

LESSON 3

Objective

Determine the slope of a line when given a set of data points.

Common Core State Standards

- **8.EE.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*

Expressions and Equations

Slope as Rate of Change

The students come to the concept of slope with an understanding of its “vertical rise to horizontal length,” or simply “rise over run.” In this activity, students will learn to formalize this understanding by working with rate of change and its impact on the slope of a line.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- **Say:** Describe the slope of the line.
- **Ask:** Is the slope positive or negative? How do you get from one point on the line to the next?
- **Ask:** What would the line look like if the rate of change (slope) was up 3 and over (to the right) 1? Would this represent more money per car or less?

Solve It

Reread the problem with students. Ask students to describe the effect of rate of change on the slope of a line. Have them include sketches.

More Ideas

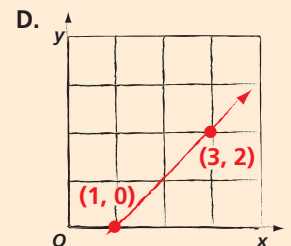
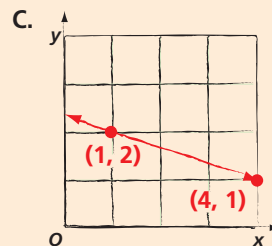
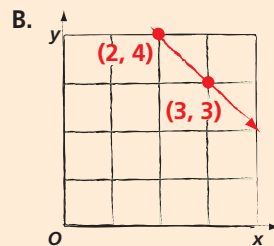
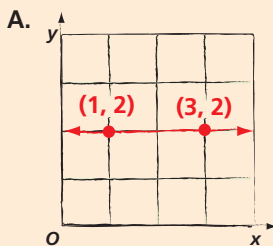
For other ways to teach about slope and rate of change—

- Have students use their XY Coordinate Pegboards to create several lines with the same slope. **Ask:** Will the lines be parallel to each other?
- Have students use their XY Coordinate Pegboards to graph a line with a slope of $1/1$ and another line with a slope of $2/1$. **Say:** Compare the two lines. **Ask:** What happens to the appearance (steepness) of the line as the slope is increased or decreased?

Formative Assessment

Have students try the following problem.

Which graph shows a positive slope?

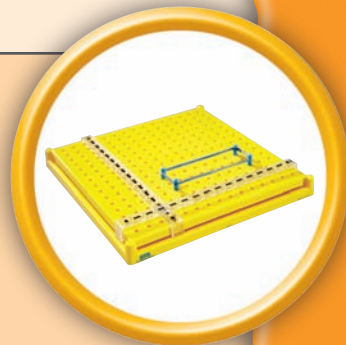


Try It! 25 minutes | Pairs

Here is a problem about rate of change.

The Math Club is raising money by holding a car wash. Graph the data shown in the table at right. Then examine the slope of the line to see the rate of change (slope). How much money will the club earn if they wash 6 cars?

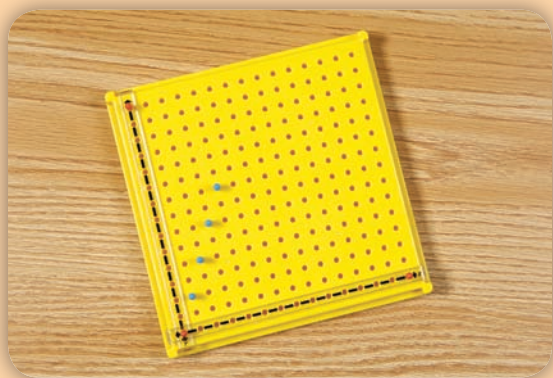
Number of Cars Washed	1	2	3	4
Money Earned	\$2	\$4	\$6	\$8



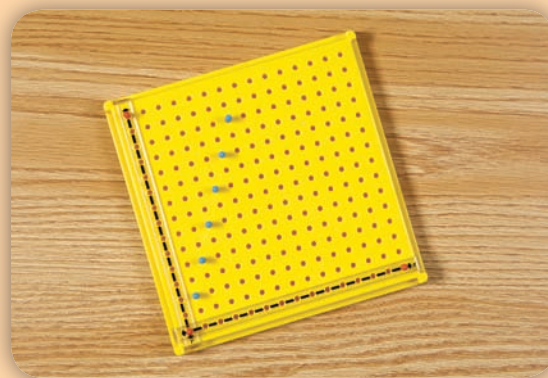
Introduce the problem. Then have students do the activity to solve the problem. Distribute the materials.

Materials

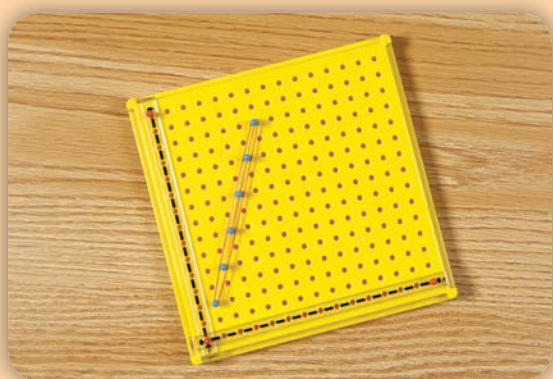
- XY Coordinate Pegboard



1. Have students set up their pegboards for Quadrant I graphing. Then have them plot the values from the table.



2. Ask: Do you see a pattern in the placement of the pegs? Elicit from students that the pattern is “up 2 and over 1.” Have students add two coordinates beyond those shown in the table.



