



Student Number: _____

2014
Higher School Certificate
Trial Examination

Mathematics General 2

Teacher Setting Paper: Miss K Cole
Head of Department: Mrs M Hill

General Instructions

- Reading time – 5 minutes
- Working time – $2\frac{1}{2}$ hours
- Write using black or blue pen
Black pen is preferred
- Board-approved calculators may be used
- A formulae and data sheet is provided at the back of this paper
- Write your answers for Section I (questions 1 to 25) on the multiple choice answer sheet provided on page 26
- Write your answers to Section II (questions 26 to 30) in the spaces provided. Show relevant mathematical reasoning and/or calculations

Total marks – 100

Section I – Pages 2 - 9

25 marks

Attempt Questions 1 - 25

Allow about 35 minutes for this section

Section II – Pages 10 - 24

75 marks

Attempt questions 26 - 30

Allow about 1 hour and 55 minutes for this section

Section I

25 marks

Attempt Questions 1 – 25

Allow about 35 minutes for this section

Use the Multiple Choice Answer Sheet provided on page 26.

1 What is $2x(3x - 5) - (7x - 8)$ in simplest form?

- (A) $-x - 10$
- (B) $6x^2 - 7x + 3$
- (C) $6x^2 - 17x + 8$
- (D) $6x^2 - 17x - 8$

2 If the average data file is 6.9 MB, how many data files can be stored on an 8 GB USB drive?

- (A) 1187
- (B) 1159
- (C) 1159420
- (D) 1215740

3 The time taken for a pendulum to oscillate varies directly with the square root of its length.

Which of the following equations represents this relationship?

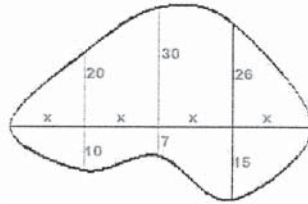
- (A) $t = \sqrt{l}$
- (B) $t = kl^2$
- (C) $t = \frac{k}{\sqrt{l}}$
- (D) $t = k\sqrt{l}$

- 4 Kristen is a real estate agent who earns an annual salary of \$65 000. She is paid her salary monthly and earns an additional 3% commission on all property that she sells for the month. How much is her gross pay for the month when she sells \$375 000 worth of property?

- (A) \$16 666.67
 (B) \$5416.67
 (C) \$11 250
 (D) \$6354.17

- 5 The surface area of this pond is 1790 m^2 . Which of the following equations was used to determine its area?

- (A) $1790 = \frac{x}{3}(30 + 4 \times 37 + 41)$
 (B) $1790 = \frac{x}{3}(30 - 4 \times 37 - 41)$
 (C) $1790 = \frac{x}{3}(4 \times 30 + 37) + \frac{x}{3}(37 + 4 \times 41)$
 (D) $1790 = \frac{x}{3}(4 \times 30 + 37) + \frac{x}{3}(4 \times 37 + 41)$



- 6 The mean of seven scores is 41. What two scores needs to be added to increase the mean to 45?

- (A) 56, 62
 (B) 73, 74
 (C) 52, 64
 (D) 45, 74

- 7 Which correlation coefficient shows a strong negative correlation?

- (A) -1.05
 (B) -0.85
 (C) -0.25
 (D) -0.65

- 8 Which of the following correctly expresses b as the subject of $a^2 + b^2 = c^2$?

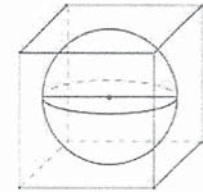
- (A) $b = c^2 - a^2$
 (B) $b = \pm\sqrt{c^2 - a^2}$
 (C) $b = \pm\sqrt{c^2 + a^2}$
 (D) $b = \pm\sqrt{a^2 - c^2}$

- 9 What is the capacity, in kL of a water tank with a diameter of 4 m and a height of 2 m?

- (A) 2513.27 kL
 (B) 25132.7 kL
 (C) 251.33 kL
 (D) 25.13 kL

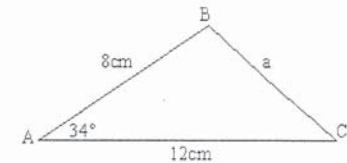
- 10 A ball fits perfectly inside a box with side length 10 cm. How much of the volume of the box is not taken up by the ball?

- (A) 3188.79 cm^3
 (B) 476.40 cm^3
 (C) 523.60 cm^3
 (D) 1000 cm^3



- 11 Which of the following demonstrates how to find length a ?

- (A) $a = \sqrt{8^2 + 12^2 - 2 \times 8 \times 12 \times \cos 34^\circ}$
 (B) $a = 8^2 + 12^2 - 2 \times 8 \times 12 \times \cos 34^\circ$
 (C) $a = \sqrt{8^2 - 12^2 + 2 \times 8 \times 12 \times \cos 34^\circ}$
 (D) $a = 8^2 + 12^2 - 2 \times 8 \times 12 \times \sin 34^\circ$



- 12 Using the following table of future values, determine the contribution amount you would have to invest at 8%, compounded quarterly for 3 years, in order to grow to a future value of \$10 000.

