

Mathematics General 2

This paper must be kept under strict security and may only be used on or after the morning of Monday 4 August, 2014 as specified in the Neap Examination Timetable.

General Instructions

Reading time – 5 minutes

Working time – 2½ hours

Write using black or blue pen.

Black pen is preferred.

Board-approved calculators may be used.

A formula and data sheet is provided at the back of this paper.

In Questions 26–30, 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 10–26

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 for Questions 1–25.

1.

| <i>Present value of \$1</i> | | | | |
|-----------------------------|-----------|-----------|-----------|-----------|
| <i>End of year</i> | <i>2%</i> | <i>3%</i> | <i>4%</i> | <i>5%</i> |
| 4 | 4.5797 | 4.4518 | 4.3295 | 4.2124 |
| 5 | 5.4172 | 5.2521 | 5.0757 | 4.9173 |
| 6 | 6.2303 | 6.0021 | 5.7864 | 5.5824 |

Using the table above, what is the present value of an annuity where \$9 000 is contributed each year for four years into an account earning 3% per annum compound interest?

- (A) \$10 129.58
- (B) \$38 965.50
- (C) \$40 066.20
- (D) \$47 178.90

2. Jessica received a 60% discount as a 'no claim bonus' on her car insurance. She paid \$960 to insure her car.

What would she have paid without the 'no claim bonus'?

- (A) \$1344
- (B) \$1536
- (C) \$1600
- (D) \$2400

3. Sydney's latitude is 34°S and longitude is 151°E. Coober Pedy is 17° west of Sydney and 5° south of Sydney.

What are the coordinates of Coober Pedy?

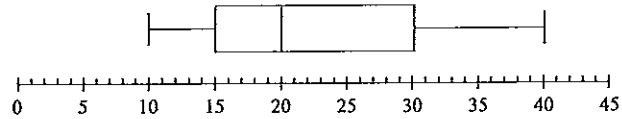
- (A) 29°S, 134°E
- (B) 29°S, 168°E
- (C) 39°S, 134°E
- (D) 39°S, 168°E

Students are advised that this is a trial examination only and cannot in any way guarantee the content or the format of the 2014 HSC Mathematics General 2 Examination.

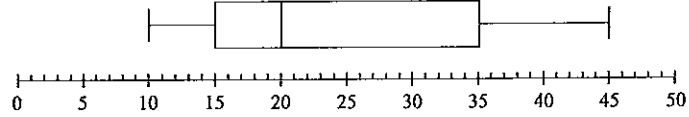
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4. Which one of the following box-and-whisker plots shows an interquartile range of 15 and a median of 20?

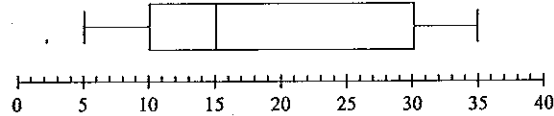
(A)



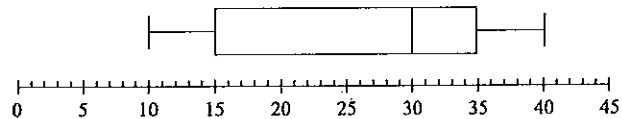
(B)



(C)

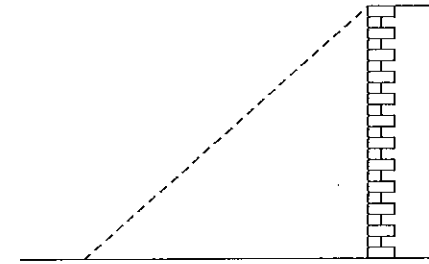


(D)



5. A relay team consists of four runners.
How many different teams are possible from eight runners?
- (A) 24
(B) 256
(C) 1680
(D) 4096

6. The angle of elevation to the top of a building from a car on the ground is 34° . The approximate perpendicular height of the building is 30 metres.



What is the distance from the car to the foot of the building?

- (A) $30 \tan 34^\circ$
(B) $\frac{30}{\sin 34^\circ}$
(C) $30 \cos 34^\circ$
(D) $\frac{30}{\tan 34^\circ}$

7. Liam scored 86 in an assessment task. The mean for this task was 72 with a standard deviation of 7.0. What is Liam's z-score?

- (A) -2.0
(B) -1.0
(C) 1.0
(D) 2.0

8. A person's maximum heart rate, MHR (in beats per minute), is given by the formula:

$$\text{MHR} = 220 - \text{age}$$

where age is in years.

It is estimated that a healthy person should have a heart rate of 55% of their maximum rate when beginning to exercise. Isaac is a healthy 17-years-and-3-months old.

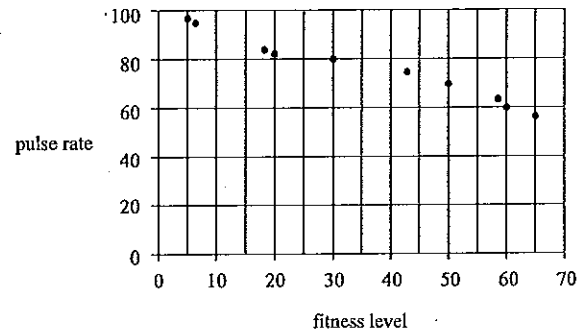
What is an estimate of his heart rate, in beats per minute, when he begins exercising?

- (A) 111.5125
(B) 111.485
(C) 202.75
(D) 202.7

9. The scale on an aerial photograph is given as 1 mm = 200 m. If the length of land is 220 m, what is the map length of the land?

- (A) 1.1 mm
(B) 2.2 mm
(C) 4.4 mm
(D) 20 mm

10. A person's fitness level and their pulse rate is shown in the scatterplot.



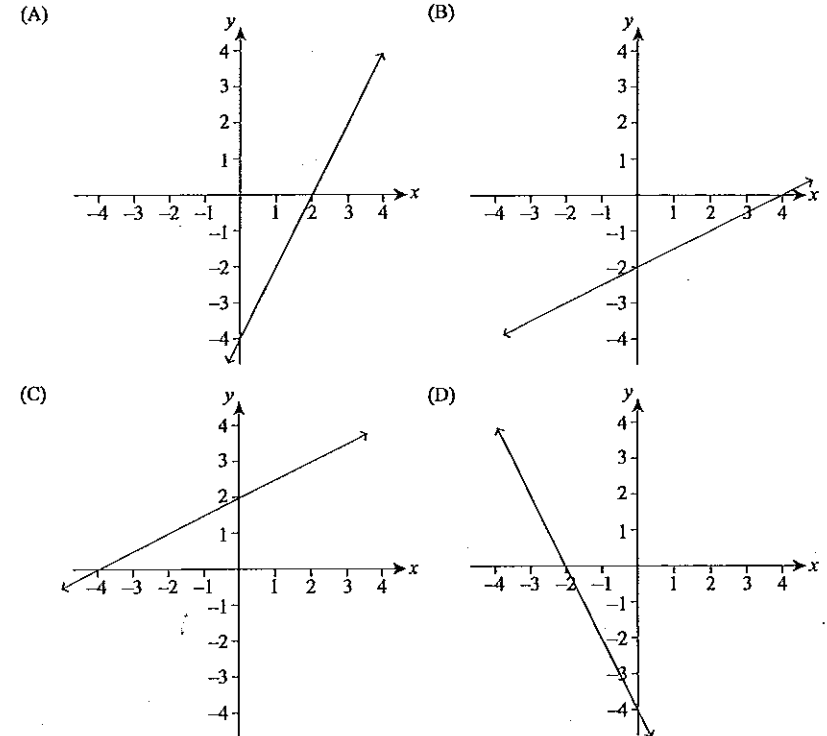
What is the correlation between the variables in this scatterplot?

