Mixed Problem Solving

Chapter 1 The Language of Algebra (pages 4–65)

GEOMETRY **For Exercises 1 and 2, use the following information.**
The surface area of a cone is the sum of the product of π and the radius r squared, and the product of π, the radius r, and the slant height ℓ. *(Lesson 1-1)*

1. Write an expression that represents the surface area of the cone.
2. Suppose the radius and the slant height of a cone have the same measure r. Write an expression that represents the surface area of this cone.

SALES **For Exercises 3 and 4, use the following information.**
At the Farmer's Market, merchants can rent a small table for \$5.00 and a large table for \$8.50. For the first market, 25 small and 10 large tables were rented. For the second market, 35 small and 12 large were rented. *(Lesson 1-2)*

3. Write an expression to show how much money was collected for table rentals during the two markets.
4. Evaluate the expression to determine how much was collected at the two markets.

ENTERTAINMENT **For Exercises 5–7, use the following information.**
The Morrows are planning to go to a water park. The table shows the ticket prices. The family has 2 adults, 2 children, and a grandparent who wants to observe. They want to spend no more than \$55. *(Lesson 1-3)*

Admission Prices (\$)		
Ticket	Full Day	Half Day
Adult	16.95	10.95
Child (6–18)	12.95	8.95
Observer	4.95	3.95

5. Write an inequality to show the cost for the family to go to the water park.
6. How much would it cost the Morrows to go for a full day? a half day?
7. Can the family go to the water park for a full day and stay within their budget?

RETAIL **For Exercises 8–10, use the following information.**
A department store is having a sale of children's clothing. The table shows the prices. *(Lesson 1-4)*

Shorts	T-Shirts	Tank Tops
\$7.99	\$8.99	\$6.99
\$5.99	\$4.99	\$2.99

8. Write three different expressions that represent 8 pairs of shorts and 8 tops.
9. Evaluate the three expressions in Exercise 8 to find the costs of the 16 items. What do you notice about all the total costs?
10. On the final sale day, if you buy 8 shorts and 8 tops, you receive a discount of 15% on the entire purchase. Find the greatest and least amount of money you can spend on the 16 items at the sale.

11. **CRAFTS** Mandy makes baby blankets and stuffed rabbits to sell at craft fairs. She sells blankets for \$28 and rabbits for \$18. Write and evaluate an expression to find her total amount of sales if she sells 25 blankets and 25 rabbits. *(Lesson 1-5)*

12. **BASEBALL** Tickets to a baseball game cost \$18.95, \$12.95, or \$9.95. A hot dog and soda combo costs \$5.50. Members of the Madison family are having a reunion. They buy 10 tickets in each price category and plan to buy 30 combos. What is the total cost for the tickets and meals? *(Lesson 1-6)*

13. **GEOMETRY** Two perpendicular lines meet to form four right angles. Write two different if-then statements for this definition. *(Lesson 1-7)*

14. **JOBS** Laurie mows lawns to earn extra money. She knows that she can mow at most 30 lawns in one week. She determines that she profits \$15 on each lawn she mows. Identify a reasonable domain and range for this situation and draw a graph. *(Lesson 1-8)*

15. **STATISTICS** Draw two graphs of the data. One graph should accurately display the data and the other should be misleading. Explain why it is misleading. *(Lesson 1-9)*

Population Density of Montana (people per square mile)	
Year	Density
1920	3.8
1960	4.6
1980	5.4
1990	5.5
2000	6.2

Source: *The World Almanac*

WEATHER **For Exercises 1–3, use the following information.**
The following values are the monthly normal temperatures for Barrow, Alaska. *(Lesson 2-1)*

–13	–2	19	39	–15	38
31	–11	–2	14	–18	34

Source: *The World Almanac*

1. Order the temperatures from least to greatest.
2. Write the absolute values of the twelve temperatures.
3. Do you think the temperatures are in order from January through December in the table? Why or why not?

4. **GEOGRAPHY** The highest point in Asia is Mount Everest at 29,035 feet above sea level and the lowest point is the Dead Sea at 1312 feet below sea level. What is the difference between these two elevations? **Source:** *The World Almanac* *(Lesson 2-2)*

PHYSICAL SCIENCE **For Exercises 5 and 6, use the following information.**
As you ascend in the Earth's atmosphere, the temperature drops about 3.6°F for every increase of 1000 feet in altitude. **Source:** www.infoplease.com *(Lesson 2-3)*

5. If you ascend 10,000 feet, what is the change in temperature?
6. If the temperature drops from 70°F at sea level to −38°F, what is the altitude you have reached?

7. **NUMBER THEORY** If a two-digit whole number is divided by the sum of its digits a certain value is obtained. For example, $\frac{71}{7+1} = 8.75$, $\frac{42}{4+2} = 7$, $\frac{10}{1+0} = 10$. Find the two-digit number that gives the least result. *(Lesson 2-4)*

WEATHER **For Exercises 8–11, use the following information.**
The table shows the average wind speeds for sixteen windy U.S. cities. *(Lesson 2-5)*

8.9	7.1	9.1	9.0	10.2	12.5	11.9	11.0
12.8	10.4	10.5	8.6	7.7	9.6	9.1	8.1

Source: *The World Almanac*

8. Make a stem-and-leaf plot of the data.
9. What is the difference between the least and greatest values?
10. Find the mean, median, and mode of the data.
11. Does the mode represent the data well? Explain.

POPULATION **For Exercises 12–14, use the following information.**
The table shows the predicted number, in millions, of people in the U.S. in each age category for 2010. Population is rounded to the nearest million. *(Lesson 2-6)*

U.S. Population			
Age	People (millions)	Age	People (millions)
under 5	20	35–44	39
5–14	39	45–54	44
15–24	43	55–64	35
25–34	39	65 & over	40

Source: *The World Almanac*

12. What is the probability that a person in the U.S. picked at random will be under age 5?
13. What are the odds that a randomly selected person will be 65 or over?
14. What is the probability that a person picked at random will not be 15–24 years old?

GARDENING **For Exercises 15 and 16, use the following information.**
A garden is to be created in the shape of a right triangle. The sides forming the right angle, called the legs, have lengths of 20 feet and 45 feet. The Pythagorean Theorem states that the length of the longest side, or hypotenuse, of a right triangle is the square root of the sum of the squares of the legs. *(Lesson 2-7)*

15. Find the length of the hypotenuse of the garden to the nearest foot.
16. Suppose that the gardener wants the length of the hypotenuse of the garden to be changed to 55 feet while one leg remains 45 feet. What should be the length of the other leg of the garden to the nearest foot?

SWIMMING **For Exercises 17–19, use the following information.**
In the 2000 summer Olympic games, the winning time for the men's 400-meter run was approximately 44 seconds. The winning time for the men's 400-meter freestyle swimming event was about 3 minutes 41 seconds. Round your answers for Exercises 17 and 18 to the nearest meter. **Source:** *The World Almanac* *(Lesson 2-4)*

17. What was the speed in meters per second for the 400-meter run?
18. What was the speed in meters per second for the 400-meter freestyle?
19. How do the speeds for the two events compare?

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GEOMETRY For Exercises 1–4, use the following information.
The lateral surface area L of a cylinder is two times π times the product of the radius r and the height h. *(Lesson 3-1)*

1. Write a formula for the lateral area of a cylinder.
2. Find the lateral area of a cylinder with a radius of 4.5 inches and a height of 7 inches. Use 3.14 for π and round the answer to the nearest tenth.
3. The total surface area T of a cylinder includes the area of the two bases of the cylinder, which are circles. The formula for the area of one circle is πr^2. Write a formula for the total surface area T of a cylinder.
4. Find the total surface area of the cylinder in Exercise 2. Round to the nearest tenth.

RIVERS For Exercises 5 and 6, use the following information.
The Congo River in Africa is 2900 miles long. That is 310 miles longer than the Niger River, which is also in Africa. **Source:** *The World Almanac* *(Lesson 3-2)*

5. Write an equation you could use to find the length of the Niger River.
6. What is the length of the Niger River?

ANIMALS For Exercises 7 and 8, use the following information.
The average length of a yellow-banded angelfish is 12 inches. This is 4.8 times as long as an average common goldfish. **Source:** *Scholastic Records* *(Lesson 3-3)*

7. Write an equation you could use to find the length of the common goldfish.
8. What is the length of an average common goldfish?

9. **PETS** In 1999, there were 9860 Great Danes registered with the American Kennel Club. The number of registered Labrador Retrievers was 6997 more than fifteen times the number of registered Great Danes. How many registered Labrador Retrievers were there? **Source:** *The World Almanac* *(Lesson 3-4)*

10. **ENTERTAINMENT** Four families went to a baseball game. A vendor selling bags of popcorn came by. The Wilson family bought half of the bags of popcorn plus one. The Martinez family bought half of the remaining bags of popcorn plus one. The Brightfeather family bought half of the remaining bags of popcorn plus one. The Wimberly family bought half of the remaining bags of popcorn plus one, leaving the vendor with no bags of popcorn. If the Wimberlys bought 2 bags of popcorn, how many bags did each of the four families buy? *(Lesson 3-4)*

11. **NUMBER THEORY** Five times the greatest of three consecutive even integers is equal to twice the sum of the other two integers plus 42. What are the three integers? *(Lesson 3-5)*

12. **GEOMETRY** One angle of a triangle measures 10° more than the second. The measure of the third angle is twice the sum of the measures of the first two angles. Find the measure of each angle. *(Lesson 3-5)*

13. **POOLS** Tyler needs to add 1.5 pounds of a chemical to the water in his pool for each 5000 gallons of water. The pool holds 12,500 gallons. How much chemical should he add to the water? *(Lesson 3-6)*

14. **COMPUTERS** A computer manufacturer dropped the selling price of a large-screen monitor from \$2999 to \$1999. What was the percent of decrease in the selling price of the monitor? *(Lesson 3-7)*

SKIING For Exercises 15 and 16, use the following information.
Michael is registering for a ski camp in British Columbia, Canada. The cost of the camp is \$1254, but the Canadian government imposes a general sales tax of 7%. *(Lesson 3-7)*

15. What is the total cost of the camp including tax?
16. As a U.S. citizen, Michael can apply for a refund of one-half of the tax. What is the amount of the refund he can receive?

FINANCE For Exercises 17 and 18, use the following information.
Allison is using a spreadsheet to solve a problem about investing. She is using the formula $I = Prt$, where I is the amount of interest earned, P is the amount of money invested, r is the rate of interest as a decimal, and t is the period of time the money is invested in years. *(Lesson 3-8)*

17. Allison needs to find the amount of money invested P for given amounts of interest, given rates, and given time. The formula needs to be solved for P to use in the spreadsheet. Solve the formula for P.
18. Allison uses these values in the formula in Exercise 17: I= \$1848.75, r = 7.25%, t = 6 years. Find P.

19. **CHEMISTRY** Isaac had 40 gallons of a 15% iodine solution. How many gallons of a 40% iodine solution must he add to make a 20% iodine solution? *(Lesson 3-9)*

RECREATION **For Exercises 1 and 2, use the following information.**
A community has a recreational building and a pool. Consider the coordinates of the building to be (0, 0) and each block to be one unit. *(Lesson 4-1)*

1. If the pool lies one block south and 2 blocks east of the building, what are its coordinates?
2. If the entrance to the community lies 5 blocks north and 3 blocks west of the building, what are its coordinates?

DESIGN **For Exercises 3–5, use the following information.**
A T-shirt design has vertices at (1, −1), (2, 2), (0, 3), (−2, 2), and (−1, −1). *(Lesson 4-2)*

3. Draw the polygon on a coordinate plane. What polygon is represented by the design?
4. The designer wants to make smaller T-shirts using a dilation of the design by a factor of 0.75. What are the coordinates of the dilation?
5. Estimate the area of each design.

HEALTH **For Exercises 6–8, use the following information.**
The table shows suggested weights for adults for various heights in inches. *(Lesson 4-3)*

Height	Weight	Height	Weight
60	102	68	131
62	109	70	139
64	116	72	147
66	124	74	155

Source: *The World Almanac*

6. Graph the relation.
7. Do the data lie on a straight line? Explain.
8. Estimate a suggested weight for a person who is 78 inches tall. Explain your method.

PLANETS **For Exercises 9–11, use the following information.**
An astronomical unit (AU) is used to express great distances in space. It is based upon the distance from Earth to the Sun. A formula for converting any distance d in miles to AU is $\text{AU} = \frac{d}{93{,}000{,}000}$. The table shows the average distances from the Sun of four planets in miles. *(Lesson 4-4)*

Planet	Distance from Sun
Mercury	36,000,000
Mars	141,650,000
Jupiter	483,750,000
Pluto	3,647,720,000

Source: *The World Almanac*

9. Find the number of AU for each planet rounded to the nearest thousandth.
10. How can you determine which planets are further from the Sun than Earth?
11. Alpha Centauri is 270,000 AU from the Sun. How far is that in miles?

HOME DECOR **For Exercises 12 and 13, use the following information.**
Pam is having blinds installed at her home. The cost for installation for any number of blinds can be described by $c = 25 + 6.5x$. *(Lesson 4-5)*

12. Graph the equation.
13. If Pam has 8 blinds installed, what is the cost?

SPORTS **For Exercises 14–16, use the following information.**
The table shows the winning times of the Olympic mens' 50-km walk for various years. The times are rounded to the nearest minute. *(Lesson 4-6)*

Year	Years Since 1980	Time
1980	0	229
1984	4	227
1988	8	218
1992	12	230
1996	16	224
2000	20	222

Source: ESPN

14. Graph the relation using columns 2 and 3.
15. Is the relation a function? Explain.
16. Predict a winning time for the 2008 games.

JEWELRY **For Exercises 17 and 18, use the following information.**
A necklace is made with beads placed in a circular pattern. The rows have the following numbers of beads: 1, 6, 11, 16, 21, 26, and 31. *(Lesson 4-7)*

17. Write a formula for the beads in each row.
18. If a larger necklace is made with 20 rows, find the number of beads in row 20.

GEOMETRY

19. The table below shows the area of squares with sides of various lengths. *(Lesson 4-8)*

Side	Area	Side	Area
1	1	4	
2	4	5	
3	9	6	

Write the first 10 numbers that would appear in the area column. Describe the pattern.

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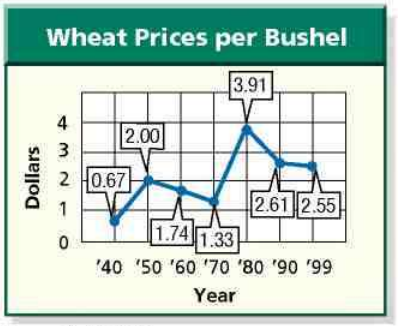
FARMING **For Exercises 1–3, use the following information.**
The graph shows wheat prices per bushel from 1940 through 1999. *(Lesson 5-1)*



Source: *The World Almanac*

1. For which time period was the rate of change the greatest? the least?
2. Find the rate of change from 1940 to 1950.
3. Explain the meaning of the slope from 1980 to 1990.

SOUND **For Exercises 4 and 5, use the following information.**
The table shows the distance traveled by sound in water for various times in seconds. *(Lesson 5-2)*

Time (seconds) x	Distance (feet) y
0	0
1	4820
2	9640
3	14,460
4	19,280

Source: *New York Public Library*

4. Write an equation that relates distance traveled to time.
5. Find the time for a distance of 72,300 feet.

POPULATION **For Exercises 6–8, use the following information.**
In 1990, the population of Wyoming was 453,589. Over the next decade, it increased by about 2890 per year. **Source:** *The World Almanac* *(Lesson 5-3)*

6. Assume the rate of change remains the same. Write a linear equation to find the population y of Wyoming at any time. Let x represent the number of years since 1990.
7. Graph the equation.
8. Estimate the population in 2005.

HEALTH **For Exercises 9 and 10, use the following information.**
A chart shows ideal heights and weights for adults with a medium build. A person with height of 60 inches should have a weight of 112 pounds and a person with height of 66 inches should have a weight of 136 pounds. **Source:** *The World Almanac* *(Lesson 5-4)*

9. Write a linear equation to estimate the weight of a person of any height.
10. Estimate the weight of a person who is 72 inches tall.

TRAVEL **For Exercises 11–13, use the following information.**
Between 1990 and 2000, the number of people taking cruises increased by about 300,000 each year. In 1990, about 3.6 million people took a cruise. **Source:** *USA TODAY* *(Lesson 5-5)*

11. Write the point-slope form of an equation to find the total number of people taking a cruise y for any year x.
12. Write the equation in slope-intercept form.
13. Estimate the number of people who will take a cruise in 2010.

GEOMETRY **For Exercises 14 and 15, use the following information.**
A quadrilateral has sides with equations $y = -2x$, $2x + y = 6$, $y = \frac{1}{2}x + 6$, and $x - 2y = 9$.
Graph the four equations to form the quadrilateral.

14. Determine whether the figure is a rectangle.
15. Explain your reasoning. *(Lesson 5-6)*

ADOPTION **For Exercises 16–18, use the following information.**
The table shows the number of children from Russia adopted by U.S. citizens from 1992–1999. The x values are shown as Years Since 1992. *(Lesson 5-7)*

Years Since 1992 x	Number of Children y
0	324
1	746
2	1530
3	1896
4	2454
5	3816
6	4491
7	4348

Source: *The World Almanac*

16. Draw a scatter plot and a line of fit for the data.
17. Write the slope-intercept form of the equation for the line of fit.
18. Predict the number of children who will be adopted in 2005.

MONEY **For Exercises 1 and 2, use the following information.**
Scott's allowance for July is $50. He wants to attend a concert that costs $26. *(Lesson 6–1)*

1. Write and solve an inequality that shows how much money he can spend in July after buying a concert ticket.
2. He spends $2.99 for lunch with his friends and $12.49 for a CD. Write and solve an inequality that shows how much money he can spend after these purchases and the concert ticket.

ANIMALS **For Exercises 3–5, use the following information.**
The world's heaviest flying bird is the great bustard. A male bustard can be up to 4 feet long and weigh up to 40 pounds. *(Scholastic Book of World Records)* *(Lesson 6-2)*

3. Write an inequality that describes the range of lengths of male bustards.
4. Write an inequality that describes the range of weights of male bustards.
5. Male bustards are usually about four times heavier than females. Write and solve an inequality that describes the range of weights of female bustards.

FOOD **For Exercises 6–8, use the following information.**
Jennie wants to make at least $75 selling caramel-coated apples at the County Fair. She plans to sell each apple for $1.50. *(Lesson 6-3)*

6. Let a be the number of apples she makes and sells. Write an inequality to find the number of apples she needs to sell to reach her goal if each apple costs her $0.30 to make.
7. Solve the inequality.
8. Interpret the meaning of the solution to the inequality.

RETAIL **For Exercises 9–11, use the following information.**
A sporting goods store is printing coupons that allow the customer to save $15 on any pair of shoes in the store. *(Lesson 6-4)*

9. The most expensive pair of shoes is $149.95 and the least expensive pair of shoes is $24.95. What is the range of prices for the shoes for customers who have the coupons?
10. You decide to buy a pair of shoes with a regular price of $109.95. You have a choice of using the coupon or having a 15% discount on the price. Which option should you choose?
11. For what price of shoe is a 15% discount the same as $15 off the regular price?

WEATHER **For Exercises 12–15, use the following information.**
The table shows the average normal temperatures for Honolulu, Hawaii, for each month in degrees Fahrenheit. *(Lesson 6-5)*

January	73	July	81
February	73	August	81
March	74	September	81
April	76	October	80
May	78	November	77
June	79	December	74

Source: *The World Almanac*

12. What is the mean of the temperatures to the nearest whole degree?
13. By how many degrees does the lowest temperature vary from the mean?
14. By how many degrees does the highest temperature vary from the mean?
15. Write an inequality to show the normal range of temperatures for Honolulu during the year.

QUILTING **For Exercises 16–18, use the following information.**
Ingrid is making a quilt in the shape of a rectangle. She wants the perimeter of the quilt to be no more than 318 inches. *(Lesson 6-6)*

16. Write an inequality that represents this situation.
17. Graph the inequality and name two different dimensions for the quilt.
18. What are the dimensions and area of the largest possible quilt Ingrid can make with a perimeter of no more than 318 inches?

GEOGRAPHY **For Exercises 19–21, use the following information.**
The table shows the area of land in square miles and in acres of the largest and smallest U.S. states. *(Lesson 6-4)*

State	Square Miles	Acres
Alaska	570,473	365,481,600
Rhode Island	1045	677,120

Source: *The World Almanac and U.S.A. Almanac*

19. Write an inequality that shows the range of square miles for U.S. states.
20. Write an inequality that shows the range of acres for U.S. states.
21. **RESEARCH** About how many acres are in a square mile? Do the figures in the table agree with that fact?

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WORKING **For Exercises 1–3, use the following information.**
The table shows the percent of men and women 65 years and older that were working in the U.S. in the given years. *(Lesson 7-1)*

U.S. Workers over 65		
Year	Percent of Men	Percent of Women
1980	19.3	8.2
1990	17.6	8.4

Source: *The World Almanac*

1. Let the year 1980 be 0. Assume that the rate of change remains the same for years after 1990. Write an equation to represent the percent of working elderly men y in any year x.
2. Write an equation to represent the percent of working elderly women.
3. Assume the rate of increase or decrease in working men and women remains the same for years after 1990. Estimate when the percent of working men and women will be the same.

SPORTS **For Exercises 4–7, use the following information.**
The table shows the winning times for the men's and women's Triathlon World Championship for 1995 and 2000. *(Lesson 7-2)*

Year	Men's	Women's
1995	1:48:29	2:04:58
2000	1:51:41	1:54:43

Source: *ESPN Sports Almanac*

4. The times in the table are in hours, minutes, and seconds. Rewrite the times in minutes rounded to the nearest minute.
5. Let the year 1995 be 0. Assume that the rate of change remains the same for years after 1995. Write an equation to represent the men's winning times y in any year x.
6. Write an equation to represent the women's winning times in any year.
7. If the trend continues, when would you expect the men's and women's winning times to be the same?

8. **TRAVEL** While driving to Fullerton, Mrs. Sumner travels at an average speed of 40 mph. On the return trip, she travels at an average speed of 56 mph and saves two hours of travel time. How far does Mrs. Sumner live from Fullerton? *(Lesson 7-2)*

MONEY **For Exercises 9–11, use the following information.**
In 1998, the sum of the number of $2 bills in circulation and the number of $50 bills in circulation was 1,500,888,647. The number of $50 bills was 366,593,903 more than the number of $2 bills. *(Lesson 7-3)* **Source:** *The World Almanac for Kids*

9. Write a system of equations to represent this situation.
10. Find the number of each type of bill in circulation.
11. Find the amount of money that was in circulation in $2 and $50 bills.

SPORTS **For Exercises 12–15, use the following information.**
In the 2000 Summer Olympic Games, the total number of gold and silver medals won by the U.S. was 64. Gold medals are worth 3 points and silver medals are worth 2 points. The total points scored for gold and silver medals was 168. *(Lesson 7-4)*
Source: *ESPN Almanac*

12. Write an equation for the sum of the number of gold and silver medals won by the U.S.
13. Write an equation for the sum of the points earned by the U.S. for gold and silver medals.
14. How many gold and silver medals did the U.S. win?
15. The total points scored by the U.S. was 201. Bronze medals are worth 1 point. How many bronze medals were won?

RADIO **For Exercises 16–20, use the following information.**
KSKY radio station is giving away tickets to an amusement park as part of a summer promotion. Each child ticket costs $15 and each adult ticket costs $20. The station wants to spend no more than $800 on tickets. They also want the number of child tickets to be greater than twice the number of adult tickets. *(Lesson 7-5)*

16. Write an inequality for the total cost of c child tickets and a adult tickets.
17. Write an inequality to represent the relationship between the number of child and adult tickets.
18. Write two inequalities that would assure you that the number of adult and the number of child tickets would not be negative.
19. Graph the system of four inequalities to show possible numbers of tickets that the station can buy.
20. Give three possible combinations of child and adult tickets for the station to buy.

GEOMETRY For Exercises 1–4, use the following information.

If the side length of a cube is s, then the volume is presented by s^3 and the surface area is represented by $6s^2$. *(Lesson 8-1)*

1. Are the expressions for volume and surface area monomials? Explain.
2. If the side of a cube measures 3 feet, find the volume and surface area.
3. Find a side length s such that the volume and surface area have the same numerical value.
4. The volume of a cylinder can be found by multiplying the radius squared times the height times π, or $V = \pi r^2 h$. Suppose you have two cylinders. Each measure of the second is twice the measure of the first, so $V = \pi(2r)^2(2h)$. What is the ratio of the volume of the first cylinder to the second cylinder? *(Lesson 8-2)*

LIGHT For Exercises 5–7, use the table that shows the speed of light in various materials. *(Lesson 8-3)*

Material	Speed m/s
vacuum	3.00×10^8
air	3.00×10^8
ice	2.29×10^8
glycerine	2.04×10^8
crown glass	1.97×10^8
rock salt	1.95×10^8

Source: *Glencoe Physics*

5. Express each speed in standard notation.
6. To the nearest hundredth, how many times as fast does light travel in a vacuum as in rock salt?
7. Through which material does light travel about 1.17 times as fast as through rock salt?

POPULATION For Exercises 8–10, use the following information.

The table shows the population density for the state of Nevada for various years. *(Lesson 8-4)*

Year	Years Since 1920	People/Square Mile
1920	0	0.7
1960	40	2.6
1980	60	7.3
1990	70	10.9

Source: *The World Almanac*

8. The population density d of Nevada from 1920 to 1990 can be modeled by $d = 0.003y^2 - 0.086y + 0.708$, where y represents the number of years since 1920. Identify the type of polynomial for $0.003y^2 - 0.086y + 0.708$.
9. What is the degree of this polynomial?
10. Predict the population density of Nevada for the year 2010. Explain your method.

RADIO For Exercises 11 and 12, use the following information.

From 1997 to 2000, the number of radio stations presenting primarily news and talk N and the total number of radio stations of all types R in the U.S. could be modeled by the following equations, where x is the number of years since 1997. *(Lesson 8-5)*

Source: *The World Almanac*

$N = 37.9x + 1315.9$
$R = 133.5x + 10{,}278.5$

11. Find an equation that models the number of radio stations O that are *not* primarily news and talk in the U.S. for this time period.
12. If this trend continues, how many radio stations that are not news and talk will there be in the year 2015?

GEOMETRY For Exercises 13–15, use the following information.

The number of diagonals of a polygon can be found by using the formula $d = 0.5n(n - 3)$, where d is the number of diagonals and n is the number of sides of the polygon. *(Lesson 8-6)*

13. Use the Distributive Property to write the expression as a polynomial.
14. Find the number of diagonals for polygons with 3 through 10 sides.
15. Describe any patterns you see in the numbers you wrote in Exercise 14.

GEOMETRY For Exercises 16 and 17, use the following information.

A rectangular prism has dimensions of x, $x + 3$, and $2x + 5$. *(Lesson 8-7)*

16. Find the volume of the prism in terms of x.
17. Choose two values for x. How do the volumes compare?

MONEY For Exercises 18–20, use the following information.

Money invested in a certificate of deposit or CD collects interest once per year. Suppose you invest \$4000 in a 2-year CD. *(Lesson 8-8)*

18. If the interest rate is 5% per year, the expression $4000(1 + 0.05)^2$ can be evaluated to find the total amount of money you will have at the end of two years. Explain the numbers in this expression.
19. Find the amount of money at the end of two years.
20. Suppose you invest \$10,000 in a CD for 4 years at a rate of 6.25%. What is the total amount of money you will have at the end of 4 years?

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FLOORING For Exercises 1 and 2, use the following information.
Eric is refinishing his dining room floor. The floor measures 10 feet by 12 feet. Flooring World offers a wood-like flooring in 1-foot by 1-foot squares, 2-foot by 2-foot squares, 3-foot by 3-foot squares, and 2-foot by 3-foot rectangular pieces. *(Lesson 9-1)*

1. Without cutting the pieces, which of the four types of flooring can Eric use in the dining room? Explain.
2. The price per piece of each type of flooring is shown in the table. If Eric wants to spend the least money, which should he choose? What will be the total cost of his choice?

Size	1 × 1	2 × 2	3 × 3	2 × 3
Price	$3.75	$15.00	$32.00	$21.00

FIREWORKS For Exercises 3–5, use the following information.
At a Fourth of July celebration, a rocket is launched with an initial velocity of 125 feet per second. The height h of the rocket in feet above sea level is modeled by the formula $h = 125t - 16t^2$, where t is the time in seconds after the rocket is launched. *(Lesson 9-2)*

3. What is the height of the rocket when it returns to the ground?
4. Let $h = 0$ in the equation $h = 125t - 16t^2$ and solve for t.
5. How many seconds will it take for the rocket to return to the ground?

FOOTBALL For Exercises 6–8, use the following information.
Some small high schools play six-man football as a team sport. The dimensions of the field are less then the dimensions of a standard football field. Including the end zones, the length of the field, in feet, is 60 feet more than twice the width. *(Lesson 9-3)*

6. Write an expression for the area of the six-man football field.
7. If the area of the field is 36,000 square feet, what are the dimensions of the field? (*Hint*: Factor a 2 out of the equation before factoring.)
8. What are the dimensions of the field in yards?

PHYSICAL SCIENCE For Exercises 9 and 10, use the following information.
Teril throws a ball upward while standing on the top of a 500-foot tall apartment building. Its height h, in feet, after t seconds is given by the equation $h = -16t^2 + 48t + 506$. *(Lesson 9-4)*

9. What do the values 48 and 506 in the equation represent?
10. The ball falls on a balcony that is 218 feet above the ground. How many seconds was the ball in the air?

DECKS For Exercises 11 and 12, use the following information.
Zelda is building a deck in her back yard. The plans for the deck show that it is to be 24 feet by 24 feet. Zelda wants to reduce one dimension by a number of feet and increase the other dimension by the same number of feet. *(Lesson 9-5)*

11. If the area of the reduced deck is 512 square feet, what are the dimensions of the deck?
12. Suppose Zelda wants to reduce the deck to one-half the area of the deck in the plans. Can she reduce each dimension by the same length and use dimensions that are whole numbers? Explain.

BUILDINGS For Exercises 13–15, use the following information.
The Petronas Towers I and II in Kuala Lumpur, Malaysia, are both 1483 feet tall. A model for the height h in feet of a dropped object is $h = -16t^2$, where t is the time in seconds after the object is dropped. *(Lesson 9-6)* **Source:** *The World Almanac*

13. To the nearest tenth of a second, how long will it take for an object dropped from the top of one of the towers to hit the ground?
14. In 1900, the tallest building in the world was the Park Row Building in New York City with a height of 386 feet. How much longer will it take an object to reach the ground from the Petronas Tower I than from the Park Row Building?
15. If a new building is built such that an object takes 12 seconds to reach the ground when dropped from the top, how tall is the building?

POOLS For Exercises 16–19, use the following information.
Susan wants to buy an aboveground swimming pool for her yard. Model A is 42 inches deep and holds 1750 cubic feet of water. The length of the pool is 5 feet more than the width. *(Lesson 9-6)*

16. What is the area of water that is exposed to the air?
17. What are the dimensions of the pool?
18. A Model B pool holds twice as much water as Model A. What are some possible dimensions for this pool?
19. Model C has length and width that are both twice as long as Model A, but the height is the same. What is the ratio of the volume of Model A to Model C?

PHYSICAL SCIENCE **For Exercises 1–4, use the following information.**

A ball is released 6 feet above the ground and thrown vertically into the air. The equation $h = -16t^2 + 112t + 6$ gives the height of the ball if the initial velocity is 112 feet per second. *(Lesson 10-1)*

1. Write the equation of the axis of symmetry and find the coordinates of the vertex of the graph of the equation.
2. What is the maximum height above the ground that the ball reaches?
3. How many seconds after release does the ball reach maximum height?
4. How many seconds is the ball in the air?

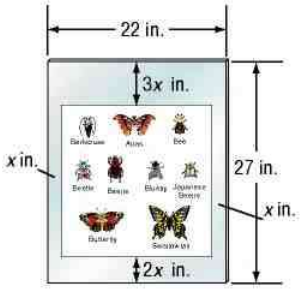
RIDES **For Exercises 5–7, use the following information.**

At an amusement park in Minnesota a popular ride whisks riders to the top of a 250-foot tower and drops them at speeds exceeding 50 miles per hour. A function for the path of a rider is $h = -16t^2 + 250$, where h is the height and t is the time in seconds. *(Lesson 10-3)*

5. The ride stops the descent of the rider 40 feet above the ground. Write an equation that models the drop of the rider.
6. Solve the equation by graphing the related function. How many roots does the equation have?
7. About how many seconds does it take to complete the ride?

PROJECTS **For Exercises 8–10, use the following information.**

Jude is making a poster for his science project. The poster board is 22 inches wide by 27 inches tall. He wants to cover two thirds of the area with text or pictures and leave a top margin 3 times as wide as the side margins and a bottom margin twice as wide as the side margins. *(Lesson 10-3)*



8. Write an equation that represents this situation.
9. Solve your equation for x by completing the square. Round to the nearest tenth.
10. What should be the widths of the margins?

TELEVISION **For Exercises 11 and 12, use the following information.**

The number of U.S. households with cable television has been on the rise. The percent of households with cable y can be approximated by the quadratic function $y = -0.11x^2 + 4.95x + 12.69$, where x stands for the number of years after 1977. *(Lesson 10-4)*

11. Use the Quadratic Formula to solve for x when $y = 30$. What do these values represent?
12. Do you think a quadratic function is a good model for this data? Why or why not?

POPULATION **For Exercises 13–15, use the following information.**

The population of Asia from 1650 to 2000 can be estimated by the function $P(x) = 335(1.007)^x$, where x is the number of years since 1650 and the population is in millions of people. *(Lesson 10-5)*

13. Graph the function and name the y-intercept.
14. What does the y-intercept represent in this problem?
15. Use the function to approximate the number of people in Asia in 2050.

MONEY **For Exercises 16–18, use the following information.**

In 1999, Aaron placed $10,000 he received as an inheritance in a 4-year certificate of deposit at an interest rate of 7.45% compounded yearly. *(Lesson 10-6)*

16. Aaron plans to take all the money out of his investment at the end of 4 years. Find the amount of money Aaron will have at the end of 4 years.
17. He plans to use the money for college tuition. From 1999 on, it is predicted that tuition will rise 6% per year from the 1999 cost of $2575. Aaron intends to begin college in 2003 and attend for 4 years. What will be his total tuition cost?
18. What recommendations would you make to Aaron for paying for the total cost of his tuition?

TRAINING **For Exercises 19–22, use the following information.**

Laurie wants to run a 5K race but has never run before. A 5K race is about 3 miles so she wants to work up slowly to running 3 miles. *(Lesson 10-7)*

19. Laurie's trainer advises her to run every other day and to begin by running one eighth of a mile. Each running session she is to run one and a half times her previous distance. Write the first 10 terms of this sequence.
20. Write a formula for the nth term of this sequence.
21. During which session will Laurie exceed 3 miles?
22. Will Laurie be ready for a 5K race in two weeks from the start of her training program?

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SATELLITES **For Exercises 1–3, use the following information.**

A satellite is launched into orbit 200 kilometers above Earth. The orbital velocity of a satellite is given by the formula $v = \sqrt{\frac{Gm_E}{r}}$, where v is velocity in meters per second, G is a given constant, m_E is the mass of Earth, and r is the radius of the satellite's orbit. *(Lesson 11-1)*

1. The radius of Earth is 6,380,000 meters. What is the radius of the satellite's orbit in meters?
2. The mass of Earth is 5.97×10^{24} kilogram and the constant G is 6.67×10^{-11} N · m^2/kg^2 where N is in Newtons. Use the formula to find the orbital velocity of the satellite in meters per second.
3. The orbital period of the satellite can be found by using the formula $T = \frac{2\pi r}{v}$, where r is the radius of the orbit and v is the orbital velocity of the satellite in meters per second. Find the orbital period of the satellite in hours.

RIDES **For Exercises 4–6, use the following information.**

The designer of a roller coaster must consider the height of the hill and the velocity of the coaster as it travels over the hill. Certain hills give riders a feeling of weightlessness. The formula $d = \sqrt{\frac{2hv^2}{g}}$ allows designers to find the correct distance from the center of the hill that the coaster should begin its drop for maximum fun. *(Lesson 11-2)*

4. In the formula above, d is the distance from the center of the hill, h is the height of the hill, v is the velocity of the coaster at the top of the hill in meters per second, and g is a gravity constant of 9.8 meters per second squared. If a hill is 10 meters high and the velocity of the coaster is 10 m/s, find d.
5. Find d if the height of the hill is 10 meters but the velocity is 20 m/s. How does d compare to the value in Exercise 4?
6. Suppose you find the same formula in another book written as $d = 1.4\sqrt{\frac{hv^2}{g}}$. Will this produce the same value of d? Explain.
7. **PACKAGING** A cylindrical container of chocolate drink mix has a volume of about 162 in^3. The formula for volume of a cylinder is $V = \pi r^2 h$, where r is the radius and h is the height. The radius of the container can be found by using the formula $r = \sqrt{\frac{V}{\pi h}}$. If the height is 8.25 inches, find the radius of the container. *(Lesson 11-3)*

TOWN SQUARES **For Exercises 8 and 9, use the following information.**

Tiananmen Square in Beijing, China, is the largest town square in the world, covering 98 acres. **Source:** *The Guinness Book of Records* *(Lesson 11-4)*

8. One square mile is 640 acres. Assuming that Tiananmen Square is a square, how many feet long is a side to the nearest foot?
9. To the nearest foot, what is the diagonal distance across Tiananmen Square?

PIZZA DELIVERY **For Exercises 10 and 11, use the following information.**

The Pizza Place delivers pizza to any location within a radius of 5 miles from the store for free. Tyrone drives 32 blocks north and then 45 blocks east to deliver a pizza. In this city, there are about 6 blocks per half mile. *(Lesson 11-5)*

10. Should there be a charge for the delivery? Explain.
11. Describe two delivery situations that would result in about 5 miles.

GEOMETRY **For Exercises 12–14, use the following information.**

A triangle on the coordinate plane has vertices (1, 1), (−3, 2), and (−7, −5). *(Lesson 11-6)*

12. What is the perimeter of the triangle? Express the answer in simplest radical form and as a decimal approximation rounded to the nearest hundredth.
13. Suppose a new triangle is formed by multiplying each coordinate by 2. What is the perimeter of the new triangle in simplest radical form and as a decimal rounded to the nearest hundredth?
14. Are the two triangles similar? Explain your reasoning.

ESCALATORS **For Exercises 15 and 16, use the following information.**

The longest escalator is located in Hong Kong, China. The escalator has a length of 745 feet and rises 377 feet vertically from start to finish. **Source:** *The Guinness Book of Records* *(Lesson 11-7)*

15. Draw a diagram of the escalator.
16. To the nearest degree, what is the angle of elevation of the escalator?

OPTOMETRY **For Exercises 1–4, use the following information.**
When a person does not have clear vision either at a distance or close up, an optometrist can prescribe lenses to correct the condition. The power P of a lens, in a unit called diopters, is equal to 1 divided by the focal length f, in meters, of the lens. The formula is $P = \frac{1}{f}$. *(Lesson 12-1)*

1. Graph the inverse variation $P = \frac{1}{f}$.
2. Find the power of a lens with focal length +20 centimeters. (*Hint*: Change 20 centimeters to meters.)
3. Find the power of a lens with focal length −40 centimeters. (*Hint*: Change 40 centimeters to meters.)
4. What do you notice about the powers in Exercises 2 and 3?

PHYSICS **For Exercises 5 and 6, use the following information.**
Some principles in physics, such as gravitational force between two objects, depend upon a relationship known as the inverse square law. The inverse square law means that two variables are related by the relationship $y = \frac{1}{x^2}$, where x is distance. *(Lesson 12-2)*

5. Make a table of values and graph $y = \frac{1}{x^2}$. Describe the shape of the graph.
6. If x represents distance, how does this affect the domain of the graph?

FERRIS WHEELS **For Exercises 7–9, use the following information.**
George Ferris built the first Ferris wheel for the World's Columbian Exposition in Chicago in 1892. It had a diameter of 250 feet. *(Lesson 12-3)*

7. To find the speed traveled by a car located on the circumference of the wheel, you can find the circumference of a circle and divide by the time it takes for one rotation of the wheel. (Recall that $C = \pi d$.) Write a polynomial expression for the speed of a car rotating in time t.
8. Suppose the first Ferris wheel rotated once every 5 minutes. What was the speed of a car on the circumference in feet per minute?
9. Use dimensional analysis to find the speed of a car in miles per hour.
10. **MOTOR VEHICLES** In 1999, the U.S. produced 13,063,000 motor vehicles. This was 23.2% of the total motor vehicle production for the whole world. How many motor vehicles were produced worldwide in 1999? **Source:** *The World Almanac* *(Lesson 12-4)*
11. **LIGHT** The speed of light is approximately 1.86×10^5 miles per second. The table shows the distances, in miles, of the planets from the Sun. Find the amount of time in minutes that it takes for light from the Sun to reach each planet. *(Lesson 12-5)*

Planet	Miles	Planet	Miles
Mercury	5.79×10^{10}	Jupiter	7.78×10^{11}
Venus	1.08×10^{11}	Saturn	1.43×10^{12}
Earth	1.496×10^{11}	Uranus	2.87×10^{12}
Mars	2.28×10^{11}	Pluto	4.50×10^{12}

12. **GEOGRAPHY** The land areas of all the continents, in thousands of square miles, are given in the table. Use this information to write the fraction of the land area of the world that is part of North and South America. *(Lesson 12-6)*

Continent	Area
North America	9400
South America	6900
Europe	3800
Asia	17,400
Africa	11,700
Oceania	3300
Antarctica	5400

Source: *The World Almanac*

13. **GARDENING** Celeste builds decorative gardens in her landscaping business. She uses either 35, 50, or 75 bricks for one garden depending upon the design. What is the least number of bricks she should order that would allow her to build a whole number of each type of garden? *(Lesson 12-7)*

CRAFTS **For Exercises 14 and 15, use the following information.**
Jordan and her aunt Jennie make tablecloths to sell at craft fairs. A small one takes one-half yard of fabric, a medium takes five-eighths yard, and a large takes one and one-quarter yard. *(Lesson 12-8)*

14. How many yards of fabric do they need to make one of each type of tablecloth?
15. A particular bolt of fabric contains 30 yards of fabric. Can they use the entire bolt by making an equal number of each type of tablecloth? Explain.
16. **CONSTRUCTION** Rick has a crew of workers that can side a particular size house in 6 days. Phil's crew can side the same house in 4 days. If the two crews work together, how long will it take to side the house? *(Lesson 12-9)*

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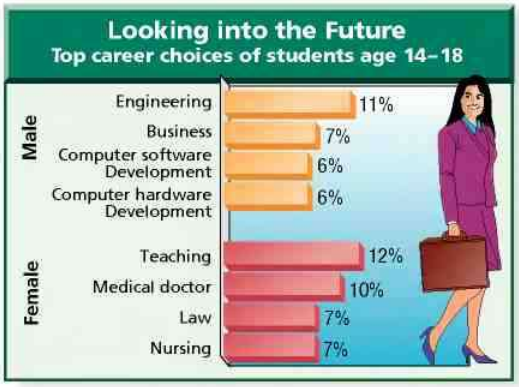
CAREERS **For Exercises 1 and 2, use the following information.**
The graph below shows the results of a survey of students asking their preferences for a future career. *(Lesson 13-1)*



Source: *USA TODAY*

1. Write a statement to describe what you do know about the sample.
2. What additional information would you like to have about the sample to determine whether the sample is biased?

POPULATIONS **For Exercises 3–7, use the following information.**
The table shows the populations for ten U.S. cities in 1990 and 1999. *(Lesson 13-2)*

City	1990	1999
Anchorage, AK	226,338	257,808
Asheville, NC	191,310	215,180
Elmira, NY	95,195	91,738
Gainesville, FL	181,596	198,484
Great Falls, MT	77,691	78,282
Kokomo, IN	96,946	100,377
Lawton, OK	111,486	106,621
Macon, GA	291,079	321,586
Modesto, CA	370,522	436,790
Pine Bluff, AR	85,487	80,785

Source: U.S. Census Bureau

3. Create matrix A for the 1999 data and matrix B for the 1990 data.
4. What are the dimensions of each matrix in Exercise 3?
5. Calculate $P = A - B$.
6. What does matrix P represent?
7. Which city had the greatest percent decrease in population from 1990 to 1999?

WEATHER **For Exercises 8–11, use the table that shows the highest and lowest (H/L) temperature ever recorded in each U.S. state.**

State	H/L (°F)	State	H/L (°F)	State	H/L (°F)
AL	112/−27	LA	114/−16	OH	113/−39
AK	100/−80	ME	105/−48	OK	120/−27
AZ	128/−29	MD	109/−40	OR	119/−54
AR	120/−29	MA	107/−35	PA	111/−42
CA	134/−45	MI	112/−51	RI	104/−25
CO	118/−61	MN	114/−60	SC	111/−19
CT	106/−32	MS	115/−19	SD	120/−58
DE	110/−17	MO	118/−40	TN	113/−32
FL	108/−2	MT	117/−70	TX	120/−23
GA	112/−17	NE	118/−47	UT	117/−69
HI	100/12	NV	125/−50	VT	105/−50
ID	118/−60	NH	106/−46	VA	110/−30
IL	117/−36	NJ	110/−34	WA	118/−48
IN	116/−36	NM	122/−50	WV	112/−37
IA	118/−47	NY	108/−52	WI	114/−54
KS	121/−40	NC	110/−34	WY	114/−66
KY	114/−37	ND	121/−60		

Source: *The World Almanac*

8. Consider the high temperature data. *(Lesson 13-3)*
   a. Determine the median of the data.
   b. Create a histogram to represent the data. Use at least four measurement classes.
   c. Write a sentence or two describing the distribution of the data.
   d. Does finding the median of the set of data help you to make a histogram for the data? Explain.
9. Consider the low temperature data. *(Lesson 13-4)*
   a. What is the range of the temperature data?
   b. What is the lower quartile and the upper quartile of the data?
   c. What is the interquartile range of the data?
   d. Name any outliers.
10. Draw a parallel box-and-whisker plot for the high and low temperatures. *(Lesson 13-5)*
    a. Compare the data in the two plots.
    b. How does the range of the high temperature data compare to the range of the low temperature data?
11. Make a table that shows the differences between the highest and lowest temperatures for each state. *(Lesson 13-5)*
    a. Create any graph of your choice that shows the difference between the high and low temperature for each state.
    b. Describe the data in your graph in part **a**.

FLOWERS **For Exercises 1–3, use the following information.**
A flower shop is making special floral arrangements for a holiday. The table shows the options available and the costs of each option. *(Lesson 14-1)*

Vase	Deluxe	Standard	Economy
Cost	$12.00	$8.00	$5.00

Ribbon	Velvet	Satin
Cost	$3.00	$2.00

Flowers	Orchids	Roses	Daisies
Cost	$35.00	$20.00	$12.00

Card	Large	Small
Cost	$2.50	$1.75

1. How many floral arrangements are possible? Each arrangement has one vase, one ribbon, one type of flowers, and one card.
2. What is the cost of the most expensive arrangement? the least expensive?
3. What is the cost of each of the four most expensive arrangements?

GAMES **For Exercises 4–6, use the following information.**
Melissa is playing a board game that requires you to make words to score points. There are 12 letters left in the box and she must choose 4. She cannot see the letters that can be chosen. *(Lesson 14-2)*

4. Suppose that the 12 letters are all different. In how many ways can she choose 4 of the 12 letters?
5. She chooses the four letters A, T, R, and E. How many different arrangements of three letters can she make from her letters?
6. How many of the three-letter arrangements are words? List the words you find.

BASEBALL **For Exercises 7–10, use the following information.**
During the 2000 baseball season, these Houston Astros players had the following number of times at bat and hits. You can consider the probability that a player gets a hit as the number of hits compared to the number of times at bat. Round each probability to the nearest hundredth for Exercises 7–10. *(Lesson 14–3)*

Name	Times at Bat	Hits
Alou	454	161
Ward	264	68
Cedeno	259	73
Hidalgo	558	175

Source: *ESPN*

7. On his next at bat, what is the probability that Hidalgo will get a hit?
8. Which player has the greatest chance to get a hit on his next at bat?
9. Suppose Ward and then Cedeno are to be the first players at bat in a new inning. What is the probability that both get a hit?
10. If the manager wants the greatest probability that two of these four players will get consecutive hits, which two should he choose? What is the probability of these two players both getting a hit?

DRIVING **For Exercises 11–13, use the following information.**
The table shows a probability distribution for various age categories of licensed drivers in the U.S. for the year 1998. *(Lesson 14-4)*

X = Age Category	Probability
under 20	0.053
20–34	0.284
35–49	0.323
50–64	0.198
65 and over	0.142

Source: *The World Almanac*

11. Determine whether this is a valid probability distribution. Justify your answer.
12. If a driver in the U.S. is randomly selected, what is the probability that the person is under 20 years old?
13. If a driver in the U.S. is randomly selected, what is the probability the person is 50 years old or over?

LOTTERIES **For Exercises 14–16, use the following information.**
A state sells lottery tickets, each with a five-digit number such that each digit can be 1–6. When you purchase a ticket, you select a number that you think will win and it is printed on your ticket. Then, once per week, a random 5-digit number is generated as the winning number. *(Lesson 14-5)*

14. How many five-digit numbers are possible? Explain how you calculated the number of possible outcomes.
15. Perform a simulation for winning the lottery. Describe the objects you used to perform the simulation.
16. According to your experiment, what is the experimental probability of winning the lottery?

CONTENTS

Prerequisite Skills

Operations with Fractions: Adding and Subtracting

- To add or subtract fractions with the same denominator, add or subtract the numerators and write the sum or difference over the denominator.

Example 1 **Find each sum or difference.**

a. $\frac{3}{5} + \frac{1}{5}$

$\frac{3}{5} + \frac{1}{5} = \frac{3+1}{5}$ The denominators are the same. Add the numerators.

$= \frac{4}{5}$ Simplify.

b. $\frac{5}{9} - \frac{4}{9}$

$\frac{5}{9} - \frac{4}{9} = \frac{5-4}{9}$ The denominators are the same. Subtract the numerators.

$= \frac{1}{9}$ Simplify.

- To write a fraction in simplest form, divide both the numerator and the denominator by their greatest common factor (GCF).

Example 2 **Write each fraction in simplest form.**

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

$\frac{4}{16} = \frac{4 \div 4}{16 \div 4}$ Divide 4 and 16 by their GCF, 4.

$= \frac{1}{4}$ Simplify.

b. $\frac{24}{36}$

$\frac{24}{36} = \frac{24 \div 12}{36 \div 12}$ Divide 24 and 36 by their GCF, 12.

$= \frac{2}{3}$ Simplify.

Example 3 **Find each sum or difference. Write in simplest form.**

a. $\frac{7}{16} - \frac{1}{16}$

$\frac{7}{16} - \frac{1}{16} = \frac{6}{16}$ The denominators are the same. Subtract the numerators.

$= \frac{3}{8}$ Simplify.

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

$\frac{5}{8} + \frac{7}{8} = \frac{12}{8}$ The denominators are the same. Add the numerators.

$= 1\frac{4}{8}$ or $1\frac{1}{2}$ Rename $\frac{12}{8}$ as a mixed number in simplest form.

- To add or subtract fractions with unlike denominators, first find the least common denominator (LCD). Rename each fraction with the LCD, and then add or subtract. Simplify if necessary.

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Example 4 **Find each sum or difference. Write in simplest form.**

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

$\frac{2}{9} + \frac{1}{3} = \frac{2}{9} + \frac{3}{9}$ The LCD for 9 and 3 is 9. Rename $\frac{1}{3}$ as $\frac{3}{9}$.

$= \frac{5}{9}$ Add the numerators.

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

$\frac{1}{2} + \frac{2}{3} = \frac{3}{6} + \frac{4}{6}$ The LCD for 2 and 3 is 6. Rename $\frac{1}{2}$ as $\frac{3}{6}$ and $\frac{2}{3}$ as $\frac{4}{6}$.

$= \frac{7}{6}$ or $1\frac{1}{6}$ Simplify.

c. $\frac{3}{8} - \frac{1}{3}$

$\frac{3}{8} - \frac{1}{3} = \frac{9}{24} - \frac{8}{24}$ The LCD for 8 and 3 is 24. Rename $\frac{3}{8}$ as $\frac{9}{24}$ and $\frac{1}{3}$ as $\frac{8}{24}$.

$= \frac{1}{24}$ Simplify.

d. $\frac{7}{10} - \frac{2}{15}$

$\frac{7}{10} - \frac{2}{15} = \frac{21}{30} - \frac{4}{30}$ The LCD for 10 and 15 is 30. Rename $\frac{7}{10}$ as $\frac{21}{30}$ and $\frac{2}{15}$ as $\frac{4}{30}$.

$= \frac{17}{30}$ Simplify.

Exercises **Find each sum or difference.**

1. $\frac{2}{5} + \frac{1}{5}$
2. $\frac{2}{7} - \frac{1}{7}$
3. $\frac{4}{3} + \frac{4}{3}$
4. $\frac{3}{9} + \frac{4}{9}$
5. $\frac{5}{16} - \frac{4}{16}$
6. $\frac{7}{2} - \frac{4}{2}$

Simplify.

7. $\frac{6}{9}$
8. $\frac{7}{14}$
9. $\frac{28}{40}$
10. $\frac{16}{100}$
11. $\frac{27}{99}$
12. $\frac{24}{180}$

Find each sum or difference. Write in simplest form.

13. $\frac{2}{9} + \frac{1}{9}$
14. $\frac{2}{15} + \frac{7}{15}$
15. $\frac{2}{3} + \frac{1}{3}$
16. $\frac{7}{8} - \frac{3}{8}$
17. $\frac{4}{9} - \frac{1}{9}$
18. $\frac{5}{4} - \frac{3}{4}$
19. $\frac{1}{2} + \frac{1}{4}$
20. $\frac{1}{2} - \frac{1}{3}$
21. $\frac{4}{3} + \frac{5}{9}$
22. $1\frac{1}{2} - \frac{3}{2}$
23. $\frac{1}{4} + \frac{1}{5}$
24. $\frac{2}{3} + \frac{1}{4}$
25. $\frac{3}{2} + \frac{1}{2}$
26. $\frac{8}{9} - \frac{2}{3}$
27. $\frac{3}{7} + \frac{5}{14}$
28. $\frac{13}{20} - \frac{2}{5}$
29. $1 - \frac{1}{19}$
30. $\frac{9}{10} - \frac{3}{5}$
31. $\frac{3}{4} - \frac{2}{3}$
32. $\frac{4}{15} + \frac{3}{4}$
33. $\frac{11}{12} - \frac{4}{15}$
34. $\frac{3}{11} + \frac{1}{8}$
35. $\frac{94}{100} - \frac{11}{25}$
36. $\frac{3}{25} + \frac{5}{6}$

Operations with Fractions: Multiplying and Dividing

- To multiply fractions, multiply the numerators and multiply the denominators.

Example 1 **Find each product.**

a. $\frac{2}{5} \cdot \frac{1}{3}$

$\frac{2}{5} \cdot \frac{1}{3} = \frac{2 \cdot 1}{5 \cdot 3}$ Multiply the numerators. Multiply the denominators.

$= \frac{2}{15}$ Simplify.

b. $\frac{7}{3} \cdot \frac{1}{11}$

$\frac{7}{3} \cdot \frac{1}{11} = \frac{7 \cdot 1}{3 \cdot 11}$ Multiply the numerators. Multiply the denominators.

$= \frac{7}{33}$ Simplify.

- If the fractions have common factors in the numerators and denominators, you can simplify before you multiply by canceling.

Example 2 **Find each product. Simplify before multiplying.**

a. $\frac{3}{4} \cdot \frac{4}{7}$

$\frac{3}{4} \cdot \frac{4}{7} = \frac{3}{\cancel{4}^{1}} \cdot \frac{\cancel{4}^{1}}{7}$ Divide by the GCF, 4.

$= \frac{3}{7}$ Simplify.

b. $\frac{4}{9} \cdot \frac{45}{49}$

$\frac{4}{9} \cdot \frac{45}{49} = \frac{4}{\cancel{9}^{1}} \cdot \frac{\cancel{45}^{5}}{49}$ Divide by the GCF, 9.

$= \frac{20}{49}$ Multiply the numerators and denominators.

- Two numbers whose product is 1 are called **multiplicative inverses** or **reciprocals**.

Example 3 **Name the reciprocal of each number.**

a. $\frac{3}{8}$

$\frac{3}{8} \cdot \frac{8}{3} = 1$ The product is 1.

The reciprocal of $\frac{3}{8}$ is $\frac{8}{3}$.

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

$\frac{1}{6} \cdot \frac{6}{1} = 1$ The product is 1.

The reciprocal of $\frac{1}{6}$ is 6.

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

$2\frac{4}{5} = \frac{14}{5}$ Write $2\frac{4}{5}$ as an improper fraction.

$\frac{14}{5} \cdot \frac{5}{14} = 1$ The product is 1.

The reciprocal of $2\frac{4}{5}$ is $\frac{5}{14}$.

CONTENTS

- To divide one fraction by another fraction, multiply the dividend by the multiplicative inverse of the divisor.

Example 4 **Find each quotient.**

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

$\frac{1}{3} \div \frac{1}{2} = \frac{1}{3} \cdot \frac{2}{1}$ Multiply $\frac{1}{3}$ by $\frac{2}{1}$, the reciprocal of $\frac{1}{2}$.

$= \frac{2}{3}$ Simplify.

b. $\frac{3}{8} \div \frac{2}{3}$

$\frac{3}{8} \div \frac{2}{3} = \frac{3}{8} \cdot \frac{3}{2}$ Multiply $\frac{3}{8}$ by $\frac{3}{2}$, the reciprocal of $\frac{2}{3}$.

$= \frac{9}{16}$ Simplify.

c. $4 \div \frac{5}{6}$

$4 \div \frac{5}{6} = \frac{4}{1} \cdot \frac{6}{5}$ Multiply 4 by $\frac{6}{5}$, the reciprocal of $\frac{5}{6}$.

$= \frac{24}{5}$ or $4\frac{4}{5}$ Simplify.

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

$\frac{3}{4} \div 2\frac{1}{2} = \frac{3}{4} \cdot \frac{2}{5}$ Multiply $\frac{3}{4}$ by $\frac{2}{5}$, the reciprocal of $2\frac{1}{2}$.

$= \frac{6}{20}$ or $\frac{3}{10}$ Simplify.

Exercises **Find each product.**

1. $\frac{3}{4} \cdot \frac{1}{5}$
2. $\frac{2}{7} \cdot \frac{1}{3}$
3. $\frac{1}{5} \cdot \frac{3}{20}$
4. $\frac{2}{5} \cdot \frac{3}{7}$
5. $\frac{5}{2} \cdot \frac{1}{4}$
6. $\frac{7}{2} \cdot \frac{3}{2}$
7. $\frac{1}{3} \cdot \frac{2}{5}$
8. $\frac{2}{3} \cdot \frac{1}{11}$

Find each product. Simplify before multiplying if possible.

9. $\frac{2}{9} \cdot \frac{1}{2}$
10. $\frac{15}{2} \cdot \frac{7}{15}$
11. $\frac{3}{2} \cdot \frac{1}{3}$
12. $\frac{1}{3} \cdot \frac{6}{5}$
13. $\frac{9}{4} \cdot \frac{1}{18}$
14. $\frac{11}{3} \cdot \frac{9}{44}$
15. $\frac{2}{7} \cdot \frac{14}{3}$
16. $\frac{2}{11} \cdot \frac{110}{17}$
17. $\frac{1}{3} \cdot \frac{12}{19}$
18. $\frac{1}{3} \cdot \frac{15}{2}$
19. $\frac{30}{11} \cdot \frac{1}{3}$
20. $\frac{6}{5} \cdot \frac{10}{12}$

Name the reciprocal of each number.

21. $\frac{6}{7}$
22. $\frac{3}{2}$
23. $\frac{1}{22}$
24. $\frac{14}{23}$
25. $2\frac{3}{4}$
26. $5\frac{1}{3}$

Find each quotient.

27. $\frac{2}{3} \div \frac{1}{3}$
28. $\frac{16}{9} \div \frac{4}{9}$
29. $\frac{3}{2} \div \frac{1}{2}$
30. $\frac{3}{7} \div \frac{1}{5}$
31. $\frac{9}{10} \div \frac{3}{7}$
32. $\frac{1}{2} \div \frac{3}{5}$
33. $2\frac{1}{4} \div \frac{1}{2}$
34. $1\frac{1}{3} \div \frac{2}{3}$
35. $\frac{11}{12} \div 1\frac{2}{3}$
36. $\frac{3}{8} \div \frac{1}{4}$
37. $\frac{1}{3} \div 1\frac{1}{5}$
38. $\frac{3}{25} \div \frac{2}{15}$

The Percent Proportion

- A **percent** is a ratio that compares a number to 100. To write a percent as a fraction, express the ratio as a fraction with a denominator of 100. Fractions should be stated in simplest form.

Example 1 **Express each percent as a fraction.**

a. 25%

$25\% = \frac{25}{100}$ or $\frac{1}{4}$ Definition of percent

b. 107%

$107\% = \frac{107}{100}$ or $1\frac{7}{100}$ Definition of percent

c. 0.5%

$0.5\% = \frac{0.5}{100}$ Definition of percent

$= \frac{5}{1000}$ or $\frac{1}{200}$ Simplify.

- In the **percent proportion**, the ratio of a part of something (part) to the whole (base) is equal to the percent written as a fraction.

part → $\frac{a}{b} = \frac{p}{100}$ ← percent
base

Example: $\underbrace{10}_{\text{part}}$ is $\underbrace{25\%}_{\text{percent}}$ of $\underbrace{40}_{\text{base}}$.

Example 2 **40% of 30 is what number?**

The percent is 40, and the base is 30. Let a represent the part.

$\frac{a}{b} = \frac{p}{100}$ Use the percent proportion

$\frac{a}{30} = \frac{40}{100}$ Replace b with 30 and p with 40.

$100a = 30(40)$ Find the cross products.

$100a = 1200$ Simplify.

$\frac{100a}{100} = \frac{1200}{100}$ Divide each side by 100.

$a = 12$ Simplify.

The part is 12. So, 40% of 30 is 12.

Example 3 **Kelsey took a survey of some of the students in her lunch period. 42 out of the 70 students Kelsey surveyed said their family had a pet. What percent of the students had pets?**

You know the part, 42, and the base, 70.
Let p represent the percent.

$\frac{a}{b} = \frac{p}{100}$ Use the percent proportion.

$\frac{42}{70} = \frac{p}{100}$ Replace a with 42 and b with 70.

$4200 = 70p$ Find the cross products.

$\frac{4200}{70} = \frac{70p}{70}$ Divide each side by 70.

$60 = p$ Simplify.

The percent is 60, so $\frac{60}{100}$ or 60% of the students had pets.

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Example 4 **67.5 is 75% of what number?**

You know the percent, 75, and the part, 67.5.
Let b represent the base.

$\frac{a}{b} = \frac{p}{100}$ Use the percent proportion.

$\frac{67.5}{b} = \frac{75}{100}$ $75\% = \frac{75}{100}$, so $p = 75$. Replace a with 67.5 and p with 75.

$6750 = 75b$ Find the cross products.

$\frac{6750}{75} = \frac{75b}{75}$ Divide each side by 75.

$90 = b$ Simplify.

The base is 90, so 67.5 is 75% of 90.

Exercises **Express each percent as a fraction.**

1. 5%
2. 60%
3. 11%
4. 120%
5. 78%
6. 2.5%
7. 0.9%
8. 0.4%
9. 1400%

Use the percent proportion to find each number.

10. 25 is what percent of 125?
11. 16 is what percent of 40?
12. 14 is 20% of what number?
13. 50% of what number is 80?
14. What number is 25% of 18?
15. Find 10% of 95.
16. What percent of 48 is 30?
17. What number is 150% of 32?
18. 5% of what number is 3.5?
19. 1 is what percent of 400?
20. Find 0.5% of 250.
21. 49 is 200% of what number?
22. 15 is what percent of 12?
23. 48 is what percent of 32?

