

Lesson 3.3:

Angles of Polygons

Essential Question

How can you find the sum of the interior angle measures and the sum of the exterior angle measures of a polygon?

 **Key Idea****Interior Angle Measures of a Polygon**

The sum S of the interior angle measures of a polygon with n sides is

$$S = (n - 2) \cdot 180^\circ.$$

Find the sum of the interior angle measures of the school crossing sign.



$$(n - 2) \cdot 180^\circ$$

$$(5 - 2) \cdot 180^\circ$$

$$3 \cdot 180^\circ$$

$$540^\circ$$

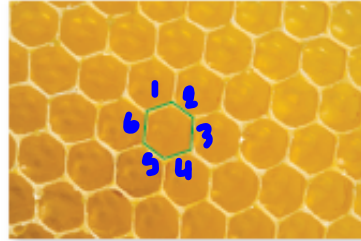
Find the sum of the interior angle measures of the green polygon.

1.



$$\begin{aligned}(7-2) \cdot 180^\circ \\ 5 \cdot 180^\circ \\ 900^\circ\end{aligned}$$

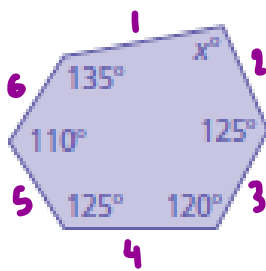
2.



$$\begin{aligned}(6-2) \cdot 180^\circ \\ 4 \cdot 180^\circ \\ 720^\circ\end{aligned}$$

Find the value of x .

3.



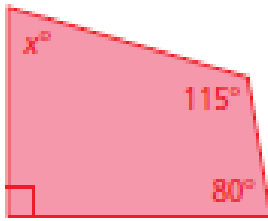
$$(6-2) \cdot 180^\circ = 4 \cdot 180^\circ = 720^\circ$$

$$\begin{array}{r} 135 \\ 110 \\ 125 \\ 120 \\ + 125 \\ \hline 615 \end{array}$$

$$\begin{array}{r} 615^\circ + x^\circ = 720^\circ \\ -615^\circ \quad -615^\circ \\ \hline x^\circ = 105^\circ \end{array}$$

Find the value of x .

4.

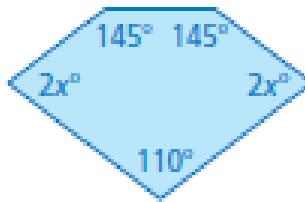


$$90^\circ + 80^\circ + 115^\circ + x^\circ = 360^\circ$$

$$285^\circ + x^\circ = 360^\circ$$

$$x^\circ = 75^\circ$$

5.



$$(5-2) \cdot 180^\circ$$

$$3 \cdot 180^\circ$$

$$540^\circ$$

$$110^\circ + 2x^\circ + 145^\circ + 145^\circ + 2x^\circ = 540^\circ$$

$$400^\circ + 4x^\circ = 540^\circ$$

$$\begin{array}{r} -400^\circ \\ \hline 4x^\circ = 140^\circ \\ \frac{4x^\circ}{4} = \frac{140^\circ}{4} \\ x^\circ = 35^\circ \end{array}$$

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

6. octagon

$$\frac{(8-2) \cdot 180^\circ}{8}$$

$$\frac{6 \cdot 180^\circ}{8}$$

$$\frac{1080^\circ}{8}$$

$$135^\circ$$

7. decagon

$$\frac{(10-2) \cdot 180^\circ}{10}$$

$$8 \cdot 18^\circ$$

$$144^\circ$$

8. 18-gon

$$\frac{(18-2) \cdot 180^\circ}{18}$$

$$16 \cdot 10^\circ$$

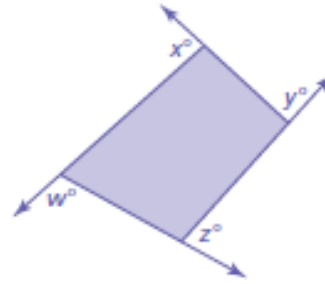
$$160^\circ$$

Key Idea

Exterior Angle Measures of a Polygon

Words The sum of the measures of the exterior angles of a convex polygon is 360° .

Algebra $w + x + y + z = 360$



True no matter how many sides the polygon has.

Find the measures of the exterior angles of each polygon. all of them

a.

$91^\circ + 127^\circ + 50^\circ + x^\circ = 360^\circ$

$$\begin{array}{r} 268^\circ + x^\circ = 360^\circ \\ -268^\circ \quad -268^\circ \\ \hline x^\circ = 92^\circ \end{array}$$

$92^\circ, 91^\circ, 127^\circ, 50^\circ$
 1 2 3 4

b.

$124^\circ + z^\circ + z^\circ + 26^\circ = 360^\circ$

$$\begin{array}{r} 2z^\circ + 150^\circ = 360^\circ \\ -150^\circ \quad -150^\circ \\ \hline 2z^\circ = 210^\circ \\ \frac{2z^\circ}{2} = \frac{210^\circ}{2} \\ z^\circ = 105^\circ \end{array}$$

$124^\circ, 131^\circ, 105^\circ$
 1 2 3

9. Find the measures of the exterior angles of the polygon.

$$3(90^\circ) + 2x^\circ = 360^\circ$$

$$2x^\circ = 90^\circ$$

$$x^\circ = 45^\circ$$

$45^\circ, 90^\circ, 90^\circ, 45^\circ, 90^\circ$
1 2 3 4 5

