**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MATHEMATICAL LITERACY P2

NOVEMBER 2010

MARKS: 150

TIME: 3 hours

This question paper consists of 12 pages and 6 annexures.

INSTRUCTIONS AND INFORMATION

1.   This question paper consists of FIVE questions. Answer ALL the questions.

2.   Answer QUESTIONS 1.2.2, 2.2.1, 3.1.2(a), 3.1.3(a) and 5.3.1 on the attached ANNEXURES. Write your centre number and examination number in the spaces provided on the ANNEXURES and hand in the ANNEXURES with your ANSWER BOOK.

3.   Number the answers exactly as they are numbered in the question paper.

4.   Start EACH question on a NEW page.

5.   You may use an approved calculator (non-programmable and non-graphical), unless stated otherwise.

6.   Show ALL the calculations clearly.

7.   Round off ALL the final answers to TWO decimal places, unless stated otherwise.

8.   Indicate units of measurement where applicable.

9.   Write neatly and legibly.

QUESTION 1

1.1
> Ma Ndlovu makes circular place mats and circular tablecloths out of material (fabric) edged with beads and sells them. The place mats have a diameter of 30 cm.
>
> The radius of the tablecloth is FOUR times the radius of a place mat.
>
> The following formula may be used:
>
> **Circumference = 2π × radius,** and using π = **3,14**

    1.1.1   (a)   Calculate the circumference of the tablecloth.   (4)

               (b)   She uses a beaded edging consisting of triangular segments to decorate the edge of each tablecloth, as shown in the diagrams below. Each segment of the beaded edging is 4,71 cm long.
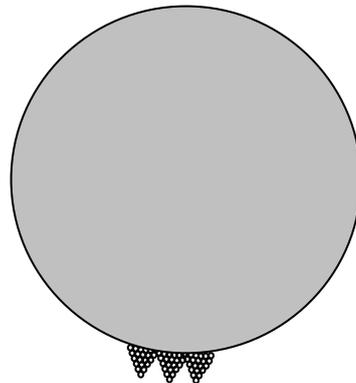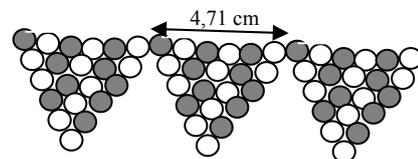
Circular tablecloth   **Enlargement of beaded
triangular segments**

Calculate the number of beaded segments that she will need for each tablecloth.   (2)

1.2 | Ma Ndlovu has a landline telephone. A service provider has offered her a choice of two different call packages.

CALL PACKAGE 1:	CALL PACKAGE 2:
• Monthly rental of R150 • First 100 minutes are free • Calls cost R0,50 per minute	• Monthly rental of R300 • First 500 minutes are free • Calls cost R0,50 per minute

1.2.1 The total cost for CALL PACKAGE 1 is given by the following formula:

**Total cost (in rand) =
R150 + R0,50 × (number of minutes more than 100)**

(a) Write down a formula which can be used to calculate the total cost (in rand) for CALL PACKAGE 2. (2)

(b) If CALL PACKAGE 2 is used, determine the total cost, in rand, if Ma Ndlovu and her family have made calls with a total duration of 510 minutes. (4)

1.2.2 The line graph illustrating the total cost for CALL PACKAGE 2 has already been drawn on ANNEXURE A.

On the same system of axes, draw a line graph to illustrate the total cost for CALL PACKAGE 1. (5)

1.2.3 (a) Define what is meant by the concept ***break-even point***. (2)

(b) Write down the number of minutes used per month as well as the total cost at the break-even point. (2)

1.2.4 Ma Ndlovu wants to spend a maximum of R550 per month on one of the call packages.

Which CALL PACKAGE would you advise Ma Ndlovu to accept?

Motivate your answer by showing ALL the calculations. (5)

[26]

QUESTION 2

Freedom High School's soccer team is taking part in a football tournament at iMbali in the iMbali Soccer Stadium.

2.1   On his way to iMbali, while travelling in a north-easterly direction, the driver of the school bus stopped in Selby Msimang Road (refer to the map on ANNEXURE B) to consult his map for directions to the iMbali Soccer Stadium.

