

6-1 Study Guide and Intervention *(continued)***Angles of Polygons**

Sum of Measures of Exterior Angles There is a simple relationship among the exterior angles of a convex polygon.

Exterior Angle Sum Theorem

If a polygon is convex, then the sum of the measures of the exterior angles, one at each vertex, is 360.

Example 1

Find the sum of the measures of the exterior angles, one at each vertex, of a convex 27-gon.

For *any* convex polygon, the sum of the measures of its exterior angles, one at each vertex, is 360.

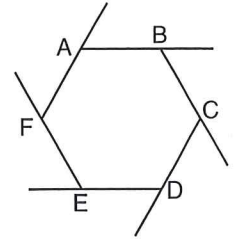
Example 2

Find the measure of each exterior angle of regular hexagon *ABCDEF*.

The sum of the measures of the exterior angles is 360 and a hexagon has 6 angles. If n is the measure of each exterior angle, then

$$6n = 360$$

$$n = 60$$

**Exercises**

Find the sum of the measures of the exterior angles of each convex polygon.

1. 10-gon

360

2. 16-gon

360

3. 36-gon

360

Find the measure of an exterior angle for each convex regular polygon.

4. 12-gon

30

5. 36-gon

10

6. $2x$ -gon

$\frac{180}{x}$

$\frac{360}{2x} = \frac{180}{x}$

Find the measure of an exterior angle given the number of sides of a regular polygon.

7. 40

9

8. 18

20

9. 12

30

10. 24

15

11. 180

2

12. 8

45

6-1 Study Guide and Intervention

Angles of Polygons

Sum of Measures of Interior Angles The segments that connect the nonconsecutive sides of a polygon are called **diagonals**. Drawing all of the diagonals from one vertex of an n -gon separates the polygon into $n - 2$ triangles. The sum of the measures of the interior angles of the polygon can be found by adding the measures of the interior angles of those $n - 2$ triangles.

Interior Angle Sum Theorem

If a convex polygon has n sides, and S is the sum of the measures of its interior angles, then $S = 180(n - 2)$.

Example 1

A convex polygon has 13 sides. Find the sum of the measures of the interior angles.

$$\begin{aligned} S &= 180(n - 2) \\ &= 180(13 - 2) \\ &= 180(11) \\ &= 1980 \end{aligned}$$

Example 2

The measure of an interior angle of a regular polygon is 120. Find the number of sides.

The number of sides is n , so the sum of the measures of the interior angles is $120n$.

$$\begin{aligned} S &= 180(n - 2) \\ 120n &= 180(n - 2) \\ 120n &= 180n - 360 \\ -60n &= -360 \\ n &= 6 \end{aligned}$$

Exercises

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

1. 10-gon 1440

2. 16-gon 2520

3. 30-gon 5040

4. 8-gon 1080

5. 12-gon 1800

6. $3x$ -gon $180(3x - 2)$

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

7. 150 12

8. 160 18

9. 175 72

10. 165 24

11. 168.75 32

12. 135 8

13. Find x .

$x = 20$

