



Roseville College

**2005 TRIAL HIGHER SCHOOL
CERTIFICATE
EXAMINATION**

General Mathematics

General Instructions

- Reading time: 5 minutes
- Working time: two and a half hours
- Calculators may be used.
- Section I consists of 22 multiple-choice questions worth 1 mark each and can be answered on the yellow detachable Multiple Choice answer sheet provided. All questions should be attempted. Allow about 30 minutes for this section.
- Section II begins on page ~~13~~⁸ and consists of 6 questions worth 13 marks each. All questions should be attempted. Allow about 2 hours for this section.
- Formulae sheets are attached to the yellow Multiple Choice answer sheets.

Total Marks – 100

Section 1 (22 marks)

Multiple Choice

Answer on the sheet provided

1. If $w = \frac{15y}{y+12}$ and $y = 7$, the value of w correct to two decimal places is:

- (A) 5.53 (B) 27.0 (C) 8.26 (D) 15.75

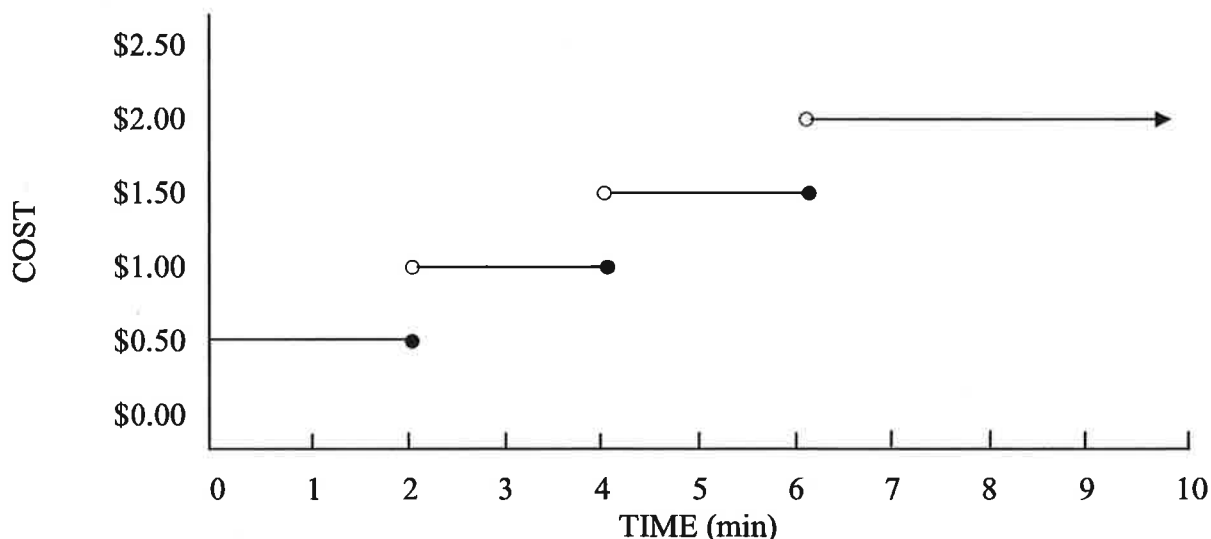
2. When simplified $3(x-2) - 2(x-1)$ becomes:

- (A) $x-8$ (B) $x-4$ (C) $x-1$ (D) $x-3$

3. An example of data collected in quantitative continuous form could be:

- (A) The weight of the fax machine
(B) The brand name on the fax machine
(C) The type of paper used in a photocopier
(D) The number of examination papers copied at any time

4. The graph below shows the cost of timed telephone calls.



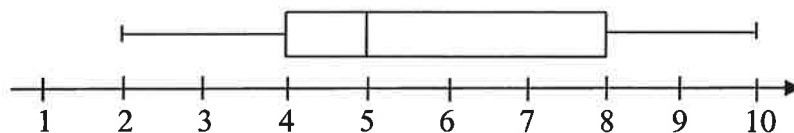
Oliver makes 2 calls to a friend of length 5 minutes and 3 minutes. How much cheaper would it have been for Oliver to make a single 8 minute call?

- (A) \$1.50 (B) \$1.00 (C) \$0.50 (D) \$2.00

5. The area of an ellipse with a major axis of 10cm and a minor axis of 8cm is given by the formula

- (A) $10 \times 8 \times \pi \text{ cm}^2$
- (B) $5 \times 4^2 \times \pi \text{ cm}^2$
- (C) $10 \times 4^2 \times \pi \text{ cm}^2$
- (D) $5 \times 4 \times \pi \text{ cm}^2$

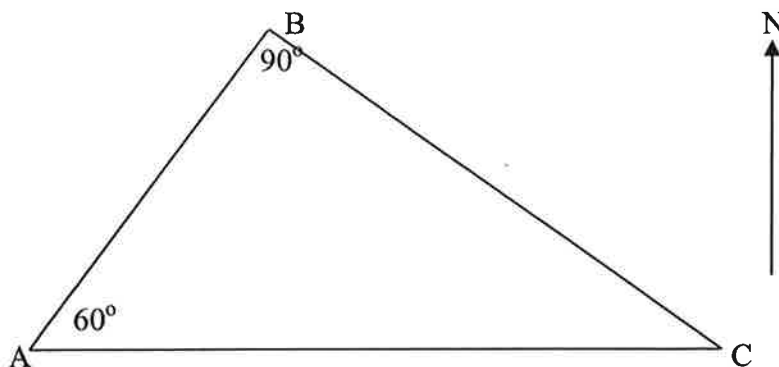
6. You are given the following box plot.



