basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE 12

MATHEMATICAL LITERACY P2

FEBRUARY/MARCH 2013

MARKS: 150

TIME: 3 hours

This question paper consists of 13 pages and 3 annexures.

INSTRUCTIONS AND INFORMATION

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

2.   QUESTION 2.3.2 must be answered on ANNEXURE A and QUESTION 4.3 must be answered on ANNEXURE C. Write your centre number and examination number in the spaces on these ANNEXURES and hand them in with you ANSWER BOOK.

3.   ANNEXURE B contains information that you need to answer QUESTION 3.3.

4.   Number the answers correctly according to the numbering system used in this question paper.

5.   Start EACH question on a NEW page.

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

7.   Show ALL the calculations clearly.

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

9.   Indicate units of measurement, where applicable.

10.   Maps and diagrams are NOT necessarily drawn to scale, unless stated otherwise.

11.   Write neatly and legibly.

QUESTION 1

1.1

> The Olympic Games were held in London in the United Kingdom during July and August 2012.
>
> In April 2012, the school principals in Jacksonville decided to hold a Mini Olympics in anticipation of the Olympic Games.
>
> As part of the Mini Olympics, a diving competition was held between the schools.
>
> Two divers, Bongani and Graham, were given the following scores by the nine diving judges after completing their dives:

Picture of a diver

Bongani's scores:	$9\frac{1}{2}$	9	8	9	$7\frac{1}{2}$	9	9	$8\frac{1}{2}$	$8\frac{1}{2}$
Graham's scores:	9	$6\frac{1}{2}$	9	$7\frac{1}{2}$	8	$8\frac{1}{2}$	9	9	$9\frac{1}{2}$

1.1.1   Use the scores to determine the following:

       (a)   Bongani's median score   (3)

       (b)   The range of Bongani's scores   (2)

1.1.2   In diving competitions, there is a rule whereby a diver's highest and lowest scores are not considered.

       (a)   Give ONE valid reason why this rule is applied.   (2)

       (b)   Determine, showing ALL calculations, which ONE of the two divers attained the higher mean score if the competition rule is applied.   (8)

1.2

> The competitors in the Mini Olympics were awarded gold, silver or bronze medals for first, second or third positions respectively.
>
> Each school in the competition represented a country. The three schools representing China, Australia and South Africa each won 23 medals.
>
> **TABLE 1: Medals awarded to schools**
>
> | | **MEDALS AWARDED** | | | |
> | --- | --- | --- | --- | --- |
> | **Country** | **Gold** | **Silver** | **Bronze** | **TOTAL** |
> | China | 9 | 3 | 11 | 23 |
> | Australia | 8 | 5 | 10 | 23 |
> | South Africa | 5 | 15 | 3 | 23 |
>
> The organisers awarded 20 points for each gold medal, 10 points for each silver medal and half the number of points of a silver medal for each bronze medal.

1.2.1   Write down a formula which can be used to calculate the total number of points scored by a school, where **g** = number of gold medals, **s** = number of silver medals and **b** = number of bronze medals, in the form:

             Total points scored = ...   (3)

1.2.2   Each principal claims that his/her school performed the best.

             In your opinion, which school performed the best? Show ALL calculations to motivate your answer.   (6)

                                                                                 [24]

QUESTION 2

2.1   The South African coastline measures approximately 2 798 km from the mouth of the Orange River on the West Coast to Ponta do Ouro in Mozambique on the East Coast. The Eastern Cape has approximately 800 km of coastline. The map below shows the coastline of South Africa.

Map showing the South African coastline

[Source: *FAO Yearbook: Fishery and Aquaculture Statistics*]

2.1.1   Determine the total length, in miles, of the South African coastline if the coastline of the Eastern Cape is approximately 500 miles long.   (3)

2.1.2   Use the map to list the coastal provinces of South Africa in descending order according to the length of their coastlines.   (3)

2.1.3   Annie measured the length of the coastline of South Africa on her map and found it to be 223 mm long.

Determine the scale of the map in the form **1 :** …
Round off the answer to the nearest hundred thousand.   (4)

2.2 | One of the big fishing industries in the Eastern Cape is the chokka industry. Chokka is the South African name for squid or calamari.

