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HSC Trial Examination 2002

General Mathematics

This paper must be kept under strict security and may only be used on or after the morning of Tuesday 6 August, 2002, 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 formulae sheet is provided at the back of this paper.

Examination structure

Section I Pages 3–10 Total marks 22

Attempt Questions 1–22.

Allow about 30 minutes for this part.

Section II Pages 11–20 Total marks 78

Attempt Questions 23–28.

Allow about 2 hours for this section.

Section I

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.

Sample 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

A ○ B ● C ○ D ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ● B ✕ C ○ D ○

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and draw an arrow as follows:

A ✕ B ✕ ← *correct* C ○ D ○

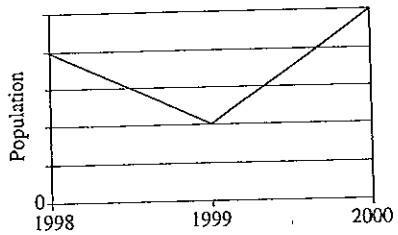
1. The cylindrical water tank at Lionel's Winery has a volume of 43 200 litres and a height of 2.6 metres. Calculate the diameter of the water tank.
   (A) 2.3 m
   (B) 4.6 m
   (C) 5.3 m
   (D) 28.0 m

2. Simplify $4(2x-1)-(x+3)$.
   (A) $7x-7$
   (B) $7x-4$
   (C) $7x-1$
   (D) $7x+2$

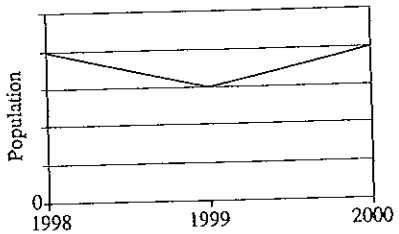
3. The speeds recorded by police speed radar on the Hovel Freeway show that the mean speed of motorists on the Hovel freeway is 100 km/h, with a standard deviation of 15 km/h. All motorists travelling at 115 km/h or faster are fined.
   What percentage of motorists on the Hovel Freeway are fined?
   (A) 16%
   (B) 32%
   (C) 34%
   (D) 68%

4. During the year 1998–1999 the population of Birkley decreased by 50%, then during the year 1999–2000 the population increased by 50% of the 1999 amount.
   Which of these graphs could show this change in the population?

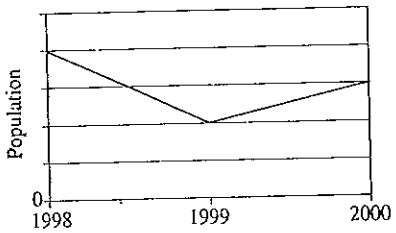
(A)



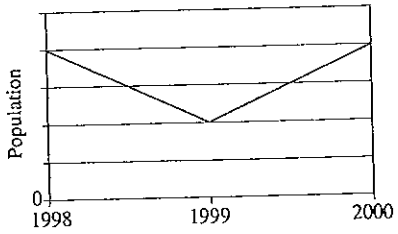
(B)



(C)



(D)



5. Roberto's business made an unexpectedly large profit this year. He knows he will need $85 000 in six years time to buy a new machine.
   How much of his profit should he invest, at 6.6% per annum monthly compounding, to provide him with $85 000 in six years time?
   (A) $852
   (B) $6129
   (C) $57 268
   (D) $82 248

6. Which table of values shows the relationship 'x is directly proportional to the square of y'?

(A)

x	1	$\frac{1}{2}$	$\frac{1}{3}$
y	1	2	3

(B)

x	1	$\frac{1}{4}$	$\frac{1}{9}$
y	1	2	3

(C)

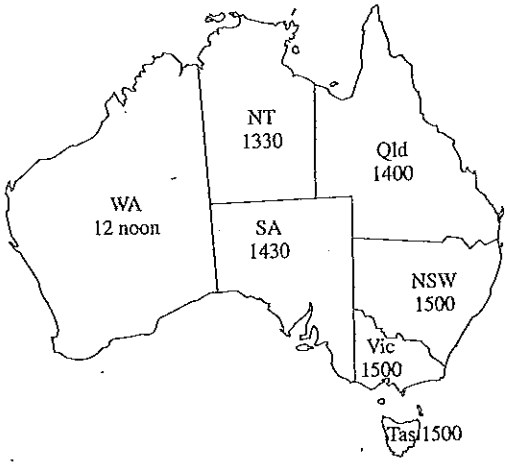
x	1	2	3
y	1	4	9

(D)

x	1	4	9
y	1	2	3

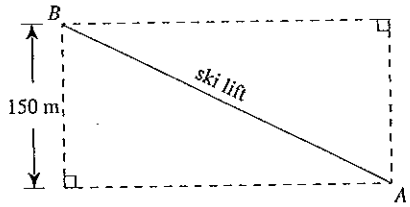
7. Rithvik lives in Brisbane, Queensland. During February he wants to watch an Australian Rules football game in Adelaide (South Australia) on TV. The football game starts at 3.00 pm South Australian time.
When it is 3.00 pm in Adelaide what time is it in Brisbane?