Future value interest factors (Future value of an annuity with a contribution of \$1 at the end of each period)									
Period	Interest rate per period								
	1%	2%	3%	4%	5%	6%	8%	10%	12%
1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	2.0100	2.0200	2.0300	2.0400	2.0500	2.0600	2.0800	2.1000	2.1200
3	3.0301	3.0604	3.0909	3.1216	3.1525	3.1836	3.2464	3.3100	3.3744
4	4.0604	4.1216	4.1836	4.2465	4.3101	4.3746	4.5061	4.6410	4.7793
5	5.1010	5.2040	5.3091	5.4163	5.5256	5.6371	5.8666	6.1051	6.3528
6	6.1520	6.3081	6.4684	6.6330	6.8019	6.9753	7.3359	7.7156	8.1152
7	7.2135	7.4343	7.6625	7.8983	8.1420	8.3938	8.9228	9.4872	10.0890
8	8.2857	8.5830	8.8923	9.2142	9.5491	9.8975	10.6366	11.4359	12.2997
9	9.3685	9.7546	10.1591	10.5828	11.0266	11.4913	12.4876	13.5795	14.7757
10	10.4622	10.9497	11.4639	12.0061	12.5779	13.1808	14.4866	15.9374	17.5487
11	11.5668	12.1687	12.8078	13.4864	14.2068	14.9716	16.6455	18.5312	20.6546
12	12.6825	13.4121	14.1920	15.0258	15.9171	16.8699	18.9771	21.3843	24.1331

- (A) \$745.60 per quarter
 (B) \$3267.55 per quarter
 (C) \$3080.34 per quarter
 (D) \$526.95 per quarter
- 13 Joshua buys a car for \$23 990. It depreciates at a rate of 18% per year. How much is the car worth after 5 years?
- (A) \$8894.05
 (B) \$19 671.80
 (C) \$15 095.95
 (D) \$4318.20

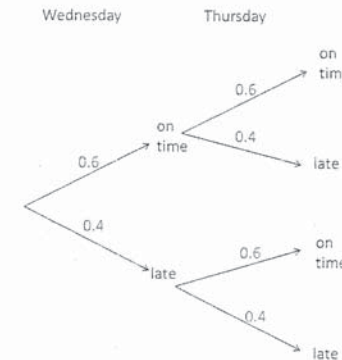
- 14 A group of 1200 university students were surveyed and the results recorded in the table below.

		Body Image			Total
		About Right	Overweight	Underweight	
Gender	Female	560	163	37	760
	Male	295	72	73	440
	Total	855	235	110	1200

What percentage of the students who believe they are overweight are female?

- (A) 14%
 (B) 21%
 (C) 31%
 (D) 69%

- 15 A train runs on time on Wednesdays and Thursdays approximately 60% of the time.



What is the probability that the train will be late on either Wednesday or Thursday and on time the other day?

- (A) 50%
 (B) 24%
 (C) 48%
 (D) 16%

- 16 The formula for estimating a female's blood alcohol content is given by

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

where BAC is the blood alcohol concentration (in mg per 100 mL sample of blood), N is the number of standard drinks consumed, H is the number of hours of drinking and M is the female's mass (kg). Calculate the BAC of a 69 kg female who has consumed five standard drinks in 4 hours.

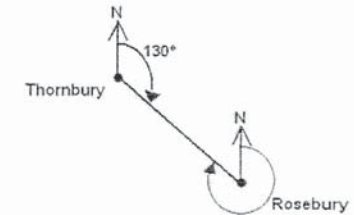
- (A) 0.007
(B) 0.053
(C) 0.033
(D) 0.026
- 17 Sara purchased concert tickets on August 9th for \$290 on her credit card. She was charged an annual compound interest rate of 18.25%. There is no interest-free period on her credit card and she made no other purchases. Sara receives a statement and pays the amount owing on September 20th. How much interest did she pay?
- (A) \$296.30
(B) \$6.30
(C) \$296.17
(D) \$6.17
- 18 Which of the following is a point on the equator?
- (A) (40°W, 0°)
(B) (40°N, 0°)
(C) (0°, 40°W)
(D) (0°, 40°N)
- 19 In a class of 21 students, how many different groups of three can be made?

- (A) 1330
(B) 7980
(C) 1140
(D) 2660

- 20 A test has a standard deviation of 14. Fiona's mark is 87% and has a z-score of 1.5. What is the mean for the test?

- (A) 59%
(B) 80%
(C) 73%
(D) 66%

- 21 Rosebury is 150 km on a bearing of 130° from Thornbury. What is the bearing of Thornbury from Rosebury?



- (A) 230°
(B) 320°
(C) 130°
(D) 310°

- 22 A patient receives her chemotherapy medication through an intravenous drip. She receives 350 mL in an hour and a half delivered at a constant rate. If 1 mL contains 9 drops, what is the drip rate per hour?

