

AIM: HOW DO WE DETERMINE THE MEASURE OF INTERIOR AND EXTERIOR ANGLES OF A POLYGON?

Do Now: **RECALL!** Use the table below to find the angles of rotation for the following figures.

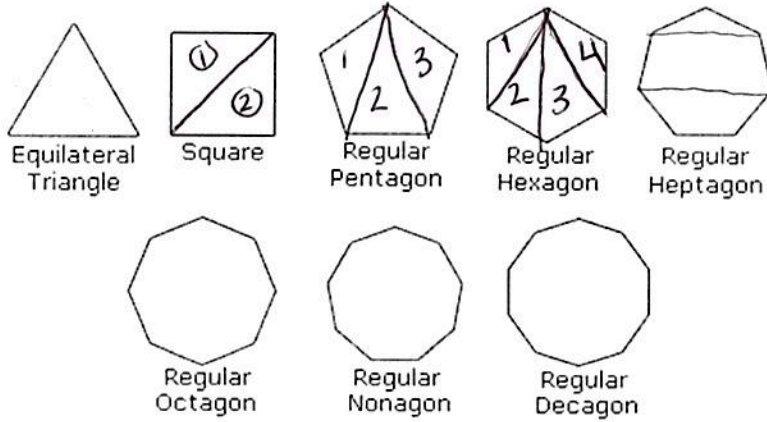
$\frac{360}{n}!$

	Equilateral Triangle	Square	Regular Pentagon	Regular Hexagon
# of sides	3	4	5	6
Angles of Rotation	120, 240, 360	90, 180, 270, 360	72, 144, 216, 288, 360	60, 120, 180, 240, 300, 360

We rotate along the EXTERIOR angle!

VOCABULARY

WORD	DEFINITION	IMAGE				
Polygon	A 2D shape with at least 3 enclosed sides	<table border="1"> <thead> <tr> <th>Polygons</th> <th>Non polygons</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> </tbody> </table>	Polygons	Non polygons		
Polygons	Non polygons					
Regular Polygon	a polygon with all \cong sides & \cong \angle 's	<table border="1"> <thead> <tr> <th>Regular Pentagon</th> <th>Irregular Pentagon</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> </tbody> </table>	Regular Pentagon	Irregular Pentagon		
Regular Pentagon	Irregular Pentagon					
Interior Angle	Angles on the <u>INSIDE</u> of a polygon					
Exterior Angle	Angles on the <u>OUTSIDE</u> of a polygon formed by the extension of a side					



*fix for next year

POLYGON	NUMBER OF SIDES	NUMBER OF TRIANGLES	SUM OF INTERIOR ANGLE MEASURES
Triangle	3	1	(1) $180^\circ = 180^\circ \div 3 = 60$
Quadrilateral	4	2	(2) $180^\circ = 360^\circ \div 4 = 90$
Pentagon	5	3	(3) $180^\circ = 540^\circ \div 5 = 108$
Hexagon	6	4	(4) $180^\circ = 720^\circ \div 6 = 120$
Decagon	10	8	(8) $180^\circ = 1440^\circ \div 10 = 144$

The pattern developed in the example above, is consistent for ALL polygons.

The <u>SUM</u> of the Interior Angles of any Polygon	<u>ONE</u> Interior Angle of a <u>Regular</u> Polygon	<u>ONE</u> Exterior angle of a <u>Regular</u> Polygon
$180(n - 2)$	$\frac{180(n - 2)}{n}$ all sides + \angle 's are =	$\frac{360}{n}$ * same as angle of rotation The sum of the exterior angles is ALWAYS 360°

** where n is the number of sides of the polygon**

Interior angles in regular polygons

If a shape is regular, all of its angles are the same size.

Equilateral Triangle

Square

Regular Pentagon

Regular Hexagon

Regular Heptagon

Regular Octagon

If the polygon has n sides, the angle sum is $(n - 2) \times 180$.

Divide this answer by n to get the size of one angle.

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

Exterior angles

The interior angle and the exterior angle of a shape add up to 180° .

$I + E = 180^\circ$

This is because angles on a straight line equal 180° .

If $I = 60^\circ$ then $E = 120^\circ$
 $60^\circ + 120^\circ = 180^\circ$.

The sum of the exterior angles of a shape is always 360° (a full turn).

If the shape is regular, then each angle is the same size.

You can find the size of one angle by dividing 360° by the number of sides, n.

$$\frac{360}{n}$$

PRACTICE! 6

1) Determine, in degrees, the measure of each interior angle of a regular octagon.

$$1 \text{ interior } \angle \rightarrow \frac{180(8-2)}{8} = 135^\circ$$

2) Determine and state the measure, in degrees, of an interior angle of a regular decagon.

$$1 \text{ interior } \angle \rightarrow \frac{180(10-2)}{10} = 144^\circ$$

3. The sum of the interior angles of a regular polygon is 540°. Determine and state the number of degrees in one interior angle of the polygon.

