

Constructions:

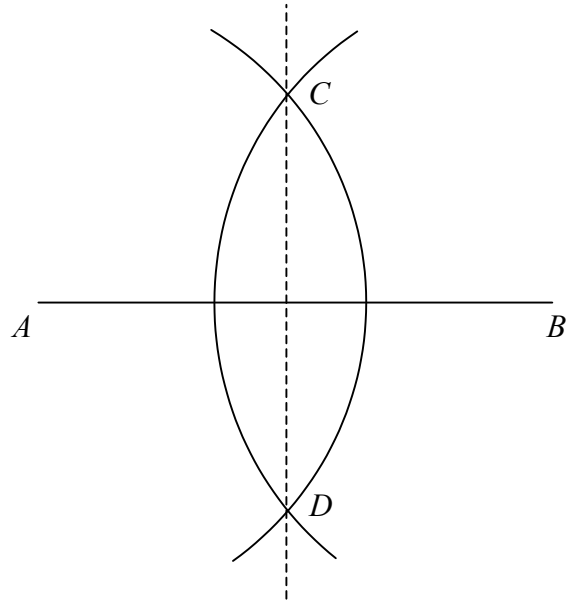
## 1.2 Perpendiculars

In this section, we will discuss three different cases for constructing perpendicular lines.

**CONSTRUCTION #4:** Construct the perpendicular bisector of a given segment.

Given  $\overline{AB}$ , construct the perpendicular bisector.

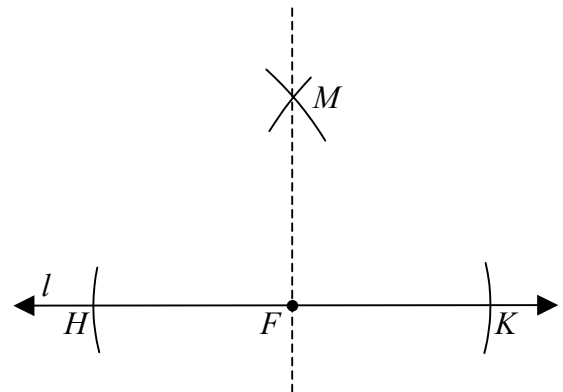
1. Choose any convenient setting that is more than  $\frac{1}{2} AB$ .
2. Set the compass at  $A$  and draw an arc through  $\overline{AB}$ .
3. Keep the same setting, put the compass at  $B$  and draw an arc that intersects the previous arc both above and below the given segment. Label these points  $C$  and  $D$ .
4. Use a straightedge to draw  $\overleftrightarrow{CD}$ .
5.  $\overleftrightarrow{CD}$  is the perpendicular bisector of  $\overline{AB}$ .



**CONSTRUCTION #5:** Given a point on a line, construct a line through the point, perpendicular to the given line.

Given point  $F$  on line  $l$ , construct a perpendicular at  $F$ .

1. Set the compass at  $F$  and draw two arcs on line  $l$  of equal distance on either side of  $F$ . Label these  $H$  and  $K$ .
2. Using a LARGER setting for the compass, put the compass at  $H$  and draw an arc above the line.
3. Using the same setting, put the compass at  $K$  and draw an arc that intersects the previous arc. Label this intersection point  $M$ .
4. Use a straightedge to draw  $\overleftrightarrow{MF}$ .
5.  $\overleftrightarrow{MF}$  is perpendicular to line  $l$  at  $F$ .



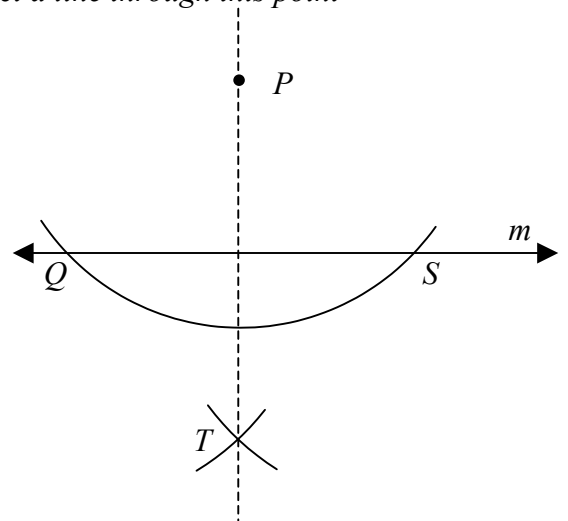
**NOTE!!** Construction #4 is applied when we need to find the midpoint of a segment.

**NOTE!!** Construction #5 is the same as problem #6 in Lesson 1. The bisector of a straight angle is a perpendicular line.

**CONSTRUCTION #6:** Given a point not on a line, construct a line through this point perpendicular to the given line.

Given line  $m$  and point  $P$  (not on line  $m$ ), construct a line through  $P$  perpendicular to  $m$ .

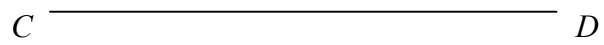
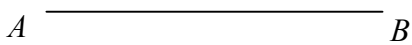
1. Set compass at  $P$  and draw any arc that intersects line  $m$  in two points. Label these  $Q$  and  $S$ .
2. Set compass at  $Q$ , draw an arc below the line.
3. Using the same setting, put compass at  $S$  and draw an arc that intersects the previous arc. Label this  $T$ .
4.  $\overleftrightarrow{PT}$  is perpendicular to line  $m$ .



