

Mixed Problem Solving

CHAPTER 1

- SOFTBALL** A softball player's batting average is $\frac{h}{a}$, where h is the number of hits and a is the number of at bats. So far this season, Jessica has 8 hits in 17 at bats. Find Jessica's batting average. Round your answer to the nearest thousandth. (Lesson 1.1)
- CANDLES** A candle company makes candles shaped like pyramids. One of the molds for these candles has a height of 8 centimeters and a square base that measures 9 centimeters on each side. Find the amount of wax needed to fill the mold by finding the volume of the pyramid. (The formula for the volume of a pyramid is $\frac{1}{3}$ times the height times the area of the base.) (Lesson 1.2)

AMUSEMENT PARKS In Exercises 3–7, use the following information. (Lesson 1.3)

A family of six has coupons for discounted admission to an amusement park. The members of the family are the following ages: 67, 40, 39, 14, 8, and 4.

Amusement Park Admission Prices		
Age	Regular price	Discounted price
13–59	\$10.00	\$7.50
5–12 and 60+	\$8.00	\$6.00
under 5	free	free

- Write an expression that represents the total cost of admission for the family at the regular price.
- Evaluate the expression from Exercise 3.
- Write an expression that represents the total cost of admission for the family at the discounted price.
- Evaluate the expression from Exercise 5.
- How much money did the family save by using the coupons?
- TRAVEL** While planning a vacation, your family budgets \$1200 to spend on lodging. The hotel costs \$129 per night. Will you have enough money in the budget to stay for 7 nights? You write the inequality $129h \leq 1200$ to model the situation. What do 129, h , and 1200 represent? (Lesson 1.4)

BULK FOODS In Exercises 9–11, use the following information. (Lesson 1.5)

The trail mix in the bulk foods section of a grocery store costs \$1.90 per pound. Martin paid \$5.70 for the bag that he filled with trail mix. Martin wants to know how many pounds of trail mix he bought.

- Write a verbal model that relates the cost per pound of the trail mix, the pounds of trail mix, and the total cost of the trail mix.
- Assign labels and write an algebraic model based on your verbal model in Exercise 9.
- Use mental math to solve the equation in Exercise 10. How many pounds of trail mix did Martin buy?
- CONCERT BAND** The table below shows the number of students in the concert band at a school for the given years. Make a line graph of the data. Discuss what the line graph shows. (Lesson 1.6)

Year	1997	1999	2001	2003
Students	62	51	54	57

TELEPHONE CALLS In Exercises 13 and 14, use the following information. (Lesson 1.7)

The total cost C (in dollars) of a telephone call from the United States to Moscow, Russia is given by $C = 0.4t$, where t represents the length of the call in minutes.

- Evaluate the equation for $t = 5, 10, 15, 20, 25$. Organize your results in an input-output table.
- Describe the domain and range of the function.

CHAPTER 2

TEMPERATURES In Exercises 1–3, use the table below, which shows the daily low temperatures in Petoskey, Michigan during a week in January. (Lesson 2.1)

Day	Temperature
Monday	7°F
Tuesday	-3°F
Wednesday	2°F
Thursday	-7°F
Friday	-5°F
Saturday	-2°F
Sunday	9°F

- Which low temperature was the coldest?
- Which days had low temperatures above -2°F ?
- What is the absolute value of the low temperature on Tuesday?
- MONEY** On a Saturday morning, your parents give you \$15 for your allowance. You spend \$18.50 at the mall. Then you make \$20 baby-sitting that night. Do you end the day with more money than you started with? If so, how much more? (Lesson 2.2)
- STOCK** You purchase some shares of stock. The price of each share fell by \$3.20 in the first month, rose by \$5.45 in the second month, and fell by \$1.12 in the third month. Did the price of a share increase or decrease over the three months? (Lesson 2.2)

WEATHER In Exercises 6 and 7, use the following information. (Lesson 2.3)

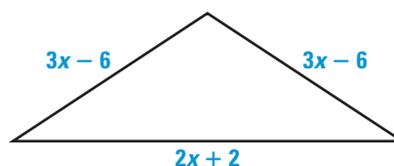
On Sunday, there were 14 inches of snow on the ground. About 1.5 inches of the snow melted on Monday, 2 inches melted on Tuesday, and 1.5 inches melted on Wednesday.

- How much snow remained at the end of the day on Wednesday?
- At the end of the day on Thursday, there were 8.5 inches of snow on the ground. How much snow melted on Thursday?

