Student Name: _____

Teacher Name: _____

Hurlstone Agricultural High School

2016 HSC Trial Examination

Mathematics General 2

General Instructions

- Reading Time – 5 minutes
- Working Time – 2.5 hours
- Write using BLUE or BLACK pen
- In Questions 26 – 30 ALL necessary working should be shown for FULL marks to be awarded
- Board-approved calculators may be used
- A formulae and data sheet is provided at the back of this paper

Total marks – 100

Section I

25 marks

- Attempt questions 1 – 25
- Allow about 30 minutes for this section

Section II

75 marks

- Attempt questions 26 – 30
- Allow about 2 hours for this section

Section I

25 marks
Attempt Questions 1 - 25
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Use the Multiple Choice Answer Sheet for Questions 1 – 25.

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1 Zoe is a carpenter. She went to her local timber supplier for some timber. She received a 20% discount for being a regular customer and then an extra 10% discount due to a discount sale. What is the total percentage discount she gets when buying the timber?

A. 15%

B. 25%

C. 28%

D. 30%

---

2 This table shows the number of plants purchased by each customer at Garden Nursery over seven days.

Number of plants purchased	Frequency
1	8
2	19
3	x
4	11
5	4

The mean number of plants sold over the week was 2.68 plants. How many customers purchased three plants during the week?

A. 3

B. 5

C. 8

D. 12

3 Amy has a bag containing several red marbles and ten green marbles. If the probability of choosing a red marble is $\frac{1}{3}$, how many red marbles does she have?

A. 3 **B.** 5

C. 8 **D.** 12

---

4 In a particular week, Zara works the number of hours shown in the table.

Hours worked			
Employee	Normal hours	Hours × 1.5	Gross wage
Zara Harrison	29	8	$697

According to the information in the table, what was the hourly rate of pay for Zara?

A. $17.00 **B.** $18.84

C. $21.12 **D.** $24.03

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5 A survey was conducted asking people whether they use sunscreen. This table shows the results of the survey.

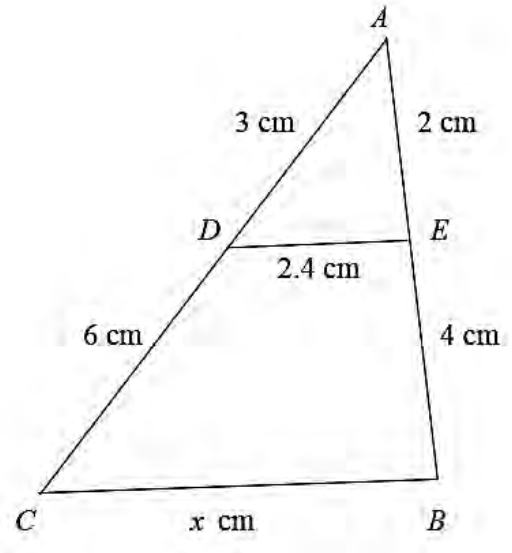
	Male	Female
Use sunscreen	1120	680
Do not use sunscreen	3910	2040

What is the probability that a person chosen at random uses sunscreen, correct to 2 decimal places?

A. 0.23 **B.** 0.29

C. 0.30 **D.** 0.33

6 ΔABC and ΔAED are similar triangles.
$AE = 2$ cm, $AD = 3$ cm, $BE = 4$ cm, $CD = 6$ cm and $DE = 2.4$ cm.



NOT TO SCALE

What is the length CB?

A. 4.8 cm

B. 5 cm

C. 6 cm

D. 7.2 cm

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7 Solve the equation $\frac{1}{x} = \frac{1}{2} + \frac{1}{4}$.

A. $\frac{1}{8}$

B. $\frac{1}{6}$

C. $\frac{3}{4}$

D. $\frac{4}{3}$

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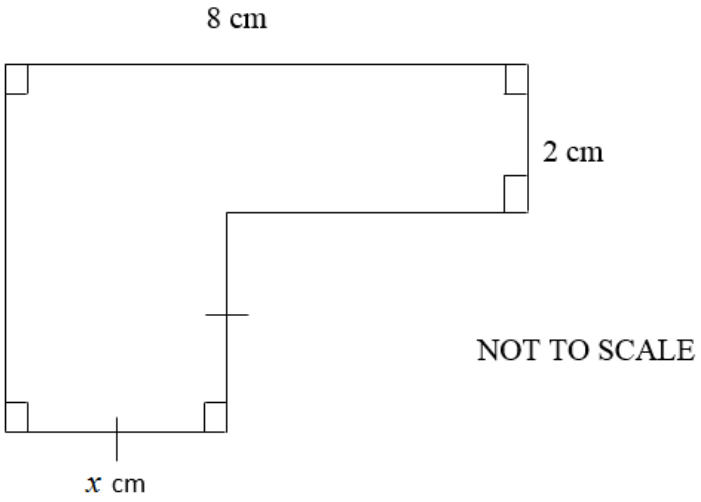
8 Find the value of x, given that the perimeter of this shape is 26 cm.



A. 2

B. 3

C. 5

D. 7

---

9 Cameron invested some money 2 years ago at a simple interest rate of 6% p.a. He now has \$3 360 in his account. How much did he invest 2 years ago?

A. **\$** 2400

B. \$ 3000

C. \$ 2800

D. \$ 3100

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10 Shanghai, China has co-ordinates (31ºN, 121ºE). William travels 36º south and 12º west of Shanghai. What are his new co-ordinates?

A. $(5°\text{S}, 109°\text{E})$

B. $(5°\text{S}, 133°\text{E})$

C. $(67°\text{N}, 109°\text{E})$

D. $(67°\text{N}, 133°\text{E})$

11 The speed at which Benji drives to school will affect his driving time.
Which of the following best describes this relationship between speed and time taken?

A. Negative correlation

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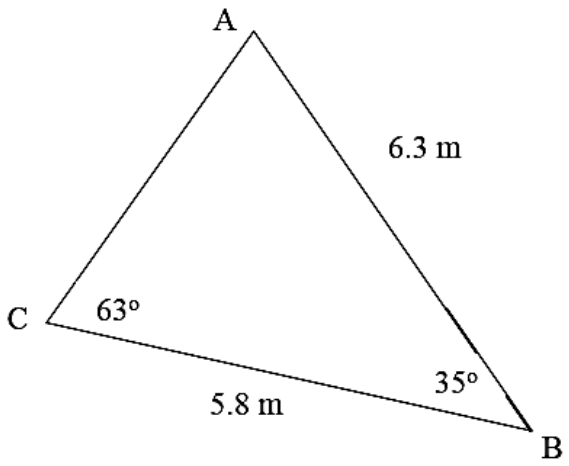

Use the diagram above to choose the correct equation.

A. $\sin 63° = \dfrac{5.8 \times \sin 82°}{6.3}$

B. $\sin 35° = \dfrac{6.3 \times \sin 63°}{5.8}$

C. $\sin 63° = \dfrac{6.3 \times \sin 82°}{5.8}$

D. $\sin 35° = \dfrac{5.8 \times \sin 63°}{6.3}$

---

13 The distance from the Earth to the Sun is 149 574 000 km, correct to the nearest 1000 km. Calculate the percentage error of this measurement, correct to two significant figures.