Daylight Saving Times – October to March



(A) 2.00 pm
(B) 2.30 pm
(C) 3.00 pm
(D) 3.30 pm

8. A ski lift has been built from the foot of a ski run (A) to a point (B) with an altitude 150 m higher. From B, the angle of depression of A is 27°.



NOT TO SCALE

Which of these expressions could be used to calculate the length (AB) of the ski lift?

(A) $AB = \dfrac{150}{\cos 27^\circ}$

(B) $AB = 150 \times \cos 27^\circ$

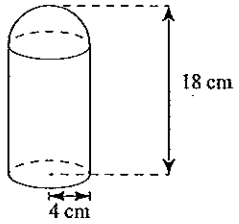
(C) $AB = 150 \times \sin 27^\circ$

(D) $AB = \dfrac{150}{\sin 27^\circ}$

9. Given that $\cos\theta = 0.2$, what is the size of angle θ?
(A) 0.99
(B) 0°12′
(C) 78°28′
(D) 78°46′

10. Emma invested $400. Her financial advisor told her that the investment has a 50% chance of making a profit of $100, a 30% chance of making a profit of $50 and a 20% chance of making a $400 loss.
What is her financial expectation for this investment?
(A) a profit of $15
(B) a loss of $15
(C) a profit of $145
(D) a loss of $145

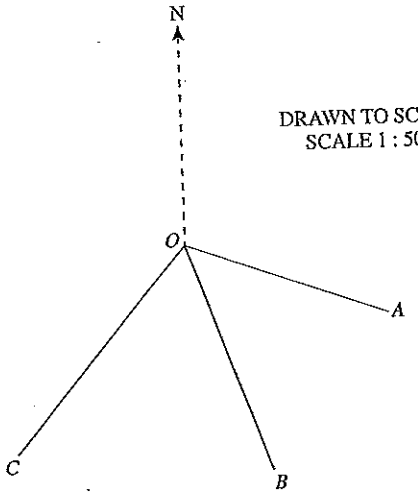
11. This diagram shows a cylinder with a hemisphere attached to one end.



NOT TO SCALE

What is the volume of this shape?
(A) 838 cm^3
(B) 972 cm^3
(C) 1039 cm^3
(D) 1173 cm^3

Use the following diagram to answer Questions 12 and 13.



12. By measurement, and any necessary calculations, determine the bearing of B from O.
    (A) 020°
    (B) 110°
    (C) 160°
    (D) 200°

13. By measurement, and using the scale, determine the length of OC in metres.
    (A) 10 m
    (B) 25 m
    (C) 100 m
    (D) 250 m

14. This table shows the monthly repayments on a $1000 home loan.

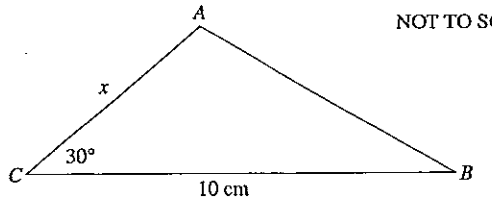
Interest rate	*10 years*	*15 years*	*20 years*	*25 years*
8.25%	$12.27	$9.70	$8.52	$7.88
8.5%	$12.40	$9.85	$8.68	$8.06
8.75%	$12.52	$10.00	$8.84	$8.22
9.0%	$12.67	$10.14	$9.00	$8.39

Harriette has a $65 000 home loan at 9% per annum to be repaid over 25 years.
Calculate the total amount she will repay in the first year of the loan.
(A) $100.68
(B) $545.35
(C) $5850.00
(D) $6544.20

15. What is the area of a circle with a radius of 5.1×10^{12} km ?
Answer in square kilometres, correct to two significant figures.
(A) 1.6×10^{25} km^2
(B) 2.6×10^{25} km^2
(C) 3.2×10^{13} km^2
(D) 8.2×10^{25} km^2

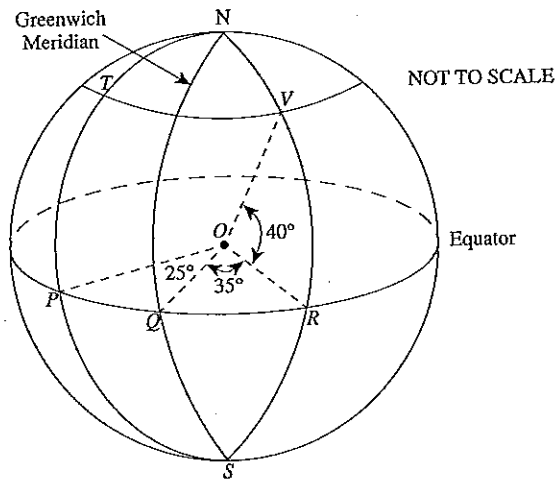
16. Hong paid $2800 for a digital video camera for his business. He plans to use a straight line depreciation of 20% per annum to calculate its value each year for his income tax return.
How much value has the digital camera lost at the end of 3 years?
(A) $1120.00
(B) $1366.40
(C) $1433.60
(D) $1680.00

17.