- (A) 58 drips per hour
(B) 2100 drips per hour
(C) 3150 drips per hour
(D) 525 drips per hour

- 23 What are the coordinates of the half-way point between Los Angeles, USA (34°N, 119°W) and Sydney (34°S, 151°E) if you are travelling over the prime meridian?

- (A) (0°, 45°W)
(B) (0°, 45°E)
(C) (0°, 16°E)
(D) (0°, 164°E)

24 Which of the following is an example of an exponential function?

- (A) $y = \frac{-3}{x}$
- (B) $y = -3x^2$
- (C) $y = -3^x$
- (D) $y = -3x^3$

25 A sample of 50 fish were captured, tagged and released back into the dam. Later another sample of 120 fish were captured. 15% of these were tagged. What is the best estimate of the population of fish in the dam?

- (A) 333
- (B) 800
- (C) 640
- (D) 400

END OF SECTION I

Section II

Student Number: _____

75 marks

Attempt Questions 26 - 30

Allow about 1 hour and 55 minutes for this section

Answer the questions in the spaces provided.

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

Extra writing space is provided on page 25. If you use this space, clearly indicate which question you are answering.

Question 26 (15 marks)

a) This table shows the monthly and fortnightly repayments for some reducing balance loans over different terms.

Loan amount	Repayment amounts					
	1 year		18 months		2 years	
	monthly	fortnightly	monthly	fortnightly	monthly	fortnightly
\$10 000	\$885	\$408	\$606	\$280	\$467	\$215
\$20 000	\$1770	\$815	\$1213	\$559	\$935	\$430
\$30 000	\$2655	\$1223	\$1819	\$838	\$1402	\$646
\$40 000	\$3540	\$1630	\$2425	\$1117	\$1869	\$861

i) What is the total amount to be repaid on a \$40 000 loan over two years with monthly repayments? 1

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.....

ii) How much interest would be saved by making fortnightly payments on a \$40 000 loan over two years? 2

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Question 26 continues on page 11

Question 26 (continued)

Student Number: _____

b) The stem-and-leaf plot shows the test results of two classes.

Class A			Class B	
Leaves	Stems		Leaves	
8 0	6		0 0	
5 0	7		0 1 3 3 5 6 7	
6 4	8		4 5 6	
6 4 4 2 1 0	9		1 2	
0 0	10			

i) Find the range, median and interquartile range for Class B. 3

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.....

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ii) Describe the shape of the distribution for each class. 2

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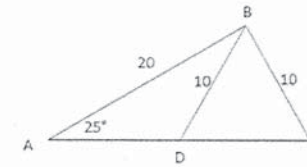
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Question 26 continues on page 12

Question 26 (continued)

Student Number: _____

c)



i) Show $\angle ADB = 58^\circ$. 2

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ii) Find the size of $\angle ABC$. Justify each step. 2

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d) Thomas travels 38 km to work in the morning and returns 38 km home in the evening.

i) During a five-day work week, how many kilometres does Thomas travel? 1

.....

ii) Thomas's car has a fuel consumption of 7.5 L/100 km. How many litres of petrol does Thomas use travelling to and from work in a week? 1

.....

.....

iii) If petrol costs \$1.78 per litre when Thomas fills his tank, how much is his petrol bill for work-related travel this week? 1

.....

.....

End of Question 26

Question 27 (15marks)

Student Number: _____

- a) This archery target has a bull's-eye with radius 6cm. Each additional ring is 6 cm wide.



- i) What is the total area of the target, to 4 significant figures? 2

- ii) What is the area of the bull's-eye, to 4 significant figures? 1

- iii) What is the probability of hitting the bull's-eye? 1

- iv) If Pete shoots 30 arrows at the target, how many arrows would he expect to hit the bull's-eye? 1

Question 27 continues on page 14

Question 27 (continued)

Student Number: _____

- b) The table below show the height and arm span of 10 top male swimmers.

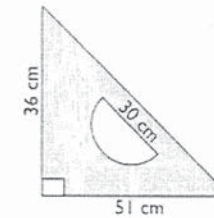
Height (h cm)	190	192	199	188	197	187	194	198	193	199
Arm span (s cm)	192	194	202	189	200	188	196	202	197	200

- i) Determine the correlation coefficient. 1

- ii) Describe the correlation between height and arm span. 1

- iii) Determine the equation of the least-squares line of best fit. Round calculations to 2 decimal places. 3

- c) Calculate the shaded area, to 2 decimal places. 3



-

Question 27 continues on page 15

Question 27 (continued)

Student Number: _____

d) Solve the equation:

$$3x - 16 = 12 - 5x$$

2

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End of Question 27

Question 28 (15 marks)

Student Number: _____

- a) Michael is travelling from Capetown, South Africa (34°S , 18°E) to Sydney (34°S , 151°E).
- i) If the radius of the earth is approximately 6400 km, determine the shortest distance between the two cities, to the nearest kilometre. 1
-
.....
- ii) If the plane travels at an average speed of 820 km/h, how long will it take to fly from Capetown to Sydney in hours and minutes? 1
-
.....
- iii) Before leaving for Sydney, Michael wants to call his sister in Sydney. If Sydney is UTC +10 and Capetown is UTC +2 and Michael wants to get a hold of his sister at 6:00 pm, what time should he call? 1
-
.....
- iv) Michael's plane leaves Capetown at 12:32 pm. What time is it scheduled to arrive in Sydney? 2
-
.....
- b) The letters of the word HOLIDAYS are randomly arranged. Calculate the probability that:
- i) the letters are arranged alphabetically 1
-
.....
- ii) the arrangement begins with H and ends with S 2
-
.....

