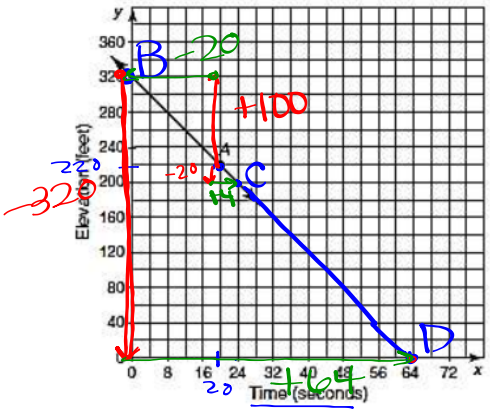
Day 4 – Slope

Scenario: The graph below shows a model of a skier's elevation, over time, while skiing down a hill. Answer the questions below the graph.

rise
run



x y
A: (20, 220)
B: (0, 320)
C: (24, 200)
D: (64, 0)

0 sec

A. What does point A represent?

At 20sec, the skier will be at 220'.

B. At what elevation did the skier start? Label that point B.

320'

C. Label the point (24, 200) with C. What does it represent?

At 24sec, the skier will be at 200'

D. How long would it take the skier to reach the bottom? Draw a line to where the skier finished. Label that point D.

64 sec

E. How many feet did the skier descend down the hill each second? Use the following points to determine:

a. Points B and D

$\frac{-320\text{ ft}}{+64\text{ sec}} = \frac{-5\text{ ft}}{\text{sec}}$

B. Points A and B

$\frac{+100\text{ ft}}{-20\text{ sec}} = \frac{-5\text{ ft}}{\text{sec}}$

C. Points A and C

$\frac{-20\text{ ft}}{+4\text{ sec}} = \frac{-5\text{ ft}}{\text{sec}}$

What did you notice? for a linear function, the slope stays the same

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
- $\frac{\text{Rise}}{\text{Run}} = \frac{\text{up + down}}{\text{subtract}} = \frac{\Delta y}{\Delta x}$
- Change (difference) in y over change (difference) in x

Foundations of Algebra Unit 5: Linear Functions Notes

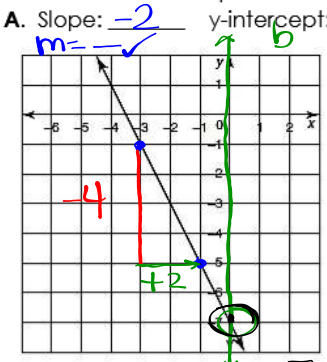
Slope from a Graph

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

Ex. Calculate the slope of each of the graphs.