Chokka

Chokka fishing boat

The fishing industry is regulated by the Department of Agriculture, Forestry and Fisheries. They issue permits to people catching chokka along the South African coastline. Chokka is caught from fishing boats of different sizes, as summarised in the table below.

TABLE 2: Information about fishing boats

TYPE	LENGTH (IN METRES)	RECOMMENDED NUMBER OF CREW MEMBERS*
Ski boat	6 to 8	6 to 10
Deck boat	8 to 18	10 to 24
Small freezer boat	10 to 13	12 to 14
Medium freezer boat	13 to 15	14 to 22
Large freezer boat	15 to 20	24 to 32

[Source: www.fcoo.co.za]

***Crew members** are all the people who work on a boat.

Mr Hugo decides to employ the maximum number of crew members for each boat.

2.2.1   Mr Hugo owns 3 ski boats, 1 small freezer boat and 2 medium freezer boats.

Calculate the maximum number of crew members in total he would need for his fishing boats. (3)

2.2.2   The Department of Agriculture, Forestry and Fisheries informed Mr Hugo that he will receive 102 chokka fishing permits for 2013. According to regulations, each crew member on a chokka boat must have a fishing permit. Mr Hugo realises that he will now be able to increase his number of fishing boats.

Which ONE of the types of fishing boats in the table above would exactly suit his needs in 2013? Justify your answer. (4)

2.3 | Once caught, the chokka is placed in a freezer which cools it down at a constant rate of 14,5 °C per hour until it reaches a minimum temperature of –40 °C.

A chest freezer used to freeze the chokka

Assume that the temperature of the chokka is 18 °C when it is caught. The temperature of the chokka as it cools down can be calculated using the following formula:

$$\textbf{Temperature in °C} = \textbf{18} - \left(\textbf{14,5} \times \frac{\textbf{time in minutes}}{\textbf{60}} \right)$$

The table below shows the change in temperature of the chokka over a period of time.

TABLE 3: The change in temperature of the chokka over a period of time

Time (in minutes)	0	**E**	120	180	240	360
Temperature (in °C)	18	0	**D**	–25,5	–40	–40

2.3.1 | Calculate the missing values **D** and **E**. | (5)

2.3.2 | Use the table to draw a line graph on the grid on ANNEXURE A. | (5)

2.3.3 | One of the crew members claims that the freezer cools down the chokka at a constant rate of 2,42 °C for every 10 minutes.

Verify, showing ALL calculations, whether this claim is valid. | (3)

[30]

QUESTION 3

3.1   Ms Nana is the Tourism teacher at a girls' school in Krugersdorp/Mogale City, Gauteng. She wanted to find out how many of the learners in her class groups had travelled in and around Krugersdorp/Mogale City, to other places in Gauteng, and to other provinces respectively. She asked them to fill in the questionnaire below.

Travel Questionnaire

Complete this questionnaire by ticking the appropriate box.

Only tick once.

Where have you travelled?

☐   Only in and around Krugersdorp/ Mogale City

☐   In and around Krugersdorp/ Mogale City, **but also to other places in Gauteng**

☐   In and around Krugerdorp/Mogale City, to other places in Gauteng, **and also to places in other provinces**

She summarised the data she collected as follows:

TABLE 4: The travelling data for Ms Nana's learners

	CLASS A	CLASS B	CLASS C	TOTAL
Only in and around Krugersdorp/Mogale City	5	4	4	**13**
In and around Krugersdorp/ Mogale City, **but also to other places in Gauteng**	26	x	x	**98**
In and around Krugerdorp/ Mogale City, to other places in Gauteng, **and also to places in other provinces**	16	8	$\frac{1}{3}x$	y

3.1.1   Calculate the missing values x and y.   (4)

3.1.2   There are 48 learners in class A.

Give ONE possible reason why the total number of learners in class A in TABLE 4 above does NOT correspond with the actual number of learners in the class.   (2)

3.2   Ms Nana decided to take the 13 learners who had never travelled out of Krugersdorp/ Mogale City and two other learners for a weekend trip to Pretoria.

