Lesson Planner

### Lesson Notes

**About the Lesson**
This lesson introduces students to points, line segments, lines, and rays. These are the figures that they will encounter in the remaining lessons about angles, triangles, quadrilaterals, and parallel and perpendicular lines. Students are familiar with lines from their work with number lines. A line is a straight path of points that has no beginning or end. A line segment is a portion of a line that has two endpoints. A ray has one endpoint and extends forever in one direction.

**About the Mathematics**
A point is an undefined term in mathematics. It has no size or shape, just position. Each of the figures that students will study in this lesson are made up of points. You may want to bring up the fact that, for example, even though a line segment generally only has its two endpoints labeled, it is made up of an infinite number of points between those endpoints. Students will name these figures according to the points they contain. It is not important right now for students to master this fact, but you may want to point out that \( \overline{AB} \) is different from \( \overline{BA} \) since the first letter in the name of a ray designates the endpoint. In the next lesson, students are introduced to angles. In this lesson, students are shown pictures of an angle and you may want to point out that an angle is made up of two rays that share an endpoint.

### Lesson 1-0

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**STUDENT OBJECTIVES**
- To recognize, draw, and name points, rays, line segments, and lines
- To identify points, rays, line segments, and lines in two dimensional figures

**NCTM Standards 1, 2, 3, 6, 7, 8, 9, 10**

**Common Core State Standards 4.G 1**
Developing Mathematical Language

Vocabulary: point, endpoint, line, line segment, ray

A point is undefined. It is just a dot on the page with no size or shape, just position. A line is a straight path of points that has no beginning or end. A line segment is a portion of a line that has two endpoints. A ray is a portion of a line which has one endpoint and extends forever in one direction.

**Beginning** Draw a line segment, line, and ray on the board. Point to each and have students name them.

**Intermediate** Draw a line segment, line, and ray. Point to each part of the figures and have students tell you what it represents. For example: the endpoints of the line segment, the endpoint of the ray, the arrows on the line.

**Advanced** Name each figure and have students draw them on the board or on paper.

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Open-Ended Problem Solving

Read the Headline Story to the class. Encourage students to solve the problem by drawing a picture and using information from the story.

**Headline Story**

A.J. and Paulo each thought of a number. A.J.’s number is less than 10. Paulo’s number is greater than 10 but less than 50. When their numbers are multiplied the product is a multiple of 5.

Possible responses:
The ones digit of the product must be 0 or 5. If A.J.’s number is 5 then Paulo’s number could be any number between 10 and 50. If A.J.’s number is not 5 then Paulo’s number must be a multiple of 5. The largest product could be 9 × 45 or 405.

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Skills Practice and Review

**Recognizing Multiples**

Remind students that a multiple of 5 must end in either 0 or 5 (5, 10, 15, and so on.) Ask students what the possible ones digit could be for a multiple of 2. 0, 2, 4, 6, 8. Then ask what the possible ones digit could be for a multiple of 3. 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. What about a multiple of 4? 0, 2, 4, 6, 8.
Chapter 4 • Lesson 1-0

2 Teach and Practice

A Introducing Points, Line Segments, Lines, and Rays

Purpose To introduce students to the terms point, line, line segment, and ray and have them draw, identify, and name each of these figures

Introduce Give students Activity Master: Connect the Dots. Display Activity Master: Connect the Dots or draw the points on the board. Tell students that the dot on the first line is called a point. Its name is A. Two points can be connected to form different figures. Use a ruler or straightedge to connect the second set of points and ask students to do the same. Tell them that this is a line segment. It has two endpoints. Write the name of this line segment, BC, next to the figure. Draw a line through the third set of points and put arrows at each end. Ask students to do the same. Tell them that this is a line. A line passes through the two points and extend in both directions forever. Write the name of this line, DE, next to the figure. Draw a ray through the last set of points and put an arrow at one end. Ask students to do the same. Tell them that this is a ray. A ray has one endpoint and extends forever in one direction. Write the name of this ray, FG, next to this figure. Mention that points are usually named with capital letters.

Task Ask students to find points, line segments, lines, and rays in the letters on the bottom of Activity Master: Connect the Dots. All of the letters in MATH are formed by connecting points with either lines, line segments, rays, or a combination of these figures. Help students to label the M with the names of the figures. You might also list the names of each figure that makes up the M: BC, DC, BA, and DE.

Share Once students have had time to label the remaining letters ask them to share their findings with the class. Students can draw the figures on the board or label them on your transparency of Activity Master: Connect the Dots.

Talk Math

What makes a line segment different from a line? A line extends on forever in both directions. A line segment is part of a line and has two endpoints.

Do you think a line named AB is the same figure as a line named BA? Possible answer: If A and B are the same points then the line that goes through them is the same line and you can name it both ways.
**Points, Line Segments, Lines, and Rays**

LAB Masters, CCRG pp. CC 12–CC 13

**Purpose** To identify, name, and draw points, line segments, lines, and rays

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**Teaching Notes for LAB Master, CCRG page CC 12**

Students identify objects as line segments, lines, or rays. All figures have two named points $X$ and $Y$.

**Differentiated Instruction**

**Above Level** For students who finish early, have them draw some real world objects and label line segments, lines, and rays in their drawings.

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**Teaching Notes for LAB Master, CCRG page CC 13**

Students interpret the symbols given for figures and draw the corresponding figures. Students use the symbols for line segments, lines, and rays to name each figure. When drawing $\overrightarrow{EF}$ make sure students draw $E$ as the endpoint of the ray.