CONCESSION STAND In Exercises 8–10, use the table below, which shows the sales at a concession stand during two different events. (Lesson 2.4)

	Soccer Game		Football Game	
	Small	Large	Small	Large
Popcorn	24	13	62	55
Nachos	18	11	29	20
Soda	31	28	53	66

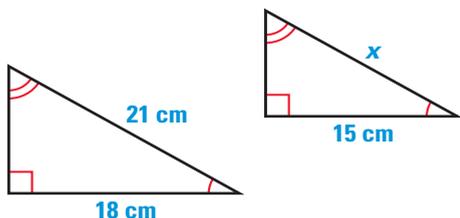
- Write a matrix for the concession stand sales at the soccer game.
- Write a matrix for the concession stand sales at the football game.
- Find the sum of the matrices from Exercises 8 and 9. Explain what the resulting matrix represents.
- HOT AIR BALLOON** A hot air balloon descends with a velocity of -678 feet per minute. Find the vertical distance traveled in 3.5 minutes. (Lesson 2.5)
- GEOMETRY** Write and simplify an expression for the perimeter of the figure. (Lesson 2.6)



- FOOD** There are $19\frac{1}{2}$ ounces of pretzels in a bag. If a serving size is $\frac{3}{4}$ ounce, then how many servings are in the bag of pretzels? (Lesson 2.7)
- MUSIC** Your compact disc collection contains 27 rock discs, 15 country discs, 28 pop discs and 10 hip-hop discs. You randomly choose a compact disc from your collection. What is the probability that the disc is a pop disc? (Lesson 2.8)

CHAPTER 3

- CATS** A veterinary assistant steps on a scale while holding a cat. The scale reads 161 pounds. Alone the assistant weighs 147 pounds. Write and solve an equation to find the weight of the cat. (Lesson 3.1)
- SNOWFALL** The average snowfall in Alpena during the month of February is 3 times the average snowfall in Madison during the month of February. The average snowfall in Alpena during February is 15 inches. Write and solve an equation to find the average snowfall in Madison during the month of February. (Lesson 3.2)
- GEOMETRY** The triangles below are similar. Write and solve an equation to find the length of the side marked x . (Lesson 3.2)



- GARDENING** An online garden supply company offers daffodil bulbs for \$.59 each plus \$2.75 for shipping and handling for the entire order. You want to spend \$15 on an order of daffodil bulbs. Write and solve an equation to find the number of daffodil bulbs you can purchase. (Lesson 3.3)
- BOOKS** You spend \$13.25 to buy 6 books and a bookmark at a used book sale. You pay the same amount for each book you buy, and the bookmark costs \$1.25. Write and solve an equation to find the cost of one book. (Lesson 3.3)
- EXERCISE** Each yoga class at a gym costs \$10 for nonmembers. If you are a member of the gym, you pay a one-time joining fee of \$45, and each yoga class costs \$5. Write and solve an equation to find the number of yoga classes you must take to justify becoming a member. (Lesson 3.4)

TRANSPORTATION In Exercises 7 and 8, use the following information. (Lesson 3.5)

Two planes leave an airport at 1:00 P.M. One plane heads south and the second plane heads north. The plane heading north is traveling 150 miles per hour. At 3:00 P.M. the two planes are 650 miles apart.

- At 3:00 P.M., how far has the plane heading north traveled?
- At 3:00 P.M., how far has the plane heading south traveled?
- TELEPHONES** Your long-distance telephone company charges a monthly fee of \$4.75 plus \$.10 for each minute of long-distance telephone calls. Your bill for last month was \$15.25. Write and solve an equation to find the number of minutes of long-distance telephone calls for last month. (Lesson 3.6)

ELECTRICAL POWER In Exercises 10 and 11, use the following information. (Lesson 3.7)

The electrical power rating P , in watts, of an electrical appliance is given by the formula $P = VI$, where V is the voltage and I is the current in amps.

- Solve the formula for I .
- Use the new formula to find the current running through the appliance given its power rating and voltage.

Appliance	Stereo	Coffeemaker
Power rating	30 watts	900 watts
Voltage	110 volts	110 volts

- FOOD** You spend \$2.34 on 6 pounds of bananas. What is the cost per pound? (Lesson 3.8)
- JEWELRY** A craft store sells assorted collections of beads. One assortment contains 100 beads and costs \$8.00. A larger assortment contains 250 beads and costs \$12.50. Which assortment is the better buy? Explain how you decided. (Lesson 3.8)

CHAPTER 4

ICE HOCKEY In Exercises 1 and 2, use the table below, which shows the number of shots on goal and the number of goals scored by players on an ice hockey team during one season. (Lesson 4.1)

Shots	Goals
64	11
39	6
38	5
43	7
46	7
28	4
51	7
35	6
28	3

1. Make a scatter plot that shows the number of shots on goal and the number of goals scored for the players. Use the horizontal axis to represent the number of shots on goal.
2. What conclusions (if any) can you make from the scatter plot?

