. 4
D. 1

19. What is $\frac{4}{5}$ as a percent?

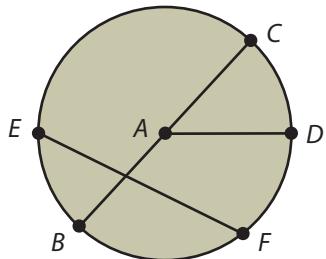
- A. 70%
B. 90%
C. 80%
D. 100%

20. Measure to the nearest sixteenth inch.



- A. $1\frac{5}{16}$
B. $1\frac{7}{16}$
C. $1\frac{9}{16}$
D. $1\frac{15}{16}$

Use $\odot A$ to find the answer.



21. What is the diameter of Circle A?

- A. \overline{AD}
- B. \overline{CB}
- C. \overline{EF}
- D. none of the above

22. If $\angle CAD$ is 73° , what is the measure of $\angle BAD$?

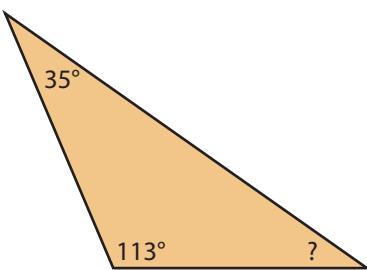
- A. 75°
- B. 90°
- C. 107°
- D. none of the above

23. Name a chord that is *not* the diameter.

- A. \overline{EF}
- B. \overline{AD}
- C. \overline{AC}
- D. none of the above

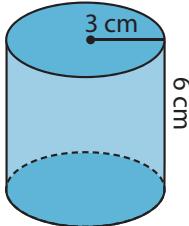
Mark the answer.

24. What is the measure of the unknown angle?



- A. 42°
- B. 32°
- C. 22°
- D. none of the above

25. What is the volume of the figure?



- A. 148.45 cm^3
- B. 169.56 cm^3
- C. 16.966 cm^3
- D. none of the above

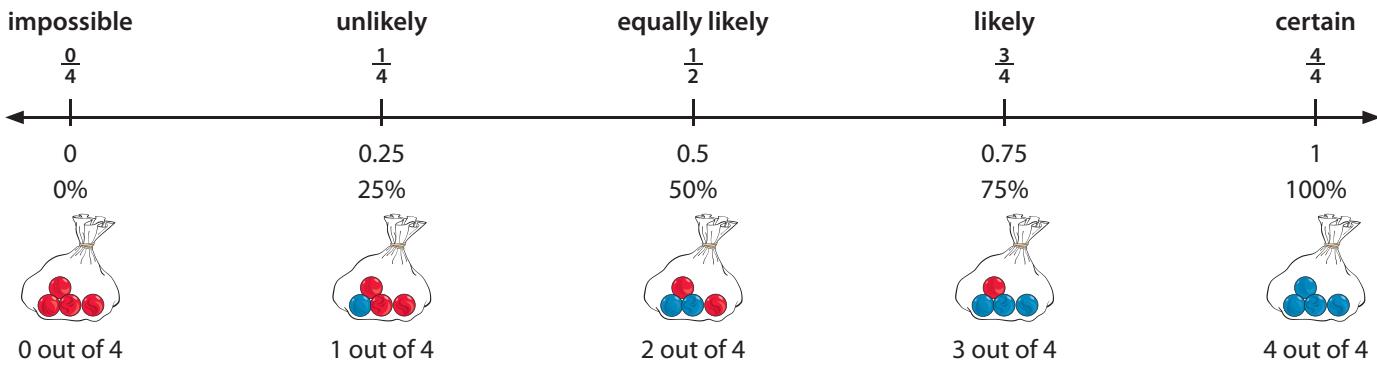
Theoretical Probability

Probability is the likelihood that an event will occur. **Theoretical probability** is found when the total possible outcomes of an event are known and all outcomes are equally likely to occur. Probability is written as a ratio or a percent.

probability
theoretical probability
complementary events

What is the probability of drawing a blue marble from each bag?

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$



Complementary events are two events that could happen, but both events cannot happen at the same time. The sum of the two events must equal 1 or 100%.

The complement of it snowing today is *not* snowing today.

$$25\% + P(\text{not snow}) = 100\%$$
$$25\% + 75\% = 100\%$$

Think $25\% + \underline{\quad} = 100\%$

When there is a 25% chance that it will snow, there is a 75% chance that it will *not* snow.

Exercises

A marble is drawn from the pictured bag.

Write the probability of the event as a fraction and as a percent.

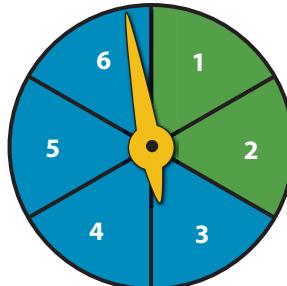
- | | | | |
|-----------------------------------|----------------------|---------------------------|------------------------|
| 1. $P(\text{green})$ | $\frac{1}{10}; 10\%$ | 5. $P(\text{blue})$ | $\frac{3}{10}; 30\%$ |
| 2. $P(\text{red})$ | $\frac{4}{10}; 40\%$ | 6. $P(\text{yellow})$ | $\frac{2}{10}; 20\%$ |
| 3. $P(\text{either red or blue})$ | $\frac{7}{10}; 70\%$ | 7. $P(\text{not red})$ | $\frac{6}{10}; 60\%$ |
| 4. $P(\text{purple})$ | $\frac{0}{10}; 0\%$ | 8. $P(\text{not purple})$ | $\frac{10}{10}; 100\%$ |



Use the spinner to find the probability of the event.

Write it as a fraction in lowest terms.

- | | | | |
|-------------------------------|-----------------------------|--------------------------------|-----------------------------|
| 9. $P(\text{blue})$ | $\frac{4}{6} = \frac{2}{3}$ | 13. $P(\text{green})$ | $\frac{2}{6} = \frac{1}{3}$ |
| 10. $P(\text{even})$ | $\frac{3}{6} = \frac{1}{2}$ | 14. $P(\text{odd})$ | $\frac{3}{6} = \frac{1}{2}$ |
| 11. $P(\text{green and odd})$ | $\frac{1}{6}$ | 15. $P(\text{green and even})$ | $\frac{1}{6}$ |
| 12. $P(\text{blue and even})$ | $\frac{2}{6} = \frac{1}{3}$ | 16. $P(\text{blue and odd})$ | $\frac{2}{6} = \frac{1}{3}$ |



Use the spinner above to find the probability of the event and its complement.

Write both as a percent. Round to the nearest whole percent.

- | | | | |
|---|--------------|---|--------------|
| 17. $P(\text{blue})$ and $P(\text{not blue})$ | $67\%; 33\%$ | 18. $P(\text{green})$ and $P(\text{not green})$ | $33\%; 67\%$ |
| 19. $P(\text{odd})$ and $P(\text{not odd})$ | $50\%; 50\%$ | 20. $P(5)$ and $P(\text{not } 5)$ | $17\%; 83\%$ |

A 1–6 number cube is rolled once. Write the probability of the event as a fraction in lowest terms and as a percent. Round to the nearest whole percent.

21. $P(3) \frac{1}{6}; 17\%$

26. $P(\text{multiple of } 2) \frac{1}{2}; 50\%$

22. $P(2 \text{ or } 5) \frac{1}{3}; 33\%$

27. $P(7) 0; 0\%$

23. $P(\text{greater than } 1) \frac{5}{6}; 83\%$

28. $P(\text{less than } 5) \frac{2}{3}; 67\%$

24. $P(4) \frac{1}{6}; 17\%$

29. $P(\text{not } 6) \frac{5}{6}; 83\%$

25. $P(\text{odd}) \frac{1}{2}; 50\%$

30. $P(\text{composite}) \frac{1}{3}; 33\%$



The probability of event A is given. Find the complement, $P(\text{not } A)$.

31. $P(A) = 30\% \quad P(\text{not } A) = 70\%$

33. $P(A) = \frac{1}{4} \quad P(\text{not } A) = \frac{3}{4}$

35. $P(A) = 40\% \quad P(\text{not } A) = 60\%$

32. $P(A) = 45\% \quad P(\text{not } A) = 55\%$

34. $P(A) = \frac{2}{5} \quad P(\text{not } A) = \frac{3}{5}$

36. $P(A) = 29\% \quad P(\text{not } A) = 71\%$

Write **certain**, **equally likely**, or **impossible**.

Each choice will be used only once.

37. If a 1–6 number cube is rolled one time, what word or phrase best describes the event?

- a) roll a 3 **equally likely**
- b) roll a number 1–6 **certain**
- c) roll a number greater than 6 **impossible**

Write the probability as a fraction and as a percent.

Round to the nearest whole percent.

38. Eighty people attended the Sunday morning service at Regency Bible Church. Twenty people sang in the choir. What is the probability that a person attending is a choir member?

$$\frac{20}{80} = \frac{1}{4}; \frac{1}{4} = 25\%$$

39. You are given 5 choices for a multiple-choice test question. If you do not know the answer, what is the probability of guessing the correct answer?

$$\frac{1}{5} = 20\%$$

J

The Heritage Christian School soccer team has a record of 8 wins and 3 losses. Victory Christian School has a record of 6 wins and 2 losses. Which team is more likely to win its next game?

$$\text{Heritage: } \frac{8}{11} \approx 73\%$$

$$\text{Victory: } \frac{6}{8} = 75\%$$

Victory Christian School is more likely to win.

Soccer Records		
	HCS	VCS
Wins	8	6
Losses	3	2
Games Played	11	8

Sample Spaces

Knowing the number of possible outcomes is necessary when calculating probability. The **sample space** for an event is the set of all possible outcomes. A **tree diagram** is an organized way to show all the possible outcomes.

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

The sample spaces show the outcomes of flipping 1, 2, and 3 coins. Each coin has a head (**H**) and a tail (**T**).

flipping 1 coin: 2 possible outcomes

$$\{\text{H}, \text{T}\}$$

flipping 2 coins: 4 possible outcomes

$$\{\text{HH}, \text{HT}, \text{TH}, \text{TT}\}$$

flipping 3 coins: 8 possible outcomes

$$\{\text{HHH}, \text{HHT}, \text{HTH}, \text{HTT}, \text{THH}, \text{THT}, \text{TTH}, \text{TTT}\}$$

sample space
tree diagram
Multiplication Counting Principle

Tree Diagram			
1st Coin	2nd Coin	3rd Coin	Outcome for Coins
H	H	H	1 HHH
H	H	T	2 HH
H	T	H	2 HT
H	T	T	2 TH
T	H	H	3 HTT
T	H	T	3 THT
T	T	H	3 TTH
T	T	T	3 TTT

Exercises

Students may or may not use simplest fraction form.

Use the sample space above to write the probability of the event as a fraction and as a percent.

1. 1 coin, $P(\text{heads}) \frac{1}{2}; 50\%$

4. 3 coins, $P(\text{at least one tail}) \frac{7}{8}; 88\%$

2. 2 coins, $P(\text{at least one head}) \frac{3}{4}; 75\%$

5. 3 coins, $P(\text{at least 2 tails}) \frac{4}{8} = \frac{1}{2}; 50\%$

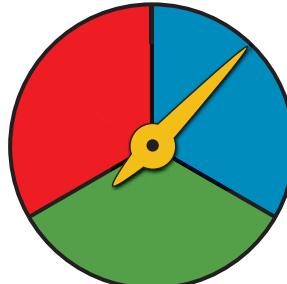
3. 2 coins, $P(\text{not tails}) \frac{1}{4}; 25\%$

6. 3 coins, $P(\text{heads and tails}) \frac{6}{8} = \frac{3}{4}; 75\%$

Use the spinner to find the answer.

7. List the sample space for spinning the spinner two times.

$$\{\text{rr}, \text{rb}, \text{rg}, \text{br}, \text{bb}, \text{bg}, \text{gr}, \text{gb}, \text{gg}\}$$



8. Use the sample space to find the probability of landing on the same color both times. $\frac{3}{9} = \frac{1}{3}$ or 33%

9. What is the probability of landing on a different color both times? $\frac{6}{9} = \frac{2}{3}$ or 67%

Use the spinner and/or the number cube to find the answer.

10. List the sample space for one spin of the spinner.

$$\{\text{A}, \text{B}, \text{C}\}$$

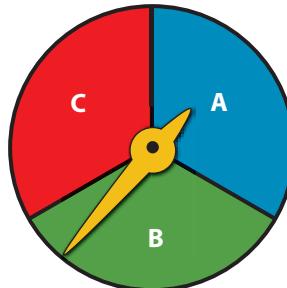
11. List the sample space for one roll of the number cube.

$$\{1, 2, 3, 4, 5, 6\}$$

12. List the sample space for one spin of the spinner or one roll of the number cube. $\{\text{A}, \text{B}, \text{C}, 1, 2, 3, 4, 5, 6\}$

13. List the sample space for one spin of the spinner and one roll of the number cube. $\{\text{A1}, \text{A2}, \text{A3}, \text{A4}, \text{A5}, \text{A6}, \text{B1}, \text{B2}, \text{B3}, \text{B4}, \text{B5}, \text{B6}, \text{C1}, \text{C2}, \text{C3}, \text{C4}, \text{C5}, \text{C6}\}$

14. Write the probability (as a fraction and as a percent) for rolling a 6 after any letter for one spin on the spinner and one roll of the number cube. $\frac{3}{18} = \frac{1}{6}; 17\%$



Use the **Multiplication Counting Principle** to find the number of outcomes when choices are given.

Jaden has 5 different-colored shirts and 3 different-colored pants. How many different outfits can he make?

$$5 \text{ shirt choices} \times 3 \text{ pant choices}$$
$$5 \times 3 = 15 \text{ outfit choices}$$

Clark's Catering offers 3 meats, 4 vegetables, and 2 desserts. How many different meal combinations can be made?

$$3 \text{ meat choices} \times 4 \text{ vegetable choices} \times 2 \text{ dessert choices}$$
$$3 \times 4 \times 2 = 24 \text{ meal combinations}$$

Exercises

Use the Multiplication Counting Principle to find the number of possible outcomes.

15. Lorenzo is purchasing a new shirt. The store has short-sleeve and long-sleeve shirts in 8 different colors. How many different shirts does Lorenzo have to choose from? **16 shirt choices**

16. Morgan is ordering an egg sandwich for breakfast. Her choices are biscuit or croissant; sausage, bacon, or ham; and with cheese or without cheese. How many sandwich choices does Morgan have? **12 sandwich choices**

17. Julian bought a combination lock with 4 dials. Each dial contains the numbers 1 to 9. How many possible combinations can be made for a lock like Julian's? **6,561 combinations**

18. Sasha is redecorating her bedroom. From the store's showroom, she can choose one of 4 beds, one of 2 nightstands, and one of 3 desks. How many possible bedroom sets can Sasha choose from? **24 bedroom sets**

Find the number of possible outcomes and list the sample space.

Write the probability as a fraction in lowest terms and as a percent.

19. Options on a new car are a standard or an automatic transmission in a 2- or 4-door model. Find $P(\text{automatic transmission}, 4\text{-door})$.

$$2 \times 2 = 4 \text{ combinations}; \frac{1}{4}; 25\%$$

20. You may choose one kind of ice-cream cone (sugar or regular), one scoop of ice cream (chocolate or vanilla), and one topping (sprinkles, peanuts, or chocolate chips). Find $P(\text{cone with chocolate ice-cream})$.

$$2 \times 2 \times 3 = 12 \text{ combinations}; \frac{1}{2}; 50\%$$

21. White and black cars come with a red, tan, or black interior. Find $P(\text{white or black car, black interior})$. **$2 \times 3 = 6 \text{ combinations}; \frac{1}{3}; 33\%$**

22. Carson packed 3 shirts (red, orange, green), 2 pants (blue, khaki), and 2 sweatshirts (solid, print). If Carson wears a shirt, a pair of pants and a sweatshirt, how many different combinations can he make? Find $P(\text{red shirt, blue pants, solid sweatshirt})$. **$3 \times 2 \times 2 = 12 \text{ combinations}; \frac{1}{12}; 8\%$**

Practice & Application

Katelyn has enough money to buy a small pizza with one topping. Thick and thin crusts cost the same price.

23. Make a tree diagram of Katelyn's choices.
24. List a sample space of her choices.
25. Find $P(\text{small pizza, thick crust})$.
26. Find $P(\text{small pizza, thick crust, pepperoni})$.

Bochi's Pizzeria		
Sizes	Crusts	Toppings
small medium large extra-large	thick thin	mushrooms olives spinach pepperoni ham extra cheese

Complete **DAILY REVIEW** b on page 461.

Experimental Probability

Experimental probability is found using data collected from an experiment or a survey. The experimental probability of an event is the number of observed occurrences of an event in relation to the total number of trials (or people surveyed).

$$P(\text{event}) = \frac{\text{number of outcomes in the event}}{\text{total number of trials}}$$

Theoretical probability tells the outcome of an experiment if all the given outcomes are equally likely to occur. The actual experimental results may not be the same as the expected (or predicted) results.

experimental probability

Exercises

Write the theoretical probability of the event when rolling a 1–6 number cube.

1. $P(5)$ **$\frac{1}{6}$ or 17%**

2. $P(3)$ **$\frac{1}{6}$ or 17%**

3. $P(6)$ **$\frac{1}{6}$ or 17%**

Use the tally chart to find the experimental probability of the event.

Write it as a fraction in lowest terms and as a percent. Answer the question.

Number Cube Rolls						
Number	1	2	3	4	5	6
Results						

10. Any variable would most likely change the outcome of experimental probability. The theoretical probability would most likely stay the same.

4. $P(1) \frac{2}{20} = \frac{1}{10}; 10\%$

7. $P(4) \frac{4}{20} = \frac{1}{5}; 20\%$

5. $P(2) \frac{3}{20}; 15\%$

8. $P(5) \frac{5}{20} = \frac{1}{4}; 25\%$

6. $P(3) \frac{5}{20} = \frac{1}{4}; 25\%$

9. $P(6) \frac{1}{20}; 5\%$

10. How would variables such as an unbalanced cube, a toss from a different angle, or the placement of each number on the cube before the toss cause a difference in the theoretical and experimental probability for the same experiment?

Use the spinner to find the probability of the event. Write it as a fraction in lowest terms and as a percent. Round to the nearest whole percent.

11. $P(\text{red}) \frac{3}{6} = \frac{1}{2}; 50\%$

14. $P(\text{blue}) \frac{2}{6} = \frac{1}{3}; 33\%$

12. $P(\text{yellow}) \frac{1}{6}; 17\%$

15. $P(\text{not blue}) \frac{4}{6} = \frac{2}{3}; 67\%$

13. $P(\text{red and blue}) 0\%;$

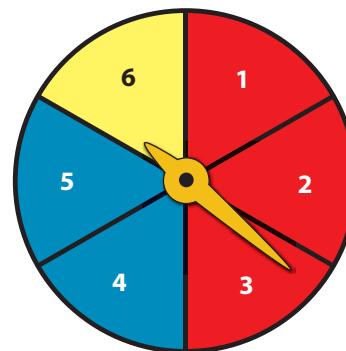
16. $P(\text{not red}) \frac{3}{6} = \frac{1}{2}; 50\%$

Spinner cannot land on 2 colors.

Use your findings in problems 11–13 to complete the following.

17. Which line plot would you expect best represents the results of an experiment that consisted of spinning the spinner 6 times? Why?

$$B; P(r) = \frac{3}{6} = \frac{1}{2}; P(b) = \frac{2}{6} = \frac{1}{3}; P(y) = \frac{1}{6}$$

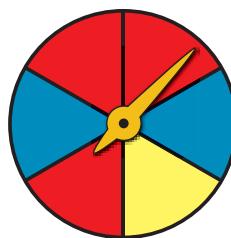


A	B	C
x x x x x x red blue yellow	x x x x x x red blue yellow	x x x x x x red blue yellow

Create a spinner similar to the model given.
Write the theoretical probability for the expected results.
Conduct the experiment and complete the table.

18. *Spinner Experiment:* Spin a paper clip on the spinner 12 times.

Theoretical Probability	Number of Trials	Expected Results	Actual Results	Experimental Probability
$P(\text{red}) = \frac{1}{2}$	12	$\frac{1}{2} = \frac{6}{12}$		
$P(\text{blue}) = \frac{1}{3}$	12	$\frac{1}{3} = \frac{4}{12}$		
$P(\text{yellow}) = \frac{1}{6}$	12	$\frac{1}{6} = \frac{2}{12}$		



Use the survey results to find the probability of the event.
Write it as a fraction in lowest terms and as a percent.
Round to the nearest whole percent.

19. $P(\text{red notebook}) \frac{3}{20}; 15\%$
 20. $P(\text{green notebook}) \frac{4}{20} = \frac{1}{5}; 20\%$
 21. $P(\text{red or blue notebook}) \frac{9}{20}; 45\%$
 22. $P(\text{mixed colors}) \frac{6}{20} = \frac{3}{10}; 30\%$

Notebook Survey

Color	Results
blue	6
red	3
green	4
mixed	6
other	1

Practice & Application

23. Five crayons (red, blue, green, yellow, and orange) were placed in a bag. Find $P(\text{orange})$. $\frac{1}{5} \text{ or } 20\%$
24. Make a list or a tree diagram to determine the sample space for flipping the same coin 3 times. Find $P(\text{at least 2 heads})$. $\{\text{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}\}; \frac{4}{8} = \frac{1}{2} \text{ or } 50\%$
25. Suppose you roll a 1–6 number cube 2 times. Use the Multiplication Counting Principle to find the number of possible outcomes. Find $P(\text{both rolls result in the same number})$. $6 \times 6 = 36 \text{ combinations}; \frac{6}{36} \text{ or } 17\%$
26. Mrs. Larson surveyed her class and found that 13 out of 25 students have brown eyes. Find $P(\text{not brown eyes})$. $\frac{12}{25} \text{ or } 48\%$
27. Mr. Hernandez surveyed his students to find their favorite type of book. He found that 37% of the class prefers historical fiction. What is $P(\text{complement})$? $P(\text{not prefer historical fiction}) = 63\%$

28. Meteorologists provide weather forecasts expressed in percents. What does the meteorologist mean by a 50% chance of rain on Monday? ***There is a 1 in 2 chance that it will rain on Monday.***
29. What percentage would a meteorologist say if $P(\text{snowstorm on Tuesday}) = \frac{3}{5}$? ***There is a 60% chance of a snowstorm on Tuesday.***
30. Write the value of n if $\frac{10}{7} = \frac{n}{21}$. ***n = 30***

31. Find the product of $15 \times 16 \times 20$. ***4,800***

32. How long will it take to travel 330 miles at a speed of 60 mph? ***5.5 hr, $5\frac{1}{2}$ hr, or 5 hr 30 min***

- J** Roll a 1–6 number cube 18 times. Draw a line plot showing the frequencies of rolling 1, 2, 3, 4, 5, and 6 during the experiment.

Answers will vary.



Number showing on number cube

Fair or Unfair?

In a **fair game**, all players are *equally likely* to win. No player has an unfair advantage. Compare the probabilities of winning for each player to determine if a game is fair.

fair game



Number Cube Roll

1. Roll a 1–6 number cube.
2. If the number is even, Player A wins.
If the number is odd, Player B wins.

Sample space: {1, 2, 3, 4, 5, 6}

$$P(\text{even}) = \frac{3}{6} = \frac{1}{2} \text{ or } 50\%$$

$$P(\text{odd}) = \frac{3}{6} = \frac{1}{2} \text{ or } 50\%$$

Since $P(\text{even}) = P(\text{odd})$, this game is fair for the two players.



Three-Coin Toss

1. Toss 3 coins.
2. If the coins match, Player A wins.
If the coins do not match, Player B wins.

Sample space: {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

$$P(\text{match}) = \frac{2}{8} = \frac{1}{4} \text{ or } 25\%$$

$$P(\text{no match}) = \frac{6}{8} = \frac{3}{4} \text{ or } 75\%$$

Since $P(\text{match}) < P(\text{no match})$, this game is unfair. The players are not equally likely to win. Player B has an unfair advantage.

Exercises

Use the spinner to find the answer.

Write the probability as a fraction in lowest terms.

1. Three players choose a color on the spinner. If the spinner lands on red, Player A wins. If it lands on blue, Player B wins. If it lands on green, Player C wins. Find $P(\text{red})$, $P(\text{blue})$, and $P(\text{green})$. Is this game fair or unfair?
 $P(\text{blue}) = \frac{1}{3}; P(\text{red}) = \frac{1}{3}; P(\text{green}) = \frac{1}{3}; \text{fair}$

2. The three players change colors. This time Player A chooses blue, and Player B chooses red. Player C does not want green again, so he chooses *not* green. Find $P(\text{blue})$, $P(\text{red})$, and $P(\text{not green})$. Is this game fair or unfair?
 $P(\text{blue}) = \frac{1}{3}; P(\text{red}) = \frac{1}{3}; P(\text{not green}) = \frac{2}{3}; \text{unfair}$

List the sample space to find the answer.

Write the probability as a fraction in lowest terms.

3. A bag contains 1 red marble and 1 blue marble. One marble is drawn from the bag. If the marble is red, Player A wins. If the marble is blue, Player B wins. Find $P(\text{drawing a red marble})$ and $P(\text{drawing a blue marble})$. Is this game fair or unfair? Explain. **Sample Space:** {r, b};
 $P(\text{red}) = \frac{1}{2}; P(\text{blue}) = \frac{1}{2}; P(\text{red}) = P(\text{blue}); \text{fair}$

4. A 1–6 number cube is rolled once. Player A wins if the number is less than 4. Player B wins if the number is greater than 4. Find $P(\text{less than } 4)$ and $P(\text{greater than } 4)$. Is this game fair or unfair?

Sample Space: {1, 2, 3, 4, 5, 6};

$$P(\text{less than } 4) = \frac{3}{6} = \frac{1}{2};$$

$$P(\text{greater than } 4) = \frac{3}{6} = \frac{1}{2};$$

$P(\text{less than } 4) > P(\text{greater than } 4); \text{unfair}$

3. **Explanation: The game is fair because each player has a 50% chance of winning.**

5. **Sample space:** {HH, HT, TH, TT};

$$P(\text{no heads}) = \frac{1}{4};$$

$$P(\text{at least 1 head}) = \frac{3}{4};$$

$P(\text{no heads}) < P(\text{at least 1 head}); \text{unfair}$

6. **Sample space:** {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT};

$$P(\text{at least 2 heads}) = \frac{4}{8} = \frac{1}{2};$$

$$P(\text{at least 2 tails}) = \frac{4}{8} = \frac{1}{2};$$

$P(\text{at least 2 heads}) = P(\text{at least 2 tails}); \text{fair}$

5. Cory and Edward have to decide who will empty the dishwasher. Edward suggests that they toss 2 coins. If no heads come up, Edward will empty the dishwasher. If at least 1 head comes up, Cory will empty the dishwasher. Find $P(\text{no heads})$ and $P(\text{at least 1 head})$ for tossing 2 coins. Is Edward's proposal fair or unfair?

6. Cory suggests that they toss 3 coins. If at least 2 heads come up, Edward will empty the dishwasher. If at least 2 tails come up, Cory will empty the dishwasher. Find $P(\text{at least 2 heads})$ and $P(\text{at least 2 tails})$ for tossing 3 coins. Is Cory's proposal fair or unfair?

The probability of event A is given. Find the complement, $P(\text{not } A)$.

7. $P(A) = \frac{6}{10}$ $P(\text{not } A) = \frac{4}{10}$

8. $P(A) = \frac{2}{3}$ $P(\text{not } A) = \frac{1}{3}$

9. $P(A) = \frac{3}{8}$ $P(\text{not } A) = \frac{5}{8}$

10. $P(A) = 35\%$ $P(\text{not } A) = 65\%$

11. $P(A) = 85\%$ $P(\text{not } A) = 15\%$

12. $P(A) = 37\%$ $P(\text{not } A) = 63\%$

A 1–6 number cube is rolled once. Write the probability of the event as a fraction in lowest terms and as a percent. Round to the nearest whole percent.

13. $P(6) \frac{1}{6}; 17\%$

14. $P(9) 0; 0\%$

15. $P(\text{odd}) \frac{1}{2}; 50\%$

16. $P(\text{a number other than } 4) \frac{5}{6}; 83\%$

17. $P(\text{a multiple of } 3) \frac{1}{3}; 33\%$

18. $P(\text{a prime number}) \frac{2}{3}; 67\%$

Solve.

19. At Peggy's Pancake House, you can order regular or whole-wheat pancakes with a choice of blueberry, strawberry, or maple syrup. How many different choices of pancakes with syrup do you have? **2 pancakes \times 3 syrups = 6 choices**

20. The combination lock on the family's storage building has 3 dials. Each dial contains the numbers 1 to 9. How many possible combinations are there for this lock? **9 digits \times 9 digits \times 9 digits = 729 combinations**

21. Tessa attempted 15 free throws and made 9 of them. What is the probability that she will be successful and make the next throw? **$\frac{9}{15} = \frac{3}{5}$ or 60%**

22. You are given 4 choices for a multiple-choice question. If you do not know the answer, what is the probability of guessing the correct answer? **$\frac{1}{4}$ or 25%**

23. You are answering a true or false question. If you do not know the answer, what is the probability of guessing the correct answer? **$\frac{1}{2}$ or 50%**

Use the survey results to write the probability as a decimal and as a percent.

Scientists use the probability of an event to make predictions. A survey using a sample of 100 sixth-graders can be used to predict the genetic traits of other sixth-graders.

Genetic Survey Results (sample = 100 students)

Trait	Dimples	Straight Hair	Attached Earlobes	Widow's Peak
Yes	40	50	30	50
No	60	50	70	50

24. $P(\text{dimples}) 0.4; 40\%$

25. $P(\text{straight hair}) 0.5; 50\%$

26. $P(\text{attached earlobes}) 0.3; 30\%$

27. $P(\text{widow's peak}) 0.5; 50\%$



Use the information given for the sample of 100 sixth-graders to predict the number of students that will and will *not* have a genetic trait. Make a chart to show your predictions for a sample of 200 students.



widow's peak



no widow's peak



attached earlobe



detached earlobe

Complete **DAILY REVIEW** **d** on page 462.

Independent & Dependent Events

A **compound event** involves two or more simple events; they can be independent or dependent. An **independent event** occurs when the sample space of one event remains the same regardless of the outcome of a previous event. A **dependent event** occurs when the outcome of one event affects the sample space of a later event. You can find the probability of a compound event by multiplying the individual theoretical probabilities.

compound event
independent event
dependent event

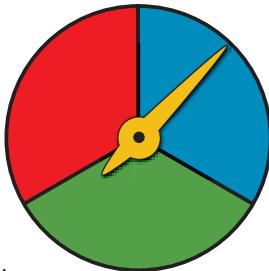
Independent Event

Alberto spins the spinner. He lands on a red section. He spins a second time and lands on blue.

Sample space for each spin:

{r, b, g}

$$P(\text{red}) = \frac{1}{3} \quad P(\text{blue}) = \frac{1}{3}$$



Find the probability of spinning red on the first spin and blue on the second spin.

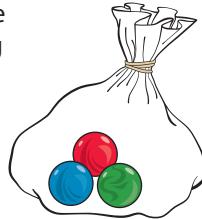
$$P(A, B) = P(A) \times P(B)$$

Sample space for 2 spins: {rr, rb, rg, bb, br, bg, gg, gr, gb}

$$P(\text{red, blue}) = \frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$$

Dependent Event

Rosalie draws a marble from the bag. She keeps the red marble and passes the bag to Jolene to draw a marble. Jolene chooses a blue marble.



Sample space for the first draw: {r, b, g}

$$P(\text{red}) = \frac{1}{3}$$

Sample space for the second draw: {b, g}

$$P(\text{blue after 1 red marble drawn}) = \frac{1}{2}$$

Find the probability of drawing a red marble followed by a blue marble.

$$P(A, B) = P(A) \times P(B \text{ after } A)$$

$$P(\text{red, blue}) = \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$$

Exercises

Write **independent** or **dependent** to describe the event.

- roll a 5 and then roll a 6 on a 1–6 number cube **independent**
- choose a soft drink and then choose a sandwich from a menu **independent**
- select a marble from a bag and return it; then select a second marble **independent**

- select a marble from a bag and keep it; then select a second marble **dependent**
- draw names from a container to form soccer teams **dependent**
- flip a coin 3 times **independent**

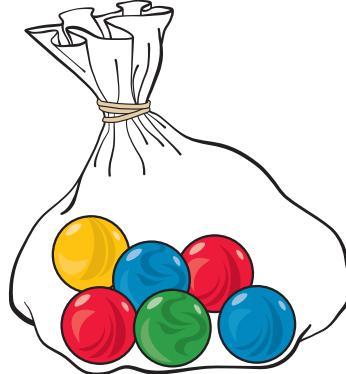
Write an equation to find the probability of the event as a fraction in lowest terms.

A marble is drawn from the bag and then replaced before the next selection.

A marble is drawn from the bag but is *not* replaced after each selection. List the sample space for each individual event.

- What is the sample space of each draw from the bag? {r, r, b, b, y, g}
- $P(\text{red, yellow}) = \frac{2}{6} \times \frac{1}{6} = \frac{2}{36} = \frac{1}{18}$
- $P(\text{yellow, green}) = \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$
- $P(\text{red, not yellow}) = \frac{2}{6} \times \frac{5}{6} = \frac{10}{36} = \frac{5}{18}$
- $P(\text{red, blue}) = \frac{2}{6} \times \frac{2}{6} = \frac{4}{36} = \frac{1}{9}$
- $P(\text{yellow, blue}) = \frac{1}{6} \times \frac{2}{6} = \frac{2}{36} = \frac{1}{18}$
- $P(\text{green, not blue}) = \frac{1}{6} \times \frac{4}{6} = \frac{4}{36} = \frac{1}{9}$

- $P(\text{red, yellow}) = \frac{1}{15}$
- $P(\text{yellow, green}) = \frac{1}{30}$
- $P(\text{red, not yellow}) = \frac{4}{15}$
- $P(\text{red, blue}) = \frac{2}{15}$
- $P(\text{yellow, blue}) = \frac{1}{15}$
- $P(\text{green, not blue}) = \frac{1}{10}$



Spin the spinner and/or roll the 1–6 number cube for the event.
Write an equation to find the probability of the event as a fraction.

20. $P(A, 2) \frac{1}{3} \times \frac{1}{6} = \frac{1}{18}$

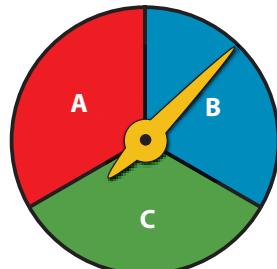


21. $P(A, B, C) \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} = \frac{1}{27}$

22. $P(B, 3, 4) \frac{1}{3} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{108}$

23. $P(B, C, 5) \frac{1}{3} \times \frac{1}{3} \times \frac{1}{6} = \frac{1}{54}$

24. Were the compound events above dependent or independent? **independent**



Write an equation to find the probability of the following dependent events.

Write the probability as a fraction in lowest terms. **Student may use calculator to find product.**

The 20 students in class were each assigned a number, 1–20. The numbers were written on slips of paper and placed in a container. The teacher drew numbers to determine which students would be grouped together for a science project. She did *not* return any numbers to the container.

25. If the numbers are *not* returned to the container, is each drawn number dependent or independent? **dependent**

26. What will happen to the number of outcomes in the sample space for each drawing?

27. $P(1, 4) \frac{1}{20} \times \frac{1}{19} = \frac{1}{380}$

28. $P(3, 17) \frac{1}{18} \times \frac{1}{17} = \frac{1}{306}$

26. ***The sample space will decrease by one name at the end of each individual event.***

29. $P(2, 6, 10) \frac{1}{16} \times \frac{1}{15} \times \frac{1}{14} = \frac{1}{3,360}$

30. $P(16, 18, 20) \frac{1}{13} \times \frac{1}{12} \times \frac{1}{11} = \frac{1}{1,716}$

31. $P(11, 12, 13, 14) \frac{1}{10} \times \frac{1}{9} \times \frac{1}{8} \times \frac{1}{7} = \frac{1}{5,040}$

32. $P(5, 7, 8, 9) \frac{1}{6} \times \frac{1}{5} \times \frac{1}{4} \times \frac{1}{3} = \frac{1}{360}$

33. What numbers are left in the container? **15, 19**

If you select 2 socks at random, find the probability of picking each pair.

Write it as a fraction in lowest terms. **Student may use calculator to find product.**

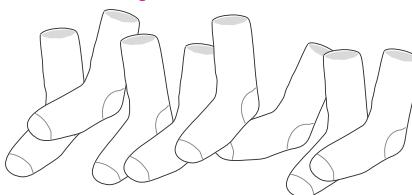
34. $P(\text{white, white}) \frac{8}{12} \times \frac{7}{11} = \frac{56}{132} = \frac{14}{33}$



35. $P(\text{white, black}) \frac{8}{12} \times \frac{4}{11} = \frac{8}{33}$

36. $P(\text{black, black}) \frac{4}{12} \times \frac{3}{11} = \frac{4}{44} = \frac{1}{11}$

37. $P(\text{black, white}) \frac{4}{12} \times \frac{8}{11} = \frac{8}{33}$



During the last 2 years in June, it rained 12 out of 60 days.

Find the probability of the independent event.

Write it as a fraction in lowest terms.

38. $P(\text{1 rain day}) \frac{12}{60} = \frac{1}{5}$ 39. $P(\text{1 rain day, 1 rain day}) \frac{1}{5} \times \frac{1}{5} = \frac{1}{25}$ 40. $P(\text{1 rain day, 1 no-rain day})$

41. $P(\text{1 no-rain day}) \frac{48}{60} = \frac{4}{5}$ 42. $P(\text{1 no-rain day, 1 no-rain day})$

$\frac{4}{5} \times \frac{4}{5} = \frac{16}{25}$

$\frac{1}{5} \times \frac{4}{5} = \frac{4}{25}$

43. $P(\text{1 no-rain day, 1 rain day})$

$\frac{4}{5} \times \frac{1}{5} = \frac{4}{25}$

CHAPTER 16 REVIEW

A marble is drawn from the pictured bag.
Write the probability of the event as a fraction and as a percent.

1. $P(\text{green}) \frac{1}{10}; 10\%$

4. $P(\text{blue}) \frac{3}{10}; 30\%$

2. $P(\text{red}) \frac{4}{10}; 40\%$

5. $P(\text{yellow}) \frac{2}{10}; 20\%$

3. $P(\text{either red or blue}) \frac{7}{10}; 70\%$

6. $P(\text{not green}) \frac{9}{10}; 90\%$



Use the spinner to find the probability of the event.

Write it as a fraction in lowest terms and as a percent.

7. $P(\text{blue}) \frac{1}{3}; 33\%$

11. $P(\text{red}) \frac{1}{2}; 50\%$

8. $P(\text{green}) \frac{1}{6}; 17\%$

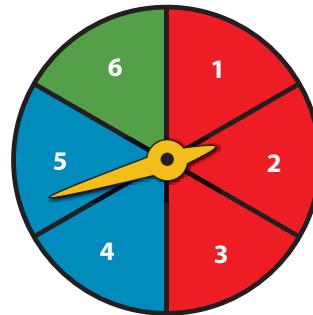
12. $P(\text{odd}) \frac{1}{2}; 50\%$

9. $P(\text{red and odd}) \frac{1}{3}; 33\%$

13. $P(\text{red or blue}) \frac{5}{6}; 83\%$

10. $P(\text{not blue}) \frac{2}{3}; 67\%$

14. $P(\text{multiple of 2}) \frac{1}{2}; 50\%$



The probability of event A is given. Find the complement, $P(\text{not } A)$.

15. $P(A) = \frac{1}{4} \quad \frac{3}{4}$

16. $P(A) = \frac{1}{5} \quad \frac{4}{5}$

17. $P(A) = 20\% \quad 80\%$

Make a list or a tree diagram to find the possible outcomes.

Write the probability as a fraction in lowest terms.

18. Moriah has a spinner with 2 equal sections labeled A and B and another spinner with 3 equal sections labeled 1, 2, and 3. If she spins both spinners, what is the probability of the outcome being B and an odd number? $\frac{1}{3}$

19. Reuben has a spinner with 3 equal sections labeled A, B, and C and another spinner with 3 equal sections labeled 1, 2, and 3. If he spins both spinners, what is the probability of the outcome being A and an odd number? $\frac{2}{9}$

Make a list or a tree diagram to find the sample space for the game.
Write the probability as a fraction in lowest terms. Determine whether the game is fair or unfair.

22. A spinner has 2 equal sections of yellow (y) and green (g). Spin the spinner 2 times. Player A wins if the spinner lands on yellow 2 times. Player B wins if it lands on green at least 1 time. What is the probability of both spins being yellow? What is the probability of at least one spin being green? Is this game fair or unfair?

$P(\text{yellow and yellow}) = \frac{1}{4}$

$P(\text{at least 1 green}) = \frac{3}{4}; \text{unfair}$

20. Luis has a spinner with 2 equal sections labeled A and B and a number cube labeled 1–6. If he rolls the number cube and spins the spinner, what is the probability of the outcome being A and an even number? $\frac{1}{4}$

21. A spinner has 2 equal sections of red (r) and blue (b). If you spin the spinner 2 times, what is the probability of landing on blue exactly 2 times? $\frac{1}{4}$

23. A 1–6 number cube is rolled once. Player A wins if the number is less than 4. Player B wins if the number is greater than 3. What is the probability of rolling a number less than 4? What is the probability of rolling a number greater than 3? Is this game fair or unfair?

