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MATHEMATICAL LITERACY
Preliminary Examination – Paper 2

Date: September 2022

Time: 3 hours

Marks: 150

EXAMINER: Dr C Sam

MODERATOR:

MEMO

INSTRUCTIONS:

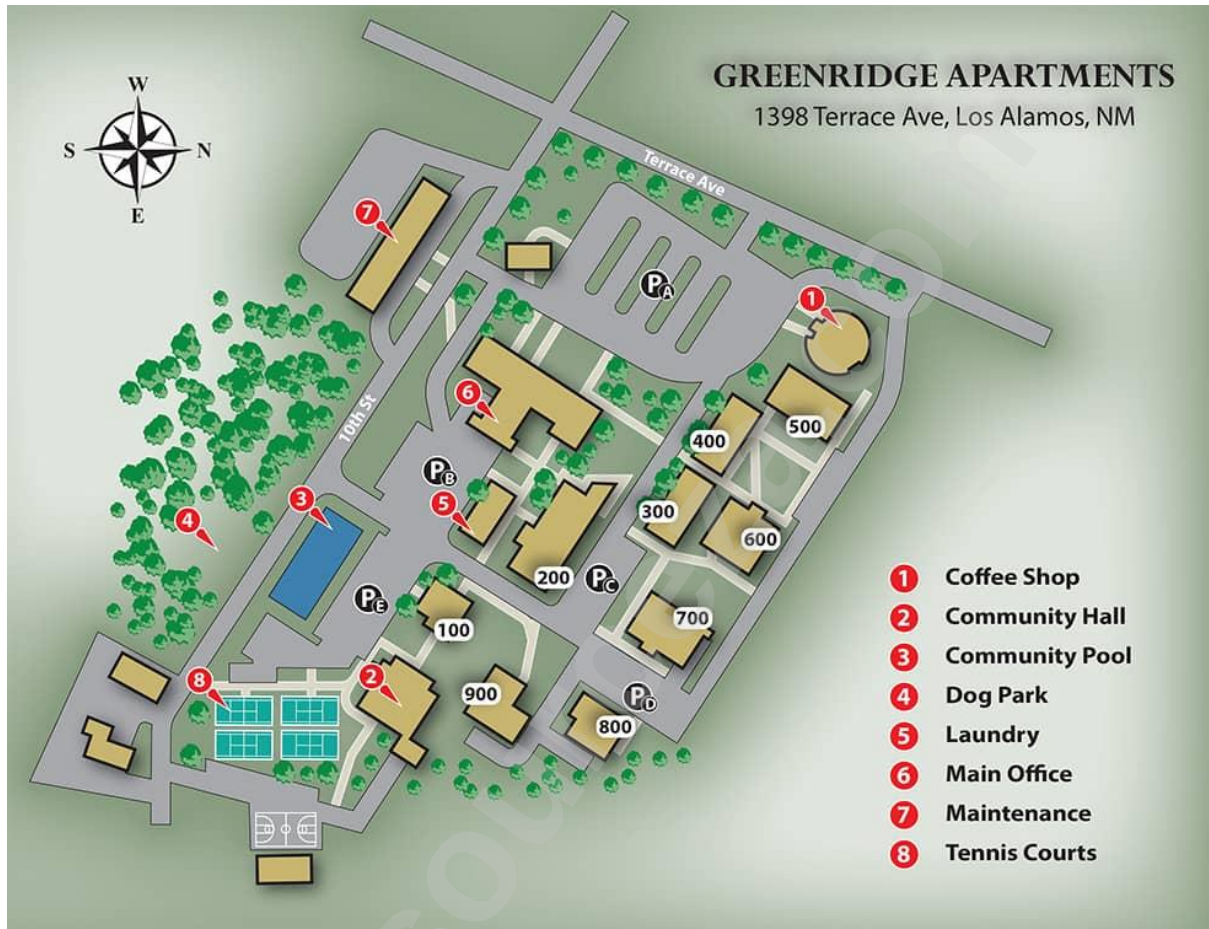
1. This question paper consists of:
 - 26 pages, which includes 2 pages at the back for extra calculations or rough work.
 2. Read the questions carefully.
 3. Answer ALL the questions in the spaces provided on the question paper.
 4. Diagrams are not necessarily drawn to scale.
 5. You may use an approved non-programmable and non-graphical calculator unless otherwise stated.
 6. Show ALL calculations clearly. Answers only will NOT necessarily be awarded full marks.
 7. It is in your own interest to write legibly and to present your work neatly.
-

QUESTION	1	2	3	4	5	TOTAL
ACTUAL						
POSSIBLE	30	32	46	25	17	150

JMH

QUESTION 1 [30 Marks]

- 1.1 You have decided to study at a university and your parents have hired you an apartment. Below is a map of the apartment complex.



- 1.1.1 How many parking lots are in the complex? (2)

5 parking lots ✓ a ✓ a

- 1.1.2 Is this a pet friendly complex? Give a reason for your answer. (2)

Yes ✓ a They have a dog park ✓ reason

- 1.1.3 Name two recreation facilities in the complex. (2)

Tennis ✓ a

Swimming pool ✓ a

John J

1.1.4 Which facility is the most North West of the apartment complex? (2)

Coffee Shop ✓ a ✓ a

1.1.5 The dimensions of the pool are 8 metres long and 3 metres wide and 1,5 metres deep. Calculate the volume of the pool in m^3 . (2)