- (A) high positive
 - (B) high negative
 - (C) low positive
 - (D) low negative
11. The solution to the equation $\frac{3m-1}{2} = 4$ is
- (A) $m = \frac{7}{3}$
 - (B) $m = 3$
 - (C) $m = \frac{10}{3}$
 - (D) $m = 6$

12. The following table shows ordered pairs for the equation $y = 2x - 4$.

| | | | |
|---|----|----|----|
| x | -1 | 0 | 1 |
| y | -6 | -4 | -2 |

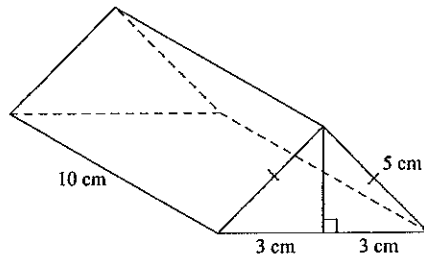
Which of the following graphs represents the equation $y = 2x - 4$?



13. Harry uses a 1.6 kilowatt per hour dishwasher for a total of 2.5 hours. He is charged at a rate of 27.4 cents per kilowatt. What is the cost of using the dishwasher?
- (A) \$1.10
 - (B) \$1.12
 - (C) \$4.00
 - (D) \$109.60

14. The formula $v = \sqrt{u^2 + 2as}$ relates the final velocity (v), initial velocity (u), acceleration (a), and distance (s).
 What is the final velocity if the initial velocity is 5 m/s, acceleration is 2.2 m/s^2 and the distance is 10 m?
 (A) 6.63 m/s
 (B) 7.00 m/s
 (C) 8.31 m/s
 (D) 31.6 m/s

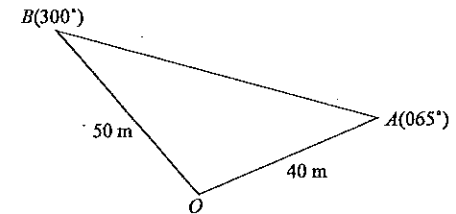
15. What is the surface area of the solid triangular prism below?



Not to scale

- (A) 120 cm^2
 (B) 124 cm^2
 (C) 172 cm^2
 (D) 184 cm^2
16. Jasmine purchased a luxury car for \$83 700. It depreciates at 16% per year.
 How much has the luxury car depreciated over four years?
 (A) \$30 132.00
 (B) \$41 671.83
 (C) \$42 028.17
 (D) \$53 568.00
17. Five university students share a house. Each person has a shower each day and uses 125 L of water per shower. Water costs \$2.36 per kilolitre (kL). It is decided to install a water-efficient showerhead that uses 34% less water.
 How much could be saved on water costs each year?
 (A) \$100
 (B) \$183
 (C) \$295
 (D) \$538

18. The diagram below shows a radial survey of a section of land proposed for a children's park.



What is the area of land AOB ?

- (A) $90 \times \cos 235^\circ$
 (B) $1000 \times \sin 125^\circ$
 (C) $1000 \times \cos 125^\circ$
 (D) $2000 \times \sin 235^\circ$
19. The table below shows the monthly payments over 30 years on a loan. Emily is planning to borrow \$200 000 over a period of 30 years at 6.5% per annum. Repayments are made monthly according to the table.

| Interest rate | Loan amount | | | |
|---------------|-------------|-----------|-----------|-----------|
| | \$100 000 | \$150 000 | \$200 000 | \$250 000 |
| 6.0% p.a. | \$600 | \$900 | \$1200 | \$1499 |
| 6.5% p.a. | \$633 | \$949 | \$1265 | \$1581 |
| 7.0% p.a. | \$666 | \$998 | \$1331 | \$1664 |

How much would Emily pay in total to repay this loan?

- (A) \$201 265
 (B) \$379 500
 (C) \$390 000
 (D) \$455 400
20. Ivy needs to select a golf team of four girls from her squad of seven girls.
 How many different possible teams can be chosen?
 (A) 28
 (B) 35
 (C) 480
 (D) 5040
21. The time taken for a journey varies inversely with a car's average speed. The journey takes 4 hours when the car travels at an average speed of 90 km/h.
 How long would the same journey take at an average speed of 50 km/h?
 (A) 5 hours
 (B) 7 hours 12 minutes
 (C) 7 hours 20 minutes
 (D) 9 hours

22. Harrison borrows \$45 000 and agrees to repay the loan and the interest in monthly instalments over 7 years. The interest charged is at a flat rate of 11.25% p.a. What is the total amount to be repaid on the loan?
 (A) \$9 562.50
 (B) \$32 200.00
 (C) \$35 437.50
 (D) \$80 437.50
23. Chloe is concerned about the lizard population in the local community. She collects 170 lizards and tags them. A couple of months later she collects 32 lizards and found 10 of them were tagged. What is her estimate of the lizard population using the capture-recapture method?
 (A) 53
 (B) 524
 (C) 544
 (D) 572
24. The two-way table below presents the results for a group of men and women who had their eyes tested at the optometrist.

| | Men | Women | |
|-----------------|-----|-------|--|
| Passed eye test | 300 | | |
| Failed eye test | | 50 | |
| | | | |

- In conducting the tests, it was found that 2 in every 5 men failed the eye test and 1 in every 5 women failed the eye test. How many men and women had their eyes tested?
 (A) 350
 (B) 500
 (C) 750
 (D) 1000
25. Zara is on holiday in Singapore and plans to buy a necklace. The cost (C) of the necklace varies directly with the square of the length (L) of the necklace. A necklace of length 30 mm costs \$1300 Singapore dollars (SGD). How much does a necklace of length 35 mm cost?
 (A) \$848
 (B) \$1517
 (C) \$1560
 (D) \$1769

End of Section I

Section II

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 27. If you use this space, clearly indicate which question you are answering.

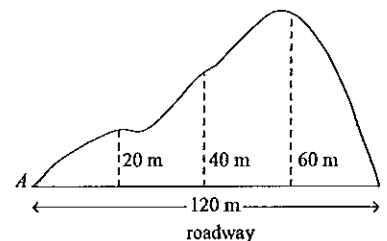
Question 26 (15 marks)

Marks

- (a) Jake invests \$18 000 over five years at a compound interest rate of 4.9% p.a. 1
 Calculate the future value after five years. Answer correct to the nearest cent.

.....

- (b) The diagram below shows the plan of an artificial lake. The offset measurements are taken at equal intervals along the 120 metre roadway.



- (i) Use Simpson's rule with two applications to calculate the approximate area of the lake. Answer correct to two decimal places. 2
-

- (ii) The lake has a consistent depth of 300 cm. 1
 Calculate the volume of the lake in cubic metres.

Question 26 continues on page 11

Question 26 (continued)

Marks

- (c) Amelia has a 70% chance of winning each game of tennis she plays in a particular competition. She is to play three games. She must win at least two of these games to make a final play-off.

2

Using a tree diagram, find the probability that she makes the final play-off.

- (d) Victoria is 63 kg and has consumed 6.5 standard drinks in the past six hours. She was stopped by police for a random breath test.

