

# SENIOR SECONDARY IMPROVEMENT PROGRAMME 2013



**education**

Department: Education

**GAUTENG PROVINCE**

**GRADE 12**

**MATHEMATICAL LITERACY**

**LEARNER NOTES**

The SSIP is supported by

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**SESSION 3: TOPIC 1: GRAPHS IN REAL LIFE SITUATIONS**

**Learner Note:** When you scan through a newspaper, many pages have graphs to illustrate visually the information that the articles are about. Sketching and reading graphs is the key to understanding the information around you.

**SECTION A: TYPICAL EXAM QUESTIONS****QUESTION 1**

A cell phone contract is set up such that the subscriber has to pay R2,80 per minute.

- a. Complete the table of values for the above contract.

(2)

Minutes	1	2	3	4	5	6
Cost	2.80	5.60		11.20	14	

- b. Sketch a graph showing the cost of the contract.

(5)

- c. Set up an equation that represents the above relationship.

(3)

[10]

**QUESTION 2**

The graph on the following page represents the break-even analysis for ABC Flower Distributors. The fixed cost per month is R250,00. The variable cost is R25,00 per bunch of flowers. The shop breaks even when they sell 10 bunches of flowers.

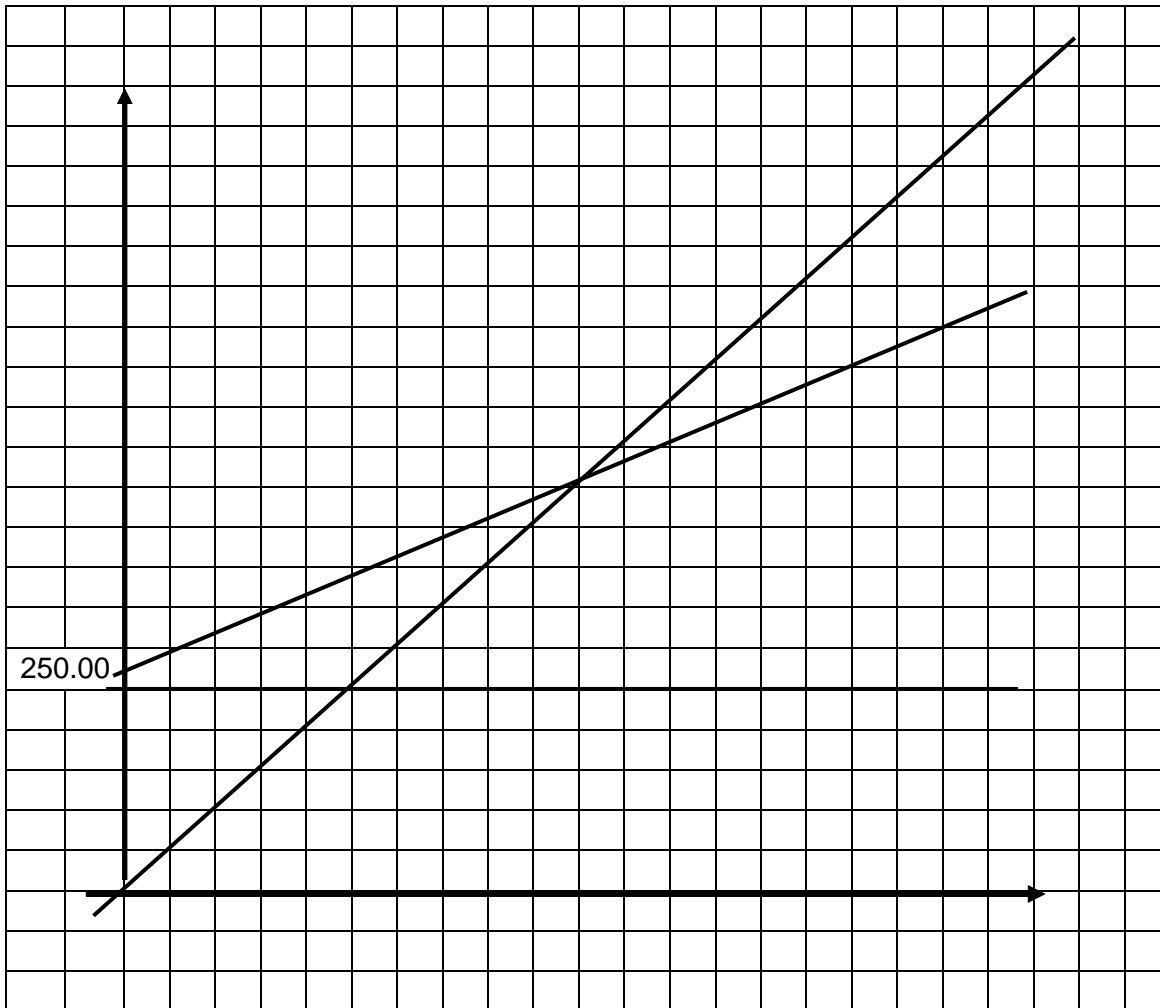
- a) Label the lines that represent fixed costs, total costs (fixed and variable) and income for the bunches of flowers.
- b) Label the axes.
- c) What are the co-ordinates of the break-even point?

(3)

(2)

(2)

[7]

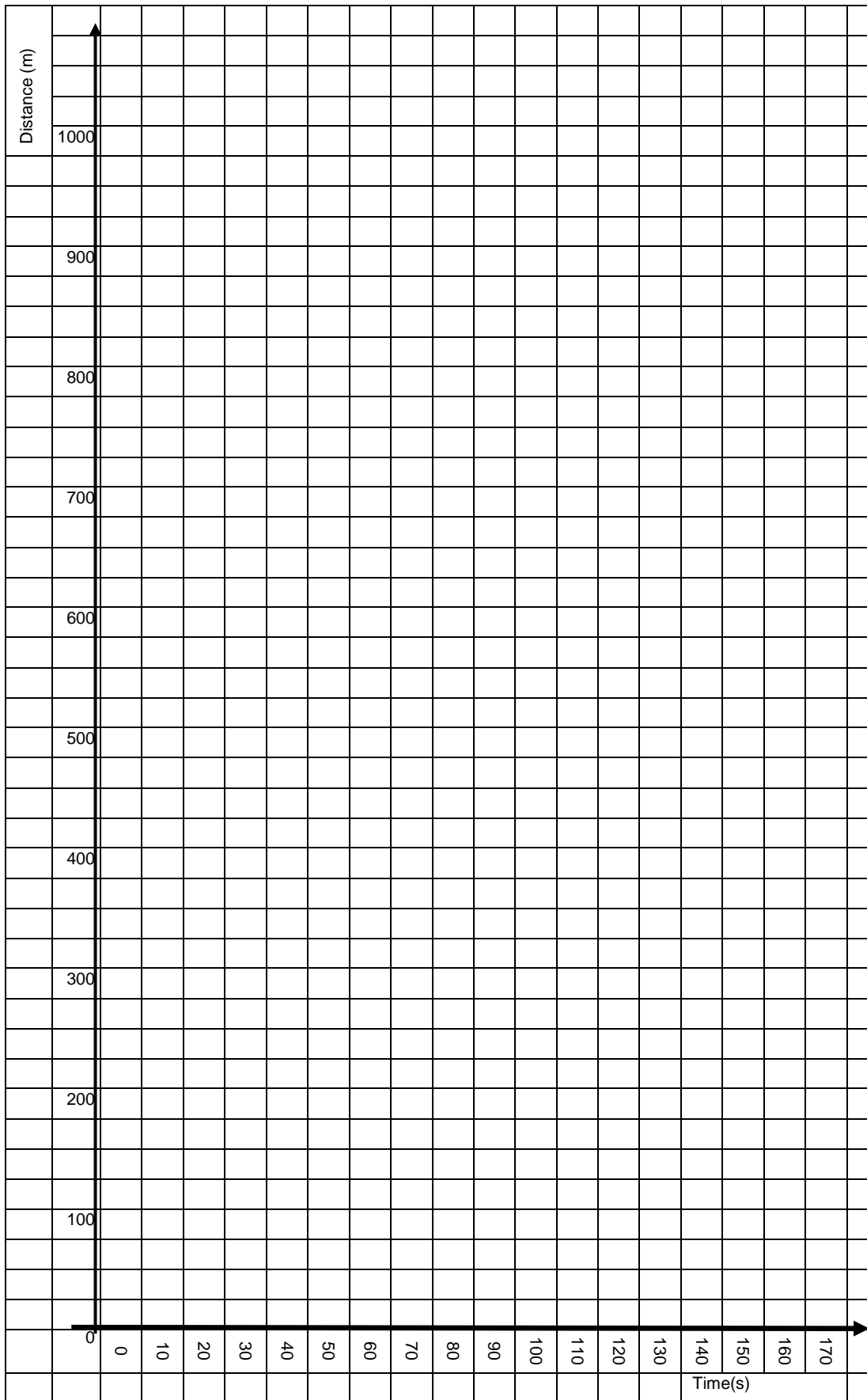


**QUESTION 3**

Fred and George run the 1000m. Below is a table of values, which shows their relative position after a given amount of time. Both runners finish at exactly the same time.

Time (sec)	25	50	75	90	115	140	165
Fred	140	280	420	560	700	850	1000
George	150	305	420	550	690	840	1000

- a. On the given set of axes sketch both sets of points. (4)



- b) During which time is Fred ahead of George. Indicate on the graph (2)
- c) At what distance other than the start or the finish have the two boys docked the same time? Indicate on your graph where you got your reading. Label this point A. (2)

$$speed = \frac{meters}{seconds}$$

- d) Use the formula above to calculate George's speed for the first 75 seconds. (2)
- e) During which interval did Fred run the fastest? (2)
- [12]

## SECTION B: ADDITIONAL CONTENT NOTES

### 1. DATA TABLES

Most information represented in graphs first gets collected in **data tables**. These tables are a collection of information, which can be represented by how different variables relate to one another.

Using a combination of data tables and graphs, you can work out **points of interest**, such as **intersection with axes**, **points of intersection**, **gradients at certain points on the graph** and **equations** that represent lines on the graph.

Being able to establish these points of interest allows for the calculation of optimal ranges as well as using constraints to determine linear programming.

### Example

In the table below is a breakdown of three cell phone contract fees. The prices are given for ten-minute intervals. Each contract has different charges:

- ❖ The first contract has no monthly contract fees, but each call is charged at R3,00 per minute.
- ❖ The second contract has a monthly contract fee of R120,00 and each call is charged at R1,00 per minute.
- ❖ The third contract has a monthly contract fee of R110,00. the first 30 minutes of all calls are free and each minute after that is charged at R2,50.

TABLE 1

Minutes per month	1	1	1	1	1	1	1	1	1
Cost A: R3,00 per minute for all calls.	0	30	60	90	120	150	180	210	240
Cost B: R120,00 contract fee. R1,00 per minute for all calls.	120	130	140	150	160	170	180	190	200
Cost C: R110,00 contract fee. 30 free minutes. R2,50 per minute for all calls	110	110	110	110	135	160	185	210	235

**1. Which contract is the most cost-effective if the caller only receives calls and makes none?**

Since no calls are made, we look at the column for zero minutes. Then, Contract A is the most cost effective, because there is no charge.

**2. Which contract is the most cost-effective if the caller makes calls for exactly 80 minutes?**

Contract B is the most cost-effective, because the charge for both other contracts is substantially more.

**3. Which contract is the cheapest if the caller makes 40 minutes of calls?**

The cost for contract A is R120,00, contract B is R160,00, and contract C is R135,00. Clearly Contract A is the cheapest at this point.

**4. At which point do Contract A and contract B cost the same?**

Here we must compare the row for contract A and the row for contract B. The rows differ at each point except for the column, which represents 60 minutes of calls. This means that the cost for 60 minutes is the same for contract A and contract B.

**5. At which point do contract A and contract C cost the same?**

Contract A and contract C differ in cost in each column except in the column representing 70 minutes of calls. They cost the same at this point.

**6. For the two previous questions, which contract costs less before, and which contract costs less after the point at which they are equal?**

In both answers we look at the columns before the point at which they cost the same. In question 4 and in question 5 contract A costs less in the columns before. To see which contract costs less after the point at which they are equal, we look at the columns after that point. In question 4 contract B costs less for more minutes and in question 5 contract C costs less for more minutes.

## 2. THE CO-ORDINATE SYSTEM – A SET OF AXES

A co-ordinate system is a system of axes that represent the values of two variables. One of the variables usually depends on the other.

An axis in a coordinate system is similar to a number line. The values on the vertical axis, i.e. the y-axis, range from smallest to biggest as we move from left to right. The values on the x-axis range from smallest to biggest as we move from the bottom to the top.

Every axis needs to be labeled so that the person reading your graph can clearly see what variables are being considered.

The example from the previous section is continued here to illustrate how we label the axes to help us sketch the graph.

### Example

- **What are the variables we need to consider?**

We are comparing cost and time. The three contracts are representations of different rules applied to the variables. These rules are defined by the equations that represent each line.

- **Which variable is dependent, which is independent?**

Ask yourself the following two questions: Is the cost of the contract dependent on the time of the calls made?

**Or**

Is the number of minutes called for dependent on the cost of the contract?

The first question makes more sense. This means that the dependent variable is the cost and the independent variable is the time spent making calls.

The dependent variable is always represented on the vertical axis - also referred to as the y-axis. The independent variable is always represented on the horizontal axis - also referred to as the x-axis. Thus the label for the horizontal axis must be: Time in minutes. The label for the vertical axis must be: Cost in Rands

## 3. SCALE

Each of the axes has a specific scale. The scale tells us how many units each block represents if you are using block-paper. Every block on the vertical axis might represent five rand while every block on the horizontal axis might represent one minute. The scale helps us to position a line in such a way that it is clear and fills the co-ordinate system properly.

The example of the previous units is continued to illustrate how you go about finding a good scale for your graph.



**Example**

- **What is the scale of the graph?**

The scale is determined by each variable. Find the lowest cost and the highest cost and then find the least and most amount of minutes. The values you find are the beginning and end values on each axis.

The minutes range from 0 – 80. The charges range from 0 – 240. (Allow one extra unit for neatness). This means that your horizontal axis should begin at 0 and end at 85 or 90 and your vertical axis should begin at 0 and end at 245 or 250

**4. SKETCHING A GRAPH**

Once you have worked out the correct scale and the correct labels you may begin sketching your graph.

Start by evenly allocating the units on each axis and then writing the labels on the side of the relevant axis.

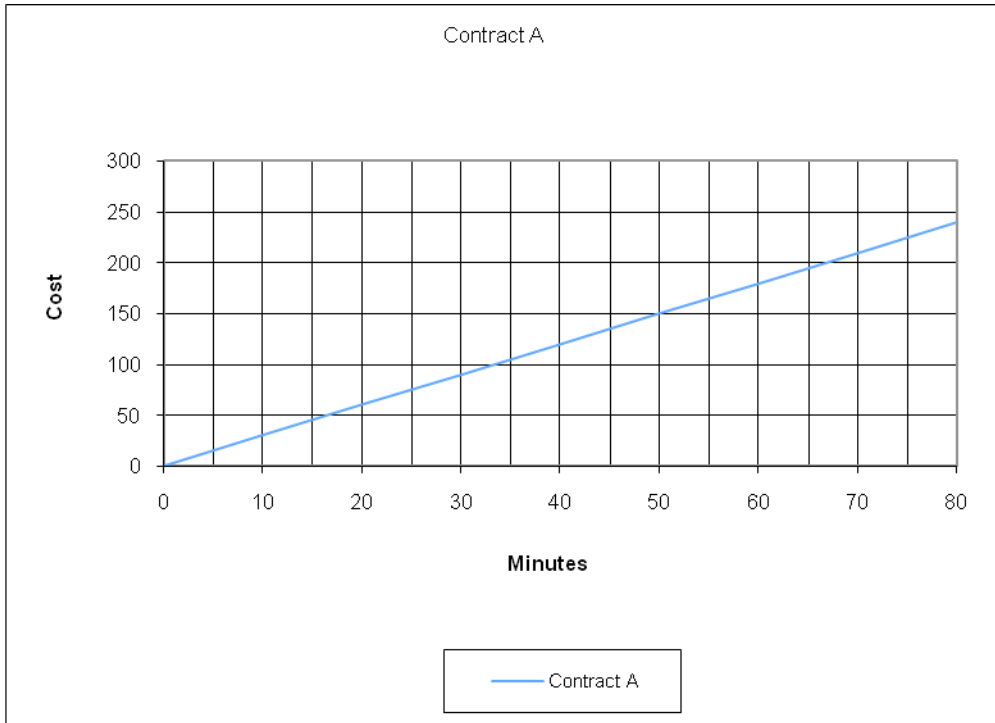
To plot a point on a set of axes, you must find the correct co-ordinates. This you can do by referring to the table of values. In the example, the values in each column are already a co-ordinate for a specific point.

**Neatness is imperative!** Often we read values off the graph, and we need to be accurate, this can only happen if the sketch has no smudges or thick, unclear lines.

**Example**

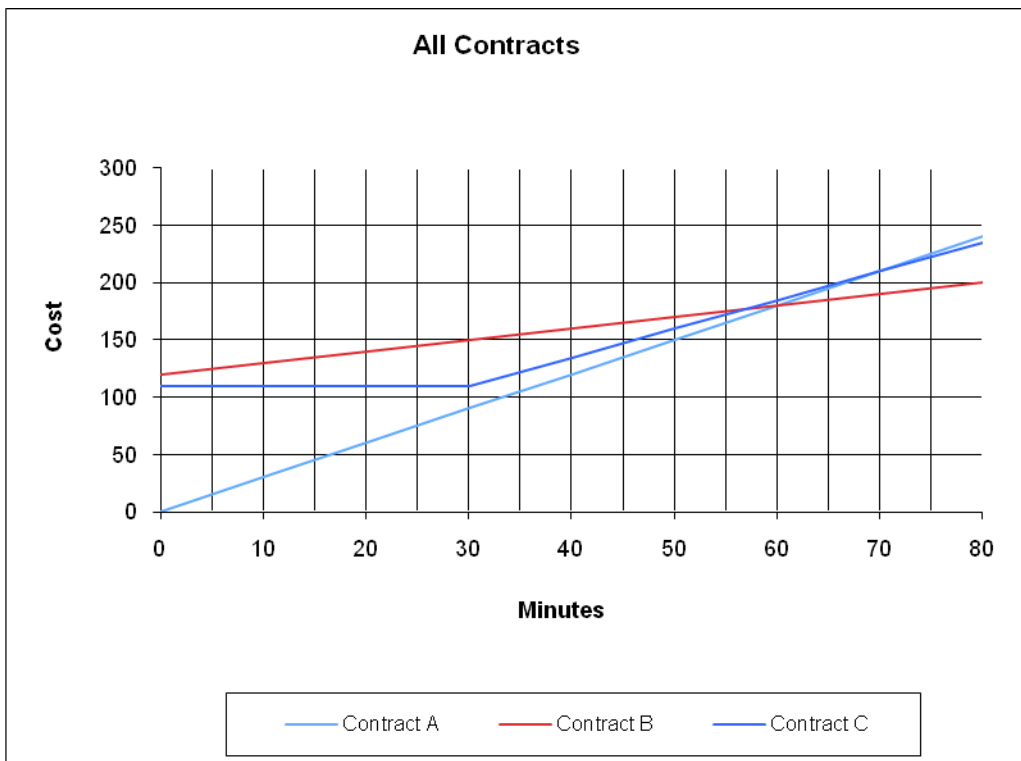
- **Plot the points for the cost of contract A. Connect the points.**

FIG 1



- Plot the points for the cost of contract B and contract C on the same set of axes. Connect each set of points.

FIG 2.



## 5. READING VALUES OFF THE GRAPH

Once you have plotted points on your graph you can use them to read off information that may not be contained in your table.

We use the axes to help us read off specific values. If the value on the x-axis is given, you go to that point and move perpendicularly upward or downward until you get to the line. Then you move horizontally to the y-axis and read off the value there. The given value is referred to as the x-co-ordinate and the value you found on the y-axis is the y-co-ordinate. These two co-ordinates together give us the exact location of the point we were looking for.

On a graph we can quickly see if two lines intersect (cross each other). This can be used as a tool to see which line is below or above another line at a specific point. Knowing this might help decide if one option was cheaper or more expensive than the other.

### Example

- **What is the cost of each contract for 25 minutes?**

We need to focus on the horizontal axis as this represents the minutes. At the point where we find 25 minutes we move vertically upward until we reach each contract. Then we move horizontally across to the axis representing the cost and read off the values.

For contract A = R75,00

For contract B = R145,00

For contract C = R110,00

- **Why is it not possible to say exactly how many minutes a person has made calls for, if they pay R110,00 for contract C?**

The charge for any number of minutes up to 30 minutes is the same. So you cannot distinguish between them.

