

HSC Trial Examination 2001

# General Mathematics

This paper must be kept under strict security and may only be used on or after the morning of Tuesday 7 August, 2001, as specified in the NEAP Examination Timetable

### General Instructions

Reading time 5 minutes

Working time 2½ hours

Write using blue or black pen.

Calculators may be used.

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

### Examination structure

Section I Pages 2–9 Total marks 22  
Attempt Questions 1–22.

Allow about 30 minutes for this section.

Section II Pages 10–18 Total marks 78  
Attempt Questions 23–28.

Allow about 2 hours for this section.

## Section I

Total marks 22

Total marks 22

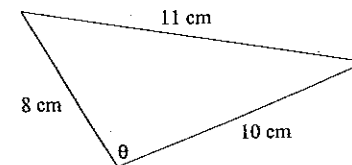
Attempt Questions 1–22.

Allow about 30 minutes for this section.

Use the multiple-choice answer sheet.

Select the alternative A, B, C or D that best answers the question.

1.



NOT TO SCALE

Which of the following expressions represents the value of  $\cos \theta$  in this triangle?

(A)  $\frac{8^2 + 10^2 - 11^2}{2 \times 8 \times 11}$

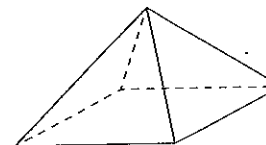
(B)  $\frac{8^2 + 10^2 - 11^2}{2 \times 8 \times 10}$

(C)  $\frac{8^2 + 11^2 - 10^2}{2 \times 8 \times 11}$

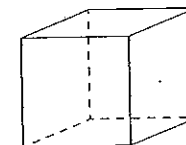
(D)  $\frac{11^2 + 10^2 - 8^2}{2 \times 8 \times 10}$

2. Which of these solids is NOT a prism?

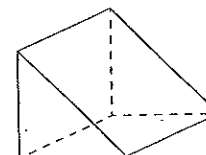
(A)



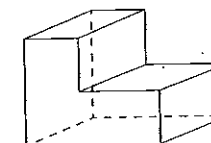
(B)



(C)



(D)



3. On which lines are the errors in Jim's solution to this equation?

$$5x - 2(4x + 5) = 17$$

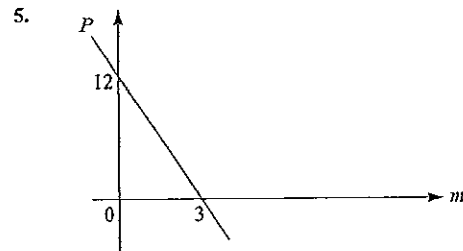
$$5x - 8x + 10 = 17 \quad \text{line 1}$$

$$3x + 10 = 17 \quad \text{line 2}$$

$$3x = 7 \quad \text{line 3}$$

$$x = \frac{3}{7} \quad \text{line 4}$$

- (A) lines 1 and 2 only  
 (B) lines 1 and 4 only  
 (C) lines 2 and 4 only  
 (D) lines 1, 2 and 4 only
4. When Bob drew a scatter graph which showed a sample of people's height and the length of their radial bone (a bone in their lower arm), he found there was a strong positive linear correlation. What conclusion could he make from this data?
- (A) Tall people have long radial bones.  
 (B) Short people have long radial bones.  
 (C) Tall people have short radial bones.  
 (D) There is no relationship between height and radial bone length.

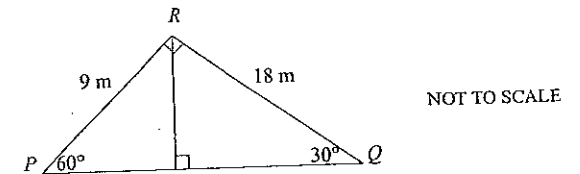


What is the equation of this line?

- (A)  $P = 3m + 12$   
 (B)  $P = 4m + 12$   
 (C)  $P = 12 - 4m$   
 (D)  $m = 12 - 4P$
6. Amanda administered her 'public opinion' questionnaire to a sample of people by phoning every 100th person in the phone book. What type of sample did Amanda use?
- (A) categorical  
 (B) random  
 (C) stratified  
 (D) systematic

7. At his favourite casino game John has a  $\frac{1}{10}$  chance of winning \$200, a  $\frac{4}{5}$  chance of losing \$50 and a  $\frac{1}{10}$  chance of winning \$30. If John plays this game 10 times which of the following possibilities should he expect to happen?
- (A) lose more than \$100  
 (B) lose between \$0 and \$100  
 (C) win between \$0 and \$100  
 (D) win more than \$100

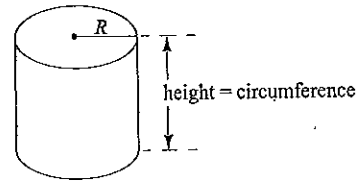
8.



Which of the following formulas could NOT be used to calculate the length of  $PQ$ , without calculating any other lengths first?

- (A)  $a^2 = b^2 + c^2$   
 (B)  $\frac{a}{\sin A} = \frac{b}{\sin B}$   
 (C)  $\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$   
 (D)  $\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$
9. There are 8 players registered to play with the 'Dribblers' basketball team. How many different 5 player teams can be formed from the 8 registered players?
- (A) 40  
 (B) 56  
 (C) 6720  
 (D) 40320
10. Evaluate  $25.2 \times \sin 36^\circ 11'$ . Answer correct to 2 decimal places.
- (A) 14.85  
 (B) 14.88  
 (C) 15.37  
 (D) 15.41

11. The height of a cylindrical can is the same as the circumference of the top of the can.

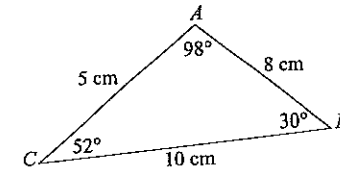


The radius of the can is  $R$ .

