Student Number

Hunters Hill High School

2023 Trial Examination

Mathematics Standard 2

General Instructions

Reading time – 10 minutes
Working time – 2 hours and 30 minutes
Write using black pen
NESA approved calculators may be used
A reference sheet is provided at the back of this paper
For questions in Section II, show relevant mathematical reasoning and/or calculations

Total Marks: 100

Section I – 15 marks (pages 3 – 9)
Attempt all Questions 1 – 15
Allow about 25 minutes for this section

Section II – 85 marks (pages 11 – 33)
Attempt All Questions 16 – 38
Allow about 2 hours and 5 minutes for this section

Section I

15 marks
Attempt Questions 1 – 15
Allow about 25 minutes for this section

Use the multiple-choice answer sheet for Question 1 – 15.

1. The stem-and-leaf plot shows the results of a survey of the ages of players at the local tennis center on a Saturday morning. Which statement is **not** correct?

Stem	Leaf
0	7 9
1	2 4 5 8 8 9
2	0 2 4 5 6 6 6 8
3	0 2 6 8
4	1 3 5

A. The median of the ages is 24.

B. The mode of the ages is 26.

C. The range of the ages is 38.

D. The maximum age is 45.

2. The time taken to complete a project varies inversely with the number of employees. The project can be completed by 12 employees in 4 days. How long will it take 6 employees to complete?

A. 2

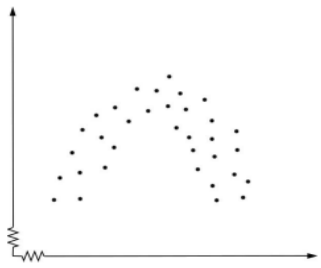
B. 6

C. 8

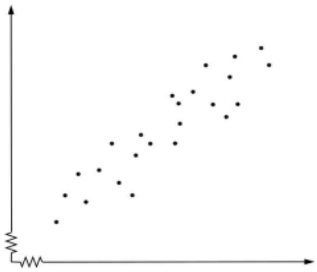
D. 12

3. Which diagram best represents a relationship with a correlation coefficient of $r = -0.84$?

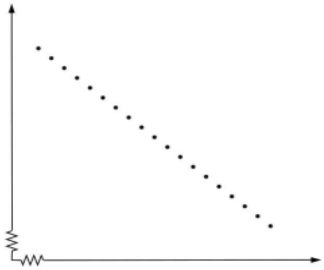
A.



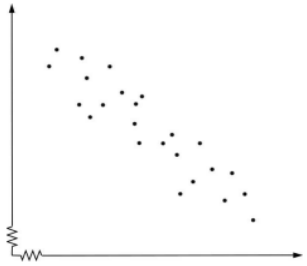
B.



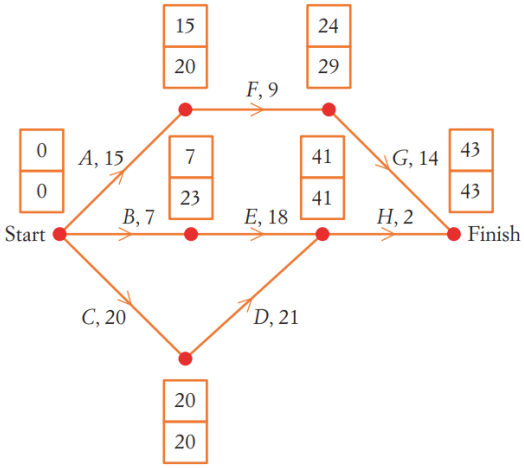
C.



D.



4. The network for a project is shown. Times shown are in days. The EST and LST have been calculated for each activity.



Determine the float time for activity B.

A. 0

B. 7

C. 16

D. 23

5. 7 students measure their hand span. They find that the data has a mean of 14 cm and a median of 12 cm. On checking their results, they find that a mistake was made. One of the measurements was recorded as 20 cm, but the correct value should have been 14 cm.

What effect will making this correction have on the mean and median?

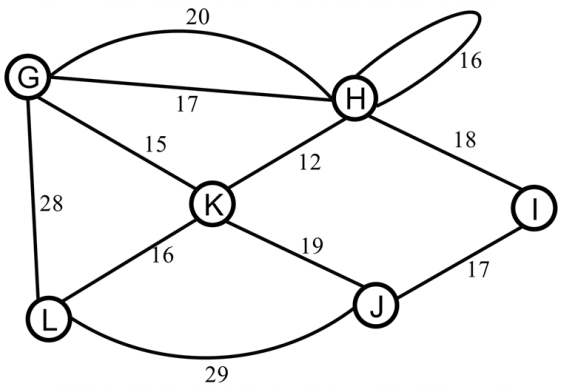
A. The mean and median will both remain unchanged.

B. The mean will remain unchanged and the median may decrease.

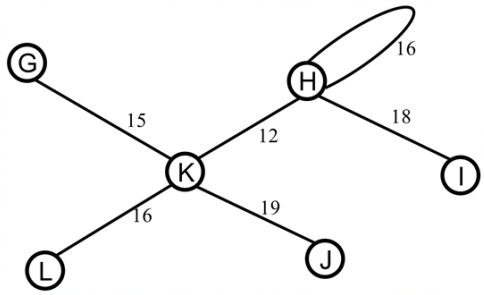
C. The mean will decrease and the median may decrease.

D. The mean will decrease and the median will remain unchanged.

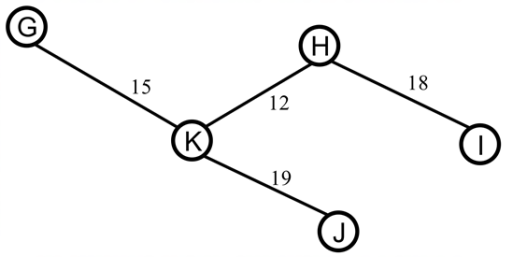
6. Which diagram shows a spanning tree for the network below?



A.



B.



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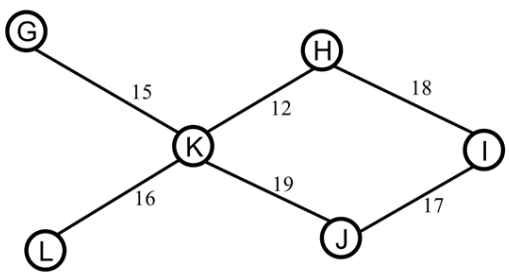
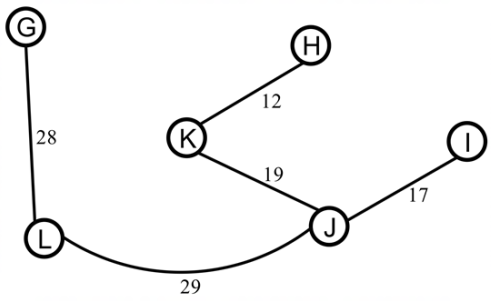


D.



7. Neli purchased 950 shares. The cost was \$5.80 per share. Neli sold the shares one year later for \$8.20 each and paid a fee of \$28.95 for selling the shares.

What profit did Neli make on these shares?

