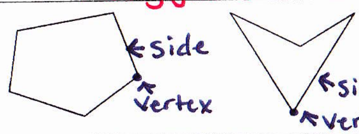
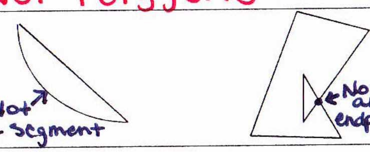
NOTES 7.1: INTERIOR ANGLES OF POLYGONS

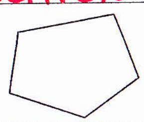
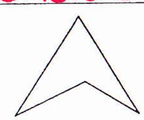
Objective: I can identify polygons & find measures of ∡s in polygons.

POLYGON: A closed, plane figure formed by 3 or more line segments (sides) that intersect at their endpoints (vertices)

Regular Polygon: A polygon that is both equilateral AND equiangular

Polygons	Not Polygons
 ←side ↖vertex ←side ←vertex	 Not a segment ←Not an endpoint

Polygons can be **CONVEX** or **CONCAVE**.

Convex	Concave
No sides go in! 	Some sides go in! 

Polygons are named according to the number of sides.

A 3-sided polygon is called a triangle.
A 4-sided polygon is called a quadrilateral.
A 5-sided polygon is called a pentagon.
A 6-sided polygon is called a hexagon.
A 7-sided polygon is called a heptagon.
An 8-sided polygon is called a octagon.
A 9-sided polygon is called a nonagon.
A 10-sided polygon is called a decagon.
An 11-sided polygon is called a undecagon.
A 12-sided polygon is called a dodecagon.
An n-sided polygon is called a n-gon.

INTERIOR AND EXTERIOR ANGLES

To find the sum of the measures of the interior/exterior angles of a polygon, use the following formulas: n = # of sides

Sum of Interior Angles	Sum of Exterior Angles
$S = 180(n-2)$	Always 360°

To find the measure of each interior/exterior angle of a regular polygon, use the following formulas:

Each Interior Angle	Each Exterior Angle
$I = \frac{180(n-2)}{n}$	$\mathcal{E} = \frac{360}{n}$

EXAMPLE 1: For a heptagon, find: n = 7

a) the sum of the measures of the interior angles. $S = 180(n-2)$ $S = 180(7-2)$ $S = 180(5)$ Sum = 900°	b) the sum of the measures of the exterior angles. Always 360° Sum = 360°

EXAMPLE 2: For a regular, 13-sided polygon, find: n = 13

a) the sum of the measures of the interior angles. $S = 180(13-2)$ $S = 180(11)$ Sum = 1980°	b) the measure of each interior angle. $I = \frac{180(13-2)}{13}$ $I = \frac{1980}{13}$ Each Angle = 152.3°
c) the sum of the measures of the exterior angles. Sum = 360°	d) the measure of each exterior angle. $\mathcal{E} = \frac{360}{13}$ Each Angle = 27.7°

* Round to nearest tenth (one # after decimal), if necessary!

Notes 7.1 (Continued)

EXAMPLE 3: Find the measure of ***each*** of the interior angles of a regular dodecagon. $n=12$

$$I = \frac{180(12-2)}{12}$$

$$I = \frac{180(10)}{12}$$

Each angle = $150°$

EXAMPLE 4: Find the measure of ***each*** of the interior angles of a regular, convex of a 20-gon. $n=20$

$$I = \frac{180(20-2)}{20}$$

$$I = \frac{180(18)}{20}$$

Each angle = $162°$

EXAMPLE 5: If the measure of ***an interior angle*** of a regular polygon is 108°, find the number of sides of the polygon.

$$108 = \frac{180(n-2)}{n}$$ *Multiply both sides by n!

$$108n = 180n - 360$$
$$-72n = -360$$
$$n = 5$$

Number of sides = 5

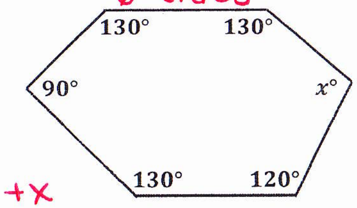
EXAMPLE 6: If the measure of ***an interior angle*** of a regular polygon is 150°, find the number of sides in the polygon.

$$150 = \frac{180(n-2)}{n}$$
$$150n = 180n - 360$$
$$-30n = -360$$
$$n = 12$$

Number of sides = 12

EXAMPLE 7: Find the missing angle.

6 sides



$$S = 180(6-2)$$
$$S = 720$$

$$720 = 90+130+130+130+120+x$$
$$720 = 600 + x$$
$$120 = x$$

$x =$ 120

EXAMPLE 8: The measure of an exterior angle of a regular polygon is 30°. Find the number of sides.

$$30 = \frac{360}{n}$$
$$30n = 360$$
$$n = 12$$

Number of sides = 12

EXAMPLE 9: The measure of an interior angle of a regular polygon is 144°. Find the number of sides.

$$144 = \frac{180(n-2)}{n}$$
$$144n = 180n - 360$$
$$-36n = -360$$

Number of sides = 10