The area of ΔABC is 40 cm^2.
Calculate the length of the side marked x.
(A) 4 cm
(B) 8 cm
(C) 16 cm
(D) 100 cm

18.



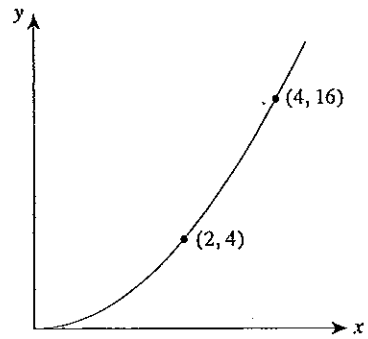
O represents the centre of the Earth. P, Q and R are on the Equator.
Q is also on the Greenwich Meridian. V and T are on the same small circle.
$\angle POQ = 25°$, $\angle ROQ = 35°$ and $\angle ROV = 40°$
What are the position coordinates of T?

(A) 40° N, 25° W
(B) 40° N, 60° W
(C) 40° N, 10° W
(D) 40° N, 25° E

19. Gavin's height was measured and recorded correct to the nearest 5 cm.
What is the maximum difference between his true height and his recorded height?

(A) $1\frac{1}{4}$ cm
(B) $2\frac{1}{2}$ cm
(C) 5 cm
(D) 10 cm

20.



This graph passes through the origin and the points $(2, 4)$ and $(4, 16)$.
What could the equation of the graph be?

(A) $y = x^2$
(B) $y = 2^x$
(C) $y = 2x$
(D) $y = \sqrt{x}$

21. Given that $r = \sqrt{\frac{2V}{5\pi - 3}}$ and $V = 17$, find the value of r, correct to two decimal places.

(A) 0.46
(B) 1.64
(C) 2.68
(D) 4.29

22. This table of values summarises Hamid's results in his Trial HSC compared with all the students studying his subjects at his school.
In which subject did Hamid do best compared with the other students in his school?

	Hamid's mark	*School mean*	*School standard deviation*
Business Studies	70%	60%	10%
English	60%	55%	3%
General Mathematics	65%	50%	10%
VET Hospitality	60%	50%	4%

(A) Business Studies
(B) English
(C) General Mathematics
(D) VET Hospitality

Section II

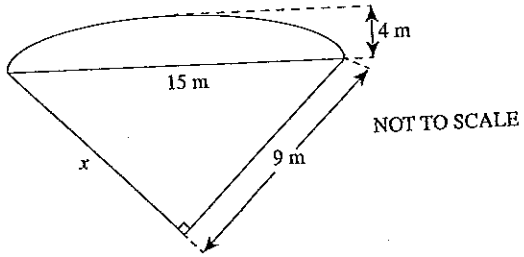
Total marks 78
Attempt Questions 23–28.
Allow about 2 hours for this part.

Answer each question in a SEPARATE writing booklet.

Marks

Question 23 (13 marks) Start a new page.

(a) The top surface of an ornamental swimming pool is made up of half an ellipse and a right-angle triangle. It has a constant depth.



NOT TO SCALE

(i) Calculate the length of the side of the pool marked x. 2

(ii) What is the area of the base of the swimming pool? 3

Answer correct to the nearest m^2.

(iii) When the pool is full it contains 190 m^3 of water. 1

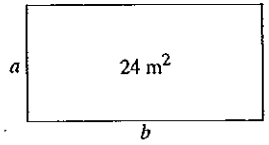
Calculate the depth of the water in the pool.

Question 23 continues on page 12

Question 23 (continued) Marks

(b) The Heathstone Bay Council restricts the size of private boat sheds. The floor area of a rectangular boat shed must be no bigger than 24 m^2.

(i) 1



NOT TO SCALE

The diagram represents a boat shed with a floor area of 24 m^2.

What is a possible set of values for a and b?

(ii) Gavin's boat shed has a floor area of 24 m^2 and it is 3 metres longer than it is wide. 1

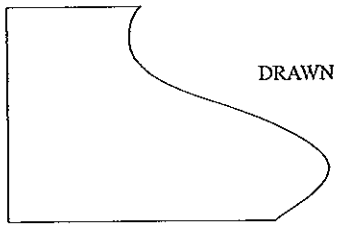
NOT TO SCALE

Let x represent the width of Gavin's boat shed. Write an algebraic expression in x (metres) to represent the length of Gavin's boat shed.

(iii) Write an equation in x that could be solved to calculate the width of Gavin's boat shed. 1

(iv) Use any suitable method to calculate the length and width of Gavin's boat shed. Answer in metres correct to one decimal place. 2

(c) The formula for Simpson's Rule is $A \approx \frac{h}{3}(d_f + 4d_m + d_l)$.