Which expression represents the volume of the can?

- (A)  $2\pi R^2$   
 (B)  $2\pi R^3$   
 (C)  $2\pi^2 R^3$   
 (D)  $4\pi R^2$
12. Ezzat bought 2000 shares at \$5.20 each and he sold them 3 weeks later for \$6.10 each. The brokerage charges were 1% of the purchase and selling prices. How much profit did Ezzat make?
- (A) \$1574  
 (B) \$1782  
 (C) \$1818  
 (D) \$2026
13. Simplify  $10x^2 - 2x(x-3)$
- (A)  $2x$   
 (B)  $14x^3$   
 (C)  $8x^2 - 6x$   
 (D)  $8x^2 + 6x$
14. One grain of rice has a mass of  $1.7 \times 10^{-3}$  grams. Approximately how many grains of rice are required to make 1 tonne of rice?
- (A)  $5.9 \times 10^2$   
 (B)  $5.9 \times 10^5$   
 (C)  $5.9 \times 10^7$   
 (D)  $5.9 \times 10^8$

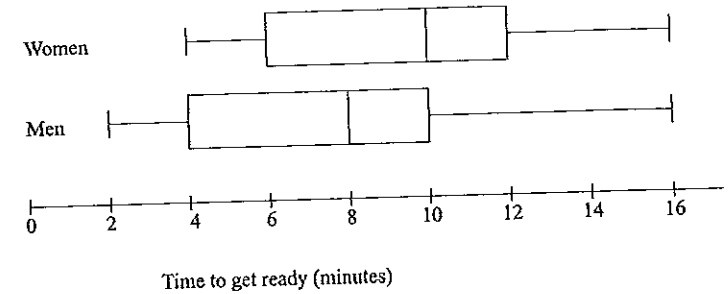
- 15.



NOT TO SCALE

Which of these expressions will give the area of  $\triangle ABC$ ?

- (A)  $\frac{1}{2} \times 8 \times 5$   
 (B)  $\frac{1}{2} \times 8 \times 5 \times \sin 98^\circ$   
 (C)  $\frac{1}{2} \times 10 \times 5 \times \sin 30^\circ$   
 (D)  $\frac{1}{2} \times 10 \times 8 \times \sin 52^\circ$
16. This double box-and-whisker plot shows the time it took 60 men and 60 women to get ready to go out to the movies.

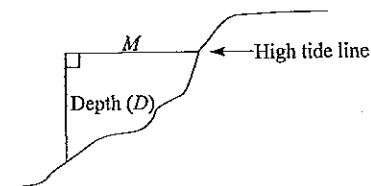


Which of these statements is WRONG?

- (A) 15 men got ready in 2 minutes.  
 (B)  $\frac{1}{2}$  of the people took between 4 and 10 minutes to get ready.  
 (C)  $37\frac{1}{2}\%$  of the people took 10 or more minutes to get ready.  
 (D)  $\frac{3}{4}$  of the men got ready in the time it took half of the women to get ready.

17.

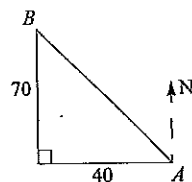
NOT TO SCALE



At Cave Rock, a popular scuba diving site, the depth of the water ( $D$ ) in metres is directly proportional to the square of the horizontal distance ( $M$ ) in metres from the high tide line on the rock. The water is 36 metres deep when the horizontal distance from the high tide line on the rock is 3 metres. How deep is the water when the horizontal distance from the high tide line is 6 metres?

- (A) 18 m
- (B) 72 m
- (C) 144 m
- (D) 648 m

18.



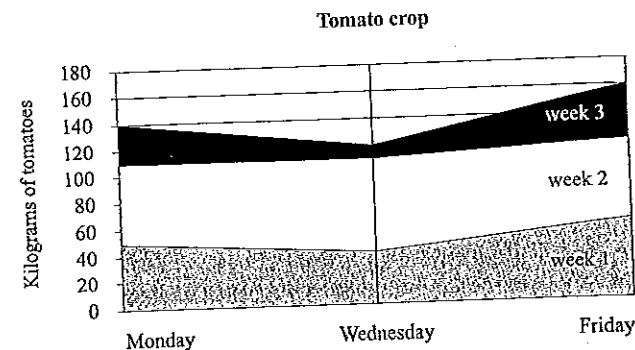
NOT TO SCALE

To avoid a large reef, Bernice sailed 40 nautical miles west from point  $A$  and then sailed 70 nautical miles north to point  $B$ .

What is the bearing from point  $B$  to point  $A$ ? Answer correct to the nearest degree.

- (A)  $030^\circ$
- (B)  $060^\circ$
- (C)  $150^\circ$
- (D)  $330^\circ$

19. Gilberto is a market gardener. He picks his tomatoes on Mondays, Wednesdays and Fridays. This area graph shows the number of kilograms of tomatoes he picked in the first 3 weeks in December.



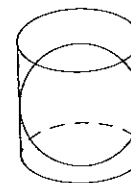
What is the total number of kilograms of tomatoes Gilberto picked in the first 3 weeks in December?

- (A) 160 kg
- (B) 340 kg
- (C) 420 kg
- (D) 910 kg

20. The highest peak on the Galapagos Islands is 1689 m above sea level. Which of these expressions represents the distance from David's yacht to the base of the peak when the angle of elevation from the yacht to the top of the peak is  $12^\circ$ ?

- (A)  $\frac{1689}{\tan 12^\circ}$
- (B)  $\frac{1689}{\sin 12^\circ}$
- (C)  $1689 \tan 12^\circ$
- (D)  $1689 \sin 12^\circ$

21.



NOT TO SCALE

A sphere is inside a closed cylinder. The sphere touches the top and bottom of the cylinder as well as the sides of the cylinder.

What is the ratio of the volume of the cylinder to the volume of the sphere?

