Algebra 1 Name: Key

Mrs. Moore/Ms. Paprocki 4.4 Notes

Objective: Find the slope of a line using the slope formula

Slope Formula

WORDS	FORMULA	EXAMPLE
The slope of a line is the ratio of the difference in *y*-values to the difference in *x*-values between any two different points on the line.	If (x_1, y_1) and (x_2, y_2) are any two different points on a line, the slope of the line is $m = \frac{y_2 - y_1}{x_2 - x_1}$.	If $(2, -3)$ and $(1, 4)$ are two points on a line, the slope of the line is $m = \frac{4-(-3)}{1-2} = \frac{7}{-1} = -7$.

Example 1: Use the given points to find the slope of the line containing the points.

$\frac{\Delta y}{\Delta x}$ $\boxed{m = \frac{y_2 - y_1}{x_2 - x_1}}$

a.) (2, 5) & (7, 6) $x_1\ y_1\ x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6-5}{7-2} = \boxed{\frac{1}{5}}$

b.) (-3, 0) & (6, -6) $x_1\ y_1\ x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-6-0}{6-(-3)} = \frac{6}{9} = \boxed{\frac{2}{3}}$

c.) (4, -3) & (8, -3) $x_1\ y_1\ x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3-(-3)}{8-4} = \frac{0}{4} = \boxed{0}$

d.) (2, -7) & (-1, 2) $x_1\ y_1\ x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2-(-7)}{-1-2} = \frac{9}{-3} = \boxed{-3}$

e.) (3, 5) & (3, -2) $x_1\ y_1\ x_2\ y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-5}{3-3} = \frac{-7}{0} = \boxed{\text{undefined}}$

cannot divide by 0

Try it! Find the slope using the formula.

1. $(3,4)$ & $(-4,7)$

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

$= \frac{7-4}{-4-3} = \boxed{\frac{3}{-7}}$

2. $(-2,3)$ & $(-2,-5)$

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

$= \frac{-5-3}{-2-(-2)} = \frac{-8}{0} = \boxed{\text{undefined}}$

3. $(-5,6)$ & $(3,6)$

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

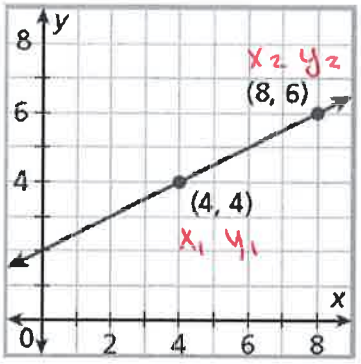
$= \frac{6-6}{3-(-5)} = \frac{0}{8} = \boxed{0}$

Example 2: The graph shows a linear relationship. Find the slope.

1.) Use the two given points.

2.) Use the slope formula to find the slope.

a.)

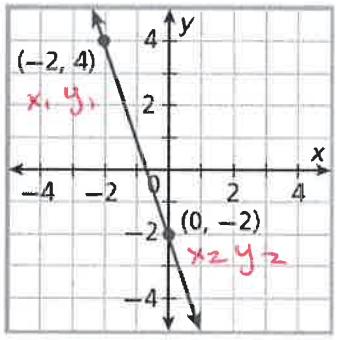


positive!

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

$= \frac{6-4}{8-4} = \frac{2}{4} = \boxed{\frac{1}{2}}$

b.)



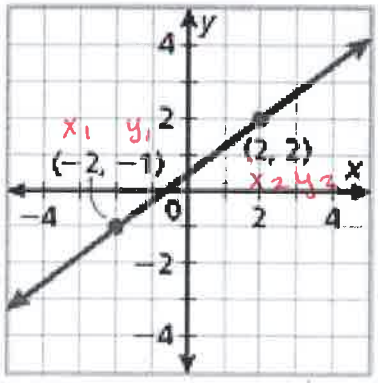
Negative!

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

$= \frac{-2-4}{0-(-2)} = \frac{-6}{2} = \boxed{-3}$

Try it!

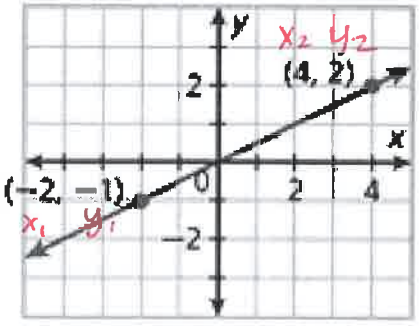
1.



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

$= \frac{2-(-1)}{2-(-2)} = \boxed{\frac{3}{4}}$

2.