A. 0.00033%

B. 0.00067%

C. 0.033%

D. 0.067%

14 Harley sat a mathematics exam and scored a z - score of +1. Which of the following statements is correct?

A. She scored one more mark than the mean

B. Her mark was one standard deviation above the mean

C. She scored in the top 10% of marks

D. She only scored one mark in the exam

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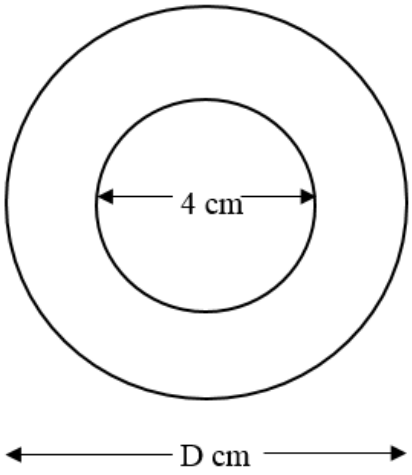
15 The diagram below shows two concentric circles. The larger circle has diameter D cm, and the smaller circle has diameter 4 cm.



If the area of the annulus formed is 32π cm^2, find the value of D.

A. 6

B. 6.9

C. 12

D. 13.9

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16 A \$7000 diamond ring appreciates in value at 2.5% per half-year. Calculate its value to the nearest dollar in 20 years.

A. \$ 11 470

B. \$ 18 573

C. \$ 18 795

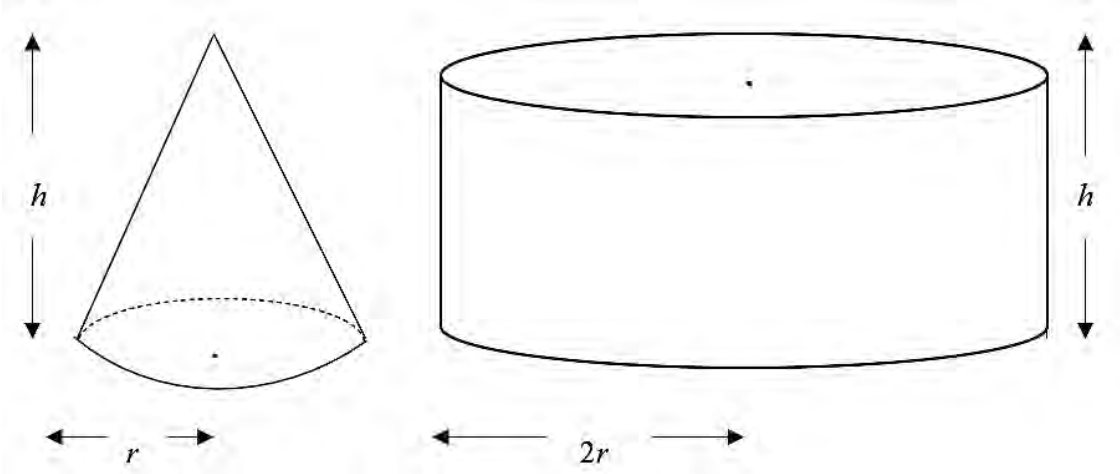
D. \$ 49 280

17 A coin is biased so it shows heads to tails in the ratio 2:3 when it is tossed. Find the number of heads expected if the coin is tossed 1000 times.

A. 200 **B.** 400

C. 600 **D.** 667

18 In the diagrams below, V_{cone} refers to the volume of the cone, while $V_{cylinder}$ refers to the volume of the cylinder. The cone and the cylinder have the same height, h. The radius of the cylinder is twice the length of the radius (r) of the cone.



What is the value of n , given that $V_{cylinder} = nV_{cone}$

A. 3 **B.** 6

C. 12 **D.** 24

19 For the reservoir shown below, which of the following is the correct approximation for volume using one application of Simpson s rule?

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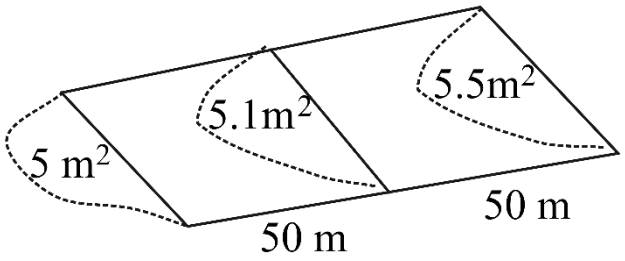

A. 108 m^3

B. 260 m^3

C. 515 m^3

D. 772.5 m^3

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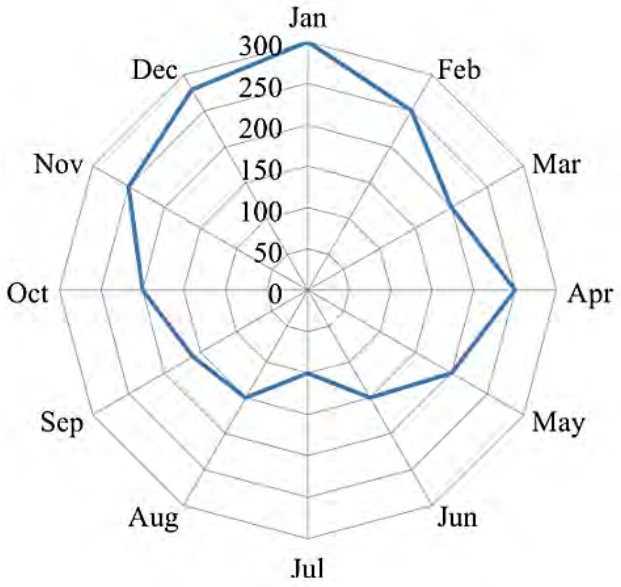
20 The radar chart shows the number of guests staying at a resort each month.



How many months had fewer guests than in May?

A. 4 months

B. 5 months

C. 6 months

D. 7 months

21 A mobile phone plan has a monthly charge of \$49 on a 24-month contract. The call rate is \$0.87 per 60-second block plus there is a \$0.20 flagfall. Jack makes a five-minute call. How much does the call cost him?

A. \$1.87 **B.** \$4.35

C. \$4.55 **D.** \$53.55

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22 Five people stand in line for a group photo. How many arrangements are possible?

A. 5 **B.** 33

C. 120 **D.** 720

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23 Ryan has just received his credit card statement. He has been charged a flat interest rate of 18% per annum on his outstanding balance of \$530, which was outstanding for 30 days. Ryan has noticed errors on his credit card statements before and wishes to check the amount of interest he should have been charged. Which calculation should he use?

