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 AB.

**STEP 1**

**Draw a segment** Use a straightedge to draw a segment longer than AB. Label point C on the new segment.

**STEP 2**

**Measure length** Set your compass at the length of AB.

**STEP 3**

**Copy length** Place the compass at C. Mark point D on the new segment. CD ≅ AB.

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

1.) \[\overline{AB}\]

2.) \[\overline{AB}\]

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 $\overline{AB}$.

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

3.)

![Diagram of bisecting segment AB](image)

4.)

![Diagram of bisecting segment AB](image)
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.

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 $\angle A$.

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

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

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