$y = mx + b$

A. Slope: -2 y-intercept: -7



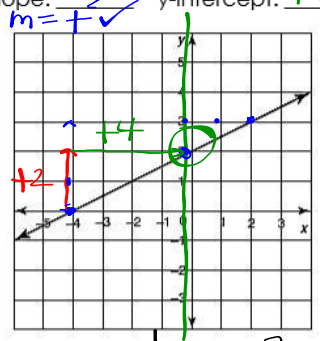
$m = -\frac{4}{2}$ ✓ b

$\frac{\text{rise}}{\text{run}}$

$\frac{-4}{+2} = -2$

Equation: $y = -2x - 7$

B. Slope: $\frac{1}{2}$ y-intercept: $+2$



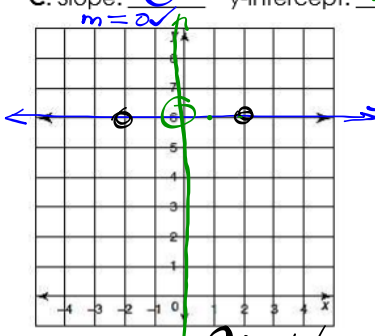
$m = +\frac{2}{4}$ ✓ b

$\frac{+2}{+4} = \frac{1}{2}$ $\frac{+3}{+6} = \frac{1}{2}$

Equation: $y = \frac{1}{2}x + 2$

$y = mx + b$

C. Slope: 0 y-intercept: $+6$

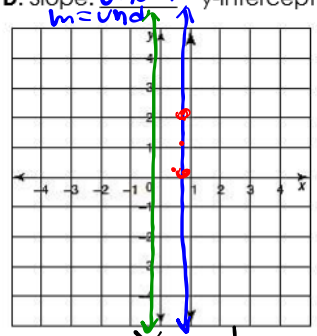


$m = 0$ ✓

$\frac{0}{4} = 0$

Equation: $y = 0x + 6$ $y = 6$

D. Slope: Undef y-intercept: none

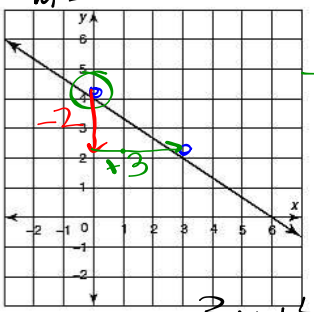


$m = \text{und}$

$\frac{2}{0} = \text{error}$ und.

Equation: $x = 1$

E. Slope: $-\frac{2}{3}$ y-intercept: $+4$

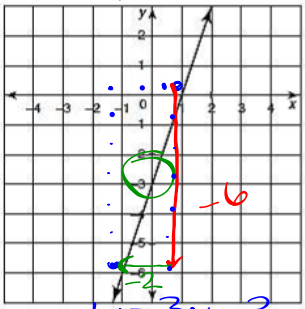


$m =$

$\frac{-2}{+3}$

Equation: $y = -\frac{2}{3}x + 4$

F. Slope: $+3$ y-intercept: -3



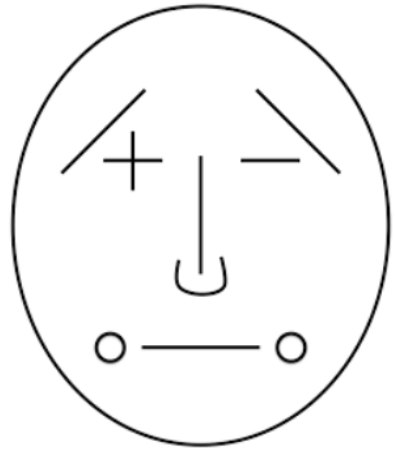
$m = \frac{+3}{+1}$

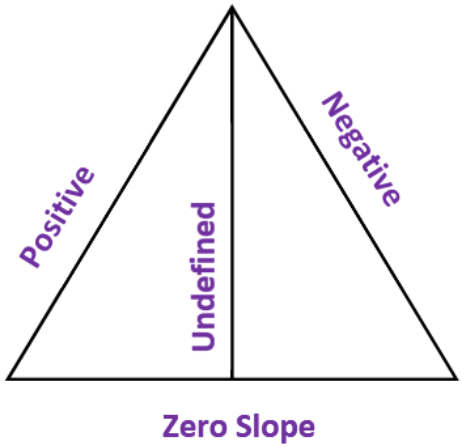
$\frac{-6}{-2} = 3$

Equation: $y = 3x - 3$

Foundations of Algebra Unit 5: Linear Functions Notes

4 Types of Slope





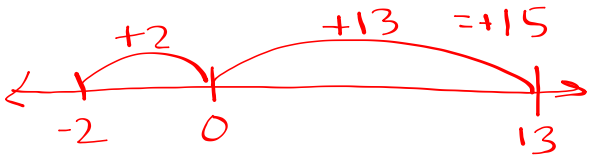
Slope from a Table

Calculate the slope using points in the table from our scenario at the beginning of the lesson. (Remember slope is the change in y divided the change in x.)

$\frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{-100}{+20} = -5$

Time (x)	Elevation (y)
0	320
20	220
24	200
64	0

+20, −100



a.

x	y
−1	13
0	−2
4	−62
10	−152

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

b.

x	y
7	9
18	9
29	9
40	9

+11, +0

$\frac{0}{33} = 0$

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

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

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) $(x_1, y_1)(x_2, y_2)$

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

B. (1, -19), (-2, -7) $x_1\ y_1\ x_2\ y_2$

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