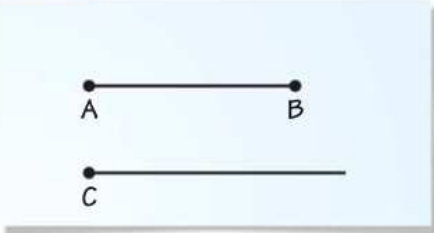
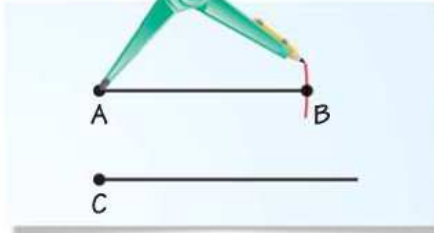
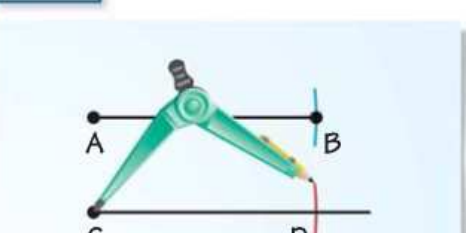


# CONSTRUCTION: Copy and Bisect Segments and Angles

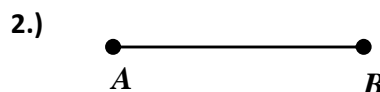
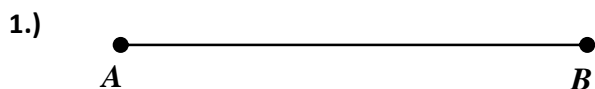
A **construction** is a geometric drawing that uses a limited set of tools, usually a **compass** and **straightedge**. You can use a compass and straightedge (a ruler without marks) to construct a segment that is congruent to a given segment, and an angle that is congruent to a given angle. You will also construct a segment bisector and an angle bisector. Look at and read each exploration below, then complete the given constructions by following the examples for each.

## Exploration #1: Copy a Segment

Use the following steps to construct a segment that is congruent to segment  $\overline{AB}$ .

<p><b>STEP 1</b></p>  <p><b>Draw a segment</b> Use a straightedge to draw a segment longer than <math>\overline{AB}</math>. Label point <math>C</math> on the new segment.</p>	<p><b>STEP 2</b></p>  <p><b>Measure length</b> Set your compass at the length of <math>\overline{AB}</math>.</p>	<p><b>STEP 3</b></p>  <p><b>Copy length</b> Place the compass at <math>C</math>. Mark point <math>D</math> on the new segment. <math>\overline{CD} \cong \overline{AB}</math>.</p>
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Follow the 3 steps above to copy each segment below using only your compass and straightedge.

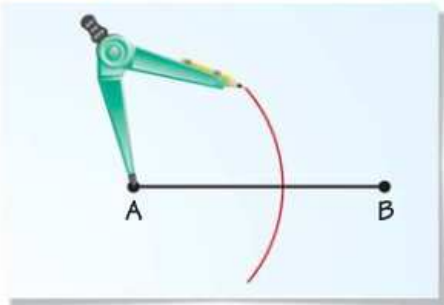


**CRITICAL THINKING:** Describe how you could use a compass and a straightedge to draw a segment that is twice as long as a given segment.

## Exploration #2: Bisect a Segment (perpendicular bisector)

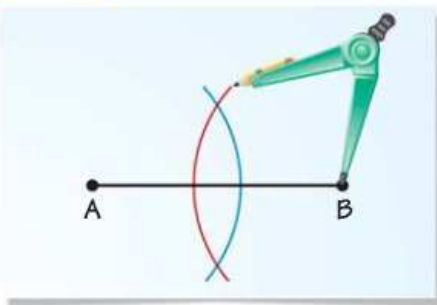
Use the following steps to construct a bisector of  $\overline{AB}$  and to find the midpoint  $M$  of  $\overline{AB}$ .

**STEP 1**



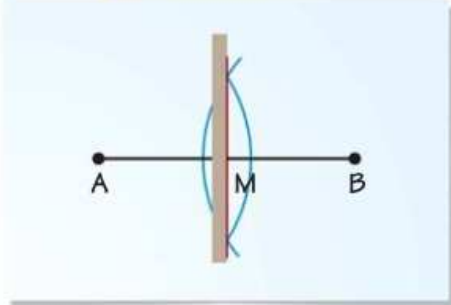
**Draw an arc** Place the compass at  $A$ . Use a compass setting that is greater than half the length of  $\overline{AB}$ . Draw an arc.

**STEP 2**



**Draw a second arc** Keep the same compass setting. Place the compass at  $B$ . Draw an arc. It should intersect the other arc at two points.