**Challenge Problem**

This problem previews angles, which students will explore in the next lesson.
Reflect and Summarize the Lesson

True or false: A segment is contained in every line.

True. A line is made up of an infinite number of points so you can identify two points as endpoints of a segment.
# Differentiated Instruction

## Leveled Problem Solving

Monica connected points \( P \) and \( Q \) with a straightedge.

### Basic Level
She began at \( P \) and drew a line that ended at \( Q \). What kind of figure did Monica draw? Explain. A segment. Monica made \( P \) and \( Q \) the endpoints of the segment.

### On Level
She began at \( Q \) and drew a line that passed through \( P \) and did not stop at \( P \). What kind of figure did Monica draw? Explain. A ray. The endpoint of the ray is \( Q \). It passes through \( P \) and keeps going on forever.

### Above Level
Monica added a point, \( R \), above \( P \). She connected these points with segments. What kind of figure did she draw? A triangle.

## Practice Master, CCRG p. CC14

### Points, Line Segments, Lines, and Rays
Identify each figure that contains points \( X \) and \( Y \) as a line segment, a line, or a ray.

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \begin{array}{c} \text{ray} \ \text{line segment} \ \text{line} \end{array} ]</td>
<td>ray, line segment, line</td>
</tr>
</tbody>
</table>

Use a ruler or straightedge to draw each figure.

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \begin{array}{c} \text{line segment} \ \text{line} \ \text{ray} \end{array} ]</td>
<td>line segment, line, ray</td>
</tr>
</tbody>
</table>

Test Prep

- Angle \( DEF \) is made up of which two rays?
  - A. ray \( ED \) and ray \( EF \)
  - B. ray \( ED \) and ray \( EF \)
  - C. ray \( DE \) and ray \( FE \)
  - D. ray \( DE \) and ray \( FE \)

## Extension Master, CCRG p. CC15

### Points, Line Segments, Lines, and Rays
When line segments, lines, or rays share one point they intersect.

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \begin{array}{c} \text{line segment} \ \text{line} \ \text{ray} \end{array} ]</td>
<td>line segment, line, ray</td>
</tr>
</tbody>
</table>

Decide whether or not each pair of figures will intersect. Write yes or no and explain your reasoning.

<table>
<thead>
<tr>
<th>Pair</th>
<th>Intersect?</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>( AB ) and ( CD )</td>
<td>No. Line segments do not extend past their endpoints.</td>
<td></td>
</tr>
<tr>
<td>( AB ) and ( CD )</td>
<td>Yes. The ray will extend straight through segment ( AB ).</td>
<td></td>
</tr>
<tr>
<td>( AB ) and ( CD )</td>
<td>No. These lines will not share any points no matter how far you extend them.</td>
<td></td>
</tr>
<tr>
<td>( AB ) and ( CD )</td>
<td>No. Line segments do not extend past their endpoints.</td>
<td></td>
</tr>
</tbody>
</table>

## Intervention Activity

### Drawing Geometric Figures
Write the name of several line segments, lines, and rays on the board. Have students draw each figure. You might use symbol notation, for example, \( AB \), \( GH \), \( DC \), \( XY \), \( ST \), or you might write out the word, for example, ray \( AB \).

### Extension Activity

### What’s My Angle?
Draw three different angles with \( A \) as the vertex.

Ask students to use their own words to describe each figure. Possible answers: The straight angle can be described as a line. The right angle can be compared to the corner of a piece of paper. The acute angle looks like a piece of pie.
1. Identify each figure that contains points X and Y as a line segment, line, or a ray.

A. 

B. 

C. 

D. 

E. 

F. 

G. 

CC 12 Common Core Resource Guide
2 Draw the following figures.

A. $\overrightarrow{CD}$  
B. $\overrightarrow{EF}$  
C. $GH$

3 Use letters and symbols to name each figure shown.

A.  
B.  
C.  

4 Challenge $\overrightarrow{XY}$ and $\overrightarrow{XZ}$ can meet at point $X$ to make a straight line.

What other figure could $\overrightarrow{XY}$ and $\overrightarrow{XZ}$ make? Draw that figure.
Points, Line Segments, Lines, and Rays

Identify each figure that contains points X and Y as a line segment, a line, or a ray.

1. ______  
2. ______  
3. ______  
4. ______  
5. ______  
6. ______  

Use a ruler or straightedge to draw each figure.

7. line CD  
8. ray AB  
9. line segment MN

Test Prep

10. Angle DEF is made up of which two rays?  
   A. ray ED and ray EF  
   B. ray ED and ray EF  
   C. ray DE and ray FR  
   D. ray DE and ray FE

CC 14  Common Core Resource Guide
Points, Line Segments, Lines, and Rays

When line segments, lines, or rays share one point they intersect.

Decide whether or not each pair of figures will intersect. Write yes or no and explain your reasoning.

1. \(\overline{AB}\) and \(\overline{CD}\)

2. \(\overline{AB}\) and \(\overline{CD}\)

3. \(\overline{AB}\) and \(\overline{CD}\)

4. \(\overline{AB}\) and \(\overline{CD}\)
Connect the Dots

Use a ruler to draw each figure.

- A point
- B C line segment
- D E line
- F G ray

Name the figures that each letter in the word MATH is made from.

M
A
T
H
Memory Game Cards

CC 17  Common Core Resource Guide