Use the map on ANNEXURE B to answer the following:

2.1.1   Give the grid reference for the iMbali Soccer Stadium.   (2)

2.1.2   In which general direction is the iMbali Soccer Stadium from where the bus stopped?   (2)

2.1.3   (a)   Describe the shortest possible route that the bus driver should take from the point where the bus stopped to the entrance of the iMbali Soccer Stadium, which is in Nkugwini Road.   (4)

(b)   Hence, use a ruler to measure (in millimetres) the approximate distance of this shortest route on the map, and then calculate the actual distance, in kilometres, using the given scale.   (4)

2.1.4   At 09:15, after looking at the map, the bus driver was ready to start driving again. He contacted the tournament coordinator to inform her that they would be at the stadium at 09:20. If the bus travelled at an average speed of 40 km/h, verify by means of relevant calculations whether the bus driver's estimated time of arrival was correct.

The following formula may be used:

$$\textbf{Average speed} = \frac{\textbf{distance}}{\textbf{time}}$$

(6)

2.2 | At Freedom High School the basic boys' uniform consists of a pair of pants and a shirt with the option of wearing a tie. The pants may be either long or short, and the shirt may be either long-sleeved or short-sleeved. They are allowed to wear any combination of these three items of clothing when they are on a trip.

 2.2.1   Complete the tree diagram on ANNEXURE C to illustrate ALL the possible combinations of these three items of clothing that the boys may wear on a trip. (7)

 2.2.2   When the boys are at school, they are only allowed to wear ONE of the following combinations of the uniform:

- Long pants with a long-sleeved shirt and a tie
- Short pants with a short-sleeved shirt and no tie

If ONE of the boys in the bus were randomly selected, use the completed tree diagram on ANNEXURE C to determine the probability (in decimal form) that he would be wearing one of these two combinations. (3)

[28]

QUESTION 3

3.1

Mr Riet is a secretary at a school and currently earns a gross monthly salary of R7 986,50.

The following amounts are deducted from his gross monthly salary:

Union Membership Fee:
R35

Pension Fund:
7,5% of gross salary

PAYE (Tax):
(Gross salary – R4 750) × 18%

Medical Aid:
$\frac{1}{3}$ of the total medical aid subscription due, as shown in TABLE 1 below.

Gross Salary
The salary **before** pension, tax, medical aid, etc. have been deducted.

Net Salary
The 'take-home' salary **after** pension, tax, medical aid, etc. have been deducted.

TABLE 1: Medical aid membership subscription costs

| GROSS MONTHLY SALARY	SUBSCRIPTION COSTS		
	MAIN MEMBER	**WIFE/PARTNER/ PARENT**	**EACH CHILD**
R0 – R8 000	R1 152	R816	R424
R8 001 – R10 500	R1 256	R900	R468
More than R10 500	R1 396	R992	R516

3.1.1 Mr Riet, his wife and two children belong to a medical aid fund. Use TABLE 1 to calculate his monthly contribution to the medical aid fund. (5)

3.1.2 (a) Calculate the total deductions from Mr Riet's monthly salary. Show ALL calculations on ANNEXURE D. (5)

(b) Hence, calculate Mr Riet's net **annual** salary. (3)

3.1.3

Mr Riet receives a 4,5% salary increase. His union membership fee remains the same. Mr Riet states that his salary increase makes no difference to his net salary.

(a) Determine whether Mr Riet's statement is valid by showing ALL relevant calculations on ANNEXURE E. (10)

(b) Hence, calculate the percentage change in his net annual salary. (3)

3.2 | Mr Riet wanted to show his colleagues that the South African government was spending more on education than on most other departments.

The two graphs below show the budgeted government expenditure for the financial years 2009/2010 and 2010/2011.

The total expenditure budgeted for 2009/2010 was R834,3 billion and for 2010/2011 was R900,9 billion.

