Learning Progression

Geometry

Ellensburg High School

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This learning progression is for a high school geometry class. The purpose of this learning progression is to align a textbook to the Common Core.

Textbook: Boswell, Larson, & Stiff. (2004). *Geometry.* Evanston, IL: McDougal Littell.

This learning progression focuses on the "Circles G-C" domain, which has a total of two clusters. However, for this learning progression, only the first will be evaluated. This cluster, "Circles HSG-C", covers a total of five standards. They are as follows:

- CCSS.Math.Content.HSG-C.A.1 Prove that all circles are similar.
- CCSS.Math.Content.HSG-C.A.2 Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*
- *CCSS.Math.Content.HSG-C.A.3* Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
- CCSS.Math.Content.HSG-C.A.4 (+) Construct a tangent line from a point outside a given circle to the circle.

These four standards will be taught as a unit in the order they are listed above. Each standard will be addressed individually per class day. All of the standards will have corresponding activities and benchmark assessments. These will be explained in detail on the following page.

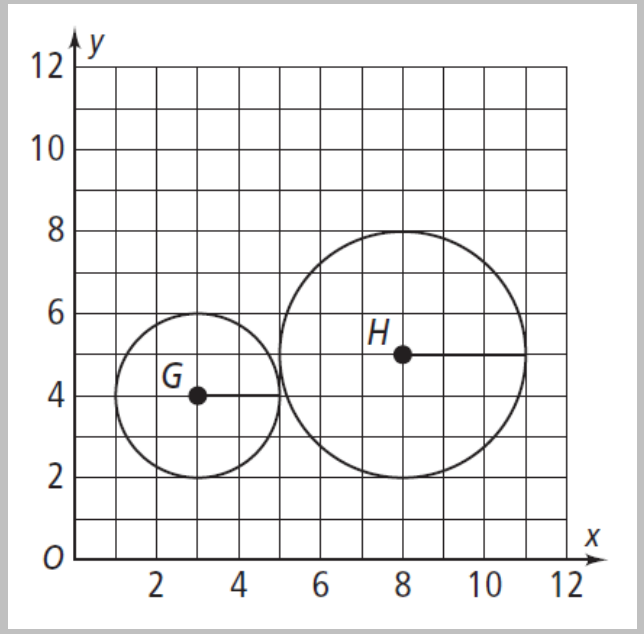
Standard HSG-C.A.1

Prove that all circles are similar.

Activity

As a whole class we will have a discussion on the definitions of circle and similarity. This discussion will get the students talking about math and thinking about it as well. Once we, as a class, have agreed on the correct definitions, we will discuss the relationship between the two. Next, students will be given the opportunity to construct circles with different radii (compasses and paper will be provided). Once the students have successfully drawn multiple circles with different radii, the students will discuss in groups if they believe these circles are similar (based on the definition). A worksheet will be given out to the students where they will use their definitions in practice (Figure 1-1).

Figure 1-1



1. Circle **G**, has center (3, 4) and a radius of 2. Circle **H** has center (8, 5) and a radius of 3.

a. Are circle **G** and circle **H** the same shape? Are they the same size?

b. Describe how to translate circle **G** so that its center is mapped onto the center of circle **H**.

c. By what scale factor do you need to dilate circle **G** to make it the same size as circle **H**?

d. What is the ratio of the radius of circle **G** to the radius of circle **H**?
ratio of the circumference of circle **G** to the circumference of circle **H**?

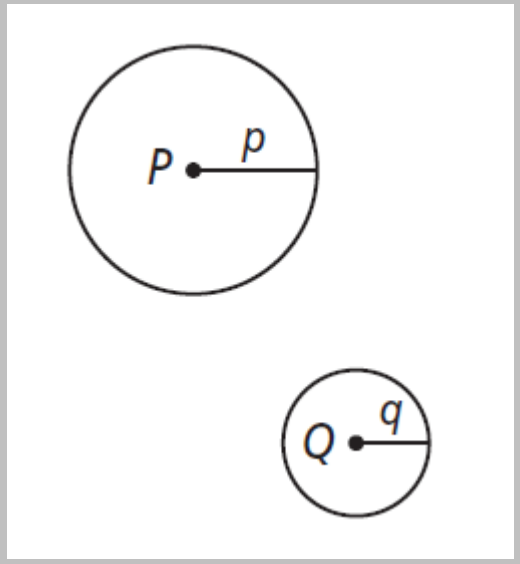
e. Are circle **G** and circle **H** similar? Explain.

Benchmark Assessment

The worksheet (Figure 1-1) will be used as a benchmark assessment. If students are able to complete the worksheet or not, I will be able to determine if they understand the standard.

Figure 1-1 continued

2. Circle **P** has radius **p** and circle **Q** has radius **q**.
 a. Do the circles have the same shape? Do they have the same size?
 b. Which transformations would you use to map circle **P** onto circle **Q**?
 c. Explain how transformations can be used to prove that any two circles are similar.



