Caringbah High School

Year 12 2016
Mathematics General 2
HSC Course
Assessment Task 4

General Instructions

- Reading time – 5 minutes
- Working time – $2\frac{1}{2}$ hours
- Write using black or blue pen
- Board-approved calculators may be used
- A formulae sheet is provided
- In Questions 26-30, show relevant mathematical reasoning and/or calculations
- Marks may not be awarded for partial or incomplete answers

Total marks – 100

Section I **25 marks**
Attempt Questions 1-25
Mark your answers on the answer sheet provided. You may detach the sheet and write your name on it.

Section II **75 marks**
Attempt Questions 26-30
Write in spaces provided.
Extra writing space is provided on page 29. If you use this space, clearly indicate which question you are answering.

Name: _____ **Class:** _____

Marker's Use Only						
Section I	**Section II**					**Total**
Q1-25	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**	
/25	/15	/15	/15	/15	/15	**/100**

Section I

25 marks
Attempt Questions 1-25
Allow about 35 minutes for this section

Use the multiple-choice answer sheet for Questions 1–25

---

1. Claire collected data about the amount of rain that fell over a number of days in Sydney. This data can be best described as being:

   (A) Discrete quantitative data

   (B) Continuous quantitative data

   (C) Nominal categorical data

   (D) Nominal ordinal data

2. Expand and simplify: $3(1-2x)-2(x+1)$.

   (A) $1-4x$

   (B) $5-4x$

   (C) $1-8x$

   (D) $5-8x$

3. Anton pays 24% of his gross pay in tax. If Anton pays \$153.12 in tax each week, Find his gross weekly pay.

   (A) \$36.75

   (B) \$177.12

   (C) \$612.48

   (D) \$638

4. Val plans to wear jeans with a T-shirt and a jumper. She has two pairs of jeans, four T-shirts and three jumpers. How many different outfits can she wear?

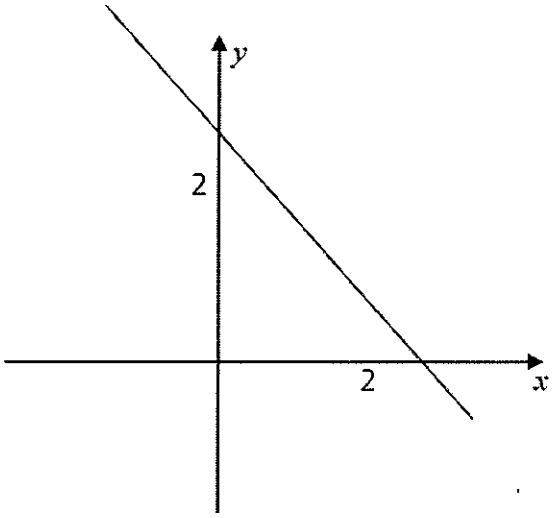
   (A) 9

   (B) 12

   (C) 18

   (D) 24

5. The equation of this straight line is:



(A) $y = 2x$

(B) $y = -2x$

(C) $y = x + 2$

(D) $y = 2 - x$

6. Perth in Western Australia is 8 hours ahead of Greenwich in England. Cape Town in South Africa is 2 hours ahead of Greenwich.

What is the time in Cape Town when it is 1 pm in Perth?

(A) 3 am

(B) 7 am

(C) 7 pm

(D) 11 pm

7. Which of the following is not equal to $12a^3b^2$?

(A) $5a^3b^2 + 7a^3b^2$

(B) $3a^2b \times 4ab$

(C) $\dfrac{24a^5b^2}{2a^2b}$

(D) $24a^3b^2 - 12a^3b^2$

8. The stamp duty on a car is calculated using the table below.

Car value	Stamp Duty
\$900 or less	2.5%
\$901 to \$30 000	3%
\$30 001 to \$55 000	\$950 plus 8% of the amount over \$30 000
\$55 001 and over	4%

Calculate the stamp duty that Luke needs to pay when he buys a car worth \$35 000.

(A) \$1050

(B) \$1350

(C) \$1400

(D) \$1550

9. Maddy calculates her z-score to be 1.85 after receiving her assessment task result of 68%. The results on the task were normally distributed.

If the standard deviation on the task was 8.5, what was the mean?

(A) 52.275

(B) 56.375

(C) 57.65

(D) 58.25

10. If $a = -3$ and $b = 2$, what is the value of $\frac{b-a^2}{b-a}$?

(A) -1.4

(B) 0.2

(C) 2.2

(D) 3

11. Luke completes a statistical analysis on the weights (in kilograms) of each member of his gym.

He finds that the data is normally distributed, with a mean of 55.0 and a standard deviation of 6.5.

What percentage would lie between 48.5 kg and 68.0 kg?

(A) 68.0%

(B) 81.5%

(C) 83.9%

(D) 95.0%

12. A builder provided a written quotation of \$18 250 to complete some renovations requested by a homeowner.

The quotation included a G.S.T of 10%.

Which of these calculations would give the amount of the G.S.T included in the quotation?

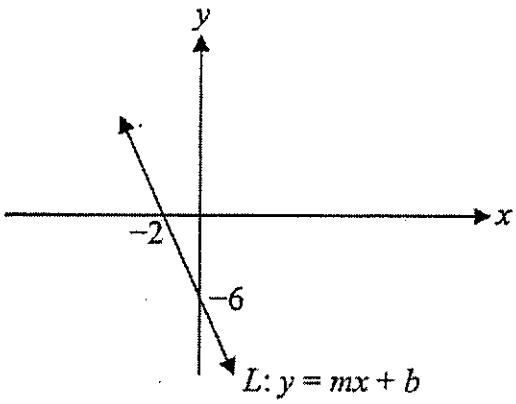
(A) $\$18\,250 \times 0.1$

(B) $\$18\,250 \div 0.1$

(C) $\$18\,250 - 1.1$

(D) $\$18\,250 \div 11$

13. In the diagram, the line L has the equation $y = mx + b$.



What are the correct values for m and b?

(A) $m = -3, b = -6$

(B) $m = -3, b = -2$

(C) $m = -\frac{1}{3}, b = -6$

(D) $m = -\frac{1}{3}, b = -2$

14. The probability that the temperature will fall below $-10°$ on any day through winter at a particular city in the northern hemisphere is 0.85.

Which calculation will give the probability that the temperature in this city will fall below $-10°$ on at least one day of the weekend?

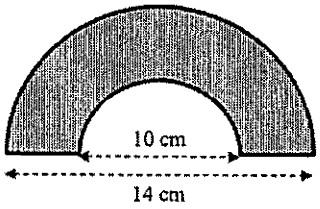
(A) $1 - (0.15)^2$

(B) $1 - (0.85)^2$

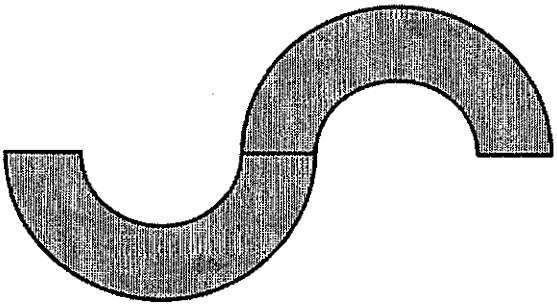
(C) $(1 - 0.15)^2$

(D) $2 \times 0.85 \times 0.15$

15. A shape in the form of a semi-circular arch is cut from a piece of cardboard.



Two of these semi-circular arch shapes are later joined to make a design, shown below.



In terms of π, what is the perimeter (in cm) of the design?

(A) $12\pi + 2$

(B) $12\pi + 6$

(C) $24\pi + 4$

(D) $24\pi + 8$

16. A car's petrol consumption (C) in litres/100km can be estimated by using the formula:

$$C = 0.01S^2 - S + 33$$

where S is the speed (in km/h) at which the car is being driven.

What is the change in petrol consumption if the speed at which a car is being driven increases from 60km/h to 80km/h?

(A) A decrease of 8 L/100km

(B) An increase of 8 L/100km

(C) A decrease of 17 L/100km

(D) An increase of 13.2 L/100km

17. A doctor prescribes a patient 750 g of medication per day to be taken every 4 hours. A bottle of this medication from the chemist contains a concentration of 50 g/5 mL.

How many millilitres does the patient need to take in each dose?

(A) 12.5

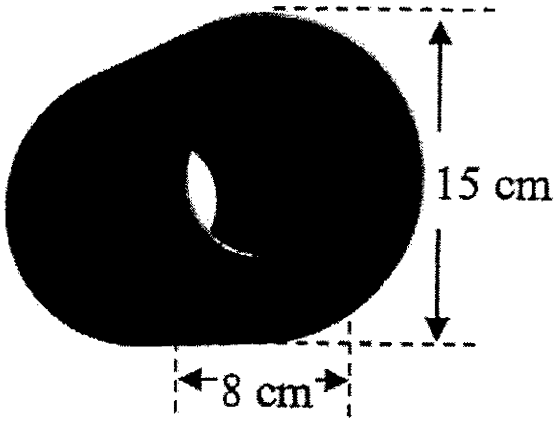
(B) 13.5

(C) 15

(D) 18.75

18. A concrete pipe shown below has length 1.25 m.

Its internal diameter is 8 cm and its external diameter is 15 cm.



Which of these calculations would correctly give the volume of concrete used to make the pipe?

(A) $\pi \times (0.15 - 0.08)^2 \times 1.25$

(B) $\pi \times (0.075^2 - 0.04^2) \times 125$

(C) $\pi \times (15^2 - 8^2) \times 1.25$

(D) $\pi \times (0.075^2 - 0.04^2) \times 1.25$

19. The number of 'standard drinks' in various glasses of wine is shown below.

Number of standard drinks

White Wine		*Red Wine*	
small glass	*large glass*	*small glass*	*large glass*
0.9	1.4	1.0	1.5

A woman weighing 62 kg drinks three small glasses of white wine and two large glasses of red wine between 8 pm and 1 am.

What would be her blood alcohol content (BAC) estimate at 1 am, correct to 3 decimal places?

(A) 0.030

(B) 0.037

(C) 0.057

(D) 0.046

20. If $a > 0$, which of the following correctly expresses a as the subject of $r = \sqrt{\frac{V}{a^2}}$?

(A) $a = \frac{\sqrt{V}}{r}$

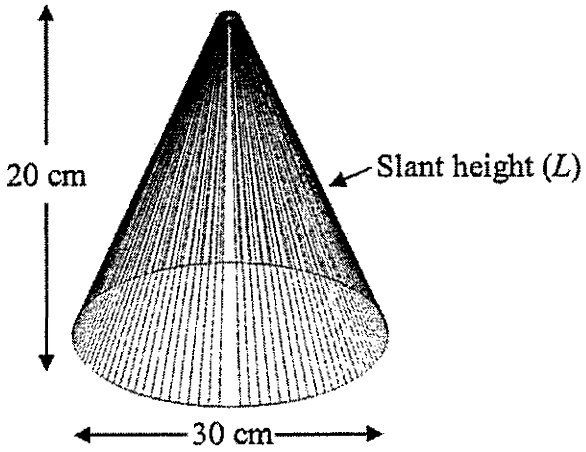
(B) $a = \frac{V}{\sqrt{r}}$

(C) $a = Vr$

(D) $a = \sqrt{\frac{V}{r}}$

21. A child's party hat is made in the shape of a cone of height 20 cm and diameter 30 cm.

The slant height (L) of the cone is the shortest length from the top, to any point on the circumference of the base.



The surface area (in square centimetres of the cone) can be given by the formula:

$$Surface\ Area = \pi rL \text{ (where } r \text{ is the radius)}$$

In terms of π, what is the surface area of the cone?

(A) 300π

(B) 375π

(C) 525π

(D) 750π

22. A table of future value interest factors up to 4 periods is shown below.

Table of future value interest factors					
	Interest rate per period				
Period	1%	2%	3%	4%	5%
1	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500
3	3.0301	3.0604	3.0909	3.1216	3.1525
4	4.0604	4.1216	4.1836	4.2465	4.3101

Using the figures in the table, what amount of interest would have been added at the end of 3 years to an annuity of $2500 per year at 4% pa?

(A) $260

(B) $304

(C) $459

(D) $530

23. Alek rolls a die. If he rolls a 6 he wins $10, but if he rolls an odd number he loses $1. What is his financial expectation?