SUMMER JOBS In Exercises 3 and 4, use the following information. (Lesson 4.2)

You charge \$50 for cleaning a large office and \$25 for cleaning a small office. You want to make \$500 in one week. An algebraic model for your earnings is $50x + 25y = 500$, where x is the number of large offices you clean per week, and y is the number of small offices you clean.

3. Write the algebraic model in function form. Then use a table of values to graph the equation.
4. If you do not clean any large offices during the week, how many small offices do you have to clean to earn \$500?
5. **MUSEUMS** The cost of admission to a science museum is \$18 for adults and \$12 for students. The museum collected \$2376 from admissions for one day. Make a graph that shows the possible numbers of adults and students admitted to the museum. (Lesson 4.3)

6. **BOWLING** In 1995, the cost of bowling one string at a bowling alley was \$1.75. In 2000, the cost of one string was \$2.25. If the cost of bowling one string increased the same amount each year, find the rate of change of the cost in dollars per year. (Lesson 4.4)

HEALTH CARE In Exercises 7 and 8, use the information below. (Lesson 4.5)

The dosage of a medication for a child is based on the child's weight. Examples of such recommendations are shown in the table below. The recommended dosage (in milligrams) varies directly with the weight (in pounds) of the child.

Weight (lb)	Dosage (mg)
20	125
28	175
32	200
40	250

7. Write a direct variation model that relates the weight w to the dosage d .
8. Estimate the dosage for a child who weighs 45 pounds.
9. **CLOTHING** A tailor charges a \$15 fee plus \$2.50 per letter to sew a name onto a jacket. The equation $y = 2.5x + 15$ models the total cost y of sewing a name with x letters. Find the slope and y -intercept of the equation. Explain what the slope and y -intercept mean in the cost model. (Lesson 4.6)
10. **CLUB MEMBERSHIP** The total cost y of a family membership to a health club for x months can be modeled by the equation $y = 30x + 75$. How many months of family membership do you have if your family pays \$225? (Lesson 4.7)
11. **BICYCLES** You ride your bicycle from your house to school. Your average speed is 15 miles per hour. Write a linear function that models the distance you travel $d(t)$ as a function of t , the time spent traveling. Then use your model to estimate the distance traveled after you ride for 0.2 hours. (Lesson 4.8)

CHAPTER 5

DOGS In Exercises 1–3, use the following information. (Lesson 5.1)

A group of dogsledders set off on an expedition with 91 pounds of dog food for their dogs. The dogs eat 7 pounds of dog food each day.

1. Write an equation in slope-intercept form to model the total remaining dog food y (in pounds) in terms of x , the days on the expedition.
2. Copy and complete the table using your equation from Exercise 1.

Days (x)	3	5	7	9
Remaining dog food (y)	?	?	?	?

3. Find the number of days that the supply of dog food will last.

VINTAGE CARS In Exercises 4 and 5, use the following information. (Lesson 5.2)

You bought a vintage car for \$4500 last year. You are told that the car is worth \$600 more this year, and you should expect the value of the car to increase by \$600 every year.

4. Write an equation that models the total value v of the car in terms of n , the number of years you have owned the car.
5. Calculate the value of the car after you have owned it for 7 years.

MOVING VANS In Exercises 6–8, use the following information. (Lesson 5.3)

The cost of renting a moving van for a 26 mile trip is \$62.50. The cost of renting the same moving van for a 38 mile trip is \$65.50.

6. Write a linear equation that models the cost c of renting the van in terms of m , the length (in miles) of the trip.
7. Use your equation from Exercise 6 to find the cost of renting the van for a 50 mile trip.
8. You have only \$75 to spend on the moving van. What is the longest trip you can take?

BASKETBALL In Exercises 9 and 10, use the following information. (Lesson 5.4)

You stood in 6 locations on a basketball court and made 20 attempts at a basket from each location. The table shows the distance each location was from the basket and the number of shots made.