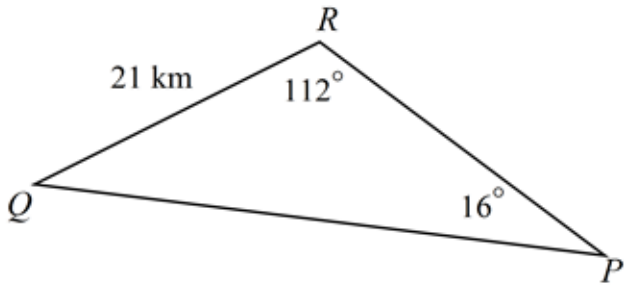
A. \$31.35

B. \$ 2251.50

C. \$2280

D. \$ 2308.95

8. Which calculation would correctly find the distance PQ in the following triangle?



A. $PQ = \dfrac{21 \sin 112°}{\sin 16°}$

B. $PQ = \dfrac{21 \sin 16°}{\sin 112°}$

C. $PQ^2 = \dfrac{16^2 + 21^2}{2 \times 16 \times 21 \cos 112°}$

D. $PQ^2 = 16^2 + 21^2 - 2 \times 16 \times 21 \cos 112°$

9. Hanna invests \$12 000 in an account paying 4.8% pa interest, compounded quarterly. What is the value of the investment after 1½ years?

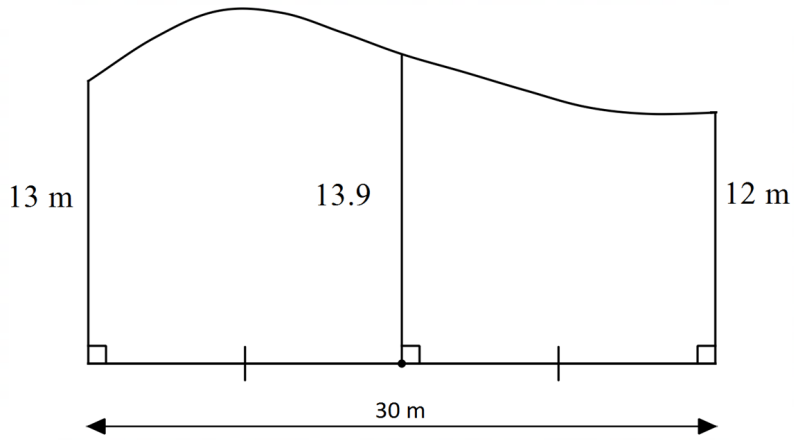
A. \$ 12 216.65

B. \$ 12874.29

C. \$ 12 890.34

D. \$ 15 898.24

10. A park, which runs along a creek, has an irregular boundary line.



Use two applications of the Trapezoidal Rule to estimate the area of the park, to the nearest square metre.

A. 292 m^2

B. 396 m^2

C. 584 m^2

D. 1167 m^2

11. An audience of a concert is asked their age as they pass through the gate.
The mean is found to be 28, with a standard deviation of 6.
Assuming the ages of the audience are normally distributed, what percentage of the audience was aged between 28 and 40?

A. 34%

B. 47.5%

C. 68%

D. 95%

12. A set of drums is priced at \$748.00 including 10% GST. A school buys the set of drums and has the 10% GST refunded. How much did the school pay in total?

A. \$68.00

B. \$673.20

C. \$680.00

D. \$700.00

13. Tim lives in Los Angeles (UTC -8) and his friend Kathy lives in Brisbane (UTC $+10$).
At 5:00pm every Wednesday Los Angeles time, Tim calls Kathy.

What is the time and day in Brisbane when Kathy answers the phone?

A. 11:00 am on Wednesday

B. 11:00 pm on Wednesday

C. 11:00 am on Thursday

D. 11:00 pm on Thursday

14. Jenny wanted to estimate the number of rabbits in a rural area.

She randomly captured 32 rabbits, then tagged and released them.

One week later she randomly captured 128 rabbits from the same area. She found that 16 of these 128 rabbits were tagged. What is the best estimate for the total number of rabbits in this area?

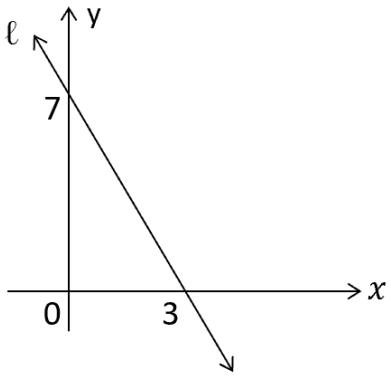
A. 8

B. 64

C. 128

D. 256

15. Which of the following is the equation of line (ℓ) shown in the graph below?



A. $y = \frac{7}{3}x + 7$

B. $y = -\frac{7}{3}x + 7$

C. $y = -\frac{7}{3}x + 3$

D. $y = \frac{7}{3}x + 3$

End of Section I

Marks

Question 16 (2 marks)

A new model washing machine has an energy consumption of 155 kWh per year and uses an average of 8 500 L of water per year. **2**

Energy is charged at \$0.42/kWh and the cost of water supply is \$2.35/kL.

What is the annual running cost of the washing machine?

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Marks

Question 17 (2 marks)

Solve $\frac{2x+1}{3} = 5$ **2**

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Marks

Question 18 (3 marks)

Young's formula allows for the calculation of the dose of a medication to be given to a child, according to the formula:

$$\text{Dosage for children 1 to 12 years} = \frac{\text{age of child (in years)} \times \text{adult dosage}}{\text{age of child (in years)} + 12}$$

(a) An 8-year-old child's dose is 5 mL. Find the adult dose. **2**

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(b) Would an 8-year-old child receive double the dose that a 4-year-old child requires? **1**
Give a reason for your answer.

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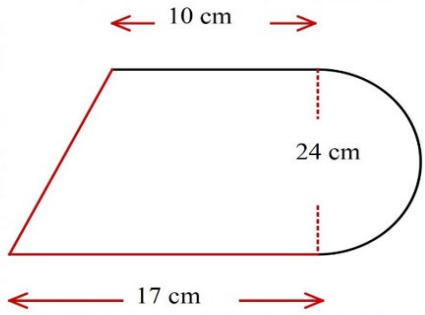
Marks

Question 19 (3 marks)

Find the perimeter of the shape below, correct to 3 significant figures. **3**



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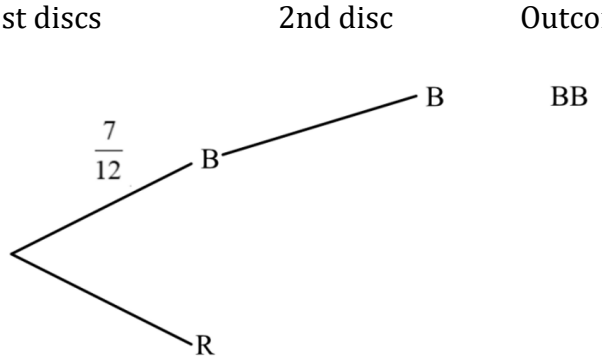
Marks

Question 20 (4 marks)

Karim has a box containing 7 blue discs and 5 red discs. He selects a disc at random from the box and places it on a table. He then selects a second disc and places it on the table next to the first disc.

(a) Complete the tree diagram below by drawing the missing branches, writing the probabilities on each branch and listing all possible outcomes. **2**



(b) What is the probability that at least one of the discs is blue? **2**

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Marks

Question 21 (2 marks)

Kyle drives a car with a petrol consumption of 8.7 L/100 km. The gas tank of the car has a capacity of 50 L. If Kyle is driving 980 km, how many full tanks of petrol will he need to reach his destination? **2**

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Marks

Question 22 (6 marks)

A tour bus company offers tours at \$45 per person. The tour bus company has a fixed cost of \$650 per tour and a variable cost of \$20 per person.

