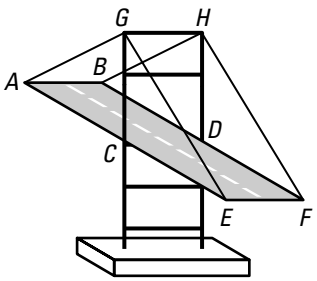
Mixed Problem Solving

CHAPTER 1

1. BACTERIA The table below shows the number of bacteria cells in a petri dish after n doubling periods. How many cells will there be after 7 doubling periods? **(Lesson 1.1)**

n (periods)	1	2	3	4
Billions of bacteria	2	4	8	16

BRIDGES In Exercises 2–4, use the diagram of the suspension bridge. *ABF* represents the road, $\overline{CG}$ and $\overline{DH}$ represent bridge supports, and $\overline{AG}$, $\overline{GE}$, $\overline{BH}$, and $\overline{HF}$ represent suspension cables. (Lesson 1.2)

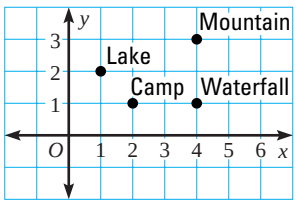


2. Name the two suspension cables that intersect at G.

3. Name the intersection of ABF and GHD.

4. Name the intersection of GHF and GHD.

HIKING In Exercises 5–7, use the hiking map below to find the distance between the locations. Coordinates on the map are given in miles. (Lesson 1.3)

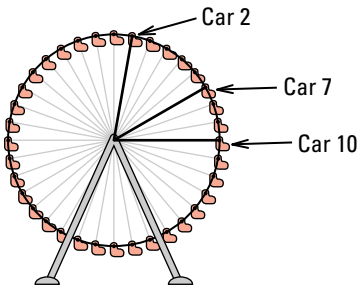


5. camp and mountain

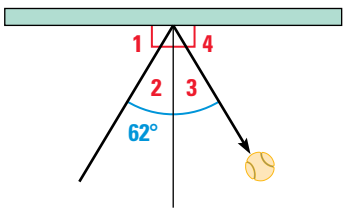
6. lake and waterfall

7. camp and lake

8. FERRIS WHEEL The first Ferris wheel was exhibited in Chicago, Illinois, in 1893. The wheel was 250 feet across and had 36 cars spaced equally apart. The measure of the angle formed by Car 2 and Car 10 was 80°, and the measure of the angle formed by Car 2 and Car 7 was 50°. Find the measure of the angle formed by Car 7 and Car 10. **(Lesson 1.4)**



9. TENNIS To practice your tennis swing, you hit a ball against a practice wall. When the ball hits the wall, it bounces off so that $\angle 2$ and $\angle 3$ are congruent. Find $m\angle 1$, $m\angle 2$, $m\angle 3$, and $m\angle 4$. **(Lesson 1.5)**



10. THE SUN Suppose that between sunrise and sunset, the sun travels across the sky in a perfect half circle. When the setting sun is just 18° above the western horizon, what is the angle formed by the sun and the eastern horizon? **(Lesson 1.6)**

11. PAINTING You would like to paint the ceiling in your bedroom. The ceiling is 13 feet long and 11 feet wide. At the store, you notice that each container of paint will coat 100 square feet. How many containers of paint will you need to buy in order to paint the ceiling with 2 coats? Explain. **(Lesson 1.7)**

CHAPTER 2

HEALTH In Exercises 1 and 2, use the following health recommendation: "You want to lower your risk of cancer and heart attacks? Eat plenty of fruits, grains, and vegetables." (Lesson 2.1)

1. Write the recommendation in if-then form. Then determine the hypothesis and conclusion.

2. Write the inverse, converse, and contrapositive of the conditional statement.

EARTHQUAKES In Exercises 3–5, use the information in the table to determine whether the statement is true or false. If false, provide a counterexample. (Lesson 2.2)

Richter Magnitude	Earthquake Effects
less than 3.5	Generally not felt, but recorded
3.5–5.4	Often felt, but rarely causes damage
5.5–6.0	Slight damage to buildings
6.1–6.9	Can be destructive in areas where people live
7.0–7.9	Major earthquake, causes serious damage
8.0 or greater	Great earthquake, great destruction

3. An earthquake is a great earthquake if and only if its Richter Magnitude is 8.0 or greater.

4. An earthquake causes damage if and only if its Richter Magnitude is greater than 6.0.

5. An earthquake is often felt if and only if its Richter Magnitude is 3.5.

MARINE BIOLOGY In Exercises 6 and 7, use the following statements. (Lesson 2.3)

If an animal is the largest animal on earth, then the animal is a blue whale. If an animal is a blue whale, then the animal can weigh 300,000 pounds.

6. Write a conditional statement that follows from the pair of true statements.

7. Write the inverse and the contrapositive of the conditional statement you wrote in Exercise 6.

8. **MOVIES** For the past three Tuesdays, a movie theater has offered half-priced tickets. Maureen concludes that the theater will offer half-priced tickets next Tuesday. Did Maureen use *inductive* or *deductive reasoning* to come to her conclusion? **(Lesson 2.3)**

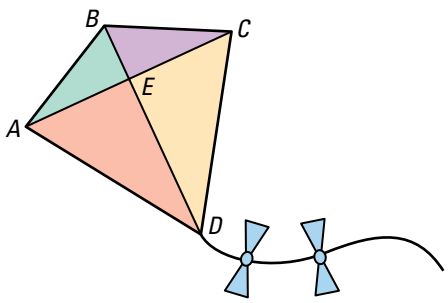
BODY WEIGHT In Exercises 9 and 10, use the following information. (Lesson 2.4)

The ideal male body weight w (in pounds) can be determined from a man's height h (in inches) using the formula $w = 110 + 5(h - 60)$.

