

FIGURE 10.13 (repeated)

$$m\angle 2 = 35^\circ$$

$$m\angle 3 = 145^\circ$$

$$m\angle 5 = 35^\circ$$

$$m\angle 4 = 180^\circ - 35^\circ = 145^\circ$$

$\angle 8$ and $\angle 2$ are alternate interior angles, so they have the same measure.

$\angle 7$ and $\angle 3$ are alternate interior angles. Thus, they have the same measure.

$\angle 8$ and $\angle 5$ are corresponding angles. Thus, they have the same measure.

$\angle 4$ and $\angle 5$ are supplementary.

STUDY TIP

There is more than one way to solve Example 5. For example, once you know that $m\angle 2 = 35^\circ$, $m\angle 5$ is also 35° because $\angle 2$ and $\angle 5$ are vertical angles.



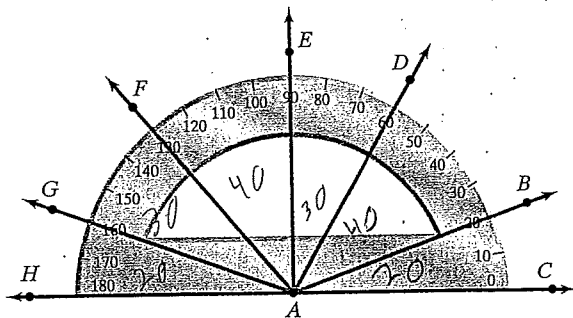
In Figure 10.13, assume that $m\angle 8 = 29^\circ$. Find the measure of each of the other seven angles.

EXERCISE SET 10.1

Practice Exercises

- The hour hand of a clock moves from 12 to 5 o'clock. Through how many degrees does it move?
- The hour hand of a clock moves from 12 to 4 o'clock. Through how many degrees does it move?
- The hour hand of a clock moves from 1 to 4 o'clock. Through how many degrees does it move?
- The hour hand of a clock moves from 1 to 7 o'clock. Through how many degrees does it move?

In Exercises 5–10, use the protractor to find the measure of each angle. Then classify the angle as acute, right, straight, or obtuse.



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|-----------------|-----------------|------------------|
| 5. $\angle CAB$ | 6. $\angle CAF$ | 7. $\angle HAB$ |
| 8. $\angle HAF$ | 9. $\angle CAH$ | 10. $\angle HAE$ |

In Exercises 11–14, find the measure of the angle in which $?\circ$ appears.

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In Exercises 15–20, find the measure of the complement and the supplement of each angle.

15. 48° 16. 52° 17. 89° 18. 1° 19. 37.4° 20. $15\frac{1}{3}$

In Exercises 21–24, use an algebraic equation to find the measures of the two angles described. Begin by letting x represent the degree measure of the angle's complement or its supplement.

- The measure of the angle is 12° greater than its complement.
- The measure of the angle is 56° greater than its complement.
- The measure of the angle is three times greater than its supplement.
- The measure of the angle is 81° more than twice that of its supplement.

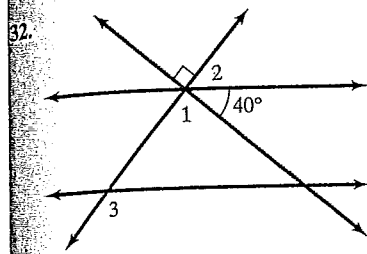
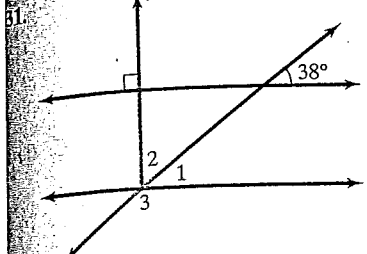
In Exercises 25–28, find the measures of angles 1, 2, and 3.

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The figures for Exercises 29–30 show two parallel lines intersected by a transversal. One of the angle measures is given. Find the measure of each of the other seven angles.