A. $\$530 \times \frac{0.05}{100} \times 30$ **B.** $\$530 \times \frac{18}{100} \times 30$

C. $\$530 \times \frac{0.05}{365} \times 30$ **D.** $\$530 \times \frac{18}{365} \times 30$

24 Fergus plays a game involving the tossing of two coins. The rules of the game are

- Two heads wins $25
- One head and one tail wins $10
- Two tails wins nothing

What is the financial expectation for this game?

A. $6.25 **B.** $11.25

C. $20.00 **D.** $35.00

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25 The table below shows the monthly repayment of $1000 on a reducing balance loan.

Term	6.00%	6.25%	6.50%	6.75%
25 years	$6.58	$6.97	$7.37	$7.77

What is the monthly repayment on $365 000 at 6.75% for 25 years?

A. $2401.70 **B.** $2544.05

C. $2690.05 **D.** $2836.05

End of Section I

Section II

75 marks
Attempt Questions 26 - 30
Allow about 2 hours for this section

Answer the questions in the spaces provided.
ALL necessary working should be shown for each question for **FULL MARKS** to be awarded.

QUESTION 26: (15 marks) **Marks**

(a) The table below gives the income tax rates for Australian citizens.

Taxable income	Tax on this income
\$0 - \$18 200	Nil
\$18 201 - \$37 000	19c for each \$1 over \$18 200
\$37 001 - \$80 000	\$3572 plus 32.5c for each \$1 over \$37 000
\$80 001 - \$180 000	\$17 547 plus 37c for each \$1 over \$80 000
\$180 001 and over	\$54 547 plus 45c for each \$1 over \$180 000

(i) Daniella's taxable income was \$59 320 last year. Calculate the amount of income tax that Daniella should pay. **2**

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Question 26 continues on page 13

(ii) James has to pay \$1 805 in income tax. Calculate James's taxable income for last year, correct to the nearest dollar. **2**

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(b) The cost, \$$C$, of manufacturing, n, tennis balls is given by the formula $C = 0.5n + 70$. The revenue, \$$R$, earned from selling n tennis balls is given by $R = 0.75n$.

(i) Use simultaneous equations to find how many tennis balls need to be sold to break even. **2**

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Question 26 continues on page 14

(ii) Calculate how much profit or loss the company will make if they manufacture 200 tennis balls. **2**

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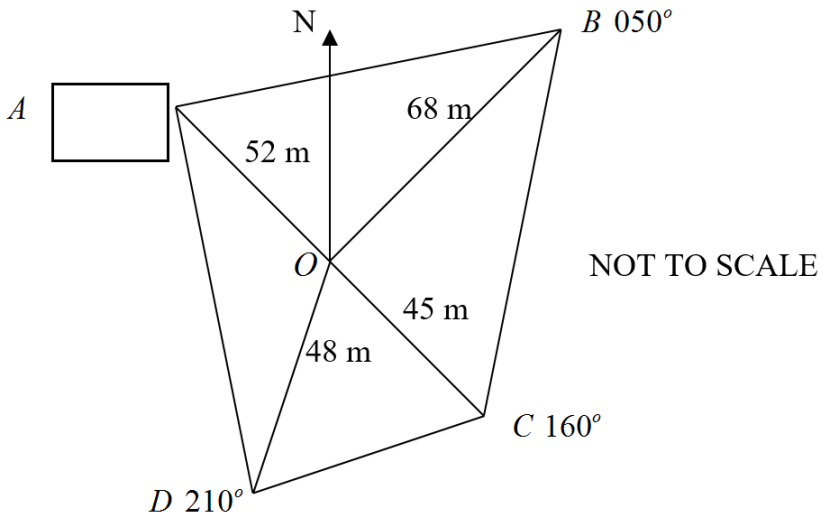
(c) The diagram below shows the result of a radial survey that David did of a field.



(i) Show that $\angle DOC = 50^o$ **1**

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Question 26 continues on page 15

(ii) Find the length of side DC, correct to 1 decimal place. **2**

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(iii) Given that the area of ΔAOD is 1205 m^2, find the size of $\angle AOD$, correct to the nearest degree, given that $\angle AOD$ is obtuse. **3**

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(iv) Hence write down the bearing of point *A* from *O*. **1**

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End of Question 26

QUESTION 27: (15 marks) **Marks**

(a) The area of a trapezium is given by the formula $A = \frac{1}{2}(x + y)h$, where x and y are the lengths of the parallel sides and h is the height.
Rearrange the formula to make x the subject. **3**

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(b) Packets of rice are labelled as weighing 500 g. When the weights were checked, they were found to be normally distributed with a mean of 500 g and a standard deviation of 2 g.

(i) What percentage of packets weighed less than the labelled weight? **1**

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(ii) If 1000 packets were checked, how many would be expected to weigh between 496 g and 502 g? **2**

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(iii) The z - score for one packet was found to be -2.5 . Find the weight of this packet of rice. **1**

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Question 27 continues on page 17

(c) A sick child had to take some medicine containing a drug with a concentration of 5 mg/mL. Calculate how many litres of medicine would be made from 10 g of the drug. **2**

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(d) Kameron had been at a party before he drove home. He weighs 85 kg and he drank 5 standard drinks over 4 hours. Given that a person should not drive with blood alcohol content of 0.05 or more, find if Kameron's BAC was low enough for him to be driving. **2**

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(e) Calculate the shortest distance between Beijing, China (40^o N, 116^o E) and Perth, Australia (32^o S, 116^o E), given that the Earth has a radius of 6400km.
Give your answer correct to 2 significant figures. **2**

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(f) A scientist tags 600 birds in a forest. The next week he catches 800 birds and notices that 200 have been tagged. Estimate how many birds are in the forest. **2**

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End of Question 27

QUESTION 28: (15 marks) **Marks**

(a) Ten adult females measured their height and the longest step that they could take. The results are recorded in the table below.

Height (cm)	151	153	154	157	160	163	164	168	170	172
Step (cm)	88	87	89	97	99	94	95	96	102	103

(i) Calculate the correlation coefficient, r, correct to 2 decimal places. **1**

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(ii) Complete the table below by calculating the mean and standard deviation. Answer to two decimal places **2**

	Mean	**Standard Deviation**
Height	$\bar{x} = 161.20$	$\sigma_x =$
Step	$\bar{y} =$	$\sigma_y = 5.33$

(iii) Using the values from the table in part (ii) show that the equation of the least-squares line of best fit is

$$y = 0.64x - 8.17 \ .$$ **2**

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Question 28 continues on page 19

(b) Ethan, Nic, Angad, Anish and David decide to play several singles matches of tennis together.

(i) Find the probability that David plays in the first game. **1**

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(ii) The probability that Colin will win any game is 0.6. Find the probability that Colin loses two games. **1**

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(iii) If n is the number of games that Colin plays, find an algebraic expression for the probability that Colin loses n games. **1**

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(c) Eric takes out a $14,000 loan over 36 months. The repayment rate is $485.38 per month.

(i) How much will Eric pay back altogether? **1**

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(ii) What is the equivalent flat rate of interest for the loan?
Answer correct to two decimal places. **2**

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(d) In how many ways can you answer the first six questions on a True/False test? **1**

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Question 28 continues on page 20

Question 28 (continued)

(e) Solve these equations simultaneously. **3**

$$5x+2y=16$$
$$x-y=-1$$

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End of Question 28

QUESTION 29: (15 marks) **Marks**

(a) The table below shows the present value of a $1 annuity.

Present value of $1						
Period	2%	4%	6%	8%	10%	12%
1	0.98	0.96	0.94	0.93	0.91	0.89
2	1.94	1.89	1.83	1.78	1.74	1.69
3	2.88	2.78	2.67	2.58	2.49	2.40
4	3.81	3.63	3.47	3.31	3.17	3.04

(i) What would be the present value of a $7 500 per year annuity at 10% per annum for 3 years, with interest compounding yearly? **1**

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(ii) What is the value of an annuity that would provide a present value of $27,633 after 2 years at 6% per annum compound interest? **1**

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(iii) An annuity of $2000 each six months is invested at 12% per annum, compounded biannually for 2 years. What is the present value of the annuity? **2**

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Question 29 continues on page 22

Question 29 (continued)

(b) Imogen flew from Sydney $(34°S, 150°E)$ on Wednesday at 9 a.m. on a 19 hour flight to Prague $(50°N, 15°E)$. When did Imogen arrive in Prague if it was:

(i) daylight saving time in Prague? **2**

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(ii) daylight saving time in Sydney? **2**

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(c) In the trial History exam, the mean mark was 75% and the standard deviation was 6.
If Hayley revived a z-score of 2.5 in this History exam, find her percentage mark. **1**

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(d) Condamine is 100 km on a bearing of 235° from Dubbo. Miles is 120 km from Condamine and due west of Dubbo.
Find the bearing of Condamine from Miles to the nearest degree. **2**

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Question 29 continues on page 23

(e) The normally distributed data below represents the assessment results in the recent examinations for English and Business Studies:

Subject	Mean	Standard Deviation
English	72%	7
Business Studies	83%	4

What mark in English would be equivalent to a mark of 91% in Business Studies? **2**

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(f) Dustin's tablet has a download speed of 125 kilobits per second. How many minutes would it take him to download 12 songs with an average size of 2.5 megabytes? (to the nearest half minute) **2**

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End of Question 29

QUESTION 30: (15 marks) **Marks**

(a) Liza buys a car which has a market value of $60 000 before on-road costs.
Stamp duty on the car is calculated at these rates:

- 3% of the market value up to and including $45,000
- 5% of the market value over $45,000.

(i) Calculate the stamp duty payable on the purchase of the car. **1**

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(ii) The car depreciates at a rate of 4.5% pa.
What is the value of the car 3 years after Liza buys it? **1**

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(b) A micro drip IV pump which delivers 60 drops/mL is used to administer medications and fluids. It requires a drip rate in drops per minute (dpm) to be set.
The formula below is used to calculate the drip rate.

$$\text{Drip rate} = \frac{\text{volume(mL)} \times \text{drops/mL}}{\text{time in minutes}}$$

(i) A patient requires 1200 mL of fluid to be given intravenously over 10 hours.
Calculate the drip rate? **1**

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(ii) Jason is working on a ward and notices the drip rate on a patient's micro drip IV is set to 75 dpm. The IV has a volume of 900 mL. How long should this IV run? **2**

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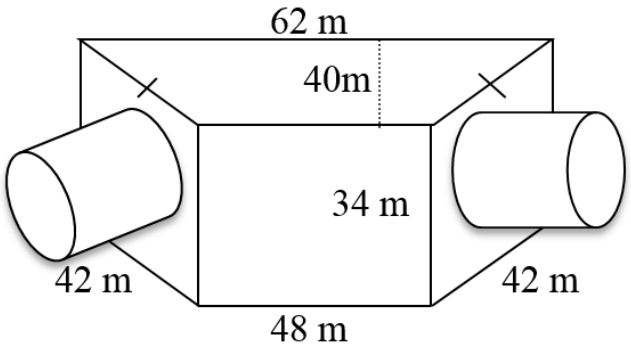
Question 30 continues on page 25

(c) The following solid has two identical closed cylinders attached to a trapezoidal prism.
Each cylinder is 26 m long and diameter of 18 m.



(i) Find the surface area of the solid, including the bottom, correct to the nearest m^2. **3**

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(ii) If a 10–litre can of paint covers 160 m^2, find the number of 10-litre cans of paint needed to paint the outside of the solid with one coat. **1**

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(iii) Paint costs $145.50 per 10 litre can. Find the cost of painting the object. **1**

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Question 30 continues on page 26

Question 30 (continued)

(d) Emma has 8 different paintings, but has space to hang only 3 of them.
How many different groups of 3 paintings can Emma select? **1**

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(e) Simplify $\dfrac{9m^2n^4 \times 4mn^2}{\left(3mn^3\right)^2}$. **2**

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(f) A class compared their assessment results to their foot length. The correlation coefficient for these quantities was 0.15.
What is the meaning of this correlation? **1**

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(g) Mitch owns a credit card that has no annual fees and charges a flat rate of 19.75% p.a. interest on all purchases.
Find the interest charged on $1800 for 15 days. Answer correct to the nearest cent. **1**

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End of Question 30

Section I

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Allow about 30 minutes for this section

Use the Multiple Choice Answer Sheet for Questions 1 – 25.

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B. 25%

C. 28%

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C. 0.30 **D.** 0.33

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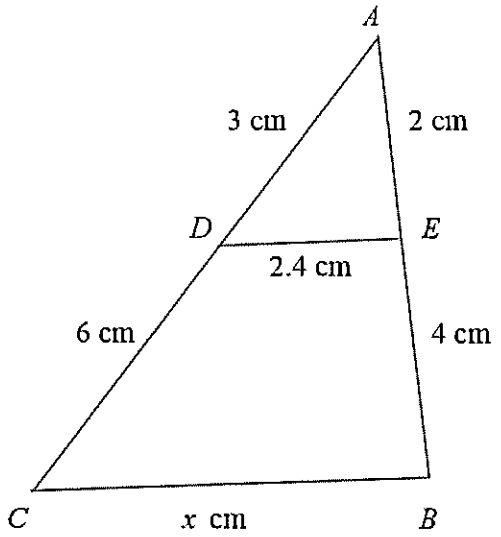
$AE = 2$ cm, $AD = 3$ cm, $BE = 4$ cm, $CD = 6$ cm and $DE = 2.4$ cm.



NOT TO SCALE

What is the length CB?