The ages of the learners were as follows:

16   17   18   17   19   18   17   17   18   20   17   17   18   18   19

To reduce costs, Ms Nana decided to drive the 16-seater minibus herself.
The Arcadia Hotel has two types of rooms: family rooms and twin rooms.
The teacher will not share a room.

TABLE 5 below shows the daily cost per room.

TABLE 5: Accommodation costs

Type of room	**FAMILY ROOM***	**TWIN ROOM****
Daily cost	R679 per room	R375 per person sharing***

NOTE:
   *A family room can accommodate 2 adults and 2 children under the age of 18.
   **A twin room can accommodate 2 adults.
***An extra charge of R150 is levied if a person stays alone.

The parents of the learners agreed that the accommodation costs will be split equally amongst the learners and Ms Nana. The group intends staying at the hotel for two nights.

3.2.1   Write down an equation which can be used to calculate the cost of hiring m twin rooms. Only one person will be staying in each twin room.   (2)

3.2.2   Determine, with calculations, the minimum number of each type of room they will need to book.   (4)

3.2.3   Ms Nana estimated that the accommodation will not cost more than R400 per person for the weekend.

Verify, showing all calculations, whether or not her estimation is correct if the cost is to be kept to a minimum.   (9)

3.3   Ms Nana used a street map of Pretoria to travel around the city. The street map, together with the recent street name changes, is given on ANNEXURE B. Some of the roads are one-way roads (traffic travels in one direction only). Use the map to answer the following questions:

3.3.1   Write down the grid reference for the Steve Biko Hospital.   (2)

3.3.2   In which general direction is Hospital Hill from the Union Buildings?   (2)

3.3.3   Write down the name of a road on the map where the traffic travels in the opposite direction to the traffic in Steve Biko Street.   (2)

3.3.4   Ms Nana drove the minibus from the Arcadia Hotel in Johannes Ramohoase Street to her friend's house in Tenth Avenue.

Describe in detail the route she took to the house.   (4)

[31]

QUESTION 4

4.1 The teacher liaison officer (TLO) at Lucky High School is planning a five-day leadership camp for all the members of the Representative Council of Learners (RCL) at the Pine Beach Holiday Resort.
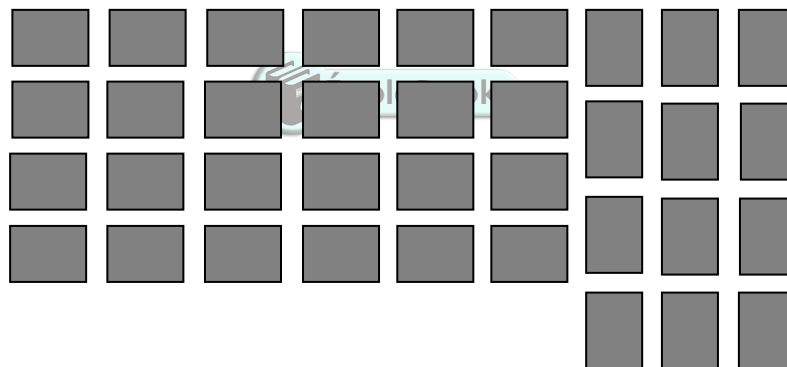
They will be camping in tents and will use the conference facilities at the holiday resort for their workshops each day.

Each tent sleeps two persons.

The dimensions of the rectangular base of each tent is 2,4 m by 1,8 m.

The camp site allocated to them is L-shaped. The tents are pitched (placed) as indicated on the sketch below.

Layout of the tents on the L-shaped campsite

The area needed to pitch each tent has dimensions (length and breadth) that are 15% more than the dimensions of the tent.

The following formula may be used:

Area of a rectangle = length × breadth

4.1.1   Determine the minimum area, to the nearest square metre, of the camp site allocated to Lucky High School.   (8)

4.1.2   Two days before the camp, the TLO listened to the weather forecast on the radio and heard that the prediction of rain is 80% for the whole of the following week.

