

## Formal Construction Geometer's Sketchpad 4.0

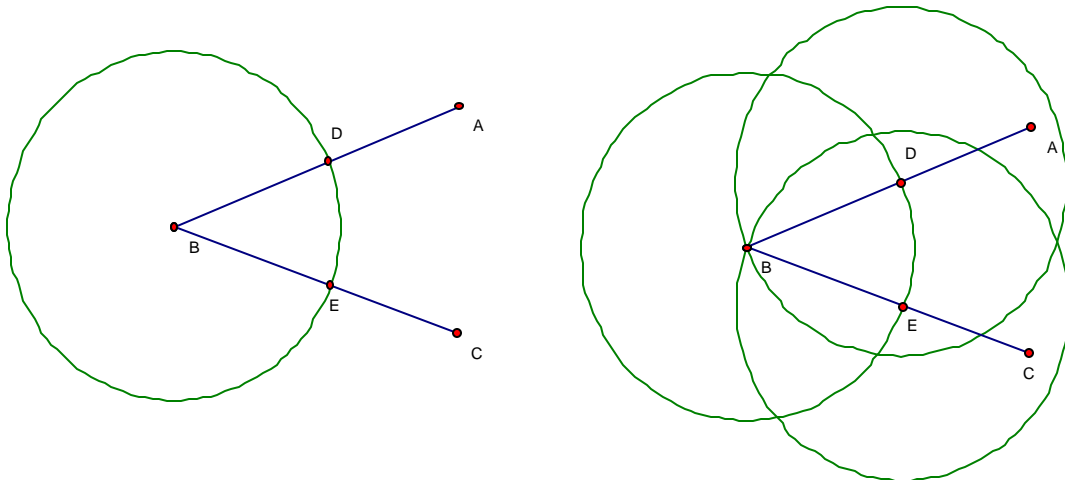
### A. Bisector of an Angle

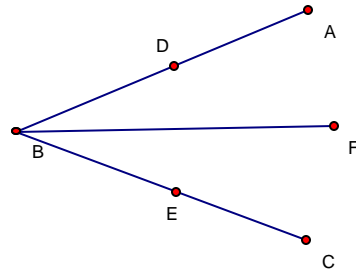
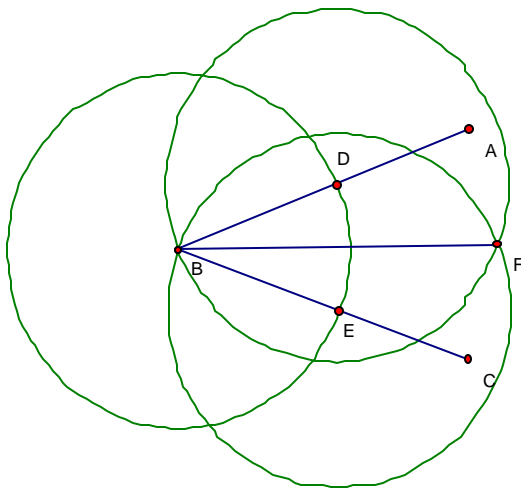
<i>Long Version</i>	<i>Short Version</i>
1. Construct $\angle ABC$ .	1. Construct $\angle ABC$ .
2. Construct a circle with the center B and the radius intersecting $\overline{AB}$ and $\overline{BC}$ .	2. Highlight points A, B, and C.
3. Highlight the circle and the two segments and find their intersection. (Under Construct or Ctrl+I) Label the intersections D and E.	3. Under Construct, select <i>Angle Bisector</i> .
4. Construct a circle with the center D and radius B. Construct another circle with the center E and radius B.	
5. Highlight the two circles and find their intersection. (Under Construct or Ctrl+I) Label the intersection F.	
6. Construct $\overrightarrow{BF}$ .	
7. Highlight the three circles and hide them. (Under Display or Ctrl+H)	

#### Questions:

1. Use the Measure feature to measure  $\angle ABF$  and  $\angle CBF$ .
2. Why does this construction work? (Hint: Why did you construct two circles?)

#### Picture of Long Version:





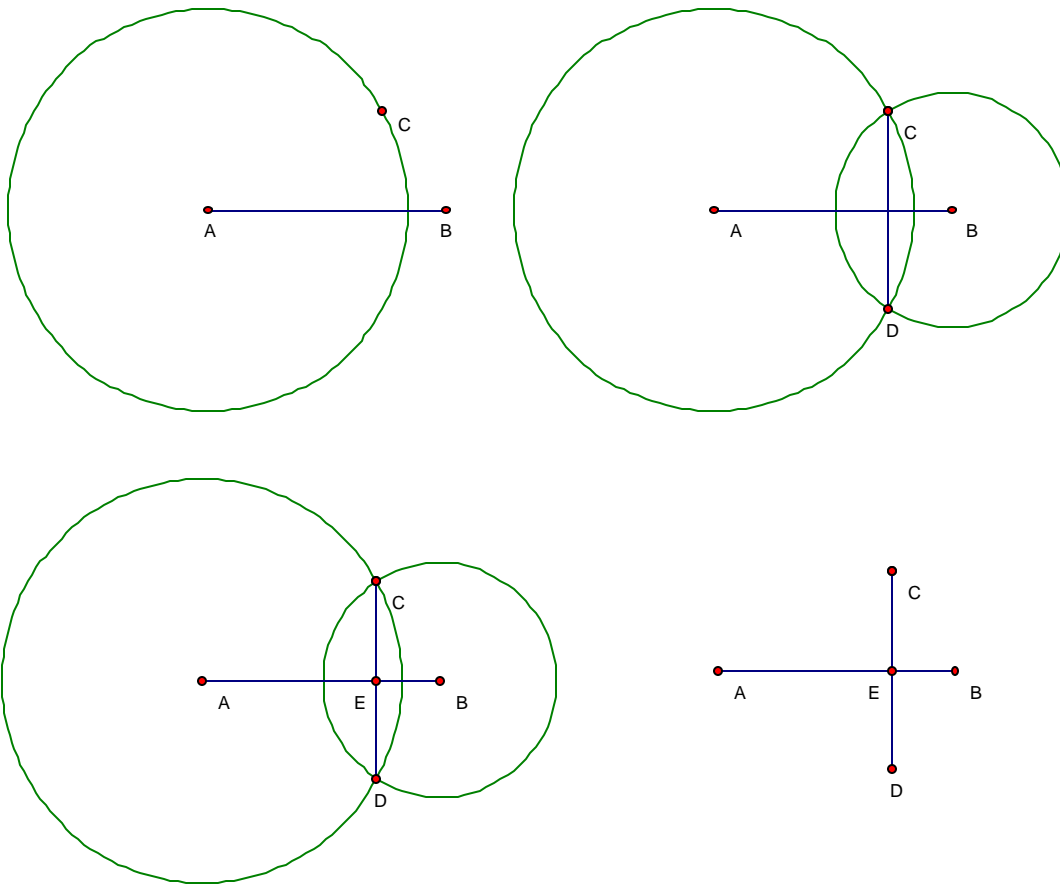
**B. Perpendicular to a given line segment from a point not on a line segment**