- (A) 2 : 3
- (B) 3 : 2
- (C) 3 : 4
- (D) 4 : 3

22. James and Maria each received \$1000 from their aunt. James invested his \$1000 in some Government Bonds and Maria invested her \$1000 in an investment account. Both investments were for a 2 year term. The details of their investments are given below.

<i>FIXED TERM BONDS</i>	<i>INVESTMENT ACCOUNT</i>
\$250 each After 2 years, each Bond can be cashed in for \$275.	6% pa interest, compounding monthly

How much more than James' investment will Maria's investment be worth at the end of the 2 year term?

- (A) \$23.60
- (B) \$27.16
- (C) \$852.16
- (D) \$1127.16

**Section II**

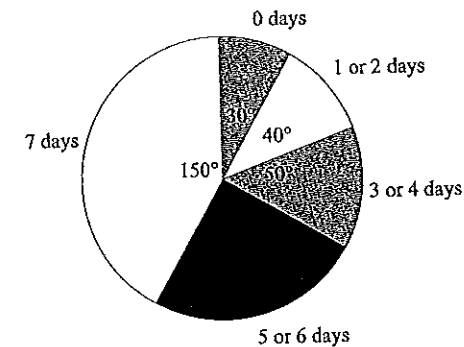
Total marks 78

Total marks 78  
Attempt Questions 23–28.  
Allow about 2 hours for this section.

Answer each question in a SEPARATE writing booklet.

Question 23 (13 marks) Use a SEPARATE writing booklet.

- (a) Keith is using a survey to investigate healthy lifestyle habits. One of the questions in his survey is 'How often do you eat fruit?'
- (i) Explain why this is not a good way to ask a question in a survey. 1
  - (ii) Suggest a better way this question could have been asked. 1
  - (iii) Keith used a sector graph to display the responses he received to his question 'How many days per week do you eat breakfast?'. 1

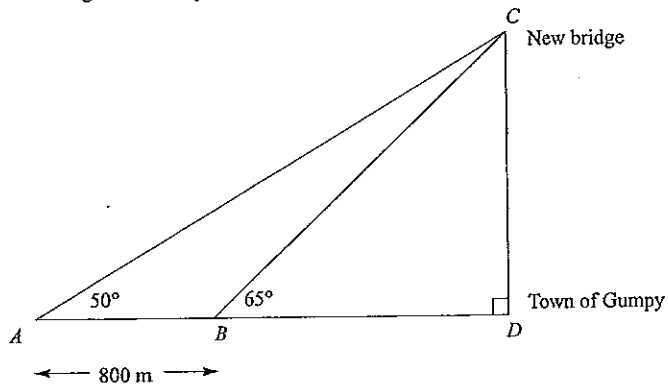


What fraction of the people Keith surveyed eat breakfast 5 or more days per week?

- (iv) Keith's survey showed that the usual number of hours people sleep was normally distributed and that 95% of them had between 6 and 8 hours sleep per night. 2
- What is the mean and standard deviation of these sleeping hours?

- (b) Solve the equation  $3\sqrt{x-1} = 12$  3

- (c) As part of the plan for the highway to bypass the town of Gumpy, a new bridge needs to be built. Two access tracks have been built from the highway (at points  $A$  and  $B$ ) to the site of the new bridge. The surveyors' measurements are shown on the diagram.



Marks

- (i) Explain why  $\angle ACB = 15^\circ$   
 (ii) Use the sine rule to show that  $BC = 2368$  metres, correct to the nearest metre.  
 (iii) Calculate the distance  $CD$ , from Gumpy to the new bridge site.

1

2

2

Marks

Question 24 (13 marks) Use a SEPARATE writing booklet.

- (a) Hassan borrowed  $\$75\,000$  to buy a home unit which he is going to use as a rental investment. This table shows some of the figures involved in the repayment of his loan.

Home Loan Table				
	Amount =	$\$75\,000$	This table assumes the same number of days in each month. Interest = rate/12 $\times$ principal	
	Annual interest rate	10%		
	Monthly repayment $R =$	$\$900$		
$N$	Principal ( $P$ )	Interest ( $I$ )	$P + I$	$P + I - R$
1	$\$75\,000.00$	$\$625.00$	$\$75\,625.00$	$\$74\,725.00$
2	$\$74\,725.00$	$\$622.71$	$\$75\,347.71$	$\$74\,447.71$
3	$\$74\,447.71$	$\$620.40$	$\$75\,068.11$	$\$74\,168.11$
4	$\$74\,168.11$	$A$	$B$	$C$
185	$\$1219.77$	$\$10.16$	$\$1229.93$	$\$329.93$
186	$\$329.93$			

- (i) Calculate the 3 missing amounts,  $A$ ,  $B$  and  $C$  for Hassan's 4th repayment.  
 (ii) What fraction of Hassan's first repayment of  $\$900$  will be interest?  
 (iii) After Hassan's 186th repayment, the loan will be repaid. Calculate the value of his last repayment.  
 (iv) Calculate the total amount of interest Hassan will pay on this loan.  
 (b) When Hassan bought the unit, it was valued at  $\$120\,000$  and its value is increasing at 4.5% per annum. How much will it be worth in 15 years time?

3

1

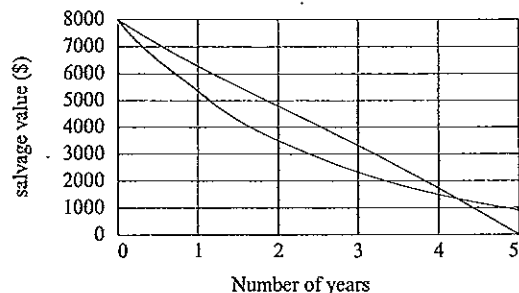
2

2

2

- (c) When he calculates his income tax, Hassan can claim the depreciation of the carpets and curtains. When he bought the unit, the carpets and curtains were valued at \$8000. This graph shows their salvage value with straight line and declining balance depreciation.

