Graphing Linear Equations

I. Slope of a line

A. The **slope** of a line measures the steepness of a line. It is the ratio of the vertical change to the horizontal change between any two selected points on the line.

The slope is thought of as

\[
\frac{\text{change in } y}{\text{change in } x} = \frac{\text{rise}}{\text{run}}.
\]

B. *By observation*, find the slope of the line using the given points.

C. Examples: *By observing* the vertical change and the horizontal change of the line between the two points indicated, determine the slope of each line.

1) ![Graph](image1)

2) ![Graph](image2)

3) ![Graph](image3)

4) ![Graph](image4)
D. Now suppose you don’t have the graph to count the change in y and x. What can you do?

If \((x_1, y_1)\) and \((x_2, y_2)\) are two points, the slope of the line through them is:

\[
slope = m =
\]

Examples: Use the slope formula to determine the slope of the line through the given points. What can we say about the line?

4) \((5,7)\) and \((1, 4)\)

5) \((5,-2)\) and \((6,-2)\)

6) \((3,4)\) and \((3, 9)\)

7) \((-1,4)\) and \((3,-2)\)
E. Relationship between the slope and the line:

- slope is positive ⇔ line _________ from left to right
- slope is negative ⇔ line _________ from left to right
- slope is zero ⇔ line is ____________
- slope is undefined ⇔ line is ____________

Examples: Find the slope of the line passing through the pair of points or state that the slope is undefined. Then indicate whether the line rises, falls, is horizontal or is vertical.

1) (3, 4) and (−1,3)

2) (5, −1) and (8,−4)

3) (2, 4) and (5,4)

II. Graphing lines using the slope and a point

The \textit{slope} tells us the \textit{direction} of the line and the \textit{point} tells us where to \textit{start} the line.

Examples: Graph the line with the given slope that goes through the given point. (I will ask for at least 3 points.)

1) through (−3,4) with \( m = 2 \)
2) through $(-6, 7)$ with $m = \frac{2}{3}$

3) through $(1, 2)$ with $m = 0$

4) through $(-2, 1)$ with $m = \frac{3}{4}$

5) through $(-1, 3)$ with slope undefined

6) through $(2, 7)$ with $m = -3$