$P(\text{is less than 4}) = \frac{1}{2}$

$P(\text{is greater than 3}) = \frac{1}{2}; \text{fair}$

Use the Multiplication Counting Principle to find the number of possible outcomes.

24. Damien is buying an ice-cream sundae. He has a choice of ice cream (vanilla, chocolate, or strawberry), a choice of syrup (chocolate, caramel, or strawberry), and a choice of one topping (nuts, chocolate chips, gummy bears, or whipped cream). How many different combinations does Damien have to choose from?

$$3 \text{ ice creams} \times 3 \text{ syrups} \times 4 \text{ toppings} = 36 \text{ combinations}$$

Use the menu to find the answer.

26. At the Pasta Palace, you can choose the shape and type of pasta, as well as the sauce. How many different combinations do the customers have to choose from?

$$3 \text{ pastas} \times 3 \text{ types} \times 3 \text{ sauces} = 27 \text{ combinations}$$

27. What is the probability that a customer will order pasta made with spinach? $\frac{9}{27} = \frac{1}{3} \text{ or } 33\%$

28. What is the probability that a customer will order pasta with the Classic Italian sauce? $\frac{9}{27} = \frac{1}{3} \text{ or } 33\%$

29. What is the probability that a customer will order egg fettuccine with Alfredo sauce? $\frac{1}{27} \text{ or } 4\%$

Write the probability as a percent.

Round to the nearest whole percent.

30. Mateo scored a field goal in 6 out of 10 games. What is the probability that he will score a field goal in today's game? $\frac{6}{10} = 60\%$

31. There are 11 boys and 14 girls in the school choir. What would be the probability of drawing a girl's name from a container having the names of all the choir members? $\frac{14}{25} = 56\%$

25. Elisa is buying a milkshake. She has a choice of ice cream (vanilla or chocolate) and a choice of add-ins (candies, cookie crumbles, mint pieces, chocolate chips, or caramel). How many different combinations does Elisa have to choose from?

$$2 \text{ ice creams} \times 5 \text{ add-ins} = 10 \text{ combinations}$$

Pasta Palace		
Pasta	Type	Sauce
Spaghetti	Egg	Classic Italian
Linguini	Wheat	Alfredo
Fettuccine	Spinach	Pesto

$$P(\text{glasses}) = \frac{6}{20}$$

$$P(\text{not glasses}) = \frac{14}{20} = 70\%$$

32. Mrs. Reed surveyed her class and found that 6 out of 20 students wear glasses. Find the complement of students *not* wearing glasses.

33. Lisa bought a bag of beads to make jewelry. All the beads are the same size and shape. There are 3 silver beads, 7 gold beads, and 5 white beads. What is the probability that the first bead Lisa pulls out of the bag will *not* be gold? $\frac{8}{15} \approx 53\%$

Use the survey results to find the probability of favorite books.

Write the probability as a fraction and as a percent.

$$34. P(\text{mystery}) = \frac{8}{20} \text{ or } \frac{2}{5}; 40\%$$

$$35. P(\text{historical fiction}) = \frac{6}{20} \text{ or } \frac{3}{10}; 30\%$$

$$36. P(\text{fantasy}) = \frac{4}{20} \text{ or } \frac{1}{5}; 20\%$$

$$37. P(\text{nonfiction}) = \frac{2}{20} \text{ or } \frac{1}{10}; 10\%$$

Use the survey results to predict the type of book chosen in a group of 100 people.

38. How many people would choose mysteries as their favorite type of book? $\frac{8}{20} = \frac{n}{100}; n = 40 \text{ people}$

39. How many people would choose historical fiction? $\frac{6}{20} = \frac{n}{100}; n = 30 \text{ people}$

40. How many people would choose nonfiction?

$$\frac{2}{20} = \frac{n}{100}; n = 10 \text{ people}$$

Survey Results (sample = 20 people)	
Book Type	Results
Mystery	8
Historical Fiction	6
Fantasy	4
Nonfiction	2

CUMULATIVE REVIEW

Test Prep

Mark the answer.

1. What is 10^6 in standard form?

A. 10,000 C. 1,000,000
B. 100,000 D. none of the above

2. Round 67.39788 to the nearest ten thousandth.

A. 67.3979 C. 67.3988
B. 67.3980 D. none of the above

3. The fraction $\frac{13}{20}$ is closest to what point on the number line?



A. 0 C. 1
B. $\frac{1}{2}$ D. $1\frac{1}{2}$

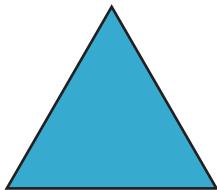
4. Which best describes the figures?



A. obtuse angles C. congruent figures
B. similar figures D. all of the above

5. What two words identify the type of triangle?

A. acute, equilateral
B. right, isosceles
C. scalene, obtuse
D. none of the above



6. How many pieces of ribbon 12.5 cm long can Jaclyn cut from a piece 145 cm long?

A. 11 pieces C. 12 pieces
B. 13 pieces D. 14 pieces

7. Leah paid \$25.95 for a new coat. If she gave the cashier forty dollars, what was her change?

A. \$12.05 C. \$13.05
B. \$14.05 D. \$11.05

8. Grandfather's house is $104\frac{7}{10}$ km from Finn's house. If Finn's family drove $60\frac{1}{2}$ km before lunch, how many more kilometers will they need to drive after lunch to reach Grandfather's house?

A. $42\frac{1}{2}$ km C. $43\frac{1}{10}$ km
B. $44\frac{1}{5}$ km D. $44\frac{4}{5}$ km

9. How many hours are in 420 minutes?

A. 6 hours C. 7 hours
B. 8 hours D. 9 hours

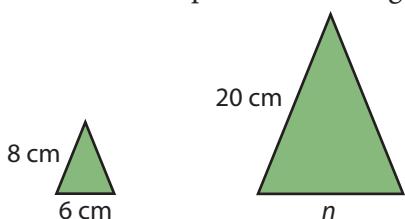
10. What is the mean temperature for the park for the given months?

Monthly Average High Temperature for Bryce Canyon National Park				
May	June	July	August	September
63°F	75°F	80°F	77°F	72°F

A. 72.8°F C. 77.3°F
B. 73.4°F D. 78°F

Mark the answer.

11. Use a proportion to find the unknown measure for the pair of similar figures.



- A. $n = 15$ cm
B. $n = 32$ cm
C. $n = 24$ cm
D. none of the above

12. Rename $\frac{32}{48}$ in lowest terms.

- A. $\frac{1}{3}$
B. $\frac{3}{7}$
C. $\frac{2}{5}$
D. $\frac{2}{3}$

13. What is the least common multiple of 14 and 21?

- A. 35
B. 49
C. 42
D. 60

- 14.

$$\frac{9}{10} \div 3$$

- A. $\frac{1}{10}$
B. $\frac{3}{10}$
C. $\frac{3}{5}$
D. $\frac{1}{2}$

15. Estimate the sum.

$$1\frac{6}{14} + 2\frac{7}{12}$$

- A. 1
B. 2
C. 4
D. 5

16. Find an equivalent ratio for $\frac{11}{12}$.

- A. $\frac{30}{36}$
B. $\frac{44}{48}$
C. $\frac{55}{56}$
D. $\frac{90}{100}$

17. $25 - 7 \times 2 + 44$

- A. 35
B. 40
C. 50
D. 55

- 18.

$$34) \overline{6,908}$$

- A. $203\frac{6}{34}$
B. $203\frac{3}{17}$
C. $213\frac{3}{34}$
D. $230\frac{1}{34}$

- 19.

$$100 \times 365.93$$

- A. 36,593
B. 0.35993
C. 3.5993
D. none of the above

- 20.

$$85 \times 6.051 \text{ g}$$

- A. 51435 g
B. 514.335 g
C. 514.005 g
D. 5143.35 g

Use the data from the stem-and-leaf plot to find the answer.

Ages of the First 44 United States Presidents at Inauguration

Stem	Leaf
4	2 3 6 6 7 7 8 9 9
5	0 1 1 1 1 1 2 2 4 4 4 4 5 5 5 6 6 6 7 7 7 7 8
6	0 1 1 1 2 4 4 5 8 9

Key 4|2 = 42

21. What is the age of the youngest president?

- A. 40 C. 49
B. 42 D. 50

24. What ages show the mode?

- A. 51 and 54 C. 51 and 61
B. 56 and 57 D. 54 and 57

22. What age is the median?

- A. 52 C. $54\frac{1}{2}$
B. 54 D. 55

25. The oldest president served 8 years as president. How old was he at the end of his term?

- A. 66 C. 75
B. 68 D. 77

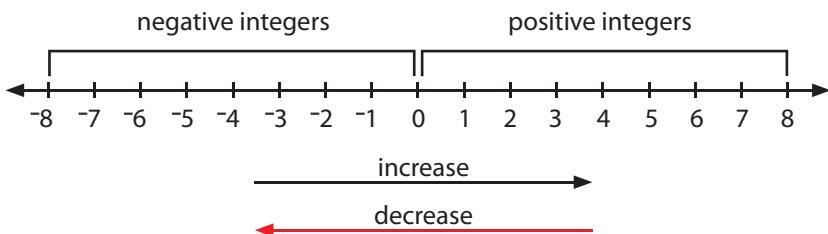
23. What is the range of ages?

- A. 20 C. 30
B. 27 D. 32

Integers

Integers consist of whole numbers and their opposites.

{... -3, -2, -1, 0, 1, 2, 3 ...}



integers
opposites
absolute value

The values of negative numbers continue to *decrease* as you move left on a number line.

$$-6 < -3$$

$$-8 < -7$$

$$-2 > -4$$

The value of a negative number will always be *less than* the value of a positive number.

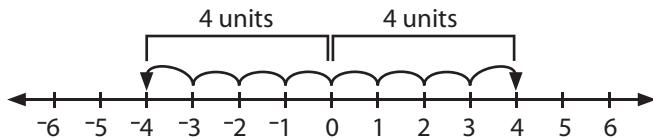
$$1 > -5$$

$$-3 < 2$$

$$7 > -7$$

The numbers 4 and -4 are **opposites** because they are the same distance from zero in opposite directions. **Absolute value** is the distance from zero. Distance is expressed as a positive value. It is indicated by the symbol $|n|$ and is read "the absolute value of n ".

- |4| The absolute value of 4 is 4.
|-4| The absolute value of negative 4 is 4.



Exercises

Draw a number line and mark the integer.

1. 5

2. -3

3. -5

4. 2

5. -1

Write the integer.

6. eighty feet below sea level
-80 feet

7. twelve degrees above zero
12°

8. a golf score of 7 under par
-7

Write a comparison sentence using $>$ or $<$.

9. $-3 < 1$

10. $-5 < 5$

11. $0 > -4$

12. $4 > -4$

13. $8 < 11$

14. $8 > -9$

15. $-11 < -10$

16. $-2 > -6$

17. $-17 < -12$

18. $20 > -25$

Write the integers from *least to greatest*.

19. **-9 12 10 -5**
-9 -5 10 12

22. **10 -5 4 -3**
-5 -3 4 10

20. **1 -2 -8 -3**
-8 -3 -2 1

23. **-6 -8 5 1**
-8 -6 1 5

21. **17 -15 -1 12**
-15 -1 12 17

24. **14 -16 16 -15**
-16 -15 14 16

Write the opposite of the given integer.

25. 17 **-17**

26. -8 **8**

27. -15 **15**

28. -9 **9**

29. 12 **-12**

30. -1 **1**

Draw a number line to show the given number and its opposite.

31. -8

32. 6

33. -9

Find the absolute value.

34. $|-5|$ **5**

35. $|12|$ **12**

36. $|-1|$ **1**

37. $|-7|$ **7**

38. $|3|$ **3**

39. $|10|$ **10**

40. $|-21|$ **21**

41. $|18|$ **18**

42. $|-13|$ **13**

43. $|-84|$ **84**

Practice & Application

44. Write the integer that is one *greater than* -8 . **-7**

49. 8^3 **512**

45. Write the integer that is one *less than* -4 . **-5**

50. 100×3.42 **342**

46. Write the absolute value of -14 . **14**

51. $16.8 \div 1,000$ **0.0168**

47. Write the absolute value of 10 . **10**

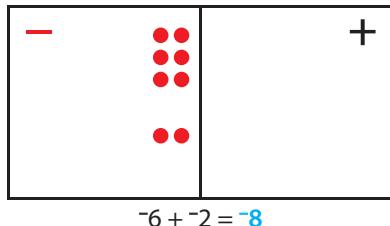
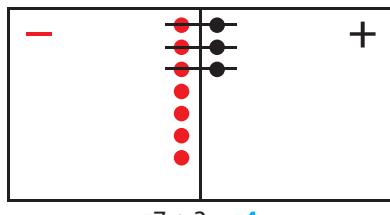
J Explain the equation $|-18| = 18$.
The absolute value of -18 is 18.

48. $\sqrt{144}$ **12**

Add Integers

Add Integers Using an Algebra Mat

1. Draw the first addend on the mat.
2. Draw the second addend on the mat.
3. A positive counter and a negative counter cancel each other out to make zero. $1 + -1 = 0$
4. The answer is the number of counters that have *not* been cancelled out.



Exercises

Draw an algebra mat to find the sum.

1. $-5 + 2$ **-3**

2. $-7 + -2$ **-9**

3. $7 + 4$ **11**

4. $-4 + 8$ **4**

Add. Use an algebra mat and counters if needed.

5. $8 + -3$ **5**

11. $7 + -7$ **0**

6. $-2 + -4$ **-6**

12. $4 + -2$ **2**

7. $-5 + 2$ **-3**

13. $12 + -7$ **5**

8. $2 + -9$ **-7**

14. $-15 + 8$ **-7**

9. $-8 + 5$ **-3**

15. $-8 + -6$ **-14**

10. $-6 + -5$ **-11**

16. $7 + -12$ **-5**

Write a comparison sentence using $>$, $<$, or $=$.

17. $1 + 5 < 12 + -4$ **$6 < 8$**

22. $-5 + -2 < -1 + -4$ **$-7 < -5$**

18. $-4 + -1 > -8 + 2$ **$-5 > -6$**

23. $3 + 1 = -2 + 6$ **$4 = 4$**

19. $5 + 4 > -14 + 6$ **$9 > -8$**

24. $7 + -2 > -1 + -4$ **$5 > -5$**

20. $7 + -1 = 9 + -3$ **$6 = 6$**

25. $-4 + 4 = -2 + 2$ **$0 = 0$**

21. $-1 + 1 < 2 + -1$ **$0 < 1$**

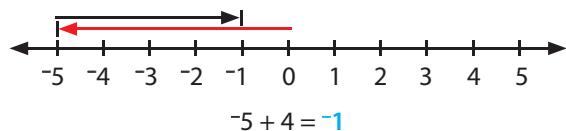
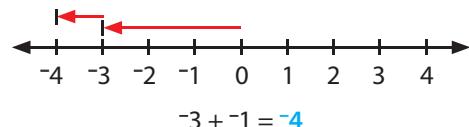
26. **(26)** $|-6| + 2 > 4 + -4$

Death Valley, California, is the lowest point in North America, with an elevation of -282 feet below sea level.



Add Integers Using a Number Line

1. Begin at 0.
2. Draw an arrow to the first addend.
3. From the first addend, draw a second arrow *right* to add a positive number or *left* to add a negative number.
4. The final stopping place is the sum.



Exercises

Draw a number line to find the sum.

27. $4 + 1$ **5**

28. $-4 + 2$ **-2**

29. $-1 + -2$ **-3**

30. $-3 + 6$ **3**

Add. Use a number line if needed.

31. $-5 + -3$ **-8**

34. $5 + 3$ **8**

37. $8 + -6$ **2**

32. $-6 + 1$ **-5**

35. $-4 + 3$ **-1**

38. $-7 + -6$ **-13**

33. $7 + -4$ **3**

36. $-5 + 7$ **2**

39. $5 + -5$ **0**

Write a positive or a negative integer to match the sentence.

40. Leslie scored 2 soccer goals. **2 goals**

41. The temperature was twelve degrees below zero.

-12°

42. The city is seven feet below sea level. **-7 ft**

43. Marcy lost ten pounds last month. **-10 lb**

Practice & Application

44. The water in the lake was 10 feet below normal. A drought caused the level to drop 2 more feet. Write an addition equation using integers to show the water level in the lake. **$-10 + -2 = -12 \text{ ft}$**

47. Jared's cell phone company automatically charges his bank account \$45.00 each month. How much money has the company deducted after a 6-month period? **$6 \times \$45.00 = \270.00**

45. Reed scored 2 strokes under par (-2) on his first game in the golf tournament. He scored 4 strokes under par (-4) on his second game. Write an addition equation using integers to show his total score for the two games. **$-2 + -4 = -6$**

48. Write the prime factorization for 132 using exponents. **$2^2 \cdot 3 \cdot 11$**

46. Chris and his friends played a game of charades, subtracting points from a team whenever someone spoke while acting. Chris spoke during both rounds of the game, losing 5 points in Round 1 and 7 points in Round 2. What addition equation shows the point loss?
 $-5 + -7 = -12 \text{ points}$

49. What is the value of $2^3 \cdot 3^2 \cdot 5$? **$8 \times 9 \times 5 = 360$**

50. Write *prime* or *composite* to identify the number.

51 78 97

**51: composite; 78: composite;
97: prime**

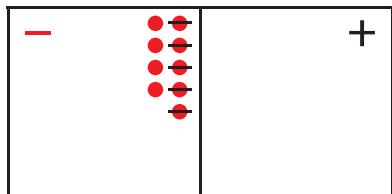


Find the sum of $8 + -5$. What subtraction equation can be written to show the same equation? **$8 + -5 = 3; 8 - 5 = 3$**

Subtract Integers

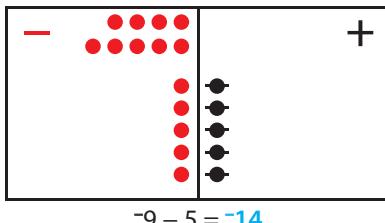
Subtract Integers Using an Algebra Mat

1. Put the minuend (the total) on the mat.
2. Cross out the subtrahend counters (the number being subtracted).
3. If there are not enough counters to subtract, draw pairs of positive and negative counters on the mat until the subtrahend can be subtracted (the Zero Principle).
4. The answer is the number of counters that have *not* been cancelled out.



Zero Principle
A number may be renamed by adding or subtracting 0 without changing the value of that number.

Zero Principle



Exercises

Draw an algebra mat to find the difference.

1. $3 - 7 = \textcolor{red}{-4}$

2. $\textcolor{red}{-}5 - 3 = \textcolor{red}{-8}$

3. $8 - \textcolor{red}{-}2 = \textcolor{red}{10}$

4. $\textcolor{red}{-}7 - \textcolor{red}{-}2 = \textcolor{red}{-5}$

Subtract. Use an algebra mat and counters if needed.

5. $4 - 7 = \textcolor{red}{-3}$

8. $\textcolor{red}{-}2 - \textcolor{red}{-}7 = \textcolor{red}{5}$

11. $\textcolor{red}{-}8 - \textcolor{red}{-}4 = \textcolor{red}{-4}$

14. $\textcolor{red}{-}7 - 9 = \textcolor{red}{-16}$

6. $\textcolor{red}{-}6 - \textcolor{red}{-}4 = \textcolor{red}{-2}$

9. $\textcolor{red}{-}10 - 2 = \textcolor{red}{-12}$

12. $2 - 8 = \textcolor{red}{-6}$

15. $3 - 6 = \textcolor{red}{-3}$

7. $4 - \textcolor{red}{-}2 = \textcolor{red}{6}$

10. $10 - \textcolor{red}{-}4 = \textcolor{red}{14}$

13. $\textcolor{red}{-}6 - 4 = \textcolor{red}{-10}$

16. $\textcolor{red}{-}8 - \textcolor{red}{-}3 = \textcolor{red}{-5}$

Solve.

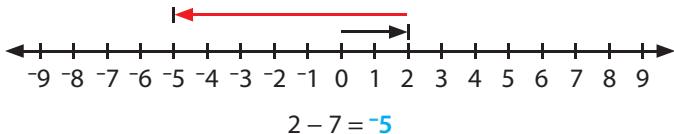
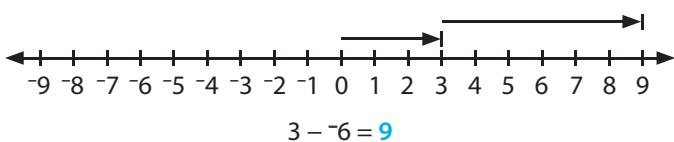
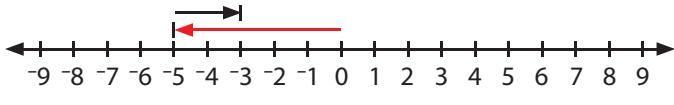
17. Mr. Perry's golf score was 6 strokes under par. Jason's score was 6 strokes over par. Write a subtraction equation using integers to find the difference between Mr. Perry's score and Jason's score. **$6 - \textcolor{red}{-}6 = 12 \text{ strokes difference}$**

18. Trey shot his bow and arrow 7 times at the target. He missed the bull's eye 4 times. Write a subtraction equation to show how many times Trey hit the bull's eye. **$7 - 4 = 3 \text{ times}$**



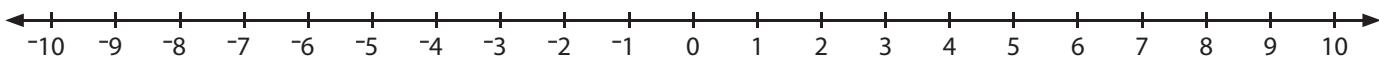
Subtract Integers Using a Number Line

1. Begin at 0 and draw an arrow to the minuend (the total).
2. Draw a second arrow from the minuend. Draw the arrow *left* of the minuend to subtract a positive number or *right* of the minuend to subtract a negative number.
3. The final stopping place is the difference.



Exercises

Use the number line to solve the equation.



- 19.** $-6 - -10$ **4** **20.** $2 - -2$ **4** **21.** $-7 - -1$ **-6** **22.** $6 - 8$ **-2** **23.** $-3 - 5$ **-8** **24.** $7 - -2$ **9**
25. $1 - 4$ **-3** **26.** $-3 - 7$ **-10** **27.** $10 - 5$ **5** **28.** $4 - -4$ **8** **29.** $-6 - 3$ **-9** **30.** $3 - 8$ **-5**

Add. Use an algebra mat and counters or a number line if needed.

- 31.** $7 + -2$ **5** **34.** $-5 + -3$ **-8** **37.** $-2 + 4$ **2**
32. $4 + -4$ **0** **35.** $-6 + -1$ **-7** **38.** $-7 + 2$ **-5**
33. $8 + -4$ **4** **36.** $-1 + -8$ **-9** **39.** $5 + -3$ **2**

Practice & Application

- 40.** How many inches are in $3\frac{3}{4}$ yards? **$\frac{15}{4} \times 36 = 135$ in.**

- 41.** Write the numbers from *least* to *greatest*.

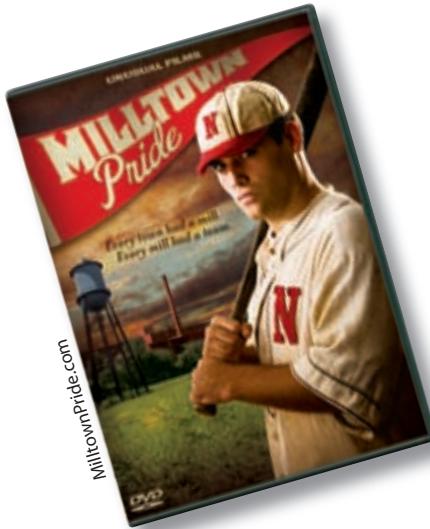
5.76	$\sqrt{25}$	$\frac{17}{3}$	$5\frac{3}{4}$	25	$\frac{17}{3}$	$5\frac{3}{4}$	5.76
------	-------------	----------------	----------------	----	----------------	----------------	------

- 42.** Write a comparison sentence using $<$ to compare 800.01 and 800.009. **$800.009 < 800.01$**

- 43.** Solve the equation using the Order of Operations.

$15 + 3 \times 8 \div 2^2 - 7$	$15 + 24 \div 4 - 7 = 15 + 6 - 7 = 14$
--------------------------------	--

- 44.** Write 17,301 in word form and in expanded form.
seventeen thousand, three hundred one
 $10,000 + 7,000 + 300 + 1$



- 45.** The *Milltown Pride* film is $2\frac{1}{4}$ hours long. How many minutes long is the film? **$\frac{9}{4} \times 60 = 135$ min**

- J** The weatherman said that the temperature was 79°F . Write a subtraction equation to show what the temperature will be if it drops 15° as expected. Use integers to write an addition equation.

$79^\circ - 15^\circ = 64^\circ\text{F}; 79^\circ + -15^\circ = 64^\circ\text{F}$

Complete **DAILY REVIEW** **C** on page 464.

Add & Subtract Integers

1. Start at 0 and move 7 units to the right.

2. Move 3 units to the left to **subtract 3**.

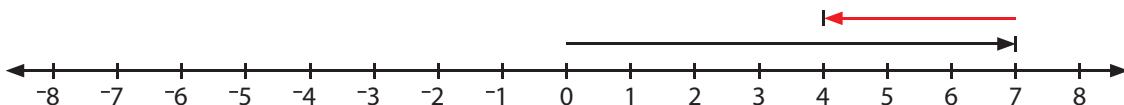
or

Move 3 units to the left to **add -3**.

$$7 - 3 = 4$$

$$7 + -3 = 4$$

Subtracting a number is the same as adding its opposite.
The opposite of 3 is -3.



Exercises

Write the opposite of the given integer.

1. 8 **-8**

2. -1 **1**

3. -12 **12**

4. 4 **-4**

5. -7 **7**

Solve.

6. $4 - 9 = \textcolor{magenta}{-5}$

11. $7 - -2 = \textcolor{magenta}{9}$

16. $1 + -9 = \textcolor{magenta}{-8}$

21. $3 + -3 = \textcolor{magenta}{0}$

7. $-1 - 3 = \textcolor{magenta}{-4}$

12. $-13 - 8 = \textcolor{magenta}{-21}$

17. $-5 + -2 = \textcolor{magenta}{-7}$

22. $8 + 7 = \textcolor{magenta}{15}$

8. $7 - 5 = \textcolor{magenta}{2}$

13. $-9 - -11 = \textcolor{magenta}{2}$

18. $1 + -8 = \textcolor{magenta}{-7}$

23. $-1 + -3 = \textcolor{magenta}{-4}$

9. $-11 - -7 = \textcolor{magenta}{-4}$

14. $6 - 10 = \textcolor{magenta}{-4}$

19. $-6 + 2 = \textcolor{magenta}{-4}$

24. $2 + -1 = \textcolor{magenta}{1}$

10. $-8 - -3 = \textcolor{magenta}{-5}$

15. $12 - -7 = \textcolor{magenta}{19}$

20. $-2 + 11 = \textcolor{magenta}{9}$

25. $-9 + -11 = \textcolor{magenta}{-20}$

Write an addition equation for the subtraction equation. Solve.

26. $-8 - 4 = \textcolor{magenta}{-8} + \textcolor{magenta}{-4} = \textcolor{magenta}{-12}$

27. $3 - 5 = \textcolor{magenta}{3} + \textcolor{magenta}{-5} = \textcolor{magenta}{-2}$

28. $-12 - 5 = \textcolor{magenta}{-12} + \textcolor{magenta}{-5} = \textcolor{magenta}{-17}$

29. $-10 - -3 = \textcolor{magenta}{-10} + \textcolor{magenta}{3} = \textcolor{magenta}{-7}$

30. $2 - 7 = \textcolor{magenta}{2} + \textcolor{magenta}{-7} = \textcolor{magenta}{-5}$

31. $9 - -5 = \textcolor{magenta}{9} + \textcolor{magenta}{5} = \textcolor{magenta}{14}$

DID YOU KNOW

The word *infinite* indicates something that goes on forever. The love of God is infinite. The symbol ∞ represents infinity. It can be used to show that a series of numbers continues forever. The set of integers can be written: $\infty, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, \infty$.

The mercy [lovingkindness] of the Lord is from everlasting to everlasting upon them that fear him.

Psalm 103:17



Write a comparison sentence using $>$, $<$, or $=$.

32. $3 + -1 > 2 - 3$ $2 > -1$

33. $-8 + -2 < 5 - 5$ $-10 < 0$

34. $3 - 4 > 2 - 4$ $-1 > -2$

35. $-5 - 2 = -3 + -4$ $-7 = -7$

36. $1 - 6 > 5 + -12$ $-5 > -7$

37. $-1 - 1 < 4 + -4$ $-2 < 0$

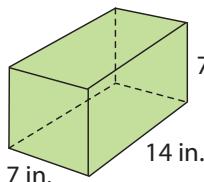
Practice & Application

38. In three days a certain stock on the stock market lost 4 points, gained 2 points, and then lost 7 points. What was the total change in three days?
 $-4 + 2 - 7 = -9$ points or $-4 + 2 + -7 = -9$ points

39. Stacie attended a coin show. She sold 10 of her duplicate coins in order to buy 2 coins she did not have in her collection. If Stacie began with 25 coins, how many does she have now?

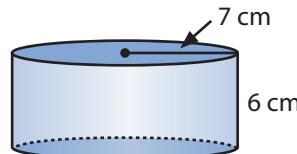
$25 - 10 + 2 = 17$ coins or $25 + -10 + 2 = 17$ coins

40. Find the surface area of the rectangular prism.



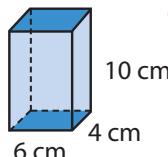
$4(14 \text{ in.} \times 7 \text{ in.}) = 392 \text{ in.}^2$
 $2(7 \text{ in.} \times 7 \text{ in.}) = 98 \text{ in.}^2$
 $\text{Surface Area} = 490 \text{ in.}^2$

41. Find the surface area of the cylinder.



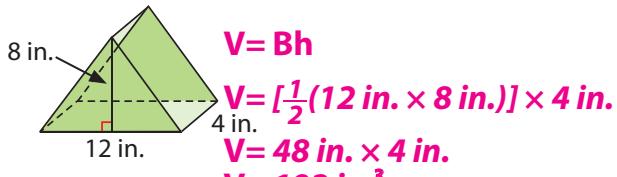
$2(3.14 \cdot 7 \text{ cm}^2) = 307.72 \text{ cm}^2$
 $(3.14 \cdot 14 \text{ cm}) \cdot 6 \text{ cm} = 263.76 \text{ cm}^2$
 $\text{Surface Area} = 571.48 \text{ cm}^2$

42. Find the volume of the rectangular prism.



$10 \text{ cm} \times 4 \text{ cm} \times 6 \text{ cm} = 240 \text{ cm}^3$

43. Find the volume of the triangular prism.



$V = Bh$

$V = [\frac{1}{2}(12 \text{ in.} \times 8 \text{ in.})] \times 4 \text{ in.}$
 $V = 48 \text{ in.} \times 4 \text{ in.}$
 $V = 192 \text{ in.}^3$

44. Solve the equation $c \div 21 = 250$. $c = 5,250$

45. Find the product of 205×36 . $7,380$

46. Write 9,843.067 in expanded form using multiplication and powers of 10.

47. Find the quotient of $1\frac{7}{8} \div \frac{3}{4}$. $\frac{15}{8} \times \frac{4}{3} = \frac{5}{2} = 2\frac{1}{2}$

- J Explain the statement *The subtraction of an integer is the same as adding its opposite*. Use the equation $-10 - 6 = -16$. $-10 - 6 = -16$ is the same as $-10 + -6 = -16$

46. $(9 \times 10^3) + (8 \times 10^2) + (4 \times 10^1) + (3 \times 10^0) + (6 \times \frac{1}{10^2}) + (7 \times \frac{1}{10^3})$



Complete **DAILY REVIEW** d on page 464.

More Integers

Exercises

Use the data from the chart to find the answer.

- At 6:30 AM the temperature was -10°F . Two hours later the temperature had risen 8 degrees. What was the temperature at 8:30 AM?
 $-10^{\circ} + 8^{\circ} = -2^{\circ}\text{F}$
- From 6:30 AM to 9:30 AM there was a rise in temperature of 10° . What was the temperature at 9:30 AM? $-10^{\circ} + 10^{\circ} = 0^{\circ}\text{F}$
- What was the difference in temperature from 12:30 PM to 6:30 PM? $10^{\circ} - -2^{\circ} = 12^{\circ}$
- At 2:30 PM the temperature was 12°F . How much did the temperature decrease by 6:30 PM?
 $12^{\circ} - -2^{\circ} = 14^{\circ}$
- Find the difference between the highest and the lowest temperatures recorded for January 5.
 $12^{\circ} - -10^{\circ} = 22^{\circ}$ difference

Temperature Readings January 5	
Time	Temperature
6:30 AM	-10°F
7:30 AM	-7°F
8:30 AM	
9:30 AM	
10:30 AM	3°F
11:30 AM	8°F
12:30 PM	10°F
1:30 PM	12°F
2:30 PM	12°F
3:30 PM	10°F
4:30 PM	5°F
5:30 PM	0°F
6:30 PM	-2°F

Solve.

- Chad's golf score was 2 under par through the 16th hole. On the 17th hole, he shot 2 over par. What was Chad's net score?
par or zero; $-2 + 2 = 0$
- A football team lost 10 yards on their first down of the third quarter. They gained 5 yards on their next down. What was their total loss or gain?
 $-10 + 5 = -5$ yards; 5 yard loss
- Ashley had 17 beads. She lost 3 beads and used 8 beads to make a bracelet. How many beads did Ashley have left? **$17 - 3 - 8 = 6$ beads**
- A scuba diver went 25 feet below the surface of the water. If he swims up 8 feet, what will his depth be?
 $-25 + 8 = -17$; 17 feet below sea level



Alvin is the deep-sea submersible that carried three men 2.5 miles below sea level to the sunken *Titanic*.

Write a comparison sentence using **>** or **<**.

10. $-3^{\circ}\text{F} > -5^{\circ}\text{F}$

13. $-1^{\circ}\text{C} > -3^{\circ}\text{C}$

16. $0^{\circ}\text{F} < 1^{\circ}\text{F}$

11. $-23^{\circ}\text{F} < 23^{\circ}\text{F}$

14. $-18^{\circ}\text{C} < 18^{\circ}\text{C}$

17. $5^{\circ}\text{C} > 4^{\circ}\text{C}$

12. $0^{\circ}\text{F} > -1^{\circ}\text{F}$

15. $-2^{\circ}\text{C} < -1^{\circ}\text{C}$

18. $-1^{\circ}\text{F} < 1^{\circ}\text{F}$

Practice & Application

19. Margo had \$100 in her checking account. She made an error and wrote a check for \$125. What was her balance after the check was written?

What is her debt? $\$100 - \$125 = -\$25$;
Margo's debt is \$25

20. If Margo's account requires a minimum balance of \$25.00 at all times, how much money must she deposit to reach her minimum balance?

$\$25.00 - -\$25.00 = \$50.00$

21. In one possession a football team gained 8 yards, lost 4 yards, lost 3 yards, and gained 2 yards.

What was the total loss or gain? $8 - 4 - 3 + 2 = 3\text{-yd gain}$ or $8 + -4 + -3 + 2 = 3\text{-yd gain}$

22. Brett's team scored 15 points and then lost 35. Hudson's team lost 45 points and then gained 30. Whose team won? By how many points did they win?

23. Rachel's baby sister weighed 8 pounds when she was born. When she came home from the hospital, she lost 2 pounds. At her first week check-up, she had gained back 1 pound. How much does Rachel's sister weigh now?

$8 - 2 + 1 = 7\text{ lb}$ or $8 + -2 + 1 = 7\text{ lb}$

24. Evan played golf while on vacation. On his first game he scored 5 strokes over par, which is written as $+5$ on his score card. On his second game he scored 1 stroke under par, which is written as -1 on his score card. What is the difference between his two scores?

$+5 - -1 = 6\text{ strokes}$

25. If there is a 40% chance of rain tomorrow, what is the chance of it *not* raining? **60%**

26. A spinner is divided into 5 equal sections. There are 2 green sections, 2 red sections, and 1 yellow section. Write a ratio to show the probability of landing on a green section. **$P(\text{green}) = \frac{2}{5}$**

27. Using the spinner from problem 26, does *certain*, *equally likely*, or *impossible* best describe the chance of landing on a blue section?

impossible

28. Find the value of n to complete the proportion.

$$\frac{15}{51} = \frac{n}{17}$$

$n = 5$

29. The ratio $\frac{12}{96}$ represents **tables** : **chairs**. Write the ratio in lowest terms and explain its terms. **$\frac{1}{8}$; there are 8 chairs for each table.**

30. Workmen were repairing the elevator at the building where Jesse makes deliveries. Jesse used the stairs to deliver a package to Mr. Samuels on Floor 31. Mr. Samuels gave him a package to deliver to Miss Murphy. Jesse descended 18 floors to Miss Murphy's office. She gave him a package to deliver to Mr. Hays, whose office is 22 floors above hers. After delivering Mr. Hays's package, Jesse took a break in the employee lounge on Floor 5. How many floors did he descend to get to the lounge? **$31 - 18 = 13$; $13 + 22 = 35$; $35 - 5 = 30\text{ floors}$**

20. $-\$25.00 + n = \25.00
 $-\$25.00 + \$25.00 + n = \$25.00 + \25.00
 $n = \$50.00$

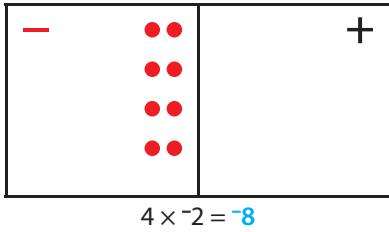
22. **Brett: $15 - 35 = -20\text{ points}$;**
Hudson: $-45 + 30 = -15\text{ points}$;
Hudson: $-15 - -20 = 5\text{ points}$

Multiply Integers

$4 \times -2 = -8$

$-2 \times 4 = -8$

4 sets of 2 negative counters can be shown on an algebra mat.



Commutative Property of Multiplication

The order of factors may be changed without changing the product. $4 \times -2 = -2 \times 4$

-2 sets of 4 counters cannot be shown on the algebra mat, but the Commutative Property states that the product for -2×4 is the same as the product for 4×-2 .

Rules for Multiplying Integers

When two factors have the same sign, the product is positive.

- positive factor \times positive factor = positive product
- negative factor \times negative factor = positive product

$4 \times 2 = 8$

$-4 \times -2 = 8$

When two factors have different signs, the product is negative.

- positive factor \times negative factor = negative product
- negative factor \times positive factor = negative product

$4 \times -2 = -8$

$-4 \times 2 = -8$

Exercises

Use the Commutative Property to write the related multiplication fact.

1. $5 \times -2 = -10$

$-2 \times 5 = -10$

2. $-10 \times 15 = -150$

$15 \times -10 = -150$

3. $-12 \times -11 = 132$

$-11 \times -12 = 132$

Find the product using the rules for multiplying integers.

Notice the pattern when one factor remains the same.

4. 4×2

8

3×2

6

2×2

4

1×2

2

0×2

0

-1×2

-2

-2×2

-4

-3×2

-6

-4×2

-8

5. 4×-3

-12

3×-3

-9

2×-3

-6

1×-3

-3

0×-3

0

-1×-3

3

-2×-3

6

-3×-3

9

-4×-3

12

6. -5×4

-20

-5×3

-15

-5×2

-10

-5×1

-5

-5×0

0

-5×-1

5

-5×-2

10

-5×-3

15

-5×-4

20

Multiply.

7. $5 \times -5 = -25$

10. $4 \times 12 = 48$

13. $-4 \times -3 = 12$

16. $-1 \times 8 = -8$

8. $6 \times -3 = -18$

11. $-6 \times -3 = 18$

14. $5 \times -10 = -50$

17. $7 \times -5 = -35$

9. $-6 \times 8 = -48$

12. $2 \times -5 = -10$

15. $-5 \times -2 = 10$

18. $-12 \times 2 = -24$

Write a comparison sentence using $>$, $<$, or $=$.

19. $9 \times -2 < -5 \times 3 = -18 < -15$

22. $-5 \times -8 > 6 \times 6 = 40 > 36$

20. $-2 \times 7 = 7 \times -2 = -14 = -14$

23. $-4 \times -6 = 2 \times 12 = 24 = 24$

21. $0 \times 2 > -1 \times 2 = 0 > -2$

24. $6 \times 3 > -9 \times 2 = 18 > -18$

Practice & Application

25. Mackenzie borrowed \$10 from her brother to purchase her rocket model. Then she borrowed \$5 more for lunch. Write an equation to show Mackenzie's debt. $\$10 + \$5 = \$15$ **debt or**
 $-\$10 + -\$5 = -\$15$

26. Stock in the Davenport Sofa Company lost 12 points each day for 4 days. Write an equation to show the number of total points lost.