Marks



- (i) What annual rate of depreciation was used for the straight line method of depreciation? 1
- (ii) Hassan wants the maximum taxation deduction possible in the first two years of his loan. Should he use straight line or declining balance depreciation? Explain your answer. 2

Question 25 (13 marks) Use a SEPARATE writing booklet.

- (a) Veterinary scientists are testing a new experimental drug to treat parasites in cattle. Without treatment, cattle with the parasites usually die.

This table shows the results of using the new experimental drug and, using traditional drugs.

	Recovered	Died	Total
Experimental Drug	2634	366	3000
Traditional Drugs	(A)	504	4500
Total	6630	(B)	7500

- (i) What are the values of the two missing numbers, (A) and (B) in the table? 2
- (ii) What percentage of the cattle treated with the experimental drug recovered? 1
- (iii) What is the probability that one of the animals treated with the traditional drugs will die? 1
- (iv) Do you think the scientists should recommend replacing the traditional drugs with the new experimental drug? Explain your answer. 1
- (b) To help him decide which type of lift to install in a new office block, the engineer investigated the reliability of 2 types of lifts, Lynch Lifts and Grump Lifts, in 2 similar office blocks. The engineer took a sample of 20 lifts from each block and recorded the number of breakdowns during a six month period. He used a double stem-and-leaf plot to display the results of his survey.

Number of breakdowns

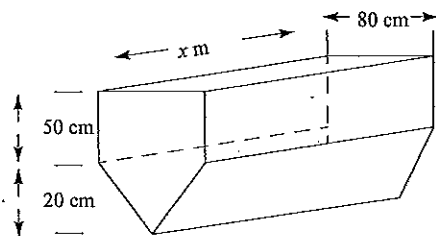
Lynch lifts		Grump lifts
7 5 3 3 3	0	5 5 5 5 6 9
9 3 3 2 2 0	1	0 1 5 5 5
9 8 7 6 5 5	2	2 3 □ 8 9 9
7 4 3	3	4 7
	4	9

- (i) One entry (indicated by a □) is missing from the Grump Lifts sample. What could this number of breakdowns have been? 1
- (ii) Calculate the mean, sample standard deviation and median for the Lynch Lifts. 3
- (iii) If the score 49 in the Grump Lifts statistics was removed, how would the mean, sample standard deviation and median be effected? 2
- (iv) The Grump Lifts have a mean of 18.75, a sample standard deviation of 12.8 and a median of 15. Based on the results of the survey, which type of lift is more reliable? Give reasons for your answer. 2

Question 26 (13 marks) Use a SEPARATE writing booklet.

Marks

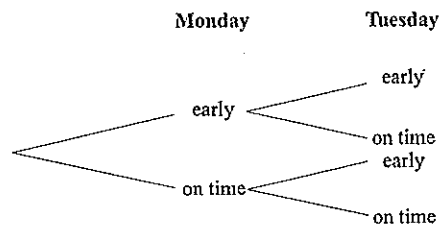
(a) The diagram represents a cattle feed hopper which is open at the top.



- (i) Express 80 cm in metres. 1
- (ii) When the feed in the hopper is level with the top, the hopper contains  $3 \text{ m}^3$  of feed. Show that the length,  $x$  metres, of the hopper can be found by solving the equation  $0.48x = 3$ . 2
- (iii) How long is the hopper? Answer correct to the nearest centimetre. 2

(b) Jessie catches the bus to school. She knows the bus is never late and that 2 out of every 5 days it is early.

- (i) What is the probability that Jessie's bus will be 'on time'? 1
- (ii)



Copy and complete this tree diagram showing the appropriate probabilities on each branch. 2

- (iii) What is the probability that Jessie's bus will be early on Monday and Tuesday? 1
  - (iv) Calculate the probability that the bus will be early at least once on Monday and Tuesday. 1
  - (v) Jessie needs to catch the bus to school 8 times during her HSC exams. On how many of these days should she expect the bus to be early? 1
- (c) Alex is trying to solve the equation  $2^x - x = 8.5$ . 2

Explain how you know that the answer is between 3 and 4.

Marks

Question 27 (13 marks) Use a SEPARATE writing booklet.

David is going to visit the Galapagos Islands. He charted a yacht in Quito, Ecuador, ( $0^\circ, 80^\circ \text{ W}$ ) to sail to the islands ( $0^\circ, 95^\circ \text{ W}$ ).

- (a) When it is 9 am in Quito, what time is it on the Galapagos Islands? 2
- (b) The optimal speed  $S$  knots, of a yacht can be determined by using the formula  $S = 1.3 \times \sqrt{3L}$  where  $L$  = length of yacht in metres. 2
  - (i) Write the formula  $S = 1.3 \times \sqrt{3L}$  with  $L$  as the subject. 1
  - (ii) The optimal speed of David's yacht is 10 knots. How long is the yacht? 1
- (c) It is 900 nautical miles from Quito to the Galapagos Islands. At an average speed of 10 knots, how long will the trip from Quito to the Islands take? Answer to the nearest day. 1
- (d) As a result of people visiting the Galapagos Islands, the number of non-native plant species growing on the islands is becoming a serious problem. The formula 1

$$N = 0.95 \times (1.064)^t$$

where  $N$  = the number of non-native plant species and  $t$  = the number of years since 1900, is being used to model the expected number of non-native plant species on the islands.