(A) $2.17

(B) $1.50

(C) $1.17

(D) $5.95

24. Catherine borrows $10 000 at 6% p.a. to buy a car and chooses to repay it in monthly repayments over 5 years.

Monthly Repayments on a loan of $10 000

Time (years)

Rate (% pa)	2	3	4	5	6	7	8
4	$434.25	$295.24	$225.79	$184.17	$156.45	$136.69	$121.89
5	$438.71	$299.71	$230.29	$188.71	$161.05	$141.34	$126.60
6	$443.21	$304.22	$234.85	$193.33	$165.73	$146.09	$131.41
7	$447.73	$308.77	$239.46	$198.01	$170.49	$150.93	$136.34
8	$452.27	$313.36	$244.13	$202.76	$175.33	$155.86	$141.37

Use the table to find how much she will pay for the car altogether.

(A) $19333.30

(B) $11966.65

(C) $11599.80

(D) $11599.99

25. The value of a motor vehicle, purchased new for $20 000, is calculated over 8 years using the declining balance method of depreciation.

The graphs *(A), (B), (C)* and *(D)* below show the calculated values over this period, with 4 different rates of depreciation applied.

Which graph best shows the value of the motor vehicle when depreciated at 22%p.a?

(A) *A*

(B) *B*

(C) *C*

(D) *D*

End of Section I

Section II

75 marks
Attempt Questions 26–30
Allow about 1 hour 55 minutes for this section

Answer the questions in the spaces provided.
Your responses should include relevant mathematical reasoning and/or calculations.

Question 26 (15 marks)

(a) Craig decides to measure the lateness of tour buses. He records the elapsed time in minutes, from the scheduled departure time to the bus leaving the depot. This data is recorded in the stem-and-leaf plot shown below.

0	2 2 3 5 9 9 9 9
1	0 0 1 1 1 4
2	2

(i) What was the mean late departure time? **1**

.....

.....

(ii) What was the median late departure time? **1**

.....

.....

(iii) Calculate the inter-quartile range. **2**

.....

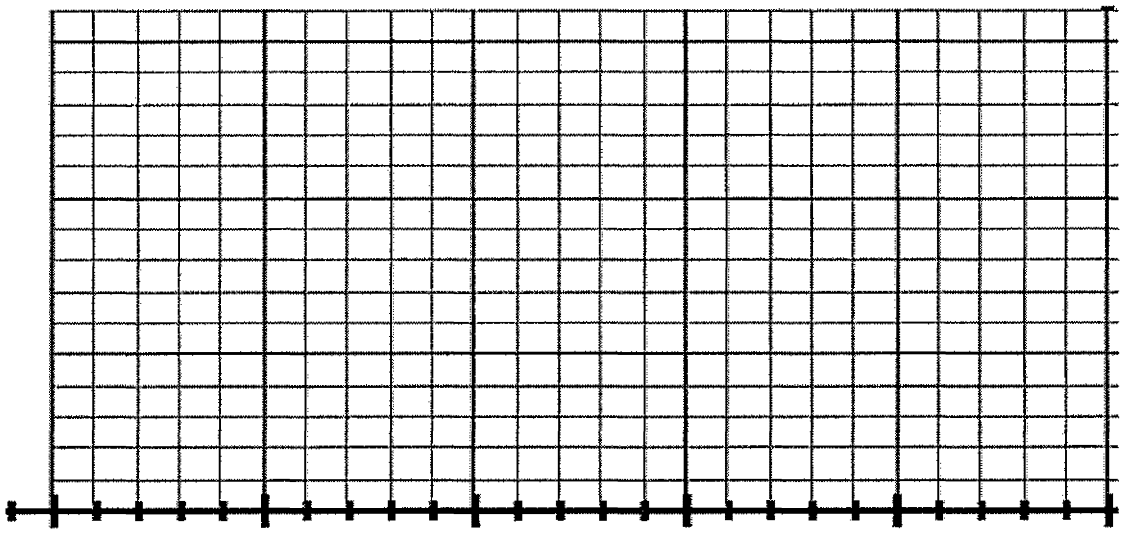
.....

.....

Question 26(a) continues on page 12

Question 26(a) continued

(iv) In the space below, draw a box-and-whisker plot using the scale given. **2**



(v) Describe the skewness of the distribution of late departure times. **1**

.....

.....

.....

(vi) Explain why the late departure time of 22 minutes could be considered an outlier for the data presented. Justify your answer with a calculation. **2**

.....

.....

.....

.....

(vii) If the late departure time of 22 minutes was not included in the data, what effect would this have on the mean? Justify your answer with a calculation. **1**

.....

.....

.....

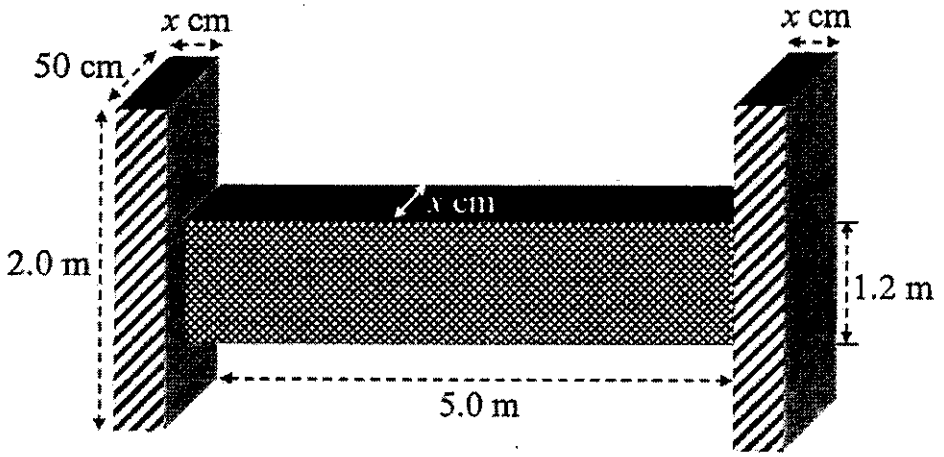
.....

Question 26 continues on page 13

(b) A company manufactures steel beams.

The diagram shows one of these beams consisting of 3 sections each of the same thickness of x cm.

The beam has 2 identical end sections and one centre section with dimensions as shown.



(i) The volume of steel in the beam is 0.36 m^3. **3**

Calculate the thickness (x) of the beam.

.....

.....

.....

.....

.....

(ii) The density of steel in the beam is measured as 7900 kg/m^3. **2**

Calculate the mass (in tonnes) of steel in the beam, correct to one decimal place.

.....

.....

.....

.....

End of Question 26

Question 27 (15 marks)

(a) A triangular pyramid is constructed from 4 pieces of glass.

Two of the glass pieces APQ and BPQ are right-angled and meet the base piece ABQ at Q, as shown.

The distance PQ is the height of the pyramid (h cm).

$AQ = 25cm$, $\angle PAQ = 69°$, $\angle PBQ = 63°$ and $\angle AQB = 115°$

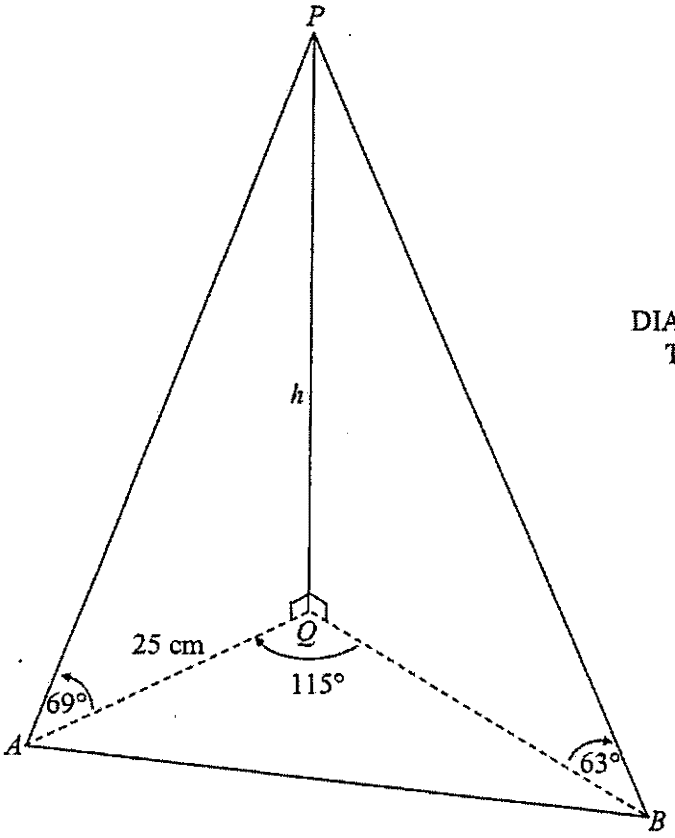


DIAGRAM NOT TO SCALE

Question 27(a) continues on page 15

(i) In triangle APQ, show that h is approximately 65 cm. **2**

.....

.....

.....

.....

(ii) Show that the length of BQ is approximately 33 cm. **2**

.....

.....

.....

.....

(iii) Calculate the length (to the nearest centimetre) of the edge AB. **2**

.....

.....

.....

.....

.....

.....

(iv) Calculate the area of the base ABQ of the pyramid, correct to the nearest square centimetre. **2**

.....

.....

.....

.....

Question 27 continues on page 17

Question 27 continued

(v) Calculate the capacity of the pyramid to the nearest litre. $(V = \frac{1}{3}AH)$ **3**

.....

.....

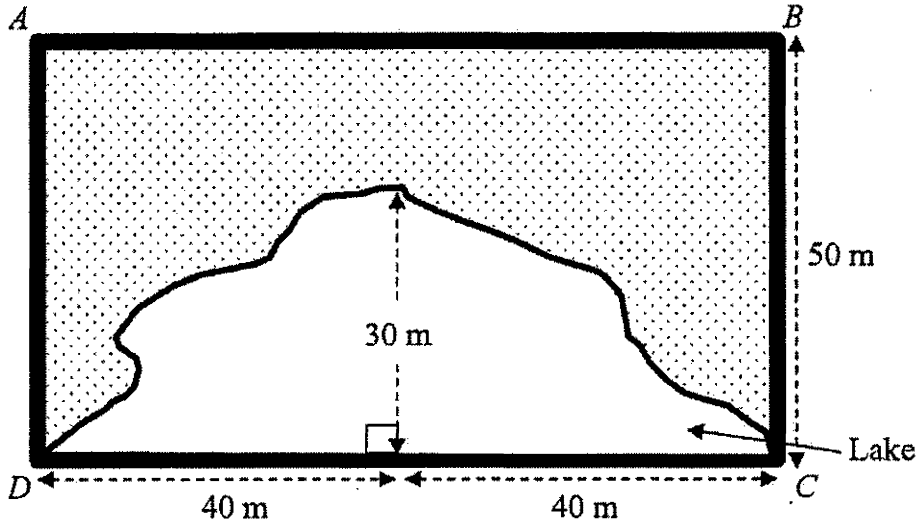
.....

.....

.....

.....

(b) An artificial lake is to be constructed within a rectangular enclosure $ABCD$ in a new estate.



(i) Using Simpson's Rule estimate the surface area of the lake. **2**

.....

.....

.....

.....

(ii) What percentage of the rectangular enclosure does the lake cover? **2**

.....

.....

.....

.....

End of Question 27

Question 28 (15 marks)

(a) Amie has signed up to the 'Basic Plan' mobile phone plan shown.

Basic Plan

Monthly cost of plan: $ 50.00

This includes $150 worth of calls and messages and 2 GB of data.

Voice Calls: 90 cents per minute plus 40 cents connection fee.

Text picture and video: 5 cents per standard text message, 50 cents for picture message and 75 cents for video messages.

Excess data: 10 cents / MB.

Last month Amie made 100 calls with an average time of 150 minutes, she sent 300 standard text messages, 30 picture texts and 6 video texts. She used 2.5 GB of data.

(i) How many MB of excess data usage did Amie have last month? **1**

.....

.....

(ii) What would Amie pay altogether for her mobile usage last month? **3**

.....

.....

.....

.....

.....