(a) Determine the linear equation that represents the cost (C) per tour in terms of the number of people (x) per tour. **1**

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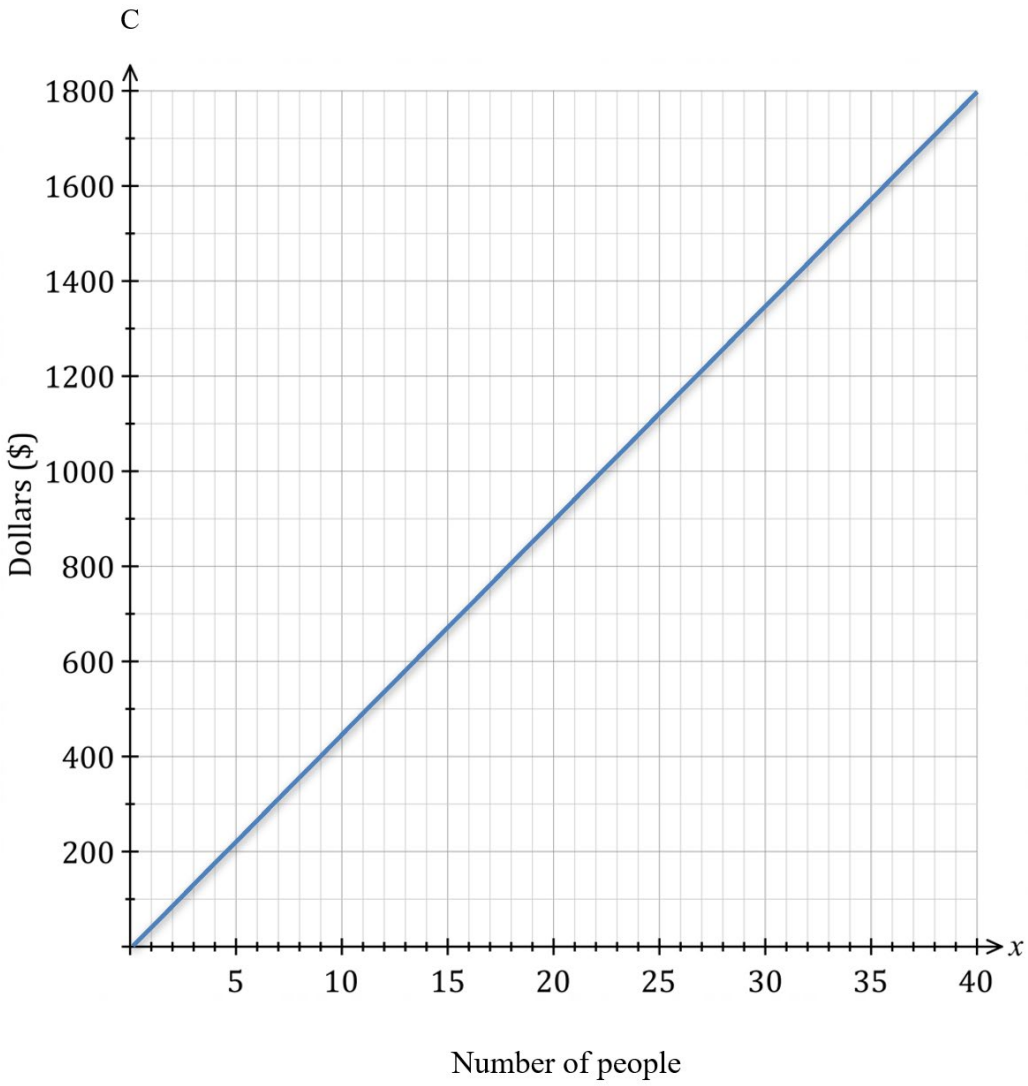
(b) The graph of the Income (I) has been drawn on the grid below. **1**
Draw a graph of the equation from part (a) on the same grid.



Question 22 continued.

(c) State the coordinates of the point of intersection of the two lines drawn in part (b). Briefly explain the significance of this point of intersection. **2**

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(d) At full capacity the bus can seat 50 people. How much profit will the company make if they sell 50 tickets? **2**

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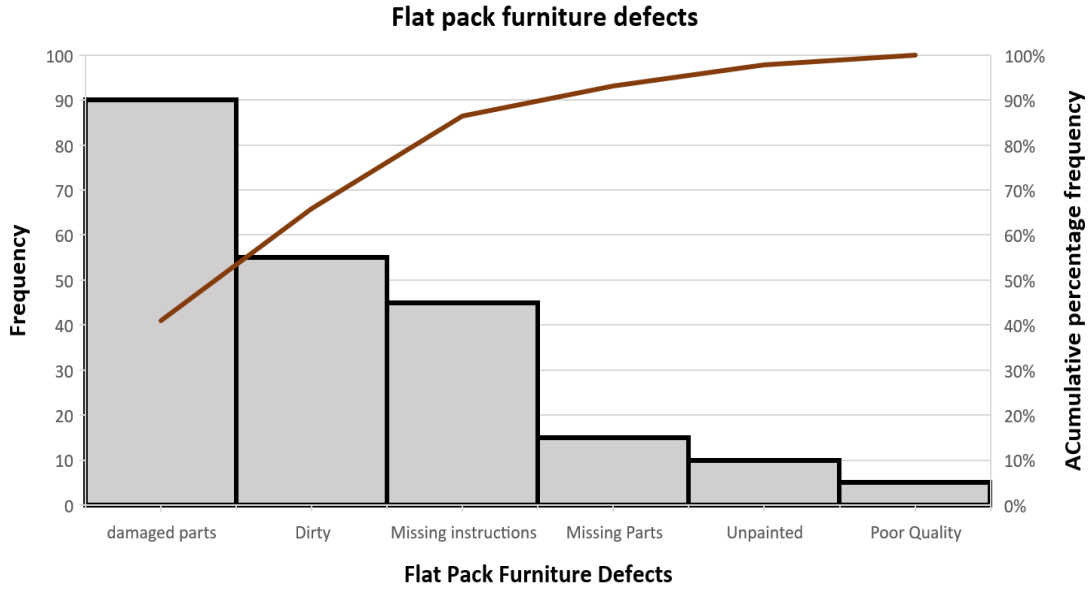
Marks

Question 23 (3 marks)

The Pareto chart below shows the concerns of customers who purchased flat pack furniture from the specialist furniture store 'I-AKE'. Flat pack furniture requires the customer to assemble each item themselves.



(a) What are the two most common complaints? **1**

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(b) What percentage of complaints are about missing parts? **1**

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(c) By considering the defects 'damaged parts', displayed in the graph above, what is one way I-AKE can work towards reducing the number of complaints. **1**

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Marks

Question 24 (3 marks)

The table shows the income tax rates for the 2022-2023 financial year.

Taxable Income	Tax payable on this income
$\$0 - \$18,200$	Nil
$\$18,201 - \$45,000$	19 cents for each $1 over $18,200
$\$45,001 - \$120,000$	$5,092 plus 32.5 cents for each dollar over $45,000
$\$120,001 - \$180,000$	$29,467 plus 37 cents for each $1 over $120,000
$\$180,001$ and over	$51,667 plus 45 cents for each $1 over $180,000

Peter earned a gross annual salary of $82 500. He has allowable tax deductions of $1800 for home office expenses. Peter must also pay a Medicare Levy of 2% of his taxable income.

Calculate the amount of tax payable by Peter, including the Medicare Levy. **3**

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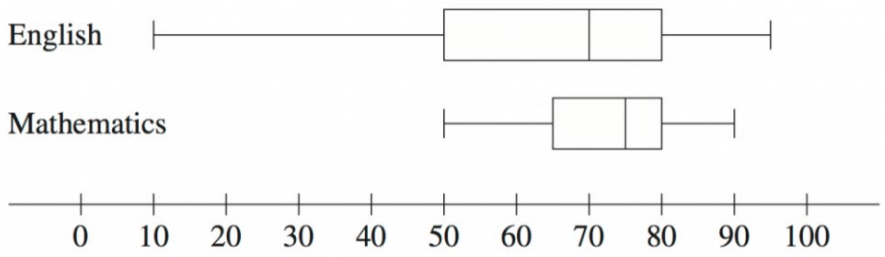
Marks

Question 25 (6 marks)

The test results for a class in both English and Mathematics were recorded and displayed in the box-and-whisker plots.