Distance from basket (feet)	Shots made
5	18
10	15
15	10
20	10
25	7
30	4

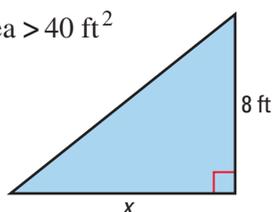
9. Make a scatter plot of the data. Let x equal the distance from the basket and let y equal the shots made.
10. Find an equation of the line that you think best fits the data.
11. **CANOEING** You are on an 18 mile long canoe trip and you are paddling at a constant rate. You started the trip at 9:00 A.M., and you traveled 6 miles by 10:30 A.M. Write an equation that gives the distance d (in miles) remaining in terms of the time t (in hours). What is the slope of the line? (Lesson 5.5)
12. **FUNDRAISING** Your scout troop holds a breakfast to raise money for a local charity. Your troop charges \$8 for an adult and \$4 for a child, and you raise a total of \$1200. Write an equation that represents the different amounts of adults x and children y that could have attended the breakfast. (Lesson 5.6)
13. **WEB SITES** The table shows the hits received by a Web site each week after its launch. Write a linear model for the data. Then predict the number of hits the Web site will receive in week 7.

Week	Hits
1	57
2	76
3	107
4	236
5	367
6	499

CHAPTER 6

- MONEY** You want to purchase a bicycle that costs \$165. You have already saved \$118 for the bicycle. Let x represent the additional amount of money you need to purchase the bicycle. Write an inequality for x . What is the least additional amount of money that you need to purchase the bicycle? (Lesson 6.1)
- CATERING COSTS** Dave is planning the awards banquet for his bowling league. He has \$1500 in the budget to spend on the catering for the 108 people that will be attending the banquet. The catering company charges a \$150 for a setup fee plus a set amount per person. Dave needs to decide how much he can afford to spend per person. Write and solve an inequality to determine the maximum amount of money that he can spend per person. (Lesson 6.2)
- GEOMETRY** Write an inequality for the value of x . (Lesson 6.2)

$$\text{Area} > 40 \text{ ft}^2$$



- TEMPERATURE** The table shows the normal daily high temperatures for the month of January in four cities in California. Write a compound inequality that represents the different temperatures. (Lesson 6.3)

City	Temperature (°F)
Los Angeles	65.7
Sacramento	52.7
San Diego	65.9
San Francisco	55.6

- CALCIUM** The recommended daily intake of calcium for teenagers is estimated between 1200 milligrams and 1500 milligrams. Write an absolute-value inequality to represent the recommended daily intake of calcium for teenagers. (Lesson 6.4)

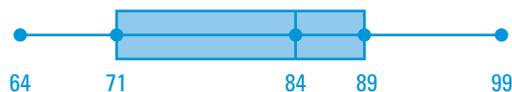
- QUALITY CONTROL** Dara works in the quality control department at a company that packages baking mixes. Each box of vanilla cake mix that she inspects must weigh between 509 grams and 525 grams. Write an absolute-value inequality to represent this situation. (Lesson 6.4)
- SEWING** You have \$15 to spend on two different fabrics for a sewing project. The solid fabric that you want costs \$2.50 per yard and the printed fabric that you want costs \$4.99 per yard. Let x represent the number of yards of the solid fabric you can buy. Let y represent the number of yards of the printed fabric you can buy. Write and graph an inequality to model the amounts of each fabric you can buy. (Lesson 6.5)

TRAVEL TIME In Exercises 8–10, use the following information. (Lesson 6.6)

A survey asks 20 students the average time (in minutes) it takes them to get to school in the morning. The results are listed below.

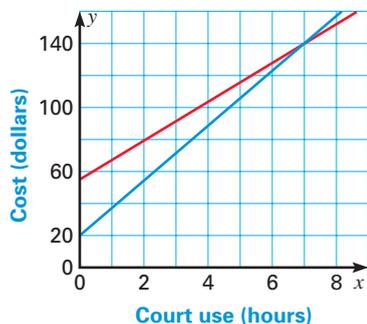
18, 23, 17, 30, 13, 22, 20, 20, 7, 22,
25, 15, 13, 30, 15, 5, 30, 21, 30, 10

- Use a stem-and-leaf plot to order the times from least to greatest.
 - Find the mean, median, and mode of the data.
 - Is one measure of central tendency most representative of a typical travel time? Explain your reasoning.
 - AGES** The ages of the employees at a roller rink are listed below. Draw a box-and-whisker plot of the data. (Lesson 6.7)
- 24, 22, 30, 18, 29, 38, 33, 17, 22, 25, 16, 41
- TEST SCORES** Create a collection of 16 test scores that could be represented by the box-and-whisker plot show below. (Lesson 6.7)



CHAPTER 7

1. **TENNIS** A tennis club charges \$55 for a summer membership plus \$12 for each hour of court use. A second club charges \$20 for a summer membership plus \$17 for each hour of court use. Use the graph below to determine the number of hours of court use for which the total cost of playing tennis at each club is the same. (Lesson 7.1)



