Objectives: To find the slope of a line given two points, or given an equation of the line. To graph a line given its slope and a point, and to use points to determine if lines are parallel, perpendicular, or neither.

Vocabulary & Formula

\[
\text{change in } y = \frac{y_2 - y_1}{x_2 - x_1}
\]

(change in x)

Symbol for slope = _____.

A.K.A. “rise over run”

RISE

RUN

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

\begin{align*}
\text{Slope} & \quad \frac{4 - 1}{2 - (-2)} = \frac{3}{4} \\
& \text{The slope of the line is } \frac{3}{4}.
\end{align*}

\begin{align*}
\text{Slope} & \quad \frac{0 - (-1)}{2 - (-2)} = \frac{1}{4} \\
& \text{The slope of the line is } \frac{1}{4}.
\end{align*}

Find the slope through the given points.

a) (0,-3) and (2,1)  

b) (4,-1) & (5,0)

c) (1,-6) & (7,5)

d) \( x + 4y = 6 \)  
e) \( 4x - 5y = 20 \)

Note: For equations in standard form, \( Ax + By = C \), use the shortcut

\[
\text{slope} = \frac{-A}{B}
\]

or...Solve for y and use slope intercept form ________.
Find the slope of the line.

\[ \text{Slope} \quad \frac{y_2 - y_1}{x_2 - x_1} \]

Substitute (1, 2) for \((x_1, y_1)\) and (-4, 2) for \((x_2, y_2)\).

Simplify.

\[ \frac{0 - 2}{1 - (-4)} = \frac{-2}{5} \]

The slope of the horizontal line is 0.

Find the slope of the line.

\[ \text{Slope} \quad \frac{y_2 - y_1}{x_2 - x_1} \]

Substitute (2, 1) for \((x_1, y_1)\) and (2, -4) for \((x_2, y_2)\).

Simplify.

\[ \frac{1 - (-4)}{2 - 2} = \frac{5}{0} \]

Division by zero is undefined.

The slope of the vertical line is undefined.

Special Lines

- The slope of a horizontal line is \[ \text{_________} \].
- The slope of a vertical line is \[ \text{_________} \].

FIND THE SLOPE OF EACH LINE.

f) \( x = 2 \)  
g) \( y + 4 = 0 \)  
h) \( 3x - y = 7 \)

Using slope to graph a line.

1) Plot the given point.
2) Starting at the plotted point, use the slope and move “rise/run” to plot a second point.
3) Repeat.
4) Graph the line.

Graph the line.

i) \((2, -2), m = \frac{1}{4}\)

j) \((-3, 5), m = 2\)

REMEMBER

- If a line SLANTS UPWARD from left to right, it has a \[ \text{_________} \] slope.
- If a line SLANTS \[ \text{_________} \] from left to right, it has a NEGATIVE slope.
More Definitions

- **Parallel lines** – lines that never intersect; have the same slope; symbol is //
- **Perpendicular lines** – lines that intersect at _______ angles (90°)
- **Negative reciprocals** – when the product of two numbers = -1

*Hint: The slope of a line | to another line, is the __________ of the slope of the given line.*

Practice with parallel and perpendicular…

What is the slope of the line parallel and perpendicular to…

- k) \( y = -3x - 5 \)
- l) \( 4x - 2y = 7 \)

Parallel, Perpendicular, or Neither?

- m) line thru (15,9) & (12,-7) and line thru (8,-4) & (5,-20)
- n) line thru \( x + 4y = 7 \) and \( 4x - y = 3 \)

Parallel, Perpendicular, or Neither?

- o) \( x = 6 \) and \( 6 - x = 8 \)

SUMMARY

- The slope of a line represents the rate of change in the x and y values.
- The slope formula is \( \frac{y_2 - y_1}{x_2 - x_1} \)
- Remember special cases!