(a) What was the median mark in the English test? **1**

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(b) What is the interquartile range for the English test? **1**

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(c) Is the lowest score in the English test an outlier? Justify your answer with mathematical working. **2**

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(d) Compare and contrast the two data sets by referring to the skewness of the distributions and the spread. **2**

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Marks

Question 26 (2 marks)

Sophie is driving on a motorway at a speed of 120 kilometres per hour and has to brake suddenly. She has a reaction time of 2 seconds and a braking distance of 63.2 metres. Stopping distance can be calculated using the following formula. **2**

$$\text{stopping distance} = \{\text{reaction time distance}\} + \{\text{breaking distance}\}$$

What is Sophie's stopping distance to the nearest metre?

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Marks

Question 27 (4 marks)

The formula below gives the blood alcohol concentration for a male.

$$\text{BAC}_{\text{Male}} = \frac{10N - 7.5H}{6.8M}$$

where

N is the number of standard drinks consumed,
H is the number of hours of drinking, and
M is the person's weight in kilograms.

Carlos drinks three bottle of beer between 8:00 pm and 1 am the next day. Each of these bottles contains 1.8 standard drinks. Carlos weighs 93 kg.

(a) Using the formula above, what is Carlos' approximate blood alcohol content (BAC) at the end of this period? Answer correct to 3 decimal places. **2**

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(b) The number of hours required for a person to reach zero BAC after they stop consuming alcohol is given by the following formula. **2**

$$\text{Time} = \frac{BAC}{0.015}$$

Using the given formulae, calculate the time in the morning when Carlos' BAC should reach zero.

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Marks

Question 28 (4 marks)

Leanne achieved a score of 77 on her Maths test. The class scores were normally distributed. The mean of the class scores for the test was 68. Leanne's z-score was 1.5.

(a) What was the standard deviation of the class scores on the test? **1**

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(b) The class scores were standardised to a mean of 74 and a standard deviation of 4. Determine Leanne's new moderated score for the test. **1**

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(c) If 120 students completed the test, how many students would be expected to receive a moderated mark less than 66? **2**

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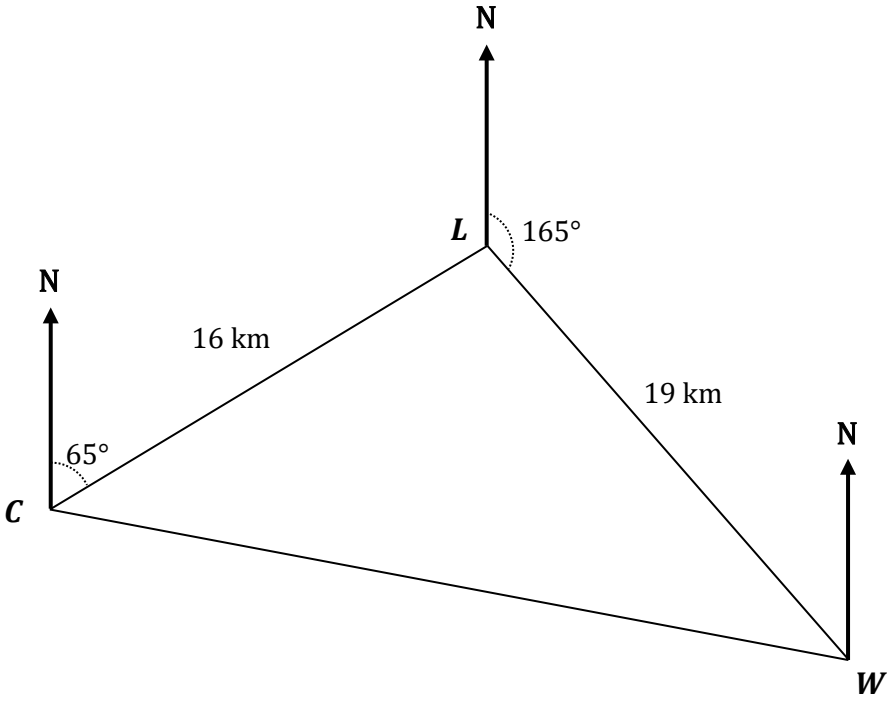
Marks

Question 29 (3 marks)

A hiker decides to leave a campsite (C) to visit some natural landmarks in the area. The hiker walks 16 km on a bearing of 65° to see a lake (L). The hiker then turns and continues walking 19 km on a bearing of 165° to reach a waterfall (W).



(a) Show that the size of $\angle CLW$ is 80°. **1**

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(b) Calculate the distance between the waterfall and the campsite, correct to the nearest kilometre. **2**

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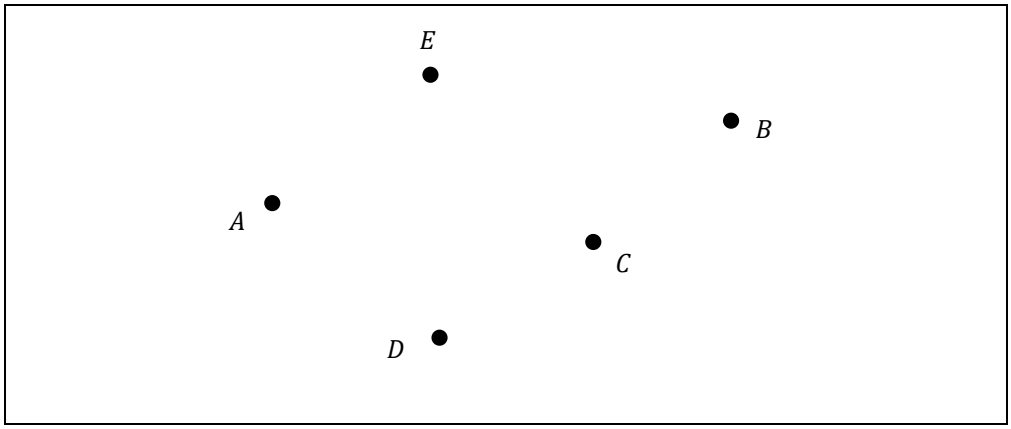
Marks

Question 30 (5 marks)

The table below represents a computer network in a small office. The number in the table represents the length of optical cable, in metres, required to connect the two computers.

	A	B	C	D	E
A	-	-	300	600	350
B	-	-	400	-	150
C	300	400	-	200	250
D	600	-	200	-	-
E	350	150	250	-	-

(a) Using the data from the table, draw a weighted network diagram in the space below. **2**



(b) Draw the minimum spanning tree for the network. **2**

(c) What minimum length of optical cable is required to connect the network? **1**

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Marks

Question 31 (2 marks)

John spends $8000 on a new photocopier for his business.
He uses the declining-balance method to calculate the depreciation of the photocopier.
He claims this amount as a tax deduction each year.
He can only claim the depreciation for that particular year.

If the rate of depreciation is 24% per annum, show that the depreciation he can claim in the second year is equal to $1459, rounded correct to the nearest dollar.

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Marks

Question 32 (4 marks)

A water tank is being emptied and the volume of water remaining in the tank is

$$V = 1000(0.82)^m$$

where V is in litres and m is the time in minutes.