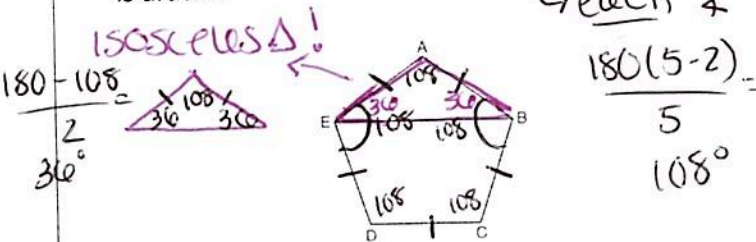
$$\begin{aligned} 180(n-2) &= 540 \\ 180n - 360 &= 540 \\ 180n &= 900 \\ n &= 5 \end{aligned} \quad \left| \quad \frac{180(5-2)}{5} = 108^\circ \right.$$

4) What is the measure of each interior angle of a regular hexagon?

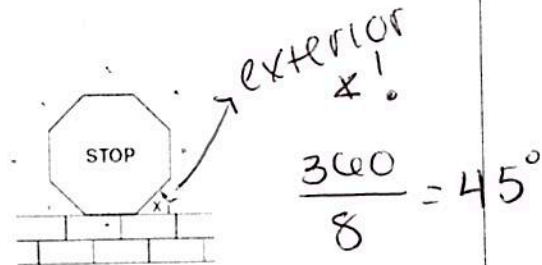
$$\frac{180(6-2)}{6} = 120^\circ$$

1) 60°
2) 120°
3) 135°
4) 270°

5. In the diagram below of regular pentagon $ABCDE$, \overline{EB} is drawn.



6) A stop sign in the shape of a regular octagon is resting on a brick wall, as shown in the accompanying diagram.



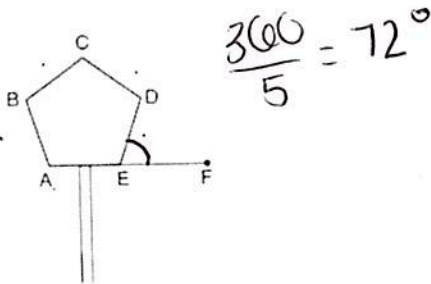
What is the measure of $\angle AEB$?

- 1) 36°
2) 54°
3) 72°
4) 108°

What is the measure of angle x ?

- 1) 45°
2) 60°
3) 120°
4) 135°

7) One piece of the birdhouse that Natalie is building is shaped like a regular pentagon, as shown in the accompanying diagram.



If side AE is extended to point F , what is the measure of exterior angle DEF ?

- 1) 36°
2) 72°
3) 108°
4) 144°

8) What is the difference between the sum of the measures of the interior angles of a regular pentagon and the sum of the measures of the exterior angles of a regular pentagon?

1) 36 sum interior \angle 's
2) 72 $180(5-2) = 540$
3) 108
4) 180

sum exterior \angle 's is always 360

$$540 - 360 = 180^\circ$$

9. The sum of the interior angles of a regular polygon is 720° . How many sides does the polygon have?

- 1) 8
- 2) 6
- 3) 5
- 4) 4

$$180(n-2) = 720$$

$$180n - 360 = 720$$

$$180n = 1080$$

$$n = 6$$

10. Melissa is walking around the outside of a building that is in the shape of a regular polygon. She determines that the measure of one exterior angle of the building is 60° . How many sides does the building have?

- 1) 6
- 2) 9
- 3) 3
- 4) 12

$$\frac{360}{n} = \frac{60}{1}$$

$$\frac{360}{60} = \frac{60n}{60}$$

$$n = 6$$

11. For which polygon does the sum of the measures of the interior angles equal the sum of the measures of the exterior angles?

- 1) hexagon $180(6-2) = 720$
- 2) pentagon $180(5-2) = 540$
- 3) quadrilateral $180(4-2) = 360$
- 4) triangle $180(3-2) = 180$

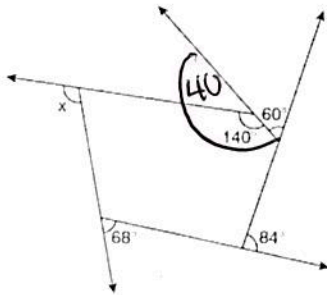
sum is always 360° !

12. A regular polygon with an exterior angle of 40° is a

- 1) pentagon $\frac{360}{5} = 72$
- 2) hexagon $\frac{360}{6} = 60$
- 3) nonagon $\frac{360}{9} = 40$
- 4) decagon $\frac{360}{10} = 36$

$$\frac{360}{9} = 40$$

13. The pentagon in the diagram below is formed by five rays.



What is the degree measure of angle x ?