9. Solve the formula for h and write a reason for each step.

10. Use the result from Exercise 9 to find the height of a man with an ideal weight of 150 pounds.

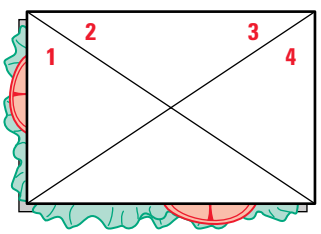
KITES In Exercises 12 and 13, use the diagram of the kite. $\overline{BD}$ is perpendicular to $\overline{AC}$, and E is the midpoint of $\overline{AC}$. (Lesson 2.5)



11. Give a reason why $\overline{AE}$ and $\overline{EC}$ are congruent.

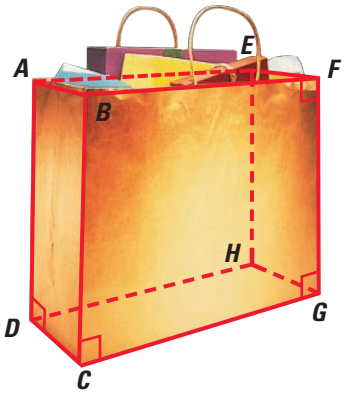
12. Can you conclude that $\overline{BE}$ and $\overline{ED}$ are congruent? Explain.

13. **SANDWICH** Suppose you divide a rectangular sandwich into four pieces using two diagonal cuts. In the diagram of the sandwich, $\angle 1$ and $\angle 4$ each measure 57°. The corners of the bread form right angles. Can you prove that $\angle 2$ is congruent to $\angle 3$? Explain your reasoning. **(Lesson 2.6)**



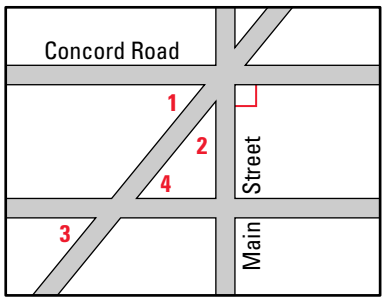
CHAPTER 3

SHOPPING BAG **In Exercises 1–3, use the following information.** **(Lesson 3.1)**
In the diagram of the shopping bag below, each segment on the bag represents a line.

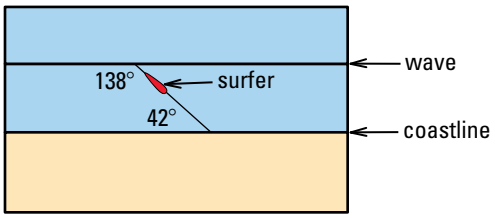


1. Name two lines that are perpendicular to $\overleftrightarrow{FG}$.
2. Name a line skew to $\overleftrightarrow{BF}$.
3. Name a plane that appears parallel to plane HGC.

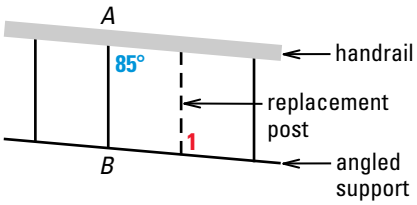
CITY STREETS **In Exercises 4–6, use the following information.** **(Lesson 3.2)**
In the diagram of the intersecting streets below, Main Street and Concord Road are perpendicular, and $\angle 2$ and $\angle 3$ are complementary angles.



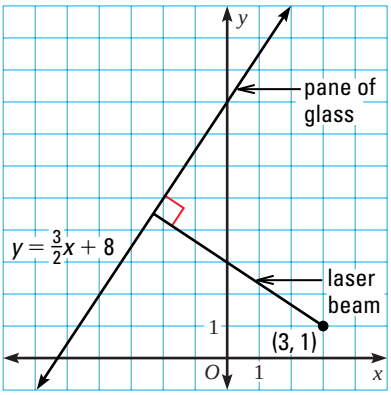
4. Find the sum of $m\angle 1$ and $m\angle 2$.
5. The measure of $\angle 3$ is 50°. Find $m\angle 1$.
6. Prove that $\angle 1$ and $\angle 4$ are congruent.
7. **PARALLEL LINES** Two parallel lines are cut by a transversal so that one of the angles formed is a right angle. What can you say about the measures of all the other angles? Explain. **(Lesson 3.3)**
8. **SURFING** To catch a wave, a surfer must angle the surfboard toward the coast. The diagram shows an overhead view of the path of the surfer. Are the wave and the coastline parallel? Explain your reasoning. **(Lesson 3.4)**



9. **BANISTER** A broken supporting post on a banister needs to be replaced. The handrail and angled support are parallel. What must $\angle 1$ measure so that the replacement post is parallel to post $\overline{AB}$? **(Lesson 3.5)**