- **How many points of intersection are there?**

There are three points of intersection.

## 6. FINDING AND USING THE EQUATION OF A GRAPH

The general equation of a linear graph is  $y = mx + c$ , where  $c$  is the y-intercept (dependent variable) and  $m$  is the gradient.

The y-intercept is the point at which a line crosses the vertical axis. If the scale is clear you can simply read off this value and put it into the formula.

If the scale is not clear or not given, you need to ask yourself what the value would be if the other variable had the value 0. At your y-intercept the co-ordinate for your variable on the x-axis is 0. If you know what the gradient is, then you could simply substitute 0 for the x in the formula and work out the value of y.

To calculate the gradient you may simply ask yourself: How much does my vertical (y-value) change for a one-unit movement on my horizontal axis (x-axis).

If the scale is not given for every unit, choose two points on your graph. Start with the point on the left. How many units do you have to move upward (rise) to get in line with the second point? Then, how many units do you have to move to the right (run) to get to the second point?

If one of your movements is downward or to the left, just add a negative in front of the number of units you moved. Put the values you found into the formula below and you get your gradient.

**The formula for the gradient of a line is:**  $gradient = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$

In order to calculate values that are not represented by the table of values, we must simply substitute the value into the equation and calculate the unknown value.

### Example

- Find an equation for each increasing section of the lines.

#### Contract A:

The charge per minute is linear and since there is no constant charge,  $c = 0$ .

The gradient can be worked out by using two points as follows:  $m = \frac{y_1 - y_0}{x_1 - x_0}$ . Using the start

and end points given in the table. Then  $m = \frac{240 - 0}{80 - 0} = 3$ .

Then the equation for contract A is:  $y = 3x$ .

#### Contract B:

The charge per minute is linear and the constant contract charge is R120,00.

Then  $c = 120$  and we calculate  $m$  as follows:  $m = \frac{200 - 120}{80 - 0} = 1$ .

Then the equation for contract B is:  $y = 2,5x + 120$

#### Contract C:

Between 0 and 30 minutes the equation is:  $y = 110$  because there is no charge that depends on the number of minutes. Between 30 and 80 minutes we have the contract fee of R110 and the charge on the minutes after 30. The charge per minute is R2,50.

We can use the point at which we charge for the minutes and the end point to calculate the

gradient. Then  $m = \frac{235 - 110}{80 - 30} = 2,5$ . Since we charge for 30 minutes less than the  $x$ -value, the

equation for contract C is as follows:  $y = 2,5(x - 30) + 110$ .

- Calculate the co-ordinates for a 30-minute call for each of the contracts.

$$X = 30$$

$$\text{Contract A: } y=3x30=90 \quad (30; 90)$$

$$\text{Contract B: } y=30+120=150 \quad (30; 150)$$

$$\text{Contract C: } y=2,5x(30-30) + 110=110 \quad (30; 110)$$

- Use the equations you set up in a previous question to calculate the co-ordinates for each contract when the cost is R195,00.

$$Y = 195$$

$$\text{Contract A: } 195 = 3x \text{ then } x = 65 \quad (65; 195)$$

$$\text{Contract B: } 195 = x + 120 \text{ then } x = 70 \quad (70; 195)$$

$$\text{Contract C: } 195 = 2,5(x-30) + 110 = 2,5x + 35 \text{ then } x=53,3 \quad (53,3; 195)$$

## 7. LINEAR PROGRAMMING

When we use linear programming, we apply mathematical formulae to the constraints determined by the environment of the venture we are planning. Each constraint has to be represented on the graph by a line. The area that is to be considered is termed to be feasible.

We can take two variables into consideration at one time. Each variable that we are considering is represented on one of the axes in our graph. The constraints must be written in a formula combining these two variables.

The feasible region on a graph determines those possible outcomes that could exist. The areas outside of the feasible region are not possible outcomes because one or more of the constraints do not allow for these options.

### Example

Thomas is a farmer. He loves animals and has many dogs and cats. His farm is quite far out of town and he prefers to travel there as little as possible.

Once a month Thomas drives to town to collect food for his dogs and his cats. Thomas has to collect a minimum of 3 bags of cat food and a minimum of 5 bags of dog food. His car cannot carry more than 12 bags of food.

In order to sketch the graphs that represent the above situation, one would need to derive the following equations:

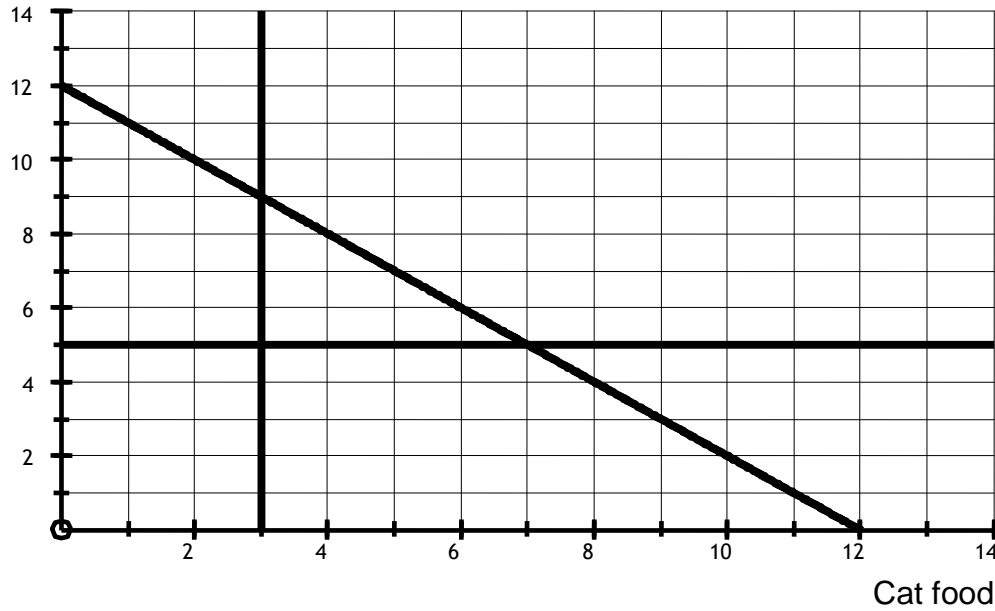
$$x \geq 3 \quad y \geq 5 \quad x + y \leq 12$$

(Where  $x$  = cat food and  $y$  = dog food)

With the use of these equations one could sketch the graphs as follows:

**Thomas's options for buying food**

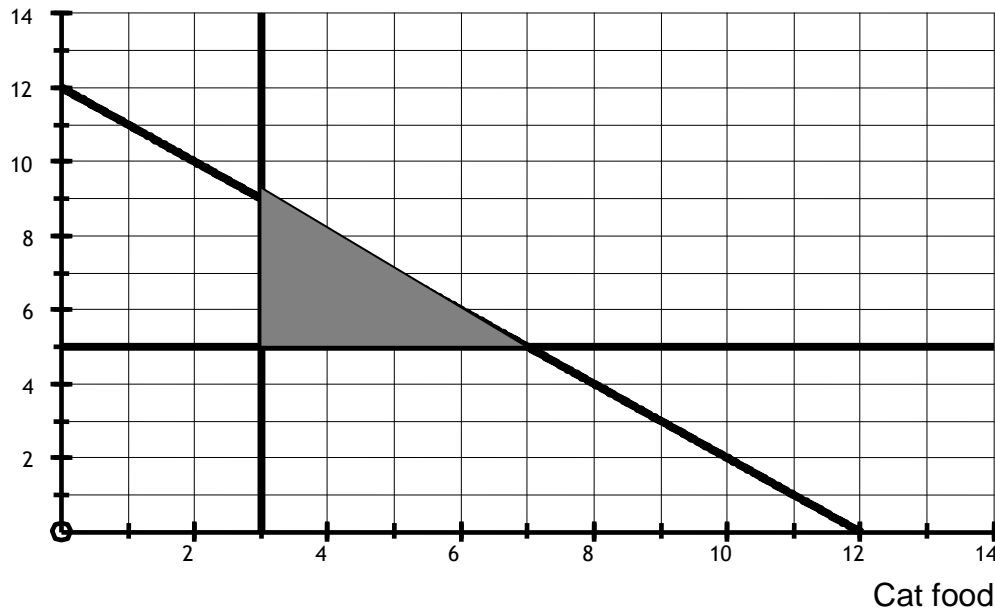
Dog food



1. Shade in the area that satisfies all three equations.

**Thomas's options for buying food**

Dog food



2. Is it possible for Thomas to get 7 bags of cat food and 6 bags of dog food into his car? Justify your answer.

No, Thomas can only buy twelve bags.  $6 + 7 > 12$

3. What is the maximum number of bags of dog food that Thomas can take along on one trip?

The highest point of the feasible region is at 9 bags of dog food. Keep in mind that his cats need a minimum of 3 bags. He will have only space for 9 more.

4. What is the minimum amount of money that Thomas could spend in order to feed all his animals if dog food costs R185 per bag and cat food costs R150 per bag?

Thomas wants to spend the least amount of money he can, so he has to make sure that all animals have the minimum amount of food required. This would be the bottom left corner of the shaded region.

$$5 \times R 185 = R 925$$

$$3 \times R 150 = R 450$$

$$925 + 450 = R 1375,00$$

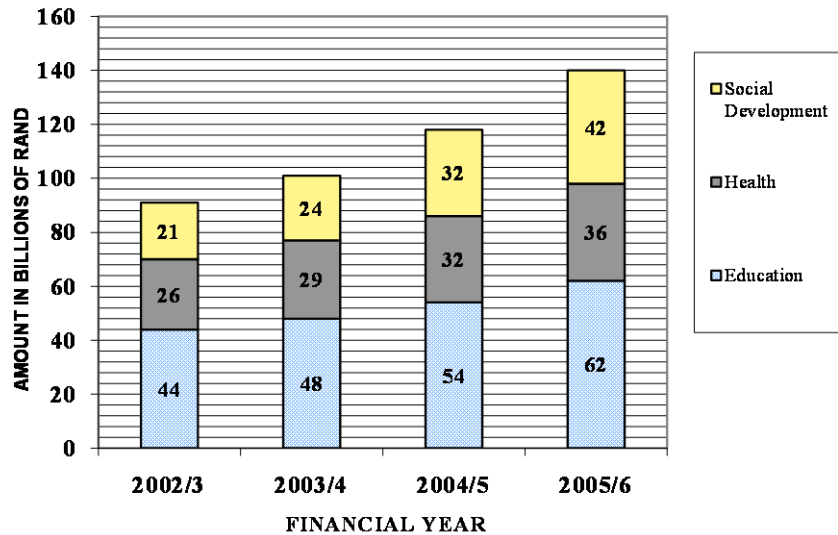
### SECTION C: HOMEWORK

**Learner Note:** As you attempt the homework, look at the mark allocations and time yourself to ensure you can answer the questions in the given time. If you cannot or you get the answers wrong, attempt the homework again as this is good practice.

#### QUESTION 1: 10 minutes

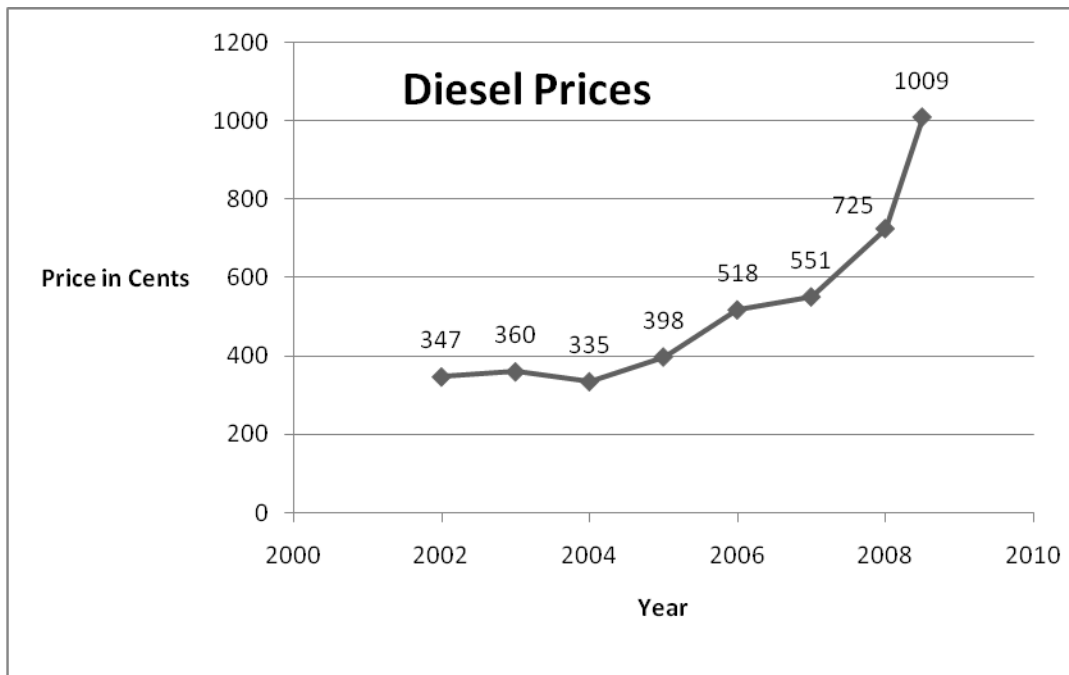
The South African Revenue Service (SARS) is responsible for collecting taxes from taxpayers on behalf of the government. The following graph shows how the government spent some of the money it received from taxes in the 2002/3, 2003/4, 2004/5 and 2005/6 financial years.

**GOVERNMENT'S SPENDING ON EDUCATION, HEALTH AND  
SOCIAL DEVELOPMENT DURING THE PERIOD 2002/3 TO  
2005/6**



- a) How much more was spent on education in the 2005/6 financial year than in the 2002/3 financial year? (2)
- b) Analyse each of the amounts spent on education, health and social development over the four financial years listed. What trend do you notice? Explain your observations. (4)
- c) What is the percentage increase on the expenditure of social development between 2002/3 and 2005/6? (2)
- d) What was the average increase on the expenditure of social development over the four years? (2)
- [10]



**QUESTION 2: 25 minutes****Fig 7**

Again in the line graph above, the exact values have been shown at the points plotted. We are now going to work through possible questions that assess other skills as well and may be more challenging.

Please refer to Fig 7 above which gives the diesel prices per litre from 2002 to May 2008.

- What was the price difference per litre between 1 January 2002 and 1 January 2008? (3)
- Determine the average increase per year from 1 January 2002 until 1 January 2008. (7)
- Determine the price increase, as a percentage, over the first 4 months of 2008. (Round your answer to the nearest whole number) (3)
- If the price of diesel was to increase at the same rate it has done for the first 4 months of 2008, calculate the expected diesel price for the end of 2008? (6)
- Why do you think the price of diesel increased so drastically in the beginning of 2008? Give two possible reasons. (2)
- If the graph above had no numbers along the vertical axis and no numbers on top of each point that has been plotted, it would still be possible to determine which year had the highest fuel increase. Explain how this would be possible. (2)

[23]

<b>SECTION B: SOLUTIONS AND HINTS TO SECTION A</b>
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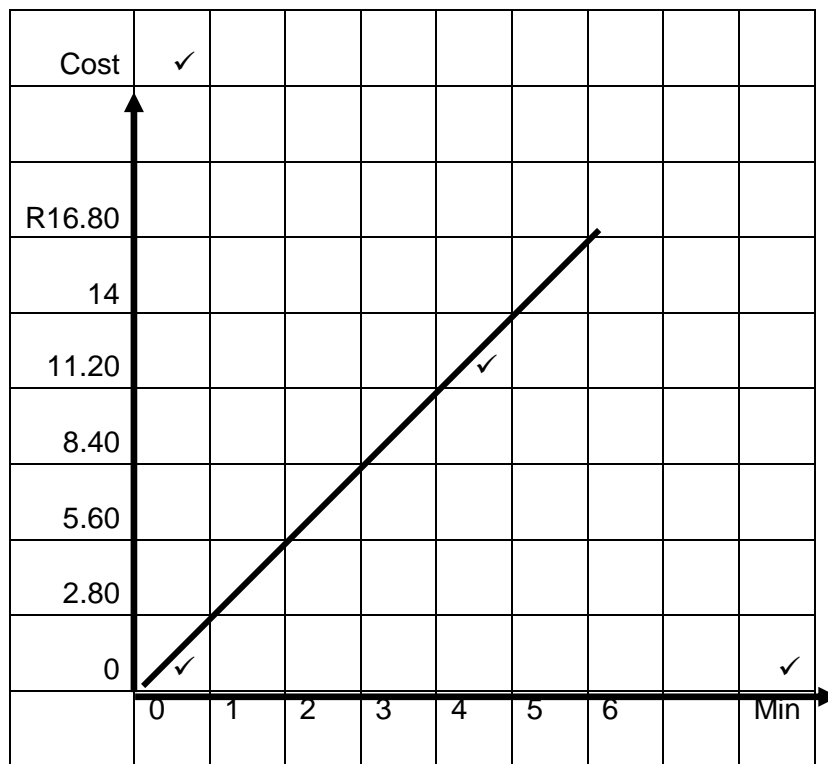
**QUESTION 1**

a) The complete table:

Minutes	1	2	3	4	5	6
Cost	2.80	5.60	<b>8.40</b> ✓	11.20	14	<b>16.8</b> ✓

**(Note: You need to look at the top value and multiply it by the R2,80)****(2)**

b) ✓ For scale and

**(Note: Take note of the ticks and where marks are allocated. Be careful as to know what graph is expected of you and that the right values are on the right axes)****(5)**

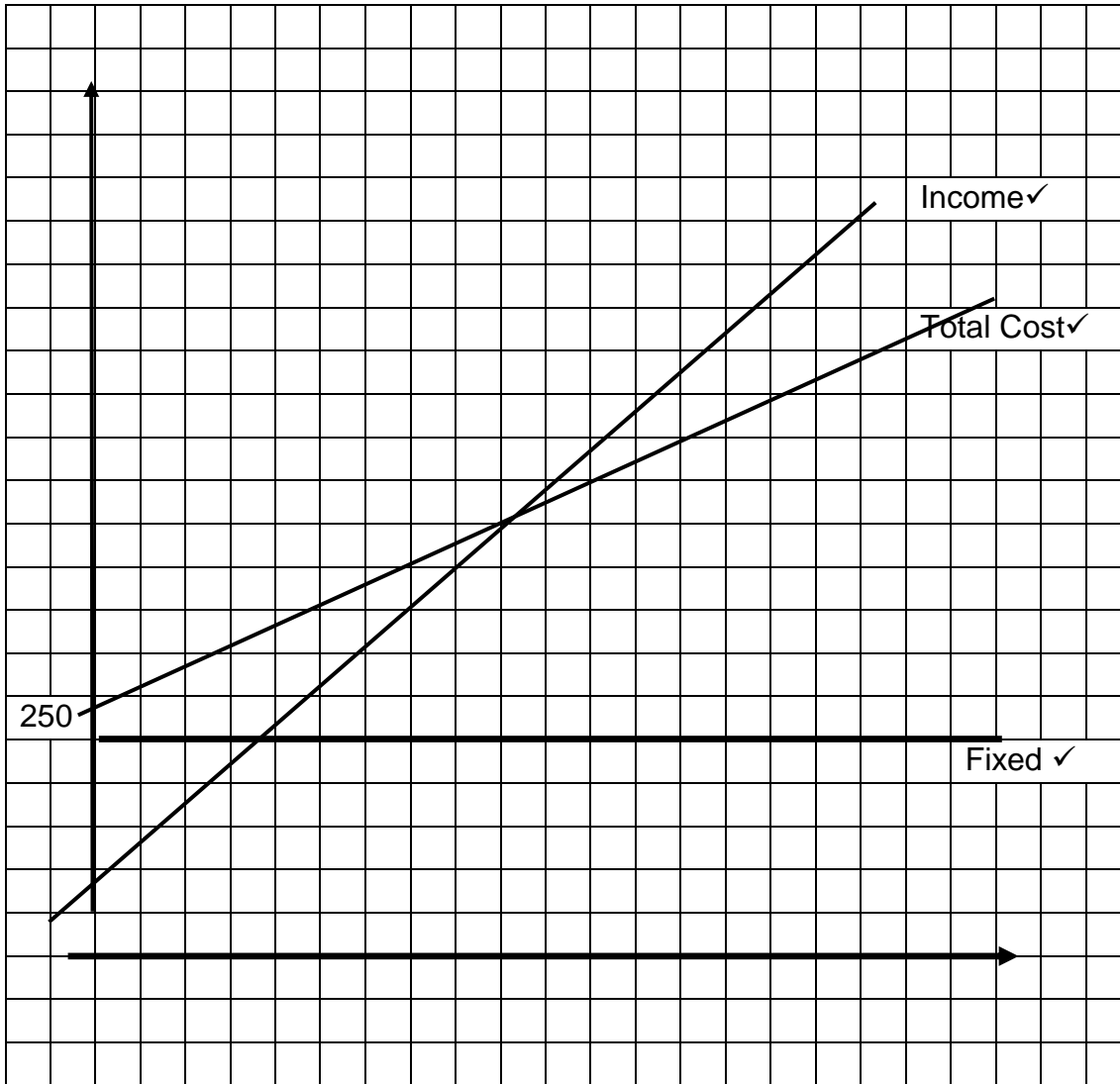
c) 
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
 (Or cost per minute);  $c = 0$ ✓