- (i) Copy and complete this table of values for  $N = 0.95 \times (1.064)^t$  2

Year	1901	1950	1970	2000	2020
$t$	1	50		100	
$N$	1		73	470	

- (ii) Use the graph paper at the end of this booklet to sketch the number of non-native plant species on the islands for values of  $t$  from 1 to 120. Attach the graph paper to your answer booklet for this question. 2
- (iii) Estimate the year in which the number of non-native plant species on the islands first exceeded 300. 1
- (iv) Which of these expressions best describes the relationship between  $N$  and  $t$ : exponential, hyperbolic, linear or quadratic? Give a reason for your answer. 1
- (v) In 1903, 1970 and 2000 scientists surveyed the island and estimated the actual number of non-native plant species. This table shows the results. 1

Year	1903	1970	2000
Number of non-native plant species	1	73	471

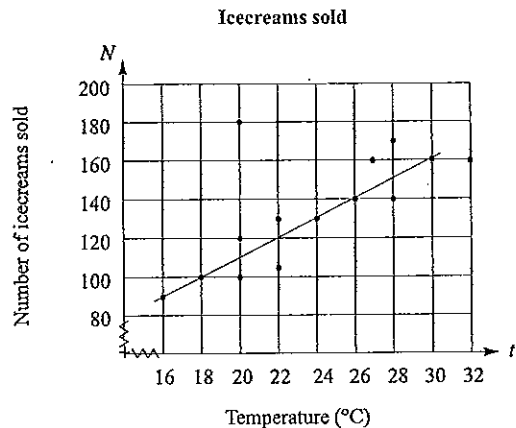
Is the equation  $N = 0.95 \times (1.064)^t$  a good model for the number of non-native plant species on the islands? Explain your answer.



Question 28 (13 marks) Use a SEPARATE writing booklet.

Marks

- (a) Muspha has an icecream truck. He displayed the number of icecreams ( $N$ ) he sold each day and the day's maximum temperature ( $t$ ) on this scatter graph.



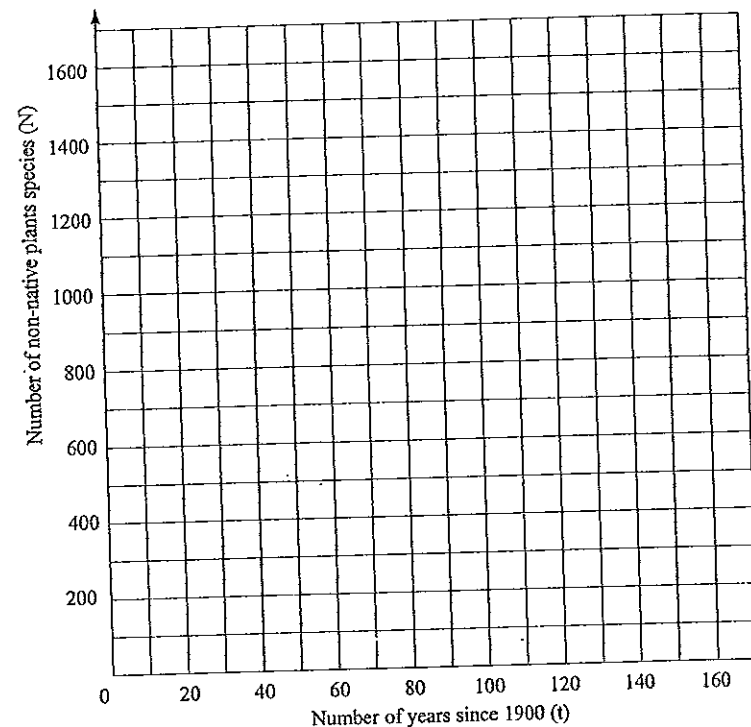
- (i) What is the equation of the line of fit Muspha drew on his scatter graph? 2
- (ii) Typically, how many extra icecreams does Muspha sell for every degree the temperature increases? 1
- (iii) Muspha has no data for very hot days. Predict the number of icecreams he could sell on a  $40^\circ\text{C}$  day and explain why your prediction may not be very accurate. 2
- (iv) The data point (20, 180) appears to be wrong. Muspha checked his records and he found that on a Saturday in April, when the temperature was  $20^\circ\text{C}$  he had sold 180 icecreams. Suggest a reason why he may have sold so many icecreams on a relatively cool day. 1
- (b) Jon and Gill have both started to invest to provide for their future.

Jon invested a lump sum of \$60 000 and Gill is investing \$500 every month. Gill's account had a zero balance before she began her \$500 monthly deposits.

Both accounts pay 6% pa interest monthly compounding.

- (i) How much will Jon's investment amount to in 30 years? 2
- (ii) Determine the value of Gill's investment in 30 years. 2
- (iii) How much interest will Gill's account earn during the 30 years? 2
- (iv) Without making any calculations, explain how Jon could change his investment strategy so that his and Gill's investments would be worth the same amount after 30 years. 1

Question 27 (d) (ii).



# General Mathematics

## Suggested solutions

### Section I

1.	B
2.	A
3.	D
4.	A
5.	C
6.	D
7.	A
8.	D
9.	B
10.	B
11.	C

12.	A
13.	D
14.	D
15.	B
16.	A
17.	C
18.	C
19.	C
20.	A
21.	B
22.	B

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1.  $\cos \theta = \frac{8^2 + 10^2 - 11^2}{2 \times 8 \times 10}$

∴ Answer B

---

2. A prism must have the same shape at both ends and have 'flat' sides.

∴ Answer A

---

3.  $5x - 8x - 10 = 17$  error in line 1

$-3x - 10 = 17$  error in line 2

$3x = 27$

$x = \frac{27}{3}$  error in line 4

∴ Answer D

---

4. With a strong positive linear correlation, as one variable increases so does the other.

∴ Answer A

---

5. Gradient =  $-\frac{12}{3} = -4$

intercepts the  $P$  axis at 12

equation of the line is  $P = -4m + 12$  or  $P = 12 - 4m$

∴ Answer C

6. Choosing the 100th, 200th, 300th etc. is a systematic sample.  
 $\therefore$  Answer D

7. In 10 games he should expect to win 1 game of \$200, loose 8 games at \$50 each and win 1 game at \$30. This means expectation =  $200 - 8 \times 50 + 30 = -\$170$

