Geometry R – Mr. Bo
Unit 4 – Day 4 Notes (Part 1)

Name: Notes
Date: _____

Polygons

Vocabulary:

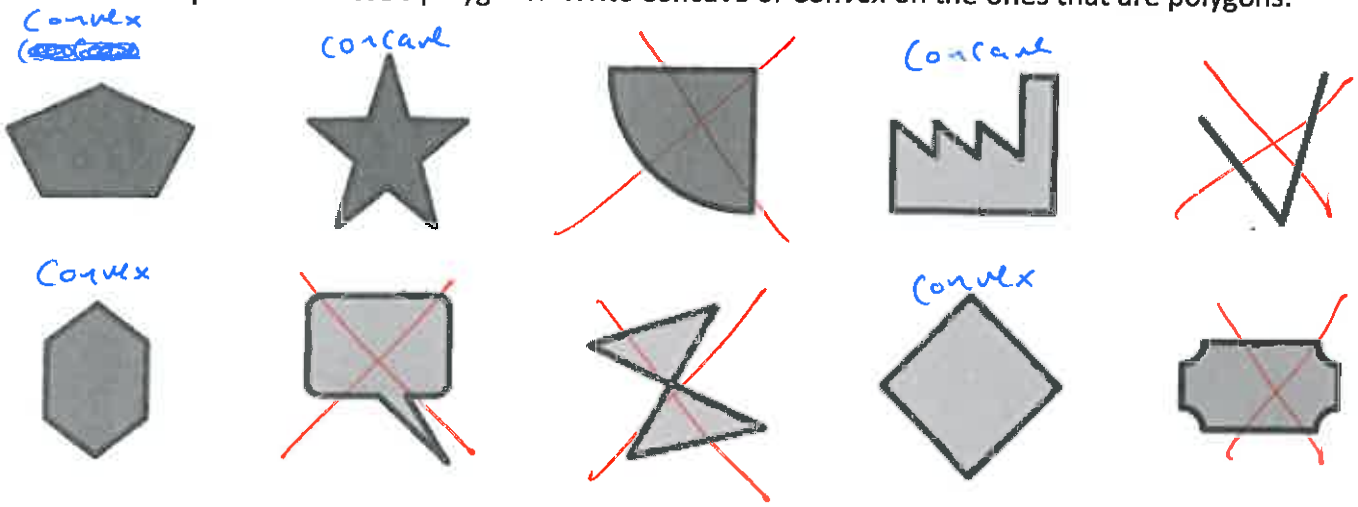
Polygon: A shape with 3 or more sides made from segments that only intersect at their endpoints.

Convex Polygon: A polygon whose diagonals are only interior.

Concave Polygon: A polygon that has at least 1 diagonal that is exterior.

Regular Polygon: A polygon with all sides congruent and all angles congruent.

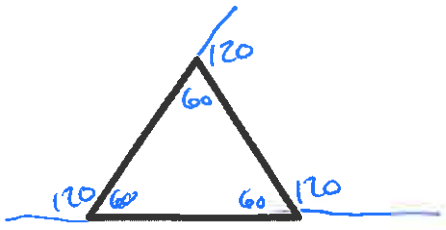
Cross out the shapes that are **NOT** polygons. Write *Concave* or *Convex* on the ones that are polygons.



Polygon Exterior Angle Sum

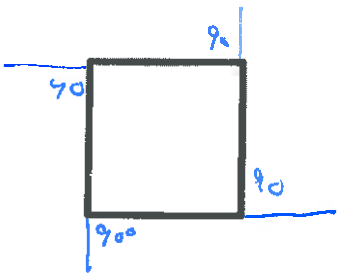
Draw the exterior angles for each polygon and find their sum.

Equilateral Triangle



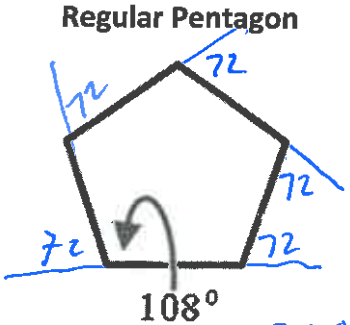
$3(120) = 360°$

Square



$4(90) = 360°$

Regular Pentagon



$5(75) = 360°$

What is the sum of the exteriors angles of any polygon?