- (i) What would be Victoria's blood alcohol content? Answer correct to two decimal places.

1

.....

- (ii) Is she over the limit? Give a reason.

1

.....

Question 26 continues on page 12

Question 26 (continued)

Marks

- (e) The table shows a family's water usage in their water basins in one day.

| Water usage | L/day |
|----------------|-------|
| bathroom basin | 6 |
| ensuite basin | 4.5 |
| kitchen basin | 8.5 |
| outside basin | 1 |

- (i) How much water is used in the water basins?

1

.....

- (ii) How much water would the family use in a year in their water basins?

1

.....

- (iii) What percentage of water usage is for the kitchen basin?

1

.....

- (f) Aaron has a mobile phone contract that charges a monthly access fee of \$49, free calls \$100, flag fall \$0.27 and call rate of \$0.35 per 30 second.

2

What is the monthly charge if Aaron made 270 calls with a duration of less than 30 seconds during the month?

.....

Question 26 continues on page 13

Question 26 (continued)

Marks

- (g) Stephanie borrowed \$372 000 at 8% p.a. reducible interest. The interest is charged monthly and the monthly repayment is \$2840. Use the table below to answer questions (i) and (ii).

| Months | Principal | Interest | $P + I$ | $P + I - R$ |
|--------|-----------|----------|---------|-------------|
| 1 | \$372 000 | \$2480 | | |
| 2 | | | | |

- (i) How much is owed at the end of the first month? 1

.....

.....

.....

.....

- (ii) Calculate the interest to be paid at the beginning of the second month. 1

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End of Question 26

Question 27(15 marks)

Marks

- (a) A car is moving at a steady speed. When the speed is 70 km/h the car consumes 6 litres of petrol for 100 km travelled.

- (i) The petrol tank holds 72 litres. 1

How many kilometres can the car travel on a full petrol tank when its speed is 70 km/h?

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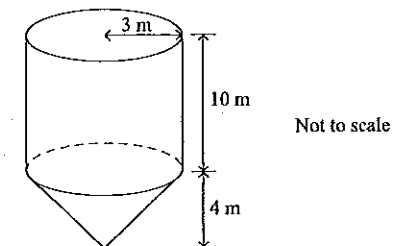
- (ii) When the speed is 100 km/h the car consumes 35% more petrol. 1

Calculate the number of litres of petrol per 100 km travelled when the car's speed is 100 km/h.

.....

.....

- (b) A silo is the shape of a cylinder with a cone at the bottom. It has dimensions as shown in the diagram below. 2



What is the volume of the silo? Answer correct to two decimal places.

.....

.....

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Question 27 continues on page 15

Marks

Question 27 (continued)

(c) The table below shows the weight of four people.

| Name | Danny | Edward | Finn | Geoff |
|-------------|-------|--------|------|-------|
| Weight (kg) | 73.7 | 71.7 | 66.8 | 70.2 |

(i) Calculate the population mean and population standard deviation. Answer correct to one decimal place.

1

.....

(ii) A sample of three people is chosen at random.
 How many samples are possible?

1

.....

(iii) List all the possible samples.

1

.....

(d) Patrick has a drum filled with 10 litres of water. However, the drum has a small hole in the base and is leaking at a rate of 0.25 litres per minute.

(i) Write a linear equation in the form $V = mt + b$ to describe this situation.

1

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(ii) What volume of water remains after 90 seconds?

1

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(iii) How long would it take for all the water to leak out?

1

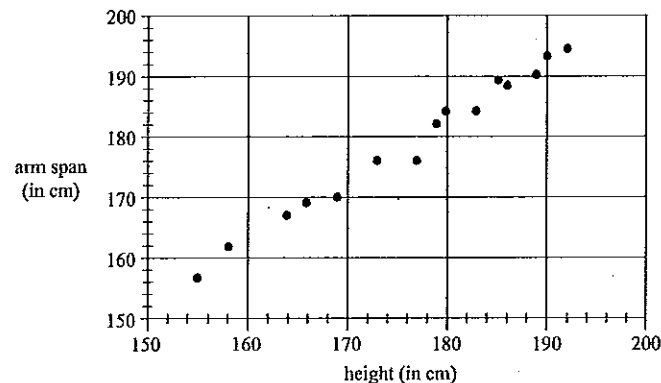
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Question 27 continues on page 16

Marks

Question 27 (continued)

(e) The scatterplot shows a person's height (h) and their arm span (a).



(i) Draw a line of best fit on the scatterplot. Find the gradient of this line.

1

.....

(ii) Gabriel is 178 cm tall.

1

Predict his arm span using the line of best fit.

.....

(iii) Calculate the value of the correlation coefficient. Answer correct to two decimal places.

1

.....

(f) Solve $7x - 2(x - 1) = 4$.

2

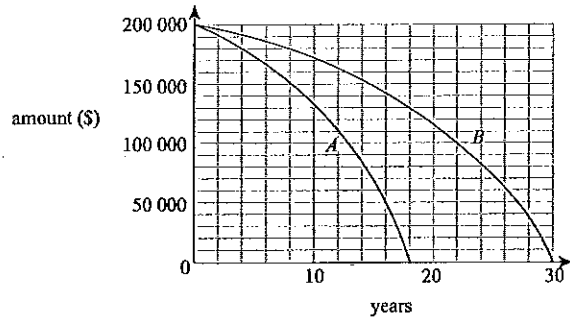
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End of Question 27

Question 28 (15 marks)

Marks

- (a) The graph below shows the amount owing at the end of each year on two loans of \$200 000 at 6.25% p.a. reducible interest with different monthly repayments. The repayments for loan *A* are \$1450 per month.



- (i) When is loan *A* repaid? 1

- (ii) Calculate the amount of interest paid on loan *A*. 1

- (iii) How much is owed on loan *B* after eight years? 1

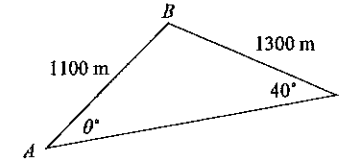
- (iv) When is the amount owing on loan *B* half the amount borrowed? 1

Question 28 continues on page 18

Question 28 (continued)

Marks

- (b) Daniel is setting a cross-country race and recorded the measurements on his iPhone. However, it was not saved. Daniel remembered that the first leg (*AB*) was 1100 m and the second leg (*BC*) was 1300 m. He also remembered the angle between the second and third leg was 40° .



- (i) Daniel needs to know what the size of $\angle BAC$ is before he can set up the cross-country course. 2
 What is the size of $\angle BAC$? Answer correct to the nearest degree.

- (ii) Calculate the total distance of the course. Answer correct to the nearest metre. 2

Question 28 continues on page 19

Question 28 (continued)

Marks

- (c) Young's rule is used to prescribe medicine for children. The formula is:

$$\text{dosage} = \frac{\text{age of child (years)} \times \text{adult dose}}{\text{age of child (years)} + 12}$$

Evelyn buys a prescription for 400 mg of medicine. The adult dose is 35 mg and the recommended dose for Evelyn's child is 5 mg.

- (i) Using Young's rule, how old is Evelyn's child?

1

.....

- (ii) How many doses for Evelyn's child are contained in the prescription?

1

.....

- (iii) It is recommended the medicine be taken at most four times a day.

1

How many days will the prescription last at this rate for Evelyn's child?

.....

Question 28 continues on page 20

Question 28 (continues)

Marks

- (d) The number of microorganisms grows exponentially according to the formula $n = 20(1.1)^t$, where n is the number of microorganisms after t hours.

