

Assessment/Intervention

G E O M E T R Y
Prerequisite Skills
Workbook

Remediation and Intervention

**Mc
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*Geometry
Prerequisite Skills Workbook*

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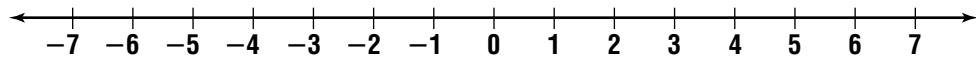
Adding Integers

You can use a number line to add integers. Locate the first addend on the number line. Move right if the second addend is positive. Move left if the second addend is negative.

Example 1 Solve $d = 4 + (-10)$.

Start at 4. Since -10 is negative, move left 10 units.

$$4 + (-10) = -6$$



So, $d = -6$.

When you add integers, remember the following.

- The sum of two positive integers is positive.
- The sum of two negative integers is negative.
- The sum of a positive integer and a negative integer is positive if the positive integer has the greater absolute value and negative if the negative integer has the greater absolute value.

Examples 2 Solve $t = 24 + (-13)$.

$|24| > |-13|$, so the sum is positive.

The difference of 24 and 13 is 11, so $t = 11$.

3 Solve $-17 + 16 = m$.

$|-17| > |16|$, so the sum is negative.

The difference of 17 and 16 is 1, so $m = -1$.

Solve each equation.

1. $h = 15 + (-10)$

2. $-20 + (-9) = g$

3. $s = -9 + 39$

4. $-50 + 20 = p$

5. $y = -11 + (-19)$

6. $z = 12 + 15$

7. $500 + (-250) = w$

8. $c = 48 + (-8)$

9. $-80 + (-20) = v$

10. $t = -109 + 49$

11. $544 + 206 = b$

12. $4 + (-16) = d$

Adding Integers (*continued*)

Solve each equation.

13. $16 + (-8) = a$

14. $q = -12 + (-12)$

15. $36 + 16 = m$

16. $-19 + 0 = p$

17. $-35 + 45 = v$

18. $n = 53 + (-63)$

19. $w = 111 + (-112)$

20. $r = -16 + (-20)$

21. $-14 + 50 = x$

22. $a = 16 + (-36)$

23. $28 + 42 = u$

24. $-31 + (-46) = b$

25. $v = 21 + (-18)$

26. $c = -8 + 34$

27. $-12 + (-16) = w$

28. $74 + (-63) = d$

29. $x = -95 + (-46)$

30. $r = 81 + 63$

31. $-57 + 86 = y$

32. $-14 + (-98) = f$

33. $z = 47 + (-63)$

34. $k = -125 + 79$

35. $-32 + (-89) = w$

Evaluate each expression if $r = 3$, $t = -3$, and $w = -5$.

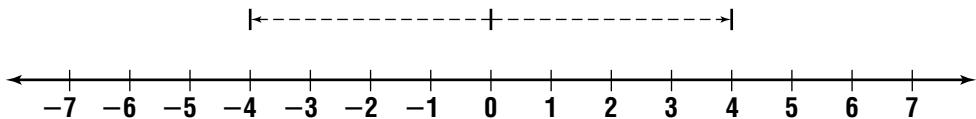
36. $r + 12$

37. $w + (-8)$

38. $t + r$

Subtracting Integers

An integer and its **opposite** are the same distance from 0 on a number line.
4 and -4 are opposites.



The sum of an integer and its opposite is 0. $-4 + 4 = 0$

To subtract an integer, add its opposite.

Examples 1 Solve $4 - 8 = y$.

$$\begin{array}{l} 4 - 8 = y \\ 4 + (-8) = y \\ \hline -4 = y \end{array}$$

2 Solve $4 - (-4) = x$.

$$\begin{array}{l} 4 - (-4) = x \\ 4 + 4 = x \\ \hline 8 = x \end{array}$$

Write the opposite of each integer.

1. -18

2. 12

3. -36

4. 61

Solve each equation.

5. $b = 16 - (-3)$

6. $n = -8 - 25$

7. $w = -11 - (-6)$

8. $-19 - (-3) = h$

9. $65 - (-45) = k$

10. $-19 - 20 = c$

11. $s = 100 - (-72)$

12. $z = -44 - (-33)$

13. $d = 89 - 17$

14. $-80 - (-35) = p$

15. $98 - (-90) = f$

16. $-75 - 23 = g$

Subtracting Integers (*continued*)

Solve each equation.

17. $a = 5 - (-3)$

18. $e = -6 - (-13)$

19. $d = -8 - 17$

20. $-2 - 16 = g$

21. $b = 15 - (-15)$

22. $42 - (-91) = k$

23. $a = 30 - (-12)$

24. $e = (-27) - (-18)$

25. $-51 - (-18) = h$

26. $63 - (-27) = f$

27. $81 - 98 = g$

28. $m = -16 - (-16)$

29. $b = -41 - (-86)$

30. $h = 273 - 421$

31. $n = (-361) - 684$

32. $c = -847 - 98$

33. $j = 647 - (-77)$

34. $427 - 847 = p$

Evaluate each expression if $w = -9$, $x = 3$, and $y = -8$.

35. $60 - w$

36. $12 - y$

37. $x - (-12)$

38. $w - x$

39. $y - w$

40. $x - y$

41. $-31 - y$

42. $w - 50$

43. $12 - x$

Evaluate each expression if $y = -6$, $p = 8$, and $x = -10$.

44. $86 - x$

45. $y - (-19)$

46. $46 - p$

47. $y + p - x$

48. $p + x - y$

49. $100 - (y + p + x)$

Multiplying Integers

The product of two positive integers is positive.

Examples 1 $k = 4(9)$

$$k = 36$$

2 $m = 6(7)(2)$

$$m = 42(2)$$

$$m = 84$$

3 $j = 5(3)(5)$

$$j = 15(5)$$

$$j = 75$$

The product of two negative integers is positive.

Examples 4 $h = (-7)(-5)$

$$h = 35$$

5 $v = (-9)^2$

$$v = -9(-9)$$

6 $z = (-25)(-7)$

$$z = 175$$

$$v = 81$$

The product of a positive integer and a negative integer is negative.

Examples 7 $c = (-20)(8)$

$$c = -160$$

8 $y = (-6)(25)$

$$y = -150$$

9 $g = (70)(-3)(2)$

$$g = -210(2)$$

$$g = -420$$

Solve each equation.

1. $z = 8(9)$

2. $t = -4(8)$

3. $b = 4(-5)$

4. $-5(-5) = h$

5. $-40(6) = n$

6. $20(-9) = y$

7. $2(-5)(-8) = h$

8. $g = -6(-3)(-2)$

9. $w = -5(10)(-4)$

10. $t = (-20)^2$

11. $-10(9)^2 = p$

12. $r = (5)^2 \cdot (-10)^2$

13. $(-3)(-6) = x$

14. $5(-4) = m$

15. $p = 6(8)$

16. $a = 9(-5)$

17. $h = 7(-15)$

18. $n = (-7)(-12)$

Multiplying Integers (*continued*)

Solve each equation.

19. $v = (-16)(-4)$

20. $(-12)(3) = j$

21. $r = -14(-8)$

22. $g = 14(36)$

23. $k = -11(-11)$

24. $s = -16(-21)$

25. $b = -16(9)$

26. $-14(-12) = k$

27. $t = -18(0)$

28. $-21(-8) = d$

29. $q = -26(7)$

30. $u = -33(-9)$

31. $r = (-2)(8)(-4)$

32. $s = (4)(0)(9)$

33. $(-3)(-4)(-5) = z$

34. $c = (-2)(8)(-90)$

35. $m = (-18)^2$

36. $8(3)(16) = w$

37. $f = (-2)(8)(-5)^2$

38. $p = (4)(-11)(3)$

39. $x = (4)^2 \cdot (-2)^2$

Evaluate each expression if $q = -4$, $r = -8$, and $s = 10$.

40. $2qr$

41. $-10sq$

42. $-8s^2$

43. qrs

44. $-3sr$

45. $5r^2$

Evaluate each expression if $a = -2$, $b = -5$, and $c = 8$.

46. $6ab$

47. $-4bc$

48. bc^2

Dividing Integers

If two integers have the same sign, their quotient is positive.

Examples 1 $m = 420 \div 7$ *The signs are the same.*
 $m = 60$ *The quotient is positive.*

2 $d = -290 \div (-29)$ *The signs are the same.*
 $d = 10$ *The quotient is positive.*

If two integers have different signs, their quotient is negative.

Examples 3 $f = -25 \div 5$ *The signs are different.*
 $f = -5$ *The quotient is negative.*

4 $a = \frac{20}{-4}$ *The signs are different.*
 $a = -5$ *The quotient is negative.*

Solve each equation.

1. $81 \div -9 = c$

2. $r = \frac{-72}{8}$

3. $b = 680 \div 4$

4. $-325 \div (-5) = p$

5. $-700 \div 35 = y$

6. $t = -560 \div (-80)$

7. $k = \frac{285}{19}$

8. $-96 \div (-32) = g$

9. $84 \div (-84) = z$

10. $-189 \div 9 = j$

11. $m = 248 \div (-4)$

12. $z = 408 \div 51$

13. $\frac{-27}{9} = b$

14. $v = \frac{42}{-7}$

15. $n = \frac{-63}{-9}$

16. $t = -42 \div 14$

17. $-12 \div (-4) = z$

18. $16 \div (-8) = p$

Dividing Integers (continued)

Solve each equation.

19. $m = 120 \div (-20)$

20. $n = -240 \div (-4)$

21. $p = -64 \div (-8)$

22. $a = \frac{-366}{3}$

23. $b = \frac{-144}{-6}$

24. $c = \frac{-80}{16}$

25. $\frac{-121}{-11} = w$

26. $\frac{-240}{8} = x$

27. $\frac{440}{-20} = y$

28. $315 \div 9 = p$

29. $-312 \div (-12) = q$

30. $285 \div (-15) = r$

31. $d = -312 \div (-6)$

32. $e = 232 \div (-8)$

33. $f = -144 \div (-9)$

34. $h = \frac{516}{12}$

35. $j = \frac{-430}{10}$

36. $g = \frac{-344}{-8}$

37. $q = \frac{-630}{42}$

38. $-360 \div 8 = r$

39. $\frac{-96}{-6} = s$

Evaluate each expression if $q = -48$, $r = 6$, and $t = -12$.

40. $-108 \div t$

41. $\frac{q}{-8}$

42. $312 \div r$

43. $\frac{q}{r}$

44. $6r \div t$

45. $-144 \div t$

Evaluate each expression if $c = -3$, $r = 9$, and $t = -10$.

46. $\frac{200}{t}$

47. $\frac{162}{r}$

48. $\frac{63}{c}$

49. $cr \div 3$

50. $tr \div c$

51. $crt \div 6$

Decimals and Place Value

Fraction: $\frac{5016}{10,000}$

Decimal: 0.5016

Say: five thousand sixteen ten-thousandths

Ones	Tenths	Hundredths	Thousands	Ten-thousandths
0	• 5	0	1	6

Here are some other examples.

Fraction	Decimal	Words
$\frac{83}{100}$	0.83	eighty-three hundredths
$\frac{924}{1,000}$	0.924	nine hundred twenty-four thousandths
$5\frac{7}{10}$	5.7	five and seven tenths

Write each decimal in words.

1. 0.31
2. 0.09
3. 0.0004
4. 0.035

5. 0.1654
6. 0.1
7. 0.006
8. 0.3

9. 0.8
10. 0.19
11. 0.07
12. 0.26

13. 0.32
14. 0.05
15. 0.4
16. 0.11

17. 0.06
18. 0.48
19. 0.93
20. 0.2

Decimals and Place Value (*continued*)

Write each decimal in words.

21. 0.407

22. 0.009

23. 0.2351

24. 0.0063

25. 0.742

26. 0.0008

27. 0.0914

28. 0.3806

29. 0.059

Write each expression as a decimal.

30. two hundred fifty-one thousandths

31. one and eleven hundredths

32. eight hundredths

33. seventy and fifty-six thousandths

34. five hundred and two ten-thousandths

35. thirty-six ten-thousandths

36. thirteen hundredths

37. two and forty-nine hundredths

38. six and eight hundredths

39. thirty-nine and two tenths

40. eighty-three hundredths

41. seven tenths

42. forty-five and two ten-thousandths

43. thirty-one thousandths

44. four thousandths

45. twelve and nine hundred five
ten-thousandths

Rounding Decimals

Round 24.625 to the nearest tenth.

You can use a number line.



Find the approximate location of 24.625 on the number line.

24.625 is closer to 24.6 than to 24.7.
24.625 rounded to the nearest tenth is 24.6.

You can also round without a number line.

Find the place to which you want to round.

24.625

Look at the digit to the right of the place being rounded. The digit remains the same if the digit to the right is 0, 1, 2, 3, or 4. Round up if the digit to the right is 5, 6, 7, 8, or 9.

24.625

2 is less than 5.
Do not change the digit.

24.6

Round each number to the underlined place-value position.

1. 46.124

2. 29.915

3. 15.1733

4. 0.159

5. 308.862

6. 0.0561

7. 0.577

8. 0.0089

9. 2.62

10. 76.0552

11. 12.1903

12. 0.855

13. 331.98

14. 0.0549

15. 6.03

16. 173.99

17. 84.012

18. 0.846

19. 12.7642

20. 0.062

Rounding Decimals (continued)

Round each number to the nearest tenth.

21. 0.235

22. 3.492

23. 8.0769

24. 9.40

25. 17.145

26. 0.392

27. 19.3208

28. 0.0063

29. 16.742

30. 6.13982

31. 0.336

32. 1.873

Round each number to the nearest hundredth.

33. 0.892

34. 0.444

35. 67.903

36. 84.590

37. 5.129806

38. 99.105

39. 62.017

40. 0.1266

41. 37.048

42. Draw a number line to show that, when rounded to the nearest whole number, 9.8 rounds to 10.

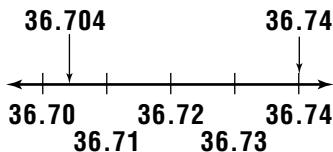
43. The Sears Tower, once the world's tallest building, is 1454 feet tall. Round this height to the nearest 100 feet.

44. In 1990, the population of St. Louis, Missouri, was 396,685. Round this number to the nearest ten thousand and to the nearest hundred thousand. How do the numbers compare?

Comparing and Ordering Decimals

Which is greater, 36.74 or 36.704?

You can compare decimals like 36.74 and 36.704 on a number line.
Numbers to the right are greater than numbers to the left.



You can also compare decimals by comparing the digits in each place-value position.

Find the first place in which the digits are different.

36.704

36.74

Compare the digits.

0 is less than 4.

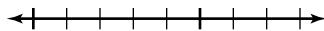
$0 < 4$

The decimal with the greater digit is greater.

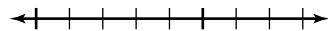
$36.704 < 36.74$

Use a number line to show which decimal is greater.

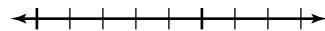
1. $0.39, 0.35$



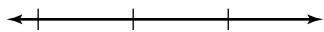
2. $1.95, 2.02$



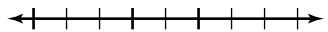
3. $6.55, 6.50$



4. $0.27, 0.29$



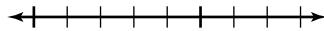
5. $1.3, 1.03$



6. $1.02, 0.98$



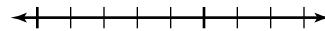
7. $4.42, 4.47$



8. $1.305, 1.042$



9. $6.12, 6.1$



Replace each \bigcirc with $<$, $>$, or $=$ to make a true sentence.

10. $8.05 \bigcirc 8.5$

11. $0.76 \bigcirc 0.67$

12. $18.20 \bigcirc 18.2$

13. $7.004 \bigcirc 7.044$

14. $6.79 \bigcirc 6.8$

15. $29.922 \bigcirc 29.299$

Comparing and Ordering Decimals (continued)

Replace each \bigcirc with $<$, $>$, or $=$ to make a true sentence.

16. $6.02 \bigcirc 6.01$

17. $0.39 \bigcirc 0.41$

18. $6 \bigcirc 0.6$

19. $0.43 \bigcirc 0.34$

20. $0.72 \bigcirc 0.72$

21. $0.0021 \bigcirc 0.021$

22. $0.34 \bigcirc 0.48$

23. $5.2 \bigcirc 5$

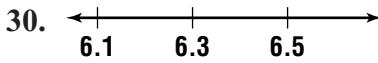
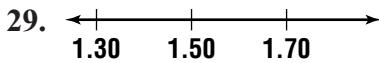
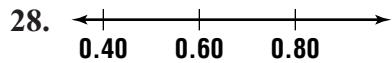
24. $3.7 \bigcirc 3.7$

25. $1.47 \bigcirc 1.47$

26. $1.75 \bigcirc 0.77$

27. $4.52 \bigcirc 0.98$

Write a sentence comparing two of the numbers shown on the number line.



Write each set of numbers in order from least to greatest.

31. $0.067, 0.6, 0.76, 0.07$

32. $56.2, 55.6, 52.2, 56.02$

33. $600.09, 609.06, 600.9, 609.9$

34. $0.88, 0.9, 0.08, 0.89$

35. $4.03, 4.003, 4.3$

36. $0.82, 1.2, 0.92$

37. $1.12, 1.135, 1.02$

38. $13.72, 1.372, 137.2$

39. $6.5, 0.65, 0.065$

40. $7.9, 3.46, 9.87, 2.1$

Adding Decimals

To add decimals, line up the decimal points. Then add the same way you add whole numbers.

Example

Find $6.22 + 7.4 + 0.895 + 13$.

$$\begin{array}{r} 6.220 \\ 7.400 \\ 0.895 \\ + 13.000 \\ \hline 27.515 \end{array}$$

Annex zeros.

The sum of the numbers is 27.515.

Find each sum.

1. $\begin{array}{r} 8.67 \\ + 1.58 \\ \hline \end{array}$

2. $\begin{array}{r} 13.5 \\ + 26.7 \\ \hline \end{array}$

3. $\begin{array}{r} 8.476 \\ + 5.72 \\ \hline \end{array}$

4. $\begin{array}{r} 709.8 \\ + 296.75 \\ \hline \end{array}$

5. $\begin{array}{r} 6.793 \\ + 15.6 \\ \hline \end{array}$

6. $\begin{array}{r} 0.058 \\ + 0.48 \\ \hline \end{array}$

7. $\begin{array}{r} 6.89 \\ 7.2 \\ + 8.67 \\ \hline \end{array}$

8. $\begin{array}{r} 12.8 \\ 8.45 \\ + 34.9 \\ \hline \end{array}$

9. $\begin{array}{r} 0.78 \\ 3.7 \\ + 1.666 \\ \hline \end{array}$

10. $\begin{array}{r} 102.8 \\ 98.35 \\ + 115.4 \\ \hline \end{array}$

11. $\begin{array}{r} 0.7 \\ 11.2 \\ + 8.75 \\ \hline \end{array}$

12. $\begin{array}{r} 77.85 \\ 16.1 \\ + 22.48 \\ \hline \end{array}$

Adding Decimals (continued)

Find each sum.

13. $4.56 + 22.7$

14. $3.75 + 8.9$

15. $0.97 + 1.9$

16. $155.3 + 46.79$

17. $35.98 + 4.7 + 37.23$

18. $5.68 + 0.9887 + 1.354$

19. $56.8 + 4.36 + 1.98 + 2.6$

20. $78.91 + 3.476 + 5.65 + 24.8$

21. A cyclist with a mass of 58.2 kilograms steps onto a balance scale wearing clothing and a helmet that have a mass of 1.32 kilograms. What is the total mass?

22. A gift box of fruit has 1.4 kilograms of pears, 1.235 kilograms of apples, and 1 kilogram of oranges. What is the total mass of the fruit?

23. Tomo wants to put a decorative border around a triangular flower garden. The lengths of the sides of the garden are 4.36 meters, 3.5 meters, and 5.75 meters. What is the perimeter of the flower garden?

24. A ticket to a movie theater costs \$5.25. A large lemonade costs \$3, and a small popcorn costs \$1.50. What is the total cost of going to the movie and buying a large lemonade and a small popcorn?

25. Rita has a part-time job. On Monday, she worked 3.5 hours. On Tuesday, she worked 4 hours. She did not work Wednesday or Thursday, but she worked 2 hours on Friday and 6.5 hours on Saturday. If she did not work on Sunday, how many hours did she work that week?

26. A barometer rose 3.2 inches in one hour and another 2 inches the next hour. What was the total rise in the barometer?

Subtracting Decimals

To subtract decimals, line up the decimal points. Then subtract the same way you subtract whole numbers.

Example**Find** $32.5 - 3.465$.

$$\begin{array}{r} 32.500 \\ \underline{- 3.465} \\ 29.035 \end{array}$$

Annex zeros.

The difference of the numbers is 29.035.

Find each difference.

1. $\begin{array}{r} 3.9 \\ - 1.5 \\ \hline \end{array}$

2. $\begin{array}{r} 72.1 \\ - 56.7 \\ \hline \end{array}$

3. $\begin{array}{r} 3.921 \\ - 2.345 \\ \hline \end{array}$

4. $\begin{array}{r} 6.789 \\ - 3.56 \\ \hline \end{array}$

5. $\begin{array}{r} 75.2 \\ - 14.85 \\ \hline \end{array}$

6. $\begin{array}{r} 6.921 \\ - 1.156 \\ \hline \end{array}$

7. $\begin{array}{r} 10.34 \\ - 4.8 \\ \hline \end{array}$

8. $\begin{array}{r} 0.897 \\ - 0.6685 \\ \hline \end{array}$

9. $\begin{array}{r} 9.03 \\ - 2.8 \\ \hline \end{array}$

10. $\begin{array}{r} 40 \\ - 13.65 \\ \hline \end{array}$

11. $\begin{array}{r} 5.72 \\ - 3.9 \\ \hline \end{array}$

12. $\begin{array}{r} 82.965 \\ - 6.39 \\ \hline \end{array}$

13. $\begin{array}{r} 25.1 \\ - 3.657 \\ \hline \end{array}$

14. $\begin{array}{r} 9.871 \\ - 3.9 \\ \hline \end{array}$

15. $\begin{array}{r} 7.19 \\ - 0.653 \\ \hline \end{array}$

Subtracting Decimals (*continued*)

Find each difference.