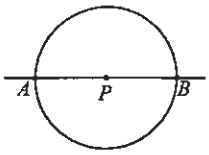
the ext. ∠'s always sum to 360°

Inscribed Polygon: A polygon drawn inside a circle such that each vertex lies on the circle.

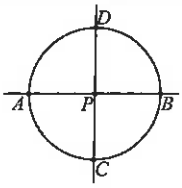
Inscribed Square	Inscribed Regular Hexagon
	

Construct an Inscribed Square inside Circle P:

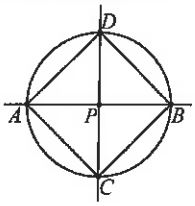
1. Construct diameter $\overline{AB}$.

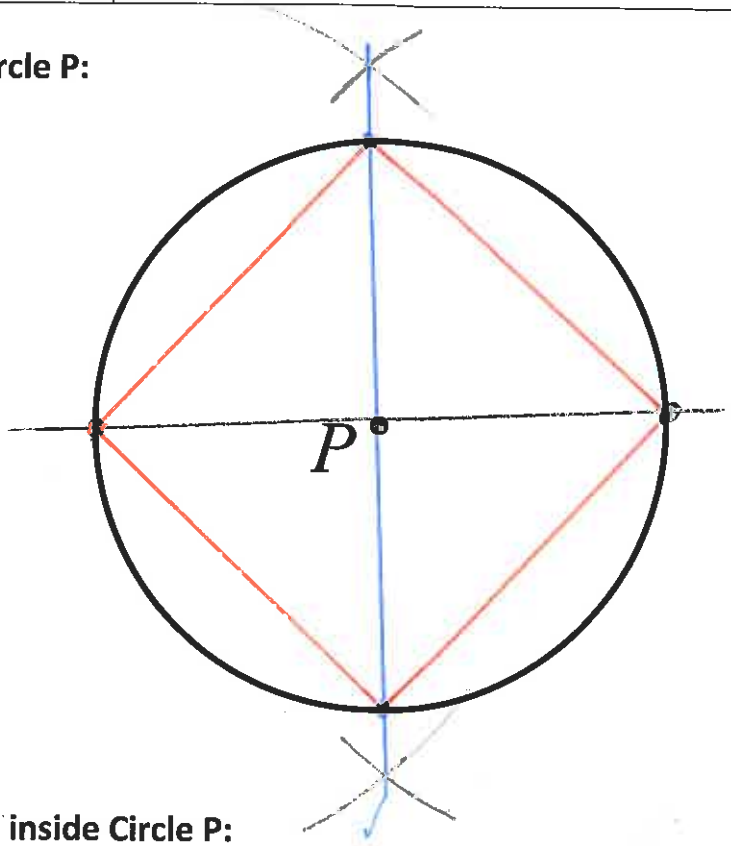


2. Construct the ⊥ bisector of $\overline{AB}$.



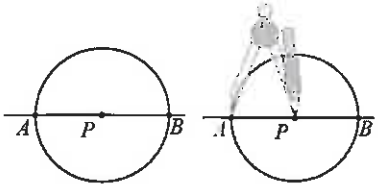
3. Construct the sides of the square.



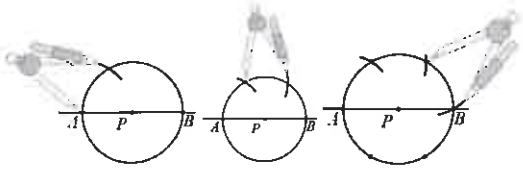


Construct an Inscribed Regular Hexagon inside Circle P:

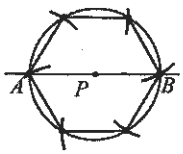
1. Construct diameter $\overline{AB}$. Measure $\overline{AP}$.

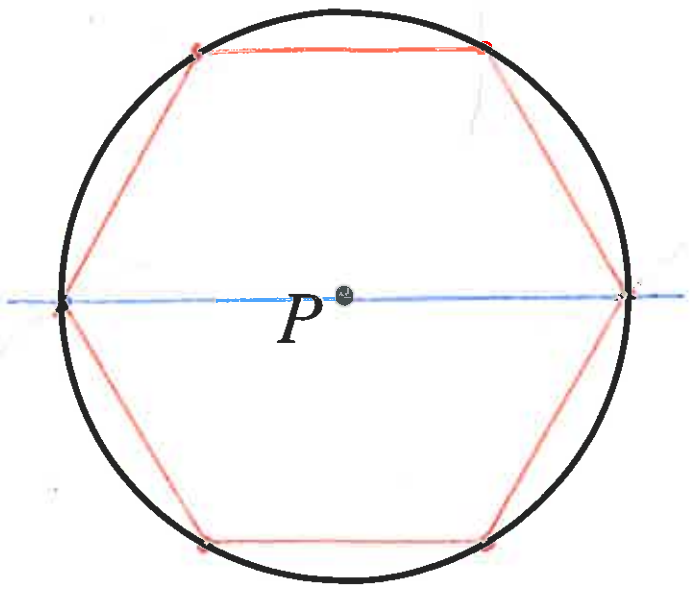


2. Construct arcs around the circle.



3. Complete the Regular Hexagon.





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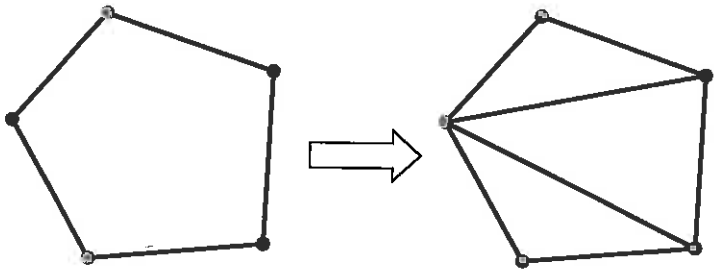
Polygon – Method 1

Directions: This is **method 1** for finding the interior angle sum of a polygon. When you and your partner have completed this method, move on to Method 2.

Please, read and follow each step carefully!

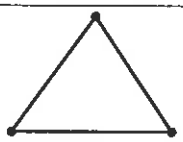
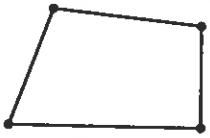
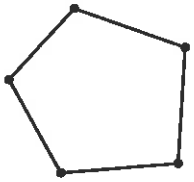
1. The interior angle sum of a triangle = 180°.

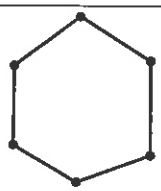
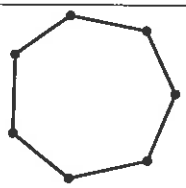
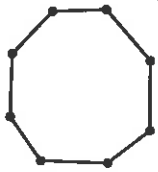
2. The interior angle sum of other polygons can be found by splitting the polygon into triangles. For example: A pentagon has 5 vertices. By choosing 1 vertex and connecting it to all other non-adjacent vertices, the pentagon is broken into 3 triangles:



So, the **interior angle sum** of a pentagon = (3 Triangles)(180° in each)
= 540° total.

3. Complete the table below using the same method described above.

Name	Picture	# of Sides	# of Triangles	Interior ∠ Sum
Triangle				
Quadrilateral				
Pentagon				

Hexagon				
Septagon (Heptagon)				
Octagon				

4. In the table, you will notice that there is a relationship between the **number of sides** of a polygon and the **number of triangles** formed. In the box below describe this relationship and then use your description to answer the questions that follow.

a) How many triangles can be formed in a polygon with 12 sides? 10

b) How many triangles can be formed in a polygon with 30 sides? 28

c) How many triangles can be formed in a polygon with ***n*** sides? n-2

5. In the table, the **interior angle sum** was found based on the **number of triangles** formed. In the box below, write a formula that gives the **interior angle sum** based on the **number of sides**. Use the variable n in your formula to represent the number of sides.

Interior angle sum = 180(n-2)

6. Test your formula by letting ***n*** = 5 and n=8. Did you get the same values that are in the table? If not, revise your formula and try again.