$$L \times B \times H$$

$$= 8 \times 3 \times 1,5 \text{ ✓ m}$$

$$= 36m^3 \text{ ✓ a}$$

1.1.6 Hence calculate the volume of the pool in litres if $1m^3 = 1\,000\text{ litres}$. (2)

$$36 \times 1\,000 \text{ ✓ m}$$

$$= 36\,000\text{ l} \text{ ✓ a}$$

1.1.7 Convert your answer in **question 1.1.6** to kilolitres. (2)

$$\frac{36\,000}{1\,000} \text{ ✓ m}$$

$$= 36\text{ kl} \text{ ✓ a}$$

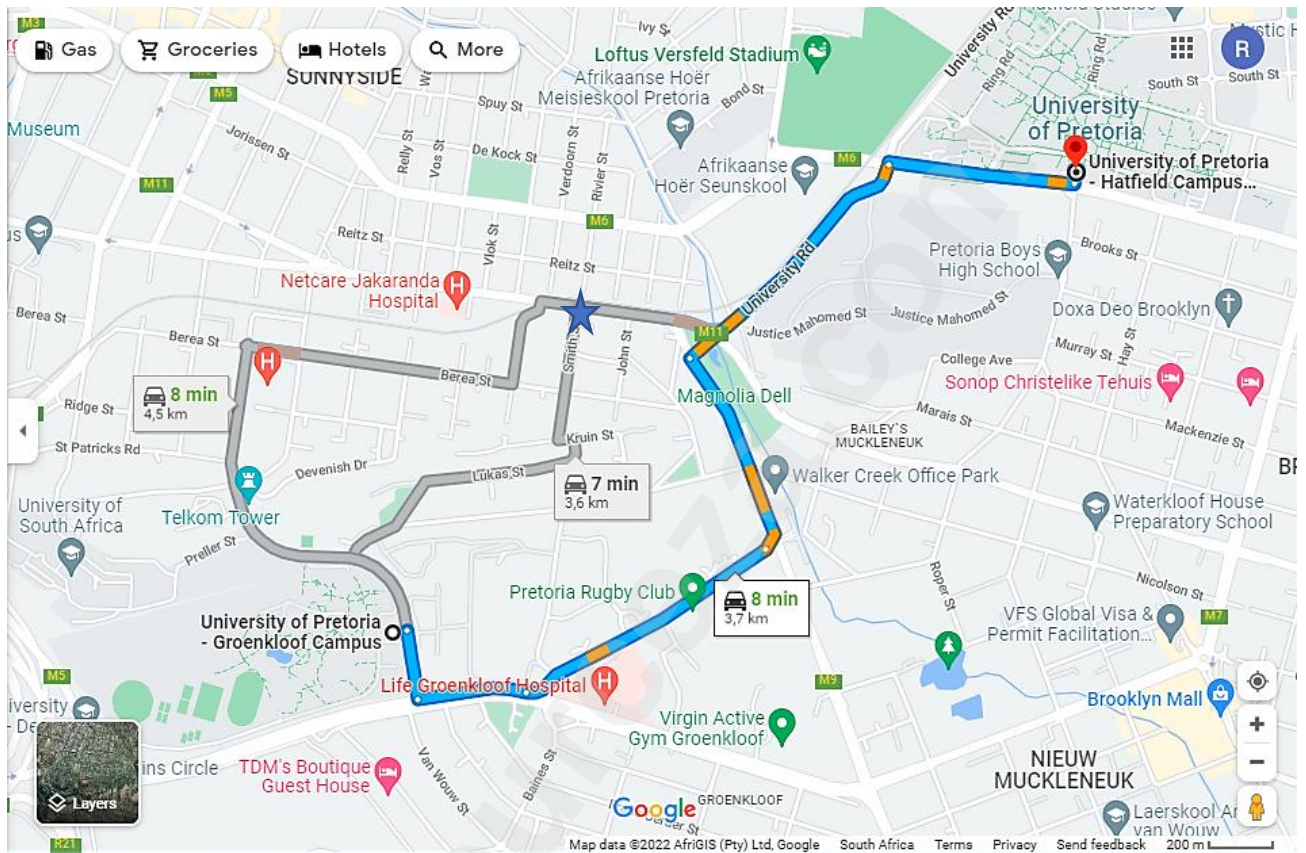
1.1.8 The size of your flat is $650\,000cm^2$. What is the square meterage of your flat? (2)

$$650\,000 \div 100 \div 100 \text{ ✓ m}$$

$$= 65m^2 \text{ ✓ a}$$

JMHJ

- 1.2 Your sister has decided to study teaching at the University of Pretoria on the Groenkloof Campus. All her lectures are on the Groenkloof Campus except Mathematics which is on the Hatfield Campus.



- 1.2.1 What is the shortest distance between the two campuses by car? (2)

3,6 km ✓ a ✓ a

- 1.2.2 There is an accident (indicated by the ★ on the map). The routes have been closed by the traffic department. How long will it take to get to Hatfield Campus? (2)

8 min ✓ a ✓ a

- 1.2.3 The people injured in the accident are taken to the nearest hospital.
Which hospital will they be taken to? (2)

Netcare Jakaranda Hospital ✓ a ✓ a

JMH

- 1.2.4 Your parents want to visit your sister and need to sleep over at a guest house.
What is the name of the closest guest house to Groenkloof Campus? (2)

TDM's Boutique Guest House ✓ a ✓ a

- 1.2.5 Name the source of this map. (2)

Google Maps ✓ a ✓ a

- 1.2.6 Convert the longest distance between the two campuses to metres. (2)

$$4,5 \times 1\,000 \text{ ✓ m}$$

$$= 4\,500 \text{ ✓ a}$$

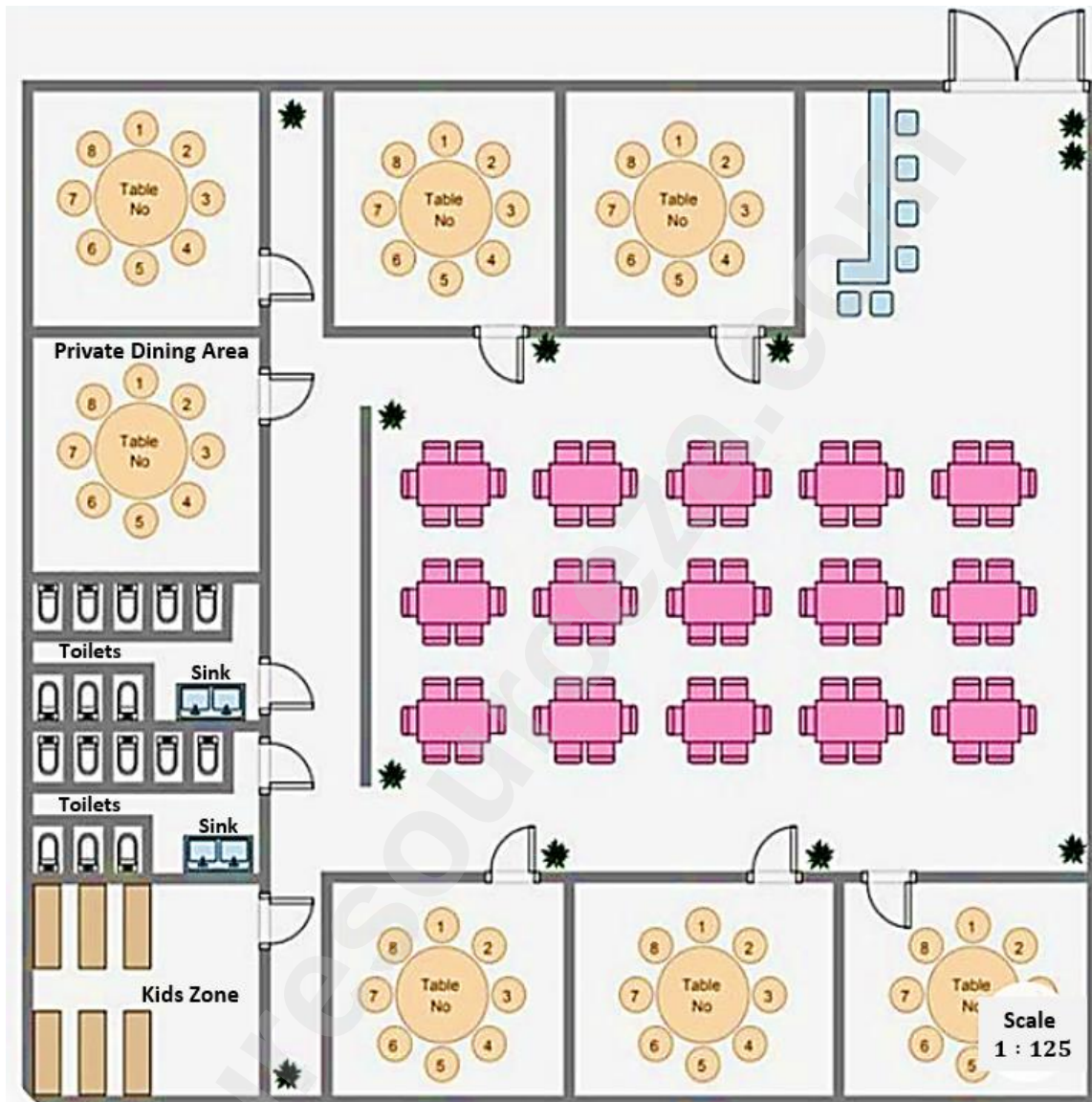
- 1.2.7 South Africa is hosting an international rugby game in the area. Where will the game be played? (2)