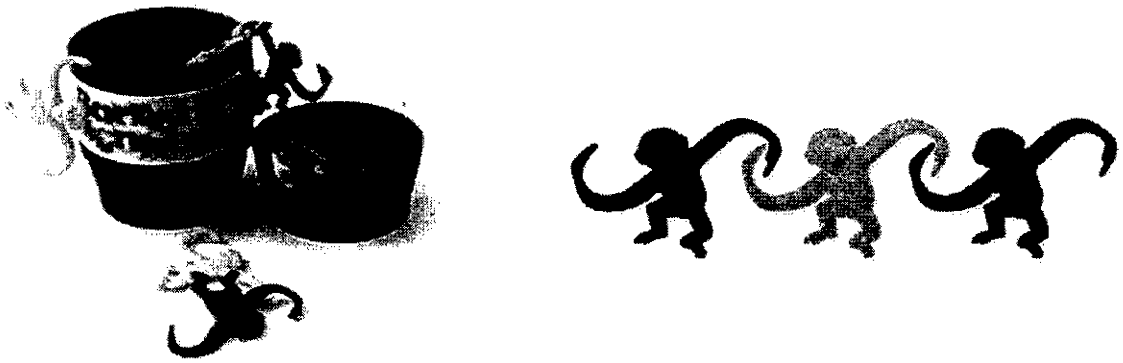
.....

.....

Question 28 continues on page 18

(b) A barrel of 12 plastic toy monkeys has 6 red, 4 yellow and 2 green.

Three of these monkeys when taken out of the barrel are linked, similar to the diagram.



(i) What is the probability that the first monkey in the link is yellow? **1**

.....

(ii) What is the probability that the first two linked monkeys are either both green or both yellow? **2**

.....

.....

.....

.....

(iii) If the three monkeys are of different colours, in how many ways can they be linked? **1**

.....

(iv) What is the probability that all 3 linked monkeys are of different colour? **2**

.....

.....

.....

.....

.....

.....

Question 28 continues on page 19

Question 28 continued

(c) The table below gives the future value of an annuity of \$1 per period for various periods and interest rates.

Table of Future Value Interest Factors								
	0.0025	0.0030	0.0035	0.0040	0.0045	0.0050	0.0055	0.0060
53	56.5961	57.3530	58.1230	58.9063	59.7033	60.5141	61.3391	62.1785
54	57.7376	58.5250	59.3264	60.1419	60.9719	61.8167	62.6765	63.5516
55	58.8819	59.7006	60.5340	61.3825	62.2463	63.1258	64.0212	64.9329
56	60.0291	60.8797	61.7459	62.6280	63.5264	64.4414	65.3733	66.3225
57	61.1792	62.0624	62.9620	63.8786	64.8123	65.7636	66.7329	67.7204
58	62.3322	63.2485	64.1824	65.1341	66.1040	67.0924	68.0999	69.1267
59	63.4880	64.4383	65.4070	66.3946	67.4014	68.4279	69.4744	70.5415
60	64.6467	65.6316	66.6359	67.6602	68.7047	69.7700	70.8565	71.9647
61	65.8083	66.8285	67.8692	68.9308	70.0139	71.1189	72.2463	73.3965
62	66.9729	68.0290	69.1067	70.2065	71.3290	72.4745	73.6436	74.8369
63	68.1403	69.2331	70.3486	71.4874	72.6499	73.8368	75.0487	76.2859
64	69.3106	70.4408	71.5948	72.7733	73.9769	75.2060	76.4614	77.7436
65	70.4839	71.6521	72.8454	74.0644	75.3098	76.5821	77.8820	79.2101
66	71.6601	72.8670	74.1004	75.3607	76.6487	77.9650	79.3103	80.6854

(i) Use the table to find the value of an investment of \$600 per month for 64 months at a rate of 0.0050 per month (as a decimal). **1**

.....

.....

(ii) Isaac invests \$300 per month in an annuity which pays 4.2% p.a. compounding monthly. What will be the value of the annuity after 5 years? **1**

.....

.....

(iii) Jillian wants to earn \$45 000 by investing in an annuity for a period of five and a half years. The best interest rate that she can find is 6.6% p.a. **1**

How much, to the nearest cent, will she need to invest each month?

.....

.....

.....

.....

Question 28 continues on page 20

(d) Monique, who lives in Toronto in Canada (44° N, 79° W), plans to ring her cousin Evie, who lives in Griffith NSW (34° S, 146° E), to wish her happy birthday. **2**

If she rings at 7 pm on Friday, Toronto local time, at what local time will Evie receive the call?

.....

.....

.....

.....

.....

.....

.....

.....

.....

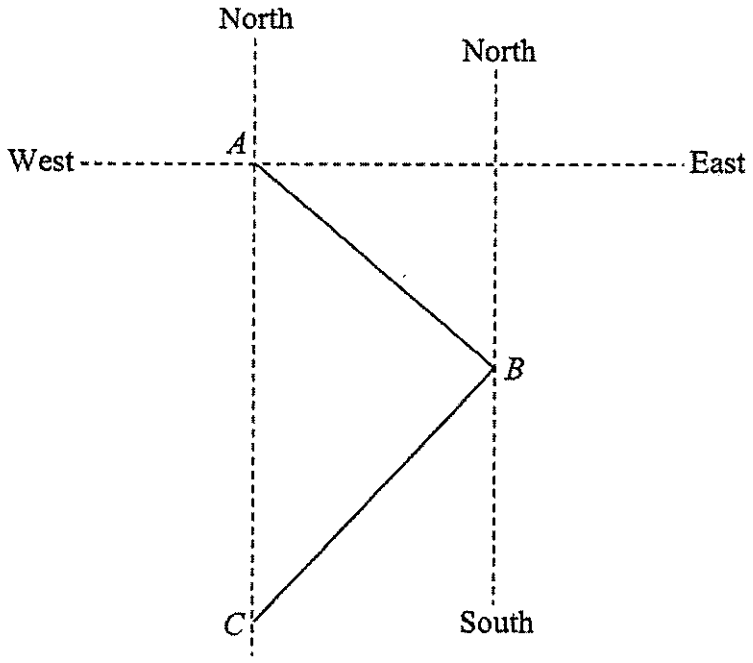
.....

End of Question 28

Question 29 (15 marks)

(a) Victoria walks 2.5 km from A to B on a bearing of 110°. Then walks 6.9 km from B to C on a bearing of 200°. C is due south of A.

The diagram below shows the positions of A, B and C, not to scale.



(i) On the diagram, insert the distance Victoria walked and show the two given bearings. **2**

(ii) What is the size of angle BAC? **1**

.....

.....

(iii) What is the bearing of B from C? **1**

.....

(iv) What is the bearing of A from B? **1**

.....

(v) How far (correct to one decimal place) is C south of A? **2**

.....

.....

.....

.....

Question 29 continues on page 22

Question 29 continued

(b) A company's cost ($\$C$) for the manufacture of n items is given by:

$$\$C = 2350 + 200n$$

The income ($\$I$) received from the scale of these items is given by:

$$\$I = 250n$$

(i) Show that the equation for the company's profit ($\$P$) from the sale of the items can be given by: **2**

$$\$P = 50n - 2350$$

.....

.....

.....

.....

(ii) How any items must the company sell in order to break even? **2**

.....

.....

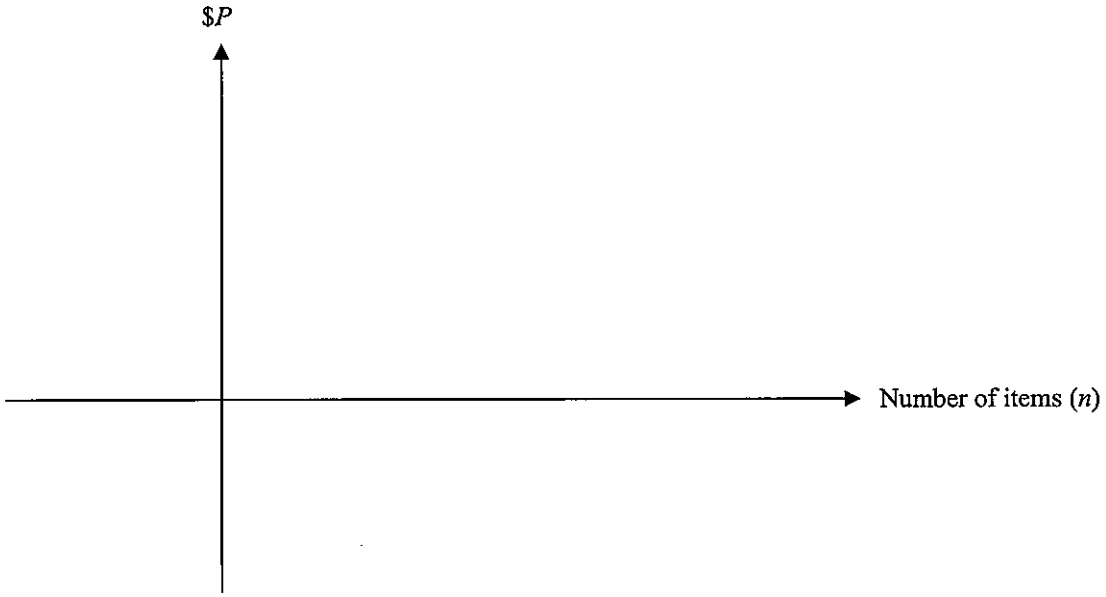
.....

(iii) Calculate the profit the company makes from the sale of 120 items. **1**

.....

.....

(iv) Using the information in (i), (ii) and (iii), draw the graph of the profit equation in the space below, labelling all relevant details. **2**



Question 29 continues on page 23

Question 29 continued

(v) Explain what the gradient of the graph represents. **1**

.....

.....

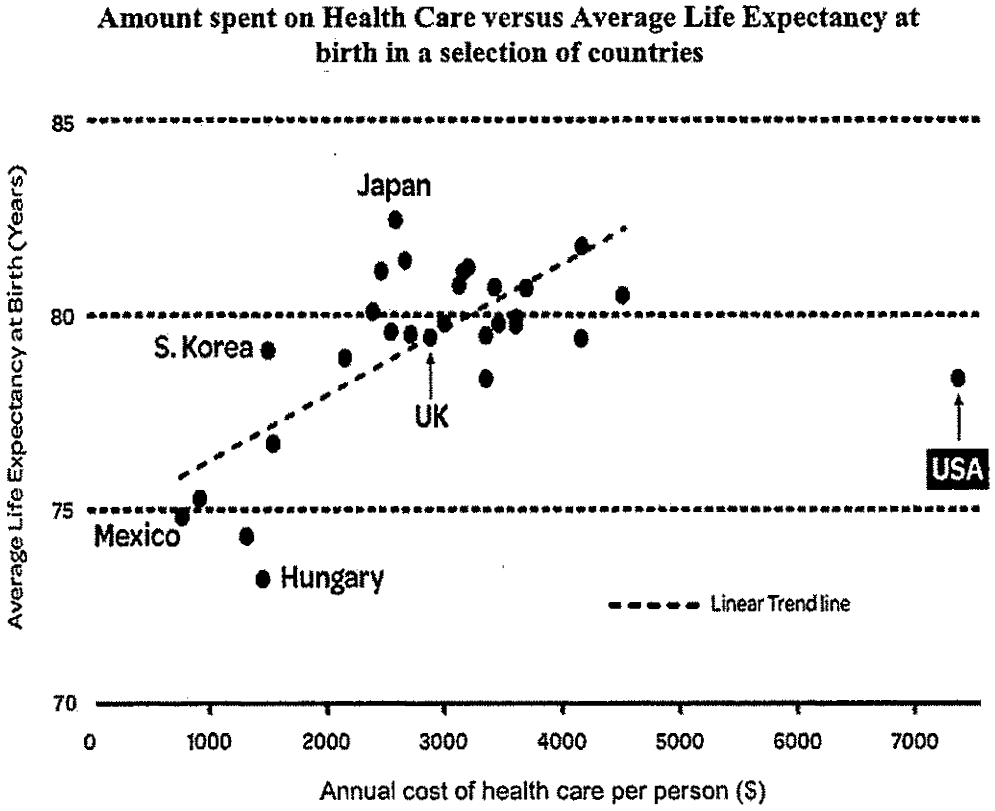
.....

.....

End of Question 29

Question 30 (15 marks)

(a) The data in the scatterplot below shows the amount spent on health care and the life expectancy in a number of countries, with 6 countries labelled.



(i) Which of the specified countries has the lowest amount spent on health care per person? **1**

.....

