

## Geometric Constructions

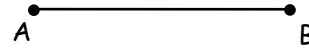


### *Construct a segment congruent to a given segment*

**Given:**  $\overline{AB}$

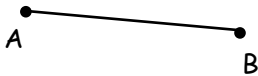
Construct a segment congruent to  $\overline{AB}$

1. Use a straightedge to draw a segment longer than the given segment.  
 Label a point R at one endpoint of the new segment.
2. Place the compass tip at point A of the given segment.  
 Adjust your compass width to equal the length of  $\overline{AB}$ .
3. Using this **same** compass setting, place the compass tip at point R and draw an arc. Label the intersection point S.
4. Erase the excess segment.
5.  $\overline{AB} \cong \overline{RS}$



Construct a segment congruent to  $\overline{AB}$ .

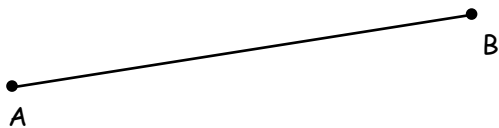
1.



2.



3.



4.

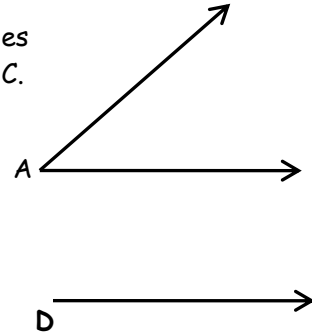


**Construct an angle congruent to a given angle**

**Given:**  $\angle A$

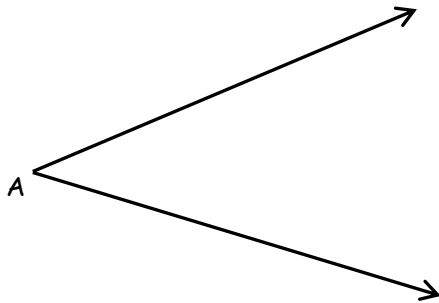
Construct an angle congruent to  $\angle A$ .

3. Draw a ray. Label the endpoint D.
4. Place the compass tip at the vertex of  $\angle A$ . Draw an arc across both sides of the given angle. Label the points of intersection with the rays B and C.
3. Using this same compass setting, place the compass tip at point D (the new ray) and draw a long arc across the ray. Label the intersection point E.
5. Set the compass so that it is the width of BC.
5. Using this same compass setting, place the compass tip at point E and draw an arc, intersecting the arc from step 3. Label the intersection F.
6. Draw  $\overrightarrow{DF}$ .  $\angle EDF \cong \angle BAC$



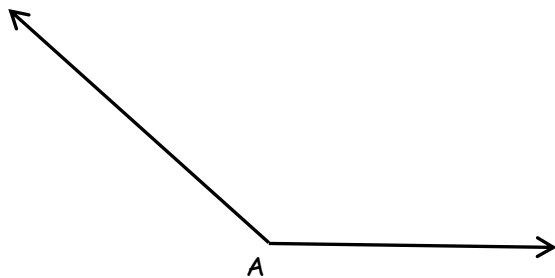
Construct an angle congruent to  $\angle A$ .

1.



Your construction here:

2.

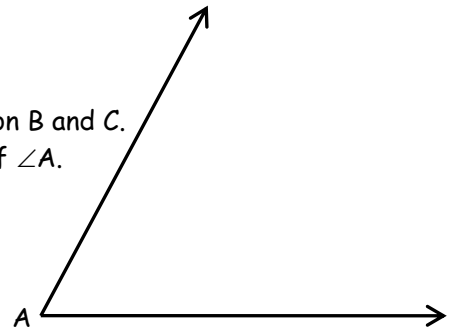


# *Angle Bisector*

**Given:**  $\angle A$ .

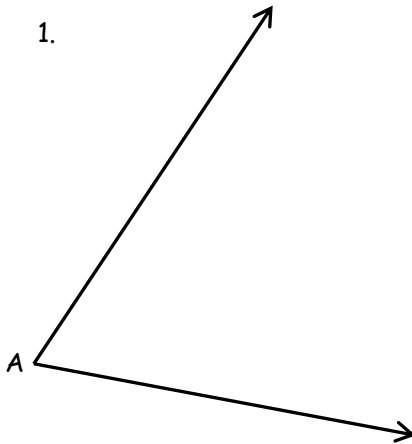
Construct the angle bisector of  $\angle A$ .

