Hunters Hill
High School

2022 **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 – 34)
Attempt All Questions 16 – 41
Allow about 2 hours and 5 minutes for this section

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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 ratio of fiction to non-fiction books in a library is 4:7. If there are 484 fiction books, how many books are non-fiction?

    A.   176

    B.   308
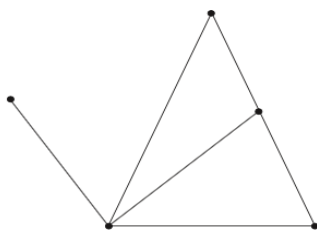
    C.   847

    D.   1047

2. The stem-and-leaf plot shows the number of goals scored by a team in each of 10 netball games. Find the standard deviation for this data set, correct to the nearest whole number?

0	6	8		
1	2	4	5	
2	1	5	5	9
3	5			

    A.   9

    B.   18

    C.   19

    D.   29

3.   The diagram shows a network. What is the sum of the degrees of all the vertices in this network?

A.   5

B.   10

C.   11

D.   12

4.   For the scatterplot is shown,
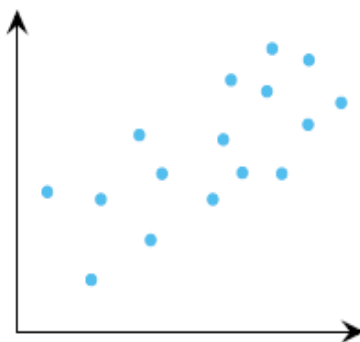
Which of the following best describes the correlation?

A.   Perfect Positive

B.   Weak Positive

C.   Strong Negative

D.   Weak Negative

5.   What is the correct expression for x in triangle ABC?
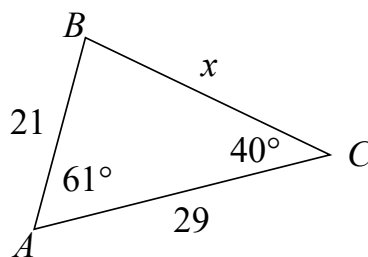
A. $x = \dfrac{29\sin 79°}{\sin 61°}$

B. $x = \dfrac{21\sin 40°}{\sin 61°}$

C. $x = \dfrac{29\sin 61°}{\sin 79°}$

D. $x = \dfrac{21\sin 40°}{\sin 79°}$

6.   A country has 30% of the population between the ages of 20 and 30. How many people aged between 20 and 30 should be included in a sample of 250 people?

A.   30

B.   45

C.   60

D.   75

7. What is the perimeter of the shape MNOQ, correct to the nearest metre?
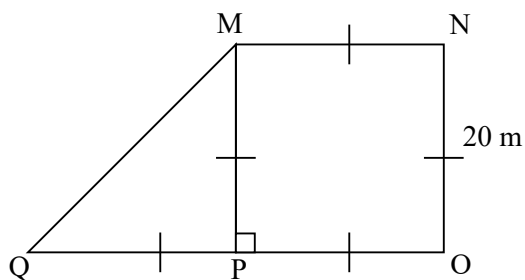
- A. 100
- B. 108
- C. 120
- D. 128

8. The normal distribution shows the results of a Mathematics Standard assessment task. It has a mean of 60 and a standard deviation of 10.
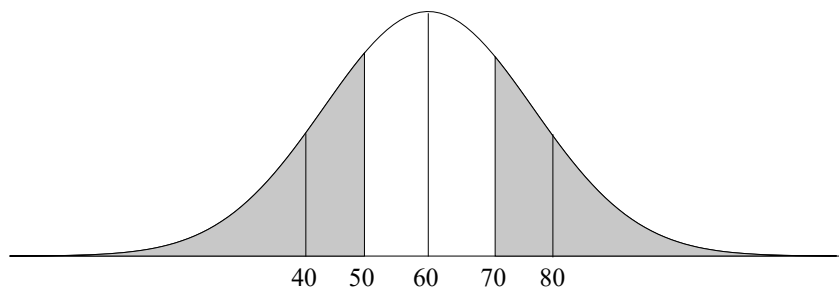
What percentage of results lies in the shaded region?

- A. 16%
- B. 32%
- C. 34%
- D. 68%

9. Grace invested $32 000 at a simple interest rate of 7% pa. Calculate the future value of Grace's investment after 5 years.

    A. $11 200

    B. $22 400

    C. $43 200

    D. $44 882

10. Which graph best represents the function $y = \dfrac{1}{x}$.

    A.
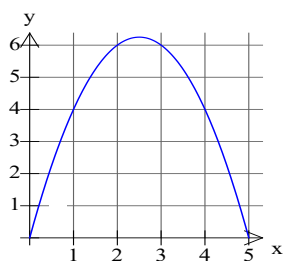
    B.
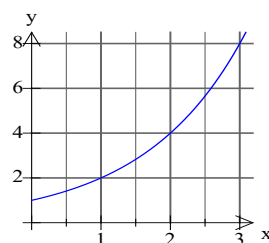
    C.
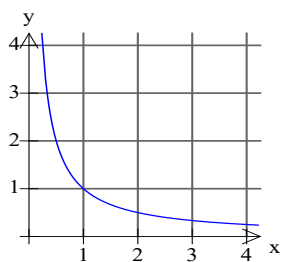
    D.
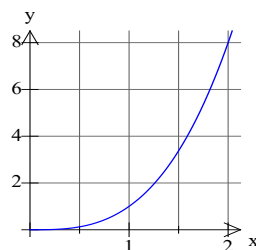
11. The compass bearing of Y from X is N32°W.

