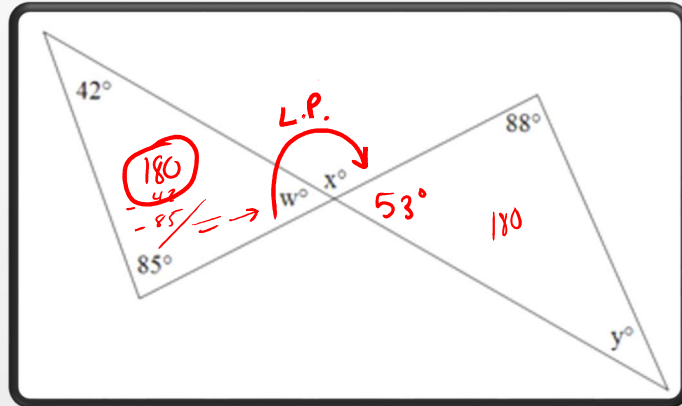


Warm-Up

Find the values of w , x , & y



$$w = \underline{53} \quad x = \underline{127} \quad y = \underline{39}$$

Angles of Polygons

Section 7.1

Today's Topics

New Vocabulary Terms

- Diagonal
- Equilateral & Equiangular Polygons
- Regular Polygon

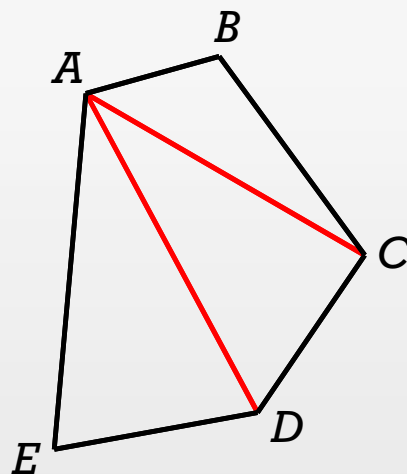
Angle Sum Formulas for any polygon

- Exterior Angle Sum Theorem
- Interior Angle Sum Theorem

Diagonals

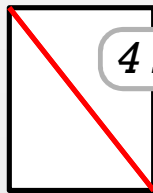
A diagonal is a line segment that connects any two non-consecutive vertices of a polygon.

Notice how this five sided polygon (pentagon) can be cut into three triangles if diagonals are constructed from one vertex.



Cutting Up Polygons

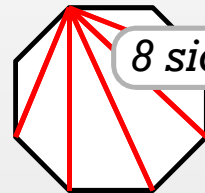
How can we determine the number of triangles that can be made from the interior of a polygon if we only use one vertex to construct the diagonals.



4 sides



6 sides



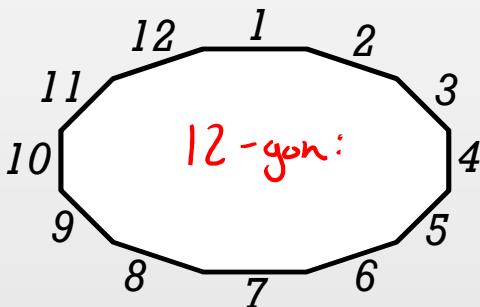
8 sides

If we know each triangle has a sum of 180 degrees ~~could we make a conclusion~~ about the interior angle sum for all of these shapes? Thoughts?

Interior Angle Sum Thm.

The interior angle sum for any convex polygon n-gon is :

$$sum = (n - 2) \cdot 180$$



Find the interior angle sum for the figure to the left.

$$sum = (12 - 2) \cdot 180$$

$$= 10 \cdot 180$$

$$= 1800$$

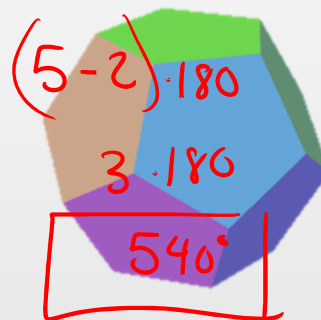
More Practice!!

$$\text{sum} = (n - 2) \cdot 180$$

Find the interior angle sum for an undecagon (11-sided polygon)



Find the interior angle sum for one of the twelve faces of a dodecahedron.



Solving for x!!

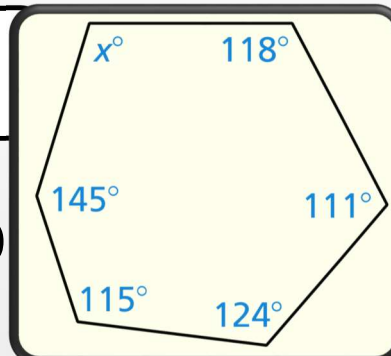
$$\text{sum} = (n - 2) \cdot 180$$

We can also use the interior sum theorem to solve for unknowns.

Step 1: use formula to find interior angle sum
 $x + 118 + 145 + 115 + 124 = 720$

Step 2: Step up equation and solve for unknown
 $x + 615 = 720$

$$x = 107$$



$$\begin{aligned} \text{sum} &= (6 - 2) \cdot 180 \\ \text{sum} &= 720 \end{aligned}$$

Find that angle

$$sum = (n - 2) \cdot 180$$

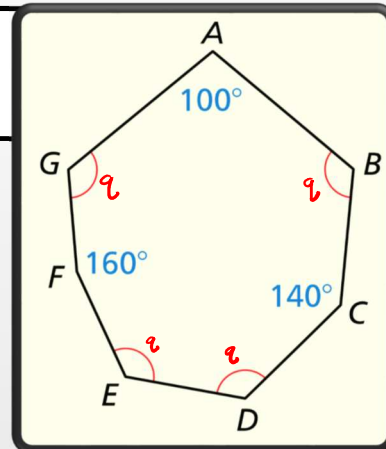
Find the value of the unknown angles in the figure to the right.

