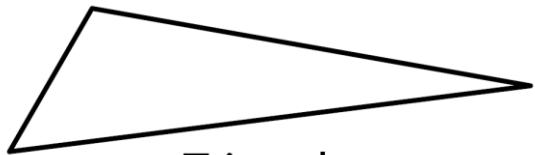


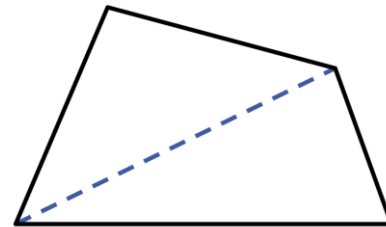
# Chapter 6 – Polygons and Quadrilaterals

Lesson 6.1B – Interior and Exterior Angles

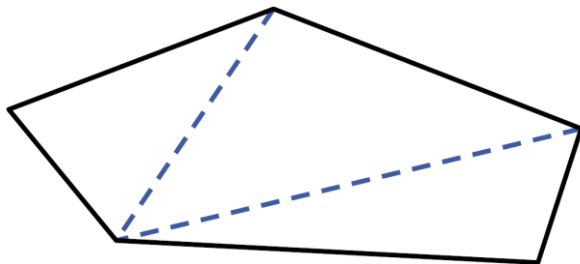
To find the sum of the interior angle measures of a convex polygon, draw all possible diagonals from one vertex of the polygon. This creates a set of triangles. The sum of the angle measures of all the triangles equals the sum of the angle measures of the polygon.



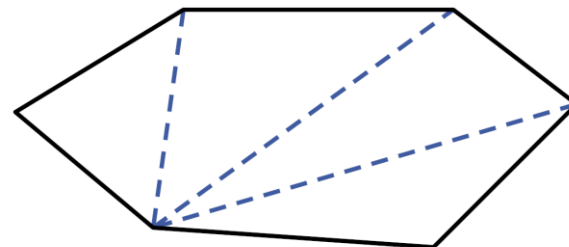
Triangle



Quadrilateral



Pentagon

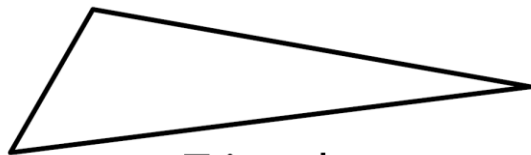


Hexagon

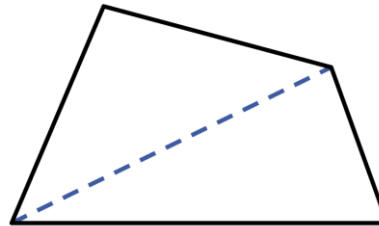
## Remember!

By the Triangle Sum Theorem, the sum of the interior angle measures of a triangle is  $180^\circ$ .

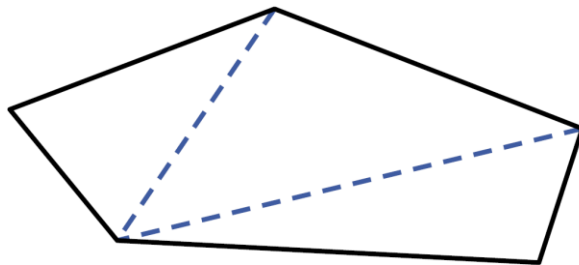
Polygon	Number of Sides	Number of Triangles	Sum of Interior Angle Measures
Triangle	3	1	(1) $180^\circ = 180^\circ$
Quadrilateral	4	2	(2) $180^\circ = 360^\circ$
Pentagon	5	3	(3) $180^\circ = 540^\circ$
Hexagon	6	4	(4) $180^\circ = 720^\circ$
$n$ -gon	$n$	$n - 2$	$(n - 2)180^\circ$



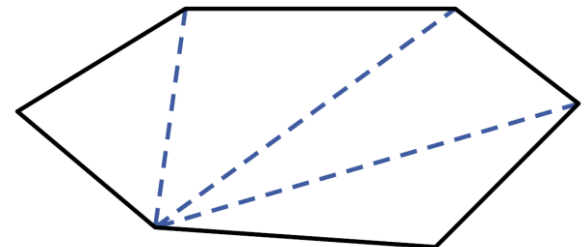
Triangle



Quadrilateral



Pentagon



Hexagon

In each convex polygon, the number of triangles formed is two less than the number of sides  $n$ . So the sum of the angle measures of all these triangles is  $(n - 2)180^\circ$ .

