01/12/05

Introducing Points, Segments, Rays, and Lines

Name(s): _____

In this activity, you'll experiment with drawing, dragging, measuring, and labeling points, segments, rays, and lines. These objects, along with circles, are the building blocks of most geometric constructions.

Sketch and Investigate: Points and Segments

Note: If at any time you think you've made a mistake or you want to do something differently, you can always undo as many steps as you like. The **Undo** and **Redo** commands are in the Edit menu.


The **Point** tool

1. Choose the **Point** tool and click in the sketch to construct a point. Click again to construct a second point. Notice that the most recently constructed point is *selected*: It appears with an outline.


The **Selection Arrow** tool

2. Choose the **Selection Arrow** tool and click in a blank area in the sketch. This deselects everything.


The **Text** tool

By default, point labels start with *A*.

3. Choose the **Text** tool. Position the finger over a point, then click to display that point's label. Display the other point's label, too.

4. With the **Selection Arrow** tool, click on both points. Now both points should be selected.

5. In the Measure menu, choose **Distance**.

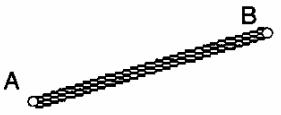
AB = 2.72 cm

6. Drag one of the points and observe the measurement.

Q1 How can you make the distance between the two points zero?


The **Segment** tool

7. Choose the **Segment** tool and draw a segment connecting the two points. You'll see a triple segment at first, indicating that the segment is selected.

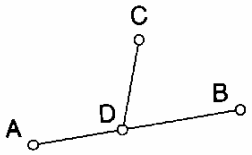


8. With the segment selected, go to the Measure menu and choose **Length**.

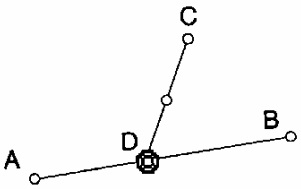
9. Use the **Selection Arrow** tool to drag either endpoint of the segment.

Q2 How does the length of a segment compare to the distance between its endpoints?

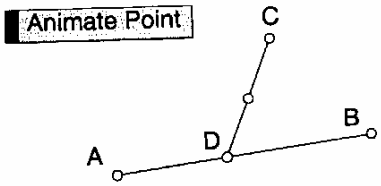
10. Use the **Segment** tool to construct a second segment with one endpoint attached to the first segment. To do this, click the mouse button first when the pointer is in a blank area of the sketch, then when it's directly on the original segment.



11. Use the **Text** tool to show the labels of this segment's endpoints.
12. Use the **Selection Arrow** tool to drag point D to confirm that it is attached to $\overline{AB}$.
13. Select $\overline{CD}$ (the segment, not its endpoints), then go to the Construct menu and notice what choices are available. Choose **Midpoint**.
14. Click in a blank area to deselect everything.
15. Select point D.



16. In the Edit menu, drag to the Action Buttons submenu and choose **Animation**. You'll get a dialog box you can use to specify animation settings. To choose the default settings, click OK. You've created an Animation action button in your sketch.



17. Press the action button (by clicking on it) to start the animation.
18. Press the button again to stop the animation.
19. Select the midpoint; then, in the Display menu, choose **Trace Midpoint**.
20. Press the Animation button again and observe the path that the midpoint traces.

Q3 Describe the path that the midpoint traces as point D moves back and forth.

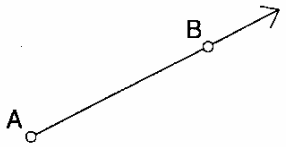
Sketch and Investigate: Rays and Lines

21. In the File menu, choose **New Sketch.**


Straightedge tool palette

22. Press and hold down the mouse button on the **Segment** tool. A palette of **Straightedge** tools will pop out to the right. Drag right and choose the **Ray** tool.

23. Draw a ray in your sketch. Notice that the ray extends in one direction beyond the edge of your sketch window.



24. Use the **Text** tool to show the labels of the ray's control points.

25. Use the **Selection Arrow** tool to drag each point to observe how it controls the ray.

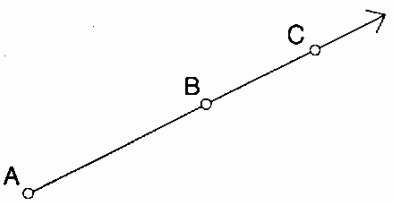
Q4 A ray with endpoint A that passes through a point B is called ray AB (represented symbolically as $\overrightarrow{AB}$). Could it also be called ray BA? Explain.

26. Select the ray and go to the Measure menu. Note that **Length** is grayed out.

Q5 Why do you think you can't measure the length of a ray?

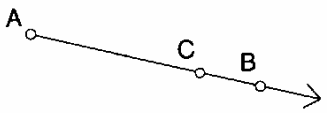
27. With the ray still selected, go to the Construct menu and look at your choices. Choose **Point On Ray.**

Q6 Why can't you construct the midpoint of a ray?



28. Drag this new point to see how its behavior compares to that of the ray's two control points.

Q7 Give two different names to the ray shown at right. Use just two points in each name.



29. Press and hold down the **Ray** tool, then drag right to choose the **Line** tool.

30. Experiment with drawing lines in your sketch.

Q8 List all the similarities and differences you can between segments, rays, and lines.

Q9 Name two rays and a segment that lie on the line below.

Q10 In Sketchpad, construct a line without using the **Line** tool. Explain what you did. Does your line remain a line when you drag points?