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TOTAL MARKS

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INTERNATIONAL SECONDARY CERTIFICATE EXAMINATION
MAY 2023

QUANTITATIVE REASONING: PAPER II

EXAMINATION NUMBER

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Time: 3 hours

150 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

- This question paper consists of:
 - 20 pages which includes 1 additional page at the end for rough work and calculations.
 - 5 questions.
 - An Appendix which includes Annexure A, B, C and D.
- Please check that your question paper is complete.
- Answer ALL the questions on the question paper and hand this in at the end of the examination. Remember to write your examination number in the space provided.**
- It is strongly recommended that all working details be clearly shown.
- An approved non-programmable calculator may be used.
- It is in your own interest to write legibly and to present your work neatly.
- Maps and diagrams are not necessarily drawn to scale, unless otherwise stated.
- ONE lined page (page 20) is included at the end of the question paper. If you run out of space for a question, use this page. Clearly indicate the number of your answer should you use this extra space.

Question	1		2		3		4		5		Total	
	Marker	Mod	Marker	Mod	Marker	Mod	Marker	Mod	Marker	Mod	Marker	Mod
Mark												
Signature												
Total	32		31		31		24		32		150	

QUESTION 1

- 1.1 Refer to **ANNEXURE A** and **ANNEXURE B**.

The map of the Etosha National Park, in Namibia, is given on **Annexure A**. Enlargements of sections of this map can be found on **Annexure B**.

Etosha means the 'great white area' and refers to the impressive *salt pan, which is the biggest salt pan in Africa.

*Natural salt pans are areas where bodies of water have evaporated, leaving behind expanses of minerals and salts that shine white under the sun.

Study the maps and answer the following questions.

- 1.1.1 Complete the statement, from the map, on the line provided below:

'Etosha National Park

Namibia's greatest ...'

_____ (2)

- 1.1.2 How many main camps are available for guest accommodation in the national park?

_____ (2)

- 1.1.3 Are visitors to the park able to arrive by aeroplane? Give a reason for your answer.

_____ (2)

- 1.1.4 State the grid reference of Onkoshi Camp.

_____ (2)

- 1.1.5 Complete the following statement by making reference to the appropriate compass direction:

Okaukuejo Camp lies _____ of Halali Camp. (2)

- 1.1.6 State the gate closest to the Namutoni Camp.

_____ (2)

- 1.1.7 State the distance between the Twee Palms waterhole and the Aroe waterhole, both found in A4.

(2)

- 1.1.8 Name the two facilities that are available for visitors to make use of if they are at the Olifantsbad waterhole found in B2.

(2)

- 1.1.9 Will tourists be able to visit the Dolomite Camp referred to in B1? Give a reason for your answer.

(2)

- 1.2 The Hoba meteorite is the largest meteorite in the world and can be found in Namibia. It's cuboid shape makes it unique among meteorites.



[Source: <<https://geology.com/records/largest-meteorite>>]

- 1.2.1 The top surface of the meteorite measures 295 cm by 295 cm, while its thickness/height varies from 75 cm to 122 cm.

- (a) What geometrical shape, according to the stated measurements, is the top surface of the meteorite?

(2)

- (b) Convert 295 cm to metres.

(2)

- (c) Calculate the difference in the thickness/height of the meteorite.

(2)

1.2.2 The Hoba meteorite

- has a mass of 60 tons
- is made up of 82,4% iron, 16,4% nickel and 0,76% cobalt which are all metals

- (a) Calculate the mass, in tons, of the nickel in the meteorite.

(2)

- (b) What percentage of the meteorite is **not** metal?

(2)

- (c) Determine the mass of the meteorite in kilograms.

(2)

- (d) The average mass of a car is 1 857 kg. Calculate the number of cars it would take to weigh the same as this meteorite.

(2)
[32]

QUESTION 2

Refer to **ANNEXURE C**.

Namibia is known for its natural attractions. The highlights include Etosha National Park, Fish River Canyon Park, the Namib desert, and the Kalahari Desert. Namibia even has some of the highest sand dunes in the world.

Study the map of Namibia given on **Annexure C** and answer the following questions.

- 2.1 Name the region capital that lies closest to the Etosha National Park.

(2)

- 2.2 A group of tourists travel east from Lüderitz through the town of Ausweiche to Keetmanshoop. From there they travel in a northerly direction to Mariental. They then travel in a NNW direction **through** two more towns along the route before reaching their destination.

Highlight their route on the section of the map given below **and** state their destination.

Destination: _____



(3)

- 2.3 Convert the scale on the map to a ratio (number) scale in the format 1 : _____. Round your answer to the nearest hundred.

(4)

- 2.4 According to the scale on the map 0,9 cm represents 50 miles.

The distance 'as the crow flies' means '***in a straight line, by the shortest route***'. Calculate the distance, in miles, from Keetmanshoop to Windhoek, as the crow flies.

(3)

- 2.5 The distance from Keetmanshoop to Windhoek by road is 300 miles. Convert this distance to kilometres using the information below. Round your answer off to the nearest kilometre.

$1 \text{ km} = 0,6214 \text{ miles}$

(3)

2.6 The distance table below shows the distance between towns and cities measured in kilometres. Study the table and answer the questions that follow.

											Keetmanshoop					
										Lüderitz			334			
									Maltahohe			374	332			
								Mariental		111	555	221				
							Okahandja		332	443	889	553				
						Omaruru		173	505	616	1060	726				
					Otavi		253	292	624	735	1179	845				
				Otjiwarongo		118	135	174	506	617	1061	727				
			Outjo		73	191	208	247	579	690	1134	800				
		Rehoboth		405	332	450	331	158	174	285	729	395				
	Ruacana		947	688	615	497	750	789	1121	1232	1676	1345				
	Swakopmund		684	445	444	371	489	236	287	619	482	731	840			
		Tsumeb		552	434	513	228	181	63	316	355	687	798	1242	907	
		Walvis Bay		673	31	715	476	476	403	521	267	318	650	451	938	814
Windhoek	389	426	356	860	87	318	245	363	242	71	261	372	816	482		

2.6.1 Mr Smit travels from Swakopmund to Omaruru and then to Windhoek. Use the distance table to calculate the total distance of his journey.

(3)

2.6.2 Lucy plans a trip from Lüderitz to Windhoek. The trip will take her 8,5 hours in total.

(a) Determine the distance between Lüderitz and Windhoek.

(2)

(b) Calculate the average speed of her trip.

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

(2)

(c) While planning her trip, Lucy takes the following into consideration:

- the fuel tank holds 45 litres
- the fuel consumption of the car is 8 litres/100 km

Lucy leaves Lüderitz with a full tank of fuel and plans to stop in Mariental to refuel. Has Lucy made a wise decision? Justify your answer using calculations.

(4)

(d) Fuel is pumped into the car's fuel tank at a rate of 13 US gallons per minute. Convert this rate to millilitres per second using the information below.

1 litre = 0,264 gallons

(5)

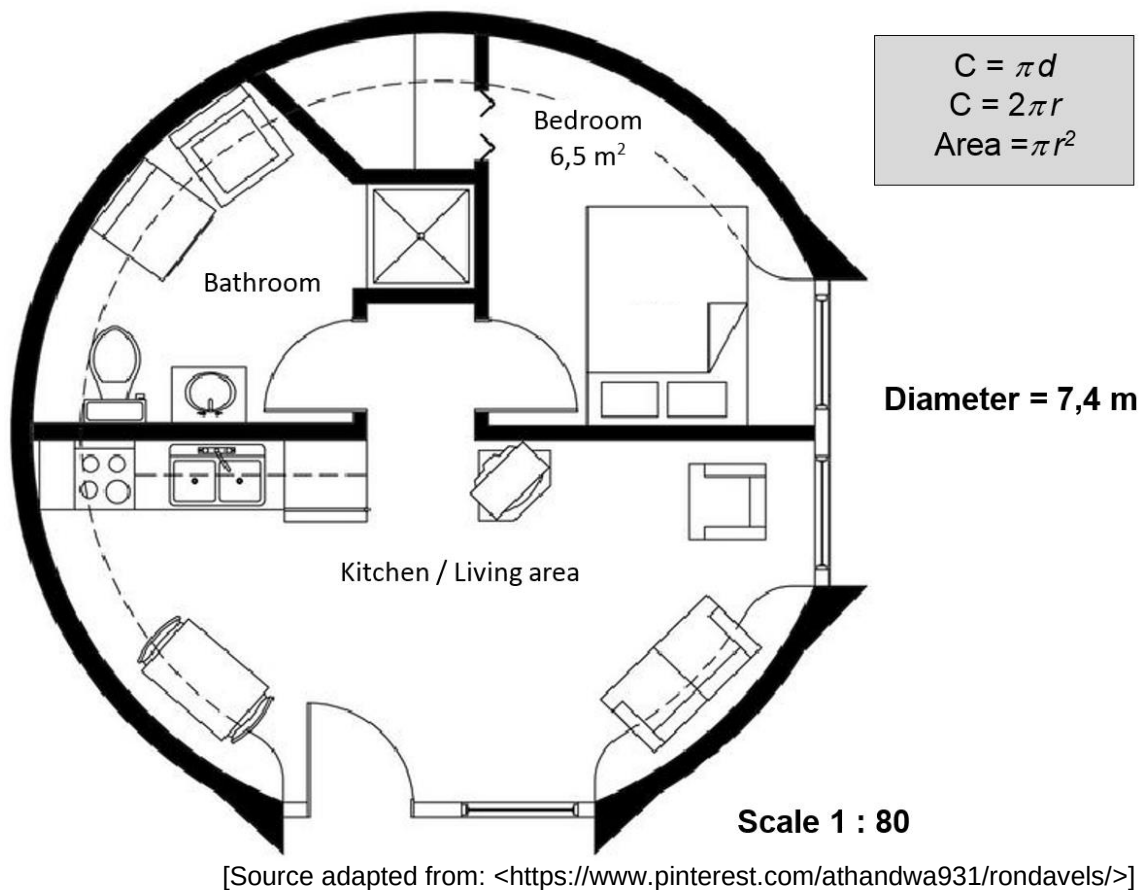
[31]

QUESTION 3

The owner of a game lodge is going to build five new *rondawels. The floor plan of each rondawel is shown below.

*Rondawel: A traditional circular African dwelling with a conical thatched roof.

Use the plan below to answer the questions that follow.



3.1 The rondawel is divided into three main sections with the Kitchen / Living area being the largest section in the rondawel.

3.1.1 Circle the correct fraction in the bracket below to describe the amount of space the Kitchen / Living area takes up in comparison to the whole rondawel.

The Kitchen / Living area takes up (a quarter / half / one third) of the floor plan area.

(2)

3.1.2 Show, by calculation, that the area of the Kitchen / Living room is 21,5 m².

(3)

3.2 Convert the area of the bedroom to square centimetres.

(2)

3.3 Calculate the actual **length** of the bed in the bedroom in 'cm'.

(3)

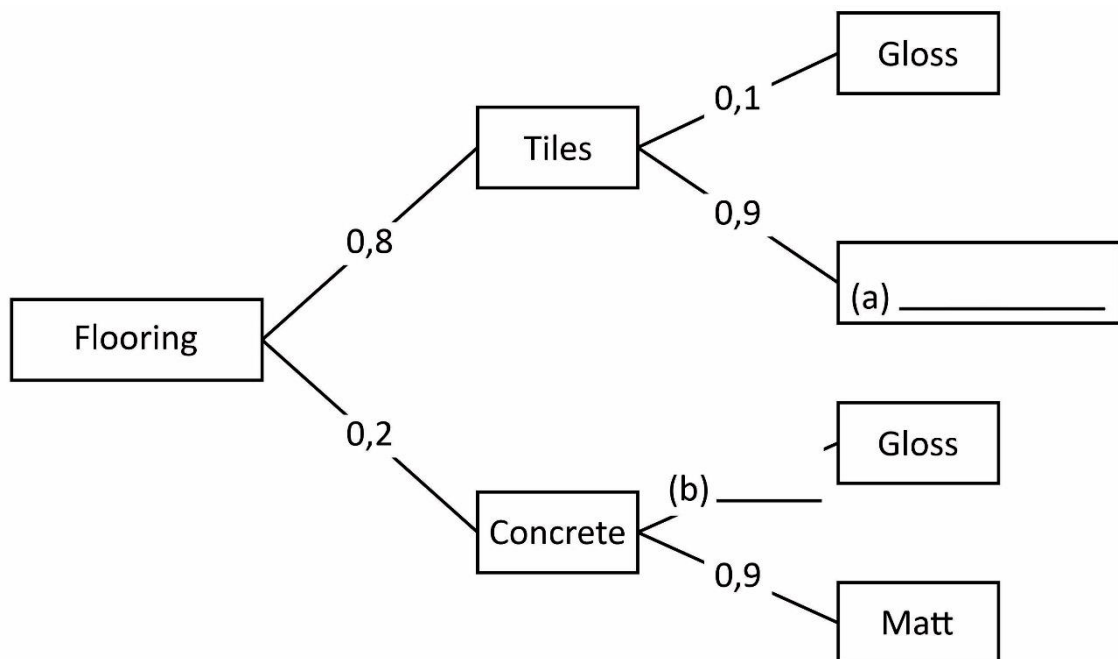
3.4 Each rondawel will be enclosed by fencing with an entrance gate. The fencing will be 5 m from the outer edge of the rondawel and the gate will be 2,5 m wide.

Show that the amount of fencing needed for one rondawel is 52,2 m.

(5)

- 3.5 The owner must decide on the flooring for the rondawels and summarises his options in the tree diagram shown below.

Study the tree diagram and complete the questions that follow.



- 3.5.1 Complete the tree diagram by filling in the missing labels **(a)** and **(b)**.

(2)

- 3.5.2 Calculate the probability, as a percentage, of choosing tiles with a gloss finish **or** concrete with a matt finish.

(5)

3.6 The owner decides to tile the rondawel floors and notes the following specifications:

- area to tile in each rondawel is 43 m^2
- tiles measure 300 mm by 300 mm
- tiles are packed in boxes with 12 tiles in each box
- the number of tiles needed must be increased by 3% to account for breakages and cutting due to the circular floor

3.6.1 Calculate the number of tiles needed to tile one rondawel.

[illegible]

3.6.2 The owner buys 2 465 tiles to tile all five rondawels. Calculate the number of boxes of tiles he needs to buy.

(3)

[31]

QUESTION 4

Ski jumping is one of the most spectacular Winter Olympic sports. Athletes compete to jump furthest after skiing down a steep slope before launching off a ramp.

These athletes can travel over 300 feet while being between 10 and 15 feet above the ground.

- 4.1 Convert 300 feet to metres using the fact that 1 foot = 0,3048 m.

(2)

- 4.2 Ski jumping as a sport can be traced back to the beginning of 1808 in Norway where military officer Olaf Rye recorded a jump of 9,5 m. The world record for the furthest ski jump of 253,5 m, set in 2017, is currently held by Austria's Stefan Kraft.

- 4.2.1 Calculate the number of years, up to and including the 2022 Beijing Winter Olympics in February, that ski jumping has been practised as a sport.

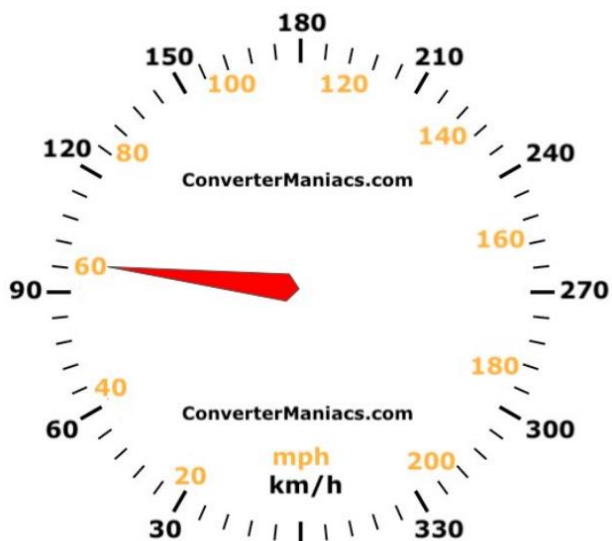
(2)

- 4.2.2 Calculate the percentage increase in the distance jumped from 1808 to 2017.

$\frac{\text{New Value} - \text{Old Value}}{\text{Old Value}} \times 100\%$

(2)

- 4.2.3 Ski jumpers travel down a large hill at 60 miles per hour (mph). Use the speed converter below to convert 60 mph to the nearest km/h.



[Source: <<https://convertermaniacs.com>>]

(2)

- 4.3 The Beijing Winter Olympics are the first ever to rely on 100% fake snow. A total of 330 000 m³ of water was converted into 700 000 m³ of snow in 70 hours.

[Source adapted from: <<https://www.nbcsports.com/chicago/beijing-2022-winter-olympics/>>]

- 4.3.1 Write the amount of water to the amount of snow produced as a ratio in simplest form.

(2)

- 4.3.2 Calculate how many days and hours it took to produce the 700 000 m³ of snow needed.

(4)

4.3.3 Calculate the rate at which the snow was produced in m^3 per hour.

(2)

4.3.4 The artificial snow is made of water. It was estimated the city of Zhangjiakou, in Beijing, used 730 000 m^3 of surface water for snow-making alone.

Convert the volume of surface water to kilolitres using the fact below.

$1 \text{ m}^3 = 1\,000 \text{ litre}$

(3)

4.3.5 Olympic swimming pools have specific dimensions. They are 50 meters long, 25 meters wide, and 2 meters deep.

'The 730 000 m^3 of surface water fills almost 300 Olympic size swimming pools'.

Is the statement above true? Justify your answer using calculations.

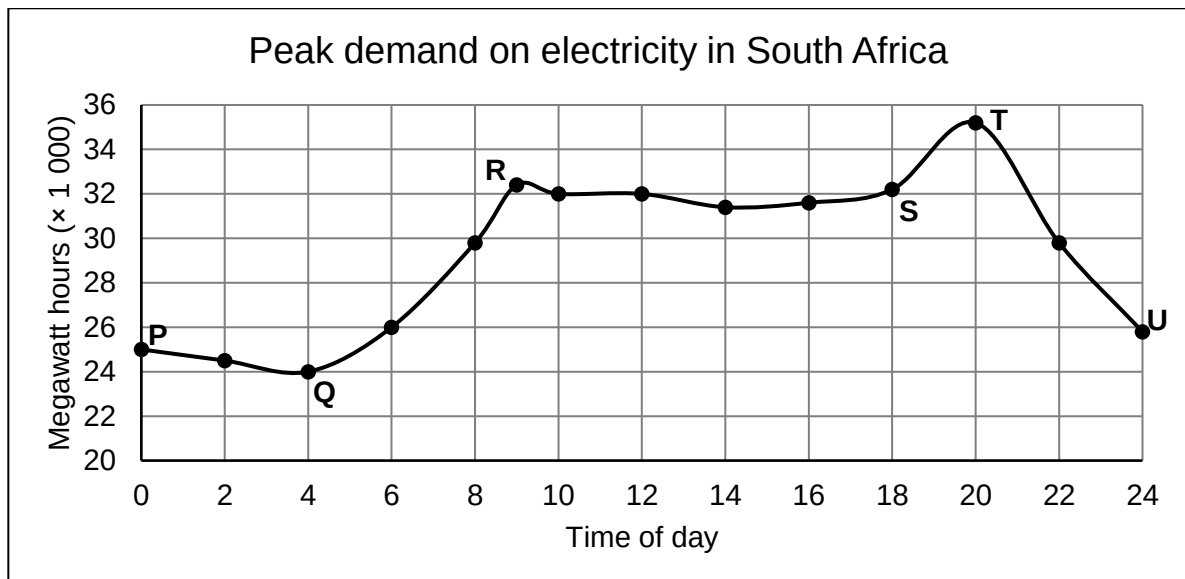
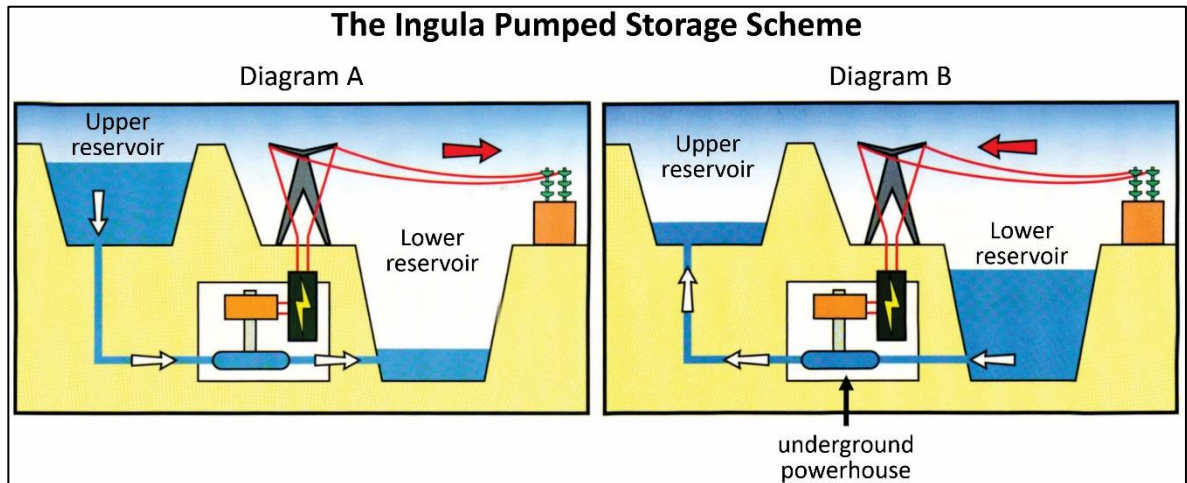
$\text{Volume} = \text{length} \times \text{breadth} \times \text{depth}$

(5)
[24]

QUESTION 5

- 5.1 The Ingula Pumped Storage Scheme consists of an upper and a lower dam (reservoir) situated 4,6 km apart. The dams are connected by underground waterways, through an underground powerhouse. During times of peak demand on electricity (highest energy usage), water will be released from the upper dam to the lower dam to generate electricity. During times of low energy demand, the pump turbines are used to pump the water from the lower dam back to the upper dam.

Use the diagrams and graph below and answer the questions that follow.



- 5.1.1 Use the points **P–U** on the graph to answer this question.
Between which two consecutive points does the demand for electricity increase the most? Write down the points and the time at each of the points.

(4)

- 5.1.2 Choose the word that best fits the statement, where a choice is given, and supply the missing information for the spaces provided in the paragraph below.

Fill in your answers next to the corresponding numbers (i–v) below the paragraph.

Between 02:00–04:00 electricity demand is at its **(i) (highest/lowest)** which means that the water flow between the dams will be shown by **(ii) (Diagram A/Diagram B)**. The time at which the demand for electricity ***starts*** stabilising is **(iii)**. This means that the water in the dams **(iv) (will/will not)** need to be pumped from dam to dam. The greatest demand for electricity during the day starts in the evening and reaches its peak (highest point) at **(v) (time in 12-hour format)**.

- (i) _____
- (ii) _____
- (iii) _____
- (iv) _____
- (v) _____
- (5)

- 5.1.3 Calculate the difference in electricity demand between 6 a.m. and 6 p.m.

(3)

5.1.4 Look at the way the information is presented on the graph on page 16.

- (a) In what way has this graph been manipulated to give misleading information?

(2)

- (b) Explain what the graph would look like if it were not manipulated.

(2)

5.2 Refer to **ANNEXURE D**.

The Cape Town Cycle Tour took place on 13 March 2022. The race started at 6 a.m. on the Sunday and all cyclists had to cross the finishing line by 17:00.

Study the route map given on **Annexure D** and answer the following questions.

5.2.1 What distance did this race cover?

(2)

5.2.2 How much time did a cyclist have to complete the race?

(2)

5.2.3 The average speed of one of the cyclists in the race was 9,7 km/h. Was the cyclist able to **complete** the race in time, travelling at that speed? Justify your answer showing all calculations.

(4)

- 5.2.4 Where was a cyclist able to get treatment from a physiotherapist for the first time in the race?

(2)

- 5.2.5 For the cyclist's safety, this race included cut-off points. This means that a cyclist needed to arrive at a certain point on the course before an allotted time (given time) to stay in the race.

- (a) State the first cut-off point **and** write down the cut-off time.

(2)

- (b) Calculate the distance a cyclist had to travel to get to the first cut-off point.

(2)

- 5.2.6 Marc Prizen won the men's 2022 Cape Town Cycle Tour in a time of 2:37:55. He started the race at quarter past six in the morning. Show, using calculations, that he finished his race at 08:52:55.

(2)
[32]

Total: 150 marks

ADDITIONAL SPACE (ALL QUESTIONS)

REMEMBER TO INDICATE AT THE QUESTION THAT YOU USED THE ADDITIONAL SPACE TO ENSURE THAT ALL ANSWERS ARE MARKED.

[illegible]