



Mathematical Sciences: MMSC4

LESSON 5

UNIT STANDARD: 7452

Topic: Describe, Represent and Interpret Mathematical Model

By the end of this lesson, you should be able to:

- Collect, use and communicate data
- Identify dependent and independent variable i.e. input and output values
- Use mathematical models to describe relationship between quantities in a variety way

1. INTRODUCTION

- Dependent variable is a variable whose value depends on that of another, which is denoted by y
- Independent variable is a variable whose variation does not depend on that of another, which is denoted by x

2. USE TABLES TO DESCRIBE RELATIONSHIPS

Given the tables below, describe the relationship between the two variables (x ; y)

x	1	2	3	4	5	6	7	8	9
y	2	4	6	8	10	12	14	16	18

Answer

We can describe the above table as follows:

$$\text{When } x = 1: y = 2$$

$$x = 2: y = 4 \text{ and so on}$$

Therefore, we can describe that $y = 2(x)$

x	1	2	3	4	5	6	7	8	9
y	3	5	7	9	11	13	15	17	19

Answer

We can describe the above table as follows:

$$\text{When } x = 1: y = 3$$

$$x = 2: y = 5 \text{ and so on}$$

Therefore, we can describe that $y = 2(x) + 1$



WORKED EXAMPLES

Determine the unknown values in the tables below

1.

x	1	2	3	4	5	6	x
y	6	10	14	y	22	26	30

2.

x	1	2	3	4	5	6	x
y	-1	2	5	y	11	14	17

3.

x	1	2	3	4	5	6	x
y	3	6	9	y	15	18	30

SOLUTIONS

1. We need to state the relationship between the variables

(a)

$$\begin{aligned}y &= 4(x) + 2 \\30 &= 4(x) + 2 \\30 - 2 &= 4(x) \\28 &= 4(x) \\4(x) &= 28 \\x &= \frac{28}{4} \\x &= 7\end{aligned}$$

(b)

$$\begin{aligned}y &= 4(x) + 2 \\y &= 4(4) + 2 \\y &= 16 + 2 \\x &= 18\end{aligned}$$

2. We need to state the relationship between the variables

(a)

$$\begin{aligned}y &= 3(x) - 4 \\17 &= 3(x) - 4 \\17 + 4 &= 3(x) \\3(x) &= 17 + 4 \\3(x) &= 21 \\x &= \frac{21}{3} \\x &= 7\end{aligned}$$



(b)

$$\begin{aligned}y &= 3(x) \\y &= 3(4) \\y &= 12 - 4 \\y &= 8\end{aligned}$$

3. We need to state the relationship between the variables

(a)

$$\begin{aligned}y &= 3(x) \\30 &= 3(x) \\3(x) &= 30 \\x &= \frac{30}{3} \\x &= 10\end{aligned}$$

