Lesson 1.01
Construction Basics

Geometry GT

Experiment

In order to gain familiarity with the compass and straightedge, practice drawing multiple lines and circles.

Try to follow these steps:

- Draw a point and label it A
- Draw a circle centered at A
- Mark a point on the circle and label it B
- Draw a circle centered at B and going through A
- Draw segment $\overline{AB}$

Definitions

Line segment: a set of points on a line with two endpoints
Circle: a set of all points that are the same distance (radius) from a given point (center)

Explore

Given segment $\overline{AB}$, follow these steps:

- Draw a circle centered at A with radius AB

- Mark a point at the middle of $\overline{AB}$ and label it C

- Draw a circle centered at B with radius BC

- Label the intersection of the circles above B as D and below B as E

- Draw segments $\overline{AD}$, $\overline{DE}$, and $\overline{AE}$

- Trace ΔADE onto patty paper

$$A \bullet \!\!\!\!\!\rule[0.5ex]{6cm}{0.4pt}\!\!\!\!\! \bullet B$$

Compare your ΔADE with your neighbors. Why might they be different? How could we ensure they are all the same?

Discuss

Using a straightedge and compass, there are a few basic construction moves that are valid:

- Draw points in blank space, on objects, and at intersections

- Draw segments, rays, and lines through two points using a straightedge

- Draw a circle centered at a point and through another point using a compass

- Set the compass to a length between two points then move the compass (preserving the length)

Demonstrate

The figure shows the first few steps of constructing a regular hexagon. Complete the construction.
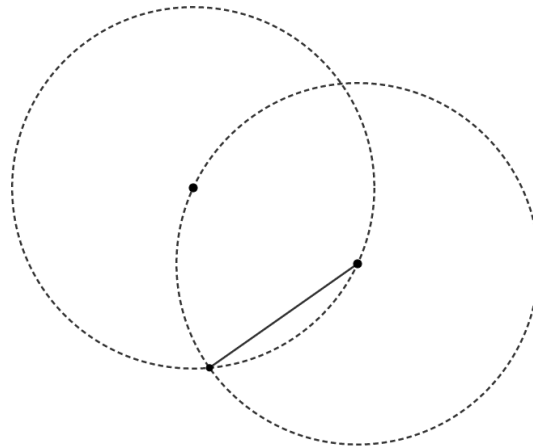
A **regular polygon** has sides with equal lengths. How can you be sure your hexagon is a regular hexagon?
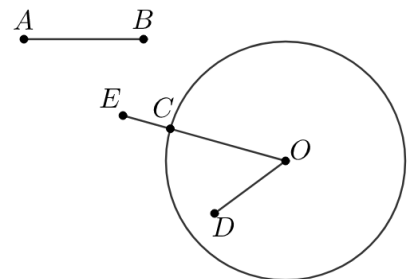
Practice

1. Here is a diagram of a straightedge and compass construction. O is the center of one circle, and C is the center of the other. Explain why the length of segment $\overline{AC}$ is the same as the length of segment $\overline{BC}$.
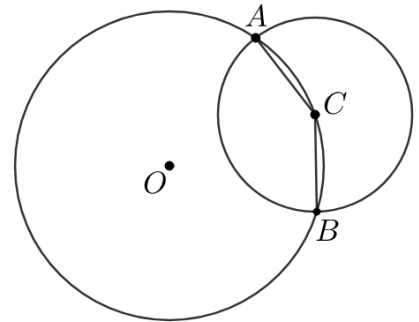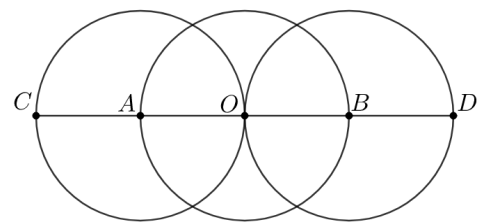
2. Esther used a compass to make a circle with radius the same length as segment $\overline{AB}$. She labeled the center O. Which statement is true?

     A. $AB > OD$

     B. $AB = OD$

     C. $AB > OE$

     D. $AB = OE$

3. The diagram was constructed with straightedge and compass tools. Points A, B, C, D, and O are all on line segment $\overline{CD}$. Name a line segment that is half the length of $\overline{CD}$. Explain how you know.

4. This diagram was constructed with straightedge nad compass tools. O is the center of one circle, and C is the center of the other.

     A. The 2 circles intersect at point B. Label the other intersection point D.

     B. How does the length of segment $\overline{CD}$ compare to the length of segment $\overline{OA}$?