(a) What is the initial volume of the tank before being emptied? **1**

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(b) Find the volume of water remaining in the tank after 6 minutes, answer correct to the nearest whole number? **1**

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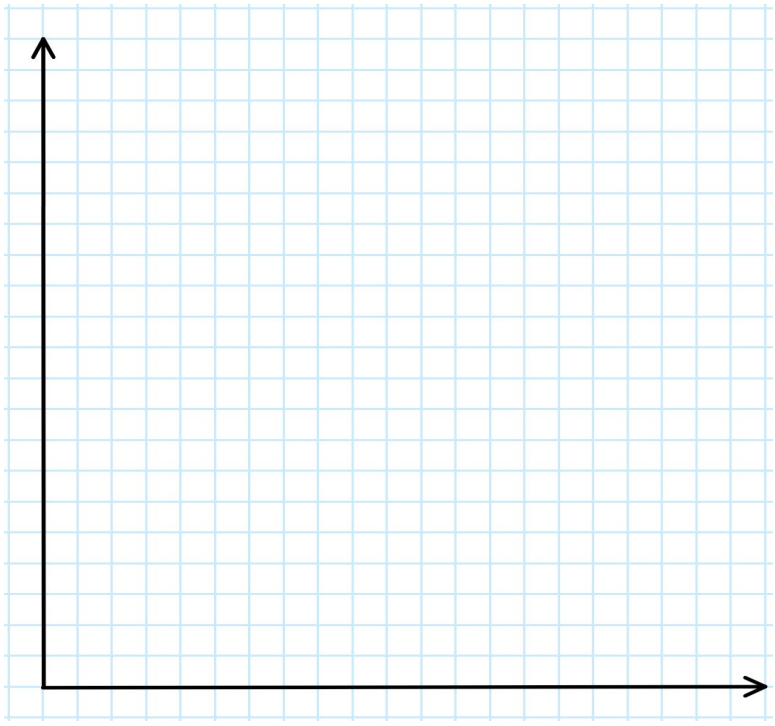
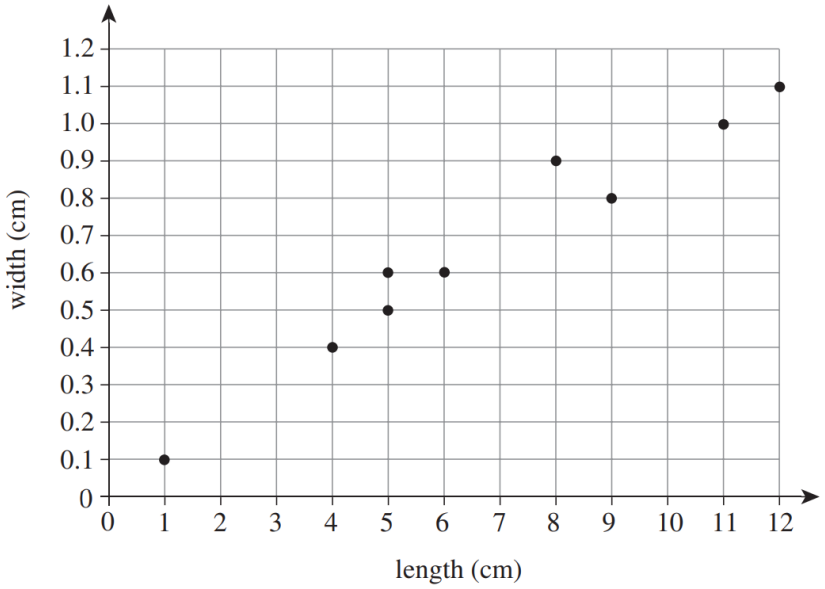
(c) On the axis below, draw the graph of the volume against time, showing the points at $m = 0$ and $m = 6$. **2**



Marks

Question 33 (4 marks)

A set of bivariate data is collected by measuring the lengths and widths of a population of flatworms. A scatterplot of this data is shown.



(a) Calculate Pearson's correlation coefficient for the data, correct to two decimal places. **1**

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(b) Identify the direction and strength of the linear relationship between the lengths and widths of the flatworms. **1**

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(c) The equation of the least-squares regression line is shown. **2**

$$\text{width} = 0.072 + 0.088 \times \text{length}$$

One flatworm has a width of 0.3 cm. Calculate the predicted length of this flatworm using the equation of least-squares regression line. Give your answer correct to one decimal place.

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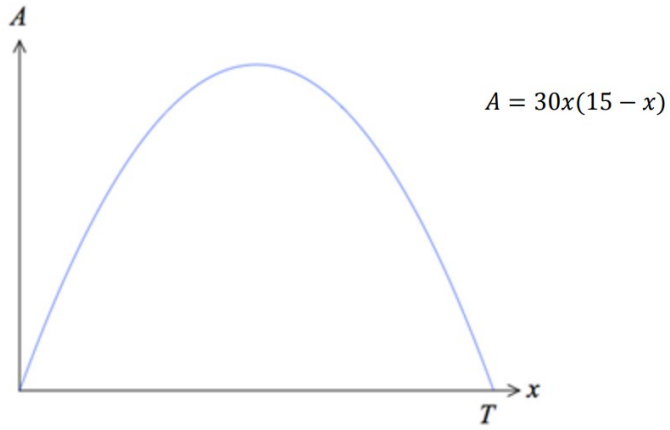
Marks

Question 34 (5 marks)

The area (A) of a rectangular yard with a length of x metres is given by the formula:

$$A = 30x(15 - x)$$

where A is in square metres. The graph of A against different values of x is shown below.



(a) Complete the following table of values. **2**

x	0	5	10	15
A				

(b) What is the value of T on the graph? **1**

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(c) Calculate the maximum area of the yard. **2**

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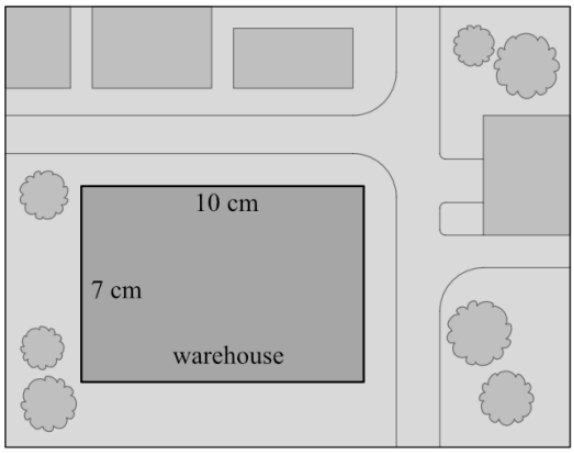
Marks

Question 35 (4 marks)

A company buys a new warehouse to improve their manufacturing capacity. They plan to save money by collecting rainwater from the entire area of the rectangular roof of the warehouse.

The diagram below shows a plan view of the warehouse and its location within its surroundings.

The dimensions of the warehouse on the diagram are 10 cm and 7 cm.



NOT TO SCALE

(a) If 10 cm on the diagram represents 100 m, what would be the scale of the diagram? Express the scale as a ratio in simplest form. **1**

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(b) If the company's goal is to collect 1200 kL of water from the roof, how much rain must fall? Answer in millimetres, correct to the nearest millimetre. **3**

$$1 \text{ m}^3 = 1 \text{ kL}$$

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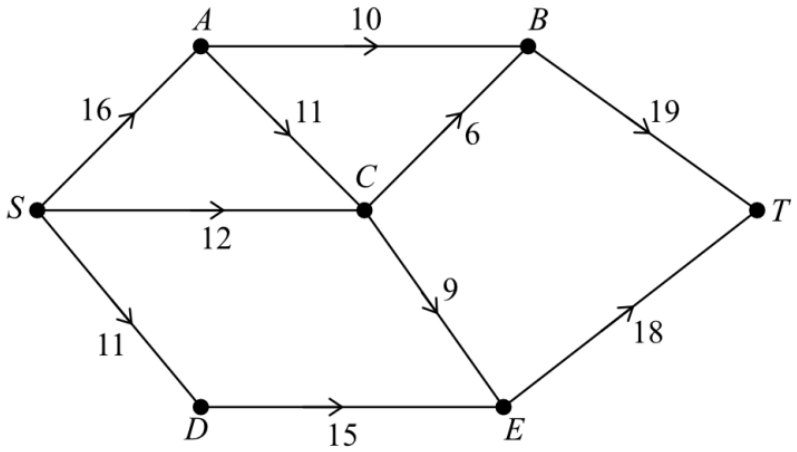
Marks

Question 36 (4 marks)

The flow of water through a series of pipes is shown in the network below. The water flows from the source (S) to the sink (T) and the numbers on the edges show the maximum capacity of each pipe in litres per minute.