24. Madeline usually makes 85% of her shots in basketball. If she shoots 20 shots, how many will she likely make?

25. Brian answered 36 items correctly on a 40-item test. What percent did he answer correctly?

26. José told his dad that he won 80% of the solitaire games he played yesterday. If he won 4 games, how many games did he play?

27. A glucose solution is prepared by dissolving 6 grams of glucose in 120 milliliters of solution. What is the percent of glucose in the solution?

HEALTH **For Exercises 28–30, use the following information.**
The U.S. Food and Drug Administration requires food manufacturers to label their products with a nutritional label. The sample label shown at the right shows a portion of the information from a package of macaroni and cheese.

28. The label states that a seving contains 3 grams of saturated fat, which is 15% of the daily value recommended for a 2000-Calorie diet. How many grams of saturated fat are recommended for a 2000-Calorie diet.

29. The 470 milligrams of sodium (salt) in the macaroni and cheese is 20% of the recommended daily value. What is the recommended daily value of sodium?

30. For a healthy diet, the National Research Council recommends that no more than 30 percent of total Calories come from fat. What percent of the Calories in a serving of this macaroni and cheese come from fat?

Nutrition Facts
Serving Size 1 cup (228g)
Servings per container 2

Amount per serving	
Calories 250	Calories from Fat 110
	%Daily value*
Total Fat 12g	**18%**
Saturated Fat 3g	**15%**
Cholesterol 30mg	**10%**
Sodium 470mg	**20%**
Total Carbohydrate 31g	**10%**
Dietary Fiber 0g	**0%**
Sugars 5g	
Protein 5g	
Vitamin A 4% •	Vitamin C 2%
Calcium 20% •	Iron 4%

Expressing Fractions as Decimals and Percents

- To write a fraction as a decimal, divide the numerator by the denominator. To write a decimal as a fraction, write the decimal as a fraction with denominator of 10, 100, 1000, ... Then simplify if possible.

Example 1 **Write each fraction as a decimal.**

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

$\frac{5}{8} = 5 \div 8$

$= 0.625$

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

$\frac{3}{5} = 3 \div 5$

$= 0.6$

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

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

$= 0.333...$

Example 2 **Write each decimal as a fraction.**

a. 0.4

$0.4 = \frac{4}{10}$ or $\frac{2}{5}$

b. 0.005

$0.005 = \frac{5}{1000}$ or $\frac{1}{200}$

c. 0.98

$0.98 = \frac{98}{100}$ or $\frac{49}{50}$

- To write a fraction for a repeating decimal, use the method in Example 3 below.

Example 3 **Write each decimal as a fraction.**

a. $0.\overline{3}$

Let $N = 0.\overline{3}$ or $0.333...$

Then $10N = 3.\overline{3}$ or $3.333...$

$10N = 3.333...$

$-1N = 0.333...$ Subtract $1N$ from $10N$.

$9N = 3$

$N = \frac{3}{9}$ or $\frac{1}{3}$

So, $0.\overline{3} = \frac{1}{3}$.

b. $0.\overline{72}$

Let $N = 0.\overline{72}$ or $0.7272...$

Then $100N = 72.7272...$

$100N = 72.7272$

$-1N = 00.7272$ Subtract $1N$ from $100N$.

$99N = 72$

$N = \frac{72}{99}$ or $\frac{8}{11}$

So, $0.\overline{72} = \frac{8}{11}$.

- To write a decimal as a percent, multiply by 100 and add the % symbol. Recall that to multiply by 100, you can move the decimal point two places to the right.
- To write a percent as a decimal, divide by 100 and remove the % symbol. Recall that to divide by 100, you can move the decimal point two places to the left.

Example 4 **Write each decimal as a percent.**

Multiply by 100 and add the % symbol.

a. 0.35

$0.35 = 0.35$

$= 35\%$

b. 0.06

$0.06 = 0.06$

$= 6\%$

c. 0.008

$0.008 = 0.008$

$= 0.8\%$

Example 5 **Write each percent as a decimal.**

Divide by 100 and remove the % symbol.

a. 36%

$36\% = 36\%$

$= 0.36$

b. 9%

$9\% = 09\%$

$= 0.09$

c. 120%

$120\% = 120\%$

$= 1.2$

CONTENTS

- To write a fraction as a percent, express the fraction as a decimal. Then express the decimal as a percent.

Example 6 **Write each fraction as a percent. Round to the nearest tenth of a percent, if necessary.**

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

$\frac{1}{8} = 0.125$

$= 12.5\%$

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

$\frac{2}{3} = 0.6666\ldots$

$= 66.7\%$

c. $\frac{3}{600}$

$\frac{3}{600} = 0.005$

$= 0.5\%$

- To write a percent as a fraction, express the percent as decimal. Then express the decimal as a fraction. Simplify if possible.

Example 7 **Write each percent as a fraction.**

a. 30%

$30\% = 0.30$

$= \frac{30}{100}$ or $\frac{3}{10}$

b. 140%

$140\% = 1.4$

$= \frac{14}{10}$ or $1\frac{2}{5}$

c. 0.2%

$00.2\% = 0.002$

$= \frac{2}{1000}$ or $\frac{1}{500}$

Exercises **Write each fraction as a decimal.**

1. $\frac{3}{8}$ **2.** $\frac{2}{5}$ **3.** $\frac{2}{3}$ **4.** $\frac{3}{4}$

5. $\frac{1}{2}$ **6.** $\frac{5}{9}$ **7.** $\frac{3}{10}$ **8.** $\frac{5}{6}$

Write each decimal as a fraction.

9. 0.9 **10.** 0.25 **11.** 5.24 **12.** $0.\overline{45}$

13. $0.\overline{6}$ **14.** 0.0034 **15.** 2.08 **16.** 0.004

Write each decimal as a percent.

17. 0.4 **18.** 0.08 **19.** 2.5 **20.** 0.33

21. 0.065 **22.** 5 **23.** 0.005 **24.** $0.\overline{3}$

Write each percent as a decimal.

25. 45% **26.** 3% **27.** 68% **28.** 115%

29. 200% **30.** 0.1% **31.** 5.2% **32.** 10.5%

Write each fraction as a percent. Round to the nearest tenth of a percent, if necessary.

33. $\frac{3}{4}$ **34.** $\frac{9}{20}$ **35.** $\frac{1}{2}$ **36.** $\frac{1}{6}$

37. $\frac{1}{3}$ **38.** $\frac{7}{8}$ **39.** $\frac{6}{5}$ **40.** $\frac{19}{25}$

Write each percent as a fraction.

41. 70% **42.** 3% **43.** 52% **44.** 25%

45. 6% **46.** 135% **47.** 0.1% **48.** 0.5%

Making Bar and Line Graphs

- One way to organize data is by using a frequency table. In a **frequency table**, you use **tally marks** to record and display the frequency of events.

Example 1 **Make a frequency table to organize the temperature data in the chart at the right.**

Noon Temperature (°F)					
52	48	60	39	55	56
60	63	70	58	59	54
63	65	66	73	76	51
54	60	52	48	47	54

Step 1 Make a table with three columns: Temperature, Tally, and Frequency. Add a title.

Step 2 Use intervals to organize the temperatures. In this case, we are using intervals of 10.

Step 3 Use tally marks to record the temperatures in each interval.

Step 4 Count the tally marks in each row and record in the Frequency column.

Noon Temperature (°F)		
Temperature	Tally	Frequency
30–39	I	1
40–49	III	3
50–59	𝍸 𝍸	10
60–69	𝍸 II	7
70–79	III	3

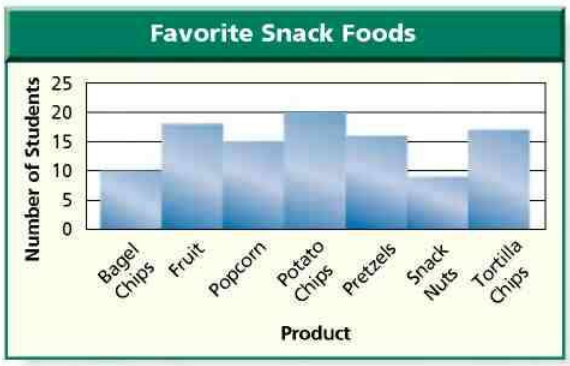
- A **bar graph** compares different categories of data by showing each as a bar whose length is related to the frequency.

Example 2 **The table below shows the results of a survey of students' favorite snacks. Make a bar graph to display the data.**

Product	Number of Students
Bagel Chips	10
Fruit	18
Popcorn	15
Potato Chips	20
Pretzels	16
Snack Nuts	9
Tortilla Chips	17

Step 1 Draw a horizontal axis and a vertical axis. Label the axes as shown. Add a title.

Step 2 Draw a bar to represent each category. The vertical scale is the number of students who chose each snack. The horizontal scale identifies the snack chosen.



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- Another way to represent data is by using a **line graph**. A line graph usually shows how data changes over a period of time.

Example 3 **Sales at the Marshall High School Store are shown in the table below. Make a line graph of the data.**

School Store Sales Amounts			
September	$670	February	$388
October	$229	March	$412
November	$300	April	$309
December	$168	May	$198
January	$290		

Step 1 Draw a horizontal axis and a vertical axis and label them as shown. Include a title.

Step 2 Plot the points to represent the data.

Step 3 Draw a line connecting each pair of consecutive points.

Exercises **Determine whether a bar graph or a line graph is the better choice to display the data.**

1. the growth of a plant
2. comparison of the populations in Idaho, Montana, and Texas
3. the number of students in each of the classes at your school
4. your height over the past eight years
5. the numbers of your friends that shower in the morning versus the number that shower at night

6. Alana surveyed several students to find the number of hours of sleep they typically get each night. The results are shown at the right. Make a bar graph of the data.

Hours of Sleep					
Alana	8	Kwam	7.5	Tomás	7.75
Nick	8.25	Kate	7.25	Sharla	8.5

7. Marcus started a lawn care service. The chart shows how much money he made over the 15 weeks of summer break. Make a line graph of the data.

Lawn Care Profits ($)								
Week	1	2	3	4	5	6	7	8
Profit	25	40	45	50	75	85	95	95
Week	9	10	11	12	13	14	15	
Profit	125	140	135	150	165	165	175	

8. The frequency table at the right shows the ages of people attending a high school play. Make a bar graph to display the data.

Age	Tally	Frequency
under 20	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 II	47
20–39	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 III	43
40–59	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 I	31
60 and over	𝍸 III	8

Making Circle Graphs

A **circle graph** is a graph that shows the relationship between parts of the data and the whole. The circle represents the total data. Individual data are represented by parts of the circle. The examples show how to construct a circle graph.

Example 1 **The table shows the percent of her income that Ms. Garcia spends in each category. Make a circle graph to represent the data.**

How Ms. Garcia Spends Her Money	
Category	Amount Spent
Savings	10%
Car Payment/Insurance	20%
Food	20%
Clothing	10%
Rent	30%
Other	10%

Step 1 Find the number of degrees for each category. Since there are 360° in a circle, multiply each percent by 360 to find the number of degrees for each section of the graph.

Savings, Clothing, Other

10% of $360° = 0.1 \cdot 360°$

$= 36°$

The sections for Savings, Clothing, and Other are each 36%.

Car Payment, Food

20% of $360° = 0.2 \cdot 360°$

$= 72°$

The sections for Car Payment and Food are each 72°

Rent

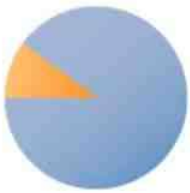
30% of $360° = 0.3 \cdot 360°$

$= 108°$

The section for Rent is 108°.

Step 2 Use a compass to draw a circle. Then draw a radius.

Step 3 Use a protractor to draw a 36° angle to make the section representing Savings. (You can start with any angle.)



Step 4 Repeat for the remaining sections.

Step 5 Label each section of the graph with the category and percent. Give the graph a title.

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Example 2 **The table shows how Jessie uses her time on a typical Saturday. Make a circle graph of the data.**

First find the ratio that compares each number of hours to the total number of hours in a day, 24.

Activity	Hours
Jogging	1
Reading	2
Sleeping	9
Eating	2
Talking on the Phone	1
Time with Friends and Family	4
Studying	5

Jogging: $\frac{1}{24}$ **Reading:** $\frac{2}{24}$ **Sleeping:** $\frac{9}{24}$ **Eating:** $\frac{2}{24}$

Phone: $\frac{1}{24}$ **Friends:** $\frac{4}{24}$ **Studying:** $\frac{5}{24}$

Then multiply each ratio by 360 to find the number of degrees for each section of the graph.

Jogging, Phone: $\frac{1}{24} \cdot 360° = 15°$

Reading, Eating: $\frac{2}{24} \cdot 360° = 30°$

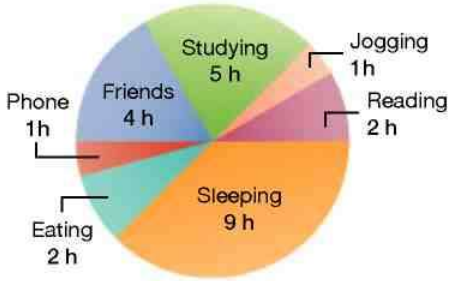
Sleeping: $\frac{9}{24} \cdot 360° = 135°$

Friends: $\frac{4}{24} \cdot 360° = 60°$

Studying: $\frac{5}{24} \cdot 360° = 75°$

Make the circle graph.

Saturday Time Use



Exercises

1. The table at the right shows the percent of the world's population living in each continent or region. Make a circle graph of the data. (Due to rounding, the percents do not total 100.)

World Population, 2000	
Continent or Region	Percent of World Total, 2000
North America	7.9%
South America	5.7%
Europe	12.0%
Asia	60.7%
Africa	13.2%
Australia	0.5%
Antarctica	0%

Source: U.S. Census Bureau

2. The number of bones in each part of the human body is shown in the table at the right. Make a circle graph of the data.

Types of Human Bones	Number
Skull	29
Spine	26
Ribs and Breastbone	25
Shoulders, Arms, and Hands	64
Pelvis, Legs, and Feet	62

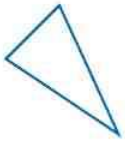
Identifying Two-Dimensional Figures

- Two-dimensional figures can be classified by the number of sides.

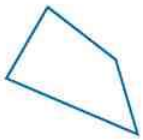
Number of Sides	Figure
3	**Tri**angle
4	**Quadri**lateral
5	**Pent**agon
6	**Hex**agon
8	**Oct**agon

The prefixes tell the number of sides.

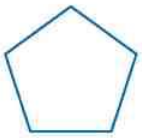
Triangle



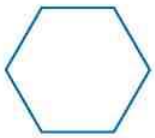
Quadrilateral



Pentagon



Hexagon



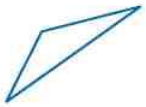
Octagon

- Triangles can be classified by their angles. An **acute** angle measures less than 90°. An **obtuse** angle measures more than 90°. A **right** angle measures exactly 90°.

Acute Triangle

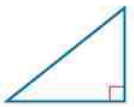
all acute angles

Obtuse Triangle



one obtuse angle

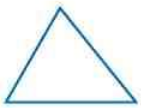
Right Triangle



one right angle

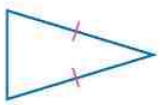
- Triangles can also be classified by their sides. Recall that **congruent** means having the same measure. Matching marks are used to show congruent parts.

Scalene Triangle



no sides congruent

Isosceles Triangle



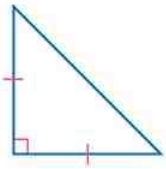
at least two sides congruent

Equilateral Triangle

all sides congruent

Example **Classify each triangle using all names that apply.**

a.



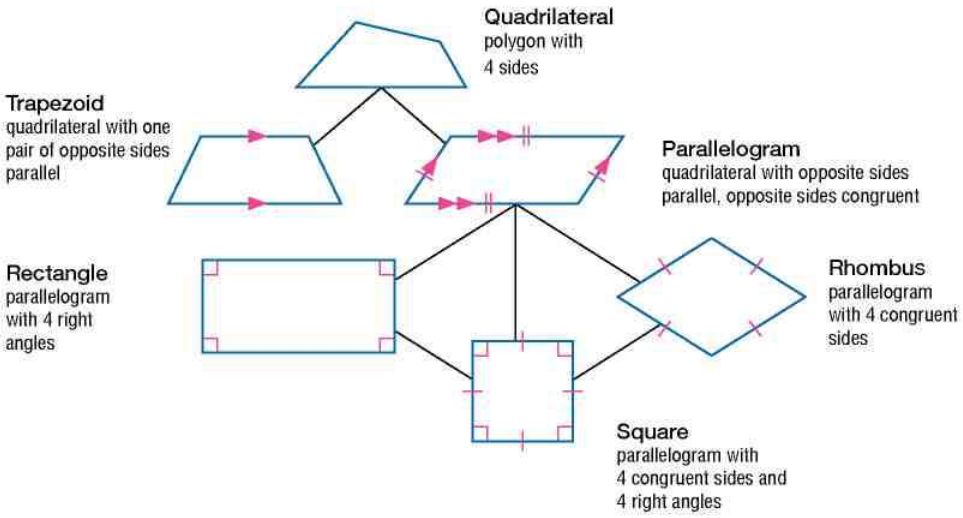
The triangle has one right angle and two congruent sides. It is a right isosceles triangle.

b.

The triangle has one obtuse angle and no congruent sides. It is an obtuse scalene triangle.

CONTENTS

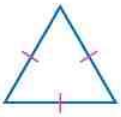
- The diagram below shows how quadrilaterals are classified. Notice that the diagram goes from most general to most specific.



Exercises **Classify each figure using all names that apply.**

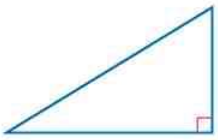
1.

2.



3.

4.



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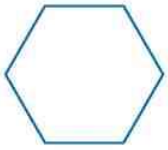

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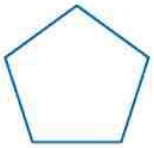

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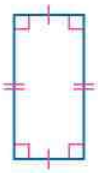

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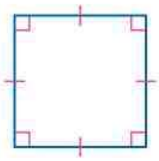

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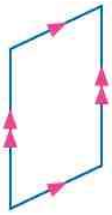
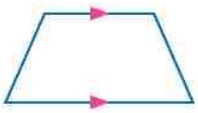
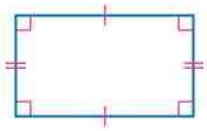


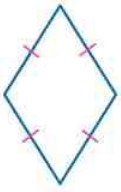
10.



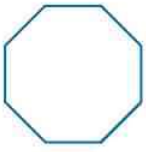
11.



12.



13.



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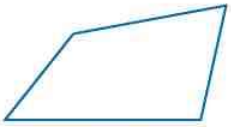
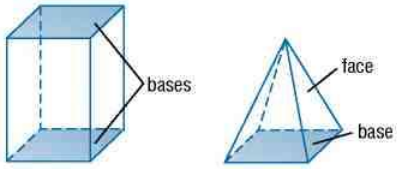


15.

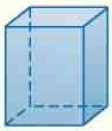
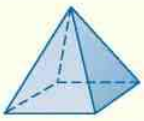
Identifying Three-Dimensional Figures

Prisms and pyramids are two types of three-dimensional figures. A **prism** has two parallel, congruent faces called **bases**. A **pyramid** has one base that is a polygon and faces that are triangles.

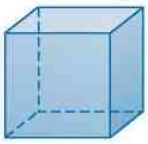


Prism Pyramid

Prisms and pyramids are named by the shape of their bases.

Name	triangular prism	rectangular prism	triangular pyramid	rectangular pyramid
Number of Bases	2	2	1	1
Polygon Base	triangle	rectangle	triangle	rectangle
Figure				

A **cube** is a rectangular prism in which all of the faces are squares.

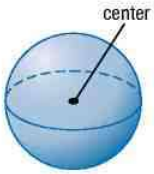


Cube

A **cone** is a shape in space that has a circular base and one **vertex**.

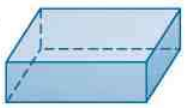
Cone

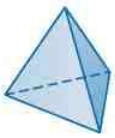
A **sphere** is the set of all points a given distance from a given point called the center.



Sphere

Exercises **Classify each solid figure using the name that *best* describes it.**

1. 

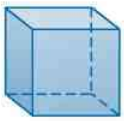
2. 

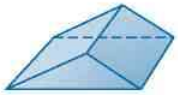
3. 

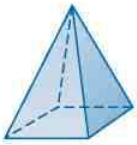
4. 

5. 

6. 

7. 

8. 

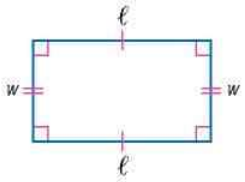
9. 

CONTENTS

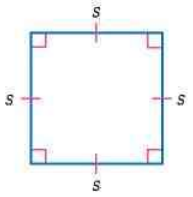
Perimeter and Area of Squares and Rectangles

Perimeter is the distance around a geometric figure. Perimeter is measured in linear units.

- To find the perimeter of a rectangle, multiply two times the sum of the length and width, or $2(\ell + w)$.
- To find the perimeter of a square, multiply four times the length of a side, or $4s$.



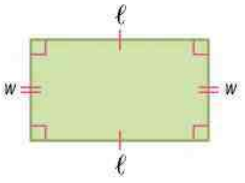
$P = 2(\ell + w)$ or $2\ell + 2w$



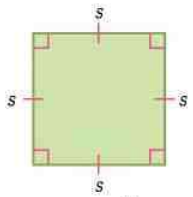
$P = 4s$

Area is the number of square units needed to cover a surface. Area is measured in square units.

- To find the area of a rectangle, multiply the length times the width, or $\ell \cdot w$.
- To find the area of a square, find the square of the length of a side, or s^2.



$A = \ell w$



$A = s^2$

Example 1 **Find the perimeter and area of each rectangle.**

a. A rectangle has a length of 3 units and a width of 5 units.

$P = 2(\ell + w)$ Perimeter formula
$= 2(3 + 5)$ Replace ℓ with 3 and w with 5.
$= 2(8)$ Add.
$= 16$ Multiply.

$A = \ell \cdot w$ Area formula
$= 3 \cdot 5$ Replace ℓ with 3 and w with 5.
$= 15$ Simplify.

The perimeter is 16 units, and the area is 15 square units.

b. A rectangle has a length of 1 inch and a width of 10 inches.

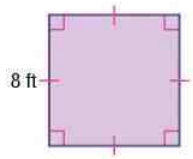
$P = 2(\ell + w)$ Perimeter formula
$= 2(1 + 10)$ Replace ℓ with 1and w with 10.
$= 2(11)$ Add.
$= 22$ Multiply.

$A = \ell \cdot w$ Area formula
$= 1 \cdot 10$ Replace ℓ with 1 and w with 10.
$= 10$ Simplify.

The perimeter is 22 inches, and the area is 10 square inches.

Example 2 **Find the perimeter and area of each square.**

a. A square has a side of length 8 feet.

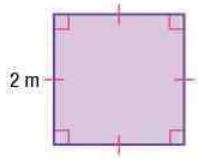


$P = 4s$ Perimeter formula
$= 4(8)$ $s = 8$
$= 32$ Multiply.

$A = s^2$ Area formula
$= 8^2$ $s = 8$
$= 64$ Multiply.

The perimeter is 32 feet, and the area is 64 square feet.

b. A square has a side of length 2 meters.



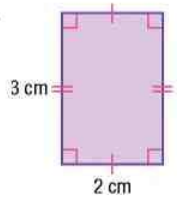
$P = 4s$ Perimeter formula
$= 4(2)$ $s = 2$
$= 8$ Multiply.

$A = s^2$ Area formula
$= 2^2$ $s = 2$
$= 4$ Multiply.

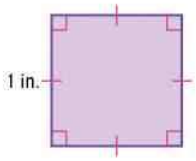
The perimeter is 8 meters, and the area is 4 square meters.

Exercises **Find the perimeter and area of each figure.**

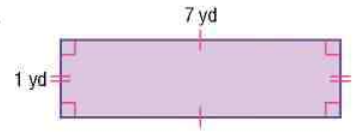
1.



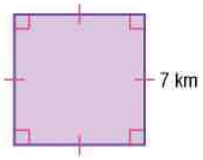
2.



3.



4.



5. a rectangle with length 6 feet and width 4 feet

6. a rectangle with length 12 centimeters and width 9 centimeters

7. a square with length 3 meters

8. a square with length 15 inches

9. a rectangle with width $8\frac{1}{2}$ inches and length 11 inches

10. a rectangular room with width $12\frac{1}{4}$ feet and length $14\frac{1}{2}$ feet

11. a square with length 2.4 centimeters

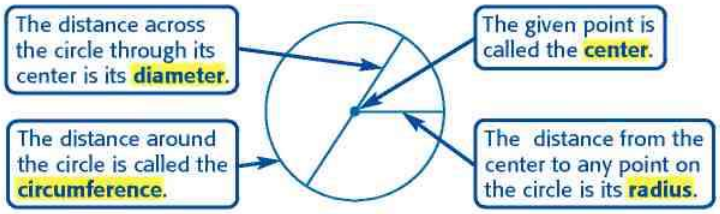
12. a square garden with length 5.8 meters

13. RECREATION The Granville Parks and Recreation Department uses an empty city lot for a community vegetable garden. Each participant is allotted a space of 18 feet by 90 feet for a garden. What is the perimeter and area of each plot?

CONTENTS

Area and Circumference of Circles

A **circle** is the set of all points in a plane that are the same distance from a given point.

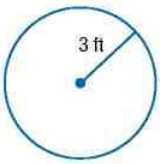


- The formula for the circumference of a circle is $C = \pi d$ or $C = 2\pi r$.

Example 1 **Find the circumference of each circle.**

a. The radius is 3 feet.

Use the formula $C = 2\pi r$.



$C = 2\pi r$ Write the formula.

$= 2\pi(3)$ Replace r with 3.

$= 6\pi$ Simplify.

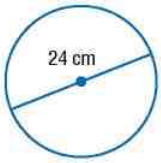
The exact circumference is 6π feet.

6 [π] [ENTER] 18.84955592

To the nearest tenth, the circumference is 18.8 feet.

b. The diameter is 24 centimeters.

Use the formula $C = \pi d$.



$C = \pi d$ Write the formula.

$= \pi(24)$ Replace d with 24.

$= 24\pi$ Simplify.

≈ 75.4 Use a calculator to evaluate 24π.

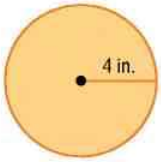
The circumference is about 75.4 centimeters.

- The formula for the area of a circle is $A = \pi r^2$.

Example 2 **Find the area of each circle to the nearest tenth.**

a. The radius is 4 inches.

$A = \pi r^2$ Write the formula.



$= \pi(4)^2$ Replace r with 4.

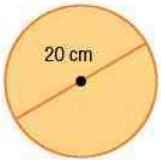
$= 16\pi$ Simplify.

≈ 50.3 Use a calculator to evaluate 16π.

The area of the circle is about 50.3 square inches.

b. The diameter is 20 centimeters.

The radius is one-half times the diameter, or 10 centimeters.



$A = \pi r^2$ Write the formula.

$= \pi(10)^2$ Replace r with 10.

$= 100\pi$ Simplify.

≈ 314.2 Use a calculator to evaluate 100π.

The area of the circle is about 314.2 square centimeters.

Example 3 **HISTORY** Stonehenge is an ancient monument in Wiltshire, England. Historians are not sure who erected Stonehenge or why. It may have been used as a calendar. The giant stones of Stonehenge are arranged in a circle 30 meters in diameter. Find the circumference and the area of the circle.

$C = \pi d$ Write the formula.
$= \pi(30)$ Replace d with 30.
$= 30\pi$ Simplify.
≈ 94.2 Use a calculator to evaluate 30π.

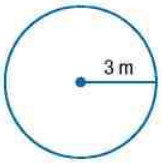
Find the radius to evaluate the formula for the area. The radius is one-half times the diameter, or 15 meters.

$A = \pi r^2$ Write the formula.
$= \pi(15)^2$ Replace r with 15.
$= 225\pi$ Simplify.
≈ 706.9 Use a calculator to evaluate 225π.

The circumference of Stonehenge is about 94.2 meters, and the area is about 706.9 square meters.

Exercises **Find the circumference of each circle. Round to the nearest tenth.**

1.



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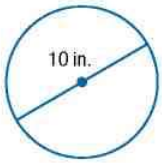
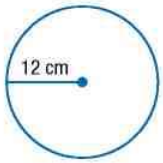


3.



4. The radius is 1.5 kilometers.

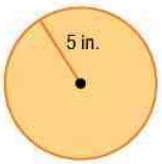
5. The diameter is 1 yard.

6. The diameter is $5\frac{1}{4}$ feet.

7. The radius is $24\frac{1}{2}$ inches.

Find the area of each circle. Round to the nearest tenth.

8.



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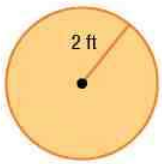

10.

11. The diameter is 4 yards.

12. The radius is 1 meter.

13. The radius is 1.5 feet.

14. The diameter is 15 centimeters.

14. GEOGRAPHY Earth's circumference is approximately 25,000 miles. If you could dig a tunnel to the center of the Earth, how long would the tunnel be?

15. CYCLING The tire for a 10-speed bicycle has a diameter of 27 inches. Find the distance the bicycle will travel in 10 rotations of the tire.

16. PUBLIC SAFETY The Belleville City Council is considering installing a new tornado warning system. The sound emitted from the siren would be heard for a 2-mile radius. Find the area of the region that will benefit from the system.

17. CITY PLANNING The circular region inside the streets at DuPont Circle in Washington, D.C., is 250 feet across. How much area do the grass and sidewalk cover?

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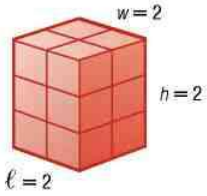
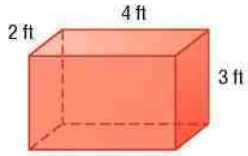
Volume

Volume is the measure of space occupied by a solid. Volume is measured in cubic units. The prism at the right has a volume of 12 cubic units.



- To find the volume of a rectangular prism, use the formula $V = \ell \cdot w \cdot h$. Stated in words, volume equals length times width times height.

Example **Find the volume of the rectangular prism.**



A rectangular prism has a height of 3 feet, width of 4 feet, and length of 2 feet.

$V = \ell \cdot w \cdot h$ Write the formula.

$V = 2 \cdot 4 \cdot 3$ Replace ℓ with 2, w with 4, and h with 3.

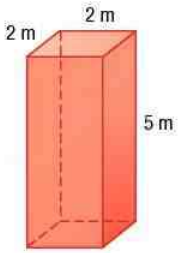
$V = 24$ Simplify.

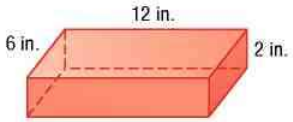
The volume is 24 cubic feet.

Exercises **Find the volume of each rectangular prism given the length, width, and height.**

1. $\ell = 2$ in., $w = 5$ in., $h = \frac{1}{2}$ in.
2. $\ell = 12$ cm, $w = 3$ cm, $h = 2$ cm
3. $\ell = 6$ yd, $w = 2$ yd, $h = 1$ yd
4. $\ell = 100$ m, $w = 1$ m, $h = 10$ m

Find the volume of each rectangular prism.

5. 

6. 

7. **AQUARIUMS** An aquarium is 8 feet long, 5 feet wide, and 5.5 feet deep. What is the volume of the tank?
8. **COOKING** What is the volume of a microwave oven that is 18 inches wide by 10 inches long with a depth of $11\frac{1}{2}$ inches?
9. **GEOMETRY** A cube measures 2 meters on a side. What is its volume?

FIREWOOD **For Exercises 10–12, use the following.**
Firewood is usually sold by a measure known as a cord. A full cord may be a stack $8 \times 4 \times 4$ feet or a stack $8 \times 8 \times 2$ feet.

10. What is the volume of a full cord of firewood?
11. A "short cord" or "face cord" of wood is $8 \times 4 \times$ the length of the logs. What is the volume of a short cord of $2\frac{1}{2}$-foot logs?
12. If you have an area that is 12 feet long and 2 feet wide in which to store your firewood, how high will the stack be if it is a full cord of wood?

Mean, Median, and Mode

Measures of central tendency are numbers used to represent a set of data. Three types of measures of central tendency are mean, median, and mode.

- The **mean** is the sum of the numbers in a set of data divided by the number of items.

Example 1 **Katherine is running a lemonade stand. She made $3.50 on Tuesday, $4.00 on Wednesday, $5.00 on Thursday, and $4.50 on Friday. What was her mean daily profit?**

$$\text{mean} = \frac{\text{sum of daily profits}}{\text{number of days}}$$

$$= \frac{\$3.50 + \$4.00 + \$5.00 + \$4.50}{4}$$

$$= \frac{\$17.00}{4} \text{ or } \$4.25$$

Katherine's mean daily profit was $4.25.

- The **median** is the middle number in a set of data when the data are arranged in numerical order. If there are an even number of data, the median is the mean of the two middle numbers.

- The **mode** is the number or numbers that appear most often in a set of data. If no item appears most often, the set has no mode.

Example 2 **The table shows the number of hits Marcus made for his team. Find the median of the data.**

Team Played	Number of Hits by Marcus
Badgers	3
Hornets	6
Bulldogs	5
Vikings	2
Rangers	3
Panthers	7

To find the median, order the numbers from least to greatest. The median is in the middle.

2, 3, 3, 5, 6, 7

There is an even number of items. Find the mean of the middle two.

$$\frac{3 + 5}{2} = 4$$

The median number of hits is 4.

Example 3 **The table shows the heights of the members of the 2001–2002 University of Kentucky Men's Basketball team. What is the mode of the heights?**

Player	Height (in.)
Blevins	74
Bogans	77
Camara	83
Daniels	79
Estill	81
Fitch	75
Hawkins	73
Heissenbuttel	76
Parker	80
Prince	81
Sears	78
Smith	74
Stone	82
Tackett	74

Source: ESPN

The mode is the number that occurs most frequently. 74 occurs three times, 81 occurs twice, and all the other heights occur once. The mode height is 74.

CONTENTS

- You can use measures of central tendency to solve problems.

Example 4 **On her first five history tests, Yoko received the following scores: 82, 96, 92, 83, and 91. What test score must Yoko earn on the sixth test so that her average (mean) for all six tests will be 90%?**

$$\text{mean} = \frac{\text{sum of the first five scores} + \text{sixth score}}{6}$$ Write an equation.

$$90 = \frac{82 + 96 + 92 + 83 + 91 + x}{6}$$ Use x to represent the sixth score.

$$90 = \frac{444 + x}{6}$$ Simplify.

$$540 = 444 + x$$ Multiply each side by 6.

$$96 = x$$ Subtract 444 from each side.

To have an average score of 90, Yoko must earn a 96 on the sixth test.

Exercises **Find the mean, median, and mode for each set of data.**

1. {1, 2, 3, 5, 5, 6, 13}
2. {3, 5, 8, 1, 4, 11, 3}
3. {52, 53, 53, 53, 55, 55, 57}
4. {8, 7, 5, 19}
5. {3, 11, 26, 4, 1}
6. {201, 201, 200, 199, 199}
7. {4, 5, 6, 7, 8}
8. {3, 7, 21, 23, 63, 27, 29, 95, 23}

9. **SCHOOL** The table shows the cost of some school supplies. Find the mean, median, and mode costs.

Cost of School Supplies	
Supply	Cost
Pencils	$0.50
Pens	$2.00
Paper	$2.00
Pocket Folder	$1.25
Calculator	$5.25
Notebook	$3.00
Erasers	$2.50
Markers	$3.50

10. **NUTRITION** The table shows the number of servings of fruits and vegetables that Cole eats one week. Find the mean, median, and mode.

Cole's Fruits and Vegetable Servings	
Day	Number of Servings
Monday	5
Tuesday	7
Wednesday	5
Thursday	4
Friday	3
Saturday	3
Sunday	8

11. **TELEVISION RATINGS** The ratings for the top television programs during one week are shown in the table at the right. Find the mean, median, and mode of the ratings. Round to the nearest hundredth.

Network Primetime Television Ratings	
Program	Rating
1	17.6
2	16.0
3	14.1
4	13.7
5	13.5
6	12.9
7	12.3
8	11.6
9	11.4
10	11.4

Source: Nielsen Media Research

12. **EDUCATION** Bill's scores on his first four science tests are 86, 90, 84, and 91. What test score must Bill earn on the fifth test so that his average (mean) will be exactly 88?

13. **BOWLING** Sue's average for 9 games of bowling is 108. What is the lowest score she can receive for the tenth game to have an average of 110?

14. **EDUCATION** Olivia has an average score of 92 on five French tests. If she earns a score of 96 on the sixth test, what will her new average score be?

Selected Answers

Chapter 1 The Language of Algebra

Page 5 Chapter 1 Getting Started

1. 64 **3.** 162 **5.** 19 **7.** 24 **9.** 16.6 cm **11.** $5\frac{1}{2}$ ft **13.** 7.2 **15.** 1.8 **17.** 9 **19.** $\frac{5}{12}$

Pages 8–9 Lesson 1-1

1. Algebraic expressions include variables and numbers, while verbal expressions contain words. **3.** Sample answer: a^5 **5.** Sample answer: $3x - 24$ **7.** 256 **9.** one half of n cubed **11.** $35 + z$ **13.** $16p$ **15.** $49 + 2x$ **17.** $\frac{2}{3}x^2$ **19.** $s + 12d$ **21.** 36 **23.** 81 **25.** 243 **27.** 1,000,000 **29.** $8.5b + 3.99d$ **31.** 7 times p **33.** three cubed **35.** three times x squared plus four **37.** a to the fourth power times b squared **39.** Sample answer: one-fifth 12 times z squared **41.** 3 times x squared minus 2 times x **43.** $x + \frac{1}{11}x$ **45.** $3.5m$ **47.** You can use the expression $4s$ to find the perimeter of a baseball diamond. Answers should include the following.

- four times the length of the sides and the sum of the four sides
- $s + s + s + s$

49. B **51.** 6.76 **53.** 3.2 **55.** $\frac{7}{12}$ **57.** $\frac{7}{6}$ or $1\frac{1}{6}$

Pages 13–15 Lesson 1-2

1. Sample answer: First add the innermost parentheses, $(2 + 5)$ then multiply by 3. Next square 6. Subtract inside the brackets. Multiply that by 8. Divide, then add 3. **3.** Chase; Laurie raised the incorrect quantity to the second power. **5.** 26 **7.** 51 **9.** $\frac{11}{100}$ **11.** 160 **13.** $20.00 + 2 \times 9.95$ **15.** 12 **17.** 21 **19.** 0 **21.** 4 **23.** 8 **25.** 6 **27.** $\frac{87}{2}$ or $43\frac{1}{2}$ **29.** 44 cm^2 **31.** \$1625 **33.** 1763 **35.** 24 **37.** 253 **39.** $\frac{37}{8}$ or $4\frac{5}{8}$ **41.** the sum of salary, commission, and 4 bonuses **43.** \$54,900 **45.** Use the order of operations to determine how many extra hours were used then how much the extra hours cost. Then find the total cost. Answers should include the following.

- $6[4.95 + 0.99(n)] - 25.00$
- You can use an expression to calculate a specific value without calculating all possible values.

47. B **49.** 2.074377092 **51.** $a^3 \cdot b^4$ **53.** $a + b + \frac{b}{a}$ **55.** $3(55 - w^3)$ **57.** 12 **59.** 256 **61.** 12 less than q squared **63.** x cubed divided by nine **65.** 7.212 **67.** 14.7775 **69.** $3\frac{11}{35}$ **71.** 36

Pages 18–20 Lesson 1-3

1. Sample answer: An open sentence contains an equals sign or inequality sign. **3.** Sample answer: An open sentence has at least one variable because it is neither true nor false until specific values are used for the variable. **5.** 15 **7.** 1.6 **9.** 3 **11.** {1.5, 2} **13.** 1000 Calories **15.** 12 **17.** 3 **19.** 18 **21.** $1\frac{1}{2}$ **23.** 1.4 **25.** 5.3 **27.** \$22.50 **29.** 11.05 **31.** 5 **33.** 9 **35.** 36 **37.** {6, 7} **39.** {10, 15, 20, 25} **41.** {3.4, 3.6, 3.8, 4} **43.** $\left\{0, \frac{1}{3}, \frac{2}{3}, 1, 1\frac{1}{3}\right\}$ **45.** $g = 15{,}579 + 6220 + 18{,}995$ **47.** $39n + 10.95 \leq 102.50$ **49.** The solution set includes all numbers less than or equal to $\frac{1}{3}$. **51.** B **53.** $r^2 + 3s$; 19 **55.** $(r + s)t^2$; $\frac{7}{4}$ **57.** 173 **59.** 50,628 **61.** $\frac{4}{21}$ **63.** $\frac{2}{7}$ **65.** $\frac{16}{63}$ **67.** $\frac{16}{75}$

Page 21 Practice Quiz 1

1. twenty less than x **3.** a cubed **5.** 28 **7.** 29 **9.** 8

Pages 23–25 Lesson 1-4

1. no; $3 + 1 \neq 3$ **3.** Sample answer: You cannot divide by zero. **5.** Additive Identity; 17

7. $6(12 - 48 \div 4)$
$= 6(12 - 12)$ *Substitution (=)*
$= 6(0)$ *Substitution (=)*
$= 0$ *Multiplicative Property of Zero*

9. $4(20) + 7$ **11.** 87 yr **13.** Multiplicative Identity; 5 **15.** Reflexive (=); 0.25 **17.** Additive Identity; $\frac{1}{3}$ **19.** Multiplicative Inverse; 1 **21.** Substitution; 3 **23.** Multiplicative Identity; 2

25. $\frac{2}{3}[3 \div (2 \cdot 1)]$
$= \frac{2}{3}[3 \div 2]$ *Substitution*
$= \frac{2}{3} \cdot \frac{3}{2}$ *Substitution*
$= 1$ *Multiplicative Inverse*

27. $6 \cdot \frac{1}{6} + 5(12 \div 4 - 3)$
$= 6 \cdot \frac{1}{6} + 5(3 - 3)$ *Substitution (=)*
$= 6 \cdot \frac{1}{6} + 5(0)$ *Substitution (=)*
$= 6 \cdot \frac{1}{6} + 0$ *Mult. Property of Zero*
$= 1 + 0$ *Multiplicative Inverse*
$= 1$ *Substitution (=)*

29. $7 - 8(9 - 3^2)$
$= 7 + 8(9 - 9)$ *Substitution (=)*
$= 7 + 8(0)$ *Substitution (=)*
$= 7 + 0$ *Mult. Property of Zero*
$= 7$ *Additive Identity*

31. $25(5 - 3) + 80(2.5 - 1) + 40(10 - 6)$
$= 25(2) + 80(2.5 - 1) + 40(10 - 6)$ *Sub. (=)*
$= 25(2) + 80(1.5) + 40(10 - 6)$ *Sub. (=)*
$= 25(2) + 80(1.5) + 40(4)$ *Substitution (=)*
$= 50 + 120 + 160$ *Substitution (=)*
$= 330$

33. $1653y = 1653$, where $y = 1$ **35.** $8(100{,}000 + 50{,}000 + 400{,}000) + 3(50{,}000 + 50{,}000 + 400{,}000) + 4(50{,}000 + 50{,}000 + 400{,}000)$ **37.** Sometimes; Sample answer: true: $x = 2, y = 1, z = 4, w = 3$; $2 \cdot 4 > 1 \cdot 3$; false: $x = 1, y = -1, z = -2, w = -3$; $1(-2) < (-1)(-3)$ **39.** A **41.** False; $4 - 5 = -1$, which is not a whole number. **43.** False; $1 \div 2 = \frac{1}{2}$, which is not a whole number. **45.** {11, 12, 13} **47.** {3, 3.25, 3.5, 3.75, 4} **49.** $\left\{1\frac{1}{4}\right\}$ **51.** 20 **53.** 31 **55.** 29 **57.** 80 **59.** 28 **61.** 10

Pages 29–31 Lesson 1-5

1. Sample answer: The numbers inside the parentheses are each multiplied by the number outside the parentheses then the products are added. **3.** Courtney; Courtney correctly combined like terms while Ben did not. **5.** $8 + 2t$

7. 1632 9. $14m$ 11. simplified 13. $12(19.95 + 2)$ 15. 96
17. 48 19. $6x + 18$ 21. $8 + 2x$ 23. $28y - 4$ 25. $ab - 6a$
27. $2a - 6b + 4c$ 29. $4(110{,}000 + 17{,}500)$ 31. 485 33. 102
35. 38 37. $12(5 + 12 + 8)$ 39. $6(78 + 20 + 12)$ 41. \$1956
43. $9b$ 45. $17a^2$ 47. $45x - 75$ 49. $7y^3 + y^4$ 51. $30m + 5n$
53. $\frac{8}{5}a$ 55. You can use the Distributive Property to calculate quickly by expressing any number as a sum or difference of a more convenient number. Answers should include the following.

- Both methods result in the correct method. In one method you multiply then add, and in the other you add then multiply.

57. C 59. Substitution (=) 61. Multiplicative Inverse
63. Reflexive (=) 65. 2258 ft 67. 11 69. 35 71. 168 cm^2

Pages 34–36 Lesson 1-6

1. Sample answer: The Associative Property says that you can group numbers together when adding or multiplying without changing the result. 3. Sample answer: $1 + 5 + 8 = 8 + 1 + 5$; $(1 \cdot 5)8 = 1(5 \cdot 8)$ 5. 10 7. 130 9. $7a + 10b$
11. $14x + 6$ 13. $15x + 10y$ 15. 81.744 cm^2 17. 53
19. 20.5 21. $9\frac{3}{4}$ 23. 540 25. 32 27. 420 29. \$291
31. \$77.38 33. $R17x + 10y$ 35. $7a^3 + 14a$ 37. $17n + 36$
39. $9.5x + 5.5y$ 41. $2.9f + 1.2g$ 43. $\frac{2}{3} + \frac{23}{10}p + \frac{6}{5}q$
45. $5(xy) + 3xy$

$= xy(5 + 3)$ *Distributive Property*
$= xy(8)$ *Substitution (=)*
$= 8xy$ *Commutative Property*

47. $6(x + y^2) - 3\left(x + \frac{1}{2}y^2\right)$

$= 6x + 6y^2 - 3x - 3\left(\frac{1}{2}y^2\right)$ *Distributive Property*
$= 6x - 3x + 6y^2 - \frac{3}{2}y^2$ *Commutative Property*
$= x(6 - 3) + y^2\left(6 - \frac{3}{2}\right)$ *Distributive Property*
$= x(3) + y^2\left(4\frac{1}{2}\right)$ *Substitution (=)*
$= 3x + 4\frac{1}{2}y^2$ *Commutative Property*

49. You can use the Commutative and Associative Properties to rearrange and group numbers for easier calculations. Answers should include the following.

- $d = (0.4 + 1.1) + (1.5 + 1.5) + (1.9 + 1.8 + 0.8)$

51. B 53. $15 + 6p$ 55. $13m + 6n$ 57. $3t^2 + 4t$ 59. 36
61. 18 63. 60 65. 13

Page 36 Practice Quiz 2

1. j 3. i 5. g 7. b 9. h

Pages 39–42 Lesson 1-7

1. Sample answer: If it rains, then you get wet. H: It rains; C: You get wet. 3. Sample answer: You can use deductive reasoning to determine whether a hypothesis and its conclusion are both true or whether one or both are false.
5. H: You play tennis; C: You run fast. 7. H: Lance does not have homework; C: he watches television; If Lance does not have homework, then he watches television.
9. H: a quadrilateral with four right angles; C: rectangle; If a quadrilateral has four right angles, then it is a rectangle.
11. No valid conclusion; the last digit could be any even number. 13. Anna could have a schedule without science class. 15. $x = 1$ 17. A 19. H: you are in Hawaii; C: you are in the tropics 21. H: $4(b + 9) \leq 68$; C: $b \leq 8$
23. H: $a = b$, and $b = c$; C: $a = c$ 25. H: it is after school; C: Greg will call; If it is after school, then Greg will call.
27. H: a number is divisible by 9; C: the sum of the digits of the number is a multiple of 9; If a number is divisible by 9, then the sum of its digits is a multiple of 9. 29. H: $s > 9$; C: $4s + 6 > 42$; If $s > 9$, then $4s + 6 > 42$; 31. Ian bought a VCR. 33. No valid conclusion; the hypothesis does not say Ian won't buy a VCR if it costs \$150 or more.
35. No valid conclusion; the conditional does not mention Ian buying 2 VCRs. 37. There is a professional team in Canada. 39. Left-handed people can have right-handed parents. 41. $2(8) = 16$ 43. $\frac{6}{3} \cdot \frac{1}{2} = 1$
45. Sample answer:

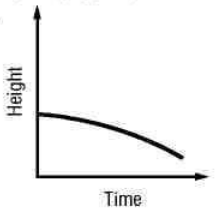
47. If the number ends with an even number it is divisible by 2 and if a number ends with a five or zero it is divisible by 5. 49. no counterexamples 51. You can use if-then statements to help determine when food is finished cooking. Answers should include the following.

- Hypothesis: you have small, underpopped kernels
  Conclusion: you have not used enough oil in your pan
- If the gelatin is firm and rubbery, then it is ready to eat.
  If the water is boiling, lower the temperature.

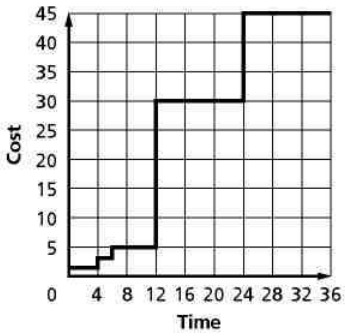
53. C 55. $a + 15b$ 57. $23mn + 24$ 59. $12x^2 + 12x$
61. Multiplicative Identity; 64 63. Substitution (=); 5
65. Additive Identity; 0 67. 41 69. 2 71. $3n - 10$
73. 36 75. 171 77. 225.5

Pages 46–48 Lesson 1-8

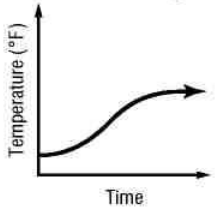
1. The numbers represent different values. The first number represents the number on the horizontal axis and the second represents the number on the vertical axis.
5. Graph B 7. (0, 500), (0.2, 480), (0.4, 422), (0.6, 324), (0.8, 186), (1, 10)
9.



11. Rashaad's account is increasing as he makes deposits and earns interest. Then he pays some bills. He then makes some deposits and earns interest.
13. Graph B
15.



17. The independent variable is the number of sides and the dependent variable is the sum of the angle measures.
19. 1080, 1260, 1440 21.



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23. Real-world data can be recorded and visualized in a graph and by expressing an event as a function of another event. Answers should include the following.
- A graph gives you a visual representation of the situation which is easier to analyze and evaluate.
- During the first 24 hours, blood flow to the brain decreases to 50% at the moment of the injury and gradually increases to about 60%
- Significant improvement occurs during the first two days.

25. A **27.** H: a shopper has 9 or fewer items; C: the shopper can use the express lane **29.** Substitution (=); 3 **31.** Multiplicative Identity; 1

Pages 53–55 Lesson 1-9

1. Compare parts to the whole; compare different categories of data; show changes in data over time. **3.** Sample answer: The percentages of the data do not total 100. **5.** tennis **7.** 14,900 **9.** Bar graph; a bar graph is used to compare similar data in the same category. **11.** The vertical axis needs to begin at 0. **13.** Sample answer: about 250 time as great **15.** Sample answer: about 2250 **17.** Yes, the graph is misleading because the sum of the percentages is not 100. To fix the graph, each section must be drawn accurately and another section that represents "other" toppings should be added. **19.** Tables and graphs provide an organized and quick way to examine data. Answers should include the following.
- Examine the existing pattern and use it to continue a graph to the future.
- Make sure the scale begins at zero and is consistent. Circle graphs should have all percents equal to 100%. The right graph is being used for the given data.

21. C **23.** $x = 12$ **25.** $6 + 6 + 2 + 2 = 16$ **27.** $6x^2 + 10x$

Pages 57–62 Chapter 1 Study Guide and Review

1. a **3.** g **5.** h **7.** i **9.** b **11.** x^5 **13.** $x + 21$ **15.** 27 **17.** 625 **19.** the product of three and a number m to the fifth power **21.** 11 **23.** 9 **25.** 0 **27.** 20 **29.** 26 **31.** 96 **33.** 23 **35.** 16 **37.** 13 **39.** 2 **41.** 4 **43.** 9 **45.** {6, 7, 8} **47.** {5, 6, 7, 8}

49. $\frac{1}{2} \cdot 2 + 2[2 \cdot 3 - 1]$

$= \frac{1}{2} \cdot 2 + 2[6 - 1]$ *Substitution (=)*

$= \frac{1}{2} \cdot 2 + 2 \cdot 5$ *Substitution (=)*

$= 1 + 2 \cdot 5$ *Multiplicative Inverse*

$= 1 + 10$ *Substitution (=)*

$= 11$ *Substitution (=)*

51. $1.2 - 0.05 + 2^3$

$= 1.2 - 0.05 + 8$ *Substitution (=)*

$= 1.15 + 8$ *Substitution (=)*

$= 9.15$ *Substitution (=)*

53. $3(4 \div 4)^2 - \frac{1}{4}(8)$

$= 3(1)^2 - \frac{1}{4}(8)$ *Substitution (=)*

$= 3 \cdot 1 - \frac{1}{4}(8)$ *Substitution (=)*

$= 3 - \frac{1}{4}(8)$ *Multiplicative Identity*

$= 3 - 2$ *Substitution (=)*

$= 1$ *Substitution (=)*

55. 72 **57.** $1 - 3p$ **59.** $24x - 56y$ **61.** simplified **63.** $8m + 8n$ **65.** $12y^2 - 5y$ **67.** $9w^2 + w$ **69.** $6a + 13b + 2c$ **71.** $17n - 24$

73. $2pq + pq$

$= (2 + 1)pq$ *Distributive Property*

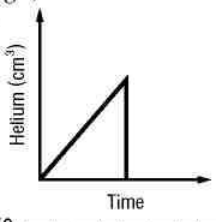
$= 3pq$ *Substitution (=)*

75. $3x^2 + (x^2 + 7x)$

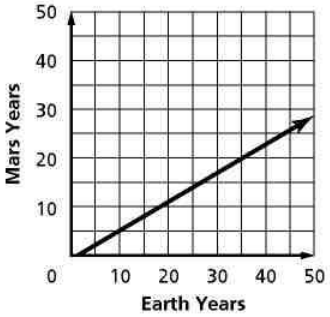
$= (3x^2 + x^2) + 7x$ *Associative Property*

$= 4x^2 + 7x$ *Substitution (=)*

77. H: a figure is a triangle, C: it has three sides; If a figure is a triangle, then it has three sides. **79.** $a = 15$, $b = 1$, $c = 12$ **81.**



83.



85. 36

Chapter 2 Real Numbers

Page 67 Getting Started

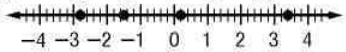
1. 2.36 **3.** 56.32 **5.** $\frac{11}{12}$ **7.** $\frac{3}{8}$ **9.** 4 **11.** 21.6 **13.** $1\frac{1}{2}$ **15.** 2.1 **17.** $8\frac{1}{6}$; 8; none **19.** 8; 7; 7 **21.** 0.81 **23.** $\frac{16}{25}$

Pages 70–72 Lesson 2-1

1. always **3.** Sample answer: Describing distances such as north versus south, or left versus right.

5. $\left\{\ldots, -\frac{11}{2}, -\frac{9}{2}, -\frac{7}{2}, -\frac{5}{2}, -\frac{3}{2}\right\}$

7.



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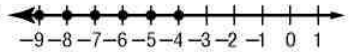
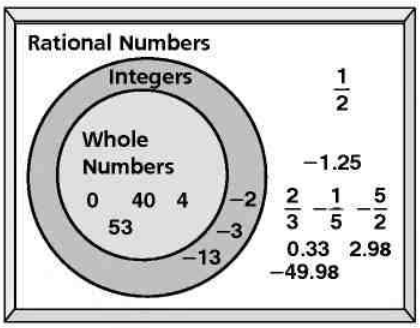


11. 18 **13.** $\frac{5}{6}$ **15.** 36

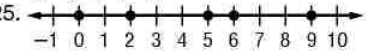
17.



19. {−7, −6, −5, −3, −2} **21.** {..., 0, 0.2, 0.4, 0.6, 0.8}

23. $\left\{\frac{1}{5}, \frac{4}{5}, \frac{7}{5}, \frac{8}{5}, 2\right\}$

25.



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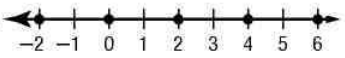
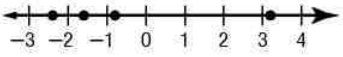
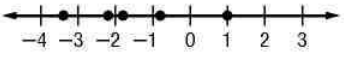
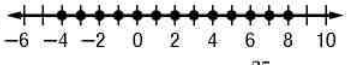
27. 

29. 

31. 

33. 

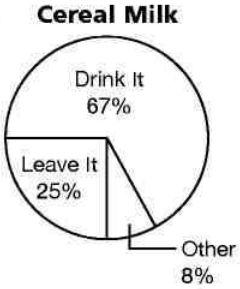
35. 10 **37.** 61 **39.** 6.8 **41.** $\frac{35}{80}$ **43.** Philadelphia, PA; Sample answer: It had the greatest absolute value. **45.** 55 **47.** 34 **49.** 14 **51.** 1.3 **53.** $\frac{1}{4}$ **55.** $\frac{13}{20}$ **57.** 0

59. Bismark, ND 11; Caribou, ME 5; Chicago, IL 4; Fairbanks, AK 9; International Falls, MN 13; Kansas City, MO 7; Sacramento, CA 34; Shreveport, LA 33 **61.** D **63.** December **65.** February, July, October **67.** $9x + 2y$ **69.** $4 + 80x + 32y$ **71.** $\frac{1}{3}$ **73.** $\frac{25}{24}$ or $1\frac{1}{24}$ **75.** $\frac{5}{12}$ **77.** $\frac{7}{18}$

Pages 76–78 Lesson 2-2

1. Sample answer: $\frac{1}{5} - \frac{3}{5}$ **3.** Gabriella; subtracting $-\frac{6}{9}$ is the same as adding $\frac{6}{9}$. **5.** −69 **7.** −17.43 **9.** $\frac{7}{60}$ **11.** 31.1 **13.** 10.25 **15.** $\frac{13}{60}$ **17.** 5 **19.** −22 **21.** −123 **23.** −5.4 **25.** −14.7 **27.** −14.7 **29.** $\frac{32}{21}$ or $1\frac{11}{21}$ **31.** $\frac{13}{55}$ **33.** $-\frac{199}{240}$ **35.** $2\frac{5}{8}$ **37.** 400 points **39.** −27 **41.** 33 **43.** −19 **45.** −16 **47.** 1.798 **49.** 105.3 **51.** $-\frac{5}{6}$ **53.** $-\frac{11}{16}$ **55.** $-\frac{49}{12}$ or $-4\frac{1}{12}$ **57.** −2, −6, −4, −4 **59.** Under; yes, it is better than par 72. **61.** week 7 **63.** Sometimes; if x is a negative number, then its absolute value is positive and the two values are additive inverses. **65.** D **67.** 15.4 **69.** 15.9

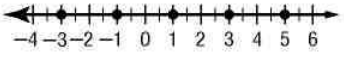
71.

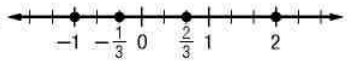


73. {5, 6} **75.** $q^2 - 8$ **77.** $\frac{1}{3}$ **79.** $\frac{5}{8}$ **81.** 5

Pages 81–83 Lesson 2-3

1. Sample answer: ab will be negative if either a or b is negative. Let $a = -2$ and $b = 3$: $-2(3) = -6$. Let $a = 2$ and $b = -3$: $2(-3) = -6$. **3.** Since multiplication is repeated addition, multiplying a negative number by another negative number is the same as adding repeatedly in the opposite, or positive direction. **5.** −40 **7.** 90.48 **9.** $-\frac{28}{135}$ **11.** $-57xy$ **13.** $-\frac{15}{8}$ or $-1\frac{7}{8}$ **15.** $56\frac{1}{4}t$ **17.** 176 **19.** −192 **21.** 3888 **23.** $\frac{5}{27}$ **25.** $-\frac{12}{35}$ **27.** $4\frac{1}{2}$ **29.** 0.845 **31.** −0.48 **33.** 8 **35.** $-45n$ **37.** $-28d$ **39.** $-21mn + (-12st)$ **41.** −$134.50 **43.** −30.42 **45.** 4.5 **47.** −13.53 **49.** −208.377 **51.** $1205.35 **53.** 60 million **55.** Even; the product of two negative numbers is positive and all even numbers can be divided into groups of two. **57.** B **59.** −12.1 **61.** 56

63. 

65. 

67. $x = 5$ **69.** $\frac{5}{16}$ **71.** $6\frac{2}{3}$ **73.** $1\frac{1}{3}$ **75.** $\frac{2}{3}$

Page 83 Practice Quiz 1

1. {−4, −1, 1, 6} **3.** −8 **5.** −8.15 **7.** 108 **9.** $16xy - 3yz$

Pages 86–87 Lesson 2-4

1. Sample answer: Dividing and multiplying numbers with the same signs both result in a positive answer while dividing or multiplying numbers with different signs results in a negative answer. However, when you divide rational numbers in fractional form, you must multiply a reciprocal. **3.** To divide by a rational number, multiply by its reciprocal. **5.** −9 **7.** 25.76 **9.** $-\frac{5}{6}$ **11.** $-65a$ **13.** 1.2 **15.** 1.67 **17.** 8 **19.** 60 **21.** −7.05 **23.** −2.28 **25.** 12.9 **27.** $-\frac{1}{12}$ **29.** $-\frac{35}{3}$ or $-11\frac{2}{3}$ **31.** $\frac{10}{9}$ or $1\frac{1}{9}$ **33.** $-\frac{175}{192}$ **35.** $\frac{222}{5}$ or $44\frac{2}{5}$ **37.** $9c$ **39.** $-r + (-3)$ **41.** $20a - 25b$ **43.** $-f + (-2g)$ **45.** 2 **47.** −16.25 **49.** 2.08 **51.** −1.21 **53.** 1.76 **55.** $1998.75 **57.** 16-karat gold **59.** Sample answer: You use division to find the mean of a set of data. Answers should include the following.

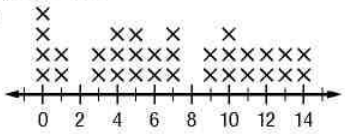
- You could track the mean number of turtles stranded each year and note if the value increases or decreases.
- Weather or pollution could affect the turtles.

61. B **63.** 3 **65.** 0.48 **67.** −6 **69.** $-\frac{11}{24}$ **71.** $20b + 24$ **73.** $3x + 4y$ **75.** 6.25; 4.5; 3 **77.** 79.3; 79.5; 84

Pages 91–94 Lesson 2-5

1. They describe the data as a whole. **3.** Sample answer: 13, 14, 14, 28

5.



7. The mean and the median both represent the data accurately as they are fairly central. **9.** 3.6

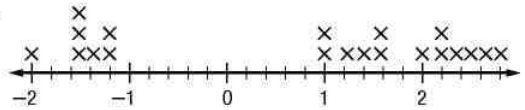
11.

Stem	Leaf
5	4 5 5 6
6	0 1 4 9
7	0 3 5 7 8
8	0 0 3 5 8 8 8
9	0
10	0 2 5
11	0

5 | 4 = 54

13. The mode is not the best measure as it is higher than most of the values.

15.



17. 23 **19.** Sample answer: Median; most of the data are near 2.

21.

Stem	Leaf
1	8 6
2	2 3 6 6 6 8 9
3	0 1 1 2 3 4
4	7

1 | 8 = 18

23. 118 **27.** Mean or median; both are centrally located and the mode is too high. **29.** 7 **31.** Sample answer: Yes; most of the data are near the median. **33.** 22

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35.