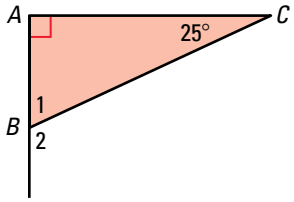


10. **WRITING EQUATIONS** Maria is asked to write the equation of a line that passes through (3, 5) and is parallel to the line $y = -2x - 1$. She writes the equation $y = -2x + 6$. Is Maria's answer correct? Explain your reasoning. **(Lesson 3.6)**
11. **LASER BEAM** A laser beam strikes a pane of glass so the beam is perpendicular to the pane of glass, as shown in the diagram below. Write an equation of the line formed by the laser beam. **(Lesson 3.7)**

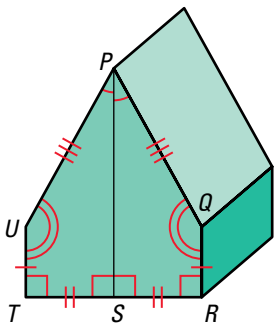


CHAPTER 4

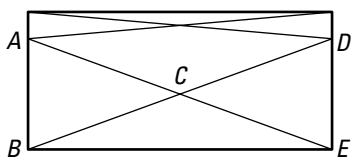
SOCCER In Exercises 1 and 2, use the following information. (Lesson 4.1)
The four corners of a soccer field are marked with red triangular flags, like the one shown below.



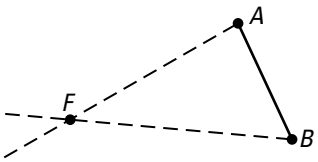
1. Identify the legs and the hypotenuse of $\triangle ABC$.
2. Find $m\angle 1$ and $m\angle 2$.
3. **CAMPING TENTS** In the diagram of the camping tent below, the front flaps of the tent are congruent. Write a congruence statement. (Lesson 4.2)



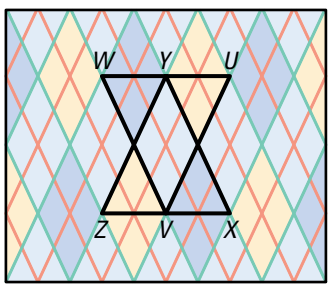
CAT'S CRADLE In Exercises 4 and 5, use the following information. (Lessons 4.3 and 4.4)
Cat's Cradle is a string game in which people use their fingers and a piece of string to create different string patterns. A step in Cat's Cradle is shown below.



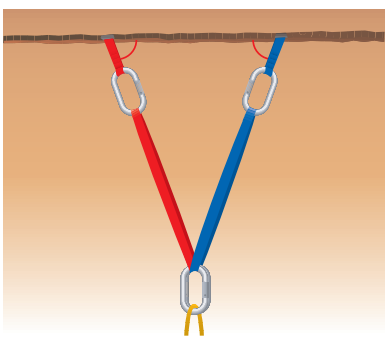
4. Assume that $\overline{AB} \cong \overline{DE}$ and $\overline{BD} \cong \overline{AE}$. Prove that $\triangle ABE \cong \triangle DEB$.
5. Assume that $\overline{BC} \cong \overline{DC}$ and $\overline{AB} \parallel \overline{DE}$. Prove that $\triangle ABC \cong \triangle EDC$.
6. **FIRE LOOKOUTS** To spot fires, the U.S. Forest Service has lookouts on top of mountains with unobstructed views. Suppose two fire lookouts, on mountains A and B, spot a fire at point F. Assuming that the lookouts provide accurate sightlines and the distance between the lookouts is known, explain how the lookouts can determine the exact location of the fire. (Lesson 4.4)



7. **ARGYLE PATTERNS** In the argyle pattern below, $\triangle ZYX$ and $\triangle WVU$ are isosceles, $\overline{UV} \cong \overline{YZ}$, and $\overline{WU} \cong \overline{ZX}$. Prove that $\angle ZYX \cong \angle WVU$ (Lesson 4.5)



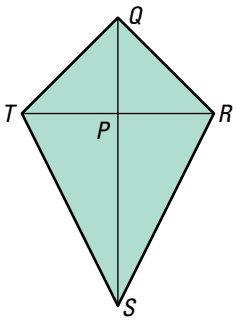
ROCK CLIMBING In Exercises 8 and 9, use the following information. (Lesson 4.6)
In one type of rock climbing, climbers tie themselves to a rope that is supported by anchors. The diagram shows a red and a blue anchor in a horizontal slit in a rock face.



8. If the red anchor is longer than the blue anchor, are the base angles congruent?
9. If a climber adjusts the anchors so they are the same length, do you think that the base angles will be congruent? Explain.

CHAPTER 5

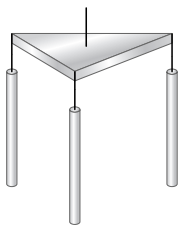
ORIGAMI In Exercises 1 and 2, use the following information. (Lesson 5.1)
One of the steps in folding an origami crane is shown below. In the diagram, $\overline{QS}$ is the perpendicular bisector of $\overline{TR}$.



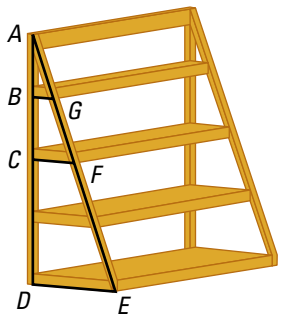
1. What is the relationship between $\overline{TP}$ and $\overline{PR}$?
2. What is the relationship between $\overline{TQ}$ and $\overline{QR}$? Explain.