DRAWN TO SCALE

(i) Use your ruler to determine the values of h, d_f, d_m and d_l required to calculate the area of this shape using one application of Simpson's Rule. Express each length correct to the nearest 5 mm. 1

(ii) Use one application of Simpson's Rule to calculate the area of this shape. 1

End of Question 23

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

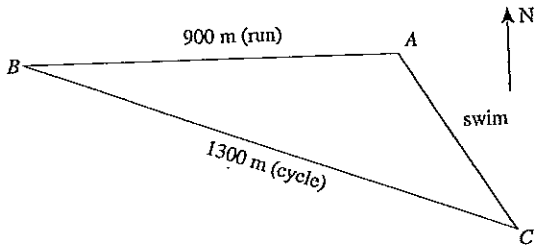
(a) Find a value for u in the formula $c^2 = 2u^2 + 3c$ when $c = 16$. **3**
Answer correct to one decimal place.

(b) Michael's charges (C dollars) for his car hire can be calculated using the rule 'multiply the number of kilometres (k) travelled by 0.30 and add 25'.

(i) Write Michael's rule as an algebraic expression in terms of C and k. **1**

(ii) Rewrite Michael's rule so that k is the subject of the formula. **2**

(c) Part of the annual Hawks Springs Show Day is a charity triathlon race. The athletes start at point A, run 900 m due west to point B and then cycle 1300 m on a bearing of 110° to point C. The final leg of the race is a swim across the river from C to A.



(i) Explain why $\angle ABC = 20°$. **1**

(ii) Show that the length of CA is 549 m, correct to the nearest metre. **2**

(iii) Determine the size of $\angle ACB$ correct to the nearest minute. **2**

(d) There are 6 players in a school tennis team.

(i) How many possible pairs can be selected to play in a 'doubles' competition? **1**

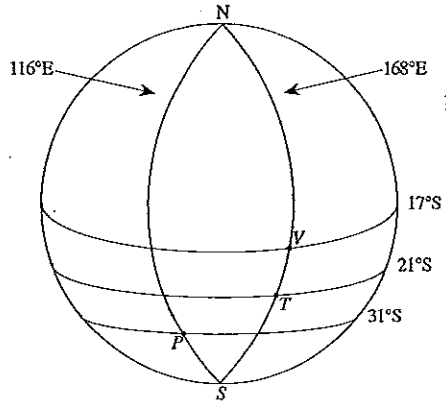
(ii) In the competition there will be four matches. **1**

In how many different orders can 4 matches be played?

End of Question 24

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

(a) In this diagram of the Earth, point P represents Perth (31°S, 116°E), T represents Tadine (21°S, 168°E) and V represents Vila (17°S, 168°E).



(i) Calculate the great circle distance from Tadine (T) to Vila (V) correct to the nearest nautical mile. (You may assume that the radius of the earth is 6400 km and that 1 nautical mile = 1.852 km.) **2**

(ii) The Pacific Star Cruise Ship travels at a speed of 12 knots. **2**

How long will it take to travel from Tadine to Vila?

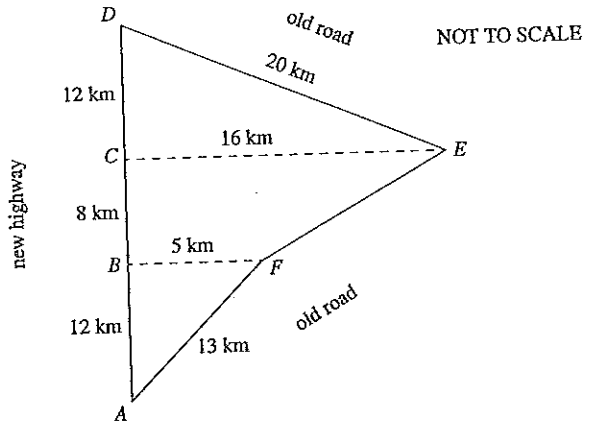
(iii) When the cruise ship arrived in Vila, Harriet phoned her parents in Perth. It was 5 pm Thursday in Vila. **2**

What was the time in Perth? (Ignore time zones.)

Question 25 continues on page 15

Question 25 (continued) Marks

(b)



The old road from A to D (via F and E) is to be replaced with a new highway ($ABCD$). The diagram shows the new highway $ABCD$ and the offset survey of the old road.

(i) Construct the surveyor's field notebook entries for this offset survey. 1

(ii) Calculate the area of $BCEF$. 2

(iii) How much longer was the old road ($AFED$) than the new highway? 2

(c) The value of Jon's house is increasing by 12% per annum monthly compounding. In January 2000 his house was valued at \$350 000. 2

After how many months will his house first be valued at \$500 000?

End of Question 25

Question 26 (13 marks) Start a new page. Marks

(a) Over the 10 weeks of summer the number of people rescued each weekend at Diamond Bay and Herons Beach are shown on this back-to-back stem-and-leaf plot.

Diamond Bay					*Herons Beach*				
6	5	4	1	0	2	6	6	9	
4	3	3	2	1	0	1	5	5	5
		1	0	2					
				3	0				

(i) Calculate the mean, mode and range of the number of rescues at Diamond Bay during this 10 week period. 2

(ii) After the next weekend, the mean number of rescues at Diamond Bay had increased but the mode and range were unchanged. 1

What could have been the number of rescues at Diamond Bay on this weekend?