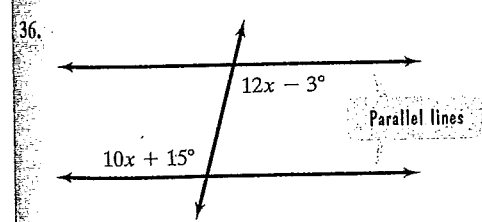
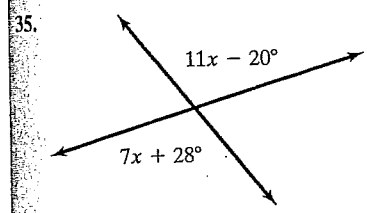
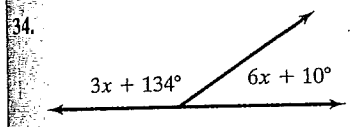
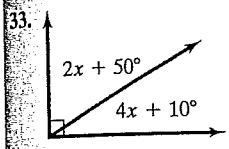
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The figures for Exercises 31–32 show two parallel lines intersected by more than one transversal. Two of the angle measures are given. Find the measures of angles 1, 2, and 3.



• Practice Plus

In Exercises 33–36, use an algebraic equation to find the measure of each angle that is represented in terms of x .



Because geometric figures consist of sets of points, we can apply set operations to obtain the union, \cup , or the intersection, \cap , of such figures. The union of two geometric figures is the set of points that belong to either of the figures or to both figures. The intersection of two geometric figures is the set of points common to both figures. In Exercises 37–44, use the line shown to find each set of points.

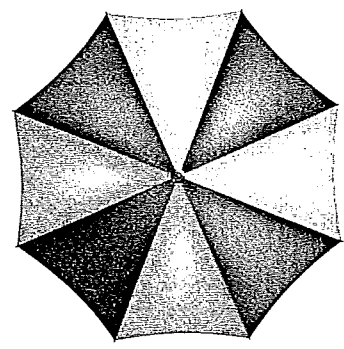


37. $\overline{AC} \cap \overline{BD}$ 38. $\overline{AB} \cap \overline{BC}$ 39. $\overline{AC} \cup \overline{BD}$

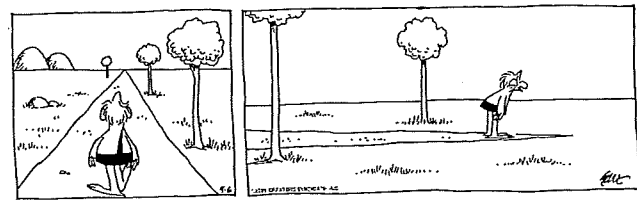
40. $\overline{AB} \cup \overline{BC}$ 41. $\overline{BA} \cup \overline{BC}$ 42. $\overline{CB} \cup \overline{CD}$
 43. $\overline{AD} \cap \overline{DB}$ 44. $\overline{AC} \cap \overline{CB}$

• Application Exercises

45. The picture shows the top of an umbrella in which all the angles formed by the spokes have the same measure. Find the measure of each angle.

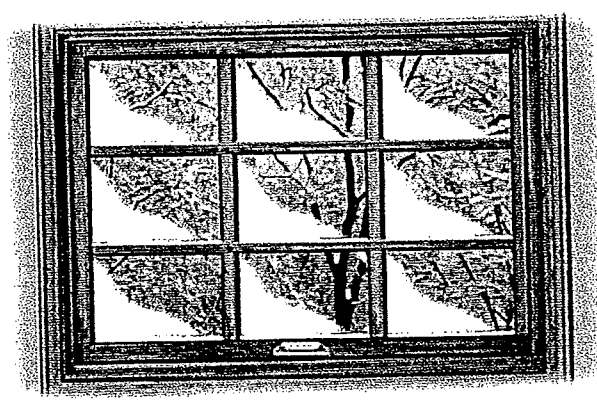


46. Use the definition of parallel lines to explain the joke in this B.C. cartoon.



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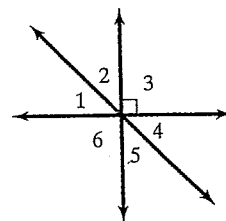
47. The picture shows a window with parallel framing in which snow has collected in the corners. What property of parallel lines is illustrated by where the snow has collected?