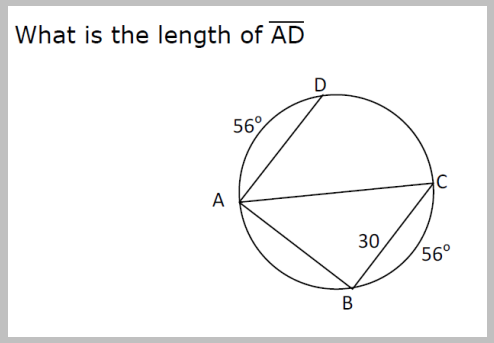
Standard HSG-C.A.2

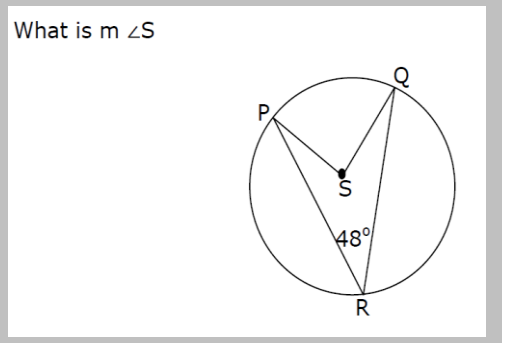
Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*

Activity

A lecture will be given in order to provide the students with adequate information needed in order to understand and apply this standard. The students will take notes on the lecture. Definitions to be defined are tangent, central angle, inscribed angle, right angles, and perpendicular. There will then be a class wide discussion about these definitions (what are they used for, how are they related, why are they important, etc). Student will be given examples of problems they are to solve (see Figure 2-1)

Figure 2-1





Benchmark Assessment

A homework assignment from the book will be assigned. Students will complete problems on pg. 599, #1-25, 29-31 and on pg. 616, #1-23 (Figure 2-2 for examples). From the grading of this homework assignment, I will be able to see if students understand this particular standard.

Standard HSG-C.A.3

Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

Activity

A lecture will be given on how to construct inscribed and circumscribed circles of a triangle, as well as the properties of angles for inscribed quadrilaterals. As a class we will go over the proofs of opposite angles of a cyclic quadrilateral are supplementary and that an exterior angle is equal to opposite interior angle of an inscribed quadrilateral. Homework will be assigned so the students can have

Figure 2-2

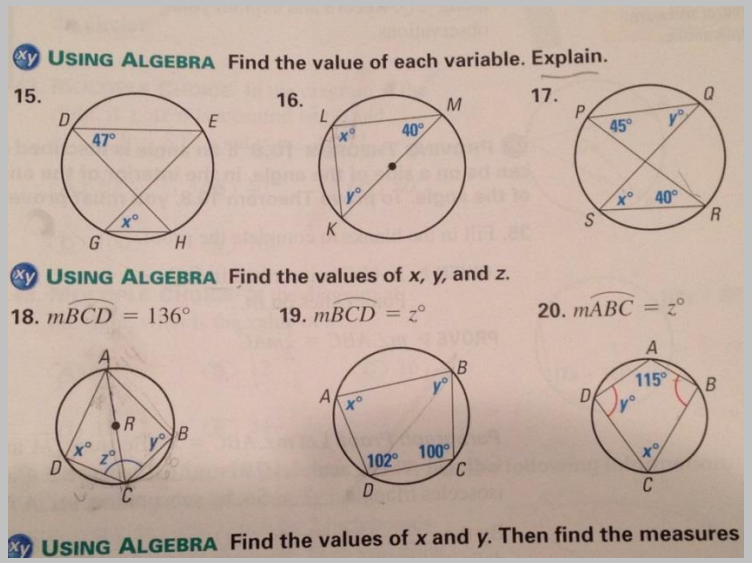
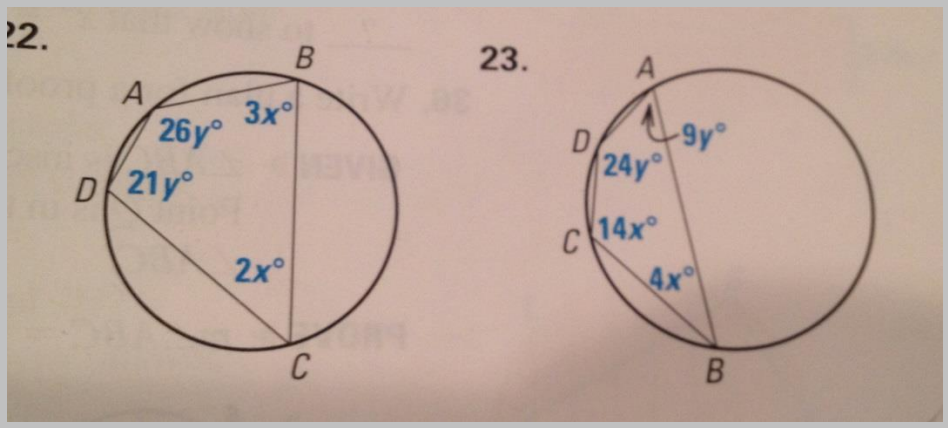


Figure 3-1



practice with these two properties (see Figure 3-1 on previous page).

Benchmark Assessment

To assess this standard, a quiz will be given to the students where they will be asked to perform the two constructions as well as provide proofs of the two properties of inscribed quadrilaterals.

Standard HSG-C.A.4

Construct a tangent line from a point outside the given circle to the circle.

Activity

For this standard, students have the opportunity to complete the construction. A correct example will be given to them.

Benchmark Assessment

In order to assess this standard, students will be given a beginning exercise where they must complete the construction using a compass and straightedge (see Figure 4-1).

Figure 4-1