### **Theorem 6-1-1**

### **Polygon Angle Sum Theorem**

The sum of the interior angle measures of a convex polygon with  $n$  sides is  $(n - 2)180^\circ$ .

**Example 3A: Finding Interior Angle Measures and Sums in Polygons**

**Find the sum of the interior angle measures of a convex heptagon.**

### **Example 3B: Finding Interior Angle Measures and Sums in Polygons**

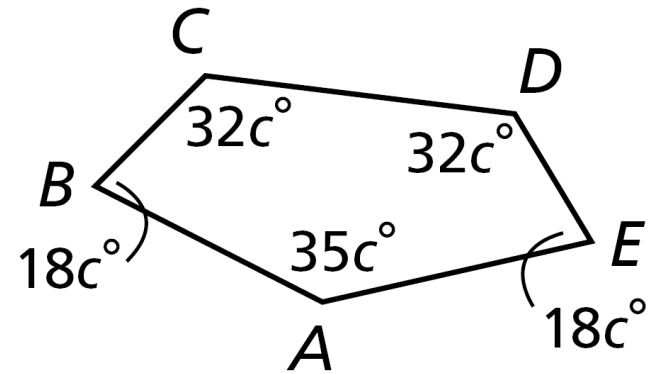
**Find the measure of each interior angle of a regular 16-gon.**

**Step 1** Find the sum of the interior angle measures.

**Step 2** Find the measure of one interior angle.

### Example 3C: Finding Interior Angle Measures and Sums in Polygons

Find the measure of each interior angle of pentagon ***ABCDE***.





**Check It Out! Example 3a**

**Find the sum of the interior angle measures of a convex 15-gon.**

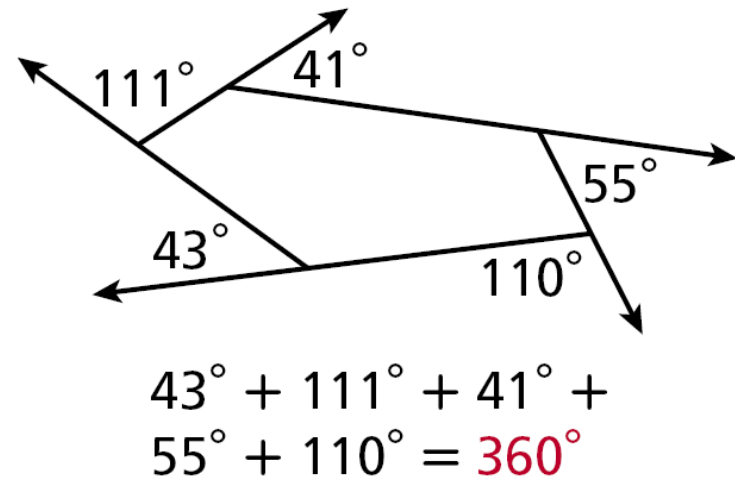
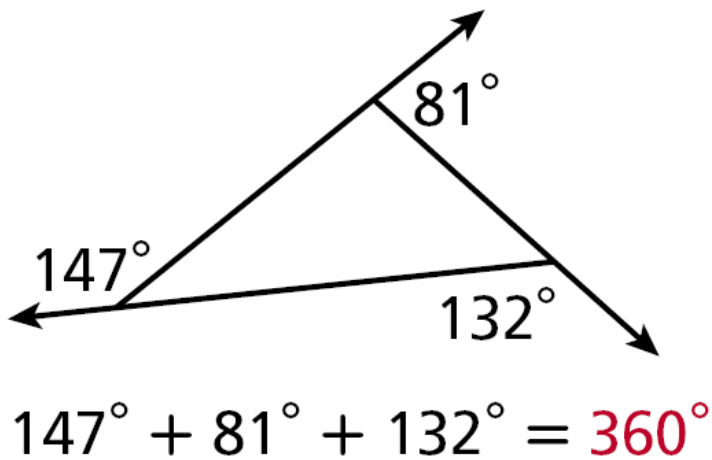
**Check It Out! Example 3b**

**Find the measure of each interior angle of a regular decagon.**

**Step 1** Find the sum of the interior angle measures.

**Step 2** Find the measure of one interior angle.

In the polygons below, an exterior angle has been measured at each vertex. Notice that in each case, the sum of the exterior angle measures is  $360^\circ$ .