Question 28 continues on page 17

Question 28 (continued)

Student Number: _____

c) Ryan throws a ball into the air. The height, h in metres, the ball travels in t seconds is given by the formula:

$$h = -t^2 + 4t + 1$$

i) What is the independent variable? 1

.....

ii) Construct a table of values and draw the graph of the ball's height. 3

iii) Explain why quadrants II, III and IV are unnecessary for your graph. 2

.....
.....

iv) What is the maximum height that the ball reaches? 1

.....

End of Question 28

Question 29 (15 marks)

Student Number: _____

a) The cost of using the Apple Charter Bus Company is $C = 400 + 10n$, where n is the number of students and C is the cost in dollars. 2

i) The City Charter Bus Line provides the same service. The table below shows the cost. 2

Number of students, n	5	10	15	20	25
Cost, C	250	400	550	700	850

Write an equation describing the cost in dollars, C , with any number of students, n .

.....

ii) What is the gradient of the City Charter Bus Line and what does it represent? 2

.....
.....

iii) Using the equations above, find the cost of transporting 23 students with each bus company. 2

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.....

iv) How many students can travel on each bus line for a fixed cost of \$940? 2

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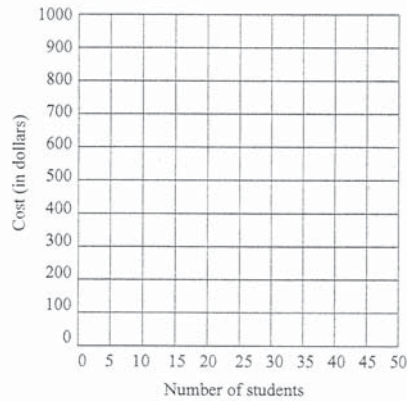
Question 29 continues on page 19

Question 29 (continued)

Student Number: _____

v) Graph both equations on the same number plane.

2



vi) For how many students is the cost of using the bus companies the same?

1

.....

b) In a game of chance, there is a 40% of winning, a 40% chance of losing and a 20% chance drawing. If you win the prize is \$5. If you lose, you pay \$3. There is no penalty/ reward for a draw. What is the financial expectation of the game?

2

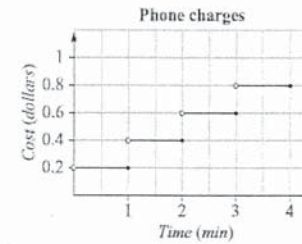
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Question 29 continues on page 20

Question 29 (continued)

Student Number: _____

c) Phone charges are shown in the step-function graph below.



i) How much is a 2 minute call?

1

.....

ii) What is the cost of a call that lasts for 3 minutes and 12 seconds?

1

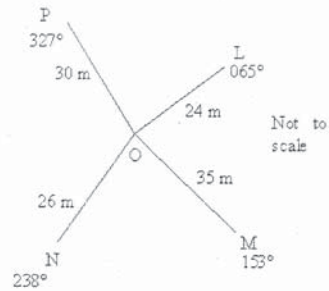
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End of Question 29

Question 30 (15 marks)

Student Number: _____

a) Here is a radial survey of a block of land, *LMNP*:



i) Explain the differences between a radial survey and a plane table survey. 2

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.....

ii) A garden is being established in the *PLO* sector. Determine its area, to the nearest square metre. 2

.....

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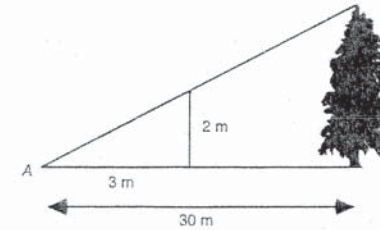
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Question 30 continues on page 22

Question 30 (continued)

Student Number: _____

b) Luke stands 2 metres tall and casts a 3 m shadow. At the same time of day, a tree casts a shadow that is 30 metres long. Determine the height of the tree. 2

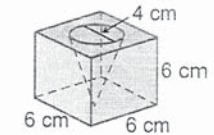


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c) This is a cube with a cone-shaped hole.



i) What is the volume of the solid, to 3 significant figures? 3

.....

.....

.....

ii) How many millilitres would it take to fill the hole? 2

.....