    What is the compass bearing of X from Y?

Not to scale
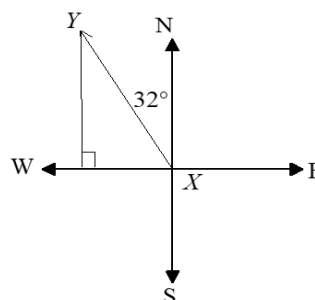
    A.   N32°W

    B.   N58°E

    C.   S32°E

    D.   S58°W

12. A piece of artwork is currently valued at $14 500. It is estimated that the artwork will appreciate at an annual rate of 2.5% over the next 4 years.
    Which of these calculations would give the estimated value of the artwork in 4 years' time?

    A. $14\,500 \div 1.025 \times 3$

    B. $14\,500 \times 1.0.25 \times 3$

    C. $14\,500 \div 1.025^4$

    D. $14\,500 \times 1.025^4$

13. The fuel consumption for a car is 7.6 liters/100 km. On a road trip, the car travels a distance of 1860 km. If the cost of fuel is $1.85/litre, calculate the total fuel cost for this trip?

    A. $26.15

    B. $45.28

    C. $261.52

    D. $452.76

14. Last month Lenny bought 220 shares at a market price of $1.35 per share. The market price is now $1.37 per share. Lenny received a dividend of 8.5 cents per share. What is the dividend yield correct to 1 decimal place?

    A.   6.2 %
    B.   6.3 %
    C.   62.0 %
    D.   62.9 %

15. Calculate the volume of a hemisphere with a radius of 5 m. Answer correct to one decimal place.
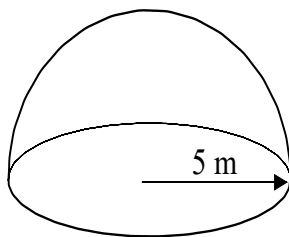
   A.   261.8 m³

   B.   523.6 m³

   C.   785.4 m³

   D.   1048 m³

End of Section I

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Student Number

2022 Trial HSC Examination

Mathematics Standard 2

Section II Answer Booklet

85 marks
Attempt Questions 16 – 41
Allow about 2 hour and 5 minutes for this section

Instructions

- 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 at the back of the booklet. If you use this space, clearly indicate which question you are answering.

Marks

Question 16 (2 marks)

Solve $x + \dfrac{10 + x}{3} = 18$

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Question 17 (2 marks)

The network diagram shows the walking path between buildings in a school. The average   2
time (in minutes) to walk between buildings is shown on the edges of the diagram.
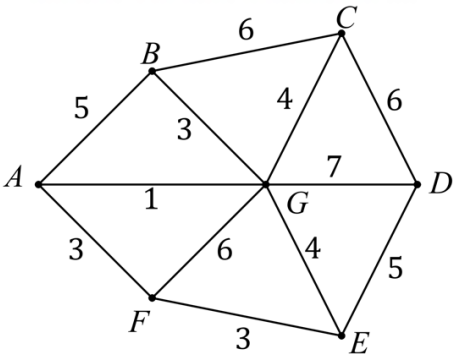
Determine which route has the shortest average time to walk from building B to F.
Justify your answer with calculations.

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Marks

Question 18 (2 marks)

A plane takes 12 hours to fly from Adelaide (UTC +9.5) to Cape Town in South Africa (UTC +2). If Shaunna leaves Adelaide at 10:00 am, what is the local time when she arrives in Cape Town?

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Question 19 (3 marks)

Fran's credit card has a no interest-free period. Interest is charged at 0.039% compounding per day.
Interest is charged on the date of purchase but not the date the account is paid.
In June, Fran made only one purchase on the 7th of June, a pair of shoes for $125.
Fran paid the account on the 1st of July. Calculate the total interest charged for June.

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Marks

Question 20 (2 marks)

The diagram shows a can of Yummy soup and its label.   **2**
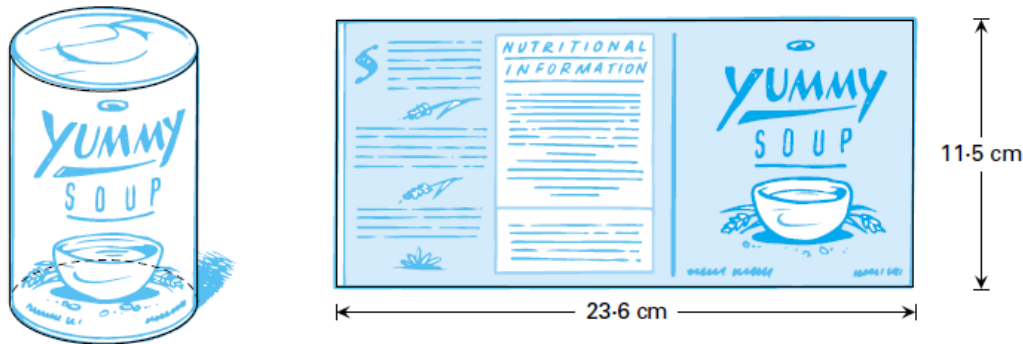
Calculate the radius of the can, correct to 1 decimal place.