16. $6.9 - 2.654$

17. $18.564 - 5.8$

18. $0.978 - 0.5$

19. $4 - 0.875$

20. $75.92 - 8.921$

21. $72.5 - 61.65$

22. $1.872 - 0.98$

23. $508 - 8.32$

24. One week, the price of gasoline was \$1.245 per gallon. The next week, the price of gasoline was \$1.269 per gallon. What was the increase for each gallon of gasoline?
25. One year, the cost of one kilowatt-hour of electricity was \$0.094. Two years later, the cost of one kilowatt-hour of electricity was \$0.112. What was the increase of each kilowatt-hour of electricity?
26. Herman has a part-time job. Last week, he worked 16 hours. This week, he worked 13.5 hours. How many more hours did he work last week than this week?
27. In the 1984 Olympics, Carl Lewis ran the 100-meter dash in 9.99 seconds. In the 1988 Olympics, he ran the 100-meter dash in 0.07 second less than his Olympic time in 1984. What was his time for the 100-meter dash in the 1988 Olympics?
28. Eduardo has \$45. If he buys a CD for \$13.98, how much money will Eduardo have left?
29. Rita received 32.45 points in her first gymnastics meet. In her second meet, she received 1.6 less points. How many points did she receive in the second meet?

Multiplying Decimals by Whole Numbers

When you multiply a decimal by a whole number, multiply as with whole numbers. The product must have the same number of decimal places as the decimal factor.

Examples 1 Find 6×5.43 .

$$\begin{array}{r} 5.43 \\ \times 6 \\ \hline 32.58 \end{array} \quad \begin{array}{l} \leftarrow \text{two decimal places} \\ \leftarrow \text{two decimal places} \end{array}$$

2 Find 120×0.056 .

$$\begin{array}{r} 0.056 \\ \times 120 \\ \hline 1120 \\ 56 \\ \hline 6.720 \end{array} \quad \begin{array}{l} \leftarrow \text{three decimal places} \\ \leftarrow \text{three decimal places} \end{array}$$

Place the decimal point in each product.

1. $0.73 \times 56 = 4088$

2. $2.7 \times 48 = 1296$

3. $2.94 \times 108 = 31752$

4. $1.035 \times 69 = 71415$

5. $0.8 \times 472 = 3776$

6. $15.06 \times 319 = 480414$

Find each product.

7. $\begin{array}{r} 0.7 \\ \times 9 \\ \hline \end{array}$

8. $\begin{array}{r} 0.78 \\ \times 17 \\ \hline \end{array}$

9. $\begin{array}{r} 0.09 \\ \times 101 \\ \hline \end{array}$

10. $\begin{array}{r} 6.2 \\ \times 12 \\ \hline \end{array}$

11. $\begin{array}{r} 4.12 \\ \times 22 \\ \hline \end{array}$

12. $\begin{array}{r} 10.4 \\ \times 221 \\ \hline \end{array}$

13. $\begin{array}{r} 131.5 \\ \times 55 \\ \hline \end{array}$

14. $\begin{array}{r} 0.3 \\ \times 494 \\ \hline \end{array}$

**SKILL
10**

Name _____ Date _____ Period _____

Multiplying Decimals by Whole Numbers (continued)

Find each product.

15.
$$\begin{array}{r} 0.9 \\ \times 6 \\ \hline \end{array}$$

16.
$$\begin{array}{r} 3.47 \\ \times 5 \\ \hline \end{array}$$

17.
$$\begin{array}{r} 0.82 \\ \times 9 \\ \hline \end{array}$$

18.
$$\begin{array}{r} 27.3 \\ \times 8 \\ \hline \end{array}$$

19.
$$\begin{array}{r} 0.64 \\ \times 32 \\ \hline \end{array}$$

20.
$$\begin{array}{r} 5.9 \\ \times 174 \\ \hline \end{array}$$

21.
$$\begin{array}{r} 0.0358 \\ \times 216 \\ \hline \end{array}$$

22.
$$\begin{array}{r} 4.76 \\ \times 95 \\ \hline \end{array}$$

23.
$$\begin{array}{r} 208.7 \\ \times 43 \\ \hline \end{array}$$

24.
$$\begin{array}{r} 0.4 \\ \times 738 \\ \hline \end{array}$$

25.
$$\begin{array}{r} 1.95 \\ \times 4620 \\ \hline \end{array}$$

26.
$$\begin{array}{r} 0.006 \\ \times 87 \\ \hline \end{array}$$

27.
$$\begin{array}{r} 89.2 \\ \times 54 \\ \hline \end{array}$$

28.
$$\begin{array}{r} 0.013 \\ \times 2361 \\ \hline \end{array}$$

29.
$$\begin{array}{r} 7.49 \\ \times 105 \\ \hline \end{array}$$

30.
$$\begin{array}{r} 2.5 \\ \times 3092 \\ \hline \end{array}$$

31. 36×0.07

32. 4.8×235

33. 1.29×614

34. 93×0.57

35. 18×270.9

36. 0.006×315

37. 3330×0.05

38. 75×0.003

39. Find the product of 58.2 and 67.

40. What is 1073 times 2.04?

Multiplying Decimals by Decimals

Multiply decimals just as you multiply whole numbers. The number of decimal places in the product is equal to the sum of the number of decimal places in the two factors.

Example**Multiply 0.16 and 1.025.**

$$\begin{array}{r} 1.025 \\ \times 0.16 \\ \hline 6150 \\ 1025 \\ \hline 0.16400 \end{array}$$

\leftarrow three decimal places
 \leftarrow two decimal places
 \leftarrow five decimal places

Place the decimal point in each product.

1. $18.6 \times 4.2 = 7812$

2. $51.9 \times 2.73 = 141687$

3. $6.3 \times 0.098 = 06174$

4. $7.05 \times 42.01 = 2961705$

5. $13.4 \times 9.65 = 129310$

6. $0.72 \times 1.408 = 101376$

Find each product.

7. 0.5×20.2

8. 1.2×2.3

9. 0.055×3.2

10. 0.014×0.4

11. 12.4×12.4

12. 3.07×1.07

Multiplying Decimals by Decimals (continued)

Find each product.

13. 2.5×6.7

14. 0.4×8.3

15. 0.6×0.91

16. 8.54×3.27

17. 0.2×0.079

18. 16.8×4.5

19. 39.6×2.417

20. 0.003×2.9

21. 5.7×18.4

22. 0.93×6.8

23. 0.0004×0.05

24. 200.41×3.06

25. 9.3×0.087

26. 6.5×0.9

27. 4.07×23.8

28. 3.5×19.2

29. 2.1×0.76

30. 50.4×1.032

Solve each equation.

31. $c = 15.5 \times 3.3$

32. $x = 202.1 \times 1.14$

33. $a = 0.008 \times 65.3$

34. $9.5 \times 17.34 = p$

35. $r = 28.6 \times 0.007$

36. $5.32 \times 104.9 = m$

Evaluate each expression if $m = 0.09$, $n = 1.2$, and $p = 8.19$.

37. mn

38. $p(n + m)$

39. pm

Evaluate each expression if $x = 4.8$, $y = 12$, and $z = 0.036$.

40. yz

41. $(y - x)z$

42. $x(y + z)$

**SKILL
12**

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Dividing Decimals by Whole Numbers

When you divide a decimal by a whole number, place the decimal point in the quotient above the decimal point in the dividend. Then divide as with whole numbers.

Examples

Place the decimal point above the decimal point in the dividend.

1 $12 \overline{)38.4}$

Divide as with whole numbers.

$$\begin{array}{r} 3.2 \\ 12 \overline{)38.4} \\ -36 \\ \hline 24 \\ -24 \\ \hline 0 \end{array}$$

2 $8 \overline{)6.48}$

$$\begin{array}{r} 0.81 \\ 8 \overline{)6.48} \\ -64 \\ \hline 8 \\ -8 \\ \hline 0 \end{array}$$

Find each quotient.

1. $48 \overline{)110.4}$

2. $12 \overline{)88.8}$

3. $39 \overline{)66.3}$

4. $28 \overline{)11.76}$

5. $17 \overline{)146.2}$

6. $9 \overline{)4.68}$

7. $11 \overline{)102.3}$

8. $19 \overline{)20.9}$

9. $31 \overline{)223.2}$

10. $22 \overline{)72.6}$

11. $5 \overline{)2.95}$

12. $6 \overline{)15.6}$

**SKILL
12**

Name _____ Date _____ Period _____

Dividing Decimals by Whole Numbers (continued)

Find each quotient.

13. $7\overline{)57.68}$

14. $32\overline{)14.72}$

15. $15\overline{)58.5}$

16. $26\overline{)13.442}$

17. $49\overline{)308.21}$

18. $78\overline{)452.4}$

19. $59\overline{)273.17}$

20. $17\overline{)3.094}$

21. $4\overline{)3.16}$

22. $92\overline{)625.6}$

23. $5\overline{)7.45}$

24. $48\overline{)12.48}$

25. $15.93 \div 27$

26. $724.12 \div 86$

27. $58.235 \div 95$

28. $25.84 \div 34$

29. $597.8 \div 61$

30. $2.268 \div 3$

Round each quotient to the nearest tenth.

31. $52.4 \div 6$

32. $63.75 \div 34$

33. $948.16 \div 27$

34. $78.29 \div 8$

Round each quotient to the nearest hundredth.

35. $65.24 \div 9$

36. $359.4 \div 75$

37. $58.179 \div 26$

38. $267.54 \div 48$

Dividing Decimals by Decimals

To divide a decimal by a decimal, first multiply the divisor by a power of ten to make it a whole number. Multiply the dividend by the same power of ten. Then divide as with whole numbers.

Example**Find** $87.3025 \div 3.715$.*Estimate:* $88 \div 4 = 22$

$$\begin{array}{r} 23.5 \\ 3.715) \overline{87.302.5} \\ \swarrow \quad \searrow \\ -74\ 30 \\ \hline 13\ 002 \\ -11\ 145 \\ \hline 1\ 857\ 5 \\ -1\ 857\ 5 \\ \hline 0 \end{array}$$

Multiply the divisor and the dividend by 1000. Place the decimal point in the quotient. Divide.

Find each quotient.

1. $1.4) \overline{9.8}$

2. $2.7) \overline{40.5}$

3. $0.41) \overline{3.69}$

4. $2.1) \overline{4.41}$

5. $0.07) \overline{2.38}$

6. $0.212) \overline{1.696}$

7. $0.013) \overline{0.0208}$

8. $6.28) \overline{87.92}$

9. $0.7) \overline{2.52}$

10. $3.8) \overline{17.1}$

11. $2.64) \overline{150.48}$

Dividing Decimals by Decimals (continued)

Find each quotient.

12. $5.5 \overline{)4.95}$

13. $0.09 \overline{)0.72}$

14. $0.014 \overline{)2.184}$

15. $1.32 \overline{)3.96}$

16. $6.7 \overline{)61.64}$

17. $0.058 \overline{)0.41992}$

18. $34.9 \overline{)628.2}$

19. $0.48 \overline{)308.64}$

20. $0.27 \overline{)1.593}$

21. $3.6 \overline{)2.52}$

22. $0.5 \overline{)0.105}$

23. $0.019 \overline{)0.16397}$

24. $0.73 \overline{)141.62}$

25. $28.6 \overline{)42.9}$

26. $0.4 \overline{)9.52}$

Solve each equation.

27. $a = 27.63 \div 0.3$

28. $8.652 \div 1.2 = z$

29. $9.594 \div 0.06 = h$

30. $s = 1.76 \div 32$

Multiplying Decimals by Powers of Ten

You can find the product of a decimal and a power of 10 without using a calculator or paper and pencil. The table below shows the product of 23.7 and powers of 10.

Decimal	Power of Ten	Product
23.7	$\times 0.001$	= 0.0237
23.7	$\times 0.01$	= 0.237
23.7	$\times 0.1$	= 2.37
23.7	$\times 10^0$ or 1	= 23.7
23.7	$\times 10^1$ or 10	= 237
23.7	$\times 10^2$ or 100	= 2370
23.7	$\times 10^3$ or 1,000	= 23,700
23.7	$\times 10^4$ or 10,000	= 237,000

For powers of 10 that are greater than 1, the exponent in the power of 10 tells you the number of places to move the decimal point to the right. For powers of 10 that are less than 1, the decimal point moves to the left.

Examples Find each product.

1 0.08×10^4

$$\begin{aligned} 0.08 \times 10^4 &= 0.08 \underbrace{0}_{\text{Move the decimal point}} \\ &= 800 \end{aligned}$$

Move the decimal point
4 places to the right.

2 6.25×0.001

$$\begin{aligned} 6.25 \times 0.001 &= 006.25 \underbrace{0}_{\text{Move the decimal point}} \\ &= 0.00625 \end{aligned}$$

Move the decimal point
3 places to the left.

Find each product.

1. 0.8×0.1

2. 6.12×10^2

3. 8.4×1000

4. 9.3×0.001

5. 4.006×100

6. 67.8×0.01

7. 15.24×10

8. 2.48×0.1

9. 0.702×100

**SKILL
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Multiplying Decimals by Powers of Ten (continued)

Find each product.

10. 0.9×0.001

11. 5.149×1000

12. 0.52×100

13. 2.587×10^0

14. 0.2674×100

15. 1.5×0.01

16. 6.8×10^2

17. 9.57×10^4

18. 6.2×10^5

Solve each equation.

19. $x = 89 \times 10,000$

20. $2.9 \times 10^3 = n$

21. $y = 24.78 \times 0.01$

22. $0.0004 \times 10^4 = p$

23. $v = 589 \times 0.001$

24. $r = 0.01 \times 10^0$

25. $d = 0.92 \times 100$

26. $12.43 \times 0.01 = h$

27. $h = 3.68 \times 10^6$

28. $a = 0.004 \times 10^2$

29. $0.23 \times 1000 = j$

30. $1.89 \times 10^0 = v$

31. $2.098 \times 0.1 = b$

32. $s = 2.69 \times 10$

33. $m = 963.2 \times 10^4$

34. $c = 20.18 \times 0.0001$

35. $x = 100 \times 0.4$

36. $f = 1000 \times 82.9$

Dividing Decimals by Powers of 10

You can find the quotient of a decimal and a power of 10 without using a calculator or paper and pencil. The table below shows the quotient of 4560 and powers of 10.

Decimal		Power of Ten	=	Quotient
4560	÷	10^{-3} or 0.001	=	4,560,000
4560	÷	10^{-2} or 0.01	=	456,000
4560	÷	10^{-1} or 0.1	=	45,600
4560	÷	10^0 or 1	=	4560
4560	÷	10^1 or 10	=	456
4560	÷	10^2 or 100	=	45.6
4560	÷	10^3 or 1000	=	4.56
4560	÷	10^4 or 10,000	=	0.456

For powers of 10 that are less than 1, the exponent in the power of 10 tells you the number of places to move the decimal point to the right. For powers of 10 that are greater than 1, the decimal point moves to the left.

Examples 1 $7 \div 10^3$

$$7 \div 10^3 = 007 \quad \begin{array}{l} \text{Move the decimal point 3 places} \\ \text{to the left.} \end{array}$$

2 $0.63 \div 10^{-2}$

$$0.63 \div 10^{-2} = 0.63 \quad \begin{array}{l} \text{Move the decimal point 2 places} \\ \text{to the right.} \end{array}$$

Find each quotient.

1. $8 \div 0.01$

2. $55.8 \div 100$

3. $679 \div 10^4$

4. $14 \div 0.1$

5. $0.139 \div 10^{-3}$

6. $18 \div 10^2$

7. $68 \div 100$

8. $1.46 \div 0.001$

9. $12 \div 10^{-1}$

10. $77 \div 1000$

11. $143 \div 100$

12. $15 \div 10$

**SKILL
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Name _____ Date _____ Period _____

Dividing Decimals by Powers of Ten (continued)

Find each quotient.

13. $13 \div 10^0$

14. $1.36 \div 1000$

15. $184 \div 10^{-3}$

16. $1.7 \div 0.01$

17. $0.08 \div 10^{-2}$

18. $1432 \div 10^4$

19. $43 \div 10$

20. $13.5 \div 0.01$

21. $55 \div 10^{-2}$

22. $137 \div 100$

23. $43,290 \div 1000$

24. $281 \div 10^2$

Solve each equation.

25. $v = 78 \div 10$

26. $q = 656 \div 10^0$

27. $m = 198 \div 0.001$

28. $r = 876 \div 100$

29. $s = 15 \div 10^{-2}$

30. $t = 12.5 \div 0.01$

31. $p = 1.4 \div 1000$

32. $q = 0.385 \div 10^{-3}$

33. $u = 8.8 \div 10$

34. $14 \div 100 = r$

35. $w = 1.34 \div 10^3$

36. $k = 14.8 \div 0.1$

37. $n = 123 \div 0.1$

38. $4326 \div 10^0 = y$

39. $81.18 \div 10^{-3} = j$

40. $480 \div 10^4 = m$

41. $r = 6820 \div 10^1$

42. $q = 2.813 \div 10^{-2}$

Equivalent Fractions

During July, Phoenix, Arizona, usually gets about $\frac{6}{10}$ or $\frac{3}{5}$ inches of rain.

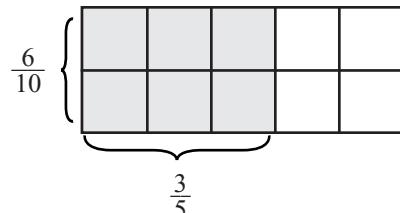
The fractions $\frac{6}{10}$ and $\frac{3}{5}$ name the same number. They are **equivalent fractions**. To find equivalent fractions, multiply or divide the numerator and denominator by the same nonzero number.

$$\frac{3}{5} = \frac{6}{10}$$

$\times 2$
 $\times 2$

$$\frac{6}{10} = \frac{3}{5}$$

$\div 2$
 $\div 2$



The shaded region at the right shows that $\frac{3}{5}$ and $\frac{6}{10}$ are equivalent.

Examples Complete so that the fractions are equivalent.

$$1 \quad \frac{3}{4} = \frac{24}{24} \rightarrow \frac{3}{4} = \frac{18}{24}$$

$\times 6$
 $\times 6$

Since $4 \times 6 = 24$, multiply both numerator and denominator by 6.

$$2 \quad \frac{20}{28} = \frac{5}{7} \rightarrow \frac{20}{28} = \frac{5}{7}$$

$\div 4$
 $\div 4$

Since $20 \div 4 = 5$, divide both numerator and denominator by 4.

Complete so that the fractions are equivalent.

1. $\frac{1}{2} = \frac{6}{\underline{\hspace{1cm}}}$

2. $\frac{4}{4} = \frac{8}{\underline{\hspace{1cm}}}$

3. $\frac{12}{3} = \frac{4}{\underline{\hspace{1cm}}}$

4. $\frac{8}{12} = \frac{1}{\underline{\hspace{1cm}}}$

5. $\frac{4}{5} = \frac{10}{\underline{\hspace{1cm}}}$

6. $\frac{8}{3} = \frac{15}{\underline{\hspace{1cm}}}$

7. $\frac{7}{9} = \frac{14}{\underline{\hspace{1cm}}}$

8. $\frac{8}{15} = \frac{24}{\underline{\hspace{1cm}}}$

9. $\frac{2}{4} = \frac{1}{\underline{\hspace{1cm}}}$

10. $\frac{12}{6} = \frac{2}{\underline{\hspace{1cm}}}$

11. $\frac{20}{24} = \frac{5}{\underline{\hspace{1cm}}}$

12. $\frac{14}{10} = \frac{7}{\underline{\hspace{1cm}}}$

Equivalent Fractions (continued)

Complete so that the fractions are equivalent.

13. $\frac{6}{12} = \frac{?}{2}$

14. $\frac{15}{40} = \frac{3}{?}$

15. $\frac{6}{4} = \frac{3}{?}$

16. $\frac{24}{4} = \frac{6}{?}$

Find three fractions equivalent to each of the following.

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

18. $\frac{5}{4}$

19. $\frac{1}{7}$

20. $\frac{4}{12}$

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

22. $\frac{6}{7}$

23. $\frac{5}{15}$

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

25. $\frac{8}{10}$

26. $\frac{7}{8}$

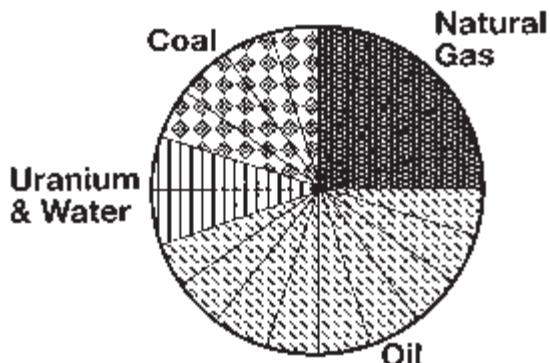
27. $\frac{6}{11}$

28. $\frac{7}{9}$

Use the circle graph to write two equivalent fractions for each of the following.

29. the fraction of energy used that is coal

U.S. Energy Use



30. the fraction of energy used that is natural gas

31. the fraction of energy used that is uranium and water

**SKILL
17**

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Simplifying Fractions

A fraction is in **simplest form** when the greatest common factor (GCF) of the numerator and the denominator is 1.

Examples 1 Express $\frac{36}{54}$ in simplest form.

factors of 36: 1, 2, 3, 4, 6, 9, 12, 18, 36

factors of 54: 1, 2, 3, 6, 9, 18, 27, 54

The GCF of 36 and 54 is 18.

$$\frac{36}{54} = \frac{36 \div 18}{54 \div 18} = \frac{2}{3} \quad \text{Divide the numerator and denominator by the GCF, 18.}$$

2 Express $\frac{28}{63}$ in simplest form.

factors of 28: 1, 2, 4, 7, 14, 28

factors of 63: 1, 3, 7, 9, 21, 63

The GCF of 28 and 63 is 7.

$$\frac{28}{63} = \frac{28 \div 7}{63 \div 7} = \frac{4}{9} \quad \text{Divide the numerator and denominator by the GCF, 7.}$$

Express each fraction in simplest form.

1. $\frac{30}{72}$

2. $\frac{45}{60}$

3. $\frac{68}{84}$

4. $\frac{54}{66}$

5. $\frac{56}{64}$

6. $\frac{17}{119}$

7. $\frac{60}{75}$

8. $\frac{75}{375}$

9. $\frac{36}{48}$

10. $\frac{33}{132}$

11. $\frac{450}{750}$

12. $\frac{25}{125}$

Simplifying Fractions (*continued*)

Express each fraction in simplest form.

13. $\frac{25}{35}$

14. $\frac{88}{55}$

15. $\frac{32}{160}$

16. $\frac{36}{80}$

17. $\frac{400}{500}$

18. $\frac{49}{72}$

19. $\frac{140}{100}$

20. $\frac{225}{625}$

21. $\frac{232}{144}$

22. $\frac{23}{46}$

23. $\frac{750}{350}$

24. $\frac{27}{45}$

25. $\frac{80}{24}$

26. $\frac{19}{48}$

27. $\frac{180}{240}$

Write two different fractions that can be expressed in simplest form as each of the following.

28. $\frac{1}{4}$

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

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

31. $\frac{1}{7}$

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

33. $\frac{3}{7}$

Writing Improper Fractions as Mixed Numbers

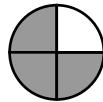
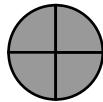
An **improper fraction** is a fraction in which the numerator is greater than the denominator. An improper fraction may be written as a **mixed number**. A mixed number is a whole number combined with a fraction. To express an improper fraction as a mixed number, divide the numerator by the denominator. Write the quotient as the whole number. Write the remainder over the denominator as the fraction.

Example

Express $\frac{7}{4}$ as a mixed number.

$$7 \div 4 = 1 \text{ R } 3 \text{ or } 1\frac{3}{4}$$

$$\text{Therefore, } \frac{7}{4} = 1\frac{3}{4}.$$



Express each improper fraction as a mixed number.

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

2. $\frac{9}{4}$

3. $\frac{11}{6}$

4. $\frac{5}{2}$

5. $\frac{9}{5}$

6. $\frac{15}{4}$

7. $\frac{13}{2}$

8. $\frac{31}{8}$

9. $\frac{26}{9}$

10. $\frac{32}{3}$

11. $\frac{39}{2}$

12. $\frac{29}{6}$

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18**

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Writing Improper Fractions as Mixed Numbers (continued)

Express each improper fraction as a mixed number.

13. $\frac{37}{4}$

14. $\frac{43}{5}$

15. $\frac{19}{6}$

16. $\frac{27}{4}$

17. $\frac{52}{9}$

18. $\frac{25}{2}$

19. $\frac{37}{5}$

20. $\frac{77}{8}$

21. $\frac{41}{3}$

22. $\frac{31}{7}$

23. $\frac{11}{7}$

24. $\frac{9}{4}$

25. $\frac{21}{2}$

26. $\frac{23}{5}$

27. $\frac{35}{3}$

28. $\frac{21}{4}$

29. $\frac{77}{6}$

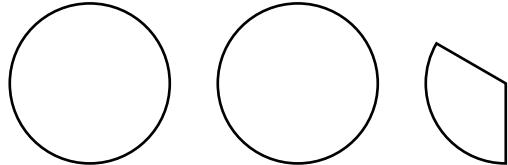
30. $\frac{55}{8}$

31. Suppose it snowed 5 inches in 2 days. Then $\frac{5}{2}$ describes the average daily snowfall. Write the improper fraction as a mixed number.

Writing Mixed Numbers as Improper Fractions

The figure shows 2 whole circles plus $\frac{1}{3}$ of a circle.

You can write the mixed number $2\frac{1}{3}$ to describe the number of circles. Mixed numbers may be expressed as improper fractions. To write a mixed number as an improper fraction, multiply the whole number by the denominator. Add the numerator to the product. Then write the sum over the denominator.



Example Express $2\frac{1}{3}$ as an improper fraction.

$$\begin{aligned}2\frac{1}{3} &= \frac{(2 \times 3) + 1}{3} \\&= \frac{6 + 1}{3} \\&= \frac{7}{3}\end{aligned}$$

Express each mixed number as an improper fraction.

1. $1\frac{2}{5}$

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

3. $7\frac{2}{3}$

4. $1\frac{7}{8}$

5. $4\frac{3}{4}$

6. $2\frac{5}{6}$

7. $5\frac{1}{9}$

8. $1\frac{2}{7}$

9. $1\frac{5}{7}$

10. $1\frac{8}{9}$

11. $3\frac{2}{5}$

12. $4\frac{1}{6}$

13. $4\frac{1}{3}$

14. $7\frac{1}{2}$

15. $6\frac{1}{5}$

16. $8\frac{1}{4}$

**SKILL
19**

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Writing Mixed Numbers as Improper Fractions (continued)

Express each mixed number as an improper fraction.

17. $1\frac{3}{8}$

18. $2\frac{1}{4}$

19. $3\frac{1}{3}$

20. $1\frac{5}{6}$

21. $6\frac{1}{2}$

22. $3\frac{7}{8}$

23. $2\frac{8}{9}$

24. $10\frac{2}{3}$

25. $5\frac{4}{7}$

26. $4\frac{5}{6}$

27. $9\frac{1}{4}$

28. $8\frac{3}{5}$

29. $2\frac{1}{2}$

30. $2\frac{1}{8}$

31. $1\frac{4}{5}$

32. $3\frac{3}{4}$

33. $3\frac{1}{6}$

34. $6\frac{3}{4}$

35. $5\frac{7}{9}$

36. $12\frac{1}{2}$

37. $7\frac{2}{5}$

38. $9\frac{5}{8}$

39. $13\frac{2}{3}$

40. $4\frac{3}{7}$

Comparing and Ordering Fractions

To compare fractions, rewrite them so they have the same denominator. The **least common denominator (LCD)** of two fractions is the least common multiple of their denominators.

Example 1 Which fraction is greater, $\frac{5}{6}$ or $\frac{3}{4}$?

Find the LCD by listing the multiples of each denominator.

multiples of 6: 6, **12**, 18, 24, 30, 36, . . .

multiples of 4: 4, 8, **12**, 16, 20, 24, . . .

The LCM of 6 and 4 is 12. So, the LCD of $\frac{5}{6}$ and $\frac{3}{4}$ is 12.

Write $\frac{5}{6}$ and $\frac{3}{4}$ as fractions with a denominator of 12.

$$\begin{array}{rcl} \frac{5}{6} & = & \frac{10}{12} \\ \times 2 \curvearrowleft & & \times 2 \curvearrowright \\ \frac{3}{4} & = & \frac{9}{12} \\ \times 3 \curvearrowleft & & \times 3 \curvearrowright \end{array} \quad \frac{10}{12} > \frac{9}{12}, \text{ so } \frac{5}{6} > \frac{3}{4}.$$

Another way to compare fractions is to express them as decimals. Then compare the decimals.

Example 2 Which fraction is greater, $\frac{7}{9}$ or $\frac{3}{4}$?

Express each fraction as a decimal. Then compare.

$$7 \div 9 = 0.\overline{7} \quad 3 \div 4 = 0.75 \quad 0.\overline{7} > 0.75, \text{ so } \frac{7}{9} > \frac{3}{4}.$$

Find the LCD for each pair of fractions.

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

2. $\frac{3}{4}, \frac{1}{8}$

3. $\frac{5}{9}, \frac{1}{2}$

4. $\frac{5}{9}, \frac{5}{6}$

5. $\frac{7}{8}, \frac{5}{12}$

6. $\frac{7}{10}, \frac{4}{5}$

7. $\frac{4}{7}, \frac{3}{5}$

8. $\frac{5}{12}, \frac{7}{24}$

9. $\frac{6}{28}, \frac{3}{7}$

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20**

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Comparing and Ordering Fractions (continued)

Find the LCD for each pair of fractions.

10. $\frac{7}{15}, \frac{1}{4}$

11. $\frac{7}{11}, \frac{3}{5}$

12. $\frac{5}{17}, \frac{7}{8}$

13. $\frac{5}{12}, \frac{7}{10}$

14. $\frac{15}{16}, \frac{1}{4}$

15. $\frac{5}{8}, \frac{3}{5}$

16. $\frac{5}{16}, \frac{3}{32}$

17. $\frac{7}{13}, \frac{1}{3}$

18. $\frac{7}{9}, \frac{13}{27}$

Replace each ○ with <, >, or = to make a true sentence.

19. $\frac{1}{2} \bigcirc \frac{5}{9}$

20. $\frac{3}{4} \bigcirc \frac{7}{8}$

21. $\frac{5}{12} \bigcirc \frac{1}{2}$

22. $\frac{3}{4} \bigcirc \frac{3}{5}$

23. $\frac{5}{8} \bigcirc \frac{4}{7}$

24. $\frac{4}{9} \bigcirc \frac{9}{14}$

25. $\frac{7}{11} \bigcirc \frac{9}{12}$

26. $\frac{6}{10} \bigcirc \frac{3}{5}$

27. $\frac{7}{12} \bigcirc \frac{3}{8}$

Write the fractions in order from least to greatest.

28. $\frac{3}{5}, \frac{2}{3}, \frac{1}{4}$

29. $\frac{21}{30}, \frac{17}{20}, \frac{11}{10}$

30. $\frac{8}{13}, \frac{7}{19}, \frac{6}{25}$

31. $\frac{1}{6}, \frac{1}{7}, \frac{6}{7}$

32. $\frac{2}{3}, \frac{3}{2}, \frac{2}{5}$

33. $\frac{8}{24}, \frac{4}{16}, \frac{2}{15}$

Multiplying Fractions

To multiply fractions, multiply the numerators and multiply the denominators. Write the product in simplest form.

Examples Find each product.

$$\begin{aligned} \textbf{1} \quad & \frac{5}{7} \times \frac{3}{5} \\ & \frac{5}{7} \times \frac{3}{5} = \frac{5 \times 3}{7 \times 5} \\ & = \frac{15}{35} \\ & = \frac{3}{7} \end{aligned}$$

$$\begin{aligned} \textbf{2} \quad & \frac{3}{8} \times 7 \\ & \frac{3}{8} \times 7 = \frac{3}{8} \times \frac{7}{1} \\ & = \frac{3 \times 7}{8 \times 1} \\ & = \frac{21}{8} \end{aligned}$$

If the numerator of one fraction and the denominator of the other fraction have a common factor, you can simplify before you multiply.

Example 3 Find $\frac{8}{11} \times \frac{3}{4}$. The GCF of 8 and 4 is 4.

$$\begin{aligned} & \cancel{^2} \frac{8}{11} \times \frac{3}{\cancel{4}^1} = \frac{2 \times 3}{11 \times 1} \\ & \qquad \qquad \qquad \text{Divide the numerator and denominator by 4.} \\ & \qquad \qquad \qquad \text{Then multiply.} \\ & \qquad \qquad \qquad = \frac{6}{11} \end{aligned}$$

Find each product. Write in simplest form.

1. $\frac{1}{3} \times \frac{1}{5}$

2. $\frac{5}{8} \times \frac{1}{2}$

3. $\frac{4}{9} \times \frac{3}{4}$

4. $6 \times \frac{2}{3}$

5. $\frac{3}{5} \times 10$

6. $\frac{2}{3} \times \frac{3}{8}$

7. $\frac{1}{7} \times \frac{1}{7}$

8. $\frac{2}{9} \times \frac{1}{2}$

9. $12 \times \frac{5}{6}$

10. $\frac{3}{4} \times \frac{1}{2}$

11. $\frac{1}{3} \times \frac{5}{6}$

12. $\frac{2}{5} \times \frac{3}{7}$

13. $\frac{3}{8} \times 10$

14. $\frac{1}{6} \times \frac{3}{5}$

15. $\frac{1}{4} \times \frac{2}{7}$

16. $\frac{2}{3} \times \frac{5}{8}$

17. $\frac{9}{10} \times \frac{4}{5}$

18. $\frac{7}{8} \times \frac{2}{9}$

Multiplying Fractions (*continued*)

Find each product. Write in simplest form.

19. $16 \times \frac{5}{12}$

20. $\frac{4}{9} \times \frac{1}{8}$

21. $\frac{5}{6} \times \frac{7}{10}$

22. $\frac{1}{5} \times \frac{15}{16}$

23. $\frac{1}{10} \times \frac{4}{7}$

24. $\frac{5}{9} \times 18$

Solve each equation. Write the solution in simplest form.

25. $m = 8 \times \frac{1}{4}$

26. $\frac{3}{5} \times \frac{5}{6} = n$

27. $c = \frac{2}{7} \times \frac{1}{3}$

28. $\frac{5}{8} \times 24 = a$

29. $k = \frac{5}{12} \times \frac{1}{5}$

30. $\frac{1}{2} \times \frac{1}{5} = t$

31. $x = \frac{6}{7} \times \frac{8}{15}$

32. $\frac{5}{12} \times 10 = t$

33. $h = \frac{8}{9} \times \frac{9}{10}$

34. $a = \frac{5}{9} \times \frac{4}{5}$

35. $\frac{5}{7} \times \frac{14}{15} = s$

36. $\frac{7}{18} \times \frac{3}{14} = p$

37. $r = \frac{2}{3} \times \frac{9}{10}$

38. $28 \times \frac{5}{8} = x$

39. $\frac{5}{6} \times \frac{4}{7} = m$

40. $d = \frac{4}{9} \times \frac{15}{16}$

41. $\frac{3}{10} \times \frac{5}{8} = k$

42. $h = \frac{3}{7} \times 35$

43. $n = \frac{3}{20} \times \frac{5}{6}$

44. $\frac{9}{14} \times \frac{7}{12} = z$

45. $f = \frac{5}{12} \times \frac{4}{15}$

46. $\frac{3}{14} \times \frac{2}{9} = c$

47. $\frac{3}{4} \times \frac{8}{9} = t$

48. $y = 15 \times \frac{3}{10}$

49. Find the product of $\frac{4}{5}$ and 30.

50. Evaluate xy if $x = \frac{2}{3}$ and $y = \frac{3}{4}$.

Multiplying Fractions and Mixed Numbers

To multiply mixed numbers, express each mixed number as an improper fraction. Then multiply the fractions.

Example Find $7\frac{1}{2} \times 3\frac{1}{3}$.

Estimate: $8 \times 3 = 24$

$$7\frac{1}{2} \times 3\frac{1}{3} = \frac{15}{2} \times \frac{10}{3}$$

Express the mixed numbers as improper fractions.

$$= \frac{\cancel{15}^5 \cdot \cancel{10}^5}{\cancel{2}^1 \cdot \cancel{3}^1}$$

*Divide 15 and 3 by the GCF, 3.
Divide 10 and 2 by the GCF, 2.*

$$= \frac{25}{1} \text{ or } 25$$

Express each mixed number as an improper fraction.

1. $5\frac{3}{4}$

2. $3\frac{7}{9}$

3. $2\frac{4}{5}$

4. $2\frac{4}{5}$

5. $6\frac{3}{4}$

6. $8\frac{6}{7}$

7. $5\frac{2}{9}$

8. $9\frac{5}{6}$

9. $3\frac{1}{12}$

Find each product. Write in simplest form.

10. $\frac{2}{3} \times 3\frac{1}{2}$

11. $5\frac{3}{4} \times \frac{2}{3}$

12. $9 \times 1\frac{5}{6}$

13. $1\frac{1}{4} \times \frac{3}{5}$

14. $2\frac{1}{2} \times 1\frac{1}{5}$

15. $\frac{1}{8} \times 1\frac{1}{3}$

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22**

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Multiplying Fractions and Mixed Numbers (continued)

Find each product. Write in simplest form.

16. $3\frac{1}{5} \times \frac{3}{4}$

17. $9 \times 4\frac{2}{3}$

18. $2\frac{5}{6} \times 4\frac{1}{2}$

19. $\frac{4}{7} \times 3\frac{1}{9}$

20. $1\frac{3}{8} \times 2\frac{2}{7}$

21. $4\frac{1}{6} \times \frac{9}{10}$

22. $3\frac{1}{3} \times 2\frac{1}{4}$

23. $\frac{8}{9} \times 5\frac{1}{7}$

24. $2\frac{5}{8} \times 6$

25. $3\frac{3}{4} \times 2\frac{4}{5}$

26. $\frac{5}{7} \times 4\frac{3}{8}$

27. $20 \times 1\frac{2}{5}$

Solve each equation. Write the solution in simplest form.

28. $2\frac{1}{2} \times 4 = n$

29. $k = 4\frac{2}{3} \times 1\frac{1}{2}$

30. $\frac{4}{5} \times 1\frac{1}{4} = p$

31. $y = 6 \times 3\frac{1}{3}$

32. $4\frac{1}{2} \times \frac{8}{9} = a$

33. $8\frac{1}{3} \times \frac{3}{5} = r$

34. $2\frac{4}{9} \times \frac{6}{11} = s$

35. $p = 1\frac{1}{8} \times 3\frac{3}{7}$

36. $\frac{6}{7} \times 2\frac{5}{12} = x$

37. $d = 14 \times 1\frac{3}{4}$

38. $5\frac{2}{5} \times \frac{8}{9} = t$

39. $3\frac{3}{5} \times 2\frac{2}{9} = a$

40. $r = 1\frac{4}{5} \times 3\frac{4}{7}$

41. $n = \frac{2}{3} \times 5\frac{1}{6}$

42. $1\frac{5}{14} \times \frac{7}{8} = y$

43. $k = 2\frac{3}{8} \times 16$

44. $5\frac{1}{4} \times 2\frac{1}{3} = b$

45. $m = \frac{7}{9} \times 5\frac{5}{8}$

Dividing Fractions

Two numbers are **reciprocals** if their product is 1.

$$\frac{1}{3} \times 3 = 1$$

$\frac{1}{3}$ and 3 are reciprocals.

$$\frac{17}{18} \times \frac{18}{17} = 1$$

$\frac{17}{18}$ and $\frac{18}{17}$ are reciprocals.

To divide by a fraction, multiply by its reciprocal.

Example Find $\frac{5}{6} \div \frac{2}{3}$.

$$\begin{aligned}\frac{5}{6} \div \frac{2}{3} &= \frac{5}{6} \times \frac{3}{2} \\ &= \frac{\cancel{5}}{2} \times \frac{3^1}{\cancel{2}^1} \\ &= \frac{5 \times 1}{2 \times 2} \\ &= \frac{5}{4} \text{ or } 1\frac{1}{4}\end{aligned}$$

Multiply by the reciprocal of $\frac{2}{3}$.
Divide 3 and 6 by the GCF, 3.
Multiply the numerators.
Multiply the denominators.

Find the reciprocal of each number.

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

2. $\frac{5}{8}$

3. 9

4. $\frac{12}{13}$

5. $\frac{1}{4}$

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

7. 7

8. $\frac{8}{15}$

9. 12

10. $\frac{9}{14}$

11. $\frac{3}{11}$

12. 6

Find each quotient. Write in simplest form.

13. $\frac{1}{2} \div \frac{3}{4}$

14. $\frac{4}{5} \div \frac{1}{10}$

15. $\frac{3}{8} \div \frac{3}{4}$

16. $\frac{14}{15} \div 7$

17. $\frac{5}{12} \div \frac{5}{6}$

18. $\frac{9}{10} \div 3$

Dividing Fractions (*continued*)

Find each quotient. Write in simplest form.

19. $\frac{5}{6} \div \frac{1}{3}$

20. $\frac{3}{4} \div \frac{5}{8}$

21. $\frac{1}{2} \div \frac{3}{5}$

22. $8 \div \frac{4}{5}$

23. $\frac{1}{6} \div \frac{2}{9}$

24. $\frac{9}{10} \div \frac{1}{4}$

25. $\frac{3}{8} \div 9$

26. $\frac{8}{9} \div \frac{8}{9}$

27. $\frac{2}{5} \div \frac{4}{7}$

28. $15 \div \frac{5}{9}$

29. $\frac{7}{8} \div \frac{7}{10}$

30. $\frac{1}{9} \div \frac{5}{12}$

31. $\frac{1}{5} \div \frac{7}{20}$

32. $\frac{5}{7} \div 10$

33. $\frac{7}{9} \div \frac{1}{7}$

Solve each equation. Write the solution in simplest form.

34. $8 \div \frac{1}{2} = a$

35. $x = \frac{3}{5} \div \frac{9}{10}$

36. $\frac{5}{9} \div \frac{5}{6} = w$

37. $j = \frac{6}{7} \div \frac{3}{14}$

38. $\frac{4}{9} \div \frac{14}{15} = b$

39. $\frac{9}{16} \div \frac{3}{4} = s$

40. $m = \frac{3}{5} \div \frac{9}{20}$

41. $\frac{7}{12} \div \frac{5}{6} = a$

42. $p = \frac{3}{8} \div \frac{9}{10}$

Evaluate each expression.