$4 \times -12 = -48$ **points**

27. Show 4 sets of -3 on a number line. Write a multiplication equation and solve.

$4 \times -3 = -12$

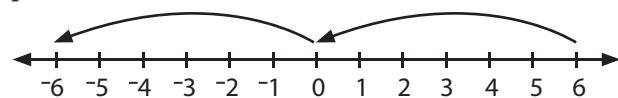
28. Draw a picture to show how one positive counter cancels out one negative counter. Solve the equation $-11 + 15$. $-11 + 15 = 4$

29. Write an addition equation for $-4 - 7$. Solve. (Remember that subtraction of an integer is the same as adding its opposite.) $-4 + -7 = -11$

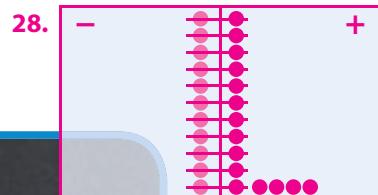
30. The quarterback was sacked on 3 consecutive plays. He lost 10 yards on each sack. Write an addition equation and a multiplication equation to show how many yards he lost in 3 plays. $-10 + -10 + -10 = -30$ **yards**; $3 \times -10 = -30$ **yards**

J

- Explain how the number line helps you solve the problem $6 + -12$. Write the sum. -6



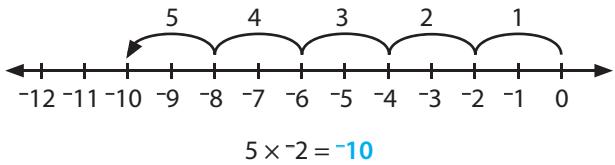
12 jumps away from 6 are needed.
Using the fact $6 + 6 = 12$ allows for
2 jumps instead of 12 individual jumps.
6 to 0 = 6 jumps
0 to -6 = 6 jumps



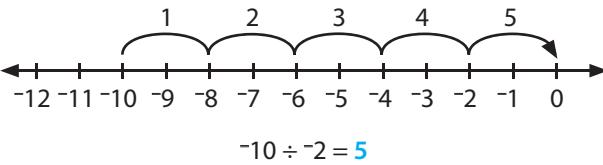
Over 5,000 artifacts have been recovered from the sunken *Titanic* by RMS *Titanic*, Inc.

Multiply & Divide Integers

Multiply and Divide Integers



1. Begin at 0.
 2. Add five sets of -2 .
- $5 \times -2 = -10$;
therefore, $-10 \div -2 = 5$ and $-10 \div 5 = -2$.



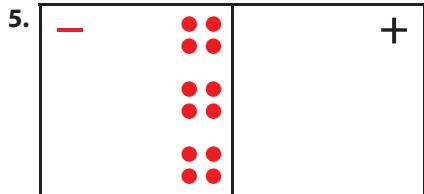
1. Begin at -10 .
 2. Subtract sets of -2 until you reach 0.
- Check: $5 \times -2 = -10$

Exercises

Solve the related division facts.

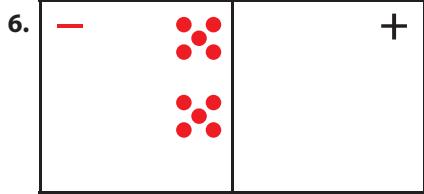
1. $-3 \times 5 = -15$; therefore, $-15 \div 5 = \underline{-3}$ and $-15 \div -3 = \underline{5}$.
2. $6 \times -4 = -24$; therefore, $-24 \div -4 = \underline{6}$ and $-24 \div 6 = \underline{-4}$.
3. $-2 \times 7 = -14$; therefore, $-14 \div 7 = \underline{-2}$ and $-14 \div -2 = \underline{7}$.
4. $-4 \times -2 = 8$; therefore, $8 \div -2 = \underline{-4}$ and $8 \div -4 = \underline{-2}$.

Write a statement that explains the picture for the division equation. Write the related multiplication equation.



$$-12 \div 3 = -4$$

$$3 \times -4 = -12$$



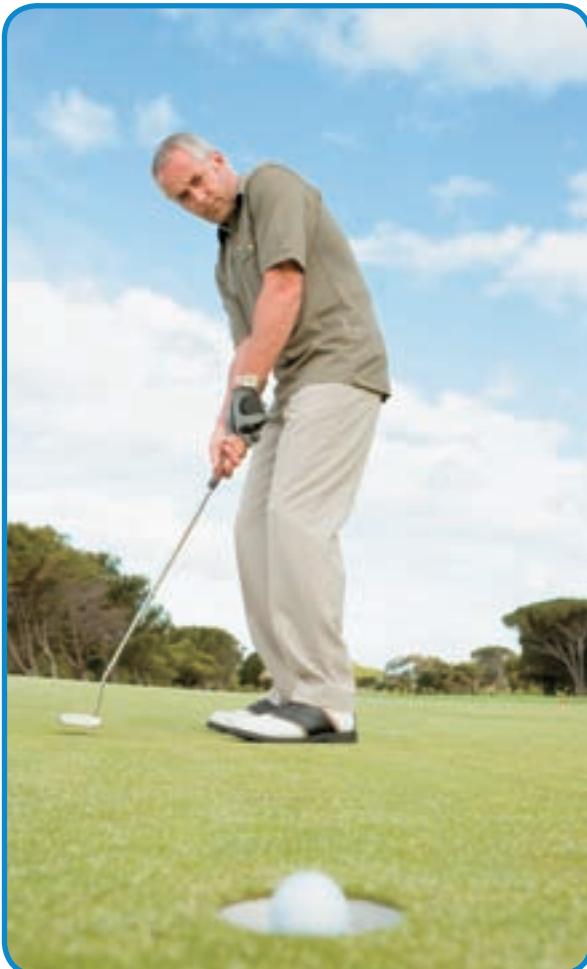
$$-10 \div -5 = 2$$

$$2 \times -5 = -10$$

Draw a mat to illustrate the sentence.

Write an equation and solve.

7. Divide 21 negative counters into 7 equal sets.
 $\underline{-21 \div 7 = -3}$
8. Divide 30 negative counters into sets of 6 negative counters.
 $\underline{-30 \div -6 = 5}$



Multiply.

9. $5 \times -7 = -35$

12. $-7 \times -9 = 63$

15. $2 \times -12 = -24$

18. $-8 \times -1 = 8$

10. $-2 \times 6 = -12$

13. $-8 \times 6 = -48$

16. $4 \times 10 = 40$

19. $4 \times 7 = 28$

11. $3 \times -12 = -36$

14. $-5 \times -15 = 75$

17. $-6 \times 0 = 0$

20. $16 \times -6 = -96$

Divide.

21. $-15 \div 3 = -5$

24. $80 \div 4 = 20$

27. $42 \div 2 = 21$

30. $-8 \div 4 = -2$

22. $-100 \div 2 = -50$

25. $18 \div -3 = -6$

28. $-2 \div -2 = 1$

31. $-12 \div 4 = -3$

23. $99 \div -9 = -11$

26. $-16 \div -2 = 8$

29. $-12 \div 6 = -2$

32. $-20 \div -5 = 4$

Write a comparison sentence using $>$, $<$, or $=$.

33. $-16 \div 4 = -4 = 2 \times -2 = -4 = -4$

34. $4 \div -4 < 3 \div 3 = -1 < 1$

35. $0 \times 3 > -1 \times 2 = 0 > -2$

36. $-2 \times -3 > -1 \times 5 = 6 > -5$

Practice & Application

37. Marc's golf team scored 6 strokes under par (-6) each day for 5 days. Write an equation to show the team's combined score. $5 \times -6 = -30$

38. At the end of a 3-day golf tournament, Mr. Davis had a final score of -12 , or 12 strokes under par. Write an equation to show his average score each day. $-12 \div 3 = -4$ strokes average per day

39. Cody collected 36 blankets for the homeless. He gave away 6 blankets each day for 5 days. Write a multiplication and an addition equation using integers to show how many blankets Cody has left. $36 - (5 \times 6) = 6$ blankets; $6 + 6 + 6 + 6 + 6 = 30$; $36 - 30 = 6$ blankets

40. Clark made 3 clay pots each day during 4 days at Art Camp. While in the kiln, 5 of the pots cracked. How many pots does Clark have left? $4 \times 3 - 5 = 12 - 5 = 7$ pots

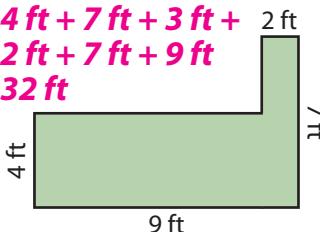
41. Lexie's lap times at the swim meet were 12 seconds slower than the best time. If her time decreases 2 seconds each day, how many days will it take her to tie the best time? $-12 \div -2 = 6$ days or $12 \div 2 = 6$ days

43. $P = 10 m + 15 m + 11 m + 22 m$
 $P = 58 m$

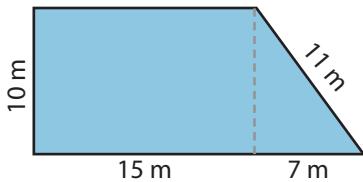
$$A = (10 m \times 15 m) + \frac{1}{2}(7 m \times 10 m)$$
$$A = 185 m^2$$

42. Find the perimeter and the area of the figure.

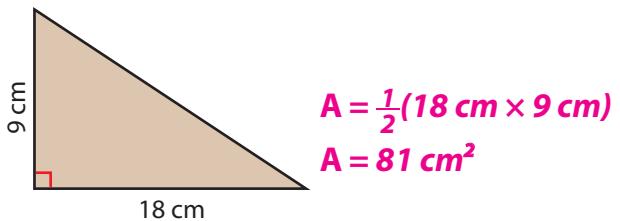
$$\begin{aligned} P &= 4 \text{ ft} + 7 \text{ ft} + 3 \text{ ft} + \\ &\quad 2 \text{ ft} + 7 \text{ ft} + 9 \text{ ft} \\ P &= 32 \text{ ft} \end{aligned}$$
$$\begin{aligned} A &= (4 \text{ ft} \times 9 \text{ ft}) + \\ &\quad (2 \text{ ft} \times 3 \text{ ft}) \\ A &= 42 \text{ ft}^2 \end{aligned}$$



43. Find the perimeter and the area of the trapezoid.



44. Find the area of the triangle.



Use $10 \times 18 = 180$ to explain the statement *The inverse operation of multiplication is division.*

Division is used to take apart what multiplication puts together. 180 items can be put into 10 sets of 18 or 18 sets of 10.

Mixed Review

Order of Operations

- Do all operations inside the parentheses first.
- Do all multiplication and division in order from left to right.
- Do all addition and subtraction in order from left to right.

$$2(-5 - 4) = -9 + -8 \div 4 = \\ 2 \times -9 = -18 \quad -9 + -2 = -11$$

Exercises

Solve. Follow the Order of Operations.

1. $-7 + -8 - 3$ **-18**

5. $-4 - 5 + -3$ **-12**

9. $-1 + 1 - 1$ **-1**

2. $5 - (6 + -5)$ **4**

6. $8 + (2 - 7)$ **3**

10. $9 - 7 + -3$ **-1**

3. $2(-7 + 5)$ **2(-2) = -4**

7. $4 + -6 \div 3$ **4 + -2 = 2**

11. $8(-1 + -3)$ **8(-4) = -32**

4. $-8 \div 2 - 3$ **-4 - 3 = -7**

8. $6 \div (6 - 9)$ **6 \div -3 = -2**

12. $-5 - 2 \times 2$ **-5 - 4 = -9**

Add.

13. $-8 + 3$ **-5**

17. $6 + 8$ **14**

21. $-10 + 9$ **-1**

14. $1 + -5$ **-4**

18. $-4 + 7$ **3**

22. $13 + -2$ **11**

15. $-7 + -3$ **-10**

19. $2 + -2$ **0**

23. $-15 + 9$ **-6**

16. $-2 + 7$ **5**

20. $14 + -3$ **11**

24. $-6 + 6$ **0**

Subtract.

25. $3 - 8$ **-5**

29. $10 - -2$ **12**

33. $5 - 7$ **-2**

26. $-4 - 10$ **-14**

30. $-6 - -4$ **-2**

34. $-4 - -4$ **0**

27. $-7 - -2$ **-5**

31. $-2 - 5$ **-7**

35. $2 - 3$ **-1**

28. $5 - -4$ **9**

32. $3 - 9$ **-6**

36. $6 - 5$ **1**

Multiply.

37. 6×-5 **-30**

40. -1×1 **-1**

43. -3×6 **-18**

38. -8×-7 **56**

41. 2×-3 **-6**

44. -1×-9 **9**

39. -4×3 **-12**

42. -4×-5 **20**

45. 7×-2 **-14**

Divide.

46. $-15 \div 3$ **-5**

49. $6 \div -3$ **-2**

52. $-4 \div -1$ **4**

47. $4 \div -2$ **-2**

50. $-10 \div -5$ **2**

53. $18 \div -9$ **-2**

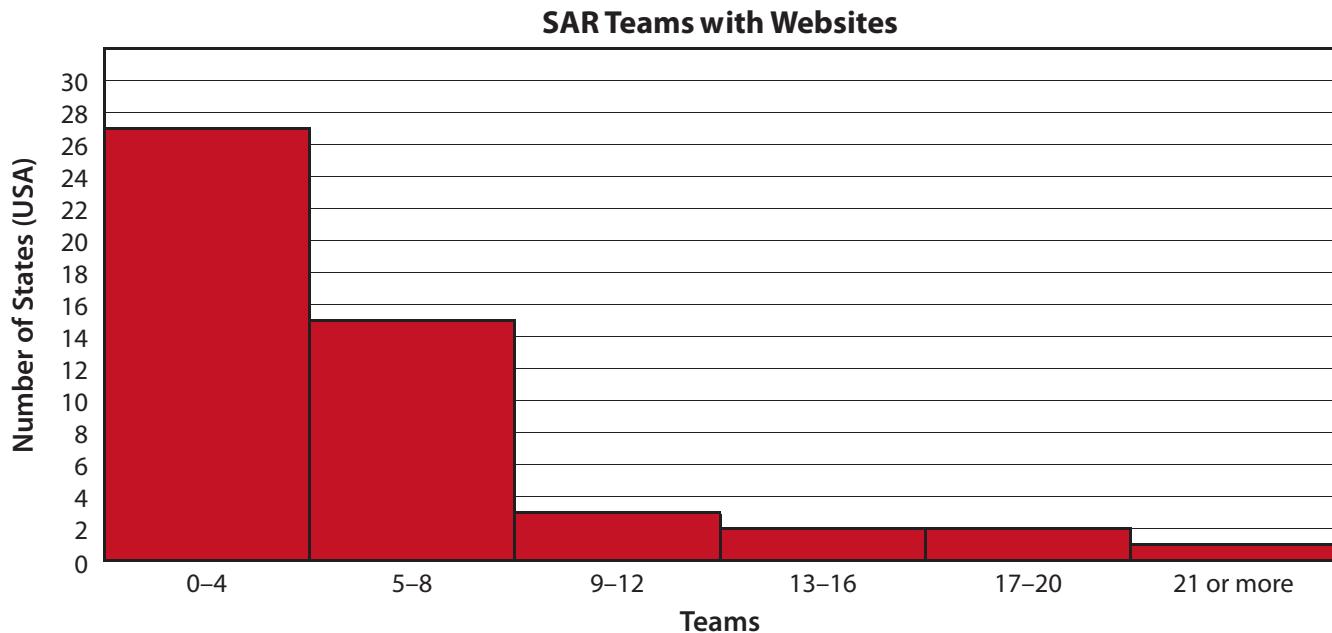
48. $-12 \div -6$ **2**

51. $16 \div 4$ **4**

54. $39 \div 3$ **13**

Practice & Application

As of 2011, there were more than 1,500 search-and-rescue (SAR) teams in the United States. The histogram shows the number of teams that have their own website by state.



55. How many states list more than 20 search-and-rescue teams? **1 state**
56. What interval shows the mode? **0-4**
57. Pennsylvania has 14 teams listed. In which interval is Pennsylvania? **13-16**
58. How many states have 13 or more search-and-rescue teams listed? **5 states**
59. How many states have 12 or fewer search-and-rescue teams listed? **45 states**
60. What percentage of states is in the 0-4 interval?
 $\frac{27}{50} = \frac{54}{100} = 54\%$
61. Hannah is training for a 5K race. Her finish time has decreased 30 seconds each week for 6 weeks. What is the total change in her finish time at the end of the 6 weeks? **$6 \times -30 = -180 \text{ sec} = -3 \text{ min}$**
62. The weatherman predicted that the temperature would rise to 12°F . If the temperature is -3°F , how many degrees must it rise to make the prediction true?
 $-3 + n = 12^\circ$
 $-3 - 3 + n = 12^\circ - -3^\circ$
 $n = 15^\circ$
63. The youth group filled 15 trash bags with leaves while helping Mrs. Slocum with yard work. When they carried the bags to the street to be picked up, 2 of the bags broke, spilling the leaves. How many full bags of leaves did they still have?
 $15 + -2 = 13 \text{ bags}$ or $15 - 2 = 13 \text{ bags}$



Coordinate Plane

Coordinate Plane

An **ordered pair** is used to describe the location of a point on a **coordinate plane** in relation to the **origin** $(0, 0)$. Each ordered pair is located in a quadrant of the graph or on the **x-axis** or **y-axis**.

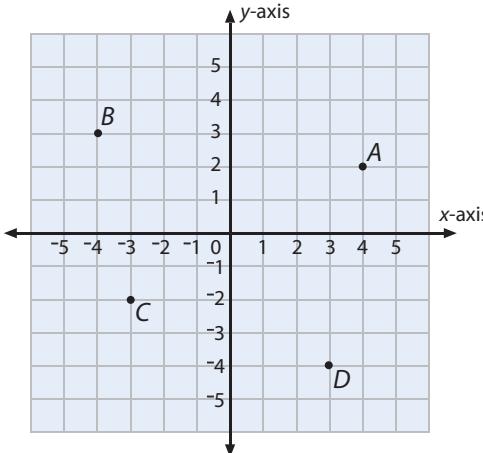
ordered pair
coordinate plane
origin
x-axis
y-axis

Quadrant II contains points with a negative x-coordinate and a positive y-coordinate.

$$B = (-4, 3)$$

Quadrant III contains points with negative x- and y-coordinates.

$$C = (-3, -2)$$



Quadrant I contains points with positive x- and y-coordinates.

$$A = (4, 2)$$

Quadrant IV contains points with a positive x-coordinate and a negative y-coordinate.

$$D = (3, -4)$$

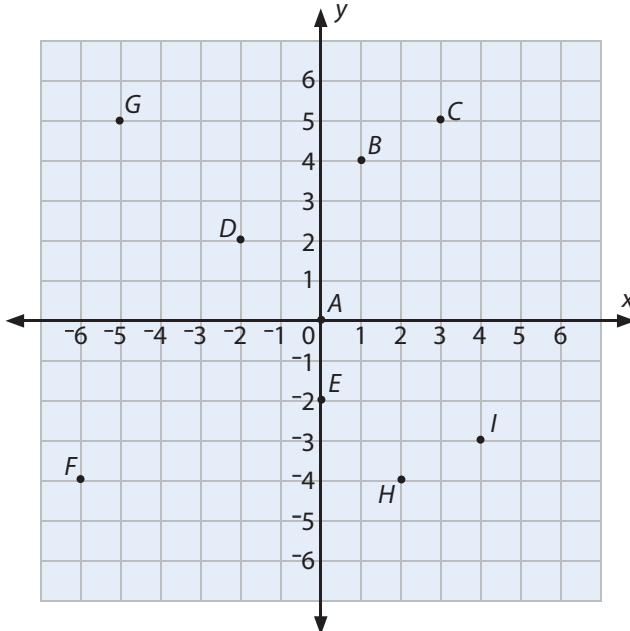
Exercises

Write the ordered pair for each point on the coordinate plane.

Answer the questions.

1. A **(0, 0)**
2. B **(1, 4)**
3. C **(3, 5)**
4. D **(-2, 2)**
5. E **(0, -2)**
6. F **(-6, -4)**
7. G **(-5, 5)**
8. H **(2, -4)**
9. I **(4, -3)**

10. How many points are in quadrant I? **2**
11. How many points are in quadrant II? **2**
12. What point is located in quadrant III? **F**
13. What points are located in quadrant IV? **H and I**
14. Where is point E located? **on the y-axis**
15. Name the point located at the origin of the coordinate plane. **Point A**



Graph each ordered pair on a coordinate plane.

Connect the points in order to form a figure.

16. $(1, 1) \rightarrow (5, -3) \rightarrow (3, 3) \rightarrow (0, 0) \rightarrow (-3, -3)$

17. $(3, -3) \rightarrow (-3, 3) \rightarrow (-5, -3) \rightarrow (-1, 1)$

Graph each ordered pair on a coordinate plane.

Connect the points in order. Connect the last point to the first.

Identify the quadrilateral.

18. $(1, -2) \rightarrow (5, -2) \rightarrow (5, -5) \rightarrow (1, -5)$ **rectangle**

19. $(-1, 0) \rightarrow (-5, 0) \rightarrow (-5, 3) \rightarrow (-3, 3)$ **trapezoid**

20. $(0, 0) \rightarrow (2, 2) \rightarrow (5, 2) \rightarrow (3, 0)$ **parallelogram**

21. $(-6, 6) \rightarrow (6, 6) \rightarrow (6, -6) \rightarrow (-6, -6)$ **square**

Write the ordered pair for each point on the coordinate plane.

22. A **(-5, -5)**

27. F **(-5, -4)**

23. B **(5, -5)**

28. G **(-2, 4)**

24. C **(5, 1)**

29. H **(-2, 5)**

25. D **(0, 6)**

30. I **(-4, 5)**

26. E **(-5, 1)**

31. J **(-4, 2)**

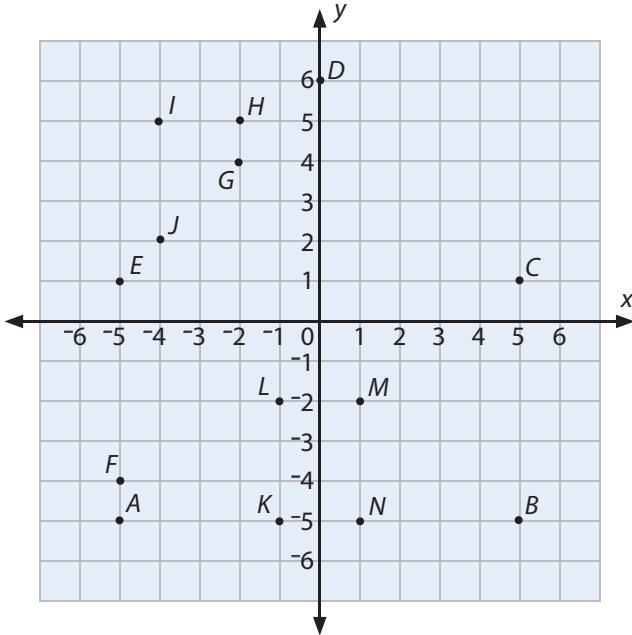
Write the letter of the point named by the ordered pair.

32. $(-1, -5)$ **K**

33. $(1, -2)$ **M**

34. $(-1, -2)$ **L**

35. $(1, -5)$ **N**



Connect the points in order.

Identify the shape.

36. On a 4-quadrant coordinate plane, plot the points for problems 22–35.

$A \rightarrow B \rightarrow C \rightarrow D \rightarrow E \rightarrow F \rightarrow A$

$G \rightarrow H \rightarrow I \rightarrow J$

$K \rightarrow L \rightarrow M \rightarrow N$

37. Name the shape that is made. **a house**



What is always true about the location of a point whose first coordinate is 0? **The point is on the y-axis.**

CHAPTER 17 REVIEW

Complete the sentence.

- The set of whole numbers and their opposites is called _____. **integers**
- The distance a number is from zero is that number's _____. **absolute value**
- The numbers 4 and -4 are the same distance from _____. **zero**

zero
integers
absolute value

Write the integer.

- The thermometer shows the temperature as 13 degrees below zero. **-13**
- Every four years February has an extra day. **1**
- The distance to school is 25 miles. **25**
- Three inches of rain fell in the month of June. **3**
- Part of the city of New Orleans is 7 feet below sea level. **-7**
- David's miniature golf score was 4 strokes under par. **-4**

Write a comparison sentence using $>$ or $<$.

- | | | |
|-----------------|---------------|--------------|
| 10. $-2 > -27$ | 13. $6 > -6$ | 16. $0 > -1$ |
| 11. $-16 < -14$ | 14. $8 > -9$ | 17. $-3 < 1$ |
| 12. $3 > -6$ | 15. $-2 < -1$ | 18. $2 < 3$ |

Write the integers from *least to greatest*.

- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------|-------|------|-----|------|------|-----|-----|---|------|-------|-------|------|-------|-------|------|------|---|------|-----|-----|------|------|------|-----|-----|---|------|------|------|-----|------|------|------|-----|
| 19. <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>-6</td><td>3</td><td>-8</td><td>1</td></tr><tr><td>-8</td><td>-6</td><td>1</td><td>3</td></tr></table> | -6 | 3 | -8 | 1 | -8 | -6 | 1 | 3 | 20. <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>16</td><td>-17</td><td>-13</td><td>12</td></tr><tr><td>-17</td><td>-13</td><td>12</td><td>16</td></tr></table> | 16 | -17 | -13 | 12 | -17 | -13 | 12 | 16 | 21. <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>-1</td><td>5</td><td>2</td><td>-5</td></tr><tr><td>-5</td><td>-1</td><td>2</td><td>5</td></tr></table> | -1 | 5 | 2 | -5 | -5 | -1 | 2 | 5 | 22. <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>-4</td><td>-1</td><td>-2</td><td>1</td></tr><tr><td>-4</td><td>-2</td><td>-1</td><td>1</td></tr></table> | -4 | -1 | -2 | 1 | -4 | -2 | -1 | 1 |
| -6 | 3 | -8 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -8 | -6 | 1 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | -17 | -13 | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -17 | -13 | 12 | 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -1 | 5 | 2 | -5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -5 | -1 | 2 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -4 | -1 | -2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -4 | -2 | -1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Add.

- | | | |
|---------------------------------------|--|-------------------------------------|
| 23. $-7 + 9$ 2 | 26. $-6 + -4$ -10 | 29. $-3 + 3$ 0 |
| 24. $-8 + 5$ -3 | 27. $-12 + -1$ -13 | 30. $0 + -7$ -7 |
| 25. $-4 + -7$ -11 | 28. $7 + -4$ 3 | 31. $8 + -9$ -1 |

Subtract.

- | | | |
|-------------------------------------|---------------------------------------|-------------------------------------|
| 32. $6 - -3$ 9 | 33. $-12 - 8$ -20 | 34. $0 - -6$ 6 |
| 35. $5 - 13$ -8 | 36. $-4 - -1$ -3 | 37. $8 - 17$ -9 |

Solve.

38. 6×-2 **-12**

41. $-16 \div -4$ **4**

44. $-21 \div -3$ **7**

39. -3×-2 **6**

42. $27 \div -9$ **-3**

45. -3×-8 **24**

40. $12 \div -6$ **-2**

43. -3×7 **-21**

46. $24 \div -8$ **-3**

Write a comparison sentence using **>** or **<**.

47. $3 + -5 < 1 - 1$ **-2 < 0**

48. $0 - -3 > 2 + -2$ **3 > 0**

49. $-6 + 3 < 4 - 5$ **-3 < -1**

50. $4 - 7 > 2 \times -3$ **-3 > -6**

51. $-2 - -1 < -4 + 6$ **-1 < 2**

52. $4 + 2 > -6 \div 1$ **6 > -6**

Use the Order of Operations to solve.

53. $3(-5 + -1)$ **-18**

54. $-4 \times 3 - 6$ **-18**

55. $2 + -12 \div 2$ **-4**

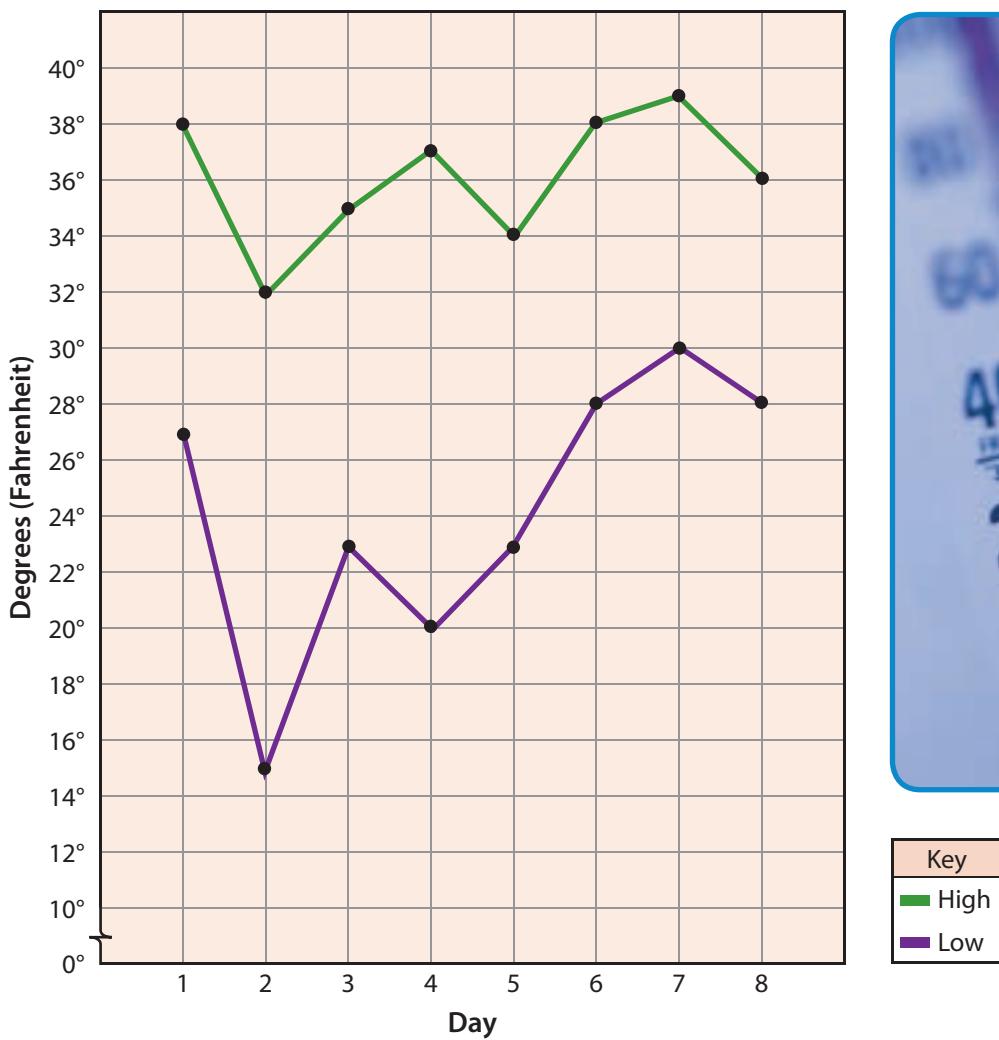


A sign marks sea level about two-thirds of the way up a cliff in Badwater Basin, California.

Test Prep

Use the data from the double line graph to find the answer.

High and Low Temperatures January 1–8



Key
High
Low

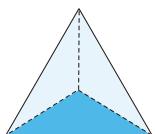
- What is the range in the temperature on the graph?
A. 24°
B. 27°
C. 30°
D. 38°
- What is the range of high temperatures?
A. 5°
B. 6°
C. 7°
D. 8°
- What is the average high temperature?
A. 35.75°F
B. 36.125°F
C. 36.5°F
D. 37°F
- What day shows the least difference between the high and low temperatures?
A. Day 1
B. Day 2
C. Day 4
D. Day 8
- What is the mode for the high temperature?
A. 32°F
B. 34°F
C. 38°F
D. 40°F
- What was the change in low temperature from Day 1 to Day 2?
A. -12°
B. 12°
C. 10°
D. -10°

Mark the answer.

7. Which polygon has 7 sides and 7 angles?

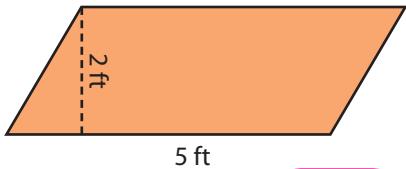
- A. pentagon C. heptagon
B. hexagon D. quadrilateral

8. Match the figure to its net.



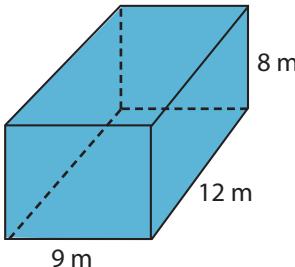
- A.
C.
B.
D.

9. Find the area of the figure.



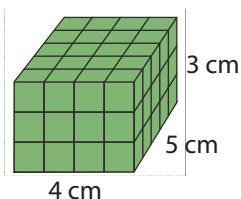
- A. 7 ft C. 10 ft^2
B. 10 ft^3 D. 12 ft

10. Find the surface area.



- A. 204 m^3 C. 864 m^3
B. 552 m^2 D. 900 m^2

11. Find the volume.



- A. 20 cm^3
B. 60 cm^3
C. 35 cm^3
D. 70 cm^3

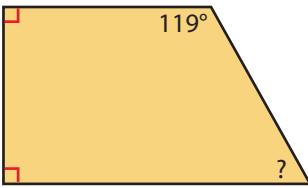
12. Which figure represents a plane?

- A.
B.
C.
D.

13. Which angle is obtuse?

- A.
B.
C.
D.

14. What is the measure of the unknown angle?



- A. 21°
B. 39°
C. 50°
D. 61°

Mark the answer.

15. Use rounding to estimate.

$$\begin{array}{r} 28.36 \\ - 12.52 \\ \hline \end{array}$$

- A. 10 C. 30
B. 20 D. 40

16. Round to the nearest cent.

$$26) \$86.00$$

- A. \$2.07 C. \$3.08
B. \$3.07 D. \$3.31

17. $\begin{array}{r} 4 \text{ pt } 3 \text{ c} \\ - 3 \text{ pt } 1 \text{ c} \\ \hline \end{array}$
- A. 1 pt 7 c C. 2 pt 5 c
B. 1 pt 2 c D. 4 pt

18. Solve for n .

$$n \times 132 = 528$$

- A. $n = 1$ C. $n = 3$
B. $n = 2$ D. $n = 4$

19. Estimate the answer.

$$\frac{3}{8} + \frac{5}{6} \approx \underline{\hspace{2cm}}$$

- A. $1\frac{1}{2}$ C. $2\frac{1}{2}$
B. 2 D. 3

20. $3\frac{1}{8} - \frac{3}{4} = \underline{\hspace{2cm}}$

- A. $1\frac{5}{8}$ C. $2\frac{1}{4}$
B. $2\frac{3}{8}$ D. $3\frac{1}{4}$

21. $4\frac{1}{2} \times 2\frac{1}{6} = \underline{\hspace{2cm}}$

- A. $8\frac{1}{6}$
B. $8\frac{1}{2}$
C. $9\frac{1}{4}$
D. $9\frac{3}{4}$

22. $2\frac{3}{4} \div \frac{1}{2} = \underline{\hspace{2cm}}$

- A. $1\frac{3}{8}$
B. $3\frac{1}{8}$
C. $5\frac{1}{2}$
D. 6

23. Devin has 60 minutes to do his chores. If he has worked for 36 minutes, what part of his chore time has passed?

- A. $\frac{2}{5}$
B. $\frac{4}{5}$
C. $\frac{3}{5}$
D. $\frac{5}{5}$

24. What is three hundred one and six thousand, four hundred two ten thousandths in standard form?

- A. 301.6402
B. 310.6042
C. 3,001.6042
D. 301.642

25. A photographer took student pictures for three schools. He took 125 pictures at the first school, 230 at the second, and 560 at the third. Which expression could be used to determine the number of pictures taken at the three schools?

- A. $560 - (230 + 125)$
B. $125 + 230 + 560$
C. $(125 + 230) \times 560$
D. $(230 - 125) + 560$

DAILY 1 REVIEW**a**

Add or subtract.

1.
$$\begin{array}{r} 3 \\ 7 \\ + 8 \\ \hline 18 \end{array}$$

2.
$$\begin{array}{r} 3 \\ 3 \\ + 3 \\ \hline 9 \end{array}$$

3.
$$\begin{array}{r} 2 \\ 8 \\ + 3 \\ \hline 13 \end{array}$$

4.
$$\begin{array}{r} 9 \\ 1 \\ + 7 \\ \hline 17 \end{array}$$

5.
$$\begin{array}{r} 20 \\ - 8 \\ \hline 12 \end{array}$$

6.
$$\begin{array}{r} 39 \\ - 10 \\ \hline 29 \end{array}$$

7.
$$\begin{array}{r} 45 \\ - 9 \\ \hline 36 \end{array}$$

8.
$$\begin{array}{r} 80 \\ - 9 \\ \hline 71 \end{array}$$

9.
$$\begin{array}{r} 100 \\ - 45 \\ \hline 55 \end{array}$$

10.
$$\begin{array}{r} 732 \\ + 149 \\ \hline 881 \end{array}$$

11.
$$\begin{array}{r} 4,200 \\ - 1,341 \\ \hline 2,859 \end{array}$$

12.
$$\begin{array}{r} 9,851 \\ - 3,480 \\ \hline 6,371 \end{array}$$

13. $8 + \underline{\quad} = 15$ **7**

14. $7 + \underline{\quad} = 13$ **6**

15. $3 + \underline{\quad} = 12$ **9**

16. $30 - \underline{\quad} = 25$ **5**

17. $35 - \underline{\quad} = 20$ **15**

18. $30 - \underline{\quad} = 22$ **8**

19. $7 + 8 - 5 + 6 = \underline{\quad}$ **16**

20. $9 + 3 - 0 + 4 = \underline{\quad}$ **16**

b

Solve.

1.
$$\begin{array}{r} 23 \\ 47 \\ + 15 \\ \hline 85 \end{array}$$

2.
$$\begin{array}{r} 71 \\ 69 \\ + 34 \\ \hline 174 \end{array}$$

3.
$$\begin{array}{r} 84 \\ 45 \\ + 61 \\ \hline 190 \end{array}$$

4.
$$\begin{array}{r} 999 \\ - 374 \\ \hline 625 \end{array}$$

5.
$$\begin{array}{r} 500 \\ - 389 \\ \hline 111 \end{array}$$

6.
$$\begin{array}{r} 600 \\ - 421 \\ \hline 179 \end{array}$$

7. $54 - \underline{\quad} = 40$ **14**

8. $36 - \underline{\quad} = 30$ **6**

9. $49 - \underline{\quad} = 30$ **19**

10. $27 + \underline{\quad} = 50$ **23**

11. $73 + \underline{\quad} = 80$ **7**

12. $26 + \underline{\quad} = 40$ **14**

13. $8 \times \underline{\quad} = 24$ **3**

14. $7 \times \underline{\quad} = 42$ **6**

15. $6 \times \underline{\quad} = 48$ **8**

16.
$$\begin{array}{r} 89 \\ + 15 \\ \hline 104 \end{array}$$

17.
$$\begin{array}{r} 50 \\ - 25 \\ \hline 25 \end{array}$$

18.
$$\begin{array}{r} 300 \\ - 72 \\ \hline 228 \end{array}$$

19.
$$\begin{array}{r} 1,457 \\ + 2,394 \\ \hline 3,851 \end{array}$$

20.
$$\begin{array}{r} 7,000 \\ - 1,329 \\ \hline 5,671 \end{array}$$

c

Write the answer using **387,406**.

1. The value of 8 in standard form **80,000**

3. The value of 4 in standard form **400**

2. The digit in the Hundred Thousands place **3**

4. Round to the greatest place. **400,000**

Write the numbers from *least to greatest*.

5.

42,389	41,857	42,399
--------	--------	--------

41,857 42,389 42,399

6.

819,234	89,973	809,583	819,233
---------	--------	---------	---------

89,973 809,583 819,233 819,234

Write a comparison sentence using **>** or **<**.

7. $63,271,809 > 63,270,899$

8. $403,241,589 > 49,864,101$

9. 19 million **<** 9 billion

Complete the equation.

10. $4 + 4 + 4 = \underline{?} \times 4$ **3**

11. $8 + 8 = \underline{?} \times 8$ **2**

12. $9 + 9 + 9 + 9 = \underline{?} \times 9$ **4**

13. $7 + 7 = 2 \times \underline{?}$ **7**

14. $6 + 6 + 6 + 6 = 4 \times \underline{?}$ **6**

15. $5 + 5 + 5 = \underline{?} \times 5$ **3**

16. $5 \times 7 = \underline{?}$ **35**

17. $4 \times 8 = \underline{?}$ **32**

18. $9 \times 3 = \underline{?}$ **27**

19. $6 \times 10 = \underline{?}$ **60**

20. $2 \times 9 = \underline{?}$ **18**

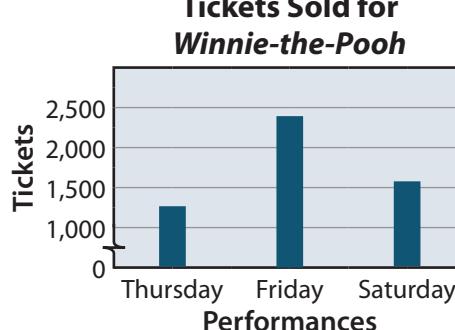
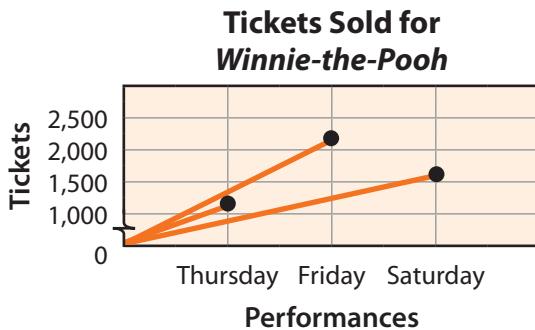
d

Solve.

