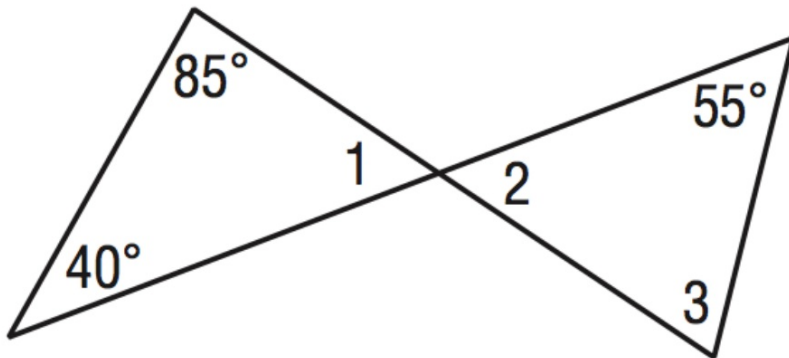


Geometry BELL WORK

Find the measures of angles 1, 2, and 3.



6-1 Angles of Polygons

We have worked with triangle interior and exterior angles.

Today we will work with the interior and exterior angles of any polygon.

- Find and use the measures of the interior angles of a polygon
- Find and use the sum of the measures of the exterior angles of a polygon.

G.MG.A.1 Use geometric shapes, their measures and their properties to describe objects

G.GPE Expressing Geometric Properties with equations

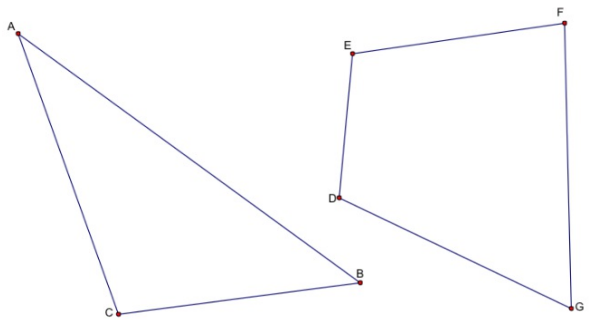
9-gon

$$9 - 2 = 7 \text{ triangles}$$

$$180(7)$$

Sum int. angles $180(n-2)$

Opening task: Angles of Polygons



1. What is the sum of the interior angles in Triangle ABC?

187 185 178
180

2. Is the sum of the interior angles of a triangle always the same value? How do you know?

3. What is the sum of the interior angles in Quadrilateral DEFG?



375 360 325
368

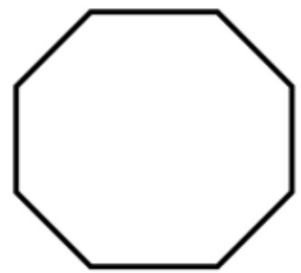
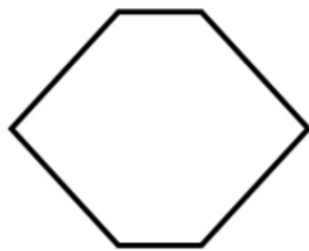
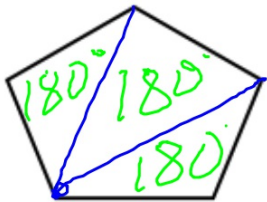
4. Is the sum of the interior angles of a quadrilateral always the same value? How do you know?



Investigation:

Part 1 In this investigation you are going to discover an easier way to find the sum of the interior angles of a polygon, by dividing a polygon into triangles.

Polygon	Sketch	Number of sides	Number of diagonals from 1 vertex	Number of triangles	Interior angle sum
Triangle		3	0	1	180°
Quadrilateral		4	1	2	360°
Pentagon		5	2	3	540°
Hexagon		6	3	4	720°
Heptagon		7	4	5	900°
Octagon		8	5	6	1080°



$$\begin{array}{r} 180 \\ +180 \\ +180 \\ \hline 540^\circ \end{array}$$

What is the relationship between the number of sides and the number of triangles you have drawn in the figure?