Loftus Versfeld Stadium ✓ a ✓ a



QUESTION 2 [32 Marks]

2.1 A new restaurant has opened in Ballito KZN. Study the floorplan below to answer the questions.



2.1.1 There is a 70% capacity restriction on the restaurant due to COVID regulations. How many diners are allowed to be seated at the round tables in the restaurant? (3)

$$\begin{aligned}
 &7 \times 8 \times \frac{70}{100} \\
 &= 56 \checkmark a \times \frac{70}{100} \checkmark m \\
 &= 39,2 = 39 \text{ diners} \checkmark ca
 \end{aligned}$$

JMAJ

2.1.2 Health regulations stipulate that the top of each table in the kidz zone must be covered with plastic.

The width of each table is 90 cm and the total combined area to be covered is 11,34 m². Calculate the length of one of the tables. (4)

$$90 \div 100$$

$$= 0,9 \text{ m} \checkmark \text{ con}$$

$$11,34 \div 6 \text{ tables } \checkmark \text{ m}$$

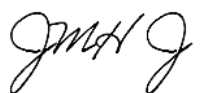
$$= 1,89 \text{ m}^2$$

$$A = L \times B$$

$$1,89 = L \times 0,9$$

$$\frac{1,89}{0,9} \checkmark \text{ m} = L$$

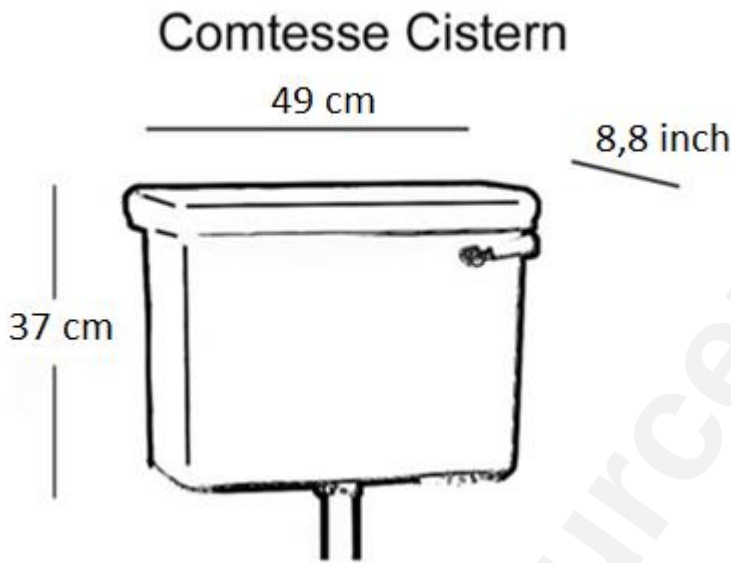
$$L = 2,1 \text{ m} \checkmark \text{ ca}$$



2.1.3 Due to construction nearby, the water pipe supplying the restaurant was damaged, reducing the flow of water to the restaurant.

The manager ordered a water tank to supply water to the bathrooms to ensure that hygiene standards were maintained and that the toilets could be flushed. How many litres of water are required to fill all the cisterns in the bathrooms?

(5)



Useful formulae:

Area = length x breadth

Perimeter = 2(length + breadth)

Volume = length x breadth x height

1 litre = 1 000 cm³

1 cm = 0,394 inches

<https://tinyurl.com/2hn5naxy>

$$\text{Breadth} = \frac{1}{0.394} \times 8,8$$

$$\text{Breadth} = 22,33502538$$

$$\text{Breadth} = 22 \text{ cm} \checkmark \text{ con}$$

$$V = 49 \times 22 \times 37$$

$$V = 39\,886 \text{ cm}^3 \checkmark \text{ ca}$$

$$\frac{39\,886}{1\,000}$$

$$= 39,886 \text{ l} \checkmark \text{ ca}$$

$$39,886 \times 16 \checkmark \text{ m}$$

$$= 638,176 \text{ l} \checkmark \text{ ca}$$

$$\text{or } V = 49 \times 22,33502538 \times 37$$

$$V = 40\,493,40101 \text{ cm}^3$$

$$\frac{40\,493,40101}{1\,000}$$

$$= 40,49340101 \text{ l}$$

$$40,49349191 \times 16$$

$$= 647,8944\,162 \text{ l}$$

Handwritten signature

- 2.1.4 The private dining area floor closest to the bathrooms has been damaged by the water leak. The flooring needs to be replaced. Use the scale to calculate the area of the floor that needs to be replaced. (4)

$$l = b \approx 3,6 \text{ cm} \checkmark \text{ a} \quad \text{OR } L = 3,5 \text{ cm}/3,6 \text{ cm} \text{ and } B = 3,6 \text{ cm}/3,7 \text{ cm}$$