Which of the following statements is incorrect?

- (A) The median is 5
 - (B) The IQR is 8
 - (C) About 50% of the data is less than 5
 - (D) The data set is positively skewed
7. Two points on the surface of the Earth are M(45°N, 45°W) and N(30°S, 60°E). Which of the following statements about the time difference between M and N is true?
- (A) M is 5 hours behind N
 - (B) M is 5 hours ahead of N
 - (C) M is 7 hours behind N
 - (D) M is 7 hours ahead of N
8. The time taken for a team of 10 workers to construct a house is 60 days. How long will it take for a team of 12 workers to complete the same house working at the same rate?
- (A) 72 days (B) 60 days (C) 50 days (D) 48 days

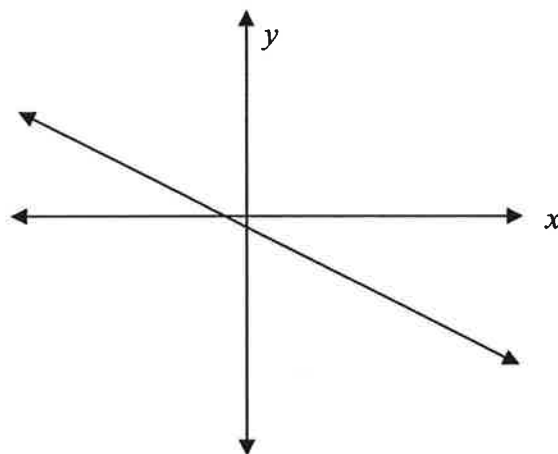
9. Three towns, A, B and C are situated as shown in the diagram. C is due east of town A.



The bearing of C from B is

- (A) 030° (B) 120° (C) 150° (D) 300°

10. Consider the linear function drawn below



The gradient of the function would be closest to

- (A) $-\frac{1}{2}$ (B) -2 (C) 2 (D) $\frac{1}{2}$

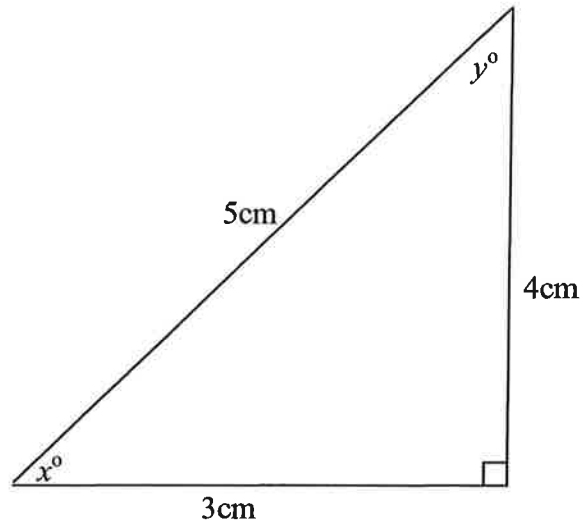
11. The fishing authorities are concerned about the number of fish in a certain lake. To investigate this they use the 'capture-recapture' method. They capture 70 fish, tag and release them. The following day they return and take a sample of 20 fish from the lake, noting that 3 of these are tagged.

Estimate the number of fish in the lake.

- (A) 93 (B) 210 (C) 467 (D) 4200

12. Which *one* of the following ratios is the largest?

- (A) $\sin x$
- (B) $\sin y$
- (C) $\tan x$
- (D) $\tan y$



13. A sphere has a volume of 360 cm^3 . Its radius (correct to one decimal place) would be:

- (A) 8.1cm
- (B) 1.7cm
- (C) 9.3cm
- (D) 4.4cm

14. A biased coin is tossed 50 times and gives 35 tails. Based on this result, how many tails would you expect if the same coin was tossed 200 times?

- (A) 70
- (B) 140
- (C) 100
- (D) 85

15. One hundred tickets are sold in a raffle. There are two prizes. Karen buys five tickets. Which expression gives the probability that Karen wins both prizes?

- (A) $\frac{5}{100} + \frac{4}{100}$
- (B) $\frac{5}{100} + \frac{4}{99}$
- (C) $\frac{5}{100} \times \frac{4}{100}$
- (D) $\frac{5}{100} \times \frac{4}{99}$

16. The table below shows monthly repayments over 30 years.

Interest rate per annum	Loan amount			
	\$100 000	\$150 000	\$200 000	\$250 000
5.0%	\$537	\$806	\$1074	\$1343
5.5%	\$568	\$852	\$1136	\$1420
6.0%	\$600	\$900	\$1200	\$1499
6.5%	\$633	\$949	\$1265	\$1581
7.0%	\$666	\$998	\$1331	\$1664
7.5%	\$700	\$1049	\$1399	\$1749

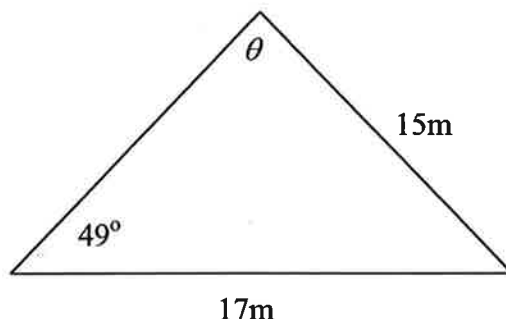
How much would you repay on a loan of \$200 000 taken over 30 years at 6.5% p.a.?

