

5.5 Slope

Math 10

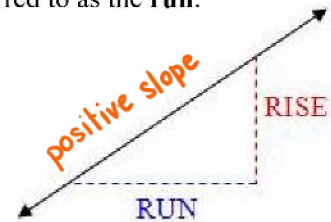
Slope

Name: _____

The **slope**, m , is a measure of the steepness of a line. The vertical distance between two points on the line is referred to as the **rise**. The horizontal distance between the two points is referred to as the **run**.

The slope is calculated as $m = \frac{\text{rise}}{\text{run}}$.

A line rising from left to right has a **positive slope**.
 A line falling from left to right has a **negative slope**.



Example: Calculate the slope of a ramp at a loading dock which rises 2.5 m over a horizontal distance of 4 m.

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{2.5}{4} = 0.625 \quad (\text{no units are ever included with slope})$$

Example: The point (4, 7) is on a line that has a slope of $-\frac{5}{3}$. Find the coordinates of two other points on the line.

rise = -5, run = 3 OR rise = 5, run = -3

$7 - 5 = 2$ $4 + 3 = 7$ $7 + 5 = 12$ $4 - 3 = 1$

new point: (7, 2) new point: (1, 12)

(1, 12) (4, 7) (7, 2) (10, -3)

Given two points on a line, (x_1, y_1) and (x_2, y_2) , the slope can be calculated using the formula:

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

p.132 #2,3,5

Example: Determine the slope of the line passing through the points $(3, 8)$ and $(-7, 3)$.

$$m = \frac{3 - 8}{-7 - 3} = \frac{-5}{-10} = \frac{1}{2}$$

The slope is $\frac{1}{2}$.

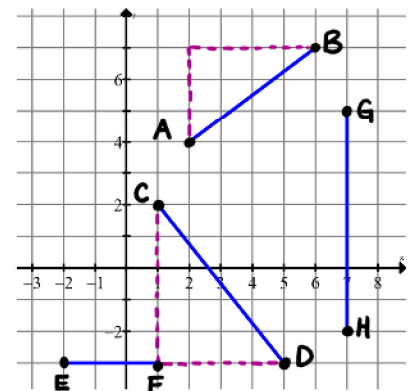
Example: Calculate the slope of each line segment shown on the right.

$$m_{AB} = \frac{3}{4}$$

$$m_{CD} = \frac{-5}{4}$$

$$m_{EF} = \frac{0}{3} = 0$$

$$m_{GH} = \frac{7}{0} \rightarrow \text{undefined}$$



The slope of any horizontal line is 0. The slope of any vertical line is undefined.

p.132 #2,3,5

Rate of change is the change in one quantity relative to the change of another. A rate of change requires units, such as km/h or bpm.

The slope of a graph describes the rate of change.

Example: Speed is an example of rate of change. It is the change in distance divided by the change in time. If Zoe runs 5 km in 20 min, what is her speed?

$$\frac{5\text{km}}{20\text{min}} \div 20 = \frac{0.25\text{km}}{1\text{min}} = 0.25\text{km/min}$$

$$\frac{5\text{km}}{20\text{min}} \times 3 = \frac{15\text{km}}{60\text{min}} = \frac{15\text{km}}{1\text{h}} = 15\text{km/h}$$

both are correct
* could also come up with an answer in terms of m/s.

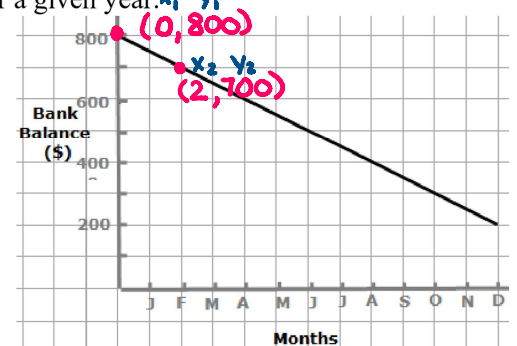
Zoe's speed is 15km/h.

Example: The graph shows the amount of money in an account for a given year.

a) Calculate the slope of the graph.

① Choose two points on the graph. (There are many options on this graph.)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{700 - 800}{2 - 0} = \frac{-100}{2} = -50$$



b) Interpret the slope as a rate of change.

\$50 is being removed from this account each month.

(-\$50/month)

Example: Corbin drives along the highway at a constant speed. When he is 300 km from his destination, there are 80L of fuel in the gas tank. When he is 50 km from his destination, 50L of fuel remain. Calculate the fuel consumption of Corbin's car.

$$\left(\overset{x_1}{300}, \overset{y_1}{80} \right) \quad \left(\overset{x_2}{50}, \overset{y_2}{50} \right)$$

$$\frac{50 - 80}{50 - 300} = \frac{-30}{-250} = 0.12$$

The fuel consumption is 0.12L/km.

Assignment: p. 132 #2, 3, 5, 7, 9, 12