

MTH1W Grade 9 Mathematics

Unit 3 Review

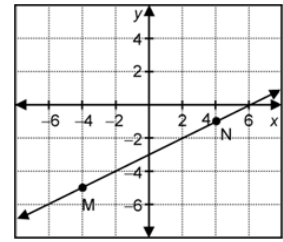
Goal(s) - *To brush up on a few things you may need for the assessment!*

Linear Relationships

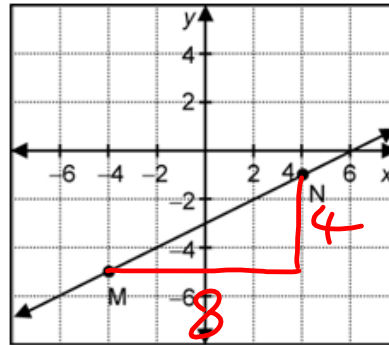
A linear relationship is a relationship between two variables:

- the **independent variable**
 - can be any value
 - left-most column of a table of values
 - horizontal axis on a graph
- the **dependent variable**
 - changes as the independent variable changes
 - right-hand column of a table of values
 - vertical axis on a graph

The graph of a linear relationship is of a straight line because it has a **constant rate of change**.



The **rate of change** can be determined from a graph by comparing the **vertical change (count up/down)** to the **horizontal change (count right)**.



$$\begin{aligned} \text{Rate of Change} &= \frac{\text{rise}}{\text{run}} \\ &= \frac{4}{8} \\ &= \frac{1}{2} \end{aligned}$$

A linear relationship can be represented in a table of values. We can determine whether a relationship is linear or not, by calculating the **first differences** (*differences between consecutive y-values in a table with evenly spaced x-values*).

x	y	1st Differences
-2	6	
-1	8	
0	10	
1	12	
2	14	

The **rate of change** of a linear relationship can be determined from a table of values by comparing the **first differences** to the change in **x-values**.

x	y	1st Differences
-2	6	$8 - 6 = 2$
-1	8	$10 - 8 = 2$
0	10	$12 - 10 = 2$
1	12	$14 - 12 = 2$
2	14	

$$\text{Rate of Change} = \frac{\text{1st Differences}}{\text{Change in x-values}}$$

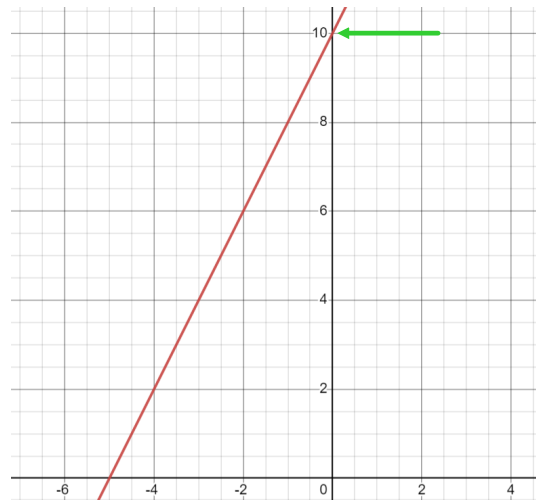
The **rate of change** can be determined from a statement by identifying the independent and dependent variable and expressing it as a **rate**. Where possible, express as a unit rate.

A canoe rental costs \$75 for a 3 hour rental.

$$\begin{aligned}\text{Unit rate} &= \frac{\$}{\text{time}} \\ &= \frac{75}{3} \\ &= \$25/\text{hour}\end{aligned}$$

The **initial value** of a linear relationship is the value of the dependent variable when the value of the independent variable is 0. It is also the point where the line crosses the vertical axis on the graph.

x	y
-2	6
-1	8
0	10 ←
1	12
2	14



Linear relations can be modelled algebraically using equations of the form:

$$\text{dependent variable} = \text{initial value} + (\text{rate of change})\text{independent variable}$$

A linear relation's initial value and rate of change can be determined from its graph, table of values, equation and word description.

Solving Equations

solve - find the value of the variable that makes the equation true

(LS = RS)

solve by isolating the variable - collect variable terms on one side of the equation; collect constant terms on the other side

- always look to see if the expression can be simplified first
- use opposite operations to undo what has been done to the variable
- undo using reverse BEDMAS (SAMDEB)
- maintain balance → whatever is done to one side of the equation MUST also be done to the other side

$$2w + 4 = w - 8$$

$$2w + 4 - w = w - 8 - w$$

$$w + 4 = -8$$

$$w + 4 - 4 = -8 - 4$$

$$w = -12$$

Check

$$2(-12) + 4 = -12 - 8$$

$$-24 + 4 = -20$$

$$-20 = -20$$

$$LS = RS \checkmark$$

$$-3q - 9 = 18 + 6q$$

$$-3q - 9 + 3q = 18 + 6q + 3q$$

$$-9 = 18 + 9q$$

$$-9 - 18 = 18 + 9q - 18$$

$$\frac{-27}{9} = \frac{9q}{9}$$

$$-3 = q$$

Check

$$-3(-3) - 9 = 18 + 6(-3)$$

$$9 - 9 = 18 - 18$$

$$0 = 0$$

$$LS = RS \checkmark$$