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Question 21 (3 marks)

After completing a numeracy test (%), Hanna had achieved a z-score of –2.

(a) How does Hanna's result compare with those of her peers? Explain your answer
   in terms of the mean and standard deviation.   **1**

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(b) If the mean test mark was 86 and the standard deviation was 4, calculate Hanna's   **2**
   actual mark.

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Marks

Question 22 (4 marks)

The volume (V litres) of water in a tank as it is being drained over time (t) minutes can be modelled by the equation $V = 360 - 12t$.

(a)   At what rate is the tank draining?   1

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(b)   What is the initial volume of the tank?   1

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(c)   After how many minutes will the tank have half the initial volume of water?   2

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Marks

Question 23 (2 marks)

The table shows the average energy used in kilojoules per kilogram of body mass, when   **2**
cycling at two different speeds for 30 minutes.

Cycle Speed	Average energy used (kJ/kg) in 30 minutes
15 km/h	11.52
20 km/h	18.43

Shane weighs 62 kg. If 1 calorie is equivalent to 4.184 kilojoules, approximately how
many more calories would Shane use, cycling at 20 km/h, than he would at 15 km/h
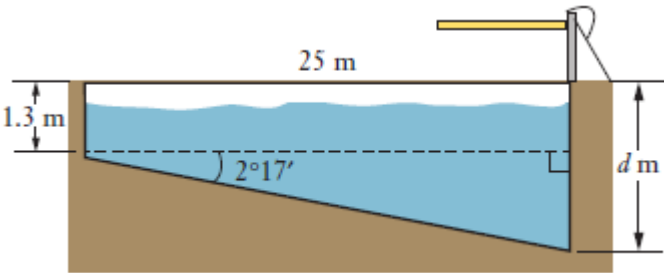during the 30 minutes? Answer correct to the nearest whole number.

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Question 24 (2 marks)

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The floor of a swimming pool inclines at 2°17' to the horizontal. The shallow end is
1.3 m deep and the pool is 25 m long. What is the depth d m, to the nearest 0.1 m, at the
deep end?

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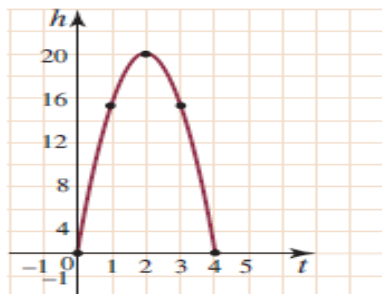
Marks

Question 25 (2 marks)

A ball is thrown in the air. Its height h metres, after t second can be given by the formula $h = 20t - 5t^2$. The graph of the function is shown below.

(a)   What is the height of the ball 3 seconds after it is thrown in the air?   1

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(b)   What limitations are there on this model?   1

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Question 26 (2 marks)

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A teacher set up seven activity stations in the school hall. The table shows the distances (in metres) between the seven activity stations.

	A	B	C	D	E	F	G
A	-	6	-	-	-	-	4
B	6	-	9	4	9	8	7
C	-	9	-	6	-	-	-
D	-	4	6	-	7		-
E	-	9	-	7	-	2	-
F	-	8	-		2	-	3
G	4	7	-	-	-	3	

Using the data from the table, draw a weighted network diagram in the space below.

Marks

Question 27 (2 marks)

Jemma is a political advisor who studies the effects of time on television over a month on the approval rating of six politicians. The data is shown below.

Time (in minutes)	20	10	70	15	5	80
Approval rating (%)	25	50	55	30	80	85

(a) Using a calculator, find Pearson's correlation coefficient r. Answer correct to four decimal places.   **1**

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(b) Jemma concludes that a new politician should appear on television as often as possible to gain a high approval rating. Do you agree? Give a reason.   **1**

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Marks

Question 28 (4 marks)

Anna sells bracelets for $15 each at a market. Each bracelet cost her $6.25 to make and she pays a one-off fee of $70 to sell these at the market.

(a)   Write an equation to describe the relationship between income (I) and the number of bracelets (n).   **1**

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(b)   Write an equation to describe the relationship between costs (C) and the number of bracelets (n).   **1**

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(c)   How many bubble makers must Anna sell to break-even?   **2**

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Marks

Question 29 (3 marks)

Adam makes an initial deposit of $5000 on an investment taken out over one year at a rate of 7.2% per annum compounded quarterly, and an additional deposit of $200 is made each quarter.

The amount in the account immediately after the nth deposit can be determined using the recurrence relation

$$A_{n+1} = A_n(1 + r) + 200$$

Where $n = 1, 2, 3, \ldots$ and $A_0 = 5000$
A_{n+1} is the value of the loan after $(n + 1)$ repayments
A_n is the value of the loan after n repayments
r is the rate of interest.

(a) Find the value of r correct to two significant figures.   1

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(b) Use the recurrence relation to find the amount of money in the account   2
     immediately after the second deposit.

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Marks

Question 30 (3 marks)

The table shows the income tax rates for the 2020-2021 financial year.   **3**

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	$5092 plus 32.5 cents for each $1 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

Wendy has a gross annual salary of $94 000. She has allowable tax deductions of $1900 for home-office equipment and $470 for union fees. Wendy must also pay a Medicare Levy of 2% of her taxable income. Calculate the total tax payable by Wendy including the Medicare Levy.