- (i) What is the initial number of microorganisms?

1

.....

- (ii) Complete the table of ordered pairs. Express the number of microorganisms to the nearest whole number.

1

| | | | | | |
|-----|---|---|----|----|----|
| t | 0 | 5 | 10 | 15 | 20 |
| n | | | | | |

- (iii) Draw a graph of $n = 20(1.1)^t$.

1

- (iv) Estimate the time taken for the number of microorganisms to reach 70.

1

.....

End of Question 28

Question 29 (15 marks)

Marks

(a) Simplify these expressions:

(i) $9 + 2(c - 3)$

1

.....

(ii) $4x^2 + 3x(x^2 - 2x)$

1

.....

(iii) $5x^{-3} \times 4x^9$

1

.....

(iv) $\frac{15x^8 \times (2x - 1)}{6x^2 \times (2x - 1)}$

1

.....

(b) The positions of two towns, X and Y, are given as (50°N, 31°E) and (13°S, 31°E).

(i) What is the angular distance between the two towns?

1

.....

(ii) Calculate the distance between the two towns to the nearest kilometre.

1

.....

(c) Life expectancy and mobile phone use have increased strongly in the last decade.

2

Is this strong relationship between the two correlational, or causal?

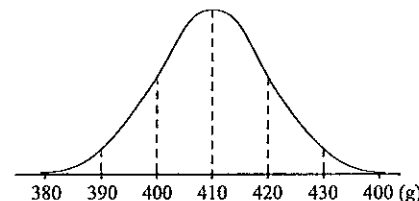
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Question 29 continues on page 22

Question 29 (continued)

Marks

(d) The NRL ensures that the balls have a weight within certain limits. A number of balls were weighed and the results, which satisfied a normal distribution, were recorded on the bell-shaped curve shown below.



Use the bell-shaped curve to answer the following:

(i) What was the mean weight of the balls tested?

1

.....

(ii) What was the standard deviation?

1

.....

(iii) What z-score corresponds to a weight of 390 g?

1

.....

(iv) The NRL requires the weight of the balls to be between 390 g and 430 g. What percentage of the balls tested would satisfy these requirements?

1

.....

(v) What is the probability that a ball randomly selected from those tested would weigh less than 390 g?

1

.....

Question 29 continues on page 23

Question 29 (continued)

Marks

(e) In a game, two unbiased coins are tossed. A player outlays \$50 and if both coins show tails, the player is paid \$80. If both coins show heads the player is paid \$100.

(i) What is the probability of throwing two tails?

1

.....

(ii) What is the expected return from \$500 for this game?

1

.....

End of Question 29

Question 30 (15 marks)

Marks

(a) Tyler Transport company employs sixty people.

| Annual income (\$) | Class centre (x) | Number of employees (f) | fx |
|--------------------|----------------------|-----------------------------|------|
| 40 000–49 999 | 45 000 | 15 | |
| 50 000–59 999 | 55 000 | 24 | |
| 60 000–69 999 | 65 000 | 10 | |
| 70 000–79 999 | 75 000 | 7 | |
| 80 000–89 999 | 85 000 | 4 | |
| | | | |

(i) Complete the table by finding the fx column.

1

(ii) Determine the mean annual income.

1

.....

(iii) In which annual income class does the median of this distribution lie?

1

.....

(iv) Find the standard deviation of this distribution. Answer to the nearest dollar.

1

.....

(v) Tyler transport wishes to employ another six people. Three of these new employees will earn \$45 000 p.a. each, and the other three people will earn \$85 000 p.a. each.

1

What will be the effect of these new employees on the standard deviation of income distribution at Tyler Transport? Give a brief reason for your answer.

.....

Question 30 continues on page 25

- Question 30 (continued) Marks
- (b) A business sells mobile phones to retail outlets. The income received is calculated using the formula $I = 82n$, where n is the number of mobile phones sold. Costs associated with selling the mobile phones are calculated using the formula $C = 18n + 1600$. 2
- How many mobile phones need to be sold to break even?
-
-
-
-
- (c) James owns a credit card that has no annual fees and charges 15.7% p.a. simple interest on all purchases. The interest is charged from the day of purchase, including the day of purchase.
- (i) Show that the daily interest rate is 0.0430%. 1
-
-
- (ii) On the 29th of July, James bought an entertainment unit for \$1240 using his credit card. James paid his credit card account on the 9th of August. 2
- What was the total amount James paid for the entertainment unit, including interest? Answer correct to the nearest cent.
-
-
-
-
-
-

Question 30 continues on page 26

- Question 30 (continued) Marks
- (d) Melbourne is located at (38°S, 145°E) and Durban in South Africa is located at (30°S, 31°E).
- (i) What is the time difference between these places? 2
-
-
-
-
- (ii) What is the time in Durban if it is 11:00 am in Melbourne? 1
-
-
- (e) Solve the following pair of simultaneous equations: 2
- $$2x - 5y = 9$$
- $$x + 3y = -1$$
-
-
-
-
-
-
-

End of paper

Section II Extra writing space

If you use this space, clearly indicate which question you are answering.

Formulae and Data Sheet

Financial Mathematics

Simple interest

$$I = PRn$$

- P is initial amount
- r is interest rate per period, expressed as a decimal
- n is number of periods

Compound interest

$$A = P(1 + r)^n$$

- A is final amount
- P is initial amount
- r is interest rate per period, expressed as a decimal
- n is number of compounding periods

Present value and future value

$$PV = \frac{FV}{(1 + r)^n}, \quad FV = PV(1 + r)^n$$

- r is interest rate per period, expressed as a decimal
- n is number of compounding periods

Straight-line method of depreciation

$$S = V_0 - Dn$$

- S is salvage value of asset after n periods
- V_0 is initial value of asset
- D is amount of depreciation per period
- n is number of periods

Declining-balance method of depreciation

$$S = V_0(1 - r)^n$$

- S is salvage value of asset after n periods
- V_0 is initial value of asset
- r is depreciation rate per period, expressed as a decimal
- n is number of periods

Data Analysis

Mean of a sample

$$\bar{x} = \frac{\text{sum of scores}}{\text{number of scores}}$$

z-score

For any score x ,

$$z = \frac{x - \bar{x}}{s}$$

\bar{x} is mean

s is standard deviation

Outlier(s)

score(s) less than $Q_L - 1.5 \times IQR$

or

score(s) more than $Q_U + 1.5 \times IQR$

Q_L is lower quartile

Q_U is upper quartile

IQR is interquartile range

Least-squares line of best fit

$$y = \text{gradient} \times x + y\text{-intercept}$$

$$\text{gradient} = r \times \frac{\text{standard deviation of } y \text{ scores}}{\text{standard deviation of } x \text{ scores}}$$

$$y\text{-intercept} = \bar{y} - (\text{gradient} \times \bar{x})$$

r is correlation coefficient

\bar{x} is mean of x scores

\bar{y} is mean of y scores

Normal distribution

- approximately 68% of scores have z-scores between -1 and 1
- approximately 95% of scores have z-scores between -2 and 2
- approximately 99.7% of scores have z-scores between -3 and 3

Spherical Geometry

Circumference of a circle

$$C = 2\pi r \quad \text{or} \quad c = \pi D$$

r is radius

D is diameter

Arc length of a circle

$$l = \frac{\theta}{360} 2\pi r$$

r is radius

θ is number of degrees in central angle

Radius of Earth

(taken as) 6400 km

Time differences

For calculation of time differences using longitude:

$15^\circ = 1$ hour time difference

Area

Circle

$$A = \pi r^2$$

r is radius

Sector

$$A = \frac{\theta}{360} \pi r^2$$

r is radius

θ is number of degrees in central angle

Annulus

$$A = \pi(R^2 - r^2)$$

R is radius of outer circle

r is radius of inner circle

Trapezium

$$A = \frac{h}{2}(a + b)$$

h is perpendicular height

a and b are the lengths of the parallel sides

Area of land and catchment areas

unit conversion: 1 ha = 10 000 m²

Surface Area

Sphere

$$A = 4\pi r^2$$

r is radius

Closed cylinder

$$A = 2\pi r^2 + 2\pi rh$$

r is radius

h is perpendicular height

Volume

Prism or cylinder

$$V = Ah$$

A is area of base

h is perpendicular height

Pyramid or cone

$$V = \frac{1}{3}Ah$$

A is area of base

h is perpendicular height

Volume and capacity

unit conversion: 1 m³ = 1000 L

Approximation Using Simpson's Rule

Area

$$A \approx \frac{h}{3}(d_f + 4d_m + d_l)$$

h is distance between successive measurements

d_f is first measurement

d_m is middle measurement

d_l is last measurement

Volume

$$V \approx \frac{h}{3}(A_L + 4A_M + A_R)$$

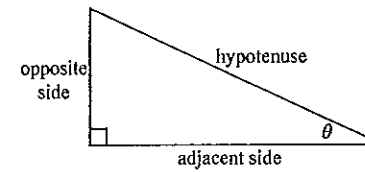
h is distance between successive measurements

A_f is first measurement

A_m is middle measurement

A_l is last measurement

Trigonometric Ratios



$$\sin \theta = \frac{\text{opposite side}}{\text{hypotenuse}}$$

$$\cos \theta = \frac{\text{adjacent side}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite side}}{\text{adjacent side}}$$

Sine rule

In $\triangle ABC$,

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Area of a triangle

In $\triangle ABC$,

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

Cosine rule

In $\triangle ABC$,

$$c^2 = a^2 + b^2 - 2ab \cos C$$

or

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

Units of Memory and File Size

1 byte = 8 bits

1 kilobyte = 2¹⁰ bytes = 1024 bytes

1 megabyte = 2²⁰ bytes = 1024 kilobytes

1 gigabyte = 2³⁰ bytes = 1024 megabytes

1 terabyte = 2⁴⁰ bytes = 1024 gigabytes

Blood Alcohol Content Estimates

$$BAC_{\text{male}} = \frac{10N - 7.5H}{6.8M}$$

or

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

N is number of standard drinks consumed

H is number of hours of drinking

M is person's mass in kilograms

Distance, Speed and Time

$$D = ST, \quad S = \frac{D}{T}, \quad T = \frac{D}{S}$$

$$\text{average speed} = \frac{\text{total distance travelled}}{\text{total time taken}}$$

$$\text{stopping distance} = \left\{ \begin{array}{l} \text{reaction-time} \\ \text{distance} \end{array} \right\} + \left\{ \begin{array}{l} \text{braking} \\ \text{distance} \end{array} \right\}$$

Probability of an Event

The probability of an event where outcomes are equally likely is given by:

$$P(\text{event}) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$$

Straight Lines

Gradient

$$m = \frac{\text{vertical change in position}}{\text{horizontal change in position}}$$

Gradient-intercept form

$$y = mx + b$$

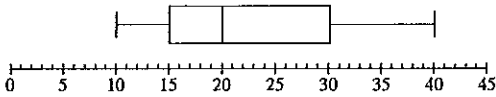
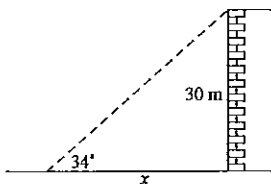
m is gradients

b is y-intercept

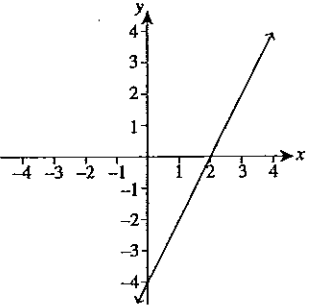
Mathematics General 2

Solutions and marking guidelines

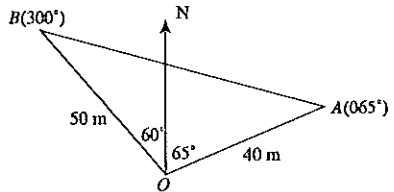
Section I

| | Answer and explanation | Content area assessed | Outcomes assessed |
|------------|---|-----------------------|-------------------|
| Question 1 | C $PV = 4.4518 \times 9000$ $= \$40\,066.20$ Present value of the annuity is \$40 066.20. | FM4 | MG2H-6 |
| Question 2 | D 40% of insurance = \$960 10% of insurance = $\frac{\$960}{4} = \240 100% of insurance = $\$240 \times 10 = 2400$ | FSDr1 | MGP-6 |
| Question 3 | C Cooper Pedy is (39°S, 134°E). | MM6 | MG2H-5 |
| Question 4 | A $IQR = Q_3 - Q_1$ Median = 20 $= 30 - 15 = 15$  | DS4 | MG2H-1 |
| Question 5 | C number of arrangements = $8 \times 7 \times 6 \times 5 = 1680$ | PB2 | MG2H-8 |
| Question 6 | D  $\tan 34^\circ = \frac{30}{x}$ $x = \frac{30}{\tan 34^\circ}$ | MM3 | MGP-4 |
| Question 7 | D $z = \frac{x - \bar{x}}{s}$ $= \frac{86 - 72}{7} = 2$ | DS5 | MG2H-7 |

Section I (continued)

| | Answer and explanation | Content area assessed | Outcomes assessed |
|-------------|---|-----------------------|-------------------|
| Question 8 | A MHR = 200 - age = 220 - 17.25 = 202.75 MHR exercising = 0.55 × 202.75 = 111.5125 | FSHe1 | MG2H-3 |
| Question 9 | A 200 mm = 1 mm or 20 mm = $\frac{1}{10}$ mm 220 mm = $\frac{11}{10}$ mm = 1.1 mm | FARe2 | MG2H-5 |
| Question 10 | B Strong negative relationship between the quantities. High negative correlation. | FSHe1 | MG2H-7 |
| Question 11 | B $\frac{3m-1}{2} = 4$ $3m-1 = 8$ $3m = 9$ $m = 3$ | AM3 | MG2H-3 |
| Question 12 | A $y = 2x - 4$ has a gradient of 2 and a y-intercept of -4 ($y = mx + b$).  | AM4 | MG2H-3 |
| Question 13 | A electricity = 1.6 × 2.5 = 4 kWh cost = 4 × 0.274 = \$1.096 = \$1.10 | FSRe3 | MG2H-5 |