          Explain what this prediction means in terms of probability.   (2)

4.2   The table below shows the daily 24-hour programme to be followed for the five-day leadership camp.

TABLE 6: Daily 24-hour programme for the five-day leadership camp

TIME	ACTIVITY
07:00–08:00	Breakfast
08:00–10:00	**Workshop session 1**
10:00–10:15	Tea
10:15–12:30	**Workshop session 2**
12:30–13:15	Lunch
13:15–15:15	**Team building exercises**
15:15–15:30	Tea
15:30–17:30	**Plenary session and review of the day's activities**
17:30–18:30	Supper
18:30–07:00	Games, bathing, sleeping

* The learners will arrive at the camp at 07:00 on Day 1, have breakfast and then go straight into the first workshop session.
* On Day 5, the plenary session and review will be moved to the 13:15–15:15 time slot.
* On Day 5, the learners will leave immediately after the afternoon tea.

The TLO informed the learners that the time spent in workshops, team-building exercises, plenaries and reviews will only be 35% of the time spent at the camp.

Verify, showing all calculations, whether this information given to the learners was accurate.   (8)

4.3   Sandwiches will be prepared for morning tea. The sandwiches are made from an equal number of white, brown and whole-wheat loaves of bread. The fillings used for the sandwiches are egg or fish, with or without mayonnaise.

An incomplete tree diagram which could be used to work out the different combinations of sandwiches that could be made, is given on ANNEXURE C.

    4.3.1   Explain what the outcome BEM represents on the tree diagram.   (2)

    4.3.2   Complete the tree diagram on ANNEXURE C.   (4)

    4.3.3   Use the tree diagram to write down the probability, in simplified form, that a sandwich selected at random would:

       (a)   Be a whole-wheat fish sandwich without mayonnaise   (2)

       (b)   Not be a white bread sandwich   (3)

                                       [29]

QUESTION 5

5.1

> The cost of electricity in South Africa has increased drastically over the past two years.
>
> Individual households are charged according to the number of kilowatt-hours (kWh) of electricity used. Households using more electricity are charged a higher rate per kWh than those using less electricity.
>
> TABLE 7 below shows the average monthly increases in the cost of electricity (excluding VAT of 14%) between 2011 and 2012.
>
> **TABLE 7: The average monthly increases in the cost of electricity (excluding VAT) between 2011 and 2012**
>
> | | AVERAGE MONTHLY USAGE IN kWh | | | | |
> |---|---|---|---|---|---|
> | | **50** | **150** | **600** | **1 000** | **1 500** |
> | **Amount payable in 2011** | R27,35 | R85,83 | R393,67 | R728,63 | R1 147,33 |
> | **Amount payable in 2012** | R28,83 | R94,99 | R467,43 | R888,83 | **C** |
> | **Increase between 2011 and 2012** | R1,48 | R9,16 | **A** | | |
> | **Percentage increase between 2011 and 2012** | 5,39% | 10,67% | 18,74% | **B** | 23,38% |
>
> [Source: www.eskom.co.za]
>
> **NOTE:** VAT is value-added tax.

5.1.1   (a)   During 2012, the Ngubane family used an average of 600 kWh of electricity per month and the Khembo family used an average of 150 kWh of electricity per month.

                Use TABLE 7 above to calculate the difference in the cost per kWh that the Ngubane and the Khembo family are charged.   (4)

        (b)   The difference in the cost of electricity can be viewed by some consumers as fair and by others as unfair.
Give a suitable reason for EACH of these two views.   (4)

5.1.2   Determine the missing values **A**, **B** and **C**.

          The following formula may be used:

          Percentage increase between 2011 and 2012
$$= \frac{\textbf{Amount payable in 2012} - \textbf{Amount payable in 2011}}{\textbf{Amount payable in 2011}} \times \textbf{100\%}$$ (6)

5.1.3   Mrs Ntanzi used an average of 1 000 kWh of electricity per month.

          Determine the total annual increase, including VAT, of her electricity bill between 2011 and 2012.   (4)

5.2   To reduce her electricity bill, Mrs Ntanzi decides to install a solar geyser on the roof of her house.

Cylindrical storage tank

The solar geyser consists of rectangular solar panels and a cylindrical storage tank as shown in the diagrams.

The solar panels use sunlight to heat the water stored in the cylindrical tank. The heated water can then be used in the house.