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Marks

Question 31 (5 marks)

Two school classes performed an experiment to determine the correct volume of a chemical solution. Their results, in milliliters, were presented in the parallel box-plot below.
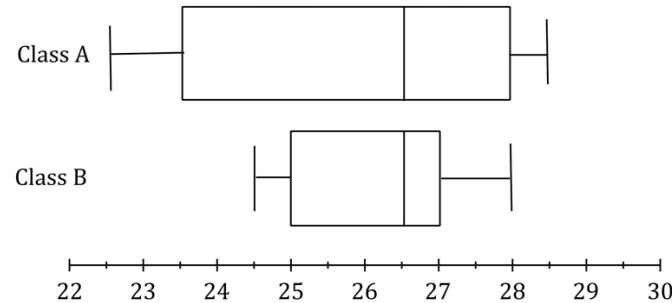
(a)   What percentage of the results found by Class A were below 28 mL?   **1**

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(b)   Find the Range and Interquartile range for the results found by each class.   **2**

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(c)   One student claimed that there was no difference between the results of the classes. Is the student's comment reasonable if based on the data? Using the box plots, compare and contrast the data to justify your response.   **2**

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Marks

Question 32 (3 marks)

The network diagram below shows pipes providing water from a dam to six farms. These pipes connect the farms to each other and to the dam. The lengths of the pipes (in km) are shown.
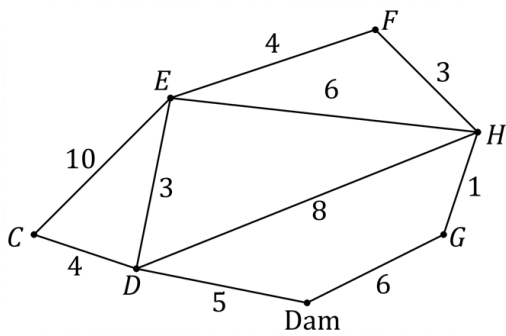
A plumber is hired to check the water pipes.

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

(b)   The system of pipes is due for replacement. What is the minimum length of pipe   **1**
required to service all of the farms?

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Marks

Question 33 (4 marks)

Andrew purchased a car for $55 950.

(a)   The table shows the stamp duty rates for a motor vehicle in the state where   2
Andrew lives and purchased the car.

Vehicle value	Rate
0–$4999	Nil
$5000–$44999	$3 for every $100 (or part thereof)
$45000 and over	$1300 plus $6 for every $100 (or part thereof)

Using the table, calculate the stamp duty payable on the car.

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(b)   The car has an expected depreciation rate of 18% per annum.   2
What is the salvage value of the car after 5 years?

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Marks

Question 34 (4 marks)

Young's rule is used to calculate the required dosage of medicine for children aged 1 to 12 years.

$$D = \frac{yA}{y + 12}$$

Where:
D = Child dosage in milligrams
y = Age of child in years
A = Adult dosage in milligrams

(a)   What is the required dose for an 18-month-old child, if the adult dose is 72 mg?   **2**

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(b)   The recommended dose for a 3-year-old child is 5 mg. What is the adult dosage   **2**
using Young's rule?

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Marks

Question 35 (5 marks)

Olivia and Henry play a game of darts. Olivia has a 0.8 chance of hitting the number 12 and Henry has a 0.6 chance of hitting the number 12. They each throw a single dart at the board, both aiming at the number 12.

(a)   Complete the probability tree diagram.

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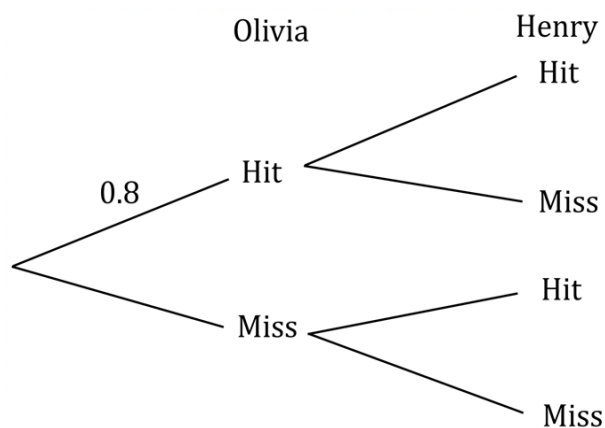
(b)   Find the probability that they both hit the number 12.   1

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(c)   Find the probability that exactly one of the darts hits the number 12.   2

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Marks

Question 36 (4 marks)

The diagram below shows the aerial view of a roof for a farm shed.
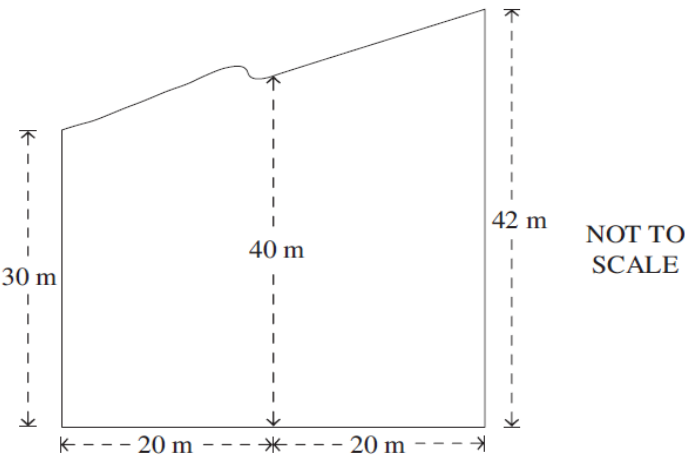
(a)   Using two applications of the Trapezoidal rule, find the approximate area of the
       roof.   **2**

