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SESSION 1: GRAPHS

Key Concepts

In this session we will focus on summarising what you need to know about:

- Drawing graphs
- Interpreting graphs
- Simultaneous equations
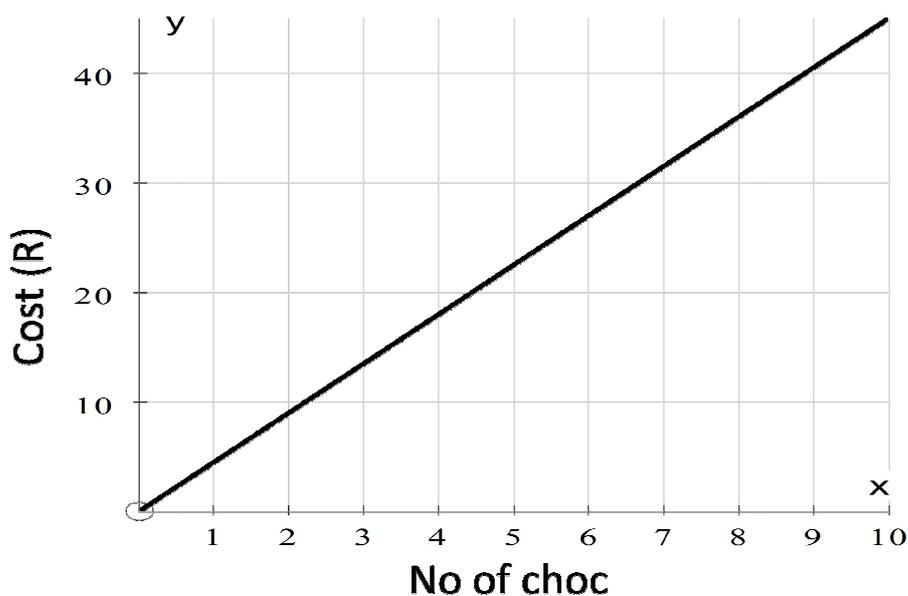- Profit, loss and break even

X-planation

1.   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 your 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.

2. 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 breakeven point – where the amount of income is equal to the expenses.

3. SIMULTANEOUS EQUATIONS

Simultaneous equations are usually dealt with graphically, i.e. you will be given or asked to draw two graphs on the same set of axes; the point where they intersect (cross) is the point where the equations are equal.

The best example of this and the one seen most often is a graph showing the income versus expense of a company, which then shows us the profit, loss and break even points.

4. PROFIT, LOSS AND BREAK EVEN

In order for a business to do well they need to be in control of their income and their expenses. Income – Expenses = Profit. The goal of every business is to make the maximum profit.

- If the income is more than the expenses, the business makes a profit.
- If the income is less than the expenses, the business makes a loss.
- If the income is exactly the same as the expenses, the business breaks even.

X-ample Questions

Question 1

The matriculants of Malendela High are planning a matric farewell function and have a choice between their school hall and the Central Hotel as a venue.
If their school hall is used, the caterers will provide the food and table decorations as well as the music at a cost of R110 per person.

TABLE 1: Cost of using the school hall

Number of tickets sold	0	10	25	40	80	100
Cost in rand	0	1 100	2 750	4 400	8 800	11 000

The Central Hotel quotes a basic cost of R2 400 which covers the cost of the music and decorations. An additional charge of R50 per person for food will be levied.

TABLE 2: Cost of using the Central Hotel

Number of tickets sold	0	10	20	40	50	100
Cost in rand	2 400	2 900	3 400	4 400	4 900	7 400

Use TABLE 1 and TABLE 2 to answer the following questions:

a) Determine the total cost if 50 tickets are sold for the function in their school hall. (3)
b) Write down the following:
   i)   The number of tickets sold when the cost for the two venues is the same.   (2)
   ii) The corresponding cost.   (1)
c) Calculate the number of ticket sold if the cost of hiring the Central Hotel is
    R8 400.   (3)
d) Use the grid provided to draw two graphs using the data in TABLE 1 and
    TABLE 2.   (6)
e) If there were 30 matriculants and each one brings a date to the function,
    which hall should they use? Justify your answer.   (2)

Question 2

Mr Ndlovu has been given permission to sell stationery packs at Freedom High
School at the beginning of the school year. He has to give the school a once-off payment
of R800 for the right to sell the stationery at the school.
He buys the packs from a wholesaler who charges R100 per pack (including VAT)
if 50 or less packs are bought, and 10% less if more than 50 packs are bought.
He intends selling the stationery packs to the learners at R140 a pack.

a) Write down Mr Ndlovu's fixed cost.   (1)
b) Calculate the price of a pack when more than 50 packs are bought.   (2)
c) Mr Ndlovu wants to draw two graphs to illustrate his income and expenses on
    the same system of axes.

The tables below illustrate Mr Ndlovu's total income and total cost for different numbers of stationery packs.

TABLE 3: Income of stationery packs

Number of packs bought	0	30	50	60	80	100
Total income in Rand	0	4 200	7 000	8 400	11 200	14 000

TABLE 4: Cost of stationery packs

Number of packs bought	0	30	50	60	80	100
Total costs in rand	800	3 800	5 800	6 200	A	B

    i)   Use the given information to calculate the missing values A and B in the table.

            (4)

    ii)   Use the grid provided and the values from TABLE 3 and TABLE 4 to draw the graphs to illustrate Mr Ndlovu's income and expenses for the different numbers of stationery packs bought.   (6)

d) Use the graph to determine the following:
    i)   How many stationery packs Mr Ndlovu must sell to break even?   (1)
    ii)   The profit he made if all 100 packs of stationery were sold .   (3)

e) Mr Ndlovu only sold 80 of the 100 packs he bought.
    i)   Suppose he keeps the 20 packs that were not sold. How much profit would he make now?   (4)
    ii)   Suppose the wholesaler agrees to buy back the packs that were not sold at 80% of the cash price paid by Mr Ndlovu. Determine how much profit Mr Ndlovu would now make if he sold the 20 packs to the wholesaler.   (5)

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X-ercise

Question 1

A certain company wants to get three of their staff members each a cell phone that will be used during office hours. The director of the company is investigating two package deals which include the following:

> **PACKAGE 1**
> No monthly contract
> Peak calls – R2,40 per minute or part thereof
> Off-Peak calls – R1,20 per minute or part thereof
>
> **PACKAGE 2**
> A monthly contract cost of R150
> Peak Calls – R1,80 per minute or part thereof
> Off-Peak calls – R0.90

a) Would the cost of the Off-Peak calls be of any interest to the director? Explain your answer. (3)
b) Consider the graph below which illustrates the costs involved during peak time with the two packages for each phone.
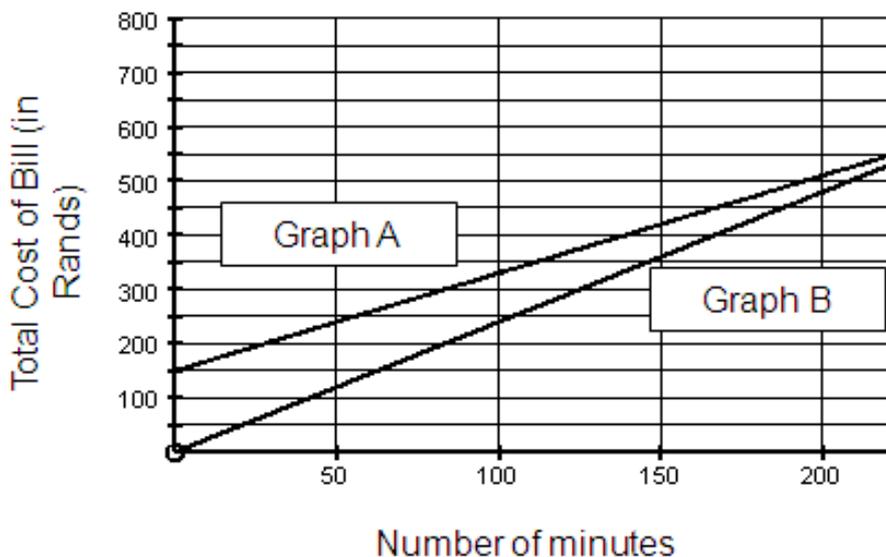
i) Both graphs are straight lines. Explain the reason for this. (2)
ii) Which package is illustrated by graph A? Explain your reasoning. (2)
iii) Package 1 can be described as $Cost = R2,40 \times number\ of\ \min$. Write an equation that describes package 2. (3)
iv) Using the two equations, accurately determine the number of minutes that need to be used for the break-even point to be reached. (3)

v) The company has a policy that all the staff must use the same package.
The director decides to use package 2 for each of his three staff members.
At the end of the month, he analyses how many minutes worth of calls each
member has made and finds the following:

- Staff member 1 – 143 minutes
- Staff member 2 – 267 minutes
- Staff member 1 – 301 minutes

With the use of calculations, determine whether the director of the company
made the correct decision. (10)