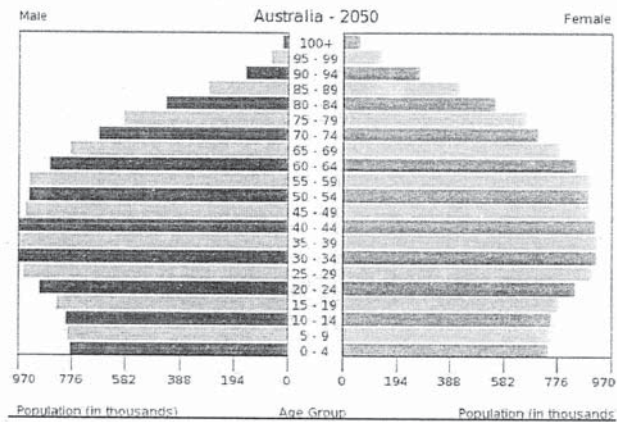
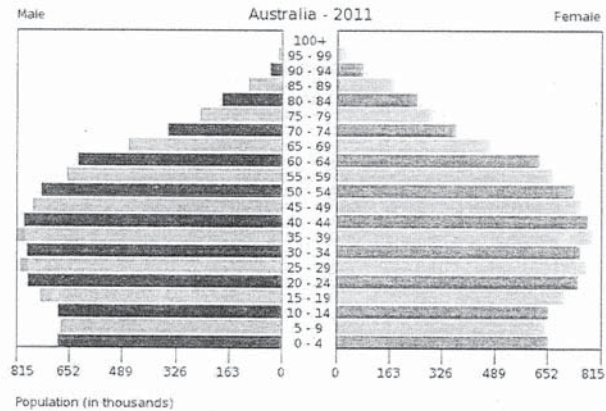
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Question 30 continues on page 23

Question 30 (continued)

Student Number: _____

- d) The following population pyramids Australian population in 2011 and its population projection for 2050.



Question 30 continues on page 24

Question 30 (continued)

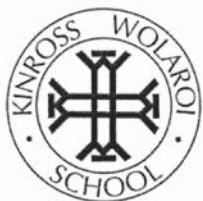
Student Number: _____

- i) Approximately how many males were aged 20-24 in 2011? 1

 ii) Approximate the increase of females aged 65-69 from 2011 to 2050. 1

 iii) Comment on the changes in distribution from 2011 to 2050. 2

End of Paper



Student Number: SOLUTIONS

2014

MULTIPLE CHOICE ANSWER SHEET

For multiple choice questions, choose the best answer A, B, C or D and fill in the correct circle.

- 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

Student Number: SOLUTIONS

75 marks

Attempt Questions 26 - 30

Allow about 1 hour and 55 minutes for this section

Answer the questions in the spaces provided.

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

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Question 26 (15 marks)

- a) This table shows the monthly and fortnightly repayments for some reducing balance loans over different terms.

Loan amount	Repayment amounts					
	1 year		18 months		2 years	
	monthly	fortnightly	monthly	fortnightly	monthly	fortnightly
\$10 000	\$885	\$408	\$606	\$280	\$467	\$215
\$20 000	\$1770	\$815	\$1213	\$559	\$935	\$430
\$30 000	\$2655	\$1223	\$1819	\$838	\$1402	\$646
\$40 000	\$3540	\$1630	\$2425	\$1117	\$1869	\$861

- i) What is the total amount to be repaid on a \$40 000 loan over two years with monthly repayments? 1

$2425 \times 2 \times 12 = \58200 ✓

- ii) How much interest would be saved by making fortnightly payments on a \$40 000 loan over two years? 2

$861 \times 2 \times 26 = 44772$ ✓

$58200 - 44772 = \$13428$ ✓

Question 26 continues on page 11

b) The stem-and-leaf plot shows the test results of two classes.

Class A		Stems	Class B	
Leaves			Leaves	
8 0	6	0 0		
5 0	7	0 1 3 3 5	6 7	
6 4	8	4 5 6		
6 4 4 2 1 0	9	1 2		
0 0	10			

i) Find the range, median and interquartile range for Class B. 3

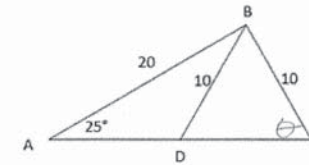
Range = $92 - 60 = 32$ ✓
 Median = 75.5 ✓
 IQR = $85 - 71 = 14$ ✓

ii) Describe the shape of the distribution for each class. 2

Class A is negatively skewed ✓
 Class B is positively skewed ✓

Question 26 continues on page 12

c)



i) Show $\angle ADB = 58^\circ$. 2

$\frac{\sin \theta}{20} = \frac{\sin 25^\circ}{10}$ $\sin \theta = \frac{20 \times \sin 25^\circ}{10}$ ✓
 $\theta = \sin^{-1}(0.845)$ ✓
 $= 58^\circ$

ii) Find the size of $\angle ABC$. Justify each step. 2

$25 + 58 + \angle ABC = 180^\circ$ (angle sum of \triangle) ✓ Working
 $\angle ABC = 97^\circ$ ✓

d) Thomas travels 38 km to work in the morning and returns 38 km home in the evening.