7. Move on to Method 2.

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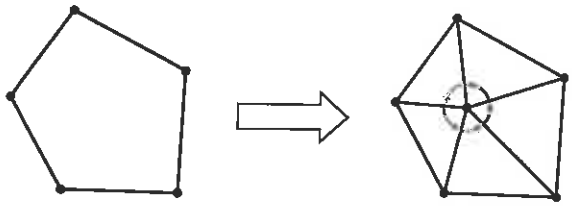
Polygon – Method 2

Directions: This is **Method 2** for finding the interior angle sum of a polygon. When you and your partner have completed this method, move on to the Activity Summary .

Please, read and follow each step carefully!

1. The interior angle sum of a triangle = 180°.

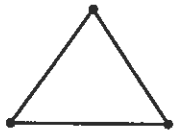
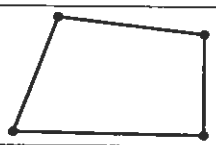
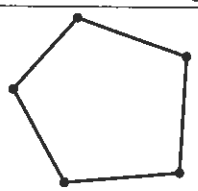
2. The interior angle sum of other polygons can be found by splitting the polygon into triangles. For example: A pentagon has 5 vertices. Draw a point anywhere inside the pentagon and connect it to each of the 5 vertices to form 5 triangles.

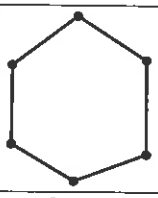
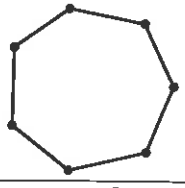
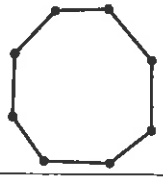


The 5 triangle vertices touching the interior point form a circle which is 360°.

So, the interior angle sum of a pentagon = (5 triangles)(180° each)-360°
=540°.

3. Complete the table below using the method described above.

Name	Picture	# of Sides	# of Triangles	Interior ∠ Sum
Triangle				
Quadrilateral				
Pentagon				

Hexagon				
Septagon (Heptagon)				
Octagon				

4. In the table, you will notice that there is a relationship between the **number of sides** of a polygon and the **number of triangles** formed. In the box below describe this relationship and then use your description to answer the questions that follow.

a) How many triangles are formed in a polygon with 12 sides? 12

b) How many triangles are formed in a polygon with 30 sides? 30

c) How many triangles are formed in a polygon with ***n*** sides? n

5. In the table, the **interior angle sum** was found based on the **number of triangles** formed. In the box below, write a formula that gives the **interior angle sum** based on the **number of sides**. Use the variable n in your formula to represent the number of sides.

Interior angle sum = $180n - 360$

6. Test your formula by letting ***n*** = 5 and n=8. Did you get the same values that are in the table? If not, revise your formula and try again.

7. Move on to the Activity Summary.

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Polygon – Activity Summary

Directions: This is the **Activity Summary** for finding the interior angle sum of a polygon.

1. In the box below, briefly describe how to calculate the interior angle sum of a polygon using method 1.

2. In the box below, briefly describe how to calculate the interior angle sum of a polygon using method 2.

3. In the activity you created two formulas. Write the formulas in the boxes below.

Method 1 Formula	Method 2 Formula
$180(n-2)$	$180n - 360$

What does n represent in each of the formulas?

4. Although the formulas look different, are they really different? Explain in this space.

5. With your partner answer the following questions:

a) What is the interior angle sum of a 25-gon?

$180(25-2) = 180(23) = \boxed{4140^\circ}$

b) What is the measure of one angle of a ***regular*** 15-gon?
(Hint: regular = all sides ≅ & all angles ≅.)

int $\angle$ sum $= 180(15-2) = 180(13) = 2340^\circ$

1 int $\angle = \frac{2340}{15} = \boxed{156^\circ}$

c) How many sides does a polygon have if the interior angle sum is 7020°?

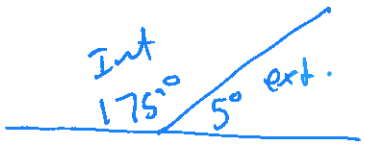
int $\angle$ sum $= 7020$

$7020 = 180(n-2)$

$39 = n-2$

$\boxed{n = 41}$

d) How many sides does a **regular** polygon have if one angle measures 175°?
(Hint: Try using **ex**terior angles.)



ext. $\angle$ sum $= 360^\circ$

1 ext $= \frac{360^\circ}{5^\circ} = 72$ sides/angles.

e)