Unit 6: Lesson 02 **Slope**

The slope of a line (denoted with the letter **m**) can be defined in several different ways; however, they are all consistent with each other.

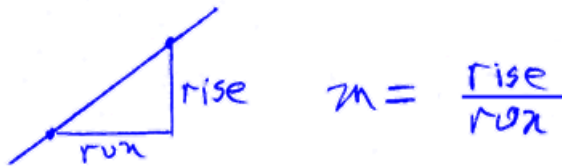Definition #1:

The slope of a line can be thought of as the rate of vertical change with respect to the horizontal change.

$$m = \frac{vert.change}{horiz.change}$$

Definition # 2:

The slope of a line can be defined in terms of **rise** and **run**.

$$m = \frac{rise}{run}$$

Definition # 3:

Simplest of all, slope can be thought of as a measurement of the **steepness** of a line; the larger the slope, the steeper the line.

$$m = 0$$

infinite steepness   This one is steeper

Definition # 4:

Given two points on a line (x_1, y_1) and (x_2, y_2) the slope m is:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Lines that slope **up** when moving from left to right have a **positive slope**.

m → positive

Lines that slope **down** when moving from left to right have a **negative slope.**

m → neg slope

Horizontal lines have a slope of 0.

$m = 0$

Vertical lines have a steepness so great that it is infinity and is, therefore, **undefined**. In this case, we say **"no slope"**, or **does not exist**. (Note that this does not mean 0, it simply means the slope is so large, we can't say what it is.)

Example 1: If a line increases three units in the vertical direction for every two units of change in the horizontal direction, what is the slope?
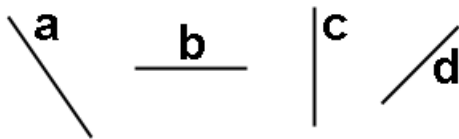
$$m = \frac{vert.\ change}{horiz.\ change}$$

$$= \boxed{\frac{3}{2}}$$

Example 2: If a line decreases five units in the vertical direction for every six units of change in the horizontal direction, what is the slope?

$$m = \frac{vert.\ change}{horiz.\ change}$$

$$m = \boxed{\frac{-5}{6}}$$

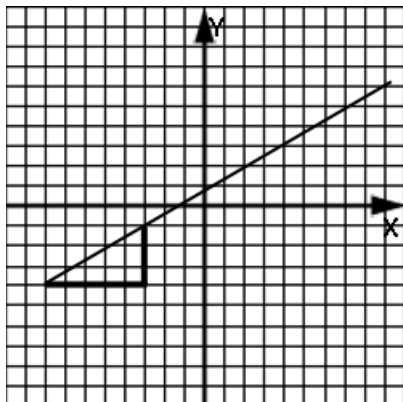**Example 3:** Identify the slopes of these lines as being positive, negative, 0, or no slope:

a   b   c   d

a is negative   b is 0   c is No slope   d is positive
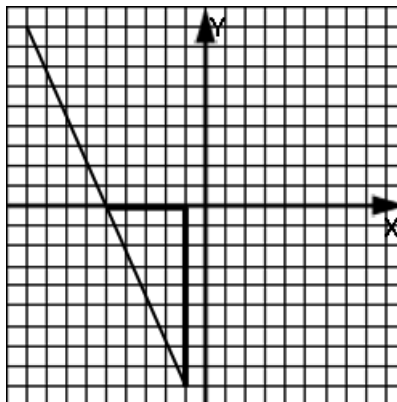
Example 4: Using the rise and run definition, what is the slope of this line?

$$m = rise/run$$
$$= \boxed{3/5}$$

Example 5: Using the rise and run definition, what is the slope of this line?

$$m = rise/run$$
$$m = \boxed{-9/4}$$

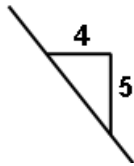**Example 6:** Find the slope of a line passing through (-5, -2) and (6, -7).

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7 - (-2)}{6 - (-5)}$$

$$= \frac{-7 + 2}{6 + 5}$$

$$= \boxed{\frac{-5}{11}}$$
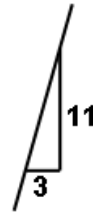
Assignment:

|	
1. Define slope in terms of rise and run.	2. Give a slope formula in terms of two points (a, b) and (c, d).
3. Find the slope of this line.	4. Find the slope of this line.
5. If a line decreases 22 units in the vertical direction for every four units of change in the horizontal direction, what is the slope?	6. If a line increases two units in the vertical direction for every two units of change in the horizontal direction, what is the slope?

7. What are the slopes of these lines pos., neg., 0, or "no slope"?
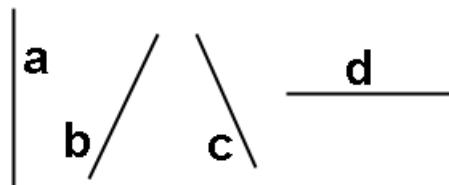
8. When working with linear functions the variable *m* usually means what?

9. Several different lines have slopes of m = 3, m = 2, m = 11, and m = 0. Which of the lines has the greatest steepness?

Use these points for problems 10 -18.
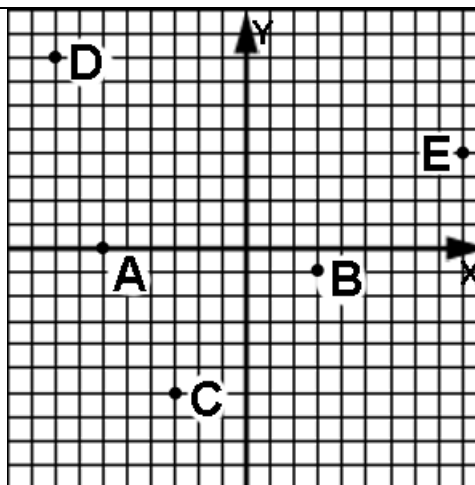
10. Is the slope of the line between A & B positive or negative?

11. Is the slope of the line between C & E positive or negative?

12. The line between which two points has the steepest negative slope?

13. Between which two points is the slope zero?

14. What is the slope of the line passing through points A and E?

15. What is the slope of the line passing through points D and B?

16. What is the slope of the line passing through points D and the origin?

17. To what value should the *x* coordinate of point A be changed so that the slope of the line connecting A and C be undefined?	18. To what value should the *y* coordinate of point E be changed so that the slope of the line connecting E and B be zero?