Stem	Leaf
3	0 4 7
4	
5	2 9
6	2 7
7	7
8	4 5

$3 \mid 0 = 30$

37. no mode **39.** High school: \$10,123; College: \$11,464; Bachelor's Degree: \$18,454; Doctoral Degree: \$21,608

41. Sample answer: Because the range in salaries is often very great with extreme values on both the high end and low end. **43.** C **45.** -4 **47.** -13.5 **49.** $-17x$ **51.** $-3t$ **53.** 1 **55.** 9 **57.** $\frac{2}{3}$ **59.** $\frac{7}{10}$ **61.** $\frac{1}{2}$ **63.** $\frac{4}{9}$

Pages 98–101 Lesson 2-6

1. Sample answers: impossible event: a number greater than 6; certain event: a number from 1 to 6; equally likely event: even number **3.** Doug; Mark determined the odds in favor of picking a red card. **5.** $\frac{1}{26}$ **7.** $\frac{1}{26}$ **9.** 3:7 **11.** 6:4 **13.** $\frac{3}{10}$ **15.** $\frac{1}{3} \approx 33\%$ **17.** $\frac{1}{2} = 50\%$ **19.** $\frac{13}{30} \approx 43\%$ **21.** 1 **23.** $\frac{7}{12} \approx 58\%$ **25.** $1 = 100\%$ **27.** $\frac{25}{36} \approx 69\%$ **29.** $\frac{1}{6} \approx 17\%$ **31.** $\frac{2}{3} \approx 67\%$ **33.** $\frac{1}{2} = 50\%$ **35.** $\frac{15}{31} \approx 48\%$ **37.** 4:20 or 1:5 **39.** 13:11 **41.** 9:15 or 3:5 **43.** 12:20 or 3:5 **45.** 15:17 **47.** 13:19 **49.** 1:2 **51.** $\frac{19}{40} = 47.5\%$ **53.** 7:13 **55.** 42:4 or 21:2 **57.** $\frac{1}{1{,}000{,}001}$ **59.** $\frac{6}{7} \approx 86\%$ **61.** B

63.

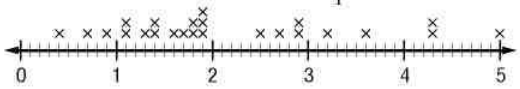
Stem	Leaf
5	8.3
6	4.3 5.1 5.5 6.7 7.0 8.7 9.3
7	0.0 2.8 3.2 5.8 7.4 7.4

$5 \mid 8.3 = 58.3$

65. $-\frac{5}{3}$ or $-1\frac{2}{3}$ **67.** -3.9 **69.** $-\frac{5}{8}$ **71.** 4.25 **73.** $\frac{2}{3}$ **75.** 36 **77.** 64 **79.** 2.56 **81.** $\frac{16}{81}$

Page 101 Practice Quiz 2

1. 17 **3.** -11.7 **5.** $x + 8$ **7.** Sample answer: scale 0–5.0

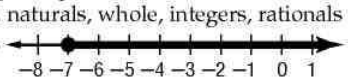


9. $\frac{13}{18}$

Pages 107–109 Lesson 2-7

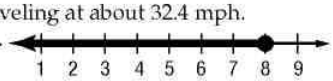
1. Sometimes; the square root of a number can be negative, such as $\sqrt{16} = 4$ and $\sqrt{16} = -4$. **3.** There is no real number that can be multiplied by itself to result in a negative product. **5.** 1.2 **7.** 5.66 **9.** rationals **11.** naturals, whole, integers, rationals

13.



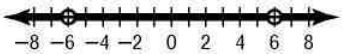
15. = **17.** $-15, \sqrt{\frac{1}{8}}, \frac{1}{8}, 0.\overline{15}$ **19.** C **21.** 9 **23.** 2.5 **25.** -9.70 **27.** $\pm\frac{5}{7}$ **29.** 0.77 **31.** ± 22.65 **33.** naturals, wholes, integers, rationals **35.** rationals **37.** irrationals **39.** rationals **41.** rationals **43.** rationals **45.** rationals **47.** irrationals **49.** irrational **51.** No; Jerome was traveling at about 32.4 mph.

53.



55.

57.



59. < **61.** < **63.** > **65.** $0.\overline{24}, \sqrt{0.06}, \frac{\sqrt{9}}{12}$ **67.** $-4.\overline{83}, -\frac{3}{8}, 0.4, \sqrt{8}$ **69.** $7\frac{4}{9}, \sqrt{122}, \sqrt{200}$ **71.** about 3.4 mi **73.** They are true if q and r are positive and $q > r$. **75.** The length of the side is the square root of the area.

77. Sample answer: By using the formula Surface Area $= \sqrt{\frac{\text{height} \times \text{weight}}{3600}}$, you need to use square roots to calculate the quantity. Answers should include the following.

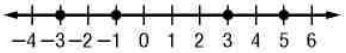
- You must multiply height by weight first. Divide that product by 3600. Then determine the square root of that result.
- Sample answers: exposure to radiation or chemicals; heat loss; scuba suits
- Sample answers: determining height, distance

79. B **81.** 5:8 **83.** 12:1 **85.** -61 **87.** $5.1x - 7.6y$

Pages 110–114 Chapter 2 Study Guide and Review

1. true **3.** true **5.** true **7.** false; sample answer: $0.\overline{6}$ or 0.666…

9.



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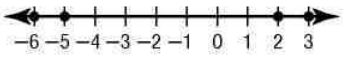
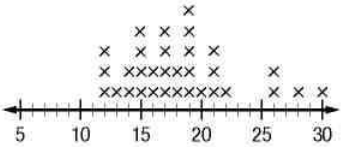


13. 5 **15.** 14 **17.** -5 **19.** -1.4 **21.** $\frac{1}{2}$ **23.** 16 **25.** -2.5 **27.** $\frac{13}{24}$ **29.** -36 **31.** 8.64 **33.** $\frac{3}{10}$ **35.** n **37.** -9 **39.** -10.9 **41.** -20 **43.** $-2 + 4x$ **45.** $-x + 6y$ **47.** -3.2

49.



Stem	Leaf
1	2 2 2 3 4 4 5 5 5 5 6 6 7
	7 7 7 8 8 9 9 9 9 9
2	0 1 1 1 2 6 6 8
3	0

$1 \mid 2 = 12$

51. Sample answer; Median; it is closest in value to most of the data **53.** $\frac{1}{4}$ **55.** $\frac{1}{4}$ **57.** 18:31 **59.** 25:24 **61.** ± 1.1 **63.** $\pm\frac{2}{15}$ **65.** naturals, wholes, integers, rationals **67.** < **69.** >

Chapter 3 Solving Linear Equations

Page 119 Chapter 3 Getting Started

1. $\frac{1}{2}t + 5$ **3.** $3a + b^2$ **5.** $95 - 9y$ **7.** 15 **9.** 16 **11.** 7 **13.** 5 **15.** 25% **17.** 300% **19.** 160%

Pages 123–126 Lesson 3-1

1. Explore the problem, plan the solution, solve the problem, and examine the solution. **3.** Sample answer: After sixteen people joined the drama club, there were 30 members. How many members did the club have before the new members? **5.** $5(m + n) = 7n$ **7.** $C = 2\pi r$ **9.** $\frac{1}{3}$ of b minus $\frac{3}{4}$ equals 2 times a. **11.** $155 + g = 160$ **13.** $200 - 3x = 9$ **15.** $\frac{1}{3}q + 25 = 2q$ **17.** $2(v + w) = 2z$ **19.** $g \div h = 2(g + h) + 7$ **21.** $0.46E = P$ **23.** $A = bh$

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25. $P = 2(a + b)$ **27.** $c^2 = a^2 + b^2$ **29.** d minus 14 equals 5. **31.** k squared plus 17 equals 53 minus j. **33.** $\frac{3}{4}$ of p plus $\frac{1}{2}$ equals p. **35.** 7 times the sum of m and n equals 10 times n plus 17. **37.** The area A of a trapezoid equals one-half times the product of the height h and the sum of the bases, a and b. **39.** Sample answer: Lindsey is 7 inches taller than Yolanda. If 2 times Yolanda's height plus Lindsey's height equals 193 inches, find Yolanda's height. **41.** $V = \frac{1}{3}\pi r^2 h$ **43.** $V = \frac{4}{3}\pi r^3$ **45.** $1912 + y$ **47.** 16 yr **49.** $a + (4a + 15) = 60$ **53.** Equations can be used to describe the relationships of the heights of various parts of a structure. Answers should include the following.

- The equation representing the Sears Tower is $1454 + a = 1707$.

55. D **57.** $-\frac{5}{6}$ **59.** −7.42 **61.** $\frac{1}{2}$ **63.** $8d + 3$ **65.** $8a + 6b$ **67.** 408 **69.** 9.37 **71.** 1.88 **73.** $\frac{13}{15}$ **75.** $\frac{1}{9}$

Pages 131–134 Lesson 3-2

1. Sample answers: $n = 13$, $n + 16 = 29$, $n + 12 = 25$ **3.** (1) Add −94 to each side. (2) Subtract 94 from each side. **5.** −13 **7.** 171 **9.** $\frac{5}{6}$ **11.** $n + (-37) = -91$; −54 **13.** $16.8h$ **15.** 23 **17.** 28 **19.** 38 **21.** 43 **23.** −96 **25.** 73 **27.** 3.45 **29.** −2.58 **31.** 15.65 **33.** $1\frac{7}{12}$ **35.** $1\frac{1}{8}$ **37.** $-\frac{2}{15}$ **39.** 19 **41.** $x + 55 = 78$; 23 **43.** $n - 18 = 31$; 49 **45.** $n + (-16) = -21$; −5 **47.** $n - \frac{1}{2} = -\frac{3}{4}; -\frac{1}{4}$ **49.** Sometimes, if $x = 0$, $x + x = x$ is true. **51.** $\ell + 10 = 34$ **53.** 37 mi **55.** Sample answer: 29 mi; 29 is the average of 24 (for the 8-cylinder engine) and 34 (for the 4-cylinder engine). **57.** 31 ft **59.** $11.4 + x = 13.6$; 2.2 million volumes **61.** $24.0 + 13.6 + 11.4 = x$; 49.0 million volumes **63.** $1379 + 679 + 1707 + x = 1286 + 634 + 3714$; 1869 **65.** $a = b$, $x = 0$ **67.** C **69.** $A = \pi r^2$ **71.** < **73.** = **75.**

Stem	Leaf
0	5 8
1	1 2 4 7
2	3 6 8 9
3	
4	1 5

0 | 5 = 0.5

77. H: if it is Friday; C: there will be a science quiz

79. $(2^5 - 5^2) + (4^2 - 2^4)$
$= (32 - 25) + (16 - 16)$ *Substitution (=)*
$= 7 + 0$ *Substitution (=)*
$= 7$ *Additive Identity*

81. {1, 3, 5} **83.** 10.545 **85.** 0.22 **87.** $\frac{1}{6}$ **89.** $3\frac{1}{3}$

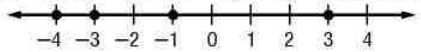
Pages 138–140 Lesson 3-3

1. Sample answer: $4x = -12$ **3.** Juanita; to find an equivalent equation with $1q$ on one side of the equation, you must divide each side by 8 or multiply each side by $\frac{1}{8}$. **5.** −35 **7.** $1\frac{1}{9}$ **9.** $\frac{10}{13}$ **11.** $\frac{2}{5}n = -24$; −60 **13.** −11 **15.** 35 **17.** −77 **19.** 21 **21.** 10 **23.** −6.2 **25.** −3.5 **27.** $8\frac{6}{13}$ **29.** $\frac{11}{15}$ **31.** 30 **33.** $7n = -84$; −12 **35.** $\frac{1}{5}n = 12$; 60 **37.** $2\frac{1}{2}n = 1\frac{1}{5}; \frac{12}{25}$ **39.** $\ell = \frac{1}{7}p$ **41.** 455 people **43.** 0.48 s **45.** about 0.02 s **47.** $x + 8x = 477$ **49.** 424 g **51.** You can use the distance formula and the speed of light to find the time it takes light from the stars to reach Earth. Answers should include the following.

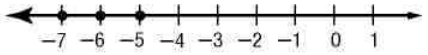
- Solve the equation by dividing each side of the equation by 5,870,000,000,000. The answer is 53 years.
- The equation $5{,}870{,}000{,}000{,}000t = 821{,}800{,}000{,}000{,}000$ describes the situation for the star in the Big Dipper farthest from Earth.

53. A **55.** 13 **57.** $10a = 5(b + c)$ **59.** 0.00879

61.



63.



65. Commutative Property of Addition **67.** 25 **69.** 9

Page 140 Practice Quiz 1

1. $S = 4\pi r^2$ **3.** −45 **5.** −24 **7.** 27 **9.** −9

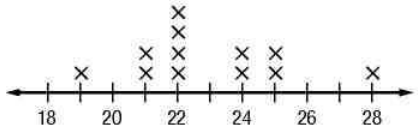
Pages 145–148 Lesson 3-4

1. Sample answers: $2x + 3 = -1$, $3x - 1 = -7$ **3.** $n - 2$ **5.** 6 **7.** −1 **9.** $12\frac{2}{3}$ **11.** 28 **13.** $12 - 2n = -34$; 23 **15.** 12 letters **17.** 24 **19.** 80 lb **21.** $60 **23.** −6 **25.** −7 **27.** −15 **29.** −56 **31.** −125 **33.** $25\frac{1}{3}$ **35.** −42.72 **37.** −12.6 **39.** 7 **41.** 2 **43.** $29 = 13 + 4n$; 4 **45.** $n + (n + 2) + (n + 4) = -30$; −12, −10, −8 **47.** $n + (n + 2) + (n + 4) + (n + 6) = 8$; −1, 1, 3, 5 **49.** 16 cm, 18 cm, 20 cm **51.** 10 in. **53.** $75,000 **55.** never **57.** B **59.** −3 **61.** −126 **63.** 5 **65.** −13 **67.** $2\frac{1}{4}$ **69.** 29 models **71.** 1:1 **73.** $-\frac{2}{7}$ **75.** $-\frac{3}{4}a + 4$ **77.** 153 **79.** 20 **81.** $5m + \frac{n}{2}$ **83.** $3a + b^2$ **85.** $6m$ **87.** $-8g$ **89.** $-10m$

Pages 151–154 Lesson 3-5

1a. Incorrect; the 2 must be distributed over both g and 5; 6. **1b.** correct **1c.** Incorrect; to eliminate $-6z$ on the right side of the equal sign, $6z$ must be added to each side of the equation; 1. **3.** Sample answer: $2x - 5 = 2x + 5$ **5.** 4 **7.** 3 **9.** 2.6 **11.** all numbers **13.** D **15a.** Subtract v from each side. **15b.** Simplify. **15c.** Subtract 9 from each side. **15d.** Simplify. **15e.** Divide each side by 6. **15f.** Simplify. **17.** 4 **19.** −3 **21.** $-1\frac{1}{2}$ **23.** 4 **25.** 8 **27.** no solution **29.** 2 **31.** 10 **33.** −4 **35.** 4 **37.** 0.925 **39.** all numbers **41.** −36 **43.** 26, 28, 30 **45.** 8-penny **47.** 2.5 by 0.5 and 1.5 by 1.5 **49.** Sample answer: $3(x + 1) = x - 1$ **51.** D **53.** 90 **55.** −2 **57.** $33\frac{1}{3}$ min

59.



61. −4 **63.** Sample answer: $1 + 3 = 4$ **65.** 5 **67.** 0 **69.** $\frac{4}{7}$ **71.** $\frac{1}{15}$ **73.** $\frac{2}{3}$ **75.** $\frac{1}{3}$

Page 158–159 Lesson 3-6

3. Find the cross products and divide by the value with the variable. **5.** no **7.** 8 **9.** 4.62 **11.** yes **13.** no **15.** no **17.** USA: $\frac{871}{2116}$; USSR/Russia: $\frac{498}{1278}$; Germany: $\frac{374}{1182}$; GB: $\frac{180}{638}$; France: $\frac{188}{598}$; Italy: $\frac{179}{479}$; Sweden: $\frac{136}{469}$ **19.** 20 **21.** 18 **23.** $9\frac{1}{3}$ **25.** 2.28 **27.** 1.23 **29.** $19\frac{1}{3}$ **31.** 14 days **33.** 3 in. **35.** 18 **37.** Sample answer: Ratios are used to determine how much of each ingredient to use for a given number of servings. Answers should include the following.

CONTENTS

- To determine how much honey is needed if you use 3 eggs, write and solve the proportion $2:\frac{3}{4} = 3:h$, where h is the amount of honey.
- To alter the recipe to get 5 servings, multiply each amount by $1\frac{1}{4}$.

39. C **41.** no solution **43.** -2 **45.** -8 **47.** -1
49. 0.4125 **51.** 77 **53.** 0.85 **55.** 30% **57.** 40%

Page 162–164 Lesson 3-7

1. Percent of increase and percent of decrease are both percents of change. If the new number is greater than the original number, the percent of change is a percent of increase. If the new number is less than the original number, the percent of change is a percent of decrease. **3.** Laura; Cory used the new number as the base instead of the original number. **5.** increase; 11% **7.** decrease; 20% **9.** \$16.91 **11.** \$13.37 **13.** about 77% **15.** decrease; 28% **17.** increase; 162% **19.** decrease; 27% **21.** increase; 6% **23.** increase; 23% **25.** decrease; 14% **27.** 30% **29.** 8 g **31.** \$14.77 **33.** \$7.93 **35.** \$42.69 **37.** \$27.00 **39.** \$24.41 **41.** \$96.77 **43.** \$101.76 **45.** \$46.33 **47.** India **49.** always; $x\%$ of $y \rightarrow \frac{x}{100} = \frac{P}{y}$ or $P = \frac{xy}{100}$; $y\%$ of $x \rightarrow \frac{y}{100} = \frac{P}{x}$ or $P = \frac{xy}{100}$ **51.** B **53.** 9 **55.** 18 **57.** -6 **59.** $\frac{1}{10}$ **61.** $\frac{4}{27}$ **63.** false **65.** true **67.** -3 **69.** -11 **71.** 3

Page 164 Practice Quiz 2

1. $-8\frac{1}{3}$ **3.** 1.5 **5.** all numbers **7.** 5 **9.** 5

Pages 168–170 Lesson 3-8

1. (1) Subtract az from each side. (2) Add y to each side. (3) Use the Distributive Property to write $ax - az$ as $a(x - z)$. (4) Divide each side by $x - z$. **3.** Sample answer for a triangle: $A = \frac{1}{2}bh$; $b = \frac{2A}{h}$ **5.** $a = \frac{54 + y}{5}$ **7.** $y = 3c - a$ **9.** $w = \frac{5 + t}{m - 2}$ **11.** $h = \frac{2A}{b}$ **13.** $g = \frac{h}{4}$ **15.** $m = \frac{y - b}{x}$ **17.** $y = \frac{am - z}{7}$ **19.** $m = \frac{6y - 5x}{k}$ **21.** $x = \frac{n - 20}{3a}$ **23.** $y = \frac{3c - 2}{b}$ **25.** $y = \frac{4}{3}(c - b)$ **27.** $A = \frac{2S - nt}{n}$ **29.** $a = \frac{c + b}{r - t}$ **31.** $t - 5 = r + 6$; $t = r + 11$ **33.** $\frac{5}{8}x = \frac{1}{2}y + 3$; $y = \frac{5}{4}x - 6$ **35.** 6 m **37.** 3 errors **39.** 225 lb

41. about 17.4 cm

43. Equations from physics can be used to determine the height needed to produce the desired results. Answers should include the following.

- Use the following steps to solve for h. (1) Use the Distributive Property to write the equation in the form $195g - hg = \frac{1}{2}mv^2$. (2) Subtract $195g$ from each side. (3) Divide each side by g.
- The second hill should be 157 ft.

45. C **47.** \$9.75 **49.** 22.5 **51.** 5 **53.** $\frac{2}{3}$, 1.1, $\sqrt{5}$, 3 **55.** $\frac{1}{4}$ **57.** Multiplicative Identity Property **59.** Reflexive Property of Equality **61.** $12 - 6t$ **63.** $-21a - 7b$ **65.** $-9 + 3t$

Pages 174–177 Lesson 3-9

1. Sample answer: grade point average

3.

	Number of Coins	Value of Each Coin	Total Value
Dimes	d	\$0.10	$0.10d$
Quarters	$d - 8$	\$0.25	$0.25(d - 8)$

5. $0.10(6 - p) + 1.00p = 0.40(6)$ **7.** 4 qt **9.** about 3.56

11.

	Number of Dozens	Price per Dozen	Total Price
Peanut Butter	p	\$6.50	$6.50p$
Chocolate Chip	$p - 85$	\$9.00	$9.00(p - 85)$

13. 311 doz

15.

	Number of Ounces	Price per Ounce	Value
Gold	g	\$270	$270g$
Silver	$15 - g$	\$5	$5(15 - g)$
Alloy	15	\$164	$164(15)$

17. 9 oz

19.

	r	t	$d = rt$
Eastbound Train	40	t	$40t$
Westbound Train	30	t	$30t$

21. $3\frac{1}{2}h$ **23.** 15 lb **25.** 200 g of 25% alloy, 800 g of 50% alloy **27.** 120 mL of 25% solution, 20 mL of 60% solution **29.** 87 **31.** 15 s **33.** 3.2 qt **35.** about 98.0

37. A weighted average is used to determine a skater's average. Answers should include the following.

- The score of the short program is added to twice the score of the long program. The sum is divided by 3.
- $\frac{4.9(1) + 5.2(2)}{1 + 2} = 5.1$

39. C **41.** $b = 4a + 25$ **43.** increase; 20% **45.** 2:1 **47.** $3xy$ **49.** {..., -2, -1, 0, 1, 2, 3}

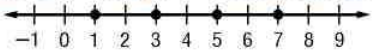
Pages 179–184 Chapter 3 Study Guide and Review

1. Addition **3.** different **5.** identity **7.** increase **9.** weighted average **11.** $3n - 21 = 57$ **13.** $a^2 + b^3 = 16$ **15.** -16 **17.** 21 **19.** -8.5 **21.** -7 **23.** 40 **25.** -10 **27.** 3 **29.** -153 **31.** 11 **33.** 2 **35.** 1 **37.** -3 **39.** 18 **41.** 9 **43.** 1 **45.** decrease; 20% **47.** increase; 6% **49.** \$10.39 **51.** $y = \frac{b + c}{a}$ **53.** $y = \frac{7a + 9b}{8}$ **55.** 450 mph, 530 mph

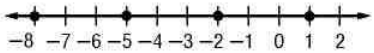
Chapter 4 Graphing Relations and Functions

Page 191 Chapter 4 Getting Started

1.



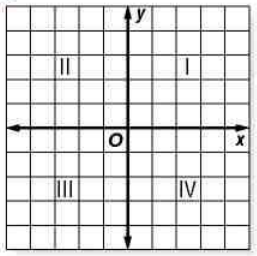
3.



5. $21 - 3t$ **7.** $-15b + 10$ **9.** $y = 1 - 2x$ **11.** $y = 2x - 4$ **13.** $y = 18 - 8x$ **15.** 6 **17.** 0 **19.** 3

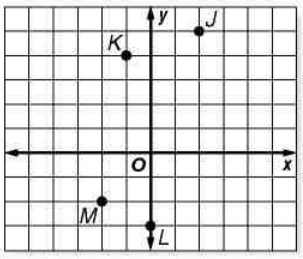
Pages 194–196 Lesson 4-1

1.



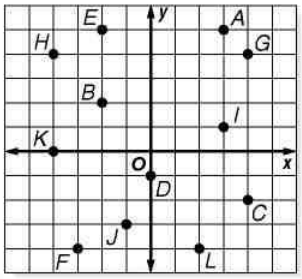
3. Sample answer: I(3, 3), II(-3, 3), III(-3, -3), IV(3, -3) **5.** (-1, 1); II **7.** (-4, -2); III

8–11.



13. $(-4, 5)$; II
15. $(-1, -3)$; III
17. $(-3, 3)$; II
19. $(2, -1)$; IV
21. $(0, 4)$; none
23. $(7, -12)$

25–36.



37. Sample answer: Louisville and Richmond **39.** coins, (3, 5); plate, (7, 2); goblet, (8, 4); vase, (5, 9) **41.** C4
43. B5, C2, D4, E1

45. Archaeologists used coordinate systems as a mapping guide and as a system to record locations of artifacts. Answers should include the following.

- The grid gives archaeologists a point of reference so they can identify and explain to others the location of artifacts in a site they are excavating. You can divide the space so more people can work at the same time in different areas.
- Knowing the exact location of artifacts helps archaeologists reconstruct historical events.

47. B **49.** $(7, -5)$ **51.** 320 mph **53.** $d = c$ **55.** $t = \frac{3a}{11}$
57. 7.94 **59.** -16 **61.** 51 **63.** 30 **65.** 48 **67.** $-x - 3$
69. $-6x + 15$ **71.** $\frac{5}{4}x - \frac{1}{2}y$

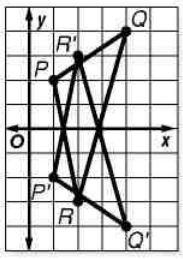
Pages 200–203 Lesson 4-2

1.

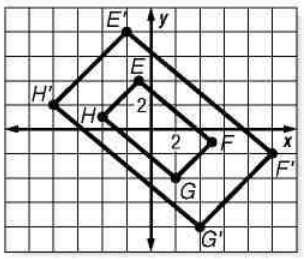
Transformation	Size	Shape	Orientation
Reflection	same	same	changes
Rotation	same	same	changes
Translation	same	same	same
Dilation	changes	same	same

3. translation

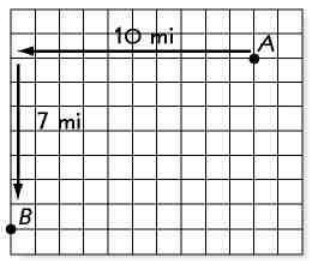
5. $P'(1, -2)$, $Q'(4, -4)$, $R'(2, 3)$



7. $E'(-2, 8)$, $F'(10, -2)$, $G'(4, -8)$, $H'(-8, 2)$

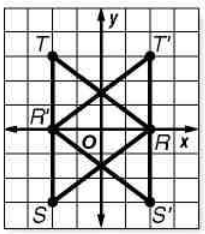


9.

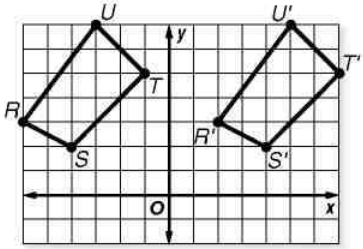


11. translation
13. reflection
15. reflection

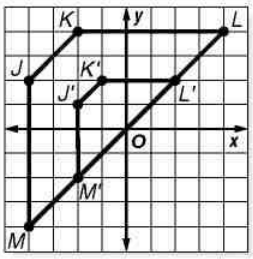
17. $R'(-2, 0)$, $S'(2, -3)$, $T'(2, 3)$



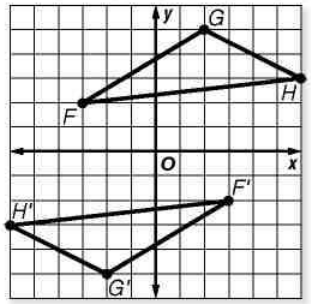
19. $R'(2, 3)$, $S'(4, 2)$, $T'(7, 5)$, $U'(5, 7)$



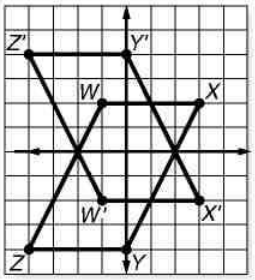
21. $J'(-2, 1)$, $K'(-1, 2)$, $L'(2, 2)$, $M'(-2, -2)$



23. $F'(3, -2)$, $G'(-2, -5)$, $H'(-6, -3)$



25. $W'(-1, -2)$, $X'(3, -2)$, $Y'(0, 4)$, $Z'(-4, 4)$



27. $A(-5, -1)$, $B(-3, -3)$, $C(-5, -5)$, $D(-5, -4)$, $E(-8, -4)$, $F(-8, -2)$, $G(-5, -2)$

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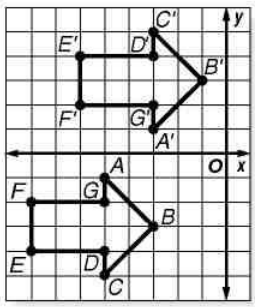
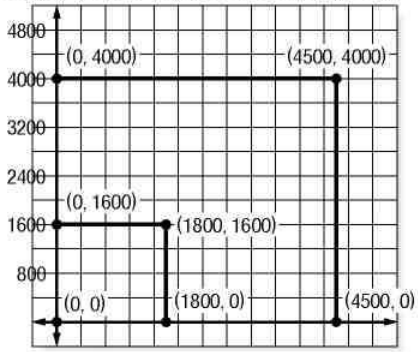
29.



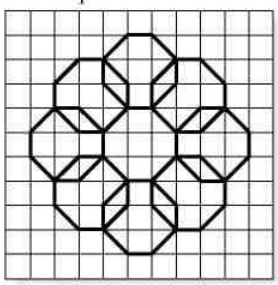
31. $\frac{1}{2}$

33. 90° counterclockwise rotation

35. (0, 0), (1800, 0), (1800, 1600), (0, 1600)



37. The pattern resembles a snowflake.

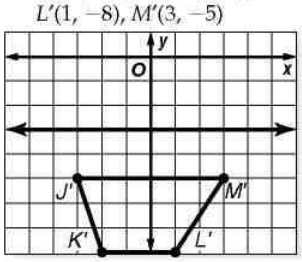


39. $(y, -x)$ **41.** Artists use computer graphics to simulate movement, change the size of objects, and create designs. Answers should include the following.

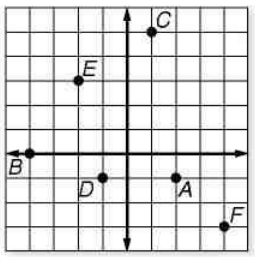
- Objects can appear to move by using a series of translations. Moving forward can be simulated by enlarging objects using dilations so they appear to be getting closer.
- Computer graphics are used in special effects in movies, animated cartoons, and web design.

43. C

45. $J'(-3, -5)$, $K'(-2, -8)$, $L'(1, -8)$, $M'(3, -5)$



47–52.



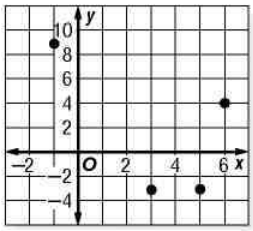
53. 10 mL **55.** $\frac{1}{12} \approx 8\%$ **57.** $\frac{5}{6} \approx 83\%$ **59.** (0, 100), (5, 90), (10, 81), (15, 73), (20, 66), (25, 60), (30, 55)}

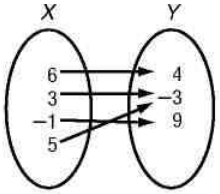
Pages 208–211 Lesson 4-3

1. A relation can be represented as a set of ordered pairs, a table, a graph, or a mapping. **3.** The domain of a relation is the range of the inverse, and the range of a relation is the domain of the inverse.

5. D = {−1, 3, 5, 6}; R = {−3, 4, 9}

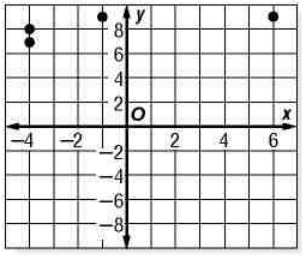
x	y
6	4
3	−3
−1	9
5	−3

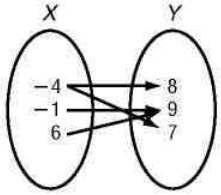




7. D = {−4, −1, 6}; R = {7, 8, 9}

x	y
−4	8
−1	9
−4	7
6	9



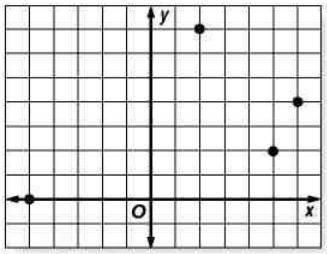


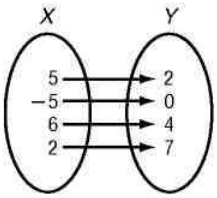
9. {(−4, 9), (2, 5), (−2, −2), (11, 12)}; {(9, −4), (5, 2), (−2, −2), (12, 11)} **11.** {(2, 8), (3, 7), (4, 6), (5, 7)}; {(8, 2), (7, 3), (6, 4), (7, 5)} **13.** {(−4, −4), (−3, 0), (0, −3), (2, 1), (2, −1)}; {(−4, −4), (0, −3), (−3, 0), (1, 2), (−1, 2)} **15.** {1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998}

17. There are fewer students per computer in more recent years. So the number of computers in schools has increased.

19. D = {−5, 2, 5, 6}; R = {0, 2, 4, 7}

x	y
5	2
−5	0
6	4
2	7

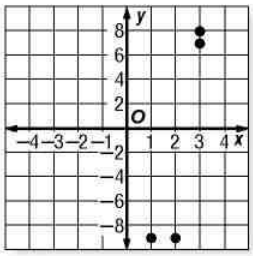


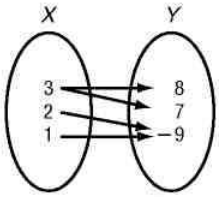


CONTENTS

21. D = {1, 2, 3}; R = {−9, 7, 8}

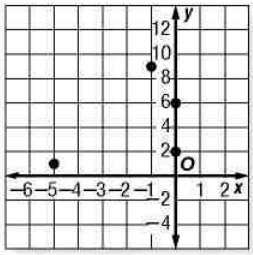
x	y
3	8
3	7
2	−9
1	−9

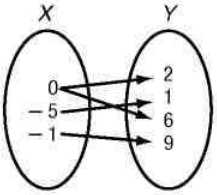




23. D = {−5, −1, 0}; R = {1, 2, 6, 9}

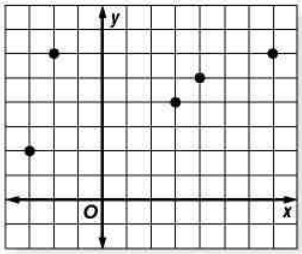
x	y
0	2
−5	1
0	6
−1	9

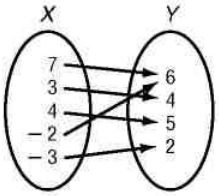




25. D = {−3, −2, 3, 4, 7}; R = {2, 4, 5, 6}

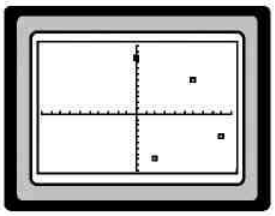
x	y
7	6
3	4
4	5
−2	6
−3	2





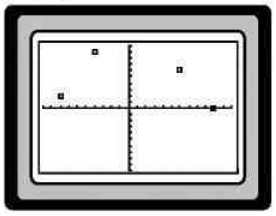
27. {(0, 3), (−5, 2), (4, 7), (−3, 2)}; {(3, 0), (2, −5), (7, 4), (2, −3)} **29.** {(−8, 4), (−1, 1), (0, 6), (5, 4)}; {(4, −8), (1, −1), (6, 0), (4, 5)} **31.** {(−3, 3), (1, 3), (4, 2), (−1, −5)}; {(3, −3), (3, 1), (2, 4), (−5, −1)} **33.** {(1, 16.50), (1.75, 28.30), (2.5, 49.10), (3.25, 87.60), (4, 103.40)}; {(16.50, 1), (28.30, 1.75), (49.10, 2.5), (87.60, 3.25), (103.40, 4)} **35.** {(2, 0), (2, 4), (3, 7), (5, 0), (5, 8), (−7, 7)}; {(0, 2), (4, 2), (7, 3), (0, 5), (8, 5), (7, −7)} **37.** {(−3, −1), (−3, −3), (−3, −5), (0, 3), (2, 3), (4, 3)}; {(−1, −3), (−3, −3), (−5, −3), (3, 0), (3, 2), (3, 4)} **39.** {(212.0, 0), (210.2, 1000), (208.4, 2000), (206.5, 3000), (201.9, 5000), (193.7, 10,000)} **41.** D = {1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000}; R = {6.3, 7.5, 9, 9.2, 9.5, 9.8, 10, 10.4} **43.** The production seems to go up and down every other year, however since 1995, farmers have produced more corn each year. **45.** D = {100, 105, 110, 115, 120, 125, 130}; R = {40, 42, 44, 46, 48, 50, 52} **47.** D = {40, 42, 44, 46, 48, 50, 52}; R = {100, 105, 110, 115, 120, 125, 130} **49.** Sample answer: $F = \{(-1, 1), (-2, 2), (-3, 3)\}$, $G = \{(1, -2), (2, -3), (3, -1)\}$; The elements in the domain and range of F should be paired differently in G. **51.** B

53a.



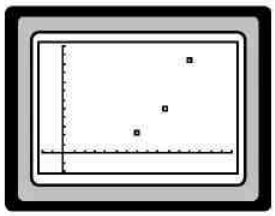
53b. x: [−10, 10] by 1, y: [−10, 12] by 1

53c. {(10, 0), (−8, 2), (6, 6), (−4, 9)}



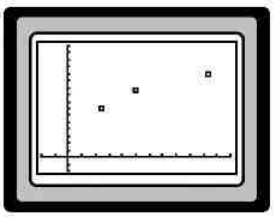
53d. (0, 10), none; (10, 0), none; (2, −8), IV; (−8, 2), II; (6, 6), I; (6, 6), I; (9, −4), IV; (−4, 9), II

55a.



55b. x: [−10, 80] by 5; y: [−10, 60] by 5

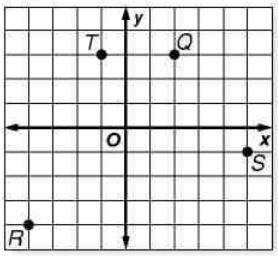
55c. {(12, 35), (25, 48), (52, 60)}



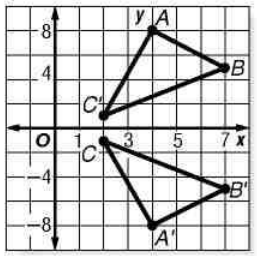
55d. (35, 12), (48, 25), and (60, 52) are all in I. (12, 35), (25, 48), and (52, 60) are all in I. **57.** rotation **59.** translation **61.** (3, 2); I **63.** (1, −1); IV **65.** (−4, −2); III **67.** (−2, 5); II **69.** 8 **71.** 9 **73.** $9n + 13$ **75.** 5 **77.** 3 **79.** 6

Page 211 Practice Quiz 1

1–4.



5. $A'(4, -8)$, $B'(7, -5)$, $C'(2, 1)$



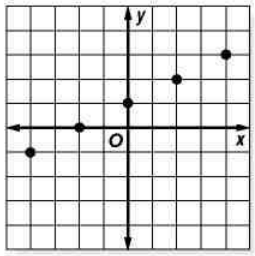
7. D = {1, 2, 4}; R = {3, 5, 6}; I = {(3, 1), (6, 4), (3, 2), (5, 1)} **9.** D = {−8, 11, 15}; R = {3, 5, 22, 31}; I = {(5, 11), (3, 15), (22, −8), (31, 11)}

Pages 214–217 Lesson 4-4

1. Substitute the values for y and solve for x. **3.** Bryan; x represents the domain and y represents the range. So, replace x with 5 and y with 1. **5.** {(−7, −3), (−2, −1)} **7.** {(−3, 7), (−1, 5), (0, 4), (2, 2)} **9.** {(−3, 11), (−1, 8), (0, 6.5), (2, 3.5)}

CONTENTS

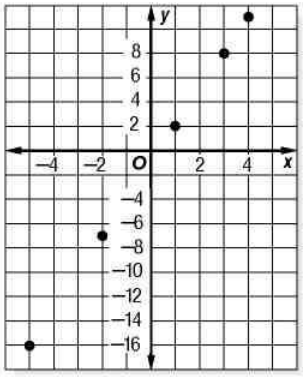
11. {(−4, −1), (−2, 0), (0, 1), (2, 2), (4, 3)}



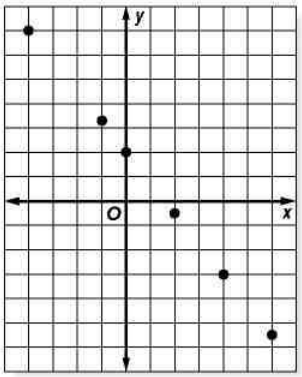
13. 12 karats **15.** {(4, −4), (2, 2)} **17.** {(3, 0), (2, 1), (4, −1)} **19.** {(0.25, 3.5), (1, 2)} **21.** {(−2, −1), (−1, 1), (1, 5), (3, 9), (4, 11)} **23.** {(−2, 9), (−1, 8), (1, 6), (3, 4), (4, 3)} **25.** {(−2, −9), (−1, −3), (1, 9), (3, 21), (4, 27)}

27. {(−2, −2), (−1, −1), (1, 1), (3, 3), (4, 4)} **29.** {(−2, 10), (−1, 8.5), (1, 5.5), (3, 2.5), (4, 1)} **31.** {(−2, −24), (−1, −18), (1, −6), (3, 6), (4, 12)}

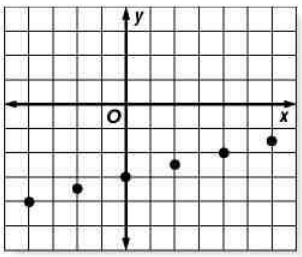
33. {(−5, −16), (−2, −7), (1, 2), (3, 8), (4, 11)}



35. {(−4, 7), (−1, 3.25), (0, 2), (2, −0.5), (4, −3), (6, −5.5)}



37. {(−4, −4), (−2, −3.5), (0, −3), (2, −2.5), (4, −2), (6, −1.5)}

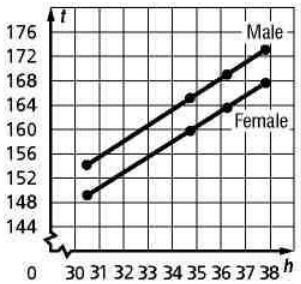


39. {−14, −12, −4, 6, 8} **41.** New York: 1.1°C, Chicago: −5°C, San Francisco: 12.8°C, Miami: 22.2°C, Washington, D.C.: 4.4°C **43.** w is independent; ℓ is dependent.

45.

Male		
Length of Tibia (cm)	Height (cm)	(T, H)
30.5	154.9	(30.5, 154.9)
34.8	165.2	(34.8, 165.2)
36.3	168.8	(36.3, 168.8)
37.9	172.7	(37.9, 172.7)

Female		
Length of Tibia (cm)	Height (cm)	(T, H)
30.5	148.9	(30.5, 148.9)
34.8	159.6	(34.8, 159.6)
36.3	163.4	(36.3, 163.4)
37.9	167.4	(37.9, 167.4)

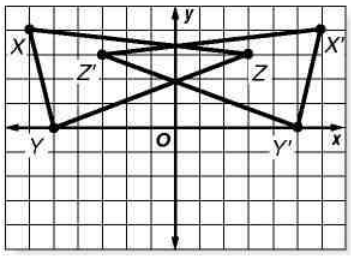


47a. {−6, −4, 0, 4, 6} **47b.** {−13, −8, −4, 4, 8, 13} **47c.** {−5, 0, 4, 8, 13} **49.** When traveling to other countries, currency and measurement systems are often different. You need to convert these systems to the system with which you are familiar. Answers should include the following.

- At the current exchange rate, 15 pounds is roughly 10 dollars and 10 pounds is roughly 7 dollars. Keeping track of every 15 pounds you spend would be relatively easy.
- If the exchange rate is 0.90 compared to the dollar, then items will cost less in dollars. For example, an item that is 10 in local currency is equivalent to $9.00. If the exchange rate is 1.04, then items will cost more in dollars. For example, an item that costs 10 in local currency is equivalent to $10.40.

51. C **53.** {(−8, 94), (−5, 74.5), (0, 42), (3, 22.5), (7, −3.5), (12, −36)} **55.** {(−2.5, −4.26), (−1.75, −3.21), (0, −0.76), (1.25, 0.99), (3.33, 3.90)} **57.** {(2, 7), (6, −4), (6, −1), (11, 8)}; {(7, 2), (−4, 6), (−1, 6), (8, 11)}

59. $X'(6, 4)$, $Y'(5, 0)$, $Z'(-3, 3)$



61. yes **63.** yes **65.** no **67.** H: it is hot; C: we will go swimming **69.** H: $3n - 7 = 17$; C: $n = 8$ **71.** 5 **73.** −2 **75.** 12

Pages 221–223 Lesson 4-5

1. The former will be a graph of four points, and the latter will be a graph of a line. **3.** Determine the point at which the graph intersects the x-axis by letting $y = 0$ and solving for x. Likewise, determine the point at which the graph intersects the y-axis by letting $x = 0$ and solving for y.

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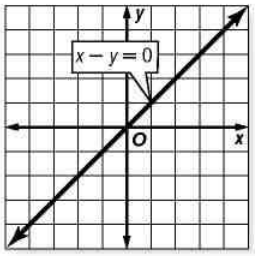
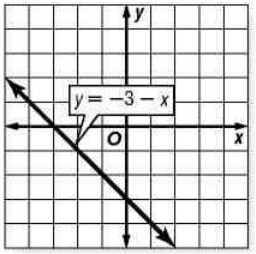
Draw a line through the two points. 5. yes; $3y = -2$ 7. no

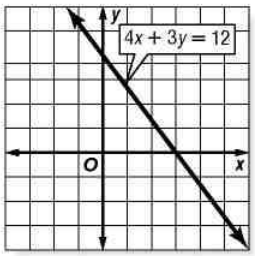
9.



11.

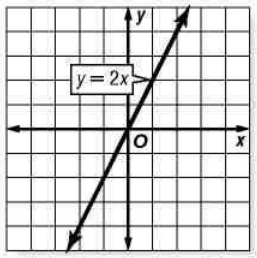


13.



15. $15.75
17. yes; $2x + y = 6$
19. yes; $y = -5$ 21. no
23. yes; $3x - 4y = 60$
25. yes; $3a = 2$

27.



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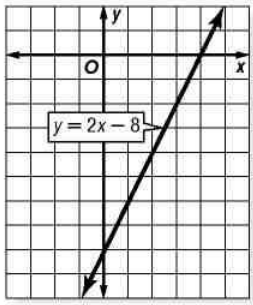
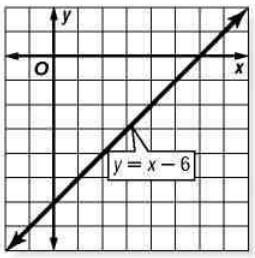
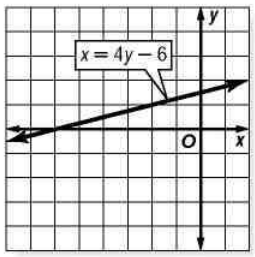


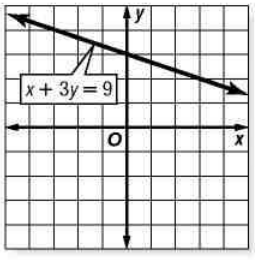
31.



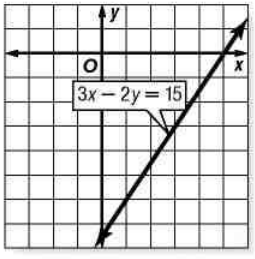
33.



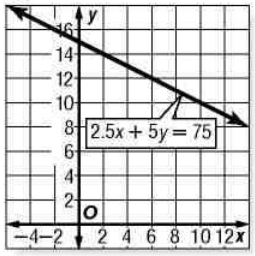
35.



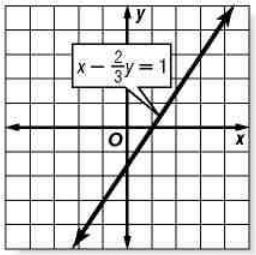
37.



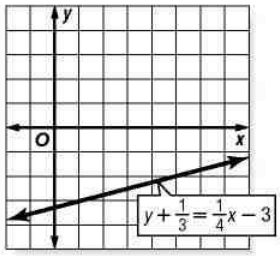
39.



41.



43.



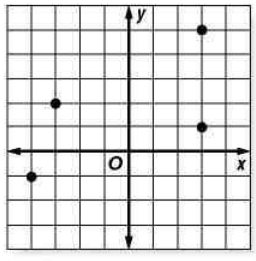
45. $5x + 3y = 15$
47. 7.5, 15

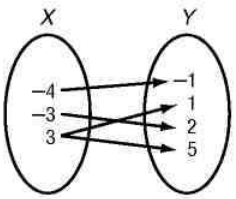
49.

t	d
0	0
2	0.42
4	0.84
6	1.26
8	1.68
10	2.1
12	2.52
14	2.94
16	3.36

51. about 14 s 53. 171 lb
55. 186.7 psi 57. Substitute the values for x and y into the equation $2x - y = 8$. If the value of $2x - y$ is less than 8, then the point lies *below* the line. If the value of $2x - y$ is greater than 8, then the point lies *above* the line. If the value of $2x - y$ equals 8, then the point lies *on* the line. Sample answers: (1, 5) lies below the line, (5, 1) lies above the line, (6, 4) lies on the line. 59. A 61. {(−3, −8), (−1, −6), (2, −3), (5, 0), (8, 3)} 63. {(−3, 21), (−1, 15), (2, 6), (5, −3), (8, −12)} 65. {(−3, −30), (−1, −18), (2, 0), (5, 18), (8, 36)}
67. D = {−4, −3, 3}; R = {−1, 1, 2, 5}

x	y
3	5
−4	−1
−3	2
3	1

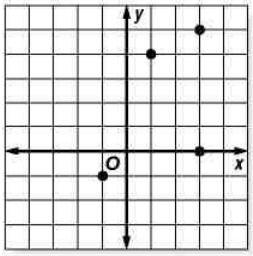


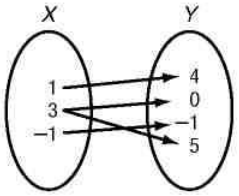


CONTENTS

69. D = {−1, 1, 3}; R = {−1, 0, 4, 5}

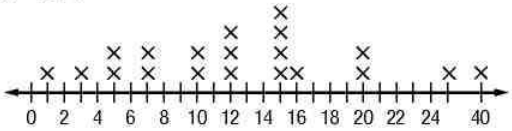
x	y
1	4
3	0
−1	−1
3	5





71. 3 **73.** 4

75.

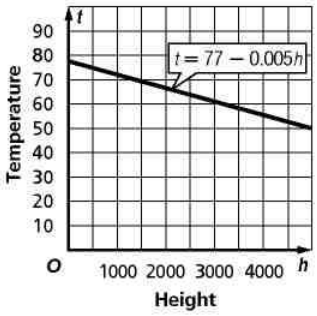


77. 15 yr **79.** 39 **81.** 48 **83.** 408

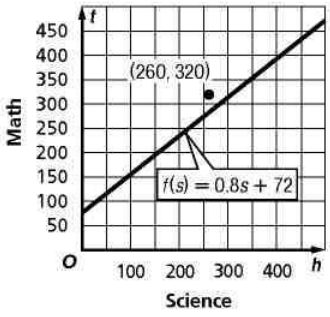
Pages 228–231 Lesson 4-6

1. y is not a function of x since 3 in the domain is paired with 2 and −3 in the range. x is not a function of y since −3 in the range is paired with 4 and 3 in the domain. **3.** $x = c$, where c is any constant **5.** no **7.** yes **9.** yes **11.** 2 **13.** $t^2 - 3$ **15.** $4x + 15$ **17.** no **19.** yes **21.** yes **23.** yes **25.** yes **27.** yes **29.** no **31.** yes **33.** 1 **35.** 0 **37.** 26 **39.** $3a^2 + 7$ **41.** $6m - 8$ **43.** $6x^2 + 4$ **45.** $f(h) = 77 - 0.005h$

47.



49.

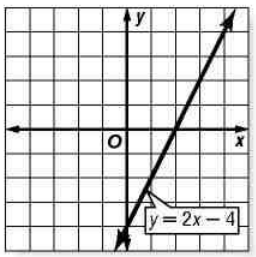


51. Krista's math score is above the average because the point at (260, 320) lies above the graph of the line for $f(s)$. **53.** Functions can be used in meteorology to determine if there is a relationship between certain weather conditions. This can help to predict future weather patterns. Answers should include the following.

- As barometric pressure decreases, temperature increases. As barometric pressure increases, temperature decreases.
- The relation is not a function since there is more than one temperature for a given barometric pressure. However, there is still a pattern in the data and the two variables are related.

55. A

57.

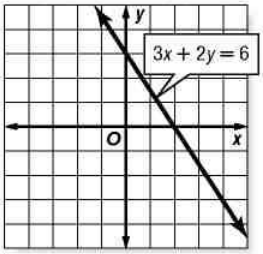


59. {(3, 12), (−1, −8)} **61.** approximately 3 h 9 min **63.** Reflexive (=); 3.5 **65.** −4 **67.** 20 **69.** $\frac{5}{8}$

Page 231 Practice Quiz 2

1. {(−3, 2), (−1, 4), (0, 5), (2, 7), (4, 9)} **3.** {(−3, 5.5), (−1, 4.5), (0, 4), (2, 3), (4, 2)}

5.

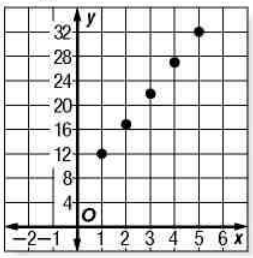


7. no **9.** $6a + 5$

Pages 236–238 Lesson 4-7

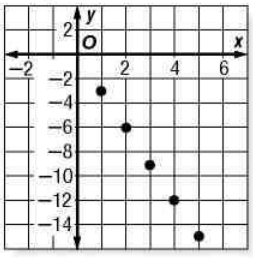
1. Sample answer: 2, −8, −18, −28, … **3.** Marisela; to find the common difference, subtract the first term from the second term. **5.** no **7.** 14, 9, 4 **9.** −90 **11.** 101

13. $a_n = 5n + 7$

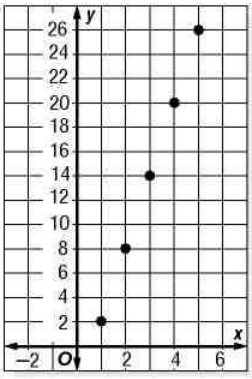


15. yes; −1 **17.** no **19.** yes; 0.5 **21.** 16, 19, 22 **23.** −82, −86, −90 **25.** $3\frac{2}{3}$, 4, $4\frac{1}{3}$ **27.** 125 **29.** 1264 **31.** $3\frac{1}{4}$ **33.** 25 **35.** 25 **37.** 17

39. $a_n = -3n$

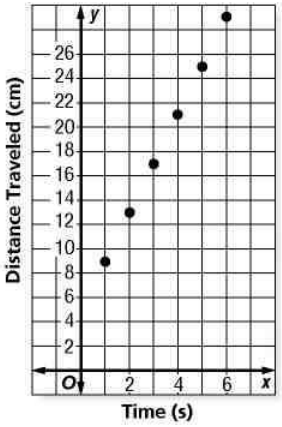


41. $a_n = 6n - 4$



43. 4 **45.** $5 + 3(n - 1)$ **47.** $a_n = 28 + 8(n - 1)$ **49.** Yes, the section was oversold by 4 seats. **51.** $a_n = 4n + 5$

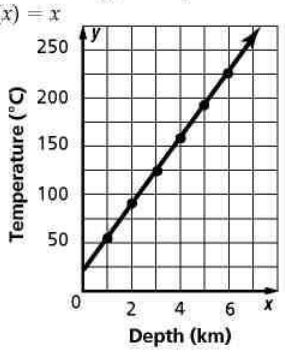
53.



55. $92,500
57. 45 **59.** C
61. 10 **63.** 32
65. yes; $x + y = 18$
67. $200 - 3x = 9$
69. −21 **71.** 12
73. $-\frac{5}{14}$
75. (−2, 2)
77. (−4, −2)
79. (3, 5)

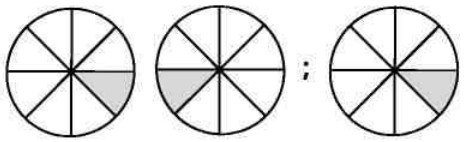
Pages 243–245 Lesson 4-8

1. Once you recognize a pattern, you can find a general rule that can be written as an algebraic expression. **3.** Test the values of the domain in the equation. If the resulting values match the range, the equation is correct. **5.** 16, 22, 29
7. $f(x) = x$
9.



11. 370°

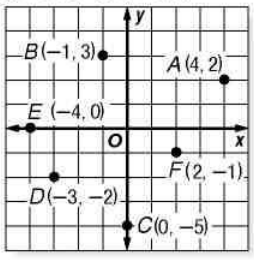
13.



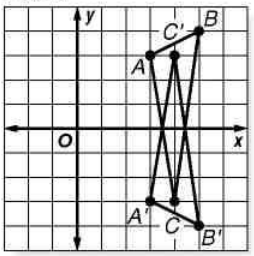
15. 10, 13, 11 **17.** 27, 35, 44 **19.** $4x + 1, 5x + 1, 6x + 1$
21. $f(x) = \frac{1}{2}x$ **23.** $f(x) = 6 - x$ **25.** $f(x) = 12 - 3x$
27. 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144 **29.** $f(a) = -0.9a + 193$
31. 5, 8, 11, 14 cm **33.** 74 cm **35.** B **37.** 13, 16, 19
39. −1, 5, 11 **41.** no

Pages 246–250 Chapter 4 Study Guide and Review

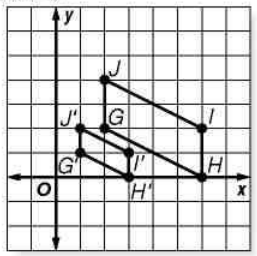
1. e **3.** d **5.** k **7.** c **9.** b
11–16.



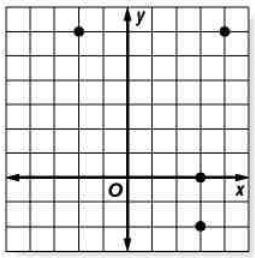
17. $A'(3, -3)$, $B'(5, -4)$, $C'(4, 3)$

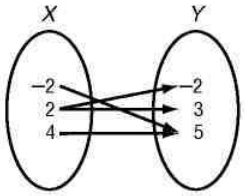


19. $G'(1, 1)$, $H'(3, 0)$, $I'(3, 1)$, $J'(1, 2)$

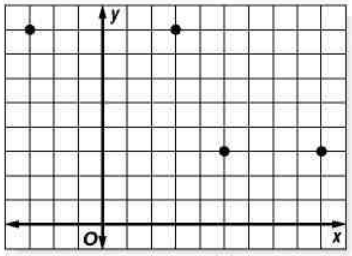


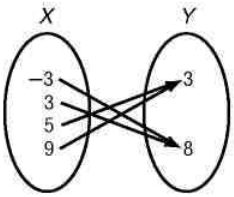
21. D = {−2, 3, 4}, R = {−2, 0, 6}



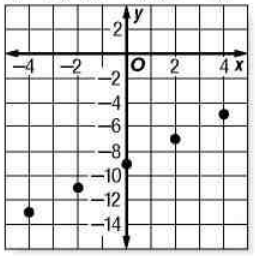


23. D = {−3, 3, 5, 9}, R = {3, 8}

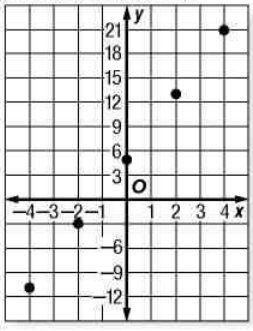




25. {(−4, −13), (−2, −11), (0, −9), (2, −7), (4, −5)}

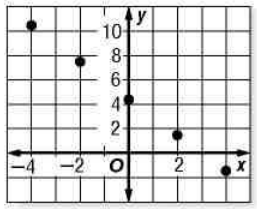


27. {(−4, −11), (−2, −3), (0, 5), (2, 13), (4, 21)}



CONTENTS

29. $\{(-4, 10\frac{1}{2}), (-2, 7\frac{1}{2}), (0, 4\frac{1}{2}), (2, 1\frac{1}{2}), (4, -1\frac{1}{2})\}$



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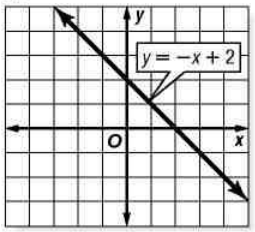

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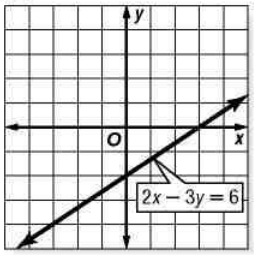

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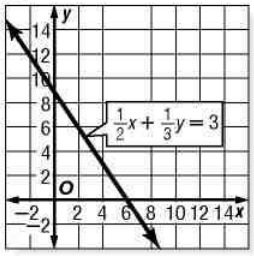


37. yes 39. yes 41. 3 43. 18 45. $4n^2 + 2n + 1$
47. 26, 31, 36 49. 6, 4, 2 51. −11, −5, 1 53. $f(x) = -x - 1$

Chapter 5 Analyzing Linear Equations

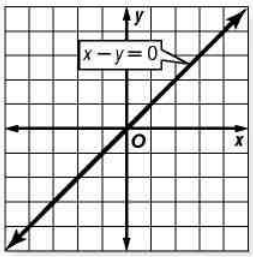
Page 255 Chapter 5 Getting Started

1. $\frac{1}{5}$ 3. $-\frac{1}{4}$ 5. $\frac{1}{3}$ 7. 3 9. $\frac{1}{4}$ 11. $-\frac{3}{4}$ 13. 0 15. (1, 2)
17. (2, −3) 19. (−2, 2)

Pages 259–262 Lesson 5-1

1. Sample answer: Use (−1, −3) as (x_1, y_1) and (3, −5) as (x_2, y_2) in the slope formula. 3. The difference in the x values is always the 0, and division by 0 is undefined.
5. $\frac{3}{2}$ 7. −4 9. 0 11. 5 13. 1.5 million subscribers per year
15. $\frac{3}{4}$ 17. −2 19. undefined 21. $\frac{10}{7}$ 23. $\frac{3}{8}$
25. undefined 27. 0 29. $-\frac{1}{2}$ 31. $\frac{15}{4}$ 33. $-\frac{2}{3}$
35. Sample answer: $\frac{8}{11}$ 37. $\frac{s}{r}$ 39. 4 41. −1 43. 1
45. $\frac{1}{4}$ 47. 7 49. (−4, −5) is in Quadrant III and (4, 5) is in Quadrant I. The segment connecting them goes from lower left to upper right, which is a positive slope. 51. 12–14; steepest part of the graph 53. '90–'95; '80–'85 55. a decline in enrollment 57. 13 ft 9 in. 59. D 61. $\frac{1}{3}$; The slope is the same regardless of points chosen. 63. $f(x) = 5x$
65. yes 67. no

69.

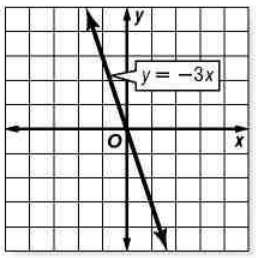


71. −21 73. −36
75. $-\frac{7}{24}$ 77. 9
79. $26\frac{2}{3}$ 81. $4\frac{1}{2}$
83. $20\frac{4}{7}$ 85. $10\frac{2}{3}$

Pages 267–270 Lesson 5-2

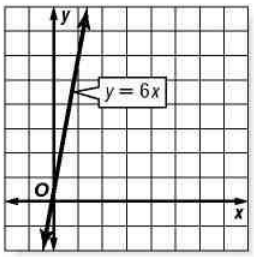
1. $y = kx$ 3. They are equal. 5. 1; 1

7.