Calvary Christian School performed *Winnie-the-Pooh* in the Civic Center Auditorium.

1. Addison bought tickets for the play. His parents, sister, and cousin were going with him to the performance. In addition, he got tickets for the neighbors. He purchased eleven tickets. How many tickets did he purchase for the neighbors?
6 tickets
3. Which graph correctly compares the number of tickets sold for each performance? **the bar graph**

2. The ticket office sold 1,243 tickets for the Thursday night performance of the play, 2,390 for the Friday night performance, and 1,596 for the Saturday afternoon performance. How many tickets were sold for the play? **5,229 tickets**
4. The main floor of the auditorium can seat 1,500 people. The balcony is used when more seats are needed. Which performances would require seating in the balcony? **Friday and Saturday performances**

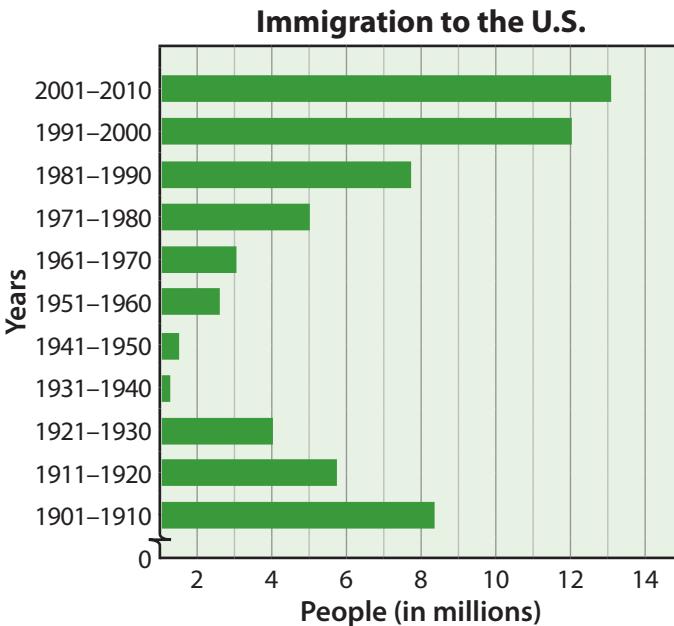


Chapter 1 continued

e

Use the data from the graph to find the answer.

1. What type of graph is pictured? **bar graph**
2. In what year does the graph begin? **1901**
3. Write in word form the number of immigrants that came to the U.S. from 1991 to 2000.
twelve million
4. In which years did the smallest number of immigrants come to the U.S.? **1931–1940**
5. In which years did four million immigrants come to the U.S.? **1921–1930**
6. About how many million immigrants came to the U.S. from 2001 to 2010? **13 million**



Complete the fact.

- | | | | |
|----------------------------------|------------------------------------|------------------------------------|-----------------------------------|
| 7. $24 \div 6$ 4 | 8. $56 \div 7$ 8 | 9. $27 \div 9$ 3 | 10. $50 \div 5$ 10 |
| 11. $21 \div 7$ 3 | 12. $45 \div 5$ 9 | 13. $32 \div 8$ 4 | 14. $42 \div 6$ 7 |
| 15. $\frac{?}{3} = 6$ 2 | 16. $\frac{4}{?} = 28$ 7 | 17. $4 \frac{9}{?} = 36$ 36 | 18. $6 \frac{?}{48} = 8$ 8 |
| 19. $? \overline{) 35}$ 5 | 20. $9 \frac{2}{?} = 18$ 18 | | |

f

Write the value of the given digit in standard form using 925,018,703,460.

- | | | |
|-----------------------|----------------------------|-----------------------------|
| 1. 8 8,000,000 | 2. 6 60 | 3. 4 400 |
| 4. 7 700,000 | 5. 2 20,000,000,000 | 6. 9 900,000,000,000 |

Write the digit for the given place.

149.735

- | | | | |
|------------------------|----------------------|--------------------|-------------------|
| 7. hundredths 3 | 8. hundreds 1 | 9. tenths 7 | 10. tens 4 |
|------------------------|----------------------|--------------------|-------------------|

Write a comparison sentence using $>$, $<$, or $=$.

- | | | |
|--------------------|---------------------|---------------------|
| 11. $427 < 487$ | 12. $6,906 < 6,990$ | 13. $0.2 > 0.15$ |
| 14. $0.45 < 0.540$ | 15. $0.75 = 0.750$ | 16. $0.999 < 1.012$ |

Complete the fact.

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 17. $63 \div 7$ 9 | 18. $24 \div 8$ 3 | 19. $42 \div 7$ 6 | 20. $18 \div 3$ 6 |
|--------------------------|--------------------------|--------------------------|--------------------------|

g

Solve.

1.
$$\begin{array}{r} 7.4 \\ + 2.5 \\ \hline 9.9 \end{array}$$

2.
$$\begin{array}{r} 8.2 \\ - 3.5 \\ \hline 4.7 \end{array}$$

3.
$$\begin{array}{r} 62.3 \\ - 19.4 \\ \hline 42.9 \end{array}$$

4.
$$\begin{array}{r} \$127.39 \\ + \$48.80 \\ \hline \$176.19 \end{array}$$

5. $\$4.50 + \3.75 **\$8.25**

6. $\$5.00 - \2.08 **\$2.92**

7. $1.327 + 2.5$ **3.827**

Write the numbers from *least to greatest*.

8.

17	0.17	0.0017	1.7
0.0017	0.17	1.7	17

11.

8.3275	83,275	832.75	8,327.5
8.3275	832.75	8,327.5	83,275

9.

64	6.4	0.64	0.006
0.006	0.64	6.4	64

12.

410.298	410,698	420,698	41.0698
41.0698	410.298	410,698	420,698

10.

143.8	14.38	4.389	0.43
0.43	4.389	14.38	143.8

13.

52.01	5.201	5,201	520.1
5.201	52.01	520.1	5,201

Complete the fact.

14. $\frac{8}{?} 64$ **8**

15. $9) \frac{9}{?}$ **81**

16. $6) \frac{?}{54}$ **9**

17. $\frac{6}{?} 42$ **7**

18. $9) \frac{5}{?}$ **45**

19. $\frac{?}{7} 56$ **8**

h

Write an equation for the part-whole model. Solve. *Process to solve may vary.*

1.

<i>n</i>			
25	25	25	25

$$4 \times 25 = n$$

$$n = 100$$

2.

15		
<i>n</i>	5	5

$$15 - 10 = n$$

$$n = 5$$

3.

500	
125	<i>n</i>

$$500 - 125 = n$$

$$n = 375$$

Round to the greatest place to estimate the sum or difference. Solve.

4. $73,295 + 29,863$
100,000; 103,158

5. $8,732 - 1,953$
7,000; 6,779

6. $25.9 - 14.1$
20; 11.8

Solve.

7. $14 + 8 + 6$ **28**

8. $21 + 9 + 32$ **62**

9. $18 + 22 + 45$ **85**

10. $(15 + 5) - 8$ **12**

11. $(4 + 16) + 105$ **125**

12. $1.2 + (13 + 7)$ **21.2**

13.
$$\begin{array}{r} 372,541 \\ + 895,030 \\ \hline 1,267,571 \end{array}$$

14.
$$\begin{array}{r} 43,200 \\ - 21,143 \\ \hline 22,057 \end{array}$$

15.
$$\begin{array}{r} 93,457 \\ + 23,811 \\ \hline 117,268 \end{array}$$

16.
$$\begin{array}{r} 40,032 \\ - 21,450 \\ \hline 18,582 \end{array}$$

Use an addition property to complete the equation.

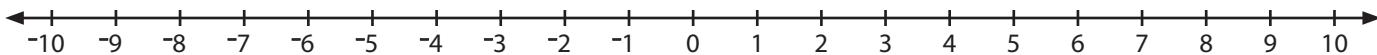
17. $(5 + 3) + 2 = 5 + (3 + ?)$ **2**

18. $298 = ? + 298$ **0**

19. $457 + 39 = ? + 457$ **39**

Chapter 1 continued

i



Write a comparison sentence using $>$ or $<$.

1. $3 > -3$

4. $-2 < 1$

2. $-8 < 0$

5. $-10 < 1$

3. $1 < 7$

6. $-8 > -10$

Use the number line to find the answer.

7. $-3 + -1 = -4$

10. $10 + -3 = 7$

8. $4 + -7 = -3$

11. $-8 + 9 = 1$

9. $7 + -10 = -3$

12. $3 + 6 = 9$

Write the numbers from *least to greatest*.

13. $307.968 \quad 370,968 \quad 307,931 \quad 307,969$
 $307.968 \quad 307,931 \quad 307,969 \quad 370,968$

14. $24.79 \quad 2.479 \quad 247.9 \quad 2,479$
 $2.479 \quad 24.79 \quad 247.9 \quad 2,479$

Complete the fact.

15. $\begin{array}{r} 8 \\ \times ? \\ \hline 64 \end{array}$

16. $\begin{array}{r} ? \\ \times 6 \\ \hline 42 \end{array}$

17. $\begin{array}{r} 5 \\ \times 4 \\ \hline ? \end{array}$

18. $\begin{array}{r} 9 \\ ? \overline{) 45} \\ \hline 5 \end{array}$

19. $\begin{array}{r} 8 \\ 4 \overline{) ?} \\ \hline 32 \end{array}$

20. $\begin{array}{r} ? \\ 6 \overline{) 30} \\ \hline \end{array}$

DAILY **2** REVIEW

a

Use the number **281,503,764,900** to find the answer.

1. Name the greatest place. **Hundred Billions**

2. Write the value of the 5 in standard form.

500,000,000

3. Round to the greatest place. **300,000,000,000**

4. What digit is in the Hundred Thousands place? **7**

5. What digit is in the One Billions place? **1**

6. What is the value of 6 in standard form? **60,000**

Write a comparison sentence using $>$ or $<$.

7. $2.473 < 2,479$

8. $34.95 > 3.495$

9. $0.34 < 0.345$

10. $309,276,501 < 309,276,510$

11. $400,000,000,000 + 10,000,000,000 + 9,000,000,000 >$ forty-three billion, two hundred five thousand, six hundred twenty-seven

Round to the greatest place.

12. $832,763$ **800,000**

13. $491,076,305$ **500,000,000**

14. $75,860$ **80,000**

15. 3.9 **4**

16. 2.15 **2**

17. 0.89 **0.9**

b

Round the addends to the greatest place to estimate the sum.

1. $27,241,560 + 31,497,301$

$30,000,000 + 30,000,000 = 60,000,000$

3. $39.68 + 2.09$

$40 + 2 = 42$

2. $89,304 + 120,745$

$90,000 + 100,000 = 190,000$

4. $0.94 + 4.5$

$0.9 + 5 = 5.9$

Add.

5. $249,683 + 504,391$ **754,074**

6. $83.45 + 21.3$ **104.75**

7. $\$1.59 + \4.83 **\$6.42**

8. $94,371 + 413,820$ **508,191**

9. $1.89 + 12.3$ **14.19**

10. $\$76.13 + \123.09 **\$199.22**

11. $346,143$

$+ 204,129$

550,272

12. $\$75.32$

$+\$25.91$

\$101.23

13. 2.570

$+ 1.039$

3.609

14. $1,437$

$2,891$

$+ 5,040$

9,368

15. $(3 + 4) + 20$ **27**

16. $9 + (3 + 7)$ **19**

17. $(8 + 8) + 8$ **24**

c

Solve.

1. $341,720 - 190,813$ **150,907**

2. $12.09 - 4.2$ **7.89**

3. $\$25.00 - \1.45 **\$23.55**

4. $\$3.45$

$-\$1.92$

\$1.53

5. $728,341$

$- 32,906$

695,435

6. $29,500$

$- 1,241$

28,259

7. $8,000$

$- 2,315$

5,685

Solve. Write a related addition equation.

8. $12 - 8$ **4**

$4 + 8 = 12$

9. $15 - 9$ **6**

$6 + 9 = 15$

10. $13 - 7$ **6**

$6 + 7 = 13$

11. $14 - 7$ **7**

$7 + 7 = 14$

12. $32 - 12$ **20**

$20 + 12 = 32$

13. $100 - 98$ **2**

$2 + 98 = 100$

14. $50 - 25$ **25**

$25 + 25 = 50$

15. $75 - 50$ **25**

$25 + 50 = 75$

Round the numbers to the greatest place to estimate the difference.

16. $39.407 - 25.394$

$40 - 30 = 10$

17. $\$29.54 - \19.85

$\$30 - \$20 = \$10$

Chapter 2 continued

d

Write the value in standard form.

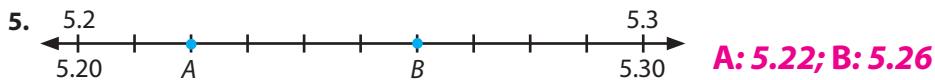
1. $\frac{347}{1,000} \text{ } 0.347$

2. $7 + 0.3 + 0.9 \text{ } 8.2$

3. $(3 \times 1) + (2 \times 0.1) + (6 \times 0.01)$
3.26

4. thirty-four hundredths
0.34

Write the decimals represented by point A and point B on the number line.



Write the value of 7 in word form.

6. 734.2

seven hundred

7. 6.07

seven hundredths

8. 0.704

seven tenths

9. 8.917

seven thousandths

Write the numbers from least to greatest.

10. **0.1075 1.075 10.75 107.5**

11. **2.4 2.45 2.451 2.53**

Round to the greatest place.

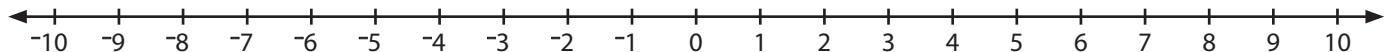
12. 2.45 **2**

13. 3.89 **4**

14. 28.01 **30**

15. 0.39 **0.4**

e



Write a comparison sentence using > or <.

1. $0 > -1$

2. $1 > -5$

3. $-3 < 3$

4. $7 > -10$

Use the number line to find the sum.

5. $-3 + -5 = -8$

6. $4 + -7 = -3$

7. $-8 + 3 = -5$

8. $-8 + -2 = -10$

Draw a number line to show the given number and its opposite.



Solve.

12. 8
 $\times 7$
56

13. 9
 $\times 4$
36

14. 6
 $\times 8$
48

15. 7
 $\times 9$
63

16. 6
 $\times 3$
18

17. $9 \times 8 = 72$

18. $7 \times 6 = 42$

19. $6 \times 9 = 54$

20. $8 \times 5 = 40$

f

Use the data from the stem-and-leaf plot to find the answer.

Mrs. Barbow's sixth-grade class practiced curl-ups for the Presidential Physical Fitness Test. Mrs. Barbow recorded the number of curl-ups on a stem-and-leaf plot.

- According to the key what does 3|5 represent?
35 curl-ups
- What was the range, the difference between the lowest and highest number of curl-ups, that was plotted? **$60 - 29 = 31$**
- How long did each student have to do the curl-ups?
1 minute
- Were the most curl-ups recorded in the 30s, 40s, or 50s? **40s**
- What number of curl-ups was recorded by the most students? **48**
- How many students completed 55 curl-ups? **2**
- How many students completed only 32 curl-ups? **0**

Number of Curl-ups per Minute	
Stem	Leaf
2	9 9
3	5 6 9 9 9
4	0 1 1 1 2 3 5 5 7 8 8 8 8
5	2 5 5 7
6	0

Key | 3|5 = 35 curl-ups



g

Write a division equation for the phrase. Solve.

1. 35 pages divided among 5 students

$$35 \div 5 = 7$$

2. 20 cookies given to 10 children

$$20 \div 10 = 2$$

3. 32 stickers for 4 girls

$$32 \div 4 = 8$$

Write the quotient.

4. $4\overline{)20}$ **5**

5. $6\overline{)36}$ **6**

6. $9\overline{)45}$ **5**

7. $7\overline{)49}$ **7**

8. $3\overline{)24}$ **8**

9. $\frac{15}{3}$ **5**

10. $\frac{18}{9}$ **2**

11. $\frac{16}{4}$ **4**

12. $\frac{21}{7}$ **3**

13. $\frac{18}{2}$ **9**

Write a related multiplication equation.

14. $18 \div 6 = 3$
 $3 \times 6 = 18$

15. $28 \div 4 = 7$
 $7 \times 4 = 28$

16. $81 \div 9 = 9$
 $9 \times 9 = 81$

17. $72 \div 8 = 9$
 $9 \times 8 = 72$

DAILY **3** REVIEW

a

Identify the parts of the multiplication equation: **factor** or **product**.

1. 435 **product**

$$\begin{array}{r} 87 \\ \times 5 \\ \hline 435 \end{array}$$

2. 5 **factor**

3. 87 **factor**

Use a multiplication property to complete the equation.

4. $86 \times \underline{\quad} = 86$ **1**

8. $(6 \times 2) \times 8 = 6 \times (\underline{\quad} \times 8)$ **2**

5. $19 \times 3 = 3 \times \underline{\quad}$ **19**

9. $47 \times \underline{\quad} = 0$ **0**

6. $9 \times (4 \times \underline{\quad}) = (9 \times 4) \times 3$ **3**

10. $35 \times \underline{\quad} = 35$ **1**

7. $6,754 \times \underline{\quad} = 6,754$ **1**

11. $84 \times 13 = \underline{\quad} \times 84$ **13**

Solve.

12. $\begin{array}{r} 547 \\ \times 315 \\ \hline 172,305 \end{array}$

13. $\begin{array}{r} 231 \\ \times 103 \\ \hline 23,793 \end{array}$

14. $\begin{array}{r} 854 \\ \times 671 \\ \hline 573,034 \end{array}$

15. $\begin{array}{r} 790 \\ \times 436 \\ \hline 344,440 \end{array}$

16. $\begin{array}{r} 2,543 \\ \times 174 \\ \hline 442,482 \end{array}$

17. $\begin{array}{r} 984 \\ \times 617 \\ \hline 607,128 \end{array}$

18. $\begin{array}{r} 4,328 \\ \times 754 \\ \hline 3,263,312 \end{array}$

b

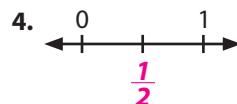
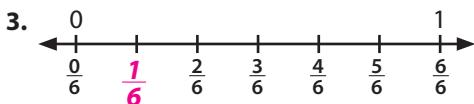
Identify the parts of the fraction: **numerator** and **denominator**.

1. 8 **denominator**

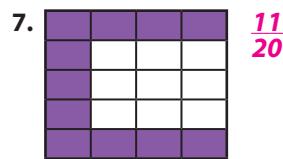
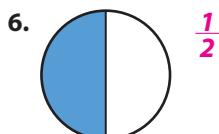
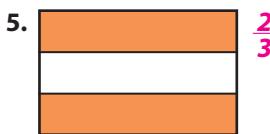
$$\frac{5}{8}$$

2. 5 **numerator**

Write the missing fraction on the number line.



Write the fraction for the part that is colored.



Write a comparison sentence using **>**, **<**, or **=**.

9. $\frac{8}{8} > \frac{2}{4}$

10. $\frac{2}{3} > \frac{1}{4}$

11. $\frac{5}{10} = \frac{1}{2}$

12. $\frac{1}{9} < \frac{4}{7}$

13. $\frac{3}{12} = \frac{1}{4}$

14. $\frac{2}{6} < \frac{9}{10}$

15. $\frac{1}{3} < \frac{1}{2}$

16. $\frac{7}{9} > \frac{1}{4}$

c

Identify the figure as **line**, **line segment**, or **ray**.



line segment



ray



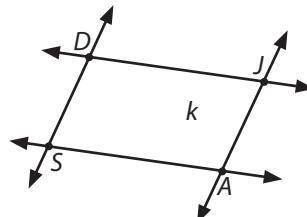
line

Use plane *k* to find the answer.

Use symbols to name the lines and line segments.

4. Name 4 points on plane *k*. **D, J, A, S**

5. Name 2 lines on plane *k*. **\overleftrightarrow{DJ} , \overleftrightarrow{JA} , \overleftrightarrow{AS} , or \overleftrightarrow{SD}**



Write **parallel**, **perpendicular**, or **intersecting** to complete the sentence.

Use the map to find the answer.

6. Carnation and Maple are streets. **perpendicular**

7. Dogwood and Oak are streets. **intersecting**

8. Maple and Oak are streets. **parallel**

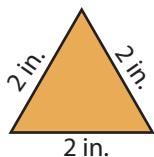
9. Carnation and Primrose are streets. **parallel**

10. Primrose and Maple are streets. **perpendicular**

**d**

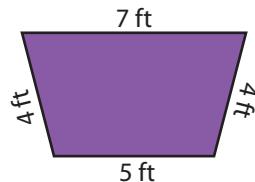
Write an addition equation to find the perimeter of the figure.

- 1.



$$2 \text{ in.} + 2 \text{ in.} + 2 \text{ in.} = 6 \text{ in.}$$

- 2.

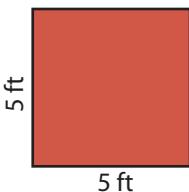


$$7 \text{ ft} + 4 \text{ ft} + 5 \text{ ft} + 4 \text{ ft} = 20 \text{ ft}$$

Multiply *length* \times *width* to find the area of the figure.

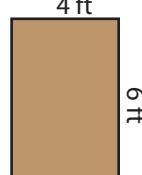
Label the answer as **square feet**.

- 3.



$$5 \text{ ft} \times 5 \text{ ft} = 25 \text{ square feet}$$

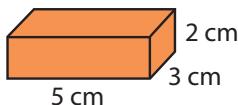
- 4.



$$4 \text{ ft} \times 6 \text{ ft} = 24 \text{ square feet}$$

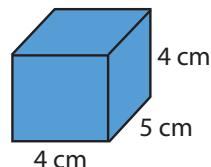
Find the volume of the figure by multiplying *length* \times *width* \times *height*.

- 5.



$$\frac{5}{l} \text{ cm} \times \frac{3}{w} \text{ cm} \times \frac{2}{h} \text{ cm} = \underline{\underline{30}} \text{ cm}^3$$

- 6.



$$\frac{4}{l} \text{ cm} \times \frac{4}{w} \text{ cm} \times \frac{4}{h} \text{ cm} = \underline{\underline{80}} \text{ cm}^3$$

Chapter 3 continued

e

Write the measurement of the line segment.

1.  **4 1/2 in.**

2.  **2 1/2 in.**



Complete the fact.

3. 1 ft = **12** in.

4. 1 yd = **36** in.

5. 1 yd = **3** ft

6. 1 mi = **5,280** ft

7. 1 mi = **1,760** yd

Write the equivalent measurement.

8. 2 ft **24 in.**

4 ft
3 yd
24 in.
72 in.

9. 48 in. **4 ft**

10. 9 ft **3 yd**

11. 2 yd **72 in.**

Write the unit of measurement.

12. the height of a man **6 ft**

13. the width of a house **26 ft**

14. the length of a desk **4 ft 2 in.**

15. the width of a cell phone **2 in.**

4 ft 2 in.
2 in.
26 ft
6 ft

f

Use the data from the line graph to answer the question.

1. What data is shown on this graph? **the amount of pet food sold from July to December**

2. Which kind of pet does this company probably make food for? **cats**

3. Did sales increase or decrease from September to October? **decrease**

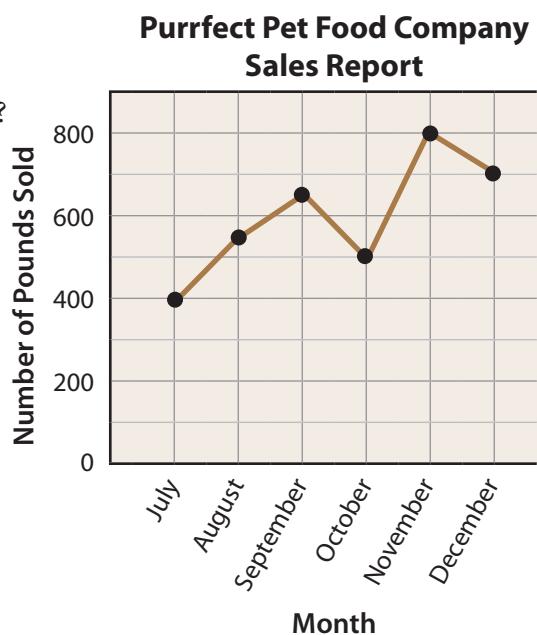
4. Where is the greatest increase in sales shown? **from October to November**

5. Do sales seem to be generally increasing or decreasing for this company? **increasing**

6. Which month shows the highest sales? **November**

7. Which month had the lowest sales? **July**

8. What is the range (difference between the greatest and least amount) of sales? **$800 - 400 = 400$ lb**



g

Use the data from the chart to find the answer.

Katy and her cousins are keeping track of the number of pages they read during the library's summer reading contest.

- How many more pages did Katy read than Joshua? **425 pages**
- What was the average number of pages read the week of July 14–20? **1,045 pages**

Solve.

Tim, Dave, and John are selling tickets to the school play, *Cheaper by the Dozen*. A student ticket costs \$3.75, and an adult ticket costs \$5.50.

- John sold 7 adult tickets to his neighbors. How much money should he collect? **\$38.50**
- Dave sold 3 student tickets and 2 adult tickets. What is the total cost? **\$22.25**
- John's neighbors gave him \$50 for the tickets. How much change should John give back to them? **\$11.50**
- Tim sold 8 student tickets and 3 adult tickets. What is the total cost? **\$46.50**

Pages read during the week of 7/14–7/20

Katy—1,400 pages	Lydia—800 pages
Joshua—975 pages	Jonathan—1,005 pages

- How many pages did the cousins read altogether? **4,180 pages**
- Each book that Lydia read had 200 pages. How many books did she read? **4 books**

h

Solve.

- $375 + 14 + 72 + 7$ **468**
- $9,432 + 108 + 17 + 64$ **9,621**
- $3.5 + 0.87 + 21.46$ **25.83**
- $$\begin{array}{r} 6,475 \\ + 1,328 \\ \hline 7,803 \end{array}$$
- $$\begin{array}{r} 768 \\ + 314 \\ \hline 1,082 \end{array}$$
- $$\begin{array}{r} 43.89 \\ + 7.21 \\ \hline 51.10 \end{array}$$
- $$\begin{array}{r} \$84.00 \\ + \$62.58 \\ \hline \$146.58 \end{array}$$
- $$\begin{array}{r} 907 \\ - 368 \\ \hline 539 \end{array}$$
- $$\begin{array}{r} 453 \\ - 372 \\ \hline 81 \end{array}$$
- $$\begin{array}{r} 102 \\ - 84 \\ \hline 18 \end{array}$$
- $$\begin{array}{r} 843 \\ - 518 \\ \hline 325 \end{array}$$
- $$\begin{array}{r} 75 \\ \times 16 \\ \hline 1,200 \end{array}$$
- $$\begin{array}{r} 843 \\ \times 37 \\ \hline 31,191 \end{array}$$
- $$\begin{array}{r} 6,452 \\ \times 108 \\ \hline 696,816 \end{array}$$
- $$\begin{array}{r} 375 \\ \times 218 \\ \hline 81,750 \end{array}$$
- $$\begin{array}{r} 46 \\ 4 \overline{) 184} \\ -16 \\ \hline 24 \\ -24 \\ \hline 0 \end{array}$$
- $$\begin{array}{r} 8 \\ 42 \overline{) 336} \\ -336 \\ \hline 0 \end{array}$$
- $$\begin{array}{r} 20 \\ 60 \overline{) 1,200} \\ -120 \\ \hline 00 \\ -0 \\ \hline 0 \end{array}$$
- $$\begin{array}{r} 5 \\ 35 \overline{) 175} \\ -175 \\ \hline 0 \end{array}$$

DAILY **4** REVIEW

a

Write factor pairs for numbers that are composite.

Write prime if there are no other factors.

1. $\boxed{18}$

$$1 \times 18$$

$$\begin{array}{l} 2 \times 9 \\ 3 \times 6 \end{array}$$

2. $\boxed{27}$

$$1 \times 27$$

$$3 \times 9$$

3. $\boxed{37}$

$$1 \times 37$$

prime

4. $\boxed{10}$

$$1 \times 10$$

$$2 \times 5$$

Write the expression in exponent form. Solve.

5. $3 \times 3 \times 3 \times 3$
 $3^4; 81$

6. $7 \times 7 \times 7$
 $7^3; 343$

7. $2 \times 2 \times 2 \times 2 \times 2$
 $2^5; 32$

8. $4 \times 4 \times 4$
 $4^3; 64$

Solve.

9. $\begin{array}{r} 375 \\ \times 786 \\ \hline 294,750 \end{array}$

10. $\begin{array}{r} 135 \\ \times 107 \\ \hline 14,445 \end{array}$

11. $\begin{array}{r} 451 \\ \times 202 \\ \hline 91,102 \end{array}$

12. $\begin{array}{r} 784 \\ \times 601 \\ \hline 471,184 \end{array}$

13. $\begin{array}{r} 422 \\ \times 219 \\ \hline 92,418 \end{array}$

14. $\begin{array}{r} 507 \\ \times 260 \\ \hline 131,820 \end{array}$

15. $\begin{array}{r} 946 \\ \times 834 \\ \hline 788,964 \end{array}$

16. $\begin{array}{r} 5,187 \\ \times 918 \\ \hline 4,761,666 \end{array}$

b

Write the divisor that the number is divisible by.

1. 375 is divisible by **5**.

2. 824 is divisible by **4**.

3. 4,512 is divisible by **3**.

2 5 10

4 6 10

3 5 9

Use the statement to write an equation. Solve.

Mrs. Elliot has 240 toy coins.

4. Mrs. Elliot used 24 coins to decorate the party invitations. How many coins are left?

$$240 - 24 = 216 \text{ coins}$$

5. Mrs. Elliot will divide the remaining coins among 12 party bags. How many coins will each guest receive? **$216 \div 12 = 18 \text{ coins}$**

Follow the Order of Operations to solve.

6. $18 - 2 \times 3 + 7$ **19**

7. $54 \div 6 + 2 - 7$ **4**

8. $(6 \times 3) + 7 - 5 \times 2$ **15** 9. $(7 \times 8) - 3^3 + 5$ **34**

Solve.

10. $16 \overline{)128}$ **8**

11. $35 \overline{)7,035}$ **201**

12. $14 \overline{)350}$ **25**

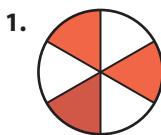
13. $55 \overline{)1,045}$ **19**

14. $8 \overline{)2,752}$ **344**

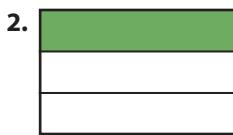
15. $21 \overline{)1,365}$ **65**

c

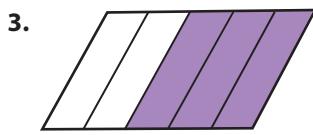
Use the picture to write the value of n .



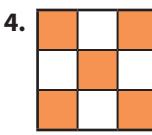
$$\frac{3}{n}; n = 6$$



$$\frac{1}{n}; n = 3$$



$$\frac{n}{5}; n = 3$$



$$\frac{n}{9}; n = 5$$

Solve for n .

$$\begin{array}{ccc} \triangle & \triangle & \triangle \\ \triangle & \triangle & \triangle \end{array} \quad \frac{1}{2} = \frac{n}{6} \quad n = 3$$

$$\begin{array}{ccccc} \square & \square & \square & \square & \square \\ \square & \square & \square & \square & \square \\ \square & \square & \square & \square & \square \\ \square & \square & \square & \square & \square \end{array} \quad \frac{1}{2} = \frac{6}{n} \quad n = 12$$

$$\begin{array}{c} \text{yellow} \\ \text{white} \end{array} \quad \frac{1}{2} = \frac{n}{8} \quad n = 4$$

Draw a picture for the sentence. *Pictures may vary.*

8. $\frac{1}{3}$ of the square is blue.

9. $\frac{4}{9}$ of the triangles are red.

10. $\frac{3}{4}$ of the circle is orange.

Write a comparison sentence using $>$, $<$, or $=$.

11. $\frac{4}{8} < \frac{6}{7}$

12. $\frac{3}{4} > \frac{2}{10}$

13. $\frac{3}{6} = \frac{5}{10}$

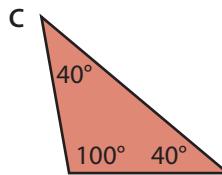
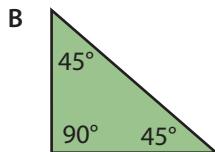
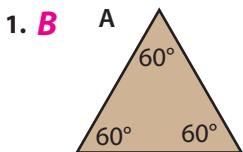
14. $\frac{1}{9} < \frac{1}{2}$

15. $\frac{7}{8} > \frac{7}{10}$

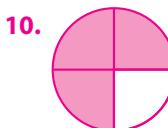
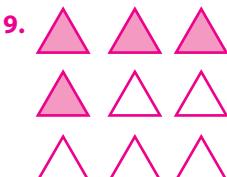
16. $\frac{6}{12} = \frac{2}{4}$

d

Write the letter of the triangle that is the right triangle.

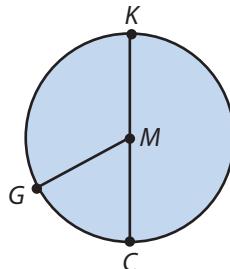


Section c



Use the line segment symbol to write the answer.

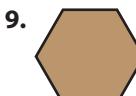
2. One radius of circle M is _____. **\overline{MG} , \overline{MK} , or \overline{MC}**



3. The diameter of circle M is _____. **\overline{KC}**

Write the name of the shape.

hexagon octagon pentagon quadrilateral triangle



quadrilateral

pentagon

triangle

octagon

quadrilateral

hexagon

Chapter 4 continued

e

Write the number to match the expression.

1. value of 8 is 8,000

347,918,256

2. 392 millions, 415 thousands, 786 ones

392,415,786

3. six hundred seventy-eight million, four hundred fifty-one thousand, nine hundred thirty-two

678,451,932

4. $700,000,000 + 60,000,000 + 8,000,000 + 300,000 + 20,000 + 9,000 + 100 + 50 + 4$

768,329,154

678,451,932 768,329,154 392,415,786 347,918,256

Write the number to match the statement.

5. One of the Northwest Brook Falls in New York is 8 feet high. **8**

-8 5 -5 8

6. The shark swam lazily in circles about 5 feet below the surface. **-5**

7. Dad was 5 strokes over par during his golf game. **5**

8. New Orleans, Louisiana, is 8 feet below sea level. **-8**

Choose the answer.

9. What is true about the set of numbers 1, 3, 15, and 45?

Only 3 is a prime number.

All are factors of 45.

Both 15 and 45 are composite numbers.

All of the above are true.

10. Which is not a name for 302?

300 + 2

3,000 + 2

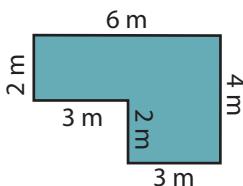
three hundred two

three hundreds, zero tens, two ones

f

Identify the equation as the **area** or the **perimeter** of the shape. Solve.

- 1.



$$2 \text{ m} + 6 \text{ m} + 4 \text{ m} + 3 \text{ m} + 2 \text{ m} + 3 \text{ m} = \underline{\underline{20}} \text{ m}$$

perimeter

- 2.



$$9 \text{ in.} \times 32 \text{ in.} = \underline{\underline{288}} \text{ in.}^2$$

area

Solve.

3. $32 \overline{)384}$ **12**

4. $25 \overline{)500}$ **20**

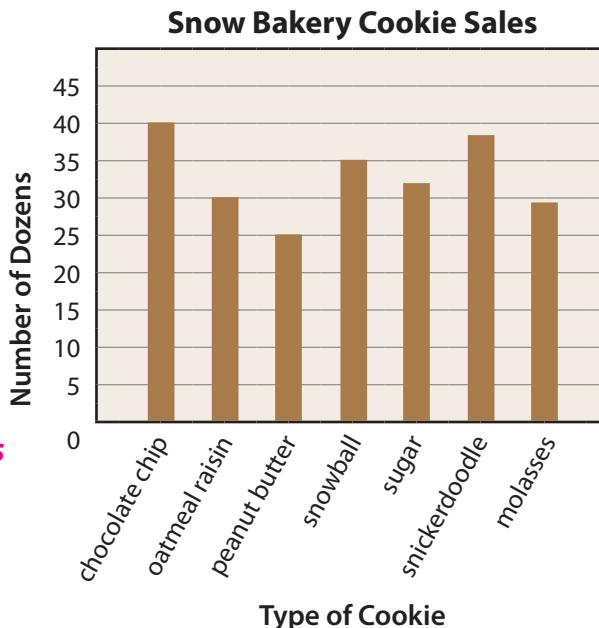
5. $4 \overline{)636}$ **159**

6. $85 \overline{)7,055}$ **83**

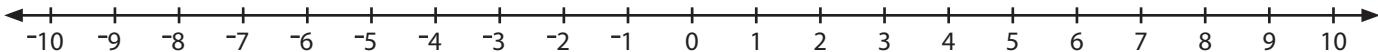
g

Use the data from the bar graph to find the answer.

- Emily recorded how many cookies her bakery sold last month. Which type of cookie sold most? **chocolate chip**
- Which types of cookies sold more than 35 dozen? **chocolate chip and snickerdoodle**
- Write an equation that tells how many individual peanut butter cookies were sold. **$25 \times 12 = 300$ cookies**
- How many dozen more snowball cookies were sold than peanut butter cookies? **10 dozen**
- Which type of cookie had 29 dozen sales? **molasses**
- How many dozen sugar cookies were sold? **32 dozen**
- Which sold more, the oatmeal raisin cookies or the molasses cookies? **oatmeal raisin**
- If 229 dozen cookies were sold, how many individual cookies were sold altogether? **$229 \times 12 = 2,748$ cookies**

**h**

Use the number line to solve.



- $7 + -7$ **0**
- $1 + -3$ **-2**
- $4 + -7$ **-3**
- $-6 + -2$ **-8**
- $-6 + -4$ **-10**
- $8 + -3$ **5**
- $-2 + 9$ **7**
- $7 + -2$ **5**
- $10 + -3$ **7**

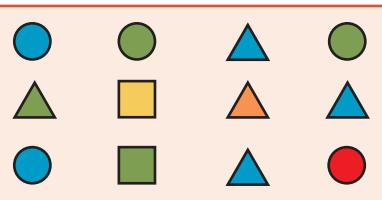
Follow the Order of Operations to solve.

- $24 \div 6 + 2 - 1$ **5**
- $(25 + 5) \div 6 - 2$ **3**
- $(6 - 3)^2 \times 7$ **63**
- $5 + 10 \times 12$ **125**
- $8 + 3 + 5^2$ **36**
- $(5 - 3)^4 \div 4$ **4**
- $6 \times (5 + 3)$ **48**
- $48 \div (4 + 6 - 2)$ **6**
- $(25 - 15) \times 7$ **70**

DAILY **5** REVIEW

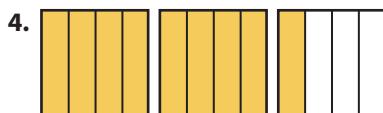
a

Write a fraction to answer the question.



- What part of the set is triangles? $\frac{5}{12}$
- What part of the set is circles? $\frac{5}{12}$
- What part of the set is yellow? $\frac{1}{12}$

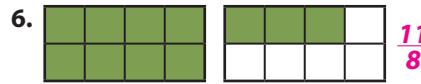
Write the improper fraction for the picture.



4. $\frac{9}{4}$

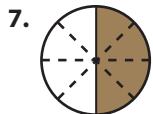


5. $\frac{3}{2}$



6. $\frac{11}{8}$

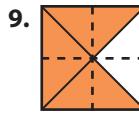
Use the picture to find the value for n .



7. $\frac{1}{2} = \frac{n}{8}$
 $n = 4$



8. $\frac{2}{3} = \frac{n}{12}$
 $n = 8$



9. $\frac{3}{4} = \frac{6}{n}$
 $n = 8$

Rename the mixed number as an improper fraction.

Rename the improper fraction as a mixed number.

10. $3\frac{1}{4} \frac{13}{4}$

11. $\frac{17}{8} 2\frac{1}{8}$

12. $6\frac{4}{9} \frac{58}{9}$

13. $\frac{22}{4} 5\frac{2}{4}$

Write the fraction in lowest terms. Identify the GCF.

14. $\frac{18}{60} \frac{3}{10}; GCF = 6$

15. $\frac{48}{56} \frac{6}{7}; GCF = 8$

16. $\frac{6}{12} \frac{1}{2}; GCF = 6$

17. $\frac{12}{16} \frac{3}{4}; GCF = 4$

b

Follow the Order of Operations to solve.

1. $(6 + 4) \times 5 - 3$ **47**

2. $(65 - 5) \div 5 + 4$ **16**

3. $64 \div (4 \times 2)$ **8**

4. $6 \times 3 + 9$ **27**

Solve.

5. $7,432$
+ 379
7,811

6. $1,492$
+ 1,074
2,566

7. $75,612$
+ 4,987
80,599

8. $654,312$
+ 579,488
1,233,800

9. $\$54.17$
- \$ 6.75
\$47.42

10. 674
- 329
345

11. $9,114$
- 7,857
1,257

12. 45
- 16
29

13. $17 \cdot 8$ **136**

14. 65×32 **2,080**

15. $6,924 \times 375$ **2,596,500**

16. 391×25 **9,775**

17. $120 \div 6$ **20**

18. $1,300 \div 20$ **65**

19. $425 \div 17$ **25**

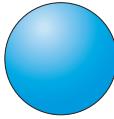
20. $5,748 \div 12$ **479**

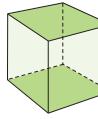
c

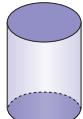
Name the shape.

cone cylinder cube sphere

1.  cone

2.  sphere

3.  cube

4.  cylinder

Use the figures above to complete the sentence.

