<table>
<tr><td>SUBJECT and GRADE</td><td colspan="2">TECHNICAL SCIENCE Grade 11</td></tr>
<tr><td>TERM 1</td><td colspan="2">Week 4</td></tr>
<tr><td>TOPIC</td><td colspan="2">DIRECT and INVERSE PROPORTION GRAPHS</td></tr>
<tr><td>AIMS OF LESSON</td><td colspan="2">At the end of the lesson, you should be able to:
• Define direct and inverse proportion
• Draw graphs that demonstrate the two types of proportions
• Identify the factors/conditions for direct or inverse proportion
• Relate proportions to applications in technology.</td></tr>
<tr><td rowspan="2">RESOURCES</td><td>Paper based resources</td><td>Digital resources</td></tr>
<tr><td>Technical Sciences Gr 11 Textbook Page17 to 24</td><td>https://youtu.be/6ThUB1bKhhM
https://www.khanacademy.org/commoncore/grade-7-RP#7.RP.A.2a</td></tr>
<tr><td>INTRODUCTION</td><td colspan="2">In order to understand relationships depicted in graphs, you must a have thorough knowledge of variables.

<u>Three variables:</u>
Dependent variable, independent variable and a controlled (or constant) variable.

<u>The independent variable</u>
Is the variable that is being manipulated and changed at constant intervals.
It is plotted on the x-axis on a Cartesian plane.

<u>The dependent variable</u>
The variable that responds to the independent variable.
It is dependent on the changes made to the independent variable
It is plotted on the y-axis of the Cartesian plane.

<u>The controlled (or constant) variables</u>
The variables that will be fixed and kept constant throughout the investigation in order to get fair results.</td></tr>
<tr><td>CONCEPTS AND SKILLS</td><td>Proportion: is used to show how quantities and amounts are related to each other. The amount that one quantity changes in relation to another quantity is governed by proportion rules.

Proportionality: A relationship between two parts that are in proportion.</td><td>CAN YOU?
Define direct proportion?

Identify the graph for direct proportion?</td></tr>
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Recall:
The **origin** of the Y- and X-axes with coordinates (x;y)/(0;0) in the Cartesian plane.

Variables are: x and y and have a special relationship, i.e. proportionality relationship.

Here, we will concentrate on the linear relationship where:
1.the straight line
2. passes through the origin in the Cartesian plane
3.and the constant has the same effect on both variables

This linear relationship in which the straight line passes through the origin is called a:
DIRECT PROPORTION:
The relationship between two variables when their ratio is equal to a constant value.

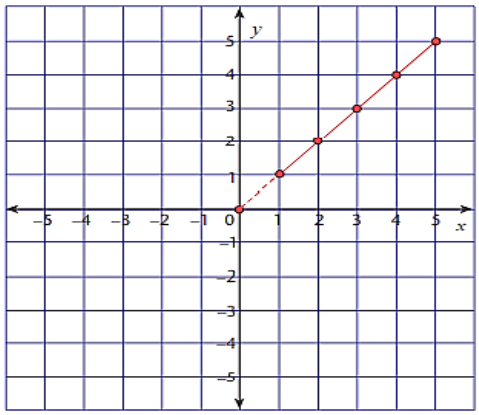
In a direct proportionality the two variables are directly proportional if they increase or decrease at the same rate.
y is directly proportional to x, if the ratio y : x is constant.

The ratio x:y is 1 in the table below and it remains constant.

x	y	y:x
1	1	1
2	2	1
3	3	1
4	4	1
5	5	1
6	6	1

Direct proportionality is depicted in the table above.

The graph will look as follows:



CAN YOU?
Draw proportion graphs.

Note: If the graph is extended so that it cuts the axes, it will pass through the **origin.**

Mathematically this is written as: $y \propto x$

Whenever you have a direct proportion as stated above you can change it into an equation by using a proportionality constant: **y = kx**