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(b)   Any rain that falls on to the roof flows directly into a rainwater tank. Assuming   **2**
       there is no runoff, calculate how many litres of water is collected in the rainwater
       tank when 120 mm of rain falls onto the roof.

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

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Marks

Question 37 (4 marks)

The number of cases of infection of a certain disease grows exponentially according to the function $c = 150(1.09)^d$, where c is the number of cases and d is the time in days.

Number of days (d)	0	4	8	12	16	20
Number of cases (c)	150	212	299	422	596	

(a)   How many cases are there after 20 days? Answer correct to the nearest whole   **1**
number?

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(b)   On the grid below, draw the graph that represents the relationship between   **2**
d and c.
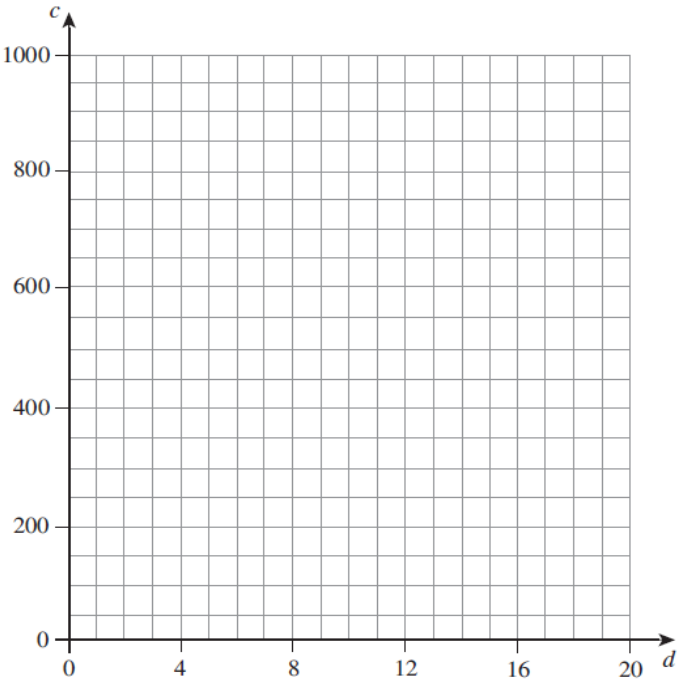
(c)   Using the graph drawn, estimate the time taken, in days, for the number of cases   **1**
to reach 800. Give your answer correct to the nearest whole number.

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Marks

Question 38 (4 marks)

The table below shows the future value of a $1 annuity.

Future value of $1						
Period	1%	2%	3%	4%	5%	6%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500	2.0600
3	3.0301	3.0604	3.0909	3.1216	3.1525	3.1836
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746

(a) An annuity of $14 800 is invested every half-year at 6% per annum, compounded six-monthly for 2 years. What is the future value of the annuity?   2

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(b) Sonia aims to have a deposit for an apartment of at least $180 000 in 3 years-time by investing in an annuity. The annuity has an interest rate of 2% p.a. compounded annually. Calculate Sonia's yearly contribution to achieve the deposit. Answer to the nearest dollar.   2

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Marks

Question 39 (5 marks)

The price of various second-hand Mazda cars are shown below.
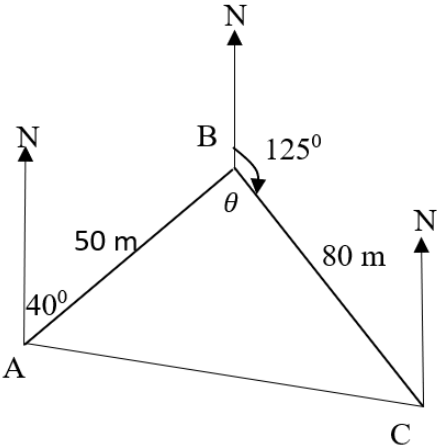
Age (a)	1	2	0	5	7	4	3	4	8
Value (v)($\$$)	15000	11000	18900	9800	7500	11600	10500	11000	3500

(a) Find the equation of the least-square regression line in terms of Age (a) and Value (v) of the car.   **1**

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(b) What is the value of the y-intercept for this equation, and what does it represent in the context of the data?   **2**

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(c) When would the value of the car be $\$0$? Answer correct to the nearest year.   **2**

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Marks

Question 40 (6 marks)

The diagram below shows the plan for a triangular park ABC. Fence posts have been located at points A, B and C. AB is 50 m and BC is 80 m. The bearing of B from A is 040° and the bearing of C from B is 125°.

(a) What is the size of angle θ?   1

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(b) What is the true bearing of point A from point B?   1

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(c) Find the area of the park? Answer correct to one decimal place.   2

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Marks

Question 40 continued.