$$3,6 \times 125$$

$$\approx 450 \text{ cm} \checkmark \text{ ca}$$

$$450 \div 100$$

$$\approx 4,5 \text{ m}$$

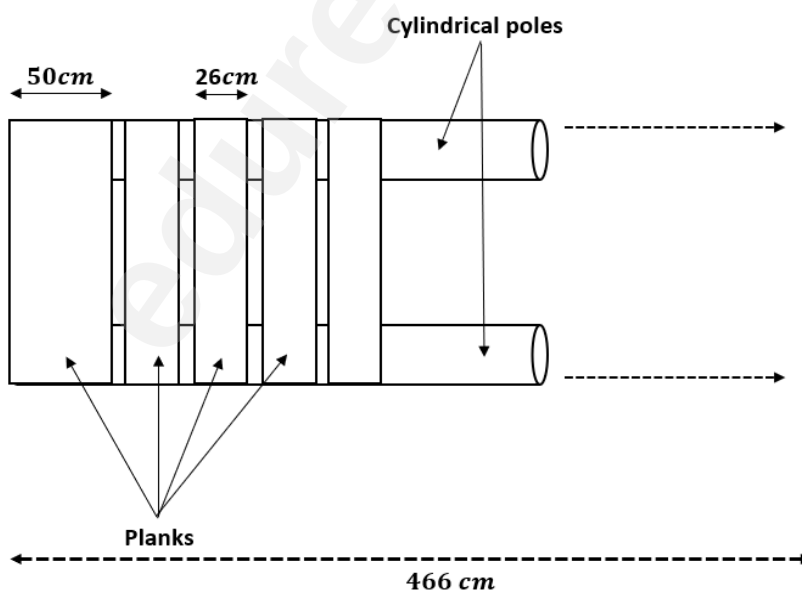
$$A \approx 4,5 \times 4,5 \checkmark \text{ m}$$

$$A \approx 20,25 \text{ m}^2 \checkmark \text{ ca}$$

- 2.2 The back of the restaurant borders on a recreational park. The wooden bridge linking the restaurant property to the park was damaged in a flood. The owner of the restaurant is willing to pay to repair the bridge.

The bridge has to be 466 cm in length. The bridge will be made by placing two cylindrical poles on the ground which rectangular planks placed across them.

The two wider planks on each end are 50 cm wide and each of the other narrower planks, in the middle, are 26 cm in width. There is a 2 cm gap between each of the planks.



JMH

2.2.1 Calculate the effective width of one of the narrower planks (the width of the plank, including the gap). (2)

$$26 + 2 \checkmark \text{ m}$$

$$= 28 \text{ cm} \checkmark \text{ a}$$

2.2.2 Hence calculate the number of narrower planks required. (4)

$$\frac{\text{length of bridge} - (2 \times \text{wide plank}) - \text{first gap}}{\text{effective width of narrow plank}}$$

$$= \frac{466 - 50 - 50 - 2 \checkmark \text{ m} \checkmark \text{ a}}{28 \checkmark \text{ mca}}$$

$$= \frac{364}{28}$$

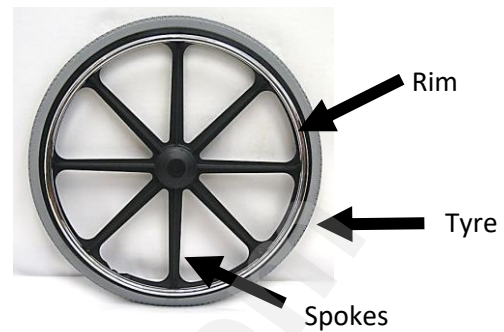
$$13 \text{ planks} \checkmark \text{ ca}$$

2.2.3 Give a reason why the restaurant owner would pay for the repair of the bridge even though it is not on his property. (2)

To encourage people in the park to come to his restaurant (easy access) $\checkmark \text{ a} \checkmark \text{ a}$

JMAG

2.3 Thandi has an injury that requires her to use a wheelchair for a while.



2.3.1 The outer diameter of the bigger wheel is 54% of the length of the wheelchair.
Determine the outer diameter of this wheel to the nearest mm. (3)

$$\begin{aligned} &129,92 \times \frac{54}{100} \checkmark \text{ m} \\ &= 70,1568 \text{ cm} \checkmark \text{ a} \\ &70,1568 \times 10 \\ &= 702 \text{ mm} \checkmark \text{ a} \quad \text{must be mm} \end{aligned}$$

JMH

2.3.2 The big wheel has eight equally spaced cylindrical spokes attached to the rim.

The width of each spoke is 6 mm.

The inner diameter of the rim is 584 mm.

Calculate how far apart the wheel spokes are spaced from each other on the rim.

You may use the following formula: Circumference = 3,142 x diameter. (5)

$$C = 3,142 \times 584$$

$$C = 1834,928$$

$$C = 1\,835\text{ mm} \checkmark \text{ a}$$

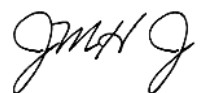
$$\frac{1\,835 - (6 \times 8) \checkmark \text{ m} \checkmark \text{ a}}{8 \checkmark \text{ a}}$$

$$= \frac{1\,835 - 48}{8}$$

$$= \frac{1\,787}{8}$$

$$= 223,375$$

$$= 223\text{ mm} \checkmark \text{ ca}$$



QUESTION 3 [46 Marks]

Formula One (F1) is the highest class of international racing for open-wheeled single-seater formula racing cars and has a large viewing audience.

The 1st two races of the season were held at the Bahrain International Circuit and the Jeddah Corniche Circuit respectively.

3.1 The results of the top 5 racers for each race is shown below:

Table 1: Bahrain International Circuit

Pos		Driver	Time	Pts
1		C. Leclerc Ferrari #16	1:37:33.584	26
2		C. Sainz Jr. Ferrari #55	+5.598s	18
3		L. Hamilton Mercedes #44	+9.675s	15
4		G. Russell Mercedes #63	+11.211s	12
5		K. Magnussen Haas #20	+14.754s	10

Table 2: Jeddah Corniche Circuit

Pos		Driver	Time	Pts
1		M. Verstappen Red Bull #1	1:24:19.293	25
2		C. Leclerc Ferrari #16	+0.549s	19
3		C. Sainz Jr. Ferrari #55	+8.097s	15
4		S. Pérez Red Bull #11	+10.800s	12
5		G. Russell Mercedes #63	+32.732s	10



