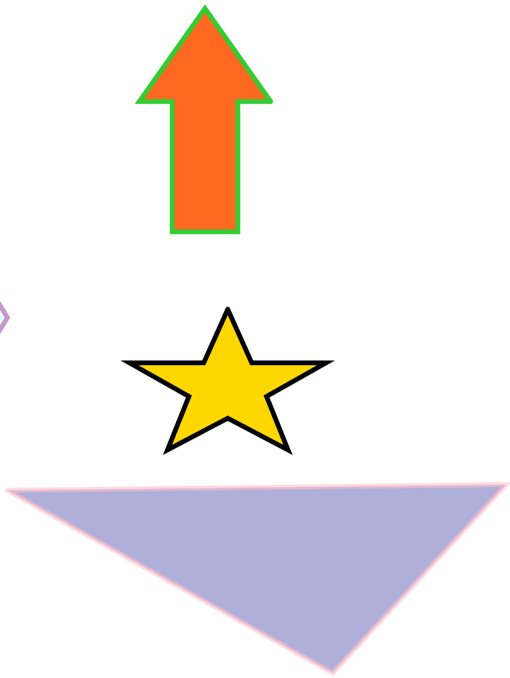
AGENDA - Unit 9 -

Polygons

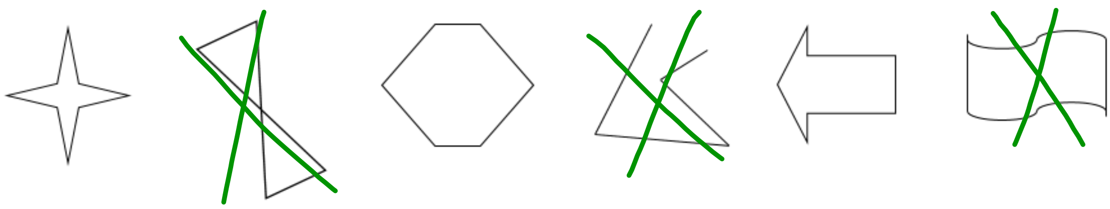
- Go over Bridge
- Notes 9.1

HW - 9.1

- Worksheet
- CR #8 - Due 4/7

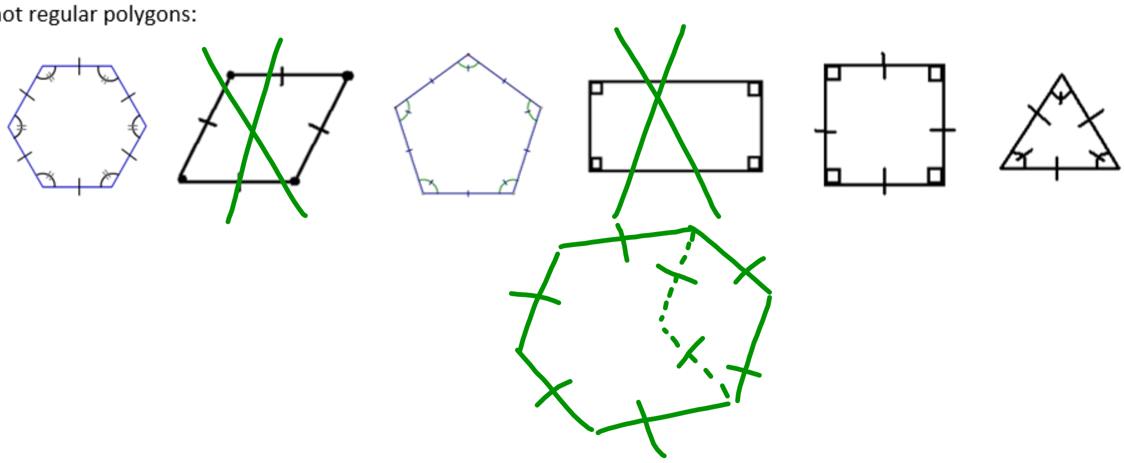


3. A **polygon** is a simple, closed, plane figure formed by three or more segments such that each segment intersects exactly two other segments only at their endpoints and no two segments with a common endpoint are collinear. Note: the number of sides = the number of vertices. CROSS off any of the following that are not polygons:

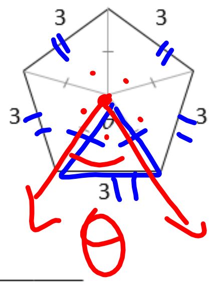


4. A polygon can be **convex or concave**. In a convex polygon, all diagonals from any vertex to another are completely contained within/on the polygon. CROSS off any of the following polygons that are not convex:

5. A **regular** polygon in one in which all the sides and angles are congruent. CROSS OFF any of the following who are not regular polygons:



6. The pentagon pictured is a regular pentagon.



a. The little triangles with a vertex at the center of the pentagon could be classified by sides as ISOS. Would they all be congruent? YES

If so, why? SSS ≅ SAS ≅ ?

b. What do you think would be the measure of θ? $\frac{360°}{5}$ = 72° Why? Sum ∠'S AT A POINT

*Note: this is called the **central angle** of the polygon.*

Geometry + LAB : Unit 6 Day 1 – Polygon Investigation(From Mathbits)

Polygon Investigations

Name________________________

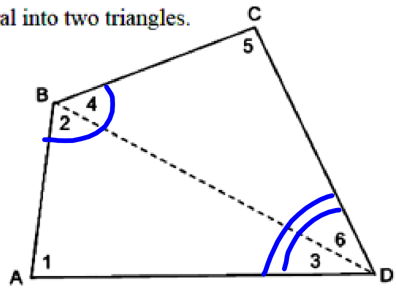
Part 1:

1. How many degrees are in the sum of the angles of a triangle? 180°

If you know the answer to question #1, you can find the sum of the interior angles in any polygon by simply dividing it into triangles.