Budgeted Government Expenditure 2009/2010

Budgeted Government Expenditure 2010/2011

H 15%
A 9%
G 4%
B 22%
F 14%
C 9%
E 17%
D 10%

H 15%
A 10%
G 4%
B 17%
F 15%
C 10%
E
D 11%
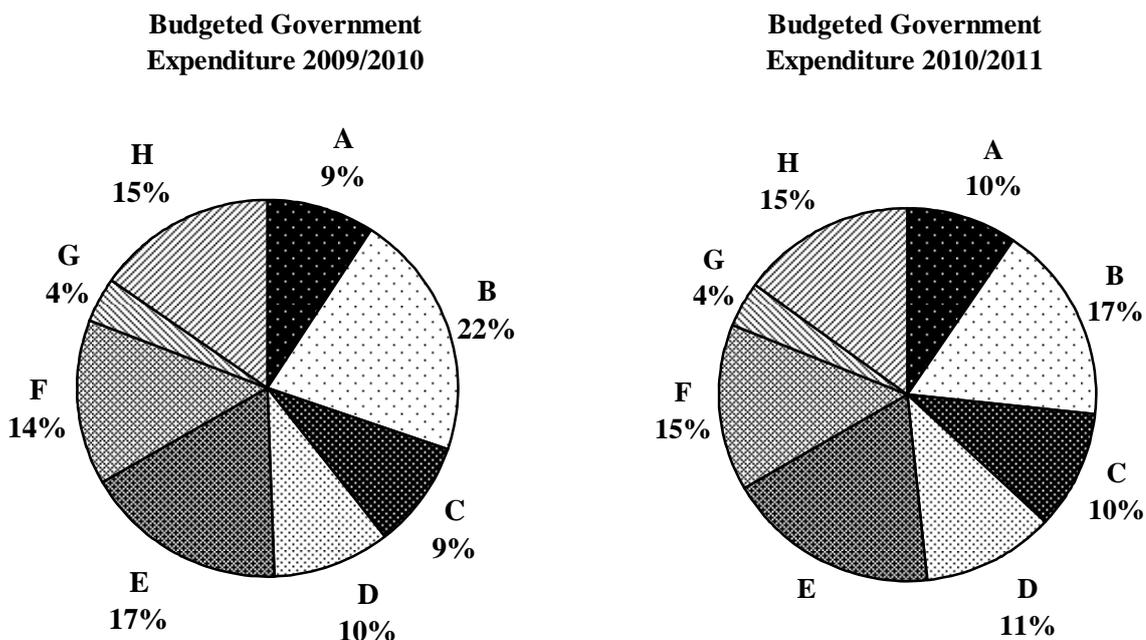
1 billion = 1 000 million

KEY	
A: Public order and safety	E: Education
B: Economic affairs	F: Social protection
C: Housing and community amenities	G: Defence
D: Health	H: Other

[Source: www.sars.gov.za]

NOTE: The names of the national government departments have since changed as per *President's Minute 690*.

3.2.1 Show that the difference between the amounts budgeted for education for the financial years 2009/2010 and 2010/2011 is more than R20 000 000 000. (8)

3.2.2 Give TWO possible reasons why you think the South African government should increase its budgeted expenditure for education. (4)

[38]

QUESTION 4

Triggers Enterprises was awarded the tender for making rectangular cardboard boxes to package bottles of cough syrup. Each bottle is packed in a cardboard box with a square base, as shown below.

- The diameter of the base of the bottle is 58 mm and the height of the box is 143 mm.
- The length of the side of the base of the box must be approximately 105% of the diameter of the base of the bottle.
- The height of the box is approximately 102% of the height of the bottle.
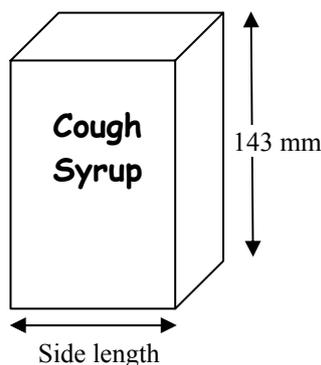
The following formulae may be used:

Area of circle = $\pi \times$ (radius)² , and using $\pi = 3,14$
Area of square = (side length)²
Area of rectangle = length $\times$ breadth
Area of opened cardboard box = 4(A + D) + 2(B + C) + E
(See design of open cardboard box in QUESTION 4.3)

The following conversions may be useful:

1 cm² = 100 mm²
1 m² = 10 000 cm²

4.1   Calculate the height of the bottle to the nearest millimetre.   (3)

4.2   In order to minimise the cost of cardboard required for the box, the following guideline is used:

The difference between the areas of the base of the cardboard box and the base of the bottle should not be more than 11 cm².