43. $y \div z$, if $y = \frac{4}{5}$ and $z = \frac{2}{3}$

44. $c \div d$, if $c = 14$ and $d = \frac{7}{8}$

45. $a \div b$, if $a = \frac{2}{9}$ and $b = \frac{1}{3}$

46. $h \div f$, if $h = 18$ and $f = \frac{3}{4}$

Dividing Fractions and Mixed Numbers

To divide mixed numbers, express each mixed number as an improper fraction. Then divide as with fractions.

Example Solve $m = 2\frac{5}{8} \div 1\frac{3}{4}$. Estimate: $2 \div 2 = 1$

$$m = \frac{21}{8} \div \frac{7}{4}$$

Express each mixed number as an improper fraction.

$$m = \frac{21}{8} \times \frac{4}{7}$$

Multiply by the reciprocal of $\frac{7}{4}$.

$$m = \frac{\cancel{2}^3 \cancel{21}^3}{\cancel{2}^1} \times \frac{\cancel{4}^1}{\cancel{7}^1}$$

Divide 21 and 7 by the GCF, 7.
Divide 4 and 8 by the GCF, 4.

$$m = \frac{3 \times 1}{2 \times 1}$$

Multiply the numerators and multiply the denominators.

$$m = \frac{3}{2} \text{ or } 1\frac{1}{2}$$

Simplify and compare with your estimate.

Write each mixed number as an improper fraction.

Then write its reciprocal.

1. $8\frac{3}{4}$

2. $9\frac{6}{7}$

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

4. $3\frac{5}{12}$

5. $1\frac{7}{16}$

6. $6\frac{7}{8}$

Find each quotient. Write in simplest form.

7. $2\frac{1}{2} \div \frac{4}{5}$

8. $1\frac{2}{3} \div 1\frac{1}{4}$

9. $5 \div 1\frac{3}{7}$

10. $2\frac{1}{3} \div \frac{7}{9}$

11. $5\frac{2}{5} \div \frac{9}{10}$

12. $7\frac{1}{2} \div 1\frac{2}{3}$

Dividing Fractions and Mixed Numbers (continued)

Find each quotient. Write in simplest form.

13. $4 \div 2\frac{2}{5}$

14. $3\frac{1}{4} \div 1\frac{3}{8}$

15. $\frac{8}{9} \div 5\frac{1}{3}$

16. $2\frac{1}{2} \div 4\frac{2}{7}$

17. $3\frac{1}{9} \div 7$

18. $6\frac{2}{3} \div 4\frac{4}{5}$

19. $2\frac{1}{7} \div \frac{3}{14}$

20. $3\frac{3}{5} \div 2\frac{4}{7}$

21. $9 \div 3\frac{3}{7}$

22. $1\frac{2}{9} \div 1\frac{5}{6}$

23. $\frac{7}{10} \div 2\frac{5}{8}$

24. $3\frac{1}{5} \div 1\frac{7}{9}$

25. $1\frac{3}{4} \div 14$

26. $2\frac{2}{15} \div 3\frac{5}{9}$

27. $2\frac{1}{10} \div \frac{7}{8}$

28. $6\frac{3}{4} \div 1\frac{7}{20}$

29. $18 \div 1\frac{1}{8}$

30. $4\frac{1}{6} \div 1\frac{3}{7}$

Solve each equation. Write the solution in simplest form.

31. $n = 10\frac{1}{2} \div \frac{7}{10}$

32. $3\frac{3}{5} \div 10 = p$

33. $r = 6\frac{3}{5} \div 2\frac{1}{5}$

34. $15 \div 3\frac{1}{3} = t$

35. $6\frac{2}{5} \div 1\frac{3}{5} = c$

36. $h = 2\frac{1}{12} \div 5$

37. $m = 18 \div \frac{9}{11}$

38. $r = 4\frac{4}{5} \div \frac{8}{15}$

39. $6\frac{3}{4} \div 1\frac{1}{8} = k$

40. $\frac{5}{12} \div 2\frac{1}{2} = p$

41. $s = 2\frac{2}{3} \div 1\frac{5}{6}$

42. $a = 1\frac{4}{5} \div 6$

43. $k = 2\frac{2}{5} \div 1\frac{7}{9}$

44. $1\frac{1}{6} \div \frac{5}{18} = d$

45. $1\frac{3}{5} \div 3\frac{4}{7} = x$

Adding Fractions with Like Denominators

To add fractions with like denominators, add the numerators. Write the sum over the common denominator. Then simplify.

Examples 1 Find $\frac{7}{8} + \frac{5}{8}$.

$$\begin{aligned}\frac{7}{8} + \frac{5}{8} &= \frac{7+5}{8} && \text{Add the numerators.} \\ &= \frac{12}{8} \\ &= \frac{3}{2} \text{ or } 1\frac{1}{2} && \text{Simplify.}\end{aligned}$$

2 Find $\frac{9}{10} + \frac{7}{10}$.

$$\begin{aligned}\frac{9}{10} + \frac{7}{10} &= \frac{9+7}{10} && \text{Add the numerators.} \\ &= \frac{16}{10} \\ &= \frac{8}{5} \text{ or } 1\frac{3}{5} && \text{Simplify.}\end{aligned}$$

Find each sum. Write in simplest form.

1. $\frac{7}{12} + \frac{2}{12}$

2. $\frac{9}{10} + \frac{3}{10}$

3. $\frac{7}{9} + \frac{5}{9}$

4. $\frac{7}{16} + \frac{3}{16}$

5. $\frac{5}{11} + \frac{6}{11}$

6. $\frac{7}{8} + \frac{5}{8}$

7. $\frac{2}{3} + \frac{2}{3}$

8. $\frac{11}{12} + \frac{5}{12}$

9. $\frac{3}{4} + \frac{3}{4}$

10. $\frac{4}{5} + \frac{1}{5}$

11. $\frac{5}{6} + \frac{1}{6}$

12. $\frac{7}{10} + \frac{1}{10}$

13. $\frac{3}{7} + \frac{4}{7}$

14. $\frac{15}{16} + \frac{3}{16}$

15. $\frac{5}{8} + \frac{3}{8}$

Adding Fractions with Like Denominators (continued)

Find each sum. Write in simplest form.

16. $\frac{2}{9} + \frac{4}{9}$

17. $\frac{13}{16} + \frac{7}{16}$

18. $\frac{5}{8} + \frac{7}{8}$

19. $\frac{17}{18} + \frac{9}{18}$

20. $\frac{13}{15} + \frac{4}{15}$

21. $\frac{3}{4} + \frac{2}{4}$

22. $\frac{11}{12} + \frac{7}{12}$

23. $\frac{19}{20} + \frac{11}{20}$

24. $\frac{8}{14} + \frac{8}{14}$

25. $\frac{9}{10} + \frac{4}{10}$

26. $\frac{4}{5} + \frac{1}{5}$

27. $\frac{6}{7} + \frac{5}{7}$

28. $\frac{10}{11} + \frac{2}{11}$

29. $\frac{17}{18} + \frac{4}{18}$

30. $\frac{5}{6} + \frac{4}{6}$

31. $\frac{12}{13} + \frac{12}{13}$

32. $\frac{9}{16} + \frac{11}{16}$

33. $\frac{14}{15} + \frac{9}{15}$

34. $\frac{13}{20} + \frac{7}{20}$

35. $\frac{11}{14} + \frac{5}{14}$

36. $\frac{11}{18} + \frac{3}{18}$

37. $\frac{9}{11} + \frac{7}{11}$

38. $\frac{10}{13} + \frac{4}{13}$

39. $\frac{3}{10} + \frac{9}{10}$

40. Amber spent $\frac{2}{5}$ of an hour on her math assignment and $\frac{4}{5}$ of an hour studying for her science test. How much time did she spend doing her homework?

41. Mr. Garcia planted $\frac{11}{16}$ of his fields with corn and $\frac{3}{16}$ of his fields with wheat. How much of his fields were planted with corn and wheat?

Adding Fractions with Unlike Denominators

To add fractions with unlike denominators, rename the fractions with the least common denominator. Then add.

Examples 1 Find $\frac{3}{4} + \frac{5}{6}$.

$$\begin{aligned}\frac{3}{4} + \frac{5}{6} &= \frac{9}{12} + \frac{10}{12} \\ &= \frac{9+10}{12} \\ &= \frac{19}{12} \text{ or } 1\frac{7}{12}\end{aligned}$$

The LCM of 4 and 6 is 12.
Rename the fractions with 12 as the denominator.

2 Find $\frac{2}{3} + \frac{3}{5}$.

$$\begin{aligned}\frac{2}{3} + \frac{3}{5} &= \frac{10}{15} + \frac{9}{15} \\ &= \frac{10+9}{15} \\ &= \frac{19}{15} \text{ or } 1\frac{4}{15}\end{aligned}$$

The LCM of 3 and 5 is 15.
Rename the fractions with 15 as the denominator.

Find the LCD for each pair of fractions.

1. $\frac{1}{6}, \frac{2}{3}$

2. $\frac{1}{2}, \frac{2}{5}$

3. $\frac{7}{8}, \frac{5}{6}$

4. $\frac{5}{8}, \frac{1}{3}$

5. $\frac{3}{10}, \frac{4}{15}$

6. $\frac{5}{12}, \frac{1}{2}$

7. $\frac{3}{8}, \frac{5}{12}$

8. $\frac{2}{9}, \frac{4}{15}$

9. $\frac{1}{6}, \frac{9}{14}$

10. $\frac{2}{3}, \frac{3}{16}$

11. $\frac{4}{5}, \frac{5}{6}$

12. $\frac{7}{10}, \frac{5}{8}$

Adding Fractions with Unlike Denominators (continued)

Find each sum. Write in simplest form.

13. $\frac{1}{6} + \frac{1}{2}$

14. $\frac{2}{3} + \frac{1}{2}$

15. $\frac{1}{4} + \frac{7}{8}$

16. $\frac{4}{5} + \frac{1}{12}$

17. $\frac{11}{15} + \frac{1}{3}$

18. $\frac{1}{9} + \frac{1}{6}$

19. $\frac{3}{10} + \frac{4}{5}$

20. $\frac{4}{5} + \frac{1}{6}$

21. $\frac{2}{3} + \frac{1}{4}$

22. $\frac{3}{4} + \frac{5}{6}$

23. $\frac{7}{8} + \frac{2}{3}$

24. $\frac{4}{7} + \frac{1}{2}$

25. $\frac{8}{9} + \frac{5}{12}$

26. $\frac{2}{3} + \frac{3}{5}$

27. $\frac{6}{7} + \frac{1}{4}$

28. $\frac{1}{6} + \frac{13}{15}$

29. $\frac{9}{16} + \frac{5}{12}$

30. $\frac{1}{3} + \frac{5}{7}$

31. $\frac{7}{12} + \frac{9}{20}$

32. $\frac{11}{12} + \frac{3}{4}$

33. $\frac{5}{6} + \frac{9}{10}$

34. $\frac{3}{8} + \frac{2}{7}$

35. $\frac{8}{9} + \frac{2}{3}$

36. $\frac{4}{5} + \frac{2}{9}$

37. $\frac{1}{2} + \frac{3}{11}$

38. $\frac{7}{9} + \frac{3}{4}$

39. $\frac{5}{8} + \frac{9}{16}$

40. $\frac{1}{3} + \frac{6}{13}$

41. $\frac{5}{12} + \frac{2}{5}$

42. $\frac{3}{5} + \frac{3}{8}$

43. What is the sum of $\frac{1}{4}$, $\frac{3}{8}$, and $\frac{5}{14}$?

Adding Fractions and Mixed Numbers

To add fractions and mixed numbers:

1. Add the fractions. Rename if necessary, using the LCD.
2. Add the whole numbers.
3. Simplify.

Examples

$$\begin{array}{r}
 \mathbf{1} \quad \begin{array}{r} 14\frac{1}{2} \\ + 18\frac{2}{3} \\ \hline \end{array} \longrightarrow \begin{array}{r} 14\frac{3}{6} \\ + 18\frac{4}{6} \\ \hline \end{array} \longrightarrow \begin{array}{r} 14\frac{3}{6} \\ + 18\frac{4}{6} \\ \hline \frac{7}{6} \end{array} \longrightarrow \begin{array}{r} 14\frac{3}{6} \\ + 18\frac{4}{6} \\ \hline 32\frac{7}{6} = 33\frac{1}{6} \end{array}
 \end{array}$$

$$\begin{array}{r}
 \mathbf{2} \quad \begin{array}{r} 21\frac{3}{4} \\ + \frac{5}{8} \\ \hline \end{array} \longrightarrow \begin{array}{r} 21\frac{6}{8} \\ + \frac{5}{8} \\ \hline \end{array} \longrightarrow \begin{array}{r} 21\frac{6}{8} \\ + \frac{5}{8} \\ \hline \frac{11}{8} \end{array} \longrightarrow \begin{array}{r} 21\frac{6}{8} \\ + \frac{5}{8} \\ \hline 21\frac{11}{8} = 22\frac{3}{8} \end{array}
 \end{array}$$

Find each sum. Write in simplest form.

1. $8\frac{1}{7} + 5\frac{3}{7}$

2. $9\frac{3}{4} + \frac{1}{4}$

3. $6\frac{5}{8} + 3\frac{3}{8}$

4. $5\frac{1}{2} + \frac{1}{4}$

5. $6\frac{1}{3} + 2\frac{1}{6}$

6. $9 + 3\frac{2}{5}$

7. $2\frac{3}{4} + 7\frac{3}{4}$

8. $6\frac{1}{2} + 6\frac{1}{3}$

9. $18\frac{1}{2} + 5\frac{5}{8}$

10. $13\frac{2}{9} + \frac{1}{3}$

11. $15\frac{14}{15} + 13\frac{1}{2}$

12. $26 + 6\frac{12}{13}$

Adding Fractions and Mixed Numbers (continued)

Find each sum. Write in simplest form.

13. $2\frac{1}{3} + 5\frac{1}{3}$

14. $9\frac{6}{7} + \frac{1}{7}$

15. $3\frac{4}{5} + 1\frac{3}{5}$

16. $8\frac{3}{4} + \frac{1}{8}$

17. $7\frac{5}{6} + 2\frac{1}{3}$

18. $9\frac{5}{12} + 5\frac{3}{4}$

19. $12\frac{7}{10} + 5\frac{3}{4}$

20. $6\frac{5}{6} + 7\frac{3}{8}$

21. $9\frac{3}{8} + 1\frac{2}{3}$

22. $4\frac{5}{6} + \frac{5}{12}$

23. $2\frac{4}{9} + 3\frac{2}{15}$

24. $6\frac{7}{8} + 2\frac{1}{3}$

25. $1\frac{5}{6} + 4\frac{3}{4}$

26. $7\frac{1}{2} + 8\frac{5}{12}$

27. $5\frac{12}{15} + 2\frac{4}{9}$

28. $10\frac{7}{9} + 4\frac{1}{4}$

29. $8\frac{4}{15} + 6\frac{3}{5}$

30. $2\frac{1}{4} + 3\frac{1}{2} + 5\frac{5}{8}$

Subtracting Fractions with Like Denominators

To subtract fractions with like denominators, subtract the numerators. Write the difference over the common denominator. Then simplify.

Example

Find $\frac{7}{12} - \frac{5}{12}$.

$$\begin{array}{r} \frac{7}{12} \\ - \frac{5}{12} \\ \hline \frac{2}{12} \end{array} = \frac{1}{6}$$

Simplify.

The difference is $\frac{1}{6}$.

Find each difference.

$$\begin{array}{r} \frac{3}{4} \\ - \frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{5}{7} \\ - \frac{3}{7} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{11}{12} \\ - \frac{3}{12} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{5}{6} \\ - \frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{7}{8} \\ - \frac{5}{8} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{10}{11} \\ - \frac{5}{11} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{8}{9} \\ - \frac{2}{9} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{15}{16} \\ - \frac{7}{16} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{7}{18} \\ - \frac{2}{18} \\ \hline \end{array}$$

Subtracting Fractions with Like Denominators (continued)

Find each difference.

$$\begin{array}{r} \frac{7}{16} \\ - \frac{3}{16} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{9}{10} \\ - \frac{3}{10} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{11}{12} \\ - \frac{5}{12} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{11}{12} \\ - \frac{1}{12} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{8}{15} \\ - \frac{2}{15} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{4}{5} \\ - \frac{1}{5} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{17}{18} - \frac{2}{18} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{7}{8} - \frac{1}{8} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{3}{5} - \frac{2}{5} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{2}{5} - \frac{1}{5} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{11}{12} - \frac{5}{12} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{5}{6} - \frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{7}{10} - \frac{3}{10} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{7}{9} - \frac{1}{9} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{4}{7} - \frac{1}{7} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{4}{5} - \frac{2}{5} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{7}{8} - \frac{5}{8} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{8}{15} - \frac{3}{15} \\ \hline \end{array}$$

28. A large orange weighs $\frac{11}{16}$ pound. A small orange weighs $\frac{5}{16}$ pound.
How much more does the large orange weigh?

29. In a recent year, North America produced $\frac{2}{8}$ of the world's coal. The only area that produced more coal was the Far East, which produced $\frac{3}{8}$ of the coal. How much more of the world's coal was produced by the Far East than North America?

30. In a recent year, North America consumed about $\frac{7}{35}$ of the coal produced and Western Europe consumed about $\frac{5}{35}$ of the coal produced. How much more coal was consumed by North America than Western Europe?

31. A page of a book has a $\frac{2}{4}$ -inch margin on the top and a $\frac{3}{4}$ -inch margin on the bottom. How much deeper is the bottom margin than the top margin?

Subtracting Fractions with Unlike Denominators

To subtract fractions with unlike denominators, rename the fractions with the least common denominator. Then subtract.

Examples 1 Find $\frac{7}{8} - \frac{7}{12}$.

$$\begin{aligned}\frac{7}{8} - \frac{7}{12} &= \frac{21}{24} - \frac{14}{24} \\&= \frac{21 - 14}{24} \\&= \frac{7}{24}\end{aligned}$$

The LCM of 8 and 12 is 24. Rename the fractions with 24 in the denominator.

2 Find $\frac{7}{9} - \frac{1}{6}$.

$$\begin{aligned}\frac{7}{9} - \frac{1}{6} &= \frac{14}{18} - \frac{3}{18} \\&= \frac{14 - 3}{18} \\&= \frac{11}{18}\end{aligned}$$

The LCM of 6 and 9 is 18. Rename the fractions with 18 in the denominator.

Find each difference. Write in simplest form.

1. $\frac{5}{8} - \frac{1}{2}$

2. $\frac{7}{9} - \frac{2}{3}$

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

4. $\frac{2}{5} - \frac{1}{6}$

5. $\frac{4}{7} - \frac{1}{2}$

6. $\frac{11}{12} - \frac{2}{3}$

7. $\frac{4}{9} - \frac{1}{6}$

8. $\frac{5}{6} - \frac{5}{8}$

9. $\frac{1}{4} - \frac{1}{8}$

10. $\frac{8}{15} - \frac{2}{5}$

11. $\frac{7}{12} - \frac{3}{10}$

12. $\frac{1}{2} - \frac{1}{6}$

Subtracting Fractions with Unlike Denominators (continued)

Find each difference. Write in simplest form.

13.
$$\begin{array}{r} \frac{5}{7} \\ - \frac{1}{14} \\ \hline \end{array}$$

14.
$$\begin{array}{r} \frac{1}{2} \\ - \frac{1}{4} \\ \hline \end{array}$$

15.
$$\begin{array}{r} \frac{11}{12} \\ - \frac{1}{3} \\ \hline \end{array}$$

16.
$$\begin{array}{r} \frac{8}{15} \\ - \frac{2}{5} \\ \hline \end{array}$$

17.
$$\begin{array}{r} \frac{17}{25} \\ - \frac{3}{10} \\ \hline \end{array}$$

18.
$$\begin{array}{r} \frac{7}{8} \\ - \frac{2}{3} \\ \hline \end{array}$$

19.
$$\begin{array}{r} \frac{6}{7} \\ - \frac{1}{10} \\ \hline \end{array}$$

20.
$$\begin{array}{r} \frac{9}{10} \\ - \frac{1}{5} \\ \hline \end{array}$$

21.
$$\begin{array}{r} \frac{6}{7} \\ - \frac{2}{3} \\ \hline \end{array}$$

22. $\frac{11}{15} - \frac{3}{5}$

23. $\frac{4}{5} - \frac{1}{10}$

24. $\frac{17}{18} - \frac{2}{9}$

25. $\frac{3}{4} - \frac{1}{9}$

26. $\frac{7}{8} - \frac{1}{3}$

27. $\frac{7}{9} - \frac{1}{3}$

28. $\frac{3}{4} - \frac{2}{5}$

29. $\frac{4}{5} - \frac{10}{13}$

30. $\frac{3}{10} - \frac{3}{20}$

Subtracting Fractions and Mixed Numbers

Sometimes it is necessary to rename the fraction part of a mixed number as an improper fraction before you can subtract.

Examples 1
$$\begin{array}{r} 6\frac{1}{2} \\ - 2\frac{3}{4} \\ \hline \end{array} \longrightarrow \begin{array}{r} 6\frac{2}{4} \\ - 2\frac{3}{4} \\ \hline \end{array}$$
 You cannot subtract $\frac{3}{4}$ from $\frac{2}{4}$. $\longrightarrow - \begin{array}{r} 2\frac{3}{4} \\ \hline 3\frac{3}{4} \end{array}$ Rename $6\frac{2}{4}$ as $5\frac{6}{4}$. Then subtract.