Thus,  $y = m \cdot x + c$  becomes  **$y = 2.80x$**  ✓✓

**(3)****[10]**

**QUESTION 2**

a)



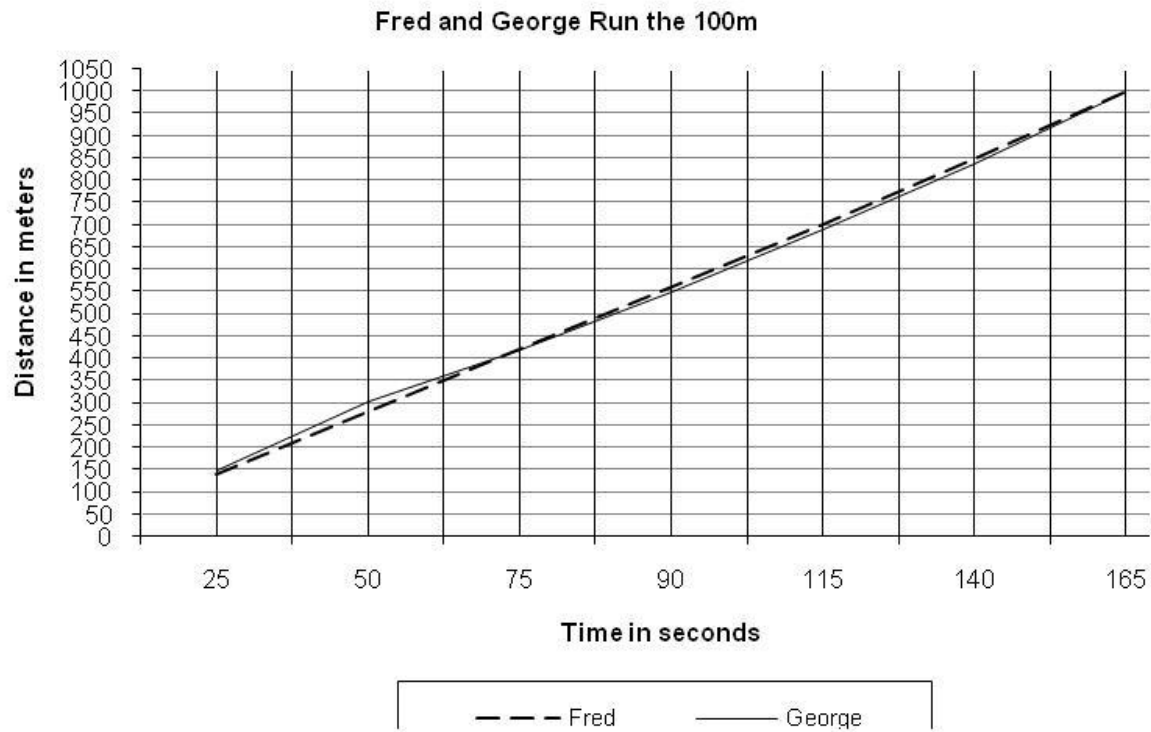
**(Note:** look at the mark allocation to ensure you add everything that is required) (3)

- a) x-axis: 1 unit per square ✓ (2)
- y-axis: 50 units per square ✓

- b) Read off: (10 ✓; 500 ✓) (2)
- [7]**

## QUESTION 3

- a) Answer is below after (e). (4)
- b) **Show on the graph:** Fred is ahead of George for the last 90 seconds or Fred is ahead of George from 75 to 165 seconds ✓✓ (2)
- c) **The label A on the graph should** be at (75 ✓; 420 ✓) (2)
- d)  $speed = \frac{meters}{seconds}$  So for George:  $speed = \frac{420m}{75s} = 5.6m/s$  ✓✓ (2)
- e) Between 75 and 90 seconds Fred ran the fastest. **Read off from table or from graph.** ✓✓ (2)



[12]

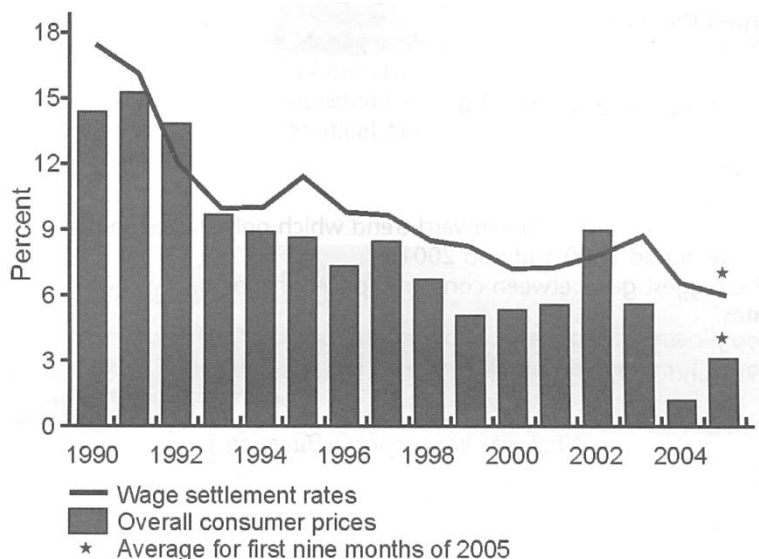
## SESSION 3: TOPIC 2: DRAW AND INTERPRET MORE THAN ONE GRAPH ON A SYSTEM OF AXES

### SECTION A: TYPICAL EXAM QUESTIONS

#### QUESTION 1: 5 minutes

(From Cluster Prelim Exam 2008)

The graph below illustrates the ratio between wage settlement rates (line graph) and the consumer price inflation (bar graph) that were achieved during collective bargaining agreements for the period 1990 to 2005.



1. During which year was the lowest wage settlement rate achieved? (1)
  2. During which year(s) does the consumer price inflation exceed the wage settlement rate? (1)
  3. Study the wage settlement trend from 1995 to 2001. Is it generally increasing or decreasing? (1)
  4. In which year is the largest percentage gap between the consumer price inflation and the wage settlement? (1)
  5. During which year(s) was the wage settlement rate and consumer price inflation almost on par? (1)
- [5]

#### QUESTION 2: 15 minutes

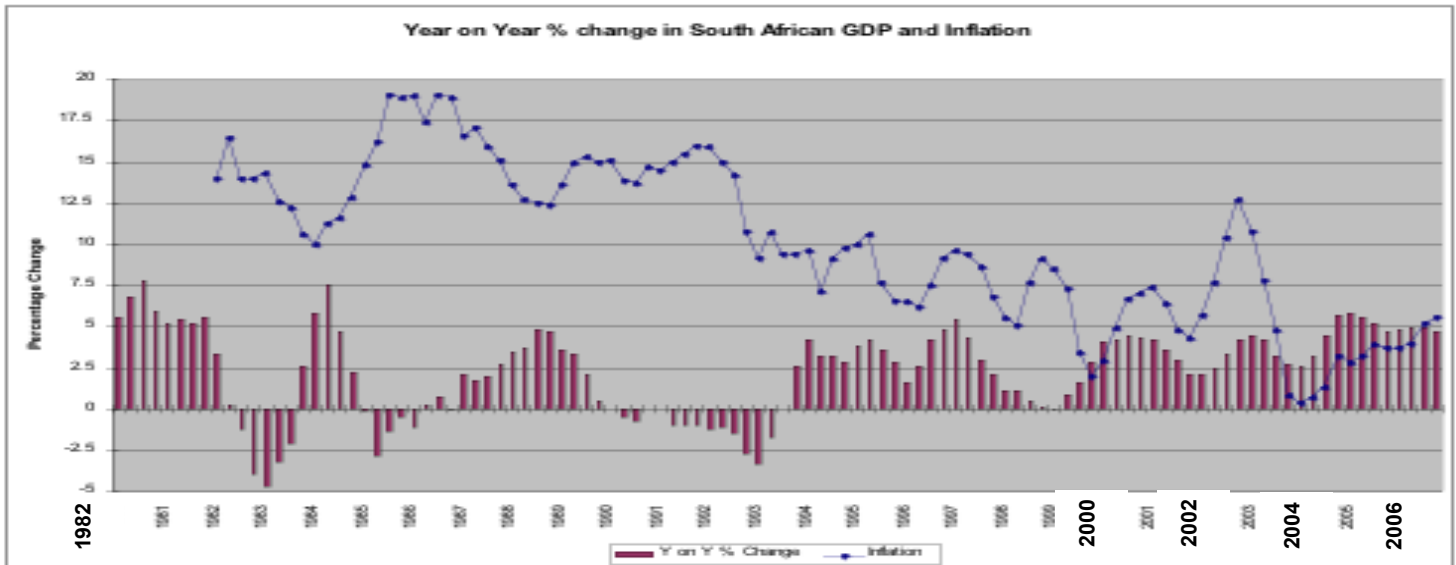
(From June Examination 2008)

**NOTE: Look at how negative values are interpreted.**

The graph on the following page shows the annual percentage change in Gross Domestic Product (GDP) for South Africa over the period 1980 to 2006.

There are four bars for each year, i.e., each bar represents one financial quarter: January to March, April to June, etc.

The line represents the annual percentage change in the rate of inflation from 1982 to 2006.



**HINT: Use a ruler to read the values from the graph so that you do not make errors.**

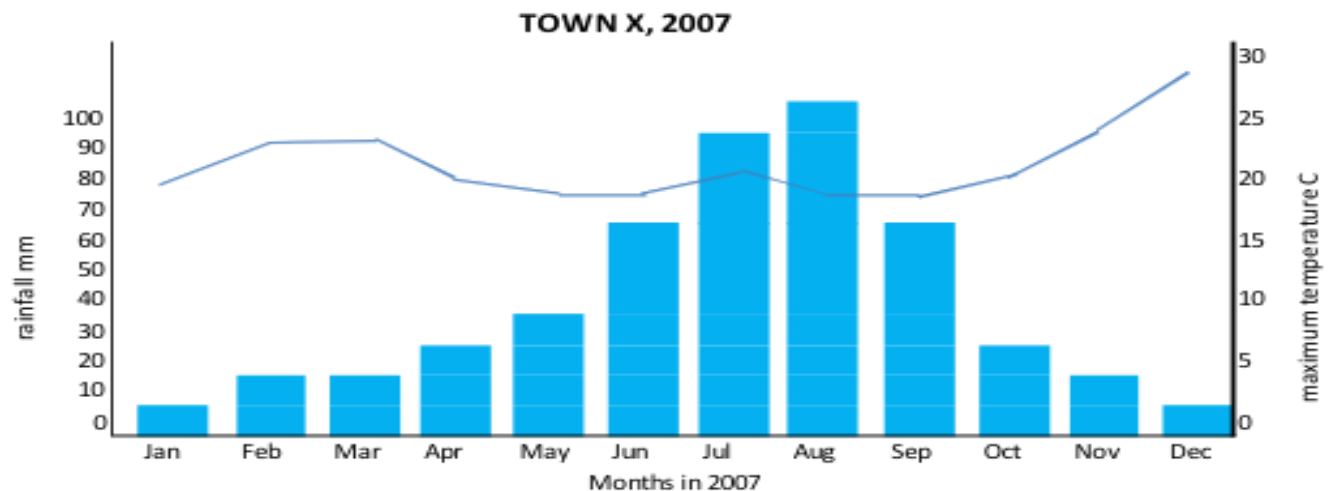
1. In what year did GDP growth reach its lowest level? (1)
2. What is the highest rate of inflation since the turn of the century? (1)
3. Explain why there are two quarters 'missing' in 1991 GDP graph. (1)
4. Describe what was happening to South Africa's GDP from the second half of 1991 through until the middle of 1993. (2)
5. In a short paragraph, describe the differences in South Africa's GDP growth for the two periods 1980 to 1993 and 1994 to 2006. (6)
6. Identify and explain the relationship that exists between GDP growth and inflation over the period 1982 to 1992. (2)
7. Making specific reference to the period 2001 to 2006, explain why a very low rate of inflation is not beneficial for the general economy. (2)

[15]

**QUESTION 3: 10 minutes**

The graph on the following page shows the average maximum temperature and rainfall figures for Town X, in Africa, in 2007.

**HINT: Use a ruler to read the values from the graph so that you do not make errors.**



- Give the highest and lowest temperatures recorded. (2)
  - Is Town X in the northern or southern hemisphere?  
Give a reason for your answer. (2)
  - In which month is the highest rainfall recorded? (1)
  - In which season does Town X have the most rainfall? (2)
  - Determine the total rainfall for Town X for 2007 and hence find the average monthly rainfall for Town A in 2007. (3)
- [10]

## SECTION B: ADDITIONAL CONTENT NOTES

### 1. INTRODUCTION

When you scan through a newspaper, many pages have graphs to illustrate visually the information that the articles are about. Sketching and reading graphs is the key to understanding the information around you.

In this section we will look at examples of graphs that contain more complex information and learn how to interpret this information correctly.

### 2. REVIEW OF WAYS TO REPRESENT DATA.

#### 2.1 BAR GRAPHS

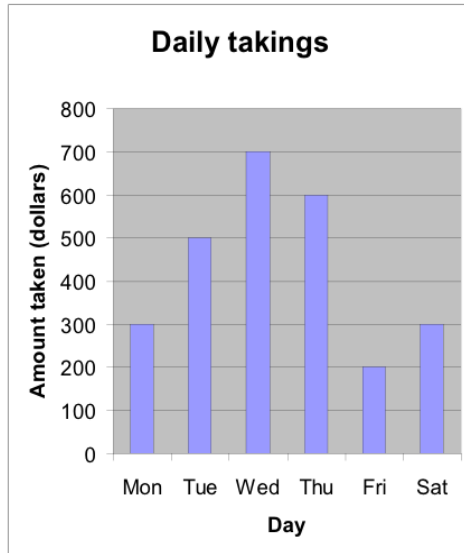
Bar graphs are used for discrete data, i.e. items depicted are completely separate. In this case Mon. is separate from Tues. which is separate from Wed. and so on.

**Vertical bar graphs** as shown in Fig 1 below, have the frequency on the vertical axis.

In this graph the highest daily taking was 700 dollars which was taken on Wednesday of the week shown.

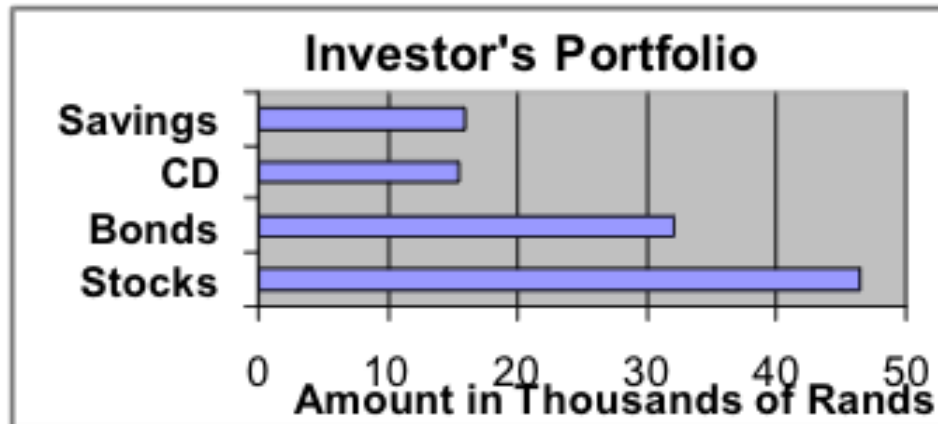
What was the lowest daily taking in the week depicted and on what day of the week was it taken?

Correct. Only 200 dollars was taken on Fri of the week depicted.



**Fig 1**

**Horizontal bar graphs** (Fig 2 below) have the frequency along the horizontal axis.



**Fig 2**

Note again that Savings, CD, Bonds and Stocks are completely different items.

What portfolio shows the highest investment? Yes. Stocks at approximately R47 000.



## Compound Bar Graphs.

A compound bar graph is a bar graph where each bar has been divided into two or more sections. A key is given. Look at this carefully as well as headings and labels on the axes to understand the graph.

### TEST ON SAMPLE OF SMOKERS

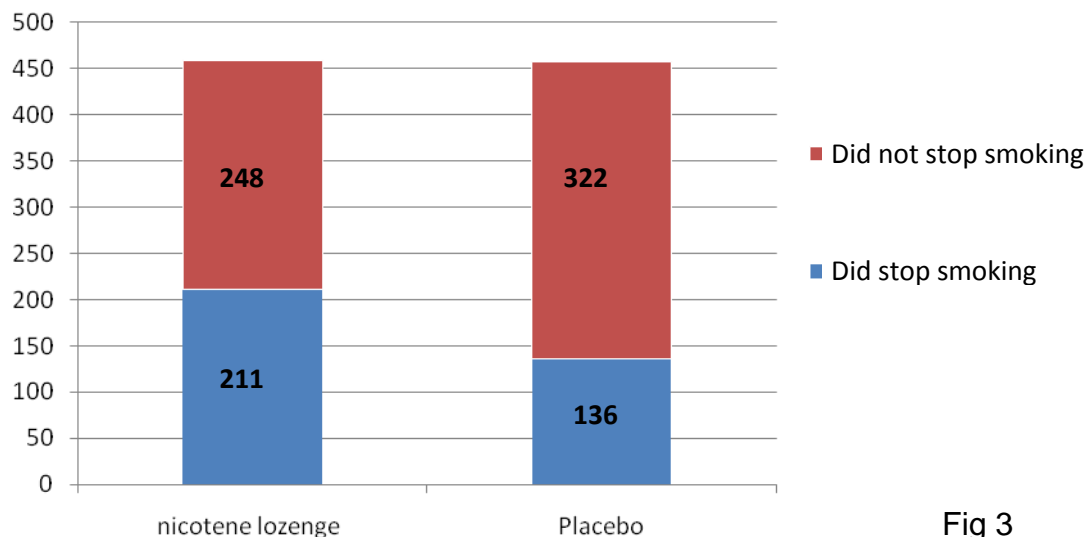


Fig 3

In the compound bar graph above (Fig 3) we notice that a total of 459 (211+248) smokers were given a nicotine lozenge while 458 smokers were given a placebo.

Of those who were given the lozenge, approximately 46% successfully abstained from smoking. This value is read off from the graph but can be checked by calculating  $211 \div 459 \times 100$ .

54% (100% – 46%) did not successfully abstain.

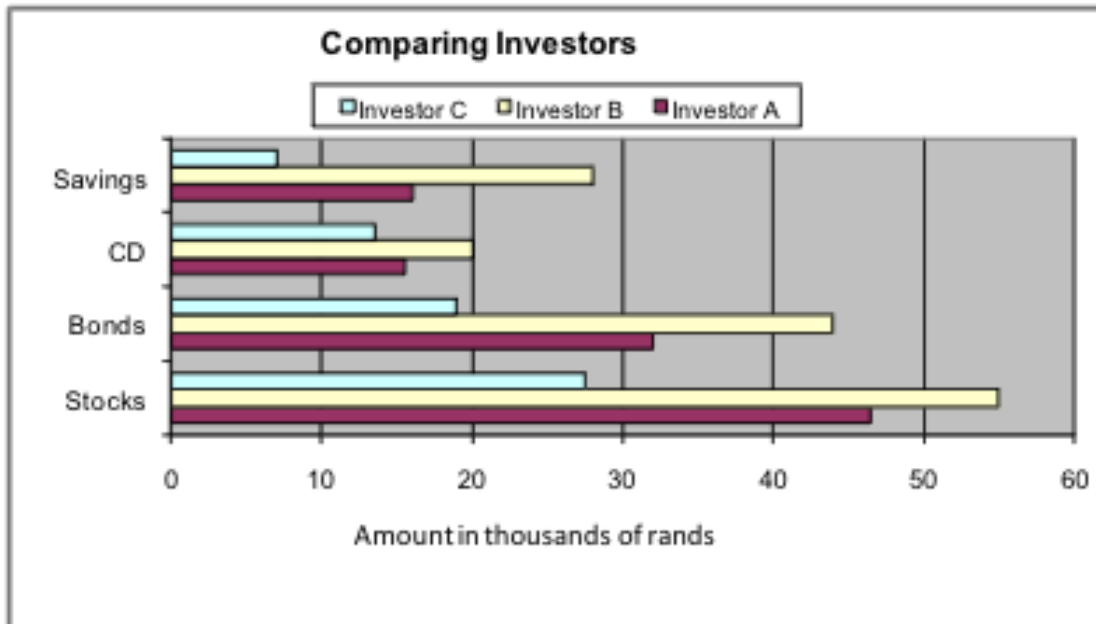
Of those smokers who were given the placebo 30% abstained and thus 70% (100% – 30%) did not successfully abstain from smoking.