        Determine whether the dimensions of this cardboard box satisfy the above guideline. Show ALL appropriate calculations.   (11)

4.3   To ensure that the box is strong enough, the cardboard used for the box has a mass of 240 grams per m² (g/m²).

The layout of the opened cardboard box is shown below.
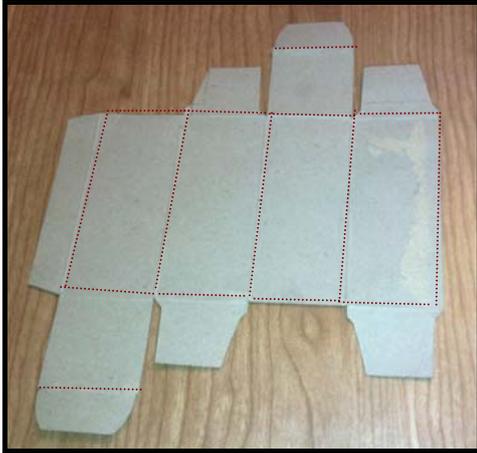
Picture of opened box   **Diagram of layout of opened box**
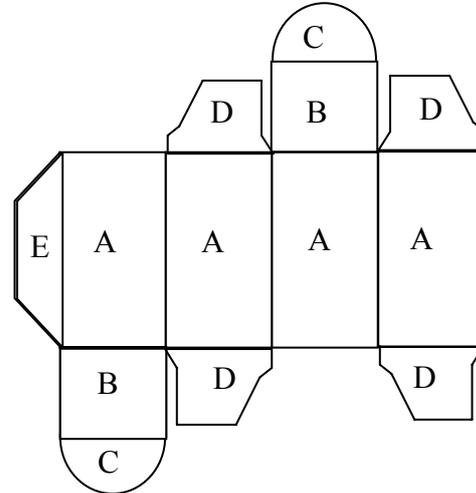
- Section C is semicircular.
- The area of each section D = 1 832 mm².
- The area of section E = 2 855 mm².

4.3.1   Calculate the total mass of the cardboard needed for one box, to the nearest gram.   (11)

4.3.2   The total cost of the cough syrup includes the cost of the cardboard box.

Use the following formula to calculate the cost of a boxed bottle of cough syrup:

Total cost = R16,00 + (mass of cardboard box) × R20,00 per kg   (3)

[28]

QUESTION 5

The **Consumer Price Index (CPI)** is the price of a collection (basket) of goods and services. The prices of these goods and services are collected every month, and the total cost of a basket is compared to that of the previous month's total cost.

The CPI is the official measure of **inflation**. Inflation is generally given as a percentage, and is the measure of how much the price of goods and services have increased over a period of time.

In 2008, Statistics South Africa decided that a fruit basket should consist of bananas, apples, oranges and lemons since these types of fruit are generally available throughout the year.

The graph drawn on ANNEXURE F shows the month-on-month changes in the CPI from January 2008 to December 2008 expressed as a percentage.

5.1   Use the graph drawn on ANNEXURE F to answer the following questions:

       5.1.1   (a)   Name the consecutive months between which there was no change
                 in the CPI.   (2)

              (b)   During which months was the CPI less than that of the previous
                 month?   (2)

              (c)   Name the consecutive months between which the increase in the
                 CPI was the greatest.   (2)

       5.1.2   (a)   Determine the percentage change in the CPI from April 2008 to
                 May 2008.   (3)

              (b)   Hence, calculate the price of the fruit basket in May 2008 if it cost
                 R150,00 in April 2008.   (3)

5.2   In November 2009 Statistics South Africa announced that the annual inflation rate was 5,8%.

       5.2.1   Determine the price of a bicycle in November 2008 if it cost R1 586,95 in
             November 2009.   (3)

       5.2.2   Calculate the projected cost of a loaf of brown bread in November 2014 if
             it cost R5,45 in November 2008. Assume the annual inflation rate
             remained at 5,8% over the given period.

             The formula $A = P(1 + i)^n$ may be used, where:

             A = projected cost
             P = current cost
             n = number of years
             i = annual inflation rate   (4)

5.3 | Prior to 2008 a fruit basket consisted of fruit which was not available throughout the year. Statistics South Africa refers to this fruit basket as the 'old' fruit basket.
|
In 2008, Statistics South Africa kept a record of the monthly costs of both the 'old' fruit basket and the 'current' fruit basket.