*Alternative method*

$$\text{In 1 game: expectation} = \frac{1}{10} \times 200 - \frac{4}{5} \times 50 + \frac{1}{10} \times 30 = -17$$

$$\text{In 10 games the expectation} = 10 \times (-\$17) = -\$170$$

$\therefore$  Answer A

8. Answer D

9.  ${}^8C_3 = \frac{8 \times 7 \times 6 \times 5 \times 4}{1 \times 2 \times 3 \times 4 \times 5} = 56$

$\therefore$  Answer B

10.  $25.2 \times \sin 36^\circ 11' = 25.2 \times 0.59037\dots$   
 $= 14.88$

$\therefore$  Answer B

11.  $h = \text{circumference} = 2\pi R$

$$\text{Volume} = \pi R^2 h$$

$$= \pi R^2 \times 2\pi R$$

$$= 2\pi^2 R^3$$

$\therefore$  Answer C

12. Share price =  $2000 \times \$5.20$   
 $= \$10\,400$

$$\text{Purchase brokerage: } 0.01 \times \$10\,400 = \$104$$

$$\text{Total purchase price} = \$10\,400 + \$104$$

$$= \$10\,504$$

$$\text{Selling price} = 2000 \times \$6.10$$

$$= \$12\,200$$

$$\text{Selling brokerage: } 0.01 \times \$12\,200 = \$122$$

$$\text{Receipt after selling: } \$12\,200 - \$122 = \$12\,078$$

$$\text{Profit} = \$12\,078 - \$10\,504$$

$$= \$1574$$

*Alternate solution*

$$\text{Purchase price: } 2000 \times \$5.20 \times 1.01 = \$10\,504$$

$$\text{Receipt after selling: } 2000 \times \$6.10 \times 0.99 = \$12\,078$$

$$\text{Profit: } \$12\,078 - \$10\,504 = \$1574$$

$\therefore$  Answer A

13.  $10x^2 - 2x(x-3) = 10x^2 - 2x^2 + 6x$   
 $= 8x^2 + 6x$

$\therefore$  Answer D

14. 1 tonne = 1000 kg  
 $= 1000 \times 1000$  grams

$$\text{Number of grains} = 1\,000\,000 \div (1.7 \times 10^{-3})$$

$$= 588\,235\,294$$

$$= 5.9 \times 10^8$$

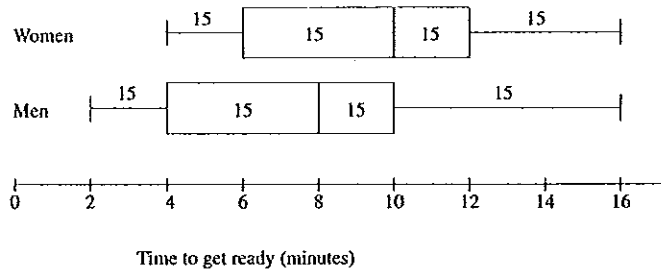
$\therefore$  Answer D

15. Area =  $\frac{1}{2} bc \sin A$

$$= \frac{1}{2} \times 8 \times 5 \times \sin 98^\circ$$

$\therefore$  Answer B

16.

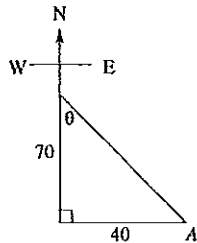


- A is wrong. All the men took longer than 2 minutes to get ready.  
 B is correct. 30 men and 30 women took between 4 and 10 minutes.  
 This means 60 out of 120 people or  $\frac{1}{2}$  the people.  
 C is correct. 15 men and 30 women is a total of 45 out of 120 or  $37\frac{1}{2}\%$   
 D is correct. Half the women took up to 10 minutes to get ready.  
 So did  $\frac{3}{4}$  of the men.

17.  $D \propto M^2$   
 $D = kM^2$   
 $36 = k \times 3^2$   
 $36 = 9k$   
 $k = 4$   
 $D = 4M^2$   
 $= 4 \times 6^2 = 144 \text{ m}$   
 $\therefore$  Answer C

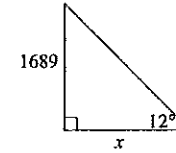
18. (C)  $\tan \theta = \frac{40}{70}$   
 $\theta = 30^\circ$

Bearing is  $180^\circ - 30^\circ = 150^\circ$   
 $\therefore$  Answer C



19. Total =  $140 + 120 + 160$   
 $= 420 \text{ kg}$   
 $\therefore$  Answer C

20.  $\tan 12^\circ = \frac{1689}{x}$   
 $x \times \tan 12^\circ = 1689$   
 $x = \frac{1689}{\tan 12^\circ}$   
 $\therefore$  Answer A



21. The radius of the cylinder and the sphere =  $R$   
 The height of the cylinder =  $2R$

$$\begin{aligned} \text{Volume (cylinder): Volume (sphere)} &= \pi R^2 \times 2R : \frac{4}{3} \pi R^3 \\ &= 2\pi R^3 : \frac{4}{3} \pi R^3 \\ &= 2 : \frac{4}{3} \quad (\text{Multiply this line by 3}) \\ &= 6 : 4 \quad (\text{Divide this line by 2}) \\ &= 3 : 2 \end{aligned}$$

$\therefore$  Answer B

22. After 2 years James' investment =  $4 \times \$275$   
 $= \$1100$

$$\begin{aligned} \text{After 2 years Maria's investment} &= 1000(1.005)^4 \\ &= \$1127.16 \end{aligned}$$

Maria's investment is worth  $\$1127.16 - \$1100$  more than James' investment.  
 That is: Maria's investment is worth  $\$27.16$  more.  
 $\therefore$  Answer B

**SECTION II**

Marks

Codes used in these answers.

cfpa means accept this answer calculated correct from previous answer.  
 at 1 means allow 1 mark if the answer is correct at this stage but incorrect at the finish.  
 aw 1 means award 1 mark.  
 ISE means ignore subsequent errors and pay the mark at this point in the solution.