LOCATIONS In Exercises 3–5, use the following information. (Lesson 5.2)
Using a compass and a map, it is possible to find your position relative to landmarks. You are equidistant from cliff $C(1, 5)$, mountain $M(5, 6)$, and waterfall $W(5, 1)$. The coordinates are given in miles.

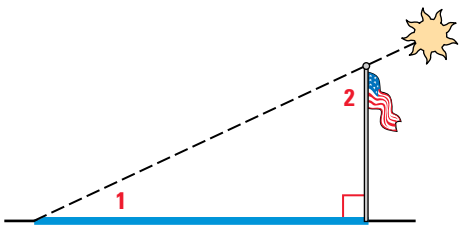
3. Plot the points in a coordinate plane, and connect them to form $\triangle CMW$.
4. Draw the perpendicular bisectors to find your position P. What are the coordinates of P?
5. Estimate your distance from the cliff.
6. **WIND CHIMES** You want to make a wind chime by hanging three metal rods of equal weight from the vertices of a metal triangle. Explain how to find the point on the triangle at which to attach a wire so that the triangle will balance. (Lesson 5.3)



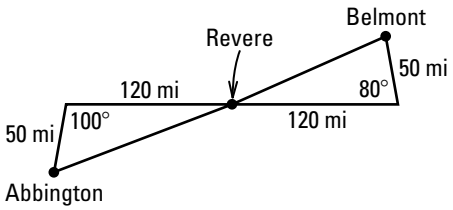
7. **FOLDING SHELVES** A set of folding shelves is shown below. $\overline{CF}$ is a midsegment of $\triangle ADE$, and $\overline{BG}$ is a midsegment of $\triangle ACF$. The length of $\overline{DE}$ is 1 foot. Find CF and BG. (Lesson 5.4)



SHADOWS In Exercises 8 and 9, use the diagram of a flagpole and its shadow. (Lesson 5.5).

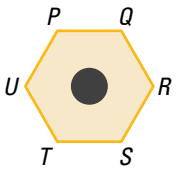


8. Is the shadow longer than the flagpole if $m\angle 1$ is greater than $m\angle 2$? Explain your reasoning.
9. When the length of the shadow is equal to the length of the flagpole, what is $m\angle 1$? Explain your reasoning.
10. **TRAINS** At two o'clock in the afternoon, two trains begin traveling at the same speed heading toward Revere Train Station. Train A starts at Abbington, and Train B starts at Belmont. Which train will get to Revere Train Station first? Explain your reasoning. (Lesson 5.6)



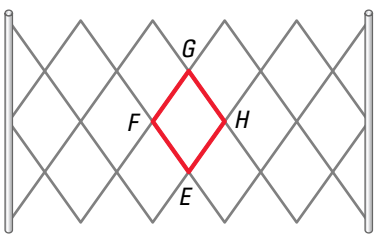
CHAPTER 6

PENCILS **In Exercises 1–3, use the diagram of a cross section of an unsharpened pencil.** (Lesson 6.1)



1. What type of polygon is $PQRSTU$?
2. Tell whether $PQRSTU$ is convex or concave.
3. Does $PQRSTU$ appear to be equilateral, equiangular, regular, or none of these?

SECURITY GATE **In Exercises 4–6, use the following information.** (Lesson 6.2)
City shops often use expandable metal security gates. The crossing beams of these gates form parallelograms that move together to open and close the gate, as shown below.

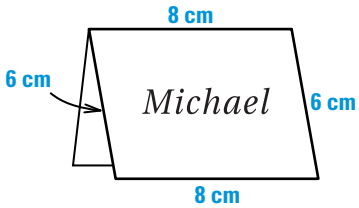


4. Suppose that $m\angle FGH = 73°$. Find $m\angle GHE$.
5. When you close the gate, the measure of $\angle GFE$ increases. What happens to the measure of $\angle FEH$?
6. When the measure of $\angle GFE$ increases, what happens to the length of $\overline{GE}$?

STAIRCASES **In Exercises 7 and 8, use the following information.** (Lesson 6.3)
$ABCD$ is a step on a staircase, where $AB = 20$ in., $BC = 12$ in., $CD = 20$ in., and $AD = 12$ in.

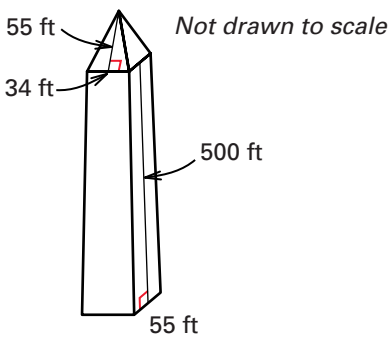
7. Explain why $ABCD$ is a parallelogram.
8. Suppose that $m\angle A = 90°$. Find $m\angle B$, $m\angle C$, and $m\angle D$.