(ii) Approximately, how much longer is a person living in South Korea expected to live than a person living in Hungary? **1**

.....

.....

(iii) Compare and contrast the data presented for Japan and the USA. **1**

.....

.....

.....

.....

Question 30(a) continues on page 25

Question 30(a) continued

(iv) If the data for the USA was not included on the graph, comment on the effect on the correlation between the amount spent on health care and life expectancy. **1**

.....

.....

.....

(v) The following table gives some values of calculations from the data in the graph.

	Mean	*Standard Deviation*
Amount spent on health care	\$2836.79	\$1308.81
Average life expectancy	79.33 years	2.31 years
Correlation coefficient	$r = 0.48$	

Use the figures in the table to calculate the gradient of the trend line. (Give your answer correct to four decimal places) **2**

.....

.....

.....

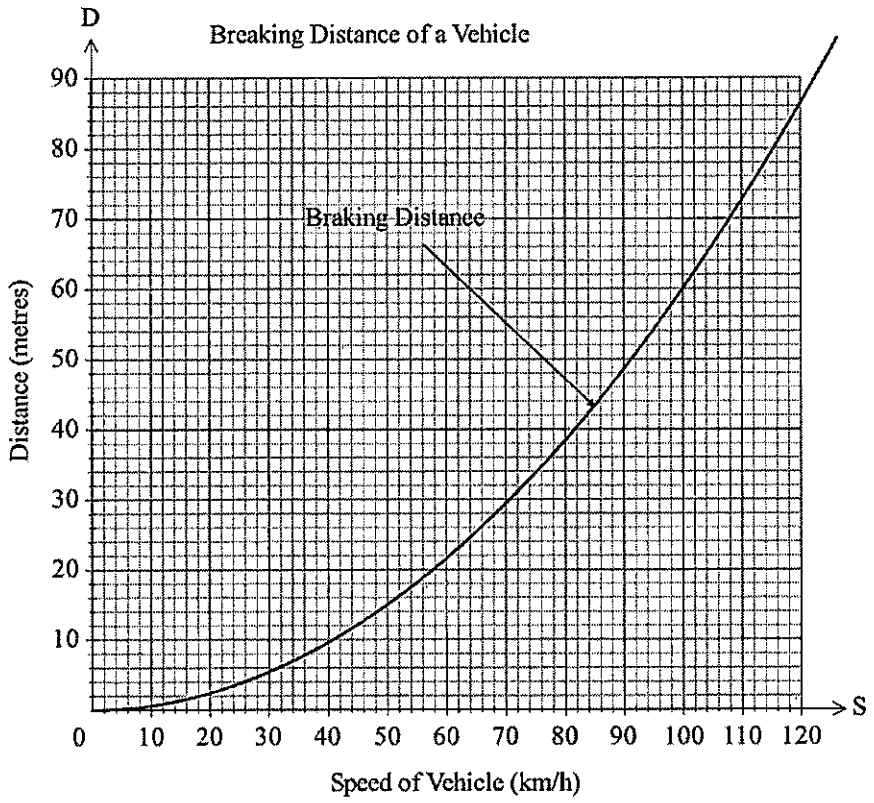
.....

Question 30 continues on page 26

Question 30 continued

(b) The graph below shows how the braking distance of a car changes with the speed of the car.

The braking distance is the distance the car travels before stopping after the brakes are applied.



(i) Braydon is travelling at a distance of six car lengths behind the car in front, to allow for the braking distance. Assuming an average car length of four metres, below what speed should he travel so that his braking distance is less than the distance between the cars? **1**

.....

.....

(ii) Before the brakes are applied there is a "thinking distance", D, which is given by the formula $D = 0.2S$, where S is the speed. **1**

Approximately how many extra car lengths should Braydon allow at the speed above, to allow for thinking time?

.....

.....

.....

Question 30 continues on page 27

(c) The rangers in Anajaraby National Park wanted to estimate the number of antechinus (a marsupial mouse) in the park. They did a live trapping exercise and collected 52 antechinus, which they tagged and released.

A month later they did another live trapping exercise and collected 45 antechinus and counted the number of these which were tagged.

Based on this, they calculated an estimate of 390 for the population of antechinus in the park.

How many tagged antechinus were caught in the second trapping exercise?

2

.....

.....

.....

.....

.....

.....

Question 30 continues on page 28

Question 30 continued

(d) Blake borrows \$650 000 (P) for the purchase of a home. Interest (I) is charged monthly on the amount owing on the loan at an annual rate of 4.35%.

Blake is required to repay (R) \$2850 per month off the loan.

Let the amount Blake owes on the loan at the end of each month be (\$$A$).

(i) Using $A = P + I - R$, show that Blake owes \$649 506.25 after his first repayment. **2**

.....

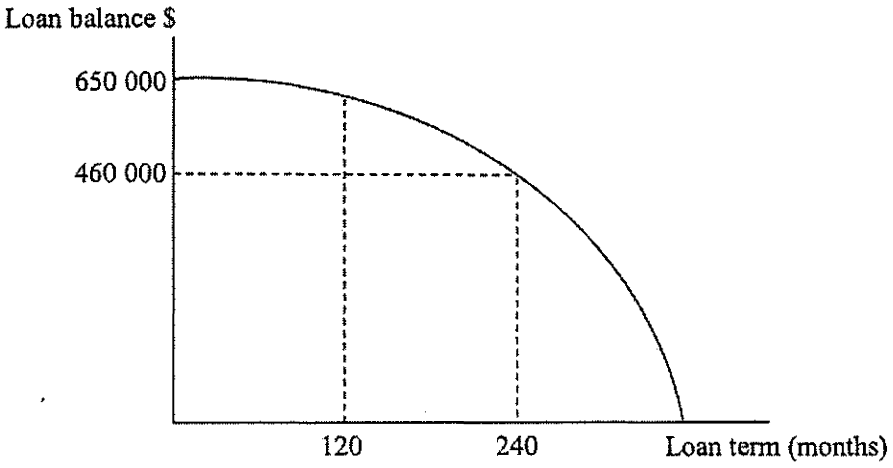
.....

.....

.....

.....

(ii) Below is a graph showing Blake's loan balance over the term of the loan, is given below.



How much interest has Blake paid on the loan after 20 years of repayment? **3**

.....

.....

.....

.....

.....

.....

End of Examination!

Caringbah High School

Year 12 2016
Mathematics General 2
HSC Course
Assessment Task 4

General Instructions

- Reading time – 5 minutes
- Working time – $2\frac{1}{2}$ hours
- Write using black or blue pen
- Board-approved calculators may be used
- A formulae sheet is provided
- In Questions 26-30, show relevant mathematical reasoning and/or calculations
- Marks may not be awarded for partial or incomplete answers

Total marks – 100

Section I **25 marks**
Attempt Questions 1-25
Mark your answers on the answer sheet provided. You may detach the sheet and write your name on it.

Section II **75 marks**
Attempt Questions 26-30
Write in spaces provided.
Extra writing space is provided on page 29. If you use this space, clearly indicate which question you are answering.

Name: Solutions **Class:** _____

Marker's Use Only						
Section I	**Section II**					**Total**
Q1-25	**Q26**	**Q27**	**Q28**	**Q29**	**Q30**	
/25	/15	/15	/15	/15	/15	**/100**

Section I

25 marks
Attempt Questions 1-25
Allow about 35 minutes for this section

Use the multiple-choice answer sheet for Questions 1–25

---

1. Claire collected data about the amount of rain that fell over a number of days in Sydney. This data can be best described as being:

   (A) Discrete quantitative data
   (B) Continuous quantitative data
   (C) Nominal categorical data
   (D) Nominal ordinal data

2. Expand and simplify: $3(1-2x)-2(x+1)$.

   (A) $1-4x$
   (B) $5-4x$
   (C) $1-8x$
   (D) $5-8x$

   $3-6x-2x-2$
   $= 1-8x$

3. Anton pays 24% of his gross pay in tax. If Anton pays \$153.12 in tax each week, Find his gross weekly pay.

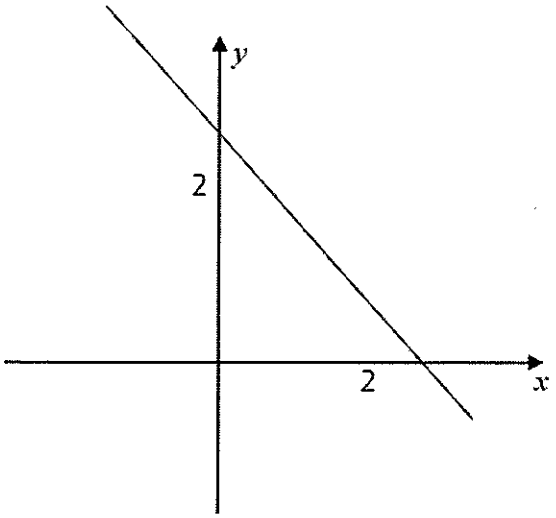
   (A) \$36.75
   (B) \$177.12
   (C) \$612.48
   (D) \$638

   $24\% = \$153.12$
   $1\% = \frac{\$153.12}{24}$
   $100\% = \frac{\$153.12}{24} \times 100$
   $= \$638$

4. Val plans to wear jeans with a T-shirt and a jumper. She has two pairs of jeans, four T-shirts and three jumpers. How many different outfits can she wear?

   (A) 9
   (B) 12
   (C) 18
   (D) 24

5. The equation of this straight line is:



(A) $y=2x$

(B) $y=-2x$

(C) $y=x+2$

(D) $y=2-x$

6. Perth in Western Australia is 8 hours ahead of Greenwich in England. Cape Town in South Africa is 2 hours ahead of Greenwich.

What is the time in Cape Town when it is 1 pm in Perth?

$1-6=12-5$
$=7am$

(A) 3 am

(B) 7 am

(C) 7 pm

(D) 11 pm

7. Which of the following is not equal to $12a^3b^2$?

(A) $5a^3b^2+7a^3b^2$

(B) $3a^2b\times 4ab$

(C) $\frac{24a^5b^2}{2a^2b}$

(D) $24a^3b^2-12a^3b^2$

8. The stamp duty on a car is calculated using the table below.

Car value	Stamp Duty
\$900 or less	2.5%
\$901 to \$30 000	3%
\$30 001 to \$55 000	\$950 plus 8% of the amount over \$30 000
\$55 001 and over	4%

Calculate the stamp duty that Luke needs to pay when he buys a car worth \$35 000.

(A) \$1050

(B) \$1350

(C) \$1400

(D) \$1550

\$950 + 0.08 × \$5000

= \$1350

9. Maddy calculates her z-score to be 1.85 after receiving her assessment task result of 68%. The results on the task were normally distributed.

If the standard deviation on the task was 8.5, what was the mean?

(A) 52.275

(B) 56.375

(C) 57.65

(D) 58.25

$$z\text{-score} = \frac{\text{score} - \bar{x}}{\sigma_n}$$

$$1.85 = \frac{68 - \bar{x}}{8.5}$$

$$68 - \bar{x} = 15.725$$

$$\bar{x} = 52.275$$

10. If $a = -3$ and $b = 2$, what is the value of $\frac{b-a^2}{b-a}$?

(A) −1.4

(B) 0.2

(C) 2.2

(D) 3

$$\frac{2-(-3)^2}{2-(-3)} = \frac{2-9}{2+3}$$

$$= -1.4$$

11. Luke completes a statistical analysis on the weights (in kilograms) of each member of his gym.

He finds that the data is normally distributed, with a mean of 55.0 and a standard deviation of 6.5.

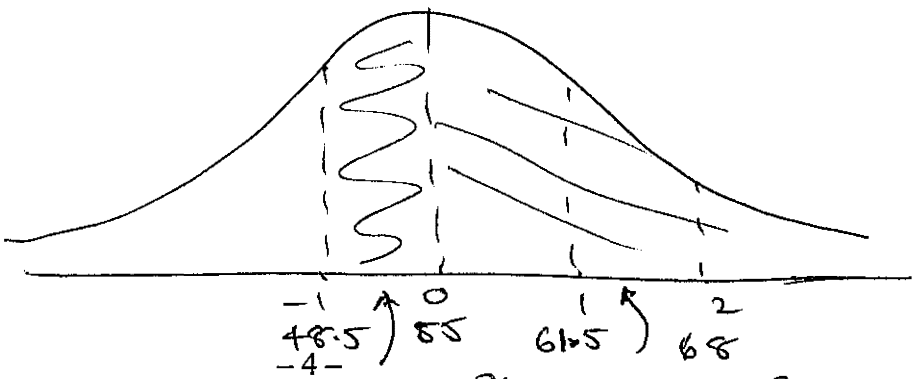
What percentage would lie between 48.5 kg and 68.0 kg?