2. Find the number of degrees in the sum of the interior angles of quadrilateral *ABCD*.

Notice that a diagonal has been drawn, dividing the quadrilateral into two triangles.



$m\angle 1 + m\angle 2 + m\angle 3 =$ 180°

$m\angle 4 + m\angle 5 + m\angle 6 =$ 180°

$m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 + m\angle 5 + m\angle 6 =$ 360°

Sum of interior angles of a quadrilateral = 360°

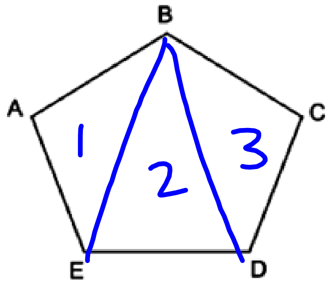
3. Find the number of degrees in the sum of the interior angles of pentagon *ABCDE*.

Hint: From ONE vertex, draw all possible diagonals.

Number of triangles formed = 3

Sum of the angles in each triangle = 180°

Sum of the interior angles of a pentagon = 540°



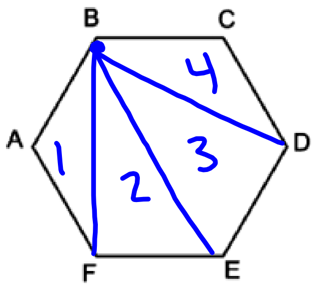
4. Find the number of degrees in the sum of the interior angles of hexagon *ABCDEF*.

Hint: From ONE vertex, draw all possible diagonals.

Number of triangles formed = 4

Sum of the angles in each triangle = 180°

Sum of the interior angles of a hexagon = 720°

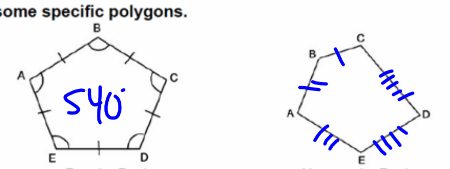


5. A pattern is starting to develop between the sum of the angles in a polygon and the number of triangles that comprise the polygon. Complete the following chart to find the pattern.

Polygon	Number of Sides	Number of Triangles	Sum of Interior Angles
Triangle	3	1	180°
Quadrilateral	4	2	360°
Pentagon	5	3	540°
Hexagon	6	4	720°
Heptagon	7	5	900°
Octagon	8	6	1080°
Nonagon	9	7	1260°
Decagon	10	8	1440°
Dodecagon	12	10	1800°
Now, let's generalize this information for a polygon with ANY number of sides.			
n-gon	n	$n-2$	$(n-2)(180°)$

The pattern is: The sum of the interior angles of any polygon = $(n-2)180°$

Part 2: **Let's continue our investigation by looking at individual angles in some specific polygons.**



Regular Pentagon Non-regular Pentagon

1. Describe what is required for a polygon to be described as "regular".

EQUIANGULAR & EQUILATERAL

2. What is the sum of the measures of the interior angles of ANY pentagon? $n=5$

$\text{SUM INT} = (n-2)180°$ $(5-2)180° = 540°$

3. What is the measure of one angle of a REGULAR pentagon?

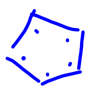
$\text{EACH INT} = \frac{540°}{5} = 108°$

4. What is the measure of one angle of a NON-REGULAR pentagon?

? HAVE TO SUM ONLY

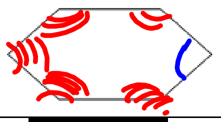
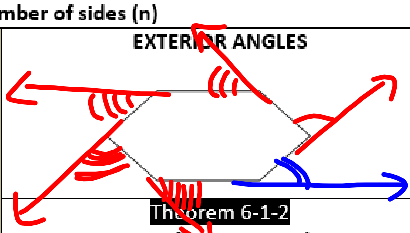
5. Describe how to find the measure of each angle of a regular polygon.