(d)   Find the length of *AC*? Answer correct to one decimal place.   **2**

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Marks

Question 41 (3 marks)

At a school carnival, the final heights jumped by year 12 competitors were found to be normally distributed with a mean of 5.54 metres and a standard deviation of 3 metres.

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The standard normal distribution table is shown. The values in the table represent the area under the normal curve to the left of the z-score.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.50000	0.50399	0.50798	0.51197	0.51595	0.51994	0.52392	0.52790	0.53188	0.53586
0.1	0.53983	0.54380	0.54776	0.55172	0.55567	0.55966	0.56360	0.56749	0.57142	0.57535
0.2	0.57926	0.58317	0.58706	0.59095	0.59483	0.59871	0.60257	0.60642	0.61026	0.61409
0.3	0.61791	0.62172	0.62552	0.62930	0.63307	0.63683	0.64058	0.64431	0.64803	0.65173
0.4	0.65542	0.65910	0.66276	0.66640	0.67003	0.67364	0.67724	0.68082	0.68439	0.68793
0.5	0.69146	0.69497	0.69847	0.70194	0.70540	0.70884	0.71126	0.71566	0.71904	0.72240
0.6	0.72575	0.72907	0.73237	0.73565	0.73891	0.74215	0.74537	0.74857	0.75175	0.75490
0.7	0.75804	0.76115	0.76424	0.76730	0.77035	0.77337	0.77637	0.77935	0.78230	0.78524
0.8	0.78814	0.79103	0.79389	0.79673	0.79955	0.80234	0.80511	0.80785	0.81057	0.81327
0.9	0.81594	0.81859	0.82121	0.82381	0.82639	0.82894	0.83147	0.83398	0.83646	0.83891
1.0	0.84134	0.84375	0.84614	0.84849	0.85083	0.85314	0.85543	0.85769	0.85993	0.86214

Using standardised scores and the standard normal distribution table, find the probability that a randomly chosen competitor achieves height between 5.99 and 6.59 metres. Give your answer correct to three decimal places.

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End of Paper

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.

correct

A ✖   B ✖   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 ⚪

Marking Guidelines

Section I

Q		outcome
1	$\dfrac{484}{4} \times 7 = 847$ C	MS2-12-10
2	9 A	MS2-12-2
3	12 D	MS2-12-8
4	Weak Positive B	MS2-12-7
5	$x = \dfrac{29 \sin 61°}{\sin 79°}$ C	MS2-12-4
6	$0.3 \times 250 = 75$ D	MS2-12-2
7	$\sqrt{20^2 + 20^2} + (20 \times 4) = 108$ B	MS2-12-4
8	$100\% - 68\% = 32\%$ B	MS2-12-7
9	$32000 \times 0.07 \times 5 + 32000 = \$43200$ C	MS2-12-5
10	Hyperbola C	MS2-12-6
11	S32°E C	MS2-12-4
12	$14\,500 \times 1.025^4$ D	MS2-12-5
13	$1860 \div 100 \times 7.6 \times 1.85 = 261.52$ C	MS2-12-3
14	$\dfrac{0.085}{1.37} \times 100 = 6.2\%$ A	MS2-12- 5
15	$\dfrac{4}{3} \times \pi \times 5^3 \times \dfrac{1}{2} = 261.8 \text{ m}^3$ A	MS2-12- 4

Section II

16	$$x + \frac{10 + x}{3} = 18$$ $$3x + 10 + x = 54$$ $$x = 11$$	MS2-12-1 **2 marks:** provides correct answer showing appropriate mathematical working for solving equations. **1 mark:** correctly creates a common fraction
17	The shortest path is B– G- A – F $$3 + 1 + 3 = 7 \text{ min}$$ The shortest average walk time is 7 minutes.	MS2-12-8 **2 marks:** Correct answer with working. **1 mark:** Finds the shortest path or shows some understanding.
18	The time difference between the cities is $9.5 - 2 = 7.5$ hours. Adelaide is ahead of Cape town. Go back 7.5 hours from 10:00 am then add 12 hours flying time. 10 am – 7.5 hour +12 hours = 2:30 pm. It is 2:30 pm on the same day	MS2-12-3 **2 marks:** Correct answer with working. **1 mark:** Find correct time difference
19	7th June to 30th June is 24 days. $$FV = PV(1 + r)^n$$ $$= 125(1 + 0.00039)^{24}$$ $$= 126.17526 \dots$$ $$\approx \$126.18$$ $$I = FV - PV$$ $$= 126.18 - 125$$ $$= \$1.18$$ Interest charged is $1.18	MS2-12-5 **3 marks:** Correct answer with working. **2 marks:** Correct answer for FV. **1 mark:** Finds the number of days or uses the compound interest formula.
20	$$C = 2 \times \pi \times r$$ $$2 \times \pi \times r = 23.6$$ $$= 3.7560\dots\dots$$ $$= 3.8 \, cm$$	MS2-12-4 **2 marks:** Correct answer with working. **1 mark:** Shows understanding by using the correct formula.