(iii) One of the scores at Herons Beach is an outlier. 2

Which score is it and suggest a possible reason for this outlying score?

(b) At the school swimming carnival the probability that any race will have a false start is $\frac{1}{20}$.

(i) What is the probability that a race will not have a false start? 1

(ii) Ng entered two races at the swimming carnival. What is the probability that

(1) both his races will have false starts? 1

(2) at least one of his races will have a false start? 2

(c) Residents were interviewed about the local council's plans to cut down the trees along the side of the road. This table shows the results of the interviews.

	Agree	*Disagree*	*Total*
Males	*A*	105	180
Females	46	*B*	140
Total	121	*C*	320

(i) Complete the 3 missing values in the table. 2

(ii) What percentage of the males disagree? 1

(iii) What percentage of the people who disagree are males? 1

End of Question 26

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

The media published statistics about violence in the Hunter Region of NSW.

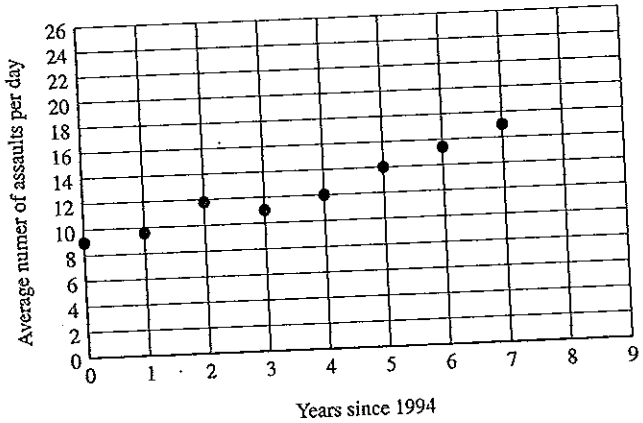
(a) From 1 October to 31 December in 2001, 3010 people were charged with domestic violence. 2

Calculate the mean number of people charged with domestic violence per day from 1 October to 31 December 2001.

(b) Between 1995 and 2001 there were 69 people murdered in private homes in the region. This represented 58% of the total number of people murdered in the region. 2

How many people were murdered in the Hunter Region between 1995 and 2001?

(c) This graph shows the average number of assaults per day for each year after 1994.



(i) Describe the correlation between the number of years since 1994 and the average number of assaults per day. 2

(ii) Use the graph to predict the average number of assaults per day in 2002 (i.e. $y = 8$). 1

Question 27 continues on page 18

Question 27 (continued) Marks

(d) The radar graph at the end of this booklet shows the typical number of cases of assault in private homes and licensed premises at different times of the day between 2 pm and 4 am.

(i) Complete the graph for licensed premises. 1

Time	9 pm	10 pm	11 pm
Number of assaults	50	80	135

(ii) What is the ratio of the number of assaults in private homes to the number of assaults in licensed premises at 1 am? 1

(iii) How many more cases of assault occur in private homes than in licensed premises at 8 pm? 1

(iv) In 2001 there were 6724 assaults in the Hunter region, of which 9% were in licensed premises. 1

How many of the 6724 assaults occurred in licensed premises?

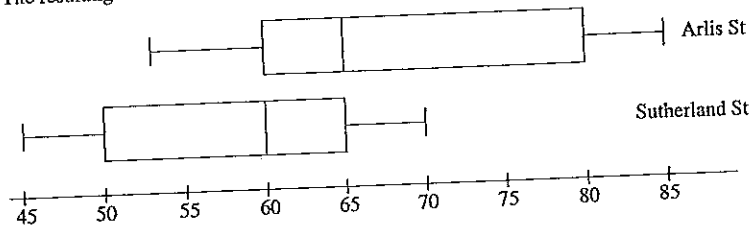
(e) Make u the subject of the formula $v^2 = u^2 + 2as$. 2

End of Question 27

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

(a) Speed radar guns were set up to analyse the speed of the traffic in Arlis Street and Sutherland Street. The speed limit in both streets is 60 km/h. In a 3 hour period 84 cars drove through Arlis Street and 56 cars drove through Sutherland Street.

The resulting data is shown in these two box-and-whiskers plots.



(i) What was the median speed in Sutherland Street? **1**

(ii) Calculate the interquartile range of the speed in Arlis Street. **1**

(iii) How many of the 56 cars that drove through Sutherland Street were travelling at 65 km/h or less? **1**

(iv) Hamish said that the same number of cars were travelling at 65 km/h or less in both streets. **2**

Was Hamish's conclusion correct? Give a reason for your answer.

(b) Eran borrowed \$90 000 at 7.2% per annum, monthly reducible and arranged to make monthly repayments of \$640. The first 2 months of her repayments are shown in this table.

N	*Principal* (P)	*Interest* (I)	$P+I$	$(P+I)-R$
1	\$90 000	\$540	\$90 540	\$89 900
2	\$89 900	\$539.40	\$90 439.40	\$89 799.40
3	\$89 799.40	\$538.80	\$90 338.20	*A*
4	*B*	*C*	*D*	*E*

(i) Eran had some sudden big expenses and couldn't afford to make her repayment at the end of the third (3rd) month. The bank manager allowed her not to make any repayment at the end of the 3rd month (without paying a fine) and she began making repayments again at the end of the 4th month. **3**

Calculate the 5 missing amounts (*A*, *B*, *C*, *D* and *E*) in Eran's loan repayment table.