- (A) \$1265.00 (B) \$455 400.00 (C) \$37 950.00 (D) \$390 000.00

17. At the end of 2001 John purchased a computer for \$4000.00. Using the declining balance method, the value of the computer at the end of 2004, assuming a depreciation rate of 30% would be:

- (A) \$1372.00 (B) \$1282.00 (C) \$1500.00 (D) \$2200.00

18. From the diagram below the value of θ would be:



- (A) 72° (B) 73° (C) 59° (D) 60°

19. The lift at Centrepoint Tower travels 298 metres in 42 seconds. Its average speed to the nearest kilometre per hour is

- (A) 2 km/h
(B) 7 km/h
(C) 26 km/h
(D) 118 km/h

20. At the end of the 2000/2001 financial year Andrew's taxable income was \$75 000.00. If he pays \$20 280.00 in taxation for the 2000/2001 financial year, what amount did Andrew claim in tax deductions?

Taxable Income 2000/01	Tax Payable
\$0-\$6000	Nil
\$6001-\$20 000	Nil plus 17 cents for each dollar over \$6000
\$20 001-\$50 000	\$2380 plus 30 cents for each dollar over \$20 000
\$50 000-\$60 000	\$11380 plus 42 cents for each dollar over \$50 000
\$60 001 and over	\$15 580 plus 47 cents for each dollar over \$60 000

- (A) \$15 000.00 (B) \$5000.00 (C) \$4700.00 (D) \$10 000.00

21. When simplified $16 \text{ nm}^3 \div 20 \text{ n}^3 \text{ m}$ would be:

- (A) $\frac{4m}{5n}$ (B) $\frac{4m^2}{5n^2}$ (C) $\frac{4n}{5m^2}$ (D) $\frac{4n^2}{5m^2}$

22. The customs Department uses sniffer dogs to detect the presence of prohibited substances in people's luggage. Rover is a trainee sniffer dog and he is tested on 100 pieces of luggage. The results of Rover's test are displayed in the two-way table below.

	Test results		TOTAL
	Accurate	Not accurate	
With prohibited substances	8	2	10
Without prohibited substances	87	3	90
TOTAL	95	5	

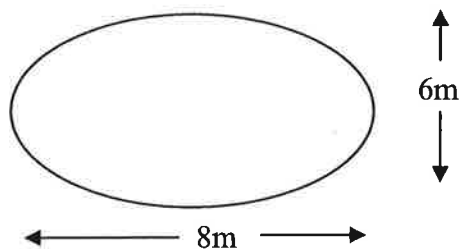
Based on the above table what is the probability that a piece of luggage with prohibited substances is detected by Rover?

- (A) 10% (B) 80% (C) 90% (D) 95%

(Marks)

Section II**Question 23 (13 marks)****Start a new page**

- (a) Marge and Homer are having a new elliptical swimming pool built. The pool will be a constant depth of 1.8m. The diagram shows Marge's sketch of the pool.



- (i) Calculate the area of the pool to the nearest square metre. (2)
- (ii) Based on their experience of building other pools in Springfield, the builders have predicted that 75% of the volume they will have to remove when they are digging the pool will be rock, which will cost \$178 per cubic metre to remove. Calculate the anticipated cost of removing the rock to build Marge and Homer's new pool. (3)
- (b) The table below is the weekly time sheet for employees at the local spinach shop.

Employee	Normal Rate	Normal Hours	Time and a Half Hours	Double Time	Weekly Gross Wage
Popeye	\$9.90	36	-	-	\$356.40
Olive	\$10.50	30	2	1	A
Brutus	B	30	5	3	\$448.05

- (i) Calculate Olive's weekly wage (A) (2)
- (ii) Calculate Brutus' normal hourly rate (B) (2)
- (iii) Popeye's weekly wage from this table is used to calculate his four weeks annual leave. He is entitled to a holiday loading of 17.5% of four weeks normal pay. What percentage of his total holiday pay is holiday loading?(Answer to 2 decimal places)(2)
- (c) Make y the subject of the formula

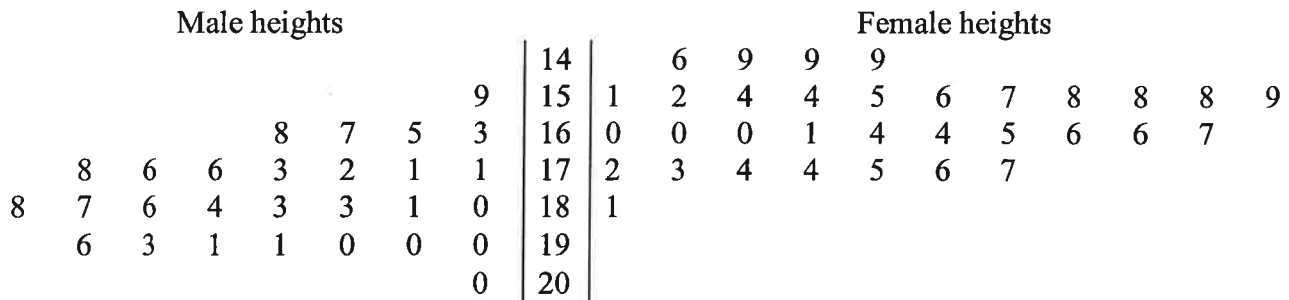
$$P = \frac{1}{2}ay + 4$$

(2)