There are altogether six people in Mrs Ntanzi's household.

Solar panels

Solar-heated water

Solar panels

B = 1,5 m

L

Cylindrical hot water tank

h
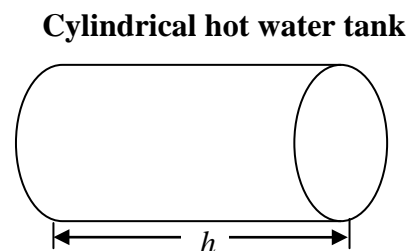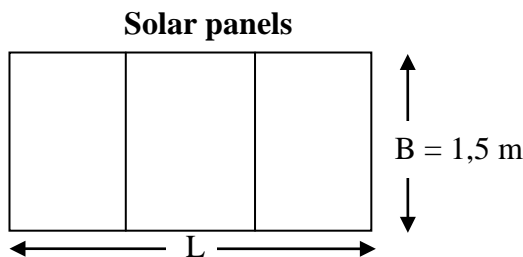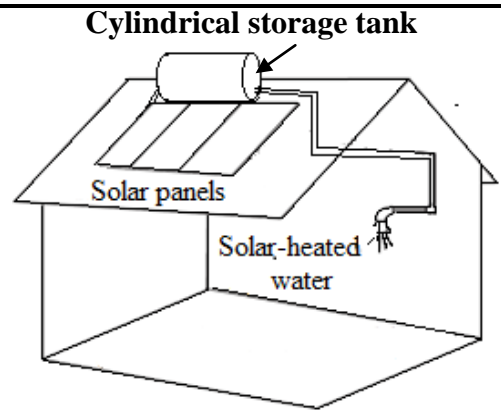
You may use the following formulae:

Area of a rectangle = length × breadth

Volume of a cylinder $= \pi \times r^2 \times h$ where r = radius, h = height and using $\pi = 3{,}14$

5.2.1   Mrs Ntanzi was told that she needed solar panels with an area of 2 m² for the first two members in her household and thereafter an area of 0,7 m² for each additional member.

(a)   Determine the total length (L) of the solar panels needed by Mrs Ntanzi if the breadth (B) is 1,5 m.   (6)

(b)   The hot water tank on the roof has a volume of 150 ℓ and a height (h) of 1,2 m.

Calculate (to the nearest cm) the length of the radius of the tank if 1 ℓ = 1 000 cm³.   (6)

5.2.2   Jake's Plumbers and Electricians normally charge R12 490 to supply and install the solar geyser. They offered a discount of R4 500 on the type of geyser Mrs Ntanzi ordered.

Mrs Ntanzi currently pays an average of R888,83 per month for electricity. She calculated that 45% of her electricity usage is for water heating.

She states that if she can save 45% on her monthly electricity bill, she will be able to recover the cost of the solar geyser within two years.

Determine whether Mrs Ntanzi's statement is valid. Justify your answer, showing ALL relevant calculations.   (6)

[36]

TOTAL: 150

CENTRE NUMBER:									

EXAMINATION NUMBER:													