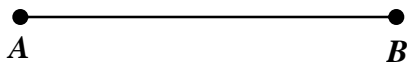
**STEP 3**



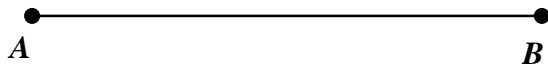
**Bisect segment** Draw a segment through the two points of intersection. This segment bisects  $\overline{AB}$  at  $M$ , the midpoint of  $\overline{AB}$ .

Follow the 3 steps above to bisect each segment below using only your compass and straightedge.

3.)

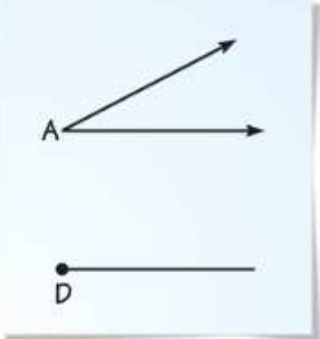
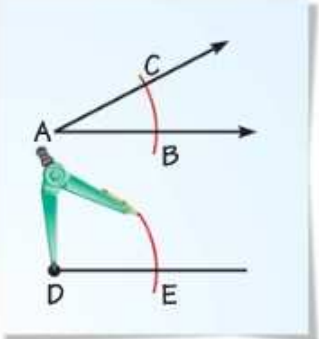
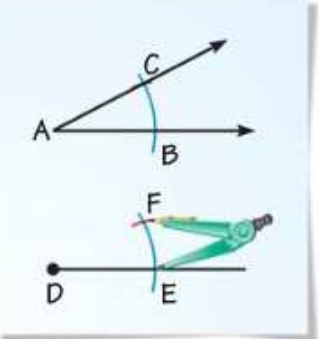
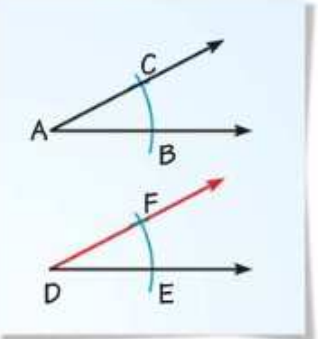


4.)



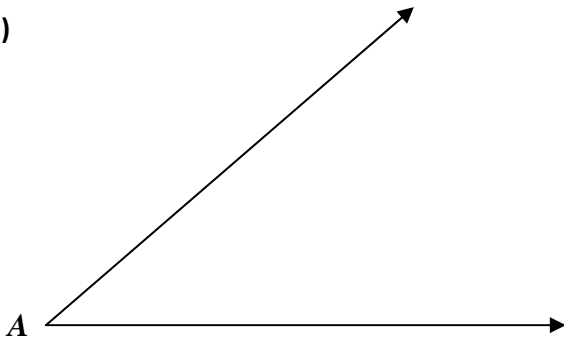
### Exploration #3: Copy an Angle

Use the following steps to construct an angle that is congruent to  $\angle A$ . In this construction, the *radius* of an arc is the distance from the point where the compass point rests (the *center* of the arc) to a point on the arc drawn by the compass.

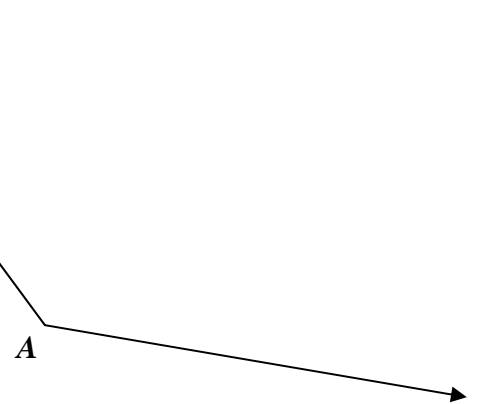
STEP 1	STEP 2	STEP 3	STEP 4
			
<p><b>Draw a segment</b> Draw a segment. Label a point <math>D</math> on the segment.</p>	<p><b>Draw arcs</b> Draw an arc with center <math>A</math>. Using the same radius, draw an arc with center <math>D</math>.</p>	<p><b>Draw arcs</b> Label <math>B</math>, <math>C</math>, and <math>E</math>. Draw an arc with radius <math>BC</math> and center <math>E</math>. Label the intersection <math>F</math>.</p>	<p><b>Draw a ray</b> Draw <math>\overrightarrow{DF}</math>. <math>\angle EDF \cong \angle BAC</math>.</p>

Follow the 4 steps above to copy each angle below using only your compass and straightedge.

5.)