3.1.1 What was L. Hamilton's finishing time for the Bahrain Grand prix? (2)

$$1 : 37 : 33.584 + 9.675 \text{ sec} \checkmark \text{ m}$$

$$= 1 : 37 : 43.26 \checkmark \text{ a}$$

$$\text{OR } 1 : 37 : 43,259$$

3.1.2 What was the time difference for C. Leclerc over the two races? (4)

$$1 : 37 : 33.584 - 1 : 24 : 19.293 \checkmark \text{ m} - 0.549 \checkmark \text{ m}$$

$$= 0 : 13 \checkmark \text{ a} : 13,74 \checkmark \text{ a}$$

$$\text{OR } 13 : 13,742$$

3.1.3 Who is at the top of the leader board for the drivers' championship after the first 2 races? (2)

C Leclerc $\checkmark \text{ a} \checkmark \text{ a}$ (45pts)

3.2 Each Grand Prix race circuit is unique in F1.

Table 3: Jeddah Corniche Grand Prix Circuit details

Race information	
Most wins (constructors)	Mercedes Red Bull Racing (1)
Circuit length	(3,836 mi)
Race distance	
Laps	50
Lap Record	1:31:634 Leclerc 2022

<https://tinyurl.com/bp98tpz5>

Table 4: Bahrain Grand Prix Circuit details

First Grand Prix	2004
Circuit length	5,412 km
Number of laps	57
Race distance	
Lap record	1:31,447 - De la Rosa (2005)

TOTAL RACE DISTANCE = length of circuit x number of laps

3.2.1 Calculate the race distance of the Bahrain circuit.

(2)

$$\begin{aligned}
 &5,412 \times 57 \checkmark \text{ m} \\
 &= 308,484 \text{ km} \checkmark \text{ a}
 \end{aligned}$$

3.2.2 Determine the difference in the total race distance between the two circuits.

Show all necessary calculations and round off your answer correct to

3 decimal places. Note: 1 mile = 1,60934 km. (5)

$$Jeddah = 1,60934 \times 3,836 \checkmark \text{ m}$$

$$Jeddah = 6,17342824 \text{ km per lap} \checkmark \text{ a}$$

$$6,17342824 \times 50 \checkmark \text{ m}$$

$$= 308,6714671 \text{ km}$$

$$Difference = 308,6714671 - 308,484 \checkmark \text{ m}$$

$$Difference = 0,187 \text{ km} \checkmark \text{ ca} \quad \text{OR} \quad 0,19 \text{ km}$$

3.2.3 De LA Rosa holds the lap record for the Bahrain circuit. Determine his average speed in **km/h** for the fastest lap.

(Distance = speed $\times$ time) (3)

