AGENDA - Unit 9 -3

Using Central Angles and Rotating Polygons

Go over HW 9.2

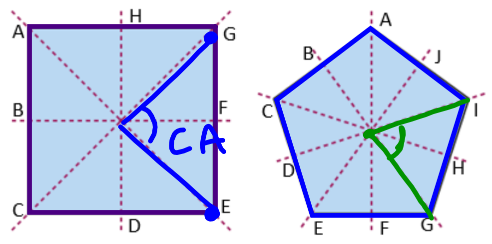
- Notes 9.3
- Quiz - (YES)- Use LS-9

HW - 9.3

- Worksheet 9.3
- CR #8 - Due 4/12

Lesson 9-3R & 9-4L Notes

In unit 1, we looked at lines of symmetry as lines of reflection to map part of a polygon onto itself (each pre-image point doesn't necessarily map to itself). For example, the square and regular pentagon have the following lines of symmetry such that



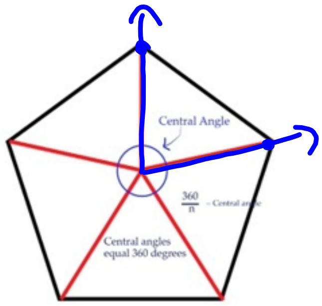
Regular square Regular pentagon

A→C, A→G, A→A, A→E A→C, A→I, A→A; B→D,B→J,B→B

But can A map to B in the square? Can A map to F in the pentagon? How would we map a polygon onto itself such that all points map somewhere onto the pre-image? We would use the transformation ROTATION. The center of rotation will be the CENTER of the polygon, and the measure of the angle of rotation will be the measure of the CENTRAL ANGLE of the polygon.

Finding the Measure of a Central Angle of a Regular Polygon

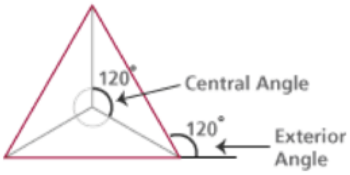
Definition: A central angle is an angle whose vertex is the CENTER of the polygon and whose rays extend through CONSECUTIVE vertices. A regular polygon with n number of sides has n number of central angles.

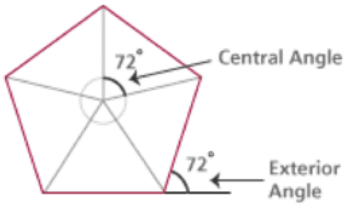


Recall from earlier units that the angles at a point sum to 360°. Therefore, the measure of a central angle of a regular polygon can be found using

$$\boxed{\text{Central Angle} = \frac{360^\circ}{n}}$$ where n = number of sides of the polygon

What do you observe about the measure of the central angle and an exterior angle of a regular pentagon?

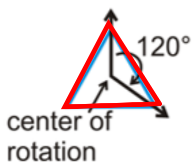


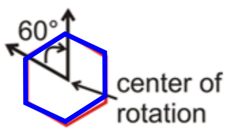


Mapping a Regular Polygon Onto Itself

To map a regular polygon onto itself, rotate around the center of the polygon by a MULTIPLE of the central angle. The minimum number of degrees will be the measure of the

CENTRAL ANGLE
(TURNING IT ONCE)

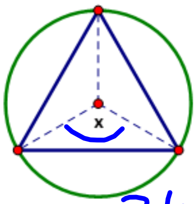




Examples:

1) What is the central angle for these regular polygons?

a)

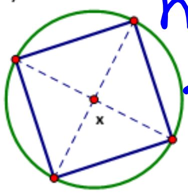


$\frac{360^\circ}{n}$

$\frac{360^\circ}{3}$

Central Angle = 120°

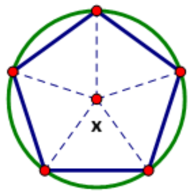
b) $n=4$



$\frac{360^\circ}{4}$

Central Angle = 90°

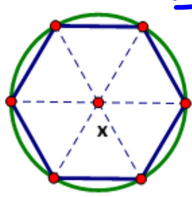
c) $n=5$



$\frac{360^\circ}{5}$

Central Angle = 72°

d) $n=6$

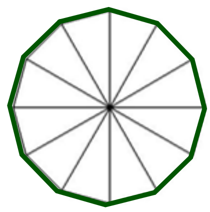


$\frac{360^\circ}{6}$

Central Angle = 60°

$n=12$

2) What is the minimum number of degrees to map a regular dodecagon onto itself?



$CA = \frac{360^\circ}{n} = \frac{360^\circ}{12} = \boxed{30^\circ}$

$n = ?$

3) Which regular polygon has a minimum rotation of 45° to carry it onto itself?

a. Octagon

b. Decagon

c. Hexagon

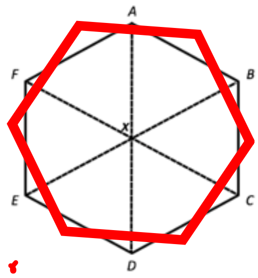
d. Pentagon

$\frac{360^\circ}{n} = 45^\circ$

$360^\circ = 45n$

$8 = n$

4) Which of the following could be the angle measure for a rotation of a regular hexagon to be carried onto itself? (circle all which apply)



~~e. 30°~~ NOT A MULTIPLE OF 60°

f. 120° $60° \times 2 = 120°$

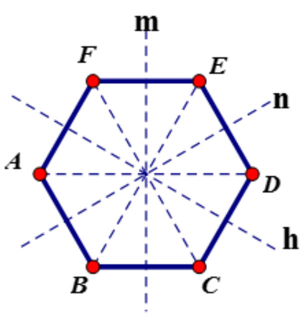
g. 180° $60° \times 3$ TURNS $= 180°$

h. 360° $360°$ $60° \times 6$ TURNS $= 360°$

$$\frac{360°}{n}$$

$$\frac{360°}{6} = 60°$$

4. Given regular hexagon ABCDEF with lines m, n, and h through midpoints of the sides,



a. Determine the number of degrees to rotate the regular hexagon such that E maps to A.

b. Identify three separate precise transformations that map F to C under a

i. Point Reflection: ______________________________

ii. Rotation: ______________________________

iii. ~~Rotation~~: ______________________________ Line Reflection

c. Identify two separate precise transformations that map F to B under a

i. Line Reflection: ______________________________

ii. Rotation: ______________________________