2. **CARPETS** Store A charges \$3 per square foot for a wall-to-wall carpet and charges \$85 for installation. Store B charges \$2 per square foot for the same carpet and charges \$100 for installation. Use a graph to determine the square footage for which the total cost of the carpet and installation at each store is the same. (Lesson 7.1)
3. **MONEY** A bag contains quarters and dimes. There are 15 coins in the bag. The value of the coins is \$2.70. Use substitution to determine the number of quarters and dimes in the bag. (Lesson 7.2)
4. **MOVIES** A movie rental store sells previously viewed movies. The movies in DVD format cost \$10 each and the movies in VHS format cost \$7 each. Jana bought 6 movies for \$51, excluding tax. Use substitution to determine the number of DVDs that Jana bought. (Lesson 7.2)
5. **TELEPHONE RATES** A telephone company offers two long distance plans. One plan charges \$4.95 per month and \$.07 per minute. The other plan does not have a monthly fee and charges \$.10 per minute. Use linear combinations to determine the number of minutes for which the cost of each plan is the same. (Lesson 7.3)
6. **AGES** Twice Mark's age minus Tom's age is equal to 9. Twice Tom's age minus 8 is equal to twice Mark's age. Use linear combinations to determine Mark's age and Tom's age. (Lesson 7.3)
7. **PLANETARIUM SHOWS** The prices for admission tickets to the planetarium shows at a science museum are listed in the table below. On Monday, 540 admission tickets for the planetarium shows are purchased. The museum collected \$3257.50 in admission ticket sales for the planetarium shows. How many student admission tickets were sold? (Lesson 7.4)

Admission Ticket Prices	
Adult	\$8
Student	\$5.50

ART SUPPLIES In Exercises 8 and 9, use the following information. (Lesson 7.5)

At an art supply store, all of the tubes of oil paint cost the same, and all of the tubes of acrylic paint cost the same. An art teacher paid \$43.71 for 3 tubes of oil paint and 6 tubes of acrylic paint. The next week he paid \$14.57 for one tube of oil paint and 2 tubes of acrylic paint.

- Can you determine how much the art teacher paid for one tube of oil paint? Explain.
- The following week, the art teacher paid \$39.89 for 3 tubes of oil paint and 5 tubes of acrylic paint. Can you determine how much he paid for one tube of oil paint? Explain.

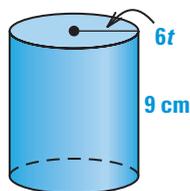
JOBS In Exercises 10 and 11, use the following information. (Lesson 7.6)

During a summer, you can work a total of no more than 30 hours a week at your two jobs. Your camp counseling job pays \$8 an hour, and your job at a retail store pays \$10 an hour. You want to earn at least \$250 a week.

- Write a system of linear inequalities that shows the various number of hours you can work at each job.
- Graph the system of linear inequalities.

CHAPTER 8

1. **GEOMETRY** The volume V of a cylinder is given by $V = \pi r^2 h$, where r is the radius of a base, h is the height, and $\pi \approx 3.14$. What is the volume of the cylinder in terms of t ? (Lesson 8.1)



TESTS In Exercises 2 and 3, use the following information. (Lesson 8.1)

Part A of a test has 15 true-false questions. Part B has 5 multiple choice questions, each of which has 4 choices. There are 2^{15} ways to answer the questions in Part A. There are 4^5 ways to answer the questions in Part B.

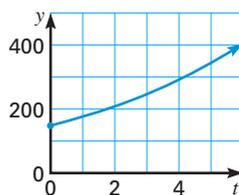
2. How many ways are there to answer all 20 questions?
3. If you guess the answer to each question, what is the probability that you will get them all right?
4. **SAVINGS ACCOUNTS** You opened a savings account in 1994. The balance A is modeled by $A = 320(1.03)^t$, where $t = 0$ represents the year 2004. What is the account balance in 1994? in 2004? in 2014? (Lesson 8.2)
5. **SPORTS** The volume V of a ball is given by $V = \frac{4}{3}\pi r^3$, where r is the radius of the ball. The radius of a baseball is about $\frac{1}{3}$ the radius of a soccer ball. Find the ratio of the volume of the baseball to the volume of the soccer ball. Let r represent the radius of the soccer ball. (Lesson 8.3)

PROBABILITY In Exercises 6 and 7, you roll a number cube five times. (Lesson 8.3)

6. What is the probability that you roll a three each time?
7. What is the probability that you roll five odd numbers in a row?