2
$$\begin{array}{r} 8 \\ - 4\frac{5}{8} \\ \hline 3\frac{3}{8} \end{array} \longrightarrow \begin{array}{r} 7\frac{8}{8} \\ - 4\frac{5}{8} \\ \hline \end{array}$$
 Rename 8 as $7\frac{8}{8}$. Then subtract.

Complete.

1. $7\frac{5}{6} = \square\frac{11}{6}$

2. $4\frac{3}{4} = 3\frac{\square}{4}$

3. $2\frac{3}{8} = 1\frac{\square}{8}$

4. $9\frac{3}{5} = \square\frac{8}{5}$

5. $10\frac{1}{3} = 9\frac{\square}{3}$

6. $15 = 14\frac{\square}{2}$

7. $20\frac{5}{12} = 19\frac{\square}{12}$

8. $13 = 12\frac{\square}{7}$

9. $6\frac{2}{5} = \square\frac{7}{5}$

10. $6\frac{4}{7} = 5\frac{\square}{7}$

11. $9\frac{3}{10} = \square\frac{13}{10}$

12. $8\frac{5}{12} = \square\frac{17}{12}$

13. $10\frac{9}{14} = 9\frac{\square}{14}$

14. $7\frac{3}{11} = 6\frac{\square}{11}$

15. $12\frac{7}{8} = \square\frac{15}{8}$

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Subtracting Fractions and Mixed Numbers (continued)

Find each difference. Write in simplest form.

16. $5\frac{1}{3} - \frac{2}{3}$

17. $12\frac{1}{6} - 7\frac{5}{6}$

18. $8\frac{3}{8} - \frac{5}{8}$

19. $9\frac{1}{2} - 4\frac{3}{4}$

20. $12 - 1\frac{2}{5}$

21. $8\frac{1}{2} - \frac{7}{8}$

22. $15\frac{1}{3} - 9\frac{5}{6}$

23. $7\frac{1}{2} - 3\frac{11}{12}$

24. $22 - 10\frac{8}{9}$

25.
$$\begin{array}{r} 4\frac{5}{7} \\ - 1\frac{6}{7} \\ \hline \end{array}$$

26.
$$\begin{array}{r} 7\frac{1}{6} \\ - 3\frac{5}{6} \\ \hline \end{array}$$

27.
$$\begin{array}{r} 10 \\ - 5\frac{1}{4} \\ \hline \end{array}$$

28.
$$\begin{array}{r} 15\frac{1}{6} \\ - 9\frac{4}{9} \\ \hline \end{array}$$

29.
$$\begin{array}{r} 17\frac{1}{5} \\ - 7\frac{2}{3} \\ \hline \end{array}$$

30.
$$\begin{array}{r} 15\frac{5}{14} \\ - 8\frac{4}{7} \\ \hline \end{array}$$

31.
$$\begin{array}{r} 10\frac{1}{6} \\ - 2\frac{3}{8} \\ \hline \end{array}$$

32.
$$\begin{array}{r} 2\frac{1}{7} \\ - \frac{2}{3} \\ \hline \end{array}$$

33.
$$\begin{array}{r} 14\frac{1}{12} \\ - 3\frac{8}{9} \\ \hline \end{array}$$

34.
$$\begin{array}{r} 3\frac{2}{5} \\ - 2\frac{3}{4} \\ \hline \end{array}$$

35.
$$\begin{array}{r} 16\frac{2}{3} \\ - 12\frac{11}{12} \\ \hline \end{array}$$

36.
$$\begin{array}{r} 18\frac{1}{9} \\ - 8\frac{5}{18} \\ \hline \end{array}$$

37.
$$\begin{array}{r} 12 \\ - 5\frac{7}{11} \\ \hline \end{array}$$

38.
$$\begin{array}{r} 14\frac{2}{7} \\ - 9\frac{3}{4} \\ \hline \end{array}$$

39.
$$\begin{array}{r} 16\frac{3}{4} \\ - 5\frac{5}{6} \\ \hline \end{array}$$

 40. If you subtract $4\frac{2}{5}$ from $8\frac{3}{8}$, what is the result?

 41. Find the difference of $5\frac{1}{6}$ and $2\frac{5}{12}$.

Writing Fractions as Decimals

To express a fraction as a decimal, divide the numerator by the denominator. If the division ends with a zero, the decimal is a **terminating decimal**.

Example 1

Express $\frac{7}{8}$ as a decimal.

Use a calculator.

$$7 \div 8 = 0.875$$

$$\frac{7}{8} = 0.875$$

The remainder is 0.
0.875 is a terminating decimal.

Use paper and pencil.

$$\begin{array}{r} 0.875 \\ 8)7.000 \\ -64 \\ \hline 60 \\ -56 \\ \hline 40 \\ -40 \\ \hline 0 \end{array}$$

Annex zeros as needed.

$$\frac{7}{8} = 0.875$$

If the decimal repeats rather than terminates, the decimal is a **repeating decimal**. A repeating decimal is written with a bar over the digits that repeat.

Example 2

Express $\frac{5}{6}$ as a decimal.

Use a calculator.

$$\begin{array}{r} 0.8333333 \\ 5 \div 6 = \end{array}$$

$$\frac{5}{6} = 0.8333333 \dots$$

The digit 3 repeats.

$$\frac{5}{6} = 0.8\bar{3}$$

Use paper and pencil.

$$\begin{array}{r} 0.833 \\ 6)5.000 \\ -48 \\ \hline 20 \\ -18 \\ \hline 2 \end{array}$$

$$\frac{5}{6} = 0.8\bar{3}$$

Write each repeating decimal using bar notation.

1. 0.22222 ...

2. 0.41666 ...

3. 0.54545 ...

4. 0.6363 ...

5. 0.2727 ...

6. 0.428571428 ...

Writing Fractions as Decimals (continued)

Express each fraction or mixed number as a decimal. Use bar notation to show a repeating decimal.

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

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

9. $\frac{1}{8}$

10. $4\frac{1}{2}$

11. $3\frac{3}{10}$

12. $\frac{4}{11}$

13. $1\frac{3}{8}$

14. $4\frac{1}{3}$

15. $\frac{5}{12}$

16. $\frac{2}{9}$

17. $6\frac{4}{5}$

18. $8\frac{1}{4}$

19. $\frac{4}{9}$

20. $1\frac{7}{18}$

21. $\frac{5}{8}$

22. $2\frac{3}{16}$

23. $6\frac{1}{12}$

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

25. $9\frac{2}{5}$

26. $7\frac{1}{18}$

27. $3\frac{24}{25}$

28. $4\frac{1}{6}$

29. $\frac{12}{11}$

30. $5\frac{8}{9}$

31. $8\frac{2}{3}$

32. $\frac{5}{16}$

33. $\frac{9}{11}$

34. $10\frac{17}{20}$

35. $2\frac{11}{18}$

36. $6\frac{2}{7}$

37. $14\frac{5}{8}$

38. $\frac{3}{13}$

39. $7\frac{9}{10}$

40. $\frac{7}{12}$

41. $\frac{11}{16}$

42. $1\frac{5}{9}$

Writing Fractions as Percents

To write a fraction as a percent, use a proportion.

Examples 1 Express $\frac{5}{8}$ as a percent.

$$\frac{5}{8} = \frac{x}{100}$$

$$5(100) = 8x$$

$$500 = 8x$$

$$\frac{500}{8} = \frac{8x}{8}$$

$$62.5 = x$$

$\frac{5}{8}$ is 62.5%.

2 Express $\frac{15}{16}$ as a percent.

$$\frac{15}{16} = \frac{m}{100}$$

$$15(100) = 16m$$

$$1500 = 16m$$

$$\frac{1500}{16} = \frac{16m}{16}$$

$$93.75 = m$$

$\frac{15}{16}$ is 93.75%.

3 Express $\frac{2}{3}$ as a percent.

$$\frac{2}{3} = \frac{x}{100}$$

$$200 = 3x$$

$$\frac{200}{3} = x$$

$$66\frac{2}{3} = x$$

$\frac{2}{3}$ is $66\frac{2}{3}\%$.

Express each fraction as a percent.

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

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

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

4. $\frac{9}{20}$

5. $\frac{19}{25}$

6. $\frac{1}{8}$

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

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

9. $\frac{2}{5}$

10. $\frac{3}{10}$

11. $\frac{17}{20}$

12. $\frac{14}{25}$

13. $\frac{3}{8}$

14. $\frac{1}{3}$

15. $\frac{1}{25}$

16. $\frac{17}{100}$

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Writing Fractions as Percents (continued)

Express each fraction as a percent.

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

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

19. $\frac{17}{20}$

20. $\frac{5}{8}$

21. $\frac{5}{5}$

22. $\frac{23}{25}$

23. $\frac{11}{12}$

24. $\frac{13}{16}$

25. $\frac{64}{125}$

26. $\frac{37}{50}$

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

28. $\frac{9}{16}$

29. $\frac{5}{4}$

30. $\frac{21}{25}$

31. $\frac{9}{10}$

32. $\frac{37}{200}$

33. $\frac{19}{50}$

34. $\frac{7}{8}$

35. $\frac{8}{25}$

36. $\frac{13}{150}$

37. $\frac{17}{25}$

38. $\frac{7}{50}$

39. $\frac{1}{16}$

40. $\frac{12}{25}$

41. $\frac{14}{25}$

42. $\frac{3}{10}$

43. $\frac{1}{40}$

Writing Decimals as Fractions

A **terminating decimal** can be written as a fraction with a denominator of 10, 100, 1000, and so on.

Examples 1 Express 0.5 as a fraction in simplest form.

$$\begin{aligned} 0.5 &= \frac{5}{10} && \text{Write the decimal as a fraction.} \\ && & \text{Use 10 as the denominator since 0.5 is 5 tenths.} \\ &= \frac{1}{2} && \text{Simplify.} \end{aligned}$$

2 Express 7.005 as a fraction in simplest form.

$$\begin{aligned} 7.005 &= 7\frac{5}{1000} && \text{Write the decimal as a mixed number.} \\ && & \text{Use 1000 as the denominator} \\ && & \text{since 0.005 is 5 thousandths.} \\ &= 7\frac{1}{200} && \text{Simplify.} \end{aligned}$$

Express each decimal as a fraction or mixed number in simplest form.

1. 0.4

2. 0.15

3. 0.125

4. 5.008

5. 7.8

6. 11.25

7. 25.2

8. 6.65

9. 10.475

10. 12.002

11. 5.5

12. 8.34

13. 0.2

14. 0.08

15. 0.075

16. 3.56

17. 4.125

18. 10.9

19. 9.35

20. 6.25

21. 8.016

Writing Decimals as Fractions (continued)

Express each decimal as a fraction or mixed number in simplest form.

22. 0.055

23. 21.5

24. 7.42

25. 5.006

26. 3.875

27. 1.29

28. 0.004

29. 6.48

30. 2.015

31. 4.95

32. 8.425

33. 9.74

34. 0.824

35. 5.019

36. 1.062

37. 3.96

38. 0.47

39. 20.8

40. 6.45

41. 4.672

42. 0.375

43. Write *fourteen thousandths* as a decimal and as a fraction in simplest form.

44. Write *one and eighty-five hundredths* as a decimal and as a fraction in simplest form.

45. Write *twenty-four thousandths* as a decimal and as a fraction in simplest form.

46. Write *twelve and seventy-five hundredths* as a decimal and as a fraction in simplest form.

Writing Decimals as Percents

To write a decimal as a percent, multiply the decimal by 100 and add the percent symbol.

Examples 1 Express 0.77 as a percent. 2 Express 0.323 as a percent.

$$\begin{aligned} 0.77 &= 0.\overbrace{77} \\ &= 77\% \end{aligned}$$

$$\begin{aligned} 0.323 &= 0.\overbrace{323} \\ &= 32.3\% \end{aligned}$$

Express each decimal as a percent.

1. 0.67

2. 0.14

3. 0.2

4. 0.345

5. 0.09

6. 0.084

7. 0.02

8. 0.89

9. 0.95

10. 0.12

11. 0.04

12. 1

13. 0.144

14. 0.8

15. 0.075

16. 0.105

Writing Decimals as Percents (continued)

Express each decimal as a percent.

17. 0.52

18. 0.9

19. 0.12

20. 0.19

21. 0.312

22. 0.74

23. 0.825

24. 0.06

25. 0.066

26. 0.628

27. 0.4

28. 0.02

29. 0.537

30. 0.22

31. 0.3

32. 0.82

33. 0.615

34. 0.089

35. 0.37

36. 0.022

37. 0.08

38. 0.018

39. 0.014

40. 0.07

41. 0.13

42. 0.18

43. 0.196

44. 0.485

45. 0.7

46. 0.2725

Writing Percents as Fractions

To write a percent as a fraction, write a fraction with a denominator of 100. Then write the fraction in simplest form.

Examples 1 Express 24% as a fraction.

$$\begin{aligned} 24\% &= \frac{24}{100} \\ &= \frac{24 \div 4}{100 \div 4} \\ &= \frac{6}{25} \end{aligned}$$

Therefore, $24\% = \frac{6}{25}$.

2 Express $87\frac{1}{2}\%$ as a fraction.

$$\begin{aligned} 87\frac{1}{2}\% &= \frac{\overline{87\frac{1}{2}}}{100} \\ &= \frac{\frac{175}{2}}{100} \\ &= \frac{175}{2} \times \frac{1}{100} \\ &= \frac{175}{200} \\ &= \frac{7}{8} \end{aligned}$$

Therefore, $87\frac{1}{2}\% = \frac{7}{8}$

Express each percent as a fraction in simplest form.

1. 70%

2. 25%

3. 85%

4. 62.5%

5. 100%

6. 92%

7. $91\frac{2}{3}\%$

8. $81\frac{1}{4}\%$

Writing Percents as Fractions (*continued*)

Express each percent as a fraction in simplest form.

9. 75%

10. 84%

11. 90%

12. $18\frac{1}{2}\%$

13. 38%

14. $87\frac{1}{2}\%$

15. 56%

16. 30%

17. 12%

18. 39%

19. 55%

20. 78%

21. Bananas don't grow on trees; they grow on plants that can be 30 feet tall. A single banana may be 75% water. Express 75% as a fraction.

22. Only 2% of the earthquakes that occur around the world are in the United States. Express 2% as a fraction.

Writing Percents as Decimals

To express a percent as a decimal, first express the percent as a fraction with a denominator of 100. Then express the fraction as a decimal.

Examples 1 Express 51% as a decimal. 2 Express 90.2% as a decimal.

$$51\% = \frac{51}{100}$$

$$= 0.51$$

Therefore, $51\% = 0.51$.

$$90.2\% = \frac{90.2}{100}$$

$$= \frac{90.2 \times 10}{100 \times 10}$$

$$= \frac{902}{1,000}$$

$$= 0.902$$

Therefore, $90.2\% = 0.902$.

Express each percent as a decimal.

1. 52%

2. 9%

3. 12%

4. 82.5%

5. 6%

6. 6.6%

7. 53.7%

8. 22%

9. 3%

Writing Percents as Decimals (continued)

Express each percent as a decimal.

10. 82%

11. 61.5%

12. 8.9%

13. $48\frac{1}{2}\%$

14. 70%

15. $27\frac{1}{4}\%$

16. 3%

17. 18%

18. 19.6%

19. 25.5%

20. 19.5%

21. 125%

Complete with $<$, $>$, or $=$.

22. $19\% \underline{\hspace{1cm}}$ 1.9

23. $31.2 \underline{\hspace{1cm}} 31.2\%$

24. $62.8\% \underline{\hspace{1cm}} 0.628$

25. $0.4 \underline{\hspace{1cm}} 4\%$

26. $38.5\% \underline{\hspace{1cm}} 38.5$

27. $0.09 \underline{\hspace{1cm}} 9\%$

28. The average household in the United States spends 15% of its money on food. Express 15% as a decimal.

29. In the United States, showers usually account for 32% of home water use. Express 32% as a decimal.

Comparing and Ordering Rational Numbers

One way to compare rational numbers is to express them as fractions with like denominators.

Example 1 Replace \bigcirc with $<$, $>$, or $=$ to make $\frac{6}{7} \bigcirc \frac{7}{9}$ a true sentence.

Method 1 Use fractions.

The least common denominator (LCD) of 7 and 9 is 63.

$$\begin{array}{rcl} \frac{6}{7} & = & \frac{54}{63} \\ & \nearrow \times 9 & \searrow \times 7 \\ & & \end{array} \quad \begin{array}{rcl} \frac{7}{9} & = & \frac{49}{63} \\ & \nearrow \times 9 & \searrow \times 7 \\ & & \end{array}$$

$\frac{54}{63} > \frac{49}{63}$, so $\frac{6}{7} > \frac{7}{9}$.

Method 2 Use decimals.

$$6 \div 7 = 0.\overline{857142857}$$

$$7 \div 9 = 0.\overline{778}$$

$$0.857 > 0.778, \text{ so } \frac{6}{7} > \frac{7}{9}.$$

Another way to compare rational numbers is to express them as decimals.

Then compare the decimals.

Example 2 Write $\frac{4}{9}$, $\frac{2}{5}$, $0.\overline{47}$, and 45% in order from least to greatest.

$$\frac{4}{9} = 4 \div 9 \text{ or } 0.\overline{4} \quad \frac{2}{5} = 2 \div 5 \text{ or } 0.4 \quad 45\% = 0.45$$

$$0.4 < 0.\overline{4} < 0.45 < 0.\overline{47}$$

$$\begin{array}{cccc} \downarrow & \downarrow & \downarrow & \downarrow \\ \frac{2}{5} & \frac{4}{9} & 45\% & 0.\overline{47} \end{array}$$

The rational numbers in order from least to greatest are $\frac{2}{5}$, $\frac{4}{9}$, 45%, and $0.\overline{47}$.

Find the LCD for each pair of fractions.

1. $\frac{7}{9}, \frac{5}{12}$

2. $\frac{3}{10}, \frac{4}{15}$

3. $-\frac{3}{10}, \frac{5}{6}$

Replace each \bigcirc with $<$, $>$, or $=$ to make a true sentence.

4. $3.7 \bigcirc 3.\overline{7}$

5. $\frac{5}{8} \bigcirc \frac{7}{11}$

6. $-6.8 \bigcirc -6\frac{4}{5}$

7. $55.5\% \bigcirc \frac{5}{9}$

8. $6\frac{7}{12} \bigcirc 6.6$

9. $\frac{3}{10} \bigcirc \frac{5}{16}$

10. $-11.6 \bigcirc 10.7$

11. $3.234 \bigcirc 3.243$

12. $3\frac{3}{5} \bigcirc 3.6$

13. $66\frac{2}{3}\% \bigcirc 0.666$

14. $0.312 \bigcirc 0.313$

15. $-4.27 \bigcirc -4.28$

Comparing and Ordering Rational Numbers (continued)

Replace each \bigcirc with $<$, $>$, or $=$ to make a true statement.

16. $3\frac{1}{5} \bigcirc 3\frac{1}{3}$

17. $2.99 \bigcirc 2.\overline{98}$

18. $\frac{16}{3} \bigcirc 5.\overline{3}$

19. $\frac{1}{7} \bigcirc \frac{4}{21}$

20. $1.001 \bigcirc 1.0001$

21. $0.09 \bigcirc 0.\overline{1}$

22. $2\frac{2}{9} \bigcirc 2\frac{4}{18}$

23. $\frac{17}{51} \bigcirc 0.\overline{3}$

24. $-6.\overline{1} \bigcirc 6.08$

Write each set of rational numbers in order from least to greatest.

25. $0.67, 60\%, 0.7, 0.06$

26. $\frac{3}{7}, \frac{2}{5}, \frac{5}{8}, \frac{1}{2}$

27. $-\frac{1}{3}, \frac{7}{8}, -\frac{9}{10}, \frac{13}{14}$

28. $\frac{15}{13}, 1.2, \frac{19}{18}$

29. $-\frac{1}{6}, \frac{1}{6}, -\frac{2}{15}, \frac{1}{9}$

30. $1.77, 1\frac{5}{6}, 150\%, 1.46$

31. $2, -3, 4, -5, 6$

32. $1, 1.1, 1.01, 1.\overline{11}$

33. $2, -2, -2.1, 2.\overline{1}$

34. $\frac{2}{3}, \frac{1}{2}, \frac{3}{5}$

35. $0, -2.1, \frac{3}{2}, \frac{2}{3}$

36. $\frac{4}{11}, 35\%, 0.3\overline{6}$

37. $\frac{3}{4}, 90\%, \frac{7}{8}, \frac{2}{3}$

38. $-0.3, -\frac{1}{3}, -0.33, -0.35$

Variables and Expressions

The table shows phrases written as mathematical expressions.

Phrase	Expression	Phrase	Expression
8 more than a number the sum of 8 and a number x plus 8 x increased by 8	$x + 8$	7 subtracted from a number h minus 4 7 less than a number a number decreased by 7	$h - 7$
Phrase	Expression	Phrase	Expression
3 multiplied by n 3 times a number the product of n and 3	$3n$	a number divided by 5 the quotient of t and 5 t divided by 5	$\frac{t}{5}$

Write each phrase as an algebraic expression.

1. 12 more than a number
2. the quotient of a number and 9
3. 4 times a number
4. 15 less than a number
5. 1 less than the product of 3 and m
6. the product of 4 times a number minus 8
7. a number minus 6
8. a number plus 14
9. 3 more than 5 times the number of dogs
10. 4 times the number of cows plus 2 times the number of ducks
11. 2 less than the quotient of 12 divided by a number
12. the product of 5 and y added to 3

Variables and Expressions (continued)

Write each phrase as an algebraic expression.