1. Place the compass tip at point A. Draw an arc that intersects both rays of the angle. Label the points of intersection B and C.
2. Place the compass tip at point B and draw an arc in the interior of  $\angle A$ .
3. Using this same compass setting, place the compass tip at point C and draw an arc that intersects the arc you drew in #2. Label the point of intersection Q.
6. Use a straightedge to draw AQ.  
\* This is the angle bisector of  $\angle A$ .
7.  $\angle BAQ \cong \angle QAC$

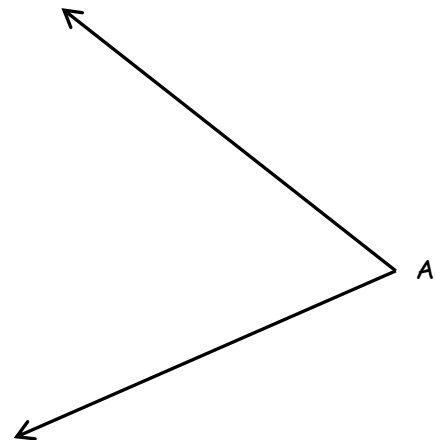


Construct the angle bisectors for each of the following angles.

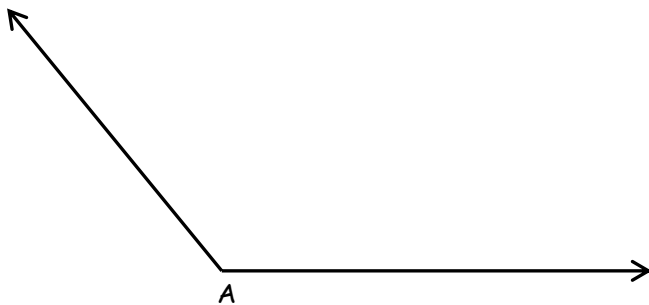
1.



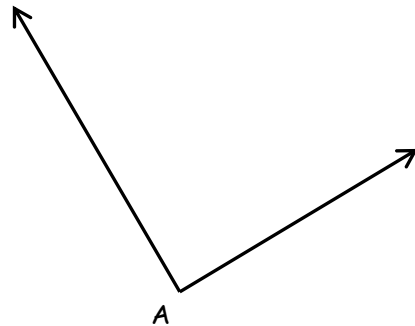
2.



3.



4.



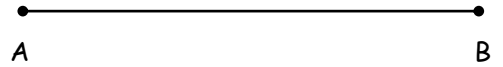
## Perpendicular Bisector

**Given:**  $\overline{AB}$

Construct the perpendicular bisector of  $\overline{AB}$ .

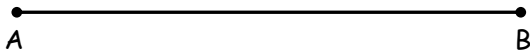
1. Choose a compass opening greater than  $1/2$  of  $\overline{AB}$  and less than the length of  $\overline{AB}$ . Place compass tip at A. Draw two arcs - above **and** below  $\overline{AB}$ .
2. Using the same compass opening, place compass tip at point B. Draw two arcs - above **and** below  $\overline{AB}$ .
3. Draw the line connecting the intersections of the two arcs. This is the perpendicular bisector of  $\overline{AB}$ .

(Can also be used to find the midpoint of  $\overline{AB}$ .)



Construct the perpendicular bisector of each of the following line segments.

