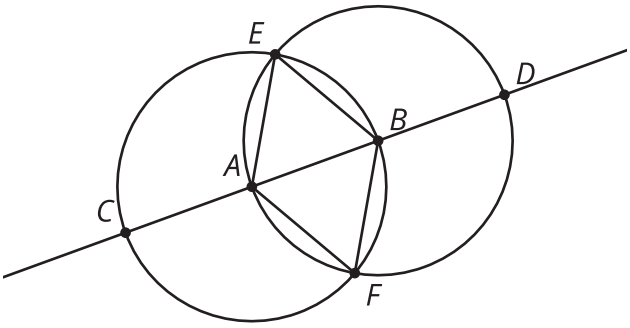
Unit 1, Lesson 2

# Constructing Patterns

Let's use compass and straightedge constructions to make patterns.

## 2.1 Math Talk: Why Is That True?

Here are 2 circles with centers $A$ and $B$.

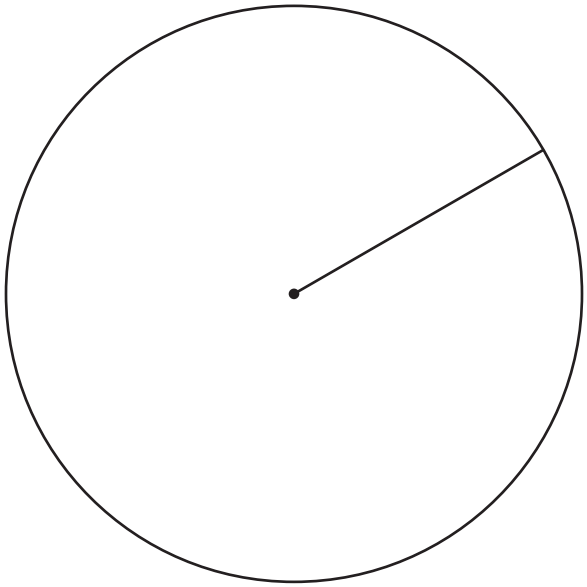



Based on the diagram, decide whether each statement is true. Be prepared to share your reasoning.

- The length of segment $EA$ is equal to the length of segment $EB$.
- Triangle $ABF$ is equilateral.
- $AB = \frac{1}{2}CD$.
- $CB = DA$.

# 2.2 Make Your Own

Use straightedge and compass moves to build your own pattern, using the circle and radius as a place to start. As you make your pattern, record each move on a separate sheet of blank paper. Use precise vocabulary so someone could make a perfect copy without seeing the original. Include instructions about how to shade or color your pattern.



### Are you ready for more?

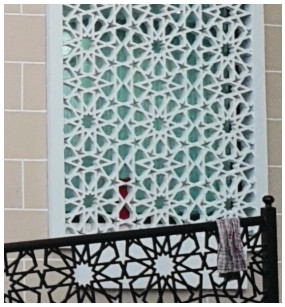
If you have ever visited a mosque (MAHSK), madrasa (muh-DRA-suh), or other location where the religion of Islam is practiced, you may have noticed walls decorated with intricate geometric patterns. Throughout history, artists and craftspeople have developed these patterns using compass and straightedge constructions.

You can find many tutorials online for creating these beautiful designs. Here is one example to try.

Video 'Fes Design' available here: https://player.vimeo.com/video/736665153.

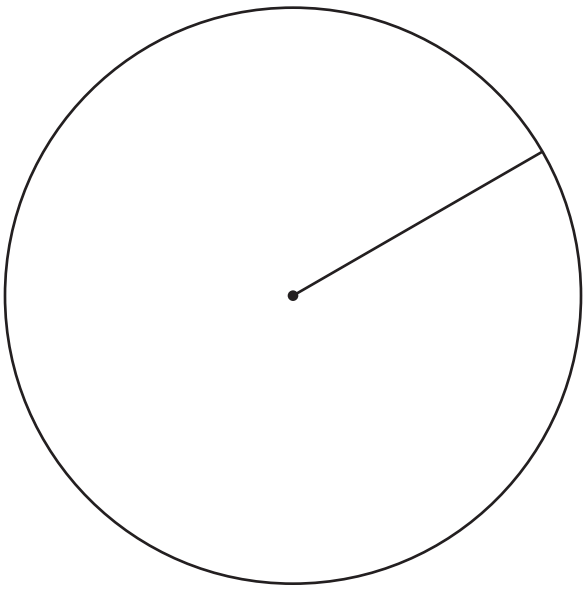






## 2.3 Make Someone Else's

1. Follow the instructions precisely to recreate your partner's pattern.



2. Use the following straightedge and compass moves to create a line **parallel** to the given line that goes through point $B$:

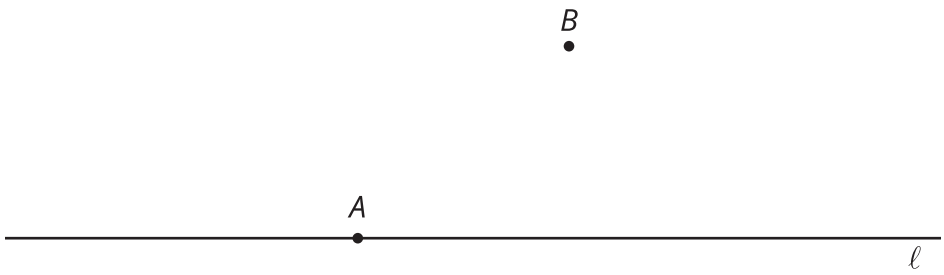
   a. Create a line through $A$ and $B$ extending in both directions. Label this line $p$.

   b. Create a circle centered at $A$ with radius $AB$. This circle intersects with line $\ell$ in 2 places. Label the intersection point to the right of $A$ as $C$.

   c. Create a circle centered at $B$ with radius $BA$. This circle intersects with line $p$ at $A$ and 1 other point. Label the new intersection point as $D$.

   d. Create a circle centered at $D$ with a radius of length $BC$. This circle intersects with the circle centered at $B$ in 2 places. Label the intersection point to the right of $B$ as $E$.

   e. Using a different colored pencil, create a line through $B$ and $E$ extending in both directions.



## Lesson 2 Summary

We can use straightedge and compass moves to construct interesting patterns. What if someone else wants to make the same pattern? We need to communicate how to reproduce the pattern precisely. Compare these sets of instructions:

1. Start with a line and 2 points.
2. Create a line.
3. Create a circle.
4. Create a circle.
5. Create a circle.
6. Create a line.

1. Start with a line $\ell$, point $A$ on line $\ell$, and point $B$ not on line $\ell$.
2. Create a line through $A$ and $B$ extending in both directions. Label this line $p$.
3. Create a circle centered at $A$ with radius $AB$. This circle intersects with line $\ell$ in 2 places. Label the intersection point to the right of $A$ as $C$.
4. Create a circle centered at $B$ with radius $BA$. This circle intersects with line $p$ at $A$ and 1 other point. Label the new intersection point as $D$.
5. Create a circle centered at $D$ with a radius of length $BC$. This circle intersects with the circle centered at $B$ in 2 places. Label the intersection point to the right of $B$ as $E$.
6. Create a line through $B$ and $E$ extending in both directions.

It is important to label points and segments, such as point $A$ or segment $AB$, to communicate precisely.

These are instructions to construct a line parallel to a given line. We say that two lines are **parallel** if they don't intersect. We also say that two segments are parallel if they extend into parallel lines.