

Name:

Date:

Period: 6

Interior Angle Measures of Polygons

Lesson Objective

WBAT classify polygons as convex or concave; derive formulas for interior angles of regular polygons

Polygon: A polygon is a closed plane figure formed by 3 or more line segments called sides.

→ **Classifying Polygons** There are two different kinds of polygons, convex and concave

String Test: Imagine a string wrapped around the polygon...

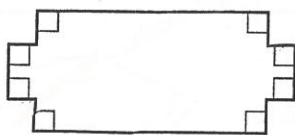
- If there is a gap between the string and a polygon, it is concave.
- If there is NOT a gap between the string and a polygon, it is convex.

Example:

1. Imagine placing a string around each of the polygons below. Which are convex? Which are concave? Which are not even polygons? Label them below.



convex



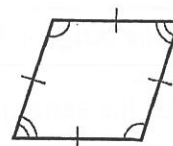
concave



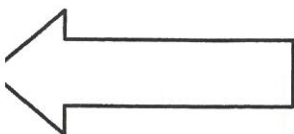
Not a polygon



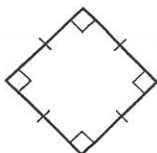
convex



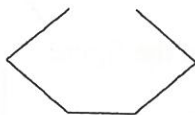
convex



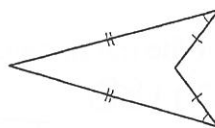
concave



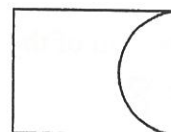
convex



Not a polygon



concave



Not a polygon

Number of sides	Name of polygon
3	triangle
4	quadrilateral
5	pentagon
6	hexagon
7	heptagon
8	octagon
9	nonagon
10	decagon
12	dodecagon
n	n-gon

11-side is a undecagon

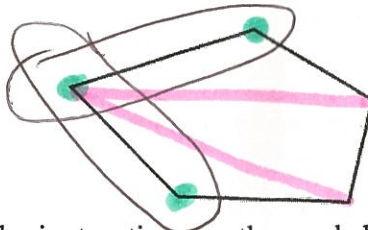
26-side is a 26-gon

EXPLORATION!!!!!!

First let's look at some more vocabulary that will help us with the Exploration.

Consecutive vertices: In a polygon, two vertices that are endpoints of the same side are called consecutive vertices.

Diagonal: A diagonal of a polygon is a segment that joins two nonconsecutive vertices.



It's now time to complete the exploration with your group. Follow the instructions on the worksheets. When your group thinks you have the general case figured out (for the n-gon), have Ms. Gerling check your work ☺

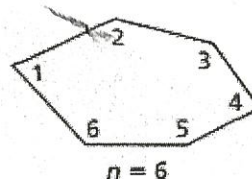
In the exploration, we noticed that the diagonals break up the polygon with n sides into n-2 triangles.

To find the total degrees in a polygon, multiply the # of Δ s (n-2) by 180° .

Polygon Interior Angles Theorem

The formula for the sum of the measures of the interior angles of a convex n-gon is

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



Example:

- Find the sum of the measures of the interior angles of the figure.

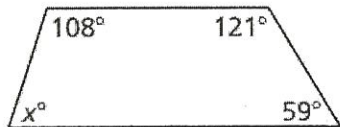
$$n = 8 \quad (8-2)180 \\ 6 \cdot 180 = \boxed{1080^\circ}$$



- The sum of the measures of the interior angles of a convex polygon is 900° . Classify the polygon by the number of sides.

$$900 = (n-2)180 \\ 5 = n-2 \\ 7 = n \longrightarrow \boxed{\text{heptagon}}$$

- Find the value of x in the diagram.



$$360 = x + 108 + 121 + 59 \\ \boxed{x = 72}$$

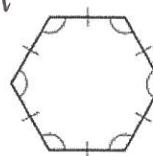
Types of Polygons		
Equilateral	Equiangular	Regular

Think About It... How could you find the measure of ONE interior angle of a REGULAR polygon?

