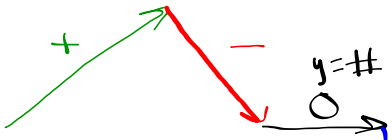
Algebra 1 Unit 2 Linear Functions Notes

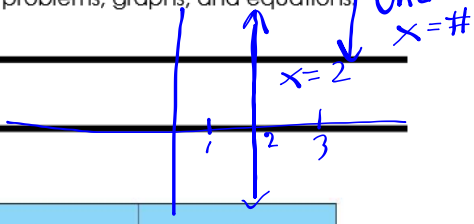
Day 2: Graph Lines, Slope, Rate of Change

What you just calculated was the **slope** of the line. Slope can be described in several ways:

- Steepness of a line
- Rate of change – rate of increase or decrease
- $\frac{\text{Rise}}{\text{Run}}$
- Change (difference) in y over change (difference) in x



Slope can be calculated in several different ways: tables, formulas, word problems, graphs, and equations.



Slope from a Table

a.

x	y
−1	13
0	−2
4	−62
10	−152

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

$m = \frac{-2-13}{0+1}$

$m = \frac{-15}{1}$

$m = -15$

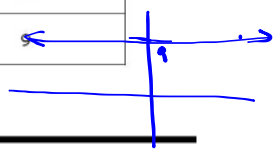
$m = \frac{\Delta y}{\Delta x} = \frac{-2+152}{0-10} = \frac{150}{-10} = -15$

b.

x	y
7	9
18	9
29	9
40	9

$m = \frac{9-9}{18-7}$

$m = 0$



Slope from a Formula

In the above problems with the table, you had to calculate the difference in two y-values first before you calculated the difference in two x-values. This leads us to the slope formula which can be used to calculate the slope of any two points.

Slope Formula

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

where (x_1, y_1) & (x_2, y_2) are coordinate points

Ex. Calculate the slope of two points using the slope formula.

A. (9, 3), (19, -17)

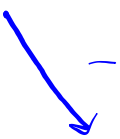
$x_1\ y_1\ x_2\ y_2$

$m = \frac{-17-3}{19-9} = \frac{-20}{10} = -2$

B. (1, -19), (-2, -7)

$x_1\ y_1\ x_2\ y_2$

$m = \frac{-7+19}{-2-1} = \frac{12}{-3} = -4$



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Algebra 1 Unit 2 Linear Functions Notes

Real World Slopes

If a graph, table, equation, or context represents a real world situation, the slope has a meaning that can be interpreted as a rate of change. For the following representations, calculate the slope and interpret it as a rate of change.

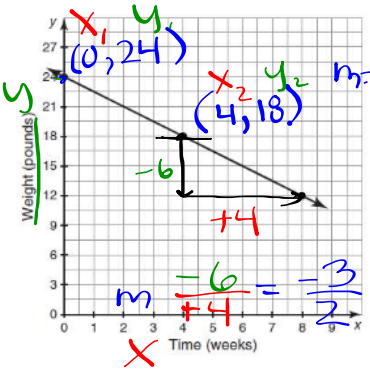
a.

Number of Carnival Ride Tickets	Cost (dollars)
4	9
8	12
16	18
32	30

$\frac{\Delta y}{\Delta x}$ $\frac{6}{8} = \frac{3}{4}$

Slope/Rate of Change: $m = \frac{3}{4} = 0.75$ $0.75 per tix

b.



$m = \frac{18-24}{4-0}$ $m = \frac{-6}{4}$ $m = \frac{-3}{2}$

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

Slope/Rate of Change: $m = -\frac{3 lb}{2 wks}$

c. Bella's Pizza Shop charges $4.50 for a small pizza, $7 for a medium pizza, and $9 for a large pizza. Toppings cost extra depending on the size of the pizza ordered. Grayson ordered a large pizza with three toppings that cost of a total of $12.60. What is the rate of cost per number of toppings for a large pizza?

$9 + 3x = 12.60$

$-9 \quad -9$

$\frac{3x}{3} = \frac{3.60}{3}$

$x = \$1.20$ per topping

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Algebra 1 Unit 2 Linear Functions Notes

Slope from a Graph

When you graph equations, you have to be able to identify the slope and y-intercept from the equation.

Step 1: Solve for y (if necessary)
Step 2. Plot the y-intercept.
Step 3: From the y-intercept, use the slope to calculate another point on the graph.
Step 4: Connect the points with a ruler or straightedge.

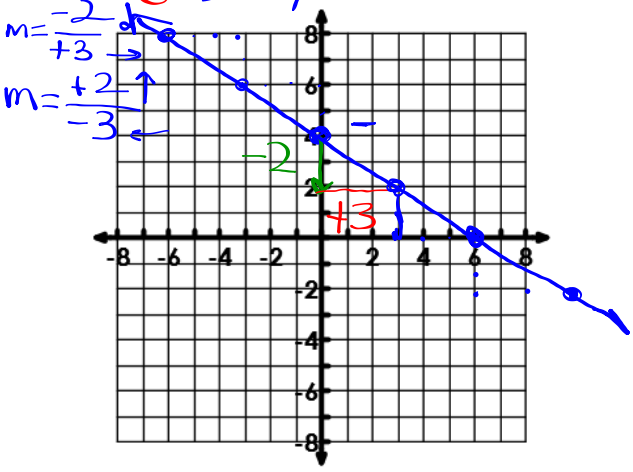
$$\text{Slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{+\uparrow \ -\downarrow}{+\rightarrow \ -\leftarrow}$$

RISE / RUN

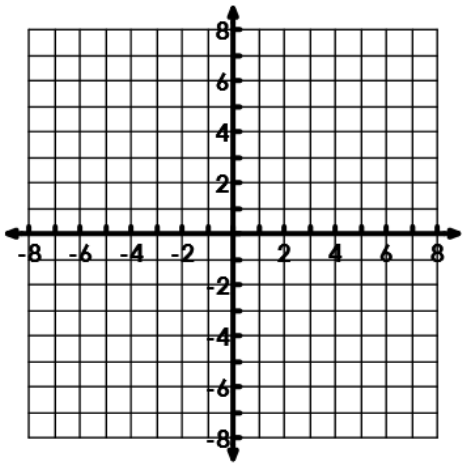
$y = mx + b$ — slope, y-int.