What can we conclude from the results shown in this graph?

We can conclude that the nicotine lozenge was more successful than the placebo in helping people give up smoking, but in general was not very successful as only 47 % abstained from smoking.

## Multiple Bar Graphs

A multiple bar graph (Fig 4 below) is where each item has a number of bars. Again, look carefully at the key headings and labels in order to understand the graph.



**Fig 4**

Which investor invested the most into bonds? Investor B. In fact we notice that Investor B, invested the most money into all of the categories and investor C invested the least into all the categories.

How much did Investor B invest into Savings? Approximately R16 000

How much was invested altogether into Bonds.

Investor C	R18 000
Investor B	R44 000
Investor A	R32 000

Add these values up to give us a total of R94 000.

As can be seen we can answer a number of questions by using this graph.

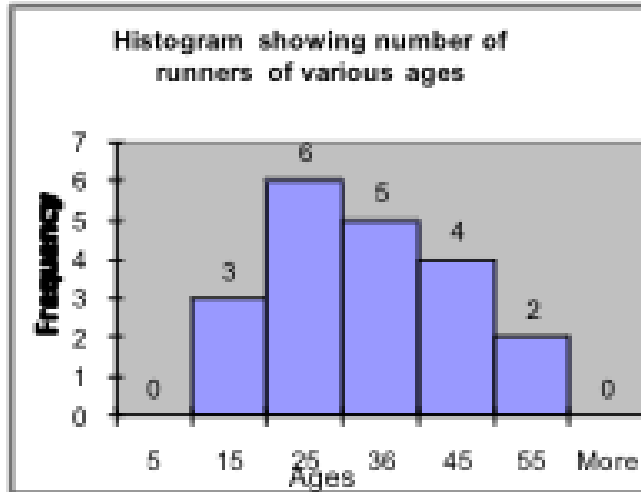
E.g., How much did Investor B invest altogether? What is the difference in Investor B and Cs investment into savings?

Try to make up and answer a number of questions yourself.

## 2.2 HISTOGRAM.

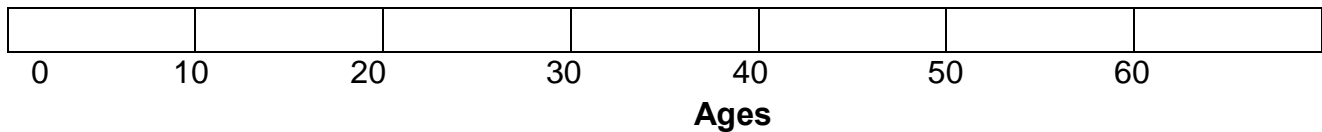
A histogram is used when the data is continuous, e.g. age, temperature, time.

**Note:** There is no gap between the bars as in a bar graph.



**Fig 5**

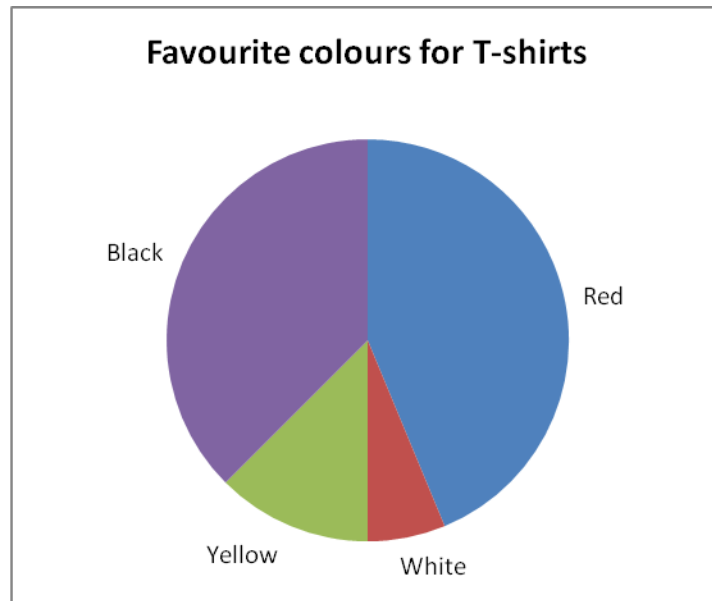
Look at the horizontal in Fig. 5 above axis. It has been labelled by indicating the middle age. Often you will see it labelled as follows



Also in this graph, you will notice the exact frequency given at the top of each bar. This value is not always given and in that case you have to read it off from the vertical axis.

From the graph it is clear that out of this group of runners the majority fall into the 20 to 30 age group and there are no runners from 0-5yrs and older than 60 years.

## 2.3 PIE CHARTS



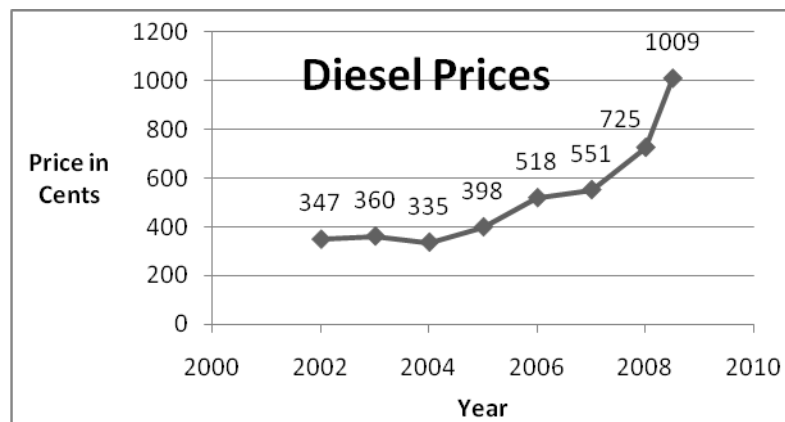
**Fig. 6**

In a pie chart, data is represented in a circle as a fraction of  $360^\circ$ . The full  $360^\circ$  shows 100%,  $180^\circ$  shows 50%,  $90^\circ$  shows 25% and so on.

In fig 6 above if the area labelled Red measures  $165^\circ$ , calculate the percentage of those surveyed who had red as their favourite T-shirt colour,

$$165 \div 360 \times 100 = 45,8\%$$

## 2.4 LINE GRAPHS



**Fig. 7**

Again in the line graph above, the exact values have been shown at the points plotted.

## SECTION C: HOMEWORK

### QUESTION 1: 12 minutes

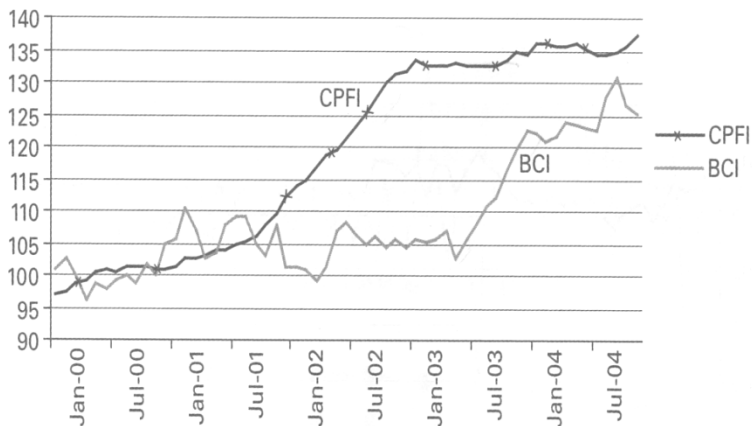
The CPFI (Consumer Price Food Index) is a measure of the inflation rate of our country.

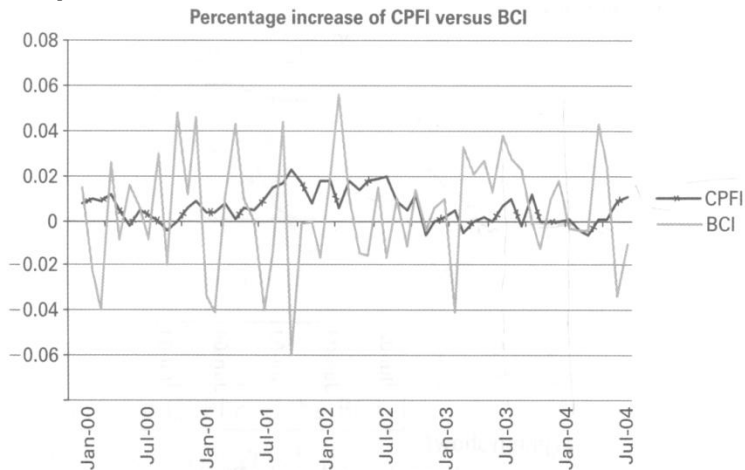
The BCI (Business Confidence Indicator) is a measure of the level of confidence that businesses (both local and foreign) have in the economy of our country.

Local businesses need to feel confident about our country's economy if they are to spend money on expansion (growing bigger).

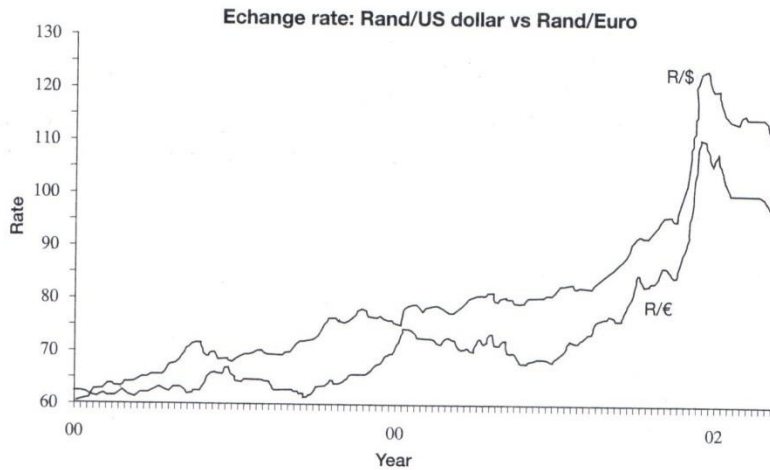
Foreign businesses also need to feel confident about our country's economy if they are to invest their money in our country. They will only do so if they feel that our country's economy is healthy and growing. If not, they would rather invest their money elsewhere.

**Graph 1** CPFI and BCI



**Graph 2**

- a) Consider GRAPH 1. What trend would you hope to see the CPFI graph follow?  
Is this possible? Justify your answer. (3)
- b) Consider GRAPH 1. When the CPFI climbs steeply, what does the BCI do?  
Do you expect this to happen? (3)
- c) Consider GRAPH 2. Graph 2 is based on the same data as Graph 1 yet looks very different. Which would be more beneficial to us as consumers: the CPFI being positive (above the 0) or the CPFI being negative (below the 0)? Justify your answer. (4)
- d) A foreign business is considering investing in our country, but he needs some convincing. Use, and refer to each of the graphs, to discuss how you would convince foreign investors to invest in South Africa. (4)
- [14]

**QUESTION 2: 10 minutes**

**Study the graph above and then answer the following questions:**

- What was the highest and what was the lowest rand/dollar exchange rate during the time period illustrated? (2)
- What was the highest and what was the lowest rand/euro exchange rate during the time period illustrated? (2)
- Both rates fluctuate a lot over the period, but show an overall trend which can be seen in spite of the fluctuations. What is this trend? (3)
- During the period illustrated on the graph, was the dollar or euro worth more in rand? (2)
- On 15 May 2006, the exchange rates were as follows: 1 US\$ = 6,42652 ZAR, and 1 Euro = 8,27310 ZAR. Compare these exchange rates with those between 2000 and 2002, as shown on the graph. What is different about the 2006 rates in comparison to the 2000 to 2002 rates? (3)

[12]

**Learner Note:** As you attempt the homework, take careful note of the time limits and marks awarded. It is important to know what is being asked. Practise, practise, practise!

<b>SECTION D: SOLUTIONS AND HINTS TO SECTION A</b>
--

**QUESTION 1**

<b>Note: read off the graph carefully</b>
---

- |                     |            |
|---------------------|------------|
| 1. 2005. ✓          | (1)        |
| 2. 1992 and 2002 ✓✓ | (1)        |
| 3. decreasing ✓     | (1)        |
| 4. 1997 ✓           | (1)        |
| 5. 1993 ✓           | (1)        |
|                     | <b>[5]</b> |

**QUESTION 2**

- |   |             |
|---|-------------|
| 1. 1983 (highest negative value) ✓  | (1)         |
| 2. Values not known, no records of GDP for this time <b>OR</b> ✓  | (1)         |
| 3. 12,5 or 12,6 % ✓   | (1)         |
| Value of GDP was zero   |             |
| 4. There was negative growth in GDP ✓ i.e. the GDP decreased steadily during this period to approx -2,6 % in first quarter of 1993 and then took a turn to end up at zero growth in middle of 1993. ✓               | (2)         |
| 5. 1980-93 Growth fluctuated ✓ - upwards followed by downwards ✓, periods of negative growth 1994 -2006 ✓ All positive growth ✓, general upwards trend possible reason end of apartheid and sanction against SA) ✓✓ | (6)         |
| 6. As inflation increases, GDP growth decreases ✓ - As prices increase, less is spent and GDP growth decreases. ✓   | (2)         |
| 7. During this period, inflation was low in comparison to earlier ✓ and as it dropped so did GDP growth. As it increased so did GDP growth. ✓   | (2)         |
|   | <b>[15]</b> |

**QUESTION 3**

- |   |                         |
|---|-------------------------|
| a) Highest temp – 29 degrees C ✓, lowest temp 18 degrees C ✓  | (2)                     |
| b) Southern H, close to the equator ✓. Temperatures are hot. ✓  | (2)                     |
| c) August ✓   | (1)                     |
| d) Winter ✓✓  | (2)                     |
| e) ) <u>5 + 15 + 14 + 25 + 35 + 62 + 98 + 105 + 62 + 22 + 12 + 5</u> ✓ (1M for adding all the temperatures) |                         |
| 12 ✓  | (1M for dividing by 12) |
| = $\frac{460}{12}$  |                         |
| = 38,33 ✓   | (3)                     |
|   | <b>[10]</b>             |

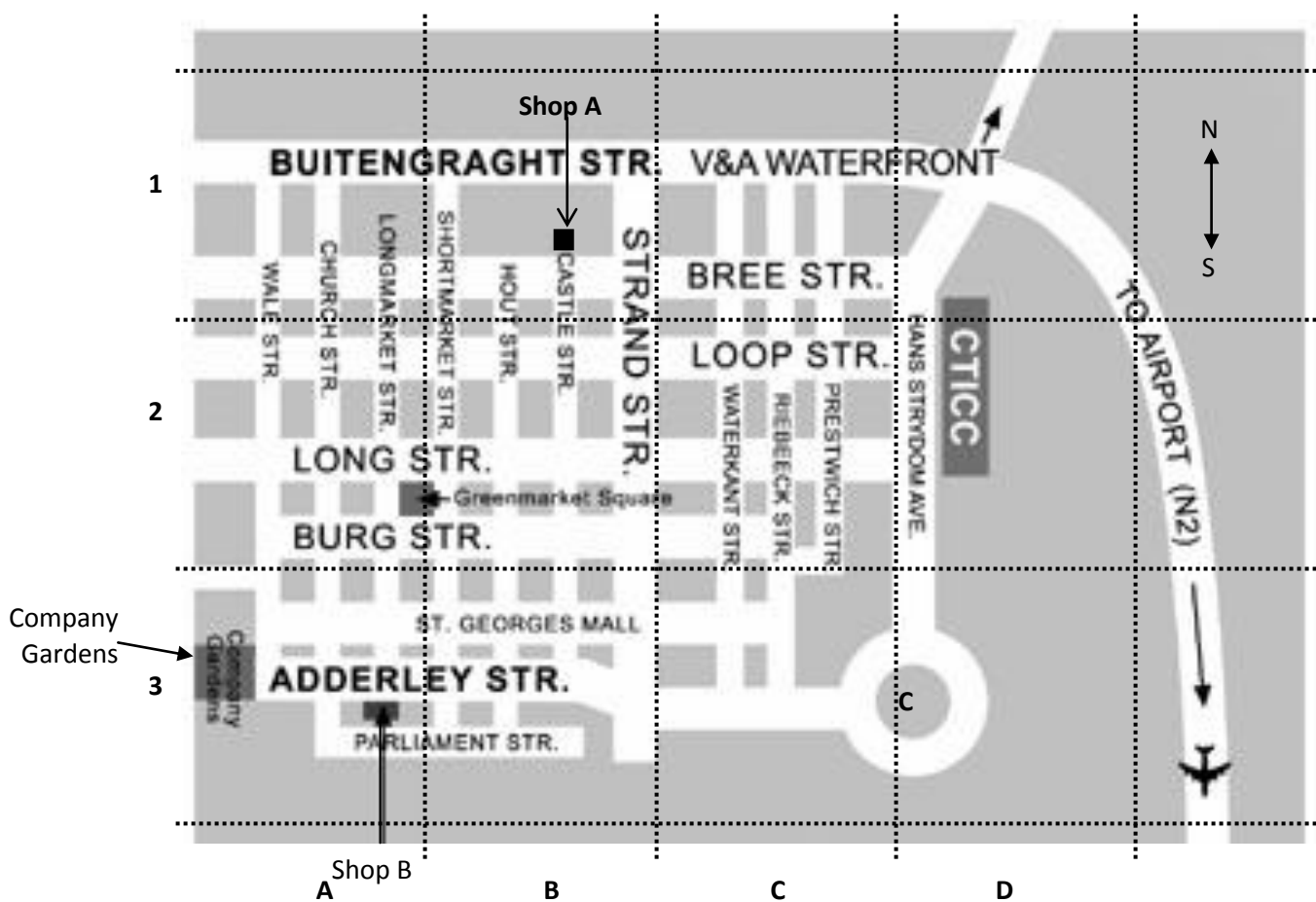


**SESSION 4: TOPIC 1: GRIDS, MAPS AND THE COMPASS - LOCATION AND RELATIVE POSITION**

**! Learner Note:** Make sure you know and understand how to (a) use grids to locate places (b) read and use maps (c) use a compass to determine bearing and direction. Make sure you know how to use a grid, map and / or compass to locate and describe the relative position of a place.