(A) 68.0%

(B) 81.5%

(C) 83.9%

(D) 95.0%



$0.5 \times 68\% = 34\%$ $0.5 \times 95\% = 47.5\%$

$\therefore$ total $= 81.5\%$.

12. A builder provided a written quotation of \$18 250 to complete some renovations requested by a homeowner.

The quotation included a G.S.T of 10%.

Which of these calculations would give the amount of the G.S.T included in the quotation?

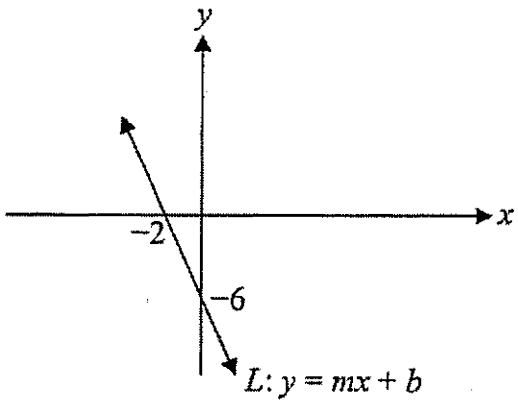
(A) $\$18\,250 \times 0.1$

(B) $\$18\,250 \div 0.1$

(C) $\$18\,250 - 1.1$

(D) $\$18\,250 \div 11$

13. In the diagram, the line L has the equation $y = mx + b$.



What are the correct values for m and b?

(A) $m = -3, b = -6$

(B) $m = -3, b = -2$

(C) $m = -\frac{1}{3}, b = -6$

(D) $m = -\frac{1}{3}, b = -2$

14. The probability that the temperature will fall below $-10°$ on any day through winter at a particular city in the northern hemisphere is 0.85.

Which calculation will give the probability that the temperature in this city will fall below $-10°$ on at least one day of the weekend?

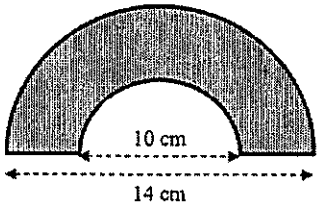
(A) $1 - (0.15)^2$

(B) $1 - (0.85)^2$

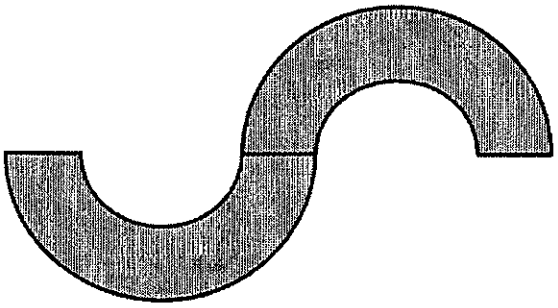
(C) $(1 - 0.15)^2$

(D) $2 \times 0.85 \times 0.15$

15. A shape in the form of a semi-circular arch is cut from a piece of cardboard.



Two of these semi-circular arch shapes are later joined to make a design, shown below.



In terms of π, what is the perimeter (in cm) of the design?

(A) $12\pi + 2$

(B) $12\pi + 6$

(C) $24\pi + 4$

(D) $24\pi + 8$

$14\pi + 10\pi + 4 = 24\pi + 4$

16. A car's petrol consumption (C) in litres/100km can be estimated by using the formula:

$$C = 0.01S^2 - S + 33$$

where S is the speed (in km/h) at which the car is being driven.

What is the change in petrol consumption if the speed at which a car is being driven increases from 60km/h to 80km/h?

(A) A decrease of 8 L/100km

(B) An increase of 8 L/100km

(C) A decrease of 17 L/100km

(D) An increase of 13.2 L/100km

sub $S=60$, $C=9$

sub $S=80$, $C=17$

$\therefore$ 17L/100km → 9L/100km

$= 8$L/100km increase.

17. A doctor prescribes a patient 750 g of medication per day to be taken every 4 hours. A bottle of this medication from the chemist contains a concentration of 50 g/5 mL.

How many millilitres does the patient need to take in each dose?

(A) 12.5

(B) 13.5

(C) 15

(D) 18.75

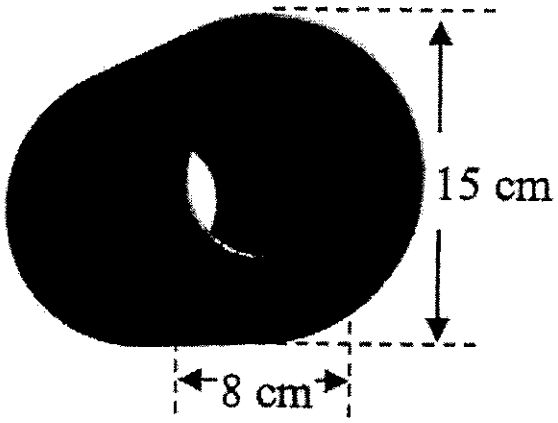
concentration $= 50$g/5mL

$= 10$g/mL

$750 \div 6 \div 10 = 12.5$mL

18. A concrete pipe shown below has length 1.25 m.

Its internal diameter is 8 cm and its external diameter is 15 cm.



Which of these calculations would correctly give the volume of concrete used to make the pipe?

(A) $\pi \times (0.15 - 0.08)^2 \times 1.25$

(B) $\pi \times (0.075^2 - 0.04^2) \times 125$

(C) $\pi \times (15^2 - 8^2) \times 1.25$

(D) $\pi \times (0.075^2 - 0.04^2) \times 1.25$

19. The number of 'standard drinks' in various glasses of wine is shown below.

Number of standard drinks

White Wine		*Red Wine*	
small glass	*large glass*	*small glass*	*large glass*
0.9	1.4	1.0	1.5

A woman weighing 62 kg drinks three small glasses of white wine and two large glasses of red wine between 8 pm and 1 am.

What would be her blood alcohol content (BAC) estimate at 1 am, correct to 3 decimal places?

(A) 0.030

(B) 0.037

(C) 0.057

(D) 0.046

$$BAC_F = \frac{10N - 7.5H}{5.5M}$$

$$= \frac{10(5.7) - 7.5(5)}{5.5(62)}$$

$$= 0.057$$

20. If $a > 0$, which of the following correctly expresses a as the subject of $r = \sqrt{\frac{V}{a^2}}$?

(A) $a = \frac{\sqrt{V}}{r}$

(B) $a = \frac{V}{\sqrt{r}}$

(C) $a = Vr$

(D) $a = \sqrt{\frac{V}{r}}$

$r^2 = \frac{V}{a^2}$

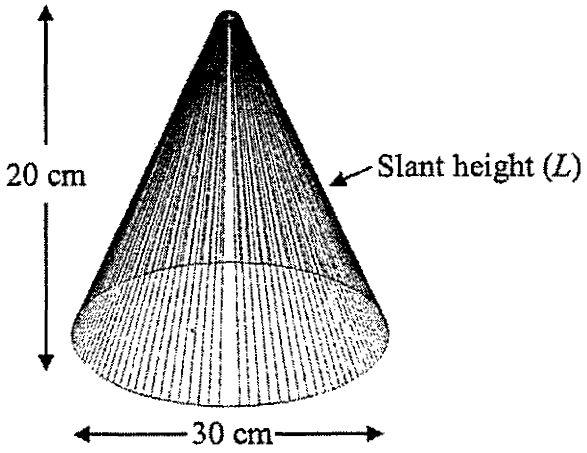
$a^2 r^2 = V$

$a^2 = \frac{V}{r^2}$

$a = \frac{\sqrt{V}}{r}$

21. A child's party hat is made in the shape of a cone of height 20 cm and diameter 30 cm.

The slant height (L) of the cone is the shortest length from the top, to any point on the circumference of the base.



The surface area (in square centimetres of the cone) can be given by the formula:

$Surface\ Area = \pi r L$ (where r is the radius)

In terms of π, what is the surface area of the cone?

(A) 300π

(B) 375π

(C) 525π

(D) 750π

$L^2 = 20^2 + 15^2$

$= 625$

$L = 25$

$\therefore SA = \pi \times 15 \times 25$

$= 375\pi$

22. A table of future value interest factors up to 4 periods is shown below.

Table of future value interest factors					
	Interest rate per period				
Period	1%	2%	3%	4%	5%
1	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500
3	3.0301	3.0604	3.0909	3.1216	3.1525
4	4.0604	4.1216	4.1836	4.2465	4.3101

Using the figures in the table, what amount of interest would have been added at the end of 3 years to an annuity of $2500 per year at 4% pa?

(A) $260

(B) $304

(C) $459

(D) $530

$(3.1216 \times 2500) - (2500 \times 3) = \$304$

23. Alek rolls a die. If he rolls a 6 he wins $10, but if he rolls an odd number he loses $1. What is his financial expectation?

(A) $2.17

(B) $1.50

(C) $1.17

(D) $5.95

$\$10 \times \frac{1}{6} - \$1 \times \frac{1}{2} = \$1.17$

24. Catherine borrows $10 000 at 6% p.a. to buy a car and chooses to repay it in monthly repayments over 5 years.

Monthly Repayments on a loan of $10 000

Time (years)

Rate (% pa)	2	3	4	5	6	7	8
4	$434.25	$295.24	$225.79	$184.17	$156.45	$136.69	$121.89
5	$438.71	$299.71	$230.29	$188.71	$161.05	$141.34	$126.60
6	$443.21	$304.22	$234.85	$193.33	$165.73	$146.09	$131.41
7	$447.73	$308.77	$239.46	$198.01	$170.49	$150.93	$136.34
8	$452.27	$313.36	$244.13	$202.76	$175.33	$155.86	$141.37

Use the table to find how much she will pay for the car altogether.

(A) $19333.30

(B) $11966.65

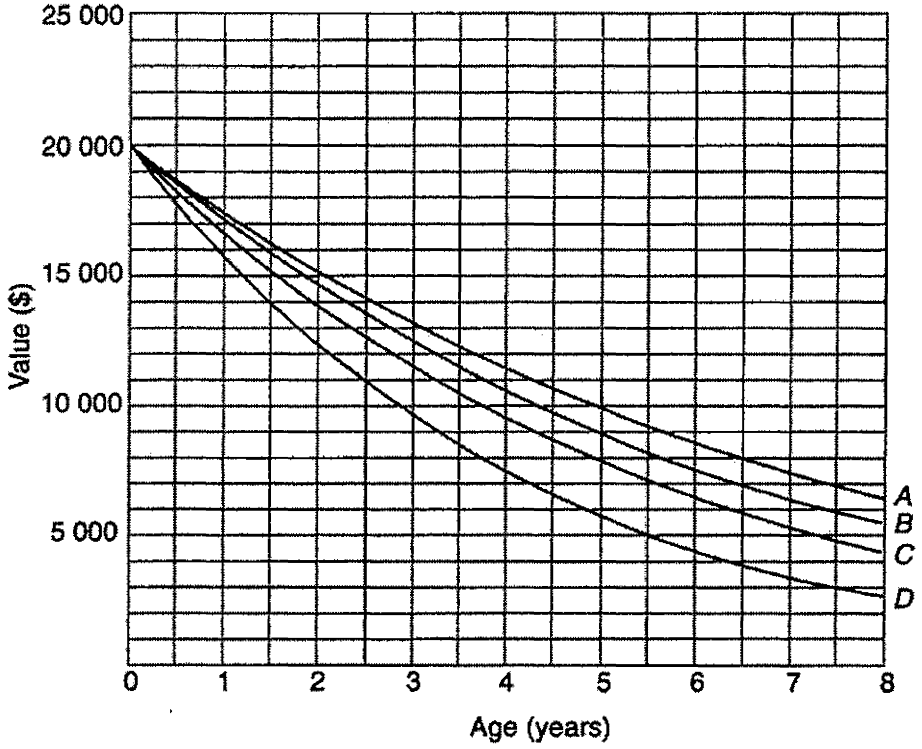
(C) $11599.80

(D) $11599.99

$\$193.33 \times 12 \times 5 = \$11599.80$

25. The value of a motor vehicle, purchased new for $20 000, is calculated over 8 years using the declining balance method of depreciation.