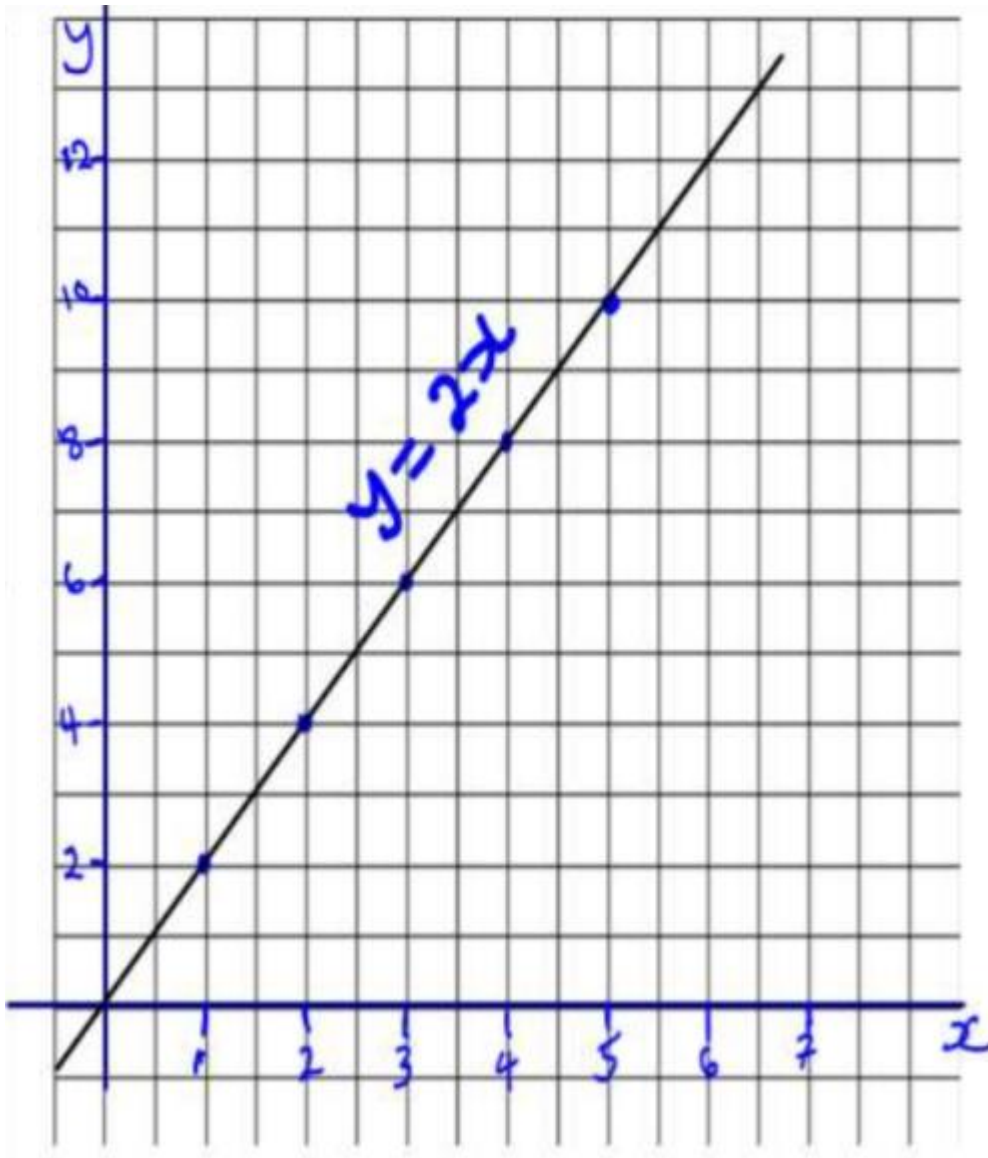
(b)