A. 4.8 cm

B. 5 cm

C. 6 cm

D. 7.2 cm

---

7 Solve the equation $\frac{1}{x} = \frac{1}{2} + \frac{1}{4}$.

A. $\frac{1}{8}$

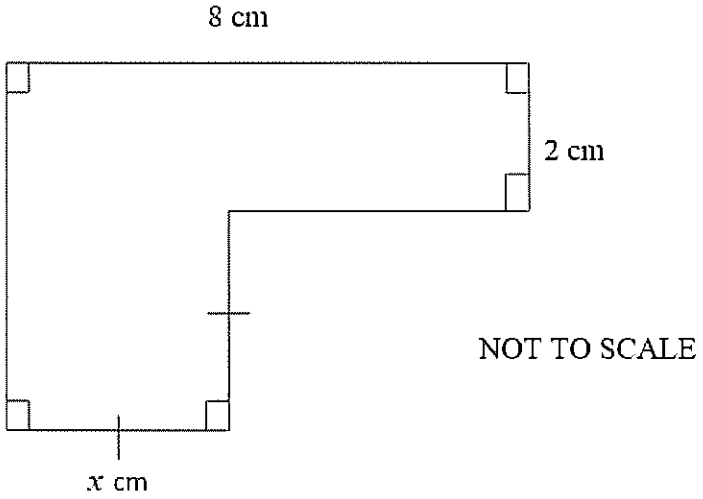
B. $\frac{1}{6}$

C. $\frac{3}{4}$

D. $\frac{4}{3}$

---

8 Find the value of x, given that the perimeter of this shape is 26 cm.



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B. 3

C. 5

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Which of the following best describes this relationship between speed and time taken?

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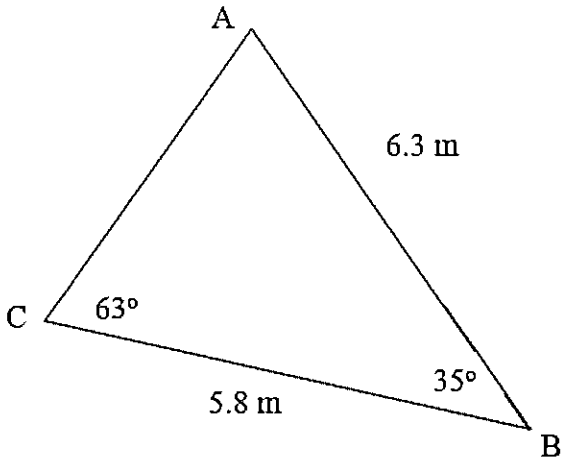
D. Regression line

12



NOT TO SCALE

Use the diagram above to choose the correct equation.

A. $\sin 63° = \dfrac{5.8 \times \sin 82°}{6.3}$

B. $\sin 35° = \dfrac{6.3 \times \sin 63°}{5.8}$

C. $\sin 63° = \dfrac{6.3 \times \sin 82°}{5.8}$

D. $\sin 35° = \dfrac{5.8 \times \sin 63°}{6.3}$

---

13 The distance from the Earth to the Sun is 149 574 000 km, correct to the nearest 1000 km. Calculate the percentage error of this measurement, correct to two significant figures.

A. 0.00033%

B. 0.00067%

C. 0.033%

D. 0.067%

14 Harley sat a mathematics exam and scored a z - score of +1. Which of the following statements is correct?

A. She scored one more mark than the mean

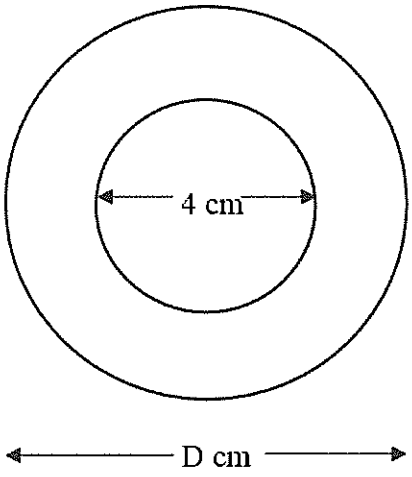
B. Her mark was one standard deviation above the mean

C. She scored in the top 10% of marks

D. She only scored one mark in the exam

---

15 The diagram below shows two concentric circles. The larger circle has diameter D cm, and the smaller circle has diameter 4 cm.



If the area of the annulus formed is 32π cm^2, find the value of D.

A. 6

B. 6.9

C. 12

D. 13.9

---

16 A \$7000 diamond ring appreciates in value at 2.5% per half-year. Calculate its value to the nearest dollar in 20 years.

A. \$ 11 470

B. \$ 18 573

C. \$ 18 795

D. \$ 49 280

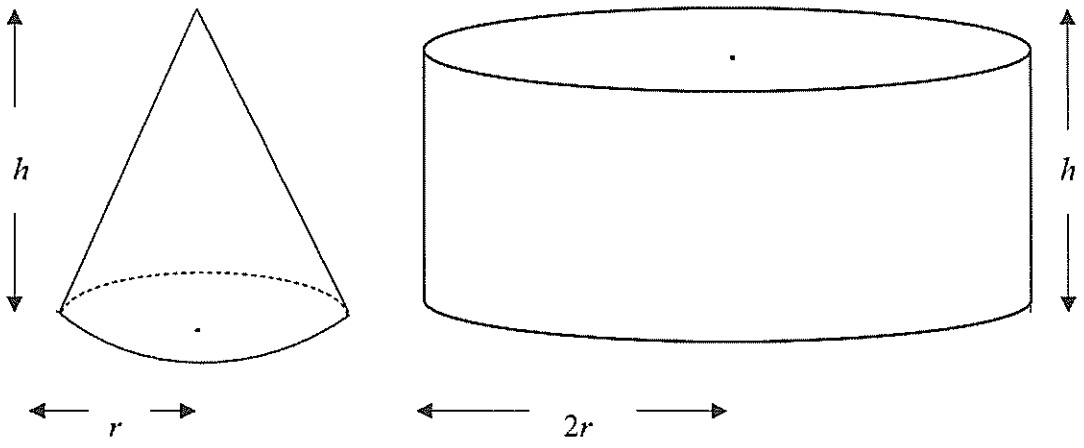
17 A coin is biased so it shows heads to tails in the ratio 2:3 when it is tossed. Find the number of heads expected if the coin is tossed 1000 times.

A. 200 **B.** 400

C. 600 **D.** 667

---

18 In the diagrams below, V_{cone} refers to the volume of the cone, while $V_{cylinder}$ refers to the volume of the cylinder. The cone and the cylinder have the same height, h. The radius of the cylinder is twice the length of the radius (r) of the cone.

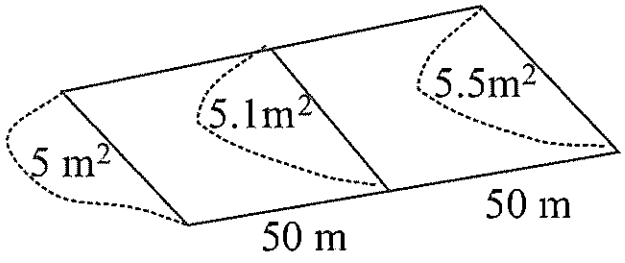


What is the value of n, given that $V_{cylinder} = nV_{cone}$

A. 3 **B.** 6

C. 12 **D.** 24

19 For the reservoir shown below, which of the following is the correct approximation for volume using one application of Simpson s rule?