i) During a five-day work week, how many kilometres does Thomas travel? 1

$38 \times 2 \times 5 = 380 \text{ km}$ ✓

ii) Thomas's car has a fuel consumption of 7.5 L/100 km. How many litres of petrol does Thomas use travelling to and from work in a week? 1

$\frac{7.5 \text{ L}}{100 \text{ km}} = \frac{x}{380 \text{ km}}$ $x = \frac{7.5 \times 380}{100}$ $x = 28.5 \text{ L}$ ✓

iii) If petrol costs \$1.78 per litre when Thomas fills his tank, how much is his petrol bill for work-related travel this week? 1

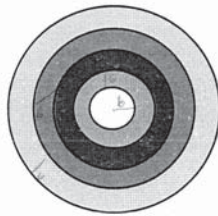
$1.78 \times 28.5 = \$45.39$ ✓

End of Question 26

Question 27 (15marks)

Student Number: _____

- a) This archery target has a bull's-eye with radius 6cm. Each additional ring is 6 cm wide.



- i) What is the total area of the target, to 4 significant figures? 2

Radius = 30cm ✓
 $A = \pi \times 30^2$
 $= 2827 \text{ cm}^2$ ✓

- ii) What is the area of the bull's-eye, to 4 significant figures? 1

$A = \pi \times 6^2$
 $= 113.1 \text{ cm}^2$ ✓

- iii) What is the probability of hitting the bull's-eye? 1

$\frac{113.1}{2827} = 0.04$ or 4% ✓

- iv) If Pete shoots 30 arrows at the target, how many arrows would he expect to hit the bull's-eye? 1

$4\% \times 30 = 1 \text{ arrow}$ ✓

Question 27 continues on page 14

5

Question 27 (continued)

Student Number: _____

- b) The table below show the height and arm span of 10 top male swimmers.

Height (<i>h</i> cm)	190	192	199	188	197	187	194	198	193	199
Arm span (<i>s</i> cm)	192	194	202	189	200	188	196	202	197	200

- i) Determine the correlation coefficient. 1

$r = 0.98$ ✓

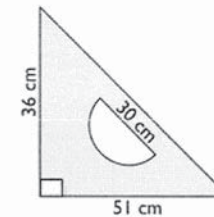
- ii) Describe the correlation between height and arm span. 1

strong positive correlation ✓

- iii) Determine the equation of the least-squares line of best fit. Round calculations to 2 decimal places. 3

$\sigma_x = 4.24$ $m = r \times \frac{\sigma_y}{\sigma_x} = 0.98 \times \frac{4.88}{4.24} = 1.13$ ✓
 $\bar{x} = 193.7$ $\bar{y} = 196$ $b = \bar{y} - m\bar{x} = 196 - 1.13 \times 193.7 = -22.88$ ✓
 $y = 1.13x - 22.88$ ✓

- c) Calculate the shaded area, to 2 decimal places. 3



$A_{\Delta} = \frac{1}{2} \times 36 \times 51 = 918 \text{ cm}^2$ ✓
 $A_{\text{sector}} = \frac{1}{2} \pi \times 15^2 = 353.43 \text{ cm}^2$ ✓
 total = $918 - 353.43 = 564.57 \text{ cm}^2$ ✓

Question 27 continues on page 15

8

d) Solve the equation:

2

$$3x - 16 = 12 - 5x$$

$$\begin{array}{r} +5x \\ 3x - 16 = 12 - 5x \\ +5x \end{array}$$

$$8x - 16 = 12$$

$$\begin{array}{r} +16 \\ 8x - 16 = 12 \\ +16 \end{array}$$

$$8x = 28$$

$$\begin{array}{r} \div 8 \\ 8x = 28 \\ \div 8 \end{array}$$

$$x = 3.5$$

✓ working

✓ answer

End of Question 27

a) Michael is travelling from Capetown, South Africa (34°S, 18°E) to Sydney (34°S, 151°E).

i) If the radius of the earth is approximately 6400 km, determine the shortest distance between the two cities, to the nearest kilometre. 1

$$d = \frac{151 - 18}{360} \times 2 \times \pi \times 6400$$

$$= 14\,856 \text{ km}$$

✓

ii) If the plane travels at an average speed of 820 km/h, how long will it take to fly from Capetown to Sydney in hours and minutes? 1

$$t = \frac{14\,856}{820} = 18 \text{ hours } 7 \text{ min}$$

✓

iii) Before leaving for Sydney, Michael wants to call his sister in Sydney. If Sydney is UTC +10 and Capetown is UTC +2 and Michael wants to get a hold of his sister at 6:00 pm, what time should he call? 1

$$6 \text{ pm} - 8 \text{ hours} = 10:00 \text{ am}$$

✓

iv) Michael's plane leaves Capetown at 12:32 pm. What time is it scheduled to arrive in Sydney? 2

$$12:32 + 18 \text{ h } 7 \text{ min} = 6:39 \text{ Capetown time} + 8 \text{ hours}$$

$$2:39 \text{ pm Sydney the next day}$$

✓

b) The letters of the word HOLIDAYS are randomly arranged. Calculate the probability that:

i) the letters are arranged alphabetically 1

$$\frac{1}{8!} = \frac{1}{40320}$$

✓

ii) the arrangement begins with H and ends with S 2

$$\frac{1}{8} \times \frac{6}{7} \times \frac{5}{6} \times \frac{4}{5} \times \frac{3}{4} \times \frac{2}{3} \times \frac{1}{2} \times \frac{1}{1} = \frac{1}{56}$$