PLACE CARDS **In Exercises 9 and 10, use the diagram of the place card below.** (Lesson 6.4)



9. Is the front of the place card a rhombus? Explain.
10. If each diagonal is 10 centimeters long, is the front of the place card a rectangle? Explain.
11. **KITES AND SQUARES** A student says that a square is a type of kite because a square has two pairs of consecutive congruent sides. Is the student correct? Explain why or why not. (Lesson 6.5)
12. **REAR WINDOW** The rear window of an automobile is a quadrilateral. Exactly one pair of opposite sides are parallel, and exactly one pair of sides are congruent. Can you conclude that the window an isosceles trapezoid? Explain. (Lesson 6.6)

MONUMENTS **In Exercises 13–15, use the following information.** (Lesson 6.7)
The Washington Monument is made up of four congruent triangular faces and four congruent trapezoidal faces. The dimensions of the monument are shown in the diagram below.

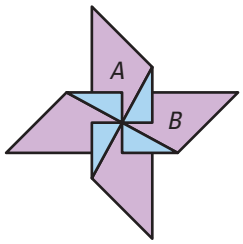


13. Find the area of one of the triangular faces.
14. Find the area of one of the trapezoidal faces.
15. Find the total area of all eight faces of the Washington Monument.

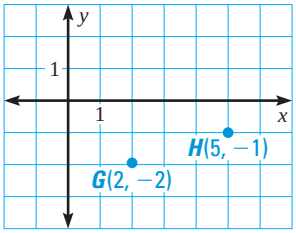
Fourth Pages

CHAPTER 7

1. PINWHEELS Use the diagram of the pinwheel below to name the transformation that will map arm A onto arm B. **(Lesson 7.1)**



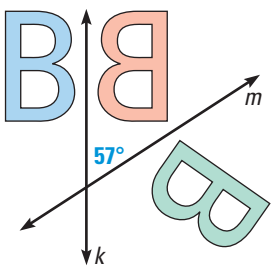
SHOPPING CENTER In Exercises 2 and 3, use the following information. (Lesson 7.2)
You park your car at some point P on the x-axis. You buy groceries at grocery store $G(2, -2)$, put the groceries in your car, and then go to hardware store $H(5, -1)$.



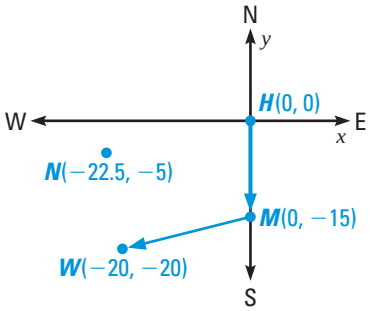
2. Explain how to find P so the distance you travel is as small as possible.

3. What are the coordinates of point P?

4. GRAPHIC DESIGN Graphic designers often use sophisticated software to rotate images and text when designing advertisements and other documents. In the diagram below, a graphic designer reflects the blue letter B in line k to produce red B', which she then reflects in line m to produce green B''. Find the angle of rotation that maps B onto B''. **(Lesson 7.3)**



HELICOPTER TOURS In Exercises 5–7, use the following information. (Lesson 7.4)
You are taking a helicopter tour of the island of Kauai, Hawaii. The tour begins at Hanalei Valley H, and then goes to Mount Waialeale M, the wettest spot on earth. From there, you fly over Waimea Canyon W.

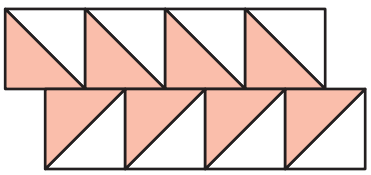


5. Write the component forms of the two vectors in the diagram.

6. Write the component form of the vector that describes the path the helicopter should take from Waimea Canyon to the Napali Coast N.

7. Suppose another helicopter flies the shortest distance from Hanalei Valley to the Napali Coast. Write the component vector that describes this flight.

8. TILE FLOORING The diagram below shows a section of tile flooring composed of identical square tiles. Describe how the design could be created using one square tile eight times. **(Lesson 7.5)**



WALLPAPER BORDERS Use the design below to create a wallpaper border using a frieze pattern with the given classification. (Lesson 7.6)

9. TR

10. TG

11. THG

12. TRHVG

CHAPTER 8

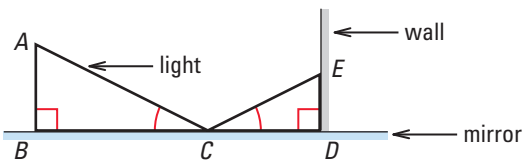
ELECTIONS In Exercises 1 and 2, use the following information. (Lesson 8.1)
In the twenty-five U.S. presidential elections held in the twentieth century, a Republican was elected 13 times and a Democrat was elected 12 times.

1. What is the ratio of elections won by Democrats to elections won by Republicans?
2. What is the ratio of elections won by Democrats to the total number of elections? Write the ratio as a fraction and as a percent.
3. **MURAL** Alejandro Romero created the rectangular mural entitled *Chicago Federation of Labor* by enlarging a rectangular sketch that was 21 inches wide and 56 inches long. The length of the mural is 196 inches. How wide is the mural? (Lesson 8.2)

ARCHITECTURE In Exercises 4 and 5, use the following information. (Lesson 8.3)
You want to make a scale model of your house, so you start with the rectangular base. The length of the house is 50 feet, and the width of the house is 40 feet. The length of the base of the scale model is 10 inches.