The graph on ANNEXURE F shows the changes in the CPI for the 'current' fruit basket.

TABLE 2 below shows the month-on-month changes in the CPI from January 2008 to December 2008 for the 'old' fruit basket.

TABLE 2:   Month-on-month changes in the CPI for the 'old' fruit basket from January 2008 to December 2008

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Percentage change	4,6	1,9	1,0	$-0,5$	$-4,5$	-3	$-0,5$	$-0,5$	0,7	1,2	5,0	4,1

5.3.1   Use the table to draw a labelled graph, on the grid provided on ANNEXURE F, to represent the month-on-month changes in the CPI of the 'old' fruit basket for the given period.   (7)

5.3.2   (a)   Describe clearly any possible trend shown by the graphs of the two fruit baskets.   (2)

(b)   Give ONE possible reason for the trend identified in QUESTION 5.3.2(a).   (2)

[30]

TOTAL: 150

ANNEXURE A

CENTRE NUMBER:

EXAMINATION NUMBER:

QUESTION 1.2.2

LANDLINE CALL PACKAGES
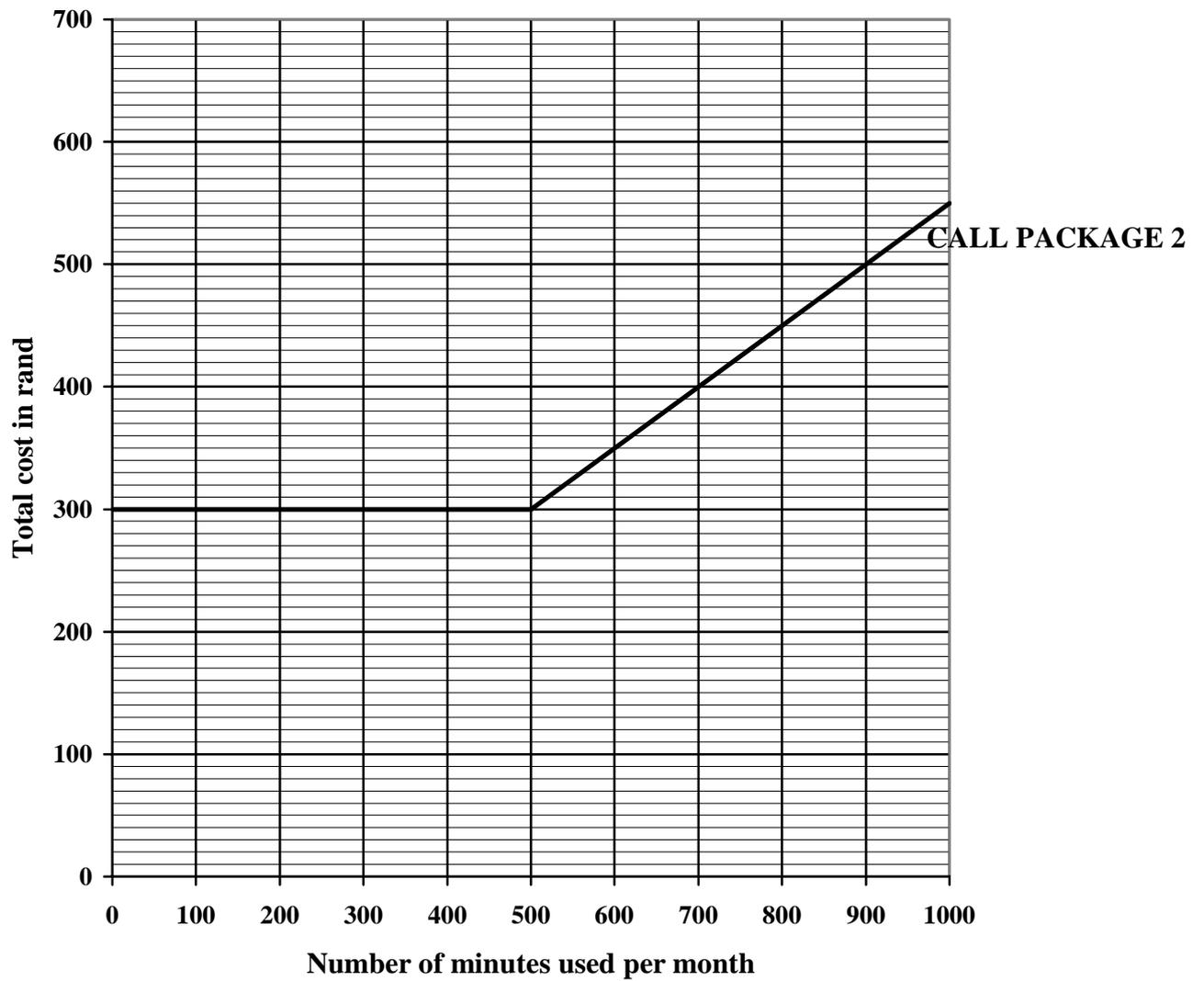
ANNEXURE B: MAP OF A SECTION OF IMBALI