Section I (continued)

| | Answer and explanation | Content area assessed | Outcomes assessed |
|-------------|--|-----------------------|-------------------|
| Question 14 | C $v = \sqrt{u^2 + 2as}$ $= \sqrt{5^2 + 2 \times 2.2 \times 10}$ $= \sqrt{69}$ ≈ 8.31 m/s | AM2 | MG2H-3 |
| Question 15 | D Use Pythagoras theorem to find the height of the triangular base. $h^2 = 5^2 - 3^2 = 16$ or $h = 4$ cm $SA = \left(\frac{1}{2} \times 6 \times 4\right) \times 2 + (10 \times 5) \times 2 + 6 \times 10$ $= 184$ cm ² | FSHe3 | MG2H-5 |
| Question 16 | C $S = V_0(1-r)^n$ $= \$83\,700 \times (1-0.16)^4$ $= \$41\,671.83$ depreciation = $S - V_0$ $= \$83\,700 - \$41\,671.83$ $= \$42\,028.17$ | FSDr2 | MGP-6 |
| Question 17 | B water costs = $5 \times 365 \times 0.125 \times \2.36 $= \$538.375$ savings = $0.34 \times \$538.375$ $= \$183.0475 \approx \183 | FSRe3 | MG2H-5 |
| Question 18 | B $A = \frac{1}{2}ab \sin C$ $= \frac{1}{2} \times 40 \times 50 \times \sin 125^\circ$ $= 1000 \times \sin 125^\circ$  | MM5 | MG2H-5 |

Section I (continued)

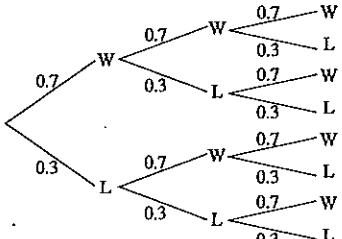
| Answer and explanation | Content area assessed | Outcomes assessed |
|--|-----------------------|-------------------|
| <p>Question 19 D</p> <p>total repayments = $\\$1265 \times 12 \times 30$ $= \\$455\,400$</p> | FM4 | MG2H-6 |
| <p>Question 20 B</p> <p>number of teams = 7C_4 $= 35$</p> <p>Alternatively: number of teams = $\frac{7 \times 6 \times 5 \times 4}{4 \times 3 \times 2 \times 1}$ $= 35$</p> | PB2 | MG2H-8 |
| <p>Question 21 B</p> <p>$t = \frac{k}{s}$ $4 = \frac{k}{90}$ $k = 4 \times 90$ $= 360$ $t = \frac{360}{50}$ $= 7.2 \text{ h or } 7 \text{ h } 12 \text{ min}$ Time taken is 7 hours 12 minutes.</p> | AMS | MG2H-3 |
| <p>Question 22 D</p> <p>$I = Prn$ $= \\$45\,000 \times 0.1125 \times 7$ $= \\$35\,437.50$</p> <p>total paid = $\\$45\,000 + \\$35\,437.50$ $= \\$80\,437.50$</p> | FM4 | MG2H-6 |
| <p>Question 23 C</p> <p>$\frac{170}{p} = \frac{10}{32}$ $10p = 5440$ $p = 544$</p> <p>Lizard population is approximately 544.</p> | DS6 | MG2H-2 |
| <p>Question 24 C</p> <p>If 2 in every 5 men failed the eye test, then 3 in every 5 passed the test. $\frac{3}{5}$ of men = 300 or $\frac{1}{5}$ of men = 100 or $\frac{5}{5}$ of men = 500, so men = 500</p> <p>If 1 in every 5 women failed the eye test, $\frac{1}{5}$ of women = 50 or $\frac{5}{5}$ of women = 250, so women = 250</p> <p>There were 750 men and women who had their eyes tested.</p> | DS4 | MG2H-2 |

Section I (continued)

| Answer and explanation | Content area assessed | Outcomes assessed |
|--|-----------------------|-------------------|
| <p>Question 25 D</p> <p>$C = k \times L^2$ $1300 = k \times 30^2$ $k = \frac{13}{9}$ (or 1.444...)</p> <p>$C = \frac{13}{9} \times 35^2$ $= \\$1767.4444\dots$ $\approx \\$1769 \text{ SGD}$</p> | AMS | MG2H-3 |

Section II

Question 26

| Sample answer | Syllabus outcomes and marking guide |
|--|---|
| <p>(a) $FV = PV(1+r)^n$ $= 18\,000(1+0.049)^5$ $= 22\,863.88074\dots$ $\approx \\$22\,863.88$ Future value is \$22 863.88.</p> | <p>FM4 MG2H-6 • Correct answer..... 1</p> |
| <p>(b) (i) $A = \frac{h}{3}(d_f + 4d_m + d_l) + \frac{h}{3}(d_f + 4d_m + d_l)$ $= \frac{30}{3}(0 + 4 \times 20 + 40) + \frac{30}{3}(40 + 4 \times 60 + 0)$ $= 4000\text{ m}^2$</p> | <p>MM4 MG2H-4 • Correct answer..... 2 • Uses Simpson's rule with at least two correct values..... 1</p> |
| <p>(ii) $h = 300\text{ cm or }3\text{ m}$ $V = Ah$ $= 4000 \times 3$ $= 12\,000\text{ m}^3$</p> | <p>MM4 MG2H-4 • Correct answer..... 1</p> |
| <p>(c)  $\Pr(E) = \Pr(WWW) + \Pr(WWL) + \Pr(WLW) + \Pr(LWW)$ $= (0.7 \times 0.7 \times 0.7) + 3 \times (0.7 \times 0.7 \times 0.3)$ $= 0.784$</p> | <p>PB2 MG2H-8 • Correct answer..... 2 • Constructs tree diagram or shows some understanding of the problem..... 1</p> |
| <p>(d) (i) $BAC_{\text{female}} = \frac{(10N - 7.5H)}{5.5M}$ $= \frac{(10 \times 6.5 - 7.5 \times 6)}{(5.5 \times 63)}$ $= 0.05772005\dots$ ≈ 0.06</p> | <p>FSDr3 MGP-3 • Correct answer..... 1</p> |
| <p>(ii) Victoria's BAC of 0.06 is over the limit of 0.05.</p> | <p>FSDr3 MGP-3 • Correct answer..... 1</p> |
| <p>(e) (i) water usage = $6 + 4.5 + 8.5 + 1$ $= 20\text{ L}$</p> | <p>FSRe1 MG2H-2 • Correct answer..... 1</p> |
| <p>(ii) yearly water usage = 20×365 $= 7300\text{ L}$</p> | <p>FSRe1 MG2H-2 • Correct answer..... 1</p> |

Question 26

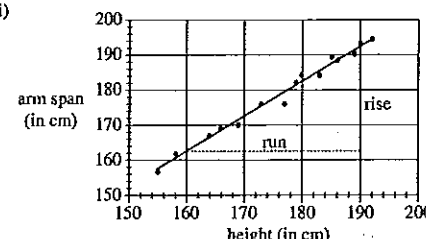
(continued)

| Sample answer | Syllabus outcomes and marking guide |
|---|--|
| <p>(iii) percentage = $\frac{8.5}{20} \times 100$ $= 42.5\%$</p> | <p>FSRe1 MG2H-2 • Correct answer..... 1</p> |
| <p>(f) charge = $270 \times (0.27 + 0.35)$ $= \\$167.40$ monthly cost = $\\$49 + \\$167.40 - \\$100$ $= \\$116.40$</p> | <p>FSCo1 MGP-6 • Correct answer..... 2 • Calculates call charge or shows some understanding..... 1</p> |
| <p>(g) (i) amount owed = $\\$372\,000 + \\$2480 - \\$2840$ $= \\$371\,640$</p> | <p>FM4 MG2H-6 • Correct answer..... 1</p> |
| <p>(ii) interest = $\\$371\,640 \times \frac{0.08}{12}$ $= \\$2477.60$</p> | <p>FM4 MG2H-6 • Correct answer..... 1</p> |