**QUESTION 23.**

(a) (i) You could get answers such as 'all the time', 'sometimes', or 'not much' which are difficult to classify. aw 1

(ii) Many answers: e.g.

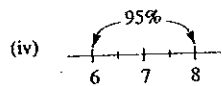
Have a box to tick, with answers such as:

every day     every 2 days     twice a week     less than twice a week aw 1

(iii) 5 or more days is represented by 90° on the graph.

Fraction who eat breakfast 5 days or more =  $\frac{90}{360}$  or  $\frac{1}{4}$

aw 1



Mean = 7 (al 1)  
 Standard deviation = half an hour (al 1)

aw 2

(b)  $3\sqrt{x-1} = 12$   
 $\sqrt{x-1} = 4$  (al 1)  
 $x-1 = 16$  (al 2)  
 $x = 17$

aw 3

(c) (i) Many answers, such as:  
 $\angle ACD = 40^\circ$  (angles in  $\triangle ACD$  add to  $180^\circ$ )  
 $\angle BCD = 25^\circ$  (angles in  $\triangle BCD$  add to  $180^\circ$ )  
 $\angle ACB = \angle ACD - \angle BCD$   
 $= 40^\circ - 25^\circ$   
 $= 15^\circ$

aw 1

(ii)  $\frac{BC}{\sin 50^\circ} = \frac{800}{\sin 15^\circ}$  (al 1)  
 $BC = \frac{800 \times \sin 50^\circ}{\sin 15^\circ}$   
 $= 2368 \text{ m}$

aw 2

(iii)  $\sin 65^\circ = \frac{h}{2368}$  (al 1)

$h = 2368 \times \sin 65^\circ$   
 $= 2146 \text{ m}$

aw 2

**QUESTION 24.**

(a) (i)  $A = \$74\ 168.11 \times 0.1 + 12$   
 $= \$618.07$  (al 1)

$B = \$74\ 168.11 + 618.07$   
 $= \$74\ 786.18$  (cfpa, al 1)

$C = \$74\ 786.18 - \$900$   
 $= \$73\ 886.18$  (cfpa)

aw 3

(ii) Interest = \$625  
 Fraction of repayment that is interest:  $\frac{625}{900} = \frac{25}{36}$

aw 1

(iii) Interest =  $\$329.93 \times 0.1 + 12$   
 $= \$2.75$  (al 1)

Amount owed =  $\$329.93 + \$2.75$  (cfpa)  
 $= \$332.68$

aw 2

His last repayment will be \$332.68

(iv) Total repaid =  $185 \times \$900 + \$332.68$  (cfpa)  
 $= \$166\ 832.68$  (al 1)

Total interest = Total repaid - Total borrowed  
 $= \$166\ 832.68 - \$750\ 000$   
 $= \$918\ 832.68$

aw 2

(b) Using  $A = P(1+r)^n$   
 Final value =  $120\ 000(1.045)^{15}$  (al 1)  
 $= \$232\ 233.89$

aw 2

(c) (i) Depreciation per year =  $\$8000 \div 5$   
 $= \$1600$   
 Annual rate of depreciation =  $\frac{1600}{8000} \times 100$   
 $= 20\%$

aw 1

- (ii) • At the end of the first year he can claim:  
 Declining balance:  $\$8000 - \$5200$  (approximately) =  $\$2800$   
 Straight line depreciation =  $\$1600$
- At the end of the second year he can claim:  
 Declining balance:  $\$5200 - \$3500$  (approximately) =  $\$1700$   
 Straight line depreciation =  $\$1600$  (al 1)
- He should use declining balance as the depreciation will be approximately  $\$4500$  compared with  $\$3200$  using straight line depreciation. aw 2

**QUESTION 25.**

- (a) (i)  $A = 6630 - 2634$   
 $= 3996$  (al 1)
- $B = 366 + 504$  aw 2  
 $= 870$
- (ii) Percentage =  $\frac{2634}{3000} \times 100$   
 $= 87.8\%$  aw 1
- (iii) Probability =  $\frac{504}{4500}$   
 $= \frac{14}{125}$  aw 1
- (iv) Percentage that die from experimental drug :  $\frac{366}{3000} \times 100 = 12.2\%$   
 Percentage that die from traditional drugs:  $\frac{504}{4500} \times 100 = 11.2\%$   
 Many answers: e.g.  
 Do not recommend using the experimental drug or more die after using the experimental drug than with the traditional drug. aw 1
- (b) (i) Could be anything from 23 to 28. (i.e. numbers 3 to 8 inclusive) aw 1
- (ii) mean = 18.2  
 sample standard deviation = 11.37  
 median = 16 (al 1 each correct answer) aw 3
- (iii) mean – would go down (the values would add to a much smaller amount)  
 sample standard deviation – would go down (the values aren't spread out as much)  
 median would still be 15 (al 1 each correct answer – max. 2) aw 2
- (iv) He should choose the Lynch Lifts.  
 They have a lower mean and the lower sample standard deviation tells us the scores are not spread out as much.  
 The Lynch Lifts are more reliable. aw 2  
 (al 1 for Lynch based on the lower mean or standard deviation,  
 or for Grump based on the lower median)