5. A ___ has a curved surface and 2 circular bases. **cylinder**

6. A ___ has 6 identical faces. **cube**

7. A ___ has a vertex, one circular face, and a curved surface. **cone**

8. A ___ has no faces, no edges, and no vertices. **sphere**

Solve.

$$\begin{array}{r} 67 \\ \times 14 \\ \hline 938 \end{array}$$

$$\begin{array}{r} 5,134 \\ \times 375 \\ \hline 1,925,250 \end{array}$$

$$\begin{array}{r} 9,421 \\ \times 77 \\ \hline 725,417 \end{array}$$

$$\begin{array}{r} 16,425 \\ \times 812 \\ \hline 13,337,100 \end{array}$$

13. $4,064 \div 16$ **254**

14. $31,378 \div 541$ **58**

15. $44,856 \div 712$ **63**

16. $20,139 \div 21$ **959**

d

Write the value of the 7.

1. 34.72 **0.7**

2. 196.347 **0.007**

3. 73.985 **70**

Solve.

$$\begin{array}{r} \$16.84 \\ + \$12.75 \\ \hline \$29.59 \end{array}$$

$$\begin{array}{r} 9.6 \\ + 8.4 \\ \hline 18.0 \end{array}$$

$$\begin{array}{r} 57.14 \\ + 31.98 \\ \hline 89.12 \end{array}$$

$$\begin{array}{r} 16.354 \\ + 2.039 \\ \hline 18.393 \end{array}$$

$$\begin{array}{r} \$20.00 \\ - \$17.74 \\ \hline \$2.26 \end{array}$$

$$\begin{array}{r} \$35.00 \\ - \$32.98 \\ \hline \$2.02 \end{array}$$

$$\begin{array}{r} 16.359 \\ - 5.142 \\ \hline 11.217 \end{array}$$

$$\begin{array}{r} 2.82 \\ - 1.59 \\ \hline 1.23 \end{array}$$

$$\begin{array}{r} \$42.16 \\ \times 12 \\ \hline \$505.92 \end{array}$$

$$\begin{array}{r} 16.8 \\ \times 3 \\ \hline 50.4 \end{array}$$

$$\begin{array}{r} \$5.50 \\ \times 14 \\ \hline \$77.00 \end{array}$$

$$\begin{array}{r} 4.009 \\ \times 27 \\ \hline 108.243 \end{array}$$

\$22.46
7. $3) \$67.38$

3.026
11. $3) 9.078$

\$13.49
15. $8) \$107.92$

1.007
19. $5) 5.035$

Chapter 5 continued

e

Measure the length of the pencil in inches.



$3\frac{1}{2}$ in.

Complete the fact.

2. $1 \text{ ft} = \underline{\hspace{1cm}}$ in. **12**

3. $1 \text{ pt} = \underline{\hspace{1cm}}$ c **2**

4. $1 \text{ lb} = \underline{\hspace{1cm}}$ oz **16**

1 $\text{yd} = \underline{\hspace{1cm}}$ in. **36**

1 $\text{gal} = \underline{\hspace{1cm}}$ qt **4**

1 $\text{tn} = \underline{\hspace{1cm}}$ lb **2,000**

1 $\text{mi} = \underline{\hspace{1cm}}$ ft **5,280**

Write the best unit of measurement.

cups feet inches miles ounces tons

5. the length of a nail **inches**

8. milk to drink with lunch **cups**

6. the distance across a room **feet**

9. an elephant's weight **tons**

7. the width of Texas **miles**

10. a bag of jellybeans **ounces**

Rename the unit of measurement.

11. $6 \text{ ft} = \underline{\hspace{1cm}}$ yd **2**

12. $4 \text{ pt} = \underline{\hspace{1cm}}$ gal **$\frac{1}{2}$**

13. $32 \text{ oz} = \underline{\hspace{1cm}}$ lb **2**

f

Follow the Order of Operations to solve.

1. 5×2^3 **40**

2. $(7 + 4) \times 3 - 8$ **25**

3. $(24 - 8) \times 2 \div 4$ **8**

4. $8 - 2 + 5^2$ **31**

Use the Associative Property and the Commutative Property to solve. **Grouping in equations will vary.**

5. $4 + 7 + 2 + 6$

$(4 + 6) + (7 + 2) = 19$

6. $8 + 9 + 7 + 1$

$(8 + 7) + (9 + 1) = 25$

7. $3 + 4 + 12 + 7$

$(3 + 7) + (4 + 12) = 26$

Use the Distributive Property to solve.

8. 8×12 **$8 \times (10 + 2) =$**
 $80 + 16 = 96$

9. 9×12 **$9 \times (10 + 2) =$**
 $90 + 18 = 108$

10. 4×14 **$4 \times (10 + 4) =$**
 $40 + 16 = 56$

Write an equation for the part-whole model. Solve. **Equations may vary.**

n	
754	916

$754 + 916 = n$
 $n = 1,670$

\$500.00	
\$250.00	n

$\$500.00 - \$250.00 = n$
 $n = \$250.00$

Write a fraction to show the probability.

Jamie has a bag of 18 jellybeans. Six jellybeans are purple. She also has 3 green, 7 black, and 2 pink jellybeans.

13. What is the probability that Jamie will pull a pink jellybean out of the bag? **$\frac{2}{18}$**

14. What is the probability that she will pull out a purple jellybean?

$\frac{6}{18}$

15. What is the probability that she will pull out a green one? **$\frac{3}{18}$**

a

Solve.

1. $1,247$
 $3,809$
 $+ 5,921$
 $\underline{10,977}$

2. $\begin{array}{r} \$52.00 \\ - \$39.84 \\ \hline \$12.16 \end{array}$

3. $\begin{array}{r} 249,731 \\ + 860,572 \\ \hline 1,110,303 \end{array}$

4. $\begin{array}{r} 70,000 \\ - 14,975 \\ \hline 55,025 \end{array}$

5. $\begin{array}{r} 243 \\ \times 150 \\ \hline 36,450 \end{array}$

6. $\begin{array}{r} \$30.75 \\ \times \quad 24 \\ \hline \$738.00 \end{array}$

7. $24 \overline{) 8,424} \quad \begin{array}{r} 351 \\ \hline 8,424 \\ - 72 \\ \hline 122 \\ - 120 \\ \hline 24 \\ - 24 \\ \hline 0 \end{array}$

8. $121 \overline{) 42,592} \quad \begin{array}{r} 352 \\ \hline 42,592 \\ - 36 \\ \hline 65 \\ - 60 \\ \hline 52 \\ - 48 \\ \hline 42 \\ - 42 \\ \hline 0 \end{array}$

9. $16 - (4 \times 3) \div 2 \quad \textbf{10}$

10. $7 + (5 \times 3) + 2^3 \quad \textbf{30}$

11. $8 \times 3 - (6 \div 3) \quad \textbf{22}$

12. $4 + 15 \div 5 - 2 \quad \textbf{5}$

Car Wash

Trucks	\$8.00
Vans	\$5.00
Cars	\$7.00

The sixth-grade class had a car wash to raise money to help a needy family. They spent \$28.79 on washing supplies. The students washed 20 trucks, 34 vans, and 19 cars. Many folks gave the family donations, which amounted to \$59.

13. What was the total amount of money taken in by the students? **\$522.00**

14. What amount of money was left after the cost of the supplies was subtracted?
 $\$522.00 - \$28.79 = \$493.21$

b

Use the data from the circle graph to find the answer.

Mr. Sanford took a survey of 100 people to find the most popular ice-cream flavors. He put the results in a circle graph.

1. What fraction of the people chose chocolate?

$\frac{1}{2}$

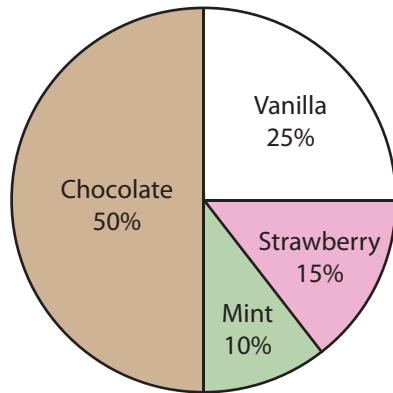
2. What fraction of the people chose vanilla?

$\frac{1}{4}$

3. What fraction of the people chose strawberry and mint? **$\frac{1}{4}$**

4. Does the circle graph compare continuous data or parts of a whole? **parts of a whole**

Popular Ice-Cream Flavors



Chapter 6 continued

c

Write the answer.

1. Is 631 between 0 and 600 or between 600 and 1,000?
600 and 1,000
2. Is 1,143 between 500 and 1,000 or between 1,000 and 1,500?
1,000 and 1,500
3. Is 291,476 between 290,000 and 390,000 or between 390,000 and 490,000?
290,000 and 390,000

Use the numbers in the box to write the answer.

4. List the odd numbers. **3, 9, 11, 7**
5. List the even numbers. **2, -6, 4, 8, 12**
6. List the prime numbers. **3, 2, 11, 7**
7. Write the product of 3 and 4. **12**
8. Write the sum of 4 and 7. **11**
9. Write a negative number. **-6**
10. Write the opposite of -3. **3**
11. Write the numbers from *least* to *greatest*.
-6, 0, 2, 3, 4, 7, 8, 9, 11, 12

3 2 -6 0 9
11 4 7 8 12

Round the number to the greatest place.

12. 468 **500**
13. 1.9 **2**
14. 82.75 **80**
15. 184,320 **200,000**

Solve.

16.
$$\begin{array}{r} 3,746 \\ \times \quad 25 \\ \hline 93,650 \end{array}$$

17.
$$\begin{array}{r} \$18.75 \\ \times \quad 40 \\ \hline \$750.00 \end{array}$$

18. $7,280 \div 20 = \underline{\hspace{2cm}}$ **364**

19. $41,652 \div 18 = \underline{\hspace{2cm}}$ **2,314**

d

Write the equivalent unit of time.

1. 1 day = ___ hours **24**
2. 1 year = ___ days **365**
3. 1 month = ___ days **30 or 31**
4. 1 minute = ___ seconds **60**
5. 1 week = ___ days **7**
6. 1 year = ___ weeks **52**

Use the calendar to answer the questions.

April						
S	M	T	W	Th	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

7. On what day of the week is April 30th? **Saturday**
8. What is the date of the second Sunday? **April 10**
9. What does *Th* mean? **Thursday**
10. Is April the second month or the fourth month of the year? **fourth**

Write the equivalent unit of measurement.

11. 1 pound = ___ ounces **16**
12. 1 ton = ___ pounds **2,000**
13. 1 gallon = ___ quarts **4**
14. 1 cup = ___ ounces **8**
15. 1 quart = ___ pints **2**
16. 1 pint = ___ cups **2**

Complete the table.

17. pounds	2	3	5	10
ounces	32	48	80	160

18. gallons	3	5	7	10
quarts	12	20	28	40

e

Add or subtract. Write the answer in lowest terms.

1. $\frac{1}{9} + \frac{3}{9} = \frac{4}{9}$

2. $\frac{2}{3} + \frac{2}{3} = 1\frac{1}{3}$

3. $\frac{4}{5} + \frac{1}{5} = 1$

4. $\frac{1}{2} + \frac{1}{2} = 1$

5. $\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$

6. $\frac{6}{9} - \frac{3}{9} = \frac{1}{3}$

7. $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$

8. $\frac{4}{8} - \frac{3}{8} = \frac{1}{8}$

9.
$$\begin{array}{r} 2\frac{1}{5} \\ + 1\frac{2}{5} \\ \hline 3\frac{3}{5} \end{array}$$

10.
$$\begin{array}{r} 3\frac{6}{7} \\ + 1\frac{1}{7} \\ \hline 4\frac{7}{7} = 5 \end{array}$$

11.
$$\begin{array}{r} 5\frac{2}{3} = 5\frac{4}{6} \\ - 2\frac{1}{6} = 2\frac{1}{6} \\ \hline 3\frac{3}{6} = 3\frac{1}{2} \end{array}$$

12.
$$\begin{array}{r} 5\frac{4}{4} \\ - 3\frac{1}{4} \\ \hline 2\frac{3}{4} \end{array}$$

13.
$$\begin{array}{r} \frac{2}{3} = \frac{4}{6} \\ + \frac{1}{6} = \frac{1}{6} \\ \hline \frac{5}{6} \end{array}$$

14.
$$\begin{array}{r} \frac{3}{4} = \frac{3}{4} \\ - \frac{1}{2} = \frac{2}{4} \\ \hline \frac{1}{4} \end{array}$$

15.
$$\begin{array}{r} 7\frac{1}{3} = 7\frac{2}{6} \\ - 2\frac{1}{6} = 2\frac{1}{6} \\ \hline 5\frac{1}{6} \end{array}$$

16.
$$\begin{array}{r} 4\frac{4}{9} = 4\frac{4}{9} \\ + 2\frac{1}{3} = 2\frac{3}{9} \\ \hline 6\frac{7}{9} \end{array}$$

17.
$$\begin{array}{r} \frac{2}{3} = \frac{4}{6} \\ + \frac{1}{2} = \frac{3}{6} \\ \hline \frac{7}{6} = 1\frac{1}{6} \end{array}$$

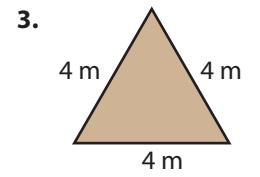
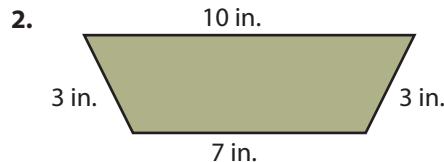
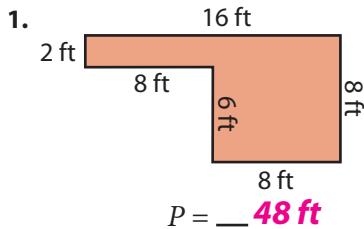
18.
$$\begin{array}{r} \frac{3}{4} = \frac{9}{12} \\ - \frac{1}{3} = \frac{4}{12} \\ \hline \frac{5}{12} \end{array}$$

19.
$$\begin{array}{r} 3\frac{1}{2} = 3\frac{5}{10} \\ + 1\frac{3}{5} = 1\frac{6}{10} \\ \hline 4\frac{11}{10} = 5\frac{1}{10} \end{array}$$

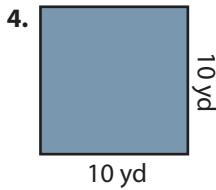
20.
$$\begin{array}{r} 8\frac{1}{2} = 8\frac{5}{10} \\ - 3\frac{1}{5} = 3\frac{2}{10} \\ \hline 5\frac{3}{10} \end{array}$$

f

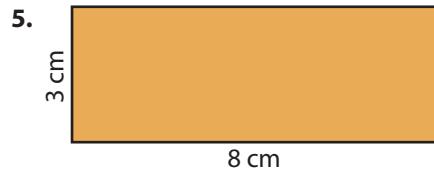
Find the perimeter of the figure.



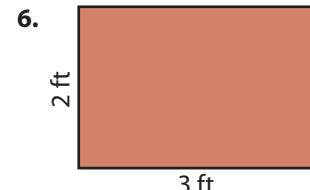
Write a multiplication equation to find the area of the figure.



$$10 \times 10 = 100 \text{ yd}^2$$

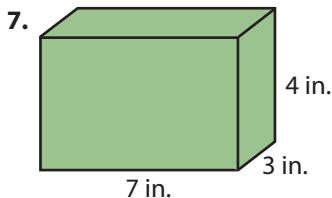


$$3 \times 8 = 24 \text{ cm}^2$$

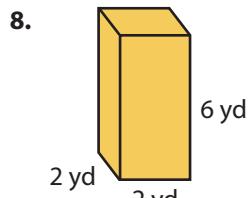


$$2 \times 3 = 6 \text{ ft}^2$$

Find the volume of the figure.



$$\underline{7} \text{ in.} \times \underline{3} \text{ in.} \times \underline{4} \text{ in.} = \underline{84} \text{ in.}^3$$

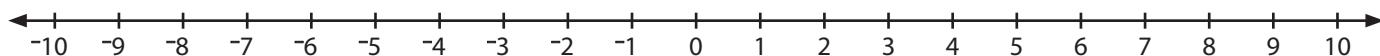


$$\underline{2} \text{ yd} \times \underline{2} \text{ yd} \times \underline{6} \text{ yd} = \underline{24} \text{ yd}^3$$

Chapter 6 continued

g

Use the number line to solve.



1. $3 + -5 = \textcolor{red}{-2}$ 2. $-4 + -4 = \textcolor{red}{-8}$ 3. $-6 + 4 = \textcolor{red}{-2}$ 4. $-7 + 7 = \textcolor{red}{0}$ 5. $-4 + 0 = \textcolor{red}{-4}$

Solve. Write the answer in lowest terms.

6. $\frac{1}{2} + \frac{3}{4} = \frac{2}{4} + \frac{3}{4} = \frac{5}{4} = \textcolor{red}{1\frac{1}{4}}$ 7. $\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$ 8. $\frac{2}{3} + \frac{1}{3} = \frac{3}{3} = \textcolor{red}{1}$ 9. $\frac{5}{6} - \frac{1}{2} = \frac{5}{6} - \frac{3}{6} = \frac{2}{6} = \frac{1}{3}$ 10. $\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$

11. $2\frac{1}{5} = 2\frac{2}{10}$
 $- 1\frac{1}{2} = 1\frac{5}{10}$
 $\underline{- \frac{7}{10}}$

12. $7\frac{5}{6} = 7\frac{5}{6}$
 $- 4\frac{1}{3} = 4\frac{2}{6}$
 $\underline{- 3\frac{3}{6} = 3\frac{1}{2}}$

13. $2\frac{3}{4}$
 $- 2\frac{3}{4}$
 $\underline{- \frac{1}{4}}$

14. $3\frac{1}{3}$
 $- 1\frac{2}{3}$
 $\underline{- 2\frac{2}{3}}$

15. $6\frac{3}{8} = 6\frac{3}{8}$
 $- 4\frac{1}{2} = 4\frac{4}{8}$
 $\underline{- 1\frac{7}{8}}$

Write the product or the quotient.

16. $\begin{array}{r} \$4.58 \\ \times \quad 5 \\ \hline \$22.90 \end{array}$ 17. $\begin{array}{r} 21.9 \\ \times \quad 31 \\ \hline 678.9 \end{array}$ 18. $\begin{array}{r} 1,568 \\ \times \quad 42 \\ \hline 65,856 \end{array}$ 19. $9,476 \div 23 = \textcolor{red}{412}$ 20. $21,702 \div 35 = \textcolor{red}{620 \text{ r}2}$

h

Determine whether the fraction is closest to 0, $\frac{1}{2}$, or 1.

1. $\frac{1}{8} = \textcolor{red}{0}$ 2. $\frac{3}{6} = \textcolor{red}{\frac{1}{2}}$ 3. $\frac{10}{12} = \textcolor{red}{1}$ 4. $\frac{5}{6} = \textcolor{red}{1}$ 5. $\frac{2}{12} = \textcolor{red}{0}$ 6. $\frac{7}{12} = \textcolor{red}{\frac{1}{2}}$

Write a comparison sentence using $>$, $<$, or $=$.

7. $\frac{3}{4} < \frac{5}{6}$ 8. $\frac{1}{3} > \frac{1}{10}$ 9. $\frac{1}{2} = \frac{4}{8}$ 10. $\frac{10}{15} < \frac{9}{10}$

Solve. Write the answer in lowest terms.

11. $5\frac{3}{4} = 5\frac{6}{8}$
 $+ 7\frac{2}{8} = 7\frac{2}{8}$
 $\underline{+ 12\frac{8}{8} = 13}$

12. $4\frac{1}{5}$
 $+ 8\frac{3}{5}$
 $\underline{+ 12\frac{4}{5}}$

13. $1\frac{3}{4} = 1\frac{3}{4}$
 $+ 2\frac{1}{2} = 2\frac{2}{4}$
 $\underline{+ 3\frac{5}{4} = 4\frac{1}{4}}$

14. $6\frac{1}{5} = 6\frac{2}{10}$
 $+ 4\frac{1}{2} = 4\frac{5}{10}$
 $\underline{+ 10\frac{7}{10}}$

15. $7\frac{2}{3} = 7\frac{4}{6}$
 $+ 5\frac{1}{6} = 5\frac{1}{6}$
 $\underline{+ 12\frac{5}{6}}$

16. $3\frac{1}{2} = 3\frac{2}{4}$
 $- \frac{1}{4} = \frac{1}{4}$
 $\underline{- 3\frac{1}{4}}$

17. $6\frac{4}{5} = 6\frac{12}{15}$
 $- 4\frac{3}{4} = 2\frac{1}{4}$
 $\underline{- 2\frac{2}{3}}$

18. $8\frac{4}{5} = 8\frac{12}{15}$
 $- 2\frac{2}{3} = 2\frac{10}{15}$
 $\underline{- 4\frac{2}{15}}$

19. $9\frac{1}{6} = 9\frac{7}{6}$
 $- 3\frac{2}{6} = 5\frac{5}{6}$
 $\underline{- 5\frac{5}{6}}$

20. $8\frac{1}{3} = 8\frac{2}{6}$
 $- 5\frac{1}{6} = 3\frac{1}{6}$
 $\underline{- 3\frac{1}{6}}$

i

Solve.

1.
$$\begin{array}{r} \$147.53 \\ + \$289.49 \\ \hline \$437.02 \end{array}$$

2.
$$\begin{array}{r} 27.983 \\ - 19.345 \\ \hline 8.638 \end{array}$$

3.
$$\begin{array}{r} 24.50 \\ 193.47 \\ + 82.09 \\ \hline 300.06 \end{array}$$

4.
$$\begin{array}{r} 5.039 \\ - 0.928 \\ \hline 4.111 \end{array}$$

5. $2.014 \times 5 = 10.07$

6. $81.53 \times 2 = 163.06$

7. $18.54 \div 3 = 6.18$

8. $4.624 \div 2 = 2.312$

9. $2.4 + 0.7 + 3.9 = 7$

10. $12.8 + 1.09 + 0.321 = 14.211$

11. $85.913 - 7.41 = 78.503$

12. $3 - 2.5 = 0.5$

13. Anna bought three shirts on sale for \$7.89 each. The original cost of each shirt was \$12.00. How much did Anna spend on the three shirts? How much money did she save? $3 \times \$7.89 = \$23.67; 3 \times \$12.00 = \$36.00; \$36.00 - \$23.67 = \$12.33$ saved

14. Tyler needed 4 sections of tubing, each measuring 1.8 inches. The tube that he bought was 1 foot long. What was the total amount of tubing that he needed? How much was left over? $4 \times 1.8 \text{ in.} = 7.2 \text{ in.}; 12 \text{ in.} - 7.2 \text{ in.} = 4.8 \text{ in. left}$

j

Use the data to answer the questions.

Jona wants to make an A in math. He recorded his grades on a chart. The range for an A is 90 to 100.

Week	1	2	3	4	5	6	7	8	9
Score	85	94	92	98	89				

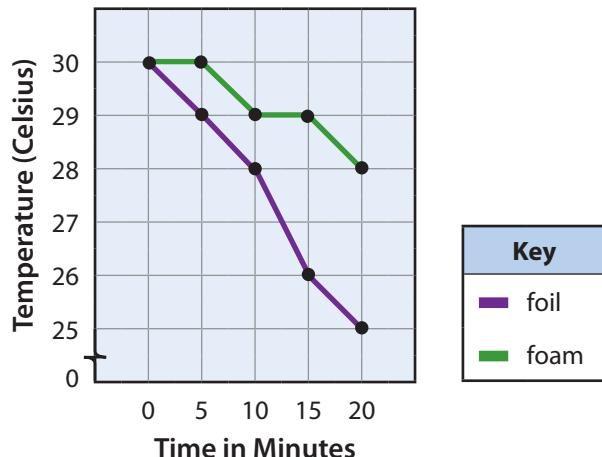
1. What is Jona's average at Week 5? Is Jona's average in the A range? $85 + 94 + 92 + 98 + 89 = 458; 458 \div 5 = 91.6$; yes
2. What are Jona's lowest and highest scores? What is the difference between Jona's lowest score and his highest score? 85 and $98; 98 - 85 = 13$ points

Aaron wanted to find out what material was the best insulator of hot water. He wrapped 2 plastic cups with different insulating materials and filled them with water. Then he measured the temperature of the water at different times. He recorded the results on a line graph.

4. According to the line graph, which material keeps the water hotter longer? **foam**
5. What is the title of the graph? **Best Insulator**
6. What are the labels on the graph? **Temperature (Celsius), Time in Minutes**

3. List the scores from least to greatest. Circle the middle score to find the median. **85, 89, 92, 94, 98**

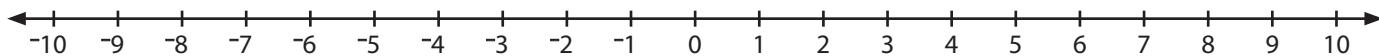
Best Insulator



Chapter 6 continued

k

Use the number line to find the answer.



1. $-3 + -2 = \underline{-5}$

2. $-5 + 2 = \underline{-3}$

3. $-3 + 0 = \underline{-3}$

4. $1 + -3 = \underline{-2}$

5. $0 + -8 = \underline{-8}$

6. $-4 + -5 = \underline{-9}$

7. $-1 + -7 = \underline{-8}$

8. $4 + -7 = \underline{-3}$

Write the numbers from *least to greatest*.

9. 2 -3 1 0 $\underline{-3 \ 0 \ 1 \ 2}$

10. -7 8 0 -5 $\underline{-7 \ -5 \ 0 \ 8}$

11. 4 3 -4 2 $\underline{-4 \ 2 \ 3 \ 4}$

12. 6 5 -9 -10 $\underline{-10 \ -9 \ 5 \ 6}$

Write a positive or negative number to match the phrase.

13. three degrees below zero $\underline{-3}$

17. negative eight $\underline{-8}$

14. earned ten points $\underline{10}$

18. seven degrees above zero $\underline{7}$

15. lost five pounds $\underline{-5}$

19. the temperature rose four degrees $\underline{4}$

16. behind six points $\underline{-6}$

20. ten feet below sea level $\underline{-10}$

DAILY **7** REVIEW

a

Solve.

1. $7 + \underline{\quad} = 11$ **4**

6. $4 + \underline{\quad} = 13$ **9**

11. $\underline{\quad} + 9 = 16$ **7**

16. $\underline{\quad} + 8 = 14$ **6**

2. $5 + 9 = \underline{\quad}$ **14**

7. $10 - 8 = \underline{\quad}$ **2**

12. $17 - 8 = \underline{\quad}$ **9**

17. $13 - 7 = \underline{\quad}$ **6**

3. $16 - \underline{\quad} = 8$ **8**

8. $15 - \underline{\quad} = 6$ **9**

13. $12 \times 6 = \underline{\quad}$ **72**

18. $6 \times 8 = \underline{\quad}$ **48**

4. $4 \times 6 = \underline{\quad}$ **24**

9. $3 \times \underline{\quad} = 21$ **7**

14. $2 \times 7 = \underline{\quad}$ **14**

19. $32 \div 4 = \underline{\quad}$ **8**

5. $36 \div 6 = \underline{\quad}$ **6**

10. $48 \div 8 = \underline{\quad}$ **6**

15. $108 \div 9 = \underline{\quad}$ **12**

20. $81 \div 9 = \underline{\quad}$ **9**

Complete the table.

$\times 7$	
Input	Output
20	140
80	560
400	2,800
600	4,200
5,000	35,000

$+ 8$	
Input	Output
40	48
90	98
700	708
1,000	1,008
6,000	6,008

$- 6$	
Input	Output
30	24
70	64
300	294
700	694
9,000	8,994

$\div 3$	
Input	Output
60	20
90	30
300	100
2,100	700
3,600	1,200

b

Write the factors from *least to greatest* for each number pair. Circle the GCF.

1. 16, 24

16: 1, 2, 4, 8, 16

24: 1, 2, 3, 4, 6, 8, 12, 24

2. 12, 36

12: 1, 2, 3, 4, 6, 12

36: 1, 2, 3, 4, 6, 9, 12, 18, 36

3. 8, 10

8: 1, 2, 4, 8

10: 1, 2, 5, 10

Write the LCM for each number pair.

4. 6, 8 **24**

5. 3, 4 **12**

6. 9, 5 **45**

Rename the fraction to its lowest terms. Rename an improper fraction as a mixed number.

7. $\frac{24}{36} \frac{2}{3}$

8. $\frac{16}{14} 1 \frac{2}{14} = 1 \frac{1}{7}$

9. $\frac{36}{45} \frac{4}{5}$

10. $\frac{6}{12} \frac{1}{2}$

11. $\frac{28}{16} 1 \frac{12}{16} = 1 \frac{3}{4}$

12. $\frac{9}{6} 1 \frac{3}{6} = 1 \frac{1}{2}$

Solve. Write the answer in lowest terms.

13. $\frac{2}{8} + \frac{1}{4} \frac{1}{2}$

14. $\frac{3}{7} + \frac{5}{8} \frac{59}{56}$ or $1 \frac{3}{56}$

15. $\frac{7}{9} - \frac{5}{9} \frac{2}{9}$

16. $\frac{2}{3} - \frac{1}{4} \frac{5}{12}$

Answer the questions.

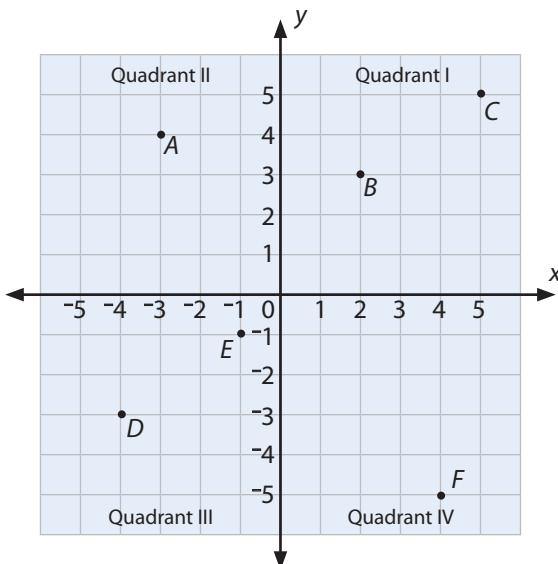
After the museum tour, Mrs. Jay's sixth graders could visit whichever exhibits they were most interested in. $\frac{3}{20}$ of the students went to the train history exhibit. $\frac{1}{4}$ of them went to the weapons hall. $\frac{3}{10}$ of them went to see the habitats section, $\frac{1}{5}$ went to the art gallery, and $\frac{1}{10}$ went to the dinosaur exhibit.

17. How many students were in the museum? **20**

18. Which exhibit did the most students go to see? **habitats**

19. Did more students go to the art gallery or the train history exhibit? **art gallery**

20. Which exhibit did 5 of the students go to see? **weapons hall**

c

Name the quadrant in which the point is located.

1. A **Quadrant II**4. B **Quadrant I**2. C **Quadrant I**5. D **Quadrant III**3. E **Quadrant III**6. F **Quadrant IV**

Write the coordinates for the point.

7. A **(-3, 4)**10. B **(2, 3)**8. C **(5, 5)**11. D **(-4, -3)**9. E **(-1, -1)**12. F **(4, -5)**

Solve.

13. 165

$$\begin{array}{r} \times 46 \\ \hline 7,590 \end{array}$$

14. 786

$$\begin{array}{r} \times 451 \\ \hline 354,486 \end{array}$$

15. 953

$$\begin{array}{r} \times 412 \\ \hline 392,636 \end{array}$$

16. 1,795

$$\begin{array}{r} \times 302 \\ \hline 542,090 \end{array}$$

17. $21 \overline{)336} \quad \begin{array}{r} 16 \\ \hline 336 \\ -21 \\ \hline 126 \\ -126 \\ \hline 0 \end{array}$

18. $43 \overline{)516} \quad \begin{array}{r} 12 \\ \hline 516 \\ -43 \\ \hline 86 \\ -86 \\ \hline 0 \end{array}$

19. $17 \overline{)553} \quad \begin{array}{r} 32 \text{ r9} \\ \hline 553 \\ -51 \\ \hline 43 \\ -34 \\ \hline 9 \end{array}$

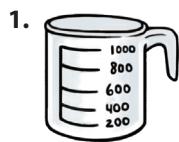
20. $94 \overline{)1,598} \quad \begin{array}{r} 17 \\ \hline 1,598 \\ -94 \\ \hline 658 \\ -658 \\ \hline 0 \end{array}$

Chapter 7 continued

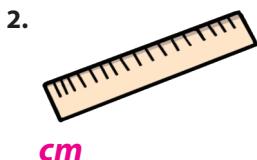
d

Write the best unit of measure for the object.

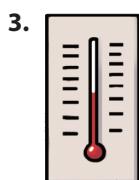
°C cm g mL



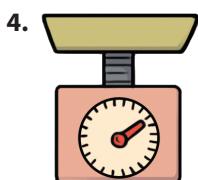
mL



cm



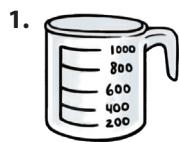
°C



g

Write the best measure for the object.

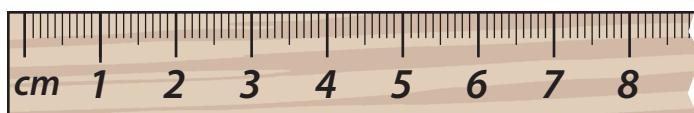
1 g 2 L 1 m



5. baseball bat **1 m**

6. paper clip **1 g**

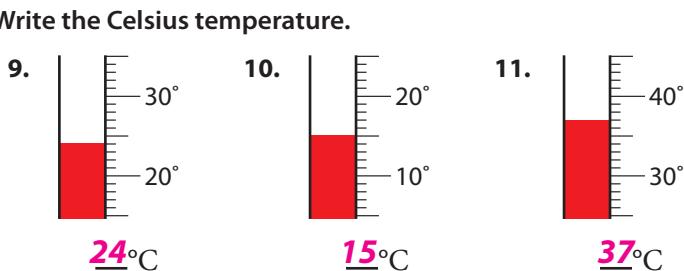
Write the measurement of the line.



7. red line: **8 cm**

8. green line: **3 cm**

Solve.



$$\begin{array}{r} 400 \text{ g} \\ - 200 \text{ g} \\ \hline 200 \text{ g} \end{array}$$

$$\begin{array}{r} 184 \text{ cm} \\ + 712 \text{ cm} \\ \hline 896 \text{ cm} \end{array}$$

$$\begin{array}{r} 97 \text{ cm} \\ - 15 \text{ cm} \\ \hline 82 \text{ cm} \end{array}$$

$$\begin{array}{r} 3241 \text{ m} \\ + 1536 \text{ m} \\ \hline 4777 \text{ m} \end{array}$$

$$\begin{array}{r} 543 \text{ m} \\ - 232 \text{ m} \\ \hline 311 \text{ m} \end{array}$$

$$\begin{array}{r} 543 \text{ g} \\ + 326 \text{ g} \\ \hline 869 \text{ g} \end{array}$$

e

Use the numbers in the box to answer the question.

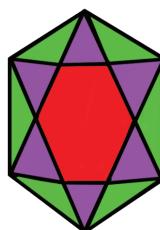
Jeremy and Holly counted the pets that live in their neighborhood. They found 8 dogs, 9 cats, 7 goldfish, 2 birds, and 4 rabbits being kept as pets.

$\frac{2}{4}$
8:9
30 to 7
30

- How many pets are in their neighborhood? **30**
- What ratio compares dogs to cats in ratio form? **8:9**
- What ratio compares pets to goldfish in word form? **30 to 7**
- What ratio compares birds to rabbits in fraction form? **$\frac{2}{4}$**

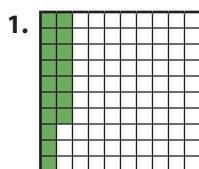
Use the picture to write the ratio.

- What is the ratio of purple triangles to green triangles? **6:6**
- What is the ratio of the red hexagon to purple triangles? **1:6**

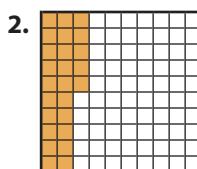


f

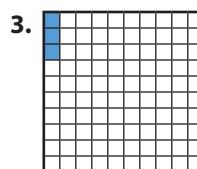
Write the fraction in decimal form.



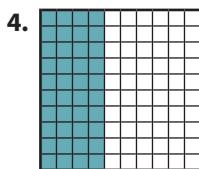
$$\frac{17}{100} \text{ } 0.17$$



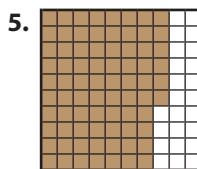
$$\frac{25}{100} \text{ } 0.25$$



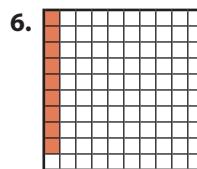
$$\frac{3}{100} \text{ } 0.03$$



$$\frac{40}{100} \text{ } 0.40$$



$$\frac{76}{100} \text{ } 0.76$$



$$\frac{9}{100} \text{ } 0.09$$

Write the percent in fraction form. Write the fraction in lowest terms.

$$7. 25\% = \frac{25}{100} \frac{1}{4}$$

$$8. 30\% = \frac{30}{100} \frac{3}{10}$$

$$9. 75\% = \frac{75}{100} \frac{3}{4}$$

$$10. 80\% = \frac{80}{100} \frac{4}{5}$$

Use the numbers in the box to answer the questions.

50% 75% 100%

11. Ryan answered all the test questions correctly.
What percentage grade did he receive? **100%**

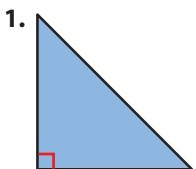
12. Katie scored $\frac{1}{2}$ of the game points.
What percentage of the points did she score?
50%

DAILY 8 REVIEW

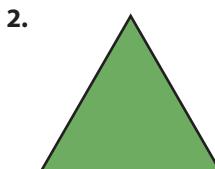
a

Classify the triangle according to the measure of its angles.

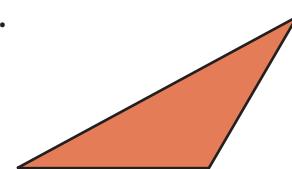
acute obtuse right



right



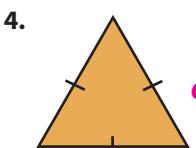
acute



obtuse

Classify the triangle according to the length of its sides.

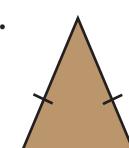
equilateral isosceles scalene



equilateral

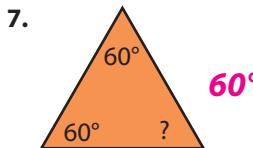


scalene

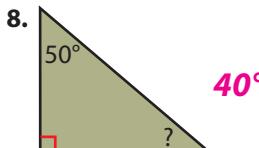


isosceles

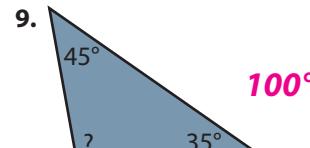
Find the measure of the unknown angle.



60°



40°



100°

Chapter 8 continued

b

Write the answer.

1. Estimate the product of 679 and 432. **280,000**

2. Estimate the quotient for 2,314 divided into 30 groups. **70 or 80**

3. What is the sum of 37,402 and 16,943? **54,345**

4. Solve the expression: $(6 \times 10) + 3$. **63**

5. Solve the expression: $2 + 1\frac{1}{4}$. **3\frac{1}{4}**

6. What is the sum of $\frac{6}{8}$ and $\frac{5}{6}$? **1\frac{7}{12}**

Solve.

7. $(7 \cdot x) + 3 = 45$ **x = 6**

8. $\frac{1}{8}$ of 16 **2**

9. 2.5×4 **10 or 10.00**

10. $\frac{3}{7} = \frac{n}{28}$ **n = 12**

11. $\frac{6}{n} = \frac{36}{54}$ **n = 9**

12. 4.8×6 **28.8**

c

Multiply. Use cancellation if possible. Write the answer in lowest terms. **Cancellation steps may vary.**

1. $\frac{4}{10} \times \frac{3}{4}$ **$\frac{3}{10}$**

2. $\frac{6}{8} \times 5$ $\frac{6}{8} \times \frac{5}{1} =$
 $\frac{30}{8} = 3\frac{3}{4}$

3. $\frac{1}{2} \times \frac{2}{6}$ **$\frac{1}{6}$**

4. $\frac{7}{8} \times 1\frac{1}{3}$ $\frac{7}{8} \times \frac{4}{3} = \frac{7}{2} \times$
 $\frac{1}{3} = \frac{7}{6} = 1\frac{1}{6}$

Use the Distributive Property to solve. **Steps used to solve may vary.**

5. $2\frac{3}{4} \times 6$

6. $4\frac{1}{4} \times 5$

7. $2\frac{1}{9} \times 4$

8. $1\frac{2}{3} \times 3$

$(2 \times 4) + (\frac{1}{9} \times 4) =$

$(1 \times 3) + (\frac{2}{3} \times 3) =$

$8 + (\frac{1}{9} \times 4) = 8\frac{4}{9}$

$3 + (\frac{2}{3} \times 3) =$

$3 + \frac{2}{1} = 5$

5. **$(2 \times 6) + (\frac{3}{4} \times 6) =$**

$12 + (\frac{3}{4} \times \frac{6}{1}) =$

$12 + \frac{9}{2} = 16\frac{1}{2}$

6. **$(4 \times 5) + (\frac{1}{4} \times 5) =$**

$20 + (\frac{1}{4} \times \frac{5}{1}) =$

$20 + \frac{5}{4} = 21\frac{1}{4}$

Solve. Write the answer in lowest terms.