QUESTION 2.1
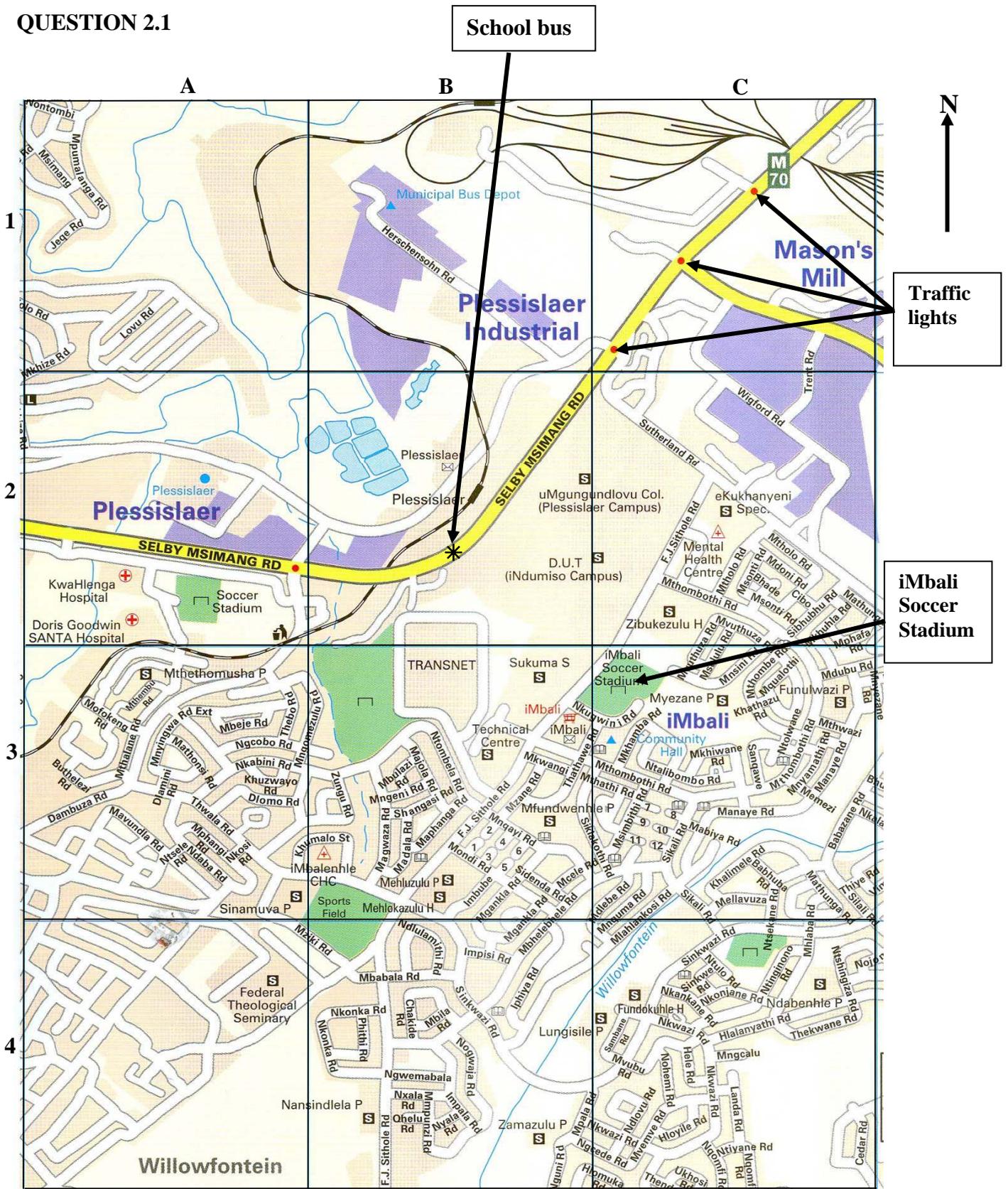
Scale 1 : 20 000

ANNEXURE C

CENTRE NUMBER:

EXAMINATION NUMBER:

QUESTION 2.2.1

CODES FOR THE TREE DIAGRAM

CODE	EXPLANATION
LP	Long pants
SP	Short pants
LS	Long sleeves
SS	Short sleeves
T	Tie
NT	No tie
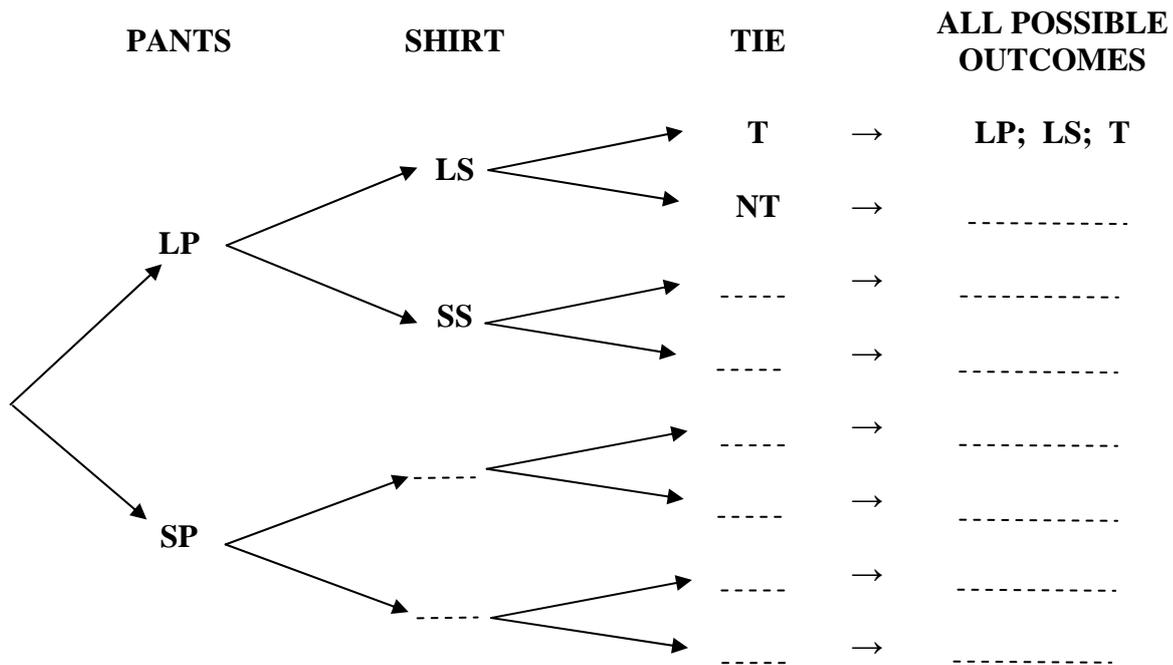
ANNEXURE D

CENTRE NUMBER:

EXAMINATION NUMBER:

QUESTION 3.1.2(a)

	MONTHLY DEDUCTIONS	3.1.2(a)
A	Union membership fee	**R35,00**
B	Pension fund = 7,5% of gross salary	
C	PAYE = (Gross salary – R4 750) × 18%	
D	Medical aid contribution	
E	TOTAL = A + B + C + D	

ANNEXURE E

CENTRE NUMBER: ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

EXAMINATION NUMBER: ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

QUESTION 3.1.3(a)

	MONTHLY DEDUCTIONS	3.1.3(a)
A	Union membership fee	**R35,00**
B	Pension fund = 7,5% of gross salary	
C	PAYE = (Gross salary – R4 750) × 18%	
D	Medical aid contribution	
E	TOTAL = A + B + C + D	

