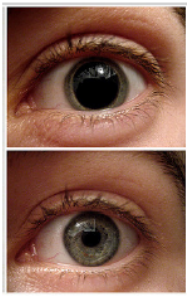
SECONDARY MATH II // MODULE 7
CIRCLES: A GEOMETRIC PERSPECTIVE – 7.2



7.2 Circle Dilations

A Develop Understanding Task

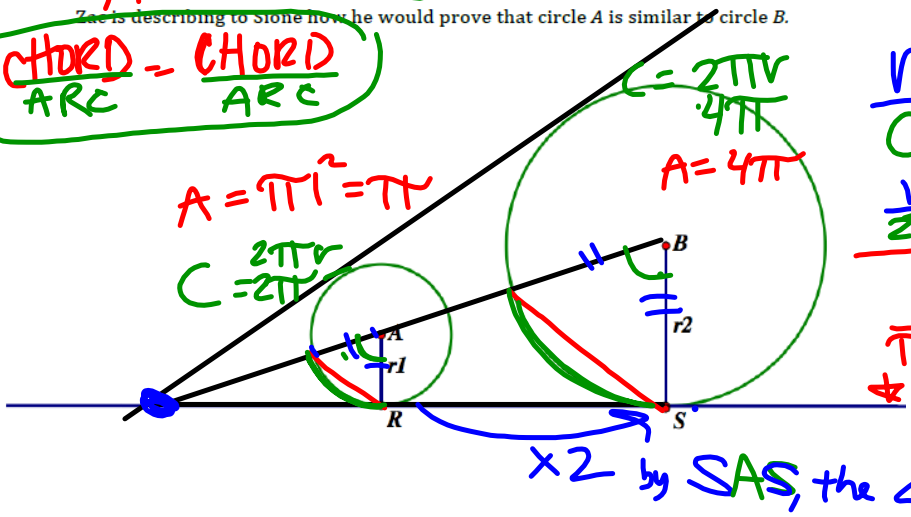
The statement "*all circles are similar*" may seem intuitively obvious, since all circles have the same shape even though they may be different sizes. However, we can learn a lot about the properties of circles by working on the proof of this statement.

Remember that the definition of similarity requires us to find a sequence of dilations and rigid motion transformations that superimposes one figure onto the other.

$A=\pi r^2$ $C=2\pi r$

Zac is describing to Slone how he would prove that circle *A* is similar to circle *B*.

$\frac{\text{CHORD}}{\text{ARC}} = \frac{\text{CHORD}}{\text{ARC}}$



$A=\pi 1^2=\pi$ $C=2\pi$ $C=2\pi r$ $A=4\pi$

$\frac{r_1}{C_A} = \frac{r_2}{C_B}$ $\frac{1}{2\pi} = \frac{2}{4\pi}$ ✓

$\frac{1}{\pi} \times \frac{2}{4\pi}$

* area not proportional

×2 by SAS, the Δ's are proportional

Zac: "Translate circle *A* until its center coincides with the center of circle *B*. Then enlarge circle *A* by dilation until the points on circle *A* coincide with the points on circle *B*. Or, you could shrink circle *B* by dilation until the points on circle *B* coincide with the points on circle *A*."

Sione has some questions: "After the translation, what is the scale factor for the enlargement that carries circle *A* onto circle *B*? And, what is the scale factor for the reduction that carries circle *B* onto circle *A*?

1. How would you answer Sione's questions?

2 x's

Based on Zac and Sione's discussion, we are probably convinced that circle *A* and circle *B* are similar. Another way we might convince ourselves that the two circles are similar would be to find the center of dilation that maps pre-image points from circle *A* onto corresponding image points on circle *B*.

2. Locate the center of dilation that carries circle *A* onto circle *B*. Explain how you know the point you found is the center of dilation. (Note that both circles have been drawn tangent to $\overleftrightarrow{RS}$.)

3. Draw some chords, triangles or other polygons inscribed in each circle that would be similar to each other. Explain how you know these corresponding figures are similar.

4. Based on the figures you drew in question 3, write some proportionality statements that you know are true.

5. Here is a proportionality statement you may not have considered. What convinces you that it is true?

$$\frac{\textit{circumference of circle A}}{\textit{diameter of circle A}} = \frac{\textit{circumference of circle B}}{\textit{diameter of circle B}}$$

$$\frac{6.28}{2} = \frac{12.56}{4}$$

$$\frac{3.14}{\pi} = \frac{3.14}{\pi}$$

Since this ratio of circumference to diameter is the same scale factor for all circles, this ratio has been given the name π (pi).

6. How much larger is the circumference of circle *B* than the circumference of circle *A*?

7. Do you think the following proportion is true or false? Why?

✓

πr^2

12.56 / 3.14

$$\frac{\text{area of circle } B}{\text{area of circle } A} \times \frac{\text{circumference of circle } B}{\text{circumference of circle } A}$$

$\frac{12.56}{6.28}$

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7.2

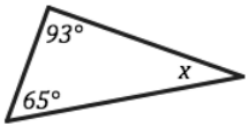
READY, SET, GO! Name Period Date

READY

Topic: Finding missing angles, rotational symmetry, regular polygons

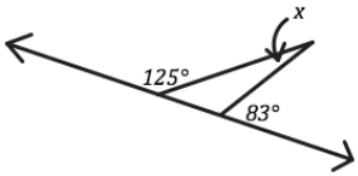
Find the missing angle in each of the figures below.