ASTRONOMY In Exercises 8–11, write the mass (in kilograms) of the planet in scientific notation. (Lesson 8.4)

8. Mercury: 330,000,000,000,000,000,000
9. Venus: 4,900,000,000,000,000,000,000
10. Mars: 640,000,000,000,000,000,000
11. Pluto: 13,000,000,000,000,000,000
12. **HEARTBEATS** Consider a person whose heart beats 65 times per minute and who lives to be 90 years old. Estimate the number of times the person's heart beats during his or her life. Do not acknowledge leap years. Write your answer in decimal form and in scientific notation. (Lesson 8.4)
13. **INVESTING** Which description best represents the growth curve in the graph? (Lesson 8.5)
- A. Deposit = \$150, annual rate = 5%
- B. Deposit = \$350, annual rate = 11%
- C. Deposit = \$150, annual rate = 18%



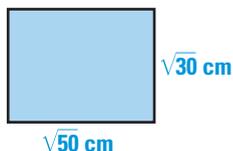
STEREOS In Exercises 14 and 15, use the following information. (Lesson 8.6)

You want to sell your old stereo system. You place an advertisement about your stereo system in the classified section of your local newspaper. The selling price listed in the advertisement is \$80.50. You decide to decrease the price by 10% each week that you do not sell the stereo system.

14. Write an exponential decay model to represent the situation.
15. You sell your stereo system for the price listed in the advertisement for the third week. How much money did you get for your stereo system?

CHAPTER 9

- DIVING** You dive from a cliff that is 20 feet above the water. Your height h after t seconds can be modeled by $h = -16t^2 + 20$. How long will it take you to reach the water? (Lesson 9.1)
- GEOMETRY** Find the area of the rectangle below. Give both the exact answer in simplified form and the decimal approximation rounded to the nearest hundredth. (Lesson 9.2)



LAWN SPRINKLERS In Exercises 3–5, use the following information. (Lesson 9.3)

The arc of the water sprayed from a lawn sprinkler is given by the model

$$y = -0.04x^2 + 0.93x$$

where x is the distance (in feet) across the lawn and y is the height (in feet) of the arc.

- Sketch the graph of the function. Label the vertex.
- What is the maximum height of the water sprayed from the sprinkler?
- The distance across the lawn from the sprinkler to where the arc lands is called the *distance of throw*. What is the distance of throw for the sprinkler?

SKI JUMPS In Exercises 6 and 7, use the following information. (Lesson 9.4)

The path of a ski jumper after takeoff can be modeled by the equation

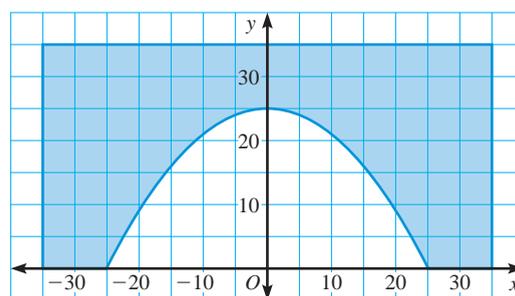
$$y = -0.036x^2 + 1.38x + 20$$

where x is the horizontal distance (in feet) and y is the vertical distance (in feet).

- Sketch a graph of the model for positive values of x and y .
- Use the graph to estimate a positive square root of the equation below.

$$0 = -0.036x^2 + 1.38x + 20$$

- SOFTBALL** You and a partner are practicing catching fly balls. When you throw the softball upward for your partner to catch, it leaves your hand when it is 5.5 feet off the ground. The softball has an initial velocity of 35 feet per second. Suppose that your partner misses the ball and it hits the ground. How long does it take for the softball to hit the ground? (Lesson 9.5)
- CHEERLEADING** A cheerleading squad does a stunt that has a flyer, who is thrown in the air and caught. The stunt works best when the flyer's feet reach a height of at least 30 feet off the ground. The flyer starts with her feet 4.5 feet off the ground and her initial velocity is 31 feet per second. Will the flyer's feet reach a height of at least 30 feet off the ground? Explain. (Lesson 9.6)
- BRIDGES** The parabolic opening in the bridge below can be modeled by $y = -0.04x^2 + 25$, where x is the distance (in feet) from the center of the opening and y is the height (in feet) above the road. Write a system of inequalities that describes the shaded region. (Lesson 9.7)

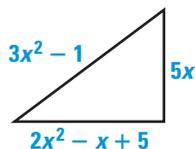


- AUTOMOBILES** The table below lists the value of an automobile over time. Which type of model best represents the data? Write a model. (Lesson 9.8)