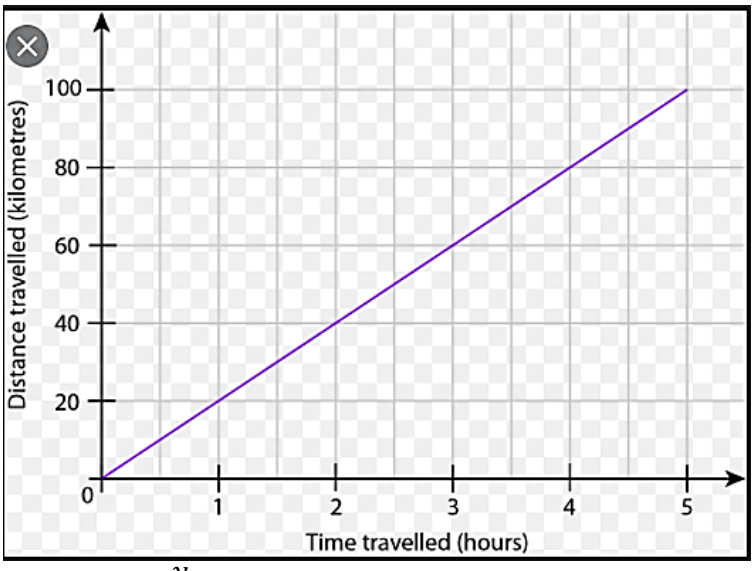
You remember that any linear relationship can be represented by **the linear equation**:

y = **m**x + **c**

In this situation, the graph runs through **c = 0,** so:

for DIRECT PROPORTION y = mx

In direct proportion, we want to be able to determine how one changing variable(**independent**) influences the other variable(**dependent**).



m = $\frac{y}{\dot{x}}$ = k

In the graph above **m = 20**

y = mx (y=kx ; k is a constant)

y =20x

This factor can be used to determine the time it will take to cover a distance of 120 km, 140 km, etc.

This factor is called the **proportional constant.** In the equation, m is the proportional constant/factor/slope.

Therefore for direct proportion, divide the two variables…if the answer is the SAME(constant), it is a direct proportion.

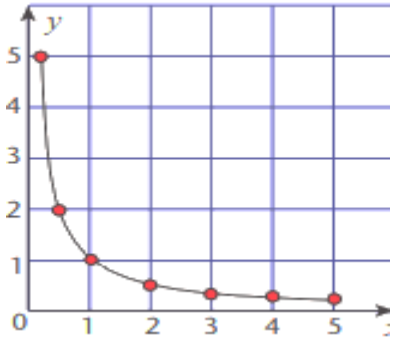
So: $\frac{y}{x}$ = **20** [**OR** y =2**0.**x]
That means it will take 6 hours to cover 120 km.

m Also represents the gradient of the graph:
m = $\frac{y2-y1}{x2-x1}$

Inverse proportionality
Generally, y is said to be inversely proportional to x if x increases and y decreases.
Y must be decreasing by the same rate at which x is increasing, such that the <u>product</u> of x and y is constant as in the table below.

x	y	xy
1	1	1
2	0,5	1
3	0,33	0,99 = 1
4	0,25	1
5	0,5	1

The product, xy, is constant. Thus, y is inversely proportional to x. The graph will be a hyperbola as depicted below.



The general equation xy = k, where k is a proportionality constant
Thus: $x_1y_1 = x_2y_2$.

This relationship between x and y is written mathematically as: $y \propto \frac{1}{x}$ which reads: y is inversely proportional to x.

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<tr><td></td><td>Thus: Two variables are inversely proportional if:
• the values of y must decrease by the same factor at which the values of x are increasing
• the graph of y versus x must be a hyperbola, that does not intersect with the axes.</td><td></td></tr>
<tr><td>ACTIVITIES/
ASSESSMENT</td><td colspan="2">Exercise 1.5 Page 22 to 24
Nr 1.1 to 1.4
Nr 2.1 to 2.6

<u>Additional activity</u>
1. Identify all the direct proportion data tables: pg. 22 Ex1.5 no.1
2. Identify all the direct proportion graphs: pg. 23-24 no.2.1 – 2.6
3. With the help of the data in the tables, 2.2 and 2.3 Explain why this data does not satisfy direct proportion conditions.
4. Why does table 2.4 satisfy direct proportion conditions. pg22-24

5. Pg 22: 1.1
5.1 Round off the weight values to the nearest ten.
5.2 Rewrite the table with the new values of weight.
<table><tr><td>Mass(kg)</td><td>Weight(N)</td></tr><tr><td>1</td><td></td></tr><tr><td>5</td><td></td></tr><tr><td>8</td><td></td></tr></table>
5.3 DRAW a graph represented by this data. [scale Mass (X):1cm=1kg Weight (y) : 1cm =10 N
From the graph, calculate the proportionality constant(k)

5.4 Write the defining equation of this linear relationship.</td></tr>
<tr><td>CONSOLIDATION</td><td colspan="2">By now you should be able to recognize direct and inverse proportions and be able to draw the representative graphs and to interpret these graphs.</td></tr>
<tr><td>VALUES</td><td colspan="2">Working with proportions stimulates creative thinking, so give it your best shot.</td></tr>
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