$$\begin{aligned}y &= 3(x) \\y &= 3(4) \\y &= 12\end{aligned}$$

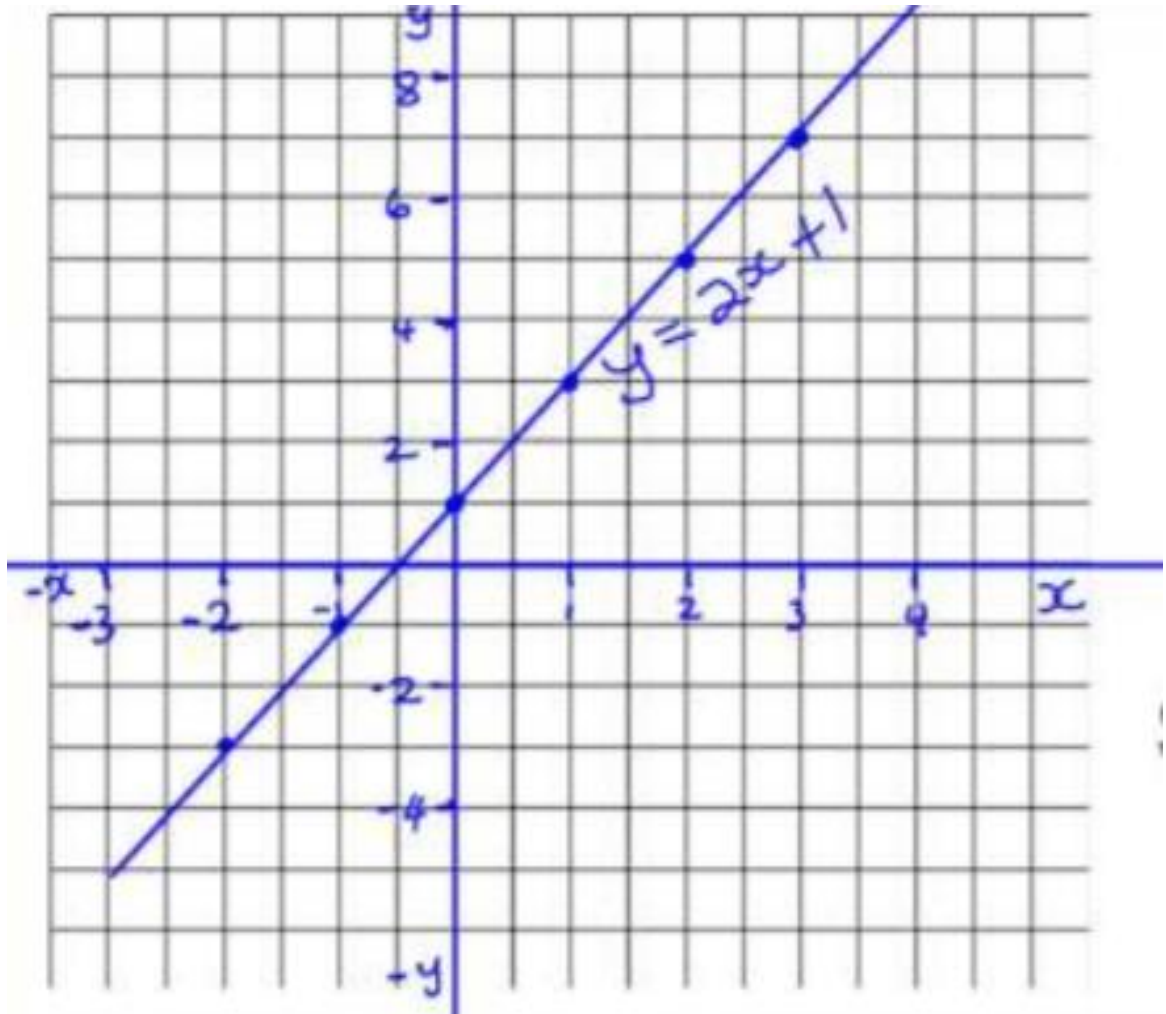
3. Using graph to describe relationships

Given the tables below, describe the relationship between the two variables (x, y)

<i>x</i>	1	2	3	4	5
<i>y</i>	2	4	6	8	10



x	-2	-1	0	1	2	3
y	-3	-1	1	3	5	7



4. Using words to describe relationships

1. Azeez's taxi service charges R5,40 per kilometre for a trip. The table below shows the cost of a trip depending on the distance travelled.

Distance travelled(km)	1	5	12	60	
Cost(R)	R5,40				R675,00

- (a) Copy and complete the table above.
- (b) Write down the formula to represent the cost (R) of a trip with Azeez's taxi services as distance travelled (d).