ANNEXURE F

CENTRE NUMBER:

EXAMINATION NUMBER:

QUESTION 5.3.1

MONTH-ON-MONTH CHANGES IN THE CPI (2008) OF A FRUIT BASKET
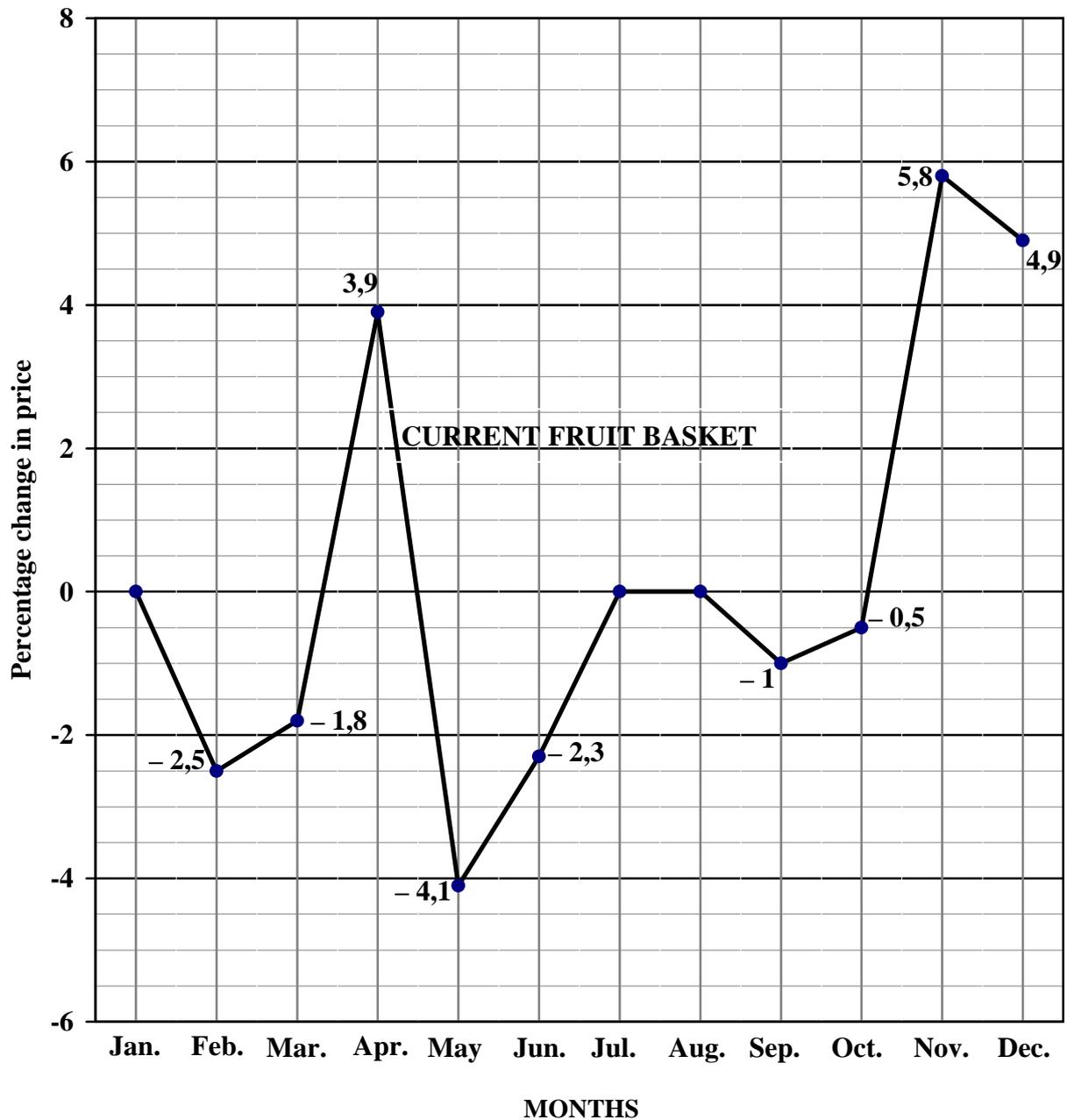
[Source: Statistics South Africa, 2009]