

# Points and Patterns

## Purpose

Students will find ordered pairs that fit an equation, graph the ordered pairs, draw the line they determine, and use the graph to find more solutions to the equation.

## Materials

*For the teacher:* transparency copy of graph paper, overhead projector, overhead markers

*For each student:* graph paper, pen or pencil

*For each group of 4-5 students:* copy of prepared linear equations page

## Activity

### A. Pre-Activity Preparation

1. Draw an  $x$ -axis and  $y$ -axis on the transparency copy of graph paper.
2. Write five linear equations on a piece of paper and make enough copies so that each group of four or five students will have one.

### B. Introduction

1. Turn on the overhead projector and plot the point (1, 6) on the transparency. Ask a student to name the ordered pair for that point.
2. Plot (0, 5), (4, 9), and (2, 7) and have students name the ordered pairs for each point. Ask students what they notice about the points [they lie in a straight line] and draw the line that connects the points.
3. Remind students that the numbers in the ordered pair stand for an  $x$ -value and a  $y$ -value. Write a table on the board with “ $x$ -value” and “ $y$ -value” as the column headings. Fill in the columns using the values in the ordered pairs you have graphed. Point out one other point on the line. Have a student find the ordered pair for the point and write the values in the table.
4. Rewrite the table with  $x$ -values in order from smallest to largest.
5. Ask students if they see a pattern with the numbers. [Rule is add 5 to  $x$  to find the  $y$ -value.]
6. Write the equation “ $y = x + 5$ ” on the chalkboard and ask students if this equation describes the relationship between the  $x$ -values and  $y$ -values of the ordered pairs.

(continued)

### MEETING INDIVIDUAL



### NEEDS

For students having difficulty with this activity, review substitution and graphing ordered pairs. Have the students practice these two concepts before focusing on the line determined by a linear equation.

### INCORPORATING



### TECHNOLOGY

Have students use a graphing calculator (or software program) to plot points on a line and have the calculator determine the linear equation. Have students also type in a linear equation and have the calculator draw the line that is determined by it.

**Standards Links**  
**5.2.1, 5.3.2, 5.3.4**

## Activity (continued)

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7. Explain that the points that lie along a line will always be related so that an equation can be written in this form. Tell them the equation is called a *linear equation*.
8. Write the linear equation " $y = 2x + 2$ " on the board and have students use substitution to find at least three ordered pairs for the equation. Graph the ordered pairs and draw the line that they determine. Show students how other solutions to the equation can be found by locating other points along the line.

### C. Group Activity

1. Divide the class into groups of four or five students.
2. Give each group one copy of the linear equation page you prepared and each student a piece of graph paper.
3. Have each person in the group choose a different linear equation. Instruct the class to use substitution to find three ordered pairs that fit their linear equation. Have students use values between 0 and 10 for their  $x$ -values.
4. Have students pass their graph papers to their right when they have found three ordered pairs. Have the next student graph the ordered pairs and draw the line that he/she determines. If the three ordered pairs do *not* fall on the same line, that student should determine the incorrect ordered pair and circle it.
5. Have students pass the graph papers to their right when they have graphed the ordered pairs (making corrections when necessary) and have drawn the corresponding lines. Have the next student mark and label two more ordered pairs along the line, check the values with the linear equation, and show his/her work on the graph paper.

## Questions for Review


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### Basic Concepts and Processes


During the Group Activity, discuss the following questions:

 Find an ordered pair that fits the linear equation  $y = 3x + 1$ .

 How did you determine the ordered pair?

 For the linear equation  $y = x + 2$ , which ordered pair will not lie on the same line as the other three: (1, 3), (5, 8), (3, 5), or (0, 2)?

 How did you find the ordered pair NOT on the same line as the others?

 What is another way you could have found the ordered pair?  
[Answer: *graphing or substitution*]