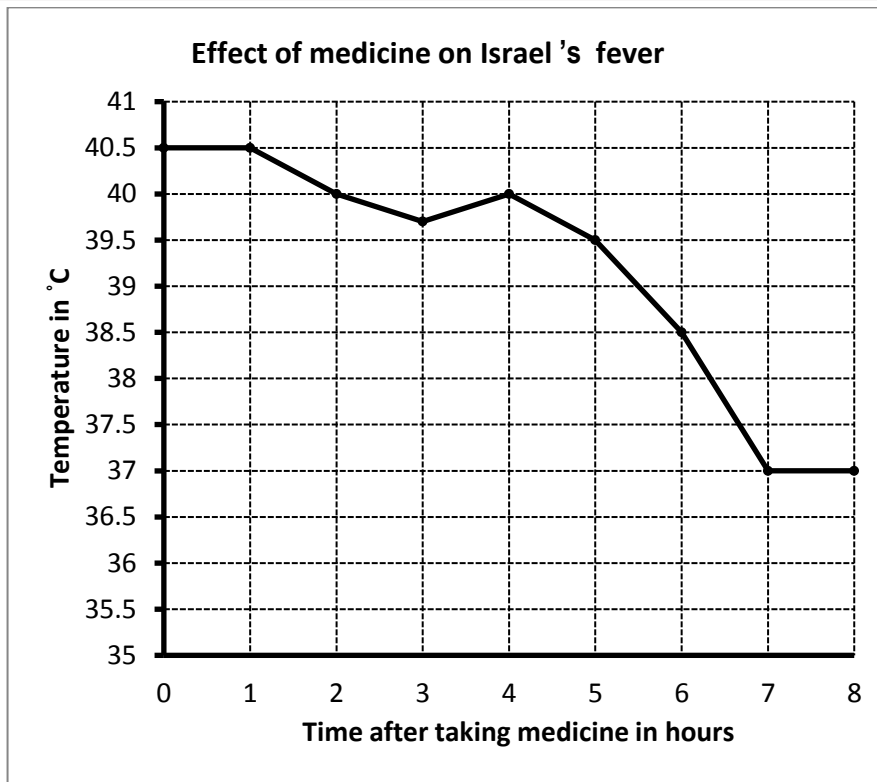
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- (c) Use the formula to work out the cost for a trip of 98 km. Show all your calculations.

Faith's discount taxi service charges R20,00 plus R2,90 for each kilometre travelled.

- (d) Write down the formula to represent the cost (c) of Faith's discount taxi service trip as dependent on the distance travelled (d).
- (e) Use the formula to work out the cost for a trip of 60 km with Faith's discount taxi services.
- (f) Will it be cheaper to take a 6 km trip with Azeez's taxi services (as discussed in QUESTION (1)) or with Faith's discount taxi services? Motivate your answer.
- (g) Will it be cheaper to take a 54 km trip with Azeez's taxi services (as discussed in QUESTION (1)) or with Faith's discount taxi service? Motivate your answer.
- (h) For what distance travelled will it be cheaper to choose Azeez's taxi services over Faith's discount taxi service?