21	a	Hazel's score is 2 standard deviation below the mean.	MS2-12-10 **1 mark**: Correct answer
	b	$$z = \frac{x - \mu}{\sigma}$$ $$-2 = \frac{x - 86}{4}$$ $$x - 86 = -8$$ $$x = 78$$ \Hanna's actual mark was 78.	MS2-12-7 **2 marks**: Correct answer with working. **1 mark**: Uses the z-score formula with at least one correct value.
22	a	Gradient is 12 therefore 12 L/min	MS2-12-1 **1 mark**: Correct answer
	b	Y-intercept is 360 therefor initial volume is 360 litres. or find V when t=0	MS2-12-1 **1 mark**: Correct answer
	c	$360 - 12t = 180$ $12t = 180$ $t = 15$ Therefore in 15 minutes.	MS2-12-1 **2 marks**: Correct answer with working. **1 mark**: Shows understanding that $V = 180$
23		$(18.43 - 11.52) \times 62 \div 4.184 = 102.3948 \ldots$ ≈ 102	MS2-12-3 **2 marks**: Correct answer with working. **1 mark**: Correctly calculates kj used to cycle at least at one speed or shows understanding
24		$\tan 2^o 17' = \frac{h}{25}$, where h is the height of the triangular shape. $h = 25 \times \tan 2^o 17'$ $= 0.996819 \ldots \ldots \ldots$ $d = 1.3 + 0.996819 \ldots$ $d \approx 2.3 \, m$ The depth is 2.3 m	MS2-12-4 **2 marks**: Provides correct solution **1 mark**: Uses the correct trigonometric ratio, or equivalent merit
25	a	$h = 15$ m	MS2-12-6 **1 mark**: Correct answer

b	If $t < 0$ or $t > 4$ the value of h becomes negative which is not possible given the ball cannot go below ground level.	MS2-12-10 **1 mark**: Correct answer	

26		MS2-12-8 **2 marks**: Draws the weighted network diagram correctly with all vertices and edges labelled correctly **1 mark**: Draws the weighted network diagram with some error

27	**a**	Using the calculator $$r = 0.40991611\ldots$$ $$\approx 0.4099$$
		MS2-12-7 **1 mark**: Correct answer
	b	Disagree. Pearson's correlation of 0.4099 indicates a weak positive correlation between time and television. In addition, Jack's investigation uses a small data sample.
		MS2-12-10 **1 mark**: Correct answer
28	**a**	Let the income for producing x bubble makers be $\$I$ $$I = 15n$$
		MS2-12-6 **1 mark**: Correct answer
	b	Let the costs for producing n bubble makers be $\$C$ $$C = 6.25n + 70$$
		MS2-12-6 **1 mark**: Correct answer
	c	Break-even point (income equals costs) $$15n = 6.25n + 70$$ $$8.75n = 70$$ $$n = \frac{70}{8.75}$$ $$= 8$$ \Ava needs to sell 8 bracelets to make a profit.
		MS2-12-6 **2 marks**: Correct answer with working **1 mark**: Equates income to costs.
29	**a**	$$r = 0.072 \div 4$$ $$= 0.018$$
		MS2-12-5 **1 mark**: correct answer, accept 1.8%

b	$5000(1 + 0.018) + 200 = 5290$ $5290(1 + 0.018) + 200 = 5585.22$ Therefore \$5585.22	MS2-12-5 **2 marks**: Correct answer with working **1 mark**: Correct answer after first deposit.	
30	Taxable income $= 94\,000 - 1900 - 470$ $= 91\,630$ Income Tax $= 5092 + 0.325 \times (91630 - 45000)$ $= 20246.75$ Medicare Levy $= 0.02 \times 91630$ $= 1832.60$ Total Tax Payable $= 20246.75 + 1832.60$ $= 22079.35$	MS2-12-5 **3 marks**: Correct answer with working **2 marks**: Correctly calculate taxable income and income tax with working **1 mark**: Only calculates taxable income or equivalent merit	
31	**a**	Below Q3 therefore 75%	MS2-12-10
	b	Class A $IQR = Q_3 - Q_1$ $= 28.0 - 23.5$ $= 4.5$ Range $= 28.5 - 22.5$ $= 6$ Class B $IQR = Q_3 - Q_1$ $= 27.0 - 25$ $= 2$ Range $= 28.0 - 24.5$ $= 3.5$	MS2-12-2 **2 marks**: Correct answers with working **1 mark**: shows some understanding
	c	The medians are equal and therefore it is reasonable for the student to assert that there appears to be no difference in the volume results obtained from both classes. (and/or) However, the results of Class A indicate a larger interquartile range and range. This indicates the results of class A are less consistent than class B.	MS2-12-10 **2 marks**: Correct answer. **1 mark**: Shows some understanding.