(ii) Eran uses a spreadsheet to calculate how long it would take her to repay the loan assuming she did not miss any more repayments. **3**

How many more lines will there be in the spreadsheet?

Question 28 continues on page 20

Question 28 (continued) **Marks**

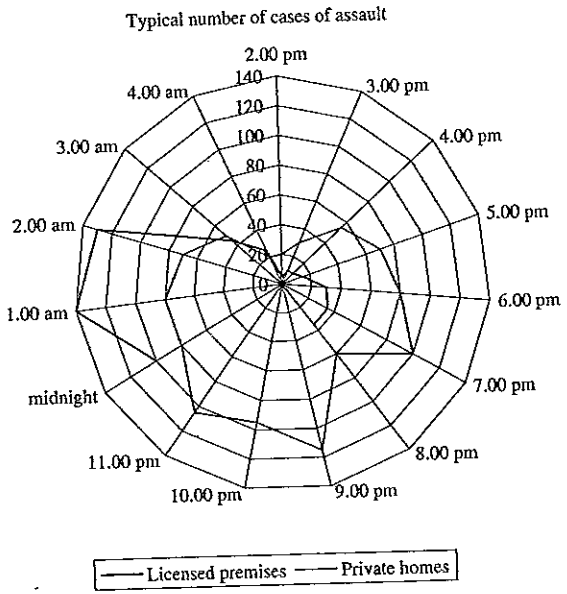
(c) On his 20th birthday Angus joined a superannuation fund which pays 9% per annum monthly compounding. He plans to have \$100 000 in his superannuation account on his 45th birthday. **2**

How much should he arrange to pay into his superannuation account each month from his 20th birthday to his 45th birthday?

End of paper

NAME: _____

Question 27 (d) (i)



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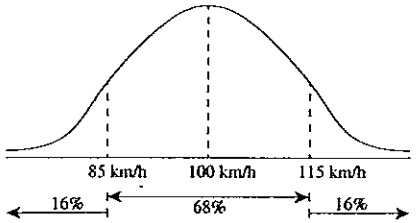
HSC Trial Examination 2002

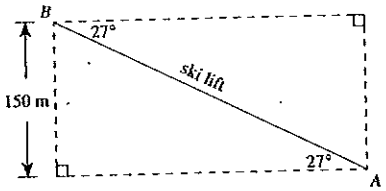
General Mathematics

Solutions and marking guidelines

Section I

Answer and explanation	Outcomes assessed	Content area assessed
Question 1 B $V = \pi r^2 h$ $43.2 = \pi \times r^2 \times h$ (Note: 43 200 litres = 43.2 m^3.) $r^2 = 5.288$ $r = 2.299$. This means the diameter is $4.599 = 4.6$ m.	P2, P6	M2
Question 2 A $4(2x-1)-(x+3) = 8x-4-x-3$ $= 7x-7$.	P2	AM1
Question 3 A Normal curve:  68% of motorists travelled at speeds between 85 km/h and 115 km/h, 16% travelled at speeds of 85 km/h or less, and 16% travelled at speeds of 115 km/h or more.	H4, H5, H9	DA6
Question 4 C Assume you start with, for example, 600 people. A decrease of 50% will reduce the population to half its original size (300 people). Now an increase of 50% will increase the population to 450 which is 75% of the original population.	P5	M1
Question 5 C Formula method: $A = P(1+r)^n$ $85\,000 = P(1.0055)^{72}$ $= P \times 1.48426$ $P = \frac{85\,000}{1.48426}$ $= \$57\,268$. Graphic calculator method: $n = 6 \times 12$ or 72 $I\% = 6.6$ $PV = ?$ (any value will do) $PMT = 0$ $FV = 85\,000$ $P/Y = 12$ $C/Y = 12$. Pressing PV gives \$57 268.	H5, H8	FM5

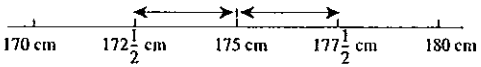
Section I (Continued)

Answer and explanation	Outcomes assessed	Content area assessed
Question 6 D $x = Ky^2$ (1,1) is in every table, $1 = K \times 1^2$ $K = 1$. This means that $x = y^2$. Table D is the only table where $x = y^2$ for all values given.	H3	AM4
Question 7 B During Daylight Saving Time, Queensland is half-an-hour behind South Australia. This means that when it is 3.00 pm in South Australia, it is 2.30 pm in Queensland.	H6, H7	M7
Question 8 D $\sin 27° = \frac{150}{AB}$ $AB \sin 27° = 150$ $AB = \frac{150}{\sin 27°}$.  NOT TO SCALE	P6	M4
Question 9 C $\cos\theta = 0.2$ $\theta = \text{shift cos } 0.2$ $= 78.463°$ $= 78°28'$.	P2	M4
Question 10 B Financial expectation $= 0.5 \times \$100 + 0.3 \times \$50 + 0.2 \times (-\$400)$ $= -\$15$. This means a loss of \$15.	H8, H10	PB4