**SECTION A: TYPICAL EXAM QUESTIONS**

**QUESTION 1:**      **13 minutes**      *(Taken from DoE/Preparatory Exam 2008 Paper 1)*



- 1.1 The grid reference of Shop B is A3. Write down the grid reference for Shop A. (1)
- 1.2 If a truck drives from Shop B in a northerly direction in Longmarket Street
  - 1.2.1 In which street should the truck turn east in order to reach Shop A? (2)
  - 1.2.2 The scale of the map is 1 : 70 000. Calculate the distance, in km, the truck travels from Shop A to Shop B as described above. (3)
- 1.3 In which direction should one travel from Shop B in order to reach the Company Gardens (grid reference A3)? (1)

- 1.4 Peter walks in a northerly direction from Shop B. At Burg Street he turns right and continues in an easterly direction until he reaches Prestwich Street. At Prestwich Street he turns and continues his journey in a northerly direction. He crosses one road and at the second road he turns right. He continues to the end of this road and reaches his destination straight ahead.  
What is his destination? (2)
- 1.5 In what direction would you have to travel from the V&A Waterfront to get to the airport?(2)
- 1.6 Complete the following: 'The traffic circle (marked C on the map) lies \_\_\_\_\_ of Shop A on a bearing of \_\_\_\_\_ (4)
- [15]

**QUESTION 2: 22 minutes** (Taken from Summary sets for diagrams and notes 2011)

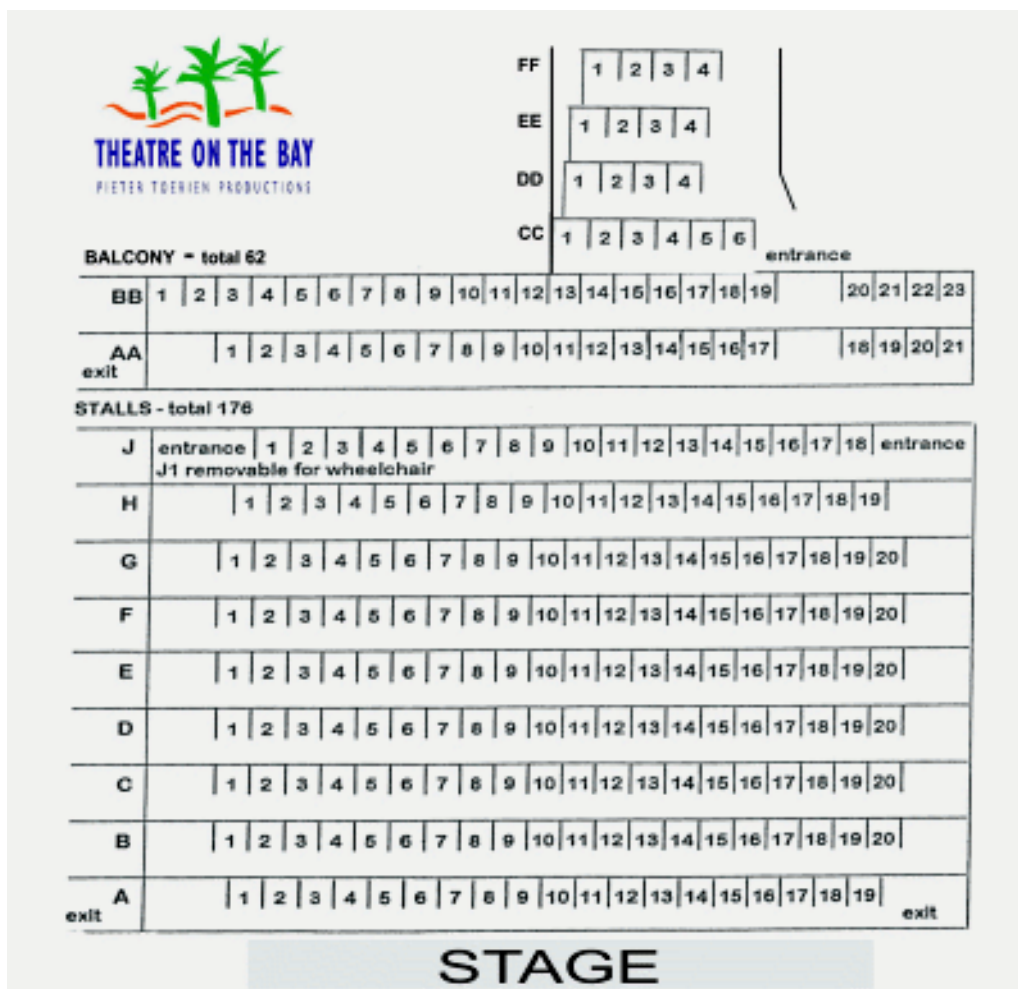
Use the map below to answer the questions that follow:



- 2.1. Estimate the direction of the following towns in relation to Machadodorp: (2)
- 2.1.1. Middelburg (2)
  - 2.1.2. Lydenburg (2)
  - 2.1.3. Draaikraal (2)
  - 2.1.4. Waterval Onder (2)
- 2.2. Determine the bearing of the following towns from Machadodorp: (2)
- 2.2.1. Middelburg (2)
  - 2.2.2. Lydenburg (2)
  - 2.2.3. Draaikraal (2)
  - 2.2.4. Waterval Onder (2)
  - 2.2.5. Identify the two main roads / highways on this map. (2)
- 2.3. Which towns, travelling on the R540 in a northerly direction, do you pass through on the way to Lydenburg? (2)
- 2.3.1. Which province lies north of Middelburg? (2)
- [22]

**QUESTION 3: 10 minutes** (Taken from Summary sets for diagrams and notes 2011)

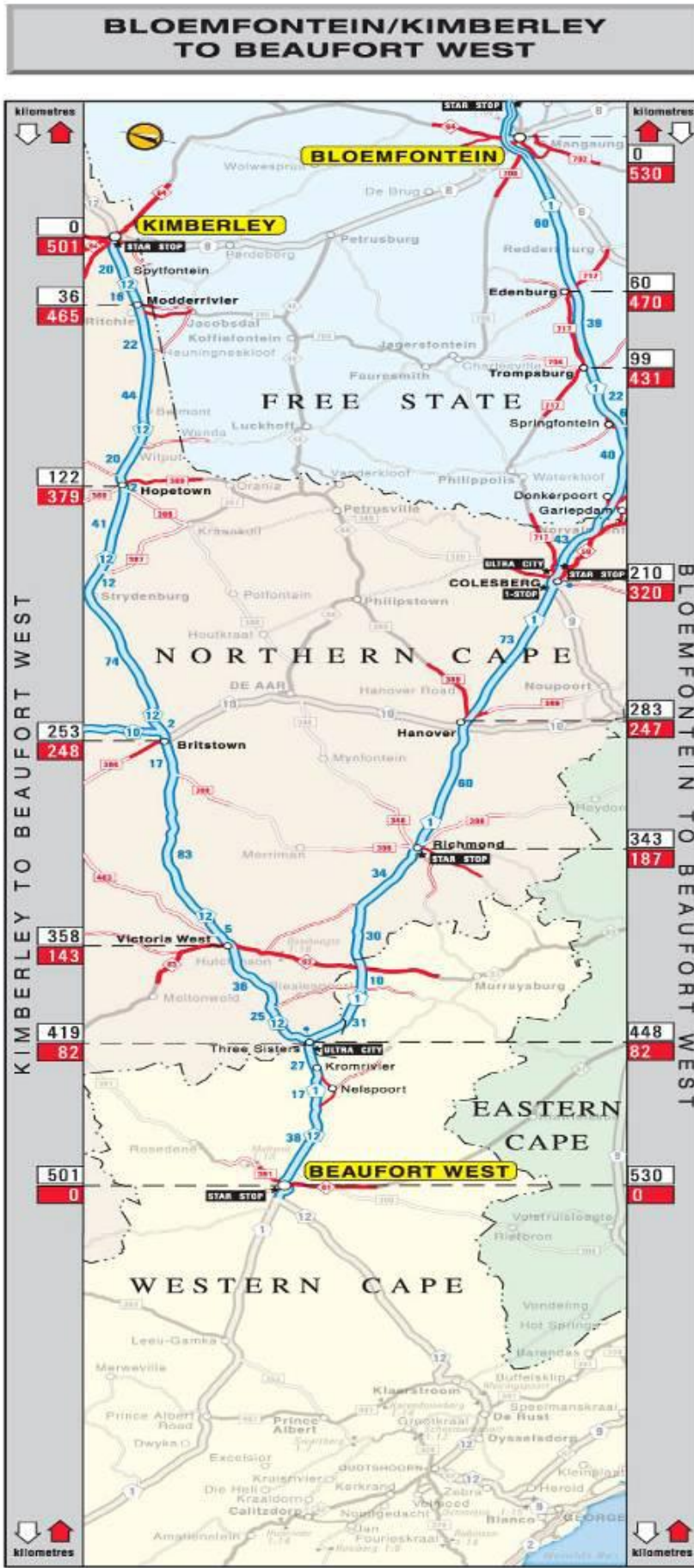
3. Use the theatre seating plan below to answer the questions that follow:



- 3.1. Without counting, determine the number of seats in the theatre. Show your working out. (3)
  - 3.2. How does the seating plan differentiate between the seats on the balcony and the seats in the stalls? (2)
  - 3.3. The stalls are downstairs whilst the balcony is upstairs. Which seats in the stalls do you think are the most expensive? Why do you say so? (2)
  - 3.4. If you are in a wheelchair, which 'seat' (you will be sitting in your wheelchair) will you be sitting in? (1)
  - 3.5. Why do you think the balcony only has one exit while the stalls have two? (2)
  - 3.6. How many seats do the majority of the rows in the stalls have? (1)
- [11]

**QUESTION 4: 10 minutes** (Taken from Summary sets for diagrams and notes 2011)

4. Consider the route map shown on the next page. This map, found on the AA website ([www.aa.co.za](http://www.aa.co.za)), shows the route that can be travelled between Bloemfontein and Beaufort West, or between Kimberley and Beaufort West.
    - 4.1. If one were to follow the route provided by the AA, then determine:
      - 4.1.1. the distance between Bloemfontein and Colesberg. (2)
      - 4.1.2. the distance between Three Sisters and Victoria West. (2)
      - 4.1.3. the provinces one would travel in when going from Bloemfontein to Beaufort West. (3)
    - 4.2. When asked the distance between Kimberley and Bloemfontein, Thiresha said it was 29km. Explain how she obtained her answer. Is she correct? (3)
- [10]



## SECTION B: ADDITIONAL CONTENT NOTES

**Scale** is always written in cm UNLESS otherwise stated, e.g. 1 : 10 000 means that 1 cm on paper (on the map) represents 10 000 cm in reality (on the ground).

To calculate distances both in reality and on the map, make use of ratio as follows: The scale of the map is 1 : 30 000

- a) The distance between Town A and Town B, on the map, is 9,4 cm. Calculate the distance, in km, between the towns.

$$\text{Paper : Reality} = \text{Paper : Reality}$$

$$1 : 30\,000 = 9,4 : x$$

$$\frac{1}{30\,000} = \frac{9,4}{x}$$

$$x = 9,4 \times 30\,000$$

$$x = 282\,000 \text{ cm}$$

$$x = 282\,000 \text{ cm} \div 100\,000$$

$$x = 2,82 \text{ km}$$

- b) The distance from Town C to Town D is 2 km. Determine how far apart the towns are on the map.

$$\text{Paper : Reality} = \text{Paper : Reality}$$

$$1 : 30\,000 = x : 2 \text{ km} \quad (\text{Units must be in cm})$$

$$1 : 30\,000 = x : 200\,000 \text{ cm}$$

$$\frac{1}{30\,000} = \frac{x}{200\,000}$$

$$30\,000x = 1 \times 200\,000$$

$$30\,000x = 200\,000$$

$$\frac{30\,000x}{30\,000} = \frac{200\,000}{30\,000}$$

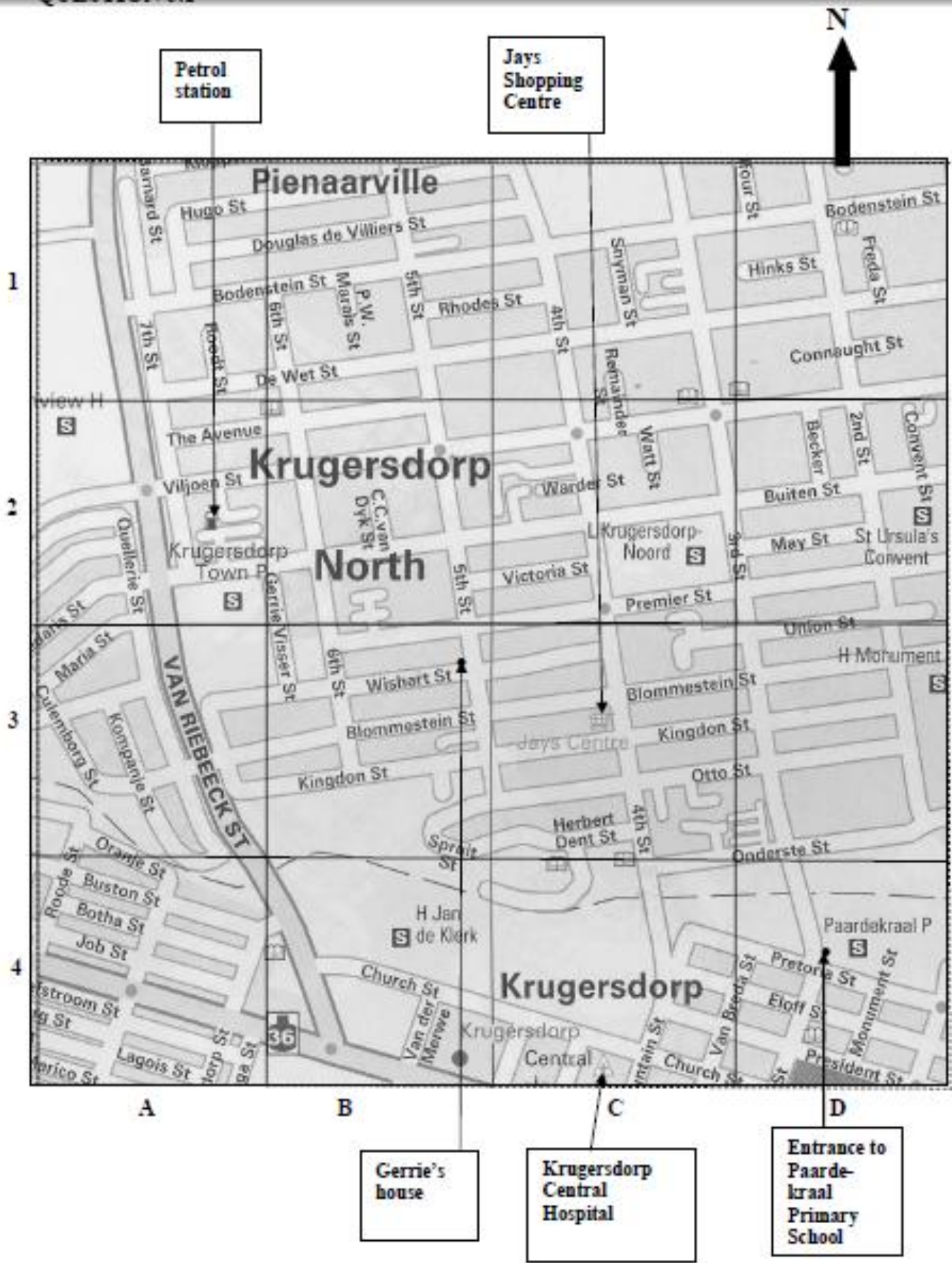
$$x = 6,67 \text{ km}$$

## SECTION C: HOMEWORK

### QUESTION 1: 20 minutes

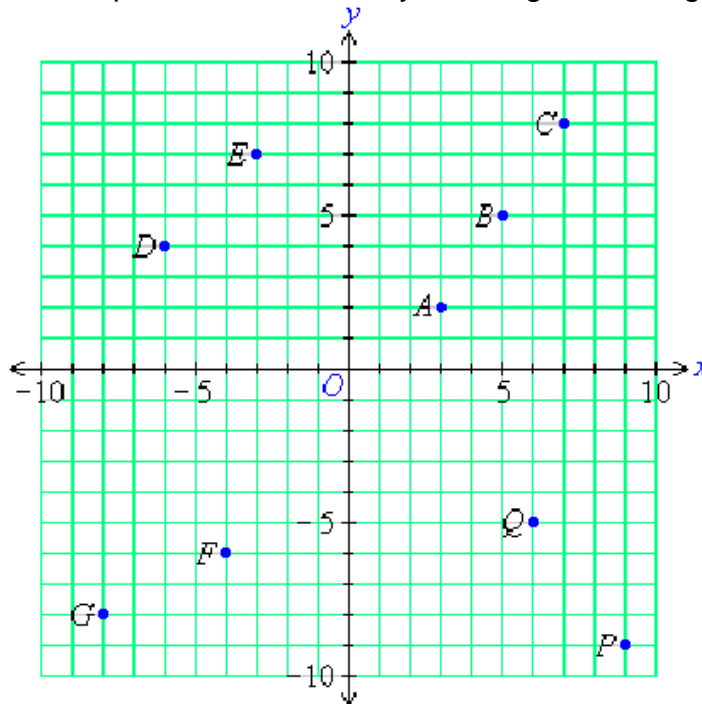
(Taken from DoE Feb Exam 2009 Paper 2)

- 1.1. On the next page is the map of part of Krugersdorp. Use it to answer the questions that follow.



- 1.1.1. Give a grid reference for the Jays Shopping Centre where Gerrie and his mother do their weekly grocery shopping. (2)
- 1.1.2. Gerrie's grandmother lives with them and goes to the hospital for her medication once a month.
- What is the relative position of Krugersdorp Central Hospital with respect to Gerrie's home? (2)
  - What is the bearing of the hospital from Gerrie's home? (2)
- 1.1.3. Gerrie's father drives from Jays Shopping Centre to the petrol station to buy petrol for his car. Describe his route if the exit from Jays Shopping Centre is in 4th Street. (3)
- 1.1.4. Every morning at 07:00, Gerrie takes the following route from home:
- Crossing 5th Street and walking in an easterly direction along Wishart Street until he reaches the T-Junction.
  - He turns right and walks in a southerly direction along 4th Street
  - He turns left and walks in an easterly direction along Onderste Street until he reaches 3rd Street.
  - He turns right and walks in a southerly direction.
  - He reaches his destination on the corner of 3rd Street and Pretoria Street.
- Where does Gerrie go? (2)
  - How old do you think he is? Give a reason for your answer. (2)
- 1.1.5. The school's entrance is on the corner of 3rd Street and Pretoria Street.
- Measure the total walking distance on the map between Gerrie's house and the Paardekraal Primary School in centimetres. (3)
  - Use the scale 1:11 000 to calculate the actual distance Gerrie walks to school. Give your answer in kilometres. (4)
- [20]

**QUESTION 2: 8 minutes** (Taken from Summary sets for diagrams and notes 2011)  
Give the co-ordinates of the points, A, E and G by referring to the diagram below. (8)

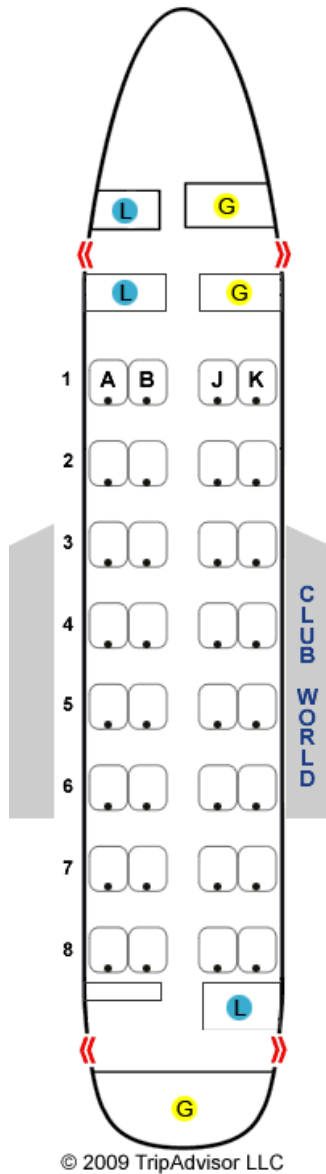




**QUESTION 3: 4 minutes**

*(Original)*

British Airways Airbus A318S



**Seatmap Key**

- Good Seat
- Some Drawbacks
- Poor Seat
- Standard Seat
- Blocked Seat
- FA Crew Seat
- Power Port
- ⏏ Emergency Exit
- ∨ Overhead TV
- G Galley
- L Lavatory
- C Closet

Use the seating plan of the Airbus on the left to answer the following questions.