(Marks)

Question 24 (13 marks)**Start a new page**

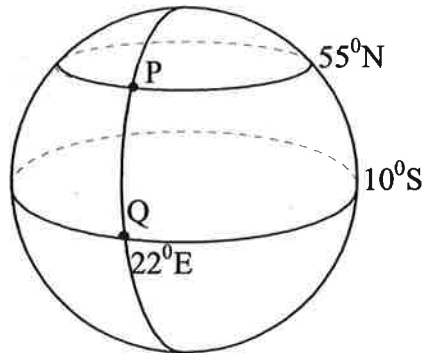
- (a) The back to back stem and leaf plot show the results of surveys of the heights (in centimetres) of male and female students in a high school.



- (i) Calculate the mean and sample standard deviation of female heights, correct to 1 decimal place. (2)
- (ii) What is the range of male heights? (1)
- (iii) A female is chosen at random from the females surveyed. What is the probability that her height will be greater than 160cm? (1)
- (b) The price of a set-square is \$33.59 after GST of 10% has been added. What was its original price? (2)
- (c) A car bought for \$27 000 depreciates at a rate of 16% per annum.
- (i) Use the declining balance method to find the value of the car in 4 years time (to the nearest dollar). (2)
- (ii) After how many years will the car be worth approximately \$10 000 (to the nearest year)? (2)
- (d) Three members from a 10-person band are chosen to play in a concert.
- (i) How many different groups containing 3 people can be chosen from the band? (1)
- (ii) What is the probability that two band members, Melody and Aria will both be in the selected group? (2)

(Marks)**Question 25 (13 marks)****Start a new page**

(a) The diagram represents Earth with two points P and Q on the surface.



- (i) What great circle runs through the points P and Q? (1)
- (ii) Calculate the angular distance between P and Q and hence find the shortest distance between P and Q in nautical miles. (2)
- (iii) Now calculate the shortest distance between P and Q to the nearest kilometre
 - (α) using the arc length formula with $r = 6400\text{km}$ (2)
 - (β) applying the conversion $1 \text{ nautical mile(M)} = 1.852 \text{ km}$. (1)
- (iv) Why are the answers in (iii) different? Give a reason for your answer. (1)

(b) The area, A , of an equilateral triangle is directly proportional to the square of the length of its side S . The area of an equilateral triangle with sides 5cm is 10.8cm^2 correct to 1 decimal place.

- (i) Find the constant of variation. (2)
- (ii) What is the length of the sides of an equilateral triangle which has an area of 27.7cm^2 ? (2)
- (iii) By how much would the area change if the side length doubled? (2)

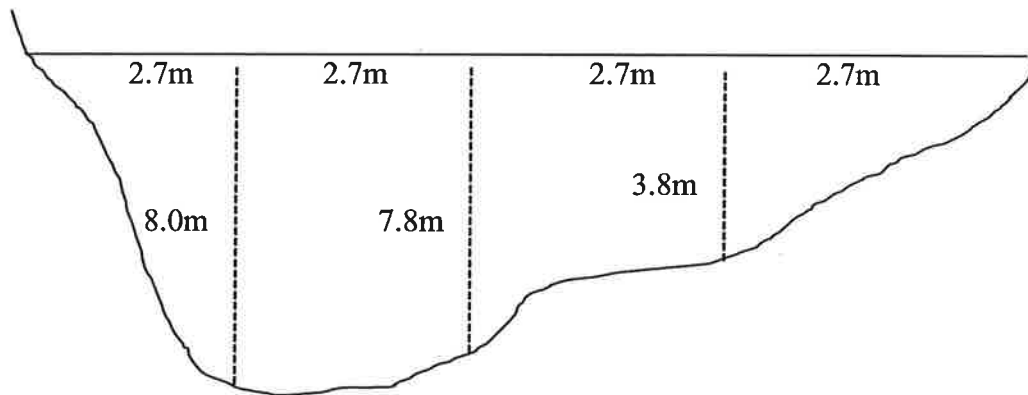
(Marks)

Question 26 (13 marks)**Start a new page**

(a) Mike invested \$120 at the end of each year for 40 years. The investment earned interest of 6% compounded yearly for the entire 40 years.

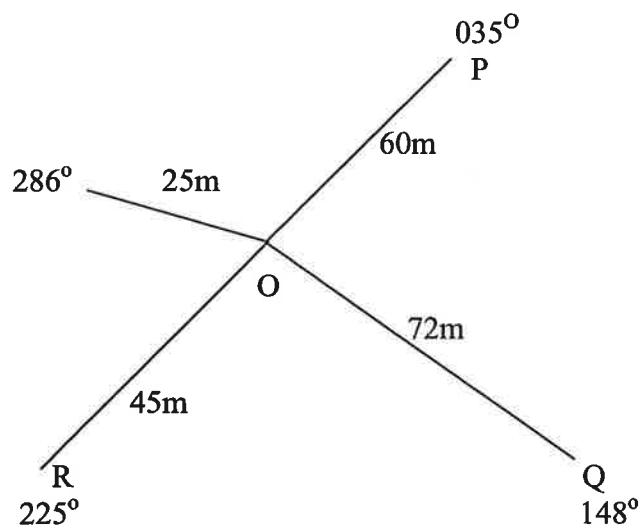
- (i) Find the total value of Mike's investment after 40 years. (2)
- (ii) What is the single amount of money that Mike would have had to invest to produce the same amount after 40 years at 6% per annum interest? (2)

(b) The diagram shows a vertical cross section of a sand bunker.