Year	Value (dollars)
2002	12,500.00
2003	11,250.00
2004	10,125.00
2005	9112.50

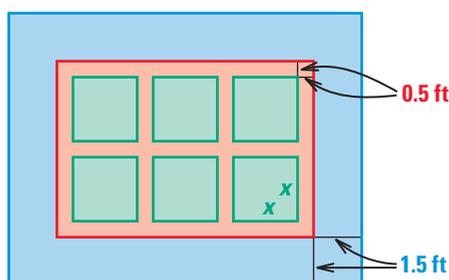
CHAPTER 10

1. **GEOMETRY** Write an expression in standard form for the perimeter of the triangle shown below. (Lesson 10.1)

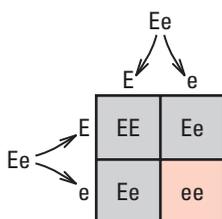


QUILTS In Exercises 2 and 3, use the information below. (Lesson 10.2)

You are making the quilt shown below, which has 6 squares in the center. The border around the squares is 0.5 foot wide, and the border around the outside of the quilt is 1.5 feet wide.



2. Write a polynomial expression that represents the total area of the quilt. Give your answer as a quadratic trinomial.
3. Use the expression from Exercise 2 to find the area of the quilt when $x = 1.5, 2,$ and 2.5 .
4. **MICE** In mice, the black eye color gene E is dominant, and the red eye color gene e is recessive. A mouse whose eye color genes are EE or Ee will have black eyes. The Punnett square shows the possible results of crossing two mice that have recessive eye color genes. Write a polynomial model that can be used to represent the Punnett square. (Lesson 10.3)



ARCHITECTURE In Exercises 5 and 6, use the following information. (Lesson 10.4)

An architect designs a large arched doorway for the main entrance to an office building. The shape of the arch can be modeled by $y = -0.04(x + 22)(x - 22)$, where x and y are measured in feet.

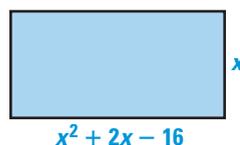
5. How wide is the arch at the base?
6. How high is the arch?
7. **GARDENS** You decide to plant a bulb garden. You want the length of the rectangular garden to be 3 feet longer than its width. The bulbs that you have will cover 88 square feet. What should the length and the width be? (Lesson 10.5)

SPORTS In Exercises 8 and 9, use the following information. (Lessons 10.6, 10.7)

In the vertical motion model $h = -16t^2 + vt + s$, h is the height (in feet), t is the time in motion (in seconds), v is the initial velocity (in feet per second), and s is the initial height (in feet).

8. A quarterback releases a football when it is 6 feet off the ground, and the football has an initial upward velocity of 46 feet per second. The receiver misses the pass and the football hits the ground. How long does it take for the football to hit the ground?
9. A volleyball is hit when it is 4 feet off the ground. The volleyball has an initial upward velocity of 32 feet per second. Does the volleyball reach a height of 20 feet? If so, how long does it take to reach that height?

GEOMETRY In Exercises 10 and 11, the rectangle below has an area of 32 square meters. (Lesson 10.8)



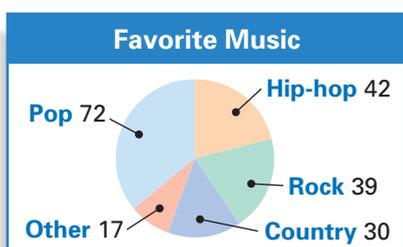
10. Write a polynomial equation that you can solve to find the length and the width of the rectangle.
11. What are the dimensions of the rectangle?

CHAPTER 11

1. **SCALE DRAWINGS** You want to make a scale drawing of your classroom. The actual length of your classroom is 36 feet and the actual width is 32 feet. In your drawing, the length of your classroom is 9 inches. What should the width of your classroom in your drawing be? (Lesson 11.1)

MUSIC In Exercises 2 and 3, use the following information. (Lesson 11.2)

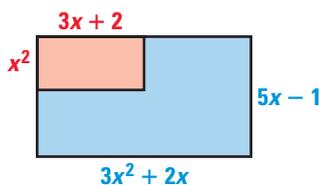
The graph shows the responses of 200 students when asked to name their favorite type of music.



2. What percent of the students said that rock is their favorite type of music?
3. What percent of the students said that pop is their favorite type of music?
4. **BABY-SITTING** The table below lists the money you receive for baby-sitting. Decide if the data show *direct* or *inverse* variation. Then write an equation that relates the hours worked h and the total pay p . (Lesson 11.3)

Hours, h	2	3	5
Pay (dollars), p	17	25.50	42.50

5. **PROBABILITY** A coin is tossed onto the large rectangular region below. It is equally likely to land on any point in the region. Write a model that gives the probability that the coin will land in the small red rectangle. (Lesson 11.4)



REAL ESTATE In Exercises 6 and 7, use the following information. (Lesson 11.5)

The models show the total value (in millions of dollars) of homes sold each year and the number of real estate agents selling homes each year at a real estate agency. Let t represent the number of years since 2000.