- 1) 72
- 2) 96
- 3) 108
- 4) 112

sum of exterior \angle 's = 360°

$$x + 68 + 84 + 60 + 40 = 360$$

$$x + 252 = 360$$

$$x = 108$$

14. The measures of five of the interior angles of a hexagon are 150° , 100° , 80° , 165° , and 150° . What is the measure of the sixth interior angle?

- 1) 75°
- 2) 80°
- 3) 105°
- 4) 180°

$$180(6-2) = 720^\circ$$

$$150 + 100 + 80 + 165 + 150 + x = 720$$

$$645 + x = 720$$

$$x = 75$$

Name: _____

Date: _____

UNIT 4

EDPUZZLE ASSIGNMENT

QUADRILATERAL PROPERTIES

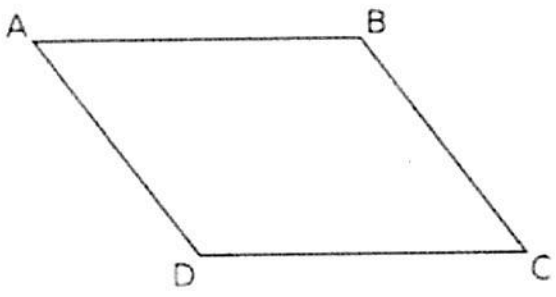
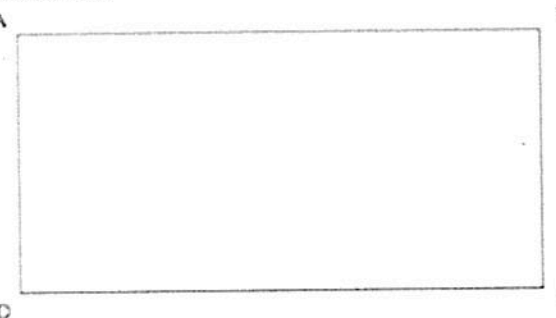
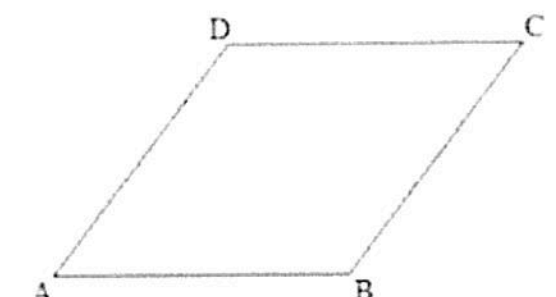
Directions:

- Follow along with the Edpuzzle and complete this worksheet AND the questions in the video.
- **Take a picture of your notes and turn it in to Google Classroom for full credit on this assignment.**

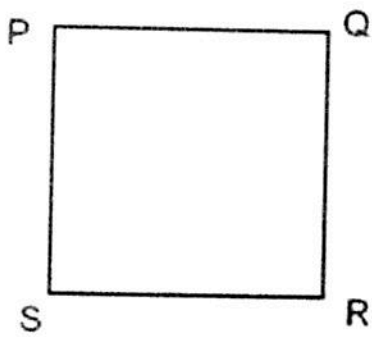
How are the different types of quadrilaterals categorized by their properties? Then, write the definition of a quadrilateral in the box below.

QUADRILATERAL	
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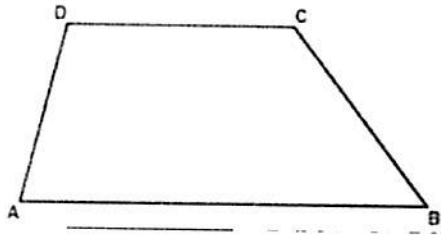
Write the properties and mark the diagram as you follow along with the video:

<p>PARALLELOGRAM</p> 	
<p>RECTANGLE</p> 	
<p>RHOMBUS</p> 	

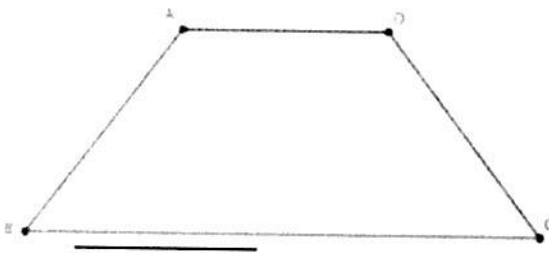
SQUARE



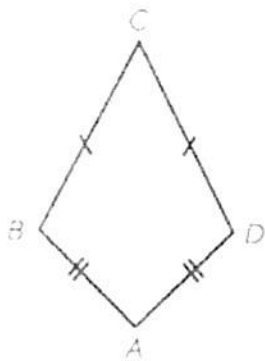
TRAPEZOID



ISOSCELES TRAPEZOID



KITE



QUADRILATERAL FAMILY TREE (No need to write anything, just follow along with the video!)