- (i) By using Simpson's rule twice, find an approximation for the area of this cross-section of the bunker. (Answer to 1 decimal place) (2)
- (ii) The bunker is 8.1m long, and assume that the bunker has approximately the same cross section throughout. Estimate the amount of sand in this bunker, to the nearest 100 cubic metres. (2)

(c)



- (i) Find the size of angle POQ (1)
- (ii) Use the cosine rule to calculate the distance PQ correct to the nearest metre. (2)
- (iii) Find the area of triangle POQ correct to the nearest square metre (2)

(Marks)

Question 27 (13 marks)**Start a new page.**

- (a) Bossie Books is organising a harbour cruise as an end of Year 12 celebration. The cost per person, C dollars, when n people attend can be found by the equation

$$C = \frac{3600}{n} \text{ for } n \text{ from } 40 \text{ to } 100$$

- (i) Using the grid paper provided on page 15, draw a graph to show the equation

$$C = \frac{3600}{n} \text{ for } n \text{ from } 40 \text{ to } 100. \text{ (Detach this page and attach to your answers)} \quad (3)$$

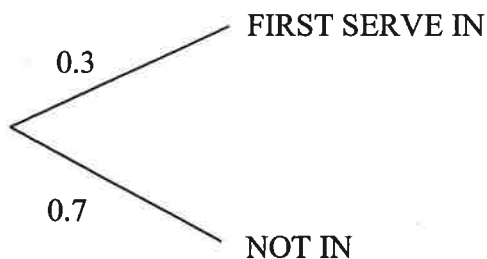
- (ii) If 75 people attend the harbour cruise how much will they each have to pay? (1)

- (iii) When 75 people attend what will be the total cost of the harbour cruise? (1)

- (iv) The formula can only be used for $n = 40$ to 100 . Suggest a reason why it cannot be used for n bigger than 100 . (1)

- (b) A tennis player gets a second serve if the first serve does not go in. Bentley's first serve has a probability of 0.3 of going in, and his second serve has a probability of 0.8 of being successful.

- (i) The tree diagram below shows the outcomes of the first serve. Copy the tree diagram and complete it for the second serve, showing the probability values on each branch. (2)



- (ii) Find the probability that Bentley serves a double fault. (A double fault occurs when both serves do not go in.) (2)
- (iii) What is the probability that at least one of Bentley's serves goes in? (2)
- (iv) Give a possible reason why Bentley's second serve has a greater probability of being more successful than the first serve. (1)

(Marks)**Question 28 (13 marks)****Start a new page****(a)**

- (i) Show that the time difference between Singapore (2°N , 104°E) and Bonn (50°N , 7°E) is $6\frac{1}{2}$ hours (to the nearest $\frac{1}{2}$ hour.) (2)

- (ii) Vesna caught a plane leaving Bonn, at 2.30pm local time on Thursday. The flight to Singapore took 8 hours. What time and day did the plane arrive in Singapore? Answer to the nearest half hour. (3)

- (b) Health care researchers have discovered a new test which predicts whether a person will develop a serious memory loss (dementia) in their old age.

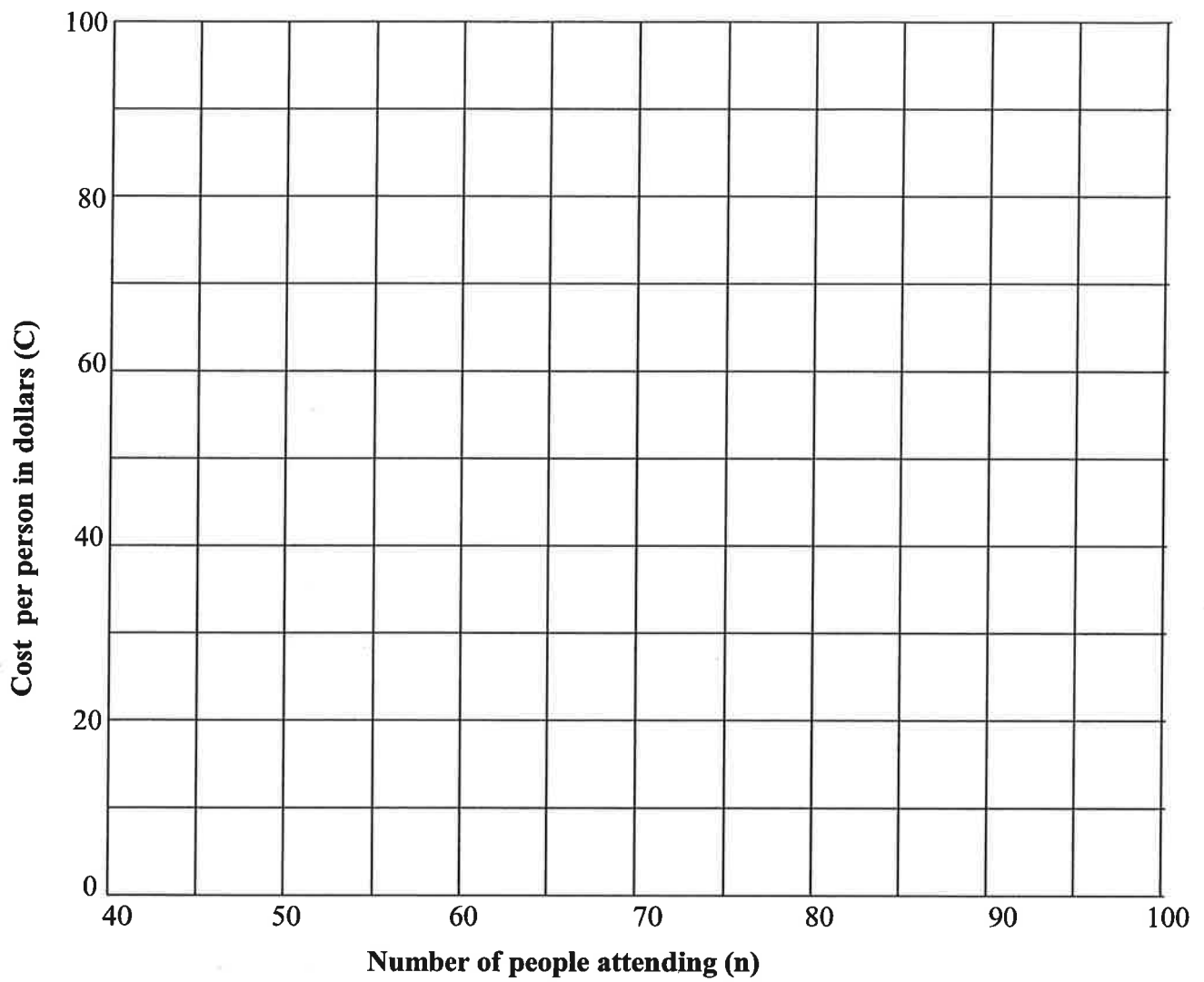
This table shows the initial results of this test.