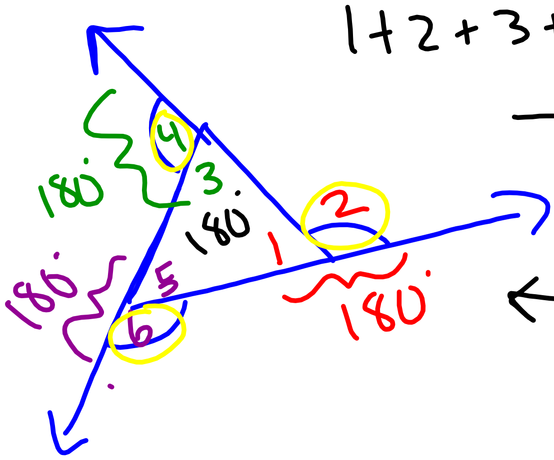
EACH INT ∡ REGULAR POLYGON $= \frac{\text{SUM}}{n} = \frac{(n-2)180°}{n}$



n SIDES = # ∡'S

Part 3 – Exterior Angles

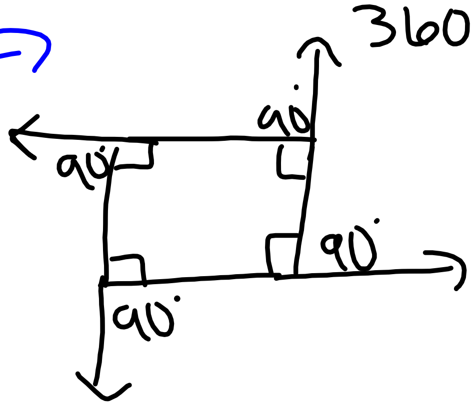
For all Convex Polygons **First Determine number of sides (n)**	
INTERIOR ANGLES	**EXTERIOR ANGLES**
	
Theorem 6-1-1 **SUM of Interior Angles** $(n-2)180°$	Theorem 6-1-2 **SUM of Exterior Angles** $360°$
For all REGULAR POLYGONS **Definition**: A ***Regular Polygon*** is a polygon that is both equilateral and equiangular.	
EACH INTERIOR ANGLE $\frac{(n-2)180°}{n}$	**EACH EXTERIOR ANGLE** $\frac{360°}{n}$
FOR EVERY REGULAR POLYGON Interior Angle + Exterior Angle = 180°	



$1+2+3+4+5+6 = 540°$

$-\ 1+3+5 \quad -180°$

$360°$



	For all Convex Polygons			For REGULAR POLYGONS	
Sides n	**Name of Figure**	**Number of Triangles (From one Vertex)**	**Sum of Interior Angles**	**Measure of each Int. Angle**	**Measure of each Ext. Angle**
3	Triangle	1	1*180° = 180°	180/3 = 60°	360/3 = 120°
4	Quadrilateral	2	360°	$360°/4 = 90°$	$360/4 = 90°$
5	Pentagon	3	540°	$540/5 = 108°$	$360/5 = 72°$
6	Hexagon	4	720°	120°	60°
7	Heptagon	5	900°	128.6°	61.4°
8	Octagon	6	1080°	135°	45°
9	Nonagon	7	1260°	140°	40°
10	Decagon	8	1440°	144°	36°
12	Dodecagon	10	1800°	150°	30°
n	*n*-gon	$n-2$	$(n-2)180°$	$\frac{(n-2)180°}{n}$	$\frac{360°}{n}$

Part 4: **Apply your investigation information.**

1. Three angles of a quadrilateral are 73°, 95°, and 110°. Find the fourth angle.

$\swarrow x$

SUM INT ∡'S QUAD = 360°

$73° + 95° + 110° + x = 360°$

$82° = 4^{TH}$ ∡

2. Find the sum of the interior angles of a polygon with 11 sides.

$n = 11$

SUM INT $= (n-2)180°$

$= (11-2)180° = 9(180°) = 1620°$

3. Find the measure of each $\boxed{\text{interior}}$ angles of a regular polygon with 20 sides.

$n = 20$

EACH INT $= \frac{(n-2)180°}{n} = \frac{(20-2)180°}{20} = 162°$

4. If the sum of the measures of the interior angles of a polygon is 2340, find the number of sides of the polygon.

SUM INT $\quad 2340 = (n-2)180°$

$\frac{2340}{180} = n-2 \qquad 13 = n-2$
$\quad\;\; +2 \quad\; +2$

$\boxed{n = 15}$

5. If the measure of each interior angle of a regular polygon is 165, find the number of sides of the polygon.

EACH INT $\quad \frac{(n-2)180°}{n} = \frac{165°}{1}$

$165n = (n-2)180$

$165n = 180n - 360$

$-180n \quad -180n$

$-15n = -360$

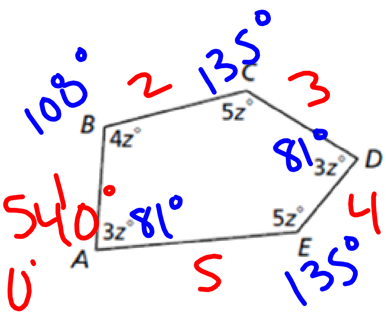
$\frac{-15n}{-15} = \frac{-360}{-15}$

$\boxed{n = 24}$

Exit Pass

Given pentagon ABCDE at right,

i. Find the measure of each interior angle.



$$3z + 4z + 5z + 3z + 5z = 540°$$

$$20z = 540°$$

$$z = 27°$$

$$(n-2)180°$$

$$(5-2)180°$$

$$540°$$

ii. Find the sum of the exterior angles.

$\boxed{360°}$