- 3.1. Would you have a window seat if you sit in K7? (1)
- 3.2. Would you be able to work on your laptop if you were in seat A2? Explain your answer. (2)
- 3.3. How many toilets are there on the plane? (1) [4]

(<http://www.seatguru.com>)

**SECTION D: SOLUTIONS AND HINTS TO SECTION A****QUESTION 1: 13 minutes***(Taken from DoE/Preparatory Exam 2008 Paper 1)*

- 1.1. B1 ✓✓ (1)
- 1.2.
- 1.2.1. Bree Street ✓✓ (2)
- 1.2.2.  $\frac{1}{70\ 000} = \frac{7,3}{x}$  ✓  $x = 511\ 000\ \text{cm}$  ✓  $= 5,11\ \text{km}$  ✓ (3)
- 1.3. South West ✓✓ (1)
- 1.4. CTICC ✓✓ (2)
- 1.5. Southerly ✓✓ (2)
- 1.6. SE ✓✓  $\pm 142^\circ$  ✓✓ (4)
- [15]**

**QUESTION 2: 13 minutes***(Taken from Summary sets for diagrams and notes 2011)*

- 2.1
- 2.1.1 West ✓✓ (2)
- 2.1.2 NNE ✓✓ (2)
- 2.1.3 North ✓✓ (2)
- 2.1.4 East ✓✓ (2)
- 2.2 Determine the bearing of the following towns from Machadorp
- 2.2.1  $\pm 262^\circ$  ✓✓ (2)
- 2.2.2  $\pm 18^\circ$  ✓✓ (2)
- 2.2.3  $\pm 300^\circ$  ✓✓ (2)
- 2.2.4  $\pm 90^\circ$  ✓✓ (2)
- 2.3 N4 ✓ and N11 ✓ (2)
- 2.4 Dullstroom ✓✓ (2)
- 2.5 Limpopo ✓✓ (2)
- [22]**

**QUESTION 3: 10 minutes***(Taken from Summary sets for diagrams and notes 2011)*

Use the theatre seating plan below to answer the questions that follow:

- 3.1  $62 \checkmark + 176 \checkmark = 238 \checkmark$  (3)
- 3.2 AA1, BB1 etc on the balcony ✓ and the stall seats are labelled A1, B1 etc. ✓ (2)
- 3.3 Row A, ✓ they are closest to the stage. ✓ (2)
- 3.4 J1 ✓ (1)
- 3.5 There are more seats/ people in the stalls. ✓✓ (2)
- 3.6 20. ✓ (1)
- [11]**

**QUESTION 4: 10 minutes***(Taken from Summary sets for diagrams and notes 2011)*

- 4.1.1 210 km (2)
- 4.1.2 105 km (2)
- 4.1.3 Western Cape, Northern Cape and Free State. (3)
- 4.1.4 She took the readings from the bars on the right hand side and left hand side and subtracted them.  $530 - 501 = 29$ . She is not correct as these bars show vertical distances and not horizontal distances (3)
- [10]**

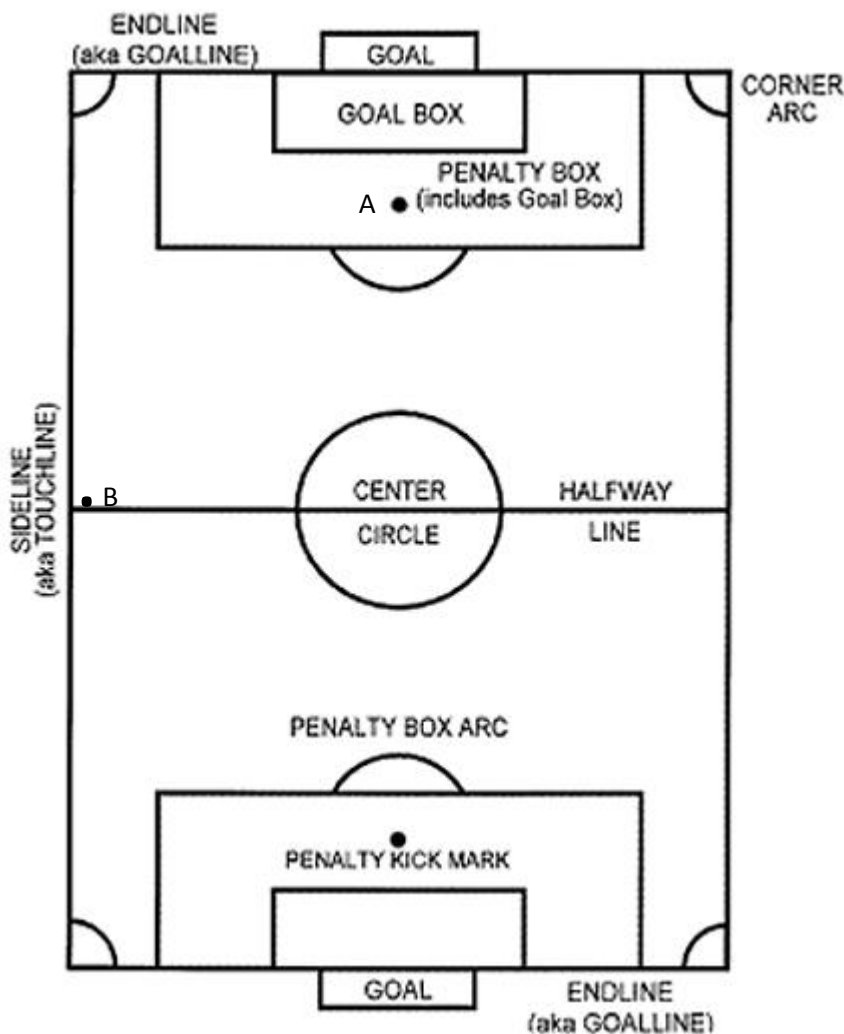
## SESSION 5: TOPIC 2: USE AND INTERPRET SCALE DRAWINGS. BUILD SCALE MODELS

**Learner Note:** Make sure you know and understand how to (a) determine the scale of a diagram or map if the dimensions are given, (b) use scale to find dimensions in reality and on paper, (c) use scale to build models

### SECTION A: TYPICAL EXAM QUESTIONS

**QUESTION 1: 14 minutes**

*(Original)*



#### The Soccer Field Dimensions

The field of play shall be rectangular, the width of which shall not exceed the length. The width is 68 m. The length is 96 m.

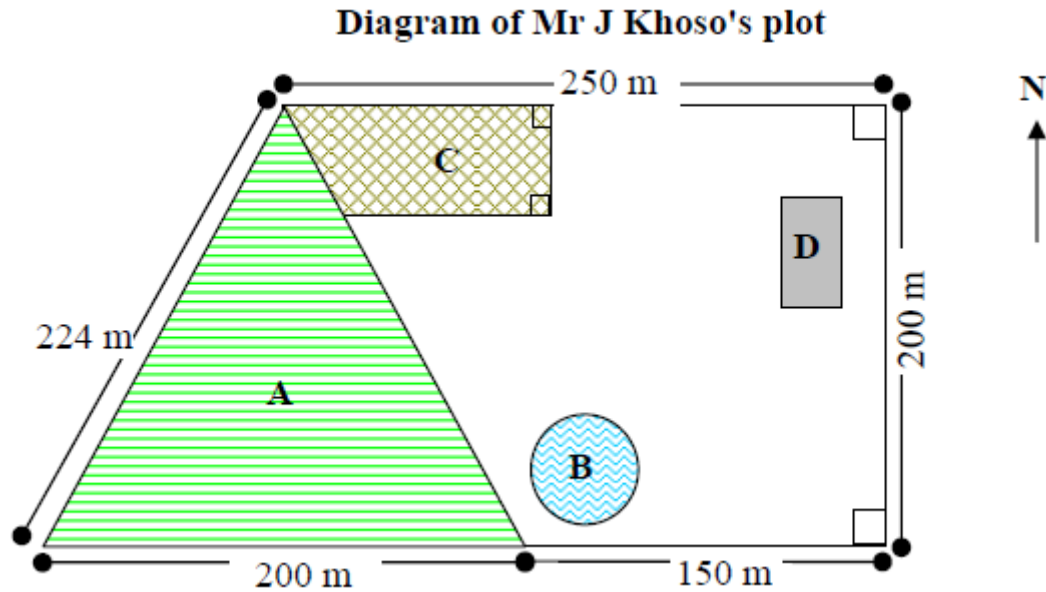
- 1.1. Use the information above and the diagram on the left to determine the scale of the diagram. Show all your working out. (6)
  - 1.2. Player A passes the ball to Player B as indicated on the diagram. Calculate the length of the pass, in metres. (4)
  - 1.3. The flat-roofed clubhouse has a length = 18 m, breadth = 12 m and height = 5 m. Use the scale 1 : 200 and draw the floor plan to scale. (4)
- [14]

<http://www.soccerwebsite.org>

**QUESTION 2:**

(Adapted from DoE/ Nov Exam 2010 Paper 1)

Mr J Khoso owns a plot, as shown in the diagram below (not drawn to scale). His house (D) is on the eastern side of the plot. Also on the plot is a cattle kraal (A), a circular water tank (B), and a vegetable garden (C).



KEY	DIMENSIONS
A Cattle kraal	Perpendicular Height = 200 m Base (south ) = 200 m Slanting side = 224 m Fencing height = 2 m
B Water tank	Radius = 10 m Height = 4 m
C Vegetable garden	Parallel sides = 100 m and 125 m Distance between parallel sides (height) = 50 m Fencing height = 2 m
D House	Length = 25 m Breadth = 8 m Height = 8 m

1.5 In groups of 4, use your knowledge of scale and build a model of Mr Khoso's plot. Use the scale 1: 500.

(15 × 3)  
[45]

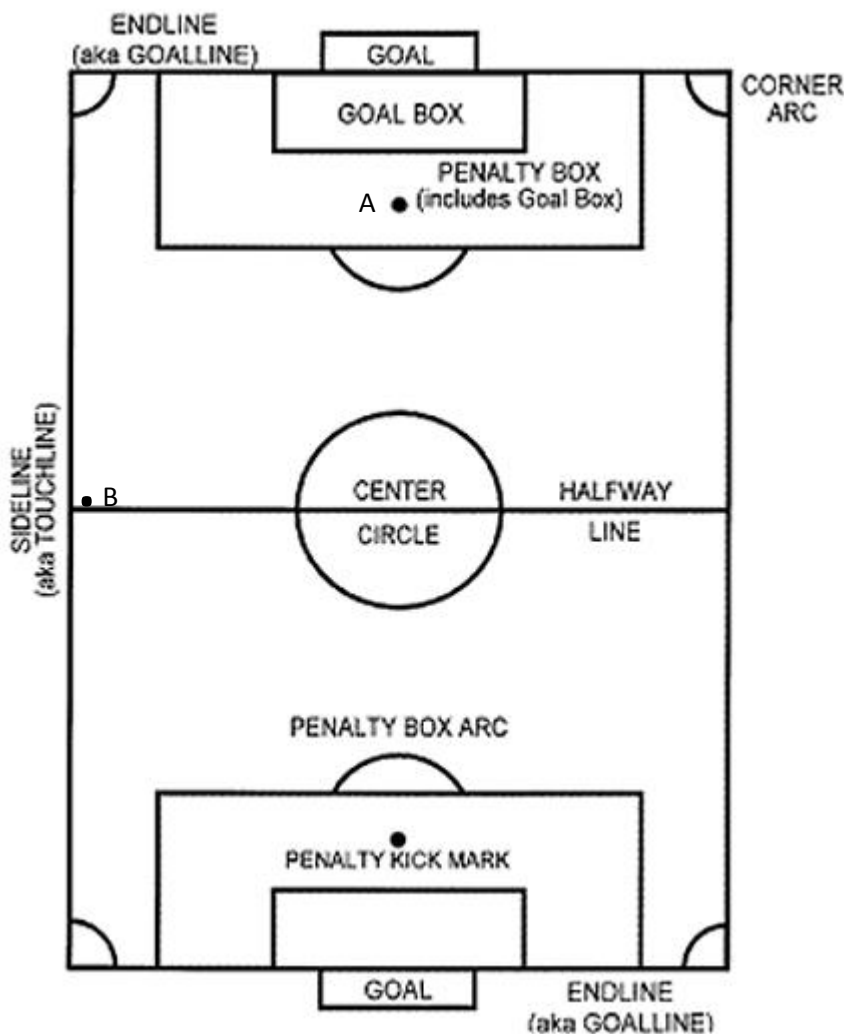
## SECTION B: ADDITIONAL CONTENT NOTES

- Building the models will take quite some time; therefore, the assessment task is out of 15, and the total is multiplied by 3.
- Scale is always in cm unless otherwise stated.
- Scale is written as Paper measurement : Reality measurement

## SECTION C: HOMEWORK

### QUESTION 1: 32 minutes

(Original)



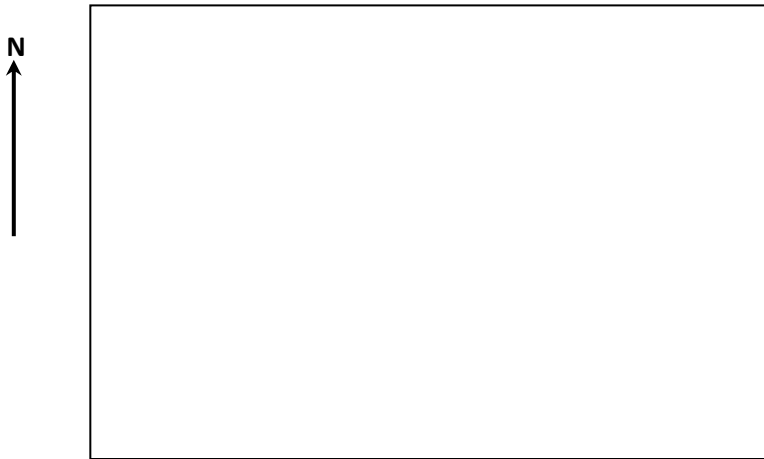
### The Soccer Field Dimensions

The field of play shall be rectangular, the width of which shall not exceed the length.  
The width is 68 m  
The length is 96 m

- 1.1. Use the scale 1 : 800 to calculate the distance from the penalty kick mark on one side of the field to the penalty kick mark on the other side of the field. (4)
- 1.2. Use the scale 1 : 800 to calculate the following:
  - 1.2.1. the actual length of the field. (4)
  - 1.2.2. the actual circumference of the centre circle. (6)

(<http://www.soccerwebsite.org>)

- 1.3. The coach wants to design a board with permanent markings of the field to use when discussion match tactics with his team. The actual field is 96 m × 68 m and his board is 3 m × 1,5 m.
- 1.3.1. Using the length of the board as the length of the field, determine whether he will fit the field onto his board using the entire board. Show all your working out. (10)
- 1.3.2. What advice would you give the coach regarding the dimensions of the board? (2)
- 1.4. The flat-roofed clubhouse has a length = 18 m, breadth = 12 m and height = 5 m. The scale 1 : 200. On the south side of the clubhouse are the Kitchen (8 m × 4 m), the Ladies' Rest Room (3m × 2 m) and the Men's Change Room (7 m × 4 m). Use the scale, draw and label the Kitchen, Ladies' Restroom and the Men's Change Room on the plan below. (6)



[32]

**SECTION D: SOLUTIONS AND HINTS TO SECTION A**

- Building the models will take quite some time; therefore, mark assessment out of 15 and multiply total by 3.
- Scale is always in cm unless otherwise stated.
- Scale is written as Paper measurement : Reality measurement

**QUESTION 1: 14 minutes***(Original)*

1.1.  $1 : x = 8,5 \text{ cm} \checkmark : 68 \text{ m}$

$1 : x = 8,5 \text{ cm} : 6800 \text{ cm} \checkmark$

$$\frac{1}{x} = \frac{8,5}{6800} \checkmark$$

$8,5x = 6800 \text{ cm}$

$$\frac{8,5x}{8,5} = \frac{6800}{8,5} \checkmark$$

$x = 800$

Scale is  $1 \checkmark : 800 \checkmark$

(6)

1.2.  $1 : 800 = 5,5 \text{ cm} \checkmark : x \text{ cm}$

$$\frac{1}{800} = \frac{5,5}{x} \checkmark$$

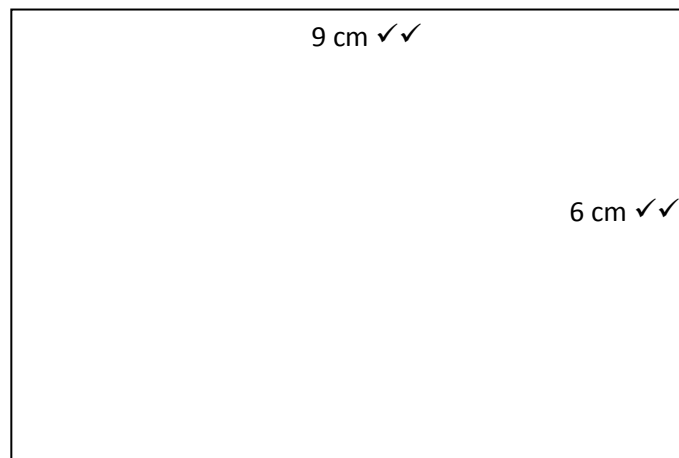
$x = 4400 \text{ cm} \checkmark$

$x = 44 \text{ m} \checkmark$

(4)

1.3. The flat-roofed clubhouse has a length = 18 m, breadth = 12 m and height = 5 m.  
Use the scale 1 : 200 and draw the floor plan to scale.

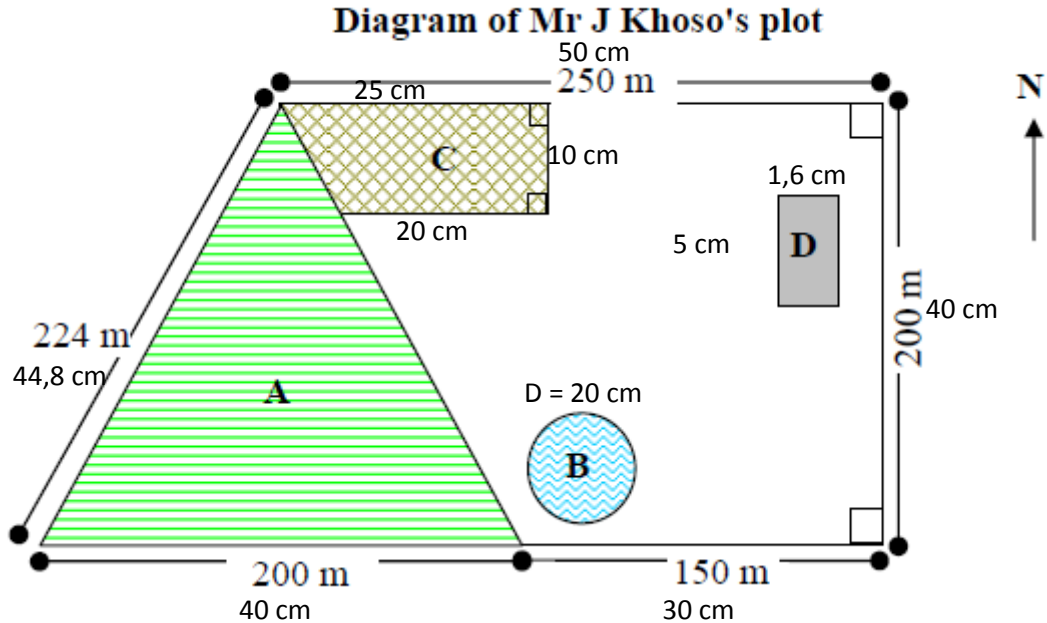
(4)

**[14]**

**QUESTION 2:**

(Taken from DoE/ Nov Exam 2010 Paper 1)

2.1 Using the scale 1: 500, construct the model..



KEY	DIMENSIONS
A Cattle kraal	Base (south ) = 40 cm ✓ Slanting side = 44,8 cm ✓ Fencing height = 0,4 cm ✓
B Water tank	Radius = 20 m ✓ Height = 0,8 cm ✓
C Vegetable garden	Parallel sides = 20 cm ✓ and 10 cm ✓ Distance between parallel sides (height) = 10 cm ✓ Fencing height = 2 m ✓
D House	Length = 5 cm ✓ Breadth = 1,6 cm ✓ Height = 1,6 cm ✓

Assembling of shapes

(12)  
(3)  
[15 × 3]  
**[45]**



## SESSION 5 SELD STUDY: TOPIC1: COMPARE, SUMMARISE AND DISPLAY DATA – DESCRIBE TRENDS.

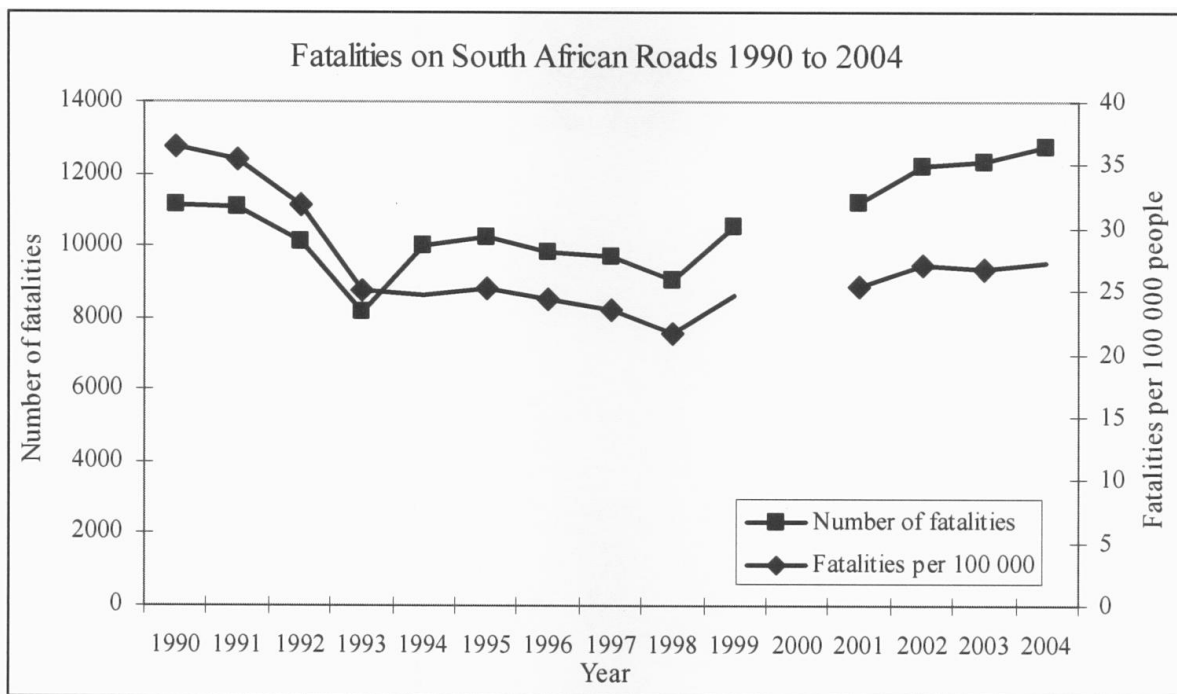
**Learner Note:** Ensure that you:

- are able to draw and interpret line and broken line graphs, histograms, bar graphs (multiple/compound bar graphs) and pie charts.
- know, understand and are able to use tally and frequency tables.
- know and understand the differences between continuous and discrete data and how to display each.
- know how to use the five-point summary to analyse two or more sets of data.