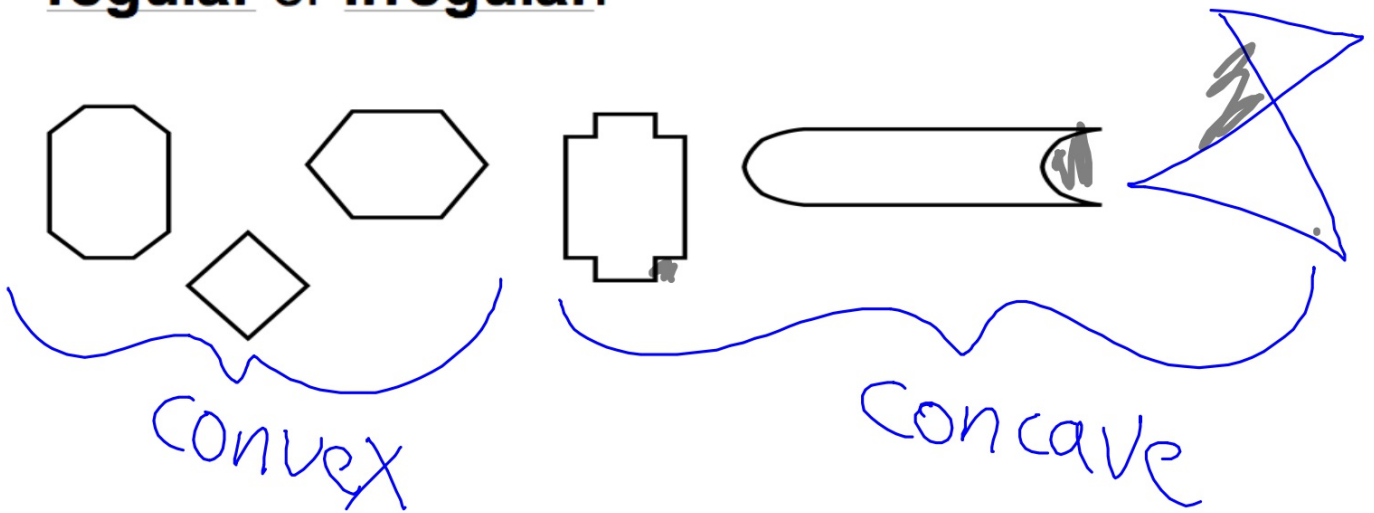
$$\# \text{ sides} - 2 = \# \triangle's$$

$$12 \text{ - sides} : 10 \triangle's$$

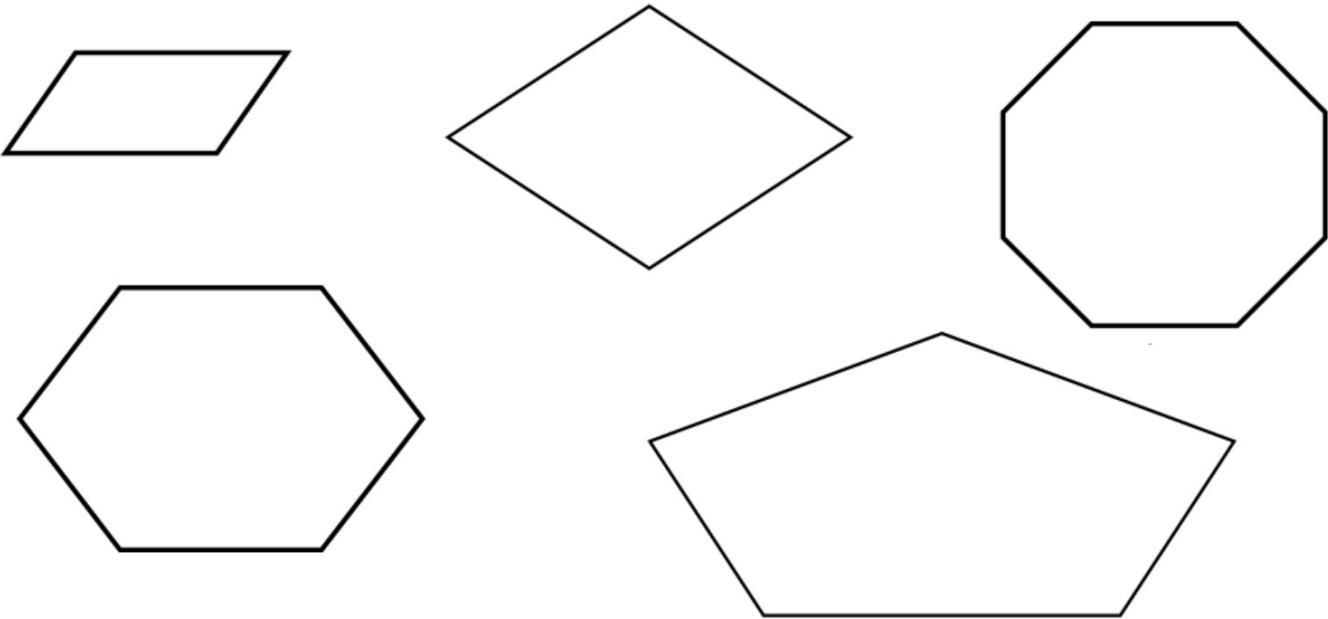
$$\begin{array}{r} 180 \\ \times 10 \\ \hline 1800^\circ \end{array}$$