÷ sum of interior $\angle$ s by # of sides
(# of $\cong \angle$ s)

Formula: Measure of One Interior Angle of a Regular Polygon

$$\frac{(n-2)180}{n}$$



$$\frac{720}{6} = 120^\circ$$

Example:

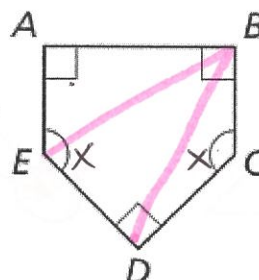
4. A home plate for a baseball field is shown.

a. Is the polygon regular? Briefly explain your reasoning.

No! not equiangular

b. Find the measures of $\angle C$ and $\angle E$.

$$(5-2)180 = 540$$



decagon

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

$$540 = 3(90) + 2x$$

$$270 = 2x$$

$$135 = x$$

$$\boxed{m\angle C = m\angle E = 135^\circ}$$

5. Find the measure of ONE interior angle of a regular 15-gon.

$$\frac{(15-2)180}{15} = \frac{13(180)}{15} = \frac{2340}{15} = \boxed{156^\circ}$$

6. Can a polygon have an interior angle sum of 2070° ? If so, name the polygon. If not, explain.

$$\rightarrow (n-2)180 = 2070$$

$$(n-2) = 11.5$$

$$n = 13.5$$

???

???

No, because...
a polygon cannot have a portion of a side (i.e. a polygon cannot have...)

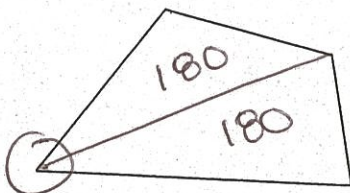
Exploration

(Worksheet for Table)

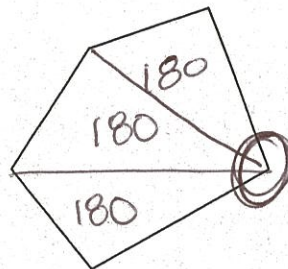
Interior Angle Sum of Polygons



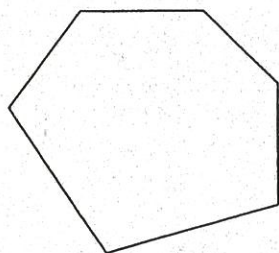
$n = 3$



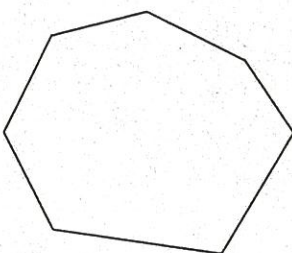
$n = 4$



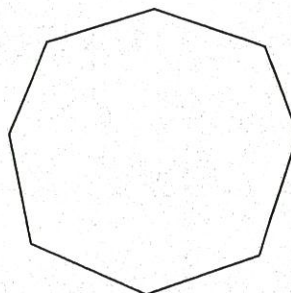
$n = 5$



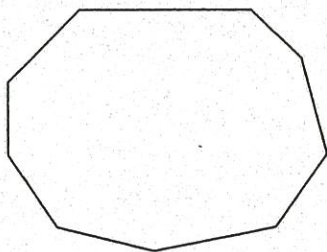
$n = 6$



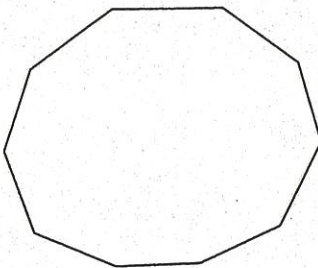
$n = 7$



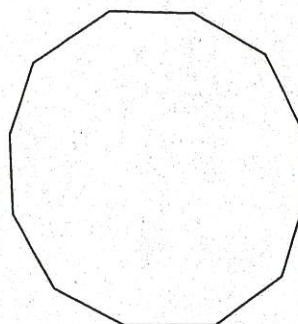
$n = 8$



$n = 9$



$n = 10$



$n = 12$

What do you notice about the
of Δ s formed in each polygon?
Any patterns??

compared to the
of sides in
the polygon