

Example 4 Find Exterior Angle Measures of a Polygon

a. ALGEBRA Find the value of x in the diagram.

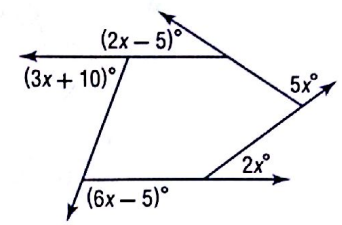
Use the Polygon Exterior Angles Sum Theorem to write an equation. Then solve for x .

$$(2x - 5) + 5x + 2x + (6x - 5) + (3x + 10) = 360$$

$$(2x + 5x + 2x + 6x + 3x) + [-5 + (-5) + 10] = 360$$

$$18x = 360$$

$$x = \frac{360}{18} \text{ or } 20$$



b. Find the measure of each exterior angle of a regular nonagon.

A regular nonagon has 9 congruent sides and 9 congruent interior angles. The exterior angles are also congruent, since angles supplementary to congruent angles are congruent. Let n = the measure of each exterior angle and write and solve an equation.

$$9n = 360 \quad \text{Polygon Exterior Angles Sum Theorem}$$

$$n = 40 \quad \text{Divide each side by 9.}$$

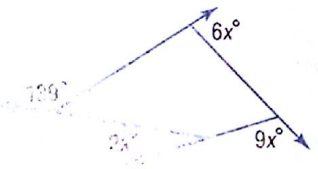
The measure of each exterior angle of a regular nonagon is 40.

StudyTip

Alternative Method
To find the measure of each exterior angle of a regular polygon, you can find the measure of each interior angle and subtract this measure from 180, since an exterior angle and its corresponding interior angle are supplementary.

GuidedPractice

- 4A. Find the value of x in the diagram.
- 4B. Find the measure of each exterior angle of a regular dodecagon.



Check Your Understanding

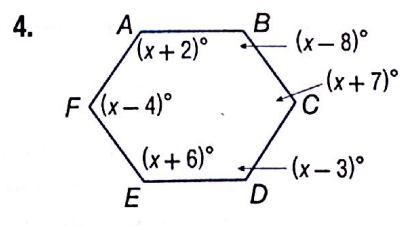
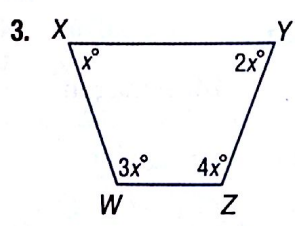
Step-by-Step Solutions begin on page R20.



Example 1 Find the sum of the measures of the interior angles of each convex polygon.

- 1. decagon
- 2. pentagon

Find the measure of each interior angle.



Example 2

5 AMUSEMENT The Wonder Wheel at Coney Island in Brooklyn, New York, is a regular polygon with 16 sides. What is the measure of each interior angle of the polygon?



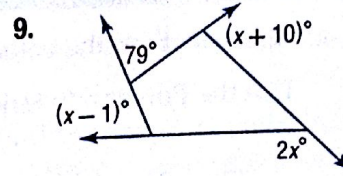
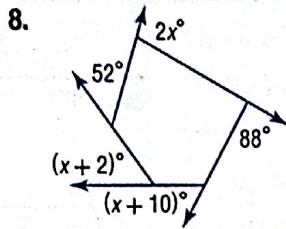
Example 3

The measure of an interior angle of a regular polygon is given. Find the number of sides in the polygon.

- 6. 150
- 7. 170



Example 4 Find the value of x in each diagram.



Find the measure of each exterior angle of each regular polygon.

10. quadrilateral

11. octagon

Practice and Problem Solving

Extra Practice begins on page 969.

Example 1 Find the sum of the measures of the interior angles of each convex polygon.

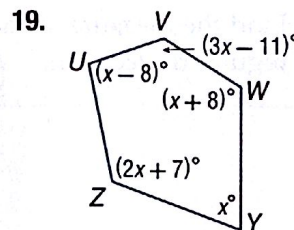
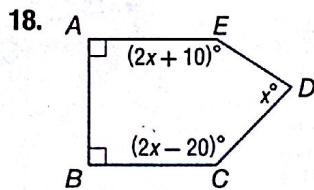
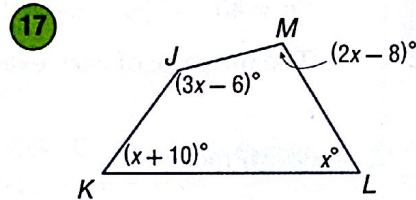
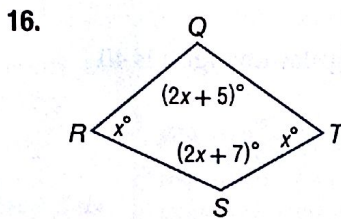
12. dodecagon

13. 20-gon

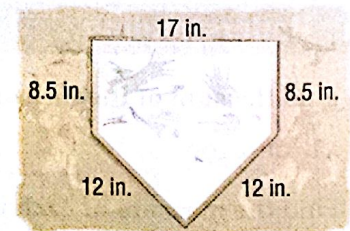
14. 29-gon

15. 32-gon

Find the measure of each interior angle.



20. **BASEBALL** In baseball, home plate is a pentagon. The dimensions of home plate are shown. What is the sum of the measures of the interior angles of home plate?



Example 2 Find the measure of each interior angle of each regular polygon.

21. dodecagon

22. pentagon

23. decagon

24. nonagon

25. **GAMES** Hexagonal chess is played on a regular hexagonal board comprised of 92 small hexagons in three colors. The chess pieces are arranged so that a player can move any piece at the start of a game.

- What is the sum of the measures of the interior angles of the chess board?
- Does each interior angle have the same measure? If so, give the measure. Explain your reasoning.



Example 3 The measure of an interior angle of a regular polygon is given. Find the number of sides in the polygon.

26. 60

27. 90

28. 120

29. 156