✓ working
✓ answer

Question 28 continues on page 17

Question 28 (continued)

Student Number: _____

c) Ryan throws a ball into the air. The height, h in metres, the ball travels in t seconds is given by the formula:

$$h = -t^2 + 4t + 1$$

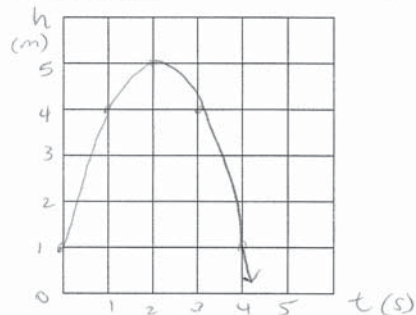
i) What is the independent variable? 1

$t = \text{time}$ ✓

ii) Construct a table of values and draw the graph of the ball's height. 3

time	0	1	2	3	4
height	1	4	5	4	1

✓ values
✓ table/graph setup



✓ line

iii) Explain why quadrants II, III and IV are unnecessary for your graph. 2

You can't have negative time.
Ball doesn't travel below ground.

iv) What is the maximum height that the ball reaches? 1

5 metres ✓

End of Question 28

Question 29 (15 marks)

Student Number: _____

a) The cost of using the Apple Charter Bus Company is $C = 400 + 10n$, where n is the number of students and C is the cost in dollars.

i) The City Charter Bus Line provides the same service. The table below shows the cost. 2

Number of students, n	5	10	15	20	25
Cost, C	250	400	550	700	850

$$m = \frac{400 - 250}{10 - 5} = 30$$

working ✓

Write an equation describing the cost in dollars, C , with any number of students, n .

$$250 = 30(s) + b \quad C = 30n + 100 \quad \checkmark$$

$$250 = 150 + b \quad b = 100$$

ii) What is the gradient of the City Charter Bus Line and what does it represent? 2

30 ✓
cost per student ✓

iii) Using the equations above, find the cost of transporting 23 students with each bus company. 2

city charter $C = 30 \times 23 + 100$
 $= \$790 \quad \checkmark$

Apple charter $C = 400 + 10 \times 23$
 $= \$630 \quad \checkmark$

iv) How many students can travel on each bus line for a fixed cost of \$940? 2

city charter $940 = 30n + 100$
 $-100 \quad -100$
 $840 = 30n$
 $\div 30 \quad \div 30$
 $n = 28 \quad \checkmark$

Apple charter $940 = 400 + 10n$
 $-400 \quad -400$
 $540 = 10n$
 $\div 10 \quad \div 10$
 $n = 54 \quad \checkmark$

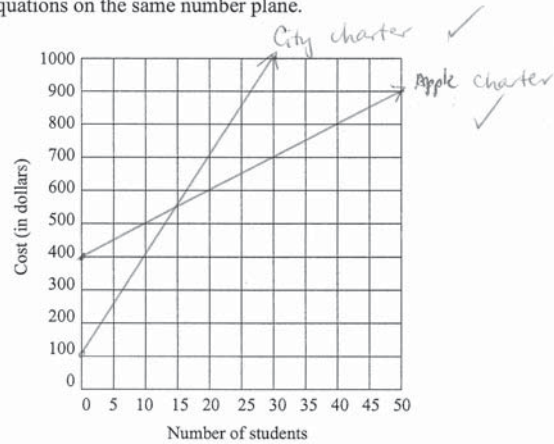
Question 29 continues on page 19

Question 29 (continued)

Student Number: _____

v) Graph both equations on the same number plane.

2



vi) For how many students is the cost of using the bus companies the same?

1

.....15.....

b) In a game of chance, there is a 40% of winning, a 40% chance of losing and a 20% chance drawing. If you win the prize is \$5. If you lose, you pay \$3. There is no penalty/ reward for a draw. What is the financial expectation of the game?

2

..... $0.4 \times 5 + 0.4 \times (-3) + 0.2 \times 0$
.....= \$0.80.....

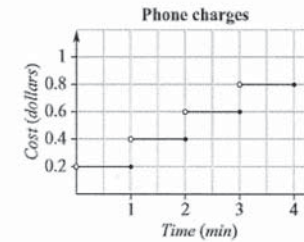
Question 29 continues on page 20

5

Question 29 (continued)

Student Number: _____

c) Phone charges are shown in the step-function graph below.



i) How much is a 2 minute call?