Section I (Continued)

Answer and explanation	Outcomes assessed	Content area assessed
Question 11 A $V = \pi r^2 h + \frac{1}{2} \times \frac{4}{3} \pi r^3$ $= \pi \times 4^2 \times 14 + \frac{1}{2} \times \frac{4}{3} \times \pi \times 4^3$ $= 703.716 + 134.04$ $= 837.75$ $= 838$.	H6	M5
Question 12 C By measurement, using a protractor, $\angle NOB = 160°$. This means the bearing of B from O is 160°.	H6, H7	M6
Question 13 B By measurement, with a ruler, the scale length of $OC = 5$ cm. Hence the real length of $OC = 5 \times 500$ cm $= 2500$ cm $= 25$ m.	P6, P7	M3
Question 14 D An interest rate of 9% over 25 years gives a repayment of \$8.39 per month on a \$1000 loan. This gives a repayment of \$8.39 × 65 per month on a \$65 000 loan. That is \$545.35 per month. Repayment for 1 year = \$545.35 × 12 = \$6544.20.	H5, H8	FM4
Question 15 D Area $= A = \pi r^2$ $= \pi \times (5.1 \times 10^{12})^2$ $= 8.2 \times 10^{25}$.	P7	M1
Question 16 D Yearly depreciation $(D) = 20\% \times \$2800$ = \$560. Value lost over 3 years = \$560 × 3 = \$1680. OR Formula method: $S = V_0 - DN$ $= 2800 - 560 \times 3$ = \$1120. Value lost = \$2800 − \$1120 = \$1680.	H2, H5, H8	FM6

Section I (Continued)

Answer and explanation	Outcomes assessed	Content area assessed
Question 17 C Area $= \frac{1}{2}ab\sin C$ $40 = \frac{1}{2} \times 10 \times x \times \sin 30°$ $40 = 2.5x$ $x = 16$.	H2, H6	M6
Question 18 A T is 25° to the left of Greenwich. This means that T is 25° West. T is 40° to the north of the equator. This means T is 40° North. The position coordinates of T are 40° N, 25° W.	H6	M7
Question 19 B Imagine Gavin's height was recorded as 175 cm.  The shortest he could be is $172\frac{1}{2}$; the tallest just less than $177\frac{1}{2}$. Maximum error $= 175 - 172\frac{1}{2}$ OR $177\frac{1}{2} - 175$ $= 2\frac{1}{2}$ cm.	P7	M1
Question 20 A The graph passes through the points (0, 0), (2, 4) and (4, 16). Of the 4 equations given, $y = x^2$ is the only curve on which all 3 points lie, because each set of values (x, y) satisfy the equation $y = x^2$. For example, if $y = \sqrt{x}$ and $x = 4$, $y = \sqrt{4} = 2$, not 16.	H3	AM4
Question 21 B $r = \sqrt{\frac{2 \times 17}{5 \times \pi - 3}}$ $= \sqrt{\frac{34}{12.708}}$ $= \sqrt{2.675}$ $= 1.64$.	H2	AM3

Section I (Continued)

Answer and explanation	Outcomes assessed	Content area assessed
Question 22 D Business studies: $z = \frac{70 - 60}{10} = 1$. English: $z = \frac{60 - 55}{3} = 1.7$. General Mathematics: $z = \frac{65 - 50}{10} = 1.5$. VET Hospitality: $z = \frac{60 - 50}{4} = 2.5$. The highest z-score is VET hospitality with 2.5.	H4, H9, H11	DA6

Section II

Codes used in these answers:

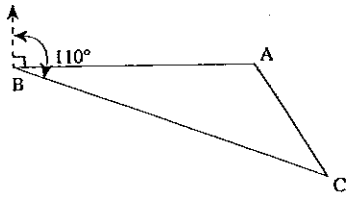
CFPA means accept answer calculated Correct From Previous Answer. In all cases, CFPA applies unless otherwise stated.

CNE means Correct Numerical Expression.