$$Time = 1 : 31,447 \text{ min}$$

$$\text{OR} \quad 1 : 31,447 \text{ is } 60 \text{ sec} + 31,447 \text{ sec}$$

$$Time = 0,025401944 \text{ h} \checkmark \text{ con}$$

$$= 91,447 \text{ sec} \div 60 \div 60$$

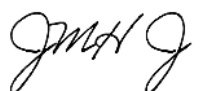
$$= 0,02540194444 \text{ h}$$

$$5,412 = speed \times 0,025401944 \checkmark \text{ sub}$$

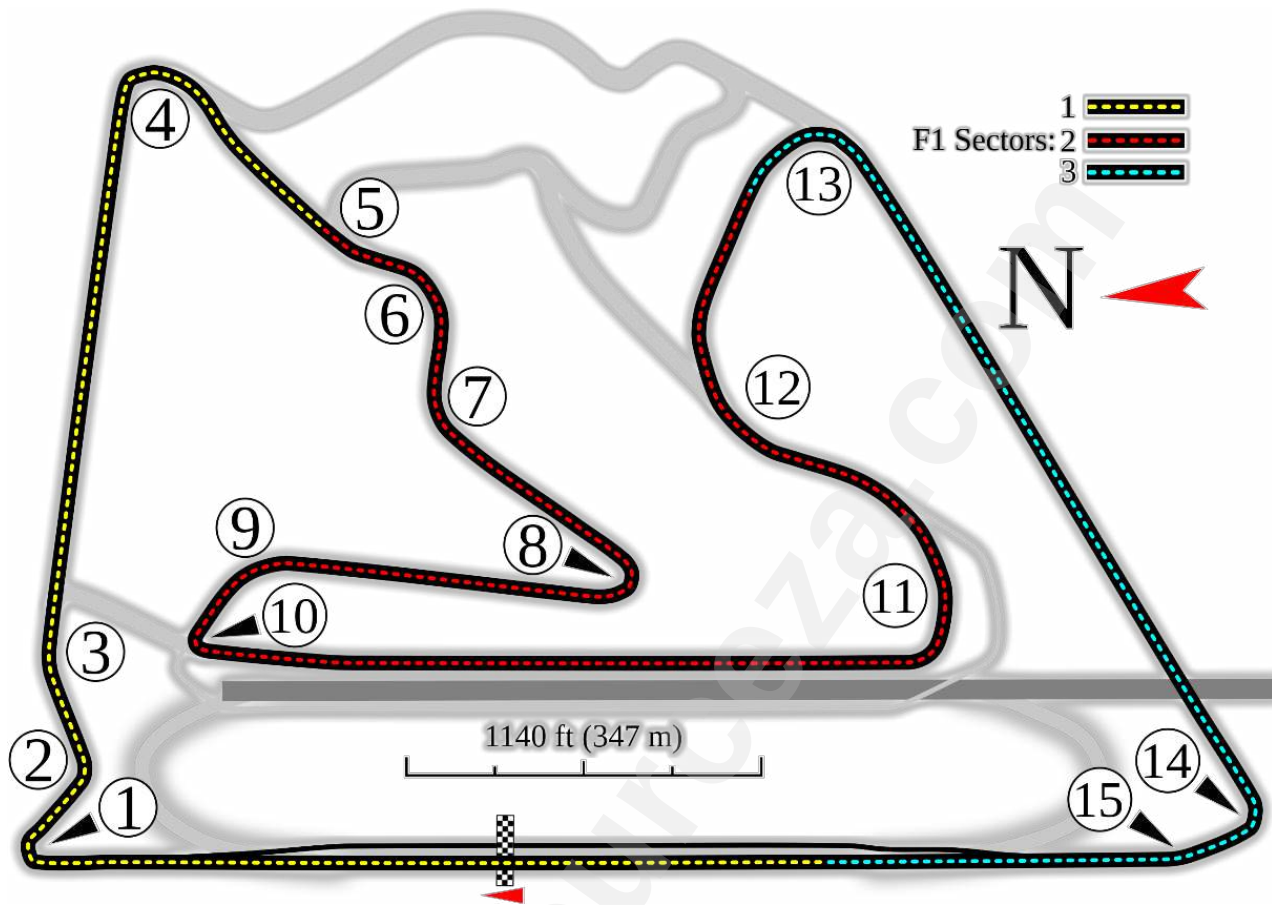
$$\frac{5,412}{0,025401944} = speed$$

$$= 213,0545562$$

$$= 213,05 \text{ km/h} \checkmark \text{ a}$$



3.3 The race circuit for the Bahrain Grand Prix is shown below:



3.3.1 The  indicates the direction of the race. Do they race in a clockwise or anti-clockwise direction? (2)

Clock wise direction ✓ a ✓ a

3.3.2 What type of scale is used on this diagram? (2)

Bar Scale ✓ a ✓ a

3.3.3 Use the scale to calculate the distance of the track in metres from bend 15 to the middle of the checked flag. (3)

$$4,4 \text{ cm} / 4,5 \text{ cm} \approx 347 \text{ m}$$

$$\approx 8,3 \text{ cm} / 8,4 \text{ cm}$$

$$\frac{347}{4,4} \times 8,3 \checkmark \text{ m} \checkmark \text{ a}$$

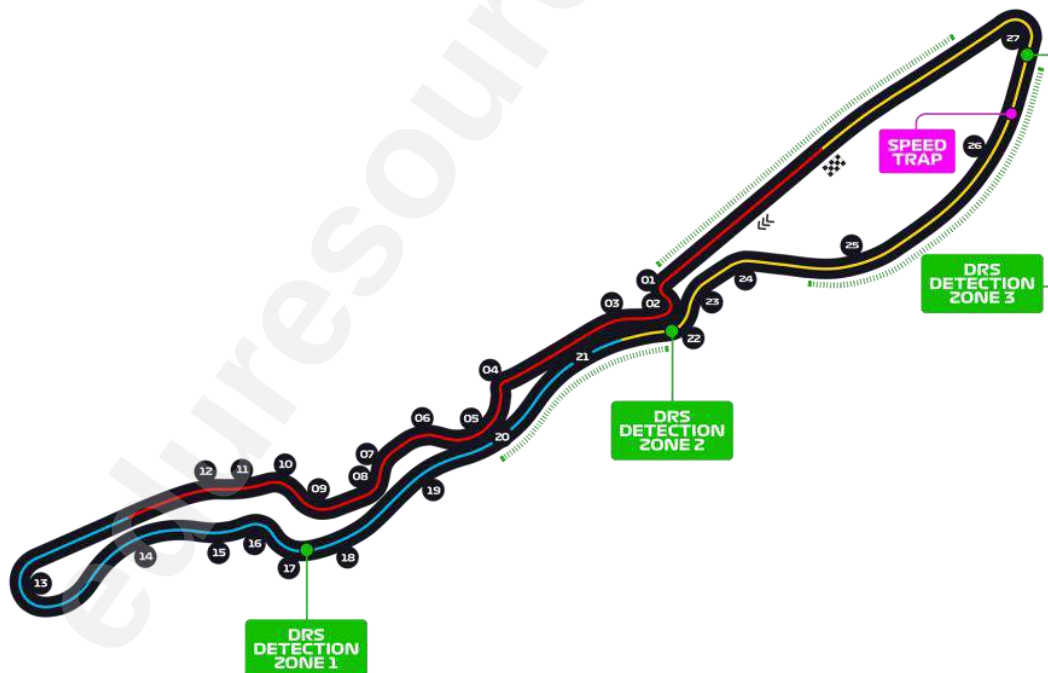
$$\approx 654,568 \text{ m} \checkmark \text{ ca}$$

3.3.4 Which 2 bends are on the furthest East side of the Bahrain circuit? (2)

Bend 4 $\checkmark$ a

Bend 13 $\checkmark$ a

3.4 The Bahrain circuit and the Jeddah circuit are very different in format.



3.4.1 Give a possible reason why the lap records for the two circuits are almost the same even though the one circuit is longer than the other circuit? (2)

gmh g

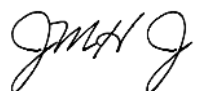
The one circuit is more challenging ✓ a ✓ a

Accept any reasonable answer

3.4.2 The diagram of Jeddah Corniche Circuit has no scale. What type of scale will be a more accurate reflection of the circuit, if the organisers added it to a pamphlet for the supporters? Give a reason for your answer. (3)

Bar scale. ✓ a A bar scale is not affected by the resizing of a map.

✓ a



3.5 Below is the starting lights used for the start of a Formula 1 race.



3.5.1 Write the probability, as a fraction in its simplest form, that a green or red light will be faulty at the start of the race? (3)

$$P(G \text{ or } R) = \frac{15 \checkmark a}{20 \checkmark a}$$

$$P(G \text{ or } R) = \frac{3}{4} \checkmark \text{simp}$$

3.5.2 Use a **word** to describe the probability that all the lights will be working properly if no lights are faulty. (2)

Certain $\checkmark a \checkmark a$ Must be a word

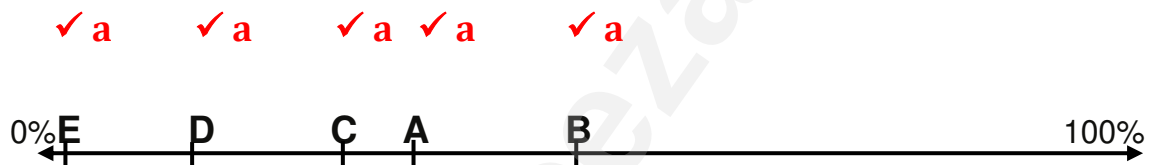
JmH J

- 3.6 The probability of a particular driver winning the driver championship after the first two races in 2022 is shown in the table below.

Drivers Championship: probability of winning:

• A:	Charles Leclerc:	$\frac{5}{14}$
• B:	Max Verstappen:	50%
• C:	Lewis Hamilton:	0,277
• D:	Carlos Sainz:	$\frac{1}{8}$
• E:	George Russell:	5,9%

Complete the probability diagram below by correctly placing the letters (A to E) on the probability scale. (5)



- 3.7 The length of a McLaren F1 car is 4,287m. A scale drawing of the car is shown below. Calculate the scale of the drawing. Round off your answer to an appropriate scale. (4)