Question 27

| Sample answer | Syllabus outcomes and marking guide |
|---|---|
| (a) (i) distance travelled = $\frac{72 \times 100}{6}$ = 1200 km | FSDr2 MGP-6 • Correct answer..... 1 |
| (ii) petrol used at 100 km/h = 135% of 6 L = 8.1 L | FSDr2 MGP-6 • Correct answer..... 1 |
| (b) $V = \pi r^2 h$ (cylinder) = $\pi \times 3^2 \times 10$ = 282.7433388... m ³ $V = \frac{1}{3} \pi r^2 h$ (cone) = $\frac{1}{3} \pi \times 3^2 \times 4$ = 37.6991184... m ³ total volume = 282.7433388... + 37.6991184 = 320.4424998... ≈ 320.44 m ³ | MM4 MG2H-4 • Correct answer..... 2 • Finds the volume of the cylinder or the cone 1 |
| (c) (i) $\mu = \frac{73.7 + 71.7 + 66.8 + 70.2}{4}$ = 70.6 kg $\sigma_n = 2.520912533...$ ≈ 2.5 kg | DS6 MG2H-7 • Correct answer..... 1 |
| (ii) number of samples = $\frac{4 \times 3 \times 2}{3 \times 2 \times 1} = 4$ (or ${}^4C_3 = 4$) There are four possible samples. | DS6 MG2H-7 • Correct answer..... 1 |
| (iii) Possible samples: {DEF, DEG, DFG, BFG} | DS6 MG2H-7 • Correct answer..... 1 |
| (d) (i) leaking at 0.25 litres per minute: $m = -0.25$ $V = mt + b$ = $-0.25t + 10$ | AM4 MG2H-3 • Correct answer..... 1 |
| (ii) $t = 90$ s or 1.5 min $V = -0.25t + 10$ = $-0.25 \times 1.5 + 10$ = 9.625 L | AM4 MG2H-3 • Correct answer..... 1 |
| (iii) $V = -0.25t + 10$ $0 = -0.25t + 10$ $0.25t = 10$ $t = 40$ min | AM4 MG2H-3 • Correct answer..... 1 |

Question 27

| Sample answer | Syllabus outcomes and marking guide |
|---|--|
| (e) (i)  $m = \frac{\text{rise}}{\text{run}}$ = $\frac{30}{30}$ = 1 | FSHe1 MG2H-5 • Correct answer..... 1 |
| (ii) When $h = 178$ cm then $a = 180$ cm or 181 cm (from the scatterplot). | FSHe1 MG2H-5 • Correct answer..... 1 |
| (iii) correlation coefficient $r = 0.992946452...$ ≈ 0.99 (using a calculator) | FSHe1 MG2H-5 • Correct answer (accept answers from 0.980 to 0.999)..... 1 |
| (f) $7x - 2(x - 1) = 4$ $7x - 2x + 2 = 4$ $5x = 2$ $x = \frac{2}{5}$ | AM3 MG2H-3 • Correct answer..... 2 • Expands parentheses 1 |

Question 28

| Sample answer | Syllabus outcomes and marking guide |
|---|--|
| <p>(a) (i) Loan A is repaid after 18 years.</p> <p>amount owing = $\\$1450 \times 12 \times 18$ $= \\$313\,200$ interest = $\\$313\,200 - \\$200\,000$ $= \\$113\,200$</p> | <p>FM5 MG2H-3 • Correct answer 1</p> |
| <p>(ii) Amount owing is \$180 000 (from graph).</p> | <p>FM5 MG2H-3 • Correct answer 1</p> |
| <p>(iii) Half the amount borrowed is \$100 000, about 22 years (from graph).</p> | <p>FM5 MG2H-3 • Correct answer 1</p> |
| <p>(b) (i) $\frac{\sin \theta}{1300} = \frac{\sin 40}{1100}$ $\sin \theta = \frac{1300 \times \sin 40}{1100}$ $\theta = 49.43406461$ $\approx 49^\circ$</p> | <p>MM5 MG2H-5 • Correct answer 2 • Uses sine rule with one correct value ... 1</p> |

Question 28 (continued)

| Sample answer | Syllabus outcomes and marking guide | | | | | | | | | | | | |
|---|--|----|----|----|-----|----|---|----|----|----|----|-----|---|
| <p>(ii) Required to find $\angle BCA$ to calculate AB: $\angle BCA + 40^\circ + 49.43406\dots^\circ = 180^\circ$ $\angle BCA = 90.56596\dots^\circ$ $AB^2 = 1300^2 + 1100^2 - 2 \times 1300 \times 1100 \times \cos 90.56\dots$ $AB^2 = 2\,928\,250.236\dots$ $AB = 1711.213089\dots$ ≈ 1711 m total distance = $1300 + 1100 + 1711$ $= 4111$ m</p> | <p>MM5 MG2H-5 • Correct answer (accept the use of 49°, resulting in a total distance of 4118 m) 2 • Makes some progress towards the solution 1</p> | | | | | | | | | | | | |
| <p>(c) (i) dosage = $\frac{\text{age of child (years)} \times \text{adult dose}}{\text{age of child (years)} + 12}$ $5 = \frac{y \times 35}{y + 12}$ $5(y + 12) = 35y$ $y + 12 = 7y$ $y = 2$ Evelyn's child is two years old.</p> | <p>FSHe2 MG2H-3 • Correct answer 1</p> | | | | | | | | | | | | |
| <p>(ii) doses = $\frac{400}{5} = 80$</p> | <p>FSHe2 MG2H-3 • Correct answer 1</p> | | | | | | | | | | | | |
| <p>(iii) days = $\frac{80}{4} = 20$ days</p> | <p>FSHe2 MG2H-3 • Correct answer 1</p> | | | | | | | | | | | | |
| <p>(d) (i) Initially $t = 0$. $n = 20(1.1)^t$ $= 20(1.1)^0 = 20$</p> | <p>AM5 MG2H-3 • Correct answer 1</p> | | | | | | | | | | | | |
| <p>(ii)</p> <table border="1"> <tr> <td>t</td> <td>0</td> <td>5</td> <td>10</td> <td>15</td> <td>20</td> </tr> <tr> <td>n</td> <td>20</td> <td>32</td> <td>52</td> <td>84</td> <td>135</td> </tr> </table> | t | 0 | 5 | 10 | 15 | 20 | n | 20 | 32 | 52 | 84 | 135 | <p>AM5 MG2H-3 • Correct answer 1</p> |
| t | 0 | 5 | 10 | 15 | 20 | | | | | | | | |
| n | 20 | 32 | 52 | 84 | 135 | | | | | | | | |
| <p>(iii)</p> | <p>AM5 MG2H-3 • Correct answer 1</p> | | | | | | | | | | | | |