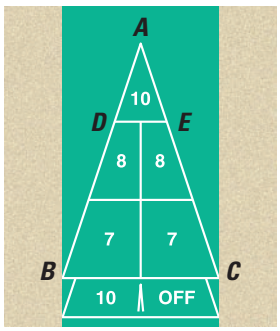
4. What is the width of the base of the scale model?
5. Find the scale factor of the house to the model.

LIGHT In Exercises 6 and 7, use the following information. (Lesson 8.4)
In the diagram below, a ray of light is reflected off a mirror and hits a point on a wall, forming two triangles.



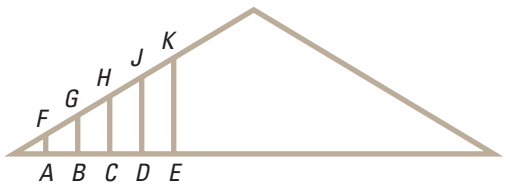
6. Explain why the two triangles in the diagram are similar.
7. Suppose that AB is 2 feet, BC is 4 feet, and CD is 2.6 feet. Find ED.

SHUFFLEBOARD In Exercises 8 and 9, use the diagram of the portion of a shuffleboard court, where $\frac{AD}{AB} = \frac{DE}{BC}$. (Lesson 8.5)



8. What additional piece of information do you need in order to show that $\triangle ADE \sim \triangle ABC$ using the SSS Similarity Theorem?
9. What additional piece of information do you need in order to show that $\triangle ADE \sim \triangle ABC$ using the SAS Similarity Theorem?

ROOF TRUSS In Exercises 10 and 11, use the following information. (Lesson 8.6)
The diagram shows five supports of a roof truss. The support bars are vertical and evenly spaced.

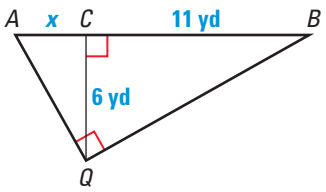


10. What can you conclude about $\overline{FG}$, $\overline{GH}$, $\overline{HJ}$, and $\overline{JK}$? Explain.
11. Suppose that AB is 24 inches and FG is 43.3 inches. Find FK and CE.
12. **DILATIONS** A triangle with vertices $X(5, 1)$, $Y(-2, 0)$, and $Z(4, -4)$ is dilated with the origin as the center and a scale factor of $\frac{1}{2}$. Find the coordinates of the vertices of the image $\triangle X'Y'Z'$. (Lesson 8.7)
13. **SHADOWS** A spotlight is shined on an actress in a student play. The actress is 5 feet 9 inches tall. The actress's shadow on the curtain at the back of the stage is 8 feet $7\frac{1}{2}$ inches tall. What is the scale factor of the actress to her shadow? (Lesson 8.7)

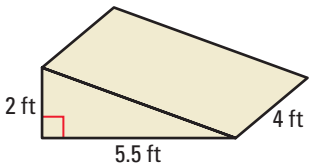
Fourth Pages

CHAPTER 9

1. **FOOTBALL** A football team is studying a play. The two wide receivers, A and B, should be positioned 10 to 15 yards from the center C. If the quarterback Q is 6 yards away from the center, is each wide receiver in the correct position? Explain. **(Lesson 9.1)**



2. **SKATEBOARDING** A skateboarder constructs a skateboard ramp using 2 triangular pieces and 1 rectangular piece of plywood. The triangular pieces are 2 feet tall and 5.5 feet long. The rectangular piece is 4 feet wide. Find the area of the rectangular piece of plywood. **(Lesson 9.2)**



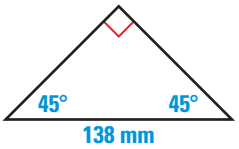
3. **BUILDINGS** A building is 1250 feet tall. If you stand 1350 feet from the top of the building, how far are you from the base of the building? **(Lesson 9.2)**

TREASURE HUNTING In Exercises 4 and 5, use the following information. (Lesson 9.3)
You and your friend find an old treasure map. You follow the map by walking 36 yards to the west, turning at a 90 degree angle, and then walking 48 yards to the north. Your friend insists on staying at the starting point and measuring the distance between the starting point and your final location to make sure you turned at a 90 degree angle.

4. How would your friend know if you actually turned at a 90 degree angle by measuring the distance between you and the starting point?

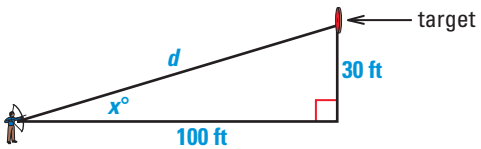
5. Your friend measures a distance of 62 yards. What kind of angle did you turn? Explain.

6. **PYRAMIDS** You are building a pyramid for a history project. A cross section of your pyramid reveals the 45°-45°-90° right triangle shown below. Find the length of the legs of the triangle. **(Lesson 9.4)**



7. **IRELAND** The Cliffs of Moher are located in County Clare, Ireland. They account for 5 kilometers of Ireland's western coastline. You are on a boat that is 150 meters away from the base of the cliffs. The angle of elevation from your boat to the top of the cliffs is 53°. How tall are the cliffs at this location? **(Lesson 9.5)**

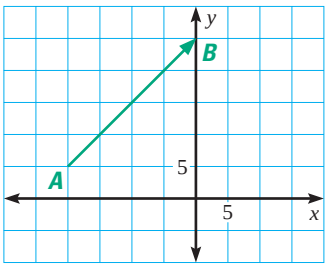
ARCHERY In Exercises 8 and 9, use the following information. (Lesson 9.6)
An archer aims for the bull's-eye of a target that rests 30 feet above the archer's eye level. The horizontal distance between the archer and the target is 100 feet.