Look Out!

Make sure students recognize that the rate of change is the ratio of the vertical “rise” over the horizontal “run” and not vice-versa. Often students invert the slope.

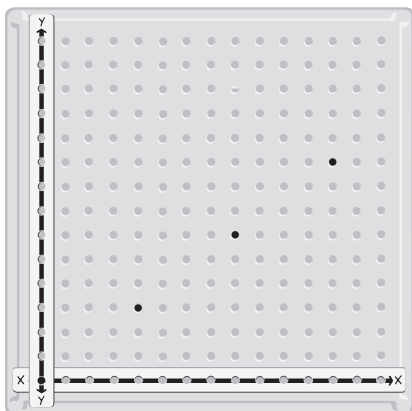
3. Have students create a line by stretching a rubber band from (1, 2) to (6, 12).

Ask: As one value goes up, what happens to the other value? **Say:** If both values go up or both go down, the slope of the line is said to be positive. If one goes up while the other goes down, the slope is negative. **Ask:** Is the slope of this line positive or negative? Discuss the rate of change (up 2 and over 1) between each of the data points with students. **Ask:** How much will the Math Club earn if they wash 6 cars?

Use an XY Coordinate Pegboard to plot the ordered pairs. Complete the table.
Find the slope, or rate of change, of the line.

(Check students' work.)

1.



x	y
0	0
4	3
8	6
12	9

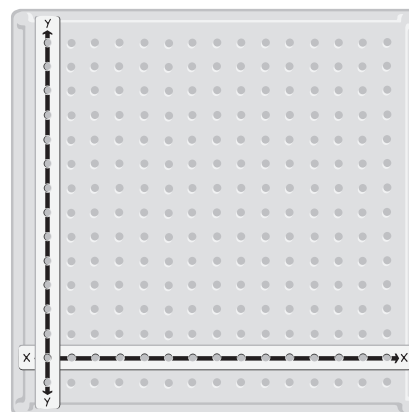
$\frac{3}{4}$

Using an XY Coordinate Pegboard, model the ordered pairs. Sketch the graph.
What is the slope of the line?

(Check students' models.)

2.

x	y
0	0
2	1
4	2
6	3
8	4
10	5



$\frac{1}{2}$

Find the slope of a line that passes through each pair of points.

3. $(-1, 2)$ and $(1, -2)$

-2

4. $(2, 2)$ and $(1, 1)$

1

5. $(-7, 3)$ and $(7, -3)$

$-\frac{3}{7}$

6. $(0, 0)$ and $(5, 0)$

0

7. $(-1, -4)$ and $(2, 8)$

4

8. $(4, 6)$ and $(6, 9)$

$\frac{3}{2}$

9. Which lines from Problems 3–8 have a negative slope?

Problems 3 and 5

Answer Key

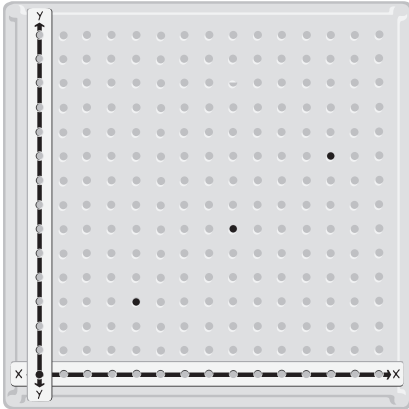
Challenge! Describe a line that has a positive slope. Describe a line that has a negative slope. What does a line with zero slope look like? Draw pictures to help.

Challenge: (Sample) If a line goes up to the right, then the line has a positive slope. If the line goes down to the right, then the line has a negative slope. A horizontal line has a slope of 0.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

Use an XY Coordinate Pegboard to plot the ordered pairs. Complete the table.
Find the slope, or rate of change, of the line.

1.

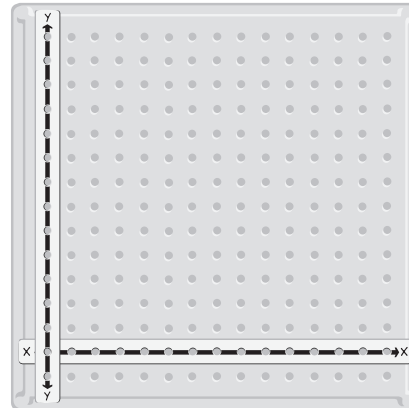


x	y

Using an XY Coordinate Pegboard, model the ordered pairs. Sketch the graph.
What is the slope of the line?

2.

x	y
0	0
2	1
4	2
6	3
8	4
10	5



Find the slope of a line that passes through each pair of points.

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4. $(2, 2)$ and $(1, 1)$

5. $(-7, 3)$ and $(7, -3)$

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7. $(-1, -4)$ and $(2, 8)$

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9. Which lines from Problems 3–8 have a negative slope?

Challenge! Describe a line that has a positive slope. Describe a line that has a negative slope. What does a line with zero slope look like? Draw pictures to help.

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