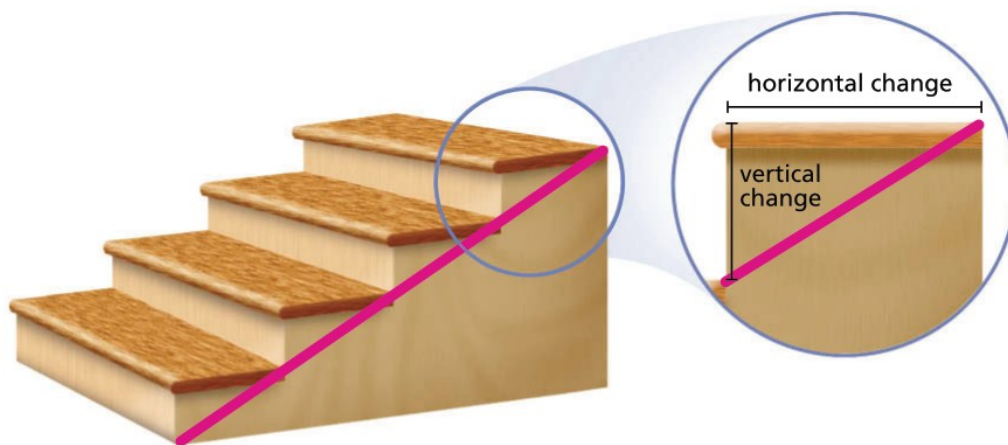# 4.2 Finding the Slope of a Line

The method for finding the steepness of stairs suggests a way to find the steepness of a line. A line drawn from the bottom step of a set of stairs to the top step touches each step at one point. The rise and the run of a step are the vertical and the horizontal changes, respectively, between two points on the line.

The steepness of the line is the ratio of rise to run, or vertical change to horizontal change, for this step. We call this ratio the **slope** of the line.

$$\text{slope} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\text{rise}}{\text{run}}$$

- Does the slope change if we take two stairs at a time?

- Is the slope the same between any two stairs?

Unlike the steepness of stairs, the slope of a line can be negative. To determine the slope of a line, you need to consider the direction, or sign, of the vertical and horizontal changes from one point to another. If vertical change is negative for positive horizontal change, the slope will be negative. Lines that slant *upward* from left to right have *positive slope*. Lines that slant *downward* from left to right have *negative slope*.
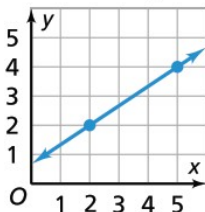
The following situations all represent linear relationships.

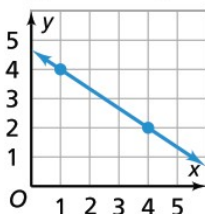- For each graph, describe how you can find the slope of the line.

Line With Positive Slope

x	2	5
y	2	4

Line With Negative Slope

x	1	4
y	4	2

- Describe how you can find the slope of the line that represents the data in the table below.

x	−1	0	1	2	3	4
y	0	3	6	9	12	15

Information about a linear relationship can be given in several different representations, such as a table, a graph, an equation, or a contextual situation. These representations are useful in answering questions about linear situations.

Investigation 4 Exploring Slope: Connecting Rates and Ratios **91**

Problem 4.2

A The graphs, tables, and equations all represent linear relationships.

Graph 1   **Graph 2**
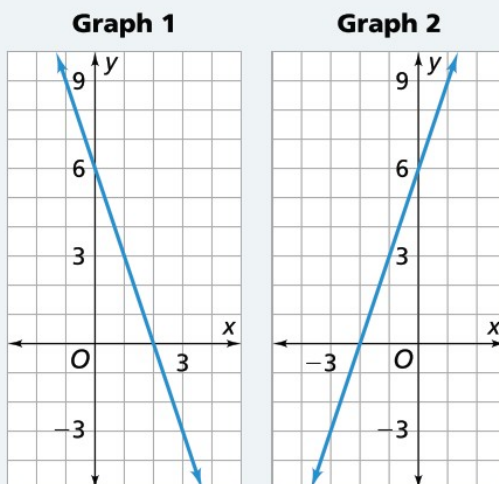
Table 1

x	−6	−4	−2	0	2	4
y	−10	−7	−4	−1	2	5

Table 2

x	1	2	3	4	5	6
y	4.5	4.0	3.5	3.0	2.5	2.0

Equation 1   **Equation 2**

$y = 2.5x + 5$ $y = 20 - 3x$

1. Find the slope and y-intercept of the line associated with each of these representations.

2. Write an equation for each graph and table.

2   Moving Straight Ahead

4/3/2015   media.pearsoncmg.com/curriculum/dash/courses/CMP3_TP_G7_20150309/course_base/resources/content_module_708/assets/A82004441AA41AD0C09…

4.1 **4.2** **4.3** 4.4

Problem **4.2**   *continued*

B The points (3, 5) and (–2, 10) lie on a line.

1. What is the slope of the line?

2. Find two more points that lie on this line. Explain your method.

3. Eun Mi observed that any two points on a line can be used to find the slope. How is Eun Mi's observation related to the idea of "linearity?"

C 1. John noticed that for lines represented by equations of the form $y = mx$, the points (0, 0) and (1, m) are always on the line. Is he correct? Explain.

2. What is the slope of a horizontal line? A vertical line? Explain your reasoning.

D 1. Compare your methods for finding the slope of a line from a graph, a table, and an equation.

2. In previous Investigations, you learned that linear relationships have a constant rate of change. As the independent variable changes by a constant amount, the dependent variable also changes by a constant amount. How is the constant rate of change of a linear relationship related to the slope of the line that represents that relationship?

A C E Homework starts on page 98.

4.3 Exploring Patterns With Lines

Your understanding of linear relationships can be used to explore some ideas about groups of lines.

For example, suppose the slope of a line is 3.

- Sketch a line with this slope.

- Can you sketch a different line with this slope? Explain.

In this Problem, you will use slope to explore some patterns among linear relationships.