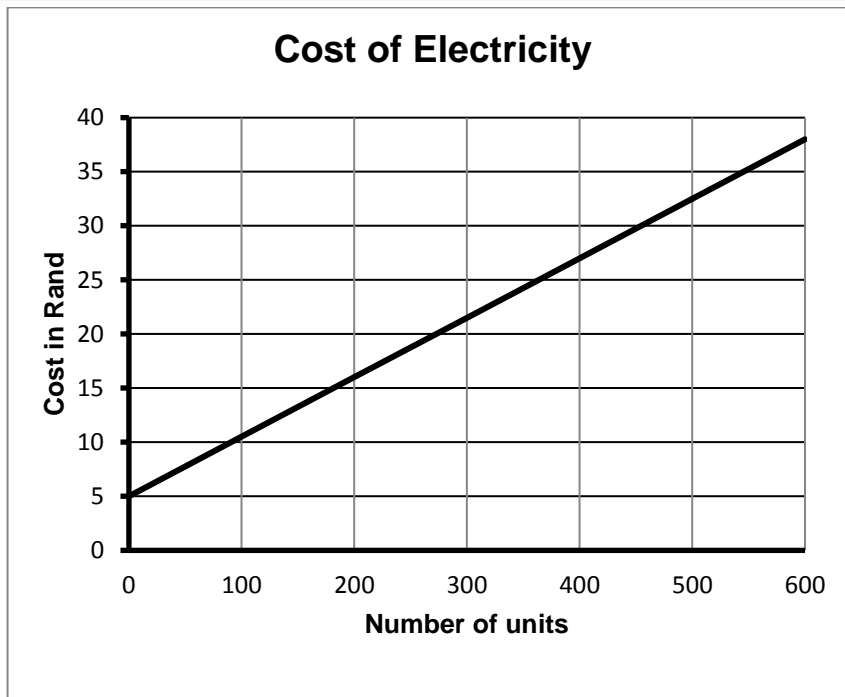
ACTIVITY 1

- (1.1) Israel had a fever and was admitted to hospital where he was given medicine. The graph shows Israel's temperature after taking the medicine.



- (a) What was Israel's temperature after 5 hours?
- (b) What happened in the period during the 3rd to the 5th hour?
- (c) Normal body temperature is about 37 °C. How long did it take for Israel's temperature to be normal again?

(1.2) The graph below shows the relationship between the cost of electricity and the number of units consumed which is based on a fixed amount per month plus a rate per unit used.

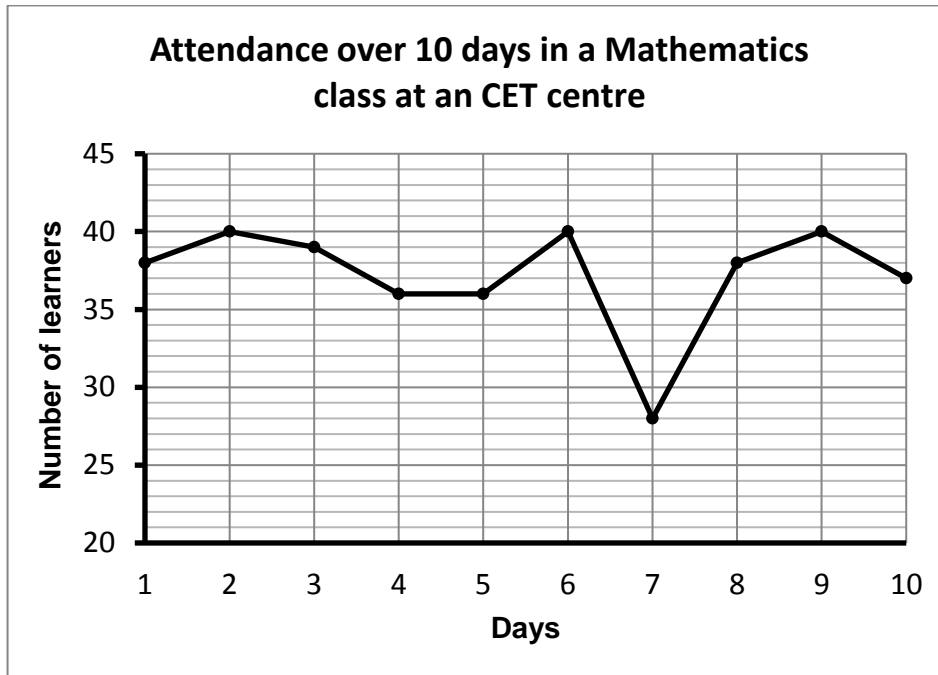


- (a) What is the fixed minimum amount to be paid per month?
- (b) Determine the cost of 100 units of electricity.
- (c) What would be the approximate cost of 460 units of electricity?
- (d) Approximately how many units were used if the bill was R22?
- (e) A formula for calculating the cost can be given by $C = 0,055u + 5$, where C is the cost in rand and u is the number of units. Use this formula and calculate how much 500 units will cost.
- (f) Use the formula $C = 0,055u + 5$ to calculate the number of units that can be bought for R60.