13. 8 more than x
14. 12 less than b
15. the product of 6 and y
16. the quotient of a and 4
17. the sum of 9 and c
18. the difference of q and 12
19. 7 times d
20. 20 less n
21. 6 less than x
22. 4 more than y
23. the product of a and 7
24. the sum of 1 and w
25. the sum of 8 and 6 times y
26. eight dollars less than Joni earned
27. Pak's salary minus a \$223 deduction
28. twice as many flowers as Susan picked
29. 6 less than the product of 8 and c
30. the cost of the tea plus 10 cents tax
31. 8 more than the number of meals served on Tuesday
32. 18 less than the number of gameboard squares
33. 1 more than twice the number of miles Timothy drove
34. the sum of 9 and the quotient of x and 7
35. 12 less than twice the number of cows
36. 17 inches less than 3 times Maria's height
37. 5 more than the number of paper clips divided into 4 groups
38. 18 more than 3 times Tony's wages
39. 8 less than the number of apples divided into 5 groups

Order of Operations

Algebraic expressions are evaluated using these rules.

Order of Operations

1. Do all operations within grouping symbols first.
2. Multiply and divide in order from left to right.
3. Add and subtract in order from left to right.

Example Evaluate $56 \div (17 - 9) + 7 \times 3$.

$$\begin{array}{rcl} 56 \div (17 - 9) + 7 \times 3 & = & 56 \div 8 + 7 \times 3 \\ & = & 7 + 7 \times 3 \\ & = & 7 + 21 \\ & = & 28 \end{array} \quad \begin{array}{l} \text{Subtract } 9 \text{ from } 17. \\ \text{Divide } 56 \text{ by } 8. \\ \text{Multiply } 7 \text{ and } 3. \\ \text{Add } 7 \text{ and } 21. \end{array}$$

Name the operation that should be done first in each expression.

1. $(9 + 3) \times 7$

2. $98 - 5 \times 7$

3. $5 \times (9 - 1)$

4. $(15 \div 3) + (4 + 5)$

5. $5 \times 4 \div 2$

6. $5(5 - 3) \times 2$

7. $5 + 4 \cdot 7$

8. $13(6 + 3)$

9. $(4 - 2) + 6$

10. $6 \times 8 \div 4$

11. $32 \div 4 \times 2$

12. $9(4 + 2) \div 3$

Evaluate each expression.

13. $2 \times 9 + 5 \times 3$

14. $(9 - 4) \div 5$

15. $15 - 18 \div 9 + 3$

16. $30 \div (12 - 6) + 4$

Order of Operations (continued)

Evaluate each expression.

17. $2(16 - 9) - (5 + 1)$

18. $(43 - 23) - 2 \times 5$

19. $81 \div (13 - 4)$

20. $7 \times 8 - 2 \times 8$

21. $8 \cdot 7 + 8 \cdot 3$

22. $(9 - 3) \div 3$

23. $8 - 6 + 3$

24. $18 \div 3 \cdot 6$

25. $9 - 4 \div 2 + 6$

26. $24 \div (6 - 2)$

27. $18 - (7 - 7)$

28. $32 \div (8 - 4)$

29. $90 - 16 \div 4$

30. $3(18 - 12) - (5 - 3)$

31. $(24 - 10) - 3 \times 3$

32. $4(22 - 18) - 3 \cdot 5$

33. $12(5 - 5) + 3 \cdot 5$

34. $18(4 - 3) \div 3 + 3$

35. $(34 + 46) \div 20 + 20$

36. $92 - 66 - 12 \div 4$

37. $9 \cdot 3 + 8 \div 4$

38. $9 + (18 \div 3)$

Insert parentheses to make each sentence true.

39. $32 + 8 \times 3 \div 4 = 30$

40. $15 - 3 \div 1 \cdot 6 = 2$

41. $\frac{88}{22} + 8 \div 3 = 4$

42. $18 \div 3 + 3 - 2 = 1$

43. $16 - 8 \div 4 + 10 = 12$

44. $5 \cdot 5 + 5 - 5 = 45$

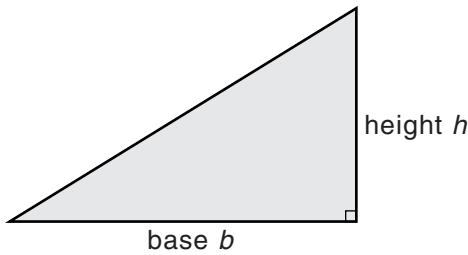
45. $6 + 6 \div 6 \cdot 6 = 42$

46. $200 - 90 + 80 + 20 = 10$

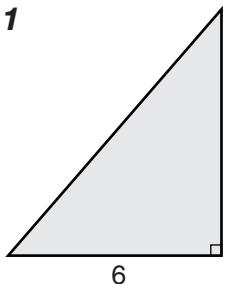
Evaluating Expressions

The area of a triangle can be found by multiplying the base of the triangle by the height of the triangle and then dividing by 2.

If we use b to represent the base of the triangle and h to represent the height of the triangle, the area of the triangle can be found by evaluating the algebraic expression $\frac{bh}{2}$.

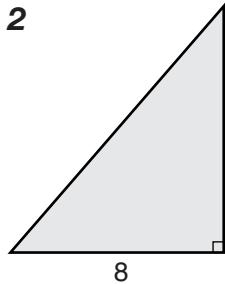


Examples Find the area of each triangle.

1Evaluate $\frac{bh}{2}$ if $b = 6$ and $h = 7$.

$$\frac{6 \times 7}{2} = \frac{42}{2}$$

$$= 21$$

2Evaluate $\frac{bh}{2}$ if $b = 8$ and $h = 10$.

$$\frac{8 \times 10}{2} = \frac{80}{2}$$

$$= 40$$

The area is 21 square units.

The area is 40 square units.

Evaluate each expression if $a = 2$, $b = 3$, $c = 4$, and $d = 12$.

1. $c + 2a$

2. $19 - d$

3. $3(b + 5)$

4. $bc \div 12$

5. $d - c + 6$

6. $a(d - b)$

7. $15 - ab$

8. $6ca$

9. $6 + \frac{d}{c}$

10. $\frac{d}{a} - b$

11. $20 - \frac{2b}{a}$

12. $6c - 4b$

13. $7ab$

14. $a(6 + c) + 1$

15. $2c + 2b - d$

16. $d + ac$

Evaluating Expressions (continued)

Evaluate each expression if $x = 5$, $y = 4$, and $z = 3$.

17. $x + 3$

18. $z - 3$

19. $10 - z$

20. $13 + y$

21. $x + z$

22. $y + z$

23. $y + 3 - z$

24. $x - 2 + z$

25. $x - x + 4$

26. $x - y + 8$

27. $xy - 2$

28. $xz - 4$

29. $yz + 10$

30. $yz - 10$

31. $xz + 4$

Evaluate each expression if $a = 8$, $b = 4$, and $c = 2$.

32. $a + b + c$

33. $4b + a$

34. $cb - a$

35. $\frac{a}{b} + 5$

36. $3bc$

37. $\frac{a}{b} + c$

38. $\frac{2a}{4} - b$

39. $3(b + a) - c$

40. $2b - 3c$

41. $\frac{2b}{c}$

42. $\frac{6(a + c)}{b}$

43. $b(b + a) - b$

Evaluate each expression if $a = 12$, $b = 3$, $c = 4$, $m = 9$, and $n = 3$.

44. $\frac{m}{n} + 6$

45. mn

46. $\frac{a}{c} - b$

47. $\frac{3n}{m} + 4$

48. $3(n + n) - m$

49. $4c - 3b$

50. $10 - \frac{2m}{n}$

51. $\frac{3(b + c)}{(b + c)}$

52. $b(c - b) + c$

Solving One-Step Equations

If you add or subtract the same number to or from each side of an equation, the two sides remain equal.

Example 1 Solve $v - 65 = 21$. Check your solution.

$$v - 65 = 21$$

$$v - 65 + 65 = 21 + 65 \quad \text{Add 65 to each side of the equation.}$$

$$v = 86$$

Check: $v - 65 = 21$

$$86 - 65 \stackrel{?}{=} 21 \quad \text{Replace } v \text{ with 86.}$$

$$21 = 21 \quad \checkmark$$

If you multiply or divide each side of an equation by the same number, the two sides remain equal.

Example 2 Solve $\frac{y}{6} = 7$.

$$\frac{y}{6} = 7$$

$$6\left(\frac{y}{6}\right) = 6(7) \quad \text{Multiply each side of the equation by 6.}$$

$$y = 42$$

Check: $\frac{y}{6} = 7$

$$\frac{42}{6} = 7 \quad \text{Replace } y \text{ with 42.}$$

$$7 = 7 \quad \checkmark$$

Solve each equation. Check your solution.

1. $d + 22 = 60$

2. $s - 46 = 12$

3. $91 - t = 20$

4. $1.5 + r = 3$

5. $\$3.50 - g = \1.25

6. $x + 140 = 300$

7. $\$5.60 + h = \7.00

8. $14k = 84$

9. $\frac{b}{6} = 12$

10. $99 = 3x$

11. $15 = \frac{d}{7}$

12. $\$5.00 = 4w$

13. $9t = 729$

14. $3 = \frac{x}{22}$

15. $0.5p = 3$

Solving One-Step Equations (continued)

Solve each equation. Check your solution.

16. $62 - 35 = x$

17. $y + 16 = 47$

18. $z - 12 = 52$

19. $a - 12 = 13$

20. $16 = s + 9$

21. $12 = t - 4$

22. $22 = c - 12$

23. $34 = d + 16$

24. $20 + n = 40$

25. $p - 75 = 156$

26. $71 + 56 = s$

27. $15 + 72 = y$

28. $12x = 36$

29. $8y = 96$

30. $54 = 9w$

31. $\frac{a}{3} = 15$

32. $\frac{a}{12} = 16$

33. $21d = 147$

34. $\frac{h}{0.3} = 19$

35. $\frac{m}{18} = 39$

36. $1.2y = 2.76$

37. $18t = 3.6$

38. $\frac{x}{1.8} = 72$

39. $\frac{n}{5} = 16.4$

Solving Multi-Step Equations

To solve a multi-step equation, undo each operation. First undo addition and subtraction. Then undo multiplication and division.

Examples 1 Solve $4k - 3 = 13$. Check your solution.

$$4k - 3 = 13$$

$$4k - 3 + 3 = 13 + 3 \quad \text{Add 3 to each side to undo subtraction of 3.}$$

$$4k = 16$$

$$\frac{4k}{4} = \frac{16}{4} \quad \text{Divide each side by 4 to undo multiplication of 4.}$$

$$k = 4$$

Check: $4k - 3 = 13$

$$4(4) - 3 \stackrel{?}{=} 13 \quad \text{Replace } k \text{ with 4.}$$

$$16 - 3 \stackrel{?}{=} 13 \quad \text{Multiply first. Then subtract.}$$

$$13 = 13 \quad \checkmark$$

2 Solve $\frac{r}{5} + 2 = 6$. Check your solution.

$$\frac{r}{5} + 2 = 6$$

$$\frac{r}{5} + 2 - 2 = 6 - 2 \quad \text{Subtract 2 from each side to undo addition of 2.}$$

$$\frac{r}{5} = 4$$

$$5\left(\frac{r}{5}\right) = 5(4) \quad \text{Multiply each side by 5 to undo division by 5.}$$

$$r = 20$$

Check: $\frac{r}{5} + 2 = 6$

$$\frac{20}{5} + 2 \stackrel{?}{=} 6 \quad \text{Replace } r \text{ with 20.}$$

$$4 + 2 \stackrel{?}{=} 6 \quad \text{Divide first. Then add.}$$

$$6 = 6 \quad \checkmark$$

Solve each equation. Check your solution.

1. $6t - 3 = 21$

2. $2m + 7 = 15$

3. $8 - 1.2y = 2$

4. $\frac{h}{3} - 5 = 2$

5. $\frac{v}{2} + 11 = 16$

6. $\frac{x}{7} + 1 = 4$

7. $9w - 7 = 74$

8. $50 - 3b = 35$

9. $\frac{n}{10} - 2.5 = 7.5$

10. $\frac{a}{7} - 13 = 12$

11. $6x - 12 = 78$

12. $7p + 8.4 = 8.4$

Solving Multi-Step Equations (continued)

Solve each equation. Check your solution.

13. $8x + 3 = 35$

14. $2y - 9 = 9$

15. $6a + 12 = 42$

16. $\frac{b}{4} - 2 = 8$

17. $\frac{w}{2} + 5 = 10$

18. $\frac{c}{7} - 3 = 0$

19. $8 + 5d = 53$

20. $12f - 9 = 27$

21. $7 + 8g = 87$

22. $6h + 3.7 = 51.7$

23. $7z - 9.4 = 11.6$

24. $4g + 0.7 = 36.7$

25. $2y - 3 = 9$

26. $6c + 4 = 58$

27. $9d - 8 = 154$

28. $9 + \frac{r}{5} = 15$

29. $\frac{s}{3} - 7 = 7$

30. $\frac{t}{6} + 12 = 24$

31. $74 = 14 + 5k$

32. $79 = 6t + 7$

33. $51 = 4m - 13$

34. $10 = 6 + \frac{t}{8}$

35. $4 = \frac{s}{5} - 16$

36. $\frac{u}{8} + 15 = 27$

37. $6x + 1.2 = 4.2$

38. $8y - 4.6 = 68.2$

39. $10f - 0.5 = 22.5$

40. $0.4m - 2.7 = 11.7$

41. $1.2n + 3.6 = 14.4$

42. $0.93 = 0.15 + 0.3w$

Solving Equations with the Variable on Both Sides

To solve equations with the variable on both sides, first add or subtract to get the variable terms on one side of the equation. Then solve the resulting equation.

Examples 1 Solve $4x + 2 = 5x - 1$.

$$4x + 2 = 5x - 1$$

$$4x + 2 - 5x = 5x - 1 - 5x \quad \text{Subtract } 5x \text{ from each side.}$$

$$-x + 2 = -1$$

$$-x + 2 - 2 = -1 - 2 \quad \text{Subtract 2 from each side.}$$

$$-x = -3$$

$$x = 3 \quad \text{Multiply each side by } -1.$$

2 Solve $3 - 3(y - 4) = 2y + 12$.

$$3 - 3(y - 4) = 2y + 12$$

$$3 - 3y + 12 = 2y + 12 \quad \text{Distributive Property}$$

$$15 - 3y = 2y + 12$$

$$15 - 3y + 3y = 2y + 12 + 3y \quad \text{Add } 3y \text{ to each side.}$$

$$15 = 5y + 12$$

$$15 - 12 = 5y + 12 - 12 \quad \text{Subtract 12 from each side.}$$

$$3 = 5y$$

$$\frac{3}{5} = \frac{5y}{5}$$

$$\frac{3}{5} = y$$

Solve each equation. Check your solution.

1. $8x + 3 = 4x - 1$

2. $9t + 5 = 7 - 2t$

3. $6w + 2 = 4(w - 2)$

4. $4h - 2 = 2h + 18$

5. $4y - 1 = 2y - 7$

6. $5p - 10 = 4p - 33$

7. $9z = 2z - 49$

8. $5r + 22 = 4r + 50$

9. $17 + m = 2m + 8$

Solving Equations with the Variable on Both Sides (continued)

Solve each equation. Check your solution.

10. $-15 + 6a = 5a - 32$ 11. $-14(y + 1) = 142 - 2y$ 12. $6c - 6 = 2(c + 125)$

13. $10s + 30 = 5(s - 25)$ 14. $50 - 5t - 5 = 5t - 105$ 15. $7j + 2 = 2 + 5j - 5$

16. $2(d + 2) = 6 - d$ 17. $14b + 6 = 2(b - 3)$ 18. $10g + 6 = 2 + 3(g + 1)$

19. $8 - 5f = 2f + 4 - 3f$ 20. $4(3s + 2) = 2(2s - 1)$ 21. $6w + 2 = 4(w - 2)$

22. $3(1 - d) = 2 - (2d + 4)$ 23. $5k + 4 = 9 + 2(k - 3)$ 24. $14m - 3 = 7m + 6 - 2m$

25. $3(3d + 2) - 1 = 4d + 2$ 26. $4(2s + 1) - 5 = 6s$ 27. $8x + 3 - 5x = 3 - 2(x + 1)$

28. $3(q + 2) + q = 2q + 5$ 29. $4w + 2 - 5w = 3(2w + 1)$ 30. $2y - 3 + y = 1 - (y + 2)$

Solving Inequalities

Inequalities are sentences that compare two quantities that are not equal. The symbols below are used in inequalities.

Symbols	Words
<	less than
>	greater than
\leq	less than or equal to
\geq	greater than or equal to
\neq	not equal to

Inequalities usually have more than one solution.

Example Solve $2r + 1 > 5$. Show the solution on a number line.

$$2r + 1 - 1 > 5 - 1 \quad \text{Undo addition.}$$

$$2r > 4$$

$$\frac{2r}{2} > \frac{4}{2} \quad \text{Undo multiplication.}$$

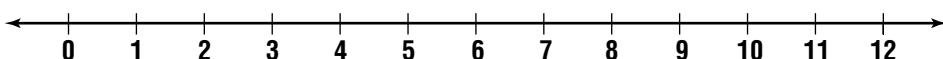
$$r > 2$$

To graph the solution on a number line, draw a circle at 2. Then draw an arrow to show all numbers greater than 2.

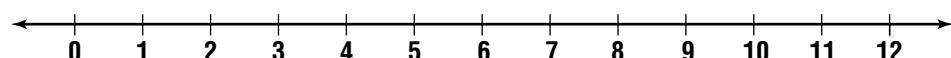


Solve each inequality. Graph the solution on a number line.

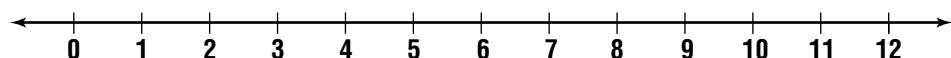
1. $y + 7 < 12$



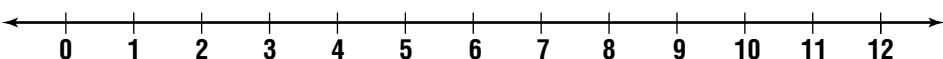
2. $2t - 1 \geq 9$



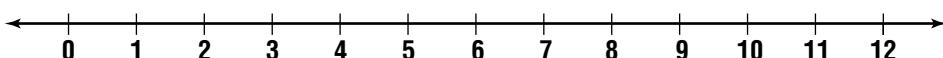
3. $m - 3 < 8$



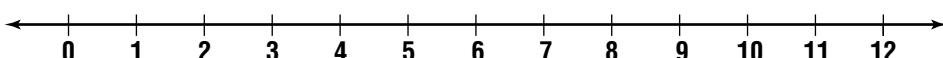
4. $6w > 18$



5. $1 + 2h \leq 15$



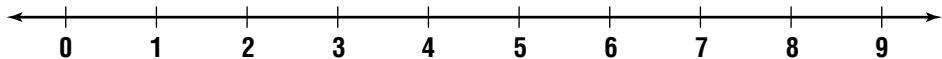
6. $\frac{b}{2} > 3$



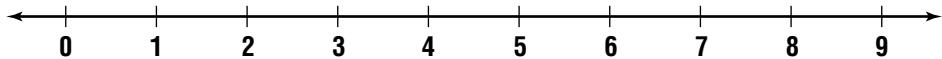
Solving Inequalities (continued)

Solve each inequality. Show the solution on the number line.

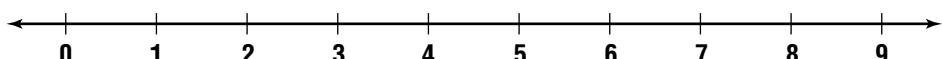
7. $x + 2 > 6$



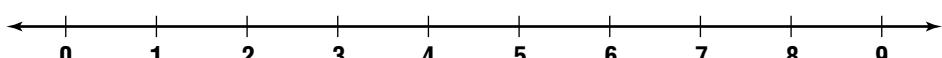
8. $y + 3 < 9$



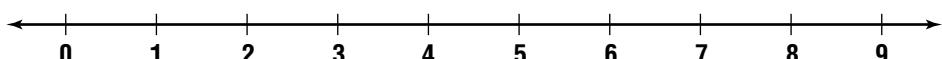
9. $3y \geq 12$



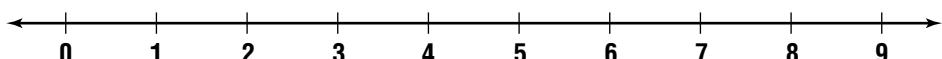
10. $\frac{f}{4} > 2$



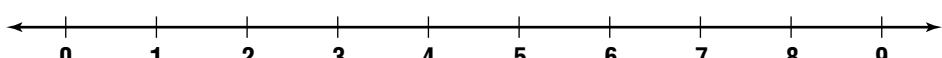
11. $a + 12 < 18$



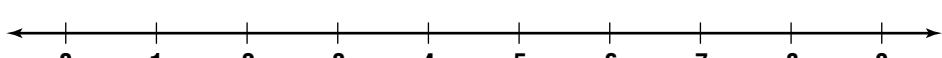
12. $b - 2 \leq 6$



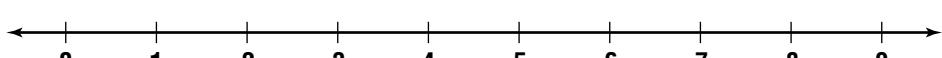
13. $4c \leq 8$



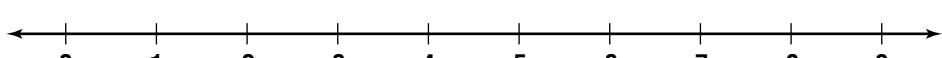
14. $\frac{d}{3} > 3$



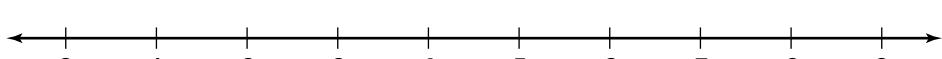
15. $2x + 3 \geq 9$



16. $4y - 6 < 18$



17. $\frac{t}{2} + 6 < 8$



Length in the Customary System

The **inch** is a customary unit of length used in the United States. Other customary units of length are **feet**, **yards**, and **miles**. Customary units of length are related in the following ways.