Ex. Graph the following lines:

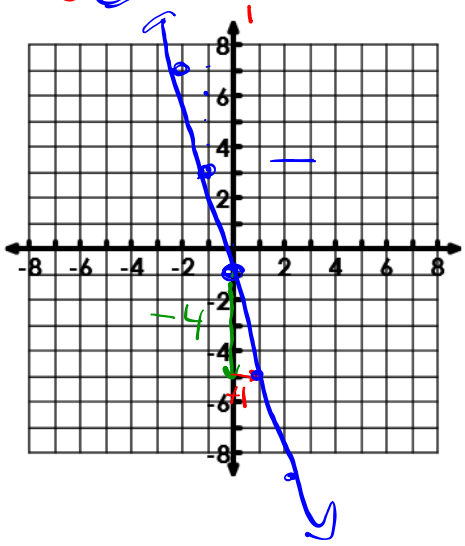
A. $y = -\frac{2}{3}x + 4$ m = $\frac{-2}{+3}$ b = $+4$



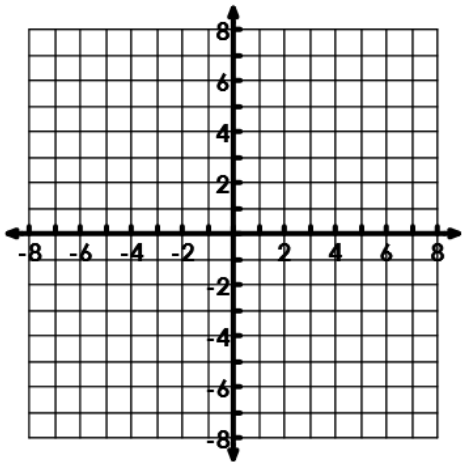
B. $y = 3x + 2$ m = _____ b = _____



C. $y = -4x - 1$ m = $\frac{-4}{1}$ b = -1



D. $y = \frac{5}{3}x - 3$ m = _____ b = _____



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Algebra 1 Unit 2 Linear Functions Notes

Graphing Horizontal and Vertical Lines

Horizontal

$m = 0$

$y = \#$

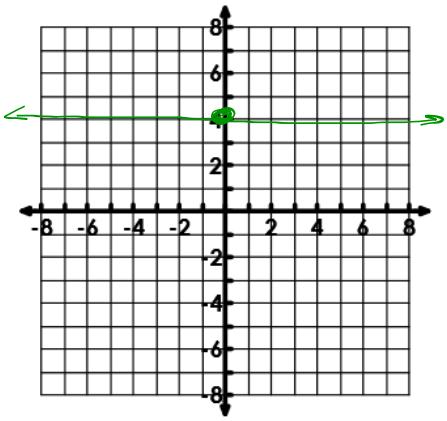
Vertical

Undefined

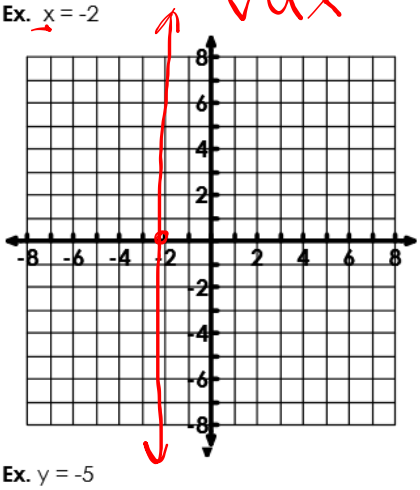
$x = \#$

When graphing horizontal and vertical lines, you will have one variable set equal to a constant. Whatever constant the variable is set equal to represents that value in a coordinate point. For example, if you have y = 2, all coordinate points must have a value of 2 and x can be whatever you want. Pick 3 points to graph the lines below.

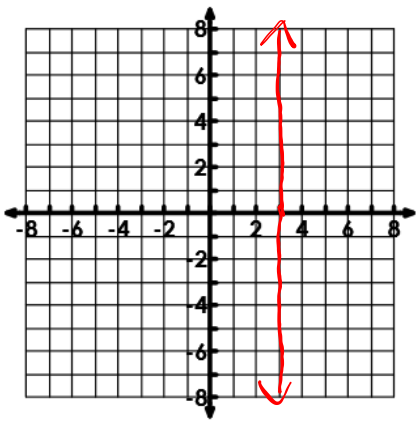
Ex. y = 4



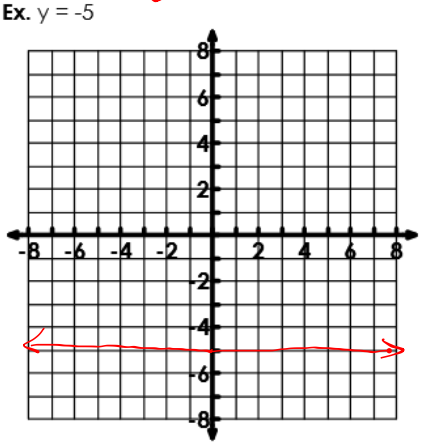
Ex. x = -2



Ex. x = 3



Ex. y = -5



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