Total value of homes sold: $V = \frac{1000 + 140t}{2 - 0.1t}$

Number of agents: $A = \frac{210 + 10t}{1 - 0.05t}$

6. Find a model for the average value of homes sold each year per agent.
7. Use your model from Exercise 6 to find the average value of homes sold per agent for 2005.

HIKING In Exercises 8–10, use the following information. (Lesson 11.6)

You are planning a 20-mile hiking trip. Some of the trails that you plan to hike are steep and some are relatively flat. You average 2 miles per hour on the steep trails and 4 miles per hour on the flat trails.

8. Write an expression for the total time of the hike. Let x represent the miles of steep trails.
9. Write your answer to Exercise 8 as a single rational expression.
10. Use your expression from Exercise 9 to determine the total time of the hike if you hike 5 miles of steep trails.
11. **GEOMETRY** The area of the rectangle below is $3x^2 + 3x - 6$. Find the length. (Lesson 11.7)



12. **BASKETBALL** You have made 27 free-throws in 45 attempts. Your free-throw average is $\frac{27}{45} = 0.6$. How many consecutive free-throws must you make to increase your free-throw average to 0.75? (Lesson 11.8)

CHAPTER 12

1. **BASEBALL** The radius of a sphere can be found using the formula $r = \sqrt{\frac{S}{4\pi}}$, where S is the surface area and r is the radius of the sphere. Find the radius of a baseball that has a surface area of 168 square centimeters. Round your answer to the nearest hundredth. (Lesson 12.1)

PENDULUMS In Exercises 2 and 3, use the following information. (Lesson 12.2)

The *period* of a pendulum is the time it takes for the pendulum to swing back and forth. The model $T = 2\pi\sqrt{\frac{L}{981}}$ relates the period T (in seconds) of a pendulum to the length L (in centimeters) of the pendulum.

2. A pendulum has a length of 50 centimeters. A second pendulum has a length of 32 centimeters. Write an expression that can be used to find the difference of the periods of the pendulums.
3. Simplify your expression from Exercise 2. Round your answer to the nearest hundredth.

ROLLER COASTERS In Exercises 4 and 5, use the following information. (Lesson 12.3)

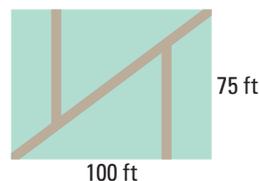
The model $v = 8\sqrt{h}$ relates the velocity v (in feet per second) of a roller coaster at the bottom of a drop to the height h (in feet) of the drop.

4. The velocity of a roller coaster at the bottom of a drop is 44 feet per second. Find the height of the drop.
5. The velocity of a roller coaster at the bottom of a drop is 68 feet per second. Find the height of the drop.
6. **FOOTBALL** The path of a kicked football can be modeled by

$$y = -0.012x^2 + 1.11x$$

where x is the horizontal distance (in feet) and y is the vertical distance (in feet). Suppose that the football is not caught and it hits the ground. Find the horizontal distance covered by the football. (Lesson 12.4)

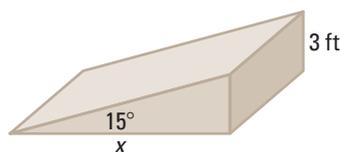
7. **PARKS** The dimensions of a rectangular park are shown below. Find the length of the path that connects opposite corners of the park. (Lesson 12.5)



HELICOPTERS In Exercises 8 and 9, use the following information. (Lesson 12.6)

A helicopter is located 4 miles east and 2 miles north of a hospital. It travels to a destination 8 miles east and 12 miles north of the hospital.

8. What is the distance from the helicopter's original location to its destination? Round your answer to the nearest hundredth of a mile.
9. What is the distance from the helicopter's destination to the hospital? Round your answer to the nearest hundredth of a mile.
10. **SKATEBOARDING** You are building a skateboarding ramp. You want the angle of incline of the ramp to be 15° , and you want the height to be 3 feet, as shown below. What is the horizontal distance x ? Round your answer to the nearest tenth of a foot. (Lesson 12.7)



COUNTEREXAMPLES In Exercises 11–13, find a counterexample to show that the statement is not true. (Lesson 12.8)

11. If a and b are odd integers, then $a + b$ is an odd integer.
12. If a and b are nonzero real numbers and $a > b$, then $\frac{1}{a} > \frac{1}{b}$.
13. For any integer a , $a^3 > a^2$.