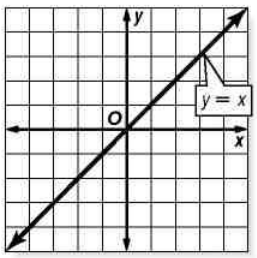
9. $y = \frac{9}{2}x$; 10
11. $y = \frac{1}{2}x$; 10

13.



15. 2; 2
17. $-\frac{1}{2}$; $-\frac{1}{2}$
19. $\frac{3}{2}$; $\frac{3}{2}$

21.



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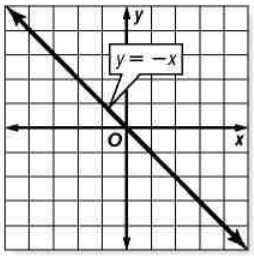

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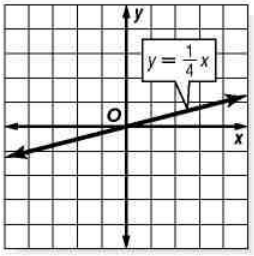

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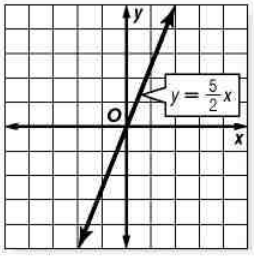

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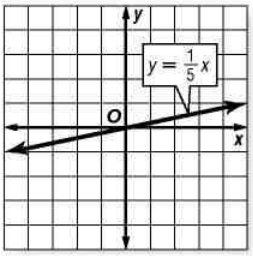
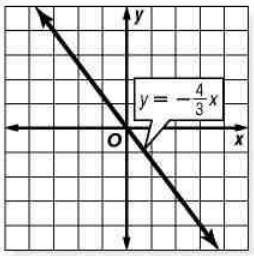
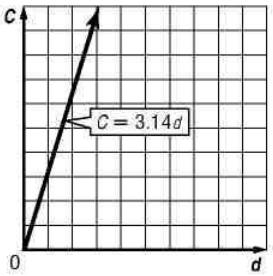


31.

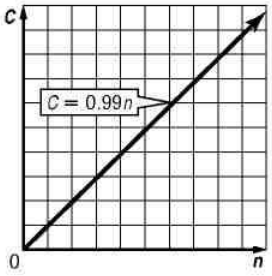


33. $y = 2x$; 10 35. $y = -4x$; −5 37. $y = \frac{1}{3}x$; −8
39. $y = 5x$; 100 41. $y = \frac{32}{3}x$; 12

43. $C = 3.14d$



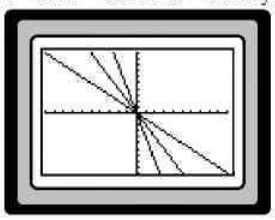
45. $C = 0.99n$



47. It also doubles. If $\frac{y}{x} = k$, and x is multiplied by 2, y must also be multiplied by 2 to maintain the value of k.

49. 2 51. 3 53. 23 lb 55. 5 yrs 4 mos 57. D

59.



61. Sample answer: $y = -5x$ 63. -3 65. 2

67.

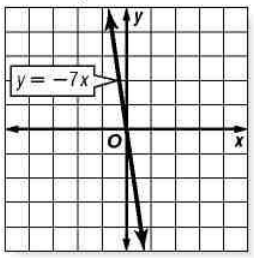
x	0	1	2	3	4	5
y	1	5	9	13	17	21

69. 3 71. -15 73. $y = 3x + 8$ 75. $y = 4x - 3$
77. $y = -3x + 4$

Page 270 Practice Quiz 1

1. -2 3. $\frac{1}{9}$ 5. 4

7.

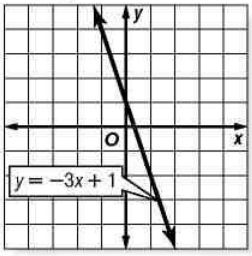


9. $y = 3x$; -9

Pages 275–277 Lesson 5-3

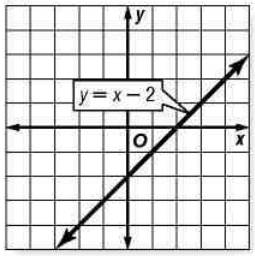
1. Sample answer: $y = 7x + 2$ 3. slope 5. $y = 4x - 2$
7. $y = -\frac{3}{2}x + 2$

9.



11. $T = 50 + 5w$ 13. \$85
15. $y = 3x - 5$
17. $y = -\frac{3}{5}x$
19. $y = 0.5x + 7.5$
21. $y = \frac{3}{2}x - 4$
23. $y = -\frac{2}{3}x + 1$
25. $y = 2$ 27. $y = 3x$

29.



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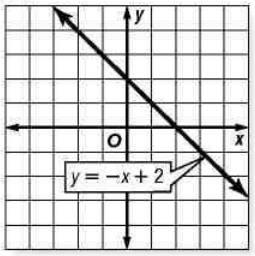

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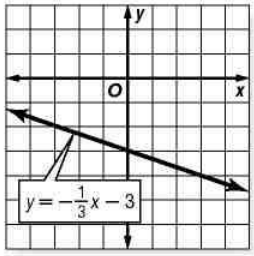

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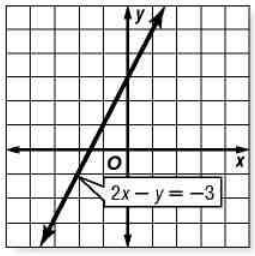
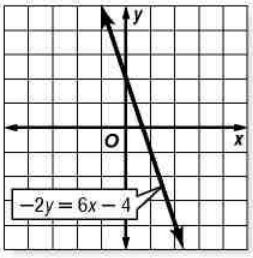
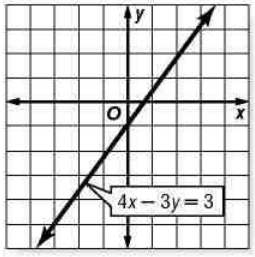


37.



39.



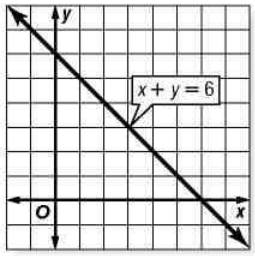
41. $C = 50 + 25h$ 43. $T = 15 - 2h$ 45. $S = 16 + t$
47. $R = 5.5 - 0.12t$ 49. 1.54 51. D 53. $y = -\frac{A}{B}x + \frac{C}{B}$
55a. $m = -2$, $b = -4$ 55b. $m = -\frac{3}{4}$, $b = 3$ 55c. $m = \frac{2}{3}$, $b = -3$ 57. $y = \frac{15}{4}x$, $37\frac{1}{2}$ 59. undefined 61. -0.5, $\frac{3}{4}$, $\frac{7}{8}$, 2.5 63. 23 65. -2 67. $-\frac{4}{3}$

Pages 283–285 Lesson 5-4

1. When you have the slope and one point, you can substitute these values in for x, y, and m to find b. When you are given two points, you must first find the slope and then use the first procedure. 3. Sometimes; if the x- and y-intercepts are both zero, you cannot write the equation of the graph. 5. $y = -3x + 16$ 7. $y = -x + 6$ 9. $y = \frac{1}{2}x - \frac{1}{2}$
11. $y = 3x - 1$ 13. $y = 3x - 17$ 15. $y = -2x + 6$
17. $y = -\frac{2}{3}x - 3$ 19. $y = x - 3$ 21. $y = x - 2$ 23. $y = -2x + 1$ 25. $y = -2$ 27. $y = \frac{1}{2}x + \frac{1}{2}$ 29. $y = -\frac{1}{4}x + \frac{11}{16}$
31. $y = -\frac{4}{3}x + 4$ 33. $y = x - 2$ 35. about 27.6 years
37. about 26.05 years 39. 205,000 41. $y = \frac{2}{7}x - 2$
43. (7, 0); (0, -2)
45. Answers should include the following.
- Linear extrapolation is when you use a linear equation to predict values that are outside of the given points on the graph.
- You can use the slope-intercept form of the equation to find the y value for any requested x value.

47. B

CONTENTS

49. 

51. $V = 2.5b$
53. $\{-2, 0, 5\}$ 55. $<$
57. -3 59. 5 61. -15

Pages 289–291 Lesson 5-5

1. They are the coordinates of any point on the graph of the equation. 3. Sample answer: $y - 2 = 4(x + 1)$; $y = 4x + 6$
5. $y + 2 = 3(x + 1)$ 7. $4x - y = -13$ 9. $2.5x - y = -5.5$
11. $y = -\frac{2}{3}x + 1$ 13. $y - 3 = 2(x + 1)$ 15. $y - 8 = 2(x - 3)$
17. $y - 4 = -3(x + 2)$ 19. $y - 6 = 0$ 21. $y + 3 = \frac{3}{4}(x - 8)$
23. $y + 3 = -\frac{5}{8}(x - 1)$ 25. $y - 8 = \frac{7}{2}(x + 4)$ 27. $y + 9 = 0$
29. $4x - y = -5$ 31. $2x + y = -7$ 33. $x - 2y = 12$
35. $2x + 5y = 26$ 37. $5x - 3y = -24$ 39. $13x - 10y = -151$
41. $y = 3x - 1$ 43. $y = -2x + 8$ 45. $y = \frac{1}{2}x - 1$ 47. $y = -\frac{1}{4}x - \frac{7}{2}$ 49. $y = x - 1$ 51. $y = -3x - \frac{7}{4}$ 53. $y + 3 = 10(x - 5)$; $y = 10x - 53$; $10x - y = 53$ 55. $y - 210 = 5(x - 12)$ 57. \$150 59. $y = 1500x - 2{,}964{,}310$
61. $\overline{RQ}$: $y + 3 = \frac{1}{2}(x + 1)$ or $y + 1 = \frac{1}{2}(x - 3)$; $\overline{QP}$: $y + 1 = -2(x - 3)$ or $y - 3 = -2(x - 1)$; $\overline{PS}$: $y - 3 = \frac{1}{2}(x - 1)$ or $y - 1 = \frac{1}{2}(x + 3)$; $\overline{RS}$: $y + 3 = -2(x + 1)$ or $y - 1 = -2(x + 3)$ 63. $\overline{RQ}$: $x - 2y = 5$; $\overline{QP}$: $2x + y = 5$; $\overline{PS}$: $x - 2y = -5$; $\overline{RS}$: $2x + y = -5$
65. Answers should include the following.
- Write the definition of the slope using (x, y) as one point and (x_1, y_1) as the other. Then solve the equation so that the ys are on one side and the slope and xs are on the other.

67. $y = mx - 2m - 5$ 69. All of the equations are the same. 71. Regardless of which two points on a line you select, the slope-intercept form of the equation will always be the same. 73. $y = 3x + 10$ 75. $y = -1$ 77. -6 79. 7
81. $\frac{1}{10}$ 83. -1 85. -9 87. $-\frac{3}{2}$

Pages 295–297 Lesson 5-6

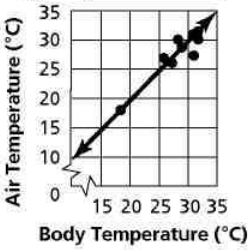
1. The slope is $\frac{3}{2}$, so the slope of a line perpendicular to the given line is $-\frac{2}{3}$. 3. Parallel lines lie in the same plane and never intersect. Perpendicular lines intersect at right angles.
5. $y = x + 1$ 7. $y = 3x + 8$ 9. $y = -3x - 8$ 11. $y = \frac{1}{2}x - 3$
13. $y = x - 9$ 15. $y = x + 5$ 17. $y = \frac{1}{2}x - \frac{3}{2}$
19. $y = -\frac{1}{3}x - \frac{13}{3}$ 21. $y = \frac{1}{2}x + \frac{3}{2}$ 23. $y = -6x - 9$
25. The lines for $x = 3$ and $x = -1$ are parallel because all vertical lines are parallel. The lines for $y = \frac{2}{3}x + 2$ and $y = \frac{2}{3}x - 3$ are parallel because they have the same slope. Thus, both pairs of opposite sides are parallel and the figure is a parallelogram. 27. $y = \frac{1}{3}x - 6$ 29. $y = -\frac{1}{4}x + \frac{5}{4}$
31. $y = \frac{1}{8}x + 5$ 33. $y = -\frac{3}{2}x + 13$ 35. $y = -\frac{5}{2}x + 2$
37. $y = -\frac{1}{5}x - 1$ 39. $y = -3$ 41. $y = -\frac{1}{2}x + 2$
43. parallel 45. They are perpendicular, because the slopes are 3 and $-\frac{1}{3}$.
47. If two equations have the same slope, then the lines are parallel. Answers should include the following.
- Sample answer: $y = -5x + 1$; The graphs have the same slope.
- Sample answer: $y = \frac{1}{5}x$; The slopes are negative reciprocals of each other.

49. C 51. $y - 7 = 5(x + 4)$ 53. $C = 0.22m + 0.99$
55. $y = -\frac{1}{2}x + \frac{3}{2}$ 57. $y = -5x + 11$ 59. $y = 9$

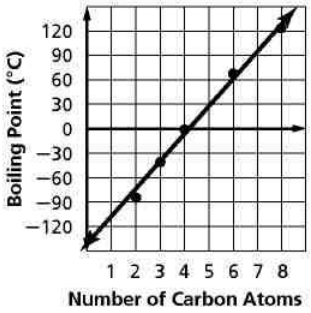
Page 297 Practice Quiz 2

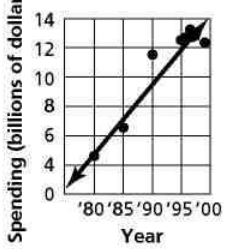
1. $y = 4x - 3$ 3. $y = \frac{5}{2}x + \frac{1}{2}$ 5. $x - 2y = -11$, $y = \frac{1}{2}x + \frac{11}{2}$

Pages 301–305 Lesson 5-7

1. If the data points form a linear pattern such that y increases as x increases, there is a positive correlation. If the linear pattern shows that y decreases as x increases, there is a negative correlation. 3. Linear extrapolation predicts values outside the domain of the data set. Linear interpolation predicts values inside the extremes of the domain.
5. Negative; the more TV you watch, the less you exercise.
7. 

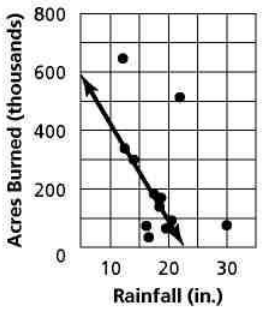
9. 40.1°F
11. no correlation
13. Positive; the higher the sugar content, the more Calories.
15. 18.85
17. \$3600

19. 

21. −116°C 23. 7
25. 

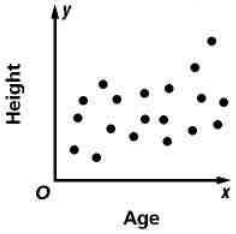
27. about \$17.3 billion

29.



31. using (12.7, 340) and (17.5, 194) and rounding, $y = -30.4x + 726.3$ 33. The data point lies beyond the main grouping of data points. It can be ignored as an extreme value.

37. You can visualize a line to determine whether the data has a positive or negative correlation. Answers should include the following.



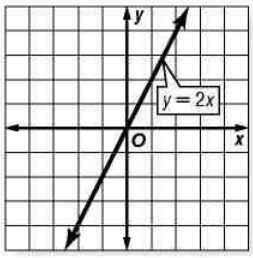
- Write a linear equation for the best-fit line. Then substitute the person's height and solve for the corresponding age.

39. B 45. $y = -4x - 3$ 47. $y - 3 = -2(x + 2)$ 49. $y + 3 = x + 3$ 51. 4, −1.6 53. −5 55. 3

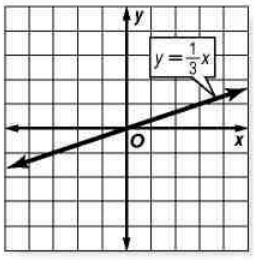
Pages 308–312 Chapter 5 Study Guide and Review

1. direct variation 3. parallel 5. slope-intercept 7. 3 9. undefined 11. 1.5

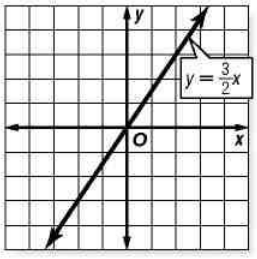
13.



15.

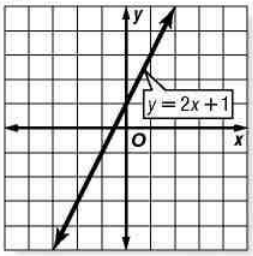


17.

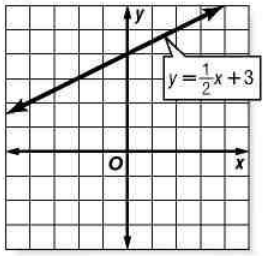


19. $y = -\frac{2}{3}x$
21. $y = -x$
23. $y = -2x$
25. $y = 3x + 2$
27. $y = 4$
29. $y = 0.5x - 0.3$

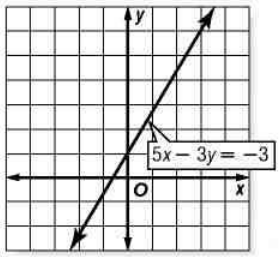
31.



33.



35.

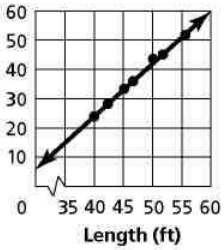


37. $y = x + 6$
39. $y = \frac{1}{2}x + \frac{11}{2}$
41. $y = 2x + 10$
43. $y = -1$
45. $y - 6 = 5(x - 4)$
47. $y + 3 = \frac{1}{2}(x - 5)$
49. $y + 2 = 3\left(x - \frac{1}{4}\right)$
51. $2x - y = -3$
53. $3x - 2y = 20$

55. $y = -2x + 6$ 57. $y = \frac{5}{12}x + 4$ 59. $y = -\frac{1}{3}x + 1$

61. $y = \frac{1}{2}x - 3$ 63. $y = -\frac{7}{2}x - 14$ 65. $y = 5x - 15$

67.



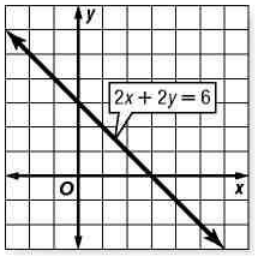
69. $38\frac{1}{3}$ long tons

Chapter 6 Solving Linear Inequalities

Page 317 Chapter 6 Getting Started

1. 53 3. −9 5. −45 7. 4 9. 22 11. 4 13. 8 15. 30 17. 7 19. 1

21.



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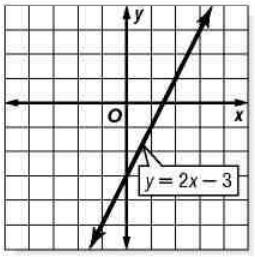
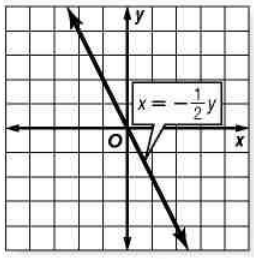
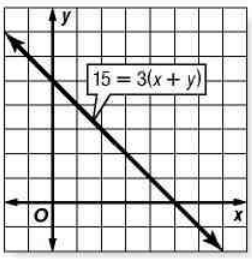


25.



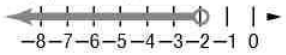
27.



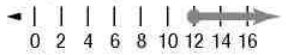
Selected Answers
CONTENTS

Pages 321–323 Lesson 6-1

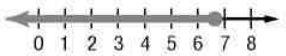
1. Sample answers: $y + 1 < -2$, $y - 1 < -4$, $y + 3 < 0$
3. The set of all numbers b such that b is greater than or equal to -5.
5. $\{a \mid a < -2\}$



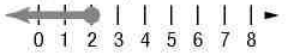
7. $\{t \mid t \geq 12\}$



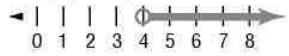
9. $\{r \mid r \leq 6.7\}$



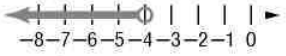
11. Sample answer: Let n = the number; $n - 8 \leq 14$; $\{n \mid n \leq 22\}$. **13.** no more than 33 g **15.** f **17.** c **19.** b
21. $\{d \mid d \leq 2\}$



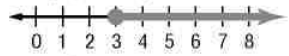
23. $\{s \mid s > 4\}$



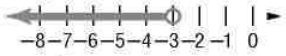
25. $\{r \mid r < -4\}$



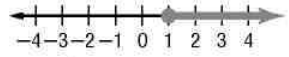
27. $\{m \mid m \geq 3\}$



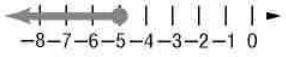
29. $\{f \mid f < -3\}$



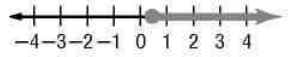
31. $\{w \mid w \geq 1\}$



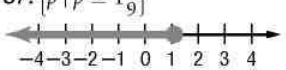
33. $\{a \mid a \leq -5\}$



35. $\{x \mid x \geq 0.6\}$



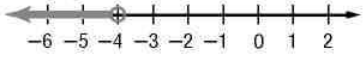
37. $\left\{p \mid p \leq 1\frac{1}{9}\right\}$



39a. 12 **39b.** 7 **39c.** 16 **41.** Sample answer: Let n = the number; $n - 5 < 33$; $\{n \mid n < 38\}$. **43.** Sample answer: Let n = the number; $2n > n + 14$; $\{n \mid n > 14\}$. **45.** Sample answer: Let n = the number; $4n \leq 3n + (-2)$; $\{n \mid n \leq -2\}$. **47.** at least 199,999,998,900 stars **49.** at least \$3747 **51.** no more than \$33 **53a.** always **53b.** never **53c.** sometimes **55.** $\{p \mid p > 25\}$ **57.** C **59.** no **61.** $y = -x + 4$ **63.** 31, 37 **65.** 48, 96 **67.** $\{(-1, -8), (3, 4), (5, 2)\}$ **69.** 7 **71.** 21 **73.** 49 **75.** 24.5

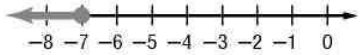
Pages 328–331 Lesson 6-2

1. You could solve the inequality by multiplying each side by $-\frac{1}{7}$ or by dividing each side by -7. In either case, you must reverse the inequality. **3.** Ilonia; when you divide each side of an inequality by a negative number, you must reverse the inequality sign. **5.** c **7.** $\{t \mid t < -108\}$
9. $\{f \mid f \geq 0.36\}$ **11.** Sample answer: Let n = the number; $\frac{1}{2}n \geq 26$; $\{n \mid n \geq 52\}$. **13.** d **15.** e **17.** b **19.** $\{g \mid g \leq 24\}$
21. $\{d \mid d \leq -6\}$ **23.** $\{m \mid m \geq 35\}$ **25.** $\{r \mid r > 49\}$
27. $\{y \mid y \geq -24\}$ **29.** $\{q \mid q \geq 44\}$ **31.** $\{w \mid w > -2.72\}$
33. $\left\{c \mid c < -\frac{1}{10}\right\}$
35. $\{y \mid y < -4\}$

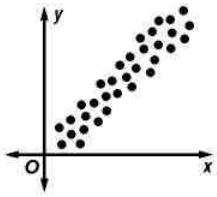


37a. 3.5 **37b.** −14 **37c.** −6 **39.** Sample answer: Let n = the number; $7n > 28$; $\{n \mid n > 4\}$. **41.** Sample answer: Let n = the number; $24 \leq \frac{1}{3}n$; $\{n \mid n \geq 72\}$. **43.** Sample answer: Let n = the number; $0.25n \geq 90$; $\{n \mid n \geq 360\}$. **45.** less than $4\frac{1}{4}$ ft
47. no more than 27 min **49.** up to about 6 ft **51.** at least 3 times **53.** at least 175 spaces
55. Inequalities can be used to compare the heights of walls. Answers should include the following.
- If x represents the number of bricks and the wall must be no higher than 4 ft or 48 in., then $3x \leq 48$.
- To solve this inequality, divide each side by 3 and do not change the direction of the inequality. The wall must be 16 bricks high or fewer.

57. C
59. $\{g \mid g \leq -7\}$



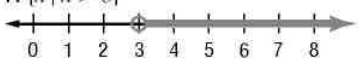
61. Sample answer:



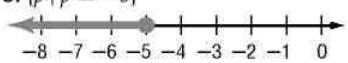
63. $y = -2$ **65.** -10 **67.** $3w + 2$ **69.** 6 **71.** 5 **73.** 7 **75.** 12 **77.** -8

Page 331 Practice Quiz 1

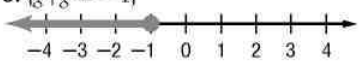
1. $\{h \mid h > 3\}$



3. $\{p \mid p \leq -5\}$



5. $\{g \mid g \leq -1\}$



7. $\{v \mid v < 35\}$ **9.** $\{r \mid r > -13\}$

Pages 334–337 Lesson 6-3

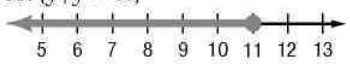
1. To solve both the equation and the inequality, you first subtract 6 from each side and then divide each side by -5. In the equation, the equal sign does not change. In the inequality, the inequality sign is reversed because you divided by a negative number. **3a.** Distributive Property **3b.** Add 12 to each side. **3c.** Divide each side by 3.
5. $\{r \mid r \geq -18\}$ **7.** $\{g \mid g < -1\}$ **9.** Sample answer: Let n = the number; $7 - 2n < 3n + 32$; $\{n \mid n > -5\}$. **11a.** Subtract 7 from each side. **11b.** Multiply each side by $\frac{5}{2}$.

13. $4(t - 7) \leq 2(t + 9)$	*Original inequality*
$4t - 28 \leq 2t + 18$	*Distributive Prop.*
$4t - 28 - 2t \leq 2t + 18 - 2t$	*Subtract 2t from each side.*
$2t - 28 \leq 18$	*Simplify.*
$2t - 28 + 28 \leq 18 + 28$	*Add 28 to each side.*
$2t \leq 46$	*Simplify.*
$\frac{2t}{2} \leq \frac{46}{2}$	*Divide each side by 2.*
$t \leq 23$	*Simplify.*

$\{t \mid t \leq 23\}$
15. $\{t \mid t \geq 3\}$ **17.** $\{d \mid d > -125\}$ **19.** $\left\{q \mid q \leq 3\frac{1}{3}\right\}$
21. $\{r \mid r \geq -9\}$ **23.** $\{v \mid v \geq 19\}$ **25.** $\{w \mid w \leq 1\}$

CONTENTS

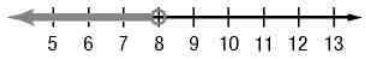
27. $\{t \mid t \geq -1\}$ **29.** $\varnothing$ **31.** $\{v \mid v \geq 4.5\}$
33. $\{y \mid y \leq 11\}$



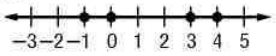
35. Sample answer: Let n = the number; $\frac{1}{8}n - 5 \geq 30$; $\{n \mid n \geq 280\}$. **37.** Sample answer: Let n = the number; $-4n + 9 \leq n - 21$; $\{n \mid n \geq 6\}$. **39.** $3a - 15 < 90$
41. $\frac{91 + 95 + 88 + s}{4} \geq 92$ **43.** $\frac{5(F - 32)}{9} < -38$ **45.** more than $12\frac{1}{2}$ weeks **47.** 3 or fewer toppings **49.** no change
51. 7, 9; 5, 7; 3, 5; 1, 3
53. Inequalities can be used to describe the temperatures for which an element is a gas or a solid. Answers should include the following.

- The inequality for temperatures in degrees Celsius for which bromine is a gas is $\frac{9}{5}C + 32 > 138$.
- Sample answer: Scientists may use inequalities to describe the temperatures for which an element is a solid.

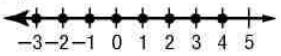
55. C **57.** $\{x \mid x \leq 8\}$ **59.** up to 416 mi
61. $\{t \mid t < 8\}$



63. $2x - y = 5$ **65.** $y = 6$ **67.** $\frac{7}{3}$ **69.** yes; $4x - 2y = 7$
71. yes; $x + 0y = 12$ **73.** 2.5
75.



77.



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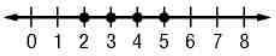
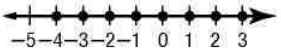
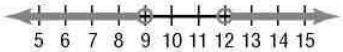


81.

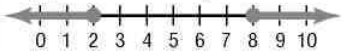


Pages 341–344 Lesson 6-4

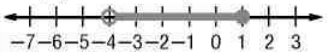
1. A compound inequality containing *and* is true only if both inequalities are true. A compound inequality containing *or* is true if one of the inequalities is true.
3. Sample answer: $x < -2$ and $x > 3$
5.



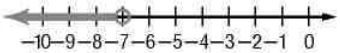
7. $x \leq -1$ or $x \geq 5$
9. $\{n \mid n \leq 2 \text{ or } n \geq 8\}$



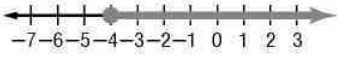
11. $\{x \mid -4 < x \leq 1\}$



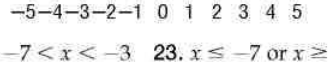
13. $4.44 \leq x \leq 6.67$
15.



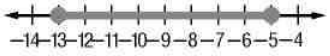
17.



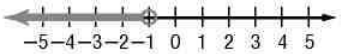
19.



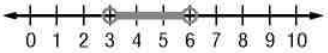
21. $-7 < x < -3$ **23.** $x \leq -7$ or $x \geq -6$ **25.** $x = 2$ or $x > 5$ **27.** $t \leq 18$ or $t \geq 22$
29. $\{f \mid -13 \leq f \leq -5\}$



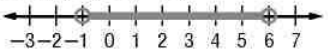
31. $\{h \mid h < -1\}$



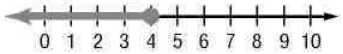
33. $\{y \mid 3 < y < 6\}$



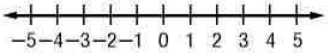
35. $\{q \mid -1 < q < 6\}$



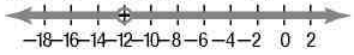
37. $\{n \mid n \leq 4\}$



39. $\varnothing$



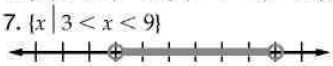
41. $\{b \mid b < -12 \text{ or } b > -12\}$



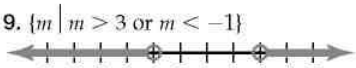
43. Sample answer: Let n = the number; $-8 < 3n + 4 < 10$; $\{n \mid -4 < n < 2\}$. **45.** Sample answer: Let n = the number; $0 < \frac{1}{2}n \leq 1$; $\{n \mid 0 < n \leq 2\}$. **47.** between \$145 and \$230 inclusive **49a.** $x \geq 5$ and $x \leq 8$ **49b.** $x > 6$ or $x < 1$
51. $15 \leq x \leq 50{,}000$; $20 \leq x \leq 20{,}000$ **53.** troposphere: $a \leq 10$; stratosphere: $10 < a \leq 30$; mesosphere: $30 < a \leq 50$; thermosphere: $50 < a \leq 400$; exosphere: $a > 400$ **55.** A
57a. $\{x \mid x < -6 \text{ or } x > -1\}$ **57b.** $\{x \mid -2 \leq x \leq 8\}$
59. $\{d \mid d \geq 5\}$ **61.** $\{t \mid t < 169\}$ **63.** 2.25 **65.** {(6, 0), (−3, 5), (2, −2), (−3, 3)}; {−3, 2, 6}; {−2, 0, 3, 5}; {(0, 6), (5, −3), (−2, 2), (3, −3)} **67.** {(3, 4), (3, 2), (2, 9), (5, 4), (5, 8), (−7, 2)}; {−7, 2, 3, 5}; {2, 4, 8, 9}; {(4, 3), (2, 3), (9, 2), (4, 5), (8, 5), (2, −7)} **69.** 5:1 **71.** −470 **73.** 7 **75.** 1 **77.** 6 **79.** 1

Page 344 Practice Quiz 2

1. $\{b \mid b < 7\}$ **3.** $\{t \mid t < -3\}$ **5.** $\{m \mid m \geq 3\}$
7. $\{x \mid 3 < x < 9\}$

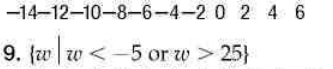


9. $\{m \mid m > 3 \text{ or } m < -1\}$

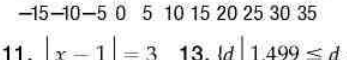


Pages 348–351 Lesson 6-5

1. The solution of $|x - 2| > 6$ includes all values that are less than -4 or greater than 8. The solution of $|x - 2| < 6$ includes all values that are greater than -4 and less than 8.
3. Leslie; you need to consider the case when the value inside the absolute value symbols is positive and the case when the value inside the absolute value symbols is negative. So $x + 3 = 2$ or $x + 3 = -2$. **5.** c
7. $\{-13, 7\}$



9. $\{w \mid w < -5 \text{ or } w > 25\}$



11. $|x - 1| = 3$ **13.** $\{d \mid 1.499 \leq d \leq 1.501\}$ **15.** f **17.** b
19. d **21.** $|t - 38| \leq 1.5$ **23.** $|s - 55| \leq 3$

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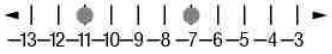
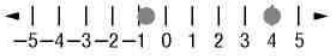
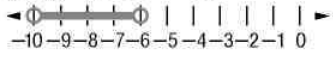
25. $\{-11, -7\}$



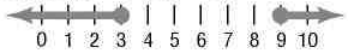
27. $\{-0.8, 4\}$



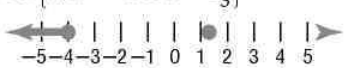
29. $\{t \mid -10 < t < -6\}$



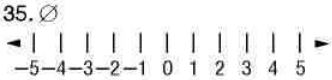
31. $\{w \mid w \leq 3 \text{ or } w \geq 9\}$



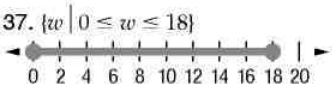
33. $\left\{k \mid k \leq -4 \text{ or } k \geq 1\frac{1}{3}\right\}$



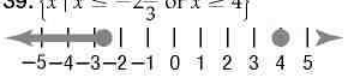
35. $\varnothing$



37. $\{w \mid 0 \leq w \leq 18\}$

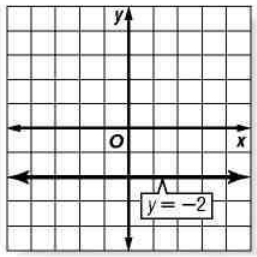


39. $\left\{x \mid x \leq -2\frac{2}{3} \text{ or } x \geq 4\right\}$



41. $|x - 3| = 5$ 43. $|x + 3| < 4$ 45. $|x + 10| \geq 2$ 47. $\{d \mid 266 \leq d \leq 294\}$ 49. $\{t \mid 65 \leq t \leq 71\}$ 51. $\{p \mid 28 \leq p \leq 32\}$ 53. $\{a \mid 2.5 \leq a \leq 3.5\}$ 55a. $\{1.8, 4.2\}$ 55b. $|x - 3| = 1.2$ 57. B 59. between 114 and 152 beats per min 61. $\left\{x \mid x \leq -1\frac{1}{3}\right\}$ 63. $-2; 4$ 65. $-\frac{2}{3}; 0$ 67. $x = \frac{3z + 2y}{e}$ 69. -5 71. 4.2 73. Substitution Property

75.



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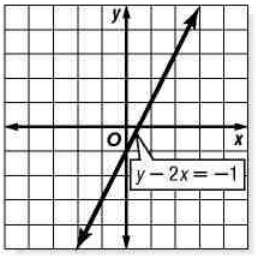

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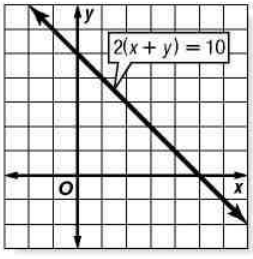
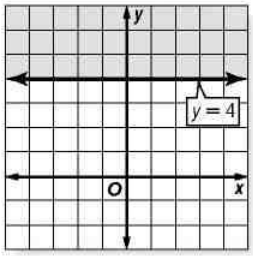


Pages 355–357 Lesson 6-6

1. The graph of $y = x + 2$ is a line. The graph of $y < x + 2$ does not include the boundary $y = x + 2$, and it includes all ordered pairs in the half-plane that contains the origin. 3. If the test point results in a true statement, shade the half-plane that contains the point. If the test point results in a false statement, shade the other half-plane. 5. $\{(2, 6)\}$

7.



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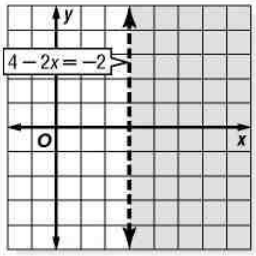
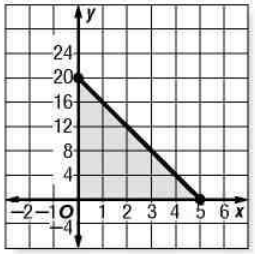
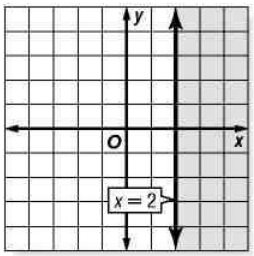


11. $12x + 3y \leq 60$



13. $\{(1, 1), (1, 2)\}$
15. $\{(-2, -4), (5, 1)\}$
17. $\{(2, -1), (-1, 1)\}$
19. $\{(6, -7)\}$ 21. a 23. b
25. above

27.



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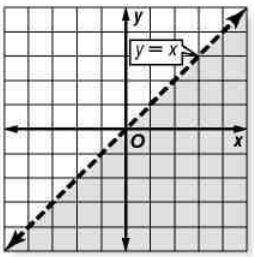

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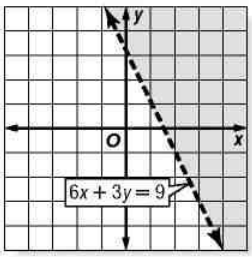

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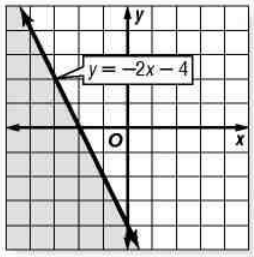

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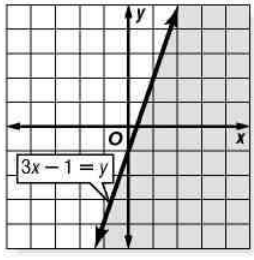

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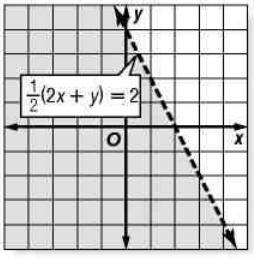
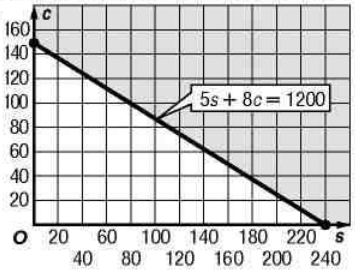


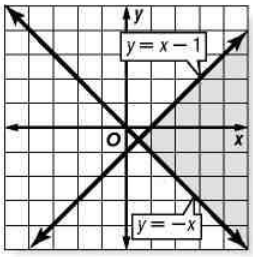
39. The solution set is limited to positive numbers.

41. No, the weight will be greater than 4000 pounds.

43.

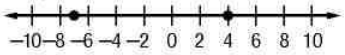


45.

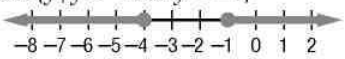


47. D

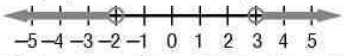
49. $\{-7, 4\}$



51. $\{y \mid y \leq -4 \text{ or } y \geq -1\}$



53. $\{m \mid m < -2 \text{ or } m > 3\}$



55. increase; 42% 57. 23 59. 3.25 61. $-3c$ 63. $6y - 3$

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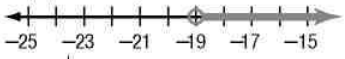
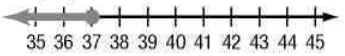
1. f 3. d 5. c 7. h

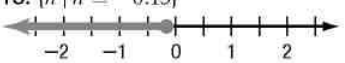
9. $\{c \mid c > -19\}$



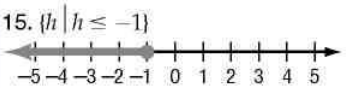
11. $\{w \mid w \leq 37\}$



13. $\{n \mid n \leq -0.15\}$

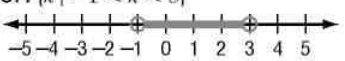


15. $\{h \mid h \leq -1\}$

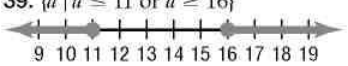


17. Sample answer: Let n = the number; $21 \geq n + (-2)$; $\{n \mid n \leq 23\}$. 19. $\{r \mid r \leq 6\}$ 21. $\{m \mid m > -11\}$ 23. $\{d \mid d < 65\}$ 25. $\{p \mid p \leq -25\}$ 27. $\{h \mid h < -2\}$ 29. $\{x \mid x > -2\}$ 31. $\{q \mid q > -7\}$ 33. $\{x \mid x \geq 4\}$ 35. Sample answer: Let n = the number; $\frac{2}{3}n - 27 \geq 9$; $\{n \mid n \geq 54\}$.

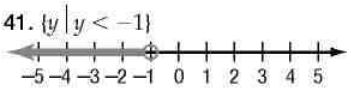
37. $\{k \mid -1 < k < 3\}$



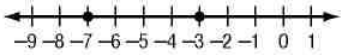
39. $\{a \mid a \leq 11 \text{ or } a \geq 16\}$



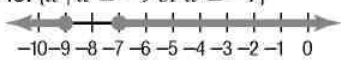
41. $\{y \mid y < -1\}$



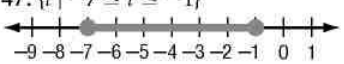
43. $\{-7, -3\}$



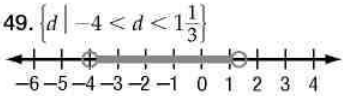
45. $\{w \mid w \leq -9 \text{ or } w \geq -7\}$



47. $\{t \mid -7 \leq t \leq -1\}$

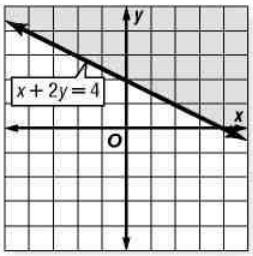


49. $\left\{d \mid -4 < d < 1\frac{1}{3}\right\}$

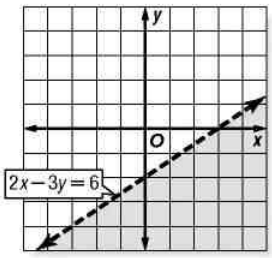


51. $\{(2, -5), (-1, 6)\}$ 53. $\{(5, 10), (3, 6)\}$

55.



57.



Chapter 7 Solving Systems of Linear Equations and Inequalities

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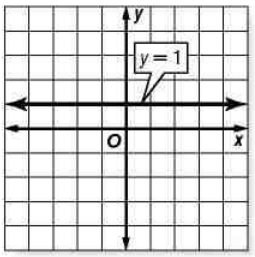
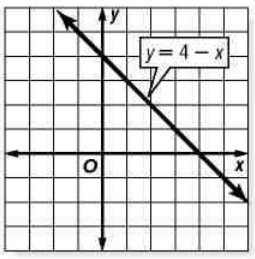
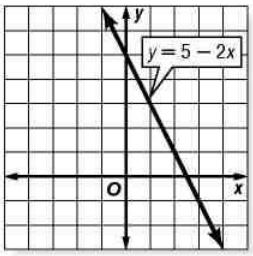
1.



3.



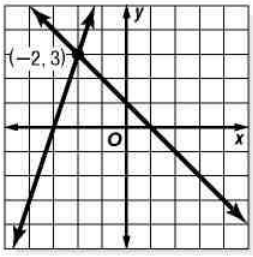
5.



7. $x = \frac{a}{2}$ 9. $b = \frac{120 + d}{7c}$ 11. x 13. $27y$ 15. $13y$ 17. $5x$ 19. $7x$

Page 371–374 Lesson 7-1

1. Sample answer:



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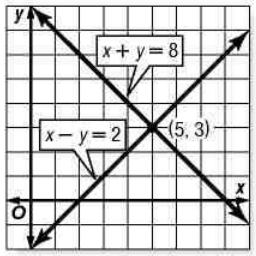
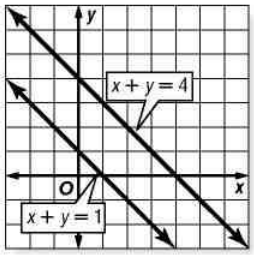
3. Sample answer: The graphs of the equations $x + y = 3$ and $2x + 2y = 6$ have a slope of -1. Since the graphs of the equations coincide, there are infinitely many solutions.
5. no solution **7.** one

9.



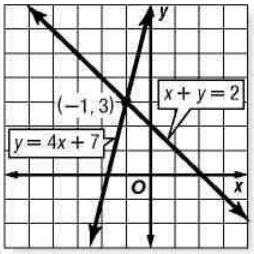
one; (5, 3)

11.



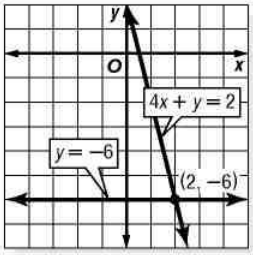
no solution

13.



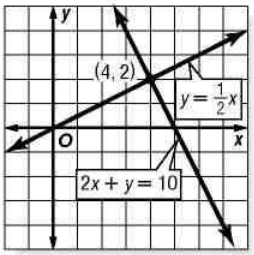
one; (−1, 3)
15. one **17.** infinitely many **19.** one **21.** one

23.



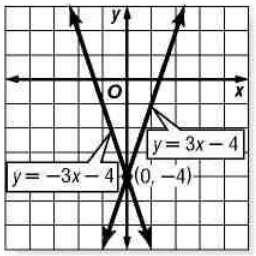
one; (2, −6)

25.



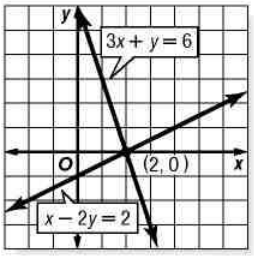
one; (4, 2)

27.



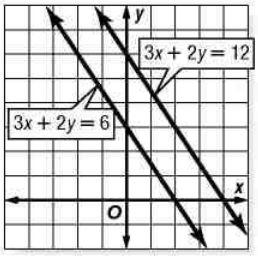
one; (0, −4)

29.



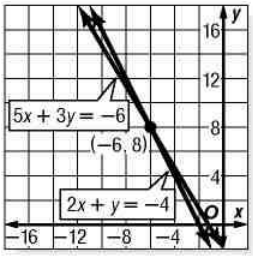
one; (2, 0)

31.



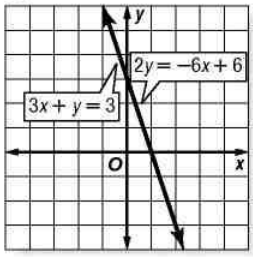
no solution

33.



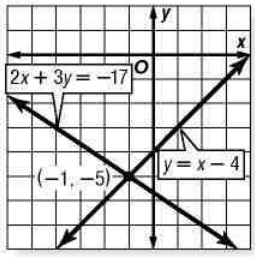
one; (−6, 8)

35.



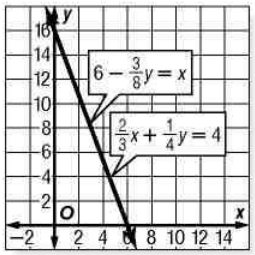
infinitely many

37.



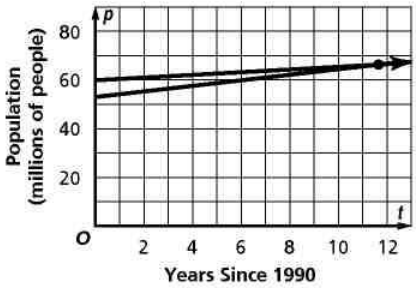
one; (−1, −5)

39.



infinitely many
41. 13 m by 7 m
43. 21 units^2 **45.** 70 m
47. \$40 **49.** neither
51. $p = 60 + 0.4t$

53.

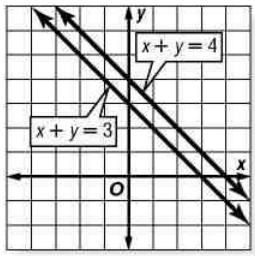


55. $A = 4, B = -4$ **57.** B **59.** $\{(5, -6)\}$ **61.** $\{n \mid 1.95 < n < 2.05\}$ **63.** $x - 3y = 3$ **65.** $y = 2x$ **67.** $q = \frac{7m - n}{10}$

Pages 379–381 Lesson 7-2

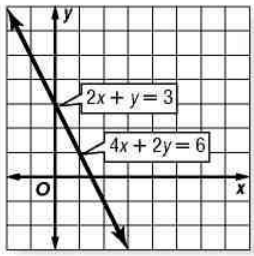
1. Substitution may result in a more accurate solution.
3. Sample answer: $y = x + 3$ and $2y = 2x + 6$ **5.** (3, 1)
7. infinitely many **9.** no solution **11.** (2, 10) **13.** (−23, −7)
15. (6, 7) **17.** no solution **19.** (7, 2) **21.** (2, 0) **23.** $\left(4\frac{1}{2}, \frac{3}{4}\right)$
25. (5, 2) **27.** $\left(2\frac{2}{3}, 4\frac{1}{3}\right)$ **29.** 14 in., 14 in., 18 in. **31.** 320 gal of 25% acid, 180 gal of 50% acid **33.** Yankees: 26, Reds: 5
35. The second offer is better if she sells less than \$80,000. The first offer is better if she sells more than \$80,000.
37. during the year 2023 **39.** (−1, 5, −4) **41.** B

43.



no solution

45.



infinitely many

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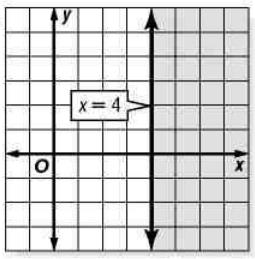
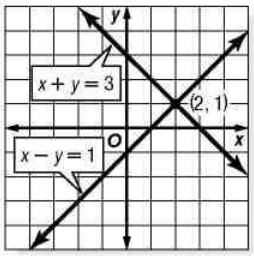
47. 

49. 50 lb **51.** $12t$
53. $5d - b$

Page 381 Practice Quiz 1

1. 

one; (2, 1)

3. $(-4, 4)$ **5.** infinitely many

Pages 384–386 Lesson 7-3

1. Sample answer: $2a + b = 5$, $a - b = 4$ **3.** Michael; in order to eliminate the s terms, you must add the two equations. **5.** $(-1, 3)$ **7.** $(0, -5)$ **9.** $\left(-2\frac{1}{2}, -2\right)$ **11.** D **13.** $(3, -1)$ **15.** $(-1, 2)$ **17.** $(7, 4)$ **19.** $(-2, 3)$ **21.** $(1, -1)$ **23.** $\left(2, -1\frac{1}{2}\right)$ **25.** $\left(\frac{3}{16}, -\frac{1}{2}\right)$ **27.** (15.8, 3.4) **29.** (24, 4) **31.** 32, 19 **33.** 5, 9 **35.** adult: \$16, student: \$9 **37.** $y = 0.0048x + 1.28$ **39.** 2048; 1.51 billion

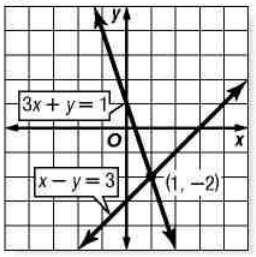
41. Elimination can be used to solve problems about meteorology if the coefficients of one variable are the same or are additive inverses. Answers should include the following.

- The two equations in the system of equations are added or subtracted so that one of the variables is eliminated. You then solve for the remaining variable. This number is substituted into one of the original equations, and that equation is solved for the other variable.

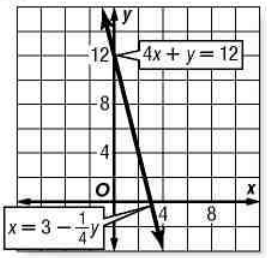
- $n + d = 24$ — *Write the equations in column form and add.*
  $(+)\ n - d = 12$
  $2n = 36$ — *Notice that the d variable is eliminated.*
  $\frac{2n}{2} = \frac{36}{2}$ — *Divide each side by 2.*
  $n = 18$ — *Simplify.*
  $n + d = 24$ — *First equation*
  $18 + d = 24$ — *n = 18*
  $18 + d - 18 = 24 - 18$ — *Subtract 18 from each side.*
  $d = 6$ — *Simplify.*

On the winter solstice, Seward, Alaska, has 18 hours of nighttime and 6 hours of daylight.

43. C **45.** $(1, -1)$

47. 

one; $(1, -2)$

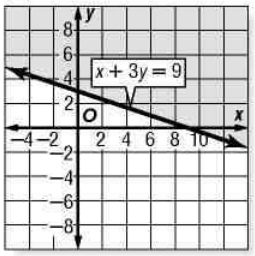
49. 

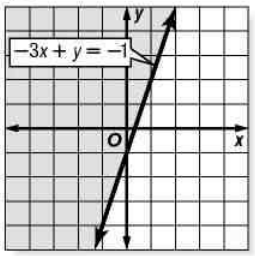
infinitely many

51. $6x + 8y$ **53.** $6m - 9n$

Pages 390–392 Lesson 7-4

1. If one of the variables cannot be eliminated by adding or subtracting the equations, you must multiply one or both of the equations by numbers so that a variable will be eliminated when the equations are added or subtracted. **3.** Sample answer: (1) You could solve the first equation for a and substitute the resulting expression for a in the second equation. Then find the value of b. Use this value for b and one of the equations to find the value of a. (2) You could multiply the first equation by 3 and add this new equation to the second equation. This will eliminate the b-term. Find the value of a. Use this value for a and one of the equations to find the value of b. **5.** $(-1, 1)$ **7.** (1.25, 2.75) **9.** elimination (+); (2, 0) **11.** elimination (−); (7, 11.5) **13.** $(-9, -13)$ **15.** (2, 1) **17.** $(-1, 5)$ **19.** $(-1, -2)$ **21.** (10, 12) **23.** $(2, -8)$ **25.** 2, −5 **27.** elimination (×); $(-2, 1)$ **29.** substitution; (2, 6) **31.** elimination (+); $\left(8, \frac{4}{3}\right)$ **33.** elimination (×) or substitution; (3, 1) **35.** elimination (−); no solution **37.** elimination (−); (24, 4) **39.** 640 2-point field goals, 61 3-point field goals **41.** 95 **43.** 475 mph **45.** A **47.** (6, 2) **49.** (11, 7) **51.** $(-4, 4)$ **53.** more than \$325,000

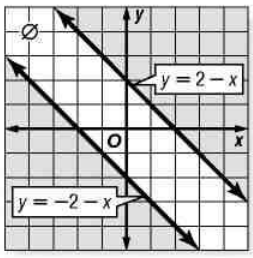
55. 

57. 

Page 392 Practice Quiz 2

1. $(2, -2)$ **3.** (5, 3) **5.** \$0.45; \$0.15

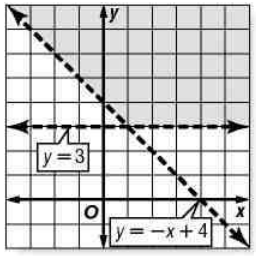
Pages 396–398 Lesson 7-5

1. Sample answer: 

CONTENTS

3. Kayla; the graph of $x + 2y \geq -2$ is the line representing $x + 2y = 2$ and the region above it.

5.



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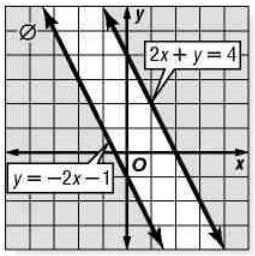

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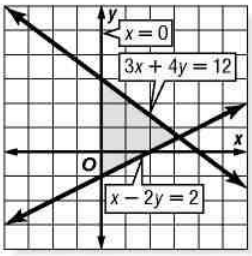
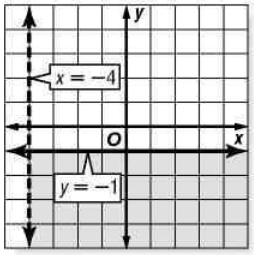


11. Sample answers: walk: 15 min, jog: 15 min; walk: 10 min, jog: 20 min; walk: 5 min, jog: 25 min

13.



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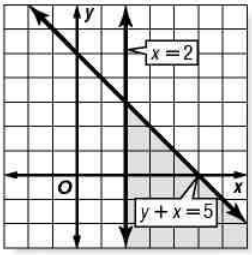

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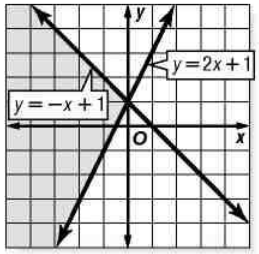

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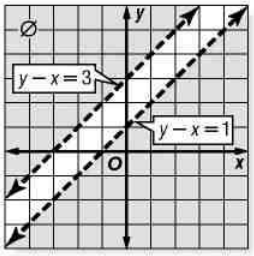

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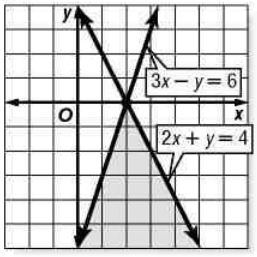

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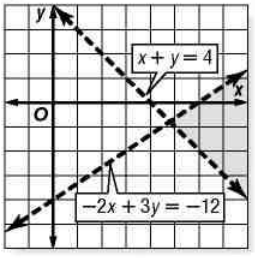

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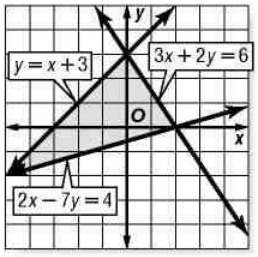
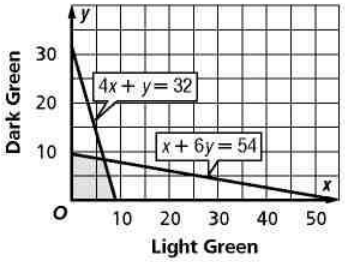


27. $y \leq x, y > x - 3$

29.



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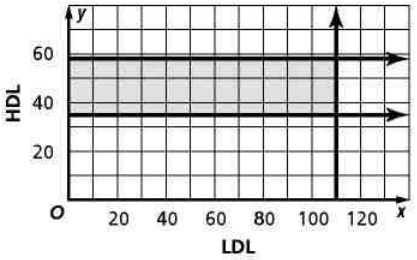

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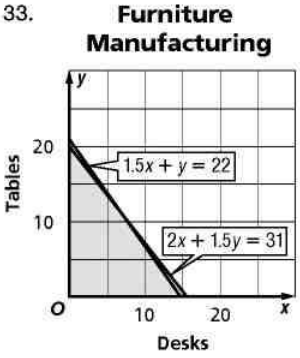
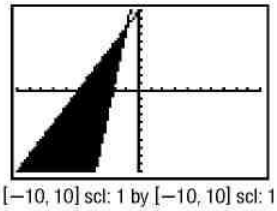


35. By graphing a system of equations, you can see the appropriate range of Calories and fat intake. Answers should include the following.

- Two sample appropriate Calorie and fat intakes are 2200 Calories and 60 g of fat and 2300 Calories and 65 g of fat.
- The graph represents $2000 \leq c \leq 2400$ and $60 \leq f \leq 75$.

37.



[−10, 10] scl: 1 by [−10, 10] scl: 1

39. D 41. (2, −1)
43. (−2, 3) 45. (−1, 3)
47. $y = 2x - 9$
49. $y = \frac{1}{3}x - \frac{11}{3}$

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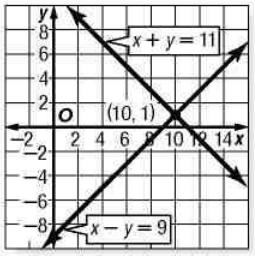
Pages 399–402 Chapter 7 Study Guide and Review

1. independent 3. dependent 5. infinitely many

7.



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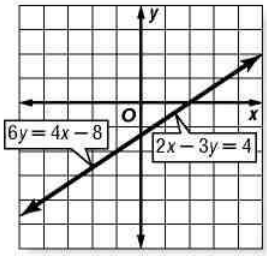
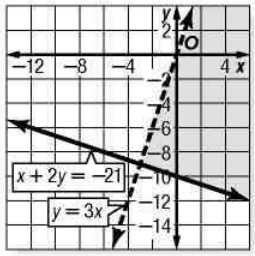


one; (10, 1) infinitely many

11. (3, −5) 13. $\left(\frac{1}{2}, \frac{1}{2}\right)$ 15. (2, 2) 17. (4, 1) 19. (5, 1)

21. $\left(2\frac{4}{5}, \frac{4}{5}\right)$ 23. substitution; $\left(1\frac{3}{5}, 3\frac{1}{5}\right)$ 25. substitution; (0, 0)

27.



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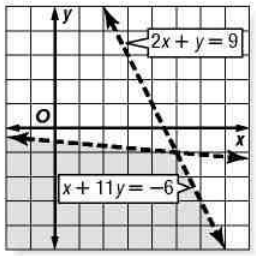

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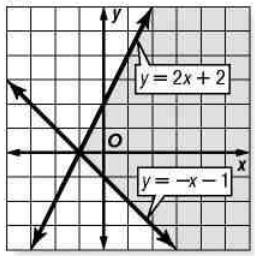

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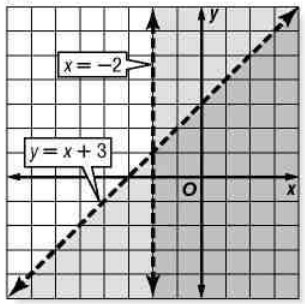
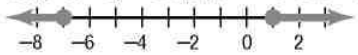
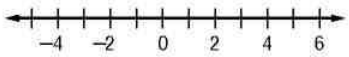


65. (−3, −4) 67. $\{h \mid h \le -7 \text{ or } h \ge 1\}$



69. ∅



71. dilation 73. reflection 75. $\frac{1}{3}$ 77. 2 79. $\frac{7}{18}$ 81. $\frac{11}{8}$

Chapter 8 Polynomials

Page 409 Chapter 8 Getting Started

1. 2^5 3. 5^2 5. a^6 7. $\left(\frac{1}{2}\right)^5$ 9. 9 11. 25 13. 36 15. $\frac{16}{81}$
17. 63 yd^2 19. 84 ft^3

Pages 413–415 Lesson 8-1

1a. Sample answer: $n^2(n^5) = n^7$ 1b. Sample answer: $(n^2)^5 = n^{10}$ 1c. Sample answer: $(nn^2)^5 = n^5n^{10}$
3. Poloma; when finding the product of powers with the same base, keep the same base and add the exponents. Do not multiply the bases. 5. No; $\frac{4a}{3b}$ shows division, not multiplication. 7. x^{11} 9. 2^{18} or 262,144 11. $-48m^3n^3$
13. $5n^5$ 15. Yes; 12 is a real number and therefore a monomial. 17. No; $a - 2b$ shows subtraction, not multiplication of variables. 19. No; $\frac{x}{y^2}$ shows division, not multiplication of variables. 21. a^2b^6 23. $-28c^4d^7$
25. $30a^5b^7c^6$ 27. $81p^2q^{14}$ 29. 3^{16} or 43,046,721 31. $0.25x^6$
33. $-\frac{27}{64}c^3$ 35. $-432c^2d^8$ 37. $144a^8g^{14}$ 39. $-9x^3y^9$
41. $40b^{12}$ 43. $15f^5g^5$ 45. $(49x^8)\pi$ 47. x^3y^5 49. 10^{12} or 1 trillion 51. 2; 8; 32 53. 2^{22} or 4,194,304 ways
55. False. Let $a = 2$ and $b = 3$. Then $(ab)^2 = (2 \cdot 3)^2$ or 36 and $ab^2 = (2)(3)^2$ or 18. 57. False. Let $a = 3$, $b = 4$, and $n = 2$. Then $(a + b)^n = (3 + 4)^2$ or 49 and $a^n + b^n = 3^2 + 4^2$ or 25. 59. D

Pages 421–423 Lesson 8-2

1. Sample answer: $9xy$ and $6xy^2$ 3. Jamal; a factor is moved from the numerator of a fraction to the denominator or vice versa only if the *exponent* of the factor is negative; $-4 \neq \frac{1}{4}$. 5. x^6y^5 7. $\frac{1}{y^4}$ 9. $\frac{g^8}{d^3c^5}$ 11. $c^{11}d^{12}$ 13. C
15. 3^6 or 729 17. y^2z^7 19. $\frac{81m^{28}}{256x^{20}y^{12}}$ 21. $\frac{1}{3b^4}$ 23. $\frac{1}{n^3p^4}$
25. $\frac{1}{125}$ 27. $\frac{8}{27}$ 29. $\frac{6k^{17}}{h^3}$ 31. $\frac{19}{3z^{12}}$ 33. $\frac{p}{q}$ 35. 1
37. $\frac{27a^9c^3}{8b^9}$ 39. $10ab$ units 41. jet plane 43. $\left(\frac{1}{2}\right)^n$
45. $\frac{1}{10^5}$ to $\frac{1}{10^4}$ cm; $\frac{1}{100{,}000}$ to $\frac{1}{10{,}000}$ cm 47. a^{n+3} 49. c^{11}

51. You can compare pH levels by finding the ratio of one pH level to another written in terms of the concentration c of hydrogen ions, $c = \left(\frac{1}{10}\right)^{\text{pH}}$. Answers should include the following.