A. 108 m^3

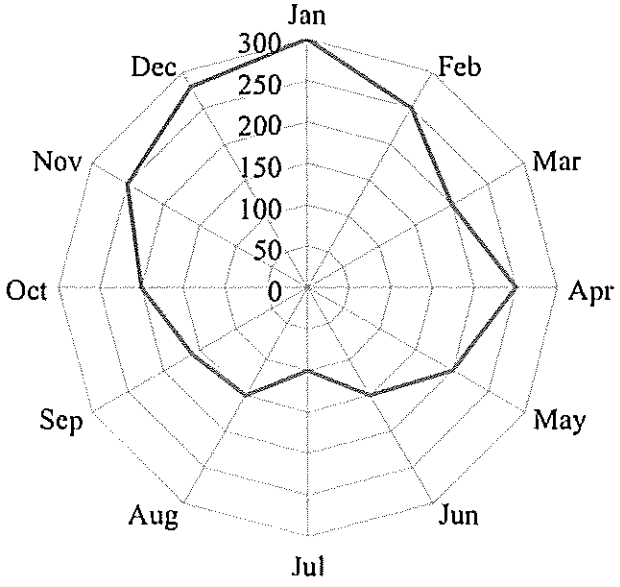
B. 260 m^3

C. 515 m^3

D. 772.5 m^3

---

20 The radar chart shows the number of guests staying at a resort each month.



How many months had fewer guests than in May?

A. 4 months

B. 5 months

C. 6 months

D. 7 months

21 A mobile phone plan has a monthly charge of \$49 on a 24-month contract. The call rate is \$0.87 per 60-second block plus there is a \$0.20 flagfall. Jack makes a five-minute call. How much does the call cost him?

A. \$1.87 **B.** \$4.35

C. \$4.55 **D.** \$53.55

---

22 Five people stand in line for a group photo. How many arrangements are possible?

A. 5 **B.** 33

C. 120 **D.** 720

---

23 Ryan has just received his credit card statement. He has been charged a flat interest rate of 18% per annum on his outstanding balance of \$530, which was outstanding for 30 days. Ryan has noticed errors on his credit card statements before and wishes to check the amount of interest he should have been charged. Which calculation should he use?

A. $\$530 \times \frac{0.05}{100} \times 30$ **B.** $\$530 \times \frac{18}{100} \times 30$

C. $\$530 \times \frac{0.05}{365} \times 30$ **D.** $\$530 \times \frac{18}{365} \times 30$

24 Fergus plays a game involving the tossing of two coins. The rules of the game are

- Two heads wins $25
- One head and one tail wins $10
- Two tails wins nothing

What is the financial expectation for this game?

A. $6.25 **B.** $11.25

C. $20.00 **D.** $35.00

---

25 The table below shows the monthly repayment of $1000 on a reducing balance loan.

Term	6.00%	6.25%	6.50%	6.75%
25 years	$6.58	$6.97	$7.37	$7.77

What is the monthly repayment on $365 000 at 6.75% for 25 years?

A. $2401.70 **B.** $2544.05

C. $2690.05 **D.** $2836.05

End of Section I

Section II

75 marks
Attempt Questions 26 - 30
Allow about 2 hours for this section

Answer the questions in the spaces provided.
ALL necessary working should be shown for each question for **FULL MARKS** to be awarded.

QUESTION 26: (15 marks) **Marks**

(a) The table below gives the income tax rates for Australian citizens.

Taxable income	Tax on this income
\$0 - \$18 200	Nil
\$18 201 - \$37 000	19c for each \$1 over \$18 200
\$37 001 - \$80 000	\$3572 plus 32.5c for each \$1 over \$37 000
\$80 001 - \$180 000	\$17 547 plus 37c for each \$1 over \$80 000
\$180 001 and over	\$54 547 plus 45c for each \$1 over \$180 000

(i) Daniella's taxable income was \$59 320 last year. Calculate the amount of income tax that Daniella should pay. **2**

Tax payable = \$3572 + {(59320 − 37000) × 0.325}

= \$10 826

Question 26 continues on page 13

(ii) James has to pay \$1 805 in income tax. Calculate James's taxable income for last year, correct to the nearest dollar. **2**

$1805 = 0.19(I - 18200)$

$I - 18200 = 9500$

$I = \$27\,700$

(b) The cost, \$$C$, of manufacturing, n, tennis balls is given by the formula $C = 0.5n + 70$. The revenue, \$$R$, earned from selling n tennis balls is given by $R = 0.75n$.

(i) Use simultaneous equations to find how many tennis balls need to be sold to break even. **2**

$0.5n + 70 = 0.75n$

$0.25n = 70$

$n = 280$

$\therefore$ There needs to be 280 balls to break even.

Question 26 continues on page 14

(ii) Calculate how much profit or loss the company will make if they manufacture 200 tennis balls. **2**

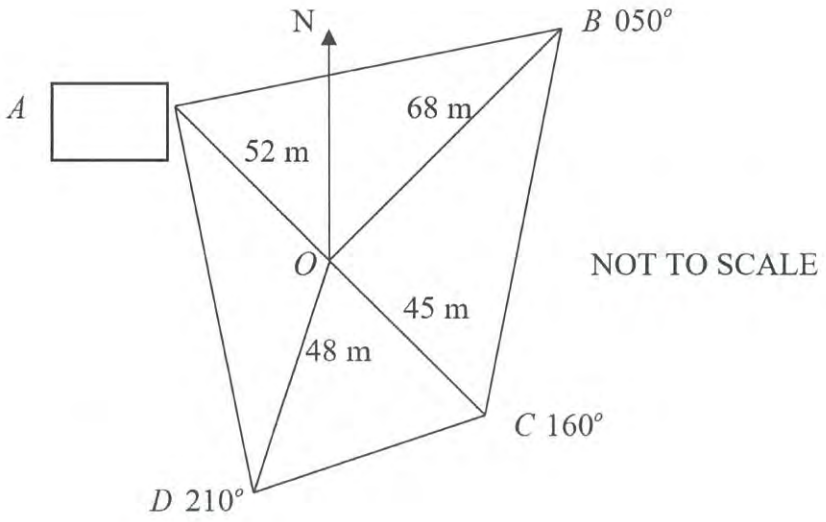
Profit = Revenue − Cost

$= (0.75 \times 200) - (0.5 \times 200 + 70)$

$= -20$

∴ a loss of $20.

(c) The diagram below shows the result of a radial survey that David did of a field.