ACTIVITY 2

- 2.1 The graph below shows the attendance of learners in a Mathematics class at a certain CET centre. No learners were absent on days 2, 6 and 9. Use the graph to answer the questions that follow.



- (a) Copy and complete the following table to show the learner attendance on certain days.

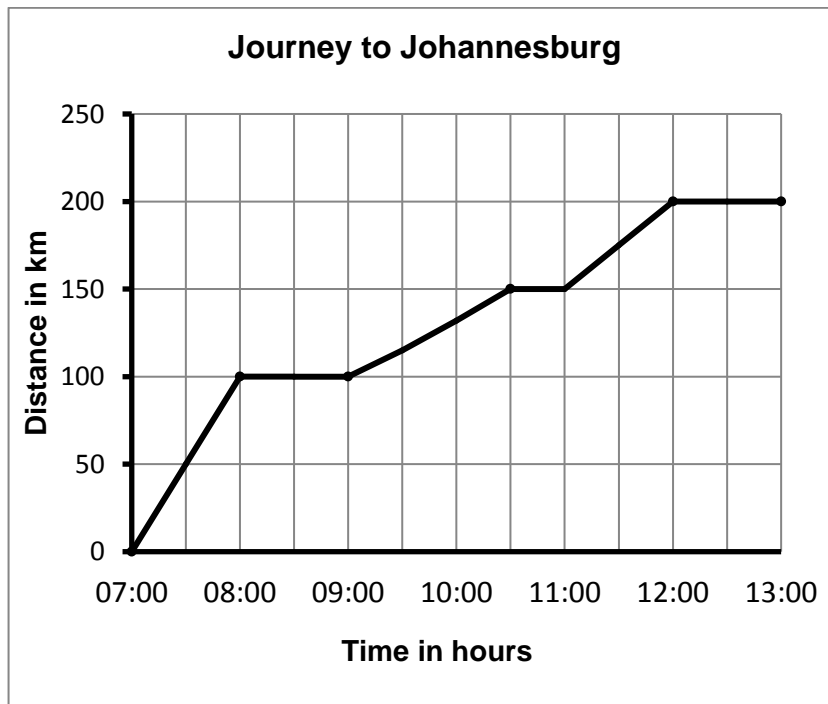
Day	3	5	8	10
Learners present				

- (b) How many learners are in the Mathematics class?
- (c) How many learners were absent on day 7?



- (d) Do you think that the attendance of the Mathematics learners over the 10 days was good? Give a reason for your answer.

- 2.2 The graph shows a journey that Denver and his father made to Johannesburg. They arrived in Johannesburg at 12:00.



- (a) At what time did they start their journey?
- (b) How many times did they stop along the road?
- (c) At what time between 9:00 and 12:00 did they stop?
- (d) How far did they travel to Johannesburg?
- (e) Calculate the average speed at which they travelled between 9:00 and 10:30? [Hint: Speed = distance \div time]



ACTIVITY 3

3.1 Esther decided to sell hamburgers at R9 each to raise money to pay for her son's school fees,

- (a) Copy and complete the table below to show the amount collected for selling a certain number of hamburgers.

Hamburgers (n)	1	5	7	11
Amount (R)	9		63	

- 3.2 (a) Use the grid on the attached Annexure to draw a graph to show the amount collected for selling a certain number of hamburgers. Use the following information to assist you:
- Show the amount in Rand on the vertical axis.
 - Show the number of hamburgers on the horizontal axis.
 - Use a suitable scale on the axes.
 - Give a suitable title to the graph.
 - Use the values from the completed table to plot the points on the system of axes.
- (b) Is the graph increasing or decreasing?
- (c) How much will Esther collect if she sells 8 hamburgers? Use dotted lines and show with the letter B where you will read this value from the graph.
- (d) Write down a formula to determine the amount (R) collected for selling n hamburgers in the form: $R = \dots$



