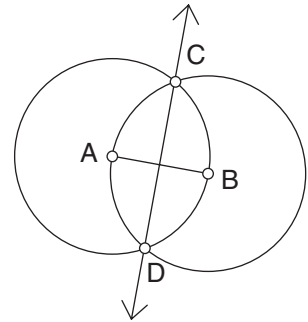


In this activity you'll use only Sketchpad's freehand tools to construct perpendicular bisectors. Then you'll investigate properties of perpendicular bisectors. In Explore More, you'll devise a shortcut for constructing a perpendicular bisector using Sketchpad's Construct menu.



Press and hold the pointer on the current **Straightedge** tool, and then drag to choose the **Line** tool.

1. Construct  $\overline{AB}$ .
2. Construct circle  $AB$ . (Make sure you use point  $A$  for the center and point  $B$  for the radius endpoint.)
3. Construct circle  $BA$ . (Use point  $B$  for the center and point  $A$  for the radius point.)
4. Construct  $\overleftrightarrow{CD}$ , where  $C$  and  $D$  are the circles' points of intersection.
5. Drag points  $A$  and  $B$  to make sure your construction stays together.



**Q1** Line  $CD$  is the perpendicular bisector of  $\overline{AB}$ . Without measuring, what can you say about the distances  $AC$  and  $BC$  and the distances  $AD$  and  $BD$ ?

6. Construct  $E$ , the point of intersection of  $\overline{AB}$  and  $\overleftrightarrow{CD}$ .

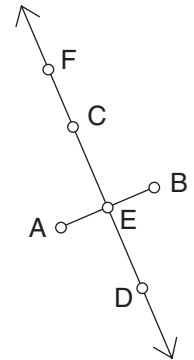
**Q2** What's special about point  $E$ ? Move points  $A$  and  $B$  to confirm your answer.

7. Hide the circles.

8. Construct a point  $F$  on  $\overleftrightarrow{CD}$ .

9. Measure the distances  $FA$  and  $FB$ .

**Q3** Drag point  $F$  up and down the line. Make a conjecture about any point on a segment's perpendicular bisector.



To measure a distance, select two points; then, in the Measure menu, choose **Distance**.

## EXPLORE MORE

For tips on making and using custom tools, choose **Tools** from the Help menu, and then click the Custom Tools link.

10. In a new sketch, construct a segment. Figure out how to construct the perpendicular bisector of the segment using the Construct menu. When you've succeeded, make a custom tool. Then save the sketch (which includes your new tool) in your own personal tool folder. Check with your teacher if you have questions about how to create your personal tool folder. Write a description of the way you did the construction.
11. Write the converse of your conjecture from Q3. In the same sketch, investigate the converse as follows: Construct a point  $G$  not on the perpendicular bisector. Measure  $GA$  and  $GB$ . Move point  $G$  until those distances are equal. Where is the point? Explain how this demonstrates the converse you wrote.

## Constructing a Perpendicular Bisector

continued



12. In a new sketch, construct a line and a point not on the line. Mark the line as a mirror and reflect the point across it. Connect the point to its mirror image with a segment. How is this segment related to the mirror line?
13. In a new sketch, construct the perpendicular bisectors of the three sides of a triangle. Investigate their point of intersection. Can you construct a circle that circumscribes the triangle?