**QUESTION 26.**

- (a) (i)  $80 \text{ cm} = 800 + 100 \text{ m}$   
 $= 0.8 \text{ m}$  aw 1
- (ii) The end of the hopper is made up of a rectangle (0.5 m by 0.8 m) and a triangle (base 0.8 m and height 0.2 m)  
 Area of base =  $0.8 \times 0.5 + \frac{1}{2} \times 0.8 \times 0.2$   
 $= 0.48 \text{ m}^2$  (al 1)
- Volume = area of base (of prism)  $\times$  length  
 $= 0.48 \times x$   
 $= 0.48x \text{ m}^3$
- The question states the volume is  $3 \text{ m}^3$   
 Hence  $0.48x = 3$  aw 2
- (iii)  $0.48x = 3$   
 $x = \frac{3}{0.48}$   
 $= 6.25$  (al 1)  
 $= 6.25 \text{ m}$  or  $625 \text{ cm}$  aw 2
- (b) (i) probability (on time) =  $\frac{3}{5}$  aw 1
- (ii) (cfpa) aw 2
- Monday

early

on time

Tuesday

early

on time

early

on time
- (iii) probability (early Mon. and early Tues.) =  $\frac{2}{5} \times \frac{2}{5}$   
 $= \frac{4}{25}$  aw 1

(iv) probability (early at least once) =  $1 - P(\text{on time both days})$   
 $= 1 - \frac{3}{5} \times \frac{3}{5}$   
 $= \frac{16}{25}$

aw 1

Alternate method

$P(\text{early, on time}) + P(\text{on time, early}) + P(\text{early, early})$

$= \frac{2}{5} \times \frac{3}{5} + \frac{3}{5} \times \frac{2}{5} + \frac{2}{5} \times \frac{2}{5} = \frac{16}{25}$

(v) Expect bus to be early =  $\frac{2}{5} \times 8$   
 $= 3.2$

She can expect the bus to be early 3 or 4 days. (More likely to be 3.)

aw 1

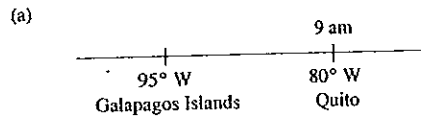
(c) Try  $x = 3$ :  $2^3 - 3 = 5$  (too small)

Try  $x = 4$ :  $2^4 - 3 = 12$  (too big)

As 8.5 is between 5 and 12,  $x$  must be between 3 and 4

aw 2

QUESTION 27.



longitude difference =  $15^\circ$

time difference =  $4 \times 15$  minutes  
 $= 60$  minutes or 1 hour (al 1)

It will be 8 am in Quito.

aw 2

(b) (i)  $S = 1.3 \times \sqrt{3L}$   
 $\frac{S}{1.3} = \sqrt{3L}$  (al 1)

$\frac{S^2}{1.69} = 3L$

$L = \frac{1}{3} \times \frac{S^2}{1.69}$   
 $= \frac{S^2}{5.07}$

aw 2

(ii)  $L = \frac{10^2}{5.07}$  (cfpa)

$= 19.7$  metres

(c) Time = Distance  $\times$  Speed  
 $= 900 \div 10$  hours  
 $= 90$  hours  
 $= 90 \div 24$  days  
 $= 3.75$  days

(ISE)

aw 1

It will take 4 days, to the nearest day.

(deduct 1 each error)

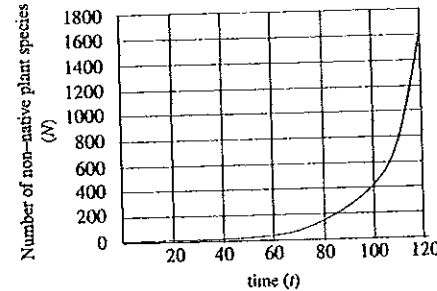
aw 2

(d) (i)

year	1901	1950	1970	2000	2020
$t$	1	50	70	100	120
$N$	1	21	73	470	1624

aw 2

(ii)



(iii) When  $N = 300$ ,  $t = 92$  (approximately)

$N$  will first exceed 300 in 1992 (cfpa)

aw 1

(iv) It is exponential. The values increase very quickly and the variable is a power.

aw 1

(v) It is a very good model. The values are exactly right for 1901 and 1970, and only one different in 2000. In addition, population growth is usually exponential.

aw 1

QUESTION 28.

(a) (i) Using points (18, 100) and (26, 140)

gradient =  $\frac{40}{8} = 5$  (aw 1)

This means equation of line is  $N = 5t + K$

Substitute point (18, 100) :  $100 = 5 \times 18 + K$

$= 90 + K$

$K = 10$

This gives the equation of the line as  $N = 5t + 10$

aw 2

(ii) five (5 is the gradient)

aw 1

- (iii) Using the formula  $N = 5 \times 40 + 10$  (cfpa)  
 $= 210$  icecreams (al 1)

This estimate is unreliable because it is outside the values of the graph.  
 The relationship may not be linear for high temperatures.

aw 2

- (iv) Many answers possible. e.g.

He could have been at a big function during Easter or on the Anzac Day holiday.

aw 1

- (b) (i) Method 1:  $A = P(1 + r)^n$   
 $= 60\,000(1.005)^{360}$  (al 1)  
 $= \$361\,354$

aw 2

Method 2:  $n = 360$  (Using Casio CFX-9850G Plus calculator)

I% = 6

PV = 60 000

PMT = 0

FV = ?

P/Y = 12

gives FV \$361 354

aw 2

- (ii) Method 1:  $A = M \left\{ \frac{(1 + r)^n - 1}{r} \right\}$   
 $= 500 \frac{(1.005^{360} - 1)}{0.005}$  (al 1)  
 $= \$502\,257$

aw 2

Method 2:  $n = 360$

I% = 6

PV = 0

PMT = 500

FV = ?

P/Y = 12

gives FV \$502 257

aw 2

- (iii) Interest = amount in account after 30 years – amount paid over 30 years  
 $= \$502\,257 - 500 \times 360$  (cfpa) (al 1)  
 $= \$322\,257$

aw 2

- (iv) Many answers, e.g.:

- Jon could invest a larger lump sum.
- Jon could make small monthly payments as well as investing his lump sum.

aw 1