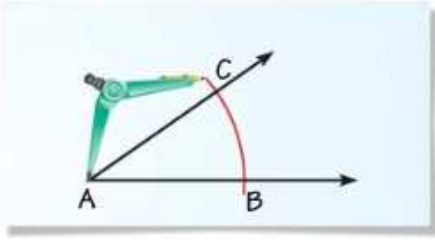
6.)



### Exploration #4: Bisect an Angle

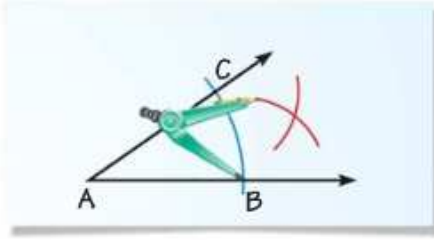
Use the following steps to construct an angle bisector of  $\angle A$ .

#### STEP 1



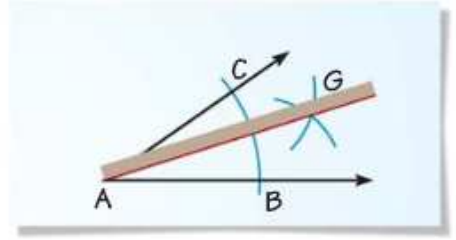
**Draw an arc** Place the compass at  $A$ . Draw an arc that intersects both sides of the angle. Label the intersections  $C$  and  $B$ .

#### STEP 2



**Draw arcs** Place the compass at  $C$ . Draw an arc. Then place the compass point at  $B$ . Using the same radius, draw another arc.

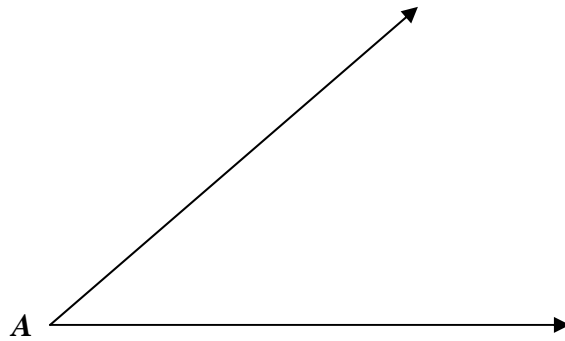
#### STEP 3



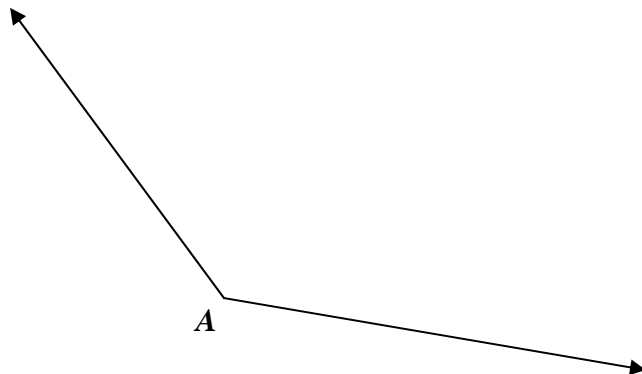
**Draw a ray** Label the intersection  $G$ . Use a straightedge to draw a ray through  $A$  and  $G$ .  $\vec{AG}$  bisects  $\angle A$ .

Follow the 3 steps above to bisect each angle below using only your compass and straightedge.

7.)

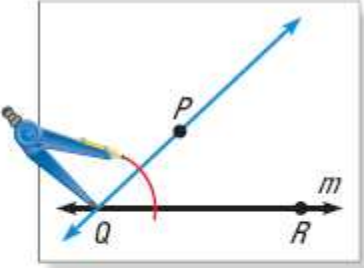


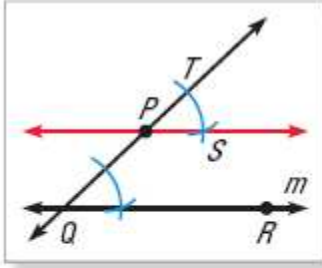
8.)



### Exploration #5: Draw a parallel line

Use the following steps to construct a line through a given point P that is parallel to a given line  $m$ .





**STEP 1** Draw points  $Q$  and  $R$  on  $m$ . Draw  $\overrightarrow{PQ}$ . Draw an arc with the compass point at  $Q$  so it crosses  $\overrightarrow{QP}$  and  $\overrightarrow{QR}$ .

**STEP 2** Copy  $\angle PQR$  on  $\overrightarrow{QP}$ . Be sure the two angles are corresponding. Label the new angle  $\angle TPS$ . Draw  $\overrightarrow{PS}$ .  $\overrightarrow{PS} \parallel \overrightarrow{QR}$ .

9.

