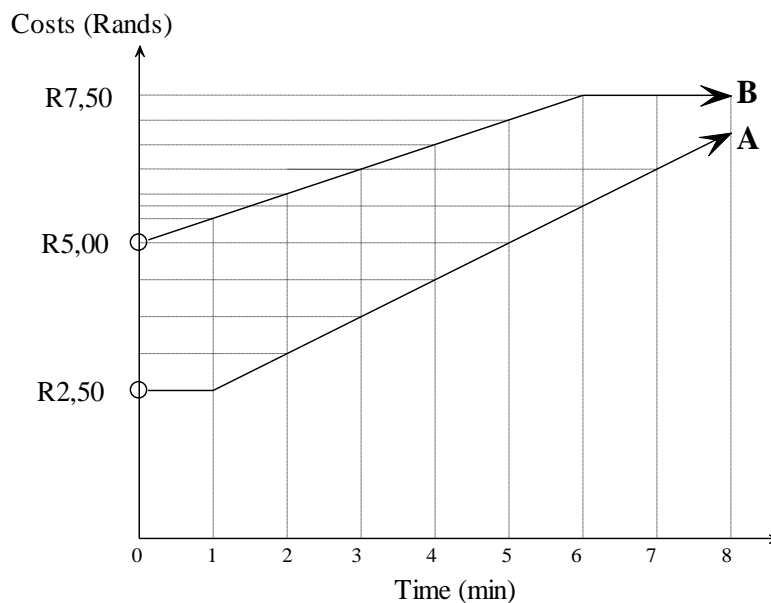


Grade 9 Mathematics Worksheet

Functional costs

Questions:

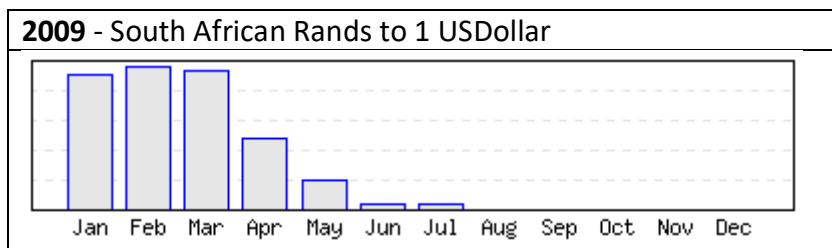
1. The graph below shows the telephone costs that are charged by two different companies.



- Describe what the open circles on the Cost axis means?
- Describe in your own words how the two different companies charge for their phone calls.
- What do you think the call charge will be for each company for a nine minute call?
- Find two equations to show the way in which each company computes their costs.
- If you make a 15 minute call, show how each company will charge using your equations in (d).

