All the linear situations you have explored so far have involved rates. You have found that the rate affects the following things:

- the steepness of the graph.

- the coefficient, m, of x in the equation y = mx + b.

- the amount the y values in the table change for each unit change in the x values.

All of these things are related to the **slope** of the line.

Climbing stairs is good exercise. Some athletes run up and down stairs as part of their training. The steepness of stairs determines how difficult they are to climb. Stairs that are very steep are more difficult to climb than stairs that rise gradually. Examining the steepness of stairs can help you understand the idea of steepness, or slope, of a line.

The steepness of stairs is determined by the ratio of vertical change to horizontal change for each step.
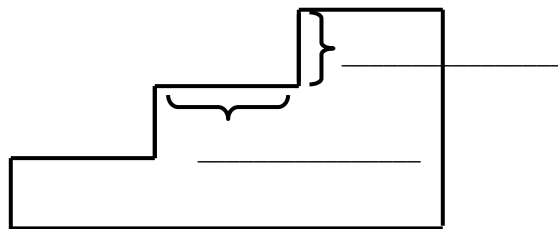
If you choose two points on a line, you can draw a line through both points.
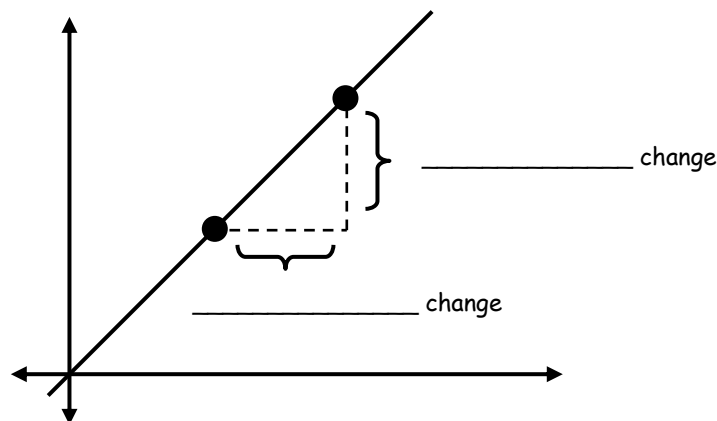
_____ change

_____ change

The steepness of the line is the ratio of vertical change to horizontal change. This is the **slope** of the line.

$$\text{Slope} = \frac{\textit{vertical change}}{\textit{horizontal change}}$$

To determine the slope of a line, you need to consider the direction, or sign, of the vertical and horizontal change from one point to another. If only one of these changes is negative, the slope will be negative.
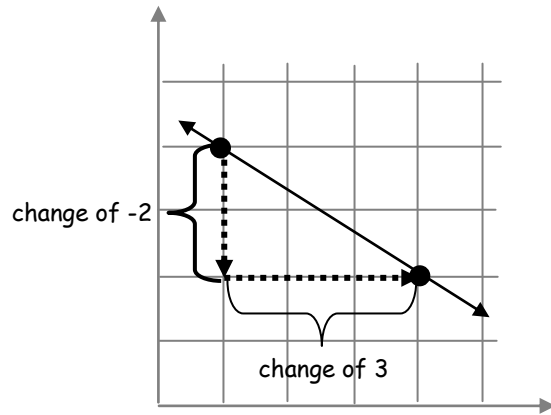
Line with **<u>Positive</u>** Slope

change of 3

change of 2

Line with **<u>Negative</u>** Slope

change of -2

change of 3
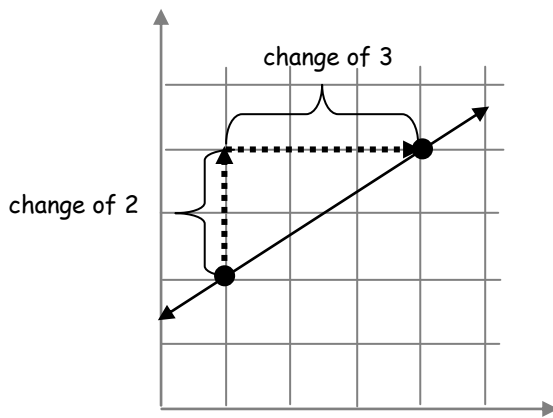
Positive slopes:

- slants upward from left to the right
- vertical and horizontal values are both positive

Negative slopes:

- slants downward from left to right
- either the vertical or horizontal value is negative

Make a table of x and y values for each equation. Then graph the equation and choose two points on the line to compute the ratio for the vertical and horizontal change, which will determine the slope of the line.
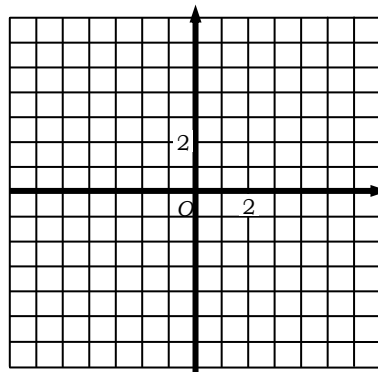
1.   y = 2x

x	y
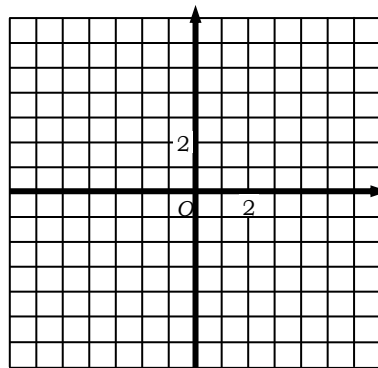
Slope _____

Name _____
Date _____ Period _____

2. $y = 5 + 2x$

x	y

Slope _____

3. $3x + y = 0$

x	y
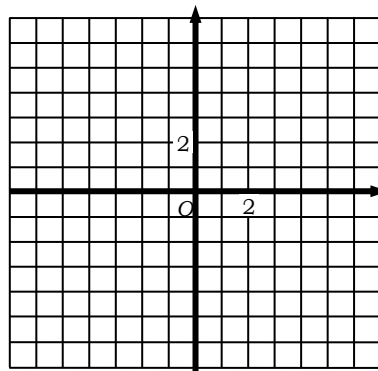
Slope _____

4. $y = \dfrac{1}{2}x + 2$

x	y
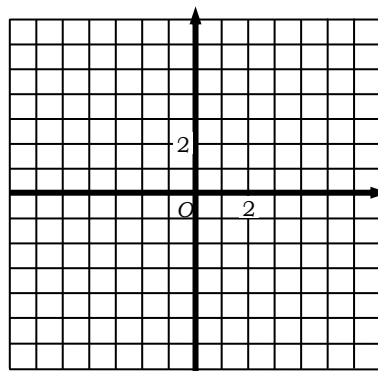
Slope _____

5.   y = 2 - x

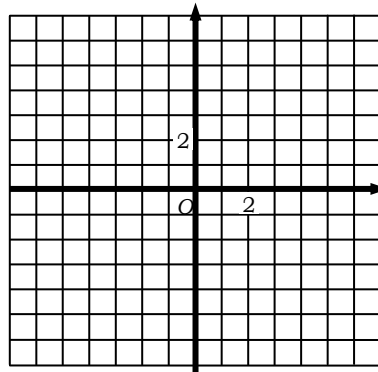| x	y

Slope _____

6.   How is the slope you computed in problems 1 – 5 related to the table of values for the line? How is it related to the equation for the line?

7.   Use the ideas you learned about slope and about vertical and horizontal change to explain why the line for y = 3x is steeper than the line for y = x.

Slope is $\dfrac{\text{vertical change}}{\text{horizontal change}}$