9. A lemon stir-fry sauce recipe calls for $\frac{1}{4}$ of a cup of lemon juice and 2 tablespoons of sugar. Kevin is making stir fry for several people and needs more sauce. How much lemon juice does he need if he doubles the recipe? How much sugar? **$\frac{1}{2}$ c of lemon juice; 4 tbsp of sugar**

10. Julie is making 5 gift baskets. She needs $2\frac{1}{2}$ yards of ribbon for each basket. How much ribbon does she need altogether?

$5 \times 2\frac{1}{2} \text{ yd} = \frac{5}{1} \times \frac{5}{2} \text{ yd} = \frac{25}{2} \text{ yd} = 12\frac{1}{2} \text{ yd}$

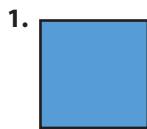
11. Kylie ran $2\frac{1}{4}$ miles. Joshua ran $1\frac{7}{8}$ miles. How many miles did the two friends run altogether?

$2\frac{1}{4} \text{ mi} + 1\frac{7}{8} \text{ mi} = 2\frac{2}{8} \text{ mi} + 1\frac{7}{8} \text{ mi} = 3\frac{9}{8} \text{ mi} = 4\frac{1}{8} \text{ mi}$

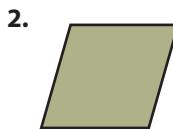
d

Write the name of the quadrilateral.

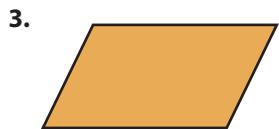
parallelogram rectangle rhombus square trapezoid



square



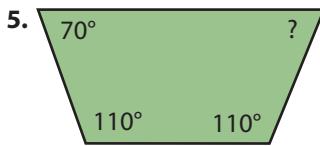
rhombus



parallelogram

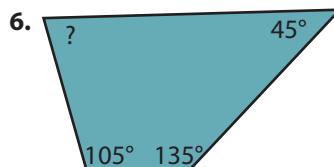


trapezoid

Find the measure of the unknown angle. *Equations may vary.*

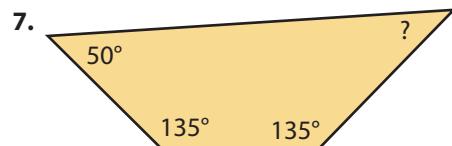
$$110 + 110 + 70 = 290;$$

$$360 - 290 = 70^\circ$$



$$105 + 135 + 45 = 285;$$

$$360 - 285 = 75^\circ$$



$$50 + 135 + 135 = 320;$$

$$360 - 320 = 40^\circ$$

Write true or false.

8. The sum of the angles in any quadrilateral is 360° . **true**
9. A rectangle is never a parallelogram. **false**
10. A square is always a rectangle. **true**

e

Use the data from the chart to find the answer.

1. Which of these animals has the most mass at birth?
gray whale
2. Which animal has a mass of 3 kg? **white-tailed deer**
3. What is the mass of a baby golden hamster?
2 g
4. What is the mass of a baby porcupine? **500 g**
5. What is the difference in mass of a baby bison and a baby leopard seal? **10,000 g**
6. What is the mass of a baby okapi? **16 kg**
7. Is the mass of a gray whale *greater than* or *less than* the total mass of an American bison and a leopard seal? **greater**

Baby Mammals	
Animal	Average Mass at Birth
American Bison	20,000 g
Eastern Cottontail	40 g
Golden Hamster	2 g
Gray Whale	500,000 g
Leopard Seal	30,000 g
Okapi	16 kg
Porcupine	500 g
Raccoon	80 g
White-tailed Deer	3 kg

8. What is the sum of the masses of a baby porcupine, a raccoon, and a hamster? **582 g**
9. Which animal has a mass that is half a baby raccoon's mass? **eastern cottontail**
10. Which animal's mass is 14,000 g less than a leopard seal's? **okapi**

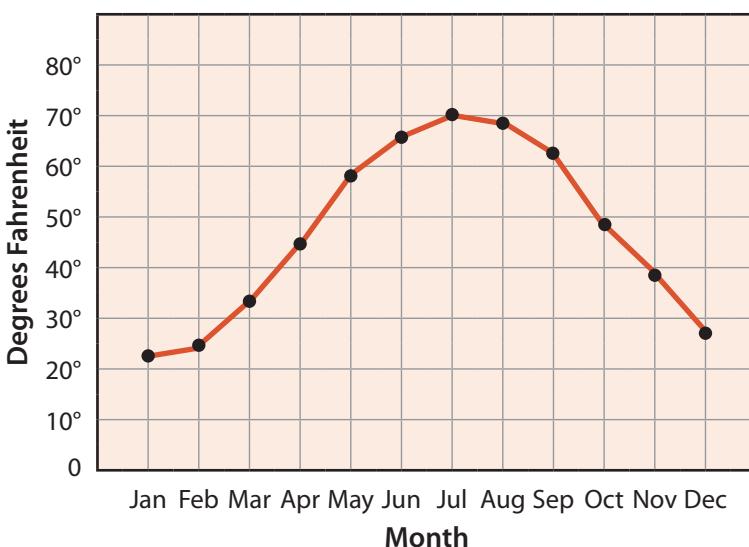
Chapter 8 continued

f

Use the data from the line graph to find the answer.

1. What data is this graph showing? **average temperatures for Verona, New York**
2. Which month of the year is the coldest in Verona? **January**
3. What is the highest average temperature for the year? **70°F**
4. Which months of the year have temperatures that are usually above 60°F? **June, July, August, September**
5. Which month has an average temperature of 45°F? **April**
6. Which month is colder, March or November? **March**
7. In what three months would the average temperature be around 68°? **June, July, and August**
8. Which months have temperatures in the 20s? **January, February, December**
9. In which months could you possibly go ice skating outside on a nearby lake? **January, February, December**

Average Temperatures in Verona, NY



g

Solve.

$$\begin{array}{r} 1. \quad \$37.16 \\ + \$14.24 \\ \hline \$51.40 \end{array}$$

$$\begin{array}{r} 2. \quad 157.04 \\ + 98.16 \\ \hline 255.20 \end{array}$$

$$\begin{array}{r} 3. \quad 784.32 \\ + 512.75 \\ \hline 1,297.07 \end{array}$$

$$\begin{array}{r} 4. \quad 6.075 \\ - 2.194 \\ \hline 3.881 \end{array}$$

$$\begin{array}{r} 5. \quad 23.60 \\ - 14.28 \\ \hline 9.32 \end{array}$$

$$\begin{array}{r} 6. \quad 94.16 \\ - 8.02 \\ \hline 86.14 \end{array}$$

$$\begin{array}{r} 7. \quad 6.75 \\ \times 4.21 \\ \hline 28.4175 \end{array}$$

$$\begin{array}{r} 8. \quad \$31.15 \\ \times 5 \\ \hline \$155.75 \end{array}$$

$$\begin{array}{r} 9. \quad 58.04 \\ \times 16 \\ \hline 928.64 \end{array}$$

$$\begin{array}{r} 10. \quad \$150.25 \\ \times 3 \\ \hline \$450.75 \end{array}$$

$$11. 9.26 \div 4 \quad \underline{\underline{2.315}}$$

$$12. 246.2 \div 8 \quad \underline{\underline{30.775}}$$

$$13. 556.8 \div 58 \quad \underline{\underline{9.6}}$$

14. Jonathan and Joshua together earned \$68.00 mowing yards. Jonathan wants to give all of his half of the money to a mission program that buys blankets for children who do not have any. How much can he donate? **$\$68 \div 2 = \34.00**

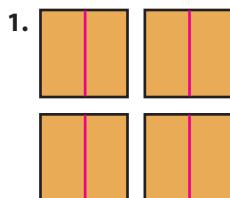
16. Anne has saved \$55.17. She wants to buy a CD that costs \$14.98 and a book that costs \$12.00. If she buys those items, will she have enough left to buy a \$30.00 computer game? **$no; \$14.98 + \$12.00 = \$26.98; \$55.17 - 26.98 = \28.19**

15. Joshua wants to give half of his money for the blankets and put the other half in his church offering. How much can he give to each? **$\$34.00 \div 2 = \17.00**

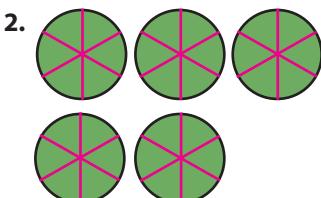
DAILY 9 REVIEW

a

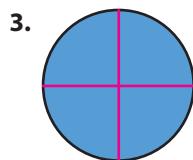
Partition the figures to help you find the quotient.



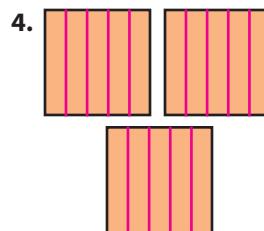
$$4 \div \frac{1}{2} \mathbf{8}$$



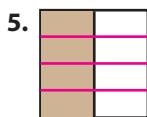
$$5 \div \frac{5}{6} \mathbf{6}$$



$$1 \div \frac{2}{4} \mathbf{2}$$



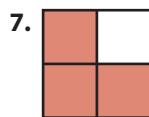
$$3 \div \frac{3}{5} \mathbf{5}$$



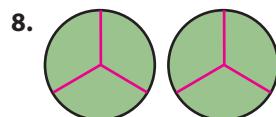
$$\frac{1}{2} \div \frac{1}{8} \mathbf{4}$$



$$\frac{1}{3} \div \frac{1}{6} \mathbf{2}$$



$$\frac{3}{4} \div \frac{3}{4} \mathbf{1}$$



$$2 \div \frac{1}{3} \mathbf{6}$$

Solve by multiplying by the reciprocal.

$$9. \frac{3}{4} \div \frac{1}{2} \frac{3}{4} \times \frac{2}{1} = \frac{3}{2} = 1\frac{1}{2}$$

$$10. 2\frac{1}{2} \div \frac{2}{3} \frac{5}{2} \times \frac{3}{2} = \frac{15}{4} = 3\frac{3}{4}$$

$$11. 3\frac{1}{5} \div \frac{2}{10} \frac{16}{5} \times \frac{10}{2} = \frac{16}{1} = 16$$

$$12. 10 \div 2\frac{1}{2} \frac{10}{1} \times \frac{2}{5} = \frac{4}{1} = 4$$

$$13. 4\frac{1}{2} \div 1\frac{3}{4} \frac{9}{2} \times \frac{4}{7} = \frac{18}{7} = 2\frac{4}{7}$$

$$14. 2\frac{1}{2} \div 1\frac{1}{4} \frac{5}{2} \times \frac{4}{5} = \frac{2}{1} = 2$$

b

Simplify.

$$1. (4 + 5) \times 3 - 2 \mathbf{25}$$

$$2. 5^2 + 3 - 8 \mathbf{20}$$

$$3. (35 \div 7) \times 4 + 6 \mathbf{26}$$

$$4. 89 - 10 + (4 \times 2) \mathbf{87}$$

$$5. 24 \div (6 \times 2) + 8 \mathbf{10}$$

$$6. 8 \times (8 + 2) + 5 \mathbf{85}$$

Solve.

<i>n</i>		
25	25	25
75		

120		
30	30	<i>n</i>
60		

150			
25	<i>n</i>	50	50
25			

Solve. Draw a part-whole model for the equation.

$$10. 12 + 12 + n = 36 \mathbf{n = 12}$$

36		
12	12	<i>n</i>

$$13. n \times 25 = 200 \mathbf{n = 8}$$

$$11. 100 - 75 = n \mathbf{n = 25}$$

100		
75	<i>n</i>	

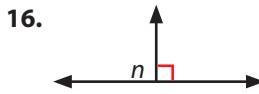
$$14. n \div 4 = 25 \mathbf{n = 100}$$

$$12. n - 5 = 20 \mathbf{n = 25}$$

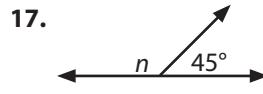
n	
5	20

$$15. \frac{150}{n} = 6 \mathbf{n = 25}$$

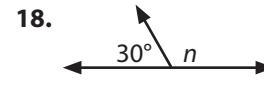
Find the measure of the unknown angle.



$$n + 90^\circ = 180^\circ \mathbf{n = 90^\circ}$$



$$n + 45^\circ = 180^\circ \mathbf{n = 135^\circ}$$



$$30^\circ + n = 180^\circ \mathbf{n = 150^\circ}$$

Chapter 9 continued

c

Write a comparison sentence using $>$, $<$, or $=$.

1. $0.075 < 0.75$

2. $3.19 < 31.9$

3. $1.7 > 0.17$

4. $2.3 = 2.30$

Solve.

5.
$$\begin{array}{r} 2.50 \\ + 3.81 \\ \hline 6.31 \end{array}$$

6.
$$\begin{array}{r} 1.46 \\ + 0.79 \\ \hline 2.25 \end{array}$$

7.
$$\begin{array}{r} 0.84 \\ - 0.30 \\ \hline 0.54 \end{array}$$

8.
$$\begin{array}{r} 7.95 \\ - 2.38 \\ \hline 5.57 \end{array}$$

9.
$$\begin{array}{r} 15.11 \\ + 26.98 \\ \hline 42.09 \end{array}$$

10. $2.45 + 1.79 = 4.24$

11. $13.01 - 8.7 = 4.31$

12. $5.08 - 0.39 = 4.69$

13. $\$5.00 - \$2.34 = \$2.66$

14.
$$\begin{array}{r} \$15.38 \\ \times \quad 3 \\ \hline \$46.14 \end{array}$$

15.
$$\begin{array}{r} 2.59 \\ \times \quad 5 \\ \hline 12.95 \end{array}$$

16.
$$\begin{array}{r} 18.401 \\ \times \quad 2 \\ \hline 36.802 \end{array}$$

17.
$$\begin{array}{r} 0.952 \\ \times \quad 4 \\ \hline 3.808 \end{array}$$

18.
$$\begin{array}{r} 7.01 \\ \times \quad 6 \\ \hline 42.06 \end{array}$$

19. Kalee earned \$10.00 taking care of her neighbor's puppy. She bought a top for \$8.49 with the money. How much change did she receive?

$\$10.00 - \$8.49 = \$1.51$

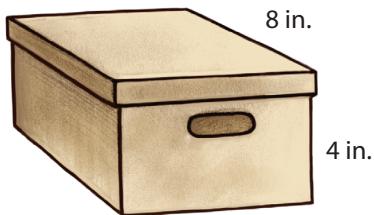
20. Kirk cut a rope into four 7.5-inch sections. He had 6 inches left over. What was the length of the original piece of rope?

$(4 \times 7.5) + 6 = 30 + 6 = 36 \text{ in.}$

d

Write an equation. Solve.

- 1.

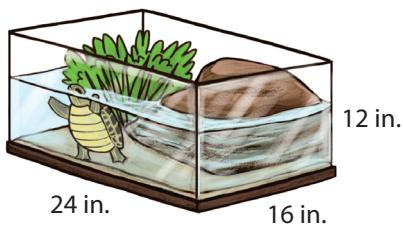


What is the perimeter of the box lid?

$P = 28 \text{ in.}$

$(2 \times 6) + (2 \times 8) = 28 \text{ in.}$

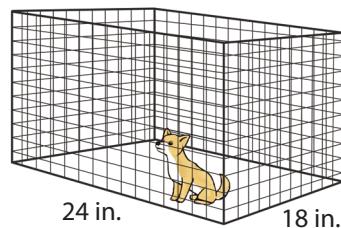
- 2.



What is the volume of the tank?

$$V = \frac{l \cdot w \cdot h}{l \cdot w \cdot h} = 4,608 \text{ in.}^3$$

- 3.



Multiply to find the area of the cage floor.

$A = \underline{\hspace{2cm}} \text{ in.}^2$

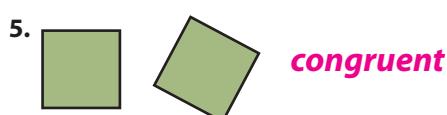
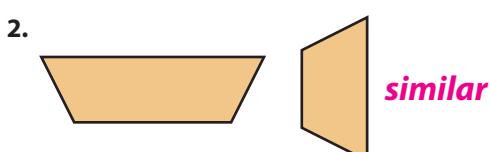
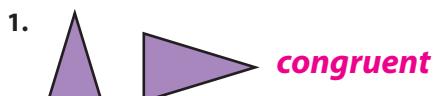
$24 \times 18 = 432 \text{ in.}^2$

4. Wes is preparing to take his dogs to the dog show. He has two cages for the dogs. The floor of the one cage is 20 inches by 18 inches. The floor of the other cage is 48 inches by 24 inches. The van has a 4-foot opening, and the length without the seat is 6 feet. Will both cages fit into the back of the van? **Yes, both cages will fit.**

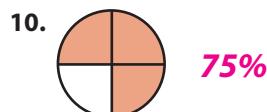
5. The dog show is held at the Morgan Arena. The arena is 150 feet by 300 feet. The dog-agility show needs a space of 100 feet by 100 feet. Can two shows go on at the same time in the Morgan Arena? **Yes, two shows can go on at the same time.**

e

Identify the shapes as **congruent** or **similar**.



Write the percent of the circle that is shaded.



Write **certain**, **equally likely**, or **impossible** to predict the probability of choosing a red counter.

**f**

Use the data from the pictograph to answer the questions.

Favorite Theme Parks	
Cedar Point	
Islands of Adventure	
Holiday World	
Knoebels	
Magic Mountain	

- What is the numerical value of ? **100**
- What is the numerical value of ? **150**
- How many people favor Cedar Point? **600 people**
- Which theme park was the favorite of 300 people? **Magic Mountain**
- Which two theme parks were favorites of the same number of people? **Holiday World and Knoebels**

Key	
	= 100 people

Solve.

6. $\begin{array}{r} \$124.79 \\ + \$734.36 \\ \hline \$859.15 \end{array}$

7. $\begin{array}{r} \$100.00 \\ - \$85.72 \\ \hline \$14.28 \end{array}$

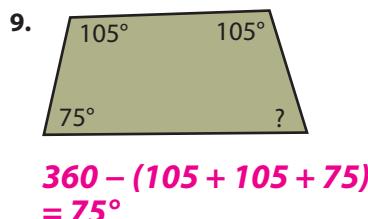
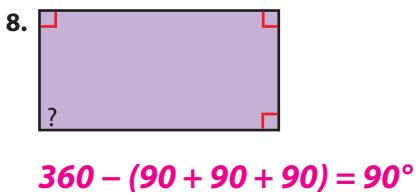
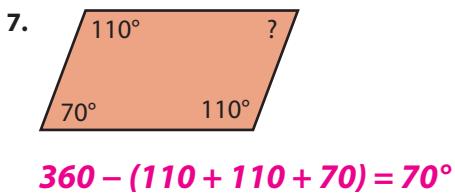
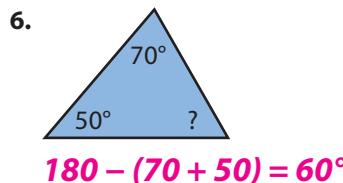
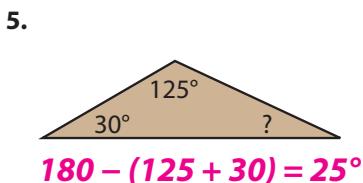
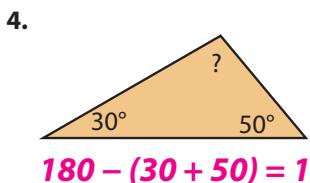
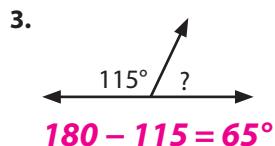
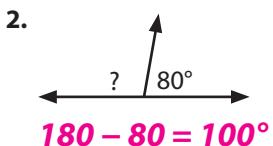
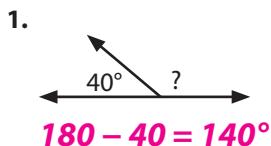
8. $\begin{array}{r} \$15.25 \\ \times \quad 8 \\ \hline \$122.00 \end{array}$ **\$8.03**

9. $25 \overline{) \$200.75}$

Chapter 9 continued

g

Find the measure of the unknown angle. *Equations may vary.*



DAILY 10 REVIEW

a

Use mental math to solve.

1. $34.7 \div 10$ **3.47**

2. $67.83 \div 100$ **0.6783**

3. $821.3 \div 1000$ **0.8213**

Rename the denominator as a power of 10. Write the fraction as a decimal.

4. $\frac{3}{4}$ **0.75**

5. $\frac{1}{2}$ **0.5**

6. $\frac{1}{4}$ **0.25**

7. $\frac{1}{5}$ **0.2**

Solve.

8. $5 \overline{) 16.25}$ **3.25**

9. $1.5 \overline{) 5.79}$ **3.86**

10. $0.21 \overline{) 4.641}$ **22.1**

11. $6 \overline{) \$39.54}$ **\$6.59**

12. $\begin{array}{r} \$4,128.45 \\ + \$2,397.15 \\ \hline \$6,525.60 \end{array}$

13. $\begin{array}{r} 395.1 \\ \times \quad 4 \\ \hline 1,580.4 \end{array}$

14. $\begin{array}{r} 158 \\ \times 25 \\ \hline 3,950 \end{array}$

15. $2.5 - 1.860$ **0.64**

16. $54.3 \div 6$ **9.05**

b

Make a factor tree for the number.

Write the prime factorization for the number in exponent form. *Factorization may vary.*

1. $81 \quad 3^4$

$3 \cdot 3 \cdot 3 \cdot 3$

2. $56 \quad 2^3 \cdot 7$

$7 \cdot 2 \cdot 2 \cdot 2$

3. $64 \quad 2^6$

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

4. $75 \quad 3 \cdot 5^2$

$5 \cdot 5 \cdot 3$

Find the greatest common factor (GCF) by listing the factors of each number.

5. 12 and 18 **GCF: 6**

12: 1, 2, 3, 4, 6, 12
18: 1, 2, 3, 6, 9, 18

6. 21 and 35 **GCF: 7**

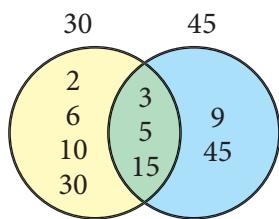
21: 1, 3, 7, 21
35: 1, 5, 7, 35

7. 36 and 48 **GCF: 12**

36: 1, 2, 3, 4, 6, 9, 12, 18, 36
48: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

Use the Venn diagram to list the factors. Find the GCF.

8. Factors of 30 and 45

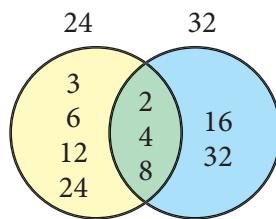


30: 2, 3, 5, 6, 10, 15

45: 3, 5, 9, 15

GCF: 15

9. Factors of 24 and 32



24: 2, 3, 4, 6, 8, 12

32: 2, 4, 8, 16

GCF: 8

Use the GCF to rename the fractions in lowest terms.

10. $\frac{12}{18} \quad \frac{2}{3}$

11. $\frac{21}{35} \quad \frac{3}{5}$

12. $\frac{36}{48} \quad \frac{3}{4}$

13. $\frac{30}{45} \quad \frac{2}{3}$

14. $\frac{24}{32} \quad \frac{3}{4}$

c

Use mental math to solve.

1. $3 \times 40 \quad 120$

5. $100 \times 5.76 \quad 576$

9. $85 \div 100 \quad 0.85$

2. $30 \times 40 \quad 1,200$

6. $1,000 \times 3.187 \quad 3,187$

10. $29.7 \div 10 \quad 2.97$

3. $300 \times 40 \quad 12,000$

7. $217 \div 10 \quad 21.7$

11. $0.835 \div 10 \quad 0.0835$

4. $10 \times 32.1 \quad 321$

8. $385 \div 100 \quad 3.85$

12. $87.32 \div 100 \quad 0.8732$

Solve.

13.
$$\begin{array}{r} 23 \\ 47 \\ 52 \\ + 89 \\ \hline 211 \end{array}$$

14.
$$\begin{array}{r} \$20.00 \\ - \$15.37 \\ \hline \$4.63 \end{array}$$

15.
$$\begin{array}{r} 137.50 \\ 21.83 \\ + 0.98 \\ \hline 160.31 \end{array}$$

16.
$$\begin{array}{r} 4.50 \\ - 0.372 \\ \hline 4.128 \end{array}$$

17.
$$\begin{array}{r} 382 \\ \times 175 \\ \hline 66,850 \end{array}$$

18.
$$\begin{array}{r} 401 \\ \times 342 \\ \hline 137,142 \end{array}$$

Solve. Round to the nearest hundredth.

19. $178 \div 24 \quad 7.416 \approx 7.42$

20. $4,065 \div 31 \quad 131.129 \approx 131.13$

Chapter 10 continued

d

Write **Ones, Thousands, Millions, or Billions** to name the underlined period.

1. 237,910,845
Millions

2. 819,061,243,755
Thousands

3. 4,603,754,103
Billions

4. 1,399,057
Ones

Round to the greatest place.

5. 89,371
90,000

6. 1,430,995
1,000,000

7. 7,510,249,631
8,000,000,000

8. 349,275,670
300,000,000

Use the numbers in the box to write the answer.

320,941,855 39,850,274 321,801,327 41,273,089

9. Write the numbers from least to greatest.
**39,850,274; 41,273,089; 320,941,855;
321,801,327**
10. Which number has a 3 in the Ten Millions place?
39,850,274
11. Which numbers have a 1 in the One Millions place?
321,801,327 and 41,273,089
12. Which number is even?
39,850,274
13. Which number equals $300,000,000 + 20,000,000 + 1,000,000 + 800,000 + 1,000 + 300 + 20 + 7$?
321,801,327

14. Which number equals 39 millions, 850 thousands, and 274 ones?
39,850,274

15. Which numbers round to 300,000,000?
320,941,855 and 321,801,327

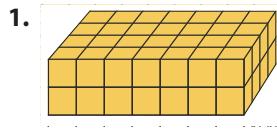
16. Which numbers round to 40,000,000?
39,850,274 and 41,273,089

17. Which numbers have the estimated sum of 80,000,000?
39,850,274 and 41,273,089

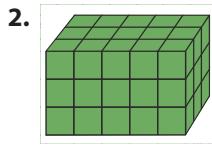
18. Which number is divisible by 5?
320,941,855

e

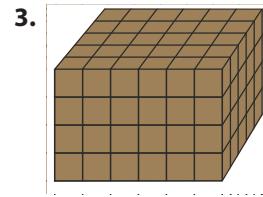
Find the volume of the figure.



$$\frac{7}{l} \times \frac{4}{w} \times \frac{2}{h} = \underline{\hspace{2cm}} \text{ units}^3$$
56

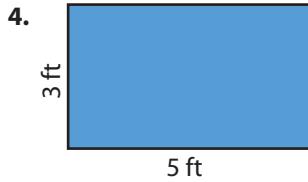


$$\frac{5}{l} \times \frac{3}{w} \times \frac{3}{h} = \underline{\hspace{2cm}} \text{ units}^3$$
45

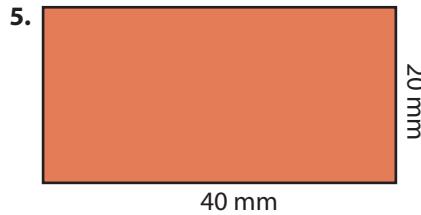


$$\frac{6}{l} \times \frac{5}{w} \times \frac{4}{h} = \underline{\hspace{2cm}} \text{ units}^3$$
120

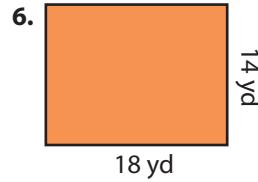
Write a multiplication equation to find the area of the figure.



$$3 \times 5 = \underline{\hspace{2cm}} \text{ ft}^2$$

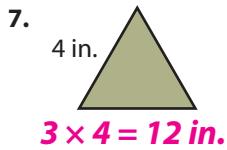


$$40 \times 20 = \underline{\hspace{2cm}} \text{ mm}^2$$

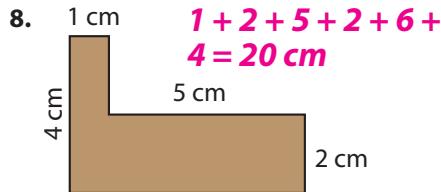


$$18 \times 14 = \underline{\hspace{2cm}} \text{ yd}^2$$

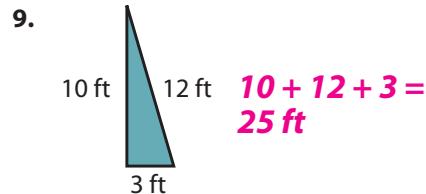
Find the perimeter of the figure.



$$3 \times 4 = \underline{\hspace{2cm}} \text{ in.}$$



$$1 + 2 + 5 + 2 + 6 + 4 = \underline{\hspace{2cm}} \text{ cm}$$



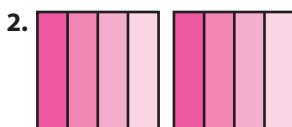
$$10 + 12 + 3 = \underline{\hspace{2cm}} \text{ ft}$$

f

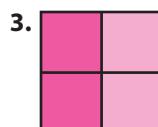
Solve. Shade the picture to illustrate the answer.



$$\frac{4}{6} \div \frac{1}{6} \textcolor{red}{4}$$



$$2 \div \frac{1}{4} \textcolor{red}{8}$$



$$1 \div \frac{2}{4} \textcolor{red}{2}$$

Solve. Write the answer in lowest terms. *Answer is shown using cancellation.*

$$4. 8 \div \frac{1}{2} \frac{8}{1} \times \frac{2}{1} = \textcolor{red}{16}$$

$$5. 2\frac{1}{9} \div 3 \frac{19}{9} \times \frac{1}{3} = \frac{19}{27}$$

$$6. \frac{4}{6} \div \frac{1}{3} \frac{4}{6} \times \frac{3}{1} = \\ \frac{4}{2} = \textcolor{red}{2}$$

$$7. \frac{6}{12} \div \frac{2}{3} \frac{6}{12} \times \frac{3}{2} = \frac{3}{4}$$

$$8. \frac{3}{4} \div \frac{1}{8} \frac{3}{4} \times \frac{8}{1} = \frac{6}{1} = \textcolor{red}{6}$$

$$9. \frac{4}{5} \div \frac{1}{5} \frac{4}{5} \times \frac{5}{1} = \frac{4}{1} = \textcolor{red}{4}$$

$$10. \frac{5}{6} \div \frac{2}{8} \frac{5}{6} \times \frac{8}{2} = \frac{20}{6} =$$

$$3\frac{2}{6} = 3\frac{1}{3}$$

$$11. \frac{3}{4} \div 8 \frac{3}{4} \times \frac{1}{8} = \frac{3}{32}$$

Use the chart to answer the question.

12. Noah prepared half of the trail mix recipe. How many cups of mix did he make?

$$\frac{1}{2}c + \frac{3}{4}c + \frac{1}{8}c = \frac{3\frac{3}{8}}{8}c$$

cereal raisins candy total

Trail Mix Recipe

3 c of cereal

$1\frac{1}{2}$ c of raisins

$2\frac{1}{4}$ c of candy

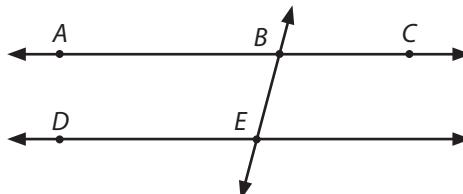
13. Mom doubled the trail mix recipe to take to the church fellowship. How many cups of mix did she make?

$$\frac{6}{cereal} + \frac{3}{raisins} + \frac{4\frac{1}{2}}{candy} = \frac{13\frac{1}{2}}{total}$$

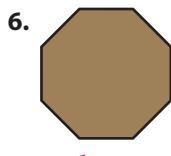
g

Use the diagram to name the geometric figure.

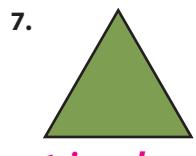
1. two collinear points *Answers may vary but may include A and C; B and E; D and E*
2. three noncollinear points *Answers may vary but may include D, B, and A; B, E, and C*
3. three lines *AC, BE, and DE*
4. a point shared by two lines *E or B*



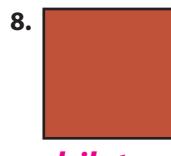
Write hexagon, octagon, pentagon, quadrilateral, or triangle to classify the polygon.



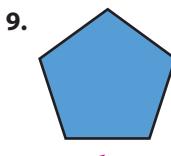
octagon



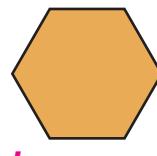
triangle



quadrilateral

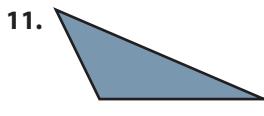


pentagon

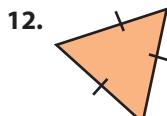


hexagon

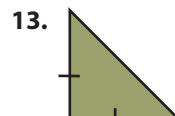
Write equilateral, isosceles, or scalene to classify the triangle.



scalene



equilateral



isosceles

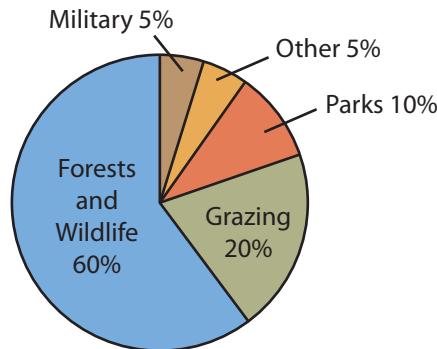
Chapter 10 continued

h

Use the data from the circle graph to answer the question.

- What is the sum of the percents shown on this graph? **100%**
- Which category shows the greatest percentage of land owned by the federal government? **forests and wildlife**
- What percentage of land owned by the government is used for grazing and parks? **$20\% + 10\% = 30\%$**
- Which two categories together make up about one-fourth of federal land? **military (or other) and grazing**

Land Owned by the U.S. Government



Solve.

5.
$$\begin{array}{r} 8,374 \\ 6,985 \\ + 4,876 \\ \hline 20,235 \end{array}$$

6.
$$\begin{array}{r} 45,799 \\ + 86,964 \\ \hline 132,763 \end{array}$$

7.
$$\begin{array}{r} 900,000 \\ - 318,974 \\ \hline 581,026 \end{array}$$

8.
$$\begin{array}{r} 60,005 \\ - 32,057 \\ \hline 27,948 \end{array}$$

Solve. Round the decimal quotient to the nearest hundredth.

9. $84 \overline{) 420}$

10. $56 \overline{) 1,975}$

$35.267 \approx 35.27$

DAILY **11** REVIEW

a

Write the numerical expression for the word phrase. Solve.

- 15 take away 2 **$15 - 2 = 13$**
- 1 more than a dozen **$12 + 1 = 13$**
- the product of 4 and 5 **$4 \times 5 = 20$**
- 6 to the second power **$6^2 = 36$**
- the sum of 14 and 16 **$14 + 16 = 30$**
- one-half of ten **$\frac{1}{2} \times \frac{10}{1} = \frac{5}{1} = 5$**
- seven times three **$7 \times 3 = 21$**
- the difference between 3 and 8 **$8 - 3 = 5$**

Write an algebraic expression for the word phrase.

9. 4 times a number **$4n$**
10. $\frac{1}{2}$ of a number **$\frac{1}{2}n$**
11. 6 less than a number **$n - 6$**
12. a number divided by 10 **$n \div 10$ or $\frac{n}{10}$**
13. 20 more than a number **$n + 20$**
14. a number to the second power **n^2**

Evaluate the expression. Let $n = 2$. Write a comparison sentence using $>$, $<$, or $=$.

15. $7 + 5 > n \cdot 5$

16. $\frac{18}{n} < 9 + 9$

17. $3n = 4 + 2$

Complete the table using the given values to evaluate the expressions.

x	$x + 3$
7	10
11	14

a	$a \cdot 4$
3	12
6	24

n	$12 \div n$
3	4
6	2

b

Solve.

1. $\begin{array}{r} \$3.47 \\ + \$1.62 \\ \hline \$5.09 \end{array}$

2. $\begin{array}{r} 45,816 \\ + 21,437 \\ \hline 67,253 \end{array}$

3. $\begin{array}{r} 86,045 \\ + 19,057 \\ \hline 105,102 \end{array}$

4. $\begin{array}{r} 832 \\ + 659 \\ \hline 1,491 \end{array}$

5. $\begin{array}{r} 371 \\ 422 \\ + 870 \\ \hline 1,663 \end{array}$

6. $\begin{array}{r} 419 \\ 27 \\ + 132 \\ \hline 578 \end{array}$

7. $\begin{array}{r} 15 \\ 32 \\ 18 \\ + 604 \\ \hline 669 \end{array}$

8. $\begin{array}{r} 38 \\ + 44 \\ \hline 82 \end{array}$

9. $\begin{array}{r} \$0.78 \\ \$2.52 \\ \$0.07 \\ + \$1.18 \\ \hline \$4.55 \end{array}$

10. $\begin{array}{r} 517,053 \\ + 13,267 \\ \hline 530,320 \end{array}$

11. $\begin{array}{r} 60,984 \\ + 321,786 \\ \hline 382,770 \end{array}$

12. $\begin{array}{r} 417,035 \\ + 562,809 \\ \hline 979,844 \end{array}$

13. $2.135 + 41.03$
43.165

14. $\$39.76 + \124.01
\\$163.77

15. $0.278 + 1.93$
2.208

16. $2\frac{1}{2} + 1\frac{3}{4}$
 $2\frac{2}{4} + 1\frac{3}{4} = 3\frac{5}{4} = 4\frac{1}{4}$

c

Solve.

1. $\begin{array}{r} \$67.48 \\ - \$17.70 \\ \hline \$49.78 \end{array}$

2. $\begin{array}{r} 37,604 \\ - 28,442 \\ \hline 9,162 \end{array}$

3. $\begin{array}{r} 525,004 \\ - 317,423 \\ \hline 207,581 \end{array}$

4. $\begin{array}{r} 719,604 \\ - 385,260 \\ \hline 334,344 \end{array}$

5. $\begin{array}{r} 8,042 \\ - 5,609 \\ \hline 2,433 \end{array}$

6. $\begin{array}{r} 45,697 \\ - 13,806 \\ \hline 31,891 \end{array}$

7. $\begin{array}{r} 200,345 \\ - 124,670 \\ \hline 75,675 \end{array}$

8. $\begin{array}{r} 63,089 \\ - 20,428 \\ \hline 42,661 \end{array}$

9. $\begin{array}{r} 6,839 \\ - 3,860 \\ \hline 2,979 \end{array}$

10. $\begin{array}{r} 747,222 \\ - 648,203 \\ \hline 99,019 \end{array}$

11. $\begin{array}{r} 832,587 \\ - 604,388 \\ \hline 228,199 \end{array}$

12. $\begin{array}{r} 783,054 \\ - 332,867 \\ \hline 450,187 \end{array}$

13. $\$5.00 - \1.32
\\$3.68

14. $14.03 - 2.5$
11.53

15. $6\frac{1}{8} - 3\frac{1}{2}$
 $6\frac{1}{8} - 3\frac{4}{8} = 5\frac{9}{8} - 3\frac{4}{8} = 2\frac{5}{8}$

16. $89 - 15.75$
73.25

17. $2,000 - 1,947$
53

18. $\$13 - \1.98
\\$11.02

Chapter 11 continued

d

Write the missing number or variable. Name the property used.

1. $(5 \cdot 3) \cdot 4 = 5 \cdot (\underline{3} \cdot 4)$

Associative Property

2. $a + b = \underline{b} + a$

Commutative Property

3. $3 + 2a = 2a + \underline{3}$

Commutative Property

Simplify the expression.

4. $x + 5x \underline{6x}$

5. $x + 8 + x \underline{8 + 2x}$

6. $x \cdot 4 \cdot 5 \underline{20x}$

Solve the equation using the inverse operation.

7. $a + 10 = 25$

$a = \underline{15}$

8. $3 \cdot n = 18$

$n = \underline{6}$

9. $12 - x = 7$

$x = \underline{5}$

10. $\frac{x}{3} = 9$

$x = \underline{27}$

11. $8n = 32$

$n = \underline{4}$

12. $15 \div c = 3$

$c = \underline{5}$

Complete the table.

x	$4x$
5	20
7	28
10	40

x	x^2
2	4
4	16
6	36

x	$3x - 1$
3	8
5	14
7	20

e

Solve.

