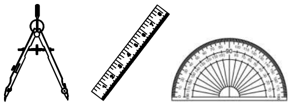
Name: ____________________________________ Date: _________________



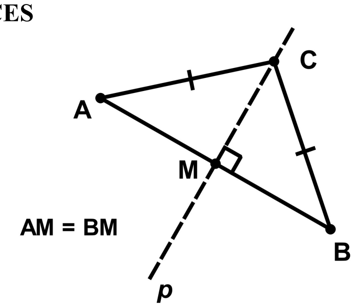
CONSTRUCTING PERPENDICULAR LINES
COMMON CORE GEOMETRY

Perpendicular lines play many critical roles in geometry. The construction of right angles, and thus perpendicular lines, has already been introduced in Unit #2. The key to understanding all the constructions that we do in this lesson is the following fact proved in that unit and Unit #3.

PERPENDICULAR BISECTORS AND EQUAL DISTANCES

A point lies on the **perpendicular bisector** of a line segment if it is **equidistant** from the **endpoints** of the segment.

If $AC = BC$ then C lies on the perpendicular bisector of $\overline{AB}$, line p.



***Exercise* #1:** In this exercise we review how to construct the perpendicular bisector of a segment. Given $\overline{AB}$ shown below, do the following.

(a) Draw an arc centered at A above $\overline{AB}$ that is more than half the length of $\overline{AB}$. Draw an arc with the same radius centered at B, also above $\overline{AB}$. Mark their intersection point C.

(b) Do the same, except with a different radius (although **it could be the same**) below $\overline{AB}$. Label this intersection point D.

(c) Why must points C and D both lie on the perpendicular bisector of $\overline{AB}$? Draw $\overline{CD}$ and verify that it is both perpendicular to $\overline{AB}$ and bisects it.

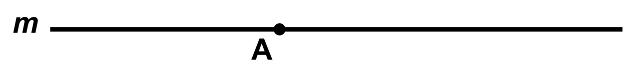
***Exercise* #2:** Given the line segment $\overline{EF}$ below, construct its midpoint and label it M.

The construction to find the perpendicular bisector of a segment can be used to **bisect a segment**, **locate** its **midpoint**, and **create a set of perpendicular lines**. It's this last property that we will now exploit for two additional constructions.

***Exercise* #3:** We want to be able to construct a perpendicular line through a point on a line. Below, we have line *m* with point *A* (not at its midpoint). We will now construct a line perpendicular to *m* through point *A*.

(a) Draw a circle around point *A* so that it intersects the line segment below twice. Mark these intersection points *B* and *C*.

(b) Explain why *A* must be the midpoint of segment $\overline{BC}$.



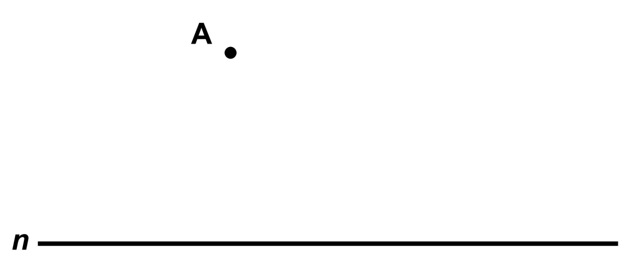
(c) Construct the perpendicular bisector of $\overline{BC}$ as we did on the front side of the sheet. Since *A* is the midpoint of $\overline{BC}$, we now have a perpendicular line passing through *A*.

Our final construction of this lesson is like the last one, but now we will construct a perpendicular line through a point not on the line.

***Exercise* #4:** Given line *n* shown below and point *A* marked, we want to construct a line that passes through *A* and is perpendicular to *n*.

(a) Draw an arc centered at *A* that intersects *n* twice. Label these intersections *B* and *C*.

(b) Explain why *A* must lie on the perpendicular bisector of segment $\overline{BC}$.



(c) Construct the perpendicular bisector of $\overline{BC}$. This will now pass through *A* and be perpendicular to *n*.