(a) Find the maximum flow from S to T. **3**

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(b) By increasing the capacity of one edge in the network, the maximum flow could be increased by 3 litres per minute. Identify the edge that could be increased. **1**

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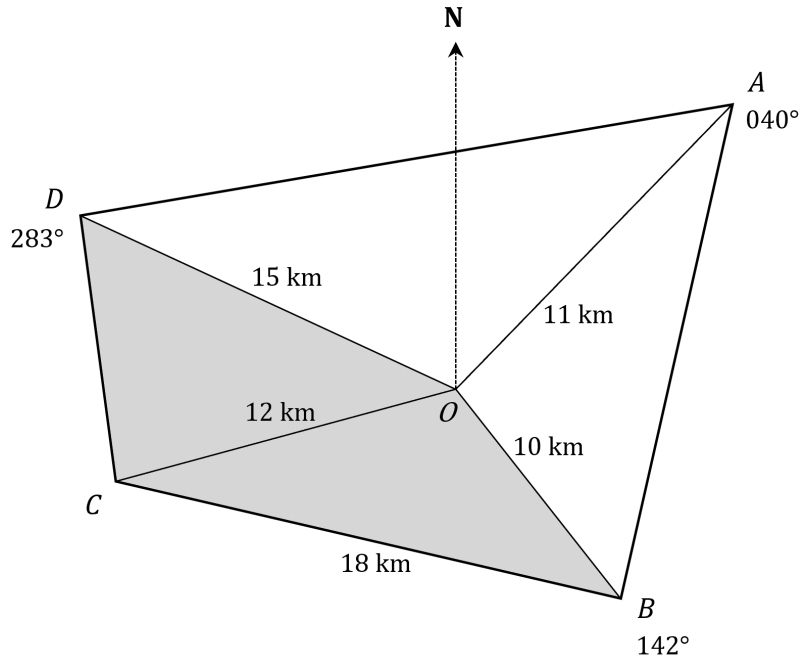
Marks

Question 37 (5 marks)

A farmer divides a paddock into four triangular areas for the purpose of giving his livestock distinct areas in which to graze. The diagram shows the compass radial survey of paddock *ABCD*.



NOT TO SCALE

The farmer wishes to house his horses in the region *OBCD.*

(a) Find the size of the angle BOC, correct to the nearest degree. **2**

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(b) Find the area of the shaded region *OBCD*, correct to the nearest square kilometre. **3**

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Marks

Question 38 (5 marks)

Neil borrows $160 000 from a bank. The loan is to be repaid over 15 years at a rate of 5.4% per annum, compounded monthly. The repayments have been set at $1300 per month.

The interest charged and the balance owing for the first three months of the loan are shown in the spreadsheet below.

Month	*Principal (at start of month)*	*Interest Charged*	*Monthly repayments*	*Balance (at end of month)*
1	$160 000	$720	$1300	$159 420
2	$159 420	**A**	$1300	$158 837.39
3	$158 837.39	$714.77	$1300	**B**

(a) What are the values of A and B? **2**

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(b) After 50 months of repaying the loan, Neil decides to make a lump sum payment of $ 45 000 and to continue making the monthly repayments of $1300. The loan will then be fully repaid after a further 75 monthly repayments. **3**

How much less will Neil pay overall by making the lump sum payment?

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End of Paper

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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

Section I – Multiple Choice Answer Sheet

Allow about 25 minutes for this section

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 the correct answer by writing the word **correct** and drawing an arrow as follows.

A ⊗ B ⊗ (correct) C ○ D ○

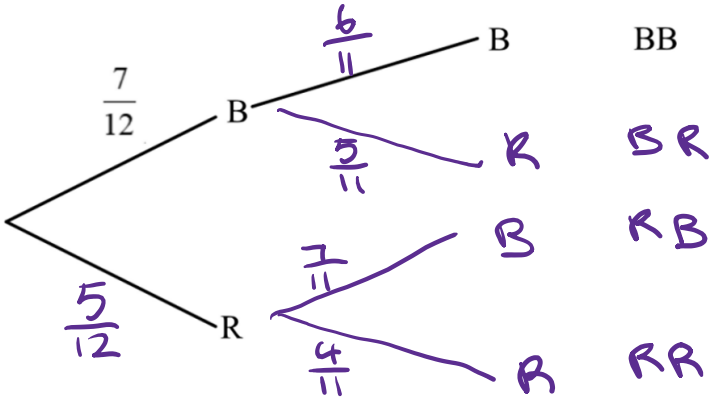
1.	A ○	B ○	C ○	D ○
2.	A ○	B ○	C ○	D ○
3.	A ○	B ○	C ○	D ○
4.	A ○	B ○	C ○	D ○
5.	A ○	B ○	C ○	D ○
6.	A ○	B ○	C ○	D ○
7.	A ○	B ○	C ○	D ○
8.	A ○	B ○	C ○	D ○
9.	A ○	B ○	C ○	D ○
10.	A ○	B ○	C ○	D ○
11.	A ○	B ○	C ○	D ○
12.	A ○	B ○	C ○	D ○
13.	A ○	B ○	C ○	D ○
14.	A ○	B ○	C ○	D ○
15.	A ○	B ○	C ○	D ○

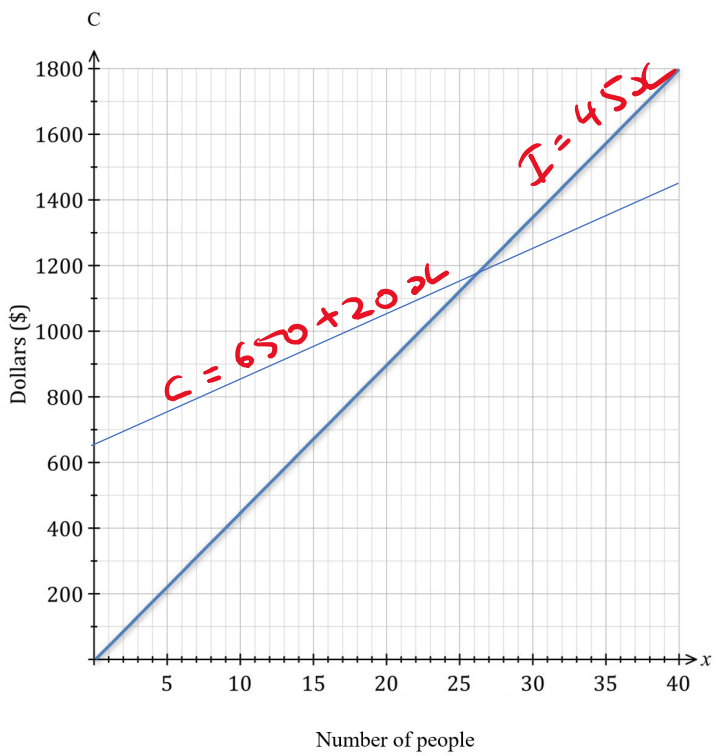
Hunters Hill High School – Standard 2 –2023 Trial HSC Examination