- Sample answer: To compare a pH of 8 with a pH of 9 requires simplifying the quotient of powers.

$$\frac{\left(\frac{1}{10}\right)^8}{\left(\frac{1}{10}\right)^9} \cdot \frac{\left(\frac{1}{10}\right)^8}{\left(\frac{1}{10}\right)^9} = \left(\frac{1}{10}\right)^{8-9}$$

$$= \left(\frac{1}{10}\right)^{-1}$$

$$= \frac{1}{\left(\frac{1}{10}\right)^1} \quad \textit{Negative Exponent Property}$$

$$= 10$$

Thus, a pH of 8 is ten times more acidic than a pH of 9.
53. Since each number is obtained by dividing the previous number by 3, $3^1 = 3$ and $3^0 = 1$. 55. $12x^8y^4$ 57. $9c^2d^{10}$
59. $-108a^3b^9$ 61. Sample answers: 3 oz of mozzarella, 4 oz of Swiss; 4 oz of mozzarella, 3 oz of Swiss; 5 oz of mozzarella, 3 oz of Swiss 63. $y = -2x + 3$ 65. $y = \frac{3}{2}x + 2$

Selected Answers

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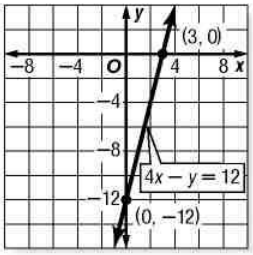
67. 

69. ± 11 71. -7.21 73. 10^{-13} 75. 10^{7} 77. 10^{-11}

Pages 428–430 Lesson 8-3

1. When numbers between 0 and 1 are written in scientific notation, the exponent is negative. If the number is not between 0 and 1, use a positive exponent 3. Sample answer: 6.5 million; 6,500,000; 6.5×10^6 5. 4590 7. 0.000036 9. 5.67×10^{-3} 11. 3.002×10^{15} 13. 1.88×10^{-7}; 0.000000188 15. 5×10^9; 5,000,000,000 17. $933.33 19. 0.0000000061 21. 80,000,000 23. 0.299 25. 6.89 27. 238,900 29. 0.0000000000000000000000000000091095 31. 3.4402×10^7 33. 9.0465×10^{-4} 35. 3.807×10^2 37. 8.73×10^{12} 39. 8.1×10^{-6} 41. 1×10^9 43. $6.02214299 \times 10^{23}$ 45. 1.71×10^9; 1,710,000,000 47. 1.44×10^{-8}; 0.0000000144 49. 2.548×10^5; 254,800 51. 4×10^{-4}; 0.0004 53. 2.3×10^{-6}; 0.0000023 55. 9.3×10^{-7}; 0.00000093 57. about $20,236 59. about 1.4×10^{14} or 140 trillion tons

61. Astronomers work with very large numbers such as the masses of planets. Scientific notation allows them to more easily perform calculations with these numbers. Answers should include the following.

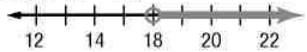
-

Planet	Mass (kg)
Mercury	330,000,000,000,000,000,000,000
Venus	4,870,000,000,000,000,000,000,000
Earth	5,970,000,000,000,000,000,000,000
Mars	642,000,000,000,000,000,000,000
Jupiter	1,900,000,000,000,000,000,000,000,000
Saturn	569,000,000,000,000,000,000,000,000
Uranus	86,800,000,000,000,000,000,000,000
Neptune	102,000,000,000,000,000,000,000,000
Pluto	12,700,000,000,000,000,000,000

- Scientific notation allows you to fit numbers such as these into a smaller table. It allows you to compare large values quickly by comparing the powers of 10 instead of counting zeros to find place value. For computation, scientific notation allows you work with fewer place values and to express your answers in a compact form.

63. 6.75×10^{18} 65. 8.52×10^{-6} 67. 1.09×10^3 69. $-\frac{4n^5}{p^5}$ 71. no 73. yes

75. $\{d \mid d > 18\}$



77. 20 79. 37 81. 10

Page 430 Practice Quiz 1

1. n^8 3. $-128w^{11}z^{18}$ 5. $\frac{36k^6}{49m^2p^8}$ 7. 4.48×10^6; 4,480,000 9. 4×10^{-2}; 0.04

Pages 434–436 Lesson 8-4

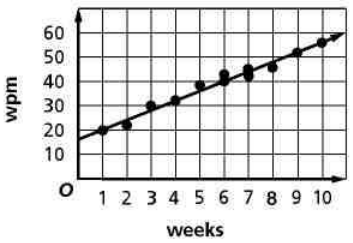
1. Sample answer: -8 3a. true; 3b. false; $3x + 5$ 3c. true 5. yes; monomial 7. 0 9. 5 11. $2a + 4x^2 - 7a^2x^3 - 2ax^5$ 13. $x^3 + 3x^2y + 3xy^2 + y^3$ 15. yes; monomial 17. yes; binomial 19. yes; trinomial 21. $0.5bh$ 23. $0.5xy - \pi r^2$ 25. 3 27. 2 29. 4 31. 2 33. 3 35. 7 37. $-1 + 2x + 3x^2$ 39. $8c - c^3x^2 + c^2x^3$ 41. $4 - 5a^7 + 2ax^2 + 3ax^5$ 43. $6y + 3xy^2 + x^2y - 4x^3$ 45. $x^5 + 3x^3 + 5$ 47. $2a^2x^3 + 4a^3x^2 - 5a$ 49. $cx^3 - 5c^3x^2 + 11x + c^2$ 51. $-2x^4 - 9x^2y + 8x + 7y^2$ 53. $0.25q + 0.10d + 0.05n$ 55. $\pi r^2h + \frac{2}{3}\pi r^3$ 57. True; for the degree of a binomial to be zero, the highest degree of either term would need to be zero. Thus both terms must be of degree zero and are therefore like terms. With these like terms combined, the expression is not a binomial, but a monomial. Therefore, the degree of a binomial can never be zero. Only a monomial can have a degree of zero. 59. B 61. 1.23×10^7 63. 1.2×10^7 65. $\frac{1}{b^2c}$ 67. $\frac{16x^6y^4}{9z^2}$ 69. no 71. $\frac{1}{2}$ 73. $7a^2 + 3a$ 75. $a - 2b$

Page 441–443 Lesson 8-5

1. The powers of x and y are not the same. 3. Kendra; Esteban added the additive inverses of both polynomials when he should have added the opposite of the polynomial being subtracted. 5. $9y^2 - 3y - 1$ 7. $11a^2 + 6a + 1$ 9. $3ax^2 - 9x - 9a + 8a^2x$ 11. about 297,692,000 13. $13z - 10z^2$ 15. $-2n^2 + 7n + 5$ 17. $5b^3 - 8b^2 - 4b$ 19. $2g^3 - 9g$ 21. $-2x - 3xy$ 23. $3ab^2 + 11ab - 4$ 25. $3x^2 - 12x + 5ax + 3a^2$ 27. $8x^2 - 6x + 15$ 29. $11x^3 - 7x^2 - 9$ 31. $6x^2 - 15x + 12$ 33. 260 outdoor screens 35. Original number $= 10x + y$; show that the new number will always be represented by $10y + x$.

new number $= 9(y - x) + (10x + y)$
$= 9y - 9x + 10x + y$
$= 10y + x$

37. $40 - 2x$ 39. $140 - 4x \leq 108$; 8 in. 41. $x + 1$ 43. 4 45. A 47. 5 49. 3 51. 8,000,000 53. 0.0005

55. 

57. Sample answer: $y = 4x + 17$ 59. No; there's a limit as to how fast one can keyboard. 61. $D = \{-4, -1, 5\}$; $R = \{2, -3, 0, 1\}$ 63. $18x - 48$ 65. $35p - 28q$ 67. $8x^2 + 24x - 32$

Page 446–449 Lesson 8-6

1. Distributive Property; Product of Powers Property 3. Sample answer: $4x$ and $x^2 + 2x + 3$; $4x^3 + 8x^2 + 12x$ 5. $18b^5 - 27b^4 + 9b^3 - 72b^2$ 7. $-20x^3y + 48x^2y^2 - 28xy^3$ 9. $20n^4 + 30n^3 - 14n^2 - 13n$ 11. $\frac{5}{3}$ 13. $T = 10{,}700 - 0.03x$ 15. $5r^2 + r^3$ 17. $-32x - 12x^2$ 19. $7ag^4 + 14a^2g^2$ 21. $-6b^4 + 8b^3 - 18b^2$ 23. $40x^3y + 16x^2y^3 - 24x^2y$ 25. $-15hk^4 - \frac{15}{4}h^2k^2 + 6hk^2$ 27. $-10a^3b^2 - 25a^4b^2 + 5a^3b^3 - 5a^6b$ 29. $-2d^2 + 19d$ 31. $20w^2 - 18w + 10$ 33. $46m^3 + 14m^2 - 32m + 20$ 35. $6c^3 - 23c^2 + 20c - 8$ 37. $6x^2 + 8x$ 39. -2 41. $-\frac{1}{3}$ 43. 0 45. $\frac{7}{4}$ 47. -5 49. $T = -0.03x + 6360$ 51. $20x^2 + 48x$ 53. $x + 2$ 55. Let x and y be integers.

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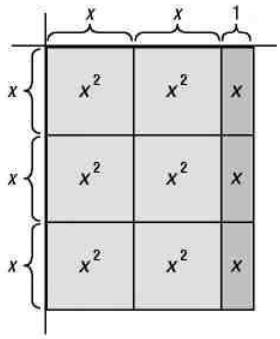
Then $2x$ and $2y$ are even numbers, and $(2x)(2y) = 4xy$. $4xy$ is divisible by 2 since one of its factors, 4, is divisible by 2. Therefore, $4xy$ is an even number.

57. Let x and y be integers. Then $2x$ is an even number and $2y + 1$ is an odd number. Their product, $2x(2y + 1)$, is always even since one of its factors is 2. **59.** \$2.20

61. \$126

63. Answers should include the following.

- The product of a monomial and a polynomial can be modeled using an area model. The area of the figure shown at the beginning of the lesson is the product of its length $2x$ and width $(x + 3)$. This product is $2x(x + 3)$, which when the Distributive Property is applied becomes $2x(x) + 2x(3)$ or $2x^2 + 6x$. This is the same result obtained when the areas of the algebra tiles are added together.
- Sample answer: $(3x)(2x + 1)$
  $(3x)(2x + 1) = (3x)(2x) + (3x)(1)$
  $= 6x^2 + 3x$



65. A **67.** $-4y^2 + 5y + 3$ **69.** $7p^3 - 3p^2 - 2p - 7$ **71.** yes; binomial **73.** yes; monomial **75.** $9n + 4 \geq 7 - 13n$; $\left\{n \mid n \geq \frac{3}{22}\right\}$ **77.** $y = -2x - 3$ **79.** \$50

81.

Stem	Leaf
1	0 4 5 8 8 8
2	0 0 1 1 2
3	0 4
4	3 4

$3|4 = 34$

83. $6x^3$
85. $12y^2 - 24y$
87. $18p^4 - 24p^3 + 36p^2$

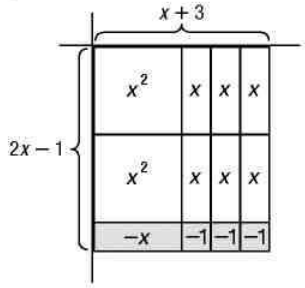
Page 449 Practice Quiz 2

1. 4 **3.** 3 **5.** $-12 + 9x + 4x^2 + 5x^3$ **7.** $10n^2 - 4n + 2$

9. $15a^5b - 10a^4b^2 + 30a^3b^3$

Pages 455–457 Lesson 8-7

1.



5. $x^2 + 4x - 12$
7. $4h^2 + 33h + 35$
9. $10g^2 + 19g - 56$
11. $6k^3 + 2k^2 - 29k + 15$
13. $b^2 + 10b + 16$
15. $x^2 - 13x + 36$
17. $y^2 - 4y - 32$
19. $2w^2 + 9w - 35$
21. $40d^2 + 31d + 6$
23. $35x^2 - 27x + 4$
25. $4n^2 + 12n + 9$
27. $100r^2 - 16$ **29.** $40x^2 - 22xy - 8y^2$ **31.** $p^3 + 6p^2 + p - 28$ **33.** $6x^3 - 23x^2 + 22x - 5$ **35.** $n^4 + 2n^3 - 17n^2 + 22n - 8$ **37.** $8a^4 + 2a^3 + 15a^2 + 31a - 56$ **39.** $2x^2 + 3x - 20$ units^2 **41.** $\frac{15}{2}x^2 + 3x - 24$ units^2 **43.** $2a^3 + 10a^2 - 2a - 10$ units^3 **45.** $a^3 + 3a^2 + 2a$ **47.** Sample answer: 6; the result is the same as the product in Exercise 46. **49.** $x - 2, x + 4$ **51.** bigger; 10 ft^2 **53.** 20 ft by 24 ft

55. Multiplying binomials and two-digit numbers each involve the use of the Distributive Property twice. Each procedure involves four multiplications and the addition of like terms. Answers should include the following.

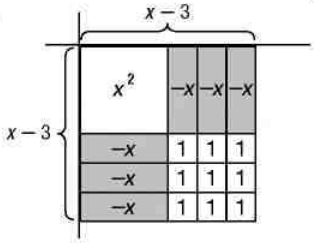
- $24 \times 36 = (4 + 20)(6 + 30)$
  $= (4 + 20)6 + (4 + 20)30$
  $= (24 + 120) + (120 + 600)$
  $= 144 + 720$
  $= 864$
- The like terms in vertical two-digit multiplication are digits with the same place value.

57. B **59.** $-28y^3 + 16y^2 - 12y$ **61.** $36x^2 - 42$ **63.** $(181 - 7x)°$ **65.** one; $(-6, 3)$ **67.** 5 **69.** $t = \frac{v}{a}$ **71.** $y = -\frac{4}{3}x + \frac{7}{3}$ **73.** $49x^2$ **75.** $16y^4$ **77.** $9g^8$

Pages 461–463 Lesson 8-8

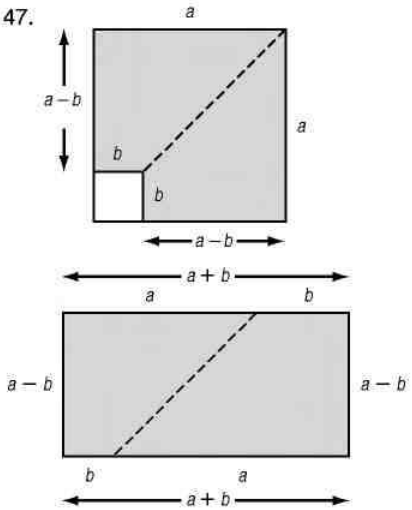
1. The patterns are the same except for their middle terms. The middle terms have different signs.

3.



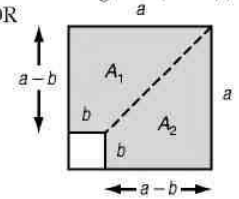
5. $a^2 + 12a + 36$
7. $64x^2 - 25$
9. $x^4 - 12x^2y + 36y^2$
11. $1.0Gg$
13. $y^2 + 8y + 16$
15. $a^2 - 10a + 25$
17. $b^2 - 49$
19. $4g^2 + 20g + 25$
21. $49 - 56y + 16y^2$
23. $121r^2 - 64$
25. $a^2 + 10ab + 25b^2$ **27.** $4x^2 - 36xy + 81y^2$ **29.** $25w^2 - 196$ **31.** $x^6 + 8x^3y + 16y^2$ **33.** $64a^4 - 81b^6$ **35.** $\frac{4}{9}x^2 - 8x + 36$ **37.** $4n^3 + 20n^2 - n - 5$ **39.** $0.5Bb + 0.5b^2$ **41.** Sample answer: 2; yes **43.** $(a + 1)^2$ **45.** $s + 2, s + 3$

47.



Area of rectangle $= (a - b)(a + b)$

OR



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Area of a trapezoid $= \frac{1}{2}$(height)(base 1 + base 2)

$A_1 = \frac{1}{2}(a - b)(a + b)$

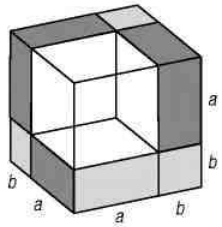
$A_2 = \frac{1}{2}(a - b)(a + b)$

Total area of shaded region

$= \left[\frac{1}{2}(a - b)(a + b)\right] + \left[\frac{1}{2}(a - b)(a + b)\right]$

$= (a - b)(a + b)$

49. C **51a.** $a^3 + 3a^2b + 3ab^2 + b^3$ **51b.** $x^3 + 6x^2 + 12x + 8$ **51c.** $(a + b)^3$



53. $c^2 - 6c - 27$ **55.** $24n^2 - 25n - 25$ **57.** $4k^3 - 6k^2 - 26k + 35$ **59.** $\frac{4}{3}$ **61.** $\frac{1}{2}$ **63.** (3, −4) **65.** $y = x + 5$ **67.** $y = \frac{1}{5}x + 6$ **69.** 61

Pages 464–468 Chapter 8 Study Guide and Review

1. negative exponent **3.** Quotient of Powers **5.** trinomial **7.** polynomial **9.** binomial **11.** y^7 **13.** $20a^5x^5$ **15.** $576x^5y^2$ **17.** $-\frac{1}{2}m^4n^8$ **19.** 531,441 **21.** $\frac{27b^3c^6}{64d^3}$ **23.** $\frac{27b}{14}$ **25.** $\frac{bx^3}{3ay^2}$ **27.** $\frac{1}{64a^6}$ **29.** 240,000 **31.** 4,880,000,000 **33.** 7.96×10^5 **35.** 6×10^{11}; 600,000,000,000 **37.** 1.68×10^{-5}; 0.0000168 **39.** 4 **41.** 6 **43.** 7 **45.** $-4x^4 + 5x^3y^2 - 2x^2y^3 + xy - 27$ **47.** $4x^2 - 5xy + 6y^2$ **49.** $21m^4 - 10m - 1$ **51.** $-7p^2 - 2p + 25$ **53.** $10x^2 - 19x + 63$ **55.** $2x^2 - 17xy^2 + 10x + 10y^2$ **57.** $1\frac{1}{7}$ **59.** $4a^2 + 13a - 12$ **61.** $20r^2 - 13rs - 21s^2$ **63.** $12p^3 - 13p^2 + 11p - 6$ **65.** $16x^2 + 56x + 49$ **67.** $25x^2 - 9y^2$ **69.** $9m^2 + 24mn + 16n^2$

Chapter 9 Factoring

Page 473 Chapter 9 Getting Started

1. $12 - 3x$ **3.** $-7n^2 + 21n - 7$ **5.** $x^2 + 11x + 28$ **7.** $54a^2 - 12ab - 2b^2$ **9.** $y^2 + 18y + 81$ **11.** $n^2 - 25$ **13.** 11 **15.** $\frac{5}{6}$

Pages 477–479 Lesson 9-1

1. false; 2 **3.** Sample answer: $5x^2$ and $10x^3$ **5.** 1, 17; prime **7.** $3^2 \cdot 5$ **9.** $-1 \cdot 2 \cdot 3 \cdot 5^2$ **11.** $3 \cdot 13 \cdot b \cdot b \cdot b \cdot c \cdot c$ **13.** 5 **15.** 9 **17.** $6a^2b$ **19.** 5 rows of 24 plants, 6 rows of 20 plants, 8 rows of 15 plants, or 10 rows of 12 plants **21.** 1, 5, 25; composite **23.** 1, 61; prime **25.** 1, 7, 17, 119; composite **27.** 1, 2, 4, 8, 16, 19, 38, 76, 152, 304; composite **29.** 194 mm; the factors of 96 whose sum when doubled is the greatest are 1 and 96. **31.** 3 packages in the box of 18 cookies and 4 packages in the box of 24 cookies **33.** $-1 \cdot 2 \cdot 7^2$ **35.** $2 \cdot 3 \cdot 17$ **37.** $2^2 \cdot 3^2 \cdot 5$ **39.** $-1 \cdot 2 \cdot 3 \cdot 7 \cdot 11$ **41.** $5 \cdot 17 \cdot x \cdot x \cdot y \cdot y$ **43.** $2 \cdot 5 \cdot 5 \cdot g \cdot h$ **45.** $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot n \cdot n \cdot n \cdot m$ **47.** $-1 \cdot 13 \cdot 13 \cdot a \cdot a \cdot b \cdot c \cdot c$ **49.** 1 **51.** 14 **53.** 21 **55.** $6d$ **57.** 1 **59.** 7 **61.** $16a^2b$ **63.** 15 **65.** 7, 31 **67.** base: 1 cm, height 40 cm; base 2 cm, height 20 cm; base 4 cm, height 10 cm; base 5 cm, height 8 cm, base 8 cm, height 5 cm, base 10 cm, height 4 cm; base 20 cm, height 2 cm; base 40 cm, height 1 cm

69. Scientists listening to radio signals would suspect that a modulated signal beginning with prime numbers would indicate a message from an extraterrestrial. Answers should include the following.

- 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 79, 83, 89, 97, 101, 103, 107, 109, 113
- Sample answer: It is unlikely that any natural phenomenon would produce such an artificial and specifically mathematical pattern.

71. A **73.** $9a^2 - 25$ **75.** $12r^2 - 16r - 35$ **77.** $b^3 + 7b^2 - 6b - 72$ **79.** 0 **81.** $10x + 40$ **83.** $6g^2 - 8g$ **85.** $7(b + c)$

Pages 484–486 Lesson 9-2

1. $4(x^2 + 3x)$, $x(4x + 12)$, or $4x(x + 3)$; $4x(x + 3)$; $4x$ is the GCF of $4x^2$ and $12x$. **3.** The division would eliminate 2 as a solution. **5.** $8xz(2 - 5z)$ **7.** $2ab(a^2b + 4 + 8ab^2)$ **9.** $(5c + 2d)(1 - 2c)$ **11.** {−2, 4} **13.** 0 ft **15.** 6.25 s; The answer 0 is not reasonable since it represents the time when the flare is launched. **17.** $4(4a + b)$ **19.** $x(x^2y^2 + 1)$ **21.** $2h(7g - 9)$ **23.** $8bc(c + 3)$ **25.** $6abc^2(3a - 8c)$ **27.** $x(15xy^2 + 25y + 1)$ **29.** $3pq(p^2 - 3q + 12)$ **31.** $(x + 7)(x + 5)$ **33.** $(3y + 2)(4y + 3)$ **35.** $(6x - 1)(3x - 5)$ **37.** $(m + x)(2y + 7)$ **39.** $(2x - 3)(5x - 7y)$ **41.** 35 **43.** 63 games **45.** $2r^2(4 - \pi)$ **47.** $81a^2 - 72ab + 16b^2$ cm^2 **49.** {−16, 0} **51.** {−3, 7} **53.** $\left\{-\frac{5}{4}, \frac{7}{3}\right\}$ **55.** {0, 5} **57.** $\left\{0, \frac{6}{7}\right\}$ **59.** $\left\{-\frac{3}{4}, 0\right\}$ **61.** about 2.8 s

63. Answers should include the following.

- Let $h = 0$ in the equation $h = 151t - 16t^2$. To solve $0 = 151t - 16t^2$, factor the right-hand side as $t(151 - 16t)$. Then, since $t(151 - 16t) = 0$, either $t = 0$ or $151 - 16t = 0$. solving each equation for t, we find that $t = 0$ or $t \approx 9.44$.
- The solution $t = 0$ represents the point at which the ball was initially thrown into the air. The solution $t \approx 9.44$ represents how long it took after the ball was thrown for it to return to the same height at which it was thrown.

65. A **67.** 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 25, 30, 50, 60, 75, 100, 150, 300; composite **69.** $16s^6 + 24s^3 + 9$ **71.** $9k^2 + 48k + 64$ **73.** $\frac{3x}{2y^5}$ **75.** 37 shares **77.** $x^2 - 9x + 20$ **79.** $18a^2 - 6a - 4$ **81.** $8y^2 - 14y - 15$

Page 486 Practice Quiz 1

1. 1, 3, 5, 9, 15, 25, 45, 75, 225; composite **3.** $2 \cdot 3 \cdot 13 \cdot a \cdot a \cdot b \cdot c \cdot c \cdot c$ **5.** $xy(4y - 1)$ **7.** $(2p - 5)(3y + 8)$ **9.** {0, 3}

Pages 492–494 Lesson 9-3

1. In this trinomial, $b = 6$ and $c = 9$. This means that $m + n$ is positive and mn is positive. Only two positive numbers have both a positive sum and product. Therefore, negative factors of 9 need not be considered. **3.** Aleta; to use the Zero Product Property, one side of the equation must equal zero. **5.** $(c - 1)(c - 2)$ **7.** $(p + 5)(p - 7)$ **9.** $(x - 3y)(x - y)$ **11.** {−9, 4} **13.** {−9, −1} **15.** {−7, 10} **17.** $(a + 3)(a + 5)$ **19.** $(c + 5)(c + 7)$ **21.** $(m - 1)(m - 21)$ **23.** $(p - 8)(p - 9)$ **25.** $(x - 1)(x + 7)$ **27.** $(h - 5)(h + 8)$ **29.** $(y - 7)(y + 6)$ **31.** $(w + 12)(w - 6)$ **33.** $(a + b)(a + 4b)$ **35.** $4x + 48$ **37.** {−14, −2} **39.** {−6, 2} **41.** {−4, 7} **43.** {3, 16} **45.** {2, −9} **47.** {4, 6} **49.** {−25, 2} **51.** {−17, 3} **53.** {4, 14} **55.** −14 and −12 or 12 and 14 **57.** −18, 18 **59.** 7, 12, 15, 16 **61.** $w(w + 52)$ m^2

63. Answers should include the following.

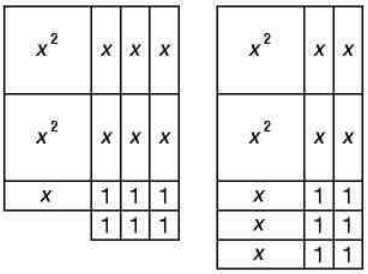
- You would use a guess-and-check process, listing the factors of 54, checking to see which pairs added to 15.
- To factor a trinomial of the form $x^2 + ax + c$, you also use a guess-and-check process, list the factors of c, and check to see which ones add to a.

65. 15 **67.** yes **69.** no; $(x - 10)(x + 21)$ **71.** $\left\{0, \frac{4}{7}\right\}$ **73.** 12 **75.** $5x^2y^4$ **77.** $1(1.54) + 17.31(1.54) = (1 + 17.31)(1.54)$ or $18.31(1.54)$ **79.** $(a + 4)(3a + 2)$ **81.** $(2p + 7)(p - 3)$ **83.** $(2g - 3)(2g - 1)$

Pages 498–500 Lesson 9-4

1. m and n are the factors of ac that add to b. **3.** Craig; when factoring a trinomial of the form $ax^2 + bx + c$, where $a \neq 1$, you must find the factors of ac not of c. **5.** prime **7.** $(x + 4)(2x + 5)$ **9.** $(2n + 5)(2n - 7)$ **11.** $\left\{\frac{1}{2}, \frac{7}{5}\right\}$ **13.** 1 s **15.** $(3x + 2)(x + 1)$ **17.** $(5d - 4)(d + 2)$ **19.** $(3g - 2)(3g - 2)$ **21.** $(x - 4)(2x + 5)$ **23.** prime **25.** $(5n + 2)(2n - 3)$ **27.** $(2x + 3)(7x - 4)$ **29.** $5(3x + 2)(2x - 3)$ **31.** $(12a - 5b)(3a + 2b)$ **33.** $\pm 31, \pm 17, \pm 13, \pm 11$ **35.** $\left\{-5, -\frac{2}{5}\right\}$ **37.** $\left\{-\frac{1}{6}, \frac{3}{4}\right\}$ **39.** $\left\{-\frac{5}{7}, \frac{5}{2}\right\}$ **41.** $\left\{-\frac{2}{3}, 3\right\}$ **43.** $\left\{\frac{1}{2}, \frac{2}{3}\right\}$ **45.** $\{-4, 12\}$ **47.** $\left\{-4, \frac{2}{3}\right\}$ **49.** 1 in. **51.** 2.5 s **53.** Answers should include the following.

- $2x + 3$ by $x + 2$
- With algebra tiles, you can try various ways to make a rectangle with the necessary tiles. Once you make the rectangle, however, the dimensions of the rectangle are the factors of the polynomial. In a way, you have to go through the guess-and-check process whether you are factoring algebraically or geometrically (using algebra tiles.)



Guess $(2x + 1)(x + 3)$ incorrect because 8 x tiles are needed to complete the rectangle

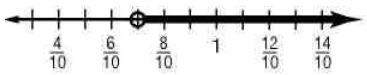
55. B **57.** prime **59.** $\left\{-\frac{7}{5}, 4\right\}$ **61.** $\{0, 12\}$ **63.** 4 **65.** 6 **67.** 10 **69.** 13

Page 500 Practice Quiz 2

1. $(x + 4)(x - 18)$ **3.** $(4a - 1)(4a - 5)$ **5.** $2(3c + 1)(4c + 9)$ **7.** $\{-16, 2\}$ **9.** $\left\{-\frac{3}{4}, \frac{4}{3}\right\}$

Pages 504–506 Lesson 9-5

1. Each term of the binomial is a perfect square, and the binomial can be written as a difference of terms. **3.** Yes; $3n^2 - 48 = 3(n^2 - 16) = 3(n + 4)(n - 4)$. **5.** $(n + 9)(n - 9)$ **7.** $2x^3(x + 7)(x - 7)$ **9.** prime **11.** $\left\{-\frac{5}{2}, \frac{5}{2}\right\}$ **13.** $\left\{-\frac{1}{6}, \frac{1}{6}\right\}$ **15.** 12 in. by 12 in. **17.** $(n + 6)(n - 6)$ **19.** $(5 + 2p)(5 - 2p)$ **21.** $(11 + 3r)(11 - 3r)$ **23.** prime **25.** $(13y + 6z)(13y - 6z)$ **27.** $3(x - 5)(x + 5)$ **29.** $2(2g^2 - 25)$ **31.** $5x(2x - 3y)(2x + 3y)$ **33.** $(a + b + c)(a + b - c)$ **35.** $\left\{\pm\frac{8}{3}\right\}$ **37.** $\left\{\pm\frac{5}{2}\right\}$ **39.** $\left\{\pm\frac{9}{10}\right\}$ **41.** $\{\pm 10\}$ **43.** $\left\{-\frac{5}{3}, 0, \frac{5}{3}\right\}$ **45.** $\left\{-\frac{3}{2}, 0, \frac{3}{2}, 4\right\}$ **47.** 2 in. **49.** 36 mph **51.** The flaw is in line 5. Since $a = b$, $a - b = 0$. Therefore dividing by $a - b$ is dividing by zero, which is undefined. **53.** A **55.** prime **57.** $(3p + 5)(7p - 2)$ **59.** $\{3, 5\}$ **61.** between 83 and 99, inclusive **63.** $r > \frac{7}{10}$



65. $x^2 + 2x + 1$ **67.** $x^2 + 16x + 64$ **69.** $25x^2 - 20x + 4$

Pages 512–514 Lesson 9-6

1. Determine if the first term is a perfect square. Then determine if the last term is a perfect square. Finally, check to see if the middle term is equal to twice the product of the square roots of the first and last terms. **3.** Sample answer: $x^3 + 5x^2 - 4x - 20$ **5.** no **7.** $(c - 3)(c - 2)$ **9.** $(2x - 7)(4x + 5)$ **11.** $(m - 2)(m + 2)(3m + 2n)$ **13.** $\{\pm 4\}$ **15.** $\{5 \pm \sqrt{13}\}$ **17.** no **19.** yes; $(2y - 11)^2$ **21.** yes; $(3n + 7)^2$ **23.** $8x + 20$ **25.** $4(k + 5)(k - 5)$ **27.** prime **29.** $3t(3t - 2)(t + 8)$ **31.** $2(5n + 1)(2n + 3)$ **33.** $3x(4x - 3)(2x - 5)$ **35.** $-3(3g - 5)^2$ **37.** $(a^2 + 2)(4a + 3b^2)$ **39.** $(y^2 + z^2)(x + 1)(x - 1)$ **41.** $x - 3y$ m, $x + 3y$ m, $xy + 7$ m **43.** $\{-4\}$ **45.** $\left\{\frac{4}{7}\right\}$ **47.** $\left\{\frac{1}{3}\right\}$ **49.** $\{-5, 3\}$ **51.** $\{8 \pm \sqrt{7}\}$ **53.** $\{-1 \pm \sqrt{6}\}$ **55.** $B = \frac{L}{16}(D - 4)^2$ **57.** 144 ft **59.** yes; 2 s **61.** 4, −4 **63.** 16 **65.** 100 **67.** C **69.** ± 5 **71.** $\pm\frac{9}{7}$ **73.** $-\frac{5}{3}; -\frac{1}{4}$ **75.** $y = -\frac{1}{2}x + \frac{9}{2}$ **77.** 2030 ft **79.** $-3, -2.5, -2$

Pages 515–518 Chapter 9 Study Guide and Review

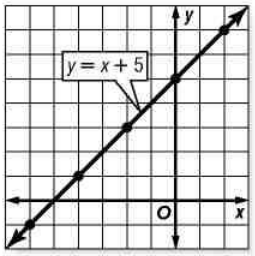
1. false, composite **3.** false, sample answer: 64 **5.** false, $2^4 \cdot 3$ **7.** true **9.** true **11.** $2^2 \cdot 7$ **13.** $2 \cdot 3 \cdot 5^2$ **15.** $-1 \cdot 83$ **17.** 5 **19.** $4ab$ **21.** $5n$ **23.** $13(x + 2y)$ **25.** $2a(13b + 9c + 16a)$ **27.** $2(r + 3p)(2s + m)$ **29.** $\left\{0, \frac{5}{2}\right\}$ **31.** $\left\{0, -\frac{7}{4}\right\}$ **33.** $(x - 12)(x + 3)$ **35.** $(r - 3)(r - 6)$ **37.** $(m + 4n)(m - 8n)$ **39.** $\{-6, 11\}$ **41.** prime **43.** $(5r + 2)(5r + 2)$ **45.** $(4b + 3)(3b + 2)$ **47.** $\left\{4, -\frac{5}{2}\right\}$ **49.** $\left\{\frac{3}{4}, -\frac{4}{5}\right\}$ **51.** prime **53.** $\{-4, 4\}$ **55.** $\left\{-\frac{9}{4}, \frac{9}{4}\right\}$ **57.** $(3k - 2)^2$ **59.** $2(4n - 5)^2$ **61.** $\left\{\frac{9}{7}\right\}$ **63.** $\left\{\pm\frac{1}{2}\right\}$

Chapter 10 Quadratic and Exponential Functions

Page 523 Chapter 10 Getting Started

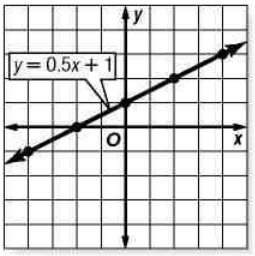
1. Sample answer:

x	y
−6	−1
−4	1
−2	3
0	5
2	7



3. Sample answer:

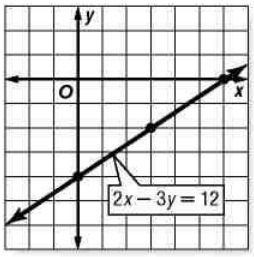
x	y
−4	−1
−2	0
0	1
2	2
4	3



CONTENTS

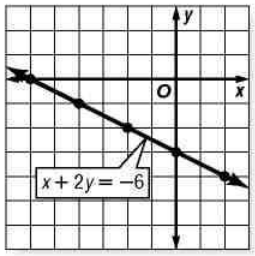
5. Sample answer:

x	y
0	−4
3	−2
6	0



7. Sample answer:

x	y
−6	0
−4	−1
−2	−2
0	−3
2	−4

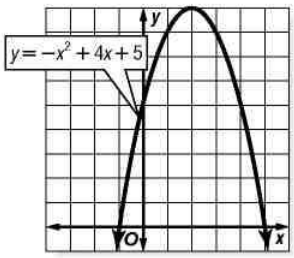


9. yes; $(t + 6)^2$ 11. no 13. yes; $(3b - 1)^2$ 15. yes; $(2p + 3)^2$ 17. 21, 25, 29 19. 8, 11, 14 21. −21, −26, −31 23. 8.1, 8.8, 9.5

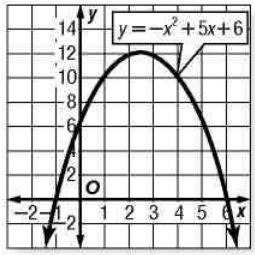
Pages 528–530 Lesson 10-1

1. Both types of parabolas are U shaped. A parabola with a maximum opens downward, and its corresponding equation has a negative coefficient for the x^2 term. A parabola with a minimum opens upward, and its corresponding equation has a positive coefficient for the x^2 term. 3. If you locate several points of the graph on one side of the axis of symmetry, you can locate corresponding points on the other side of the axis of symmetry to help graph the equation.

5.

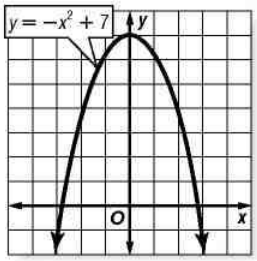


7. $x = 2.5$; (2.5, 12.25); maximum

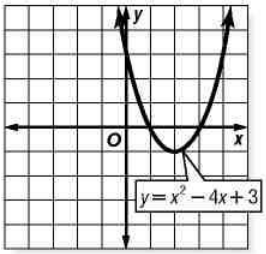


9. B

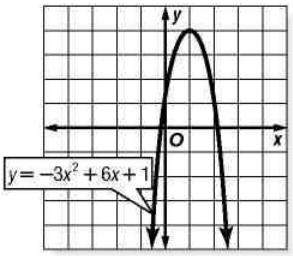
11.



13.

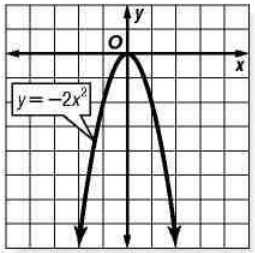


15.

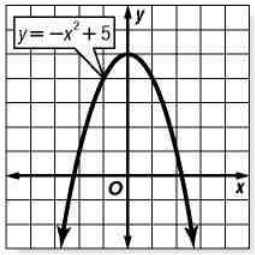


17. $x = \frac{5}{8}$

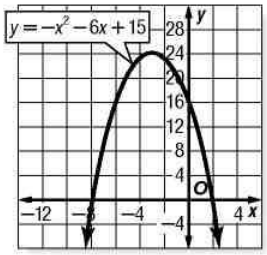
19. $x = 0$; (0, 0); maximum



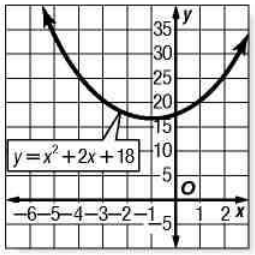
21. $x = 0$; (0, 5); maximum



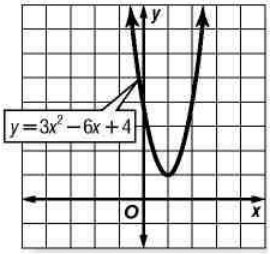
23. $x = -3$; (−3, 24); maximum



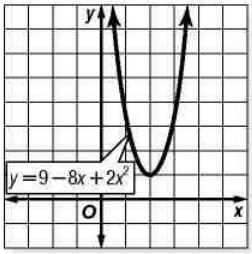
25. $x = -1$; (−1, 17); minimum



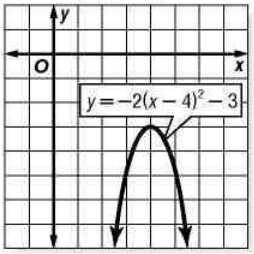
27. $x = 1$; (1, 1); minimum



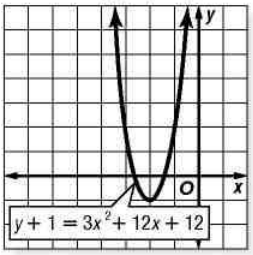
29. $x = 2$; (2, 1); minimum



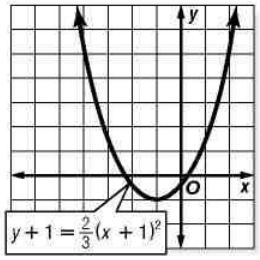
31. $x = 4$; (4, −3); maximum



33. $x = -2$; (−2, −1); minimum

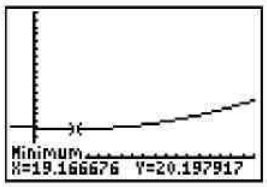


35. $x = -1$; $(-1, -1)$; minimum



37. $x = -1$ 39. 19 ft
41. $A = x(20 - x)$ or $A = -x^2 + 20x$ 43. 100 m^2
45. 630 ft 47. 1959

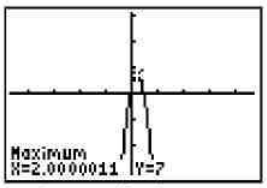
49.



51. In order to coordinate a firework with recorded music, you must know when and how high it will explode. Answers should include the following.
- The rocket will explode when the rocket reaches the vertex or when $t = -\frac{39.2}{2(-4.9)}$ which is 4 seconds.
- The height of the rocket when it explodes is the height when $t = 4$. Therefore, $h = -4.9(4^2) + 39.2(4) + 1.6$ or 80 meters.

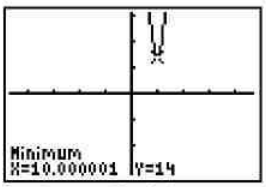
53. D

55.



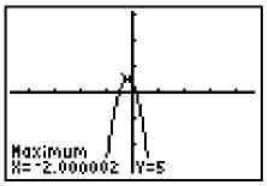
maximum; (2, 7)

57.



minimum; (10, 14)

59.

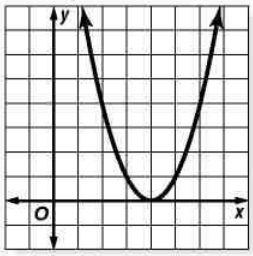


maximum; (−2, 5)

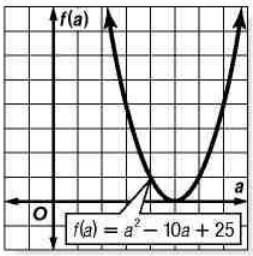
61. $(a + 11)^2$
63. $(2q - 3)(2q + 3)$
65. $(1 - 4g)(1 + 4g)$
67. $6p^2 - p - 18$
69. $\{b \mid b > -12\}$ 71. $\left\{r \mid r \leq \frac{8}{9}\right\}$
73. $y = -7$ 75. 8 77. −3.5
79. −2.5

Pages 535–538 Lesson 10-2

1. −3, −1
3. Sample answer:

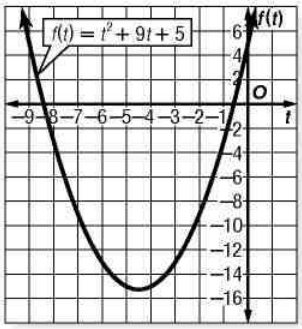


5.



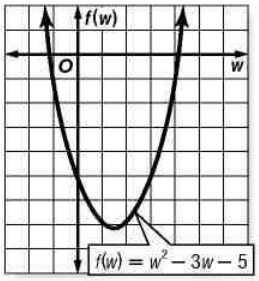
5

7.



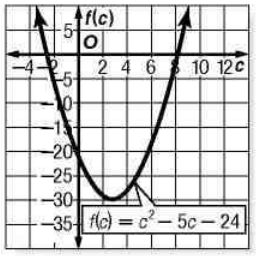
$-9 < t < -8$, $-1 < t < 0$

9.



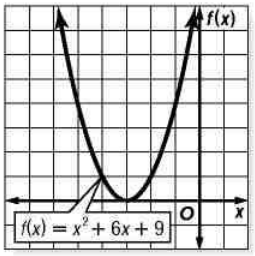
$-2 < w < -1$, $4 < w < 5$

11.



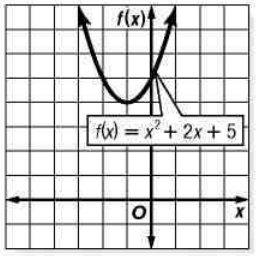
−3, 8

13.



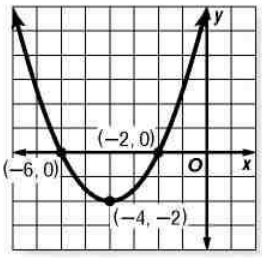
−3

15.



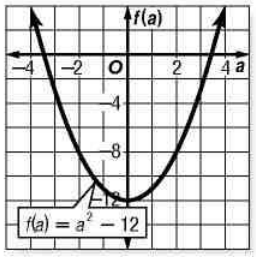
∅

17.



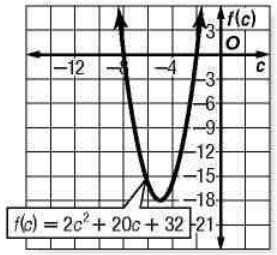
19. 4, 5

21.



$-4 < a < -3$, $3 < a < 4$

23.



−8, −2

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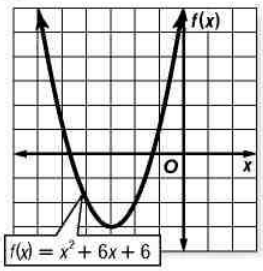
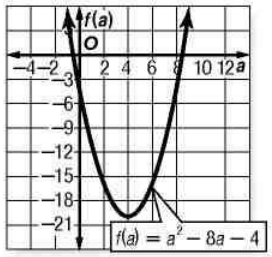
25.



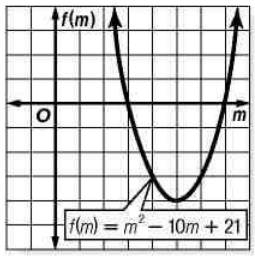
$-5 < x < -4, -2 < x < -1$

27.



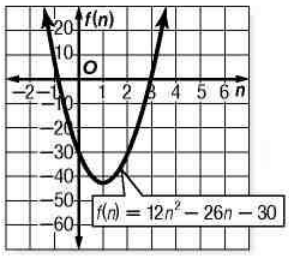
$-1 < a < 0, 8 < a < 9$

29.



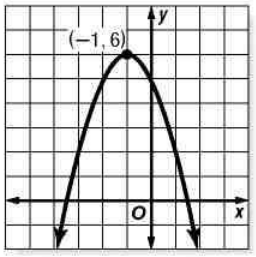
3, 7

31.

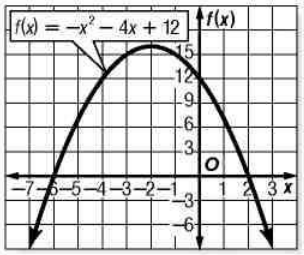


$-1 < n < 0, 3$

33.



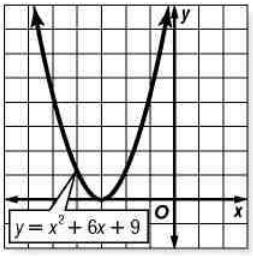
35.



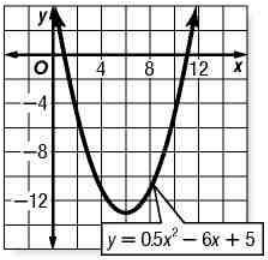
$-6, 2$

37. 16 ft 39. \$297
41. about 9 s
43. 100,000 ft²
45. about 65 ft
47. $-3, 0, 1$ 49. C
51. $-2, 1, 2$

53. $x = -3$; $(-3, 0)$; minimum



55. $x = 6$; $(6, -13)$; minimum



57. $\{5\}$ 59. $\frac{m^3}{3}$ 61. $-\frac{m^5y^4}{3}$ 63. yes; $(a + 7)^2$ 65. no
67. no

Pages 542–544 Lesson 10-3

1. Sample answer:

x	1	1
x	1	1
x^2	x	x

$x^2 + 4x + 4$

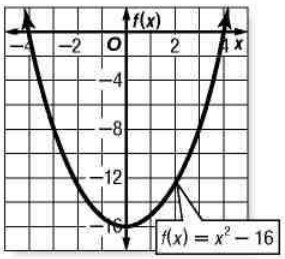
3. Divide each side by 5.
5. $-11.5, -2.5$ 7. $\frac{25}{4}$ 9. $-4, -3$
11. $-0.4, 4.4$ 13. $0.2, 2.3$ 15. $-2, 6$
17. $2.6, 5.4$ 19. $-12.2, -3.8$ 21. 64
23. 121 25. $\frac{49}{4}$ 27. $-18, 18$
29. $-2, 6$ 31. $-3, 22$ 33. $1, 4$
35. $-3, -1$ 37. $-1.9, 11.9$ 39. $2\frac{1}{3}$ 41. $-1, \frac{2}{3}$ 43. $-2.5, 0.5$
45. $-1\frac{1}{2}, 4$ 47. $-2 \pm \sqrt{4 - c}$ 49. 1.5 m 51. There are no real solutions since completing the square results in $(x + 2)^2 = -8$ and the square of a number cannot be negative.
53. Al-Khwarizmi used squares to geometrically represent quadratic equations. Answers should include the following.

- Al-Khwarizmi represented x^2 by a square whose sides were each x units long. To this square, he added 4 rectangles with length x units long and width $\frac{8}{4}$ or 2 units long. This area represents 35. To make this a square, four 4×4 squares must by added.
- To solve $x^2 + 8x = 35$ by completing the square, use the following steps.

$x^2 + 8x = 35$	*Original equation*
$x^2 + 8x + 16 = 35 + 16$	*Since* $\left(\frac{8}{2}\right)^2 = 16$, *add 16 to each side.*
$(x + 4)^2 = 51$	*Factor* $x^2 + 8x + 16$.
$x + 4 = \pm\sqrt{51}$	*Take the square root of each side.*
$x + 4 - 4 = \pm\sqrt{51} - 4$	*Subtract 4 from each side.*
$x = -4 \pm \sqrt{51}$	*Simplify.*

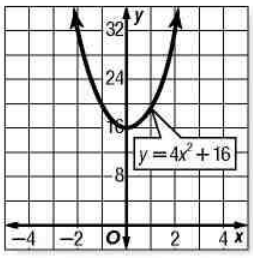
$x = -4 - \sqrt{51}$ or $x = -4 + \sqrt{51}$
$x \approx -11.14$ $x \approx 3.14$
The solution set is $\{-11.14, 3.14\}$.

55. A
57.

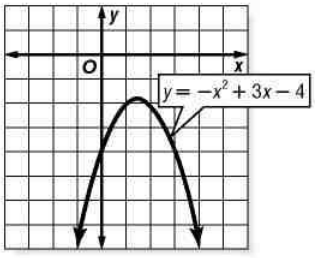


$-4, 4$

59.



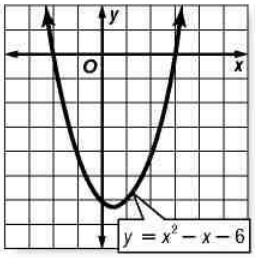
61.

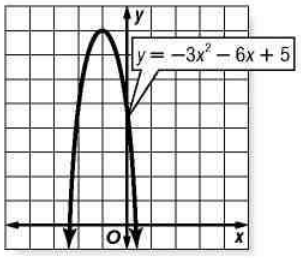


63. $8m^2n$ 65. $(4, 1)$
67. $-3 < x < 1$
69. $y = -\frac{3}{5}x + \frac{14}{5}$
71. $y = -2x$ 73. 5
75. 9.4

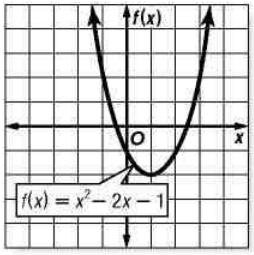
Page 544 Practice Quiz 1

1. $x = 0.5$; (0.5, −6.25); minimum **3.** $x = -1$; (−1, 8); maximum





5.

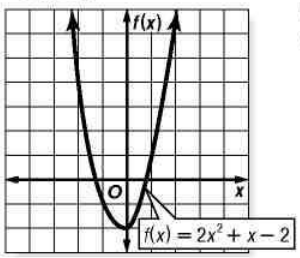


$-1 < x < 0, 2 < x < 3$ **7.** −5, −3 **9.** 4.8, 9.2

Pages 550–552 Lesson 10-4

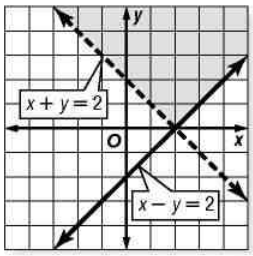
1. Sample answer: (1) Factor $x^2 - 2x - 15$ as $(x + 3)(x - 5)$. Then according to the Zero Product Property, either $x + 3 = 0$ or $x - 5 = 0$. Solving these equations, $x = -3$ or $x = 5$. (2) Rewrite the equation as $x^2 - 2x = 15$. Then add 1 to each side of the equation to complete the square on the left side. Then $(x - 1)^2 = 16$. Taking the square root of each side, $x - 1 = \pm 4$. Therefore, $x = 1 \pm 4$ and $x = -3$ or $x = 5$. (3) Use the Quadratic Formula. Therefore, $x = \frac{-2 \pm \sqrt{(-2)^2 - 4(1)(-15)}}{2(1)}$ or $x = \frac{2 \pm \sqrt{64}}{2}$. Simplifying the expression, $x = -3$ or $x = 5$. **3.** Juanita; you must first write the equation in the form $ax^2 + bx + c = 0$ to determine the values of a, b, and c. Therefore, the value of c is −2, not 2. **5.** −12, 1 **7.** ∅ **9.** $\frac{1}{5}, \frac{2}{5}$ **11.** 0; 1 real root **13.** about 18.8 cm by 18.8 cm **15.** −10, −2 **17.** $-\frac{4}{5}, 1$ **19.** ∅ **21.** 5 **23.** −0.4, 3.9 **25.** −0.5, 0.6 **27.** $-\frac{3}{4}, \frac{5}{6}$ **29.** −0.3, 0.6 **31.** −0.6, 2.6 **33.** 5 cm by 16 cm **35.** −9 and −7 or 7 and 9 **37.** about −0.2 and 1.4 **39.** 5; 2 real roots **41.** −20; no real roots **43.** 0; 1 real root **45.** 0 **47.** about 2.3 s **49.** about 29.4 ft/s **51.** about 41 yr **53.** 2049; Sample answer: No; the death rate from cancer will never be 0 unless a cure is found. If and when a cure will be found cannot be predicted. **55.** A **57.** 1, 7 **59.** −0.4, 12.4

61.



$-2 < x < -1, 0 < x < 1$ **63.** $y^3(15x + y)$ **65.** 1.672×10^{-21}

67.

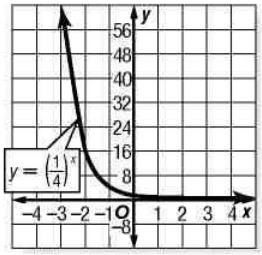


69. $\{m \mid m > 5\}$ **71.** $\{k \mid k \leq -4\}$ **73.** 147

Pages 557–560 Lesson 10-5

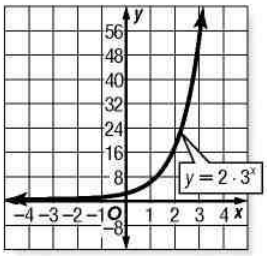
1. never **3.** Kiski; the graph of $y = \left(\frac{1}{3}\right)^x$ decreases as x increases.

5.



1; 0.1

7.

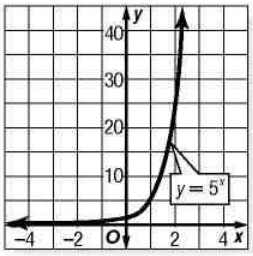


2

9. Yes; the domain values are at regular intervals and the range values have a common factor 6.

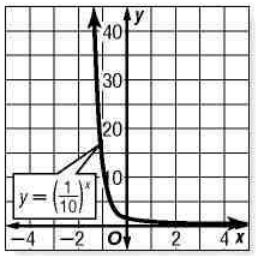
11. about 1.84×10^{19} grains

13.



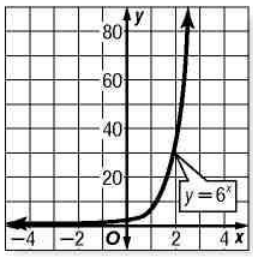
1; 5.9

15.



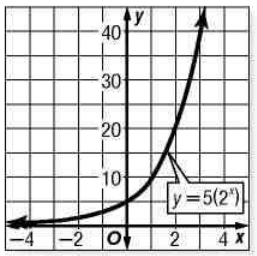
1; 20.0

17.



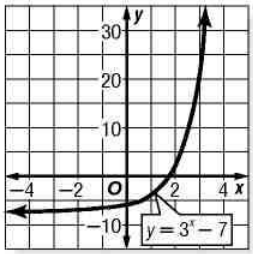
1; 1.7

19.



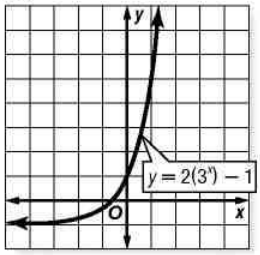
5

21.



−6

23.



1

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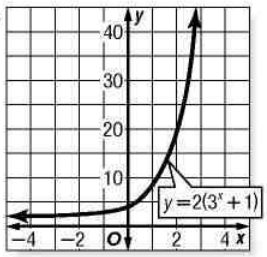
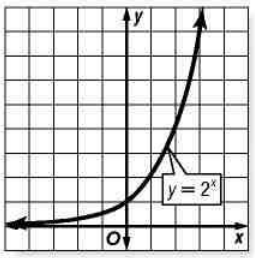
25. 

27. No; the domain values are at regular intervals and the range values have a common difference 3. **29.** Yes; the domain values are at regular intervals and the range values have a common factor 0.75.

4

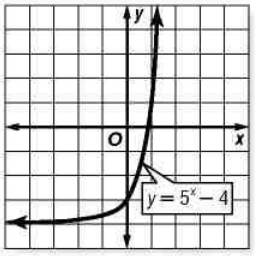
31. No; the domain values are at regular intervals, but the range values do not change. **33.** about \$37.27 million; about \$41.74 million; about \$46.75 million **35.** \$12 million sales in 1995 **37.** $y = 729\left(\frac{1}{3}\right)^x$ **39.** 6 rounds **41.** 10th week **43.** a translation 2 units up **45.** If the number of items on each level of a piece of art is a given number times the number of items on the previous level, an exponential function can be used to describe the situation. Answers should include the following.

- For the carving of the pliers, $y = 2^x$.
- For this situation, x is an integer between 0 and 8 inclusive. The values of y are 1, 2, 4, 8, 16, 32, 64, 128, and 256.
- 

47. A **49.** −1.8, 0.3 **51.** 2, 5 **53.** −5.4, −0.6 **55.** prime **57.** 6, 9 **59.** $\{x \mid x \leq 2\}$ **61.** 11.25 **63.** 144

Page 560 Practice Quiz 2

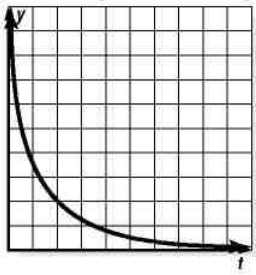
1. −7, 5 **3.** −0.2, 2.2

5. 

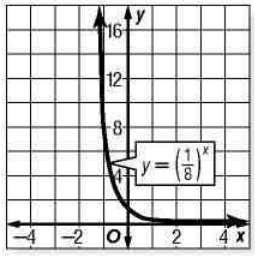
−3

Pages 563–565 Lesson 10-6

1. Exponential growth is an increase by the same percent over a period of time, while exponential decay is a decrease by the same percent over a period of time.

3. 

5. about \$43,041 **7.** about 1,767,128 people **9.** $C = 18.9(1.19)^t$ **11.** $W = 43.2(1.06)^t$ **13.** about 122,848,204 people **15.** about \$14,607.78 **17.** about \$135,849,289 **19.** about \$10,761.68 **21.** about 15.98% **23.** growth; 2.6% increase **25.** 128 g **27.** about 76.36 g **31.** C

33. 

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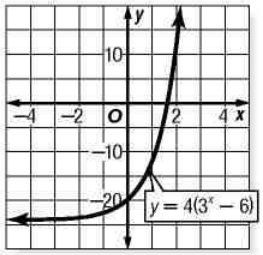
35. 

−20

37. −0.6, 2.6 **39.** $m^{10}b^2$ **41.** $0.09x^6y^4$ **43.** {1} **45.** yes **47.** −5, −8, −11

Pages 570–572 Lesson 10-7

1. Both arithmetic sequences and geometric sequences are lists of related numbers. In an arithmetic sequence, each term is found by adding the previous term to a constant called the common difference. In a geometric sequence, each term is found by multiplying the previous term by a constant called the common ratio. **3.** Sample answer: 1, 4, 9, 16, 25, 36, … **5.** yes **7.** 1280, 5120, 20,480 **9.** −40.5, 60.75, −91.125 **11.** −32 **13.** ±14 **15.** ±20 **17.** yes **19.** no **21.** no **23.** yes **25.** 256, −1024, 4096 **27.** 64, 32, 16 **29.** −0.3125, 0.078125, −0.01953125 **31.** $\frac{8}{81}, \frac{16}{243}, \frac{32}{729}$ **33.** 48 in², 24 in², 12 in², 6 in², 3 in² **35.** 320 **37.** 250 **39.** −288 **41.** 0.5859375 **43.** ±10 **45.** ±45 **47.** ±32 **49.** ±14 **51.** ±3.5 **53.** $\pm\frac{3}{10}$ **55.** 6 m, 3.6 m, 2.16 m **57.** 18 questions **59.** in 16 days **61.** sometimes **63.** Since the distance of each bounce is $\frac{3}{4}$ times the distance of the last bounce, the list of the distances from the stopping place is a geometric sequence. Answers should include the following.

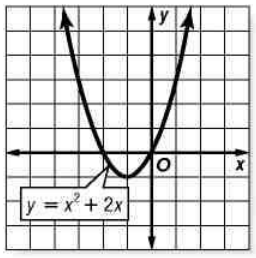
- To find the 10th term, multiply the first term 80 by $\frac{3}{4}$ to the 9th power.
- The 17th bounce will be the first bounce less than 1 ft from the resting place.