The graphs *(A), (B), (C)* and *(D)* below show the calculated values over this period, with 4 different rates of depreciation applied.



Which graph best shows the value of the motor vehicle when depreciated at 22%p.a?

(A) *A*

(B) *B*

(C) *C*

(D) *D*

$A = P(1-r)^{\wedge}$

$= 20000\ (1-0.02)^{8}$

$= \$2740.23.$

End of Section I

Section I Multiple Choice Answer Sheet

Student Number: Answers

Completely fill the response oval representing the most correct answer.

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 ○
16	A ○	B ●	C ○	D ○
17	A ●	B ○	C ○	D ○
18	A ○	B ○	C ○	D ●
19	A ○	B ○	C ●	D ○
20	A ●	B ○	C ○	D ○
21	A ○	B ●	C ○	D ○
22	A ○	B ●	C ○	D ○
23	A ○	B ○	C ●	D ○
24	A ○	B ○	C ●	D ○
25	A ○	B ○	C ○	D ●

Section II

75 marks
Attempt Questions 26–30
Allow about 1 hour 55 minutes for this section

Answer the questions in the spaces provided.
Your responses should include relevant mathematical reasoning and/or calculations.

Question 26 (15 marks)

(a) Craig decides to measure the lateness of tour buses. He records the elapsed time in minutes, from the scheduled departure time to the bus leaving the depot. This data is recorded in the stem-and-leaf plot shown below.

				Q_1				Q_2
0	2	2	3	5	9	9	9	9
1	0	0	1	1	1	4		
2	2			Q_3				

(i) What was the mean late departure time? **1**

$\bar{x} = 137 \div 15$

$= 9.13$ mins OR $9\frac{1}{3}$ mins ✓

(ii) What was the median late departure time? **1**

median $= 9$ ✓

(iii) Calculate the inter-quartile range. **2**

$IQR = Q_3 - Q_1$

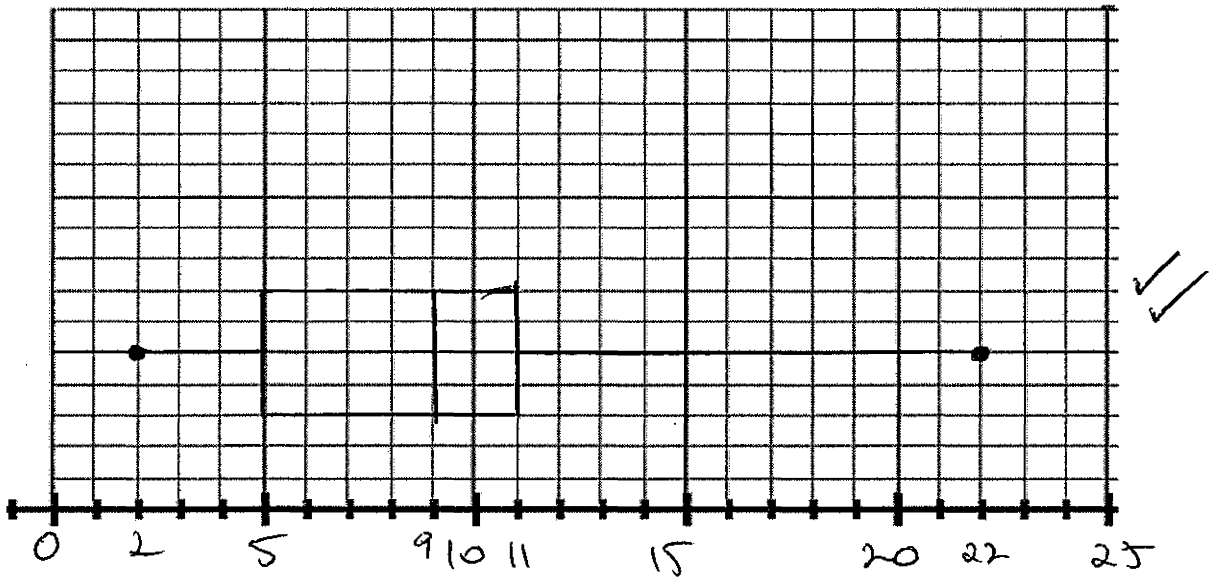
$= 11 - 5$ ✓

$= 6$ mins ✓

Question 26(a) continues on page 12

Question 26(a) continued

(iv) In the space below, draw a box-and-whisker plot using the scale given. **2**



(v) Describe the skewness of the distribution of late departure times. **1**

Positive skew since Q_3 has a greater range than Q_1 $(22-11) > (5-2)$

$11 > 2$ ✓

(vi) Explain why the late departure time of 22 minutes could be considered an outlier for the data presented. Justify your answer with a calculation. **2**

$Q_3 + 1.5 \times IQR = 11 + 1.5 \times 6$

$= 20$ mins ✓

since $22 > 20$, 22 minutes can be regarded as an outlier. ✓

(vii) If the late departure time of 22 minutes was not included in the data, what effect would this have on the mean? Justify your answer with a calculation. **1**

$\bar{x} = 9.1\dot{3}$ mins if 22 minutes is included.

$\bar{x} = 8\frac{3}{14}$ mins if 22 minutes is not included.

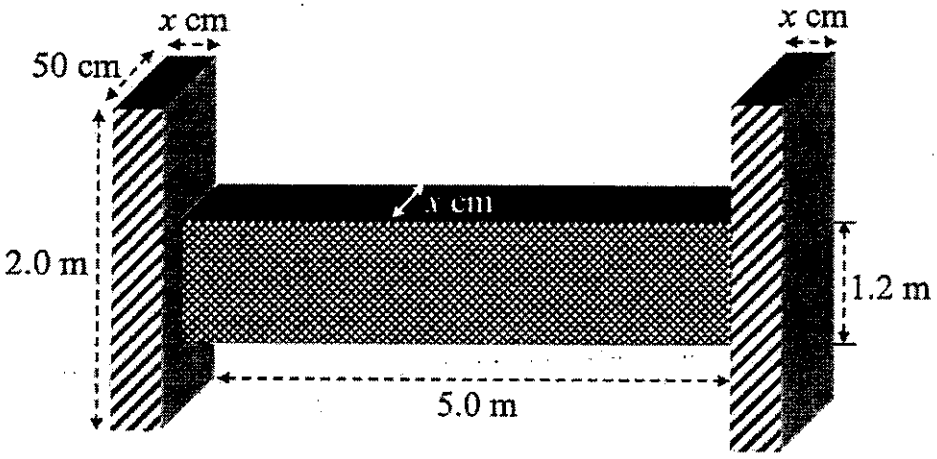
∴ the mean would decrease if outlier not included since $9.1\dot{3} > 8\frac{3}{14}$ mins ✓

Question 26 continues on page 13

(b) A company manufactures steel beams.

The diagram shows one of these beams consisting of 3 sections each of the same thickness of x cm.

The beam has 2 identical end sections and one centre section with dimensions as shown.



(i) The volume of steel in the beam is 0.36 m^3. **3**

Calculate the thickness (x) of the beam.

$V = 2(x \times 2 \times 0.5) + (x \times 1.2 \times 5)$ ✓

$= 8x$

$\therefore 8x = 0.36$ ✓

$x = 0.045\text{m}$ or 4.5m ✓

(ii) The density of steel in the beam is measured as 7900 kg/m^3. **2**

Calculate the mass (in tonnes) of steel in the beam, correct to one decimal place.

Density $= 7900 \times 0.36$ ✓

$= 2844\text{kg}$ ✓

$= 2.8$ tonnes

End of Question 26

Question 27 (15 marks)

(a) A triangular pyramid is constructed from 4 pieces of glass.

Two of the glass pieces APQ and BPQ are right-angled and meet the base piece ABQ at Q, as shown.

The distance PQ is the height of the pyramid (h cm).

$AQ = 25cm$, $\angle PAQ = 69°$, $\angle PBQ = 63°$ and $\angle AQB = 115°$

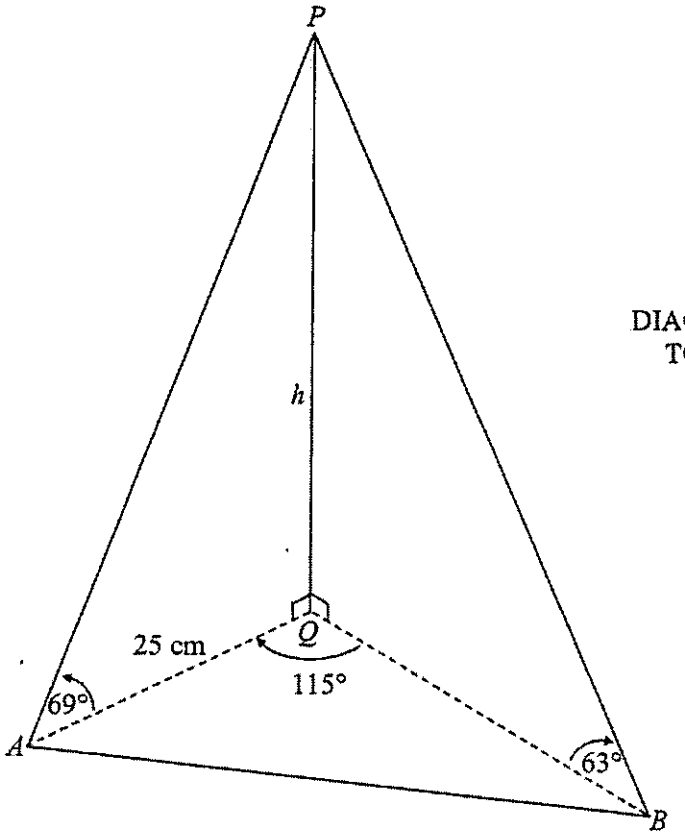


DIAGRAM NOT TO SCALE

Question 27(a) continues on page 15

Question 27(a) continued

(i) In triangle APQ, show that h is approximately 65 cm. **2**

$\tan 69^\circ = \frac{h}{25}$ ✓

$h = 25 \tan 69^\circ$

$= 65 \text{ cm}$ ✓

(ii) Show that the length of BQ is approximately 33 cm. **2**

$\tan 63^\circ = \frac{65}{BQ}$ ✓ OR $\tan 27^\circ = \frac{BQ}{65}$ ✓

$BQ = \frac{65}{\tan 63^\circ}$ ✓ OR $BQ = 65 \tan 27$

$= 33 \text{ cm}$ ✓ $= 33 \text{ cm}$ ✓

(iii) Calculate the length (to the nearest centimetre) of the edge AB. **2**

$AB^2 = 25^2 + 33^2 - 2(25)(33)\cos 115^\circ$ ✓

$= 2411.32\ldots$

$AB = 49 \text{ cm}$ ✓

(iv) Calculate the area of the base ABQ of the pyramid, correct to the nearest square centimetre. **2**

$A = \frac{1}{2} \times 25 \times 33 \sin 115^\circ$ ✓

$= 374 \text{ cm}^2$ ✓

16

Question 27 continues on page ~~17~~

Question 27 continued

(v) Calculate the capacity of the pyramid to the nearest litre. ($V = \frac{1}{3}AH$) **3**

$V = \frac{1}{3} \times 374 \times 65$ ✓

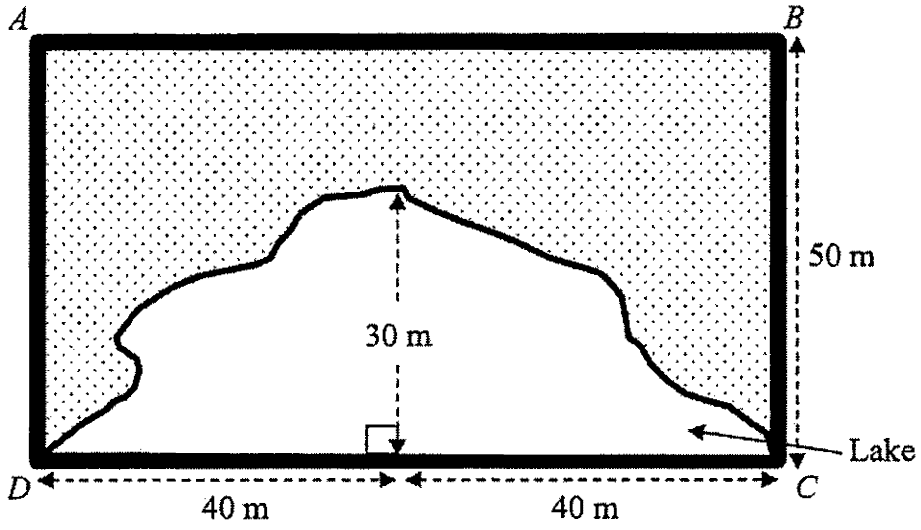
$= 8103\frac{1}{3}\,cm^3$

$= 0.00813\dot{3}\,m^3$ ✓ $(1m^3 = 1000L)$

$\therefore$ capacity $= 0.00813\dot{3} \times 1000$

$= 8L$ ✓

(b) An artificial lake is to be constructed within a rectangular enclosure $ABCD$ in a new estate.