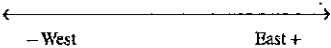
| Question 28 (continued) | Syllabus outcomes and marking guide |
|---|--|
| <p>Sample answer</p> <p>(iv) Using the graph, when $n = 70$ then $t \approx 13$ h.</p> <p>Alternatively:</p> $70 = 20(1.1)^t$ $(1.1)^t = 3.5$ $t = \frac{\log_e 3.5}{\log_e 1.1}$ $\approx 13.144\dots$ | <p>AM5 MG2H-3</p> <ul style="list-style-type: none"> Correct answer 1 |

| Question 29 | Syllabus outcomes and marking guide |
|--|---|
| <p>Sample answer</p> <p>(a) (i) $9 + 2(c - 3) = 9 + 2c - 6$ $= 2c + 3$</p> | <p>AM3 MG2H-3</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(ii) $4x^2 + 3x(x^2 - 2x) = 4x^2 + 3x^3 - 6x^2$ $= 3x^3 - 2x^2$</p> | <p>AM3 MG2H-3</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(iii) $5x^{-3} \times 4x^9 = 20x^6$</p> | <p>AM3 MG2H-3</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(iv) $\frac{15x^8 \times (2x-1)}{6x^2 \times (2x-1)} = \frac{5}{2}x^6$ or $\frac{5x^6}{2}$</p> | <p>AM3 MG2H-3</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(b) (i) angular distance = $50^\circ + 13^\circ$ $= 63^\circ$</p> | <p>MM6 MG2H-5</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(ii) $l = \frac{\theta}{360} \times 2\pi r$ $= \frac{63^\circ}{360} \times 2 \times \pi \times 6400$ ≈ 7037.1675440 ≈ 7037 km Distance between the towns is 7037 km.</p> | <p>MM6 MG2H-5</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(c) The increase in mobile phone use has not caused life expectancy to increase. Life expectancy has risen in many advanced countries due to increased living standards. At the same time, phone technology has improved and become more affordable. This relationship is correlational.</p> | <p>FSRe3 MG2H-7</p> <ul style="list-style-type: none"> Correct answer 2 Shows some understanding of the problem 1 |
| <p>(d) (i) Mean weight is 410 g.</p> | <p>DS5 MG2H-7</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(ii) Standard deviation is 10 g.</p> | <p>DS5 MG2H-7</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(iii) z-score is -2 (from the bell-shaped curve), or $z = \frac{x - \bar{x}}{s} = \frac{390 - 410}{10} = -2$</p> | <p>DS5 MG2H-7</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(iv) 390 g has a z-score of -2, 430 g has a z-score of 2. 95% will have a z-score between -2 and 2. 95% of the balls will be between 390 g and 430 g.</p> | <p>DS5 MG2H-7</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(v) percentage = $\frac{100\% - 95\%}{2}$ $= 2.5\%$</p> | <p>DS5 MG2H-7</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(e) (i) $\Pr(TT) = \frac{1}{2} \times \frac{1}{2}$ $= \frac{1}{4}$</p> | <p>PB2 MG2H-8</p> <ul style="list-style-type: none"> Correct answer 1 |
| <p>(ii) Financial expectation $= \left(\frac{1}{4} \times \\$80\right) + \left(\frac{1}{4} \times \\$100\right) + \left(\frac{1}{4} \times -\\$50\right)$ $= \\$20$ expected return = $\\$20 \times 10 = \\200 (10 games for \$500)</p> | <p>PB2 MG2H-8</p> <ul style="list-style-type: none"> Correct answer 1 |

Question 30

| Sample answer | | | | Syllabus outcomes and marking guide | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|------------------|--|---|-------------------------------------|---|----|---------------|--------|----|---------|---------------|--------|----|-----------|---------------|--------|----|---------|---------------|--------|---|---------|---------------|--------|---|---------|--|--|----|-----------|---------------------------------|
| (a) | (i) | <table border="1"> <thead> <tr> <th>Annual income (\$)</th> <th>Class centre (x)</th> <th>f</th> <th>fx</th> </tr> </thead> <tbody> <tr> <td>40 000–49 999</td> <td>45 000</td> <td>15</td> <td>675 000</td> </tr> <tr> <td>50 000–59 999</td> <td>55 000</td> <td>24</td> <td>1 320 000</td> </tr> <tr> <td>60 000–69 999</td> <td>65 000</td> <td>10</td> <td>650 000</td> </tr> <tr> <td>70 000–79 999</td> <td>75 000</td> <td>7</td> <td>525 000</td> </tr> <tr> <td>80 000–89 999</td> <td>85 000</td> <td>4</td> <td>340 000</td> </tr> <tr> <td></td> <td></td> <td>60</td> <td>3 510 000</td> </tr> </tbody> </table> | Annual income (\$) | Class centre (x) | f | fx | 40 000–49 999 | 45 000 | 15 | 675 000 | 50 000–59 999 | 55 000 | 24 | 1 320 000 | 60 000–69 999 | 65 000 | 10 | 650 000 | 70 000–79 999 | 75 000 | 7 | 525 000 | 80 000–89 999 | 85 000 | 4 | 340 000 | | | 60 | 3 510 000 | DS4 • Correct answer 1 |
| Annual income (\$) | Class centre (x) | f | fx | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 000–49 999 | 45 000 | 15 | 675 000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50 000–59 999 | 55 000 | 24 | 1 320 000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 60 000–69 999 | 65 000 | 10 | 650 000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 70 000–79 999 | 75 000 | 7 | 525 000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 80 000–89 999 | 85 000 | 4 | 340 000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 60 | 3 510 000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | (ii) | $\bar{x} = \frac{\sum fx}{\sum f} = \frac{\$3\,510\,000}{60} = \$58\,500$ | DS4 • Correct answer 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | (iii) | There are 60 employees; the median class would occur at the 30th employee. Median class is 50 000–59 999. | DS4 • Correct answer 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | (iv) | Population standard deviation \$11 665. Sample standard deviation \$11 764. (accept either answer) | DS4 • Correct answer 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | (v) | Standard deviation will increase. \$45 000 is more than 1 standard deviation below the mean and \$85 000 is more than 2 standard deviations above the mean. The spread is going to increase. Alternatively, verify the answer using the calculator: $\sigma_x = 12\,789$ and $s_x = 12\,887$ | DS4 • Correct answer 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (b) | | Break even occurs when $I = C$ $82n = 18n + 1600$ $64n = 1600$ $n = 25$ 25 mobile phones must be sold to break even. | AM4 • Correct answer 2 • Recognises that income equals cost 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (c) | (i) | daily interest rate = $\frac{15.7\%}{365}$ $= 0.04301369863\dots$ $\approx 0.0430\%$ | FM4 • Correct answer 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | (ii) | interest = $\$1240 \times 0.0430\% \times 12$ (12 days) $= \$6.400438356\dots \approx \6.40 total paid = $\$1240 + \6.40 $= \$1246.40$ Total amount paid is \$1246.40. | FM4 • Correct answer 2 • Calculates the interest 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (d) | (i) | longitude difference = $145 - 31$ $= 114^\circ$ time difference = 114×4 $= 456$ min $= 7$ h 36 min | MM6 • Correct answer 2 • Finds the longitude difference 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Question 30 (continued)

| Sample answer | | | Syllabus outcomes and marking guide |
|---------------|--|--|-------------------------------------|
| (ii) | Durban 31° E  Melbourne 145° E time in Durban = 11:00 am – 7 h 36 min $= 3.24$ am | MM6 • Correct answer 1 | |
| (e) | $2x - 5y = 9$ (1) $x + 3y = -1$ (2) Multiply equation (2) by 2 $2x + 6y = -2$ (3) Subtract equation (1) from equation (3) $11y = -11$ $y = -1$ Substitute $y = -1$ into equation (2) $x + 3 \times -1 = -1$ $x = 2$ Solution is $x = 2$ and $y = -1$ (2, -1) | AM3 • Correct answer 2 • Finds the correct value for x or y. OR • Makes some significant progress towards the solution 1 | |