ANNEXURE A

QUESTION 2.3.2

TEMPERATURE-TIME GRAPH

Time in minutes
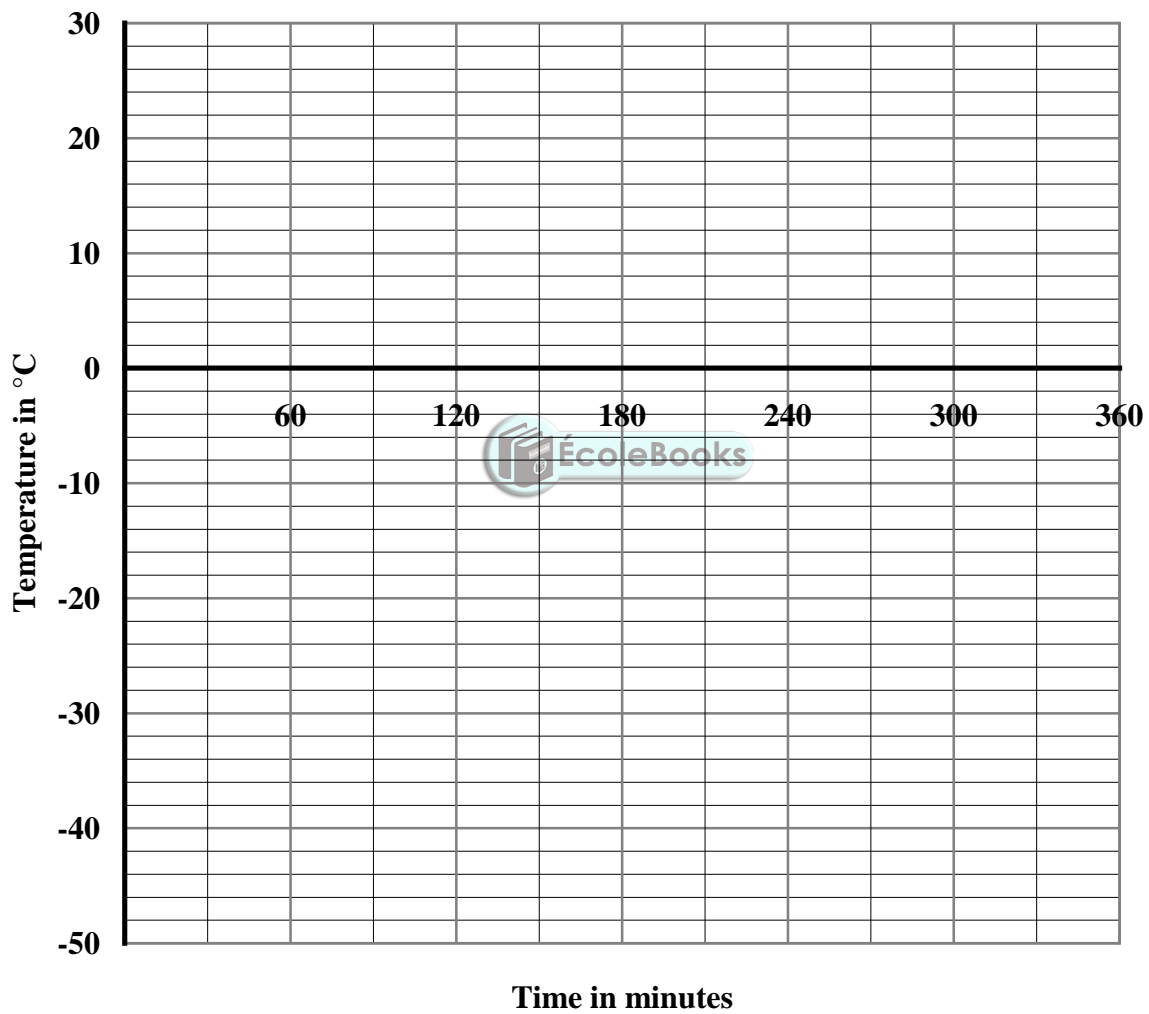
ANNEXURE B

QUESTION 3.3 (STREET MAP OF PRETORIA)