65. 1/7 **67.** 0 **69.** about \$1822.01 **71.** Yes; the domain values are at regular intervals and the range values have a common factor 3. **73.** $(2x + 3)(x - 4)$

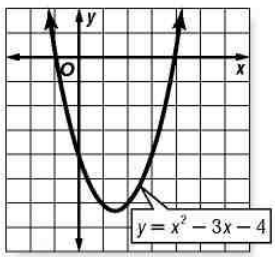
Pages 574–578 Chapter 10 Study Guide and Review

1. d **3.** i **5.** c **7.** b **9.** f

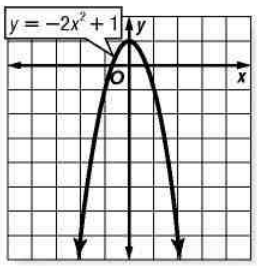
11. $x = -1$; $(-1, -1)$; minimum

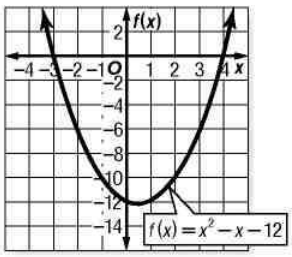


13. $x = 1\frac{1}{2}$; $\left(1\frac{1}{2}, -6\frac{1}{4}\right)$; minimum



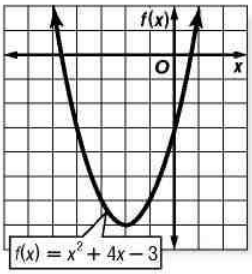
15. $x = 0$; (0, 1); maximum 17.

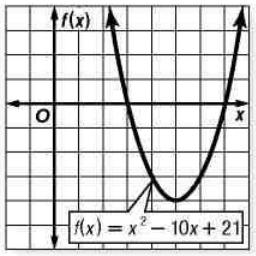




−3, 4

19. 21.

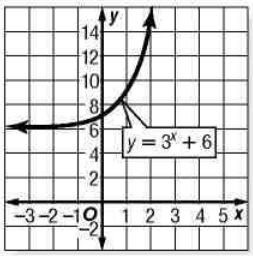


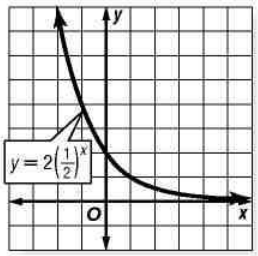


$-5 < x < -4, 0 < x < 1$ 3, 7

23. −1.2, 1.2 25. −0.7, 7.7 27. −4.4, 0.4 29. −2, 10
31. −2.5, 1.5 33. −4, 0

35. 37.





7 2

39. $12,067.68 41. $24,688.36 43. $\frac{56}{27}$ 45. ±10 47. $\pm\frac{1}{2}$

Chapter 11 Radical Expressions and Triangles

Page 585 Chapter 11 Getting Started

1. 5 3. 7.48 5. $a + 7b$ 7. $16c$ 9. {0, 5} 11. {−3, 9}
13. yes 15. no

Pages 589–592 Lesson 11-1

1. Both x^4 and x^2 are positive even if x is a negative number.
3. Sample answer: $2\sqrt{2} + 3\sqrt{3}$ and $2\sqrt{2} - 3\sqrt{3}$;
−19 5. 4 7. $3|ab|\sqrt{6}$ 9. $\frac{2\sqrt{6}}{3}$ 11. $\frac{8(3+\sqrt{2})}{7}$ 13. 28 ft²
15. $3\sqrt{2}$ 17. $4\sqrt{5}$ 19. $\sqrt{30}$ 21. $84\sqrt{5}$ 23. $2a^2\sqrt{10}$
25. $7|x^3|y^3\sqrt{3y}$ 27. $\frac{\sqrt{6}}{3}$ 29. $\frac{\sqrt{2t}}{4}$ 31. $\frac{c^2\sqrt{5cd}}{2d^3}$
33. $\frac{54+9\sqrt{2}}{17}$ 35. $2\sqrt{7} - 2\sqrt{2}$ 37. $\frac{-16-12\sqrt{3}}{11}$
39. $60\sqrt{2}$ or 84.9 cm² 41. $s = \sqrt{A}$; $6\sqrt{2}$ in. 43. $6\sqrt{5}$ or 13.4 m/s 45. $3\sqrt{2d}$ 47. 44.5 mph, 51.4 mph 49. $20\sqrt{3}$ or 34.6 ft³ 51. A lot of formulas and calculations that are used in space exploration contain radical expressions. Answers should include the following.

- To determine the escape velocity of a planet, you would need to know its mass and the radius. It would be very important to know the escape velocity of a planet before you landed on it so you would know if you had enough fuel and velocity to launch from it to get back into space.
- The astronomical body with the smaller radius would have a greater escape velocity. As the radius decreases, the escape velocity increases.

53. B 55. 6°F 57. x^2 59. $a^{-\frac{5}{6}}$ or $\frac{\sqrt[6]{a}}{a}$ 61. $s^{18}t^6\sqrt{s}$
63. 16, −32, 64 65. 144, 864, 5184 67. 0.08, 0.016, 0.0032
69. 84.9°C 71. $(5x - 4)(7x - 3)$ 73. $3(x - 7)(x + 5)$
75. $(4x - 3)(2x - 1)$ 77. {(2, 0), (1, 2.5)} 79. $\left\{\left(4, -\frac{1}{2}\right), (2, 1)\right\}$
81. 6 83. −1885 85. $a^2 + 7a + 10$ 87. $4x^2 + x - 3$
89. $12a^2 + 13ab - 14b^2$

Pages 595–597 Lesson 11-2

1. to determine if there are any like radicands 3. Sample answer: $(\sqrt{2} + \sqrt{3})^2 = 2 + 2\sqrt{6} + 3$ or $5 + 2\sqrt{6}$
5. $-5\sqrt{6}$ 7. $4\sqrt{3}$ 9. $9\sqrt{3} + 3$ 11. $17 + 7\sqrt{5}$
13. $10\sqrt{110} - 5\sqrt{330} \approx 14.05$ volts 15. $13\sqrt{6}$ 17. 0
19. $10\sqrt{5b}$ 21. $4\sqrt{6} - 6\sqrt{2} + 5\sqrt{17}$ 23. $\sqrt{6} + 4\sqrt{3}$
25. $-2\sqrt{2}$ 27. $\frac{4\sqrt{10}}{5}$ 29. $\frac{53\sqrt{7}}{7}$ 31. $10\sqrt{2} + 3\sqrt{10}$
33. $59 - 14\sqrt{10}$ 35. $3\sqrt{7}$ 37. $15\sqrt{2} + 11\sqrt{5}$
39. $\sqrt{3} + 2$ cm 41. $5\sqrt{87} - 25\sqrt{3} \approx 3.34$ mi 43. 6 in.
45. 40 ft/s; 80 ft/s 47. The velocity should be $\sqrt{9}$ or 3 times the velocity of an object falling 25 feet; $3 \cdot 40 =$ 120 ft/s, $\sqrt{2(32)(225)} = 120$ ft/s. 49. Sample answer: $a = 4, b = 9$; $\sqrt{4+9} \neq \sqrt{4} + \sqrt{9}$ 51. The distance a person can see is related to the height of the person using $d = \sqrt{\frac{3h}{2}}$. Answers should include the following.

- You can find how far each lifeguard can see from the height of the lifeguard tower. Each tower should have some overlap to cover the entire beach area.
- On early ships, a lookout position (Crow's nest) was situated high on the foremast. Sailors could see farther from this position than from the ship's deck.

53. D 55. $8\sqrt{2}$ 57. $\frac{5}{2}$ 59. $\frac{3\sqrt{14}}{}$ 61. −5103
63. $\left\{\pm\frac{9}{7}\right\}$ 65. $\left\{-\frac{5}{4}, 0, \frac{5}{4}\right\}$ 67. $n \geq \frac{5}{8}$ 69. $k > \frac{3}{5}$
71. $x^2 - 4x + 4$ 73. $x^2 + 12x + 36$ 75. $4x^2 - 12x + 9$

Pages 600–603 Lesson 11-3

1. Isolate the radical on one side of the equation. Square each side of the equation and simplify. Then check for extraneous solutions. 3. Sample answer: $\sqrt{x+1} = 8$; 63
5. 25 7. 7 9. 2 11. 3 13. 6 15. 5994 m 17. 100
19. 50 21. 4 23. no solution 25. 5 27. 2 29. 180
31. 2 33. 57 35. 2 37. 2, 3 39. 3 41. 6 43. 2
45. 11 47. sometimes 49. 0.0619 51. $4\sqrt{6}$ or 9.8 m
53. It increases by a factor of $\sqrt{2}$. 55. 2.43 ft 57. 43.8°C
59. $V < 330.45$ m/s 61. You can determine the time it takes an object to fall from a given height using a radical equation. Answers should include the following.

- It would take a skydiver approximately 42 seconds to fall 10,000 feet. Using the equation, it would take 25 seconds. The time is different in the two calculations because air resistance slows the skydiver.
- A skydiver can increase the speed of his fall by lowering air resistance. This can be done by pulling his arms and legs close to his body. A skydiver can decrease his speed

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by holding his arms and legs out, which increases the air resistance.

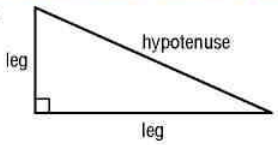
63. C **65.** 11 **67.** 15.08 **69.** no solution **71.** $20\sqrt{3}$ **73.** $8\sqrt{3}$ **75.** $3(\sqrt{10} - \sqrt{3})$ **77.** yes; $(2n - 7)^2$ **79.** $r^2 - r - 12$ **81.** $6p^3 + 7p^2 - 2p + 45$ **83.** $14x - 7y = -3$ **85.** $15x - 2y = 49$ **87.** 25 **89.** $4\sqrt{13}$

Page 603 Practice Quiz 1

1. $4\sqrt{3}$ **3.** $\frac{-2 + \sqrt{10}}{2}$ **5.** $20\sqrt{3}$ **7.** $11 + 4\sqrt{7}$ or 21.6 cm^2 **9.** 4

Pages 607–610 Lesson 11-4

1.

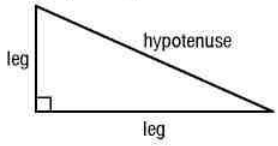


3. $d = \sqrt{2s^2}$ or $d = s\sqrt{2}$ **5.** 9 **7.** 60 **9.** $\sqrt{65} \approx 8.06$ **11.** Yes; $16^2 + 30^2 = 34^2$. **13.** 14.14 **15.** 53 **17.** 42.13 **19.** 65 **21.** 11 **23.** $\sqrt{115} \approx 10.72$ **25.** $\sqrt{67} \approx 8.19$ **27.** $\sqrt{253} \approx 15.91$ **29.** $17x$ **31.** Yes; $30^2 + 40^2 = 50^2$. **33.** No; $24^2 + 30^2 \neq 36^2$. **35.** Yes; $15^2 + (\sqrt{31})^2 = 16^2$. **37.** 18 ft **39.** $4\sqrt{3}$ in. or about 6.93 in. **41.** 415.8 ft **43.** The roller coaster makes a total horizontal advance of 404 feet, reaches a vertical height of 208 feet, and travels a total track length of 628.3 feet. **45.** 116.6 ft **47.** 900 ft^2 **49.** 1081.7 ft, 324.5 ft **51.** C **53.** 144 **55.** 12 **57.** $-3\sqrt{z}$ **59.** 5^5 or 3125 **61.** $\frac{2a^2b^3}{c^8}$ **63.** 5 **65.** $\sqrt{53}$ **67.** $\sqrt{130}$

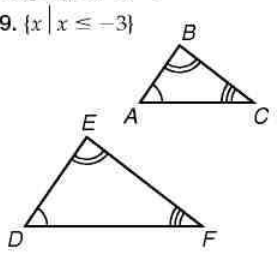
Pages 612–615 Lesson 11-5

1. The values that are subtracted are squared before being added and the square of a negative number is always positive. The sum of two positive numbers is positive, so the distance will never be negative. **3.** There are exactly two points that lie on the line $y = -3$ that are 10 units from the point (7, 5). **5.** 13 **7.** $\sqrt{10} \approx 3.16$ **9.** 2 or -14 **11.** 25.5 yd, 25 yd **13.** 20 **15.** 5 **17.** $4\sqrt{5} \approx 8.94$ **19.** $\sqrt{41} \approx 6.40$ **21.** $\frac{10}{3} \approx 3.33$ **23.** $\frac{13}{10}$ or 1.30 **25.** $2\sqrt{14} \approx 7.48$ **27.** 1 or 7 **29.** -2 or 4 **31.** -10 or 4 **33.** two; $AB = BC = 10$ **35.** 3 **37.** 109 mi **39.** Yes; it will take her 10.6 minutes to walk between the two buildings. **41.** Minneapolis-St. Cloud, 53 mi; St. Paul-Rochester, 64 mi, Minneapolis-Rochester, 70 mi; Duluth-St. Cloud, 118 mi **43.** Compare the slopes of the two potential legs to determine whether the slopes are negative reciprocals of each other. You can also compute the lengths of the three sides and determine whether the square of the longest side length is equal to the sum of the squares of the other two side lengths. Neither test holds true in this case because the triangle is not a right triangle. **45.** B **47.** 25 **49.** 3 **51.** 11 **53.** {2, 10} **55.** Asia, 1.113×10^{12}; Europe, 1.016×10^{12}; U.S./Canada, 8.84×10^{11}; Latin America, 2.41×10^{11}; Middle East, 1.012×10^{11}; Africa, 5.61×10^{10}.

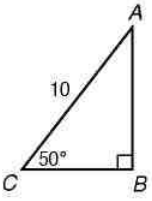
57. $\{m \mid m \geq 9\}$



59. $\{x \mid x \leq -3\}$



61. $\{r \mid r \geq 9.1\}$ **63.** 6 **65.** 12 **67.** 1



Pages 618–621 Lesson 11-6

1. If the measures of the angles of one triangle equal the measures of the corresponding angles of another triangle, and the lengths of the sides are proportional, then the two triangles are similar. **3.** Consuela; the arcs indicate which angles correspond. The vertices of the triangles are written in order to show the corresponding parts. **5.** Yes; the angle measures are equal. **7.** $b = 15, d = 12$ **9.** $d = 10.2, e = 9$ **11.** Yes; the angle measures are equal. **13.** No; the angle measures are not equal. **15.** No; the angle measures are not equal. **17.** $\ell = 12, m = 6$ **19.** $k = \frac{55}{6}, \ell = \frac{22}{3}$ **21.** $k = 3, o = 8$ **23.** $k = 2.8, m = 4.2$ **25.** always **27.** $3\frac{1}{3}$ in. **29.** 8 **31.** about 53 ft **33.** Yes; all circles are similar because they have the same shape. **35.** 4:1; The area of the first is πr^2 and the area of the other is $\pi(2r)^2 = 4\pi r^2$. **37.** D **39.** 5 **41.** $\sqrt{26} \approx 5.1$ **43.** Yes; $25^2 + 60^2 = 65^2$. **45.** Yes; $49^2 + 168^2 = 175^2$. **47.** $3x^2 - 7x + 1$ **49.** $-3x^2 + 6x + 3$ **51.** $(3, -2)$ **53.** $(1.5, 0)$ **55.** -232 ft/mi or about -0.044 **57.** $-\frac{5}{6}$ or $-0.8\overline{3}$ **59.** $\frac{9}{5}$ or 1.8 **61.** $-\frac{1}{3}$ or $-0.\overline{3}$

Page 621 Practice Quiz 2

1. 50 **3.** $2\sqrt{5} \approx 4.47$ **5.** $\sqrt{306} \approx 17.49$ **7.** $2\sqrt{2} \approx 2.83$ **9.** $a = 35, c = 15$

Pages 627–630 Lesson 11-7

1. If you know the measure of the hypotenuse, use sine or cosine, depending on whether you know the measure of the adjacent side or the opposite side. If you know the measures of the two sides, use tangent. **3.** They are equal. **5.** $\sin Y = 0.3846$, $\cos Y = 0.9231$, $\tan Y = 0.4167$ **7.** 0.2588 **9.** 80° **11.** 18° **13.** 22° **15.** $\angle A = 60°$, $AC = 21$ in., $BC = 36.4$ in. **17.** $\angle B = 35°$, $BC = 5.7$ in., $AB = 7.0$ in. **19.** $\sin R = 0.6$, $\cos R = 0.8$, $\tan R = 0.75$ **21.** $\sin R = 0.7241$, $\cos R = 0.6897$, $\tan R = 1.05$ **23.** $\sin R = 0.5369$, $\cos R = 0.8437$, $\tan R = 0.6364$ **25.** 0.5 **27.** 0.7071 **29.** 0.6249 **31.** 2.3559 **33.** 0.9781 **35.** 40° **37.** 62° **39.** 33° **41.** 12° **43.** 39° **45.** 51° **47.** 36° **49.** 37° **51.** 56° **53.** $\angle A = 63°$, $AC = 9.1$ in., $BC = 17.8$ in. **55.** $\angle B = 50°$, $AC = 12.3$ ft, $BC = 10.3$ ft **57.** $\angle B = 52°$, $AC = 30.7$ in., $AB = 39$ in. **59.** $\angle A = 23°$, $\angle B = 67°$, $AB = 13$ ft **61.** 8.1° **63.** 20.6° **65.** 2.74 m to 0.7 m **67.** If you know the distance between two points and the angles from these two points to a third point, you can determine the distance to the third point by forming a triangle and using trigonometric ratios. Answers should include the following.

- If you measure your distance from the mountain and the angle of elevation to the peak of the mountain from two different points, you can write an equation using trigonometric ratios to determine its height, similar to Example 5.
- You need to know the altitude of the two points you are measuring.

69. D **71.** $k = 8, o = 13.5$ **73.** -5 or 3 **75.** $4s^3 - 9s^2 + 12s$ **77.** (11, 3) **79.** $(-2, 1)$

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Pages 632–636 Chapter 11 Study Guide and Review

1. false, $-3 - \sqrt{7}$ 3. true 5. false, $3x + 19 = x^2 + 6x + 9$
7. false, $\frac{x\sqrt{2xy}}{y}$ 9. $\frac{2\sqrt{15}}{}$ 11. $57 - 24\sqrt{3}$
13. $\frac{5\sqrt{21} - 3\sqrt{35}}{15}$ 15. $5\sqrt{3} + 5\sqrt{5}$ 17. $36\sqrt{3}$
19. $-6\sqrt{2} - 12\sqrt{7}$ 21. $3\sqrt{2} + 3\sqrt{6}$ 23. $\sqrt{6} - 1$
25. no solution 27. $\frac{26}{7}$ 29. 12 31. 34 33. $5\sqrt{5} \approx 11.18$
35. 24 37. no 39. yes 41. 17 43. $\sqrt{205} \approx 14.32$
45. $\sqrt{137} \approx 11.70$ 47. 5 or −1 49. 10 or −14
51. $d = \frac{45}{8}, e = \frac{27}{4}$ 53. $b = \frac{44}{3}, d = 6$ 55. 0.5283
57. 0.8491 59. 1.6071 61. 39° 63. 12° 65. 27°

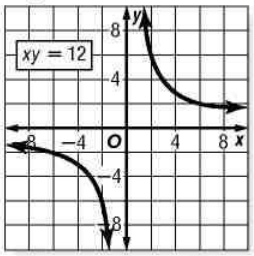
Chapter 12 Rational Expressions and Equations

Page 541 Chapter 12 Getting Started

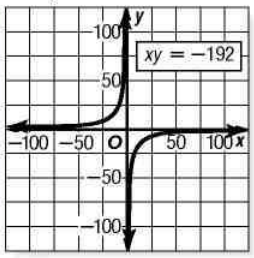
1. $-\frac{63}{16}$ 3. 5 5. 4.62 7. 10.8 9. 6 11. $4m^2n$
13. $3c^2d(1 - 2d)$ 15. $(x + 3)(x + 8)$ 17. $(2x + 7)(x - 3)$
19. −1 21. $-\frac{149}{6}$ 23. $\frac{31}{7}$ 25. 8, −7

Pages 645–647 Lesson 12-1

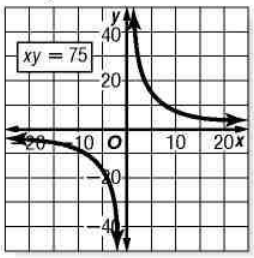
1. Sample answer: $xy = 8$ 3. b; Sample answer: As the price increases, the number purchased decreases.
5. $xy = 12$



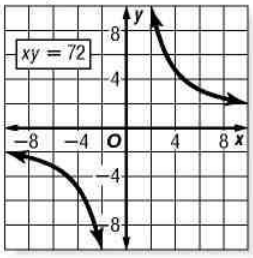
7. $xy = 24$; 4
9. $xy = 8$; $\frac{1}{4}$
11. $xy = -192$



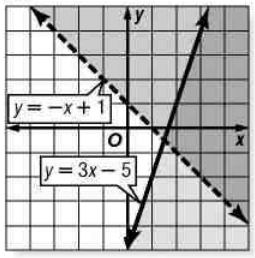
13. $xy = 75$



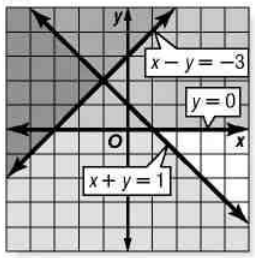
15. $xy = 72$



17. $xy = 60$; 20
19. $xy = -8.5$; 8.5
21. $xy = 28.16$; 8.8
23. $xy = 16$; $\frac{16}{7}$ 25. $xy = \frac{14}{3}$; $\frac{2}{3}$
27. $xy = 26.84$; 8.3875
29. 8 in. 31. 7.2 h
33. about 40 min 35. 20 m^3
37. 24 kg 39. It is one third.
41. B 43. 41° 45. 73°
47. $a = 6, f = 14$ 49. −9
51.



53.



55. 3 57. 30 59. $6xy^2$

Pages 651–653 Lesson 12-2

1. Sample answer: Factor the denominator, set each factor equal to 0, and solve for x. 3. Sample answer: You need to determine excluded values before simplifying. One or more factors may have been canceled in the denominator. 5. −3
7. $\frac{4}{5xy}$; 0, 0 9. $\frac{1}{x + 4}$; −4 11. $\frac{a + 6}{a + 4}$; −4, 2 13. $\frac{b + 1}{b - 9}$; 4, 9
15. $\frac{4}{9 + 2g}$ 17. −5 19. −5, 5 21. −5, 3 23. −7, −5
25. $\frac{a^2}{3b}$; 0, 0 27. $\frac{3x}{8z}$; 0, 0, 0 29. $\frac{mn}{12n - 4m}$; 3n, 0, 0
31. $z + 8$; −2 33. $\frac{2}{y + 5}$; −5, 2 35. $\frac{a + 3}{a + 9}$; −9, 3
37. $\frac{(b + 4)(b - 2)}{(b - 4)(b - 16)}$; 4, 16 39. $\frac{n - 2}{n(n - 6)}$; 0, 6 41. $\frac{3}{4}$; −2, −1
43. about 29 min 45. The times are not doubled; the difference is 12 minutes. 47. 42.75 49. $450 + 4n$ 51. 41
53. $\frac{\pi x^2}{4x^2}$ or $\frac{\pi}{4}$ 55a. Sample answer: The graphs appear to be identical because the second equation is the simplified form of the first equation. 55b. Sample answer: The first graph has a hole at $x = 4$ because it is an excluded value of the equation. 57. C 59. $xy = 60$; −5 61. $xy = -7.5$; 0.9375
63. 71° 65. 45° 67. 7 69. 6 71. 1536, 6144, 24,576
73. $\frac{81}{64}, \frac{243}{256}, \frac{729}{1024}$ 75. 7 77. 15,300 79. 72

Pages 657–659 Lesson 12-3

1. Sample answer: $\frac{2}{1}, \frac{1}{x}$ 3. Amiri; sample answer: Amiri correctly divided by the GCF. 5. $\frac{2t}{s}$ 7. $2(x + 2)$ 9. $\frac{x + 3}{5}$
11. $1\frac{2}{3}$ days 13. $\frac{2}{n}$ 15. $\frac{12ag}{5b}$ 17. $\frac{n - 4}{n + 4}$ 19. $\frac{(x - 1)(x + 7)}{(x - 7)(x + 1)}$
21. $\frac{y - 2}{y - 1}$ 23. $\frac{x - 6}{(x + 8)(x + 2)}$ 25. $\frac{2}{n(n + 3)}$ 27. $\frac{(a - 3)(a + 3)}{(a - 4)(a + 2)}$
29. 16.67 m/s 31. 20 yd^3 33. about $16.02
35. $3 \text{ lanes} \cdot \frac{13 \text{ miles}}{1 \text{ lane}} \cdot \frac{5280 \text{ feet}}{1 \text{ mile}} \cdot \frac{1 \text{ vehicle}}{30 \text{ feet}}$ 37. 5.72 h
39. Sample answer: Multiply rational expressions to perform dimensional analysis. Answers should include the following.
- $25 \text{ lights} \cdot h \text{ hours} \cdot \frac{60 \text{ watts}}{\text{light}} \cdot \frac{1 \text{ kilowatt}}{1000 \text{ watts}} \cdot \frac{15 \text{ cents}}{1 \text{ kilowatt hour}} \cdot \frac{1 \text{ dollar}}{100 \text{ cents}}$
- Sample answer: converting units of measure

41. A 43. −5, 3 45. $xy = 72$; 12 47. $xy = -192$; −48
49. -7^3 or −343 51. $\frac{4b^4c^5}{a^3}$ 53. $r \geq 2.1$ 55. 11 days
57. $(n + 8)(n - 8)$ 59. $(a + 7)(a - 5)$ 61. $3x(x - 2)(x - 6)$

Selected Answers

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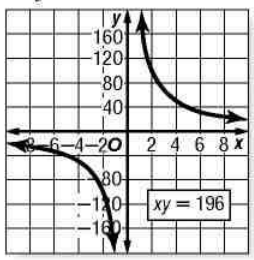
Page 659 Practice Quiz 1

1. $xy = 196$



3. $\frac{4a}{7b}$ 5. $\frac{b+1}{b-9}$ 7. $3m^2$ 9. $\frac{4}{5(n+5)}$

Pages 662–664 Lesson 12-4

1. Sample answer: $\frac{15z}{4y^2} \div \frac{3x}{4y}$ 3. Sample answer: Divide the density by the given volume, then perform dimensional analysis. 5. $\frac{2a}{a+7}$ 7. $\frac{2}{x+5}$ 9. $\frac{2(x-2)(x+3)}{(x+1)(x+9)}$ 11. $\frac{2}{9}$ lb/in^2 13. ab 15. $\frac{x}{2y^2}$ 17. $\frac{sy^2}{z^2}$ 19. $\frac{b+3}{4b}$ 21. $\frac{3k}{(k+1)(k-2)}$ 23. $\frac{3(x+4)}{4(2x-9)}$ 25. 648 27. 225 29. $x+3$ 31. $\frac{(x+1)(x-1)}{2}$ 33. $\frac{3(a+4)}{2(a-3)}$ 35. $\frac{(x+4)}{(x+3)}$ 37. about 9.2 mph 39. $n = 20{,}000 \text{ yd}^3 \div \frac{9 \text{ ft}^3}{1 \text{ yd}^3} \cdot \frac{742.5 \text{ ft}^3}{1 \text{ truck}}$; 727.27 41. 68.7 mph 43. $\frac{\left(x-\frac{1}{2}\right)\left(x-\frac{3}{4}\right)(x)}{x^3}$ 45. Sample answer: Divide the number of cans recycled by $\frac{5}{8}$ to find the total number of cans produced. Answers should include the following.

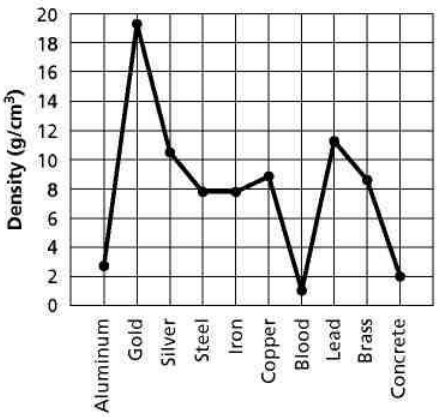
- $x = 63{,}900{,}000 \text{ cans} \div \frac{5}{8} \cdot \frac{1 \text{ pound}}{33 \text{ cans}}$

47. C 49. $\frac{x-2}{x+2}$ 51. $\frac{7(x+2y)(x+5)}{x+y}$ 53. $-\frac{x+5}{x+6}$ 55. $\frac{n+4}{n-4}$ 57. $\left\{\frac{4}{3}\right\}$ 59. $\left\{-6 \pm \sqrt{14}\right\}$ 61. 3 63. $\{g \mid g \geq 7.5\}$ 65. $\{x \mid x \geq -0.7\}$ 67. $\left\{r \mid r < -\frac{1}{20}\right\}$ 69. 39,000 covers 71. $\frac{m^3}{5}$ 73. $\frac{b^3}{c^3}$ 75. $\frac{7x^4}{z}$

Pages 669–671 Lesson 12-5

1. b and c 3. Sample answer: $x^3 + 2x^2 + 8$; $x^3 + 2x^2 + 0x + 8$ 5. $2 + \frac{5}{a} + \frac{2}{7b^2}$ 7. $r + 3 + \frac{9}{r+9}$ 9. $b + 2 - \frac{3}{2b-1}$ 11. $\frac{x}{3} + 3 - \frac{7}{3x}$ 13. $3s - \frac{5}{t} + \frac{8t}{s^2}$ 15. $x + 4$ 17. $n - 7$ 19. $z - 9 + \frac{33}{z+7}$ 21. $2r + 7$ 23. $t + 6$ 25. $3x^2 + 2x - 3 + \frac{1}{x+2}$ 27. $3x^2 + \frac{6}{2x-3}$ 29. $3n^2 - 2n + 3 + \frac{3}{2n+3}$ 31. $\frac{150(60-x)}{x}$ 33. 3 rolls 35. 5/$1.02, 10/$0.93, 16/$0.82; 18-inch

37.



39. $2w + 4$ 41. 12 43. Sample answer: Division can be used to find the number of pieces of fabric available when you divide a large piece of fabric into smaller pieces. Answers should include the following.

- The two expressions are equivalent. If you use the Distributive Property, you can separate the numerator into two expressions with the same denominator.
- When you simplify the right side of the equation, the numerator is $a - b$ and the denominator is c. This is the same as the expression on the left.

45. B 47. $\frac{m+4}{m+1}$ 49. $\frac{1}{z+6}$ 51. $10\sqrt{2}$ 53. $(d+5)(d-8)$ 55. prime 57. $4m^3 + 6m^2 - n$ 59. $-2a^3 - 2a^2b + b^2 - 3b^3$

Pages 674–677 Lesson 12-6

1. Sample answer: $\frac{x+6}{x+2} + \frac{x-4}{x+2} = 1$ 3. Sample answer: Two rational expressions whose sum is 0 are additive inverses, while two rational expressions whose difference is 0 are equivalent expressions. 5. $\frac{a}{2}$ 7. $\frac{3-n}{n-1}$ 9. $-\frac{a}{6}$ 11. $\frac{3m+6}{m-2}$ 13. $\frac{1}{10}$ 15. z 17. $n-1$ 19. 3 21. $\frac{n-3}{n+3}$ 23. $\frac{3a-1}{a-4}$ 25. $\frac{14b+7}{2b+6}$ 27. $\frac{22x+7}{2x+5}$ 29. $\frac{2n}{3}$ 31. $\frac{1}{3}$ 33. $\frac{10}{z-2}$ 35. $\frac{4-7m}{7m-2}$ 37. $\frac{10y}{y-3}$ 39. -3 41. $\frac{4b-23}{2b+12}$ 43. $\frac{60}{n}$ 45. $\frac{1}{7.48}$ ft^3 47. $\frac{x}{16}$; $\frac{x}{18}$; $\frac{x}{24}$ 49. c 51. A 53. $x^2 + 2x - 3$ 55. $\frac{b+3}{4b}$ 57. $(a+7)(a+2)$ 59. $(y-4z)(y+7z)$ 61. $7x^2 - 3x + 22$ 63. 36 65. 24 67. 60 69. 400 71. 144

Page 677 Practice Quiz 2

1. $\frac{a}{a+11}$ 3. $\frac{x-1}{x+5}$ 5. $x - 5 - \frac{1}{2x+3}$ 7. $\frac{7}{x+7}$ 9. $\frac{3x}{3x+2}$

Pages 681–683 Lesson 12-7

1. Sample answer: To find the LCD, determine the least common multiple of all of the factors of the denominators. 3. Sample answer: $\frac{x}{2x+6}$, $\frac{5}{x+3}$ 5. $6(x-2)$ 7. $\frac{12x+7}{10x^2}$ 9. $\frac{y^2+12y+25}{(y-5)(y+5)}$ 11. $\frac{2z-wz}{4w^2}$ 13. $\frac{4}{(b-4)(b+4)}$ 15. C 17. $21x^2y$ 19. $(2n-5)(n+2)$ 21. $(p+1)(p-6)$ 23. $\frac{2+7a}{a^3}$ 25. $\frac{15m+28}{35m^2}$ 27. $\frac{n^2+12}{(n+4)(n-3)}$ 29. $\frac{7x^2+3x}{(x-3)(x+1)}$ 31. $\frac{1}{3}$ 33. $\frac{7y+39}{(y+3)(y-3)}$

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35. $\frac{3x^2 + 6x + 6}{(x + 4)(x - 1)^2}$ 37. $\frac{a^3 - a^2b + a^2 + ab}{(a + b)(a - b)^2}$ 39. $\frac{4 - 25x}{15x^2}$

41. $\frac{5ax - a}{7x^2}$ 43. $\frac{k^2 - 6k - 15}{(k + 5)(k - 3)}$ 45. $\frac{2m^2 - m - 9}{(m + 1)(2m + 5)}$

47. $\frac{-3a + 6}{a(a - 6)}$ 49. $\frac{3a + 5}{-3(a - 2)}$ 51. $\frac{4a^2 + 2a + 4}{(a + 4)(a + 1)(a - 1)}$

53. $\frac{-m^3 - 11m^2 - 56m - 48}{(m - 4)(m + 4)^2}$ 55. 12 mi; \$30 57. 66,000 mi

59. Sample answer: You can use rational expressions and their least common denominators to determine when elections will coincide. Answers should include the following.

- Use each factor of the denominators the greatest number of times it appears.
- 2012

61. C 63. $\frac{4x + 5}{2x + 3}$ 65. $b + 10$ 67. $2m - 3 + \frac{2}{2m + 7}$

69. $(5r - 3)(r + 2)$ 71. \$54.85 73. $\frac{ab}{2}$ 75. $\frac{1}{4n}$ 77. $\frac{x + 4}{x + 6}$

Pages 686–689 Lesson 12-8

1. Sample answer: Both mixed numbers and mixed expressions are made up by the sum of an integer and a fraction or rational expression. 3. Bolton; he used the factors correctly to determine the LCD. 5. $\frac{42y + 5}{6y}$ 7. $\frac{14}{19}$

9. $\frac{a - b}{x + y}$ 11. $\frac{8n + 3}{n}$ 13. $\frac{2xy + x}{y}$ 15. $\frac{2m^2 - m - 4}{m}$

17. $\frac{b^3 + ab^2 + a - b}{a + b}$ 19. $\frac{5n^3 - 15n^2 - 1}{n - 3}$ 21. $\frac{x^2 - 7x + 17}{x - 3}$

23. $\frac{3}{4}$ 25. $\frac{1}{ab^2}$ 27. $\frac{y^2(x + 4)}{x^2(y - 2)}$ 29. $\frac{1}{y + 4}$ 31. $\frac{n + 2}{n + 3}$

33. $\frac{(x + 3)(x - 1)}{(x - 2)(x + 4)}$ 35. $\frac{a(b^2 + 1)}{b(a^2 + 1)}$ 37. 60 39. 404.60 cycles/s

41. $66\frac{2}{3}$ lb/in^2

43. Sample answer: Most measurements used in baking are fractions or mixed numbers, which are examples of rational expressions. Answers should include the following.

- You want to find the number of batches of cookies you can make using the 7 cups of flour you have on hand when a batch requires $1\frac{1}{2}$ cups of flour.
- Divide the expression in the numerator of a complex fraction by the expression in the denominator.

45. C 47. $\frac{3a^2 + 3ab - b^2}{(a - b)(2b + 3a)}$ 49. $\frac{2n^2 - 8n - 2}{(n - 2)^2(n + 3)}$ 51. $\frac{1}{x - 3}$

53. $\frac{2}{n + 6}$ 55. ± 4 57. $\{-5, -3, 3\}$ 59. 2.59×10^1

61. $C = 0.16m + 0.99$ 63. -48 65. 16 67. -14.4

Pages 693–695 Lesson 12-9

1. Sample answer: When you solve the equation, $n = 1$. But $n < 1$, so the equation has no solution. 3. Sample answer: $\frac{x}{5} = \frac{7}{x - 4}$ 5. -8 7. $\frac{5}{4}$ 9. $-1, \frac{2}{5}$ 11. 8 13. 3 15. -3

17. 0 19. $\frac{1}{2}$ 21. -6 23. 1 25. $-2, 1$ 27. 7 29. 9

31. about 0.82 mi 33. 600 ft^3 35. $-\frac{14}{3}$ 37. A 39. $\frac{x + 1}{x - 2}$

41. $\frac{x + 1}{x + 5}$ 43. $\frac{1}{y^2 - 2y + 1}$ 45. $4(5x - 2y)$

47. $(2p + 5)(5p - 6)$

Pages 696–700 Chapter 12 Study Guide and Review

1. false, rational 3. true 5. false, $x^2 - 144$ 7. $xy = 1176$; 21

9. $xy = 144$; 48 11. $\frac{x}{4y^2z}$ 13. $\frac{a - 5}{a - 2}$ 15. $\frac{14a^2b}{3}$ 17. $\frac{30}{x - 10}$

19. $\frac{(x + 4)^2}{(x + 2)^2}$ 21. $2p$ 23. $\frac{3}{(y + 4)(y - 2)}$ 25. $2ac^2 - 4a^2c + \frac{3c^2}{b}$

27. $x^2 + 2x - 3$ 29. $\frac{2m + 3}{5}$ 31. $a + b$ 33. 2 35. $\frac{4c^2 + 9c}{6cd^2}$

37. $\frac{8d^2 - 7a}{(a - 2)(a + 1)}$ 39. $\frac{14a - 3}{6a^2}$ 41. $\frac{5x - 8}{x - 2}$ 43. $\frac{4x^2 - 2y^2}{x^2 - y^2}$

45. $\frac{20a + 16}{2a^2 - 3a}$ 47. -5 49. $-\frac{1}{4}$ 51. -1; extraneous 0

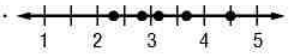
Chapter 13 Statistics

Page 707 Chapter 13 Getting Started

1. Sample answer: If $a = 5$ and $b = -2$, then $c = 3$. However, $5 > 3$. 3. Sample answer: The speed limit could be 55 mph, and Tara could be driving 50 mph. 5. 15

7. 375

9. 

11. 

Pages 710–713 Lesson 13-1

1. All three are unbiased samples. However, the methods for selecting each type of sample are different. In a simple random sample, a sample is as likely to be chosen as any other from the population. In a stratified random sample, the population is first divided into similar, nonoverlapping groups. Then a simple random sample is selected from each group. In a systematic random sample, the items are selected according to a specified time or item interval. 3. Sample answer: Ask the members of the school's football team to name their favorite sport. 5. work from 4 students; work from all students in the 1st period math class; biased; voluntary response 7. 12 pencils; all pencils in the school store; biased; convenience 9. 20 shoppers; all shoppers; biased; convenience 11. 860 people from a state; all people in the state; unbiased; stratified 13. 3 students; all of the students in Ms. Finchie's class; unbiased; simple 15. a group of U.S. district court judges; all U.S. district court judges; unbiased; stratified 17. 4 U.S. Senators; all U.S. Senators; biased; convenience 19. a group of high-definition television sets; all high-definition television sets manufactured on one line during one shift; unbiased; systematic 21. a group of readers of a magazine; all readers of the magazine; biased; voluntary response 23. Additional information needed includes how the survey was conducted, how the survey respondents were selected, and the number of respondents. 25. Sample answer: Get a copy of the list of registered voters in the city and call every 100th person. 27. Sample answer: Randomly pick 5 rows from each field of tomatoes and then pick a tomato every 50 ft along each row. 29. It is a good idea to divide the school population into groups and to take a simple random sample from each group. The problem that prevents this from being a legitimate stratified random sample is the way the three groups are formed. The three groups probably do not represent all students. The students who do not participate in any of these three activities will not be represented in the survey. Other students may be involved in two or three of these activities. These students will be more likely to be chosen for the survey. 31. B 33. $3\frac{1}{3}$ 35. $\frac{3}{25}$ 37. $\frac{a + 5}{a + 12}$ 39. $22\sqrt{6}$ cm

41. $-1\frac{2}{3}, -1\frac{1}{2}$ 43. $y^2 + 12y + 35$ 45. $x^2 - 4x - 32$

47. 24.11 49. 3.8 51. 12.45

Pages 717–721 Lesson 13-2

1°. A 2-by-4 matrix has 2 rows and 4 columns, and a 4-by-2 matrix has 4 rows and 2 columns. 3. Estrella; Hiroshi did

CONTENTS

not multiply each element of the matrix by -5. **5.** 1 by 4; first row, first column **7.** 3 by 2; first row, second column **9.** $\begin{bmatrix} -5 & 24 \\ -22 & -13 \end{bmatrix}$ **11.** $[20 \quad -28]$ **13.** No; the corresponding elements are not equal. **15.** the total sales for the weekend **17.** 2 by 2; first row, first column **19.** 3 by 1; third row, first column **21.** 3 by 3; second row, third column **23.** 2 by 3; second row, third column

25. $\begin{bmatrix} 2 & 1 & 1 \\ 1 & 5 & 1 \end{bmatrix}$ **27.** $\begin{bmatrix} -13 & 12 & -7 \\ 5 & 6 & 11 \\ 23 & 18 & 14 \end{bmatrix}$

29. $\begin{bmatrix} 86 & 82 & -7 \\ 130 & 87 & 15 \end{bmatrix}$ **31.** $\begin{bmatrix} -5 & 25 & 45 \\ 0 & -20 & -10 \\ 15 & 35 & 30 \end{bmatrix}$

33. impossible **35.** $\begin{bmatrix} -25 & 19 & -23 \\ 10 & 16 & 24 \\ 43 & 29 & 22 \end{bmatrix}$

37. $\begin{bmatrix} 224 & 155 & -84 \\ 309 & 182 & -15 \end{bmatrix}$ **39.** $V = [70 \quad 2 \quad 2 \quad 0.3]$, $S = [160 \quad 0 \quad 0 \quad 0]$, $C = [185 \quad 2 \quad 11 \quad 3.9]$

41. $[555 \quad 16 \quad 19 \quad 5.8]$ **43.** 1.20

45. $A = \begin{bmatrix} 533 & 331 & 4135 & 26 & 15 \\ 515 & 304 & 3840 & 24 & 14 \\ 499 & 325 & 4353 & 41 & 13 \\ 571 & 343 & 4436 & 36 & 15 \end{bmatrix}$,

$B = \begin{bmatrix} 571 & 357 & 4413 & 33 & 15 \\ 473 & 284 & 3430 & 28 & 11 \\ 347 & 235 & 3429 & 21 & 18 \\ 533 & 324 & 3730 & 19 & 18 \end{bmatrix}$

47. $T = \begin{bmatrix} 1104 & 688 & 8548 & 59 & 30 \\ 988 & 588 & 7270 & 52 & 25 \\ 846 & 560 & 7782 & 62 & 31 \\ 1104 & 667 & 8166 & 55 & 33 \end{bmatrix}$

49a. sometimes **49b.** always **49c.** sometimes **49d.** sometimes **49e.** sometimes **49f.** sometimes **51.** C

53. $\begin{bmatrix} 0.7 & -0.4 & 2.3 \\ -1.6 & -4 & -2.4 \end{bmatrix}$ **55.** $\begin{bmatrix} -5.3 & -12.4 & 21.1 \\ 2.4 & -7.7 & 4 \end{bmatrix}$

57. $\begin{bmatrix} 3.92 & -0.48 & 2.08 \\ -3.12 & 2.04 & -3.6 \end{bmatrix}$ **59.** biased; convenience

61. $\frac{3}{5}$ **63.** 324 **65.** 64 **67.** $(a - b)(a + 3b)$ **69.** Sample answer: Megan saved steadily from January to June. In July, she withdrew money to go on vacation. She started saving again in September. Then in November, she withdrew money for holiday presents.

Page 721 Practice Quiz 1

1. half of the households in a neighborhood; all households in the neighborhood; unbiased; systematic **3.** $\begin{bmatrix} -3 & -4 \\ -5 & -9 \end{bmatrix}$

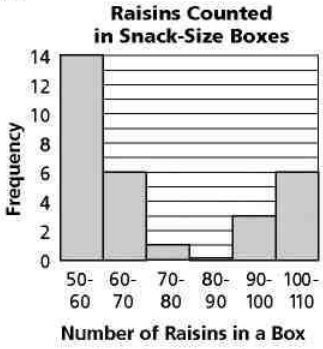
5. $\begin{bmatrix} 24 & -9 & -12 & 15 \\ 18 & -3 & 6 & 30 \end{bmatrix}$

Pages 725–728 Lesson 13-3

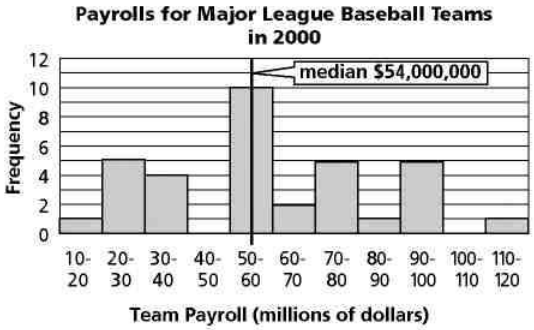
1. First identify the greatest and least values in the data set. Use this information to determine appropriate measurement classes. Using these measurement classes, create a frequency table. Then draw the histogram. Always remember to label the axes and give the histogram a title. **3.** Sample answer: 1, 1, 2, 4, 5, 5, 8, 9, 10, 11, 12, 13, 22, 24, 41 **5.** There are no gaps. The data are somewhat symmetrical. **7.** The Group A test scores are somewhat more symmetrical in appearance than the Group B test scores. There are 25 of 31 scores in Group A that are 40 or greater, while only 14 of 26 scores in Group B are 40 or greater. Also, Group B has 5 scores less than 30. Therefore, we can conclude that Group A performed better overall on the test. **9.** B

11. 3400–3800 points; There are no gaps. The data appear to be skewed to the left. **13.** Age at inauguration: 50–60 years old; age at death: 60–70 years old; both distributions show a symmetrical shape. The two distributions differ in their spread. The inauguration ages are not spread out as much as the death ages data.

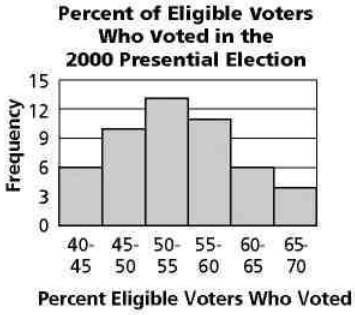
15. Sample answer:



17. Sample answer:



19. Sample answer:



23. Histograms can be used to show how many states have a median within various intervals. Answers should include the following.

- A histogram is more visual than a frequency table and can show trends easily.

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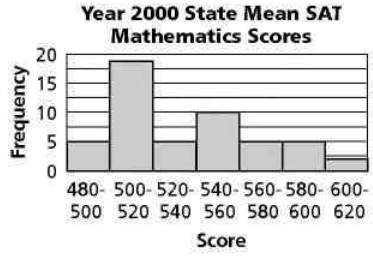
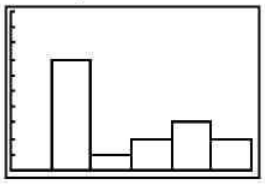
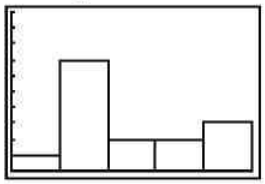


25. B

27. Sample answer:



29. Sample answer:



31. $\begin{bmatrix} 9 & -8 & -5 \\ 0 & 4 & -3 \\ -2 & 9 & 2 \end{bmatrix}$ 33. $\begin{bmatrix} 10 & -15 & -35 \\ 0 & 20 & -30 \\ -5 & 25 & -20 \end{bmatrix}$ 35. $\frac{s}{s-5}$

37. 13 39. 87 41. 9 43. 4.56

Pages 733–736 Lesson 13-4

1. Sample answer: 1, 4, 5, 6, 7, 8, 15 and 1, 2, 4, 5, 9, 9, 10

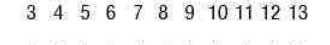
3. Alonso; the range is the difference between the greatest and the least values of the set. 5. 4.6; 9.05; 8.0; 10.05; 2.05; none 7. 5 runs 9. 6 runs 11. 37; 73; 60.5; 79.5; 19; none 13. 1.1; 30.6; 30.05; 30.9; 0.85; none 15. 46; 77; 66.5; 86; 19.5; none 17. 6.7; 7.6; 6.35; 8.65; 2.3; none 19. 471,561 visitors 21. 147,066.5 visitors; 470,030 visitors 23. none 25. 22.5 Calories 27. 46 Calories 29. 1000 ft; 970 ft 31. 520 ft; 280 ft 33. Although the range of the cable-stayed bridges is only somewhat greater than the range of the steel-arch bridges, the interquartile range of the cable-stayed bridges is much greater than the interquartile range of the steel-arch bridges. The outliers of the steel-arch bridges make the ranges of the two types of bridges similar, but in general, the data for steel-arch bridges are more clustered than the data for the cable-stayed bridges.

35. Measures of variation can be used to discuss how much the weather changes during the year. Answers should include the following.

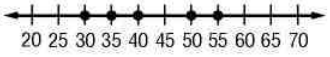
- The range of temperatures is used to discuss the change in temperatures for a certain area during the year and the interquartile range is used to discuss the change in temperature during the moderate 50% of the year.
- The monthly temperatures of the local area listed with the range and interquartile range of the data.

37. A 39. 1 by 3; first row, first column 41. 2 by 4; second row, second column 43. $\frac{1}{t-4}$; 3, 4

45.



47.



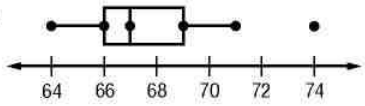
Page 736 Practice Quiz 2

1. $10–$20 3. 340 5. 835

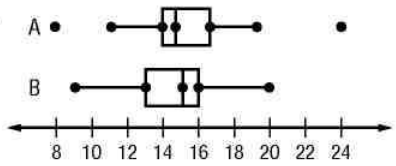
Pages 739–742 Lesson 13-5

1. The extreme values are 10 and 50. The quartiles are 15, 30, and 40. There are no outliers. 3. Sample answer: 2, 8, 10, 11, 11, 12, 13, 13, 14, 15, 16

5.



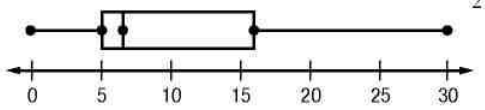
7.



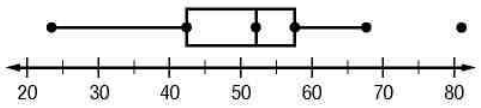
The A data are more diverse than the B data.

9. Most of the data are spread fairly evenly from about $450 million to $700 million. The one outlier ($1397 million) is far removed from the rest of the data. 11. 30 13. $\frac{1}{2}$

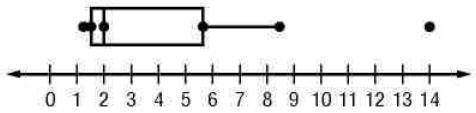
15.



17.

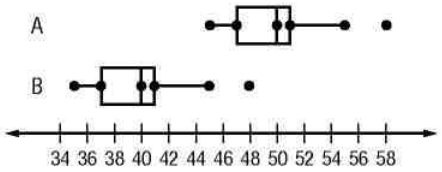


19.



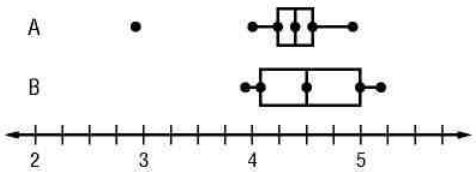
21. B 23. B

25.



The distribution of both sets of data are similar. In general, the A data are greater than the B data.

27.



The A data have an outlier. Excluding the outlier, the B data are more diverse than the A data. 29. The upper half of the data is very dispersed. The range of the lower half of the data is only 1. 31. Top half; the top half of the data goes from $48,000 to $181,000, while the bottom half goes from $35,000 to $48,000. 33. Bottom half; the top half of the data goes from 70 yr to 80 yr, while the bottom half goes from 39 yr to 70 yr. 35. No; although the interval from 54 yr to 70 yr is wider than the interval from 70 yr to 74 yr, both intervals represent 25% of the data values.

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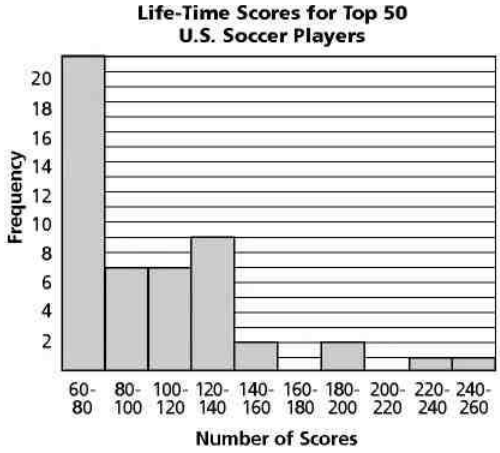
37. Sample answer:



39. Sample answer: 40, 45, 50, 55, 55, 60, 70, 80, 90, 90, 90

41. C 43. 80; 54.5; 45; 67; 22; none 45. $\frac{-y^2 + 6y + 12}{(y - 3)(y + 4)}$

47. $\frac{3w - 4}{3(5w + 2)}$ 49. $3(r + 3)$ 51. $m\angle B = 51°$, $AB \approx 15.4$, $BC \approx 9.7$ 53. 1, 6 55. −9.8, 1.8 57. $8a^2 + 2a - 1$

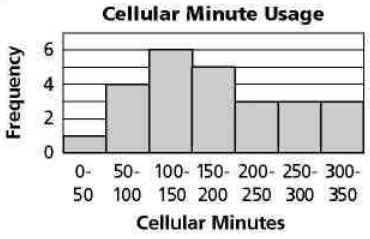
Pages 745–748 Chapter 13 Study Guide and Review

1. simple random sample 3. quartile 5. biased sample 7. interquartile range 9. outlier 11. 8 test tubes with results of chemical reactions; the results of all chemical reactions performed; biased; convenience

13. $\begin{bmatrix} 2 & 4 & -4 \\ 4 & 3 & 3 \\ -2 & -3 & 3 \end{bmatrix}$ 15. $\begin{bmatrix} -4 & -2 \\ 4 & 0 \end{bmatrix}$ 17. $\begin{bmatrix} 5 & -1 \\ -1 & 4 \end{bmatrix}$

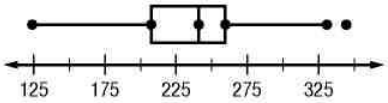
19. $\begin{bmatrix} 5 & 15 & -5 \\ 10 & 0 & 20 \\ -5 & -5 & 15 \end{bmatrix}$ 21. $\begin{bmatrix} 9 & 1 \\ -5 & 4 \end{bmatrix}$

23. Sample answer:

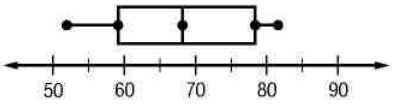


25. 70; 65; 45; 85; 40; none 27. 37; 73; 62; 77; 15; none

29.



31.



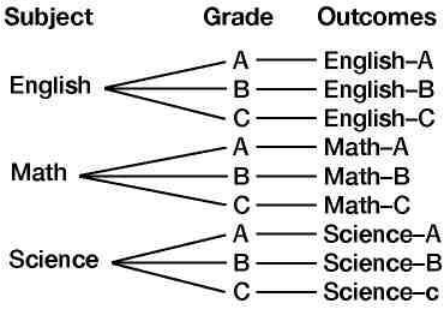
Chapter 14 Probability

Page 753 Chapter 14 Getting Started

1. $\frac{3}{7}$ 3. $\frac{2}{7}$ 5. $\frac{3}{5}$ 7. $\frac{7}{95}$ 9. $\frac{1}{52}$ 11. 72.5% 13. 40% 15. 87.5% 17. 85.6%

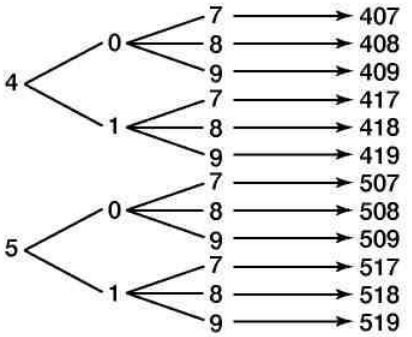
Pages 756–758 Lesson 14-1

1. Sample answer: choosing 2 books from 7 books on a shelf 3. $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$ 5. 64 7. 40,320 9. 9



11. 24 13. 39,916,800 15. 216 17. 24

19.



21. 6 23. 20 25. A 27. A: 32, 88, 44, 85, 60; B: 38, 86, 48, 74, 64 29. B 31. 79 33. 73.5; 39.5; 34.0

35. $\frac{5x^2 + 8x - 6}{(3x - 1)(x - 2)}$ 37. $\frac{3z - 1}{3z - 6}$ 39. $\pm\sqrt{22}$ 41. 7 43. −8.6, 0.6 45. −4.7, −0.3 47. $\frac{1}{13}$ 49. $\frac{1}{52}$ 51. $\frac{2}{13}$

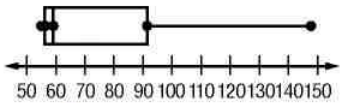
Pages 764–767 Lesson 14-2

1. Sample answer: Order is important in a permutation but not in a combination.
Permutation: the finishing order of a race
Combination: toppings on a pizza
3. Alisa; both are correct in that the situation is a combination, but Alisa's method correctly computes the combination. Eric's calculations find the number of permutations. 5. Permutation; order is important. 7. 21 9. 60 11. 720 13. B 15. Permutation; order is important. 17. Permutation; order is important. 19. Combination; order is not important. 21. Combination; order is not important. 23. 4 25. 35 27. 125,970 29. 524,160 31. 16,598,400 33. 6720 35. 362,880 37. 495 39. $\frac{1}{2970}$ 41. 7776 43. 61,425 45. 336 47. 36 49. $\frac{1}{12}$ or about 8% 51. $\frac{1}{30,240}$ 53. 24

55. Sample answer: Combinations can be used to show how many different ways a committee can be formed by various members. Answers should include the following.
- Order of selection is not important.
- Order is important due to seniority, so you need to find the number of permutations.

57. C

59.



CONTENTS

61. \$56,700, \$91,300 **63.** $\frac{1}{x+3}$ **65.** $\frac{n-5}{n+5}$ **67.** $4\sqrt{29}$
69. $-2 \pm \sqrt{2}$; $-0.59, -3.41$ **71.** $\frac{1 \pm \sqrt{33}}{4}$; $1.69, -1.19$
73. $\frac{27}{32}$ **75.** $\frac{1}{3}$ **77.** $\frac{69}{100}$

Page 767 Practice Quiz 1

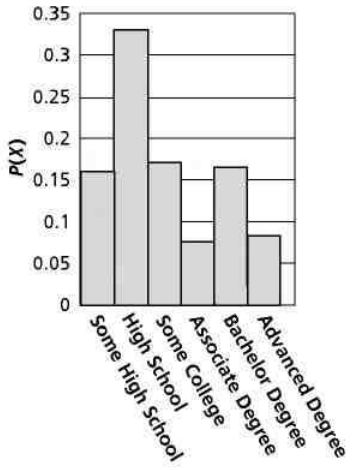
1. 24 **3.** 1287 **5.** $\frac{45}{1001}$

Pages 772–776 Lesson 14-3

1. A simple event is a single event, while a compound event involves two or more simple events. **3.** Sample answer: In a dependent event, an object is selected and not replaced. In an independent event, an object is selected and replaced. **5.** $\frac{10}{147}$ **7.** $\frac{80}{3087}$ **9.** $\frac{1}{2}$ **11.** 1 **13.** independent **15.** $\frac{1}{3}$ **17.** $\frac{2}{51}$ **19.** $\frac{7}{408}$ **21.** $\frac{1}{5}$ **23.** $\frac{1}{10}$ **25.** $\frac{27}{280}$ **27.** $\frac{69}{280}$ **29.** 98% or 0.98 **31.** no; $P(A \text{ and } B) \neq P(A) \cdot P(B)$ **33.** $\frac{9}{16}$ **35.** $\frac{1}{4}$ **37.** 356 **39.** ≈ 0.09 **41.** $\frac{5}{6}$ **43.** $\frac{1}{3}$ **45.** $\frac{7}{8}$ **47.** $\frac{3}{4}$ **49.** 101 **51.** $\frac{39}{40}$ **53.** C **55.** 10 **57.** 604,800 **59.** $\begin{bmatrix} 5 & 2 \\ 4 & -1 \end{bmatrix}$ **61.** $3\sqrt{5}$ **63.** $2b^2\sqrt{10}$ **65.** $18\sqrt{14}$ **67.** 0.375 **69.** 0.492 **71.** 0.222 **73.** 0.033 **75.** 0.036

Pages 779–781 Lesson 14-4

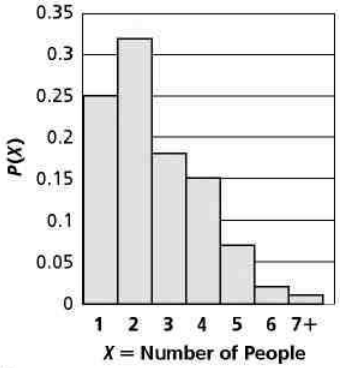
1. The probability of each event is between 0 and 1 inclusive. The probabilities for each value of the random variable add up to one. The probability of a compound event equals the sum of the probabilities of the individual probabilities. **3.** Sample answer: the number of possible correct answers on a 5-question multiple-choice quiz, and the probability of each **5.** $P(X = 4) = \frac{1}{12}$, $P(X = 5) = \frac{1}{9}$, $P(X = 6) = \frac{5}{36}$ **7.** 0.05 + 0.10 + 0.40 + 0.40 + 0.05 = 1 **9.** 0.45 **11.** $P(X = 0) = \frac{1}{64}$, $P(X = 1) = \frac{3}{64}$, $P(X = 2) = \frac{9}{64}$, $P(X = 3) = \frac{27}{64}$ **13.** No; it is more probable to spin blue than red. **15.** 0.10 + 0.15 + 0.40 + 0.25 + 0.10 = 1 **17.** 0.75
19.



21. No; 0.221 + 0.136 + 0.126 + 0.065 + 0.043 = 0.591. The sum of the probabilities does not equal 1. **23a.** $P(X = 1) = \frac{1}{2}$, $P(X = 2) = \frac{1}{4}$, $P(X = 3) = \frac{1}{8}$, $P(X = 4) = \frac{1}{16}$ **23b.** $\frac{1}{16}$
25. A **27.** $\frac{2}{13}$ **29.** $\frac{25}{52}$ **31.** 792 **33.** $\begin{bmatrix} -2 & 4 \\ 3 & 12 \end{bmatrix}$
35. $xy = 1.44$; 0.8 **37.** $13\sqrt{2}$ **39.** $-\sqrt{7}$ **41.** \$1250.46
43. 20% **45.** 26% **47.** 21%

Page 781 Practice Quiz 2

1. 0.25 + 0.32 + 0.18 + 0.15 + 0.07 + 0.02 + 0.01 = 1
3.