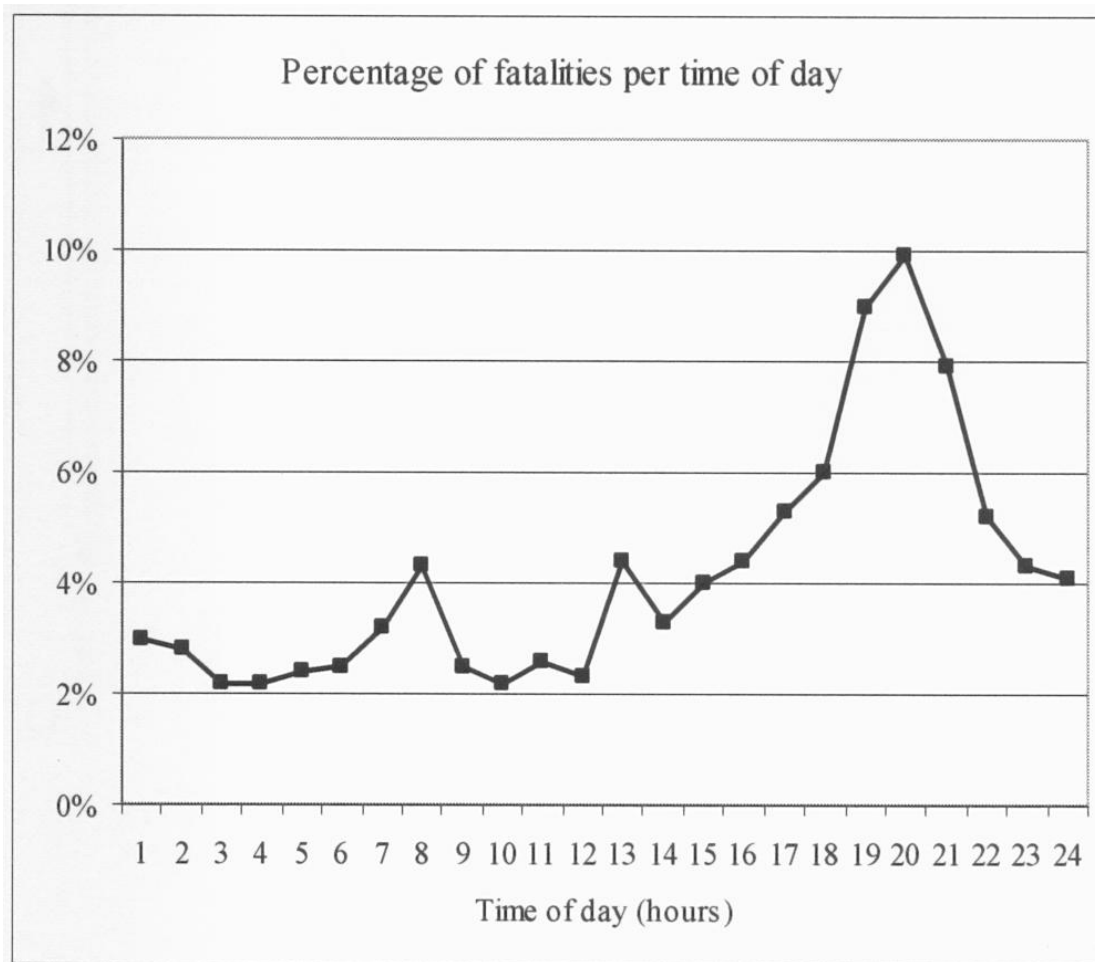
### SECTION A: TYPICAL EXAM QUESTIONS

#### QUESTION 1: 46 minutes

*Arrive Alive* ([www.arrivealive.co.za](http://www.arrivealive.co.za)) publishes a large number of statistics related to fatalities (deaths) as a result of motor car accidents. The questions that follow are based on the information supplied in the graphs and tables below.



<b>Fatalities on South African Roads 1990 to 2004</b>			
	<i>Number of road fatalities</i>	<i>South African population (millions)</i>	<i>Number of fatalities per 100 000 people</i>
<b>1990</b>	11 157	30,6	36,46
<b>1991</b>	11069	31,2	35,48
<b>1992</b>	10142	31,9	31,79
<b>1993</b>	8 140	32,6	24,97
<b>1994</b>	9981	40,4	<b>a</b>
<b>1995</b>	10256	40,63	25,24
<b>1996</b>	9848	40,58	24,27
<b>1997</b>	9691	41,27	23,48
<b>1998</b>	9068	41,95	21,62
<b>1999</b>	<b>b</b>	42,64	24,8
<b>2000</b>	not available	43,33	not available
<b>2001</b>	11201	44,25	25,31
<b>2002</b>	12 198	45,17	27,00
<b>2003</b>	12354	46,13	26,78
<b>2004</b>	12727	46,59	27,32



The fatalities on the South African Roads have been reported in terms of both the actual number of fatalities and as a rate: the number of fatalities per 100 000 in the population. Consider the graph that reports the percentage of fatalities per time of day.

- 1.1 What percentage of all fatalities occurs between 17h00 and 22h00? (1)
- 1.2 Why do you think there is a sharp rise in the graph from about 06h00? (2)
- 1.3 At what times of the day are you at the greatest risk of being killed in a motor vehicle related accident? Substantiate your claim. (3)
- 1.4 Refer to the table and graph that report on the fatalities from 1990 to 2004.
  - 1.4.1. Why is there a gap in each of the broken line graphs? (1)
  - 1.4.2. Calculate the missing values, **a** and **b**, in the table. (7)
  - 1.4.3. Calculate the percentage change in the number of fatalities from 1994 to 1999. (3)
  - 1.4.4. Calculate the change in the number of fatalities per 100 000 people from 2001 to 2004. (2)
- 1.5 Consider the graphs of the two statistics and discuss which graph might be used by the Minister of Transport to support an argument that claims there is progress in managing road accident fatalities **and** which graph might be used by somebody trying to contradict the Minister. Provide a detailed motivation for your answer. (6)

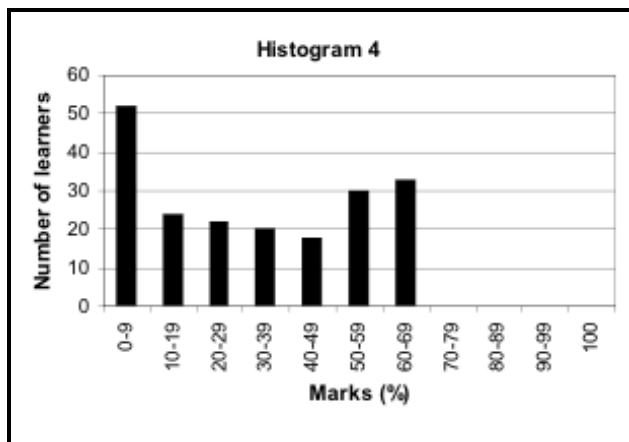
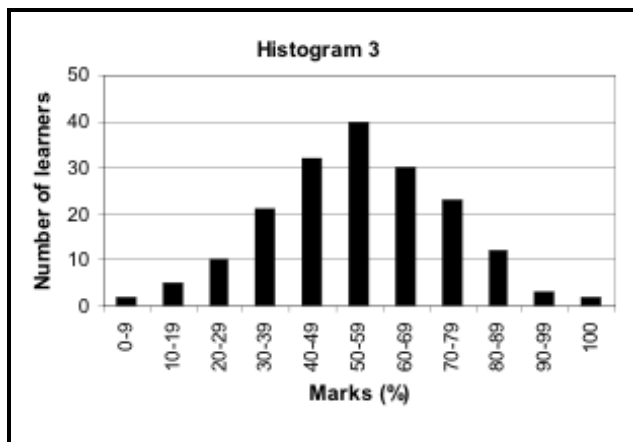
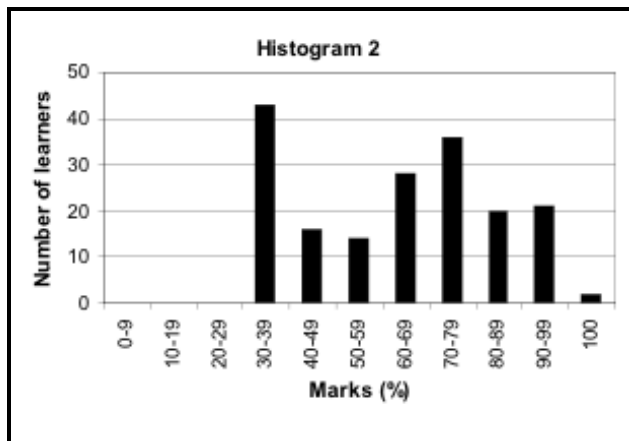
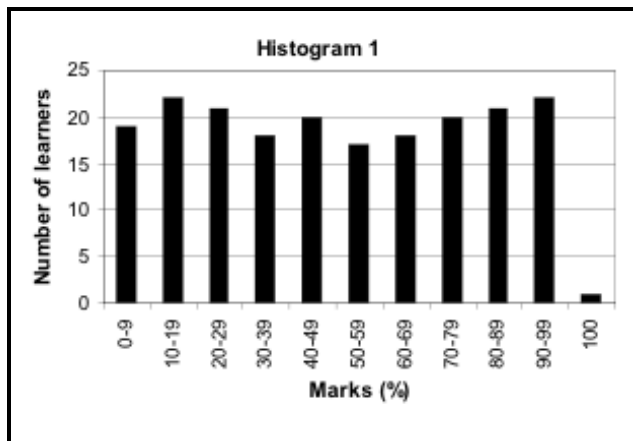
- 1.6 Which statistic, actual number of fatalities OR number of fatalities per 100 000, best represents the probability of dying in a motor vehicle related accident. Motivate your answer (4)
- 1.7 The same general knowledge test was given to Grade 12 learners at two schools. The results were given as a mark out of 100. The learners' test results are summarised in the following tables:

School A 199 learners wrote the test		School B 180 learners wrote the test	
	Mark		Mark
Minimum	0	Minimum	35
First quartile	0	First quartile	40
Median	32	Median	67
Third quartile	56	Third quartile	78
Maximum	65	Maximum	100

Use the information provided in the above tables to decide which of the following statements are definitely true. In each case, either give reasons why you agree with the statement or correct the statement if it is false.

- Exactly 25% of the learners who wrote the test from School A did not get any answers correct. (2)
  - At least half the learners from School B passed the test. In other words, they got more than 50% for the test. (2)
  - The range of marks was the same for both schools. (3)
  - At least 90 learners from School B got a better mark than the learner with the best mark from School A. (4)
  - A learner from School A got a mark that was between the 50th and 70th percentile of School B. (2)
- 1.8 Which of the following four histograms is most likely to be the histogram that represents the distribution of marks scored on the test for School A? Give clear reasons for your answer. (2)

1.9 Which of the following four histograms is most likely to be the histogram that represents the distribution of marks scored on the test for School B? (2)



[46]

**QUESTION 2: 9 minutes**

(Taken from DoE Nov Exam 2009 Paper 1)

2.1. The Geography examination marks, expressed as a percentage, of the 52 learners were recorded as follows:

54	67	83	34	49	56	78	89	90	79	20	49	50
70	89	57	27	48	56	65	70	22	98	89	29	56
47	95	49	67	89	48	46	89	63	75	45	50	58
73	67	45	76	70	38	46	37	47	36	38	99	100

2.2. Determine the:

- a) Lowest percentage mark (1)
- b) Highest percentage mark (1)

2.3. The NCS (National Curriculum Statement) requires that results be expressed in terms of seven performance levels rather than percentages. As a result, the Geography teacher needs to work out the number of learners per performance level. Draw a frequency table to work out the number of learners per performance level. (7)

[9]

## SECTION B: ADDITIONAL CONTENT NOTES

Whenever drawing graphs, remember the following:

- A heading, label both axes and fill in the units where necessary
- Spaces between the bars of a bar graph and no spaces between the bars of a histogram.
- Order data items in a set before finding the mean, median and mode and range.
- Use the five-point summary when comparing two or more sets of data: minimum; first quartile ( $Q_1$ ), median; third quartile ( $Q_3$ ); maximum.

## SECTION C: HOMEWORK

### QUESTION 1: 13 minutes

The ages (in years) of patients treated for Malaria at two different clinics during a certain month was recorded as follows:

<b>Clinic A:</b>	<b>5</b>	<b>7</b>	<b>18</b>	<b>24</b>	<b>24</b>	<b>32</b>	<b>46</b>	<b>52</b>	<b>63</b>	
<b>Clinic B:</b>	<b>37</b>	<b>28</b>	<b>17</b>	<b>56</b>	<b>43</b>	<b>55</b>	<b>39</b>	<b>40</b>	<b>26</b>	<b>35</b>

- 1.1. Calculate the median of Clinic B. (4)
- 1.2. What is the mode of Clinic A. (1)
- 1.3. Calculate the range of Clinic B. (2)
- 1.4. Calculate the mean age of Clinic B. (4)
- 1.5. Which clinic could possibly be located in a rural area? Provide a reason for your answer. (2)

[13]

### QUESTION 2: 15 minutes

When involved in a motor vehicle accident, wearing a seatbelt could determine the difference between *life* and *death*. The table on the following page, taken from ([www.arrivealive.co.za](http://www.arrivealive.co.za)), refers to information that was obtained from roadblocks when vehicles were stopped for inspection of wearing safety belts.

PROVINCE	ITEM	DRIVERS	FRONT PASSENGERS	BACK PASSENGERS
gGauten	Number	948	951	225
	Number not	236	528	193
	<b>% not wearing</b>	24,9%	55,5%	86,2%
Kwa-Zulu Natal	Number	1009	1009	250
	Number not	176	484	247
	<b>% not wearing</b>	17,4%	48%	98,8%
Western Cape	Number	1142	1144	229
	Number not	200	583	215
	<b>% not wearing</b>	17,5%	51,0%	93,9%
Eastern Cape	Number	1065	1068	399
	Number not	127	464	396
	<b>% not wearing</b>	11,9%	43,4%	99,2%
Free State	Number	900	903	903
	Number not	174	357	891
	<b>% not wearing</b>	19,3%	39,5%	98,7%
Mpumalanga	Number	1291	1305	367
	Number not	194	622	308
	<b>% not wearing</b>	15,0%	47,7%	83,09%
Limpopo	Number	826	835	178
	Number not	163	405	156
	<b>% not wearing</b>	19,7%	48,5%	87,6%
Northern Cape	Number	915	918	236
	Number not	138	442	228
	<b>% not wearing</b>	15,1%	48,1%	96,6%

- 2.1. What can you conclude about the percentage drivers that wear a safety belt? Do you think that this is an accurate reflection of drivers in general? (3)
- 2.2. Draw a compound bar graph that shows the percentage of drivers, front passengers and back passengers that do not wear safety belts. Show only Gauteng, Eastern Cape and Mpumalanga. (Let 1 block on the vertical axis represent 4%.) (12)
- [15]

<b>SECTION D: SOLUTIONS AND HINTS TO SECTION A</b>
--

**QUESTION 1**

- 1.1  $5,4 + 6 + 9 + 10 + 8 + 5 = 43.4\%$  ✓ (1)
- 1.2 More cars on the road. ✓ People are at work and school. ✓ (2)
- 1.3 Between 17h00 and 22h00. ✓✓ The graph shows a peak between those. ✓ (3)
- 1.4 1.4.1 The data was unavailable. ✓ (1)
- 1.4.2

$\frac{9981}{40400000100000} = \frac{a}{100000}$ ✓
$\frac{40400000}{40400000} a = \frac{998100000}{40400000}$ ✓
$a = 24,7$ ✓
$\frac{b}{42640000100000} = \frac{248}{100000}$ ✓
$\frac{100000}{100000} b = \frac{248 \times 42640000100000}{100000}$ ✓
$b = 10574,72$ ✓
$b \approx 10575$ ✓

(7)

1.4.3  $\frac{10575-9981}{9981} \times 100$  ✓✓ (7)

$= 5,95\%$  ✓ (3)

1.4.4  $27,32 - 25,31 = 2,01$  ✓✓ (2)

1.5 (6)

The minister would use the graph of fatalities per 100 000 ✓ as it shows a steady decline in fatalities per 100 000 ✓ from 1990 to 1998. ✓
--

Someone trying to contradict ✓ the minister would use the graph showing the number of fatalities ✓ as it shows a general increase in the number of fatalities. ✓
--



- 1.6 Fatalities per 100 000. ✓ This statistic gives you a ratio of deaths per 100 000 population no matter how large or small the population is. ✓ If you are only given the fatalities you are unable to compare it with the size. ✓ A large number of fatalities could only be a small percentage of a population or it could be a big percentage of a small population. ✓ (4)
- 1.7. The following:
- i. FALSE. ✓ At least 25% of the learners who wrote the test from School A did not get any answers correct. ✓ (2)  
(There may have been a number of learners who got 0 from the 25<sup>th</sup> percentile to the median).
  - ii. TRUE. ✓ The median shows that 50% of the learners obtained 67% and above. Therefore, at least 50% passed with 50%. ✓ (2)
  - iii. TRUE. ✓ School A: Range = 65 – 0 = 65 ✓  
School B: Range = 100 – 35 = 65 ✓ (3)
  - iv. TRUE ✓ School B has 180 learners. Therefore, the 90<sup>th</sup> learner has the median score of 67%. ✓ This means that 90 learners received a higher mark than 67% which is higher than 65% ✓, the highest mark in School A. ✓ (4)
  - v. FALSE ✓ No learner from School A got a mark that was between the 50<sup>th</sup> and 70<sup>th</sup> percentile of School B. ✓ (2)
- 1.8. Histogram 4 ✓ Marks do not go beyond 60-69 interval. Over 50 learners (approx 25%) scored 0, and 25<sup>th</sup> percentile is 0. ✓ (2)
- 1.9. Histogram 2 ✓✓ (2)
- [46]**

**QUESTION 2**

- 2.1 (a) 20% (1)  
(b) 100% (1)
- 2.2

PERFOR- MANCE LEVEL	PERCENTAGE RANGE	TALLY	FRE- QUENCY
1	0 to 29	////	4
2	30 to 39	###	5
3	40 to 49	### ### /	11
4	50 to 59	### ///	8
5	60 to 69	###	5
6	70 to 79	### ///	8
7	80 to 100	### ### /	11

✓ per performance level

(7)  
**[9]**

## SESSION 6 SELF STUDY: TOPIC 2: PROBABILITY AND MISUSE OF STATISTICS IN SOCIETY

**Learner Note:** Make sure you know and understand:

- (a) that probability is the mathematical term for 'chance'. It refers to the chance that something will take place.
- (b) that probability is measured on a scale from 0 to 1 and can be written as a fraction, a decimal fraction or as a percentage.
- (c) how to draw and analyse tree diagrams.

### SECTION A: TYPICAL EXAM QUESTIONS

#### QUESTION 1: 12 minutes

A dressmaker has 48 white buttons, 39 green buttons and 33 blue buttons in a tin.

- 1.1 (a) If she takes a button from the tin without looking, what is the probability that the button is blue? (4)
- (b) She replaces the button because she realises that a green one would be more suitable for the mending she is doing. What are the chances that when she takes a button from the tin without looking, that it will be green? (4)
- (c) She used the green button and an additional three green ones before she finished her mending. Thereafter, she had to finish the white blouse she started last week. She had to sew the white buttons on. What is the probability that when she next takes a button out of the tin without looking, that it will be white. (4)
- [12]

#### QUESTION 2: 12 minutes

Pizza is everyone's favourite. The following choices are available:

Size	Base	Topping
Medium (M)	Regular (R)	Bacon (B)
Large (L)	Thick (T)	Pineapple (P)
		Ham (H)

- 2.1. Draw a tree diagram to find all the possible combinations for the pizza choices above. (8)
- 2.2. What is the probability that a pizza with ham topping will be ordered? (4)
- [12]

#### QUESTION 3: 7 minutes

A box has two red, two green and two white balls inside it. If you choose two balls without looking, what is the probability of getting two balls of the same colour, i.e. red, red (RR) or green, green (GG) or white, white (WW). Use a tree diagram to identify all the possible outcomes.

(7)  
[7]

**QUESTION 4: 16 minutes***(Taken from DoE November 2008 Paper 2)*

Jason Reed is a professional soccer player. In 2005, he negotiated a five-year contract with Shaya FC (Shaya Football Club).

