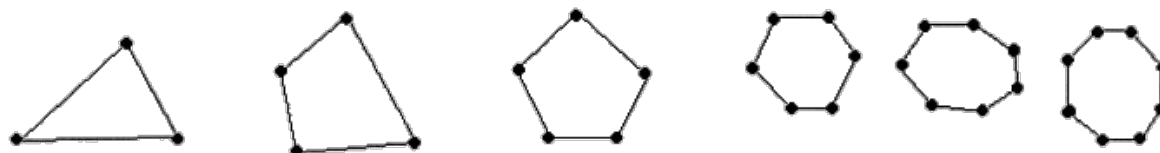


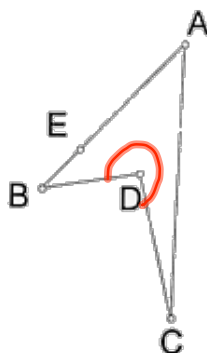
Properties of Polygons

Polygon: A closed figure consisting of 3 or more straight sides.



Convex Polygon: a segment joining any 2 vertices of the polygon lies entirely within the polygon. All of the above polygons are convex.




Concave Polygon: has at least one angle greater than 180° . It is also true that a segment can be drawn joining 2 vertices of the polygon so that part of that segment lies outside of the polygon.



The quadrilateral ABDC is concave. Interior $\angle BDC$ is larger than 180° . Segment BC lies partly outside of the polygon.

Regular Polygon: Polygon where all of the sides are the same length and all of the angles are the same measure

Investigation: Complete the chart below

Number of sides in the polygon	Sketch	Number of Triangles formed	Sum of the Interior Angles of the Polygon
3		1	(1) (180) = 180
4		2	(2) (180) = 360
5		3	(3) (180) = 540
6		4	4(180) = 720
7		5	5(180) = 900
8		6	6(180) = 1080

Write a formula that could be used to calculate the sum of the interior angles of a polygon if you know the number of sides that it has.

$$n * (n - 2) (180) = X$$

n - # of sides
 X - Sum of int. angles
 $180n - 360$

If you have a regular polygon, how could you use your formula to determine the measure of each of the interior angles of the regular polygon?

$$6 \text{ sides} = \frac{(6-2) 180}{6} = 120^\circ$$

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

Examples:

1. Calculate the sum of the measures of the interior angles of a polygon with the given number of sides.

a) 9

$$\frac{(9-2)180}{1260^\circ}$$

b) $4x$

$$\frac{(n-2)180}{(4x-2)180}$$

$$720x - 360$$

2. Determine the number of sides of a polygon whose interior angle sum equals 4140°

$$(n-2)180 = 4140$$

$$n-2 = \frac{4140}{180}$$

$$n = \frac{4140}{180} + 2$$

$$n = 25$$

3. Determine the number of sides of a regular polygon whose interior angle measures

a) 170°

$$\frac{(n-2)180}{n} = 170$$

$$(n-2)180 = 170n$$

$$180n - 360 = 170n$$

$$-360 = -10n$$

$$n = 36$$

b) k°

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

$$\frac{180n - 360}{n} = k$$

$$180n - 360 = kn$$

$$-360 = kn - 180n$$

$$-360 = n(k-180)$$

$$\frac{-360}{k-180} = n$$

4. Determine the number of sides of a regular polygon whose exterior angle measures

a) 60°

$$\text{Int } \angle = \frac{180 - 60}{120^\circ}$$

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

$$180n - 360 = 120n$$

$$-360 = -60n$$

$$n = 6$$

b) k°

$$\text{Int } \angle = 180 - k$$

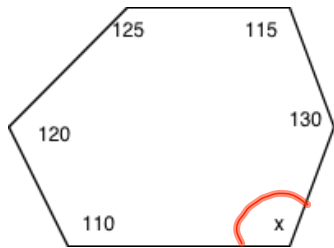
$$\frac{(n-2)180}{n} = (180 - k)$$

$$180n - 360 = (180 - k)n$$

$$180n - 360 = 180n - kn$$

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

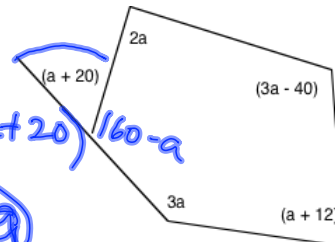
5. Determine the values of "x" and "a" in the diagrams below



$$4(180) = 720$$

$$x = 720 - \text{all } \angle\text{'s}$$

$$x = 120^\circ$$



$$180 - (a+20) = 160 - a$$

$$3(180) = 540$$

$$540 = 2a + 3a - 40 + a + 12 + 3a + 160 - a$$

$$540 = 8a + 132$$

$$408 = 8a$$

$$a = 51$$