(i) Show that $\angle DOC = 50^\circ$ **1**

$\angle DOC = 210^\circ - 160^\circ$

$= 50^\circ$

Question 26 continues on page 15

(ii) Find the length of side DC, correct to 1 decimal place. **2**

$DC^2 = 48^2 + 45^2 - 2(48)(45)\cos 50^\circ$

$= 1552.157526$

$DC = 39.4\text{m}$

(iii) Given that the area of ΔAOD is 1205 m^2, find the size of $\angle AOD$, correct to the nearest degree, given that $\angle AOD$ is obtuse. **3**

$A = \frac{1}{2}ab\sin C$

$1205 = \frac{1}{2} \times 48 \times 52 \times \sin C$

$0.965 = \sin C$

$C = 74.9^\circ$ or 105.1°

$\therefore 75^\circ$ or 105°

$\therefore \angle AOD = 105^\circ$

(iv) Hence write down the bearing of point A from O. **1**

Bearing $= 210^\circ + 105^\circ = 315^\circ$

End of Question 26

QUESTION 27: (15 marks) **Marks**

(a) The area of a trapezium is given by the formula $A = \frac{1}{2}(x+y)h$, where x and y are the lengths of the parallel sides and h is the height.
Rearrange the formula to make x the subject. **3**

$A = \frac{1}{2}(x+y)h$

$2A = (x+y)h$

$\frac{2A}{h} = x+y$

$\therefore \frac{2A}{h} - y = x$

(b) Packets of rice are labelled as weighing 500 g. When the weights were checked, they were found to be normally distributed with a mean of 500 g and a standard deviation of 2 g.

(i) What percentage of packets weighed less than the labelled weight? **1**

50%

(ii) If 1000 packets were checked, how many would be expected to weigh between 496 g and 502 g? **2**

81.5% of packets

$\frac{81.5}{100} \times 1000 = 815$

$\therefore$ 815 packets weigh between 496g and 502g

(iii) The z - score for one packet was found to be -2.5 . Find the weight of this packet of rice. **1**

$z = \frac{x-\bar{x}}{\sigma} \Rightarrow \frac{x-500}{2} = -2.5$

$x = 495$ $\therefore$ weight of packet is 495g.

Question 27 continues on page 17

(c) A sick child had to take some medicine containing a drug with a concentration of 5 mg/mL. Calculate how many litres of medicine would be made from 10 g of the drug. **2**

5mg/mL

5000mg/L ∴ 2L of medicine can

10000mg/2L be made.

10g/2L

(d) Kameron had been at a party before he drove home. He weighs 85 kg and he drank 5 standard drinks over 4 hours. Given that a person should not drive with blood alcohol content of 0.05 or more, find if Kameron's BAC was low enough for him to be driving. **2**

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

$= \frac{(10 \times 5) - (7.5 \times 4)}{6.8 \times 85}$

$= 0.035$

∴ Kameron can drive as his BAC < 0.05.

(e) Calculate the shortest distance between Beijing, China (40° N, 116° E) and Perth, Australia (32° S, 116° E), given that the Earth has a radius of 6400km.
Give your answer correct to 2 significant figures. **2**

Angular distance = 40 + 32 = 72°

$Distance = \frac{72}{360} \times 2 \times \pi \times 6400$

$= 8042.48\ km$

$\approx 8000\ km \approx 8.0 \times 10^3\ km$

(f) A scientist tags 600 birds in a forest. The next week he catches 800 birds and notices that 200 have been tagged. Estimate how many birds are in the forest. **2**

$\frac{600}{P} = \frac{200}{800}$

$\therefore P = 2400$

End of Question 27

QUESTION 28: (15 marks) **Marks**

(a) Ten adult females measured their height and the longest step that they could take. The results are recorded in the table below.

Height (cm)	151	153	154	157	160	163	164	168	170	172
Step (cm)	88	87	89	97	99	94	95	96	102	103

(i) Calculate the correlation coefficient, r, correct to 2 decimal places. **1**

$r = 0.85$

(ii) Complete the table below by calculating the mean and standard deviation. Answer to two decimal places **2**

	Mean	**Standard Deviation**
Height	$\bar{x} = 161.20$	$\sigma_x = 7.03$
Step	$\bar{y} = 95$	$\sigma_y = 5.33$

(iii) Using the values from the table in part (ii) show that the equation of the least-squares line of best fit is

$$y = 0.64x - 8.17 \ .$$ **2**

$m = r \times \frac{\sigma_y}{\sigma_x}$

$= 0.85 \times \frac{5.33}{7.03}$

$= 0.64$

$b = \bar{y} - m\bar{x}$

$= 95 - 0.64(161.20)$

$= -8.17$

$\therefore y = 0.64x - 8.17$

Question 28 continues on page 19

(b) Ethan, Nic, Angad, Anish and David decide to play several singles matches of tennis together.

(i) Find the probability that David plays in the first game. **1**

$\frac{2}{5}$

(ii) The probability that Colin will win any game is 0.6. Find the probability that Colin loses two games. **1**

$0.4^2 = 0.16$

(iii) If n is the number of games that Colin plays, find an algebraic expression for the probability that Colin loses n games. **1**

0.4^n

(c) Eric takes out a \$14,000 loan over 36 months. The repayment rate is \$485.38 per month.

(i) How much will Eric pay back altogether? **1**

$\$485.38 \times 36 = \$17\,473.68$

(ii) What is the equivalent flat rate of interest for the loan?
Answer correct to two decimal places. **2**

Interest paid = \$17473.68 − \$14000 = \$3473.68

Rate = $\frac{3473.68}{14000} \times 100 \div 3 = 8.27\%$ pa

(d) In how many ways can you answer the first six questions on a True/False test? **1**

$2^6 = 64$ ways

Question 28 continues on page 20

(e) Solve these equations simultaneously. **3**

$$5x+2y=16$$
$$x-y=-1$$

$5x+2y=16$ — ①

$x-y=-1$ — ②

② × 2 :

$2x-2y=-2$ — ③

① − ③ :

$5x+2y=16$

$2x-2y=-2$

$7x=14$

$x=2$

sub $x=2$ into ②

$2-y=-1$

$-y=-3$

$y=3$

$\therefore x=2$ and $y=3$

End of Question 28

QUESTION 29: (15 marks) **Marks**

(a) The table below shows the present value of a \$1 annuity.

Present value of \$1						
Period	2%	4%	6%	8%	10%	12%
1	0.98	0.96	0.94	0.93	0.91	0.89
2	1.94	1.89	1.83	1.78	1.74	1.69
3	2.88	2.78	2.67	2.58	2.49	2.40
4	3.81	3.63	3.47	3.31	3.17	3.04

(i) What would be the present value of a \$7 500 per year annuity at 10% per annum for 3 years, with interest compounding yearly? **1**

$PV = 7500 \times 2.49$

$= \$18\,675$

(ii) What is the value of an annuity that would provide a present value of \$27,633 after 2 years at 6% per annum compound interest? **1**

$27633 = A \times 1.83$

$A = \$15\,100$

(iii) An annuity of \$2000 each six months is invested at 12% per annum, compounded biannually for 2 years. What is the present value of the annuity? **2**

6% per 6 months $\Rightarrow n = 4$

$P = 2000 \times 3.47$

$P = \$6940$

Question 29 continues on page 22

Question 29 (continued)

(b) Imogen flew from Sydney (34°S, 150°E) on Wednesday at 9 a.m. on a 19 hour flight to Prague (50°N, 15°E). When did Imogen arrive in Prague if it was:

(i) daylight saving time in Prague? **2**

Difference in longitude = 135°

∴ normal time difference = $\frac{135}{15}$ = 9 hours

Daylight time difference = 9 − 1 = 8 hours

Arrival time = Wed 9am − 8h + 19h = Wed 8pm.