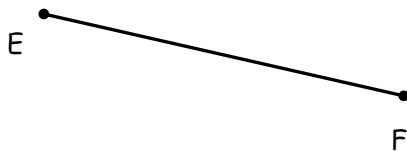
1.



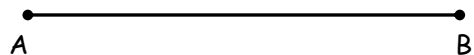
2.



3.



4.



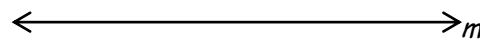
**Perpendiculars, Given a Point NOT on the Line**

**Given:** Line  $m$  and Point  $P$  not on the line.

Construct a perpendicular from point  $P$  to line  $m$ .

1. Place compass tip at point  $P$ . Using an arbitrary radius, draw arcs intersecting line  $m$  at two points. Label these points  $A$  and  $B$ .
2. Using a compass opening greater than  $\frac{1}{2} \overline{AB}$ , place compass point at point  $A$ . Draw an arc below line  $m$ .
3. Using the same compass opening, place compass tip at point  $B$  and draw an arc from point  $B$  below line  $m$ , intersecting arc from step 2.
4. Label the intersection point  $X$ .
5. Draw line  $\overline{PX}$ . This is perpendicular to  $m$  through point  $P$ .

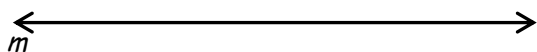
$P$  •



Construct perpendicular lines from point  $P$  to line  $m$ .

1.

$P$  •



2.

$P$  •



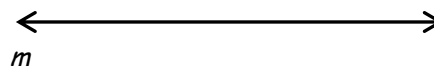
3.

$P$  •



4.

$P$  •

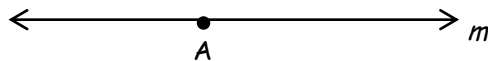


**Perpendiculars, Given a Point ON the Line**

**Given:** Line  $m$  which contains Point  $A$

Construct a perpendicular to line  $m$  through point  $A$ .

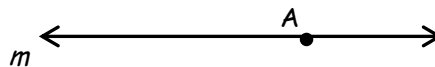
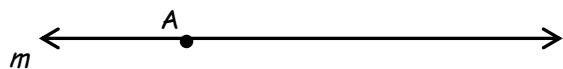
1. Place compass tip at point  $A$ . Using any compass opening less than the length of  $m$ , draw two arcs intersecting line  $m$  on both sides of  $A$ . Label these points  $C$  and  $D$ .
2. Place compass tip at point  $C$ . Adjust the compass so that it is greater than  $\frac{1}{2} \overline{CD}$  and draw an arc above  $m$ .
3. Using the same compass opening, place compass point at point  $D$ . Draw an arc above  $m$  intersecting your first arc.
4. Label the intersection point  $X$ .
5. Use a straightedge to draw line  $\overline{AX}$ . This is perpendicular to  $m$  through point  $A$ .



Construct perpendiculars to line  $m$  through point  $A$ .

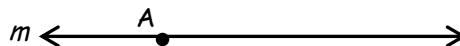
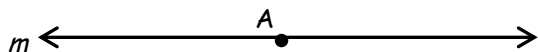
1.

2.



3.

4.

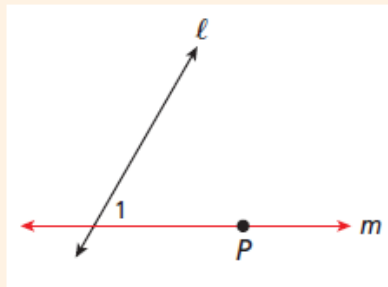


## Parallel Lines

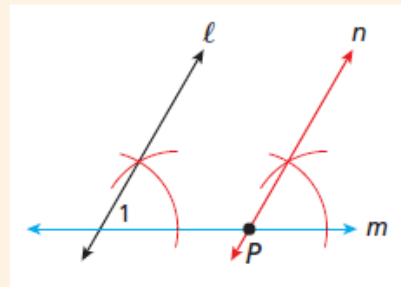
- 1 Draw a line  $\ell$  and a point  $P$  that is not on  $\ell$ .