Test Predictions	Accurate	Not Accurate	Total
People who will develop dementia	86	14	100
People who will not develop dementia	74	(p)	(h)
TOTAL	160	(m)	180

- (i) Complete the missing values, (p), (h) and (m) in this table. (3)
- (ii) What is the probability that the test will accurately predict whether an individual will, or will not, develop dementia? (1)
- (iii) What fraction of those who will not develop dementia is the test accurate? (1)
- (c) Thelma has just won some money in the lottery. She wants to invest some of the money so she can give her daughter Louise some money when she finishes her HSC in 6 years time. How much should Thelma invest today at 9% p.a. compounding yearly so that she will have \$15 000 in 6 years time, to give to Louise? (3)

GRAPH PAPER FOR QUESTION 27 (Attach this to your answer)

Question 27





Roseville College

Year 12 Trial Examination
2005 –General Mathematics
Multiple Choice Answer Sheet

Student Number:

1. ☒ ☐B ☐C ☐D
2. ☐A ☒ ☐C ☐D
3. ☒ ☐B ☐C ☐D
4. ☐A ☐B ☒ ☐D
5. ☐A ☐B ☐C ☒
6. ☐A ☒ ☐C ☐D
7. ☐A ☐B ☒ ☐D
8. ☐A ☐B ☒ ☐D
9. ☐A ☒ ☐C ☐D
10. ☒ ☐B ☐C ☐D
11. ☐A ☐B ☒ ☐D
12. ☐A ☐B ☒ ☐D
13. ☐A ☐B ☐C ☒
14. ☐A ☒ ☐C ☐D
15. ☐A ☐B ☐C ☒
16. ☐A ☒ ☐C ☐D
17. ☒ ☐B ☐C ☐D
18. ☐A ☐B ☒ ☐D
19. ☐A ☐B ☒ ☐D
20. ☐A ☒ ☐C ☐D

21. ☐A ☒ ☐C ☐D
22. ☐A ☒ ☐C ☐D

Question 23

$$(i) A = \pi \times 4 \times 3 \rightarrow ①$$

$$= 37.699 \dots$$

$$A \div 38m^2 \rightarrow ①$$

$$(ii) V = A \times 1.8$$

$$= 67.858 \dots \rightarrow ①$$

$$75\% = 50.89 \dots \rightarrow ①$$

$$\text{Cost} \div \$9059 \text{ (nearest dollar)} \rightarrow ①$$

$$\text{or } 68.4m^3 \rightarrow \text{OR } \$9131.40 \rightarrow ①$$

No marks for correct formula using 6 and 8.

① For $38 \times 75 \times 178$

$$(b)(i) \text{ Olive's wage} = (10.50 \times 30) + (1.5 \times 2 \times 10.50) + (2 \times 10.50)$$

$$= \$367.50 \rightarrow ①$$

$$(ii) \text{ Hours} = 30 + 1.5 \times 5 + 2 \times 3$$

$$= 43.5 \text{ Normal hours}$$

$$\text{Rate} = 43.5 \rightarrow ①$$

$$448.05 \div 43.5 \rightarrow ①$$

$$= \$10.30 \rightarrow ①$$

$$(iii) \text{ Holiday Loading} = 0.175 \times 356.40 \times 4$$

$$= \$249.48$$

(1) for \$249.48

$$\text{Total Holiday Pay} = (356.40 \times 4) + 249.48$$

$$= \$1675.08 \rightarrow ①$$

$$\% \text{ Loading} = \frac{249.48}{1675.08} \times 100$$

$$= 14.89\% \rightarrow ①$$

$$(c) P = \frac{1}{2}ay + 4$$

$$2P = ay + 8 \rightarrow ① \text{ or equivalent}$$

$$2P - 8 = ay$$

$$y = \frac{2P - 8}{a} \rightarrow ① \text{ or equivalent}$$

Most errors because the 4 was not doubled when multiplying both sides by 2.