<https://tinyurl.com/2mvms7b4>

13 cm ✓ a $\approx 4,287 \text{ m}$

13 : 428,7 ✓ con

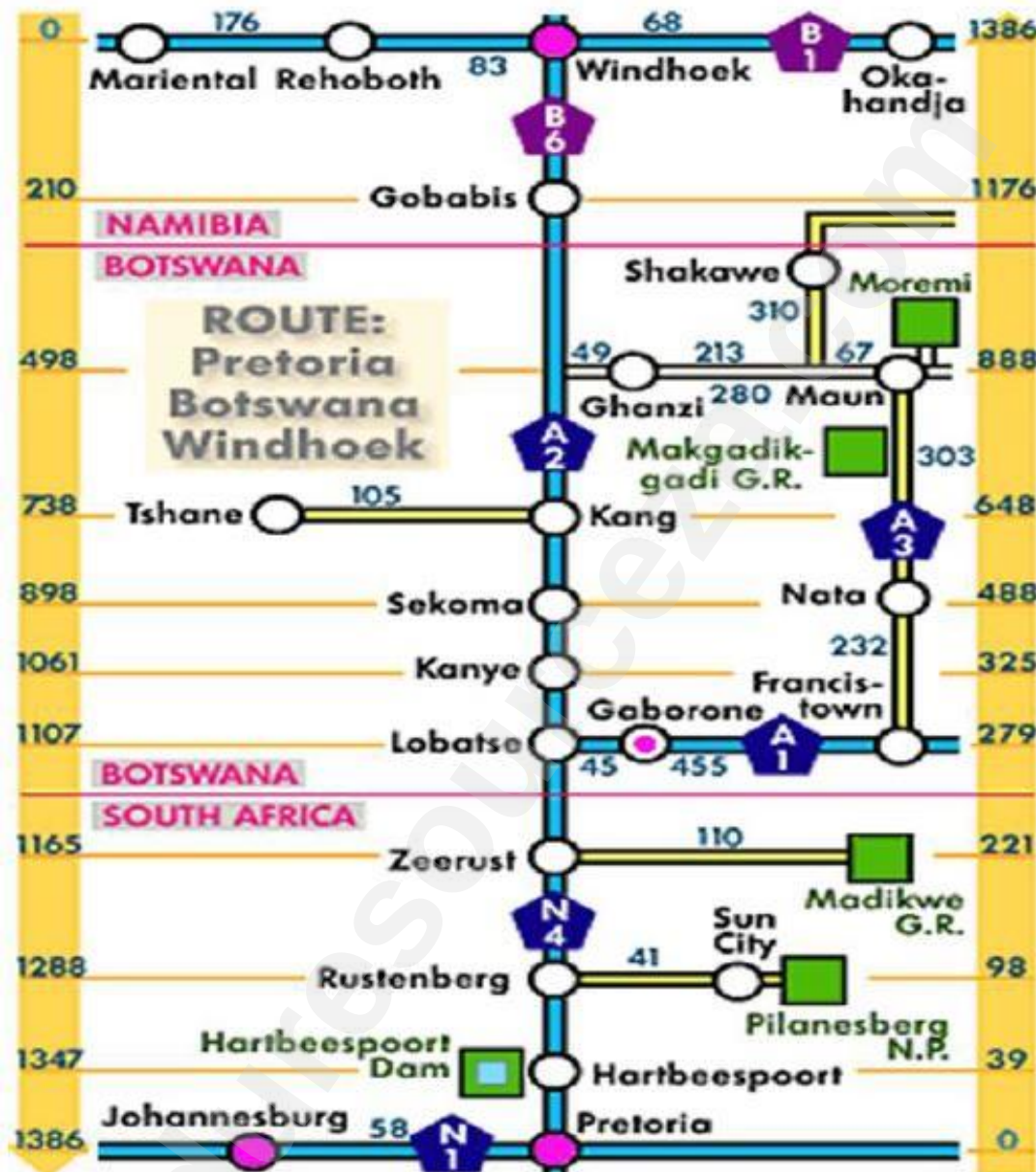
1 : 32,976 ... ✓ a

1 : 33 ✓ appropriate scale

gmh j

QUESTION 4 [25 Marks]

4.1 Johan lives in Oka-hanja. He is travelling on the national roads to a holiday destination in South Africa that is 1 397 km away.



<https://tinyurl.com/k94tyzb5>

4.1.1 What is Johan's final destination if he passes Kanye?

(2)

Sun City ✓ a ✓ a

(Oka-hanja to Windhoek to Rustenberg to Suncity)

JmH J

4.1.2 Johan is planning on doing the journey over 3 days. He drives about a third of the way on each day. Which towns could he possibly be staying over at? (3)

$$\frac{1\ 397}{3}$$

$$\approx 465,67\ km \checkmark a$$

Ghanzi $\checkmark ca$

Sokoma / Kanyo $\checkmark ca$

4.1.3 On his way back home the road has been closed between Lobatse and Kanye due to a massive sinkhole the road will be closed for several weeks.

Calculate how much further Johan had to travel to get back home. (4)

$$41 + 181 + 45 + 455 + 232 + 303 + 67 + 213 + 49 + 498 + 68 \checkmark m$$

$$= 2\ 152\ km \checkmark a$$

$$Difference = 2\ 152 - 1\ 397 \checkmark m \quad \text{OR } 1\ 364 - 609$$

$$Difference = 755\ km \checkmark ca \quad = 755\ km$$

4.1.4 Explain why the distance between the A2 and Ghanzi looks shorter than the distance between Rustenberg and Sun City. (2)