1. $\begin{array}{r} 324 \\ \times 12 \\ \hline 3,888 \end{array}$

5. $\begin{array}{r} 835 \\ \times 15 \\ \hline 12,525 \end{array}$

9. $\begin{array}{r} 1,280 \\ \times 21 \\ \hline 26,880 \end{array}$

13. $\begin{array}{r} 238 \\ \times 34 \\ \hline 8,092 \end{array}$

17. $\begin{array}{r} 507 \\ \times 42 \\ \hline 21,294 \end{array}$

2. $\begin{array}{r} 450 \\ \times 312 \\ \hline 140,400 \end{array}$

6. $\begin{array}{r} 513 \\ \times 142 \\ \hline 72,846 \end{array}$

10. $\begin{array}{r} 831 \\ \times 123 \\ \hline 102,213 \end{array}$

14. $\begin{array}{r} 452 \\ \times 171 \\ \hline 77,292 \end{array}$

18. $\begin{array}{r} 324 \\ \times 214 \\ \hline 69,336 \end{array}$

3. $\begin{array}{r} 12,475 \\ \times 20 \\ \hline 249,500 \end{array}$

7. $\begin{array}{r} \$15.75 \\ \times 4 \\ \hline \$63.00 \end{array}$

11. $\begin{array}{r} 0.03 \\ \times 0.21 \\ \hline 0.0063 \end{array}$

15. $\begin{array}{r} 2.53 \\ \times 0.04 \\ \hline 0.1012 \end{array}$

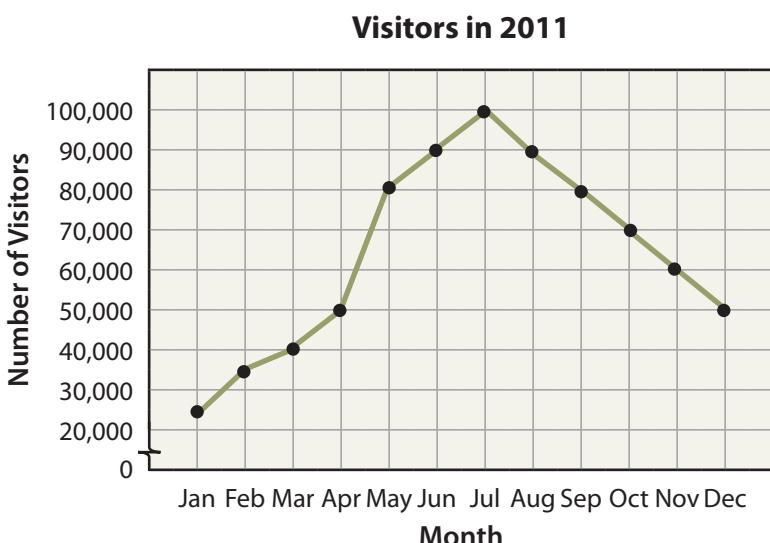
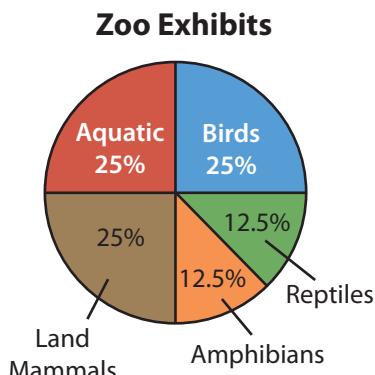
19. $\begin{array}{r} \$21.48 \\ \times 5 \\ \hline \$107.40 \end{array}$

4. $3 \times \$1.75 \underline{\$5.25}$ 8. $2.4 \times 3.7 \underline{8.88}$ 12. $8\frac{1}{2} \times 2\frac{1}{3} \underline{19\frac{5}{6}}$ 16. $\frac{3}{5} \cdot 3 \frac{9}{5} = \underline{1\frac{4}{5}}$ 20. $\frac{3}{4} \cdot \frac{2}{3} \underline{\frac{6}{12}} = \underline{\frac{1}{2}}$

f

Use the data from the chart and the graphs to answer the questions.

Zoo Admission	
Adults	\$11.00
Children 6–18 years	\$8.00
Senior Citizens	\$8.00
Family Yearly Pass	\$50.00
Children 5 and under	Free



- Which graph shows a change in the number of visitors over time? **the Visitors in 2011 line graph**
- Which graph tells how many people visited the zoo in 2011? **the Visitors in 2011 line graph**
- Which graph compares parts to a whole? **the Zoo Exhibits circle graph**
- The Zoo Exhibits circle graph represents 800 zoo animals. How many animals are land mammals? How many are reptiles? **200 land mammals; 100 reptiles**
- Which graph gives basic information about zoo admission costs? **the Zoo Admission chart**
- The Anderson family bought tickets to spend a day at the zoo. How much money did they spend on tickets for Mr. and Mrs. Anderson, 3 school-age boys, and Grandma Larson? **(2 × \$11.00) + (4 × \$8.00) = \$54.00**

g

Solve. Annex zeros if needed. Round decimal answers to the nearest hundredth.

1. $8\overline{)72}$ **9**

2. $9\overline{)54}$ **6**

3. $7\overline{)56}$ **8**

4. $8\overline{)64}$ **8**

5. $6\overline{)42}$ **7**

6. $5\overline{)60}$ **12**

7. $21 \div 7$ **3**

8. $32 \div 8$ **4**

9. $81 \div 9$ **9**

10. $50 \div 10$ **5**

11. $49 \div 7$ **7**

12. $36 \div 12$ **3**

13. $7\overline{)154}$ **22**

14. $9\overline{)8,362}$ **929.111** \approx **929.11**

15. $6\overline{)4,032}$ **672**

16. $5\overline{)\$15.35}$ **\$3.07**

17. $4\overline{)4.2}$ **1.05**

18. $21\overline{)3,407}$ **162.238** \approx **162.24**

19. $132\overline{)13,465}$ **102.007** \approx **102.01**

20. $4.1\overline{)1,484.2}$ **362**

21. $231\overline{)23,573}$ **102.047** \approx **102.05**

Chapter 11 continued

h

Solve.

1. Michelle purchased a 5.07-ounce tube of oil paint for \$5.10. What was the cost per ounce? (Round to the nearest cent.) **\$1.01 per ounce**

3. A car traveled 158.75 miles in 2.5 hours. What was the average speed in miles per hour? **63.5 mph**

Use the prices of the books to solve.

5. Which book costs the most? **The Big Book of Brain Games**
6. Which two different books could you buy with twenty-five dollars? **The Challenge Sudoku and The Quest Word Games books; $\$13.98 + \$9.95 = \$23.93$**
7. How much money would you need to purchase the puzzle and riddle book and the word game book? **$\$19.99 + \$9.95 = \$29.94$**
8. What is the cost of three brain game books? **$3 \times \$22.95 = \68.85**
9. You want to buy the brain game book and two other books. You have \$50.00. Which two other books can you purchase? **The Challenge Sudoku and The Quest Word Games; $\$22.95 + \$13.98 + \$9.95 = \46.88**

2. A large bottle of soft drink holds 67.6 ounces and costs \$1.39. What is the price per ounce? (Round to the nearest cent.) **\$0.02 per ounce**
4. Mrs. Patton purchased 12.5 pounds of chicken on sale. She spent \$11.13. What was the cost per pound? (Round to the nearest cent.) **\$0.89 per pound**



DAILY 12 REVIEW

a

Evaluate the expression. Let $n = 6$.

1. $(1.3 \cdot n) - 4$ **$(1.3 \cdot 6) - 4 = 7.8 - 4 = 3.8$**

2. $75 - 7n$ **$75 - (7 \cdot 6) = 75 - 42 = 33$**

3. $5n \div 2$ **$(5 \cdot 6) \div 2 = 30 \div 2 = 15$**

Simplify the expression.

4. $4(3x)$ **$12x$**

5. $7(n + 4)$ **$7n + 28$**

6. $8y + (3y + 4)$ **$11y + 4$**

Write the algebraic expression for the sentence.

7. The fence is 7 times longer than the gate. **$7g$**

8. Sarah ran 2 miles more than Abby. **$m + 2$**

9. David popped 5 balloons. **$b - 5$**

10. Josh is 3 years older than Aaron. **$a + 3$**

Solve.

11. $4a = 64$ **$a = 16$**

12. $k + 7 = 48$ **$k = 41$**

13. $\frac{x}{7} = 56$ **$x = 392$**

14. $b - 6.4 = 1.8$ **$b = 8.2$**

15. $a \div 16 = 4$ **$a = 64$**

16. $20r = 400$ **$r = 20$**

b

Complete the table.

meter	millimeter
1	1000
4	4000
2	2000
9	9000

gram	kilogram
1000	1
3000	3
4000	4
5000	5

milliliter	liter
1000	1
5000	5
7000	7
8000	8

Write a comparison sentence using $>$, $<$, or $=$.

4. $3\text{ m} > 300\text{ mm}$

5. $8000\text{ g} = 8\text{ kg}$

6. $2859\text{ mL} < 4\text{ L}$

Write the best unit of measurement.

Capacity	
a bottle of water	
10 mL	1 L
a mug of cocoa	
250 mL	25 L
water in a bathtub	
150 mL	150 L

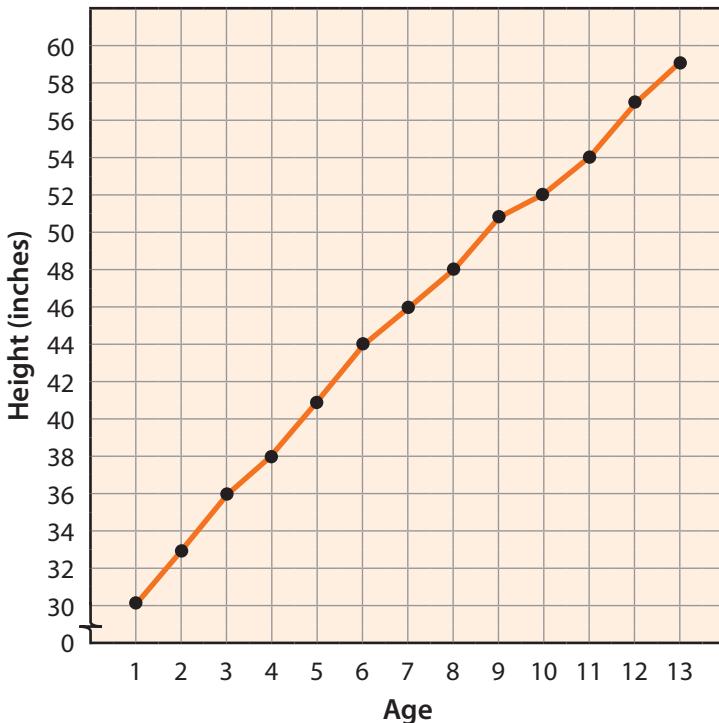
Mass	
a dog	
20 kg	20 g
four jellybeans	
4 kg	4 g
a chocolate chip cookie	
1 kg	10 g

Temperature	
swimming in the ocean	
30°C	70°C
normal body temperature	
37°C	98°C
boiling water	
0°C	100°C

c

Use the data from the graph to answer the questions.

Claire's Height



Mrs. West recorded Claire's height on each birthday. Claire took the measurements and put them in a graph form.

- What kind of graph did Claire make?
a line graph
- Why does the line increase rather than decrease? **because Claire grew taller each year**
- How tall was Claire at age 1?
30 in.
- How many inches taller was Claire at age 5 than at age 1? **$41 - 30 = 11\text{ in.}$**
- Between which two years did Claire grow only 1 inch taller?
9–10
- How tall was Claire at age 13?
59 in.
- How many inches did Claire gain between ages 6 and 7?
2 in.

Chapter 12 continued

d

Solve.

1.
$$\begin{array}{r} 4.5 \\ \times 6.7 \\ \hline 30.15 \end{array}$$

5.
$$5) \$23.40$$

$$\begin{array}{r} \$4.68 \\ \hline \$23.40 \end{array}$$

2.
$$\begin{array}{r} 7.18 \\ \times 2.9 \\ \hline 20.822 \end{array}$$

6.
$$47) 5,076$$

$$\begin{array}{r} 108 \\ \hline 5,076 \end{array}$$

3.
$$\begin{array}{r} 442 \\ \times 71 \\ \hline 31,382 \end{array}$$

7.
$$31) 7,626$$

$$\begin{array}{r} 246 \\ \hline 7,626 \end{array}$$

4.
$$\begin{array}{r} 975 \\ \times 48 \\ \hline 46,800 \end{array}$$

8.
$$206) 5,150$$

$$\begin{array}{r} 25 \\ \hline 5,150 \end{array}$$

9.
$$\begin{array}{r} \$6,932.37 \\ - \$5,331.97 \\ \hline \$1,600.40 \end{array}$$

13.
$$\begin{array}{r} 38.472 \\ 5.391 \\ + 2.0 \\ \hline 45.863 \end{array}$$

10.
$$\begin{array}{r} 20,320 \\ - 14,410 \\ \hline 5,910 \end{array}$$

14.
$$\begin{array}{r} \$169.95 \\ \$139.49 \\ + \$ 39.99 \\ \hline \$349.43 \end{array}$$

11.
$$\begin{array}{r} \$9,875 \\ - \$5,769 \\ \hline \$4,106 \end{array}$$

15.
$$31,998 + 543,477$$

$$\begin{array}{r} 575,475 \\ \hline \end{array}$$

12.
$$\begin{array}{r} 469.549 \\ - 203.895 \\ \hline 265.654 \end{array}$$

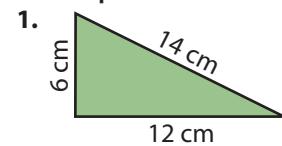
16.
$$6,003 + 6,422$$

$$\begin{array}{r} 12,425 \\ \hline \end{array}$$

DAILY **13** REVIEW

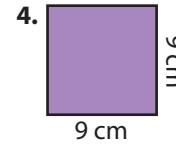
a

Find the perimeter of the figure.

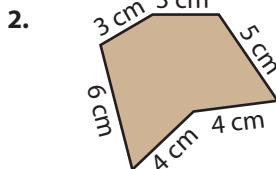


$$14 \text{ cm} + 6 \text{ cm} + 12 \text{ cm} = 32 \text{ cm}$$

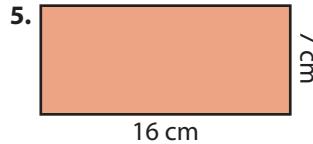
Find the area of the figure.



$$9 \text{ cm} \times 9 \text{ cm} = 81 \text{ cm}^2$$

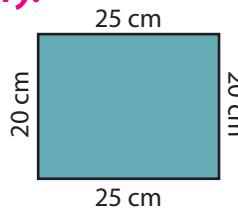


$$3 \text{ cm} + 3 \text{ cm} + 5 \text{ cm} + 4 \text{ cm} + 6 \text{ cm} = 25 \text{ cm}$$



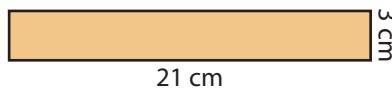
$$7 \text{ cm} \times 16 \text{ cm} = 112 \text{ cm}^2$$

3.



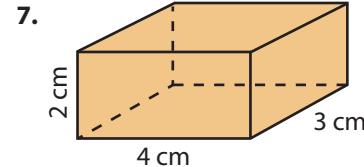
$$25 \text{ cm} + 20 \text{ cm} + 25 \text{ cm} + 20 \text{ cm} = 90 \text{ cm}$$

6.

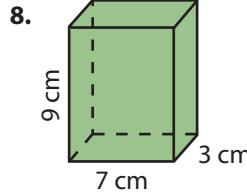


$$3 \text{ cm} \times 21 \text{ cm} = 63 \text{ cm}^2$$

Find the volume of the figure.



$$4 \text{ cm} \times 3 \text{ cm} \times 2 \text{ cm} = 24 \text{ cm}^3$$



$$7 \text{ cm} \times 3 \text{ cm} \times 9 \text{ cm} = 189 \text{ cm}^3$$

Solve.

9. Jerry made a square raised flower bed for his mother using 20-foot boards. What is the area of the flower bed? $20 \text{ ft} \times 20 \text{ ft} = 400 \text{ ft}^2$

11. Sammy and Sally have a rectangular pool that is 6 feet long and 3 feet wide. What is its perimeter? $(2 \times 6 \text{ ft}) + (2 \times 3 \text{ ft}) = 18 \text{ ft}$

10. Amy built a rectangular birdhouse for bluebirds. It is 13 inches high, 5.5 inches wide, and 5 inches long. What is the volume of the birdhouse? $13 \text{ in.} \times 5.5 \text{ in.} \times 5 \text{ in.} = 357.5 \text{ in.}^3$

b

Write a comparison sentence using $>$, $<$, or $=$.

1. $1.70 < 1.71$

2. $0.8 = 0.80$

3. $8.465 < 8.645$

4. $0.051 < 0.052$

5. $1.60 > 0.16$

6. $0.653 < 0.66$

7. $1.874 < 18.74$

8. $3.09 > 3.009$

Solve. *Equations may vary.*

9. What is the cost of 6 pounds of chicken if chicken is \$2.89 per pound?

$6 \times \$2.89 = \17.34

10. Kerri bought a two-cheeseburger meal including a drink and fries for \$3.79. Cheeseburgers normally cost \$0.99, and drinks are \$1.39. Fries are \$0.79. How much money did she save by buying the meal instead of buying the two burgers, the fries, and the drink separately?

$(2 \times \$0.99) + \$1.39 + \$0.79 = \$4.16; \$4.16 - \$3.79 = \$0.37$

Write an equation. Solve.

11. Dad used \$10.00 to purchase a drink that cost \$2.89.
- $\$10.00 - \$2.89 = \$7.11$

12. five tenths less than three and twenty-five hundredths
- $3.25 - 0.5 = 2.75$

13. thirteen hundredths more than thirteen thousandths
- $0.013 + 0.13 = 0.143$

14. the price of 1 can of beets when the price for five cans is \$2.00
- $\$2.00 \div 5 = \0.40
- each

15. Estimate the product of 57 and 236.
- $60 \times 200 = 12,000$

c

Solve. Rename to lowest terms. *Answer is shown using cancellation.*

1. $4 \times \frac{4}{5} \quad \frac{16}{5} = 3\frac{1}{5}$

8. $4 \times 2\frac{5}{6} \quad \frac{4}{1} \times \frac{17}{6} = \frac{34}{3} = 11\frac{1}{3}$

15. $\frac{5}{7} \div \frac{1}{6} \quad \frac{5}{7} \times \frac{6}{1} = \frac{30}{7} = 4\frac{2}{7}$

2. $6 \times \frac{2}{3} \quad \frac{4}{1} = 4$

9. $3 \times 2\frac{1}{10} \quad \frac{63}{10} = 6\frac{3}{10}$

16. $\frac{3}{4} \div \frac{3}{8} \quad \frac{3}{4} \times \frac{8}{3} = 2$

3. $2 \times \frac{5}{12} \quad \frac{5}{6}$

10. $7 \times 1\frac{3}{10} \quad \frac{91}{10} = 9\frac{1}{10}$

17. $\frac{8}{12} \div \frac{2}{12} \quad \frac{8}{12} \times \frac{12}{2} = 4$

4. $\frac{1}{4} \times \frac{2}{3} \quad \frac{1}{6}$

11. $2 \div \frac{1}{6} \quad \frac{2}{1} \times \frac{6}{1} = \frac{12}{1} = 12$

18. $\frac{3}{8} \div \frac{1}{2} \quad \frac{3}{8} \times \frac{2}{1} = \frac{3}{4}$

5. $\frac{3}{5} \times \frac{1}{3} \quad \frac{1}{5}$

12. $1 \div \frac{3}{12} \quad \frac{1}{1} \times \frac{12}{3} = \frac{12}{3} = 4$

19. $\frac{1}{4} \div \frac{3}{5} \quad \frac{1}{4} \times \frac{5}{3} = \frac{5}{12}$

6. $9 \times \frac{5}{7} \quad \frac{45}{7} = 6\frac{3}{7}$

13. $4 \div \frac{2}{3} \quad \frac{4}{1} \times \frac{3}{2} = 6$

20. $\frac{4}{6} \div 4 \quad \frac{4}{6} \times \frac{1}{4} = \frac{1}{6}$

7. $\frac{4}{9} \times \frac{3}{8} \quad \frac{1}{6}$

14. $3 \div \frac{1}{2} \quad \frac{3}{1} \times \frac{2}{1} = \frac{6}{1} = 6$

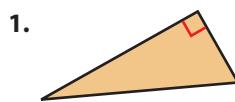
21. $2 \div \frac{1}{2} \quad \frac{2}{1} \times \frac{2}{1} = 4$

Chapter 13 continued

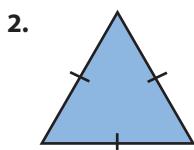
d

Classify the triangle according to its angles: acute, right, or obtuse.

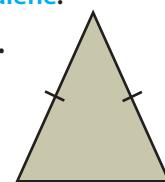
Classify the triangle according to the length of its sides: equilateral, isosceles, or scalene.



right;
scalene

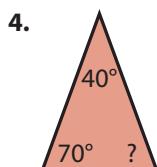


acute;
equilateral

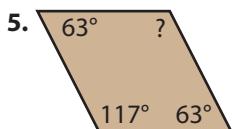


acute;
isosceles

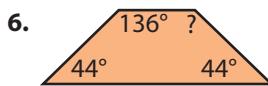
Find the unknown angle. Equations may vary.



$$180^\circ - (70^\circ + 40^\circ) = 70^\circ$$



$$360^\circ - (63^\circ + 63^\circ + 117^\circ) = 117^\circ$$



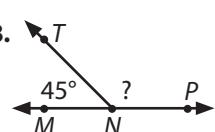
$$360^\circ - (44^\circ + 44^\circ + 136^\circ) = 136^\circ$$

Find the measure of the complementary or supplementary angle. Equations may vary.



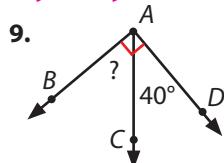
$$\angle JKD = 25^\circ$$

$$90^\circ - 65^\circ = 25^\circ$$



$$\angle TNP = 135^\circ$$

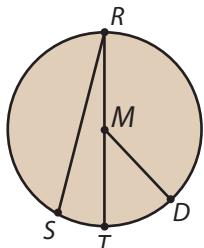
$$180^\circ - 45^\circ = 135^\circ$$



$$\angle BAC = 50^\circ$$

$$90^\circ - 40^\circ = 50^\circ$$

Use the circle to answer the questions.



10. Name the circle. **circle M**

11. Name the diameter. **\overline{RT}**

12. Name a chord that is not a diameter. **\overline{RS} or \overline{SD}**

13. Name a radius. **\overline{MD} , \overline{MT} , or \overline{MR}**

e

Rename the denominator as a power of 10. Write the fraction as a decimal.

1. $\frac{3}{5} \frac{6}{10}; 0.6$

2. $\frac{1}{4} \frac{25}{100}; 0.25$

3. $\frac{1}{2} \frac{5}{10}; 0.5$

4. $\frac{12}{25} \frac{48}{100}; 0.48$

Solve. Use a bar to mark the repeating digits.

5. $3\overline{)2}$

6. $6\overline{)139.50}$

7. $6\overline{)550}$

8. $0.12\overline{)1.58}$

Solve. Equations may vary.

9. Karen's family vacationed at the beach. The first two days the motel charged them \$89.95 each night. The rates went up to \$107.55 on Friday and Saturday nights. How much did her family spend on the motel for four nights?

$$(2 \times \$89.95) + (2 \times \$107.55) = \$395.00$$

10. On Friday, Karen's family went to a fish fry on the beach. Her dad and mom bought 2 adult plates for \$7.95 each and 3 child plates for \$4.95 each. How much did her family spend on that meal?

$$(2 \times \$7.95) + (3 \times \$4.95) = \$30.75$$

f

Complete the table using the given values to evaluate the expressions.

b	$5b + 8$
6	38
12	68
29	153
45	233

x	$\frac{x}{4} - 2$
8	0
24	4
48	10
64	14

n	$6 + n^2$
4	22
12	150
16	262
20	406

Evaluate the expression. Let $m = 4$.

4. $5m - 7$ **13**

5. $(6 + 2m) - 3$ **11**

6. $3 + m + 6$ **13**

7. $\frac{m}{2} + 7$ **9**

8. $m + 7 - 6$ **5**

9. $105 - 12m$ **57**

Simplify the expression.

10. $4(8x)$ **$32x$**

11. $9 + (6 + 2x)$ **$15 + 2x$**

12. $8x + (2 + 4x)$ **$12x + 2$**

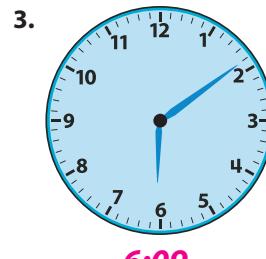
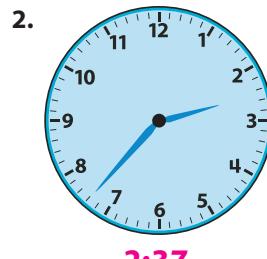
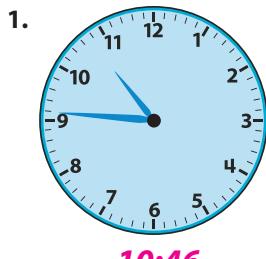
13. $6(n + 2)$ **$6n + 12$**

14. $5(4x + 3.1)$ **$20x + 15.5$**

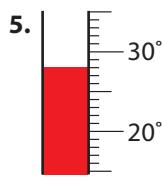
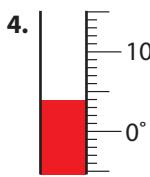
15. $9b + 3b + 12b$ **$24b$**

g

Write the time.



Write the temperature in °F.



6. freezing point of water **32°F**

7. normal body temperature **98.6°F**

8. boiling point of water **212°F**

Complete the table.

pound	ounce
1	16
4	64
7	112
10	160

inch	feet
12	1
48	4
72	6
108	9

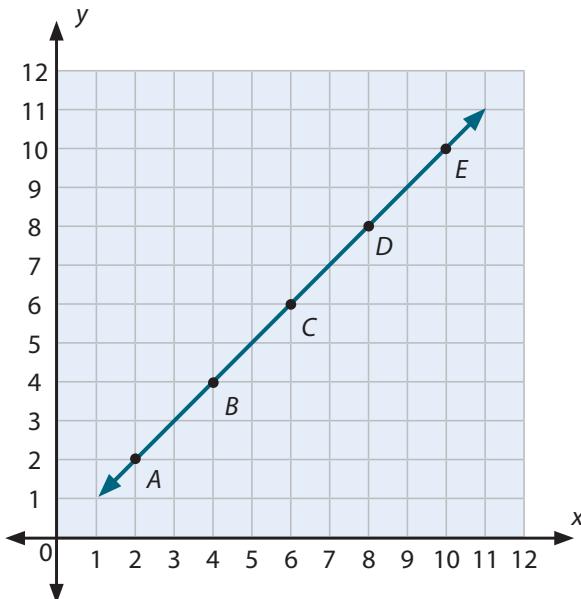
ton	pound
1	2,000
2	4,000
6	12,000
8	16,000

yard	inch
1	36
4	144
6	216
7	252

Chapter 13 continued

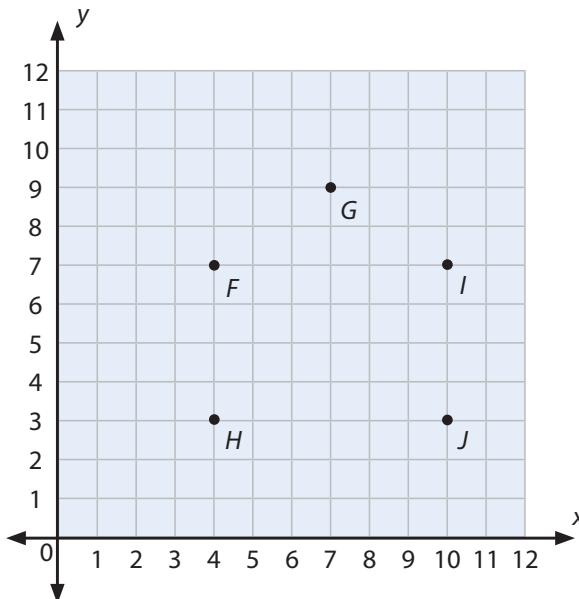
h

Write the ordered pair for the point.



1. A **(2, 2)**
2. B **(4, 4)**
3. C **(6, 6)**
4. D **(8, 8)**
5. E **(10, 10)**

Name the point on the graph represented by the ordered pair.



6. (4, 7) **F**
7. (7, 9) **G**
8. (4, 3) **H**
9. (10, 7) **I**
10. (10, 3) **J**

i

Solve.

1. $971 + 136 + 538 + 818 + 881$ **3,344**

2. $766 + 245 + 952 + 446 + 312$ **2,721**

3. $228 + 347 + 474 + 146 + 359$ **1,554**

4. $873 + 721 + 979 + 619 + 648$ **3,840**

5.
$$\begin{array}{r} 95,939 \\ - 59,962 \\ \hline 35,977 \end{array}$$

6.
$$\begin{array}{r} 62,884 \\ - 10,611 \\ \hline 52,273 \end{array}$$

7.
$$\begin{array}{r} 91,315 \\ - 87,795 \\ \hline 3,520 \end{array}$$

8.
$$\begin{array}{r} 47,386 \\ - 25,668 \\ \hline 21,718 \end{array}$$

9.
$$\begin{array}{r} 358 \\ \times 711 \\ \hline 254,538 \end{array}$$

10.
$$\begin{array}{r} 471 \\ \times 512 \\ \hline 241,152 \end{array}$$

11.
$$\begin{array}{r} 948 \\ \times 343 \\ \hline 325,164 \end{array}$$

12.
$$\begin{array}{r} 324 \\ \times 460 \\ \hline 149,040 \end{array}$$

Solve. Round the quotient to the nearest tenth.

13. $69 \overline{)854}$ **12.37** \approx **12.4**

14. $21 \overline{)389}$ **18.52** \approx **18.5**

15. $25 \overline{)514}$ **20.56** \approx **20.6**

16. $13 \overline{)624}$ **48**

a

Write the ratio as a fraction in lowest terms.

1. 10 peppermints to 6 lemon drops $\frac{10}{6} = \frac{5}{3}$

3. 8 elephants to 7 giraffes $\frac{8}{7}$

2. 2 cups sugar to 10 cups water $\frac{2}{10} = \frac{1}{5}$

4. 54 cookies to 6 students $\frac{54}{6} = \frac{9}{1}$

Use the data from the table to write the ratio. **Ratio form may vary.**

5. cats to dogs **6:4**

6. lizards to birds **$\frac{3}{12}$**

7. fish to total animals **50:93**

8. dogs to hamsters **4 to 7**

9. animals with fur to animals without fur **$\frac{20}{73}$**

10. reptiles to fish **11:50**

Andrew's Pet Store			
cats	6	fish	50
dogs	4	hamsters	7
lizards	3	gerbils	3
turtles	8	birds	12

Complete the ratio table.

 11.

cars	10	20	40	80
trucks	6	12	24	48

 12.

students	19	57	95	171
girls	10	30	50	90

b

Write a comparison sentence using $=$ or \neq .

1. $\frac{3}{5} \neq \frac{1}{3}$

2. $\frac{4}{5} = \frac{16}{20}$

3. $\frac{40}{80} \neq \frac{1}{4}$

4. $\frac{12}{27} \neq \frac{4}{7}$

Find the unit rate.

5. 15 gal of gas to drive 450 mi **30 mi/gal**

8. \$84 earned in 7 hr **\$12/hr**

6. 135 pages read in 45 min **3 pg/min**

9. 5 cans of peas for \$2.00 **\$0.40/can**

7. 4 lbs meat for \$8.76 **\$2.19/lb**

10. 12 pencils for \$6.00 **\$0.50/pencil**

Write the missing term that completes the equivalent ratio.

11. $\frac{1}{7} = \frac{n}{49}$ **n = 7**

12. $\frac{2}{7} = \frac{10}{n}$ **n = 35**

13. $\frac{36}{42} = \frac{6}{n}$ **n = 7**

14. $\frac{5}{9} = \frac{n}{36}$ **n = 20**

15. $\frac{3}{4} = \frac{18}{n}$ **n = 24**

16. $\frac{30}{16} = \frac{n}{8}$ **n = 15**

Chapter 14 continued

c

Write the percent in decimal form.

1. 52% **0.52** 2. 17% **0.17** 3. 19% **0.19** 4. 2% **0.02** 5. 75% **0.75**

Write the decimal in percent form.

6. 0.58 **58%** 7. 0.8 **80%** 8. 0.09 **9%** 9. 0.27 **27%** 10. 0.93 **93%**

Write the percent in fraction form in lowest terms.

11. 60% **$\frac{3}{5}$** 12. 20% **$\frac{1}{5}$** 13. 50% **$\frac{1}{2}$** 14. 25% **$\frac{1}{4}$** 15. 75% **$\frac{3}{4}$**

Find the percent of the number.

16. 20% of 100 **20** 17. 50% of 8 **4** 18. 50% of 90 **45** 19. 10% of 30 **3** 20. 25% of 100 **25**

d

Find the volume of a prism with the given dimensions.

Equations may vary.

- rectangular prism: $l = 3 \text{ cm}$, $w = 2 \text{ cm}$, $h = 6 \text{ cm}$ **$3 \text{ cm} \cdot 2 \text{ cm} \cdot 6 \text{ cm} = 36 \text{ cm}^3$**
- square prism: $s = 7 \text{ m}$ **$(7 \text{ m})^3 = 343 \text{ m}^3$**
- rectangular prism: $l = 7 \text{ m}$, $w = 8 \text{ m}$, $h = 6 \text{ m}$ **$7 \text{ m} \cdot 8 \text{ m} \cdot 6 \text{ m} = 336 \text{ m}^3$**

Find the volume of a cylinder with the given dimensions.

- cylinder: $r = 2 \text{ m}$, $h = 7 \text{ m}$ **$3.14 \cdot (2 \text{ m})^2 \cdot 7 \text{ m} = 87.92 \text{ m}^3$**
- cylinder: $r = 4 \text{ m}$, $h = 9 \text{ m}$ **$3.14 \cdot (4 \text{ m})^2 \cdot 9 \text{ m} = 452.16 \text{ m}^3$**
- cylinder: $r = 5 \text{ m}$, $h = 10 \text{ m}$ **$3.14 \cdot (5 \text{ m})^2 \cdot 10 \text{ m} = 785 \text{ m}^3$**

Solve.

- Jason filled a rectangular planter with potting soil. His planter is 4 feet long, 2 feet wide, and 0.5 feet high. How much potting soil did it take to fill his planter? **$4 \text{ ft} \cdot 2 \text{ ft} \cdot 0.5 \text{ ft} = 4 \text{ ft}^3$**
- Sarah made a vanilla cake in a pan that is 13 inches by 9 inches by 2 inches. What is the volume of half of her pan? **$13 \text{ in.} \cdot 9 \text{ in.} \cdot 2 \text{ in.} = 234 \text{ in.}^3; \frac{234 \text{ in.}^3}{2} = 117 \text{ in.}^3$**
- The fish tank in Dr. Goforth's office is cube shaped with equal dimensions of 3.3 feet. What is the volume of his fish tank? **$(3.3 \text{ ft})^3 = 35.937 \text{ ft}^3$**

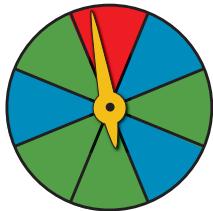
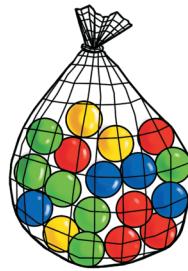
e

Answer the questions. **Ratio form may vary.**

1. Write the ratio of blue balls to total balls. **4:18**

2. Write the ratio of red balls to total balls. **5:18**

3. Which color ball is most likely to be chosen from the bag? **green**



4. Write the ratio that tells the probability that the spinner will land on blue. **3:8**

5. Write the ratio that tells the probability that the spinner will land on green. **4:8**

6. Which color has the lowest probability that the spinner will land on it? **red**

7. Write the ratio in fraction form to show the number of white-frosted doughnuts to total doughnuts. **$\frac{5}{12}$**

8. Write the ratio in word form to show the number of white-frosted doughnuts to pink-frosted doughnuts. **5 to 6**

9. Write the ratio to show the number of chocolate-frosted doughnuts to white-frosted and pink-frosted doughnuts. **1:11**

10. The box of doughnuts has 5 white-frosted donuts, 6 pink-frosted doughnuts, and 1 chocolate-frosted doughnut. If someone takes one without looking, what type of doughnut will be the least likely taken? **chocolate-frosted**

**f**

Write the numbers in order from *least to greatest*.

1.

4	-4	0	7
---	----	---	---

-4 0 4 7

2.

8	-7	0	-8
---	----	---	----

-8 -7 0 8

3.

-7	-10	-2	0
----	-----	----	---

-10 -7 -2 0

4.

0	1	-2	-5
---	---	----	----

-5 -2 0 1

Write a comparison sentence using **>** or **<**.

5. $2 > -2$

6. $-3 < -2$

7. $-50 > -75$

8. $-8 < 4$

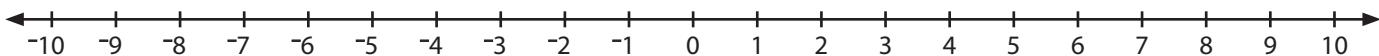
9. $-6 > -9$

10. $-12 > -16$

11. $5 > 4$

12. $6 < 7$

Use the number line to solve.



13. $-4 + -3 = \textbf{-7}$

14. $5 + 1 = \textbf{6}$

15. $-3 + -6 = \textbf{-9}$

16. $-5 + 5 = \textbf{0}$

17. $4 + -9 = \textbf{-5}$

18. $8 + -4 = \textbf{4}$

Chapter 14 continued

g

Solve.

2005	200
2006	350
2007	400
2008	425
2009	450
2010	473

Camp Silver records the number of campers that attend each year. What is the average attendance of campers for the years shown on the chart? $(200 + 350 + 400 + 425 + 450 + 473) \div 6 = 2,298 \div 6 = 383$ campers

2. Find the average grade for each student. Round the average to the nearest whole number.

	Test 1	Test 2	Test 3	Average
Kara	75	85	90	83
Jason	92	100	85	92
Abigail	85	95	90	90
Robert	100	100	97	99

3. Calculate Jim's average bowling score for Saturday's four games.

1	2	3	4
156	128	134	150

$$(156 + 128 + 134 + 150) \div 4 = 568 \div 4 = 142$$

4. Jessica saw 5 birds on Monday, 6 on Tuesday, 3 on Wednesday, 4 on Thursday, and 2 on Friday. What is the average number of birds she saw each day? $(5 + 6 + 3 + 4 + 2) \div 5 = 20 \div 5 = 4$ birds

5. In 2007 the Chicago Cubs won 85 baseball games. They won 97 games in 2008, 83 in 2009, and 75 in 2010. What is their average number of games won? $(85 + 97 + 83 + 75) \div 4 = 340 \div 4 = 85$ games

h

Solve. Rename in lowest terms. *Answer is shown using cancellation.*

$$1. \frac{1}{3} \div \frac{1}{5} \quad \frac{1}{3} \times \frac{5}{1} = \frac{5}{3} = 1\frac{2}{3}$$

$$5. \frac{3}{4} \div \frac{1}{2} \quad \frac{3}{4} \times \frac{2}{1} = \frac{3}{2} = 1\frac{1}{2}$$

$$9. 2\frac{4}{7} \div \frac{3}{4} \quad \frac{18}{7} \times \frac{4}{3} = \frac{24}{7} = 3\frac{3}{7}$$

$$2. \frac{3}{5} \div \frac{2}{3} \quad \frac{3}{5} \times \frac{3}{2} = \frac{9}{10}$$

$$6. \frac{9}{18} \div \frac{3}{6} \quad \frac{9}{18} \times \frac{6}{3} = \frac{3}{3} = 1$$

$$10. 3\frac{3}{8} \div \frac{4}{8} \quad \frac{27}{8} \times \frac{8}{4} = \frac{27}{4} = 6\frac{3}{4}$$

$$3. \frac{4}{8} \div \frac{1}{4} \quad \frac{4}{8} \times \frac{4}{1} = \frac{4}{2} = 2$$

$$7. 5\frac{1}{3} \div 2\frac{1}{6} \quad \frac{16}{3} \times \frac{6}{13} = \frac{32}{13} = 2\frac{6}{13}$$

$$11. 5\frac{6}{7} \div \frac{1}{3} \quad \frac{41}{7} \times \frac{3}{1} = \frac{123}{7} = 17\frac{4}{7}$$

$$4. \frac{9}{12} \div \frac{1}{6} \quad \frac{9}{12} \times \frac{6}{1} = \frac{9}{2} = 4\frac{1}{2}$$

$$8. 9\frac{2}{4} \div 3\frac{1}{6} \quad \frac{38}{4} \times \frac{6}{19} = \frac{6}{2} = 3$$

$$12. 4\frac{3}{8} \div 1\frac{2}{6} \quad \frac{35}{8} \times \frac{6}{1} = \frac{105}{32} = 3\frac{9}{32}$$

Solve.

13. Miss Snow teaches ice skating to beginners. Each lesson is $\frac{1}{2}$ of an hour long. How many lessons can she give in 3 hours?

$$3 \div \frac{1}{2} = \frac{3}{1} \times \frac{2}{1} = \frac{6}{1} = 6 \text{ lessons}$$

14. David is planning to grill burgers for a cookout. He uses 1 pound of hamburger to make 4 burgers. How many burgers can he make with $4\frac{1}{2}$ pounds of meat? $4\frac{1}{2} \times 4 = \frac{9}{2} \times \frac{4}{1} = \frac{18}{1} = 18$ burgers

i

Solve.