Question 24.

$$(a) \bar{x} = 161.8 \text{ cm} \quad - ①$$

$$(i) \sigma_s = 9.4 \quad - ①$$

$$(ii) 200 - 159 = 41 \text{ cm} \quad - ①$$

$$(iii) P(>160) = \frac{15}{33} \quad - ①$$

or equivalent

$$(b) \$33.59 = 110\%$$

$$\frac{33.59}{110} = 19\%$$

$$\therefore \left(\frac{33.59}{110} \right) \times 100 = 100\%$$

or equivalent working
①

$$\text{Price} = \$30.54 \quad - ①$$

$$(c) P(1-r)^n$$

$$(i) = 27000(1-0.16)^4 \quad - ① \text{ correct formula + substitution}$$

$$= \$13442.53$$

$$\approx \$13443 \quad - ①$$

$$(ii) 10000 = 27000(0.84)^n$$

$$\text{for } n=5 \quad S = \$112972$$

$$n=6 \quad S = \$9485.05$$

$$\therefore \text{in 6 years} \quad - ②$$

① for 5 years or 5.5 years

$$(d) (i) {}^{10}C_3 = 120 \quad - ①$$

$$(ii) \frac{8}{120} = \frac{1}{15} \quad - ②$$

Question 25

(a) (i) 22°E — ①

(ii) $55 + 10 = 65^\circ$ — ①

$\therefore 65 \times 60 = 3900 \text{ N miles}$ — ①

(ii) (α) $D = \frac{65}{360} \times 2 \times \pi \times 6400$ — ①

$= 7260.569688 \text{ km}$ — ①

(β) $D = 3900 \times 1.852$

$= 7222.8 \text{ km}$ — ①

(iv) In α r is given to 2 sig figs whereas 1.852 is to 3 d.p. — ①

(b) (i) $A = kS^2$ } — ① either

$\therefore 10.8 = k \times 5^2$

$k = 0.432$ — ①

$A \propto S^2$ directly proportional

(ii) $27.7 = 0.432 \times S^2$ — ① = 64.12

$S = 8.0 \text{ cm}$ — ① ✓

(iii) $A = k(2S)^2$ } valid working ①

$= k(4S^2)$

$\therefore$ multiplied by 4 — ①

working must be shown

$0.42 \times (2s)^2$

$= 0.432 \times 4 \times s^2$

$= 4(0.432s^2)$

Question 26

(a) (i) $M = \$120$ $n = 40$, $r = 0.06$

$$A = 120 \left\{ \frac{(1.06)^{40} - 1}{0.06} \right\} - \textcircled{1}$$

$$= \boxed{\$18571.44} - \textcircled{1}$$

(ii) $N = \frac{18571.44}{(1.06)^{40}} \} \textcircled{1}$

$$\boxed{N = \$1805.56} - \textcircled{1}$$

(b) (i) $A = \frac{2.7}{3} (0 + 4(8) + 7.8) + \frac{2.7}{3} (7.8 + 4(3.8) + 0) - \textcircled{1}$

$$= \boxed{56.52 \text{ m}^2} - \textcircled{1}$$

(ii) $63.7 \times 8.1 \} \textcircled{1}$

$$= 457.81$$

$$\div \boxed{500 \text{ m}^3} - \textcircled{1} \text{ Rounding}$$

(c) (i) $\angle POQ = 148 - 35$

$$= \boxed{113^\circ} - \textcircled{1}$$

(ii) $PQ^2 = 60^2 + 72^2 - 2 \times 60 \times 72 \cos 113^\circ - \textcircled{1}$

$$\boxed{PQ \div 110 \text{ m}} - \textcircled{1}$$

(iii) $A = \frac{1}{2} \times 60 \times 72 \times \sin 113^\circ - \textcircled{1}$

$$\div \boxed{1988 \text{ m}^2} - \textcircled{1}$$

Question 27.

(a) (i) see back page

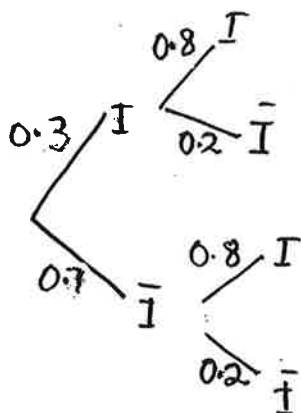
$$(ii) C = \frac{3600}{75}$$

$$= \$48 - \textcircled{1}$$

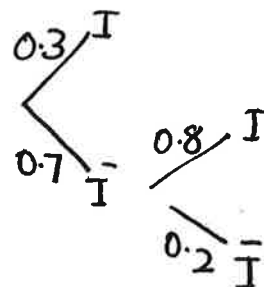
$$(iii) 75 \times 48 = \$3600 - \textcircled{1}$$