Heptagon $(7 - 2) \cdot 180$
 900

$$q + q + q + q + 100 + 160 + 140 = 900$$

$$4q + 400 = 900$$

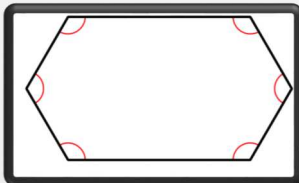
$$\begin{array}{r} 4q + 400 = 900 \\ -400 \quad -400 \\ \hline 4q = 500 \\ \frac{4q}{4} = \frac{500}{4} \\ q = 125^\circ \end{array}$$



Types of Polygons

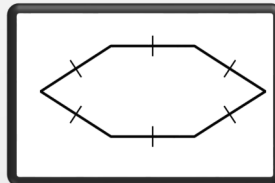
When a polygon has...

congruent
angles



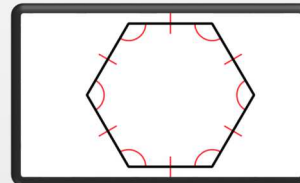
Equiangular

congruent
sides



Equilateral

congruent
sides & angles



Regular

Feelin' Regular?

Some regular polygons are so historically important that we have given them particular names.

Name of a regular triangle: Equilateral Triangle

Name of a regular quadrilateral: Square

Name of a regular pentagon: Regular Pentagon

Interior Angles / Regular

Find the angle measure for each of the angles below in the given regular polygon below...

$$sum = (10 - 2) \cdot 180 = 1440$$

Now divide this total by the number of angles:

$$x = \frac{1440}{10} = 144$$

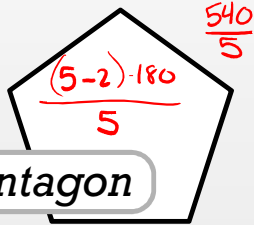
Formula for the interior angle for a regular polygon:

$$x = \frac{(n - 2) \cdot 180}{n}$$

Inside Angles

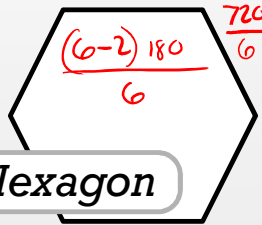
$$x = \frac{(n-2) \cdot 180}{n}$$

Find the interior angle measure for each of the regular polygons below:



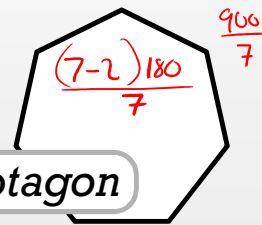
Pentagon

$$x = 108$$



Hexagon

$$x = 120$$

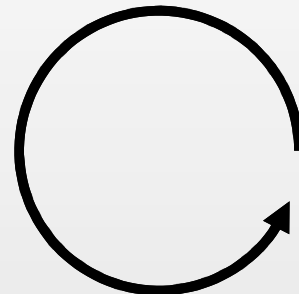
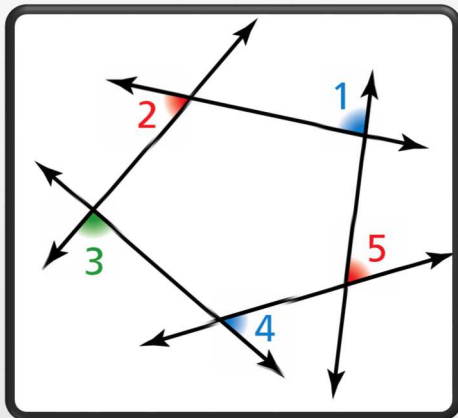


Heptagon

$$x \approx 128.57$$

Outside of the Box

The exterior angle sum for any polygon doesn't depend on the number of sides.



Sum is always 360°

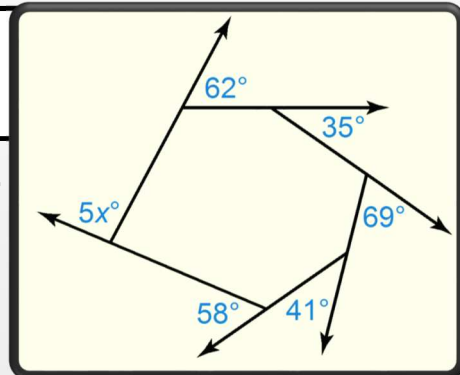
Solving for x!!

We can also use the exterior sum to solve for unknowns.

Step 1: Use our understanding of exterior angle sum (360) to step up an equation.
 $5x + 62 + 35 + 69 + 41 + 58 = 360$

Step 2: Solve for the unknown
 $5x = 95$

$$x = 19$$



$$sum = 360$$

Regular Polygon ~ Ext.

What is the measure of each exterior angle of a regular octagon?

$$sum = 360$$

Now divide this total by the number of angles:

$$x = \frac{360}{8} = 45$$

Formula for the exterior angle for a regular polygon:

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

Back to the inside!

Determine the type of regular polygon you have given the interior angle sum.

$$(n-2) \cdot 180 = 3240$$

$$n - 2 = 18$$

$$n = 20$$

Interior angle sum:

$$3240^\circ$$



Icosagon

Homework Time!

Pg.364-365

#3-4, 7-8, 13-16, 21-28, 37-40