1. $9.4 \overline{)0.1316}$ **0.014**

2. $5.4 \overline{)3.186}$ **0.59**

3. $67 \overline{)20.77}$ **0.31**

4. $1 \overline{)0.05}$ **0.05**

5. $8.9 \overline{)436.1}$ **49**

6. $7.5 \overline{)0.375}$ **0.05**

7. $1.3 \overline{)0.429}$ **0.33**

8. $27 \overline{)7.83}$ **0.29**

Rename the denominator as a power of 10. Write the fraction as a decimal.

9. $\frac{2}{5} \frac{4}{10}; 0.4$

10. $\frac{5}{25} \frac{20}{100}; 0.20$

11. $\frac{3}{4} \frac{75}{100}; 0.75$

12. $\frac{1}{2} \frac{5}{10}; 0.5$

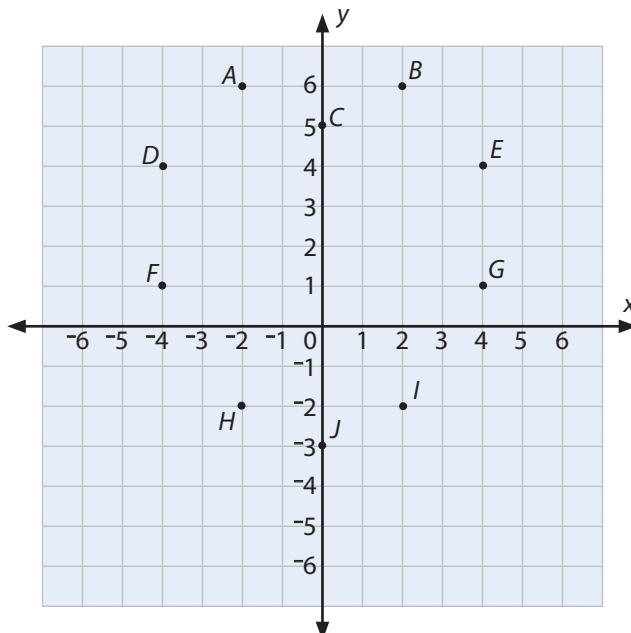
Divide. Write the fraction as a decimal. Mark the repeating digits.

13. $\frac{3}{4} \text{ } \underline{\text{0.75}}$

14. $\frac{8}{9} \text{ } \underline{\text{0.}\bar{8}}$

15. $\frac{2}{3} \text{ } \underline{\text{0.}\bar{6}}$

16. $\frac{1}{4} \text{ } \underline{\text{0.25}}$

j

Name the point represented by the coordinates.

1. $(2, 6)$ **B**

2. $(-4, 1)$ **F**

3. $(-2, -2)$ **H**

4. $(4, 4)$ **E**

5. $(0, 5)$ **C**

Write the coordinates for the point.

6. A **(-2, 6)**

7. D **(-4, 4)**

8. G **(4, 1)**

9. I **(2, -2)**

10. J **(0, -3)**

Chapter 14 continued

k

Solve.

$$\begin{array}{r} 643,564 \\ + 246,203 \\ \hline 889,767 \end{array}$$

$$\begin{array}{r} 391,715 \\ - 96,639 \\ \hline 295,076 \end{array}$$

$$\begin{array}{r} 493 \\ \times 321 \\ \hline 158,253 \end{array}$$

$$16. \quad 14 \overline{) 994} \quad \begin{array}{c} 71 \\ \hline \end{array}$$

$$\begin{array}{r} 228,258 \\ + 552,220 \\ \hline 780,478 \end{array}$$

$$\begin{array}{r} 793,151 \\ - 150,895 \\ \hline 642,256 \end{array}$$

$$\begin{array}{r} 141 \\ \times 998 \\ \hline 140,718 \end{array}$$

$$17. \quad 18 \overline{) 108} \quad \begin{array}{c} 6 \\ \hline \end{array}$$

$$\begin{array}{r} 734,280 \\ + 154,745 \\ \hline 889,025 \end{array}$$

$$\begin{array}{r} 26,956 \\ - 25,666 \\ \hline 1,290 \end{array}$$

$$\begin{array}{r} 860 \\ \times 775 \\ \hline 666,500 \end{array}$$

$$18. \quad 21 \overline{) 126} \quad \begin{array}{c} 6 \\ \hline \end{array}$$

$$\begin{array}{r} 571,900 \\ + 648,843 \\ \hline 1,220,743 \end{array}$$

$$\begin{array}{r} 472,320 \\ - 205,663 \\ \hline 266,657 \end{array}$$

$$\begin{array}{r} 106 \\ \times 215 \\ \hline 22,790 \end{array}$$

$$19. \quad 16 \overline{) 368} \quad \begin{array}{c} 23 \\ \hline \end{array}$$

$$\begin{array}{r} 826,520 \\ + 862,498 \\ \hline 1,689,018 \end{array}$$

$$\begin{array}{r} 453,388 \\ - 436,850 \\ \hline 16,538 \end{array}$$

$$\begin{array}{r} 124 \\ \times 842 \\ \hline 104,408 \end{array}$$

$$20. \quad 23 \overline{) 920} \quad \begin{array}{c} 40 \\ \hline \end{array}$$

DAILY 15 REVIEW

a

Write the ratio in word form, ratio form, and fraction form.

1. 1 computer for every 3 students **1 to 3, 1:3, $\frac{1}{3}$**
2. 2 workers for every 15 children **2 to 15, 2:15, $\frac{2}{15}$**
3. 4 tables for every 32 people **4 to 32, 4:32, $\frac{4}{32}$**
4. 6 servings for every pie **6 to 1, 6:1, $\frac{6}{1}$**
5. 6 cookies for every 3 lunches **6 to 3, 6:3, $\frac{6}{3}$**

Write the ratio as a fraction in lowest terms.

6. 2 to 8 **$\frac{1}{4}$**
7. 4 to 12 **$\frac{1}{3}$**
8. 5 to 10 **$\frac{1}{2}$**
9. 8 to 20 **$\frac{2}{5}$**
10. 10 to 100 **$\frac{1}{10}$**

Use equivalent ratios to find the missing term.

$$11. \quad \frac{4}{8} = \frac{n}{16} \quad n = 8$$

$$12. \quad \frac{1}{4} = \frac{n}{100} \quad n = 25$$

$$13. \quad \frac{2}{3} = \frac{4}{n} \quad n = 6$$

$$14. \quad \frac{1}{5} = \frac{n}{100} \quad n = 20$$

Solve.

$$15. \quad \begin{array}{r} 249.71 \\ + 84.09 \\ \hline 333.80 \end{array}$$

$$16. \quad \begin{array}{r} \$3.75 \\ \times 5 \\ \hline \$18.75 \end{array}$$

$$17. \quad \begin{array}{r} \$20.00 \\ - \$12.75 \\ \hline \$7.25 \end{array}$$

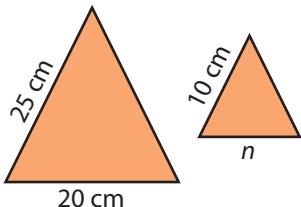
$$18. \quad 1,287 \div 3 \quad \begin{array}{c} 429 \\ \hline \end{array}$$

$$19. \quad 1.2 + 39.764 \quad \begin{array}{c} 40.964 \\ \hline \end{array}$$

b

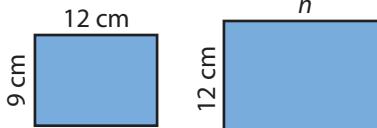
Write a proportion to find the unknown measure of the similar figure.

1.



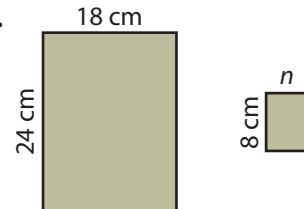
$$\frac{25}{20} = \frac{10}{n}; n = 8 \text{ cm}$$

2.



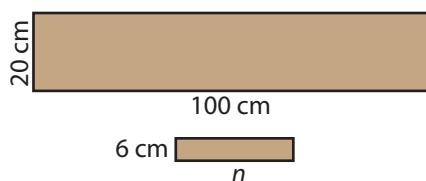
$$\frac{12}{9} = \frac{n}{12}; n = 16 \text{ cm}$$

3.



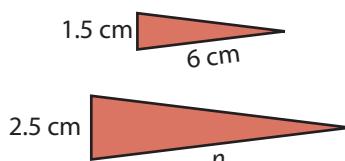
$$\frac{18}{24} = \frac{n}{8}; n = 6 \text{ cm}$$

4.



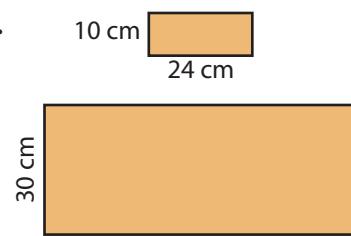
$$\frac{20}{100} = \frac{6}{n}; n = 30 \text{ cm}$$

5.



$$\frac{1.5}{6} = \frac{2.5}{n}; n = 10 \text{ cm}$$

6.



$$\frac{10}{24} = \frac{30}{n}; n = 72 \text{ cm}$$

Write a proportion to solve.

7. A parking meter that is 1.5 meters tall casts a shadow of 3 meters. A light pole in the parking lot casts a shadow of 12 meters. How tall is the light pole? $\frac{1.5}{3} = \frac{n}{12}; n = 6 \text{ m}$

8. A tree casts a shadow of 1.2 meters. A meter stick casts a shadow of 0.4 meters. What is the height of the tree? $\frac{1}{0.4} = \frac{n}{1.2}; n = 3 \text{ m}$

c

Write the percent as a decimal and as a fraction in lowest terms.

1. 53% $0.53; \frac{53}{100}$

2. 8% $0.08; \frac{2}{25}$

3. 70% $0.70 \text{ or } 0.7; \frac{7}{10}$

Write the ratio as a percent.

4. $\frac{8}{100} 8\%$

5. 20:100 20%

6. 5 per 100 5%

Write the decimal as a percent. Annex zeros as needed.

7. 0.01 1%

8. 0.1 10%

9. 0.69 69%

Write the percent as a fraction with a denominator of 100 and in lowest terms.

10. 50% $\frac{50}{100}; \frac{1}{2}$

11. 6% $\frac{6}{100}; \frac{3}{50}$

12. 10% $\frac{10}{100}; \frac{1}{10}$

Solve.

As part of a class project, Daniel surveyed 40 people to find out whether they preferred basketball or baseball.

13. What percent of the people preferred baseball?
30%

Sport	Tally	Frequency
Baseball		12
Basketball		28

Chapter 15 continued

d

Write the equivalent measurement.

1. 1 ft = ___ in. 2. 1 mi = ___ ft 3. 1 gal = ___ qt 4. 1 tn = ___ lb 5. 1 pt = ___ c 6. 1 lb = ___ oz
12 5,280 4 2,000 2 16

Rename the units.

7. 18 in. = ___ ft 8. 12 ft = ___ yd 4
 $1\frac{1}{2}$ or 1.5

9. 2 tn 1,280 lb = ___ lb
5,280

Solve.

11.
$$\begin{array}{r} 1 \text{ ft } 11 \text{ in.} \\ + 2 \text{ ft } 16 \text{ in.} \\ \hline 3 \text{ ft } 27 \text{ in.} = \\ 5 \text{ ft } 3 \text{ in.} \end{array}$$

12.
$$\begin{array}{r} 3 \text{ lb } 12 \text{ oz} \\ - \quad \quad 20 \text{ oz} \\ \hline 2 \text{ lb } 8 \text{ oz} \end{array}$$

13.
$$\begin{array}{r} 1,760 \text{ yd} \\ + \quad \quad 845 \text{ yd} \\ \hline 2,605 \text{ yd} \end{array}$$

14.
$$\begin{array}{r} 3 \text{ gal } 1 \text{ qt} \\ - \quad \quad 1 \text{ gal } 2 \text{ qt} \\ \hline 1 \text{ gal } 3 \text{ qt} \end{array}$$

15. yards in $\frac{1}{2}$ of a mile 880 yd 16. feet in $\frac{2}{3}$ of a yard 2 ft 17. inches in $\frac{1}{4}$ of a foot 3 in.

18. Mother used $2\frac{1}{2}$ pounds of hamburger to make meatloaf. How many ounces were left from the 3-pound package?
 $3 \text{ lb} - 2\frac{1}{2} \text{ lb} = \frac{1}{2} \text{ lb}; \frac{1}{2} \times 16 \text{ oz} = 8 \text{ oz}$

19. Claire placed six 18-inch pieces of ribbon across her bulletin board. How many yards of ribbon did she use? $6 \times 18 \text{ in.} = 108 \text{ in.};$
 $108 \text{ in.} \div 36 = 3 \text{ yd of ribbon}$

20. Jordan cut an 8-foot board into 3 equal pieces. How many inches long were the pieces?
 $8 \times 12 \text{ in.} = 96 \text{ in.}; 96 \text{ in.} \div 3 = 32 \text{ in.}$

e

Write the equivalent measurement.

1. 1 m = ___ cm 100 2. 1 L = ___ mL 1000 3. 1 kg = ___ g 1000 4. 1 km = ___ m 1000

Rename the units.

5. 3 m = ___ cm 300 6. 7250 m = ___ km 7.250 7. 5000 g = ___ kg 5 8. 2 L = ___ mL 2000

Solve.

9. $\frac{1}{2}$ of a kilometer 500 m

10. $\frac{1}{4}$ of a meter 25 cm

11. $\frac{3}{4}$ of a liter 750 mL

12.
$$\begin{array}{r} 2500 \text{ mL} \\ + 1500 \text{ mL} \\ \hline 4000 \text{ mL} \end{array}$$

13.
$$\begin{array}{r} 3417 \text{ kg} \\ - 2750 \text{ kg} \\ \hline 667 \text{ kg} \end{array}$$

14.
$$\begin{array}{r} 3 \text{ L} - 2750 \text{ mL} \\ \hline 250 \text{ mL} \end{array}$$

15.
$$8341 \text{ g} + 978 \text{ g}$$

9319 g

16. The punch recipe calls for 1 liter of orange juice, 2 liters of lemon-lime soda, 300 milliliters of lemonade concentrate, and 1.5 liters of water. How much punch does the recipe make? 4.8 L
or 4800 mL of punch

17. The nurse said Carissa's temperature was normal. What was her temperature in Celsius? 37° C

f

Use the data from the circle graph to find the answer.

The sixth-grade class surveyed 100 students to find their favorite subjects.

- What percent of students surveyed liked heritage the best? **50%**
- Of the 100 students surveyed, how many chose math? **25 students**
- What percent of the students surveyed chose science? **25%**

Mrs. Hancock made a circle graph to show the percents of the different kinds of flowers in her garden.

- List the kinds of flowers in order from the largest percentage to the smallest percentage. **rose, daisy/tulip, lily, violet**

The car dealership made a circle graph of the most popular car colors. They used the information to order new cars.

- Based on the graph, what color car would the dealership order the most of? **white**
- If they ordered 100 cars, how many cars would they order in black? **25 cars**
- Does this graph show how many red vans to order? **no**
- List the colors from greatest percentage to smallest percentage. **white, black, silver, gray, red**

g

Write the improper fraction as a mixed number or a whole number.

1. $\frac{4}{3} = 1\frac{1}{3}$

2. $\frac{7}{2} = 3\frac{1}{2}$

3. $\frac{12}{4} = 3$

4. $\frac{6}{6} = 1$

5. $\frac{9}{4} = 2\frac{1}{4}$

Solve. Write the answer in lowest terms. **Answer is shown using cancellation.**

6.
$$\begin{array}{r} \frac{2}{3} \\ + \frac{1}{3} \\ \hline \frac{3}{3} = 1 \end{array}$$

7.
$$\begin{array}{r} \frac{4}{5} = \frac{8}{10} \\ + \frac{2}{10} = \frac{2}{10} \\ \hline \frac{10}{10} = 1 \end{array}$$

8.
$$\begin{array}{r} 6\frac{1}{2} = 6\frac{2}{4} \\ - 4\frac{1}{4} = 4\frac{1}{4} \\ \hline 2\frac{1}{4} \end{array}$$

9.
$$\begin{array}{r} 4\frac{3}{3} \\ - 2\frac{2}{3} \\ \hline 2\frac{1}{3} \end{array}$$

10.
$$\begin{array}{r} \frac{8}{10} = \frac{4}{5} \\ - \frac{3}{15} = \frac{1}{5} \\ \hline \frac{3}{5} \end{array}$$

11. $3 \times \frac{4}{5} = \frac{12}{5} = 2\frac{2}{5}$

12. $1\frac{1}{2} \times 2\frac{3}{6} = \frac{3}{2} \times \frac{15}{6} = \frac{15}{4} = 3\frac{3}{4}$

13. $4\frac{2}{8} \times 3\frac{1}{5} = \frac{34}{8} \times \frac{16}{5} = \frac{68}{5} = 13\frac{3}{5}$

14. $3 \div \frac{1}{2} = \frac{3}{1} \times \frac{2}{1} = 6$

15. $4\frac{1}{5} \div 1\frac{1}{4} = \frac{21}{5} \times \frac{4}{5} = \frac{84}{25} = 3\frac{9}{25}$

16. $\frac{6}{8} \div \frac{1}{4} = \frac{6}{8} \times \frac{4}{1} = \frac{6}{2} = 3$

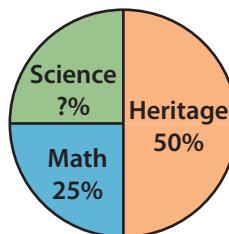
17. Jackson filled bags with candy to give to his classmates. He filled each bag with $\frac{1}{4}$ of a pound of candy. He had 3 pounds of candy. Would he have enough bags to give to 20 students?

$3 \div \frac{1}{4} = \frac{3}{1} \times \frac{4}{1} = 12$; no

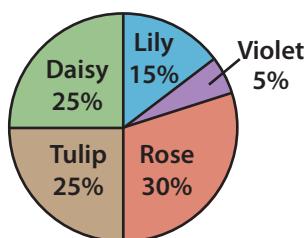
18. Missy placed $\frac{3}{4}$ of a yard of ribbon around a bouquet of flowers. She had $5\frac{1}{2}$ yards of ribbon. How many bouquets could she put ribbon around?

$5\frac{1}{2} \div \frac{3}{4} = \frac{11}{2} \times \frac{4}{3} = \frac{22}{3} = 7\frac{1}{3}$; 7 bouquets

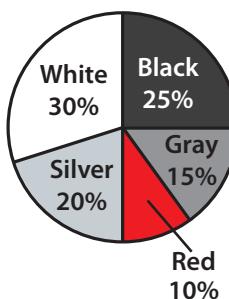
Favorite Subjects



Garden Flowers



Popular Car Colors



Chapter 15 continued

h

Solve.

1. $\begin{array}{r} \$1,285.79 \\ + \$2,391.82 \\ \hline \$3,677.61 \end{array}$

2. $\begin{array}{r} 32.105 \\ - 15.019 \\ \hline 17.086 \end{array}$

3. $\begin{array}{r} 50.12 \\ \times 3 \\ \hline 150.36 \end{array}$

4. $\begin{array}{r} \$150.00 \\ - \$ 79.35 \\ \hline \$70.65 \end{array}$

5. 4×2.175 **8.7**

6. $\frac{3}{4} \times \frac{5}{6} = \frac{5}{8}$

7. $1,518 \div 6$ **253**

8. $\frac{6}{9} \div \frac{1}{3} = \frac{6}{9} \times \frac{3}{1} = \frac{6}{3} = 2$

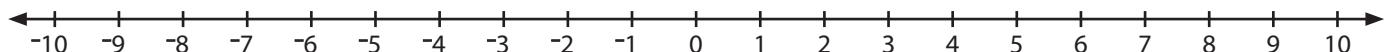
9. $3\overline{)4,560}$ **1,520**

10. $25\overline{)8,175}$ **327**

11. $47\overline{)16.215}$ **0.345**

12. $19\overline{)116.28}$ **6.12**

Use the number line to solve.



13. $3 + -1$ **2**

14. $-4 + -5$ **-9**

15. $-6 + 1$ **-5**

16. $-4 + 4$ **0**

Solve.

17. $n + 8 = 12$
n = 4

18. $\frac{n}{4} = \frac{25}{100}$
n = 1

19. $3n = 18$
n = 6

20. $36 \div 9 = n$
n = 4

DAILY **16** REVIEW

a

Make a stem-and-leaf plot with the data. Use the data to answer the questions.

Mr. Arnold recorded the number of emergency calls that were placed over a 10-day period in March.

Calls	70	82	74	70	69	76	75	80	78	73
Day	1	2	3	4	5	6	7	8	9	10

- What is the range of the calls? **82 - 69 = 13**
- What is the mean? **74.7 ≈ 75**
- What is the mode? **70**
- What is the median? **74.5**

Emergency Calls Recorded	
stem	leaf
6	9
7	0, 0, 3, 4, 5, 6, 8
8	0, 2

Key **6|9 = 69**

b

Use the picture to answer the questions.

- What is the ratio of vegetables to tuna? **3:4**
- What is the ratio of animal crackers to chips? **2:1**
- What is the ratio of rice mix to animal crackers? **2:2**
- What is the ratio of canned food to total food items? **7:12**



Write each ratio as a fraction in lowest terms.

- 6 boys to 8 girls $\frac{6}{8} = \frac{3}{4}$
- 1 c brown sugar to 2 c orange juice $\frac{1}{2}$
- 2 c gelatin to 5 c strawberries $\frac{2}{5}$
- 3 adults to 18 children $\frac{3}{18} = \frac{1}{6}$
- 15 elephants to 25 mice $\frac{15}{25} = \frac{3}{5}$
- 3 piano players to 21 brass players $\frac{3}{21} = \frac{1}{7}$

c

Write a comparison sentence using = or ≠.

- $\frac{1}{2} = \frac{2}{4}$
- $\frac{1}{3} \neq \frac{3}{7}$
- $\frac{81}{72} \neq \frac{17}{26}$
- $\frac{9}{12} \neq \frac{3}{5}$

Find the missing measurement.

- A large triangle has two sides of length 8 and a base of length x . A smaller triangle next to it has a base of 4 and a height of 2. $x = 4$
- A rectangle has a width of x , a length of 10, and a height of 3. The width of a smaller rectangle next to it is 5. $x = 6$
- A rectangle has a width of 9, a length of 12, and a height of x . The width of a smaller rectangle next to it is 4. $x = 3$

Find the missing term that completes the equivalent ratio.

- $\frac{3}{4} = \frac{q}{100}$ **q = 75**
- $\frac{2}{q} = \frac{4}{16}$ **q = 8**
- $\frac{2}{3} = \frac{6}{q}$ **q = 9**
- $\frac{65}{85} = \frac{13}{q}$ **q = 17**
- $\frac{84}{108} = \frac{q}{9}$ **q = 7**
- $\frac{q}{56} = \frac{6}{8}$ **q = 42**

Chapter 16 continued

d

Write the fraction as a percent.

1. $\frac{1}{4}$ **25%**

2. $\frac{1}{2}$ **50%**

3. $\frac{3}{4}$ **75%**

4. $\frac{1}{5}$ **20%**

Find the percent of the number.

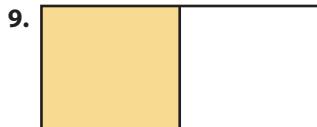
5. 50% of 80 **40**

6. 25% of \$4.00 **\$1.00**

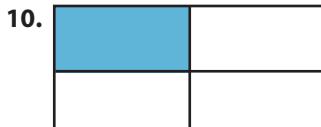
7. 10% of \$8.00 **\$0.80**

8. 75% of 40 **30**

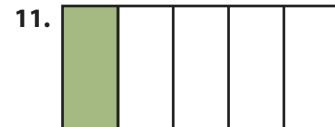
Estimate the percent shaded for the rectangle.



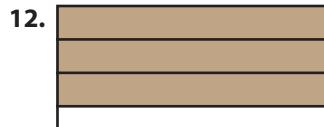
50%



25%



20%



75%

Write the number as a percent.

13. $\frac{50}{100}$ **50%**

14. 0.64 **64%**

15. $\frac{15}{100}$ **15%**

16. 0.09 **9%**

Solve.

17. John got 85% of his test correct. What percent did he miss? **15%**

19. Kyle earned \$16.00. He wants to put 10% of it in the offering. How much money will he put in the offering? **\$1.60**

18. Five out of 25 children play soccer. What percent of children play soccer? **20%**

20. Annie scored 25% of the game points. The total number of points was 40. How many points did she score? **10 points**

e

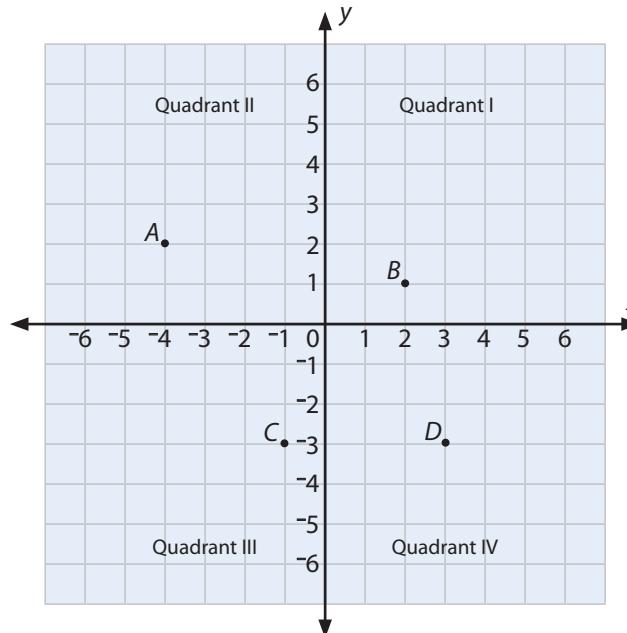
Write the ordered pair for the point.

1. A **(-4, 2)**

2. B **(2, 1)**

3. C **(-1, -3)**

4. D **(3, -3)**



Name the quadrant in which the point is located.

5. A **Quadrant II**

6. B **Quadrant I**

7. C **Quadrant III**

8. D **Quadrant IV**

a

Write the answer using **647,325,689,038**.

1. Write the value of the 5 in standard form. **5,000,000**
2. Write the digit in the Hundred Billions place. **6**
3. Round to the nearest one billion. **647,000,000,000**
4. Write the 3 digits in the Thousands period. **6, 8, 9**

Write a comparison sentence using **>**, **<**, or **=**.

5. 124 million **<** 1 billion
6. 21.8 **>** 21.09
7. twenty-one million **>** 9,475,389

Write the numbers from *least to greatest*.

8. **784,983 7,840,983 7,850,983 7,849,983**
784,983 7,840,983 7,849,983 7,850,983

9. **3,721 3.721 372.1 37.21**
3.721 37.21 372.1 3,721

Round the number to the greatest place.

10. 453,279
500,000
11. 1,982,400
2,000,000

12. 820,761,398
800,000,000
13. 4.7
5

Write the number in **standard form**.

14. five hundred thirty-two billion, one million, four hundred twenty-seven thousand, ninety-six
532,001,427,096
16. 10 billions + 427 millions + 801 thousands + 119 ones
10,427,801,119

15. $200,000,000 + 40,000,000 + 8,000,000 + 300,000 + 60,000 + 9,000 + 100 + 50 + 7$
248,369,157
17. $(7 \times 100,000) + (4 \times 10,000) + (3 \times 1,000) + (9 \times 100) + (5 \times 10) + (2 \times 1)$
743,952

b

Solve. Write the answer in lowest terms. **Answer is shown using cancellation.**

1. $\frac{5}{6} \div \frac{1}{3}$
 $\frac{5}{6} \times \frac{3}{1} = \frac{5}{2} = 2\frac{1}{2}$
2. $\frac{4}{8} \div 2$
 $\frac{4}{8} \times \frac{1}{2} = \frac{2}{8} = \frac{1}{4}$
5. $4 \times \frac{3}{4}$
3
6. $\frac{3}{6} \times \frac{2}{5}$
 $\frac{3}{15} = \frac{1}{5}$

3. $3\frac{1}{2} \div 1\frac{1}{4}$
 $\frac{7}{2} \times \frac{4}{5} = \frac{14}{10} = 2\frac{4}{5}$
4. $\frac{6}{8} \div \frac{1}{2}$
 $\frac{6}{8} \times \frac{2}{1} = \frac{6}{4} = 1\frac{1}{2}$
7. $5\frac{1}{3} \times 2\frac{1}{4}$
 $\frac{16}{3} \times \frac{9}{4} = 12$
8. $\frac{3}{5} \times \frac{4}{9}$
 $\frac{4}{15}$

9. $\frac{3}{9} = \frac{1}{3}$
 $+\frac{2}{3} = \frac{2}{3}$
 $\frac{3}{3} = 1$
10. $6\frac{1}{2} = 6\frac{5}{10}$
 $+ 2\frac{3}{5} = 2\frac{6}{10}$
 $\frac{8}{10} = 9\frac{1}{10}$
13. $\frac{9}{12}$
 $-\frac{4}{12}$
 $\frac{5}{12}$
14. $4\frac{7}{10} = 4\frac{7}{10}$
 $- 2\frac{3}{5} = 2\frac{6}{10}$
 $\frac{2}{10} = \frac{1}{5}$

11. $9\frac{4}{5}$
 $+ 2\frac{3}{5}$
 $\frac{11}{5} = 12\frac{2}{5}$
12. $8\frac{1}{5} = 8\frac{4}{20}$
 $+\frac{6}{20} = \frac{6}{20}$
 $\frac{8}{20} = 8\frac{1}{2}$
15. $6\frac{2}{7}$
 $- 3\frac{1}{2}$
 $\frac{3}{2}$
16. $10\frac{3}{4} = 10\frac{9}{12}$
 $- 5\frac{2}{3} = 5\frac{8}{12}$
 $\frac{5}{12}$

Determine whether the fraction is closest to **0**, **$\frac{1}{2}$** , or **1**.

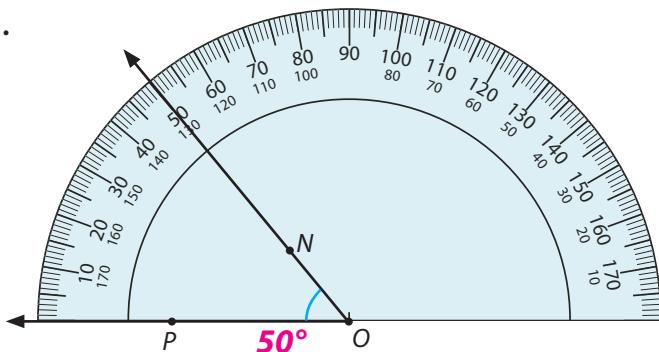
17. $\frac{6}{10}$
 $\frac{1}{2}$
18. $\frac{9}{10}$
1
19. $\frac{1}{10}$
0
20. $\frac{5}{10}$
 $\frac{1}{2}$

Chapter 17 continued

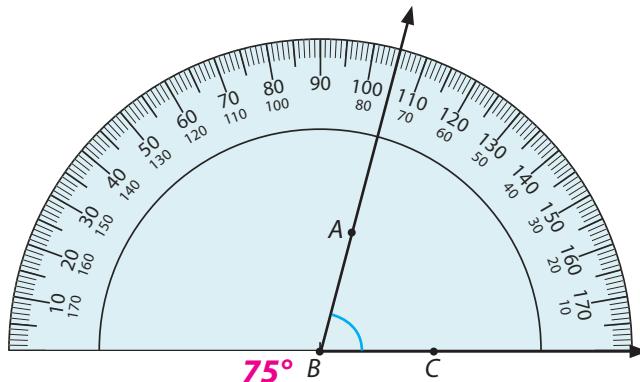
c

Write the measure of the angle.

1.

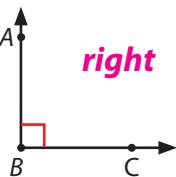


2.



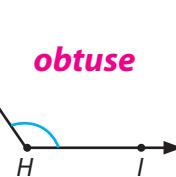
Classify the angle as acute, obtuse, right, or straight.

3.



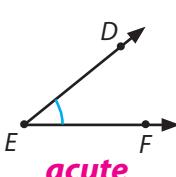
right

4.



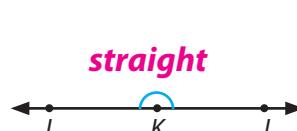
obtuse

5.



acute

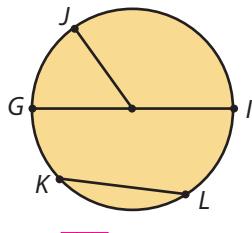
6.



straight

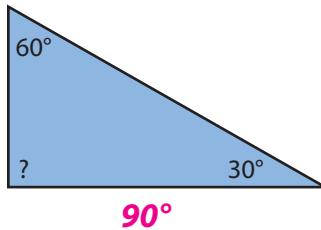
Use the figure to find the answer.

7. Name the diameter.

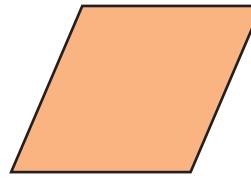


GI or IG

8. Find the measure of the unknown angle.



9. Name the shape.



parallelogram or rhombus or quadrilateral

d

Use mental math to solve.

1. 10×15.3 **153**

2. 100×0.247 **24.7**

3. 10×4.5 **45**

4. 100×23 **2,300**

5. $89.5 \div 10$ **8.95**

6. $241.3 \div 100$ **2.413**

7. $894 \div 10$ **89.4**

8. $52.47 \div 100$ **0.5247**

Solve.

9. 2.45

$$\begin{array}{r} \times 3 \\ \hline 7.35 \end{array}$$

0.12

13. $50 \overline{) 6}$

10. 398.01

$$\begin{array}{r} + 45.732 \\ \hline 443.742 \end{array}$$

3.4

14. $21 \overline{) 71.4}$

11. 42.1

$$\begin{array}{r} - 3.87 \\ \hline 38.23 \end{array}$$

0.54

15. $12 \overline{) 6.48}$

12. $8 - 3.804$

4.196

6.25

16. $9 \overline{) 56.25}$

Write the fraction as a decimal.

17. $\frac{3}{4}$ **0.75**

18. $\frac{5}{10}$ **0.5**

19. $\frac{2}{5}$ **0.4**

20. $\frac{1}{4}$ **0.25**

e

Write an algebraic expression for the word phrase.

1. seven times an unknown number **$7n$**

3. four less than five times n **$5n - 4$**

2. three more than a number **$n + 3$**

4. six more than 2 times a number **$2n + 6$**

Evaluate the expression if $n = 5$.

5. $3n$ **15**

6. $8 + n$ **13**

7. $\frac{15}{n}$ **3**

8. $20 - n$ **15**

Simplify the expression.

9. $a + a$ **$2a$**

10. $(2 + 4) + n$ **$6 + n$**

11. $3(4x)$ **$12x$**

12. $8 + y + 2$ **$10 + y$**

Complete the table.

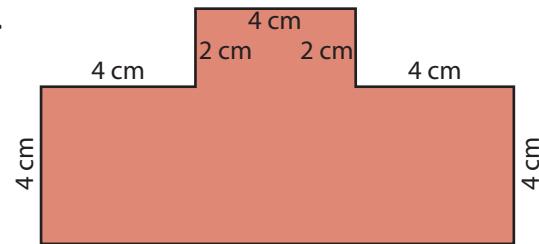
x	$3x$
2	6
5	15
7	21

a	a^2
4	16
6	36
8	64

n	$2n + 3$
7	17
9	21
10	23

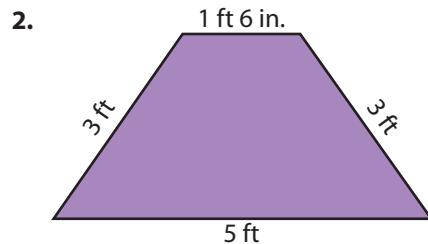
f

Find the perimeter of the figure.



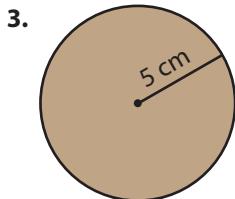
$$4 + 2 + 4 + 4 + (3 \times 4) + 4 + 4 + 2 = 36 \text{ cm}$$

Equations may vary.

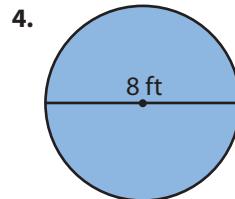


$$1 \text{ ft } 6 \text{ in.} + 3 \text{ ft} + 5 \text{ ft} + 3 \text{ ft} = 12 \text{ ft } 6 \text{ in.}$$

Write the formula. Find the circumference of the circle.

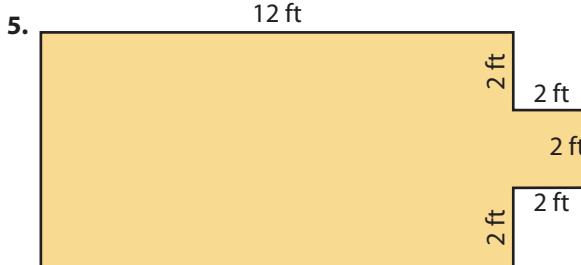


$$\begin{aligned} C &= 2\pi r \\ 2 \times 3.14 \times 5 &= 31.4 \text{ cm} \end{aligned}$$



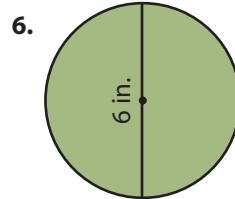
$$\begin{aligned} C &= \pi d \\ 3.14 \times 8 &= 25.12 \text{ ft} \end{aligned}$$

Find the area of the figure.



$$(3 \times 2 \times 12) + (2 \times 2) = 76 \text{ ft}^2$$

Write the formula. Find the area of the circle.



$$\begin{aligned} A &= \pi r^2 \\ 3.14 \times (3 \text{ in.})^2 &= 28.26 \text{ in.}^2 \end{aligned}$$

Chapter 17 continued

g

Find the unit rate.

- The Laphams drove 315 miles and used 15 gallons of gas. **21 mi/gal**
- Marcus earned \$40.00 cleaning several cars. He worked 5 hours. **\$8/hr**
- Mrs. Bowers bought 8 pounds of bananas for \$4.72. **\$0.59/lb**
- The team traveled 1,450 miles in two days. **725 mi/d**

Find the distance traveled in the given time.

- 4 days at 350 mi/d **1,400 mi**
- 5 hours at 65 mi/hr **325 mi**

Write a ratio. **Ratio form may vary.**

- 3 cans for \$2.00 **3:2**
- 2 bags for \$3.00 **2:3**
- one computer for every 2 students **1:2**

Write the percent as a decimal and as a fraction in lowest terms.

- 78% **0.78; $\frac{39}{50}$**
- 50% **0.5; $\frac{1}{2}$**
- 4% **0.04; $\frac{1}{25}$**

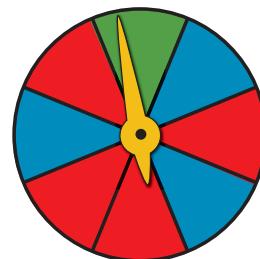
Write a proportion to find an equivalent ratio. Answer the question.

- It takes Mrs. Snow 2 hours to grade 50 math pages. At this rate, how long would it take her to grade 100 math pages? **$\frac{2}{50} = \frac{4}{100}; 4 \text{ hr}$**
- It takes Brian 25 minutes to complete a math page. At this rate, how long would it take him to complete 4 math pages? **$\frac{25}{1} = \frac{100}{4}; 100 \text{ min}$
or 1 hr, 40 min**

h

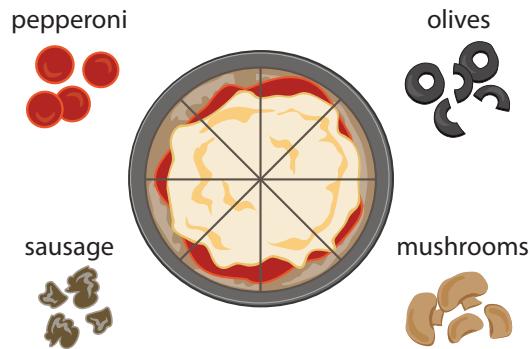
Use the spinner to find the answer.

- What color is the spinner most likely to land on? Write a fraction and a percent to show the probability.
red; $\frac{4}{8}$, 50%
- Find the probability of the spinner landing on blue. Write a fraction and a percent.
 $\frac{3}{8}$; 37.5%
- Find the probability of the spinner landing on green. Write a fraction and a percent.
 $\frac{1}{8}$; 12.5%



Answer the question.

- What are the possible combinations for a pizza with two different toppings?
{pm, po, ps, mo, ms, os}
- What is the number of possibilities?
6



Write the numbers in order from *least to greatest*.

1.

0	-1	-3	4
-3	-1	0	4

2.

15	0	-12	-8
-12	-8	0	15

3.

-15	15	13	-12
-15	-12	13	15

4.

-8	-14	8	19
-14	-8	8	19

Write a comparison sentence using $>$, $<$, or $=$.

5. $-30 < 29$

6. $-21 < 0$

7. $18 > -45$

8. $48 > -48$

9. $3 + -2 < 5$

10. $-2 + -5 < -4$

11. $-3 + 7 > -3 + 4$

12. $8 - 2 = 10 + -4$

Find the sum.

13. $-9 + -1 = \textcolor{red}{-10}$

14. $-8 + 5 = \textcolor{red}{-3}$

15. $7 + -4 = \textcolor{red}{3}$

16. $-9 + -5 = \textcolor{red}{-14}$

Subtract.

17. $8 - -2 = \textcolor{red}{10}$

18. $-3 - 8 = \textcolor{red}{-11}$

19. $9 - 15 = \textcolor{red}{-6}$

20. $-3 - -1 = \textcolor{red}{-2}$

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