32	**a**	Minimum spanning tree 	MS2-12-8 **2 marks**: Correct answer. **1 mark**: Shows some understanding.
	b	$$\text{Length} = 4 + 5 + 3 + 4 + 3 + 1$$ $$= 20 \text{ km}$$	MS2-12-8 **1 mark**: Correct answer.
33	**a**	To calculate stamp duty, the purchase price must be rounded up to the nearest \$100. Purchase price $55\,950 = \$56\,000$ $\qquad 1300 + 6 \times 56\,000 \div 100 = 4660$ Therefore, stamp duty is \$4660	MS2-12-5 **2 marks**: Correct solution with working **1 mark**: Makes some progress with ONE error
	b	$$S = Vo(1 - r)^n$$ $$= 55\,950(1 - 0.18)^5$$ $$= 20\,742.89423 \dots$$ $$\approx \$20\,742.89$$	MS2-12-5 **2 marks**: Correct solution with working **1 mark**: Shows substitution into the declining-balance formula with ONE error
34	**a**	$$D = \frac{1.5 \times 72}{1.5 + 12}$$ $$= 8$$ Therefore 8 mg	MS2-12-1 **2 marks**: Correct answer with working **1 mark**: Uses formula correctly with one error in substitution
	b	$$\frac{3 \times A}{3 + 12} = 5$$ $$\frac{3A}{15} = 5$$ $$3A = 75$$ $$A = 25$$	MS2-12-1 **2 marks**: Correct answer with working **1 mark**: Uses formula correctly with one error

35	a		MS2-12-2 **2 marks**: Correct answer **1 mark**: Correct miss for Olivia or miss for Henry or one error
	b	$P(HH) = 0.8 \times 0.6$ $= 0.48$	MS2-12-2 **1 mark**: Correct answer.
	c	$P(HM) + P(MH) = (0.8 \times 0.4) + (0.2 \times 0.6)$ $= 0.44$	MS2-12-2 **2 marks**: Correct answer with working **1 mark**: Shows some understanding one combination
36	a	$V \approx \left[\dfrac{20}{2}(30 + 40) + \dfrac{20}{2}(40 + 42)\right]$ $= 1520 \text{ m}^2$	MS2-12-4 **2 marks**: Correct answer with working **1 mark**: Shows some understanding using the correct formula.
	b	Capacity $= 1520 \times 0.12 \times 1000$ $= 182\,400\,L$	MS2-12-3 **2 marks** Correct answer with working **1 mark**: Shows some understanding
37	a	When $d = 20$ $c = 150(1.09)^{20}$ $= 840.6616\ldots..$ $\approx\ 841$ cases	MS2-12-6 **1 mark**: Correct solution with working

	b		MS2-12-6 **2 marks**: Draws the curve with all points plotted correctly **1 mark**: Draws the curve with no more than TWO error
	c	 See graph above Approximately 19 days	MS2-12-10 **1 mark**: Correct solution
38	a	Intersection value is 4.1836 (3% and 4 years) $$FV = 4.1836 \times 14\,800$$ $$= \$61917.28$$	MS2-12-5 **2 marks**: Correct answer with working **1 mark**: Finds the intersection value or shows some understanding
	b	Intersection value is 3.0604 (2% and 3 years) Let x be the amount to be invested $$FV = 3.0604 \times x$$ $$180\,000 = 3.0604 \times x$$ $$x = \frac{180\,000}{3.0604}$$ $$= \$58815.84107\ldots$$ $$\approx \$58816$$ $58816 is invested every year.	MS2-12-5 **2 marks**: Correct answer. **1 mark**: Finds the intersection value or shows some understanding

39	a	$A = 16747.2$ $B = -1527.2$ $\therefore v = 16747.2 - 1527.2a$	MS2-12-7 **1 mark**: Correct answer
	b	y-intercept is 16747.20 (or 18900 from table) The value of a new Mazda	MS2-12-7 **2 marks**: Correct answer **1 mark**: stating y intercept
	c	$16747.2 - 1527.2a = 0$ $a = \dfrac{16747.20}{1527.20} = 10.9659\ldots$ $= 11$ years	MS2-12-7 **2 marks**: Correct answer **1 mark**: Substituting $v = 0$ in equation
40	a	$\theta = 360 - (180 - 40) - 125$ $= 95°$	MS2-12-3 **1 mark**: Correct answer.
	b	Bearing $= 125° + 95°$ $= 220°$ Bearing of *A* from *B is 220°*.	MS2-12-3 **1 mark**: Correct answer.
	c	$A = \dfrac{1}{2}ab\sin C$ $= \dfrac{1}{2} \times 50 \times 80 \times \sin 95°$ $= 1992.389\ldots$ $\approx 1992.4 \text{ m}^2$ \Area of the garden is 1992.4 m².	MS2-12-4 **2 marks**: Correct answer with working. **1 mark**: Uses the area of a triangle formula with one correct value.
	d	$a^2 = b^2 + c^2 - 2bc\cos A$ $AC^2 = 50^2 + 80^2 - 2 \times 50 \times 80 \times \cos 95°$ $AC = 97.6553\ldots$ $\approx 97.7 \text{ m}$ \Length of AC is 97.7 m.	MS2-12-4 **2 marks**: Correct answer with working **1 mark**: Uses the cosine rule with 1 correct value.
41		$z = \dfrac{x - \mu}{\sigma}$ For $x = 5.99$ $z = \dfrac{5.99 - 5.54}{3}$ $= 0.15$ For $x = 6.59$	MS2-12-7 **3 marks**: Correct solution with working **2 marks**: Shows evidence (recognising z-scores) AND subtraction of probabilities from the

	$$z = \frac{6.59 - 5.54}{3}$$ $$= 0.35$$ $$P(0.15 < z < 0.35) = P(z < 0.35) - P(z < 0.15)$$ $$= 0.63683 - 0.55966$$ $$= 0.07717$$ $$\approx 0.077$$	table with some error **1 mark**: Shows evidence (recognising z-scores) AND makes some progress