8. What is the distance from the archer's eye level to the target?

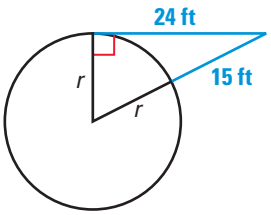
9. What is the angle from the archer's eye level that the archer aims to hit the target?

10. **PERSONAL WATERCRAFT** The given vector represents the velocity of a personal watercraft vehicle on a lake. Find the speed of the vehicle to the nearest mile per hour. What direction is the personal watercraft vehicle traveling relative to east? **(Lesson 9.7)**

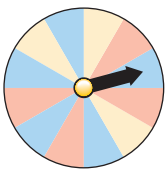


CHAPTER 10

1. WATER FOUNTAINS You are standing 15 feet from the edge of a circular water fountain. The distance from you to a point of tangency on the fountain is 24 feet. What is the radius of the water fountain? **(Lesson 10.1)**



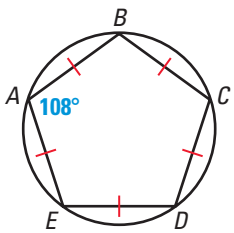
BOARD GAMES In Exercises 2 and 3, use the following information. (Lesson 10.2)
The spinner for a board game is shown below. The arcs for each of the sections are congruent.



2. What is the arc measure for each section of the spinner?

3. What is the arc measure of all the blue sections combined?

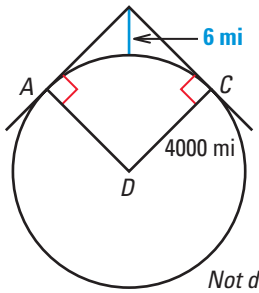
RACING In Exercises 4 and 5, use the following information. (Lesson 10.3)
You circumscribe a circle about a regular pentagon $ABCDE$ to design a race car track for your remote-controlled race car. The interior angles of the pentagon are 108°.



4. Copy the diagram and draw chord $\overline{AC}$. Find $m\angle BAC$, $m\angle BCA$, $m\angle EAC$, and $m\angle DCA$.

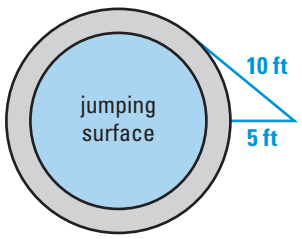
5. When chords are drawn connecting all the non-adjacent vertices of a pentagon, you get a figure called a pentagram. Find $m\angle EAD$ and $m\angle DAC$.

6. HIGH FLYING You are flying in a jet 6 miles above the surface of the Earth on a clear day. The radius of the Earth is 4000 miles. Find the measure of the arc $\overset{\frown}{AC}$ that represents the part of the earth you can see. **(Lesson 10.4)**



Not drawn to scale

WATER TRAMPOLINES In Exercises 7 and 8, use the following information. (Lesson 10.5)
You are swimming towards a circular water trampoline. You are 5 feet away from the trampoline and 10 feet away from a point of tangency.



7. What is the radius of the entire trampoline?

8. In the middle of the trampoline is a jumping surface that has a radius that is 3 feet shorter than the radius of the entire trampoline. What is the radius of the jumping surface? What is the area of the jumping surface?

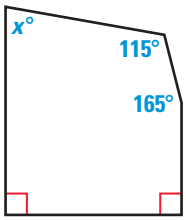
9. WALKIE-TALKIES You and a friend are communicating with walkie-talkies. Your walkie-talkie has a range of 4 miles. Your friend's walkie-talkie has a range of only 2 miles. On a grid, your location, in miles, is (1, 3). Graph the range of where your friend can hear you, as well as where your friend must be to send messages to you. **(Lesson 10.6)**

10. MOTION SENSOR LIGHTS A sensor light can detect motion at a range of 15 meters. The light is placed above an entrance on the front of a building. Draw and describe the two-dimensional locus of points at which the light will detect motion. **(Lesson 10.7)**

Fourth Pages

CHAPTER 11

1. AWNINGS A store owner has an awning put in above his doorway. She wants the awning to be at an 80 degree angle to her store. A side view of the installed awning is shown below. Was the awning installed correctly? Explain your reasoning. **(Lesson 11.1)**

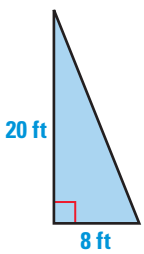


BASKETS In Exercises 2 and 3, use the following information. (Lesson 11.2)
The rim of a wicker basket is shaped like a regular octagon. You want to make a cloth cover for the basket. The perimeter of the rim of the basket is 48 inches.

2. What is the apothem of the rim of the basket?

3. How much cloth will you need to make a cover for the basket?

SCALE MODELS In Exercises 4–6, use the following information. (Lesson 11.3)
A man is making a scale model ship of a British Naval ship. The ship has a sail that is a right triangle with a height of 20 feet and a base of 8 feet. The model ship's sail is 6 inches tall.