Marking Guidelines

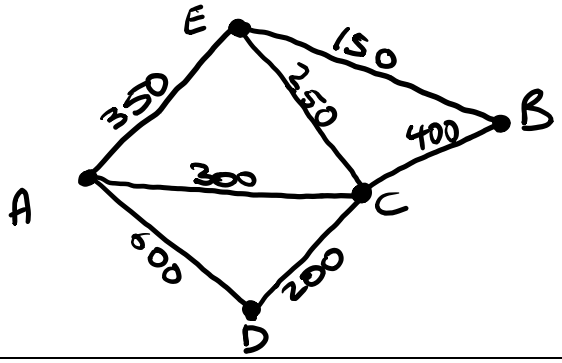
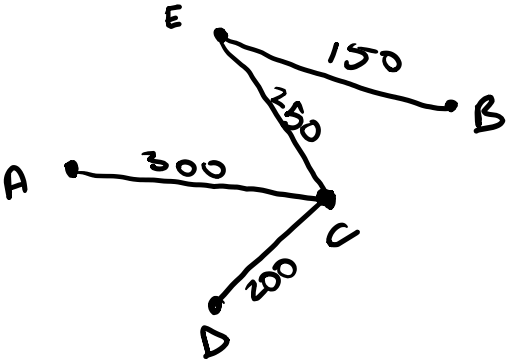
Section I

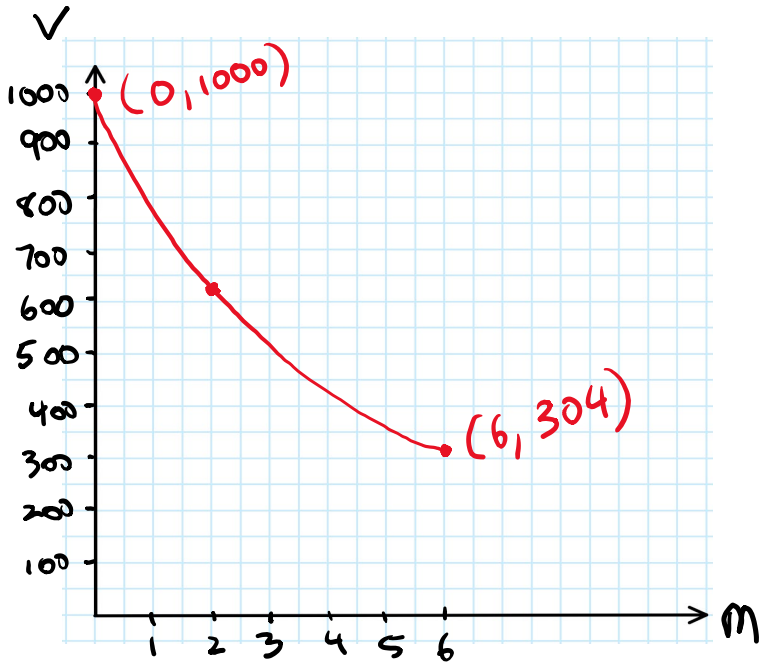
Q	Solution	
1	A	
2	C	
3	D	
4	C	
5	D	
6	D	
7	B	
8	A	
9	C	
10	B	
11	B	
12	C	
13	C	
14	D	
15	B	
16	$cost = (0.42 \times 155) + (2.35 \times 8.5)$ $= 85.075$ $\therefore \$85.08\ per\ year$	**2 marks**: Correct answer with working. **1 mark**: Shows some understanding
17	$\frac{2x+1}{3} = 5$ $2x + 1 = 15$ $2x = 14$ $x = 7$	**2 marks**: Correct answer with appropriate mathematical working for solving equations. **1 mark**: only one error in working, with error caried forward correctly.

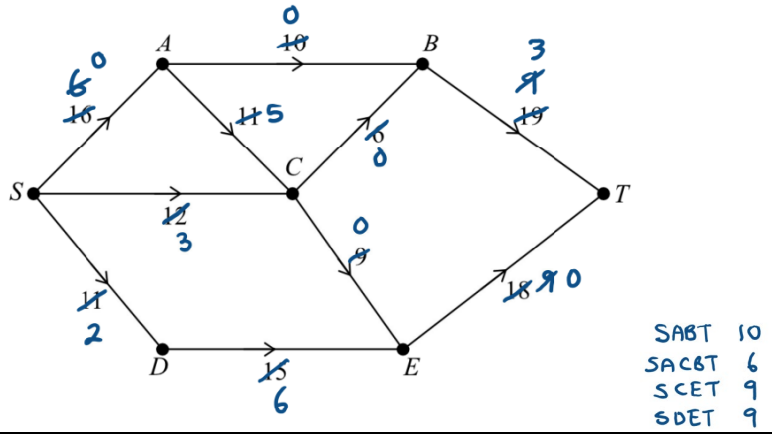
18a	$5 = \frac{8A}{8+12}$ $5 \times 20 = 8A$ $A = 12.5$ ml	**2 marks**: Correct answer with appropriate mathematical working for solving equations. **1 mark**: only one error in working, with error caried forward correctly.
b	No, the formula is not linear. Or, by calculation, the dose for a 4-year old child is 3.125 mL.	**1 mark:** Correct answer
19	$P = 10 + 17 + \sqrt{7^2 + 24^2} + (2 \times \pi \times 12 \div 2)$ $=89.69911....$ ≈ 89.7	**3 marks**: provides correct answer to 3 sig fig, showing appropriate mathematical working **2 marks**: provides correct answer, showing appropriate mathematical working where rounding is not correct. **1 mark**: Provides some understanding.
20a	1st discs 2nd disc Outcomes  	**2 marks**: Correct answer **1 mark**: At least one correct fraction.
b	$P(at\ least\ one\ B) = 1 - \frac{5}{12} \times \frac{4}{11}$ $= 1 - \frac{20}{132}$ $= \frac{28}{33}$	**2 marks**: Correct answer with working **1 mark**: Shows some understanding one combination or evidence of correct combinations chosen.
21	$\frac{980}{100} \times 8.7 = 85.26$ $85.26 \div 50 = 1.7052$ ∴ 2 Full tanks of petrol	**2 marks**: Correct answer with working **1 mark**: Shows some understanding in working toward correct answer.

22a	$C = 650 + 20x$	**1 mark**: Correct answer
b		**1 mark**: Correct Answer
c	(26, 1170). The intersection represents the break-even point, where no profit or loss has been made. Can be found algebraically too.	**2 marks**: Correct intersection and explanation. **1 mark**: Correct intersection or explanation.
d	Profit=Income- Cost $Profit = (45 \times 50) - (650 + 20 \times 50)$ $= 600$ $\therefore$ the company will make a profit of \$600	**2 marks**: Correct answer **1 mark**: Shows some understanding in working toward correct answer.
23a	Damaged parts and dirty	**1 mark**: Correct answer
b	By use of graph $\approx$ 6 to 10% By Frequency=$\frac{15}{220} \times 100 \approx 6.8\%$	**1 mark**: Correct answer
c	By Checking every box for broken or missing parts. By Providing safer packing and transportation.	**1 mark**
24	Tax Income $= 82\,500 - 1800$ $= \$80\,700$ Income Tax $= 5092 + 0.325(80\,700 - 45\,000)$ $= \$16\,694.50$ Medicare Levy $= 0.02 \times 80\,700$ $= \$1614$ $\therefore$Total tax payable$= 16\,694.50 + 1614$	**3 Marks:** Correct answer with working **2 marks**: Makes significant progress towards the solution. **1 mark**: One value calculated