Guided notes: 6-1

Polygon: **Closed** figure; sides are **segments**; can be **convex** or **concave** and **regular** or **irregular**.



Diagonal: a segment that connects any two nonconsecutive **vetices** (polygon must have more than **_3_** sides).

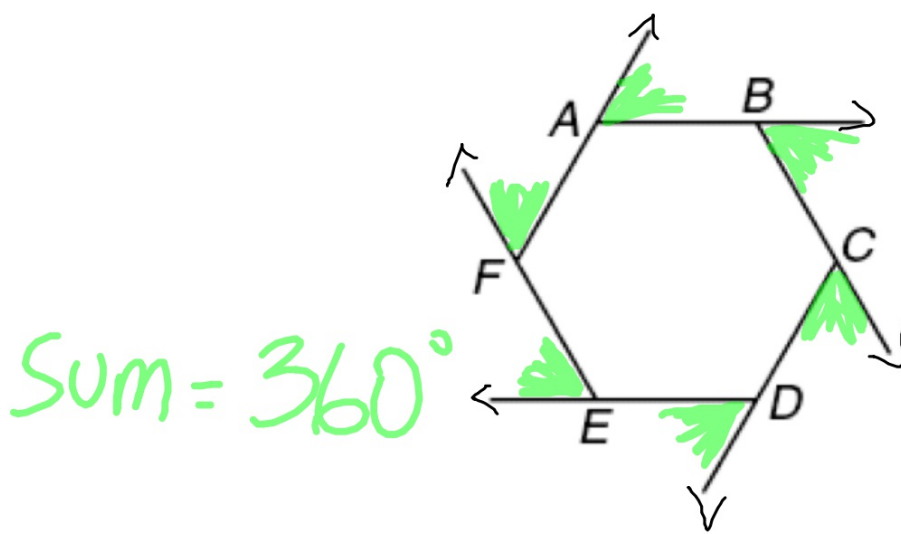


Interior Angle Sum Theorem: If a convex polygon has n sides and S is the sum of the measures of its interior angles, then