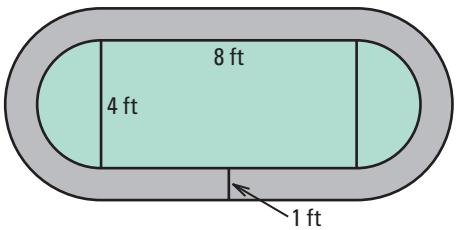
4. What is the ratio of the perimeter of the model's sail to the perimeter of the ship's sail?

5. What is the ratio of the area of the model's sail to the area of the ship's sail?

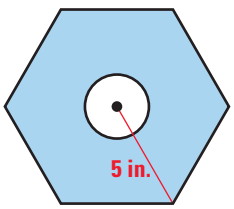
6. Cloth costs $.10 per square inch. How much will the model's sail cost to make?

7. TRICYCLES The front wheel of a tricycle has a diameter of 10 inches. The back wheels have diameters of 7 inches. How many revolutions does each wheel make if the rider travels 200 feet? **(Lesson 11.4)**

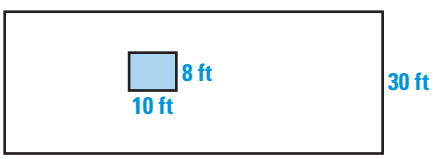
8. GARDENS A garden is made up of a long rectangular section with semicircles at its ends, as shown in the diagram. There is a brick border one foot wide along the perimeter of the garden. What is the area of the brick border? **(Lesson 11.5)**



9. MIRRORS A small circular mirror with a radius of 2 inches is placed in a frame with the shape of a regular hexagon. Use the diagram to find the area of the frame. **(Lesson 11.5)**



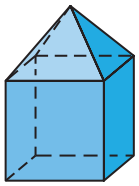
10. TRAPDOORS A rectangular stage with a rectangular trapdoor is shown below. What is the probability that a randomly chosen point on the stage is on the trapdoor? **(Lesson 11.6)**



11. PHONE CALL You are expecting a phone call from a relative anytime between 2:00 P.M. and 3:30 P.M. You unexpectedly have to run an errand and do not get back until 2:15 P.M. What is the probability that you missed your relative's call? **(Lesson 11.6)**

CHAPTER 12

1. **ARCHITECTURE** Count the number of faces, edges, and vertices of the hut below. **(Lesson 12.1)**



2. **PICNIC TABLES** The top of a picnic table is in the shape of a right regular hexagonal prism with a height of 1 inch and all base edges measuring 2 feet. Find the surface area of the hexagonal prism. Express the answer in square feet. **(Lesson 12.2)**

3. **CDs** A CD is 0.1 centimeter thick and 12 centimeters in diameter. The hole in the center is circular with a radius of 1.5 centimeters. What is the CD's total surface area? Remember to include both lateral areas. **(Lesson 12.2)**

ICE CREAM CONE In Exercises 4 and 5, use the following information. **(Lesson 12.3)**
An ice cream cone is 5 inches tall with a radius of 1.5 inches. The outer surface of the cone is covered in chocolate.

4. What is the slant height of the cone?

5. What is the area of the part of the cone covered in chocolate? Leave your answer in terms of π.

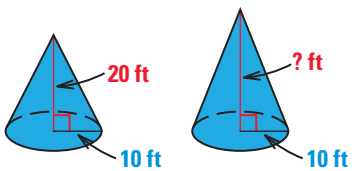
CANNED SOUP In Exercises 6 and 7, use the following information. **(Lesson 12.4)**
A cylindrical can of cream of mushroom soup is 3.3 inches tall with a radius of 1 inch.

6. How many fluid ounces of soup can fit in the can? Round the answer to two decimal places. (One cubic inch is approximately 0.554 fluid ounces.)

7. The soup is put into a cube-shaped can that is the same height as the cylindrical can. Does the cube-shaped can hold more or less soup than the cylindrical can? Explain your reasoning.

8. **WATER BOTTLES** A cylindrical water bottle has a radius of 1.5 inches and a height of 9 inches. A cylinder placed within the water bottle has a radius of 1.25 inches and height of 9 inches. The space between the two cylinders contains ice and the inner cylinder contains water. How much ice can fit in the water bottle? **(Lesson 12.4)**

9. **CHEMISTRY** Charles' Law states that the ratio of the volume V (in cubic feet) of a gas to its temperature T (in kelvins) is always constant. This law is represented by the equation $\frac{V_1}{T_1} = \frac{V_2}{T_2}$. In the diagram below, both cones are filled with the same gas at different temperatures. Use the equation to find the height of the cone on the right. Round the answer to two decimal places. **(Lesson 12.5)**



Temperature 300 kelvins | Temperature 380 kelvins

BASKETBALL In Exercises 10 and 11, use the following information. **(Lesson 12.6)**
The circumference of an official NBA basketball is 94.25 inches.

10. What is the surface area of the basketball?

11. What is the volume of air that can fit inside the basketball?

ORANGES In Exercises 12–14, use the following information. **(Lesson 12.7)**
Two crates of oranges are similar prisms with a scale factor of 1 : 2.

12. The surface area of the larger crate is 1392 square inches. Find the surface area of the smaller crate.

13. The volume of the smaller crate is 432 cubic inches. Find the volume of the larger crate.

14. If the smaller crate holds 16 oranges, how many oranges can the larger crate hold?