(i) Using Simpson's Rule estimate the surface area of the lake. **2**

$A = \frac{40}{3}(0 + 4(30) + 0)$ ✓

$= 1600\,m^2$ ✓

(ii) What percentage of the rectangular enclosure does the lake cover? **2**

Area of enclosure $= 80 \times 50$ ✓

$= 4000\,m^2$

$\therefore$ % of lake $= \frac{1600}{4000} \times 100$

$= 40\%$ ✓

End of Question 27

Question 28 (15 marks)

(a) Amie has signed up to the 'Basic Plan' mobile phone plan shown.

Basic Plan
Monthly cost of plan: $ 50.00
This includes $150 worth of calls and messages and 2 GB of data.
Voice Calls: 90 cents per minute plus 40 cents connection fee.
Text picture and video: 5 cents per standard text message, 50 cents for picture message and 75 cents for video messages.
Excess data: 10 cents / MB.

Last month Amie made 100 calls with an average time of 150 minutes, she sent 300 standard text messages, 30 picture texts and 6 video texts. She used 2.5 GB of data.

(i) How many MB of excess data usage did Amie have last month? **1**

Excess = 2.5GB − 2GB = 0.5GB
∴ excess = 0.5 × 1024 = 512 mB ✓

(ii) What would Amie pay altogether for her mobile usage last month? **3**

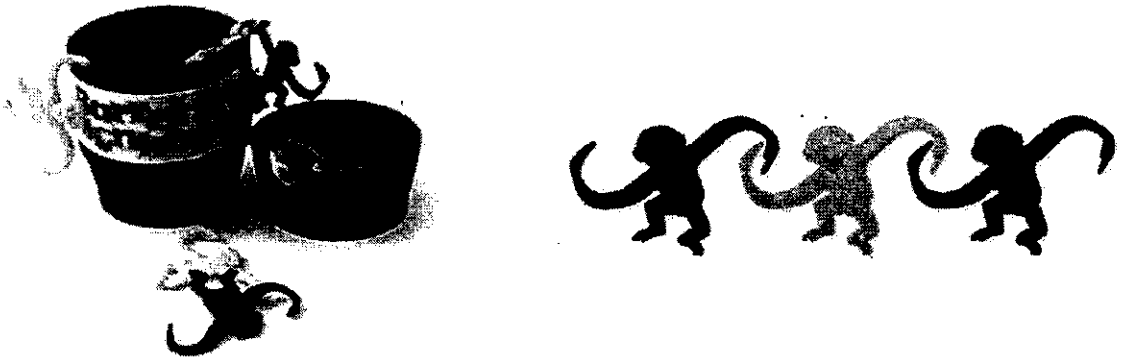
150 minutes of calls = 150 × 0.9 = $135
100 connection fees = 100 × 0.4 = $40
300 text messages = 300 × 0.05 = $15
30 picture messages = 30 × 0.5 = $15
6 video messages = 6 × 0.75 = $4.50
Total = $209.50 − $150 = $59.50 ✓
Excess data = 512 × 0.1 = $51.20 ✓

∴ total = $50 + $59.50 + $51.20
= $160.70 ✓

Question 28 continues on page 18

(b) A barrel of 12 plastic toy monkeys has 6 red, 4 yellow and 2 green.

Three of these monkeys when taken out of the barrel are linked, similar to the diagram.



(i) What is the probability that the first monkey in the link is yellow? **1**

$P(Y) = \frac{1}{3}$ ✓

(ii) What is the probability that the first two linked monkeys are either both green or both yellow? **2**

$P(GG) + P(YY) = \left(\frac{2}{12} \times \frac{1}{11}\right) + \left(\frac{4}{12} \times \frac{3}{11}\right)$ ✓

$= \frac{7}{66}$ ✓

(iii) If the three monkeys are of different colours, in how many ways can they be linked? **1**

$3 \times 2 \times 1 = 6$ ways ✓

(iv) What is the probability that all 3 linked monkeys are of different colour? **2**

$P(YGR) + P(YRG) + P(GYR) + P(GRY) + P(RGY) + P(RYG)$

$= 6 \times P(YGR)$ ✓

$= 6 \times \frac{4}{12} \times \frac{2}{11} \times \frac{6}{10}$

$= \frac{12}{55}$ ✓

Question 28 continues on page 19

Question 28 continued

(c) The table below gives the future value of an annuity of \$1 per period for various periods and interest rates.

Table of Future Value Interest Factors								
	0.0025	0.0030	0.0035	0.0040	0.0045	0.0050	0.0055	0.0060
53	56.5961	57.3530	58.1230	58.9063	59.7033	60.5141	61.3391	62.1785
54	57.7376	58.5250	59.3264	60.1419	60.9719	61.8167	62.6765	63.5516
55	58.8819	59.7006	60.5340	61.3825	62.2463	63.1258	64.0212	64.9329
56	60.0291	60.8797	61.7459	62.6280	63.5264	64.4414	65.3733	66.3225
57	61.1792	62.0624	62.9620	63.8786	64.8123	65.7636	66.7329	67.7204
58	62.3322	63.2485	64.1824	65.1341	66.1040	67.0924	68.0999	69.1267
59	63.4880	64.4383	65.4070	66.3946	67.4014	68.4279	69.4744	70.5415
60	64.6467	65.6316	66.6359	67.6602	68.7047	69.7700	70.8565	71.9647
61	65.8083	66.8285	67.8692	68.9308	70.0139	71.1189	72.2463	73.3965
62	66.9729	68.0290	69.1067	70.2065	71.3290	72.4745	73.6436	74.8369
63	68.1403	69.2331	70.3486	71.4874	72.6499	73.8368	75.0487	76.2859
64	69.3106	70.4408	71.5948	72.7733	73.9769	75.2060	76.4614	77.7436
65	70.4839	71.6521	72.8454	74.0644	75.3098	76.5821	77.8820	79.2101
66	71.6601	72.8670	74.1004	75.3607	76.6487	77.9650	79.3103	80.6854

(i) Use the table to find the value of an investment of \$600 per month for 64 months at a rate of 0.0050 per month (as a decimal). **1**

FV = 75.2060
= \$45123.60 ✓

(ii) Isaac invests \$300 per month in an annuity which pays 4.2% p.a. compounding monthly. What will be the value of the annuity after 5 years? **1**

4.2% p.a. ÷ 12 = 0.0035/month, 5 yrs = 60 months
FV = 66.6359 × 300 = \$1990.77 ✓

(iii) Jillian wants to earn \$45 000 by investing in an annuity for a period of five and a half years. The best interest rate that she can find is 6.6% p.a. **1**

How much, to the nearest cent, will she need to invest each month?

6.6% p.a. = 0.0055/month, 5.5 yrs = 66 months
45 000 = 79.3103 × monthly investment
monthly investment = 45 000 / 79.3103 = \$567.39 OR \$567.40 ✓

Question 28 continues on page 20

Question 28 continued

(d) Monique, who lives in Toronto in Canada (44° N, 79° W), plans to ring her cousin Evie, who lives in Griffith NSW (34° S, 146° E), to wish her happy birthday. **2**

If she rings at 7 pm on Friday, Toronto local time, at what local time will Evie receive the call?

Longitude difference between Toronto and Griffith is $79° + 146° = 225°$ ✓

Time difference $= 225 \times 4$

$= 900$ minutes

$= 15$ hours.

∴ Griffith is 15 hours ahead.

7pm Friday + 15 hours = 7pm + 5 hours + 10 hours

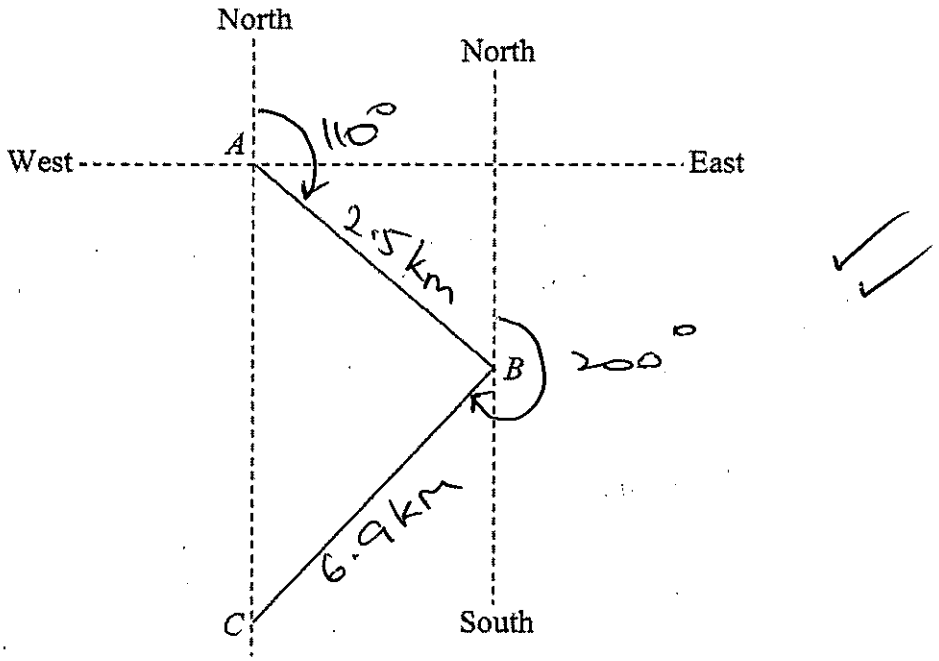
= 10am Saturday ✓

End of Question 28

Question 29 (15 marks)

(a) Victoria walks 2.5 km from A to B on a bearing of 110°. Then walks 6.9 km from B to C on a bearing of 200°. C is due south of A.

The diagram below shows the positions of A, B and C, not to scale.



