

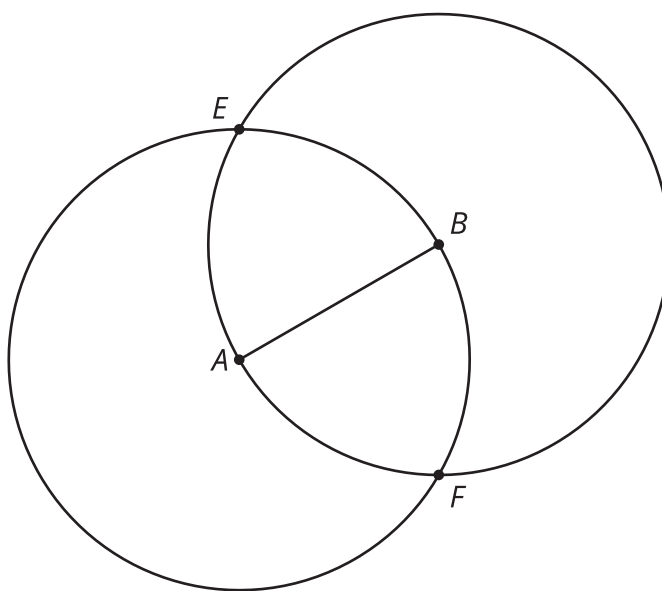


# Construction Techniques 3: Perpendicular Lines and Angle Bisectors

Let's use tools to solve some construction challenges.

## 5.1 Two Circles

Points  $A$  and  $B$  are each at the centers of circles of radius  $AB$ .



1. Compare the distance  $EA$  to the distance  $EB$ . Be prepared to explain your reasoning.
2. Compare the distance  $FA$  to the distance  $FB$ . Be prepared to explain your reasoning.
3. Draw line  $EF$ , and write a conjecture about its relationship with segment  $AB$ .

## 5.2 Make It Right

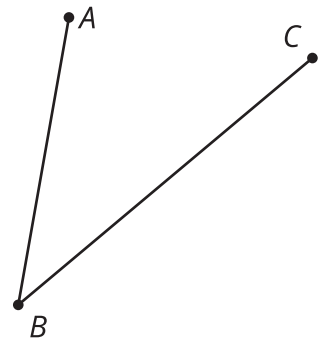
Here is a line  $\ell$  with a point labeled  $C$ . Use straightedge and compass moves to construct a line perpendicular to  $\ell$  that goes through  $C$ .



## 5.3 Bisect This

Here is an angle:

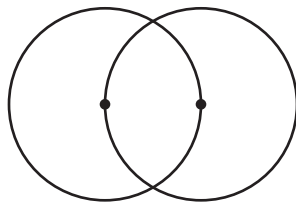
1. Estimate the location of a point  $D$  so that angle  $ABD$  is approximately congruent to angle  $CBD$ .
2. Use compass and straightedge moves to create a ray that divides angle  $CBA$  into 2 congruent angles. How close is the ray to going through your point  $D$ ?



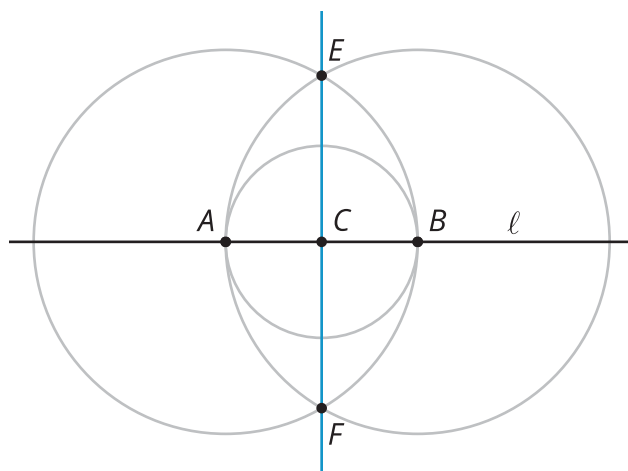


## Lesson 5 Summary

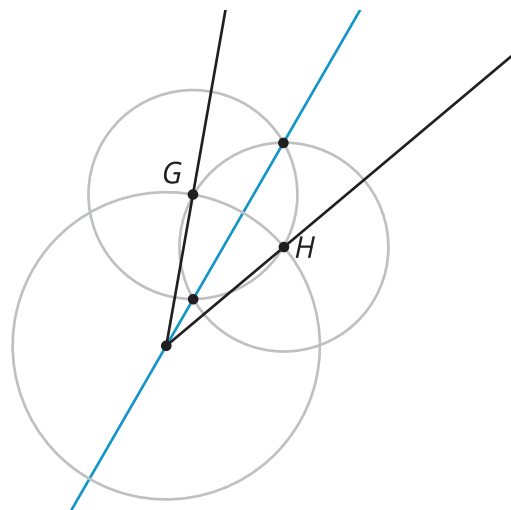
We can construct a line that is perpendicular to a given line. We can also bisect a given angle using only a straightedge and compass. The line that goes through the vertex of an angle to divide it into two equal angles is called the **angle bisector**. Both constructions use 2 circles that go through each other's centers:



To construct a line perpendicular to line  $\ell$  that goes through a given point  $C$ , start by finding 2 points, labeled here as  $A$  and  $B$ , on the given line  $\ell$  that are the same distance from  $C$ . Then create 2 circles of the same size centered at  $A$  and  $B$  that go through each other's centers. Connect the intersection points of those circles to draw a perpendicular line,  $EF$ .



To construct an angle bisector, start by finding 2 points, labeled here as  $G$  and  $H$ , that are on the rays and the same distance from the vertex. Then create the 2 circles of the same size centered at  $G$  and  $H$  that go through each other's centers. Connect the intersection points of those circles to draw the angle bisector.



In fact, we can think of creating a perpendicular line as bisecting a 180 degree angle!