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

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

Example 3: The table shows a linear relationship. Find the slope.

1.) Pick any two points.
2.) Write them as ordered pairs.
3.) Use the slope formula to find the slope.

a.)

x	0	2	5	6
y	1	5	11	13

x_1, y_1
$(0, 1)$
$(2, 5)$
x_2, y_2

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

$= \frac{5-1}{2-0} = \frac{4}{2} = \boxed{2}$

b.)

x	−2	0	2	4
y	3	0	−3	−6

x_1, y_1
$(-2, 3)$
$(2, -3)$
x_2, y_2

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

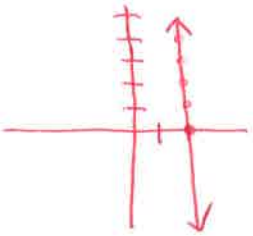
$= \frac{-3-3}{2+2} = \frac{-6}{4} = \boxed{-\frac{3}{2}}$

Try it!

1.

x	2	2	2	2
y	0	1	3	5

x_1, y_1
$(2, 0)$
$(2, 1)$
x_2, y_2



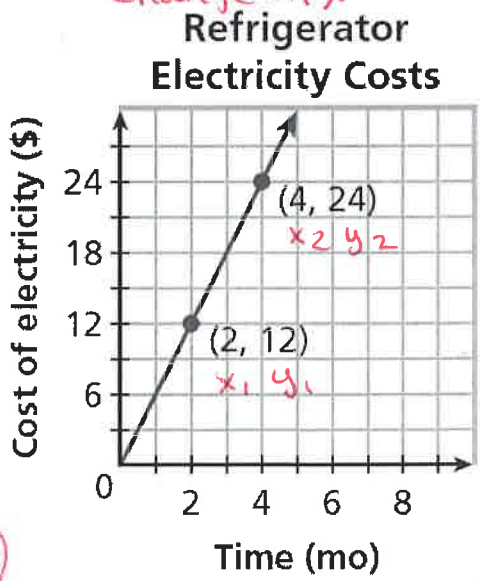
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1-0}{2-2} = \frac{1}{0} =$ **undefined**

Example 4: The graph shows the average electricity costs (in dollars) for operating a refrigerator for several months. Find the slope of the line. Then tell what the slope represents.

change in y / change in x

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

$= \frac{24-12}{4-2} = \frac{12}{2} = \boxed{6}$

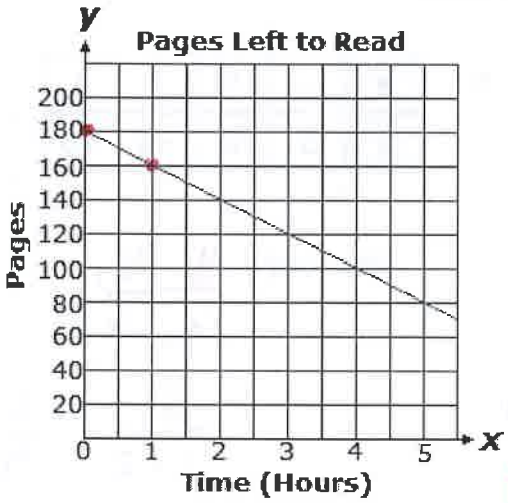


y: cost ($)
x: time (mo)

The cost of electricity increases by $6 per month

Example 1:

Paula has to read a novel for her English class. The graph below represents the number of pages she has left to read after x hours of reading.



x_1 y_1
$(0, 180)$
$(1, 160)$
x_2 y_2

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{160 - 180}{1 - 0} = \frac{-20}{1} = -20$

What is the rate of change of the graph?

The number of pages left decreases by 20 every hour.

Example 2:

From start to finish, Molly can make batches of cookies at a constant rate.

x_1 y_1 x_2 y_2

A linear model of this situation contains the values (2, 50) and (4, 100), where x represents the number of batches of cookies, and y represents the total time, in minutes.

What is the rate of change in this linear model?

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{100 - 50}{4 - 2} = \frac{50}{2} = \boxed{25}$

It takes Molly 25 minutes per batch

Example 3:

Melissa is feeding the ducks at the pond. She is going through her loaf of bread at a constant rate. The table below shows the number of slices of bread remaining in relation to the number of minutes she has been feeding the ducks.

x	Minutes	1	2	3
y	Slices of Bread	33	31	29

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

$= \frac{31 - 33}{2 - 1} = \frac{-2}{1} = \boxed{-2}$

What is the rate of change of the table?

The number of slices of bread decreases by 2 slices per minute