Name: ___________________________________ Date: _________________

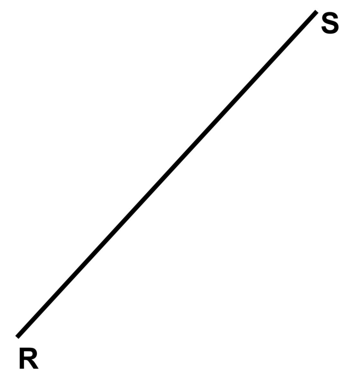
CONSTRUCTING PERPENDICULAR LINES
COMMON CORE GEOMETRY HOMEWORK

MEASUREMENT AND CONSTRUCTION

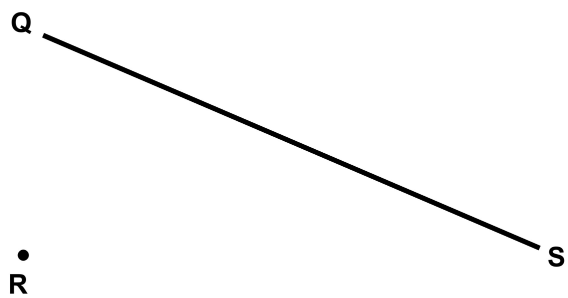
1. In each diagram below, construct the perpendicular bisector of the segment shown. Label the midpoint in each case as M. Leave all construction marks.

(a)

(b)



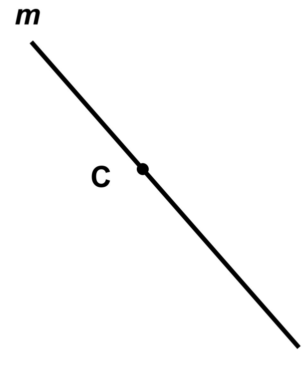
2. Sometimes you will need to be creative with how you use the construction from #1. In the diagram below, construct a line that passes through R and bisects $\overline{QS}$. Leave all construction marks.



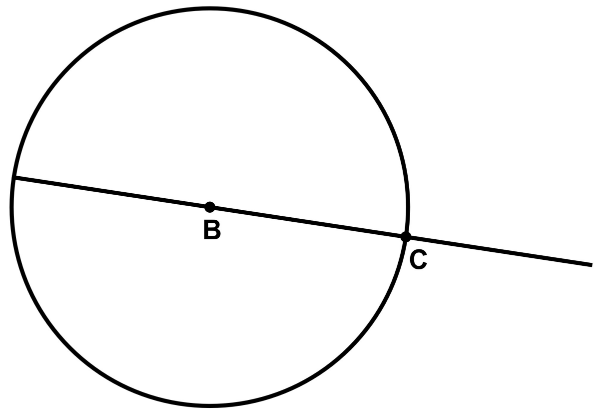
3. A line is shown below with a marked point. In each case, construct a line passing through the marked point perpendicular to the given line. Leave all construction marks.

(a)

(b)

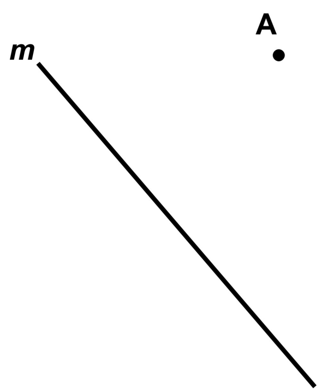


4. In the diagram below, a circle whose center is at B has had a diameter drawn and extended through the circle. Construct a line perpendicular to the diameter at point C where it intersects the circle.

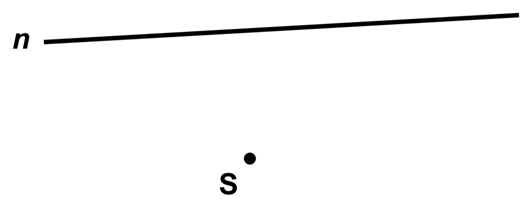


5. In the diagrams below, a segment and a point not on the segment are shown. Construct a line that passes through the point and which is perpendicular to the segment. Leave all construction marks.

(a)



(b)



6. An **altitude** of a triangle is a **line segment** drawn from one of its three vertices so that it is **perpendicular** to the opposite side. These can be created by using the construction from #7. For ΔRST shown below, construct the altitude from T to side $\overline{RS}$. Leave all construction marks.