Ms Nana's friend's house

Hospital Hill

Steve Biko Hospital

Union Buildings

Entrance of the Arcadia Hotel

KEY: →
Direction of the flow of traffic
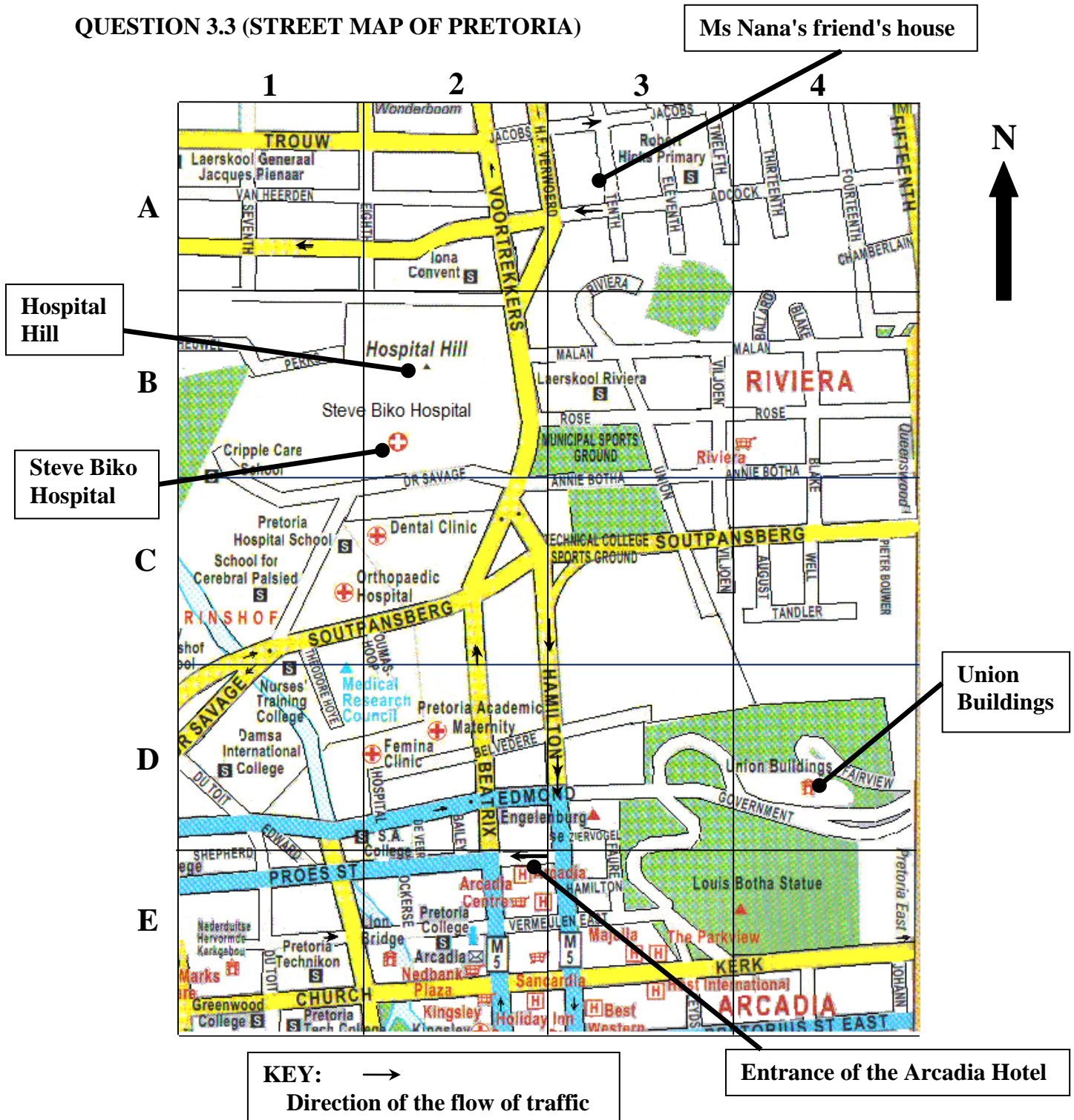
Pretoria street name changes:

Church Street east of Nelson Mandela Drive	changes to	Stanza Bopape Street
Beatrix/Voortrekkers Street	changes to	Steve Biko Street
Vermeulen Street	changes to	Madiba Street
Proes Street	changes to	Johannes Ramohoase Street

CENTRE NUMBER:

EXAMINATION NUMBER:

ANNEXURE C

QUESTION 4.3

Type of bread	Type of filling	Mayonnaise	Outcomes

```
                                              Type of filling      Mayonnaise    Outcomes
                                                                       M    →   BEM
                                                         E
                                                                       N    →   BEN
                            Type of bread
                                                                       M    →   BFM
                                 B
                                                         F
                                                                       N    →   BFN

                                                                       M    →   WEM
                                                         E
                                                                                →   (a) …
                                 W
                                                                       M    →   WFM
                                                      
                                                                                →   (b) …

                                                                                →   (c) …
                                                         E
                                                                       N    →   HEN

                                                                                →   (d) …
                                                      
                                                                       N    →   HFN
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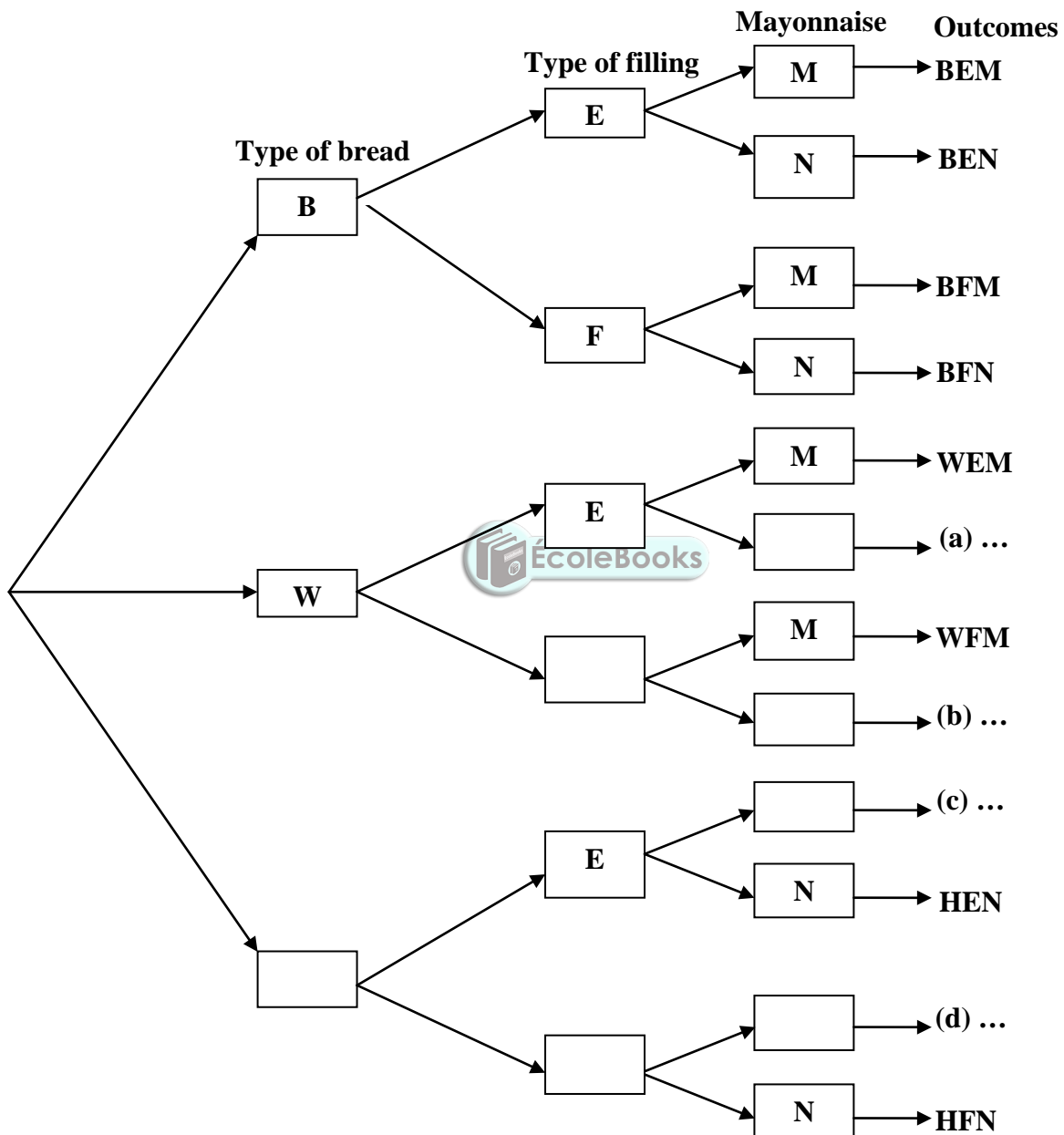
KEY TO THE TREE DIAGRAM					
Symbol	Explanation	Symbol	Explanation	Symbol	Explanation
B	Brown bread	E	Egg	M	With mayonnaise
W	White bread	F	Fish	N	Without mayonnaise
H	Whole-wheat bread				