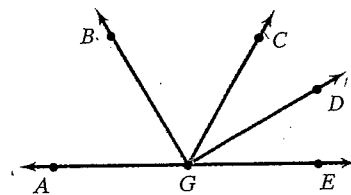
• Writing in Mathematics

48. Describe the differences among lines, half-lines, rays, and line segments.
 49. What is an angle and what determines its size?
 50. Describe each type of angle: acute, right, obtuse, and straight.
 51. What are complementary angles? Describe how to find the measure of an angle's complement.
 52. What are supplementary angles? Describe how to find the measure of an angle's supplement.
 53. Describe the difference between perpendicular and parallel lines.

- 54. If two parallel lines are intersected by a transversal, describe the location of the alternate interior angles, the alternate exterior angles, and the corresponding angles.
- 55. Describe everyday objects that approximate points, lines, and planes.
- 56. If a transversal is perpendicular to one of two parallel lines, must it be perpendicular to the other parallel line as well? Explain your answer.



58. If $m\angle AGB = m\angle BGC$, and $m\angle CGD = m\angle DGE$, find $m\angle BGD$.



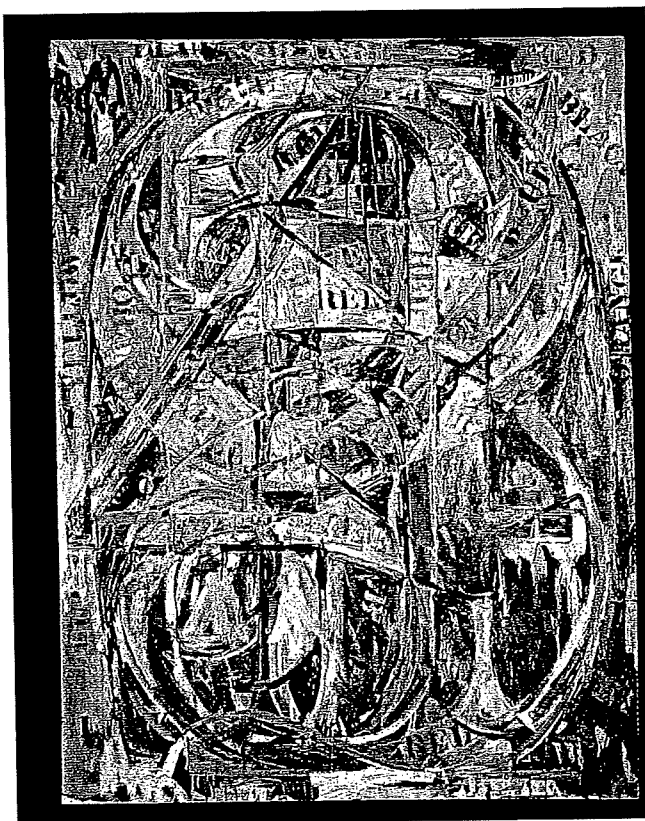
• **Critical Thinking Exercises**

57. Use the figure shown at the top of the next column to select a pair of complementary angles from the following choices:
- a. $\angle 1$ and $\angle 4$
 - b. $\angle 3$ and $\angle 6$
 - c. $\angle 2$ and $\angle 5$
 - d. $\angle 1$ and $\angle 5$.

SECTION 10.2 • TRIANGLES

OBJECTIVES

- 1. Solve problems involving angle relationships in triangles.
- 2. Solve problems involving similar triangles.
- 3. Solve problems using the Pythagorean Theorem.



Jasper Johns "0 Through 9," 1961. Oil on canvas, 137 × 105 cm. The Saatchi Collection, courtesy of the Leo Castelli Gallery. (c) Jasper Johns/ Licensed by VAGA New York, NY

In Chapter 1, we defined *deductive reasoning* as the process of proving a specific conclusion from one or more general statements. A conclusion that is proved to be true through deductive reasoning is called a **theorem**. The Greek mathematician Euclid, who lived more than 2000 years ago, used deductive reasoning. In his 13-volume book, the *Elements*, Euclid proved over 465 theorems about geometric figures. Euclid's work established deductive reasoning as a fundamental tool of mathematics.

A **triangle** is a geometric figure that has three sides, all of which lie on a flat surface or plane. If you start at any point along the triangle and trace along the entire figure exactly once, you will end at the same point at which you started. Because the beginning point and ending point are the same, the triangle is called a **closed** geometric figure. Euclid used parallel lines to prove one of the most