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

Pages 785–788 Lesson 14-5

1. An empirical study uses more data than a single study, and provides better calculations of probability. **3.** Sample answer: a survey of 100 people voting in a two-person election where 50% of the people favor each candidate; 100 coin tosses **5.** Sample answer: 5 marbles of two colors where three of the marbles are one color to represent making a free throw, and the other two are a different color to represent missing a free throw. Randomly pick one marble to simulate a free throw 25 times. **9.** Yes; 70% of the marbles in the bag represent water and 30% represent land. **11.** 0.25 or 25% **13.** Sample answer: a coin tossed 15 times **15.** Sample answer: a coin and a number cube since there are 12 possible outcomes **21.** 4 or 9
23. ≈ 0.74 or 74% **25.** Sample answer: 3 coins
33. Sample answer: Probability can be used to determine the likelihood that a medication or treatment will be successful. Answers should include the following.

- Experimental probability is determining probability based on trials or studies.
- To have the experimental more closely resemble the theoretical probability the researchers should perform more trials.

35. B **43.** 0.145 **45.** $\frac{125}{1331}$ **47.** $\frac{80}{1749}$ **49.** 6, 8 **51.** $-\frac{9}{4}$ **53.** $-1, \frac{2}{5}$ **55.** no **57.** yes **59.** 11 **61.** $-\frac{2}{5}$ **63.** $\frac{10}{9}$

Pages 789–792 Chapter 14 Study Guide and Review

1. permutation **3.** independent **5.** are not **7.** 1 **9.** 720 **11.** 20 **13.** 56 **15.** 140 **17.** 12 **19.** $\frac{1595}{32,412}$ **21.** $\frac{1}{2}$ **23.** $\frac{4}{13}$ **25.** 0.79 or 79% **27.** 39.6% **29.** 28.8%

CONTENTS

Formulas and Measures

Formulas

Slope		$m = \frac{y_2 - y_1}{x_2 - x_1}$
Distance on a coordinate plane		$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Midpoint on a coordinate plane		$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
Pythagorean Theorem		$a^2 + b^2 = c^2$
Quadratic Formula		$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Perimeter of a rectangle		$P = 2\ell + 2w$ or $P = 2(\ell + w)$
Circumference of a circle		$C = 2\pi r$ or $C = \pi d$
Area	rectangle	$A = \ell w$
	parallelogram	$A = bh$
	triangle	$A = \frac{1}{2}bh$
	trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$
	circle	$A = \pi r^2$
Surface Area	cube	$S = 6s^2$
	prism	$S = Ph + 2B$
	cylinder	$S = 2\pi rh + 2\pi r^2$
	regular pyramid	$S = \frac{1}{2}P\ell + B$
	cone	$S = \pi r\ell + \pi r^2$
Volume	cube	$V = s^3$
	prism	$V = Bh$
	cylinder	$V = \pi r^2 h$
	regular pyramid	$V = \frac{1}{3}Bh$
	cone	$V = \frac{1}{3}\pi r^2 h$

Measures

Measure	Metric	Customary
Length	kilometer (km) = 1000 meters (m) 1 meter = 100 centimeters (cm) 1 centimeter = 10 millimeters (mm)	1 mile (mi) = 1760 yards (yd) 1 mile = 5280 feet (ft) 1 yard = 3 feet 1 foot = 12 inches (in.) 1 yard = 36 inches
Volume and Capacity	1 liter (L) = 1000 milliliters (mL) 1 kiloliter (kL) = 1000 liters	1 gallon (gal) = 4 quarts (qt) 1 gallon = 128 fluid ounces (fl oz) 1 quart = 2 pints (pt) 1 pint = 2 cups (c) 1 cup = 8 fluid ounces
Weight and Mass	1 kilogram (kg) = 1000 grams (g) 1 gram = 1000 milligrams (mg) 1 metric ton (t) = 1000 kilograms	1 ton (T) = 2000 pounds (lb) 1 pound = 16 ounces (oz)

CONTENTS

Symbols and Properties

Symbols

$\pm$	plus or minus
$\times$ or $\cdot$	times
$\neq$	is not equal to
$>$	is greater than
$<$	is less than
$\geq$	is greater than or equal to
$\leq$	is less than or equal to
$\approx$	is approximately equal to
$\lvert a \rvert$	absolute value of a
$\angle$	angle
$^\circ$	degree
!	factorial
$\overline{AB}$	line segment AB
AB	measure of $\overline{AB}$
$f(x)$	f of x, the value of f at x
$-a$	opposite or additive inverse of a
(a, b)	ordered pair a, b
O	origin
π	pi
$P(A)$	probability of A
$a{:}b$	ratio of a to b
$0.7\overline{5}$	repeating decimal 0.75555…
$\sqrt{a}$	square root of a
$\triangle$	triangle

Algebraic Properties

Additive Identity	For any number a, $a + 0 = 0 + a = a$.
Multiplicative Identity	For any number a, $a \cdot 1 = 1 \cdot a = a$.
Substitution (=)	If $a = b$, then a may be replaced by b.
Reflexive (=)	$a = a$
Symmetric (=)	If $a = b$, then $b = a$.
Transitive (=)	If $a = b$ and $b = c$, then $a = c$.
Commutative (+)	For any numbers a and b, $a + b = b + a$.
Commutative (×)	For any numbers a and b, $a \cdot b = b \cdot a$.
Associative (+)	For any numbers a, b, and c, $(a + b) + c = a + (b + c)$.
Associative (×)	For any numbers a, b, and c, $(a \cdot b) \cdot c = a \cdot (b \cdot c)$.
Distributive	For any numbers a, b, and c, $a(b + c) = ab + ac$ and $a(b - c) = ab - ac$.
Additive Inverse	For any number a, there is exactly one number $-a$ such that $a + (-a) = 0$.
Multiplicative Inverse	For any number $\frac{a}{b}$, where $a, b \neq 0$, there is exactly one number $\frac{b}{a}$ such that $\frac{a}{b} \cdot \frac{b}{a} = 1$.
Multiplicative (0)	For any number a, $a \cdot 0 = 0 \cdot a = 0$.
Addition (=)	For any numbers a, b, and c, if $a = b$, then $a + c = b + c$.
Subtraction (=)	For any numbers a, b, and c, if $a = b$, then $a - c = b - c$.
Division and Multiplication (=)	For any numbers a, b, and c, with $c \neq 0$, if $a = b$, then $ac = bc$ and $\frac{a}{c} = \frac{b}{c}$.
Addition (>)*	For any numbers a, b, and c, if $a > b$, then $a + c > b + c$.
Subtraction (>)*	For any numbers a, b, and c, if $a > b$, then $a - c > b - c$.
Division and Multiplication (>)*	For any numbers a, b, and c, **1.** if $a > b$ and $c > 0$, then $ac > bc$ and $\frac{a}{c} > \frac{b}{c}$. **2.** if $a > b$ and $c < 0$, then $ac < bc$ and $\frac{a}{c} < \frac{b}{c}$.
Zero Product	For any real numbers a and b, if $ab = 0$, then $a = 0$, $b = 0$, or both a and b equal zero.

* *These properties are also true for* $<$, $\geq$, *and* $\leq$.

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Extra Practice

Lesson 1-1 *(pages 6–9)*

Write an algebraic expression for each verbal expression.

1. the sum of b and 21
2. the product of x and 7
3. a number t increased by 6
4. the sum of 4 and 6 times a number z
5. -10 increased by 4 times a number a
6. the sum of 8 and -2 times n
7. one-half the cube of a number
8. four-fifths the square of m

Evaluate each expression.

9. 2^4
10. 10^2
11. 7^3
12. 20^3
13. 3^6
14. 4^5

Write a verbal expression for each algebraic expression.

15. $2n$
16. 10^7
17. m^5
18. xy
19. $5n^2 - 6$
20. $9a^3 + 1$
21. $x^3 \cdot y^2$
22. $c^4 \cdot d^6$
23. $3e + 2e^2$

Lesson 1-2 *(pages 11–15)*

Evaluate each expression.

1. $3 + 8 \div 2 - 5$
2. $4 + 7 \cdot 2 + 8$
3. $5(9 + 3) - 3 \cdot 4$
4. $9 - 3^2$
5. $(8 - 1) \cdot 3$
6. $4(5 - 3)^2$
7. $3(12 + 3) - 5 \cdot 9$
8. $5^3 + 6^3 - 5^2$
9. $16 \div 2 \cdot 5 \cdot 3 \div 6$
10. $7(5^3 + 3^2)$
11. $\frac{9 \cdot 4 + 2 \cdot 6}{6 \cdot 4}$
12. $25 - \frac{1}{3}(18 + 9)$

Evaluate each expression if $a = 2$, $b = 5$, $x = 4$, and $n = 10$.

13. $8a + b$
14. $48 + ab$
15. $a(6 - 3n)$
16. $bx + an$
17. $x^2 - 4n$
18. $3b + 16a - 9n$
19. $n^2 + 3(a + 4)$
20. $(2x)^2 + an - 5b$
21. $[a + 8(b - 2)]^2 \div 4$

Lesson 1-3 *(pages 16–20)*

Find the solution of each equation if the replacement sets are $x = \{0, 2, 4, 6, 8\}$ and $y = \{1, 3, 5, 7, 9\}$.

1. $x - 4 = 4$
2. $25 - y = 18$
3. $3x + 1 = 25$
4. $5y - 4 = 11$
5. $14 = \frac{96}{x} + 2$
6. $0 = \frac{y}{3} - 3$

Solve each equation.

7. $x = \frac{27 + 9}{2}$
8. $\frac{18 - 7}{13 - 2} = y$
9. $n = \frac{6(5) + 3}{2(4) + 3}$
10. $\frac{5(4) - 6}{2^2 + 3} = z$
11. $\frac{7^2 + 9(2 + 1)}{2(10) - 1} = t$
12. $a = \frac{3^3 + 5^2}{2(3 - 1)}$

Find the solution set for each inequality if the replacement sets are $x = \{4, 5, 6, 7, 8\}$ and $y = \{10, 12, 14, 16\}$.

13. $x + 2 > 7$
14. $x - 1 < 8$
15. $2x \leq 15$
16. $3y \geq 36$
17. $\frac{x}{3} < 2$
18. $\frac{5y}{4} \geq 20$

CONTENTS

Lesson 1-4

(pages 21–25)

Name the property used in each equation. Then find the value of n.

1. $4 \cdot 3 = 4 \cdot n$
2. $\frac{5}{4} = n + 0$
3. $15 = 15 \cdot n$
4. $\frac{2}{3}n = 1$
5. $2.7 + 1.3 = n + 2.7$
6. $n\left(6^2 \cdot \frac{1}{36}\right) = 4$
7. $8n = 0$
8. $n = \frac{1}{9} \cdot 9$
9. $5 + 7 = 5 + n$
10. $(13 - 4)(2) = 9n$

Evaluate each expression. Name the property used in each step.

11. $\frac{2}{3}[15 \div (12 - 2)]$
12. $\frac{7}{4}\left[4 \cdot \left(\frac{1}{8} \cdot 8\right)\right]$
13. $[(18 \div 3) \cdot 0] \cdot 10$

Lesson 1-5

(pages 26–31)

Rewrite each expression using the Distributive Property. Then simplify.

1. $5(2 + 9)$
2. $8(10 + 20)$
3. $20(8 - 3)$
4. $3(5 + w)$
5. $(h - 8)7$
6. $6(y + 4)$
7. $9(3n + 5)$
8. $32\left(x - \frac{1}{8}\right)$
9. $c(7 - d)$

Use the Distributive Property to find each product.

10. $6 \cdot 55$
11. $15(108)$
12. $1689 \cdot 5$
13. 7×314
14. $36\left(5\frac{1}{4}\right)$
15. $\left(4\frac{1}{18}\right) \cdot 18$

Simplify each expression. If not possible, write *simplified*.

16. $13a + 5a$
17. $21x - 10x$
18. $8(3x + 7)$
19. $4m - 4n$
20. $3(5am - 4)$
21. $15x^2 + 7x^2$
22. $9y^2 + 13y^2 + 3$
23. $11a^2 - 11a^2 + 12a^2$
24. $6a + 7a + 12b + 8b$

Lesson 1-6

(pages 32–36)

Evaluate each expression.

1. $23 + 8 + 37 + 12$
2. $19 + 46 + 81 + 54$
3. $10.25 + 2.5 + 3.75$
4. $22.5 + 17.6 + 44.5$
5. $2\frac{1}{3} + 6 + 3\frac{2}{3} + 4$
6. $5\frac{6}{7} + 15 + 4\frac{1}{7} + 25$
7. $6 \cdot 8 \cdot 5 \cdot 3$
8. $18 \cdot 5 \cdot 2 \cdot 5$
9. $0.25 \cdot 7 \cdot 8$
10. $90 \cdot 12 \cdot 0.5$
11. $5\frac{1}{3} \cdot 4 \cdot 6$
12. $4\frac{5}{6} \cdot 10 \cdot 12$

Simplify each expression.

13. $5a + 6b + 7a$
14. $8x + 4y + 9x$
15. $3a + 5b + 2c + 8b$
16. $\frac{2}{3}x^2 + 5x + x^2$
17. $(4p - 7q) + (5q - 8p)$
18. $8q + 5r - 7q - 6r$
19. $4(2x + y) + 5x$
20. $9r^5 + 2r^2 + r^5$
21. $12b^3 + 12 + 12b^3$
22. $7 + 3(uv - 6) + u$
23. $3(x + 2y) + 4(3x + y)$
24. $6.2(a + b) + 2.6(a + b) + 3a$
25. $3 + 8(st + 3w) + 3st$
26. $5.4(s - 3t) + 3.6(s - 4)$
27. $3[4 + 5(2x + 3y)]$

Lesson 1-7

(pages 37–42)

Identify the hypothesis and conclusion of each statement.

1. If an animal is a dog, then it barks.
2. If a figure is a pentagon, then it has five sides.
3. If $3x - 1 = 8$, then $x = 3$.
4. If 0.5 is the reciprocal of 2, then $0.5 \cdot 2 = 1$.

Identify the hypotheses and conclusion of each statement. Then write the statement in if-then form.

5. A square has four congruent sides.
6. $6a + 10 = 34$ when $a = 4$.
7. The video store is open every night.
8. The band does not have practice on Thursday.

Find a counterexample for each statement.

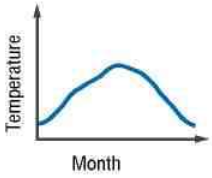
9. If the season is spring, then it does not snow.
10. If you live in Portland, then you live in Oregon.
11. If $2y + 4 = 10$, then $y < 3$.
12. If $a^2 > 0$, then $a > 0$.

Lesson 1-8

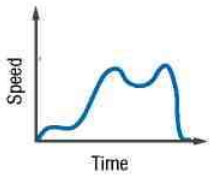
(pages 43–48)

Describe what is happening in each graph.

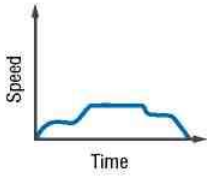
1. The graph shows the average monthly high temperatures for a city over a one-year period.



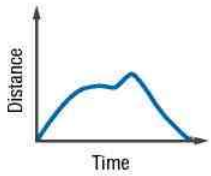
2. The graph shows the speed of a roller coaster car during a two-minute ride.



3. The graph shows the speed of a jogger over time.



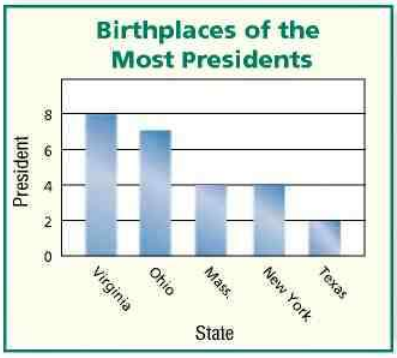
4. The graph shows the distance from camp traveled by a hiker over time.



Lesson 1-9

(pages 50–55)

For Exercises 1–4, use the graph, which shows the five states that were the birthplace of the most U.S. presidents.



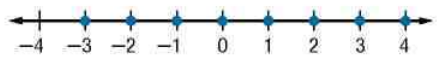
1. How many times more presidents were born in Virginia than Texas?
2. Did any states have the same number of presidents? If so, which states?
3. Would it be appropriate to display this data in a circle graph? Explain.
4. By the year 2001, there had been forty-three different presidents. What percent of U.S. presidents at that time had been born in Ohio?

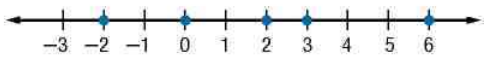
CONTENTS

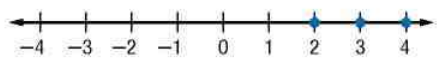
Lesson 2-1

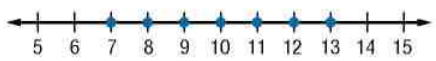
(pages 68–72)

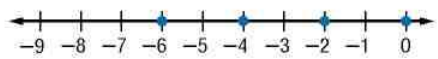
Name the coordinates of the points graphed on each number line.

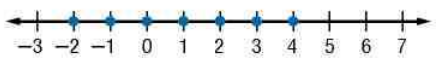
1. 

2. 

3. 

4. 

5. 

6. 

Graph each set of numbers.

7. $\{-2, -4, -6\}$
8. $\{\ldots, -3, -2, -1, 0\}$
9. {integers greater than -1}
10. {integers less than -5 and greater than -10}

Find each absolute value.

11. $|22|$
12. $|-2.5|$
13. $\left|\frac{2}{3}\right|$
14. $\left|-\frac{7}{8}\right|$

Lesson 2-2

(pages 73–78)

Find each sum.

1. $3 + 16$
2. $-27 + 19$
3. $8 + (-13)$
4. $-14 + (-9)$
5. $-25 + 47$
6. $97 + (-79)$
7. $-4.8 + 3.2$
8. $-1.7 + (-3.4)$
9. $-0.009 + 0.06$
10. $-\frac{11}{9} + \left(-\frac{7}{9}\right)$
11. $-\frac{3}{5} + \frac{5}{6}$
12. $\frac{3}{8} + \left(-\frac{7}{12}\right)$

Find each difference.

13. $27 - 14$
14. $8 - 17$
15. $12 - (-15)$
16. $-35 - (-12)$
17. $-2 - (-1.3)$
18. $1.9 - (-7)$
19. $-4.5 - 8.6$
20. $89.3 - (-14.2)$
21. $-18 - (-1.3)$
22. $\frac{5}{11} - \frac{6}{11}$
23. $\frac{2}{7} - \frac{3}{14}$
24. $-\frac{7}{15} - \left(-\frac{5}{12}\right)$

Lesson 2-3

(pages 79–83)

Find each product.

1. $5(12)$
2. $(-6)(11)$
3. $(-7)(-5)$
4. $(-6)(4)(-3)$
5. $\left(-\frac{7}{8}\right)\left(-\frac{1}{3}\right)$
6. $(5)\left(-\frac{2}{5}\right)$
7. $\left(-4\frac{1}{2}\right)\left(2\frac{1}{3}\right)$
8. $\left(-1\frac{2}{7}\right)\left(-3\frac{5}{9}\right)$
9. $(-5.34)(3.2)$
10. $(-6.8)(-5.415)$
11. $(4.2)(-5.1)(3.6)$
12. $(-3.9)(1.6)(8.4)$

Simplify each expression.

13. $5(-3a) - 6a$
14. $-8(-x) - 3x$
15. $2(6y - 2y)$
16. $(c + 7c)(-3)$
17. $-3n(4b) + 2a(3b)$
18. $-7(2m - 3n)$

Lesson 2-4 *(pages 84–87)*

Find each quotient.

1. $-49 \div (-7)$
2. $52 \div (-4)$
3. $-66 \div (0.5)$
4. $25.8 \div (-2)$
5. $-55.25 \div (-0.25)$
6. $-82.1 \div (16.42)$
7. $-\frac{2}{5} \div 5$
8. $\frac{7}{8} \div (-4)$
9. $-4 \div \left(-\frac{7}{10}\right)$
10. $\frac{3}{2} \div \left(-\frac{1}{2}\right)$
11. $-\frac{8}{5} \div \left(-\frac{5}{8}\right)$
12. $-\frac{13}{15} \div \frac{3}{25}$

Simplify each expression.

13. $\frac{32a}{4}$
14. $\frac{12x}{-2}$
15. $\frac{5n + 15}{-5}$
16. $\frac{-2b - 10}{-2}$
17. $\frac{65x - 15y}{5}$
18. $\frac{2a - 10b}{-2}$
19. $\frac{-27c + (-99b)}{9}$
20. $\frac{-3n + (-3m)}{-3}$

Lesson 2-5 *(pages 88–94)*

Use each set of data to make a line plot.

1. 134, 147, 137, 138, 156, 140, 134, 145, 139, 152, 139, 155, 144, 135, 144
2. 19, 12, 11, 11, 7, 7, 8, 13, 12, 12, 9, 9, 8, 15, 11, 4, 12, 7, 7, 6
3. 66, 74, 72, 78, 68, 75, 80, 69, 62, 65, 63, 78, 71, 78, 76, 75, 80, 69, 62, 71, 76, 79, 70, 64, 62, 74, 74, 75, 70
4. 111, 133, 146, 141, 129, 138, 154, 155, 175, 169, 172, 151, 154, 164, 163

Use each set of data to make a stem-and-leaf plot.

5. 22 17 35 19 45 23 35 18 22 47 39 23 17 44 35 19 18 40 10
6. 1.2 1.3 5.6 4.1 1.1 2.0 1.9 3.0 4.5 2.1 4.1 1.2 1.8 1.0 3.2 2.2 2.5
7. 123 134 111 105 108 121 133 135 109 101 130 101 139 129 137 104

Lesson 2-6 *(pages 96–101)*

Find the probability of each event.

1. A coin will land tails up.
2. You eat this month.
3. A baby will be a girl.
4. You will see a blue elephant.
5. This is an algebra book.
6. Today is Wednesday.

A computer randomly picks a letter in the word *success*. Find each probability.

7. the letter e
8. P(not c)
9. the letter s
10. the letter b
11. P(vowel)
12. the letters u or c

One die is rolled. Find the odds of each outcome.

13. a 4
14. a number greater than 3
15. a multiple of 3
16. a number less than 5
17. an odd number
18. not a 6

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Lesson 2-7

(pages 103–109)

Find each square root. If necessary, round to the nearest hundredth.

1. $\sqrt{121}$
2. $-\sqrt{36}$
3. $\sqrt{2.89}$
4. $-\sqrt{125}$
5. $\sqrt{\frac{81}{100}}$
6. $-\sqrt{\frac{36}{196}}$
7. $\pm\sqrt{9.61}$
8. $\pm\sqrt{\frac{7}{8}}$

Name the set or sets of numbers to which each real number belongs.

9. $-\sqrt{149}$
10. $\frac{5}{6}$
11. $\sqrt{\frac{8}{2}}$
12. $-\frac{66}{55}$
13. $\sqrt{225}$
14. $-\sqrt{\frac{3}{4}}$
15. $\frac{-1}{7}$
16. $\sqrt{0.0016}$

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

17. $6.\overline{16}$ ● 6
18. 3.88 ● $\sqrt{15}$
19. $-\sqrt{529}$ ● -20
20. $-\sqrt{0.25}$ ● $-0.\overline{5}$
21. $\frac{1}{3}$ ● $\frac{\sqrt{3}}{3}$
22. $\frac{1}{\sqrt{3}}$ ● $\frac{\sqrt{3}}{3}$
23. $-\sqrt{\frac{1}{4}}$ ● $-\frac{1}{4}$
24. $-\frac{1}{6}$ ● $-\frac{1}{\sqrt{6}}$

Lesson 3-1

(pages 120–126)

Translate each sentence into an equation or formula.

1. A number z times 2 minus 6 is the same as m divided by 3.
2. The cube of a decreased by the square of b is equal to c.
3. Twenty-nine decreased by the product of x and y is the same as z.
4. The perimeter P of an isosceles triangle is the sum of twice the length of the leg a and the length of the base b.
5. Thirty increased by the quotient of s and t is equal to v.
6. The area A of a rhombus is half the product of lengths of the diagonals a and b.

Translate each equation into a verbal sentence.

7. $0.5x + 3 = -10$
8. $\frac{n}{-6} = 2n + 1$
9. $18 - 5h = 13h$
10. $n^2 = 16$
11. $2x^2 + 3 = 21$
12. $\frac{m}{n} + 4 = 12$

Lesson 3-2

(pages 128–134)

Solve each equation. Then check your solution.

1. $-2 + g = 7$
2. $9 + s = -5$
3. $-4 + y = -9$
4. $m + 6 = 2$
5. $t + (-4) = 10$
6. $v - 7 = -4$
7. $a - (-6) = -5$
8. $-2 - x = -8$
9. $d + (-44) = -61$
10. $e - (-26) = 41$
11. $p - 47 = 22$
12. $-63 - f = -82$
13. $c + 5.4 = -11.33$
14. $-6.11 + b = 14.321$
15. $-5 = y - 22.7$
16. $-5 - q = 1.19$
17. $n + (-4.361) = 59.78$
18. $t - (-46.1) = -3.673$
19. $\frac{7}{10} - a = \frac{1}{2}$
20. $f - \left(-\frac{1}{8}\right) = \frac{3}{10}$
21. $-4\frac{5}{12} = t - \left(-10\frac{1}{36}\right)$
22. $x + \frac{3}{8} = \frac{1}{4}$
23. $1\frac{7}{16} + s = \frac{9}{8}$
24. $17\frac{8}{9} = d + \left(-2\frac{5}{6}\right)$

Lesson 3-3

(pages 135–140)

Solve each equation. Then check your solution.

1. $7p = 35$
2. $-3x = -24$
3. $2y = -3$
4. $62y = -2356$
5. $\frac{a}{-6} = -2$
6. $\frac{c}{-59} = -7$
7. $\frac{f}{14} = -63$
8. $84 = \frac{x}{97}$
9. $\frac{w}{5} = 3$
10. $\frac{q}{9} = -3$
11. $\frac{2}{5}x = \frac{4}{7}$
12. $\frac{z}{6} = -\frac{5}{12}$
13. $-\frac{5}{9}r = 7\frac{1}{2}$
14. $2\frac{1}{6}j = 5\frac{1}{5}$
15. $3 = 1\frac{7}{11}q$
16. $-1\frac{3}{4}p = -\frac{5}{8}$
17. $57k = 0.1824$
18. $0.0022b = 0.1958$
19. $5j = -32.15$
20. $\frac{w}{-2} = -2.48$
21. $\frac{z}{2.8} = -6.2$
22. $\frac{x}{-0.063} = 0.015$
23. $15\frac{3}{8} = -5p$
24. $-18\frac{1}{4} = 2.5x$

Lesson 3-4

(pages 142–148)

Solve each equation. Then check your solution.

1. $2x - 5 = 3$
2. $4t + 5 = 37$
3. $7a + 6 = -36$
4. $47 = -8g + 7$
5. $-3c - 9 = -24$
6. $5k - 7 = -52$
7. $5s + 4s = -72$
8. $3x - 7 = 2$
9. $8 + 3x = 5$
10. $-3y + 7.569 = 24.069$
11. $7 - 9.1f = 137.585$
12. $6.5 = 2.4m - 4.9$
13. $\frac{e}{5} + 6 = -2$
14. $\frac{d}{4} - 8 = -5$
15. $-\frac{4}{13}y - 7 = 6$
16. $\frac{p + 3}{10} = 4$
17. $\frac{h - 7}{6} = 1$
18. $\frac{5f + 1}{8} = -3$
19. $\frac{4n - 8}{-2} = 12$
20. $\frac{-3t - 4}{2} = 8$
21. $4.8a - 3 + 1.2a = 9$

Lesson 3-5

(pages 149–154)

Solve each equation. Then check your solution.

1. $5x + 1 = 3x - 3$
2. $6 - 8n = 5n + 19$
3. $-3z + 5 = 2z + 5$
4. $\frac{2}{3}h + 5 = -4 - \frac{1}{3}h$
5. $\frac{1}{2}a - 4 = 3 - \frac{1}{4}a$
6. $6(y - 5) = 18 - 2y$
7. $-28 + p = 7(p - 10)$
8. $\frac{1}{3}(b - 9) = b + 9$
9. $-4x + 6 = 0.5(x + 30)$
10. $4(2y - 1) = -8(0.5 - y)$
11. $1.9s + 6 = 3.1 - s$
12. $2.85y - 7 = 12.85y - 2$
13. $2.9m + 1.7 = 3.5 + 2.3m$
14. $3(x + 1) - 5 = 3x - 2$
15. $\frac{x}{2} - \frac{1}{3} = \frac{x}{3} - \frac{1}{2}$
16. $\frac{6v - 9}{3} = v$
17. $\frac{3t + 1}{4} = \frac{3}{4}t - 5$
18. $0.4(x - 12) = 1.2(x - 4)$
19. $3y - \frac{4}{5} = \frac{1}{3}y$
20. $\frac{3}{4}x - 4 = 7 + \frac{1}{2}x$
21. $-0.2(1 - x) = 2(4 + 0.1x)$

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Lesson 3-6

(pages 155–159)

Solve each proportion.

1. $\frac{4}{5} = \frac{x}{20}$
2. $\frac{b}{63} = \frac{3}{7}$
3. $\frac{y}{5} = \frac{3}{4}$
4. $\frac{7}{4} = \frac{3}{a}$
5. $\frac{t-5}{4} = \frac{3}{2}$
6. $\frac{x}{9} = \frac{0.24}{3}$
7. $\frac{n}{3} = \frac{n+4}{7}$
8. $\frac{12q}{-7} = \frac{30}{14}$
9. $\frac{1}{y-3} = \frac{3}{y-5}$
10. $\frac{x}{8.71} = \frac{4}{17.42}$
11. $\frac{a-3}{8} = \frac{3}{4}$
12. $\frac{6p-2}{7} = \frac{5p+7}{8}$
13. $\frac{2}{9} = \frac{k+3}{2}$
14. $\frac{5m-3}{4} = \frac{5m+3}{6}$
15. $\frac{w-5}{4} = \frac{w+3}{3}$
16. $\frac{96.8}{t} = \frac{12.1}{7}$
17. $\frac{r-1}{r+1} = \frac{3}{5}$
18. $\frac{4n+5}{5} = \frac{2n+7}{7}$

Lesson 3-7

(pages 160–164)

State whether each percent of change is a percent of increase or a percent of decrease. Then find each percent of change. Round to the nearest whole percent.

1. original: \$100
   new: \$67
2. original: 62 acres
   new: 98 acres
3. original: 322 people
   new: 289 people
4. original: 78 pennies
   new: 36 pennies
5. original: \$212
   new: \$230
6. original: 35 mph
   new: 65 mph

Find the final price of each item.

7. television: \$299
   discount: 20%
8. book: \$15.95
   sales tax: 7%
9. software: \$36.90
   sales tax: 6.25%
10. boots: \$49.99
    discount: 15%
    sales tax: 3.5%
11. jacket: \$65
    discount: 30%
    sales tax: 4%
12. backpack: \$28.95
    discount: 10%
    sales tax: 5%

Lesson 3-8

(pages 166–170)

Solve each equation or formula for x.

1. $x + r = q$
2. $ax + 4 = 7$
3. $2bx - b = -5$
4. $\frac{x-c}{c+a} = a$
5. $\frac{x+y}{c} = d$
6. $\frac{ax+1}{2} = b$
7. $d(x-3) = 5$
8. $nx - a = bx + d$
9. $3x - r = r(-3 + x)$
10. $y = \frac{5}{9}(x - 32)$
11. $A = \frac{1}{2}h(x + y)$
12. $A = 2\pi r^2 + 2\pi rx$

Lesson 3-9

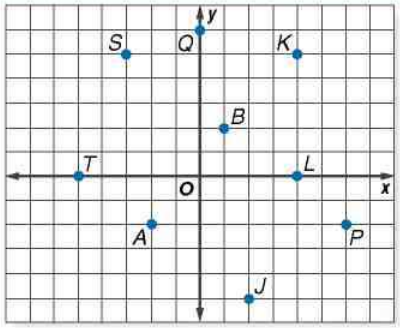
(pages 171–177)

1. **ADVERTISING** An advertisement for grape drink claims that the drink contains 10% grape juice. How much pure grape juice would have to be added to 5 quarts of the drink to obtain a mixture containing 40% grape juice?
2. **GRADES** In Ms. Pham's social studies class, a test is worth four times as much as homework. If a student has an average of 85% on tests and 95% on homework, what is the student's average?
3. **ENTERTAINMENT** At the Golden Oldies Theater, tickets for adults cost \$5.50 and tickets for children cost \$3.50. How many of each kind of ticket were purchased if 21 tickets were bought for \$83.50?
4. **FOOD** Wes is mixing peanuts and chocolate pieces. Peanuts sell for \$4.50 a pound and the chocolate sells for \$6.50 a pound. How many pounds of chocolate mixes with 5 pounds of peanuts to obtain a mixture that sells for \$5.25 a pound?
5. **TRAVEL** Missoula and Bozeman are 210 miles apart. Sheila leaves Missoula for Bozeman and averages 55 miles per hour. At the same time, Casey leaves Bozeman and averages 65 miles per hour as he drives to Missoula. When will they meet? How far will they be from Bozeman?

Lesson 4-1

(pages 192–196)

Write the ordered pair for each point shown at the right. Name the quadrant in which the point is located.



1. B
2. T
3. P
4. Q
5. A
6. K
7. J
8. L
9. S

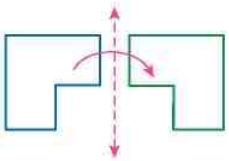
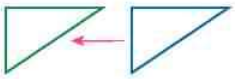
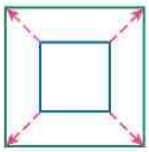
Plot each point on a coordinate plane.

10. $A(2, -3)$
11. $B(3, 6)$
12. $C(-4, 0)$
13. $D(-4, 3)$
14. $E(-5, -5)$
15. $F(-1, 1)$
16. $G(0, -2)$
17. $H(2, 3)$
18. $J(0, 3)$

Lesson 4-2

(pages 197–203)

Determine whether each transformation is a *reflection*, *translation*, *dilation*, or *rotation*.

1. 
2. 
3. 

For Exercises 4–9, complete parts a and b.

a. Find the coordinates of the vertices of each figure after the given transformation is performed.

b. Graph the preimage and its image.

4. quadrilateral $ABCD$ with $A(2, 2)$, $B(-3, 5)$, $C(-4, 0)$, and $D(2, -2)$ translated 1 unit up and 2 units right
5. square $SQUA$ with $S(1, 1)$, $Q(4, 1)$, $U(4, 4)$, and $A(1, 4)$ reflected over the y-axis
6. $\triangle RED$ with $R(2, 1)$, $E(-3, -1)$, and $D(2, -4)$ dilated by a scale factor of 2
7. pentagon $BLACK$ with $B(-3, -5)$, $L(4, -5)$, $A(4, 1)$, $C(0, 4)$, and $K(-4, 1)$ reflected over the x-axis
8. $\triangle ANG$ with $A(2, 1)$, $N(4, 1)$, and $G(3, 4)$ rotated 90° counterclockwise about the origin
9. parallelogram $GRAM$ with $G(-3, -2)$, $R(4, -2)$, $A(6, 4)$, and $M(-1, 4)$ translated 2 units down and 1 unit left

CONTENTS

Lesson 4-3

(pages 205–211)

Express each relation as a table, a graph, and a mapping. Then determine the domain and range.

1. $\{(5, 2), (0, 0), (-9, -1)\}$
2. $\{(-4, 2), (-2, 0), (0, 2), (2, 4)\}$
3. $\{(7, 5), (-2, -3), (4, 0), (5, -7), (-9, 2)\}$
4. $\{(3.1, -1), (-4.7, 3.9), (2.4, -3.6), (-9, 12.12)\}$

Express the relation shown in each table, mapping, or graph as a set of ordered pairs. Then write the inverse of the relation.

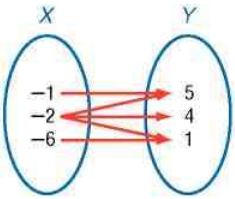
5.

x	y
1	3
2	4
3	5
4	6
5	7

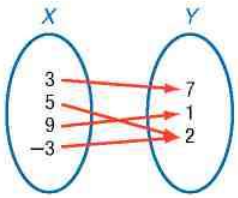
6.

x	y
−4	1
−2	3
0	1
2	3
4	1

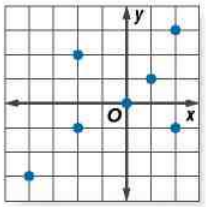
7.



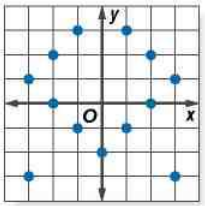
8.



9.



10.



Lesson 4-4

(pages 212–217)

Find the solution set for each equation, given the replacement set.

1. $y = 3x - 1$; $\{(0, -1), (4, 2), (2, 4), (2, 5)\}$
2. $3y = x + 7$; $\{(1, 8), (0, 7), (2, 3), (5, 4)\}$
3. $4x = 8 - 2y$; $\{(2, 0), (0, 4), (0, 2), (-4, 12)\}$
4. $3x = 10 - 4y$; $\{(3, 0.25), (-10, 5), (2, 1), (5, 5)\}$

Solve each equation if the domain is $\{-2, -1, 0, 1, 2\}$.

5. $x + y = 3$
6. $y = x$
7. $y = 5x + 1$
8. $4x + 3y = 13$
9. $5y = 8 - 4x$
10. $2x + y = 4$
11. $y = 4 + x$
12. $2x + 3y = 10$
13. $2y = 3x + 1$

Solve each equation for the given domain. Graph the solution set.

14. $x = y + 1$ for $x = \{-2, -1, 0, 1, 2\}$
15. $y = x + 1$ for $x = \{-3, -1, 0, 1, 3\}$
16. $x + 4y = 2$ for $x = \{-8, -4, 0, 4, 8\}$
17. $y - 3 = x$ for $x = \{-5, -1, 3, 7, 9\}$
18. $x + y = -2$ for $x = \{-4, -3, 0, 1, 3\}$
19. $2x - 3y = -5$ for $x = \{-5, -3, 0, 5, 6\}$
20. $3y = \frac{2}{3}x - 4$ for $x = \{-6, -3, 0, 1, 3\}$
21. $-2y = 8 - \frac{3}{2}x$ for $x = \{-4, 0, 4, 6, 8\}$

Lesson 4-5

(pages 218–223)

Determine whether each equation is a linear equation. If so, write the equation in standard form.

1. $3x = 2y$
2. $2x - 3 = y^2$
3. $4x = 2y + 8$
4. $5x - 7y = 2x - 7$
5. $2x + 5x = 7y + 2$
6. $\frac{1}{x} + \frac{5}{y} = -4$

Graph each equation.

7. $3x + y = 4$
8. $y = 3x + 1$
9. $3x - 2y = 12$
10. $2x - y = 6$
11. $2x - 3y = 8$
12. $y = -2$
13. $y = 5x - 7$
14. $x = 4$
15. $x + \frac{1}{3}y = 2$
16. $5x - 2y = 8$
17. $4.5x + 2.5y = 9$
18. $\frac{1}{2}x + 3y = 12$

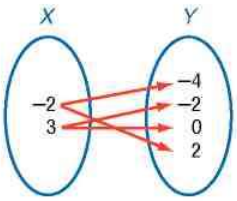
Lesson 4-6 (pages 226–231)

Determine whether each relation is a function.

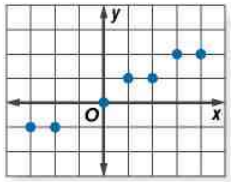
1.

x	y
1	3
2	5
1	−7
2	9

2.



3.



4. {(−2, 4), (1, 3), (5, 2), (1, 4)}
5. {(5, 4), (−6, 5), (4, 5), (0, 4)}
6. {(3, 1), (5, 1), (7, 1)}
7. {(3, −2), (4, 7), (−2, 7), (4, 5)}
8. $y = 2$
9. $x^2 + y = 11$

If $f(x) = 2x + 5$ and $g(x) = 3x^2 - 1$, find each value.

10. $f(-4)$
11. $g(2)$
12. $f(3) - 5$
13. $g(-2) + 4$
14. $f(b^2)$
15. $g(a + 1)$
16. $f(0) + g(3)$
17. $f(n) + g(n)$

Lesson 4-7 (pages 233–238)

Determine whether each sequence is an arithmetic sequence. If it is, state the common difference.

1. −2, −1, 0, 1, …
2. 3, 5, 8, 12, …
3. 2, 4, 8, 16, …
4. −21, −16, −11, −6, …
5. 0, 0.25, 0.5, 0.75, …
6. $\frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \frac{1}{81}, \ldots$

Find the next three terms of each arithmetic sequence.

7. 3, 13, 23, 33, …
8. −4, −6, −8, −10, …
9. −2, −1.4, −0.8, −0.2, …
10. 5, 13, 21, 29, …
11. $\frac{3}{4}, \frac{7}{8}, 1, \frac{9}{8}, \ldots$
12. $-\frac{1}{3}, -\frac{5}{6}, -\frac{4}{3}, -\frac{11}{6}, \ldots$

Find the nth term of each arithmetic sequence described.

13. $a_1 = 3, d = 6, n = 12$
14. $a_1 = -2, d = 4, n = 8$
15. $a_1 = -1, d = -3, n = 10$
16. $a_1 = 2.2, d = 1.4, n = 5$
17. −2, −7, −12, … for $n = 12$
18. $2\frac{1}{2}, 2\frac{1}{8}, 1\frac{3}{4}, 1\frac{3}{8}, \ldots$ for $n = 10$

Write an equation for the nth term of the arithmetic sequence. Then graph the first five terms in the sequence.

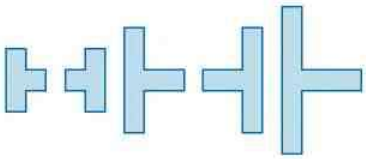
19. −3, 1, 5, 9, …
20. 25, 40, 55, 70, …
21. −9, −3, 3, 9, …
22. −3.5, −2, −0.5, 1, …

Lesson 4-8 (pages 240–245)

Find the next two items for each pattern.

1.

2.

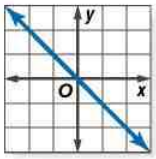


Find the next three terms in each sequence.

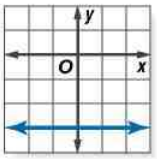
3. 12, 23, 34, 45, …
4. 39, 33, 27, 21, …
5. 6.0, 7.2, 8.4, 9.6, …
6. 86, 81.5, 77, 72.5, …
7. 4, 8, 16, 32, …
8. 3125, 625, 125, 25, …
9. 15, 16, 18, 21, 25, 30, …
10. $w - 2, w - 4, w - 6, w - 8, \ldots$
11. 13, 10, 11, 8, 9, 6, …

Write an equation in function notation for each relation.

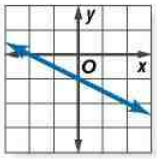
12.



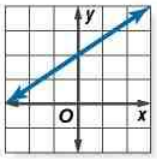
13.



14.



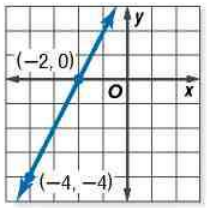
15.

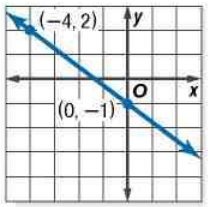


CONTENTS

Lesson 5-1 *(pages 256–262)*

Find the slope of the line that passes through each pair of points.

1. 

2. 

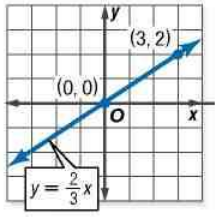
3. $(-2, 2), (3, -3)$
4. $(-2, -8), (1, 4)$
5. $(3, 4), (4, 6)$
6. $(-5, 4), (-1, 11)$
7. $(18, -4), (6, -10)$
8. $(-4, -6), (-4, -8)$
9. $(0, 0), (-1, 3)$
10. $(-8, 1), (2, 1)$

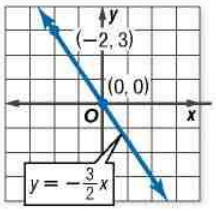
Find the value of r so the line that passes through each pair of points has the given slope.

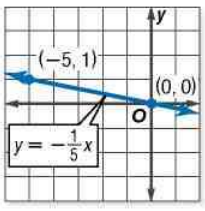
11. $(-1, r), (1, -4), m = -5$
12. $(r, -2), (-7, -1), m = -\frac{1}{4}$
13. $(-3, 2), (7, r), m = \frac{2}{3}$

Lesson 5-2 *(pages 264–270)*

Name the constant of variation for each equation. Then determine the slope of the line that passes through each pair of points.

1. 

2. 

3. 

Graph each equation.

4. $y = 5x$
5. $y = -6x$
6. $y = -\frac{4}{3}x$

Write a direct variation equation that relates x and y. Assume that y varies directly as x. Then solve.

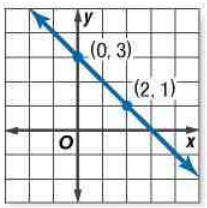
7. If $y = 45$ when $x = 9$, find y when $x = 7$.
8. If $y = -7$ when $x = -1$, find x when $y = -84$.
9. If $y = 450$ when $x = -6$, find y when $x = 10$.
10. If $y = 6$ when $x = 48$, find y when $x = 20$.

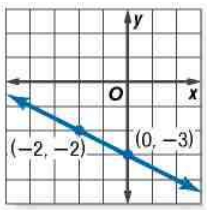
Lesson 5-3 *(pages 272–277)*

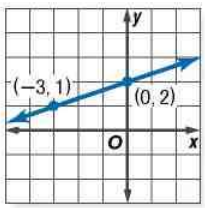
Write an equation of the line with the given slope and y-intercept.

1. slope: 5, y-intercept: -15
2. slope: -6, y-intercept: 3
3. slope: 0.3, y-intercept: -2.6
4. slope: $-\frac{4}{3}$, y-intercept: $\frac{5}{3}$
5. slope: $-\frac{2}{5}$, y-intercept: 2
6. slope: $\frac{7}{4}$, y-intercept: -2

Write an equation of the line shown in each graph.

7. 

8. 

9. 

Graph each equation.

10. $y = 5x - 1$
11. $y = -2x + 3$
12. $3x - y = 6$

Lesson 5-4

(pages 280–285)

Write an equation of the line that passes through each point with the given slope.

1. $(0, 0)$; $m = -2$
2. $(-3, 2)$; $m = 4$
3. $(0, 5)$; $m = -1$
4. $(-2, 3)$; $m = -\frac{1}{4}$
5. $(1, -5)$; $m = \frac{2}{3}$
6. $\left(\frac{1}{2}, \frac{1}{4}\right)$; $m = 8$

Write an equation of the line that passes through each pair of points.

7. $(-1, 7), (8, -2)$
8. $(4, 0), (0, 5)$
9. $(8, -1), (7, -1)$
10. $(1, 0), (0, 1)$
11. $(5, 7), (-1, 3)$
12. $(-3, -5), (3, -15)$
13. $(-2, 3), (1, 3)$
14. $(0, 0), (-4, 3)$
15. $\left(-\frac{1}{2}, \frac{1}{2}\right), \left(\frac{1}{4}, \frac{3}{4}\right)$

Write an equation of the line that has each pair of intercepts.

16. x-intercept: 2, y-intercept: 1
17. x-intercept: 1, y-intercept: -4
18. x-intercept: 5, y-intercept: 5
19. x-intercept: -1, y-intercept: 3
20. x-intercept: -4, y-intercept: -1
21. x-intercept: 3, y-intercept: -3

Lesson 5-5

(pages 286–291)

Write the point-slope form of an equation for a line that passes through each point with the given slope.

1. $(5, -2)$, $m = 3$
2. $(5, 4)$, $m = -5$
3. $(0, 6)$, $m = -2$
4. $(-3, 1)$, $m = 0$
5. $(-1, 0)$, $m = \frac{2}{3}$
6. $(-2, -4)$, $m = \frac{3}{4}$

Write each equation in standard form.

7. $y + 3 = 2(x - 4)$
8. $y + 3 = -\frac{1}{2}(x + 6)$
9. $y - 4 = -\frac{2}{3}(x - 5)$
10. $y + 2 = \frac{4}{3}(x - 6)$
11. $y - 1 = 1.5(x + 3)$
12. $y + 6 = -3.8(x - 2)$

Write each equation in slope-intercept form.

13. $y - 1 = -2(x + 5)$
14. $y + 3 = 4(x - 1)$
15. $y - 6 = -4(x - 2)$
16. $y + 1 = \frac{4}{5}(x + 5)$
17. $y - 2 = -\frac{3}{4}(x - 2)$
18. $y + \frac{1}{4} = \frac{2}{3}\left(x + \frac{1}{2}\right)$

Lesson 5-6

(pages 292–297)

Write the slope-intercept form of an equation of the line that passes through the given point and is parallel to the graph of each equation.

1. $(1, 6)$, $y = 4x - 2$
2. $(4, 6)$, $y = 2x - 7$
3. $(-3, 0)$, $y = \frac{2}{3}x + 1$
4. $(5, -2)$, $y = -3x - 7$
5. $(0, 4)$, $3x + 8y = 4$
6. $(2, 3)$, $x - 5y = 7$

Write the slope-intercept form of an equation that passes through the given point and is perpendicular to the graph of each equation.

7. $(0, -1)$, $y = -\frac{3}{5}x + 4$
8. $(-2, 3)$, $6x + y = 4$
9. $(0, 0)$, $y = \frac{3}{4}x - 1$
10. $(4, 0)$, $4x - 3y = 2$
11. $(6, 7)$, $3x - 5y = 1$
12. $(5, -1)$, $8x + 4y = 15$

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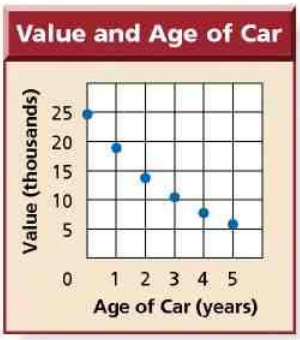
Lesson 5-7

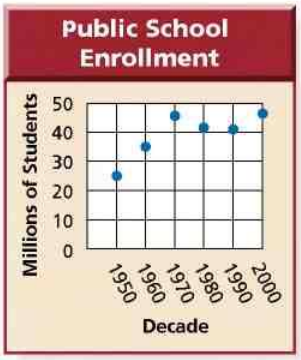
(pages 298–305)

Determine whether each graph shows a *positive correlation*, a *negative correlation*, or *no correlation*. If there is a positive or negative correlation, describe its meaning in the situation.

1.



2.

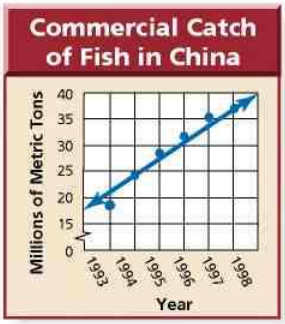


3.

Source: *ESPN Almanac*

For Exercises 4–6, use the scatter plot that shows the year and the amount of fish caught in China in millions of metric tons.

4. Describe the relationship that exists in the data.
5. Use the points (1994, 24) and (1998, 38) to write the slope-intercept form of an equation for the line of fit shown in the scatter plot.
6. Predict the amount of fish that will be caught in China in 2005.



Source: *The World Almanac*

Lesson 6-1

(pages 318–323)

Solve each inequality. Then check your solution and graph it on a number line.

1. $c + 9 \leq 3$
2. $d - (-3) < 13$
3. $z - 4 > 20$
4. $h - (-7) > -2$
5. $-11 > d - 4$
6. $2x > x - 3$
7. $2x - 3 \geq x$
8. $16 + w < -20$
9. $14p > 5 + 13p$
10. $-7 < 16 - z$
11. $1.1v - 1 > 2.1v - 3$
12. $\frac{1}{2}t + \frac{1}{4} \geq \frac{3}{2}t - \frac{2}{3}$
13. $9x < 8x - 2$
14. $-2 + 9n \leq 10n$
15. $a - 2.3 \geq -7.8$
16. $5z - 6 > 4z$

Define a variable, write an inequality, and solve each problem.

17. The sum of a number and negative six is greater than 9.
18. Negative five times a number is less than the sum of negative six times the number and 12.

Lesson 6-2

(pages 325–331)

Solve each inequality. Then check your solution.

1. $7b \geq -49$
2. $-5j < -60$
3. $\frac{w}{3} > -12$
4. $\frac{p}{5} < 8$
5. $-8f < 48$
6. $-0.25t \geq -10$
7. $\frac{g}{-8} < 4$
8. $-4.3x < -2.58$
9. $4c \geq -6$
10. $6 \leq 0.8n$
11. $\frac{2}{3}m \geq -22$
12. $-25 > -0.05a$
13. $-15a < -28$
14. $-\frac{7}{9}x < 42$
15. $0.375y \leq 32$
16. $-7y \geq 91$

Define a variable, write an inequality, and solve each problem.

17. Negative one times a number is greater than -7.
18. Three fifths of a number is at least negative 10.
19. Seventy-five percent of a number is at most 100.

Lesson 6-3

(pages 332–337)

Solve each inequality. Then check your solution.

1. $3y - 4 > -37$
2. $7s - 12 < 13$
3. $-5e + 9 > 24$
4. $-6v - 3 \geq -33$
5. $-2k + 12 < 30$
6. $-2x + 1 < 16 - x$
7. $15t - 4 > 11t - 16$
8. $13 - y \leq 29 + 2y$
9. $5q + 7 \leq 3(q + 1)$
10. $2(w + 4) \geq 7(w - 1)$
11. $-4t - 5 > 2t + 13$
12. $\frac{2t + 5}{3} < -9$
13. $\frac{z}{4} + 7 \geq -5$
14. $13r - 11 > 7r + 37$
15. $8c - (c - 5) > c + 17$
16. $-5(k + 4) \geq 3(k - 4)$
17. $9m + 7 < 2(4m - 1)$
18. $3(3y + 1) < 13y - 8$
19. $5x \leq 10(3x + 4)$
20. $3\left(a + \frac{2}{3}\right) \geq a - 1$

Lesson 6-4

(pages 339–344)

Solve each compound inequality. Then graph the solution set.

1. $2 + x < -5$ or $2 + x > 5$
2. $-4 + t > -5$ or $-4 + t < 7$
3. $3 \leq 2g + 7$ and $2g + 7 \leq 15$
4. $2v - 2 \leq 3v$ and $4v - 1 \geq 3v$
5. $3b - 4 \leq 7b + 12$ and $8b - 7 \leq 25$
6. $-9 < 2z + 7 < 10$
7. $5m - 8 \geq 10 - m$ or $5m + 11 < -9$
8. $12c - 4 \leq 5c + 10$ or $-4c - 1 \leq c + 24$
9. $2h - 2 \leq 3h \leq 4h - 1$
10. $3p + 6 < 8 - p$ and $5p + 8 \geq p + 6$
11. $2r + 8 > 16 - 2r$ and $7r + 21 < r - 9$
12. $-4j + 3 < j + 22$ and $j - 3 < 2j - 15$
13. $2(q - 4) \leq 3(q + 2)$ or $q - 8 \leq 4 - q$
14. $\frac{1}{2}w + 5 \geq w + 2 \geq \frac{1}{2}w + 9$
15. $n - (6 - n) > 10$ or $-3n - 1 > 20$
16. $-(2x + 5) \leq x + 5 \leq 2x - 9$

Lesson 6-5

(pages 345–351)

Solve each open sentence. Then graph the solution set.

1. $|y - 9| < 19$
2. $|g + 6| > 8$
3. $|t - 5| \leq 3$
4. $|a + 5| \geq 0$
5. $|14 - 2z| = 16$
6. $|a - 5| = -3$
7. $|2m - 5| > 13$
8. $|14 - w| \geq 20$
9. $|13 - 5y| = 8$
10. $|3p + 5| \leq 23$
11. $|6b - 12| \leq 36$
12. $|25 - 3x| < 5$
13. $|7 + 8x| > 39$
14. $|4c + 5| \geq 25$
15. $|4 - 5s| > 46$
16. $|4 - (1 - x)| \geq 10$
17. $\left|\frac{2n - 1}{3}\right| = 10$
18. $\left|\frac{7 - 2b}{2}\right| \leq 3$
19. $|-2 + (x - 3)| \leq 7$
20. $|-3 - (2b - 6)| \geq 10$

CONTENTS

Lesson 6-6

(pages 352–357)

Determine which ordered pairs are part of the solution set for each inequality.

1. $x + y \geq 0$, $\{(0, 0), (1, -3), (2, 2), (3, -3)\}$
2. $2x + y \leq 8$, $\{(0, 0), (-1, -1), (3, -2), (8, 0)\}$
3. $y > x$, $\{(0, 0), (2, 0), (-3, 4), (2, -1)\}$
4. $3x - 2y < 1$, $\{(0, 0), (3, 2), (-4, -5), (0, 6)\}$

Graph each inequality.

5. $y \leq -2$
6. $x < 4$
7. $x + y < -2$
8. $x + y \geq -4$
9. $y > 4x - 1$
10. $3x + y > 1$
11. $3y - 2x \leq 2$
12. $x < y$
13. $3x + y \leq 4$
14. $5x - y < 5$
15. $-2x + 6y \geq 12$
16. $-x + 3y \leq 9$
17. $y > -3x + 7$
18. $3x + 8y \leq 4$
19. $5x - 2y \geq 6$

Lesson 7-1

(pages 369–374)

Graph each system of equations. Then determine whether the system has *no* solution, *one* solution, or *infinitely many* solutions. If the system has one solution, name it.

1. $y = 3x$
   $4x + 2y = 30$
2. $x = -2y$
   $x + y = 1$
3. $y = x + 4$
   $3x + 2y = 18$
4. $x + y = 6$
   $x - y = 2$
5. $x + y = 6$
   $3x + 3y = 3$
6. $y = -3x$
   $4x + y = 2$
7. $2x + y = 8$
   $x - y = 4$
8. $\frac{1}{5}x - y = \frac{12}{5}$
   $3x - 5y = 6$
9. $x + 2y = 0$
   $y + 3 = -x$
10. $x + 2y = -9$
    $x - y = 6$
11. $x + \frac{1}{2}y = 3$
    $y = 3x - 4$
12. $\frac{2}{3}x + \frac{1}{2}y = 2$
    $4x + 3y = 12$
13. $y = x - 4$
    $x + \frac{1}{2}y = \frac{5}{2}$
14. $2x + y = 3$
    $4x + 2y = 6$
15. $12x - y = -21$
    $\frac{1}{2}x + \frac{2}{3}y = -3$

Lesson 7-2

(pages 376–381)

Use substitution to solve each system of equations. If the system does *not* have exactly one solution, state whether it has *no* solutions or *infinitely many* solutions.

1. $y = x$
   $5x = 12y$
2. $y = 7 - x$
   $2x - y = 8$
3. $x = 5 - y$
   $3y = 3x + 1$
4. $3x + y = 6$
   $y + 2 = x$
5. $x - 3y = 3$
   $2x + 9y = 11$
6. $3x = -18 + 2y$
   $x + 3y = 4$
7. $x + 2y = 10$
   $-x + y = 2$
8. $2x = 3 - y$
   $2y = 12 - x$
9. $6y - x = -36$
   $y = -3x$
10. $\frac{3}{4}x + \frac{1}{3}y = 1$
    $x - y = 10$
11. $x + 6y = 1$
    $3x - 10y = 31$
12. $3x - 2y = 12$
    $\frac{3}{2}x - y = 3$
13. $2x + 3y = 5$
    $4x - 9y = 9$
14. $x = 4 - 8y$
    $3x + 24y = 12$
15. $3x - 2y = -3$
    $25x + 10y = 215$

Lesson 7-3

(pages 382–386)

Use elimination to solve each system of equations.

1. $x + y = 7$
   $x - y = 9$
2. $2x - y = 32$
   $2x + y = 60$
3. $-y + x = 6$
   $y + x = 5$
4. $s + 2t = 6$
   $3s - 2t = 2$
5. $x = y - 7$
   $2x - 5y = -2$
6. $3x + 5y = -16$
   $3x - 2y = -2$
7. $x - y = 3$
   $x + y = 3$
8. $x + y = 8$
   $2x - y = 6$
9. $2s - 3t = -4$
   $s = 7 - 3t$
10. $-6x + 16y = -8$
    $6x - 42 = 16y$
11. $3x + 0.2y = 7$
    $3x = 0.4y + 4$
12. $9x + 2y = 26$
    $1.5x - 2y = 13$
13. $x = y$
    $x + y = 7$
14. $4x - \frac{1}{3}y = 8$
    $5x + \frac{1}{3}y = 6$
15. $2x - y = 3$
    $\frac{2}{3}x - y = -1$

Lesson 7-4

(pages 387–392)

Use elimination to solve each system of equations.

1. $-3x + 2y = 10$
   $-2x - y = -5$
2. $2x + 5y = 13$
   $4x - 3y = -13$
3. $5x + 3y = 4$
   $-4x + 5y = -18$
4. $\frac{1}{3}x - y = -1$
   $\frac{1}{5}x - \frac{2}{5}y = -1$
5. $3x - 5y = 8$
   $4x - 7y = 10$
6. $x - 0.5y = 1$
   $0.4x + y = -2$
7. $x + 8y = 3$
   $4x - 2y = 7$
8. $4x - y = 4$
   $x + 2y = 3$
9. $3y - 8x = 9$
   $y - x = 2$
10. $x + 4y = 30$
    $2x - y = -6$
11. $3x - 2y = 0$
    $4x + 4y = 5$
12. $9x - 3y = 5$
    $x + y = 1$
13. $2x - 7y = 9$
    $-3x + 4y = 6$
14. $2x - 6y = -16$
    $5x + 7y = -18$
15. $6x - 3y = -9$
    $-8x + 2y = 4$

Lesson 7-5

(pages 394–398)

Solve each system of inequalities by graphing.

1. $x > 3$
   $y < 6$
2. $y > 2$
   $y > -x + 2$
3. $x \leq 2$
   $y + 3 \geq 5$
4. $x + y \leq -1$
   $2x + y \leq 2$
5. $y \geq 2x + 2$
   $y \geq -x - 1$
6. $y \leq x + 3$
   $y \geq x + 2$
7. $x + 3y \geq 4$
   $2x - y < 5$
8. $y - x > 1$
   $y + 2x \leq 10$
9. $5x - 2y > 15$
   $2x - 3y < 6$
10. $4x + 3y > 4$
    $2x - y < 0$
11. $4x + 5y \geq 20$
    $y \geq x + 1$
12. $-4x + 10y \leq 5$
    $-2x + 5y < -1$
13. $y - x \geq 0$
    $y \leq 3$
    $x \geq 0$
14. $y > 2x$
    $x > -3$
    $y < 4$
15. $y \leq x$
    $x + y < 4$
    $y \geq -3$

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Lesson 8-1

(pages 410–415)

Determine whether each expression is a monomial. Write *yes* or *no*. Explain your reasoning.

1. $n^2 - 3$
2. 53
3. $9a^2b^3$
4. $15 - x^2y$

Simplify.

5. $a^5(a)(a^7)$
6. $(r^3t^4)(r^4t^4)$
7. $(x^3y^4)(xy^3)$
8. $(bc^3)(b^4c^3)$
9. $(-3mn^2)(5m^3n^2)$
10. $[(3^3)^2]^2$
11. $(3s^3t^2)(-4s^3t^2)$
12. $x^3(x^4y^3)$
13. $(1.1g^2h^4)^3$
14. $-\frac{3}{4}a(a^2b^3c^4)$
15. $\left(\frac{1}{2}w^3\right)^2(w^4)^2$
16. $[(-2^3)^3]^2$
17. $\left(\frac{2}{3}y^3\right)(3y^2)^3$
18. $(10s^3t)(-2s^2t^2)^3$
19. $(-0.2u^3w^4)^3$

Lesson 8-2

(pages 417–423)

Simplify. Assume that no denominator is equal to zero.