## Remember!

An exterior angle is formed by one side of a polygon and the extension of a consecutive side.

**Theorem 6-1-2****Polygon Exterior Angle Sum Theorem**

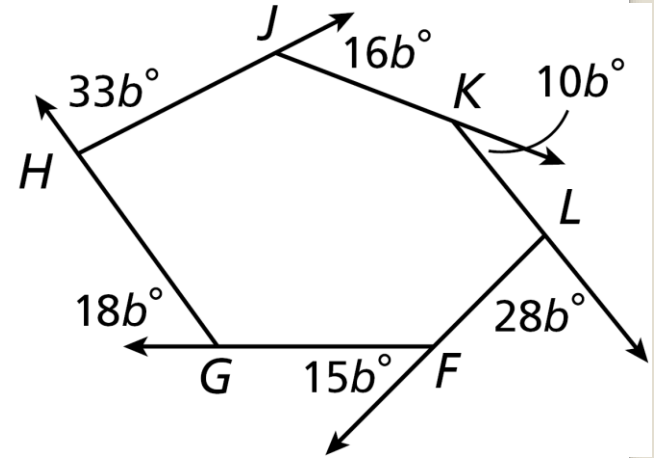
The sum of the exterior angle measures, one angle at each vertex, of a convex polygon is  $360^\circ$ .

**Example 4A: Finding Interior Angle Measures and Sums in Polygons**

**Find the measure of each exterior angle of a regular 20-gon.**

## Example 4B: Finding Interior Angle Measures and Sums in Polygons

Find the value of  $b$  in polygon  $FGHJKL$ .



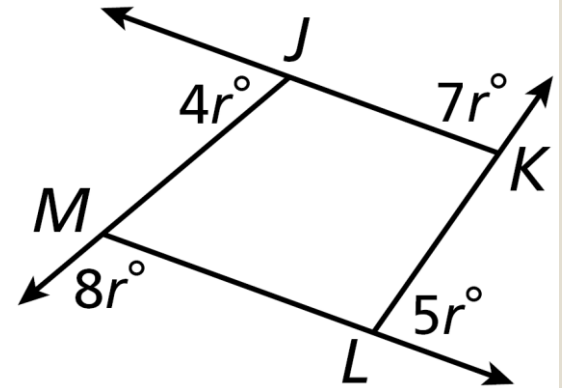
**Check It Out! Example 4a**

**Find the measure of each exterior angle of a regular dodecagon.**



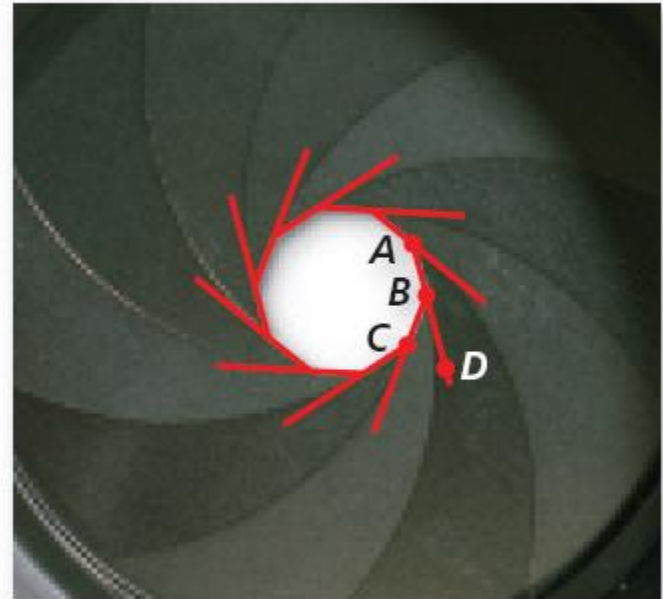
**Check It Out! Example 4b**

Find the value of  $r$  in polygon  $JKLM$ .



## Check It Out! Example 5

**What if...?** Suppose the shutter were formed by 8 blades instead of 10 blades. What would the measure of each exterior angle be?



## Lesson Quiz

- 1.** Name the polygon by the number of its sides. Then tell whether the polygon is regular or irregular, concave or convex.
- 2.** Find the sum of the interior angle measures of a convex 11-gon.
- 3.** Find the measure of each interior angle of a regular 18-gon.
- 4.** Find the measure of each exterior angle of a regular 15-gon.