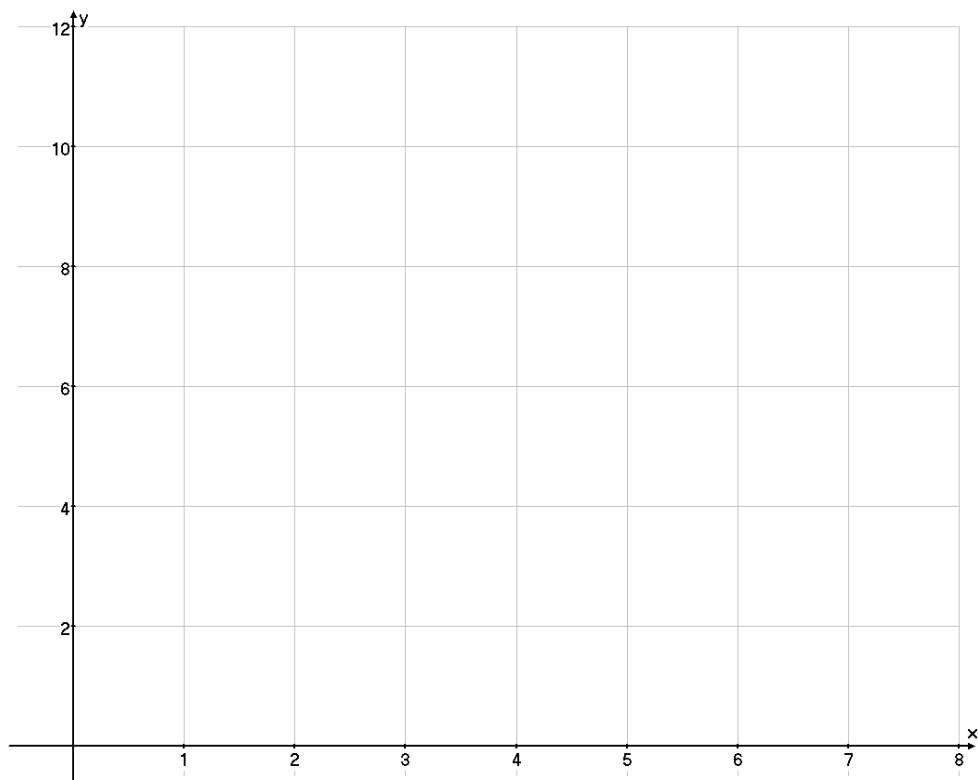
Grade 9 Mathematics Worksheet

2. The following information is given about the Rand / Dollar exchange rate for an average period of 21 days:



	Average Rates
January	9.92034 ZAR (21 days average)
February	10.0135 ZAR (20 days average)
March	9.96366 ZAR (22 days average)
April	9.00644 ZAR (21 days average)
May	8.39039 ZAR (21 days average)
June	8.04231 ZAR (22 days average)
July	8.05826 ZAR (13 days average)

- a) Why do you think the average periods are 21 days each?
- b) Use the axes below and plot a graph that represents this information:



Grade 9 Mathematics Worksheet

Choose appropriate labels for your axes.

- c) Use the graph you plotted in (b) and predict what will happen to the exchange rate for the next few months.

Grade 9 Mathematics Worksheet

Solution

1. a) Open circle means not included. In terms of the context – at zero seconds there is no cost charged.
- b) Company A: Charges the same rate for a minute, and then the charge increases as the time increases. For 4 minutes the charge went from R2,50 to a total of R5 four minutes after the first minute. So then the rate per minute will be:

$$\frac{5,00 - 2,50}{4} = \frac{2,50}{4} = 0,625 = 62,5c = 63c \text{ per minute starting from R2,50.}$$

Company B: The charges increases as the time increases, as soon as you reach 6 minutes you then pay a flat rate for your call. For 6 minutes the charge went from R5 to a total of R7,50. So then the rate per minute will be:

$$\frac{7,50 - 5}{6} = \frac{2,50}{6} = 41,6 = 42 \text{ cents a minute, starting from R5.}$$

- c) A: Cost = R2,50 + 8(R0,625) = R7,50
 B: Cost = R7,50

d) Cost A =
$$\begin{cases} R2,50 \text{ if } m < 1 \\ R2,50 + 0,63m \text{ if } m \geq 1 \end{cases}$$

Cost B =
$$\begin{cases} R5 + 0,42m \text{ if } m < 6 \\ R7,50 \text{ if } m \geq 6 \end{cases}$$