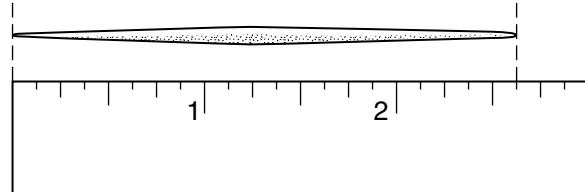
Length
1 foot (ft) = 12 inches (in.)
1 yard (yd) = 36 inches or 3 feet
1 mile (mi) = 5280 feet or 1760 yards

- Examples** 1 Which is the best estimate for the width of a kitchen table: 4 inches, 4 feet, 4 yards, or 4 miles?

The width of a kitchen table is much greater than 4 inches, and much less than 4 miles. So, it is either 4 feet or 4 yards. The length of a 3-ring binder is an estimate for 1 foot. About four 3-ring binders would fit across the table. Therefore, the best estimate is 4 feet.

- 2 Find the length of the toothpick to the nearest eighth inch.

Line up the toothpick with 0 on a ruler. The toothpick is $2\frac{5}{8}$ inches long.



Complete each sentence with the most reasonable unit. Write **inches**, **feet**, **yards**, or **miles**.

1. Chen walked 3 _____ along the hiking path.
2. The length of a bed is 6 _____ .
3. South Carolina is about 285 _____ long.
4. The height of your classroom is about 3 _____ .

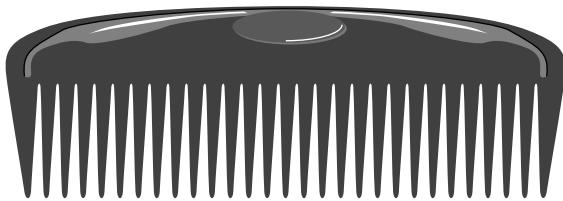
Length in the Customary System (continued)

Circle the best estimate.

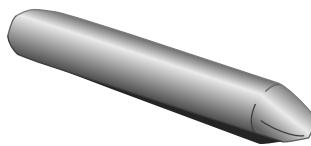
- | | | | |
|--------------------------|--------|-------|-------|
| 5. length of a goldfish | 2 in. | 2 ft | 2 yd |
| 6. width of a driveway | 14 in. | 14 ft | 14 yd |
| 7. height of an elephant | 3 in. | 3 yd | 3 mi |
| 8. width of a TV screen | 15 in. | 15 ft | 15 mi |

Find the length of each object to the nearest eighth inch.

9.



10.



11.



12.



13. Pat is 5 feet tall, and Kay is 58 inches tall. Which of them is taller?

14. Name three objects whose lengths are between 1 foot and 1 yard.

15. Mark an \times in the box that names the best unit for measuring each item. You may choose more than one unit.

Item	inches	feet	yards	miles
height of a student				
width of a book				
distance between cities				
length of a race				

Capacity in the Customary System

Liquid Capacity
1 cup (c) = 8 fluid ounces (fl oz)
1 pint (pt) = 2 cups
1 quart (qt) = 2 pints
1 gallon (gal) = 4 quarts

To change from larger units to smaller units, multiply.

Example 1 $4 \text{ c} = \underline{\hspace{2cm}} \text{ fl oz}$ *Think: Each cup equals 8 fluid ounces.*

$$4 \times 8 = 32 \quad \text{Multiply to change from cups to fluid ounces.}$$

$$4 \text{ c} = 32 \text{ fl oz}$$

To change from smaller units to larger units, divide.

Example 2 $700 \text{ qt} = \underline{\hspace{2cm}} \text{ gal}$ *Think: It takes 4 quarts to make 1 gallon.*

$$700 \div 4 = 175 \quad \text{Divide to change from quarts to gallons.}$$

$$700 \text{ qt} = 175 \text{ gal}$$

Complete.

1. $2 \text{ c} = \underline{\hspace{2cm}} \text{ fl oz}$ 2. $3 \text{ pt} = \underline{\hspace{2cm}} \text{ c}$ 3. $5 \text{ c} = \underline{\hspace{2cm}} \text{ fl oz}$

4. $1.5 \text{ c} = \underline{\hspace{2cm}} \text{ fl oz}$ 5. $10 \text{ pt} = \underline{\hspace{2cm}} \text{ qt}$ 6. $12 \text{ qt} = \underline{\hspace{2cm}} \text{ gal}$

7. $12 \text{ fl oz} = \underline{\hspace{2cm}} \text{ c}$ 8. $24 \text{ c} = \underline{\hspace{2cm}} \text{ pt}$ 9. $7 \text{ c} = \underline{\hspace{2cm}} \text{ fl oz}$

10. $2.5 \text{ pt} = \underline{\hspace{2cm}} \text{ c}$ 11. $1.5 \text{ gal} = \underline{\hspace{2cm}} \text{ qt}$ 12. $3.5 \text{ qt} = \underline{\hspace{2cm}} \text{ pt}$

13. $48 \text{ fl oz} = \underline{\hspace{2cm}} \text{ c}$ 14. $8 \text{ qt} = \underline{\hspace{2cm}} \text{ pt}$ 15. $2 \text{ pt} = \underline{\hspace{2cm}} \text{ c}$

Capacity in the Customary System (continued)

Complete.

16. $6 \text{ pt} = \underline{\hspace{2cm}} \text{ c}$

17. $20 \text{ qt} = \underline{\hspace{2cm}} \text{ gal}$

18. $64 \text{ fl oz} = \underline{\hspace{2cm}} \text{ c}$

19. $7 \text{ c} = \underline{\hspace{2cm}} \text{ fl oz}$

20. $12 \text{ qt} = \underline{\hspace{2cm}} \text{ pt}$

21. $12 \text{ qt} = \underline{\hspace{2cm}} \text{ pt}$

22. $8 \text{ gal} = \underline{\hspace{2cm}} \text{ qt}$

23. $9 \text{ pt} = \underline{\hspace{2cm}} \text{ c}$

24. $72 \text{ fl oz} = \underline{\hspace{2cm}} \text{ c}$

25. $4 \text{ c} = \underline{\hspace{2cm}} \text{ fl oz}$

26. $14 \text{ c} = \underline{\hspace{2cm}} \text{ pt}$

27. $26 \text{ pt} = \underline{\hspace{2cm}} \text{ qt}$

28. $10 \text{ qt} = \underline{\hspace{2cm}} \text{ gal}$

29. $2 \text{ gal} = \underline{\hspace{2cm}} \text{ qt}$

30. $18 \text{ pt} = \underline{\hspace{2cm}} \text{ c}$

31. $3\frac{1}{2} \text{ c} = \underline{\hspace{2cm}} \text{ fl oz}$

32. $128 \text{ c} = \underline{\hspace{2cm}} \text{ gal}$

33. $96 \text{ qt} = \underline{\hspace{2cm}} \text{ gal}$

34. $21 \text{ qt} = \underline{\hspace{2cm}} \text{ pt}$

35. $750 \text{ pt} = \underline{\hspace{2cm}} \text{ qt}$

36. $3 \text{ qt} = \underline{\hspace{2cm}} \text{ fl oz}$

37. $15 \text{ pt} = \underline{\hspace{2cm}} \text{ qt}$

38. $7 \text{ gal} = \underline{\hspace{2cm}} \text{ qt}$

39. $2 \text{ gal} = \underline{\hspace{2cm}} \text{ c}$

40. $19 \text{ c} = \underline{\hspace{2cm}} \text{ pt}$

41. $4 \text{ qt} = \underline{\hspace{2cm}} \text{ c}$

42. $17 \text{ c} = \underline{\hspace{2cm}} \text{ q}$

43. $6 \text{ gal} = \underline{\hspace{2cm}} \text{ qt}$

44. $104 \text{ fl oz} = \underline{\hspace{2cm}} \text{ c}$

45. $64 \text{ pt} = \underline{\hspace{2cm}} \text{ gal}$

Weight in the Customary System

The most commonly used customary units of weight are **ounce**, **pound**, and **ton**.

Weight
1 pound (lb) = 16 ounces (oz)
1 ton (T) = 2000 pounds

To change from larger units to smaller units, multiply.

Example 1 A small car weighs 1.2 tons. How many pounds does the car weigh?

Since there are 2000 pounds in a ton, multiply 1.2 by 2000 to find the weight in pounds.

$$1.2 \text{ T} = \underline{\hspace{2cm}} \text{ lb}$$

$$1.2 \text{ T} = 1.2 \times 2000 \text{ lb}$$

$$1.2 \text{ T} = 2400 \text{ lb}$$

The car weighs 2400 pounds.

To change from smaller units to larger units, divide.

Example 2 $72 \text{ oz} = \underline{\hspace{2cm}} \text{ lb}$

$72 \div 16 = 4.5$ Divide to change from ounces to pounds.

$$72 \text{ oz} = 4.5 \text{ lb}$$

Complete.

1. $3 \text{ lb} = \underline{\hspace{2cm}} \text{ oz}$

2. $4 \text{ T} = \underline{\hspace{2cm}} \text{ lb}$

3. $1.25 \text{ lb} = \underline{\hspace{2cm}} \text{ oz}$

4. $3.2 \text{ T} = \underline{\hspace{2cm}} \text{ lb}$

5. $6000 \text{ lb} = \underline{\hspace{2cm}} \text{ T}$

6. $32 \text{ oz} = \underline{\hspace{2cm}} \text{ lb}$

7. $9000 \text{ lb} = \underline{\hspace{2cm}} \text{ T}$

8. $\frac{1}{2} \text{ lb} = \underline{\hspace{2cm}} \text{ oz}$

9. $0.75 \text{ T} = \underline{\hspace{2cm}} \text{ lb}$

10. $56 \text{ oz} = \underline{\hspace{2cm}} \text{ lb}$

11. $3.125 \text{ lb} = \underline{\hspace{2cm}} \text{ oz}$

12. $8.05 \text{ T} = \underline{\hspace{2cm}} \text{ lb}$

Weight in the Customary System (continued)

Complete.

13. $70 \text{ oz} = \underline{\hspace{2cm}} \text{ lb}$

14. $5\frac{1}{4} \text{ lb} = \underline{\hspace{2cm}} \text{ oz}$

15. $5800 \text{ lb} = \underline{\hspace{2cm}} \text{ T}$

16. $18 \text{ oz} = \underline{\hspace{2cm}} \text{ lb } \underline{\hspace{2cm}} \text{ oz}$

17. $91 \text{ oz} = \underline{\hspace{2cm}} \text{ lb } \underline{\hspace{2cm}} \text{ oz}$

18. $7 \text{ lb } 5 \text{ oz} = \underline{\hspace{2cm}} \text{ oz}$

19. $2 \text{ lb } 7 \text{ oz} = \underline{\hspace{2cm}} \text{ oz}$

20. $133 \text{ oz} = \underline{\hspace{2cm}} \text{ lb } \underline{\hspace{2cm}} \text{ oz}$

Honey is sold in 3-pound jars. Use this information to answer Exercises 21–23.

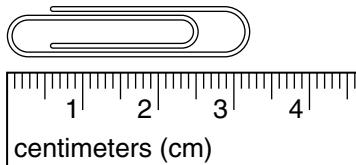
21. How many 12-ounce containers can be filled from one jar of honey?
22. How many 8-ounce containers can be filled from two jars of honey?
23. How many 14-ounce containers can be filled from three jars of honey? Will there be enough honey left over to fill an 8-ounce container?
24. The oil tanker *Jahre Viking* is the heaviest ship ever built. When fully loaded, it weighs 622,420 long tons. If one long ton is equal to 2,240 pounds, what is the weight of the ship in pounds?
25. Juanita made a batch of brownies. The brownies weigh $2\frac{1}{2}$ pounds. How many 2-ounce brownies can she cut from this batch?
26. Find the weight of a full container of one of your favorite foods. What part of the food in a full container do you usually eat in one serving? About how many ounces do you usually eat?

Length in the Metric System

The **meter** is the basic unit of length in the metric system. Other metric units of length are **millimeters**, **centimeters**, and **kilometers**. Metric units of length are related in the following ways.

Length
1 millimeter (mm) = 0.001 meter (m)
1 centimeter (cm) = 0.01 meter
1 kilometer (km) = 1,000 meters

Example The metric ruler shown below can be used to measure the length of the paper clip in centimeters and in millimeters.



Centimeters The distance between two numbered marks is a centimeter. Each centimeter is divided into tenths. Therefore, the paper clip is about 3.2 centimeters long.

Millimeters The distance between two smaller marks is a millimeter. There are 10 millimeters in one centimeter. Therefore, the paper clip is about 32 millimeters long.

Complete each sentence with the most reasonable unit.

Write millimeters, centimeters, meters, or kilometers.

1. Jack rode 5 _____ along the bike trail.
2. The length of the room is about 6 _____ .
3. The width of a kite is about 85 _____ .
4. The button from your coat is about 5 _____ thick.

Length in the Metric System (continued)

Circle the best estimate.

- | | | | |
|--------------------------------|--------|-------|--------|
| 5. length of a river | 500 cm | 500 m | 500 km |
| 6. length of a quilt | 2.5 cm | 2.5 m | 2.5 km |
| 7. diameter of a CD | 12 mm | 12 cm | 12 m |
| 8. thickness of a rope | 9 mm | 9 cm | 9 m |
| 9. diameter of a bicycle wheel | 65 cm | 65 m | 65 km |
| 10. length of a bolt | 20 cm | 20 m | 20 mm |
| 11. length of a bus route | 15 cm | 15 m | 15 km |

Find the length of each object in centimeters and millimeters.

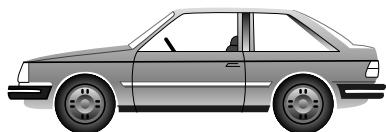
12.



13.



14.



15.



16. Name three objects whose lengths are between 1 centimeter and 1 meter.

17. Estimate the length of your pencil in centimeters. Then measure to check your estimate.

18. Juan ran 0.5 kilometers and Maria ran 600 meters. Who ran farther?

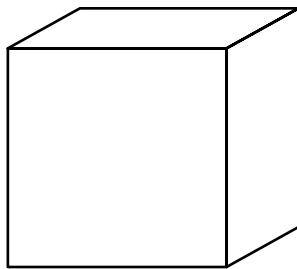
19. Mrs. Miller bought 2.75 meters of blue ribbon and 3.75 meters of red ribbon. How many meters of ribbon did she buy in all?

Capacity in the Metric System

Capacity describes the amount a container will hold.

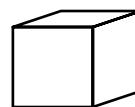
In the metric system, the basic unit of capacity is the **liter** (L).

A 10-centimeter cube has a capacity of 1 L.



A milliliter (mL) is 0.001 of a liter. 1,000 milliliters equal 1 liter.

A 1-centimeter cube has a capacity of 1 mL.



A kiloliter (kL) is 1000 liters.

Units may be changed by multiplying or dividing by multiples of 10.

Examples

1 $3500 \text{ mL} = \underline{\hspace{2cm}} \text{ L}$

$1000 \text{ mL} = 1 \text{ L}$

Divide 3500 by 1000.

$3500 \text{ mL} = 3.5 \text{ L}$

2 $7.6 \text{ kL} = \underline{\hspace{2cm}} \text{ L}$

$1\text{kL} = 1000 \text{ L}$

Multiply 7.6 by 1000.

$7.6 \text{ kL} = 7600 \text{ L}$

Write the unit that you would use to measure the capacity of each of the following.

1. a swimming pool
2. a spoonfull of medicine
3. a pail
4. a bottle of milk
5. a tea pot
6. the liquid in a test tube
7. a glass of juice
8. hot chocolate in a large thermos
9. a cup of hot cider
10. the water in an aquarium
11. a can of soup
12. the water in a team's cooler
13. a bottle of expensive perfume
14. the water in a washing machine

Capacity in the Metric System (continued)

The metric system is a base-10 system. The **meter** is the basic unit of length. The **liter** is the basic unit of capacity. The **gram** is the basic unit of mass.

Prefix	Meaning	Length	Capacity	Mass
kilo-	1,000	kilometer (km)	kiloliter (kL)	kilogram (kg)
hecto-	100	hectometer (hm)	hectoliter (hL)	hectogram (hg)
deka-	10	dekameter (dam)	dekaliter (daL)	dekagram (dag)
basic unit	1	meter (m)	liter (L)	gram (g)
deci-	0.1	decimeter (dm)	deciliter (dL)	decigram (dg)
centi-	0.01	centimeter (cm)	centiliter (cL)	centigram (cg)
milli-	0.001	millimeter (mm)	milliliter (mL)	milligram (mg)

Write whether you multiply or divide to change each measurement. Then complete.

15. $6.21 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$

16. $890 \text{ mL} = \underline{\hspace{2cm}} \text{ L}$

17. $53.7 \text{ mL} = \underline{\hspace{2cm}} \text{ L}$

18. $3.72 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$

19. $\underline{\hspace{2cm}} \text{ cm} = 9.75 \text{ m}$

20. $0.018 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$

21. $\underline{\hspace{2cm}} \text{ g} = 0.56 \text{ kg}$

22. $2.4 \text{ m} = \underline{\hspace{2cm}} \text{ mm}$

23. $\underline{\hspace{2cm}} \text{ mL} = 9.3 \text{ L}$

24. $0.89 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$

25. $0.085 \text{ g} = \underline{\hspace{2cm}} \text{ mg}$

26. $\underline{\hspace{2cm}} \text{ km} = 7,124 \text{ m}$

27. $609 \text{ mg} = \underline{\hspace{2cm}} \text{ g}$

28. $\underline{\hspace{2cm}} \text{ L} = 38 \text{ mL}$

29. $150 \text{ cm} = \underline{\hspace{2cm}} \text{ mm}$

30. $\underline{\hspace{2cm}} \text{ cm} = 40 \text{ mm}$

31. $\underline{\hspace{2cm}} \text{ m} = 7 \text{ km}$

32. $\underline{\hspace{2cm}} \text{ mL} = 0.0817 \text{ L}$

33. $480 \text{ mL} = \underline{\hspace{2cm}} \text{ L}$

34. $\underline{\hspace{2cm}} \text{ mm} = 53 \text{ cm}$

35. $\underline{\hspace{2cm}} \text{ g} = 3,020 \text{ mg}$

36. $26 \text{ km} = \underline{\hspace{2cm}} \text{ m}$

37. $6.1 \text{ mm} = \underline{\hspace{2cm}} \text{ m}$

38. $3.904 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$

Mass in the Metric System

The basic unit of mass in the metric system is the **gram (g)**. A **kilogram (kg)** is 1000 grams. A **milligram (mg)** is 0.001 gram.

Examples Jacob is filling small boxes with raisins. Each small box will hold 50 grams of raisins.

1 How many kilograms is one small box of raisins?

You need to change 50 grams to kilograms.

$$50 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$$

$50 \div 1000 = 0.05$ Divide to change from smaller units to larger units.

$$50 \text{ g} = 0.05 \text{ kg}$$

2 How many small boxes can he fill using a 4-kilogram bag of raisins?

To answer this question, first change 4 kilograms to grams.

$$4 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$$

$4 \text{ kg} = 4 \times 1000 \text{ g}$ Multiply to change from larger units to smaller units.

$$4 \text{ kg} = 4000 \text{ g}$$

Then divide 4000 grams by 50 grams to find the number of small boxes that can be filled. Since $4000 \div 50 = 80$, Jacob can fill 80 small boxes with raisins.

Complete.

1. $5 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$

2. $16 \text{ g} = \underline{\hspace{2cm}} \text{ mg}$

3. $120 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$

4. $180 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$

5. $150 \text{ mg} = \underline{\hspace{2cm}} \text{ g}$

6. $0.6 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$

7. $500 \text{ mg} = \underline{\hspace{2cm}} \text{ g}$

8. $0.005 \text{ g} = \underline{\hspace{2cm}} \text{ mg}$

9. $0.7 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$

Mass in the Metric System (continued)

Complete.

10. $60,000 \text{ mg} = \underline{\hspace{2cm}} \text{ g}$ 11. $5.6 \text{ g} = \underline{\hspace{2cm}} \text{ mg}$ 12. $7,800 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$
13. $1,500 \text{ mg} = \underline{\hspace{2cm}} \text{ g}$ 14. $0.003 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$ 15. $2.002 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$
16. $8,500 \text{ mg} = \underline{\hspace{2cm}} \text{ kg}$ 17. $0.009 \text{ kg} = \underline{\hspace{2cm}} \text{ mg}$ 18. $1.018 \text{ kg} = \underline{\hspace{2cm}} \text{ mg}$

The USDA term “Lean” is used on meat and poultry products. It means that, per serving of the product, there are less than 10 grams of fat and 95 milligrams of cholesterol. Use this information to answer Exercises 19–25.

19. How many milligrams of fat are there per serving of a lean product?
20. How many kilograms of fat are there per serving of a lean product?
21. Do you think it is better to give the amount of fat in milligrams, grams, or kilograms? Why?
22. How many grams of cholesterol are there per serving of a lean product?
23. How many kilograms of cholesterol are there per serving of a lean product?
24. Do you think it is better to give the amount of cholesterol in milligrams, grams, or kilograms? Why?
25. Suppose that a package of meat contains 8 servings and is labeled “Lean.” What is the maximum number of grams of cholesterol the meat can contain?
26. How many 30-gram servings are contained in a box of cereal that has a mass of 0.403 kilograms?

Converting Customary Units to Metric Units

You can use the following chart to convert customary units to metric units.