The map is not to scale $\checkmark a \checkmark a$

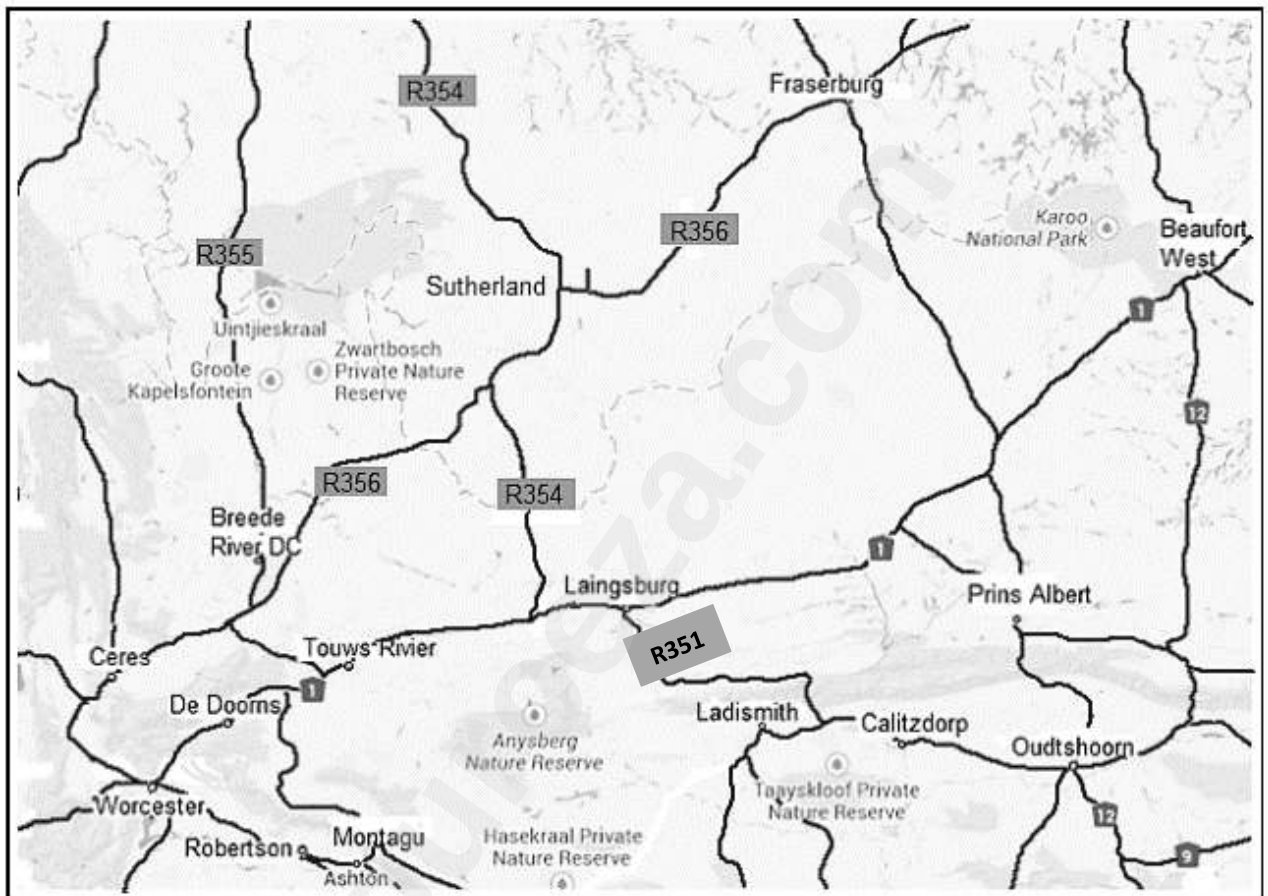
4.1.5 Explain why are printed maps not used as frequently as it used to be? (2)

People use technology like waze and google maps. $\checkmark a \checkmark a$

Accept any reasonable answer



4.2.1 Mrs Yang lives in Fraserburg and is driving to Ladismith to attend a business conference.



Directions from Fraserburg to Ladismith (334 km)

- Turn Right towards Ladismith
- Turn Right onto the R356
- Turn Left onto the N1
- Turn Left onto the R354
- Turn Right onto the R351

<https://tinyurl.com/35hjua9c>

4.2.1 Give Mrs Lang the directions from Fraserburg to Ladismith by rewriting the directions above in the correct order. (4)

- | | |
|---|--|
| A | Turn Right onto the R356 ✓ a ✓ a ✓ a ✓ a |
| B | Turn Left onto the R354 |
| C | Turn Left onto the N1 |
| D | Turn Right onto the R351 |
| E | Turn Right towards Ladismith |

-1 for each incorrect answer

JMH

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- 4.2.2 Mrs Yang travels at an average speed of 85 km/h. Calculate how long, in hours and minutes, the journey took. (4)

$$\text{Time} = \frac{334}{85} \checkmark \text{ m}$$

$$\text{Time} = 3,929411765 \checkmark \text{ a}$$

$$\text{Time} = 3 \text{ H } 55 \text{ m } 45 \text{ sec}$$

$$\text{Time} = 3 \text{ H } \checkmark \text{ ca } 56 \text{ m } \checkmark \text{ ca}$$

- 4.2.3 Give 2 reasons why Mrs Yang would be using a printed map for her directions. (4)

She has no reception $\checkmark \text{ a } \checkmark \text{ a}$

She has no data $\checkmark \text{ a } \checkmark \text{ a}$

Accept any 2 reasonable answers



QUESTION 5 [17 Marks]

Michael is a handy man and would prefer to make items that can be used in the home instead of buying them. One of his projects is making a braai out of a drum.



H = height of the drum

D = diameter of the drum (57,2 cm)

- 5.1 A $\frac{1}{3}$ of the base of the drum is filled with sand before braaiing.

Give 2 practical reasons why sand is placed in the drum. (4)

To protect the drum ✓ a ✓ a

To use less coals ✓ a ✓ a

To bring the fire closer to the grid

Accept any 2 reasonable answers

- 5.2 Michael needs to buy a grid to fit the top of the drum. The grid length needs to be 1% longer than the length of the drum to the nearest cm.

The volume the drum shown is given by:

$$V = \frac{1}{2} \times \pi \times \text{radius}^2 \times H, \text{ where } \pi = 3,14$$

$$\text{Volume} = 108\,000 \text{ cm}^3$$

Michael finds a grid that is 84,5 cm in length.

Verify, using calculations, whether the grid will be long enough to cover the top of the braai drum. (6)

$$108\,000 \text{ ✓ sub} = \frac{1}{2} \times \pi \times 28,6^2 \times h$$

$$r = \frac{57,2}{2}$$

$$\frac{108\,000 \times \frac{2}{1}}{\pi \times 28,6^2} = h$$

$$r = 28,6 \text{ cm ✓ a}$$

$$h = 84,09923336$$

$$h = 84 \text{ cm ✓ a}$$

$$84 + 84 \times \frac{1}{100} \text{ ✓ m}$$

$$= 84,84$$

$$= 85 \text{ cm ✓ ca}$$

Will not be enough ✓ ca

- 5.3 The surface area of the drum is $2m^2$. Michael has 200 ml of paint left from one of his other do-it-yourself projects. The paint has a spread rate of $10 m^2$ per litre of paint. Will Michael have enough paint to paint the drum with 2 coats of paint? Show all necessary calculations to verify your answer. (5)

$$200 \div 1\,000$$

$$= 0,2\,l$$

$$\frac{1}{10} \times 2 \checkmark m$$

$$= 0,2\,l \checkmark a$$

$$\text{OR} \quad 1\,L : 10\,m^2$$

$$1000\,ml : 10\,m^2$$

$$200\,ml : 2\,m^2$$

Only enough for one coat

$$0,2 \times 2 \checkmark m$$

$$= 0,4\,l \checkmark ca \quad \text{or} \quad 400\,ml$$

Will NOT have enough for 2 coats $\checkmark ca$

- 5.4 It takes 3 people four hours to paint 24 drums. How long will it take Michael and his friend to paint 24 drums? (2)

$$3 \times 4 \div 2 = 6\, \text{hours} \checkmark m \checkmark a$$

TOTAL = 150 Marks

JMAJ