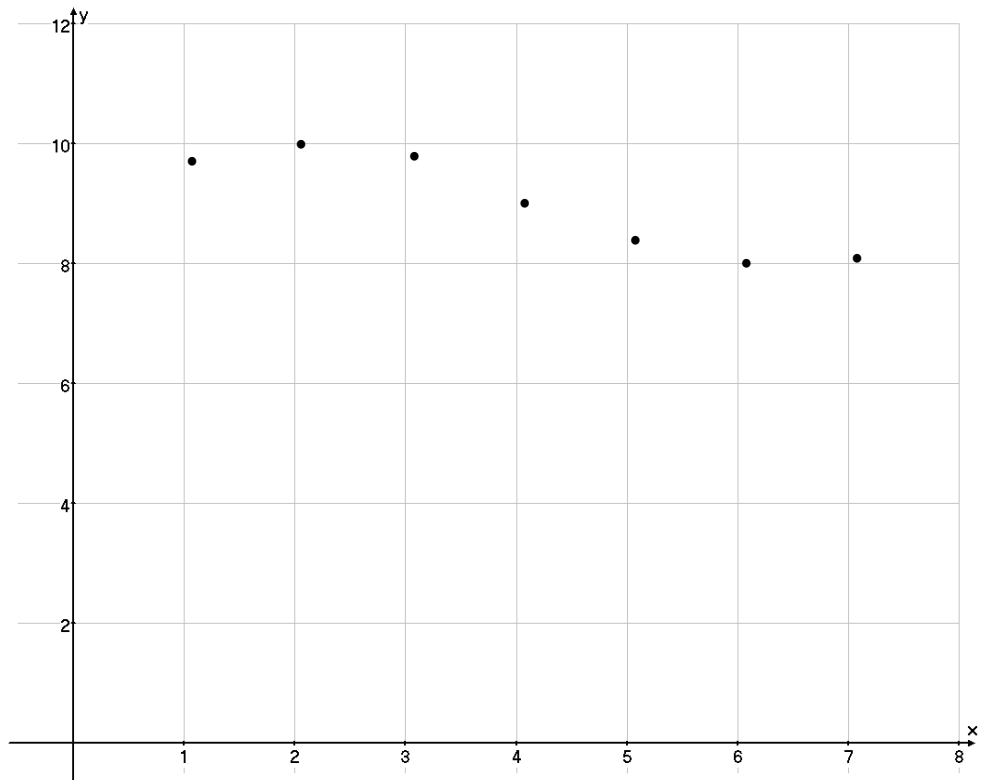
Where m is the number of minutes spoken on the phone

- e) For 15 minutes:
 Cost A = R2,50 + 14(0,63) = R11,32
 Cost B = R7,50

Grade 9 Mathematics Worksheet

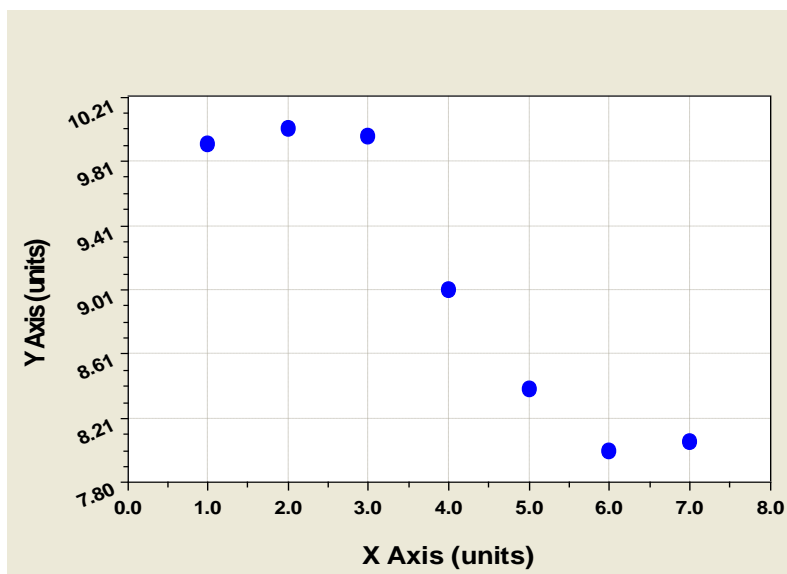
2. a) There are on average 21 working days in a month. That is from Monday to Friday.

b) Rand / Dollar Exchange



Months passed since December

We include the following graph which is accurate only for information:



Grade 9 Mathematics Worksheet

- c) It appears that the rand is becoming slightly weaker against the dollar, so one will expect that the rand will drop in value against the dollar.

For company A the rate of increase is 62,5 cents for every minute, but we still need to add the cost for the first minute. We don't round off in our calculations, only the answers.

The algebraic habits of mind come to the foreground very well in this problem. Finding rules that represent functions and abstracting from computation – these are skills that teachers must foster in class at all times.

This graph is actually based on a continuous charge equivalent to per second billing. It should actually be a step function because the charge is a per minute charge.

These points are all approximations on the scale that was provided for.

Extracting from computation or extrapolating from the graph is a key mathematical skill that must be developed.