Jason's starting salary with the club was R178 500 per year (excluding bonuses), with an assured salary increase of 5% per year.

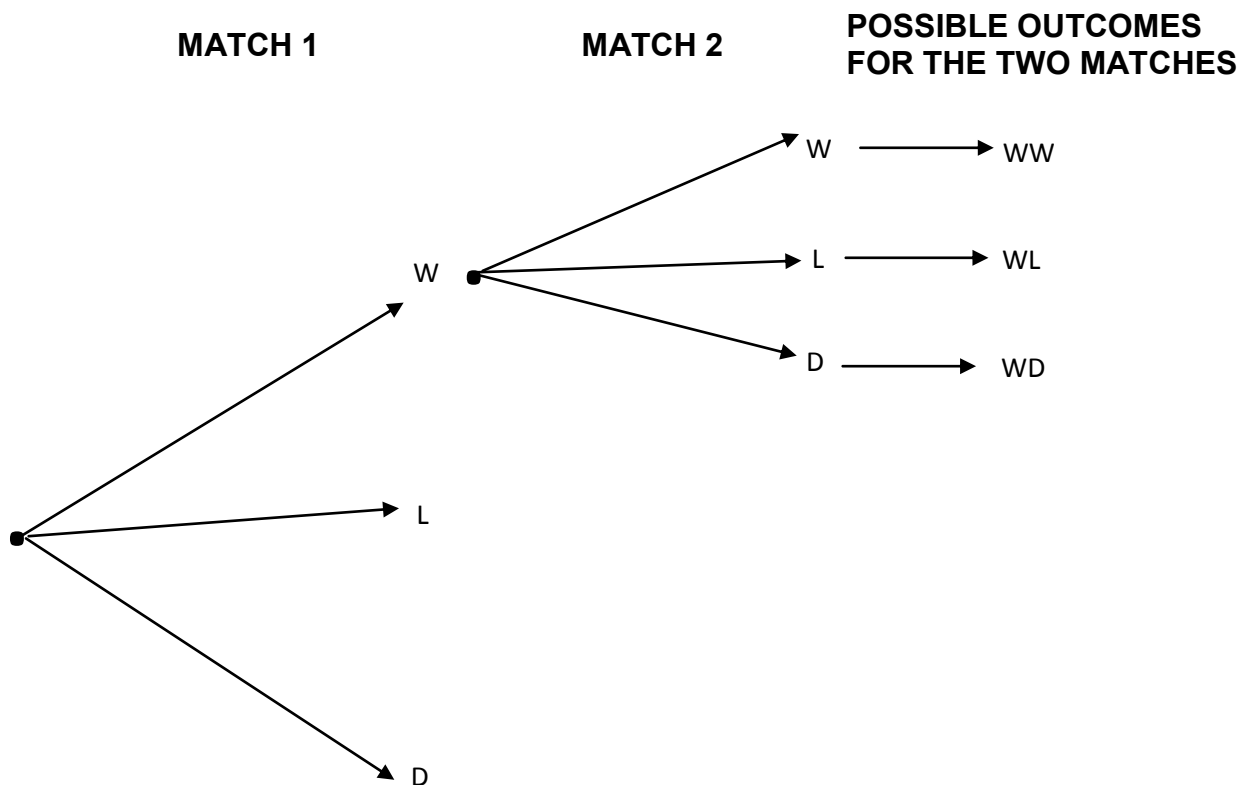
The table below shows Jason's annual salary (excluding bonuses) for the first five years.

**TABLE 4: Jason's annual salary**

YEAR	2005	2006	2007	2008	2009
Salary (in rand)	178 500	...	196 796,25	...	216 967,87

Shaya FC plays two matches in March. There are THREE possible outcomes for each match: win (W), lose (L) or draw (D).

A tree diagram is drawn to work out the possible outcomes for the two matches.

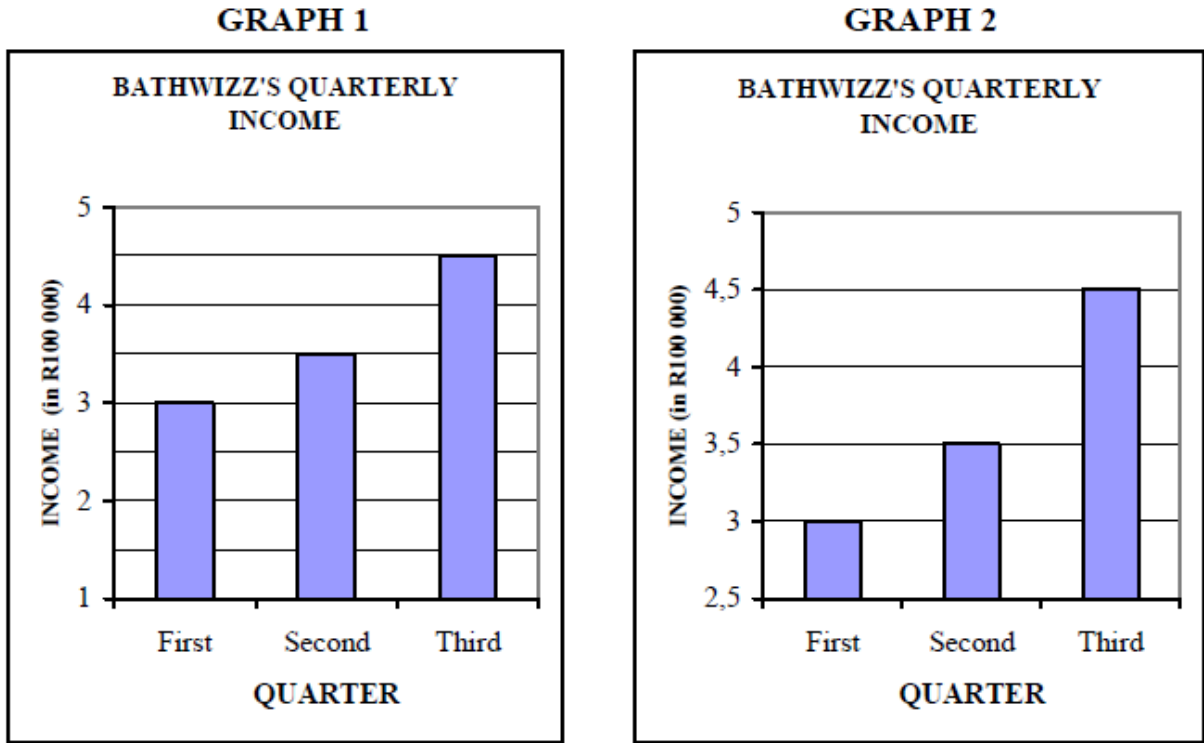


- 4.1. Complete the tree diagram to show all the possible outcomes of the two matches. (6)
- 4.2. Use the completed tree diagram to predict the probability that Shaya FC will:
- win both matches (3)
  - win only one of the matches (3)
  - draw at least one of the matches (4)

[16]

**QUESTION 5: 5 minutes***(Taken from DoE Feb 2009 Paper 2)*

Bathwizz is a company that installs and renovates bathrooms. The general manager had to present the company's earnings for the first three quarters of the year to the company directors. He drew the two graphs below.



- 5.1 What possible trend do you notice with regard to Bathwizz's quarterly income? (2)
- 5.2 The general manager wanted to prove to the company directors that Bathwizz's income was increasing and that the company was doing well.

Which graph would be the better one to show to the company directors?

Give a reason for your answer.

(3)  
[5]

**SECTION B: ADDITIONAL CONTENT NOTES**

- Most probability problems can be solved using tree diagrams
- Remember to determine whether the problem involves replacement or not when calculating probability

<b>SECTION C: HOMEWORK</b>
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**QUESTION 1: 20 minutes**

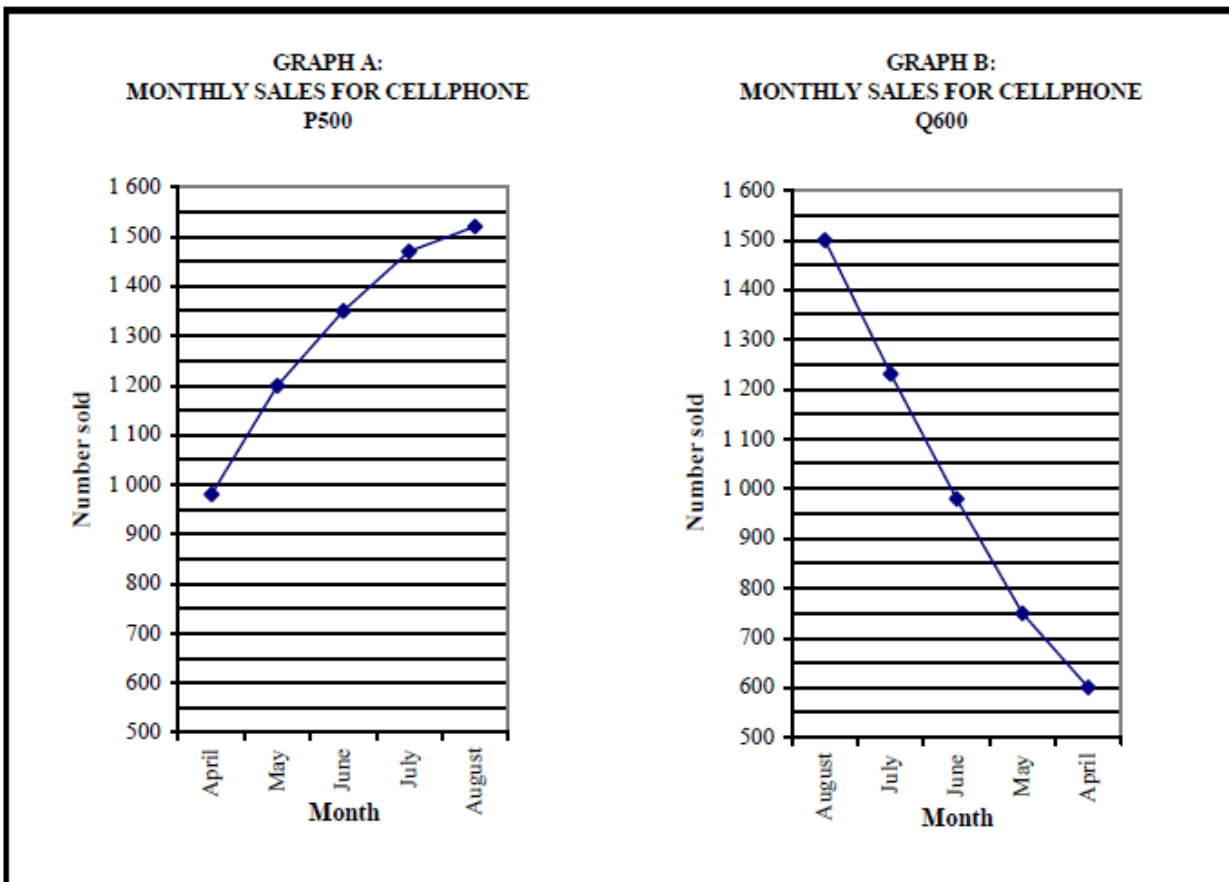
A dressmaker has 48 white buttons, 39 green buttons and 33 blue buttons in a tin.

- 1.1 If she takes a button from the tin without looking, what is the probability that the button is:
- red? (3)
  - not white (3)
  - green or blue (4)
- 1.2. (a) You toss a coin twice. Draw a tree diagram to determine the probability of Getting two tails? (7)
- (b) What is the probability of getting a head and a tail in any order? (3)
- [20]

**QUESTION 2: 3 minutes**

(Taken from DoE Nov 2009 Paper 2)

The salesman for cell phone P500 claimed that the monthly sales for cell phone Q600 were decreasing while the sales of cell phone P500 were increasing. To support his claim, he used the two graphs below.



The manager of the cell phone shop noted that one of the graphs was misleading. Identify the misleading graph and explain why it is misleading.

(3)

[3]

**QUESTION 3: 9 minutes**

- 3.1. Mr Mandela, the Headmaster, did a survey to see how many junior boys play sport. He only had some of the values in his table. Help him to determine how many junior boys play rugby and soccer in each grade by completing the table below.

(5)

	Soccer	Rugby	Total
Grade 8			35
Grade 9	10		28
Total	25		

- 3.2. What is the probability that a Grade 8 boy chosen randomly will be a soccer player? (2)

- 3.3. What is the probability that a boy chosen randomly will be a rugby player? (2)

[9]

**SECTION D: SOLUTIONS AND HINTS TO SECTION A**
**QUESTION 1**

1.1 (a) Blue =  $\frac{33}{120}$  ✓✓ =  $\frac{11}{40}$  ✓✓ (4)

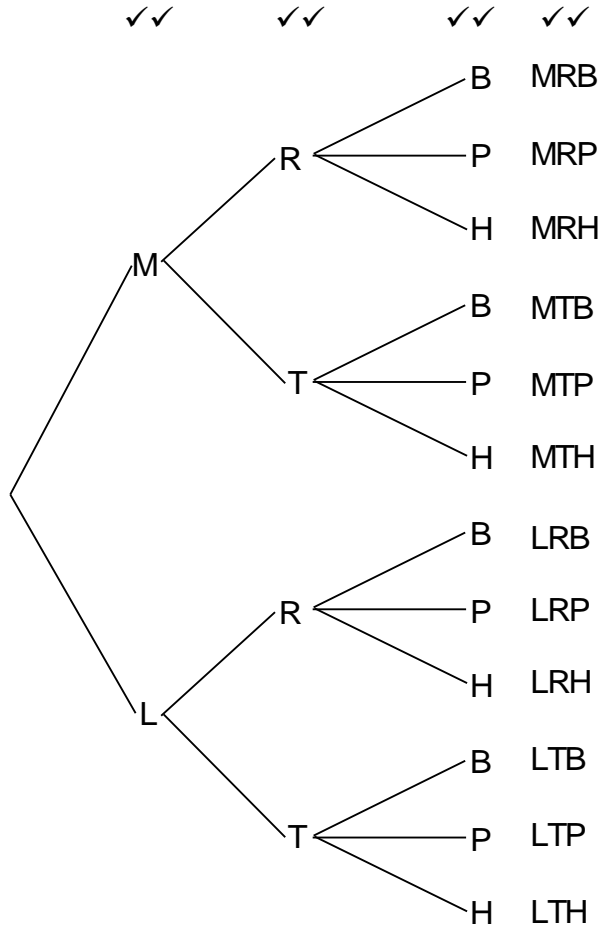
(b) Green =  $\frac{39}{120}$  ✓✓ =  $\frac{13}{40}$  ✓✓ (4)

(c) White =  $\frac{48}{116}$  ✓✓ =  $\frac{12}{29}$  ✓✓ (4)

[12]

**QUESTION 2**

2.1



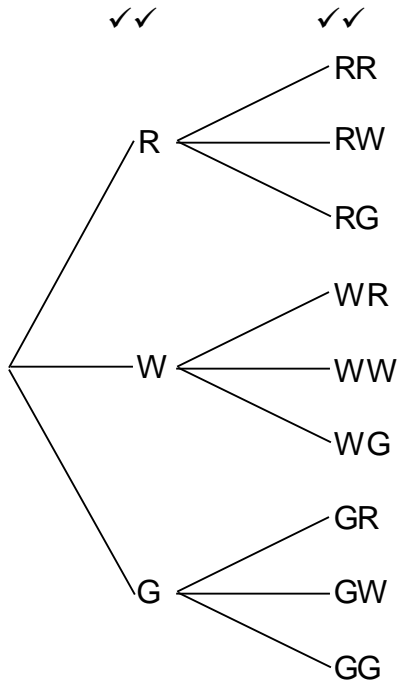
(8)

2.2  $P(H) = \frac{4}{12} \checkmark\checkmark = \frac{1}{3} \checkmark\checkmark$

(4)

[12]

QUESTION 3



$$\text{Probability} = \frac{3}{9} \checkmark\checkmark = \frac{1}{3} \checkmark$$

(7)

[7]



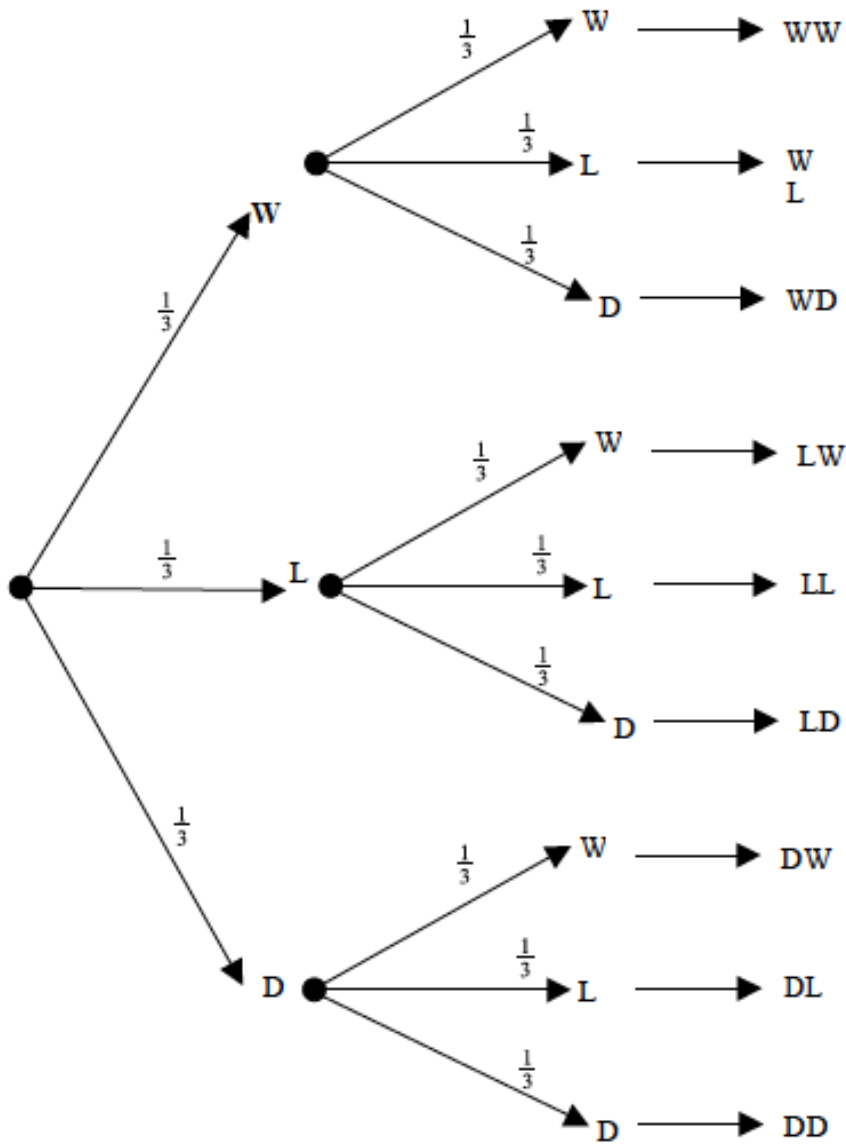
QUESTION 4

4.1

✓✓

✓✓

✓✓



(6)

$$4.2 \quad a) \quad P(\text{win}) = \frac{1}{3}; \quad P(\text{lose}) = \frac{1}{3} \quad P(\text{draw}) = \frac{1}{3} \checkmark$$

$$P(\text{win both matches}) = \frac{1}{3} \times \frac{1}{3} = \frac{1}{9} \checkmark \checkmark \quad (3)$$

$$b) \quad P(WL) + P(WD) + P(LW) + P(DW)$$

$$= \left(\frac{1}{3} \times \frac{1}{3}\right) + \left(\frac{1}{3} \times \frac{1}{3}\right) + \left(\frac{1}{3} \times \frac{1}{3}\right) + \left(\frac{1}{3} \times \frac{1}{3}\right) \checkmark$$

$$= \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} = \frac{4}{9} \checkmark \checkmark \quad (3)$$

$$c) \quad P(WD) + P(LD) + P(DW) + P(DL) + P(DD) \checkmark$$

$$= \left(\frac{1}{3} \times \frac{1}{3}\right) + \left(\frac{1}{3} \times \frac{1}{3}\right) + \left(\frac{1}{3} \times \frac{1}{3}\right) + \left(\frac{1}{3} \times \frac{1}{3}\right) + \left(\frac{1}{3} \times \frac{1}{3}\right) \checkmark$$

$$= \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} = \frac{5}{9} \checkmark \checkmark \quad (4)$$

**[16]****QUESTION 5**5.1. There is a steady increase in income  $\checkmark \checkmark$ **OR** any other suitable explanation of trend.  $\checkmark \checkmark$ 

(2)

5.2. Graph 2.  $\checkmark$  The vertical scale starts at 2,5 and gives the impression that the quarterly increase is larger than it actually is.  $\checkmark \checkmark$ 

(3)

**[5]**