1. $\frac{6^{10}}{6^7}$
2. $\frac{b^6c^5}{b^3c^2}$
3. $\frac{(-a)^4b^8}{a^4b^7}$
4. $\frac{(-x)^3y^3}{x^3y^6}$
5. $\frac{12ab^5}{4a^4b^3}$
6. $\frac{24x^5}{-8x^2}$
7. $\frac{-9h^2k^4}{18h^5j^3k^4}$
8. $\left(\frac{2a^2b^4}{3a^3b}\right)^2$
9. $\frac{9a^2b^7c^3}{2a^5b^4c^5}$
10. $\frac{-15xy^{-5}z^7}{-10x^{-4}y^6z^{-4}}$
11. 3^{-4}
12. $\left(\frac{5}{6}\right)^{-2}$
13. $a^5b^0a^{-7}$
14. $\frac{(-u^{-3}v^3)^2}{(u^3v)^{-3}}$
15. $\left(\frac{a^3}{b^2}\right)^{-3}$
16. $\left(\frac{2x}{y^{-3}}\right)^{-2}$
17. $\frac{(-r)s^5}{r^{-3}s^{-4}}$
18. $\frac{28a^{-4}b^0}{14a^3b^{-1}}$
19. $\frac{(j^2k^3m)^4}{(jk^4)^{-1}}$
20. $\left(\frac{-2x^4y}{4y^2}\right)^0$
21. $\left(\frac{-18x^0a^{-3}}{-6x^{-2}a^{-3}}\right)$
22. $\left(\frac{2a^3b^{-2}}{2^{-1}a^{-5}b^3}\right)^{-1}$
23. $\left(\frac{5n^{-1}m^2}{2nm^{-2}}\right)^0$
24. $\frac{(3ab^2c)^{-3}}{(2a^2bc^2)^2}$

Lesson 8-3

(pages 425–430)

Express each number in standard notation.

1. 2.6×10^5
2. 4×10^{-3}
3. 6.72×10^3
4. 4.93×10^{-4}
5. 1.654×10^{-6}
6. 7.348×10^7

Express each number in scientific notation.

7. 6500
8. 953.56
9. 0.697
10. 843.5
11. 568,000
12. 0.0000269
13. 0.121212
14. 543×10^4
15. 739.9×10^{-5}
16. 6480×10^{-2}
17. 0.366×10^{-7}
18. 167×10^3

Evaluate. Express each result in scientific and standard notation.

19. $(2 \times 10^5)(3 \times 10^{-8})$
20. $\frac{4.8 \times 10^3}{1.6 \times 10^1}$
21. $(4 \times 10^2)(1.5 \times 10^6)$
22. $\frac{8.1 \times 10^2}{2.7 \times 10^{-3}}$
23. $\frac{7.8 \times 10^{-5}}{1.3 \times 10^{-7}}$
24. $(2.2 \times 10^{-2})(3.2 \times 10^5)$
25. $(3.1 \times 10^4)(4.2 \times 10^{-5})$
26. $(78 \times 10^6)(0.01 \times 10^5)$
27. $\frac{2.31 \times 10^{-2}}{3.3 \times 10^{-3}}$

Lesson 8-4

(pages 432–436)

State whether each expression is a polynomial. If the expression is a polynomial, identify it as a *monomial*, a *binomial*, or a *trinomial*.

1. $5x^2y + 3xy - 7$
2. 0
3. $\frac{5}{k} - k^2y$
4. $3a^2x - 5a$

Find the degree of each polynomial.

5. $a + 5c$
6. $14abcd - 6d^3$
7. $\frac{a^3}{4}$
8. 10
9. $-4h^5$
10. $\frac{x^2}{3} - \frac{x}{2} + \frac{1}{5}$
11. -6
12. $a^2b^3 - a^3b^2$

Arrange the terms of each polynomial so that the powers of x are in ascending order.

13. $2x^2 - 3x + 4x^3 - x^5$
14. $x^3 - x^2 + x - 1$
15. $2a + 3ax^2 - 4ax$
16. $-5bx^3 - 2bx + 4x^2 - b^3$
17. $x^8 + 2x^2 - x^6 + 1$
18. $cdx^2 - c^2d^2x + d^3$

Arrange the terms of each polynomial so that the powers of x are in descending order.

19. $5x^2 - 3x^3 + 7 + 2x$
20. $-6x + x^5 + 4x^3 - 20$
21. $5b + b^3x^2 + \frac{2}{3}bx$
22. $21p^2x + 3px^3 + p^4$
23. $3ax^2 - 6a^2x^3 + 7a^3 - 8x$
24. $\frac{1}{3}s^2x^3 + 4x^4 - \frac{2}{5}s^4x^2 + \frac{1}{4}x$

Lesson 8-5

(pages 439–443)

Find each sum or difference.

1. $(3a^2 + 5) + (4a^2 - 1)$
2. $(5x - 3) + (-2x + 1)$
3. $(6z + 2) - (9z + 3)$
4. $(-4n + 7) - (-7n - 8)$
5. $(-7t^2 + 4ts - 6s^2) + (-5t^2 - 12ts + 3s^2)$
6. $(6a^2 - 7ab - 4b^2) - (2a^2 + 5ab + 6b^2)$
7. $(4a^2 - 10b^2 + 7c^2) + (-5a^2 + 2c^2 + 2b)$
8. $(z^2 + 6z - 8) - (4z^2 - 7z - 5)$
9. $(4d + 3e - 8f) - (-3d + 10e - 5f + 6)$
10. $(7g + 8h - 9) + (-g - 3h - 6k)$
11. $(9x^2 - 11xy - 3y^2) - (x^2 - 16xy + 12y^2)$
12. $(-3m + 9mn - 5n) + (14m - 5mn - 2n)$
13. $(4x^2 - 8y^2 - 3z^2) - (7x^2 - 14z^2 - 12)$
14. $(17z^4 - 5z^2 + 3z) - (4z^4 + 2z^3 + 3z)$
15. $(6 - 7y + 3y^2) + (3 - 5y - 2y^2) + (-12 - 8y + y^2)$
16. $(-7c^2 - 2c - 5) + (9c - 6) + (16c^2 + 3) + (-9c^2 - 7c + 7)$

Lesson 8-6

(pages 444–449)

Find each product.

1. $-3(8x + 5)$
2. $3b(5b + 8)$
3. $1.1a(2a + 7)$
4. $\frac{1}{2}x(8x - 6)$
5. $7xy(5x^2 - y^2)$
6. $5y(y^2 - 3y + 6)$
7. $-ab(3b^2 + 4ab - 6a^2)$
8. $4m^2(9m^2n + mn - 5n^2)$
9. $4st^2(-4s^2t^3 + 7s^5 - 3st^3)$
10. $-\frac{1}{3}x(9x^2 + x - 5)$
11. $-2mn(8m^2 - 3mn + n^2)$
12. $-\frac{3}{4}ab^2\left(\frac{1}{3}b^2 - \frac{4}{9}b + 1\right)$

Simplify.

13. $-3a(2a - 12) + 5a$
14. $6(12b^2 - 2b) + 7(-2 - 3b)$
15. $x(x - 6) + x(x - 2) + 2x$
16. $11(n - 3) + 2(n^2 + 22n)$
17. $-2x(x + 3) + 3(x + 3)$
18. $4m(n - 1) - 5n(n + 1)$
19. $-7xy + x(7y - 3)$
20. $5(-c + 3a) - c(2c + 1)$
21. $-9n(1 - n) + 4(n^2 + n)$

Solve each equation.

22. $-6(11 - 2x) = 7(-2 - 2x)$
23. $11(n - 3) + 5 = 2n + 44$
24. $a(a - 6) + 2a = 3 + a(a - 2)$
25. $q(2q + 3) + 20 = 2q(q - 3)$
26. $w(w + 12) = w(w + 14) + 12$
27. $x(x - 3) + 4x - 3 = 8x + x(3 + x)$
28. $-3(x + 5) + x(x - 1) = x(x + 2) - 3$
29. $n(n - 5) + n(n + 2) = 2n(n - 1) + 1.5$

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Lesson 8-7 *(pages 452–457)*

Find each product.

1. $(d + 2)(d + 5)$
2. $(z + 7)(z - 4)$
3. $(m - 8)(m - 5)$
4. $(a + 2)(a - 19)$
5. $(c + 15)(c - 3)$
6. $(x + y)(x - 2y)$
7. $(2x - 5)(x + 6)$
8. $(7a - 4)(2a - 5)$
9. $(4x + y)(2x - 3y)$
10. $(7v + 3)(v + 4)$
11. $(7s - 8)(3s - 2)$
12. $(4g + 3h)(2g - 5h)$
13. $(4a + 3)(2a - 1)$
14. $(7y - 1)(2y - 3)$
15. $(2x + 3y)(4x + 2y)$
16. $(12r - 4s)(5r + 8s)$
17. $(-a + 1)(-3a - 2)$
18. $(2n - 4)(-3n - 2)$
19. $(x - 2)(x^2 + 2x + 4)$
20. $(3x + 5)(2x^2 - 5x + 11)$
21. $(4s + 5)(3s^2 + 8s - 9)$
22. $(3a + 5)(-8a^2 + 2a + 3)$
23. $(a - b)(a^2 + ab + b^2)$
24. $(c + d)(c^2 - cd + d^2)$
25. $(5x - 2)(-5x^2 + 2x + 7)$
26. $(-n + 2)(-2n^2 + n - 1)$
27. $(x^2 - 7x + 4)(2x^2 - 3x - 6)$
28. $(x^2 + x + 1)(x^2 - x - 1)$
29. $(a^2 + 2a + 5)(a^2 - 3a - 7)$
30. $(5x^4 - 2x^2 + 1)(x^2 - 5x + 3)$

Lesson 8-8 *(pages 458–463)*

Find each product.

1. $(t + 7)^2$
2. $(w - 12)(w + 12)$
3. $(q - 4h)^2$
4. $(10x + 11y)(10x - 11y)$
5. $(4e + 3)^2$
6. $(2b - 4d)(2b + 4d)$
7. $(a + 2b)^2$
8. $(3x + y)^2$
9. $(6m + 2n)^2$
10. $(3m - 7d)^2$
11. $(5b - 6)(5b + 6)$
12. $(1 + x)^2$
13. $(5x - 9y)^2$
14. $(8a - 2b)(8a + 2b)$
15. $\left(\frac{1}{4}x + 4\right)^2$
16. $(c - 3d)^2$
17. $(5a - 12b)^2$
18. $\left(\frac{1}{2}x + y\right)^2$
19. $(n^2 + 1)^2$
20. $(k^2 - 3j)^2$
21. $(a^2 - 5)(a^2 + 5)$
22. $(2x^3 - 7)(2x^3 + 7)$
23. $(3x^3 - 9y)(3x^3 + 9y)$
24. $(7a^2 - b)(7a^2 + b)$
25. $\left(\frac{1}{2}x - 10\right)\left(\frac{1}{2}x + 10\right)$
26. $\left(\frac{1}{3}n - m\right)\left(\frac{1}{3}n + m\right)$
27. $(a - 1)(a - 1)(a - 1)$
28. $(x + 2)(x - 2)(2x + 5)$
29. $(4x - 1)(4x + 1)(x - 4)$
30. $(x - 5)(x + 5)(x + 4)(x - 4)$
31. $(a + 1)(a + 1)(a - 1)(a - 1)$
32. $(n - 1)(n + 1)(n - 1)$
33. $(2c + 3)(2c + 3)(2c - 3)(2c - 3)$
34. $(4d + 5e)(4d + 5e)(4d - 5e)(4d - 5e)$

Lesson 9-1 *(pages 474–479)*

Find the factors of each number. Then classify each number as *prime* or *composite*.

1. 23
2. 21
3. 81
4. 24
5. 18
6. 22

Find the prime factorization of each integer.

7. 42
8. 267
9. -72
10. 164
11. -57
12. -60

Factor each monomial completely.

13. $240mn$
14. $-64a^3b$
15. $-26xy^2$
16. $-231xy^2z$
17. $44rs^2t^3$
18. $-756m^2n^2$

Find the GCF of each set of monomials.

19. 16, 60
20. 15, 50
21. 45, 80
22. 29, 58
23. 55, 305
24. 126, 252
25. 128, 245
26. $7y^2$, $14y^2$
27. $4xy$, $-6x$
28. $35t^2$, $7t$
29. $16pq^2$, $12p^2q$, $4pq$
30. 5, 15, 10
31. $12mn$, $10mn$, $15mn$
32. $14xy$, $12y$, $20x$
33. $26jk^4$, $16jk^3$, $8j^2$

Lesson 9-2

(pages 481–486)

Factor each polynomial.

1. $10a^2 + 40a$
2. $15wx - 35wx^2$
3. $27a^2b + 9b^3$
4. $11x + 44x^2y$
5. $16y^2 + 8y$
6. $14mn^2 + 2mn$
7. $25a^2b^2 + 30ab^3$
8. $2m^3n^2 - 16mn^2 + 8mn$
9. $2ax + 6xc + ba + 3bc$
10. $6mx - 4m + 3rx - 2r$
11. $3ax - 6bx + 8b - 4a$
12. $a^2 - 2ab + a - 2b$
13. $8ac - 2ad + 4bc - bd$
14. $2e^2g + 2fg + 4e^2h + 4fh$
15. $x^2 - xy - xy + y^2$

Solve each equation. Check your solutions.

16. $a(a - 9) = 0$
17. $d(d + 11) = 0$
18. $z(z - 2.5) = 0$
19. $(2y + 6)(y - 1) = 0$
20. $(4n - 7)(3n + 2)$
21. $(a - 1)(a + 1) = 0$
22. $10x^2 - 20x = 0$
23. $8b^2 - 12b = 0$
24. $14d^2 + 49d = 0$
25. $15a^2 = 60a$
26. $33x^2 = -22x$
27. $32x^2 = 16x$

Lesson 9-3

(pages 489–494)

Factor each trinomial.

1. $x^2 - 9x + 14$
2. $a^2 - 9a - 36$
3. $x^2 + 2x - 15$
4. $n^2 - 8n + 15$
5. $b^2 + 22b + 21$
6. $c^2 + 2c - 3$
7. $x^2 - 5x - 24$
8. $n^2 - 8n + 7$
9. $m^2 - 10m - 39$
10. $z^2 + 15z + 36$
11. $s^2 - 13st - 30t^2$
12. $y^2 + 2y - 35$
13. $r^2 + 3r - 40$
14. $x^2 + 5x - 6$
15. $x^2 - 4xy - 5y^2$
16. $r^2 + 16r + 63$
17. $v^2 + 24v - 52$
18. $k^2 - 27kj - 90j^2$

Solve each equation. Check your solutions.

19. $a^2 + 3a - 4 = 0$
20. $x^2 - 8x - 20 = 0$
21. $b^2 + 11b + 24 = 0$
22. $y^2 + y - 42 = 0$
23. $k^2 + 2k - 24 = 0$
24. $r^2 - 13r - 48 = 0$
25. $n^2 - 9n = -18$
26. $2z + z^2 = 35$
27. $-20x + 19 = -x^2$
28. $10 + a^2 = -7a$
29. $z^2 - 57 = 16z$
30. $x^2 = -14x - 33$
31. $22x - x^2 = 96$
32. $-144 = q^2 - 26q$
33. $x^2 + 84 = 20x$

Lesson 9-4

(pages 495–500)

Factor each trinomial, if possible. If the trinomial cannot be factored using integers, write *prime*.

1. $4a^2 + 4a - 63$
2. $3x^2 - 7x - 6$
3. $4r^2 - 25r + 6$
4. $2z^2 - 11z + 15$
5. $3a^2 - 2a - 21$
6. $4y^2 + 11y + 6$
7. $6n^2 + 7n - 3$
8. $5x^2 - 17x + 14$
9. $2n^2 - 11n + 13$
10. $8m^2 - 10m - 3$
11. $6y^2 + 2y - 2$
12. $2r^2 + 3r - 14$
13. $5a^2 - 3a + 15$
14. $18v^2 + 24v + 12$
15. $4k^2 + 2k - 12$
16. $10x^2 - 20xy + 10y^2$
17. $12c^2 - 11cd - 5d^2$
18. $30n^2 - mn - m^2$

Solve each equation. Check your solutions.

19. $8t^2 + 32t + 24 = 0$
20. $6y^2 + 72y + 192 = 0$
21. $5x^2 + 3x - 2 = 0$
22. $9x^2 + 18x - 27 = 0$
23. $4x^2 - 4x - 4 = 4$
24. $12n^2 - 16n - 3 = 0$
25. $12x^2 - x - 35 = 0$
26. $18x^2 + 36x - 14 = 0$
27. $15a^2 + a - 2 = 0$
28. $14b^2 + 7b - 42 = 0$
29. $13r^2 + 21r - 10 = 0$
30. $35y^2 - 60y - 20 = 0$
31. $16x^2 - 4x - 6 = 0$
32. $28d^2 + 5d - 3 = 0$
33. $30x^2 - 9x - 3 = 0$

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Lesson 9-5

(pages 501–506)

Factor each polynomial, if possible. If the polynomial cannot be factored, write *prime*.

1. $x^2 - 9$
2. $a^2 - 64$
3. $4x^2 - 9y^2$
4. $1 - 9z^2$
5. $16a^2 - 9b^2$
6. $8x^2 - 12y^2$
7. $a^2 - 4b^2$
8. $x^2 - y^2$
9. $75r^2 - 48$
10. $x^2 - 36y^2$
11. $3a^2 - 16$
12. $12t^2 - 75$
13. $9x^2 - 100y^2$
14. $49 - a^2b^2$
15. $5a^2 - 48$
16. $169 - 16t^2$
17. $8r^2 - 4$
18. $-45m^2 + 5$

Solve each equation by factoring. Check your solutions.

19. $4x^2 = 16$
20. $2x^2 = 50$
21. $9n^2 - 4 = 0$
22. $a^2 - \frac{25}{36} = 0$
23. $\frac{16}{9} - b^2 = 0$
24. $18 - \frac{1}{2}x^2 = 0$
25. $20 - 5g^2 = 0$
26. $16 - \frac{1}{4}p^2 = 0$
27. $\frac{1}{4}c^2 - \frac{4}{9} = 0$
28. $3z^2 - 48 = 0$
29. $72 - 2z^2 = 0$
30. $25a^2 = 1$
31. $2q^3 - 2q = 0$
32. $3r^3 = 48r$
33. $100d - 4d^3 = 0$

Lesson 9-6

(pages 508–514)

Determine whether each trinomial is a perfect square trinomial. If so, factor it.

1. $x^2 + 12x + 36$
2. $n^2 - 13n + 36$
3. $a^2 + 4a + 4$
4. $x^2 - 10x - 100$
5. $2n^2 + 17n + 21$
6. $4a^2 - 20a + 25$

Factor each polynomial, if possible. If the polynomial cannot be factored, write *prime*.

7. $3x^2 - 75$
8. $n^2 - 8n + 16$
9. $4p^2 + 12pr + 9r^2$
10. $6a^2 + 72$
11. $s^2 + 30s + 225$
12. $24x^2 + 24x + 9$
13. $1 - 10z + 25z^2$
14. $28 - 63b^2$
15. $4c^2 + 2c - 7$

Solve each equation. Check your solutions.

16. $x^2 + 22x + 121 = 0$
17. $343d^2 = 7$
18. $(a - 7)^2 = 5$
19. $c^2 + 10c + 36 = 11$
20. $16s^2 + 81 = 72s$
21. $9p^2 - 42p + 20 = -29$

Lesson 10-1

(pages 524–530)

Use a table of values to graph each function.

1. $y = x^2 + 6x + 8$
2. $y = -x^2 + 3x$
3. $y = -x^2$
4. $y = x^2 + x + 3$
5. $y = x^2 + 1$
6. $y = 3x^2 + 6x + 16$

Write the equation of the axis of symmetry, and find the coordinates of the vertex of the graph of each equation. Identify the vertex as a maximum or minimum. Then graph the equation.

7. $y = -x^2 + 2x - 3$
8. $y = 3x^2 + 24x + 80$
9. $y = x^2 - 4x - 4$
10. $y = 5x^2 - 20x + 37$
11. $y = 3x^2 + 6x + 3$
12. $y = 2x^2 + 12x$
13. $y = x^2 - 6x + 5$
14. $y = x^2 + 6x + 9$
15. $y = -x^2 + 16x - 15$
16. $y = 4x^2 - 1$
17. $y = -2x^2 - 2x + 4$
18. $y = 6x^2 - 12x - 4$
19. $y = -x^2 - 1$
20. $y = -x^2 + x + 1$
21. $y = -5x^2 - 3x + 2$
22. $y = -x^2 + x + 20$
23. $y = 2x^2 + 5x - 2$
24. $y = -3x^2 - 18x - 15$

Lesson 10-2 *(pages 533–538)*

Solve each equation by graphing.

1. $a^2 - 25 = 0$
2. $n^2 - 8n = 0$
3. $d^2 + 36 = 0$
4. $b^2 - 18b + 81 = 0$
5. $x^2 + 3x + 27 = 0$
6. $-y^2 - 3y + 10 = 0$

Solve each equation by graphing. If integral roots cannot be found, estimate the roots by stating the consecutive integers between which the roots lie.

7. $x^2 + 2x - 3 = 0$
8. $-x^2 + 6x - 5 = 0$
9. $-a^2 - 2a + 3 = 0$
10. $2r^2 - 8r + 5 = 0$
11. $-3x^2 + 6x - 9 = 0$
12. $c^2 + c = 0$
13. $3t^2 + 2 = 0$
14. $-b^2 + 5b + 2 = 0$
15. $3x^2 + 7x = 1$
16. $x^2 + 5x - 24 = 0$
17. $8 - n^2 = 0$
18. $x^2 - 7x = 18$
19. $a^2 + 12a + 36 = 0$
20. $64 - x^2 = 0$
21. $-4x^2 + 2x = -1$
22. $5z^2 + 8z = 1$
23. $p = 27 - p^2$
24. $6w = -15 - 3w^2$

Lesson 10-3 *(pages 539–544)*

Solve each equation. Round to the nearest tenth, if necessary.

1. $x^2 - 4x + 4 = 9$
2. $t^2 - 6t + 9 = 16$
3. $b^2 + 10b + 25 = 11$
4. $a^2 - 22a + 121 = 3$
5. $x^2 + 2x + 1 = 81$
6. $t^2 - 36t + 324 = 85$

Find the value of c that makes each trinomial a perfect square.

7. $a^2 + 20a + c$
8. $x^2 + 10x + c$
9. $t^2 + 12t + c$
10. $y^2 - 9y + c$
11. $p^2 - 14p + c$
12. $b^2 + 13b + c$

Solve each equation by completing the square. Round to the nearest tenth, if necessary.

13. $a^2 - 8a - 84 = 0$
14. $c^2 + 6 = -5c$
15. $p^2 - 8p + 5 = 0$
16. $2y^2 + 7y - 4 = 0$
17. $t^2 + 3t = 40$
18. $x^2 + 8x - 9 = 0$
19. $y^2 + 5y - 84 = 0$
20. $t^2 + 12t + 32 = 0$
21. $2x - 3x^2 = -8$
22. $2y^2 - y - 9 = 0$
23. $2z^2 - 5z - 4 = 0$
24. $8t^2 - 12t - 1 = 0$

Lesson 10-4 *(pages 546–552)*

Solve each equation by using the Quadratic Formula. Round to the nearest tenth, if necessary.

1. $x^2 - 8x - 4 = 0$
2. $x^2 + 7x - 8 = 0$
3. $x^2 - 5x + 6 = 0$
4. $y^2 - 7y - 8 = 0$
5. $m^2 - 2m = 35$
6. $4n^2 - 20n = 0$
7. $m^2 + 4m + 2 = 0$
8. $2t^2 - t - 15 = 0$
9. $5t^2 = 125$
10. $t^2 + 16 = 0$
11. $-4x^2 + 8x = -3$
12. $3k^2 + 2 = -8k$
13. $8t^2 + 10t + 3 = 0$
14. $3x^2 - \frac{5}{4}x - \frac{1}{2} = 0$
15. $-5b^2 + 3b - 1 = 0$
16. $s^2 + 8s + 7 = 0$
17. $d^2 - 14d + 24 = 0$
18. $3k^2 + 11k = 4$
19. $n^2 - 3n + 1 = 0$
20. $2z^2 + 5z - 1 = 0$
21. $3h^2 = 27$

State the value of the discriminant for each equation. Then determine the number of real roots of the equation.

22. $3f^2 + 2f = 6$
23. $2x^2 = 0.7x + 0.3$
24. $3w^2 - 2w + 8 = 0$
25. $4r^2 - 12r + 9 = 0$
26. $x^2 - 5x = -9$
27. $25t^2 + 30t = -9$

CONTENTS

Lesson 10-5

(pages 554–560)

Graph each function. State the y-intercept. Then use the graph to determine the approximate value of the given expression. Use a calculator to confirm the value.

1. $y = 7^x$; $7^{1.5}$
2. $\left(\frac{1}{3}\right)^x$; $\left(\frac{1}{3}\right)^{5.6}$
3. $y = \left(\frac{3}{5}\right)^x$; $\left(\frac{3}{5}\right)^{-4.2}$

Graph each function. State the y-intercept.

4. $y = 3^x + 1$
5. $y = 2^x - 5$
6. $y = 2^{x+3}$
7. $y = 3^{x+1}$
8. $y = \left(\frac{2}{3}\right)^x$
9. $y = 5\left(\frac{2}{5}\right)^x$
10. $y = 5(3^x)$
11. $y = 4(5)^x$
12. $y = 2(5)^x + 1$
13. $y = \left(\frac{1}{2}\right)^{x+1}$
14. $y = \left(\frac{1}{8}\right)^x$
15. $y = \left(\frac{3}{4}\right)^x - 2$

Determine whether the data in each table display exponential behavior. Explain why or why not.

16.

x	−1	0	1	2
y	−5	−1	3	7

17.

x	1	2	3	4
y	25	125	625	3125

Lesson 10-6

(pages 561–565)

1. **EDUCATION** Marco is saving for tuition costs at a state university. He deposited $8500 in a 4-year certificate of deposit earning 7.25% compounded monthly.
   a. Write an equation for the amount of money Marco will have at the end of four years.
   b. Find the amount of money he will have for his tuition at the end of the four years.
2. **TRANSPORTATION** Elise is buying a new car selling for $21,500. The rate of depreciation on this type of car is 8% per year.
   a. Write an equation for the value of the car in 5 years.
   b. Find the value of the car in 5 years.
3. **POPULATION** In 1990, the town of Belgrade, Montana, had a population of 3422. For each of the next 8 years, the population increased by 4.9% per year.
   a. Write an equation for the population of Belgrade in 1998.
   b. Find the population of Belgrade in 1998.

Lesson 10-7

(pages 567–572)

Determine whether each sequence is geometric.

1. 12, 23, 34, 45, …
2. 6, 7.2, 8.64, 10.368, …
3. 39, 33, 27, 21, …
4. 86, 68.8, 55.04, 44.032, …
5. 4, 8, 16, 32, …
6. 13, 10, 11, 8, 9, 6, …

Find the next three terms in each geometric sequence.

7. 3125, 625, 125, 25, …
8. 15, −45, 135, −405, …
9. 243, 81, 27, 9, …
10. 15, −7.5, 3.75, −1.875, …
11. −25, −15, −9, −5.4, …
12. $\frac{1}{4}, \frac{1}{10}, \frac{1}{25}, \frac{2}{125}, \ldots$

Find the nth term of each geometric sequence.

13. $a_1 = 1, n = 10, r = 6$
14. $a_1 = -1, n = 7, r = -4$
15. $a_1 = -6, n = 4, r = 0.4$
16. $a_1 = 100, n = 10, r = 0.1$
17. $a_1 = -750, n = 5, r = -1.5$
18. $a_1 = 64, n = 5, r = 8$
19. $a_1 = 0.5, n = 9, r = -10$
20. $a_1 = -20, n = 6, r = 2.5$
21. $a_1 = 350, n = 4, r = -0.9$

Find the geometric means in each sequence.

22. 1, ____, 81
23. −81, ____, −9
24. 504, ____, 14
25. 0.5, ____, 162
26. −1, ____, −4
27. 0.25, ____, 0.36
28. $\frac{1}{2}$, ____, $\frac{1}{8}$
29. $-\frac{2}{3}$, ____, $-\frac{32}{27}$
30. 6.25, ____, 2.25

Lesson 11-1

(pages 587–593)

Simplify.

1. $\sqrt{50}$
2. $\sqrt{200}$
3. $\sqrt{162}$
4. $\sqrt{700}$
5. $\frac{\sqrt{3}}{\sqrt{5}}$
6. $\frac{\sqrt{72}}{\sqrt{6}}$
7. $\sqrt{\frac{8}{7}}$
8. $\sqrt{\frac{7}{32}}$
9. $\sqrt{\frac{5}{8}} \cdot \sqrt{\frac{2}{6}}$
10. $\sqrt{\frac{2}{3}} \cdot \sqrt{\frac{3}{2}}$
11. $\sqrt{\frac{2x}{30}}$
12. $\sqrt{\frac{50}{z^2}}$
13. $\sqrt{10} \cdot \sqrt{20}$
14. $\sqrt{7} \cdot \sqrt{3}$
15. $6\sqrt{2} \cdot \sqrt{3}$
16. $5\sqrt{6} \cdot 2\sqrt{3}$
17. $\sqrt{4x^4y^3}$
18. $\sqrt{200m^2y^3}$
19. $\sqrt{12ts^3}$
20. $\sqrt{175a^4b^6}$
21. $\sqrt{\frac{54}{g^2}}$
22. $\sqrt{99x^3y^7}$
23. $\sqrt{\frac{32c^5}{9d^2}}$
24. $\sqrt{\frac{27p^4}{3p^2}}$
25. $\frac{1}{3+\sqrt{5}}$
26. $\frac{2}{\sqrt{3}-5}$
27. $\frac{\sqrt{3}}{\sqrt{3}-5}$
28. $\frac{\sqrt{6}}{7-2\sqrt{3}}$

Lesson 11-2

(pages 594–598)

Simplify each expression.

1. $3\sqrt{11} + 6\sqrt{11} - 2\sqrt{11}$
2. $6\sqrt{13} + 7\sqrt{13}$
3. $2\sqrt{12} + 5\sqrt{3}$
4. $9\sqrt{7} - 4\sqrt{2} + 3\sqrt{2} + 5\sqrt{7}$
5. $3\sqrt{5} - 5\sqrt{3}$
6. $4\sqrt{8} - 3\sqrt{5}$
7. $2\sqrt{27} - 4\sqrt{12}$
8. $8\sqrt{32} + 4\sqrt{50}$
9. $\sqrt{45} + 6\sqrt{20}$
10. $2\sqrt{63} - 6\sqrt{28} + 8\sqrt{45}$
11. $14\sqrt{3t} + 8\sqrt{3t}$
12. $7\sqrt{6x} - 12\sqrt{6x}$
13. $5\sqrt{7} - 3\sqrt{28}$
14. $7\sqrt{8} - \sqrt{18}$
15. $7\sqrt{98} + 5\sqrt{32} - 2\sqrt{75}$
16. $4\sqrt{6} + 3\sqrt{2} - 2\sqrt{5}$
17. $-3\sqrt{20} + 2\sqrt{45} - \sqrt{7}$
18. $4\sqrt{75} + 6\sqrt{27}$
19. $10\sqrt{\frac{1}{5}} - \sqrt{45} - 12\sqrt{\frac{5}{9}}$
20. $\sqrt{15} - \sqrt{\frac{3}{5}}$
21. $3\sqrt{\frac{1}{3}} - 9\sqrt{\frac{1}{12}} + \sqrt{243}$

Find each product.

22. $\sqrt{3}(\sqrt{5} + 2)$
23. $\sqrt{2}(\sqrt{2} + 3\sqrt{5})$
24. $(\sqrt{2} + 5)^2$
25. $(3 - \sqrt{7})(3 + \sqrt{7})$
26. $(\sqrt{2} + \sqrt{3})(\sqrt{3} + \sqrt{2})$
27. $(4\sqrt{7} + \sqrt{2})(\sqrt{3} - 3\sqrt{5})$

Lesson 11-3

(pages 599–604)

Solve each equation. Check your solution.

1. $\sqrt{5x} = 5$
2. $4\sqrt{7} = \sqrt{-m}$
3. $\sqrt{t} - 5 = 0$
4. $\sqrt{3b} + 2 = 0$
5. $\sqrt{x - 3} = 6$
6. $5 - \sqrt{3x} = 1$
7. $2 + 3\sqrt{y} = 13$
8. $\sqrt{3g} = 6$
9. $\sqrt{a} - 2 = 0$
10. $\sqrt{2j} - 4 = 8$
11. $5 + \sqrt{x} = 9$
12. $\sqrt{5y + 4} = 7$
13. $7 + \sqrt{5c} = 9$
14. $2\sqrt{5t} = 10$
15. $\sqrt{44} = 2\sqrt{p}$
16. $4\sqrt{x - 5} = 15$
17. $4 - \sqrt{x - 3} = 9$
18. $\sqrt{10x^2 - 5} = 3x$
19. $\sqrt{2a^2 - 144} = a$
20. $\sqrt{3y + 1} = y - 3$
21. $\sqrt{2x^2 - 12} = x$
22. $\sqrt{b^2 + 16} + 2b = 5b$
23. $\sqrt{m + 2} + m = 4$
24. $\sqrt{3 - 2c} + 3 = 2c$

CONTENTS

Lesson 11-4

(pages 606–611)

If c is the measure of the hypotenuse of a right triangle, find each missing measure. If necessary, round to the nearest hundredth.

1. $b = 20, c = 29, a = ?$
2. $a = 7, b = 24, c = ?$
3. $a = 2, b = 6, c = ?$
4. $b = 10, c = \sqrt{200}, a = ?$
5. $a = 3, c = 3\sqrt{2}, b = ?$
6. $a = 6, c = 14, b = ?$
7. $a = \sqrt{11}, c = \sqrt{47}, b = ?$
8. $a = \sqrt{13}, b = 6, c = ?$
9. $a = \sqrt{6}, b = 3, c = ?$
10. $b = \sqrt{75}, c = 10, a = ?$
11. $b = 9, c = \sqrt{130}, a = ?$
12. $a = 9, c = 15, b = ?$
13. $b = 5, c = 11, a = ?$
14. $a = \sqrt{33}, b = 4, c = ?$
15. $a = 5, c = \sqrt{34}, b = ?$

Determine whether the following side measures form right triangles.

16. 14, 48, 50
17. 20, 30, 40
18. 21, 72, 75
19. 5, 12, $\sqrt{119}$
20. 15, 39, 36
21. $\sqrt{5}$, 12, 13
22. 10, 12, $\sqrt{22}$
23. 2, 3, 4
24. $\sqrt{7}$, 8, $\sqrt{71}$

Lesson 11-5

(pages 612–616)

Find the distance between each pair of points whose coordinates are given. Express answers in simplest radical form and as decimal approximations rounded to the nearest hundredth if necessary.

1. (4, 2), (−2, 10)
2. (−5, 1), (7, 6)
3. (4, −2), (1, 2)
4. (−2, 4), (4, −2)
5. (3, 1), (−2, −1)
6. (−2, 4), (7, −8)
7. (−5, 0), (−9, 6)
8. (5, −1), (5, 13)
9. (2, −3), (10, 8)
10. (−7, 5), (2, −7)
11. (−6, −2), (−5, 4)
12. (8, −10), (3, 2)
13. (4, −3), (7, −9)
14. (6, 3), (9, 7)
15. (10, 0), (9, 7)
16. (2, −1), (−3, 3)
17. (−5, 4), (3, −2)
18. (0, −9), (0, 7)
19. (−1, 7), (8, 4)
20. (−9, 2), (3, −3)
21. $(3\sqrt{2}, 7), (5\sqrt{2}, 9)$
22. (6, 3), (10, 0)
23. (3, 6), (5, −5)
24. (−4, 2), (5, 4)

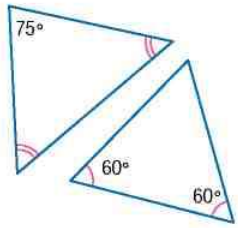
Find the possible values of a if the points with the given coordinates are the indicated distance apart.

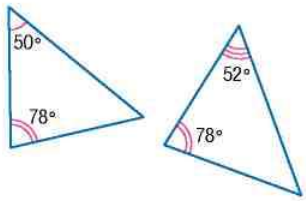
25. $(0, 0), (a, 3); d = 5$
26. $(2, -1), (-6, a); d = 10$
27. $(1, 0), (a, 6); d = \sqrt{61}$
28. $(-2, a), (5, 10); d = \sqrt{85}$
29. $(15, a), (0, 4); d = \sqrt{274}$
30. $(3, 3), (a, 9); d = \sqrt{136}$

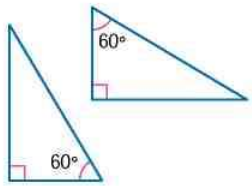
Lesson 11-6

(pages 617–622)

Determine whether each pair of triangles is similar. Justify your answer.

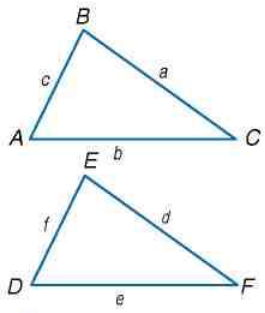
1. 

2. 

3. 

For each set of measures given, find the measures of the missing sides if $\triangle ABC \sim \triangle DEF$.

4. $a = 5, d = 10, b = 8, c = 7$
5. $a = 2, b = 3, c = 4, d = 3$
6. $a = 6, d = 4.5, e = 7, f = 7.5$
7. $a = 15, c = 20, b = 18, f = 10$
8. $f = 17.5, d = 8.5, e = 11, a = 1.7$
9. $b = 5.6, e = 7, a = 4, c = 7.2$
10. $e = 125, a = 80, d = 100, f = 218.75$

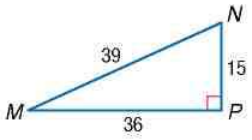


Lesson 11-7

(pages 624–631)

For each triangle, find sin N, cos N, and tan N to the nearest ten thousandth.

1.



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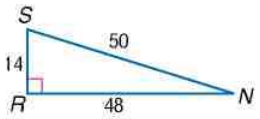

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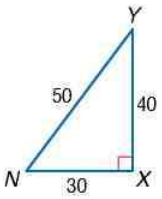


Use a calculator to find the value of each trigonometric ratio to the nearest ten thousandth.

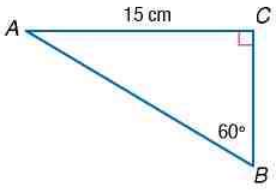
4. cos 25°
5. tan 31°
6. sin 71°
7. cos 64°
8. tan 9°
9. sin 2°

Use a calculator to find the measure of each angle to the nearest degree.

10. tan $B = 0.5427$
11. cos $A = 0.8480$
12. sin $J = 0.9654$
13. cos $Q = 0.3645$
14. sin $R = 0.2104$
15. tan $V = 11.4301$

Solve each right triangle. State the side lengths to the nearest tenth and the angle measures to the nearest degree.

16.



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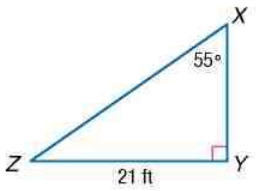

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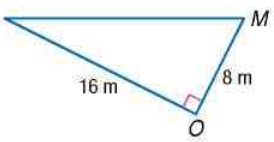

Lesson 12-1

(pages 642–647)

Graph each variation if y varies inversely as x.

1. $y = 10$ when $x = 7.5$
2. $y = -5$ when $x = 3$
3. $y = -6$ when $x = -2$
4. $y = 1$ when $x = -0.5$
5. $y = -2.5$ when $x = 3$
6. $y = -2$ when $x = -1$

Write an inverse variation equation that relates x and y. Assume that y varies inversely as x. Then solve.

7. If $y = 54$ when $x = 4$, find x when $y = 27$.
8. If $y = 18$ when $x = 6$, find x when $y = 12$.
9. If $y = 12$ when $x = 24$, find x when $y = 9$.
10. If $y = 8$ when $x = -8$, find y when $x = -16$.
11. If $y = 3$ when $x = -8$, find y when $x = 4$.
12. If $y = 27$ when $x = \frac{1}{3}$, find y when $x = \frac{3}{4}$.
13. If $y = -3$ when $x = -8$, find y when $x = 2$.
14. If $y = -3$ when $x = -3$, find x when $y = 4$.
15. If $y = -7.5$ when $x = 2.5$, find y when $x = -2.5$.
16. If $y = -0.4$ when $x = -3.2$, find x when $y = -0.2$.

Lesson 12–2

(pages 648–653)

State the excluded values for each rational expression.

1. $\frac{x}{x+1}$
2. $\frac{m}{n}$
3. $\frac{c-2}{c^2-4}$
4. $\frac{b^2-5b+6}{b^2-8b+15}$

Simplify each expression. State the excluded values of the variables.

5. $\frac{13a}{39a^2}$
6. $\frac{38x^2}{42xy}$
7. $\frac{p+5}{2(p+5)}$
8. $\frac{a+b}{a^2-b^2}$
9. $\frac{y+4}{y^2-16}$
10. $\frac{c^2-4}{c^2+4c+4}$
11. $\frac{a^2-a}{a-1}$
12. $\frac{x^2+4}{x^4-16}$
13. $\frac{r^3-r^2}{r-1}$
14. $\frac{4t^2-8}{4t-4}$
15. $\frac{6y^3-12y^2}{12y^2-18}$
16. $\frac{5x^2+10x+5}{3x^2+6x+3}$

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Lesson 12-3

(pages 655–659)

Find each product.

1. $\frac{a^2b}{b^2c} \cdot \frac{c}{d}$
2. $\frac{6a^2n}{8n^2} \cdot \frac{12n}{9a}$
3. $\frac{2a^2d}{3bc} \cdot \frac{9b^2c}{16ad^2}$
4. $\frac{10n^3}{6x^3} \cdot \frac{12n^2x^4}{25n^2x^2}$
5. $\frac{6m^3n}{10a^2} \cdot \frac{4a^2m}{9n^3}$
6. $\frac{(a-5)(a+1)}{(a+1)(a+7)} \cdot \frac{(a+7)(a-6)}{(a+8)(a-5)}$
7. $\frac{x-1}{(x+2)(x-3)} \cdot \frac{x+2}{(x-3)(x-1)}$
8. $\frac{5n-5}{3} \cdot \frac{9}{n-1}$
9. $\frac{a^2}{a-b} \cdot \frac{3a-3b}{a}$
10. $\frac{2a+4b}{5} \cdot \frac{25}{6a+8b}$
11. $\frac{3}{x-y} \cdot \frac{(x-y)^2}{6}$
12. $\frac{x+5}{3x} \cdot \frac{12x^2}{x^2+7x+10}$
13. $\frac{a^2-b^2}{4} \cdot \frac{16}{a+b}$
14. $\frac{4a+8}{a^2-25} \cdot \frac{a-5}{5a+10}$
15. $\frac{r^2}{r-s} \cdot \frac{r^2-s^2}{s^2}$
16. $\frac{a^2-b^2}{a-b} \cdot \frac{7}{a+b}$
17. $\frac{x^2+10x+9}{x^2+11x+18} \cdot \frac{x^2+3x+2}{x^2+7x+6}$
18. $\frac{x^2-6x+5}{x^2+7x+12} \cdot \frac{x^2+14x+40}{x^2+5x-50}$

Lesson 12-4

(pages 660–664)

Find each quotient.

1. $\frac{5m^2n}{12a^2} \div \frac{30m^4}{18an}$
2. $\frac{25g^7h}{28t^3} \div \frac{5g^5h^2}{42s^2t^3}$
3. $\frac{6a+4b}{36} \div \frac{3a+2b}{45}$
4. $\frac{x^2y}{18z} \div \frac{2yz}{3x^2}$
5. $\frac{p^2}{14qr^3} \div \frac{2r^2p}{7q}$
6. $\frac{5e-f}{5e+f} \div (25e^2-f^2)$
7. $\frac{t^2-2t-15}{t-5} \div \frac{t+3}{t+5}$
8. $\frac{5x+10}{x+2} \div (x+2)$
9. $\frac{3d}{2d^2-3d} \div \frac{9}{2d-3}$
10. $\frac{3v^2-27}{15v} \div \frac{v+3}{v^2}$
11. $\frac{3g^2+15g}{4} \div \frac{g+5}{g^2}$
12. $\frac{b^2-9}{4b} \div (b-3)$
13. $\frac{p^2}{y^2-4} \div \frac{p}{2-y}$
14. $\frac{k^2-81}{k^2-36} \div \frac{k-9}{k+6}$
15. $\frac{2a^3}{a+1} \div \frac{a^2}{a+1}$
16. $\frac{x^2-16}{16-x^2} \div \frac{7}{x}$
17. $\frac{y}{5} \div \frac{y^2-25}{5-y}$
18. $\frac{3m}{m+1} \div (m-2)$
19. $\frac{2m+16}{m-2} \div \frac{m^2+6m-16}{m^2+m-6}$
20. $\frac{a^2+3a-10}{a^2+3a+2} \div \frac{a^2+3a-10}{a^2-2a-3}$
21. $\frac{x^2-x-2}{x^2+4x+3} \div \frac{x^2-6x+8}{x^2-x-12}$

Lesson 12-5

(pages 666–671)

Find each quotient.

1. $(2x^2-11x-20) \div (2x+3)$
2. $(a^2+10a+21) \div (a+3)$
3. $(m^2+4m-5) \div (m+5)$
4. $(x^2-2x-35) \div (x-7)$
5. $(c^2+6c-27) \div (c+9)$
6. $(y^2-6y-25) \div (y+7)$
7. $(3t^2-14t-24) \div (3t+4)$
8. $(2r^2-3r-35) \div (2r+7)$
9. $\frac{12n^2+36n+15}{6n+3}$
10. $\frac{10x^2+29x+21}{5x+7}$
11. $\frac{4t^3+17t^2-1}{4t+1}$
12. $\frac{2a^3+9a^2+5a-12}{a+3}$
13. $\frac{4m^2+4m-15}{2m-3}$
14. $\frac{6t^3+5t^2+12}{2t+3}$
15. $\frac{27c^2-24c+8}{9c-2}$
16. $\frac{4b^3+7b^2-2b+4}{b+2}$
17. $\frac{t^3-19t+9}{t-4}$
18. $\frac{9x^3+2x-10}{3x-2}$

Lesson 12-6 (pages 672–677)

Find each sum.

1. $\frac{4}{z} + \frac{3}{z}$
2. $\frac{a}{12} + \frac{2a}{12}$
3. $\frac{5}{2t} + \frac{-7}{2t}$
4. $\frac{y}{2} + \frac{y}{2}$
5. $\frac{b}{x} + \frac{2}{x}$
6. $\frac{y}{2} + \frac{y-6}{2}$
7. $\frac{x}{x+1} + \frac{1}{x+1}$
8. $\frac{2n}{2n-5} + \frac{5}{5-2n}$
9. $\frac{x-y}{2-y} + \frac{x+y}{y-2}$
10. $\frac{r^2}{r-s} + \frac{s^2}{r-s}$
11. $\frac{12n}{3n+2} + \frac{8}{3n+2}$
12. $\frac{6x}{x+y} + \frac{6y}{x+y}$

Find each difference.

13. $\frac{5x}{24} - \frac{3x}{24}$
14. $\frac{7p}{3} - \frac{8p}{3}$
15. $\frac{8k}{5m} - \frac{3k}{5m}$
16. $\frac{8}{m-2} - \frac{6}{m-2}$
17. $\frac{y}{b+6} - \frac{2y}{b+6}$
18. $\frac{a+2}{6} - \frac{a+3}{6}$
19. $\frac{2a}{2a+5} - \frac{5}{2a+5}$
20. $\frac{1}{4z+1} - \frac{(-4z)}{4z+1}$
21. $\frac{3a}{a-2} - \frac{3a}{a-2}$
22. $\frac{n}{n-1} - \frac{1}{1-n}$
23. $\frac{a}{a-7} - \frac{(-7)}{7-a}$
24. $\frac{2a}{6a-3} - \frac{(-1)}{3-6a}$

Lesson 12-7 (pages 678–683)

Find the LCM for each pair of expressions.

1. $27a^2bc,\ 36ab^2c^2$
2. $3m - 1,\ 6m - 2$
3. $x^2 + 2x + 1,\ x^2 - 2x - 3$

Find each sum.

4. $\frac{s}{3} + \frac{2s}{7}$
5. $\frac{5}{2a} + \frac{-3}{6a}$
6. $\frac{6}{5x} + \frac{7}{10x^2}$
7. $\frac{5}{xy} + \frac{6}{yz}$
8. $\frac{2}{t} + \frac{t+3}{s}$
9. $\frac{a}{a-b} + \frac{b}{2b+3a}$
10. $\frac{4a}{2a+6} + \frac{3}{a+3}$
11. $\frac{3t+2}{3t-2} + \frac{t+2}{t^2-4}$
12. $\frac{-3}{a-5} + \frac{-6}{a^2-5a}$

Find each difference.

13. $\frac{2n}{5} - \frac{3m}{4}$
14. $\frac{3z}{7w^2} - \frac{2z}{w}$
15. $\frac{s}{t^2} - \frac{r}{3t}$
16. $\frac{a}{a^2-4} - \frac{4}{a+2}$
17. $\frac{m}{m-n} - \frac{5}{m}$
18. $\frac{y+5}{y-5} - \frac{2y}{y^2-25}$
19. $\frac{t+10}{t^2-100} - \frac{1}{10-t}$
20. $\frac{2a-6}{a^2-3a-10} - \frac{3a+5}{a^2-4a-12}$

Lesson 12-8 (pages 684–689)

Write each mixed expression as a rational expression.

1. $4 + \frac{2}{x}$
2. $8 + \frac{5}{3t}$
3. $\frac{b+1}{2b} + 3b$
4. $3z + \frac{z+2}{z}$
5. $\frac{2}{a-2} + a^2$
6. $3r^2 + \frac{4}{2r+1}$

Simplify each expression.

7. $\frac{3\frac{1}{2}}{4\frac{3}{4}}$
8. $\frac{\frac{x^2}{y}}{\frac{y}{x^3}}$
9. $\frac{\frac{t^4}{u}}{\frac{t^3}{u^2}}$
10. $\frac{\frac{x-3}{x+1}}{\frac{x^2}{y^2}}$
11. $\frac{\frac{y}{3} + \frac{5}{6}}{2 + \frac{5}{y}}$
12. $\frac{\frac{1}{x} + \frac{1}{y}}{\frac{1}{y} - \frac{1}{x}}$
13. $\frac{t-2}{\frac{t^2-4}{t^2+5t+6}}$
14. $\frac{a + \frac{2}{a+1}}{a - \frac{3}{a-2}}$

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Lesson 12-9

(pages 690–695)

Solve each equation. State any extraneous solutions.

1. $\frac{k}{6} + \frac{2k}{3} = -\frac{5}{2}$
2. $\frac{2x}{7} + \frac{27}{10} = \frac{4x}{5}$
3. $\frac{18}{b} = \frac{3}{b} + 3$
4. $\frac{3}{5x} + \frac{7}{2x} = 1$
5. $\frac{2a-3}{6} = \frac{2a}{3} + \frac{1}{2}$
6. $\frac{3x+2}{x} + \frac{x+3}{x} = 5$
7. $\frac{2b-3}{7} - \frac{b}{2} = \frac{b+3}{14}$
8. $\frac{2y}{y-4} - \frac{3}{5} = 3$
9. $\frac{2t}{t+3} + \frac{3}{t} = 2$
10. $\frac{5x}{x+1} + \frac{1}{x} = 5$
11. $\frac{r-2}{r+2} - \frac{2r}{r+9} = 6$
12. $\frac{m}{m+1} + \frac{5}{m-1} = 1$
13. $\frac{2x}{x-3} - \frac{4x}{3-x} = 12$
14. $\frac{14}{b-6} = \frac{1}{2} + \frac{6}{b-8}$
15. $\frac{a}{4a+15} - 3 = -2$
16. $\frac{5x}{3x+10} + \frac{2x}{x+5} = 2$
17. $\frac{2a-3}{a-3} - 2 = \frac{12}{a+2}$
18. $\frac{z+3}{z-1} + \frac{z+1}{z-3} = 2$

Lesson 13-1

(pages 708–713)

Identify each sample, suggest a population from which it was selected, and state if it is unbiased (random) or biased. If unbiased, classify the sample as *simple*, *stratified*, or *systematic*. If biased, classify as *convenience* or *voluntary response*.

1. The sheriff has heard that many dogs in the county do not have licenses. He drives from his office and checks the licenses of the first ten dogs he encounters.
2. The school administration wants to check on the incidence of students leaving campus without permission at lunch. An announcement is placed in the school bulletin for 25 students to volunteer to answer questions about leaving campus.
3. The store manager of an ice cream store wants to see whether employees are making ice cream cones within the weight guidelines he provided. During each of three shifts, he selects every tenth cone to weigh.
4. Every fifth car is selected from the assembly line. The cars are also identified by the day of the week during which they were produced.
5. A table is set up outside of a large department store. All people entering the store are given a survey about their preference of brand for blue jeans. As people leave the store, they can return the survey.
6. A community is considering building a new swimming pool. Every twentieth person on a list of residents is contacted in person for their opinion on the new pool.
7. A state wildlife department is concerned about a report that malformed frogs are increasing in the state's lakes. Residents are asked to write in to the state department if they see a malformed frog.
8. The manager at a grocery store has been told that many cartons of strawberries are spoiled. She asks one of her employees to bring in the top 10 cartons on the shelf.

Lesson 13-2

(pages 715–721)

State the dimensions of each matrix.

1. $\begin{bmatrix} 1 & 0 & -2 & 5 \end{bmatrix}$
2. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
3. $\begin{bmatrix} 1 & -1 & 1 \\ -1 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$
4. $\begin{bmatrix} 10 \end{bmatrix}$

If $A = \begin{bmatrix} 2 & -4 \\ -3 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -1 & 4 \\ 0 & 3 & -2 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, and $D = \begin{bmatrix} -5 & 1 & -4 \\ -3 & 0 & 2 \end{bmatrix}$, find each sum, difference, or product. If the sum or difference does not exist, write *impossible*.

5. $A + B$
6. $A + C$
7. $B + D$
8. $D - B$
9. $2B$
10. $3C$
11. $A - C$
12. $-5C$
13. $2A + C$
14. $3D - B$
15. $5B + C$
16. $2C + 3A$

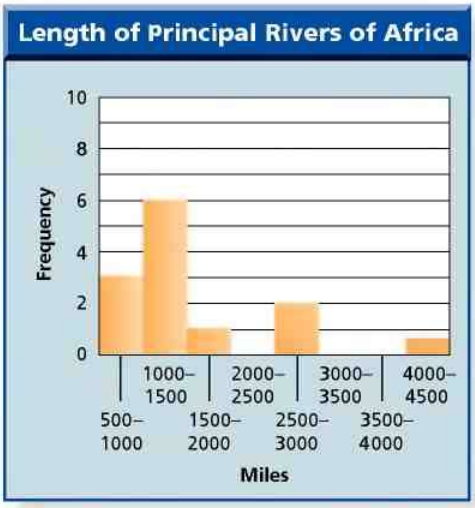
Lesson 13-3

(pages 722–728)

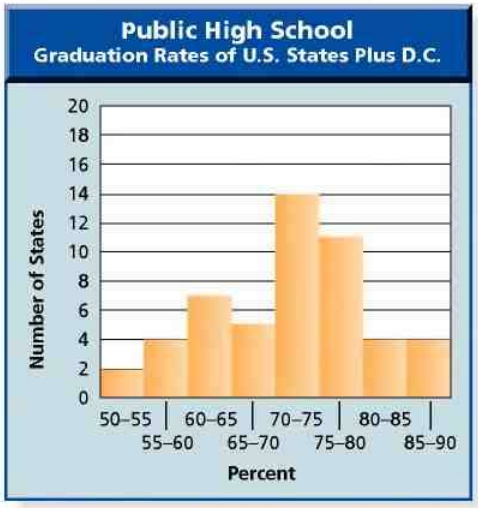
For each histogram, answer the following.

- **In what measurement class does the median occur?**
- **Describe the distribution of the data.**

1.



2.



Create a histogram to represent each data set.

3. Sale prices of notebooks at various department stores, in cents: 13, 69, 89, 25, 55, 20, 99, 75, 42, 18, 66, 88, 89, 79, 75, 65, 25, 99, 66, 78

4. Number of fish in tanks at a pet store: 1, 25, 7, 4, 54, 15, 12, 6, 2, 1, 25, 17, 20, 5, 6, 15, 24, 2, 17, 1, 5, 7, 20, 12, 12, 3

5. Number of defective light bulbs found on the assembly line during each of 20 shifts: 5, 1, 7, 6, 4, 3, 2, 1, 10, 12, 1, 2, 0, 7, 6, 2, 8, 4, 2, 0

Lesson 13-4

(pages 731–736)

Find the range, median, lower quartile, upper quartile, and interquartile range of each set of data. Identify any outliers.

1. 56, 45, 37, 43, 10, 34, 33, 45, 50

2. 77, 78, 68, 96, 99, 84, 65, 95, 65, 84

3. 30, 90, 40, 70, 50, 100, 80, 60

4. 4, 5.2, 1, 3, 2.4, 6, 3.7, 8, 1.3, 7.1, 9

5. 25°, 56°, 13°, 44°, 0°, 31°, 73°, 66°, 4°, 29°, 37°

6. 234, 648, 369, 112, 527, 775, 406, 268, 400

Lesson 13-5

(pages 737–742)

Draw a box-and-whisker plot for each set of data.

1. 3, 2, 1, 5, 7, 9, 2, 11, 3, 4, 8, 8, 10, 12, 4

2. 59, 63, 69, 69, 49, 40, 55, 69, 55, 89, 45, 55

3. 1.8, 2.2, 1.2, 3.5, 5.5, 3.2, 1.2, 4.2, 3.0, 2.6, 1.7, 1.8

4. 15, 18, 25, 37, 52, 69, 22, 35, 50, 65, 15, 99, 35, 25

Draw a parallel box-and-whisker plot for each set of data. Compare the data.

5. A: 21, 24, 34, 46, 58, 67, 72, 70, 61, 50, 40, 27
B: 67, 69, 72, 75, 79, 81, 83, 83, 82, 78, 74, 69

6. A: 100, 85, 65, 72, 83, 92, 92, 60, 99, 88, 75, 76, 92, 91, 70
B: 98, 82, 85, 62, 77, 85, 91, 95, 77, 65, 99, 73, 81, 92, 88

7. A: 3.6, 2.2, 2.2, 1.5, 1.1, 0.5, 0.8, 0.4, 0.8, 2.3, 3.0, 3.8
B: 5.4, 4.0, 3.8, 2.5, 1.8, 1.6, 0.9, 1.2, 1.9, 3.3, 5.7, 6.0

8. A: 4.75, 6.25, 7.95, 2.65, 5.25, 6.50, 8.25, 3.25, 4.25
B: 9.50, 8.65, 3.25, 5.25, 4.50, 5.75, 6.95, 5.50, 4.25

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Lesson 14-1

(pages 754–758)

Draw a tree diagram to show the sample space for each event. Determine the number of possible outcomes.

1. choosing a dinner special at a restaurant offering the choice of lettuce salad or coleslaw; chicken, beef, or fish; and ice cream, pudding, or cookies
2. tossing a coin four times
3. spinning a spinner with five equal-sized sections, one each of white, yellow, blue, red, and green, two times
4. selecting a sundae with choice of vanilla or chocolate ice cream; chocolate, strawberry, or marshmallow topping; and walnuts or peanuts

Determine the number of possible outcomes for each situation.

5. A state offers special graphic license plates. Each license plate features two digits followed by two letters. Any digit and any letter can be used in the appropriate space.
6. A lounge chair can be ordered with a choice of rocking or non-rocking, swivel or non-swivel, cotton, leather, or plush cover, and in green, blue, maroon, or black.
7. At the Big Mountain Ski Resort, you can choose from three types of boots, four types of skis, and five types of poles.
8. A game is played by rolling three four-sided dice, one red, one blue, and one white.

Find the value of each expression.

9. $8!$ **10.** $1!$ **11.** $0!$ **12.** $5!$
13. $2!$ **14.** $9!$ **15.** $3!$ **16.** $14!$

Lesson 14-2

(pages 760–767)

Determine whether each situation involves a *permutation* or *combination*. Explain your reasoning.

1. three topping flavors for a sundae from ten topping choices
2. selection and placement of four runners on a relay team from 8 runners
3. five rides to ride at an amusement park with twelve rides
4. first, second, and third place winners for a 10K race
5. a three-letter arrangement from eight different letters
6. selection of five digits from ten digits for a combination lock
7. selecting six items from twelve possible items to include in a custom gift basket

Evaluate each expression.

8. ${}_5P_2$ **9.** ${}_7P_7$ **10.** ${}_{10}C_2$ **11.** ${}_6C_5$
12. ${}_8P_2$ **13.** ${}_{18}C_{10}$ **14.** ${}_{13}C_{13}$ **15.** ${}_9P_6$
16. $({}_7P_3)({}_4P_2)$ **17.** $({}_8C_6)({}_7C_5)$ **18.** $({}_3C_2)({}_{10}P_{10})$ **19.** $({}_3P_2)({}_{10}C_{10})$

Lesson 14-3

(pages 769–776)

A red die and a blue die are rolled. Find each probability.

1. P(red 1, blue 1)
2. P(red even, blue even)
3. P(red prime number, blue even)
4. P(red 6, blue greater than 4)
5. P(red greater than 2, blue greater than 3)

At a carnival game, toy ducks are selected from a pond to win prizes. Once a duck is selected, it is not replaced. The pond contains 8 red, 2 yellow, 1 gold, 4 blue, and 40 black ducks. Find each probability.

6. P(red, then gold)
7. P(2 black)
8. P(2 yellow)
9. P(black, then gold)
10. P(3 blacks, then red)
11. P(yellow, then blue, then gold)
12. P(2 gold)
13. P(4 blue)
14. P(4 blue, then gold)

Lesson 14-4

(pages 777–781)

For Exercises 1–3, use the table that shows the possible products when rolling two dice and the number of ways each product can be found.

Product	Ways	Product	Ways	Product	Ways
1	1	8	2	18	2
2	2	9	1	20	2
3	2	10	2	24	2
4	3	12	4	25	1
5	2	15	2	30	2
6	4	16	1	36	1

1. Draw a table to show the sample space of all possible outcomes.
2. Find the probability for $X = 9$, $X = 12$, and $X = 24$.
3. What is the probability that the product of two dice is greater than 15 on two separate rolls?

For Exercises 4–7, use the table that shows a probability distribution for the number of customers that enter a particular store during a business day.

Number of Customers	0–500	501–1000	1001–1500	1501–2000	2000–2500
Probability	0.05	0.25	0.35	0.30	0.05

4. Define a random variable and list its values.
5. Show that this is a valid probability distribution.
6. During a business day, what is the probability that fewer than 1000 customers enter?
7. During a business day, what is the probability that more than 500 customers enter?

Lesson 14-5

(pages 782–788)

For Exercises 1–3, toss 4 coins, one at a time, 50 times and record your results.

1. Based on your results, what is the probability that any two coins will show tails?
2. Based on your results, what is the probability that the first and fourth coins show heads?
3. What is the theoretical probability that all four coins show heads?

For Exercises 4–6, roll two dice 50 times and record the products.

4. Based on your results, what is the probability that the product is 15?
5. If you roll the dice 50 more times, which product would you expect to see about 10% of the time?
6. What is the theoretical probability that the product of the dice will be 2?

For Exercises 7–9, use the following information.

A survey was sent to randomly selected households asking the number of people living in each of the households. The results of the survey are shown in the table.

7. Find the experimental probability distribution for the number of households of each size.
8. Based on the survey, what is the probability that a person chosen at random lives in a household with five or more people?
9. Based on the survey, what is the probability that a person chosen at random lives in a household with 1 or 2 people?

Number of People Per Household Surveyed	
Number in Household	Number of Households
1	172
2	293
3	482
4	256
5 or more	148

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