

## SESSION 3: GRAPHS THAT TELL A STORY

### KEY CONCEPTS:

- Line Graphs
  - Direct Proportion
  - Inverse Proportion
- Tables
- Formulae

### X-PLANATION

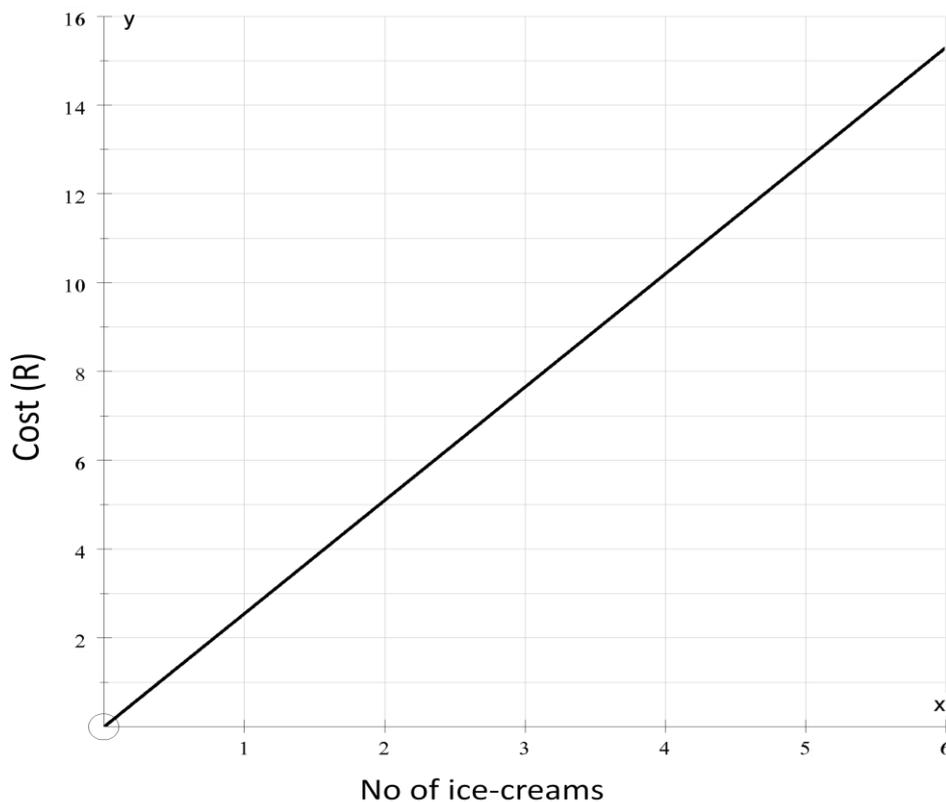
#### 1. DIRECT PROPORTION

Two quantities are said to be in direct proportion if as the one quantity increases (or decreases) the other quantity increases (or decreases) by the same ratio. When two quantities are directly proportional then the ratio of any two pairs of quantities will be equal.

#### Example:

- i) 1 ice-cream cone costs R2,55  
 2 ice-cream cones cost R5,10  
 5 ice-cream cones cost R12,75

As you can see from the prices and the graph below that the cost of a cone stays the same no matter how many cones we buy, ie this is in direct proportion.



## 2. INVERSE PROPORTION

Two quantities are said to be in inverse proportion if as the one quantity increases (or decreases) the other quantity decreases (or increases) by the same ratio. When two quantities are inversely proportional then the product of any pair of quantities is always constant.

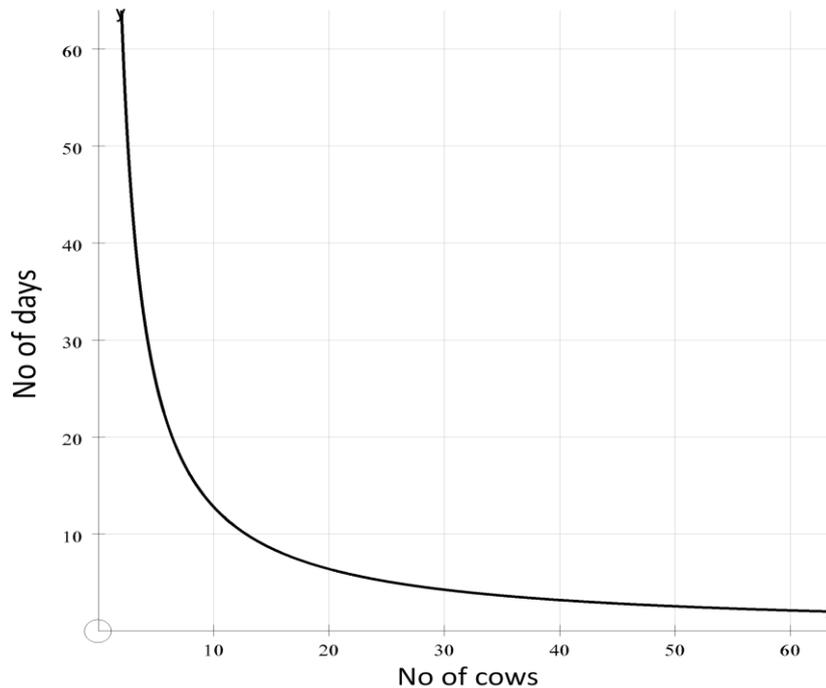
### Example:

- i) A farmer has enough food to feed 64 cows for 2 days. How long will the food last if we change the number of cows.

Cows	64	32	16	8	4	2
Days	2	4	8	16	32	64

Look at the table and the graph below carefully do you see that if you halve the number of cows you double the number of days? We can now see what inverse proportion is all about.

We can also look at the product of the pairs and notice that  $64 \times 2 = 128 = 32 \times 4$  therefore the number of cows and the number of days are inversely proportional to each other.



### 3. HINTS FOR DRAWING GRAPHS

When drawing graphs you need to keep the following in mind.

- a) In order to draw a graph we need points to plot. These points are called the co-ordinates. To keep our co-ordinates organised in Mathematical Literacy we will always use a table.

Example:

No of Choc	1	2	5	10
Cost (R)	R4,50	R9,00	R22,50	R45,00

- The independent variable is plotted on the  $x$  axis (horizontal axis), in this case no of choc, as these values can be chosen at random.
  - The dependent variable is plotted on the  $y$  axis (vertical axis), in this case cost ( $r$ ), as these values depend on the  $x$  axis.
- b) Choose your scale carefully. Look at the highest and lowest values that need to be plotted in order to determine the scale.
- c) It is very important that once you decide on the intervals of the scale, they must remain constant.
- d) It is not necessary for you  $x$  axis to have the same intervals or scale as the  $y$  axis.
- e) Don't forget to label your axes.
- f) Use a ruler to plot the points and connect the points if the data allows to create the graph.
- g) When drawing a straight line graph you can only join the points if the data is continuous and not discrete e.g. if the independent variable is "number of people" we can't have half a person. In this case the dots must be joined using a broken line graph.
- h) When drawing more than one graph on the same set of axes don't forget to label the graphs.
- i) When drawing a bar graph you must have a space between the  $y$  axis and the first bar.

### 4. INTERPRETING GRAPHS

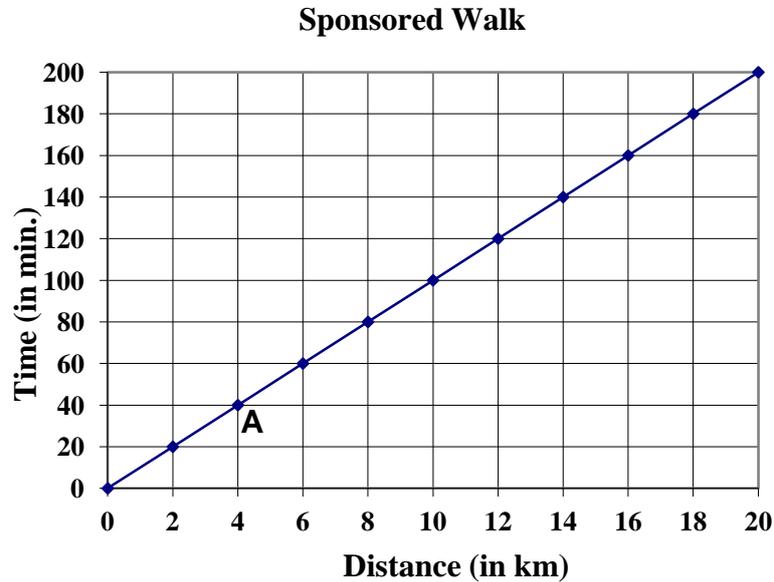
The following information will help you interpret graphs.

- a) Always use a rule to help you read values off the graph
- b) When you are looking at two line graphs on the same set of axes the point of intersection (where the two graphs cross) is where the two graphs are equal.
- c) When dealing with income and expense graphs the point of intersection will be the break even point – where the amount of income is equal to the expenses.

**X-AMPLE QUESTIONS:**

**Question 1:**

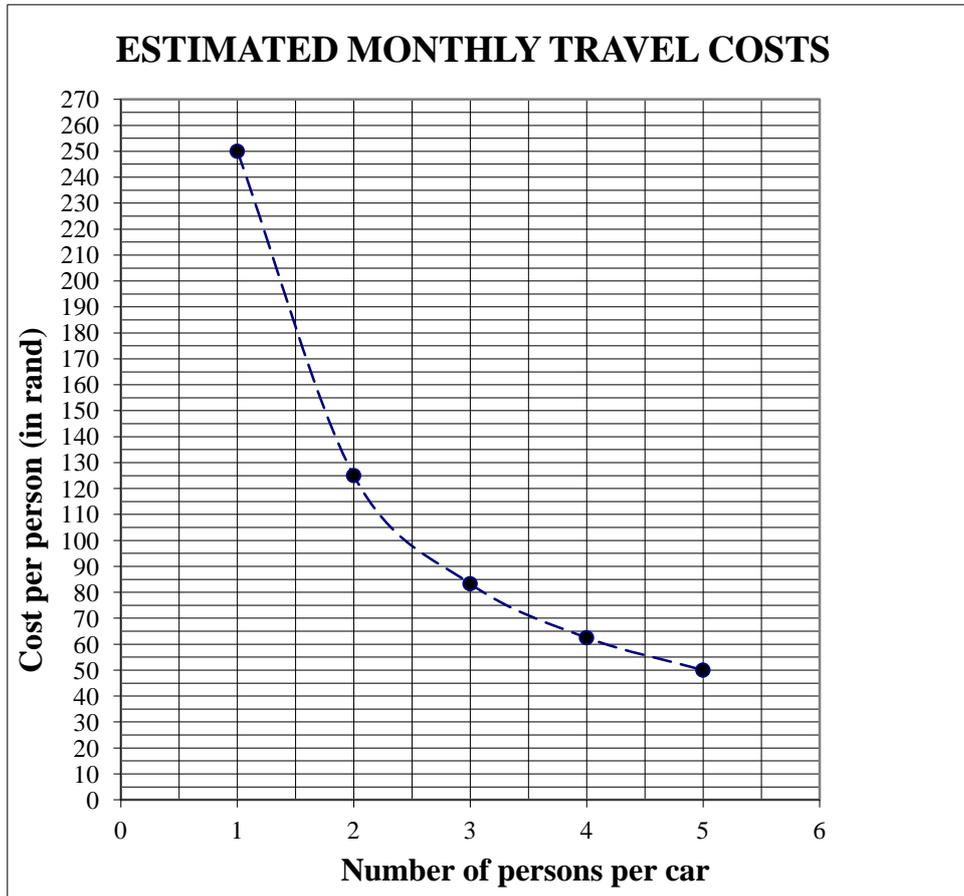
The graph below shows Taki's progress during s sponsored walk.



- a) What was the total distance of the sponsored walk? (1)
- b) How many minutes did it take Taki to do the following:
  - i) Reach point A? (1)
  - ii) Cover 10km? (2)
  - iii) Cover 15km? (2)
- c) Calculate the time (in hours) that Taki took to complete the race. Round off the answer to ONE decimal place. (3)
- d) Determine Taki's average walking speed in km/min. (3)
- e) Taki completed the walk in 200 minutes. The winner completed the walk in 80% of Taki's time. Calculate the time taken by the winner to complete the walk. (2)

**Question 2:**

A group of colleagues work for the same company. They want to organise a car pool so that they can travel together to help to reduce traffic congestion on the road. The estimated cost per person is shown in the graph below.



- What is the monthly transport cost if there is one person in the car? (1)
- How much would each person pay per month if there were 2 people in the car? (1)
- If each person pays R50 per month, how many people are there in the car? (1)
- Explain what happens to the travelling cost per person, if the number of people in the car is increased. (2)

**Question 3:**

Thembi prices her catering for functions at R30 per head.

The table below shows the cost for catering for various number of people

Number of people (N)	1	2	5	10	iii)	iv)	N
Cost for catering (C)	R30	R60	i)	ii)	R750	R900	v)

- Complete the missing values i) to v) in the table. (10)
- Name the dependant and independent variables. (2)

- c) Use the table to draw a line graph on the paper provided. The x axis represents N and must increase from 0 to 30 in 5 unit spaces and the y axis represents C and must increase from 0 to 900 in spaces of 50 units. (5)
- d) If it costs Thembi R27,43 per person, how much profit does she make if 100 people are catered for? (3)

**Question 4:**

Thuli fell off her horse and broke her leg very badly. She has to use a wheelchair until she can walk again. She can hire a wheelchair from Co-med Suppliers or from H.E.L.P Medical Suppliers. The tariffs are set out in the table below.

Co-med Suppliers	H.E.L.P Medical Suppliers
• Basic minimum charge R150	• Basic minimum charge R220
• R21 per day	• R16 per day

- a) Write an equation for calculating the Cost (C) when hiring the wheelchair for (d) days from Co-med Suppliers. (2)
- b) Calculate the cost of hiring a wheelchair for 14 days from H.E.L.P Medical Suppliers. (2)
- c) Use the information in the table above to calculate the missing values in the table below:

Number of days wheelchair is needed	0	5	10	15
Cost of hiring from Co-med Suppliers	R150	R255	(C)	R465
Cost of hiring from H.E.L.P Medical Suppliers	(A)	(B)	R380	(D)

- d) Use graph paper to draw two line graphs on the same set of axes showing: (7)
- i) the number of days (independent variable) against the cost if the wheelchair (dependent variable) hired from Co-med Suppliers. (5)
- ii) the number of days (independent variable) against the cost if the wheelchair (dependent variable) hired from H.E.L.P Medical Suppliers. (2)
- iii) What is the break-even point? What does this value represent? (2)