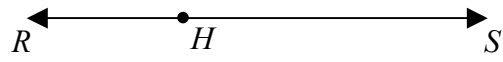
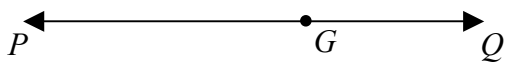
**NOTE!!:** Construction #6 is applied when we need to construct the altitude of a triangle. Point  $P$  would be the vertex angle and the line would be the base of the triangle (extended when needed).

ASSIGNMENT:

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



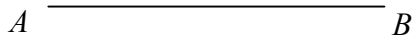
2. Construct a line through  $G$  and  $H$  perpendicular to  $\overleftrightarrow{PQ}$  and  $\overleftrightarrow{RS}$ .



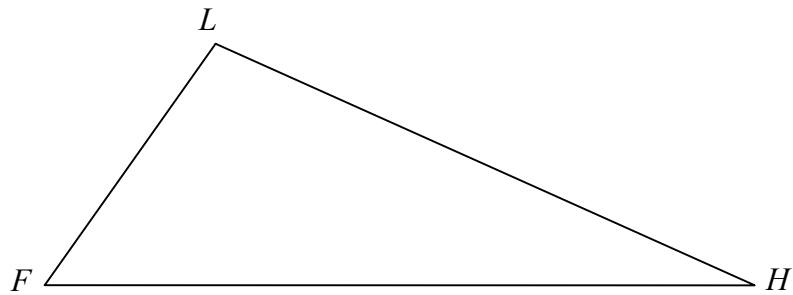
3. Construct a line through  $J$  and  $K$  perpendicular to  $\overline{AB}$  and  $\overline{CD}$ .

•  $J$

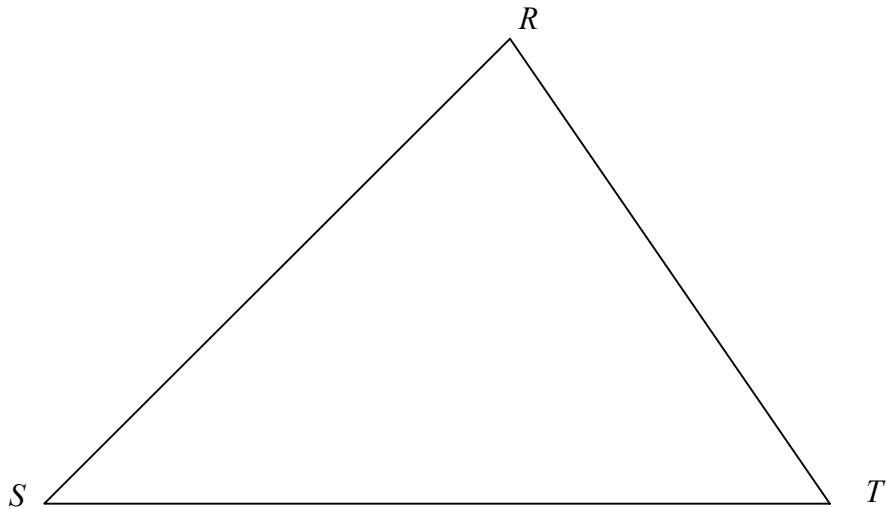
•  $K$



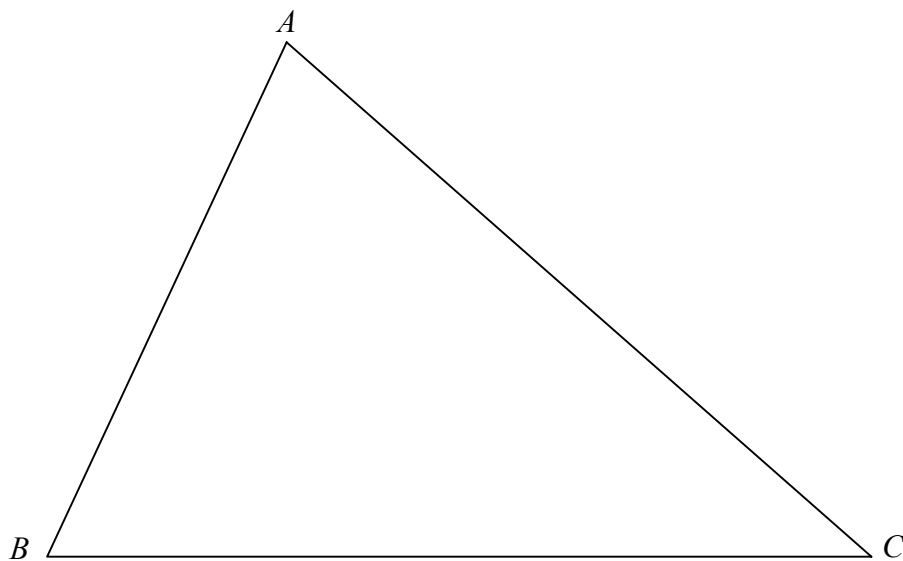
4. Determine the midpoint of  $\overline{FL}$  and  $\overline{HL}$ .



5. Construct the median from  $R$  to side  $\overline{ST}$ .



6. For  $\triangle ABC$ , construct the three altitudes to each side. What appears to be true?



7. Construct the  $\perp$  bisectors for each side. Extend until they cross. Measure the distance from this point to each vertex. What seems to be true?

