
Unit 3 Part 2: Modelling with Graphs
5.4 Slope as a Rate of Change

Slope as Rate of Change.

Recall that a "rate" is a ratio that includes units.

Rate of change is the change in one quantity relative to the change in another.

A rate of change requires units, such as kilometers per hour.

When a relation is graphed, the **slope describes the rate of change**.

Ex. Sarah runs every morning before school, today she ran 5km in 20 min.

a) Calculate the rate of change of Sarah's distance from her starting point.

b) Graph Sarah's distance as it relates to time.

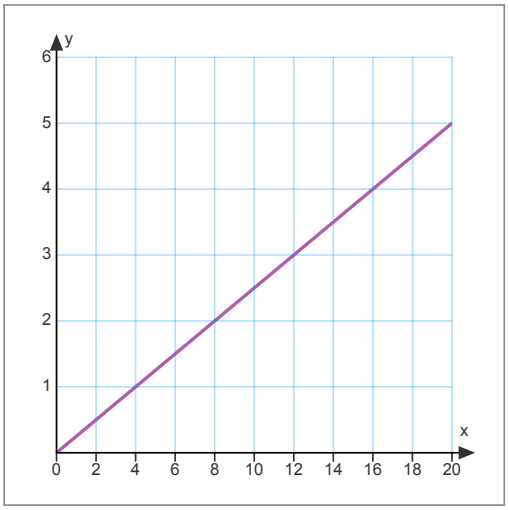
c) Explain the meaning of the rate of change and how it relates to the graph.

Rate of change = $\frac{\text{change in dependent variable}}{\text{change in independent variable}}$

Rate of change = $\frac{\text{change in distance}}{\text{change in time}}$

$= \frac{5}{20}$

$= 0.25$



∴ **Sarah's rate of change is 0.25 km/min. This represents her average running speed. It is also the slope of the graph!**

Example 2: The graph shows the volume of gasoline remaining in a car's tank.

a) Calculate the slope of the graph.

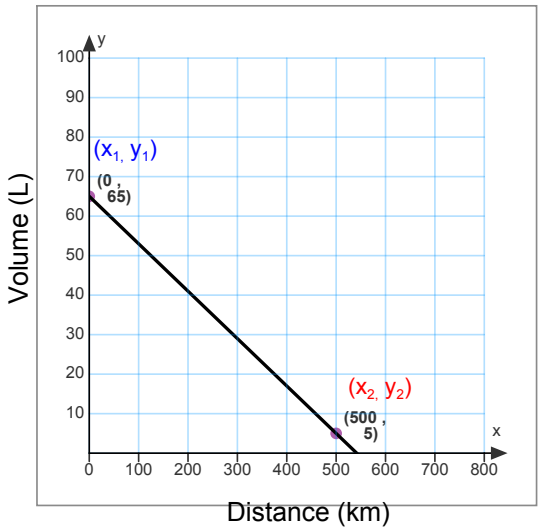
b) Interpret the slope as a rate of change.

Sometimes it can be difficult to read the change from a graph. There is a formula that we can use as long as we know two points on the graph:

$m = \frac{rise}{run}$ can be written as $m = \frac{y_2 - y_1}{x_2 - x_1}$

(x_1, y_1) stands for the coordinates of the first point.

(x_2, y_2) stands for the coordinates of the second point.



$$m = \frac{rise}{run}$$
$$= \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{5 - 65}{500 - 0}$$
$$= \frac{-60}{500}$$
$$= -\frac{3}{25}$$
$$= -0.12$$

The rate of change of the volume of gasoline is -0.12L/km. The car uses an average of 0.12L of gas per km driven. The rate of change is negative because the volume of gasoline in the tank is decreasing.

c) Determine the equation of the line in the form y = mx + b

m =
b =

equation is: