ABBOTSLEIGH

Student's Name: _____

Student Number: | | | | | | | | | |

Teacher's Name: _____

2025 HSC ASSESSMENT TASK 4

Mathematics Standard 2

General Instructions

Reading time – 10 minutes
Working time – 2.5 hours
Write using a black pen
NESA approved calculators may be used
A reference sheet is provided
Diagrams are not to scale unless indicated
For questions in Section I, answer on the sheet provided
For questions in Section II, III, IV, show all necessary working.
All necessary working should be shown for each question in the spaces provided.
Extra writing spaces are provided at the end of each question.
Show relevant mathematical reasoning and/or calculations.

Total marks: 100

Section I – 15 marks (pages 3 – 9)

Attempt Questions 1 – 15

Allow about 15 minutes for this section

Sections II, III and IV – 85 marks (pages 11 – 42)

Attempt Questions 16 – 40

Allow about 2 hour 15 minutes for this section

Year 11 Mathematics Standard outcomes

MS11-1 uses algebraic and graphical techniques to compare alternative solutions to contextual problems

MS11-2 represents information in symbolic, graphical and tabular form

MS11-3 solves problems involving quantity measurement, including accuracy and the choice of relevant units

MS11-4 performs calculations in relation to two-dimensional and three-dimensional figures

MS11-5 models relevant financial situations using appropriate tools

MS11-6 makes predictions about everyday situations based on simple mathematical models

MS11-7 develops and carries out simple statistical processes to answer questions posed

MS11-8 solves probability problems involving multistage events

MS11-9 uses appropriate technology to investigate, organise and interpret information in a range of contexts

Year 12 Mathematics Standard 2 outcomes

MS2-12-1 uses detailed algebraic and graphical techniques to critically evaluate and construct arguments in a range of familiar and unfamiliar contexts

MS2-12-2 analyses representations of data in order to make inferences, predictions and draw conclusions

MS2-12-3 interprets the results of measurements and calculations and makes judgements about their reasonableness, including the degree of accuracy and the conversion of units where appropriate

MS2-12-4 analyses two-dimensional and three-dimensional models to solve practical problems

MS2-12-5 makes informed decisions about financial situations, including annuities and loan repayments

MS2-12-6 solves problems by representing the relationships between changing quantities in algebraic and graphical forms

MS2-12-7 solves problems requiring statistical processes, including the use of the normal distribution and the correlation of bivariate data

MS2-12-8 solves problems using networks to model decision-making in practical problems

MS2-12-9 chooses and uses appropriate technology effectively in a range of contexts, and applies critical thinking to recognise appropriate times and methods for such use

SECTION I

15 marks

Attempt Questions 1 – 15

Use the multiple-choice answer sheet

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

(A) ○ (B) ● (C) ○ (D) ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

(A) ● (B) ⊗ (C) ○ (D) ○

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows.

correct ←

(A) ⊗ (B) ⊗ (C) ○ (D) ○

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1. While conducting our measurement unit this year, we went and measured the length of the synthetic field as 90.0 metres, correct to one decimal place.

What is the percentage error in our measurement?

A. 0.06%

B. 0.11%

C. 0.60%

D. 1.10%

2. Lili bought a new car three years ago for $45 500 and since then it had depreciated at a rate of 34.5% pa using the declining balance method.

What is the current value of the car correct to the nearest dollar?

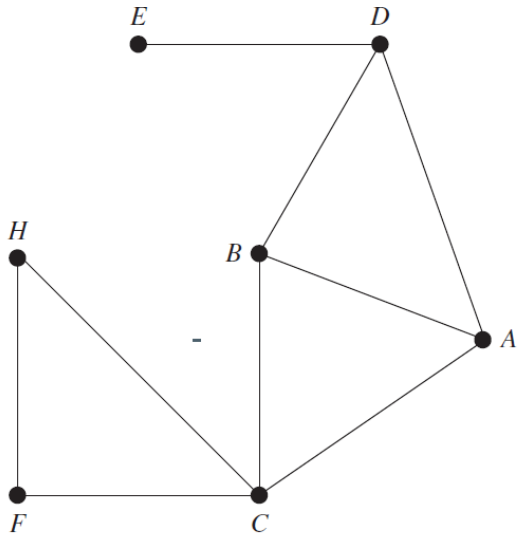
A. $12 786

B. $14 105

C. $19 521

D. $29 803

3. Consider this network.



Which of the following describes *ACHFCB*?

A. trail

B. circuit

C. path

D. cycle

4. Daisy is a real estate agent; she is paid an annual salary of $26 000 plus a commission of 2% on all sales. She is also paid a car allowance of $50 per week.

Assuming exactly 52 weeks in a year.

What is Daisy's total yearly income if she sold $12 000 000 worth of property in one year?

A. $242 600

B. $266 000

C. $268 600

D. $554 600

5. Which of the following affects the shape of a normal distribution bell curve?

A. Interquartile range

B. Median

C. Standard deviation

D. Range

6. Which of the following is NOT a fee or charge associated with using a credit card?

A. Interest

B. Cash advance fee

C. Late payment fee

D. Repayment fee

7. A map of a particular city has a scale ratio of 1: 50 000. If the distance between Clare's home and the airport is 4 cm on the map, what is the actual distance?

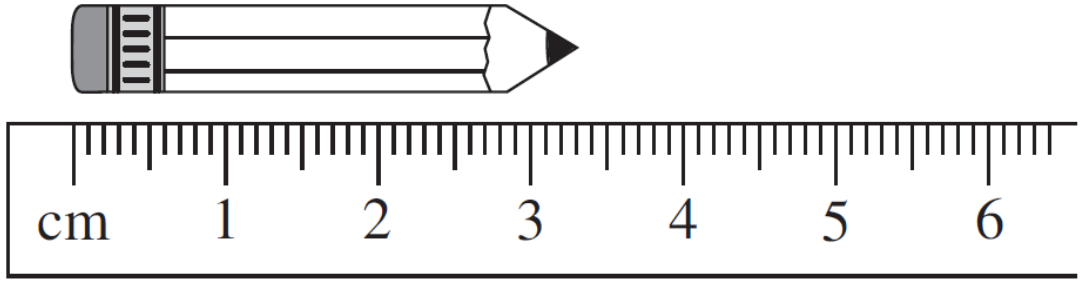
A. 200 m

B. 2 km

C. 20 km

D. 2 000 km

8. A pencil is measured using this ruler.



Between which values does the true length of the pencil lie?

A. 3.3 ± 0.05 cm

B. 3.3 ± 0.1 cm

C. 3.3 ± 0.5 cm

D. 3.3 ± 0.25 cm

9. Which of the following beverages is the cheapest per mL?

A. Coffee at $3.50 for 500 mL

B. Juice at $4.00 for 1 L

C. Milk at $2.00 for 250 mL

D. Lemonade at $1.80 for 300 mL

10. Which true bearing is the same as southeast?

A. 045°

B. 135°

C. 225°

D. 315°

11. More than 10 000 athletes from more than 200 countries competed in the Paris Summer Olympic Games. An analysis of the number of athletes per country produced the following five number summary.

Minimum	First quartile	Median	Third Quartile	Maximum
2	5	11	48	613

The smallest number of athletes per country that would display as an outlier on a boxplot of this data is

A. 49

B. 112

C. 113

D. 613

12. If the GST increases from 10% to 12%, the price of a textbook rises by $1.32.
What is the original price of the textbook, including GST?

A. $66.00

B. $72.60

C. $73.92

D. $75.24

13. The Pareto Chart below looks at the issues an online store had with having its products delivered, based on customer complaints.



If the store wants to address 80% of the complaints in the first month, what is the least number of issues they would need to address.

A. 2

B. 3

C. 4

D. 5

14. Luke works on outside jobsites and is paid $64.50 per hour.

In harsh weather conditions, he is paid a 16% adversity allowance on top of his normal hourly rate.

What would he be paid for a 40-hour week in which 18 hours were in harsh weather conditions?

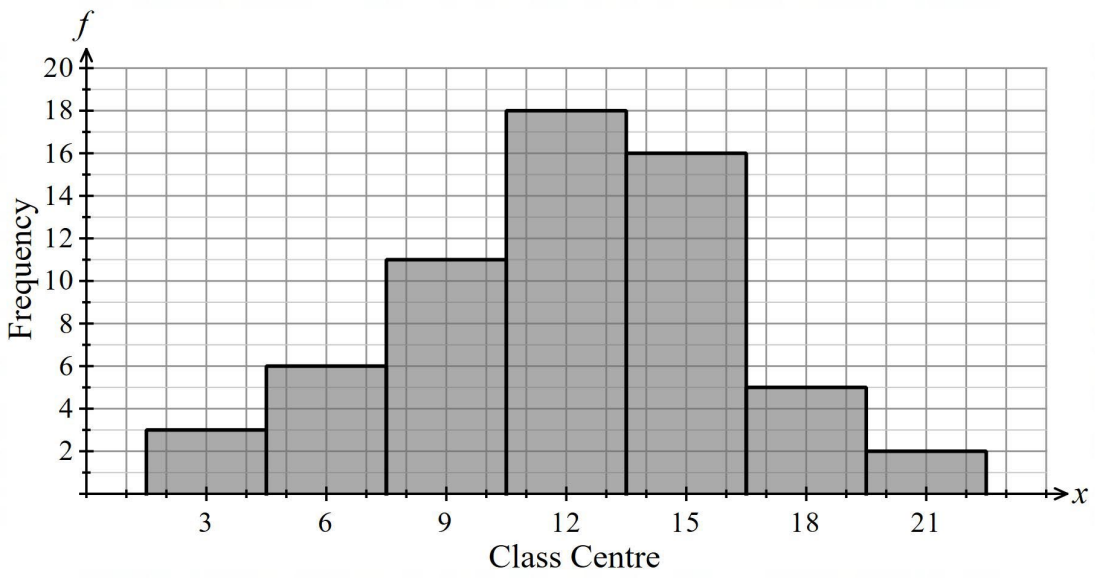
A. $2 580.00

B. $2 765.76

C. $2 786.40

D. $2 992.80

15. A grouped frequency histogram is shown below.



What is the mean of the scores summarised in the histogram.

A. 11.05

B. 11.25

C. 11.85

D. 12.00

End of Section I

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Student Number: | | | | | | | | | |

2025 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

Mathematics Standard 2

Section II Answer Booklet 1

Section II

85 marks

Attempt Questions 16 – 40

Allow about 2 hours and 15 minutes for this section

Booklet 1: Attempt Questions 16 – 24 (25 marks)

Booklet 2: Attempt Questions 25 – 32 (30 marks)

Booklet 3: Attempt Questions 33 – 40 (30 marks)

Answer the questions in the spaces provided.

These spaces provide guidance for the expected length of response.

Your responses should include relevant mathematical reasoning and/or calculations.

Extra writing space is provided on pages 19, 20, 30, 41 and 42. If you use this space, clearly indicate which question you are answering.

Please Turn Over

Question 16 (2 marks)

Solve the following equation: **2**

$$\frac{1}{2}k + 3 = \frac{1}{3}k + 5$$

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Question 17 (2 marks)

A person is standing at the top of a cliff 200 m above sea level.

They are watching a boat that is floating on the sea below them.

The angle of depression of the boat from the person at the top of the cliff is 20°.

What is the distance between the boat and the base of the cliff, correct to the nearest metre? **2**

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Question 18 (4 mark)

James was paid a gross salary of $5 350.00 per fortnight throughout the 2024-2025 tax year.

Taxable Income	Tax on this income
$0 to $18 200	Nil
$18 201 - $45 000	16c for each $1 over $18 200
$45 001 - $135 000	$4 288 plus 30c for each $1 over $45 000
$135 001 - $190 000	$31 288 plus 37c for each $1 over $135 000
$190 001 and over	$51 638 plus 45c for each $1 over $190 000

The Medicare levy to be paid is 2% of the taxable income.

(a) He has allowable tax deductions of $3 198.00 for the year. What is his taxable income for the 2024-2025 tax year? **1**

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(b) Use the tax table above to calculate the amount of income tax he should pay for the year. **Do not include the Medicare Levy.** **1**

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(c) James paid $36 265.00 in PAYG tax instalments during the year. Calculate the Medicare levy due on his income and hence determine the size of the refund or bill James will have after submitting his tax return. **2**

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Question 19 (3 marks)

Harry and Lauren are twins who live in Morisset, NSW (UTC+10) and have their birthday on 16th June. On their birthday this year, Lauren was on vacation in Tahiti (UTC–10).

(a) Harry rang Lauren from home at 12 noon, according to his phone, on their birthday.

At what local date and time in Tahiti did Lauren take the call? **2**

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(b) At what time should Harry have rung if he wanted Lauren to receive the call at 11:00 am on her birthday, Tahiti time? **1**

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Question 20 (2 marks)

A wildlife researcher wants to estimate the population of kangaroos in a national park. The researcher captures and tags 40 kangaroos before releasing them back into the park. A week later, the researcher captures a second sample of 80 kangaroos, of which 10 are found to be tagged.

Use the capture-recapture method to estimate the total population of kangaroos in the park. **2**

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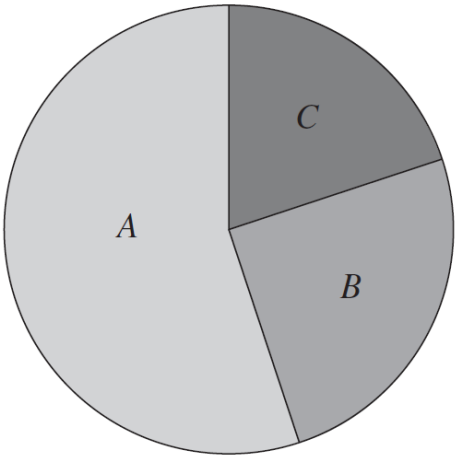
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Question 21 (4 marks)

A spinner is divided into three sections: A, B and C.



NOT TO SCALE

Section	Angle size of section
A	$7x + 10$
B	90
C	$3x$

(a) Find the value of x. **2**

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(b) If the spinner is spun 360 times, how many times would it be expected to land on section A? **2**

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Question 22 (2 marks)

Find the equation of a straight line that has a gradient of –2 and an x-intercept of 1. **2**

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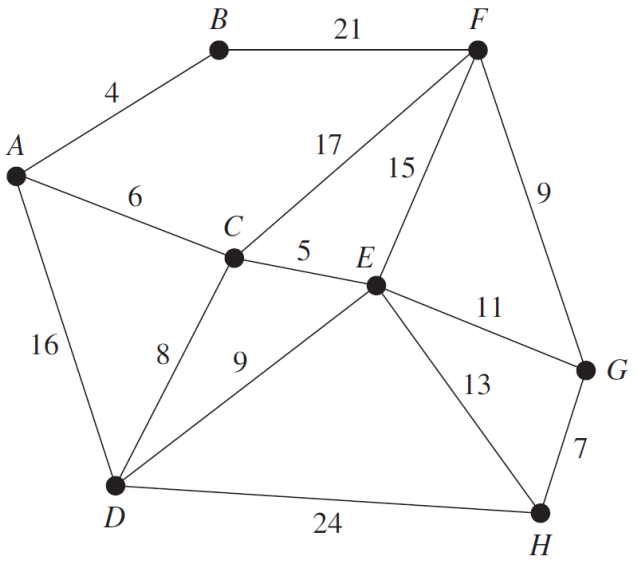
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Question 23 (2 marks)

The network diagram shows the tracks connecting eight train stations A, B, C, D, E, F, G and H. The distance between each station, in kilometres, is shown.



Determine the minimum length of track required to connect all eight stations. **2**

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Question 24 (4 marks)

Tony takes a reducing balance loan of $240 000, with an interest rate of 4.8% p. a compounding monthly. Tony makes regular monthly repayments.

The following table shows the balance of the first three months.

Payment Number	Interest Paid ($)	Payment Paid ($)	Principal Reduction ($)	Balance ($)
0	0.00	0.00	0.00	240 000.00
1	960	2741.05	1781.05	238 218.95
2	952.88	2741.05	1788.17	236 420.78
3	**A**	2741.05		**B**

(a) Determine the values of **A** and **B**. **2**

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(b) If Tony repays the loan in 13 years, calculate the amount of interest Tony pays in total over the life of the loan. **2**

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End of Booklet 1

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Section II Extra writing space

If you use this space, clearly indicate which question you are answering.

Section II Extra writing space

If you use this space, clearly indicate which question you are answering.

Student Number: | | | | | | | | | |

2025 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

Mathematics Standard 2

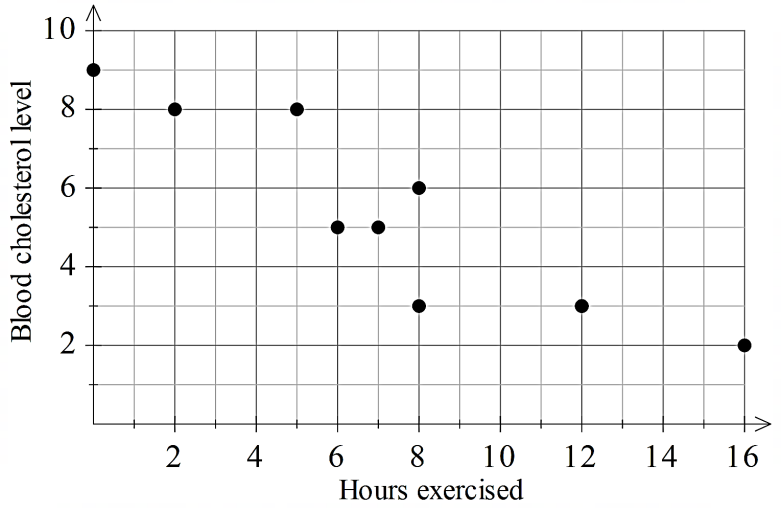
Section II Answer Booklet 2

Booklet 2: Attempt Questions 25 – 32 (30 marks)

Please Turn Over

Question 25 (5 marks)

A set of bivariate data is collected by measuring the blood cholestrol level and hours exercised of nine adults. The graph shows a scatterplot of the results.



(a) Calculate Pearsons coefficient for this data, correct to two decimal places. **1**

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(b) Identify the direction and the strength of the linear association between blood cholestrol level and hours exercised. **1**

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(c) The equation of the least-squares regression line would be. Answer 4 decimal places **1**

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(d) An adult's blood cholesterol level is at 4. Calculate the number of hours exercised for this adult using the equation of the least squares regression line.

Correct to the nearest 2 decimal places. **2**

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Question 26 (4 marks)

Sets of data on the attention span of participants (in seconds) are collected for two groups of people.

The stem and leaf plot below shows the data for Group X.

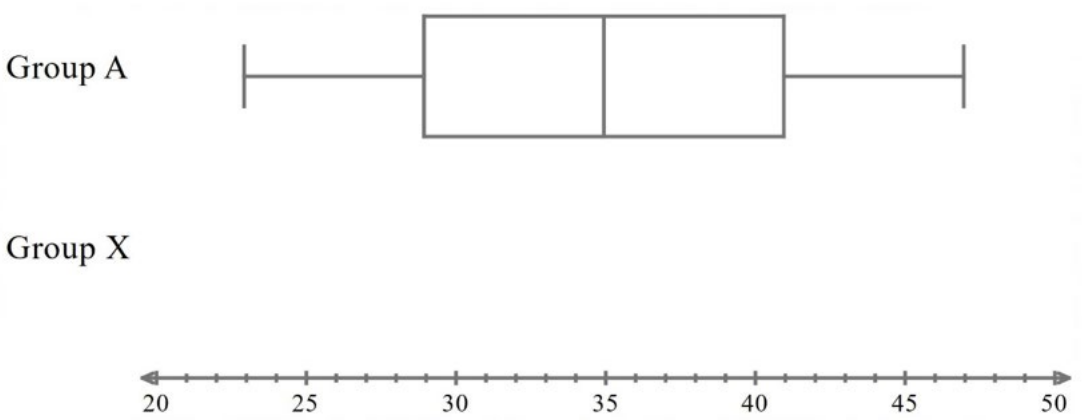
2	3	4	9					
3	1	2	5	7				
4	1	2	3	3	4	5	6	7

Key

2	3

23 secs

The box plot below shows the data for Group A.



(a) In the space provided above, and using the same scale, draw a box plot for Group X. **2**

(b) Compare the skew and spread of the two sets of data, quoting appropriate results from the parallel box plots. **2**

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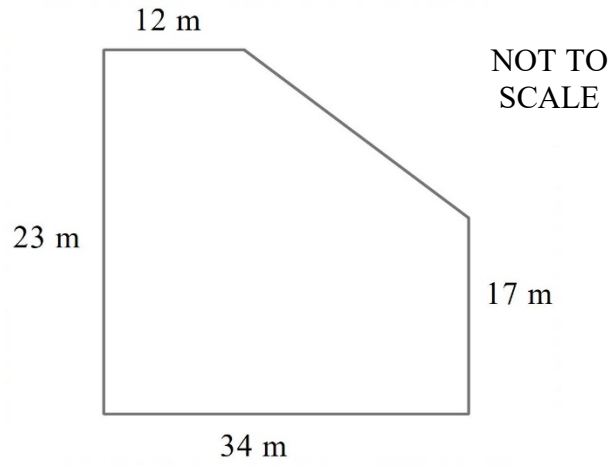
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Question 27 (4 marks)

The diagram below shows a five-sided field.



(a) Calculate the perimeter of the field to the nearest metre. **2**

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(b) Calculate the area of the field to the nearest square metre. **2**

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Question 28 (4 marks)

The table shows the weights of three objects.

Object	Weight
A	0.007 kg
B	4500 g
C	1.25×10^4 mg

(a) Which objects weight is expressed to the greatest number of significant figures? **1**

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(b) Write the weight of object C in standard notation. **1**

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(c) Find which object has the median weight. **2**

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Question 29 (4 marks)

Avery earns an annual salary of $122 500.

(a) Avery receives 17.5% of 4 weeks normal pay as holiday loading. What is Avery's pay for the holidays if she receives both the annual leave loading and her 4 weeks wages? **2**

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(b) After receiving her annual leave loading, Avery decides to invest it.

She opens a bank account that earns simple interest at 15.25% per annum and makes no further withdrawals or deposits.

After how many years will Avery's account balance be $5500? **2**

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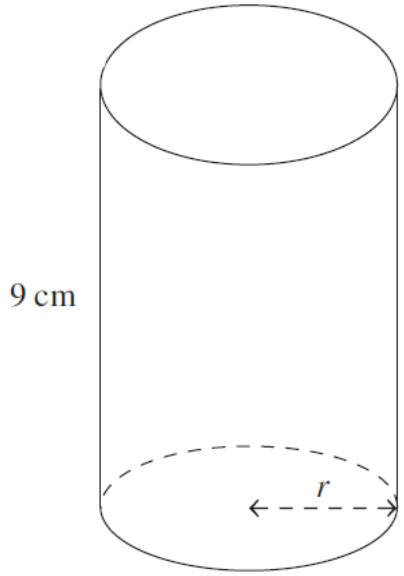
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Question 30 (4 marks)

A cylinder has a volume of 25π cm^3 and a height of 9 cm.



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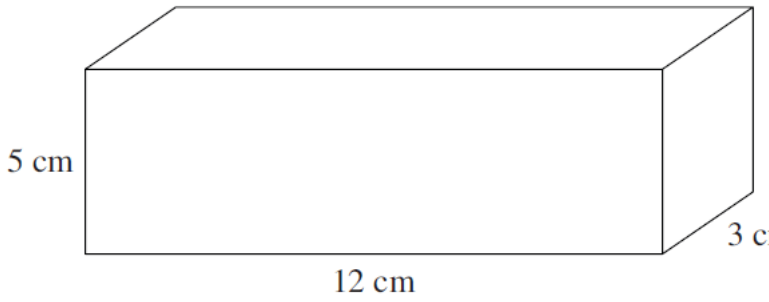
(a) Find the radius of the cylinder. **2**

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(b) The cylinder is filled with water which is then poured into a rectangular tray that has a height of 5 cm, a length of 12 cm and a width of 3 cm.



NOT TO SCALE

What is the depth of the water in the tray? Give your answer correct to one decimal place. **2**

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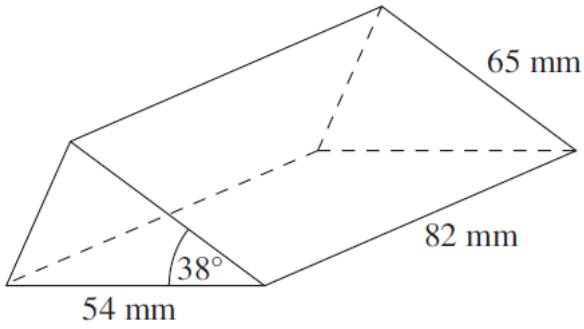
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Question 31 (3 marks)

The diagram shows a triangular prism.



NOT TO SCALE

Find the volume of the prism, correct to the nearest cubic centimetre. **3**

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Question 32 (2 marks)

Summer owns a share portfolio.

Details of her share portfolio on 30 June 2025 are given in the table below:

Company name	Number of shares in Summer's portfolio	Dividend yield	Market price per share
WDS	2500	6 %	$22.50
BHP	3000	?	$45.00

Summer received a total annual dividend of $5217.50 from her share portfolio.

Calculate the dividend yield for company **BHP.** **2**

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End of Booklet 2

Section II Extra writing space

If you use this space, clearly indicate which question you are answering.

Student Number: | | | | | | | | | |

2025 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

Mathematics Standard 2

Section II Answer Booklet 3

Booklet 3: Attempt Questions 33 – 45 (30 marks)

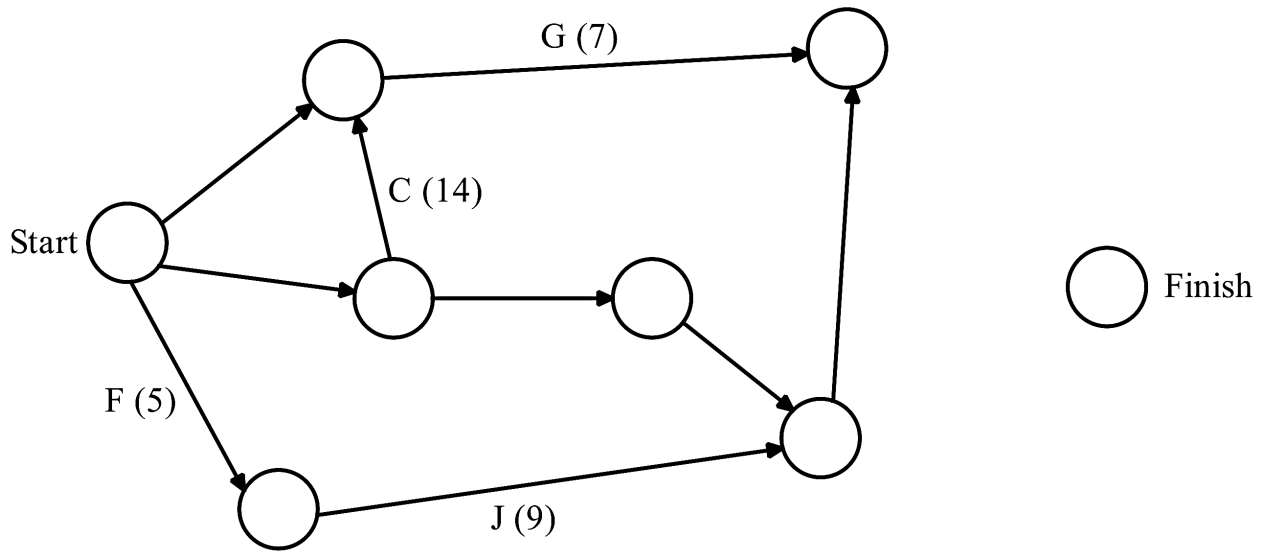
Please Turn Over

Question 33 (6 marks)

The following table, consisting of 11 activities, contains information for a project in a small manufacturing company.

Activity	Immediate predecessors	Time (hours)
A	-	4
B	-	5
C	A	14
D	A	7
E	-	7
F	-	5
G	B, C	7
H	D	6
J	E, F	9
K	H, J	10
L	G, K	6

(a) Complete the project with all required activities on this diagram. **1**



Question 33 continues on page 33

Question 33 (continued)

(b) Using the diagram above, complete forward scanning and backwards scanning to determine the critical path and the minimum completion time for this project. **2**

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(c) Determine the float time for Activity G. **1**

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(d) Due to some unforeseen problems with Activity G and J, one of these activities will require an extra three hours to complete. Which of the activities should be chosen to complete the project in the minimum time?

Justify your answer with relevant mathematical calculations. **2**

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Question 34 (5 marks)

The time spent waiting for a taxi at a large international airport is normally distributed. The waiting time is less than 184 seconds (16% of the time) and greater than 304 seconds (0.15% of the time).

(a) During the first three months of 2024 it was found that 4.16 million people visited the airport. If 30% of these people took a taxi from the airport, find the approximate number of people whose waiting time was greater than 184 seconds **2**

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(b) Determine the mean and standard deviation for the time spent waiting for a taxi at the airport. **3**

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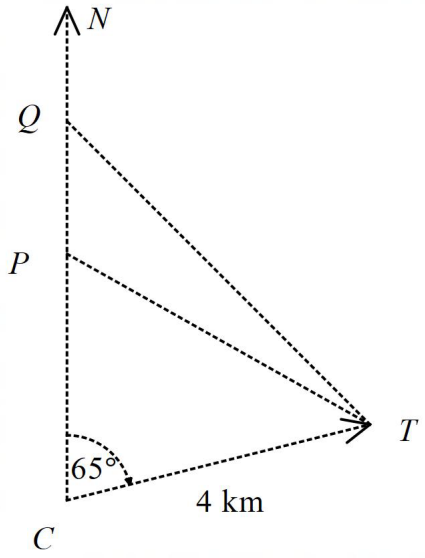
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Question 35 (5 marks)

Two mountains, P and Q lie directly north of a campground C.
Jayda walks from C on a bearing of 065°, to a point T, a distance of 4 km.

The diagram below shows the relative positions, when viewed from above.



NOT TO SCALE

(a) From point T, the base of mountain P is on a bearing of 285° whilst the base of mountain Q is on a bearing of 315°. Show that $\angle QTC = 70°$. **1**

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(b) Find the distance from her campsite (C) to the furthest mountain, correct to 1 decimal place. **2**

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(c) Hence or otherwise find the distance between the two mountains. **2**

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Question 36 (4 marks)

An athlete can find their maximum heart rate using the formula:

Maximum heart rate in beats per minute (bpm) = 220 – age in years.

The table below indicates how different heart rates fit into a training regime for athletes.

Target Zone	Percentage of Maximum Heart Rate	Description and Purpose
5	90% – 100%	Elite – Competition and top-level training
4	80% – 90%	Training – Develop endurance and performance
3	70% – 80%	Fitness – Develop aerobic fitness
2	60% – 70%	Weight Loss – Begin to burn fat
1	50% – 60%	Recovery – Warm up and cool down

While exercising, Michael and Kerrie check their heart rates.

Kerrie, who is 50 years old, counts 92 heart beats in 40 seconds and completes a quick calculation to find her heart rate in bpm.

Michael, who is 18 years old, has a smartwatch which shows that his current heart rate is 150 bpm and tracks it as it changes.

(a) Find by showing calculations which exercise zone both are exercising in. **2**

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(b) Find the minimum change in his heart rate that Michael must achieve if he wants to exercise in the same Target Zone as Kerrie. **2**

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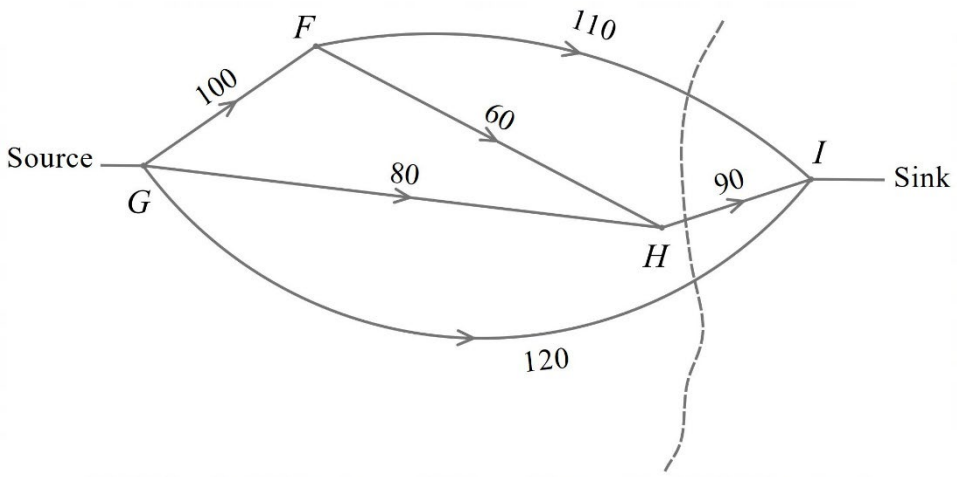
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Question 37 (3 marks)

The diagram below shows a network of pipes carrying water from a source, through several pumping stations (*F*, *G*, *H* and *I*) to a sink. The capacity of each pipe is shown in kL/h.

A cut has been drawn on the diagram.



(a) What is the capacity of the cut shown? **1**

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(b) What is the maximum flow of the network? **1**

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(c) The manager wants the capacity of the cut shown in part (a) to be the maximum flow of the network. Suggest one pipe that could be increased to allow this to happen and by how much? **1**

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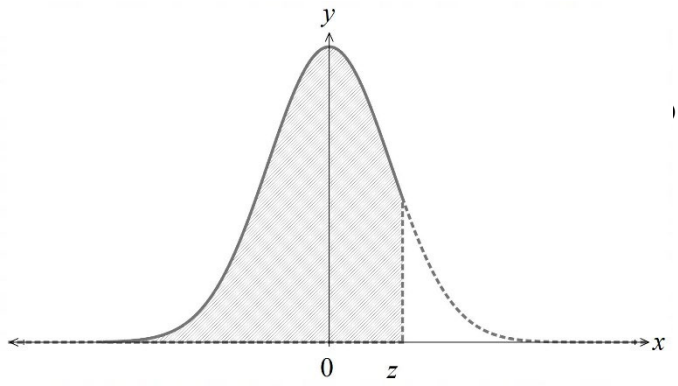
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Question 38 (3 marks)

A random variable is normally distributed with mean 0 and standard deviation 1. The table to the right gives the probability that this random variable is less than z.

z-score	Probability
0	0.5
0.2	0.57926
0.4	0.65542
0.6	0.72575
0.8	0.78814
1	0.84134
1.2	0.88493
1.4	0.91924
1.6	0.94520
1.8	0.96407
2	0.97725
2.2	0.98610
2.4	0.99180

The probability values given in the table for different values of z are represented by the shaded area in the following diagram.



A study with 500 participants found that the circumference of their head was normally distributed with mean 56.0 cm and standard deviation 1.5 cm.

By calculating z-scores, find the number of participants whose head circumference was between 57.2 cm and 58.4 cm. **3**

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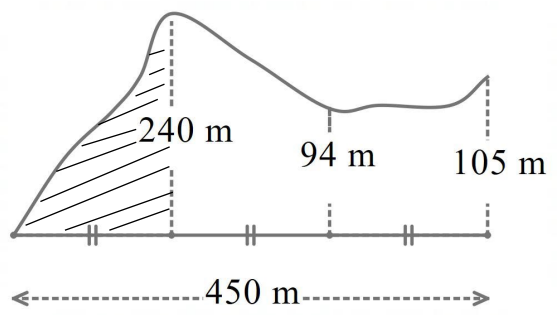
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Question 39 (2 marks)

Izzy owns a rural block that has one irregular boundary that follows a road, as shown in the diagram below. Offset measurements have been taken at right angles to a straight boundary at regular intervals.



NOT TO SCALE

Izzy wants to only fence the left section (shaded) to create a paddock.

Use one application of the trapezoidal rule to find the shaded area of the paddock. **2**

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Question 40 (2 marks)

The table shows the future value of an annuity of $1.

Future values of an annuity of $1

Period (years)	*Interest rate per period*							
	0.5%	*1.0%*	*1.5%*	*2.0%*	*2.5%*	*3.0%*	*3.5%*	*4.0%*
4	4.03010	4.06040	4.09090	4.12161	4.15252	4.18363	4.21494	4.24646
8	8.14141	8.28567	8.43284	8.58297	8.73612	8.89234	9.05169	9.21423
12	12.33556	12.68250	13.04121	13.41209	13.79555	14.19203	14.60196	15.02581
16	16.61423	17.25786	17.93237	18.63929	19.38022	20.15688	20.97103	21.82453
20	20.97912	22.01900	23.12367	24.29737	25.54466	26.87037	28.27968	29.77808
24	25.43196	26.97346	28.63352	30.42186	32.34904	34.42647	36.66653	39.08260
28	29.97452	32.12910	34.48148	37.05121	39.85980	42.93092	46.29063	49.96758
32	34.60862	37.49407	40.68829	44.22703	48.15028	52.50276	57.33450	62.70147
36	39.33610	43.07688	47.27597	51.99437	57.30141	63.27594	70.00760	77.59831
40	44.15885	48.88637	54.26789	60.40198	67.40255	75.40126	84.55028	95.02552

At the beginning of each year, Chloe deposits $6000 into a bank account that earns interest at a rate of 4% per annum, compounding quarterly. She makes these contributions over a period of 5 years.

How much interest will the account have earned after those 5 years? **2**

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End of Booklet 3

END OF PAPER

Section II Extra writing space

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Section II Extra writing space

If you use this space, clearly indicate which question you are answering.