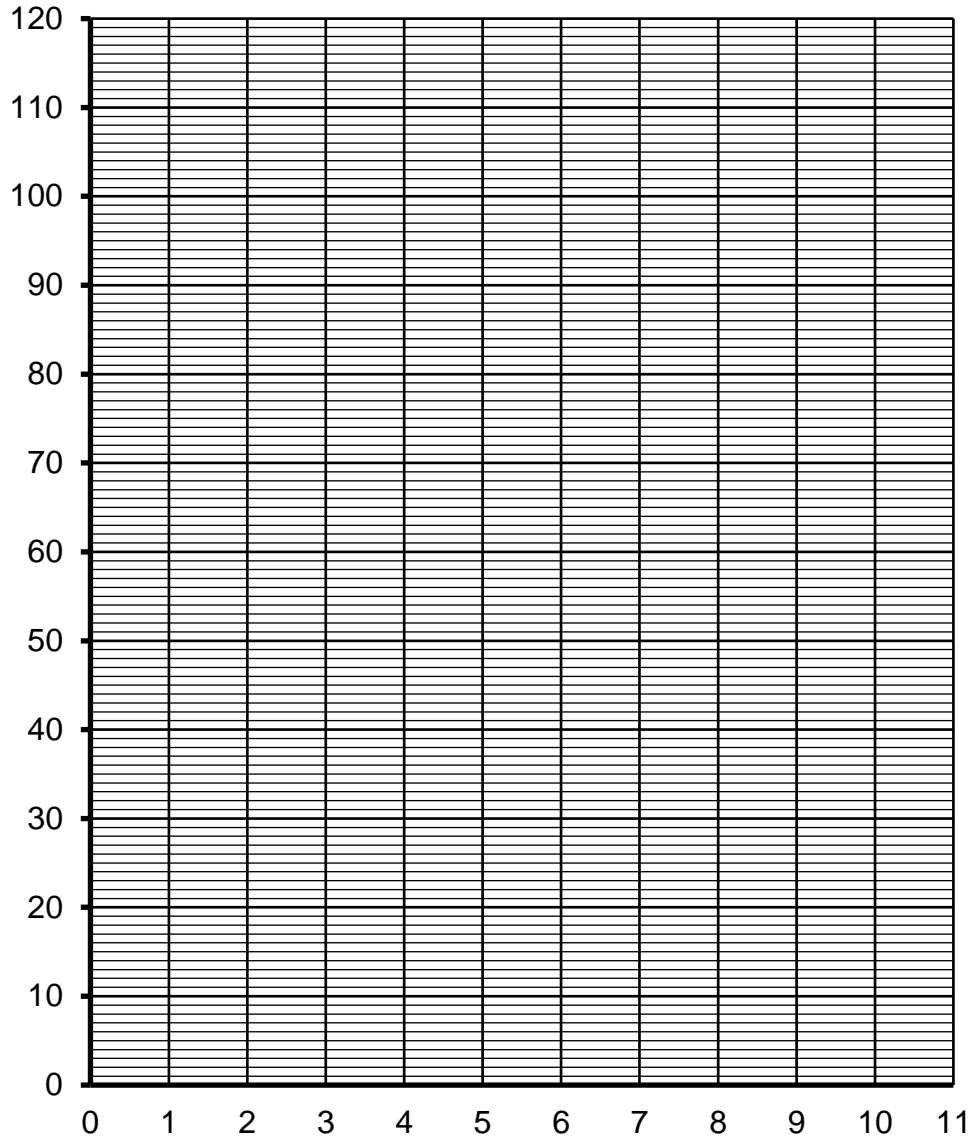
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- (e) Esther's expenses to buy ingredients for the hamburgers were R103. How many hamburgers must she sell before she will show a profit?
- (f) Her son's school fees are R200. How many hamburgers must she sell to cover her expenses as well as her son's school fees?



Annexure: QUESTION 3.2 (a)

Centre:.....

Name:.....



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