	$= 18\ 308.50$	
25a	70	**1 mark**: Correct answer
b	$\text{IQR} = 80 - 50 = 30$	**1 mark**: Correct answer
c	Lower Limit$= Ql - 1.5 \times IQR$ $= 50 - 1.5 \times 30$ $= 5$ $10 > 5$ $\therefore$ *The lowest score* 10 *is not an outlier since it is greater than the lower limit of* 5.	**2 marks**: Correct answer with working **1 mark**: Correctly calculates lower limit for English.
d	English has a greater negatively skewed distribution. Maths is more normally distributed. English has a range of 85, Maths has a range of 40. English has a larger IQR than Maths (30 v's 15). Accept: both negatively skewed English is less or maths is more consistent.	**2 marks**: Correctly describes skewness for each Box-Plot and correctly compares the spread. **1 mark**: One of the above.
26	Speed in m/s$= 120 \times 1000 \div 3600 = 33.3333$ In 2 second$33.3 \times 2 \approx 66.6666\ m$ Stopping distance $= 63.2 + 66.66 = 129.866666$ $\therefore$ her stopping distance is 130 m Note: no marks for adding 2. Shows working to find 33m/sec at least	**2 marks**: Correct Answer with working **1 mark**: Find the speed in m/s
27a	$BAC_{\text{Male}} = \dfrac{10(1.8 \times 3) - 7.5 \times 5}{6.8 \times 93}$ $= 0.02609 \ldots \ldots$ ≈ 0.026	**2 marks**: Correct Answer with working **1 mark**: 1 error in substituting into formula
b	$Time = \dfrac{0.026}{0.015}$ $= 1.7333333$ $= 1$ hour and 44 minutes Time$= 1\ pm + 1\ hour\ and\ 44\ minutes = 2{:}44\ am$ Note: rounding errors accepted	**2 marks**: Correct Answer with working **1 mark**: Finding the correct time as a decimal.
28a	$z = \dfrac{x - \mu}{\sigma} = \dfrac{77 - 68}{\sigma} = 1.5$ $\sigma = \dfrac{9}{1.5} = 6$	**1 mark**: Correct Answer
b	$z = \dfrac{x - \mu}{\sigma}$ $\dfrac{x - 74}{4} = 1.5$ $x = 80$	**1 mark**: Correct Answer

c	A moderated mark of 66 is 2 standard deviations below the mean. $\frac{100-95}{2} = 2.5\%$ $0.025 \times 120 = 3$ $\therefore$ 3 students	**2 marks**: Correct Answer with working **1 mark**: Finding the correct Percentage.
29a	$\angle CLW = 360 - (180 - 65) - 165$ $= 80$	**1 mark**: Correct Answer
b	Cosine rule $CD^2 = 16^2 + 19^2 - 2 \times 16 \times 19\cos 80°$ $= 22.6146 \ldots$ $CD \approx 23$ km	**2 marks**: Correct Answer with working **1 mark**: Uses cosine rule with at least one correct value.
30a		**2 marks**: Correct Answer **1 mark**: Correct network with measurements missing or only one error in diagram.
b		**2 marks**: Correct Answer **1 mark**: Correct network with measurements missing or one error minimum lengths chosen.
C	150+250+200+300=900 m	**1 mark**: Correct Answer or error carried forward.
31	$r = 24\%\ pa = 0.24$ After 1 year: $S = 8000(1 - 0.24)^1$ $= \$6080$ After 2 years: $S = 8000(1 - 0.24)^2$ $= \$4620.80$ $\therefore depreciation\ in\ 2nd\ year = 6080 - 4620.80$ $= 1459.20$ $= \$1459$	**2 marks**: Correct Answer with working . **1 mark**: Correct salvage value after 1 year or 2nd year.

<table>
<tr><td>32a</td><td>When $m = 0$
$V = 1000(0.82)^0$
$= 1000$</td><td>1 mark: Correct answer
Working not necessary.</td></tr>
<tr><td>b</td><td>When $m = 6$
$V = 1000(0.82)^6$
$= 304.00667$
≈ 304</td><td>1 mark: Correct answer with working</td></tr>
<tr><td>c</td><td> 
</td><td>2 marks: Correct Graph, correct intersection, correctly labelled (6,304) and axis labels included.
1 mark: Sketched an exponential graph with axis labelled correctly.</td></tr>
<tr><td>33a</td><td>$r = 0.9786$
0.98</td><td>1 mark: Correct Answer</td></tr>
<tr><td>b</td><td>Strong Positive</td><td>1 mark: Correct Answer</td></tr>
<tr><td>c</td><td>$0.3 = 0.072 + 0.088 \times length$
$0.228 = 0.088 \times length$
$length = \frac{0.228}{0.088}$
$= 2.5909$
≈ 2.6 cm</td><td>2 marks: Correct answer with working
1 mark: Correct substitution of 0.3.</td></tr>
<tr><td>34a</td><td><table>
<tr><td>x</td><td>0</td><td>5</td><td>10</td><td>15</td></tr>
<tr><td>A</td><td>0</td><td>1500</td><td>1500</td><td>0</td></tr>
</table></td><td>2 marks: Correctly completing the table
1 mark: At most, two errors in the table</td></tr>
<tr><td>b</td><td>$T = 15$</td><td>1 mark: Correct Answer</td></tr>
</table>

c	The maximum area is when $x = \frac{5+10}{2} = 7.5$ $A = 30 \times 7.5(15 - 7.5)$ $= 1687.5\ m^2$	**2 marks**: Correct answer with working **1 mark**: Makes significant progress towards the solution.
35a	$10\ cm = 100m$ $\therefore 10\ cm = 10\ 000\ cm$ $\therefore scale = 10: 10\ 000$ $= 1: 1000$	**1 mark**: Correct Answer
b	Actual roof measurement are 70 m by 100 m $Area\ of\ roof = 70 \times 100$ $= 7000m^2$ $V = 1200\ kL = 1200\ m^3$ $v = Ah$ $1200 = 7000h$ $h = 0.171428 \ldots . m$ $= 171\ mm$	**3 marks**: Correct answer with working **2 marks**: Actual roof measurement and correct volume found. **1 mark**: Actual roof measurement or volume found.
36		**3 marks**: Correct answer with working **2 marks**: max flow found with 1 ECF. Working shown **1 mark**: max flow found with no working shown.
a	10+6+9+9=34 L/min	
b	The minimum cut passes through AB, CB and ET so only changes to these edges will affect the maximum flow. Only edge CB has the potential for increase by 3.	**1 mark**: Correct answer stating BC, no reason required.
37	$\text{angle BOC} = \cos^{-1}\frac{12^2 + 10^2 - 18^2}{2 \times 12 \times 10}$ $= 109.4712206 \ldots^o$ $\approx 109^o$	**2 marks**: Correct answer with working **1 mark**: Using the cosine rule with one error in substitution.
b	Area BOC=$\frac{1}{2} \times 12 \times 10 \times sin109^0$=56.731111…. $Bearing\ at\ C = 142 + 109 = 251^0$ Angle COD=$283 - 251 = 32^0$	**3 marks**: Correct answer with working **2 marks**: Correct angle for COD, and either Area found correctly **1 mark**: One of the above.

	Area COD$=\frac{1}{2} \times 12 \times 15 \times sin32^0 = 47.6927\ldots$ $\therefore Total\ area\ is\ 104.4\ m^2$	
38a	$A = 159\,420 \times \frac{0.054}{12}$ $= 717.39$ $B = 158\,837.39 + 714.77 - 1300$ $= 158252.16$	**2 marks**: Correct Answer for A and B **1 mark**: Correct answer for either A or B
b	Total payment if the lump sum not paid $= (15 \times 12) \times 1300$ $= \$234\,000$ Total payments if lump sum paid $= 45\,000 + (50 + 75) \times 1300$ $= \$207\,500$ Savings by paying the lump sum $= 234\,000 - 207\,500$ $= \$26\,500$	**3 marks**: Correct answer with working **2 marks**: Total payments and saving found with one error in working. **1 mark**: Correct total payment without the lump sum included.