1

.....\$0.40.....

ii) What is the cost of a call that lasts for 3 minutes and 12 seconds?

1

.....\$0.80.....

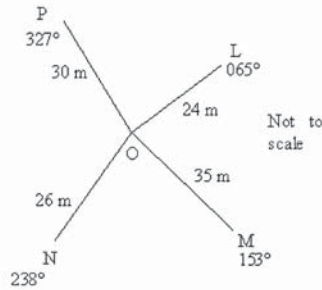
End of Question 29

2

Question 30 (15 marks)

Student Number: _____

a) Here is a radial survey of a block of land, LMNP:



i) Explain the differences between a radial survey and a plane table survey. 2

Radial survey... places compass at centre and measures true bearings to corners.
Plane table survey places table at centre and measures the angles formed at the centre.

ii) A garden is being established in the PLO sector. Determine its area, to the nearest square metre. 2

$33 + 65 = 98^\circ$ $A = \frac{1}{2} \times 24 \times 30 \times \sin 98^\circ$
 $= 356 \text{ m}^2$

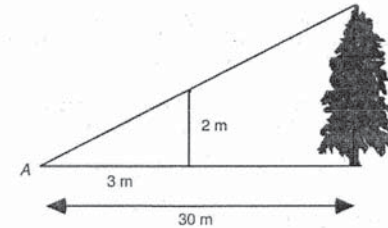
Question 30 continues on page 22

4

Question 30 (continued)

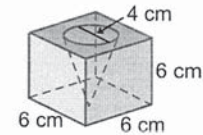
Student Number: _____

b) Luke stands 2 metres tall and casts a 3 m shadow. At the same time of day, a tree casts a shadow that is 30 metres long. Determine the height of the tree. 2



$\frac{2}{3} = \frac{x}{30}$ $x = \frac{2 \times 30}{3}$
 $= 20 \text{ m}$

c) This is a cube with a cone-shaped hole. 3



i) What is the volume of the solid, to 3 significant figures? 3

$V_{\text{cube}} = 6^3 = 216 \text{ cm}^3$
 $V_{\text{cone}} = \frac{1}{3} \pi \times 2^2 \times 6 = 25.1 \text{ cm}^3$
total = $216 - 25.1 = 191 \text{ cm}^3$

ii) How many millilitres would it take to fill the hole? 2

$V = \frac{1}{3} \pi \times 2^2 \times 6 = 25.1 \text{ cm}^3$
 $1 \text{ cm}^3 = 1 \text{ mL}$
 $\approx 25 \text{ mL}$

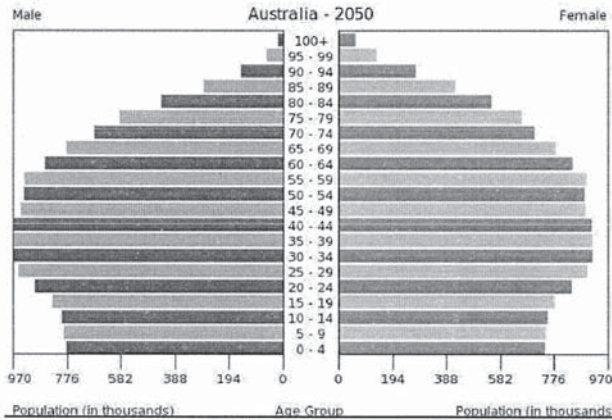
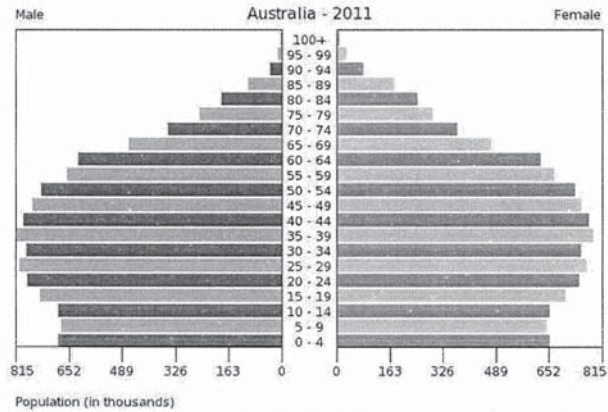
Question 30 continues on page 23

7

Question 30 (continued)

Student Number: _____

d) The following population pyramids Australian population in 2011 and its population projection for 2050.



Question 30 continues on page 24

Question 30 (continued)

Student Number: _____

i) Approximately how many males were aged 20-24 in 2011? 1

750 000 to 800 000 ✓

ii) Approximate the increase of females aged 65-69 from 2011 to 2050. 1

280 000 to 315 000 ✓

iii) Comment on the changes in distribution from 2011 to 2050. 2

Both males + females are expected to live longer in 2050 ✓
2011 is more positively skewed than 2050. ✓

End of Paper