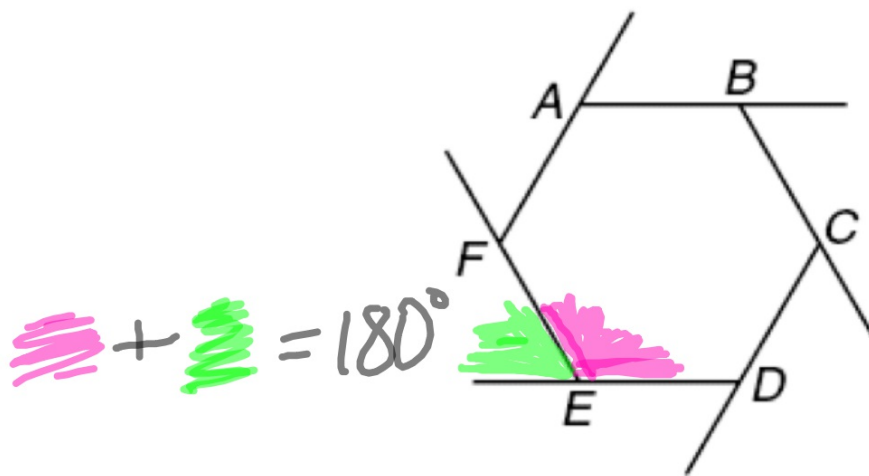
$$S = 180(n - 2)$$

Convex Polygon	Number of Sides	Sum of Angles
triangle	3	$(180 \times 1) = 180$
quadrilateral	4	$(180 \times 2) = 360$
pentagon	5	$(180 \times 3) = 540$
hexagon	6	$(180 \times 4) = 720$
heptagon	7	$(180 \times 5) = 900$
octagon	8	$(180 \times 6) = 1080$

Sum of the Measures of Exterior Angles:



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**.



The sum of an interior angle and an exterior angle is 180.

Makes a line

1. Find the sum of the measures of the interior angles of a convex pentagon.

$$n = 5 \quad S = 180(n - 2)$$

$$S = 180(5 - 2)$$

$$180(3)$$

$$= 540^\circ$$

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

$$S = 120n$$

$$S = 180(n-2)$$

$$120n = 180(n-2)$$

$$120n = 180n - 360$$

$$\begin{array}{r} -180n \quad -180n \\ \hline \end{array}$$

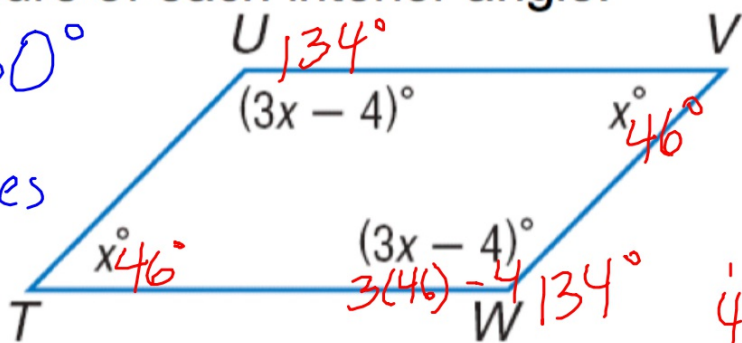
$$\begin{array}{r} -60n = -360 \\ \hline -60 \quad \quad -60 \end{array}$$

$$n = 6$$

3. Find the measure of each interior angle.

$$180(4-2) = 360^\circ$$

sum of interior angles
= 360°



$$\underline{(3x-4)} + \underline{x} + \underline{(3x-4)} + \underline{x} = 360$$

$$\begin{array}{r} 46 \\ 3 \\ \hline 138 \end{array}$$

$$8x - 8 = 360$$

$$x = 46$$

$$\begin{array}{r} +8 \quad +8 \\ \hline 8x = 368 \end{array}$$

4. The measure of an exterior angle is 72° .
Find the number of sides of a regular polygon.

Sum of exterior angles = 360°

$$\frac{72n}{72} = \frac{360}{72}$$

$$n = 5$$

Assignment:

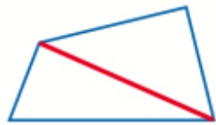
6.1 pg 393 # 1-7

Polygon Interior Angles Sum

The sum of the interior angles of a polygon is the sum of the angles of all the triangles that can be drawn in the figure from one vertex.



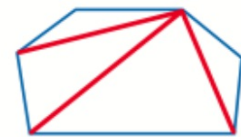
Triangle



Quadrilateral



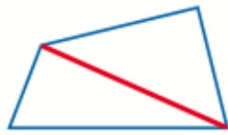
Pentagon



Hexagon



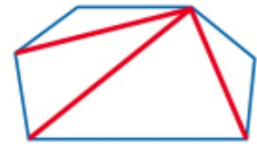
Triangle



Quadrilateral



Pentagon



Hexagon

Polygon	Number of Sides	Number of Triangles	Sum of Interior Angle Measures
Triangle	3	1	
Quadrilateral	4	2	
Pentagon	5	3	
Hexagon	6	4	
<i>n</i> -gon			

Vocabulary:

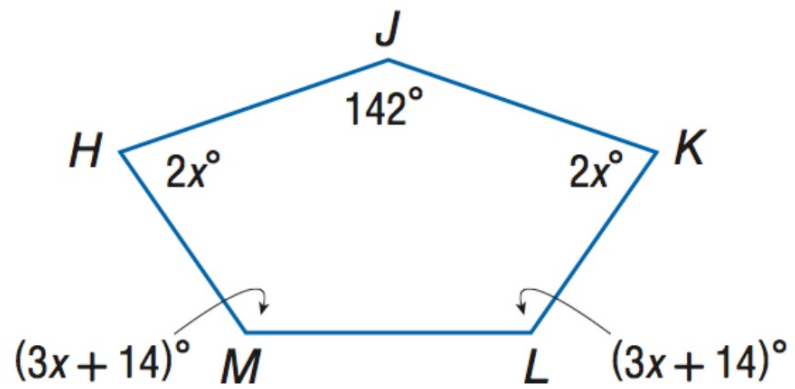
convex

regular polygon

Find the sum of the measures of the interior angles of a convex heptagon.

Find the sum of the measures of the interior angles of a convex octagon.

Find the measure of each interior angle of pentagon $HJKLM$ shown



TENTS The poles for a tent form the vertices of a regular hexagon. When the poles are properly positioned, what is the measure of the angle formed at a corner of the tent?



D₁
sit

pc

COINS Find the measure of each interior angle of the regular 11-gon that appears on the face of a Susan B. Anthony one-dollar coin.

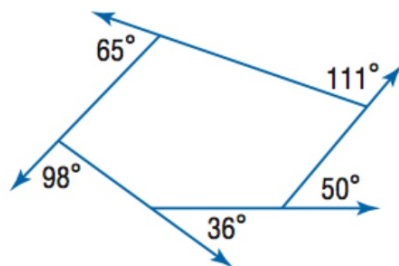
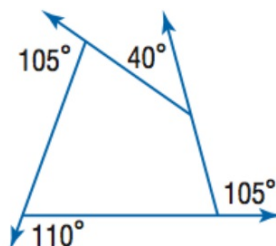
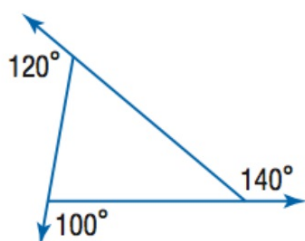
HOT TUBS A certain company makes hot tubs in a variety of different shapes. Find the measure of each interior angle of the nonagon model.

The measure of an interior angle of a regular polygon is 135. Find the number of sides in the polygon.

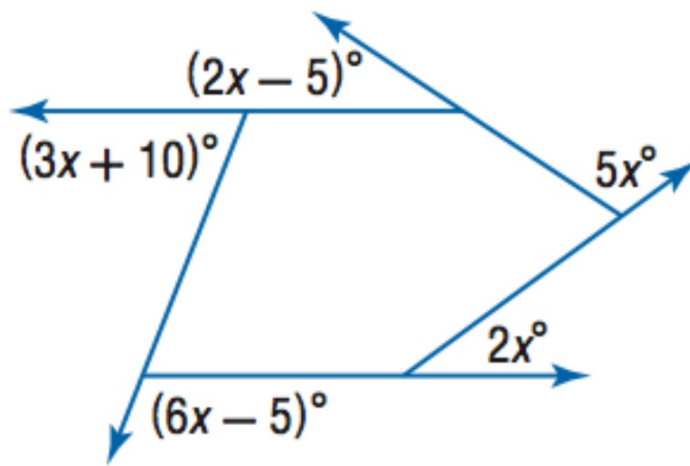
The measure of an interior angle of a regular polygon is 144. Find the number of sides in the polygon.

Polygon Exterior Angles Sum

Add the measures of the exterior angles of the following polygons. What do you notice?



Find the value of x in the diagram.



6-1 Angles of Polygons

In summary:

The measures of the *interior* angles of a polygon add to _____

The measures of the *exterior* angles of a polygon add to _____

G.MG.A.1 Use geometric shapes, their measures and their properties to describe objects
G.GPE Expressing Geometric Properties with equations