(i) On the diagram, insert the distance Victoria walked and show the two given bearings. **2**

(ii) What is the size of angle BAC? **1**

$\angle BAC = 180° - 110°$

$= 70°$ ✓

(iii) What is the bearing of B from C? **1**

020° ✓

(iv) What is the bearing of A from B? **1**

290° ✓

(v) How far (correct to one decimal place) is C south of A? **2**

$AC^2 = 2.5^2 + 6.9^2$ ✓

$= 53.86$

$AC = 7.3$ km ✓

Question 29 continues on page 22

Question 29 continued

(b) A company's cost ($\$C$) for the manufacture of n items is given by:

$$\$C = 2350 + 200n$$

The income ($\$I$) received from the scale of these items is given by:

$$\$I = 250n$$

(i) Show that the equation for the company's profit ($\$P$) from the sale of the items can be given by: **2**

$$\$P = 50n - 2350$$

Profit = Income − Cost ✓

$= 250n - (2350 + 200n)$

$= 250n - 2350 - 200n$ ✓

$= 50n - 2350$

(ii) How any items must the company sell in order to break even? **2**

$P = 0$, $50n - 2350 = 0$ ✓

$50n = 2350$

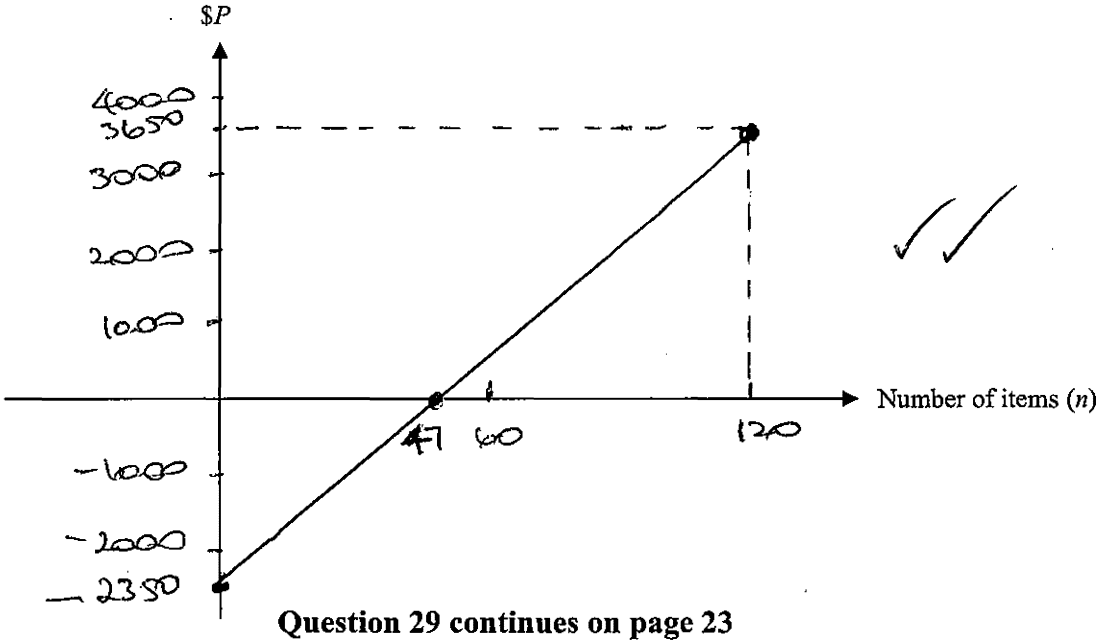
$n = 47$ items ✓

(iii) Calculate the profit the company makes from the sale of 120 items. **1**

$P = 50 \times 120 - 2350$

$= \$3650$ ✓

(iv) Using the information in (i), (ii) and (iii), draw the graph of the profit equation in the space below, labelling all relevant details. **2**



✓✓

Question 29 continues on page 23

Question 29 continued

(v) Explain what the gradient of the graph represents. **1**

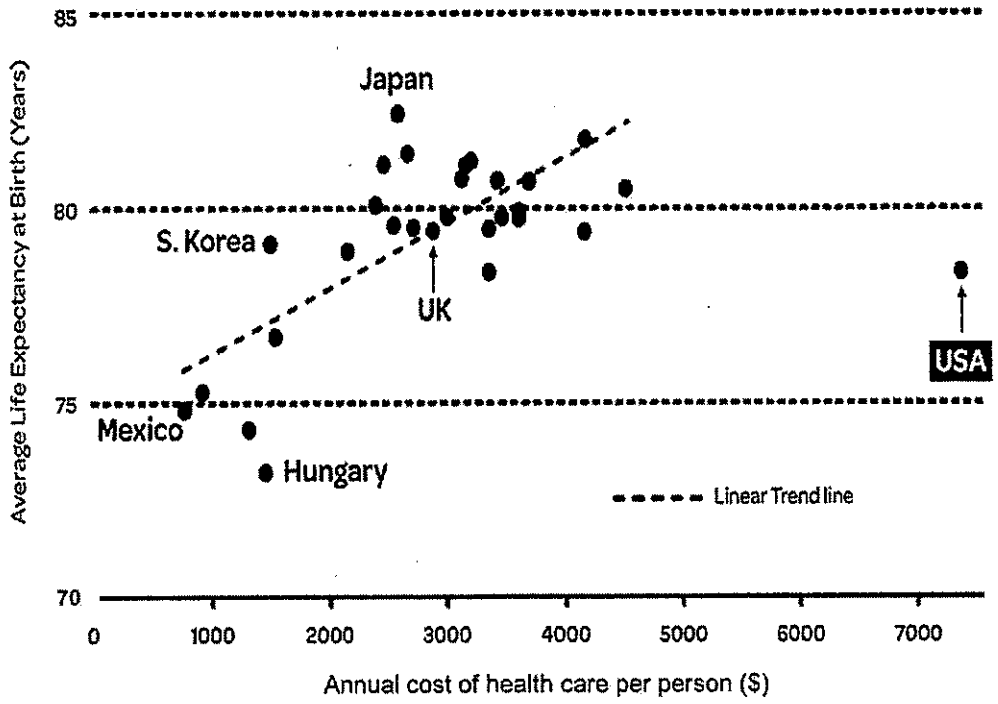
The gradient ($m=50$) indicates the profit made on the sale of each item after 47 items are sold. ✓

End of Question 29

Question 30 (15 marks)

(a) The data in the scatterplot below shows the amount spent on health care and the life expectancy in a number of countries, with 6 countries labelled.

Amount spent on Health Care versus Average Life Expectancy at birth in a selection of countries



(i) Which of the specified countries has the lowest amount spent on health care per person? **1**

Mexico ✓

(ii) Approximately, how much longer is a person living in South Korea expected to live than a person living in Hungary? **1**

79 − 73 = 6

∴ South Korean person lives 6 years more ✓

(iii) Compare and contrast the data presented for Japan and the USA. **1**

USA pay $7500 and Japan pay $2600.
USA has lower life expectancy than Japan by about 5 years. ✓

Question 30(a) continues on page 25

Question 30(a) continued

(iv) If the data for the USA was not included on the graph, comment on the effect on the correlation between the amount spent on health care and life expectancy. **1**

If the data for the USA were included from the analysis, the correlation coefficient would be higher for the remaining data. ✓

(v) The following table gives some values of calculations from the data in the graph.

		Mean	*Standard Deviation*
x	*Amount spent on health care*	\$2836.79	\$1308.81
y	*Average life expectancy*	79.33 years	2.31 years
	Correlation coefficient	$r = 0.48$	

Use the figures in the table to calculate the gradient of the trend line. (Give your answer correct to four decimal places) **2**

Gradient (m) = correlation coefficient $\times \frac{\sigma_y \text{ scores}}{\sigma_x \text{ scores}}$ ✓

$= 0.48 \times \frac{2.31}{1308.81}$

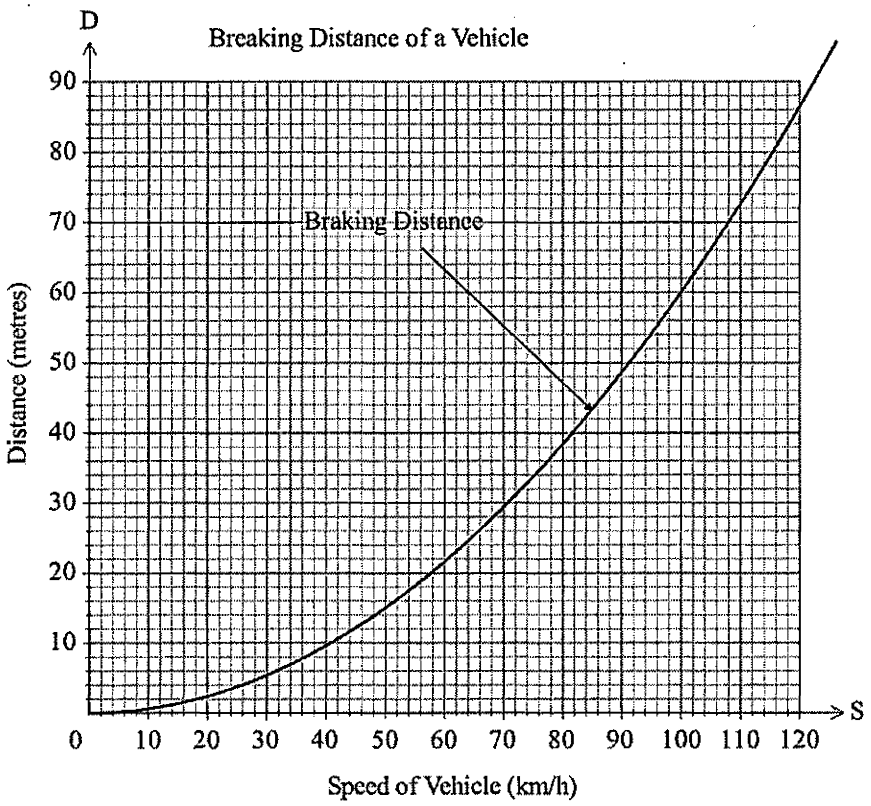
$= 0.0008$ ✓

Question 30 continues on page 26

Question 30 continued

(b) The graph below shows how the braking distance of a car changes with the speed of the car.

The braking distance is the distance the car travels before stopping after the brakes are applied.



(i) Braydon is travelling at a distance of six car lengths behind the car in front, to allow for the braking distance. Assuming an average car length of four metres, below what speed should he travel so that his braking distance is less than the distance between the cars? **1**

6 car lengths = 6 × 4 = 24m

From the graph, speed ≈ 63 km/h ✓

(ii) Before the brakes are applied there is a "thinking distance", D, which is given by the formula $D = 0.2S$, where S is the speed. **1**

Approximately how many extra car lengths should Braydon allow at the speed above, to allow for thinking time?

$S = 63$, $D = 0.2 \times 63$

$= 12.6$

No of car lengths $= \frac{12.6}{4} = 3.15$

∴ about 3 car lengths. ✓

Question 30 continues on page 27

(c) The rangers in Anajaraby National Park wanted to estimate the number of antechinus (a marsupial mouse) in the park. They did a live trapping exercise and collected 52 antechinus, which they tagged and released.

A month later they did another live trapping exercise and collected 45 antechinus and counted the number of these which were tagged.

Based on this, they calculated an estimate of 390 for the population of antechinus in the park.

How many tagged antechinus were caught in the second trapping exercise?

2

$\frac{x}{45} = \frac{52}{390}$ ✓

$x = \frac{52 \times 45}{390}$ ✓

= 6 antechinus were tagged.

Question 30 continues on page 28

Question 30 continued

(d) Blake borrows \$650 000 (P) for the purchase of a home. Interest (I) is charged monthly on the amount owing on the loan at an annual rate of 4.35%.

Blake is required to repay (R) \$2850 per month off the loan.

Let the amount Blake owes on the loan at the end of each month be (\$$A$).

(i) Using $A = P + I - R$, show that Blake owes \$649 506.25 after his first repayment. **2**

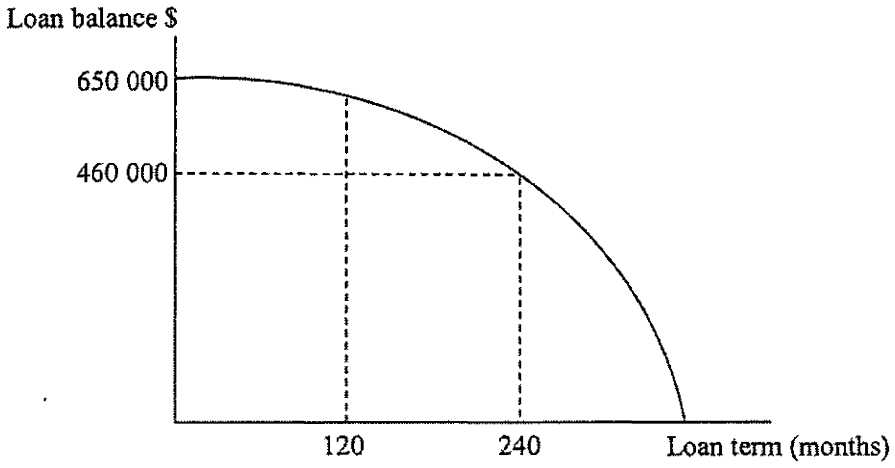
$I = \frac{4.35\%}{12} \times 650\,000$

$= \$2356.25$ ✓

$A = \$650\,000 + \$2356.25 - \$2850$

$= \$649\,506.25$ ✓

(ii) Below is a graph showing Blake's loan balance over the term of the loan, is given below.



How much interest has Blake paid on the loan after 20 years of repayment? **3**

After 20 years of repayments, Blake owes \$460 000. He has paid \$650 000 − \$460 000 = \$190 000 off the principle of the loan. ✓

He has repaid $240 \times 2850 = \$684\,000$ over 20yrs ✓

Interest $= \$684\,000 - \$190\,000$

$= \$494\,000$ ✓

End of Examination!