1.



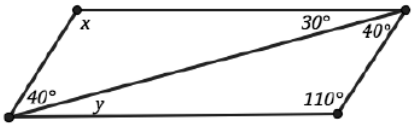
$m\angle x =$

2.



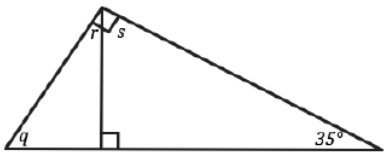
$m\angle x =$

3.



$m\angle x =$ $m\angle y =$

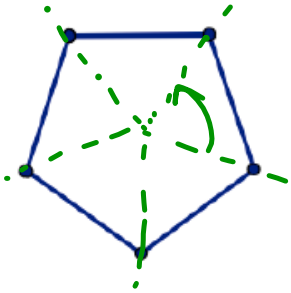
4.



$m\angle q =$ $m\angle r =$ $m\angle s =$

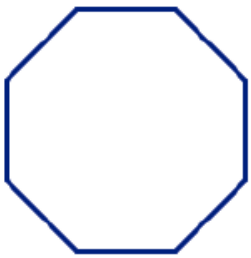
Find the angles of rotational symmetry for the regular polygons. Rotational symmetry means that the polygon rotates the indicated number of degrees to land on itself and all points in the image coincide with the pre-image.

5.



$\frac{360}{5} = 72°$

6.



SET

Topic: Dilation, proportionality between similar figures

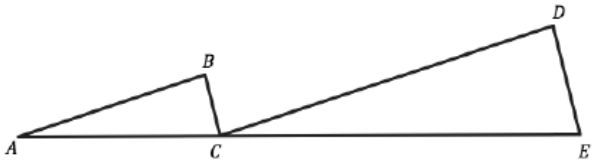
For each set of similar figures complete the proportionality statements.

7. $\Delta ABC \sim \Delta CDE$

a. $\frac{AB}{CD} = \frac{BC}{?}$

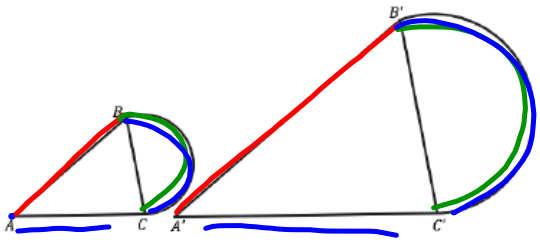
b. $\frac{AC}{AB} = \frac{?}{CD}$

c. $\frac{BC}{AC} = \frac{DE}{?}$



8a. $\frac{AB}{\widehat{BC}} = \frac{?}{\widehat{B'C'}}$ A'B'

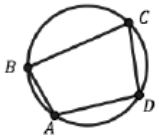
b. $\frac{\widehat{BC}}{\widehat{B'C'}} = \frac{?}{?}$ AC / A'C'

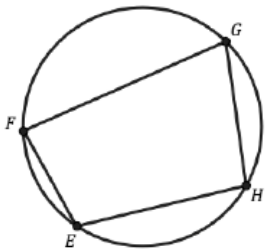


9. Quadrilateral ABCD ∽ Quadrilateral EFGH

a. $\frac{\widehat{EF}}{?} = \frac{GH}{CD}$

b. $\frac{Circumference\ Large\ Circle}{Circumference\ Small\ Circle} = \frac{?}{?}$



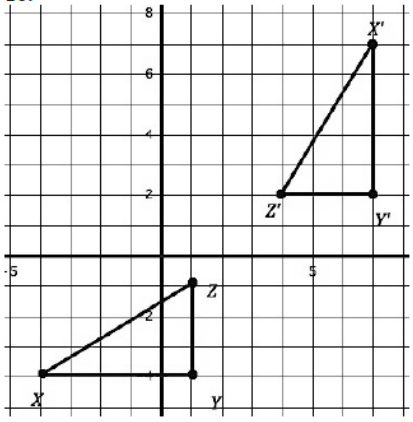


GO

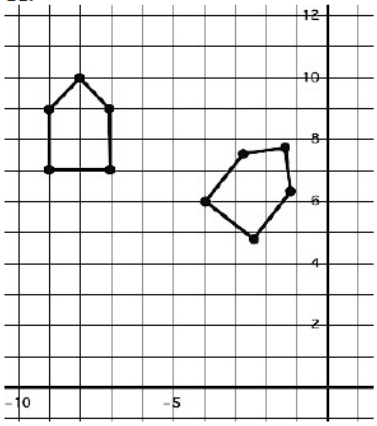
Topic: Finding lines of reflection, finding the center of a circle.

Find the line of reflection between the image and the pre-image.

10.

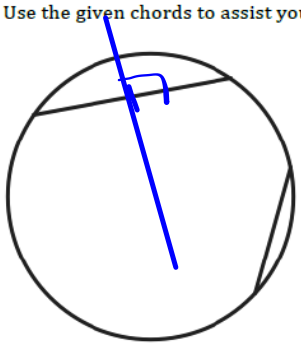


11.



Find the center of each circle. (Hint: rotations happen on circles and so finding the center of a circle is like finding the center of rotation between pairs of point on the circle.)

12. Use the given chords to assist you.



13. Draw two chords to assist you.