

Algebra 1: 3.5 Slope-Intercept Form of a line

$$y = mx + b$$

Essential Question: How can you describe the graph of the equation $y = mx + b$?

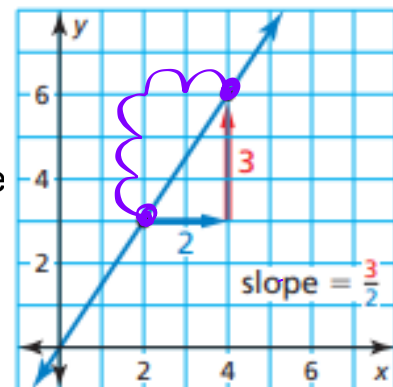
Learning Objectives:

- The student will find the slope of a line
- The student will use slope-intercept form of a line
- The student will use slope and y intercepts to solve real-life problems

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Slope is the **rate of change** between any two points on a line. It is the measure of the **steepness** of the line.

To find the slope of a line, find the **ratio** of the **change in y (vertical)** to the **change in x (horizontal)**.



$$\text{slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x} = \frac{y_1 - y_2}{x_1 - x_2}$$

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The Slope of a Line

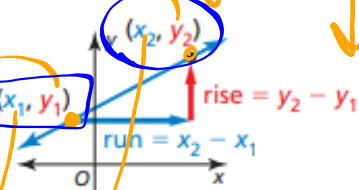
Core Concept

Slope

The **slope** m of a nonvertical line passing through two points (x_1, y_1) and (x_2, y_2) is the ratio of the **rise** (change in y) to the **run** (change in x).

$$\text{slope} = m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$

When the line rises from left to right, the slope is positive. When the line falls from left to right, the slope is negative.



$m = \text{undefined}$

$0 = m$

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Example 1:

Describe the slope of each line. Then find the slope.

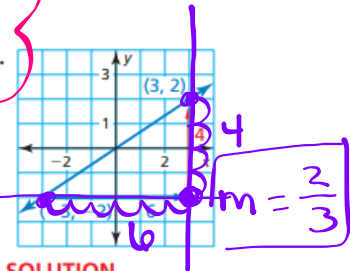
$$m = \frac{\text{rise}}{\text{run}} \frac{\Delta y}{\Delta x}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 2}{-3 - 3}$$

STUDY TIP

When finding slope, you can label either point as (x_1, y_1) and the other point as (x_2, y_2) . The result is the same.

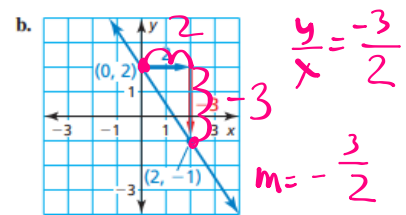
$$m = \frac{4}{6}$$



SOLUTION

a. The line rises from left to right. So, the slope is positive. Let $(x_1, y_1) = (-3, -2)$ and $(x_2, y_2) = (3, 2)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - (-2)}{3 - (-3)} = \frac{4}{6} = \frac{2}{3}$$



b. The line falls from left to right. So, the slope is negative. Let $(x_1, y_1) = (0, 2)$ and $(x_2, y_2) = (2, -1)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 2}{2 - 0} = \frac{-3}{2} = -\frac{3}{2}$$

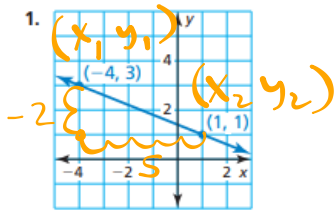
READING

In the slope formula, x_1 is read as "x sub one" and y_2 is read as "y sub two." The numbers 1 and 2 in x_1 and y_2 are called *subscripts*.

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Your Turn:

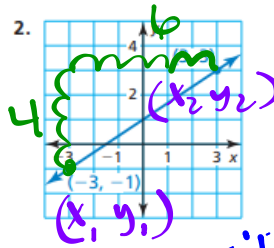
Describe the slope of each line. Find slope by counting. Then verify the slope with the slope formula.



describe: *negative slope*

counting: $m = -\frac{2}{5}$

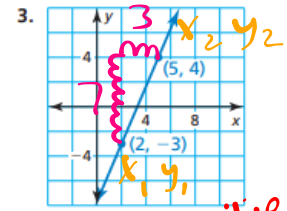
formula: $\frac{1-3}{1-(-4)} = -\frac{2}{5}$



describe: *positive slope*

counting: $m = \frac{4}{6} = \frac{2}{3}$

formula: $\frac{3-(-1)}{3-(-3)} = \frac{4}{6} = \frac{2}{3}$



describe: *positive slope*

counting: $m = \frac{7}{3}$

formula: $m = \frac{3-4}{2-5} = \frac{-1}{-3} = \frac{1}{3}$

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Example 2:

$y = \text{#} + b$

The points represented by each table lie on a line. How can you find the slope of each line from the table? What is the slope of each line?

a. *pos. Range*

x	y
4	20
7	14
10	8
13	2

-3 < 4 > 6
-3 < 7 > 6
-3 < 10 > 6
-3 < 13 > 6

$\frac{\Delta y}{\Delta x} = \frac{6}{-3} = -2$

b. $y = \text{#}$

x	y
-1	2
1	2
3	2
5	2

-2 < -1 > 0
-2 < 1 > 0
-2 < 3 > 0
-2 < 5 > 0

$m = \frac{0}{-2} = 0$

c. $x = \text{#}$

x	y
-3	-3
-3	0
-3	6
-3	9

0 < -3 > -3
0 < -3 > -6
0 < -3 > -3

$m = \frac{\Delta y}{\Delta x} = \frac{\text{#}}{0}$

$0 = \frac{0}{K}$

$\frac{N}{0} = \text{undefined}$

undefined

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Your Turn:

The points represented by the table lie on a line. How can you find the slope of the line from the table? What is the slope of the line?

4.

x	2	4	6	8
y	10	15	20	25

-2 -2 -2
-5 -5 -5

$$m = \frac{-5}{-2} = \frac{5}{2}$$

5.

x	5	5	5	5
y	-12	-9	-6	-3

0 0 0
-3 -3 -3

$$m = \frac{\Delta y}{\Delta x} = \frac{-3}{0} \leftarrow \frac{N}{0}$$

$$m = \text{undefined}$$

3.5 Assignment

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A & B: 1, 2, 5 - 14

C: 1, 2, 5 - 12

Count & Verify

with the formula.

Concept Summary