(iv) The boat won't hold any more people - ①

(b) (i)



or



$$(ii) P(\text{double fault}) = 0.7 \times 0.2 - \textcircled{1}$$

$$= 0.14 - \textcircled{1}$$

$$(iii) P(\text{at least one in}) = (0.3 \times 0.2) + (0.3 \times 0.8) + (0.7 \times 0.8)$$

$$= 0.86 - \textcircled{2}$$

(iv). Slower pace and therefore more accurate
①

Question 28

$$(a)(i) 104 - 7 = 97 - ①$$

$$\text{Time diff. } 97 \times 4 = 6\text{h } 28\text{m}$$

$$\div \boxed{6\text{h } 30\text{m}} - ①$$

$$(ii) \text{Singapore Time leaves at } 2:30\text{pm} + 6\frac{1}{2}\text{h}$$

$$= 9:00\text{pm} \quad \left. \vphantom{\begin{array}{l} 2:30\text{pm} \\ 9:00\text{pm} \end{array}} \right\} ① \text{ or equivalent working.}$$

$$\text{Arrives at } 9:00\text{pm} + 8\text{h}$$

$$= \boxed{5:00\text{am Friday}}$$

①
①

(b)

$$(i) \boxed{p = 6} - ①$$

$$\boxed{h = 80} - ①$$

$$\boxed{m = 20} - ①$$

$$(ii) \frac{160}{180} = \boxed{89\%} - ①$$

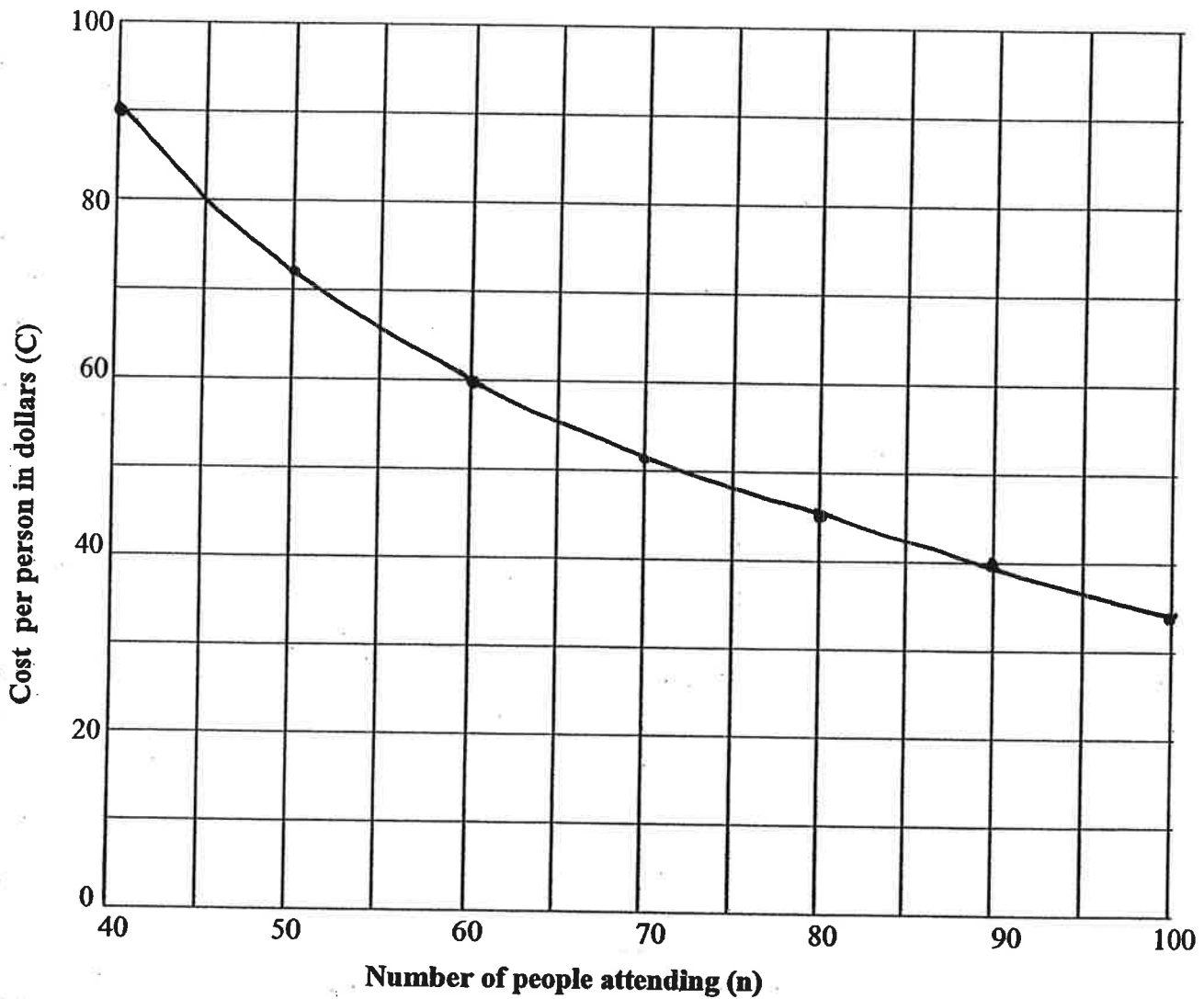
$$(iii) \frac{74}{80} = \boxed{\frac{37}{40}} - ①$$

$$(c) N = \frac{15000}{(1+0.09)^6} \quad \left. \vphantom{\frac{15000}{(1+0.09)^6}} \right\} ②$$

$$\div \boxed{\$8944} - ①$$

GRAPH PAPER FOR QUESTION 27 (Attach this to your answer)

Question 27



subtract 1 ^{each} for incorrect points.
 or for not joining points.
 or for using a ruler to join
 points