(ii) daylight saving time in Sydney? **2**

Arrival time = Wed 9am − 10h + 19h

= Wed 6pm.

(c) In the trial History exam, the mean mark was 75% and the standard deviation was 6. If Hayley revived a z-score of 2.5 in this History exam, find her percentage mark. **1**

$\frac{x - 75}{6} = 2.5$

∴ $x = 90\%$

(d) Condamine is 100 km on a bearing of 235° from Dubbo. Miles is 120 km from Condamine and due west of Dubbo.
Find the bearing of Condamine from Miles to the nearest degree. **2**

$\frac{\sin\theta}{100} = \frac{\sin 35}{120}$

$\sin\theta = \frac{100 \sin 35°}{120}$

$\theta = 28°$

∴ Bearing = 90 + 28

= 118°

Question 29 continues on page 23

(e) The normally distributed data below represents the assessment results in the recent examinations for English and Business Studies:

Subject	Mean	Standard Deviation
English	72%	7
Business Studies	83%	4

What mark in English would be equivalent to a mark of 91% in Business Studies? **2**

91% = 83 + 2×4 (2 standard deviations)

English = 72 + (2×7)

= 86%

(f) Dustin's tablet has a download speed of 125 kilobits per second. How many minutes would it take him to download 12 songs with an average size of 2.5 megabytes? (to the nearest half minute) **2**

Size = $12 \times 2.5\text{ MB} = 12 \times 2.5 \times 2^{20}$ bytes

= 31457280 bytes

= $31457280 \times \frac{8}{1000}$ kbits = 251658.24 kilobits

Download time = 251658.24 ÷ 125

= 2013.27 seconds

≈ 33.55 minutes

End of Question 29

QUESTION 30: (15 marks) **Marks**

(a) Liza buys a car which has a market value of $60 000 before on-road costs.
Stamp duty on the car is calculated at these rates:

- 3% of the market value up to and including $45,000
- 5% of the market value over $45,000.

(i) Calculate the stamp duty payable on the purchase of the car. **1**

$0.03 \times 45\,000 + 0.05 \times 15\,000$

$= \$2100$

(ii) The car depreciates at a rate of 4.5% pa.
What is the value of the car 3 years after Liza buys it? **1**

$V = 60\,000\,(1-0.045)^3$

$= \$52\,259.03$

(b) A micro drip IV pump which delivers 60 drops/mL is used to administer medications and fluids. It requires a drip rate in drops per minute (dpm) to be set.
The formula below is used to calculate the drip rate.

$$\text{Drip rate} = \frac{\text{volume(mL)} \times \text{drops/mL}}{\text{time in minutes}}$$

(i) A patient requires 1200 mL of fluid to be given intravenously over 10 hours.
Calculate the drip rate? **1**

$\text{Drip rate} = \dfrac{1200 \times 60}{600} = 120 \text{ dpm.}$

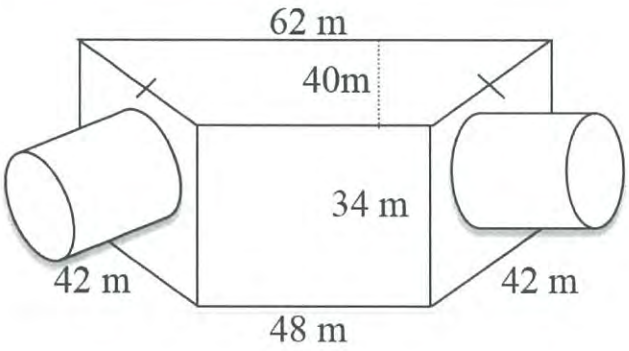
(ii) Jason is working on a ward and notices the drip rate on a patient's micro drip IV is set to 75 dpm. The IV has a volume of 900 mL. How long should this IV run? **2**

$75 = \dfrac{900 \times 60}{t}$

$t = \dfrac{900 \times 60}{75} = 720 \text{ minutes} = 12 \text{ hours}$

Question 30 continues on page 25

(c) The following solid has two identical closed cylinders attached to a trapezoidal prism. Each cylinder is 26 m long and diameter of 18 m.



(i) Find the surface area of the solid, including the bottom, correct to the nearest m^2. **3**

$SA = 2(2\pi(9)(26)) + (48\times34) + (34\times62) + 2\times(42\times34) + 2\times\frac{40}{2}(62+48)$

$= 2940.5 + 1632 + 2108 + 2856 + 4400$

$= 13936.5$

$= 13937\ m^2$

Without back:

$SA = 13937 - (62\times34)$

$= 11829\ m^2$

(ii) If a 10–litre can of paint covers 160 m^2, find the number of 10-litre cans of paint needed to paint the outside of the solid with one coat. **1**

No. of Cans $= 139.37 \div 160 = 87.10$

$= 88$ cans

(iii) Paint costs \$145.50 per 10 litre can. Find the cost of painting the object. **1**

Costs $= 88 \times 145.50$

$= \$12\,804$

Question 30 continues on page 26

(d) Emma has 8 different paintings, but has space to hang only 3 of them.
How many different groups of 3 paintings can Emma select? **1**

$^8C_3 = 56$

(e) Simplify $\dfrac{9m^2n^4 \times 4mn^2}{(3mn^3)^2}$. **2**

$\dfrac{9m^2n^4 \times 4mn^2}{9m^2n^6} = 4m$

(f) A class compared their assessment results to their foot length. The correlation coefficient for these quantities was 0.15.
What is the meaning of this correlation? **1**

no relationship between their assessment result and foot length.

(g) Mitch owns a credit card that has no annual fees and charges a flat rate of 19.75% p.a. interest on all purchases.
Find the interest charged on \$1800 for 15 days. Answer correct to the nearest cent. **1**

Daily interest $= \dfrac{19.75}{365} = 0.054\% = 0.00054$

$A = 1800(1 + 0.00054)^{15}$

$= \$1814.64$

Interest $= 1814.64 - 1800$

$= \$14.64$

End of Question 30

Student Name: SOLUTIONS

Teacher Name: _____

Hurlstone Agricultural High School

2016 HSC Trial Examination

Mathematics General 2

Multiple Choice Answer Sheet

1	A	B	**C**	D	13	**A**	B	C	D
2	A	B	**C**	D	14	A	**B**	C	D
3	A	**B**	C	D	15	A	B	**C**	D
4	**A**	B	C	D	16	A	B	**C**	D
5	**A**	B	C	D	17	A	**B**	C	D
6	A	B	C	**D**	18	A	B	**C**	D
7	A	B	C	**D**	19	A	B	**C**	D
8	A	**B**	C	D	20	**A**	B	C	D
9	A	**B**	C	D	21	A	B	**C**	D
10	**A**	B	C	D	22	A	B	**C**	D
11	**A**	B	C	D	23	**A**	B	C	D
12	A	B	**C**	D	24	A	**B**	C	D
					25	A	B	C	**D**