<i>Long Version</i>	<i>Short Version</i>
1. Construct a line segment $\overline{AB}$ and a point C not on $\overline{AB}$ .	1. Construct a line segment $\overline{AB}$ and a point C not on $\overline{AB}$ .
2. Construct two circles with the endpoints as the center and the radius touching point C.	2. Highlight $\overline{AB}$ and C. Under Construct, select <i>perpendicular line</i> .
3. Highlight the two circles and find their intersections. (Under Construct or Ctrl+I) One of the intersections is point C. Label the other point D.	
4. Construct the line segment $\overline{CD}$ .	
5. Construct the intersection of $\overline{AB}$ and $\overline{CD}$ . Label the intersection E.	
6. Highlight the two circles. Under Display, select <i>hide circles</i> .	

Questions:

1. Use the Measure feature to confirm the line is perpendicular.
2. Why does this construction work? (Hint: What do you know about diagonals of quadrilaterals?)

Picture of Long Version



**C. Bisector of a Line Segment**

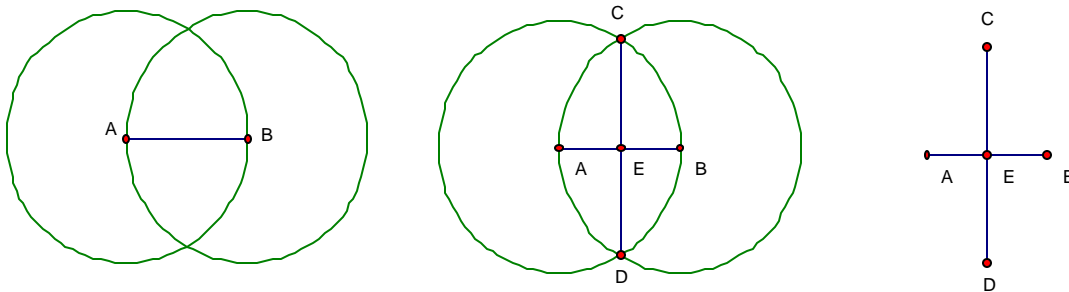
<i>Long Version</i>	<i>Short Version</i>
1. Construct a line segment $\overline{AB}$ .	1. Construct a line segment $\overline{AB}$
2. Highlight the endpoint and segment. Under Construct, select <i>circle by center and radius</i> . Do the same thing with the other endpoint.	2. Highlight $\overline{AB}$ . Under Construct, select <i>midpoint</i> . Label the midpoint C.
3. Highlight the two circles and find the intersections. Label the intersections as points C and D. (Under Construct or Ctrl+I)	3. Highlight $\overline{AB}$ and C. Under Construct, select <i>perpendicular line</i> .

4. Construct the line segment $\overline{CD}$ .	
5. Construct the intersection of $\overline{AB}$ and $\overline{CD}$ . Label the intersection E.	
6. Highlight all the circles and hide them. (Under Display or Ctrl+H)	

Questions:

1. Find the distance between the subsegments. Find EB and EA.
2. Why do you think the formal construction works? (Hint: Look at the equilateral triangle.)

Picture of Long Version



**C. Perpendicular to a given line segment from a point on the line segment**

<i>Long Version</i>	<i>Short Version</i>
1. Construct a line segment $\overline{AB}$ and a point C on $\overline{AB}$ .	1. Construct a line segment $\overline{AB}$ and a point C on $\overline{AB}$ .
2. Construct a circle, with point C as the center, so that the circle intersects $\overline{AB}$ in two points.	2. Highlight $\overline{AB}$ and C. Under Construct, select <i>perpendicular line</i> .
3. Highlight the circle and the line segment. Find their intersections. (Under Construct or Ctrl+I) Label the intersections D and E.	
4. Construct a circle with D as the center and the radius of the circle touching E. Construct another circle with E as the center and the radius of the circle touching D.	
5. Highlight the two circles and find their intersections. (Under Construct or Ctrl+I) Label the intersections F and G.	
6. Construct the line segment $\overline{FG}$	
7. Highlight the two circles. Under Display, select <i>hide circles</i> .	

Questions:

1. Use the Measure feature to confirm the line is perpendicular.
2. Why does this construction work? (Hint: What do you know about diagonals of quadrilaterals?)

Picture of Long Version