- 2 Draw a line  $m$  through  $P$  that intersects  $\ell$ . Label the angle 1.



- 3 Construct an angle congruent to  $\angle 1$  at  $P$ . By the converse of the Corresponding Angles Postulate,  $\ell \parallel n$ .



Construct a line parallel to line  $m$  at point  $X$  in the following problems.

1.

2.

X

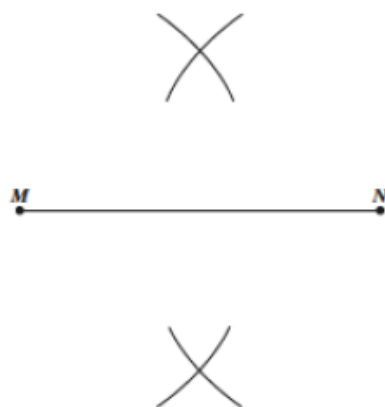
X

$m$  ←————→

$m$  ←————→

# Review

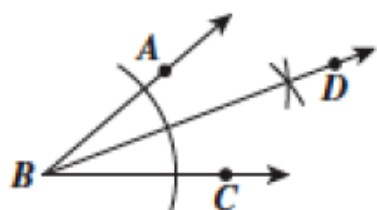
The arcs for a compass and straightedge construction are shown below.



What construction is apparently being made?

- A) Two lines parallel to  $\overline{MN}$
- B) Two congruent angles
- C) A segment congruent to  $\overline{MN}$
- D) The perpendicular bisector of  $\overline{MN}$

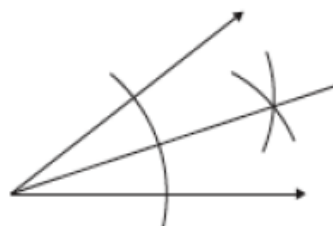
Eric constructed BD as shown.



Which of the following statements *must* be true?

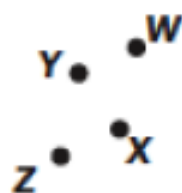
- A)  $\overline{BA} \cong \overline{BC}$
- B)  $\overline{BD} \cong 2\overline{BA}$
- C)  $m\angle ABD \cong m\angle CBD$
- D)  $m\angle CBD \cong 2(m\angle ABC)$

Which of the following constructions is illustrated?

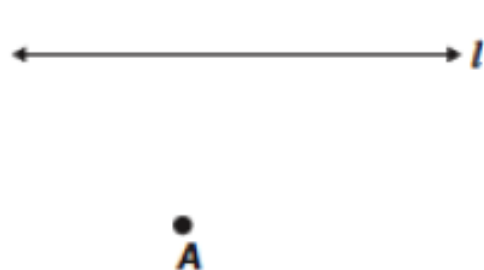


- A) The angle congruent to a given angle
- B) The bisector of a given angle
- C) The bisector of a given segment
- D) The perpendicular bisector of a given segment

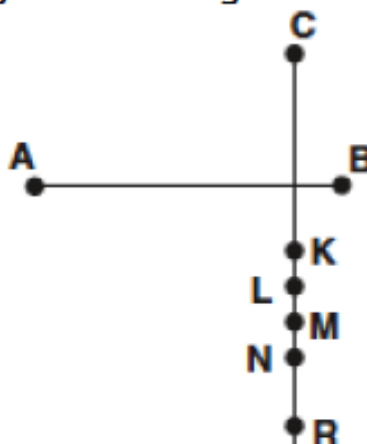
Which point apparently lies on the perpendicular to  $l$  from A?



- A) X
- B) Y
- C) Z
- D) W



Which segment is congruent to  $\overline{AB}$ ?



- A)  $\overline{CK}$
- B)  $\overline{CL}$
- C)  $\overline{CM}$
- D)  $\overline{CN}$