Customary Unit	Metric Unit
1 in.	2.54 cm
1 ft	30.48 cm or 0.3048 m
1 yd	0.914 m
1 mi	1.609 km
1 oz	28.350 g
1 lb	454 g or 0.454 kg
1 fl oz	29.574 mL
1 qt	0.946 L
1 gal	3.785 L

Examples 1 $4 \text{ ft} = \underline{\hspace{2cm}} \text{ cm}$

$$4 \times 30.48 = 121.92 \quad 1 \text{ ft} = 30.48 \text{ cm, so multiply by 30.48.}$$

$$4 \text{ ft} = 121.92 \text{ cm}$$

2 $3\frac{1}{2} \text{ gal} = \underline{\hspace{2cm}} \text{ L}$

$$3\frac{1}{2} \times 3.785 = 3.5 \times 3.785 \\ = 13.2475 \quad 1 \text{ gal} = 3.785 \text{ L, so multiply by 3.785.}$$

$$3\frac{1}{2} \text{ gal} = 13.2475 \text{ L}$$

3 $2.5 \text{ lb} = \underline{\hspace{2cm}} \text{ kg}$

$$2.5 \times 0.454 = 1.135 \quad 1 \text{ lb} = 0.454 \text{ kg, so multiply by 0.454.}$$

$$2.5 \text{ lb} = 1.135 \text{ kg}$$

Complete.

1. $6 \text{ in.} = \underline{\hspace{2cm}} \text{ cm}$ 2. $8 \text{ oz} = \underline{\hspace{2cm}} \text{ g}$ 3. $3 \text{ qt} = \underline{\hspace{2cm}} \text{ L}$

4. $5 \text{ mi} = \underline{\hspace{2cm}} \text{ km}$ 5. $2 \text{ gal} = \underline{\hspace{2cm}} \text{ L}$ 6. $36 \text{ oz} = \underline{\hspace{2cm}} \text{ g}$

7. $10 \text{ fl oz} = \underline{\hspace{2cm}} \text{ mL}$ 8. $7 \text{ lb} = \underline{\hspace{2cm}} \text{ g}$ 9. $5 \text{ yd} = \underline{\hspace{2cm}} \text{ m}$

Converting Customary Units to Metric Units (continued)

Complete.

10. $4.5 \text{ in.} = \underline{\hspace{2cm}} \text{ cm}$

11. $14 \text{ ft} = \underline{\hspace{2cm}} \text{ m}$

12. $7 \text{ qt} = \underline{\hspace{2cm}} \text{ L}$

13. $10 \text{ fl oz} = \underline{\hspace{2cm}} \text{ mL}$

14. $12 \text{ lb} = \underline{\hspace{2cm}} \text{ kg}$

15. $8 \text{ mi} = \underline{\hspace{2cm}} \text{ km}$

16. $2.5 \text{ ft} = \underline{\hspace{2cm}} \text{ m}$

17. $3.5 \text{ gal} = \underline{\hspace{2cm}} \text{ L}$

18. $5\frac{1}{4} \text{ mi} = \underline{\hspace{2cm}} \text{ km}$

19. $3.25 \text{ yd} = \underline{\hspace{2cm}} \text{ m}$

20. $16 \text{ lb} = \underline{\hspace{2cm}} \text{ kg}$

21. $18 \text{ fl oz} = \underline{\hspace{2cm}} \text{ L}$

22. $2\frac{1}{8} \text{ mi} = \underline{\hspace{2cm}} \text{ km}$

23. $2\frac{3}{4} \text{ ft} = \underline{\hspace{2cm}} \text{ cm}$

24. $5.5 \text{ qt} = \underline{\hspace{2cm}} \text{ L}$

25. $9 \text{ fl oz} = \underline{\hspace{2cm}} \text{ mL}$

26. $12 \text{ qt} = \underline{\hspace{2cm}} \text{ L}$

27. $224 \text{ mi} = \underline{\hspace{2cm}} \text{ km}$

28. $16 \text{ yd} = \underline{\hspace{2cm}} \text{ m}$

29. $12.35 \text{ lb} = \underline{\hspace{2cm}} \text{ kg}$

30. $16 \text{ qt} = \underline{\hspace{2cm}} \text{ L}$

31. $360.5 \text{ mi} = \underline{\hspace{2cm}} \text{ km}$

32. $24 \text{ fl oz} = \underline{\hspace{2cm}} \text{ mL}$

33. $2.5 \text{ lb} = \underline{\hspace{2cm}} \text{ kg}$

Converting Metric Units to Customary Units

You can use the following chart to convert customary units to metric units.

Metric Unit	Customary Unit
1 cm	0.394 in.
1 m	3.281 ft or 1.093 yd
1 km	0.621 mi
1 g	0.035 oz
1 kg	2.205 lb
1 mL	0.034 fl oz
1 L	1.057 qt or 0.264 gal

Examples 1 $4 \text{ cm} = \underline{\hspace{1cm}}$ in.

$$4 \times 0.394 = 1.576 \quad 1 \text{ cm} = 0.394 \text{ in.}, \text{ so multiply by } 0.394.$$

$$4 \text{ cm} = 1.576 \text{ in.}$$

2 $150 \text{ g} = \underline{\hspace{1cm}}$ oz

$$150 \times 0.035 = 5.25 \quad 1 \text{ g} = 0.035 \text{ oz}, \text{ so multiply by } 0.035.$$

$$150 \text{ g} = 5.25 \text{ oz}$$

3 $2.5 \text{ L} = \underline{\hspace{1cm}}$ qt

$$2.5 \times 1.057 = 2.6425 \quad 1 \text{ L} = 1.057 \text{ qt}, \text{ so multiply by } 1.057.$$

$$2.5 \text{ L} = 2.6425 \text{ qt}$$

Complete.

1. $6 \text{ cm} = \underline{\hspace{1cm}}$ in.

2. $888 \text{ g} = \underline{\hspace{1cm}}$ oz

3. $5 \text{ L} = \underline{\hspace{1cm}}$ qt

4. $5 \text{ km} = \underline{\hspace{1cm}}$ mi

5. $4 \text{ L} = \underline{\hspace{1cm}}$ gal

6. $200 \text{ g} = \underline{\hspace{1cm}}$ oz

7. $175 \text{ mL} = \underline{\hspace{1cm}}$ fl oz

8. $8 \text{ km} = \underline{\hspace{1cm}}$ mi

9. $3 \text{ m} = \underline{\hspace{1cm}}$ yd

10. $4.5 \text{ km} = \underline{\hspace{1cm}}$ mi

11. $12 \text{ mL} = \underline{\hspace{1cm}}$ fl oz

12. $6.5 \text{ L} = \underline{\hspace{1cm}}$ gal

Converting Metric Units to Customary Units (continued)

Complete.

13. $6.5 \text{ m} = \underline{\hspace{2cm}}$ ft 14. $3.3 \text{ m} = \underline{\hspace{2cm}}$ yd 15. $6.5 \text{ L} = \underline{\hspace{2cm}}$ qt
16. $245 \text{ mL} = \underline{\hspace{2cm}}$ fl oz 17. $18 \text{ kg} = \underline{\hspace{2cm}}$ lb 18. $4.25 \text{ m} = \underline{\hspace{2cm}}$ ft
19. $16.5 \text{ km} = \underline{\hspace{2cm}}$ mi 20. $12 \text{ L} = \underline{\hspace{2cm}}$ gal 21. $25 \text{ g} = \underline{\hspace{2cm}}$ oz
22. $3.25 \text{ m} = \underline{\hspace{2cm}}$ ft 23. $16 \text{ kg} = \underline{\hspace{2cm}}$ lb 24. $18 \text{ L} = \underline{\hspace{2cm}}$ gal
25. $3.65 \text{ km} = \underline{\hspace{2cm}}$ mi 26. $2.8 \text{ cm} = \underline{\hspace{2cm}}$ in. 27. $5.5 \text{ L} = \underline{\hspace{2cm}}$ qt
28. $90 \text{ mL} = \underline{\hspace{2cm}}$ fl oz 29. $12.9 \text{ L} = \underline{\hspace{2cm}}$ gal 30. $228 \text{ km} = \underline{\hspace{2cm}}$ mi
31. $16 \text{ m} = \underline{\hspace{2cm}}$ yd 32. $12.35 \text{ kg} = \underline{\hspace{2cm}}$ lb 33. $20.5 \text{ L} = \underline{\hspace{2cm}}$ qt
34. $8 \text{ cm} = \underline{\hspace{2cm}}$ in. 35. $12.5 \text{ m} = \underline{\hspace{2cm}}$ yd 36. $24 \text{ g} = \underline{\hspace{2cm}}$ oz
37. $4.25 \text{ L} = \underline{\hspace{2cm}}$ qt 38. $80 \text{ kg} = \underline{\hspace{2cm}}$ lb 39. $1.8 \text{ m} = \underline{\hspace{2cm}}$ ft

**SKILL
53**

Name _____ Date _____ Period _____

Adding and Subtracting Units of Time

To add units of time, add the seconds, add the minutes, and add the hours.
Rename if necessary.

$$\begin{aligned}1 \text{ hour (h)} &= 60 \text{ minutes (min)} \\1 \text{ minute (min)} &= 60 \text{ seconds (s)}\end{aligned}$$

Example 1 4 h 25 min 40 s
+ 5 h 30 min 25 s

$$\begin{aligned}9 \text{ h } 55 \text{ min } 65 \text{ s} &= 9 \text{ h } 55 \text{ min } + 1 \text{ min } 5 \text{ s} && \text{Rename } 65 \text{ s as } 1 \text{ min } 5 \text{ s.} \\&= 9 \text{ h } 56 \text{ min } 5 \text{ s}\end{aligned}$$

To subtract measures of time, rename if necessary.
Then subtract seconds, subtract minutes, and subtract hours.

Example 2 7 h 15 min 40 s
- 3 h 20 min 10 s

$$\begin{array}{r}7 \text{ h } 15 \text{ min } 40 \text{ s} \\- 3 \text{ h } 20 \text{ min } 10 \text{ s} \\ \hline \end{array}$$

You cannot subtract 20 min from 15 min.

*Rename 7 h 15 min as 6 h 75 min.
Then subtract.*

Complete.

1. $14 \text{ min } 85 \text{ s} = \underline{\hspace{2cm}} \text{ min } 25 \text{ s}$

2. $9 \text{ h } 5 \text{ min} = 8 \text{ h } \underline{\hspace{2cm}} \text{ min}$

3. $3 \text{ h } 20 \text{ min } 7 \text{ s} = 3 \text{ h } \underline{\hspace{2cm}} \text{ min } 67 \text{ s}$

4. $7 \text{ h } 9 \text{ min } 25 \text{ s} = 6 \text{ h } \underline{\hspace{2cm}} \text{ min } 25 \text{ s}$

5. $9 \text{ h } 24 \text{ min} = 8 \text{ h } \underline{\hspace{2cm}} \text{ min}$

6. $15 \text{ min } 95 \text{ s} = \underline{\hspace{2cm}} \text{ min } 35 \text{ s}$

7. $12 \text{ h } 108 \text{ min} = \underline{\hspace{2cm}} \text{ h } 48 \text{ min}$

8. $20 \text{ min } 54 \text{ s} = 19 \text{ min } \underline{\hspace{2cm}} \text{ s}$

9. $3 \text{ h } 12 \text{ min } 6 \text{ s} = \underline{\hspace{2cm}} \text{ h } 72 \text{ min } 6 \text{ s}$

10. $7 \text{ h } 46 \text{ min } 15 \text{ s} = 6 \text{ h } \underline{\hspace{2cm}} \text{ min } 75 \text{ s}$

Adding and Subtracting Units of Time (*continued*)

Add or subtract. Rename if necessary.

11.
$$\begin{array}{r} 6 \text{ h } 20 \text{ min} \\ - 3 \text{ h } 17 \text{ min} \\ \hline \end{array}$$

12.
$$\begin{array}{r} 35 \text{ min } 45 \text{ s} \\ + 12 \text{ min } 12 \text{ s} \\ \hline \end{array}$$

13.
$$\begin{array}{r} 12 \text{ h } 15 \text{ s} \\ + 10 \text{ h } 55 \text{ s} \\ \hline \end{array}$$

14.
$$\begin{array}{r} 9 \text{ h } 45 \text{ min } 10 \text{ s} \\ - 3 \text{ h } 30 \text{ min } 50 \text{ s} \\ \hline \end{array}$$

15.
$$\begin{array}{r} 1 \text{ h } 55 \text{ min } 12 \text{ s} \\ + 3 \text{ h } 25 \text{ min } 34 \text{ s} \\ \hline \end{array}$$

16.
$$\begin{array}{r} 7 \text{ h } 20 \text{ min} \\ - 2 \text{ h } 9 \text{ min } 10 \text{ s} \\ \hline \end{array}$$

17.
$$\begin{array}{r} 9 \text{ h } 42 \text{ min} \\ - 3 \text{ h } 18 \text{ min} \\ \hline \end{array}$$

18.
$$\begin{array}{r} 23 \text{ min } 16 \text{ s} \\ + 12 \text{ min } 34 \text{ s} \\ \hline \end{array}$$

19.
$$\begin{array}{r} 6 \text{ h } 38 \text{ min} \\ + 5 \text{ h } 22 \text{ min} \\ \hline \end{array}$$

20.
$$\begin{array}{r} 18 \text{ h } 27 \text{ min} \\ - 9 \text{ h } 52 \text{ min} \\ \hline \end{array}$$

21.
$$\begin{array}{r} 45 \text{ min } 17 \text{ s} \\ - 39 \text{ min } 50 \text{ s} \\ \hline \end{array}$$

22.
$$\begin{array}{r} 8 \text{ h } 49 \text{ min} \\ + 7 \text{ h } 35 \text{ min} \\ \hline \end{array}$$

23.
$$\begin{array}{r} 21 \text{ min } 54 \text{ s} \\ + 26 \text{ min } 19 \text{ s} \\ \hline \end{array}$$

24.
$$\begin{array}{r} 14 \text{ h} \\ - 9 \text{ h } 43 \text{ min} \\ \hline \end{array}$$

25.
$$\begin{array}{r} 51 \text{ min } 6 \text{ s} \\ - 37 \text{ min } 48 \text{ s} \\ \hline \end{array}$$

26.
$$\begin{array}{r} 32 \text{ min} \\ - 14 \text{ min } 16 \text{ s} \\ \hline \end{array}$$

27.
$$\begin{array}{r} 13 \text{ h } 41 \text{ min} \\ + 6 \text{ h } 19 \text{ min} \\ \hline \end{array}$$

28.
$$\begin{array}{r} 38 \text{ min } 48 \text{ s} \\ + 29 \text{ min } 12 \text{ s} \\ \hline \end{array}$$

29.
$$\begin{array}{r} 11 \text{ h } 23 \text{ min } 6 \text{ s} \\ - 5 \text{ h } 36 \text{ min } 29 \text{ s} \\ \hline \end{array}$$

30.
$$\begin{array}{r} 6 \text{ h } 10 \text{ min } 47 \text{ s} \\ + 2 \text{ h } 51 \text{ min } 28 \text{ s} \\ \hline \end{array}$$

31.
$$\begin{array}{r} 20 \text{ h} \\ - 8 \text{ h } 33 \text{ min } 18 \text{ s} \\ \hline \end{array}$$

Find the elapsed time.

32. 6:35 A.M. to 9:55 A.M.

33. 12:20 P.M. to 3:05 P.M.

34. 10:45 A.M. to 5:25 P.M.

35. 8:10 P.M. to 1:15 A.M.

36. 11:50 A.M. to 7:25 P.M.

37. 2:40 P.M. to 4:35 P.M.

Probability

If you roll a cube with the numbers 1 through 6 on the faces, there are six possible outcomes: 1, 2, 3, 4, 5, and 6. Each of the outcomes is equally likely to occur. A particular outcome, such as rolling a 5, is an event. Probability is the chance that the event will occur.

$$\text{probability} = \frac{\text{number of ways an event can occur}}{\text{number of possible outcomes}}$$

Rolling a 5 can occur 1 way out of 6 possible outcomes. So, $P(5) = \frac{1}{6}$.

Examples Balls numbered 1 through 25 are placed in a box and one is drawn at random. Find each probability.

1 probability of drawing a 12

$$P(12) = \frac{\text{number of ways 12 can occur}}{\text{number of possible outcomes}} \\ = \frac{1}{25}$$

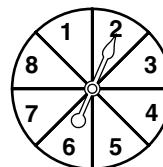
2 probability of drawing an odd number

The odd numbers are 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, and 25. There are thirteen balls with an odd number.

$$P(\text{odd}) = \frac{\text{number of ways an odd number can occur}}{\text{number of possible outcomes}} \\ = \frac{13}{25}$$

The spinner shown is equally likely to stop on each of the regions. Find the probability that the spinner will stop on each of the following.

- | | |
|----------------------------|--------------------|
| 1. a number less than 5 | 2. an even number |
| 3. a number greater than 5 | 4. a multiple of 4 |
| 5. a factor of 8 | 6. 7 |



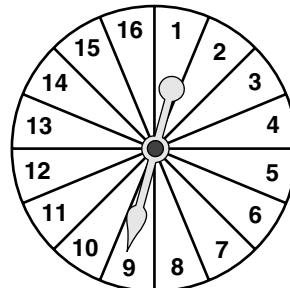
A drawer contains 4 blue socks, 8 black socks, and 10 white socks. If one sock is taken out of the drawer without looking, find the probability that each of the following will be drawn. Express each ratio as a fraction in simplest form.

- | | |
|-----------------------------|----------------------------|
| 7. a blue sock | 8. a black sock |
| 9. a white sock | 10. a blue or a black sock |
| 11. a black or a white sock | 12. a blue or a white sock |

Probability (*continued*)

The spinner shown is equally likely to stop on each of its regions numbered 1 to 16. Find the probability that the spinner will stop on each of the following.

13. an even number 14. a prime number
 15. a factor of 10 16. a number less than 7
 17. a multiple of 3 18. the GCF of 10 and 15



A bag of marbles contains 3 yellow, 6 blue, 1 green, 12 white, and 8 black marbles. If you reach in the bag and draw one marble at random, what is the probability that you will draw each of the following? Express each ratio as a fraction in simplest form and as a percent.

19. a yellow marble 20. a white marble 21. a blue marble
 22. either a black or a green marble 23. a white or a blue marble

A package of candy contains 14 cherry, 16 orange, 10 lemon, and 10 lime flavored candies. If you reach in the package and draw one piece of candy at random, what is the probability that you will select each of the following? Express each ratio as a fraction in simplest form and as a percent.

24. a lemon candy 25. an orange candy 26. a cherry candy
 27. an orange or lemon candy 28. a lime, lemon, or cherry candy
 29. any candy 30. a candy that is not lemon, lime or cherry

Reading Graphs

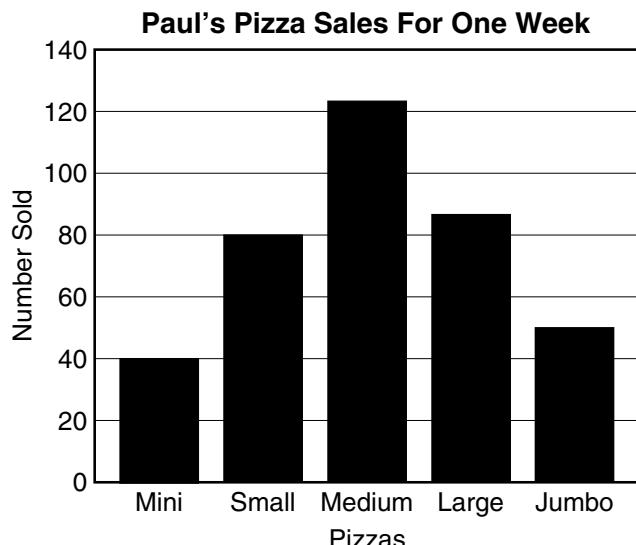
The bar graph shows the pizza sales at Paul's Pizza for one week.

Example About how many more medium pizzas than mini pizzas did Paul sell that week?

Examine the scale showing the number of pizzas. Paul sold about 125 medium pizzas and about 40 mini pizzas.

$$125 - 40 = 85$$

Paul sold about 85 more medium pizzas than mini pizzas.



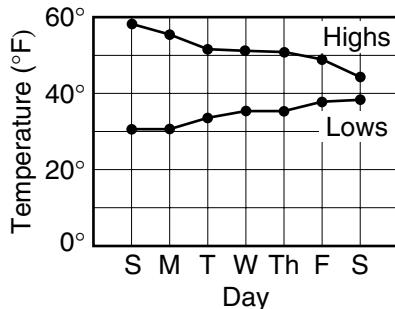
Use the graph in the example to answer Exercises 1–4.

1. About how many more large pizzas than jumbo pizzas were sold?
2. What size pizzas sold about twice as many as the mini pizzas?
3. Which two sizes of pizza sold about the same number?
4. About how many pizzas were sold for the week?

Reading Graphs (continued)

The high and low temperatures of Springfield for the past week are shown in the line graph at the right. Use this information to answer Exercises 5–8.

5. Which day had the lowest high temperature?
6. Which day had the greatest difference between the high and the low temperatures?
7. What was the difference between the high and the low temperatures on Thursday?
8. Summarize the information shown in the graph.



The circle graphs show the weekly budgets for Chico and Ling. Use the graphs to answer Exercises 9–13.

9. On which budget item does Chico spend the most amount of money?
10. On which budget item does Ling spend the least amount of money?
11. How does Ling's budget for recreation compare to Chico's budget for recreation?
12. If Chico earns \$30.00 per week, how much of his earnings does he save?
13. If Ling earns \$10.00 more per week than Chico, how much of her earnings does she spend on clothing?