Question 23

Sample answer	Syllabus outcomes and marking guide
(a) (i) $15^2 = x^2 + 9^2$ $144 = x^2$ $x = 12$ m.	M4–P6 • Shows correct working, calculates x .... 2 • Gives correct statement using Pythagorean Theorem 1
(ii) Area of triangle $= \frac{1}{2} \times 9 \times 12$ $= 54$ m^2. Area of half ellipse $= \frac{1}{2} \times \pi \times 4 \times 7.5$ $= 47.1(\ldots)$ m^2. Total area $= 54 + 47.1$ $= 101$ m^2.	M5–H2, H6 • Correctly calculates area ..... 3 • Calculates 1 area correctly, 1 area incorrectly and correctly adds the 2 areas together. OR • Calculates both areas correctly but doesn't add them (correctly)..... 2 • Calculates 1 area correctly. OR • Correctly adds 2 areas together 1
(iii) $V = Ah$ $190 = 101 \times h$ $h = 1.88$ m. (Accept 1.9 m.)	M5–H6, H7 • Correctly calculates depth of water..... 1
(b) (i) Many answers such as 6×4, 2.5×9.6.	AM3–H7 • Gives 2 positive numbers with a product of 24..... 1
(ii) (Length) $= x + 3$.	AM1–P3 • Correct expression for length in terms of x..... 1
(iii) $x(x + 3) = 24$.	AM4–H5 • Correct equation for area of shed..... 1
(iv) Width = 3.6 m (*al* 1). Length = 6.6 m.	AM3–H11 • Calculates correct values for width and length from a quadratic equation requiring the 'guess and check' method ..... 2 • Calculates correct values of width (x). OR • Calculates length as 'their value of x' + 3 1
(c) (i) $h = 20$ mm, $d_f = 25$ mm. $d_m = 45$ mm, $d_l = 50$ mm.	M5–H2, H7 • Correctly measures all 4 required lengths (ignore any lack of rounding off)..... 1
(ii) $A = \frac{20}{3} \times (25 + 4 \times 45 + 50)$ $= 1700$ mm^2 (or equivalent in cm^2, m^2).	AM3–H2 • Uses their values to correctly evaluate Simpson's Rule 1

Question 24

Sample answer	Syllabus outcomes and marking guide
(a) $c^2 = 2u^2 + 3c$ $16^2 = 2 \times u^2 + 3 \times 16$ $256 = 2u^2 + 48$ $208 = 2u^2$ $104 = u^2$ $u = 10.2$ or -10.2.	AM3–H2 • Correctly calculates a value of u ..... 3 • Correctly finds a value of u^2 ..... 2 • Substitutes correctly into the given equation. OR • Correctly finds a value of u from their value of u^2 1
(b) (i) $C = 0.30k + 25$.	AM4–H3 • Gives correct expression for C..... 1
(ii) $C - 25 = 0.30k$ $\frac{C - 25}{0.30} = k$.	AM3–H3 • Gives correct answer ..... 2 • Correctly rearranges line 1 or line 2 of the solution 1
(c) (i) $\angle ABC = 110° - 90° = 20°$. 	M6–H11 • Gives correct numerical reason for 20° .. 1
(ii) $AC^2 = AB^2 + BC^2 - 2AB \cdot BC\cos\angle ABC$ $AC^2 = (900^2 + 1300^2 - 2 \times 900 \times 1300 \times \cos 20°)$ $AC^2 = 30119.2674$ $AC = 548.7$ $= 549$ m.	M6–H6 • Uses cosine rule to correctly calculate AC ..... 2 • Displays a non-trivial attempt to use cosine rule..... 1
(iii) $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ or $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ $\frac{\sin C}{900} = \frac{\sin 20°}{549}$ $\sin C = \frac{900 \times \sin 20°}{549}$ $= 0.56068$ $C = 34.103°$ $= 34°6'$. OR $\cos C = \frac{1300^2 + 549^2 - 900^2}{2 \times 1300 \times 549}$ $= 0.8276\ldots$ $C = 34°8'$.	M6–H6, H7 • Correctly calculates the size of $\angle ACB$ .. 2 • Correctly substitutes into either correct formula. OR • Correctly finds the value of $\angle ACB$ from their value of $\sin C$ or $\cos C$ (nearest minute required)..... 1

Question 24 (Continued)

Sample answer	Syllabus outcomes and marking guide
(d) (i) ${}^6C_2$ or 15	PB3–H4 • Gives the correct answer 1
(ii) ${}^4P_4$ or 4! or 24	PB3–H4 • Gives the correct answer 1

Question 25

Sample answer	Syllabus outcomes and marking guide
(a) (i) Angular distance = 21° – 17° = 4°. Distance = 4 × 60 = 240 nautical miles. OR Angular distance = 21° – 17° = 4°. Arc length = $\frac{4}{360} \times 2 \times \pi \times 6400$ = 446.804... km = 446.804 ÷ 1.852 = 241 nautical miles.	M7–H6 • Calculates the correct distance. ..... 2 • Calculates correct angular distance. OR • Correctly calculates distance in nautical miles from their incorrect angular distance 1
(ii) $T = \frac{D}{S} = \frac{240}{12}$ = 20 hours. OR $T = \frac{241}{12}$ = 20 hr 5 min. (Accept 20 hr, 20.08 hr, 20.1 hr.)	M7–H2, H7 • Calculates the correct time. ..... 2 • Divides distance by speed to find time .. 1
(iii) Angle difference = 168° – 116° = 52°. Time difference = 52° × 4 min = 208 min = 3 hr 28 min. Perth is west of Vila. Perth time = 5 pm – 3 hr 28 min = 1.32 pm.	M7–H7 • Calculates correct time. ..... 2 • Calculates correct time difference. OR • Correctly calculates time in Perth from an incorrect time difference (in hours and minutes). 1
(b) (i)	M2–P6 • Correctly draws field notebook 1

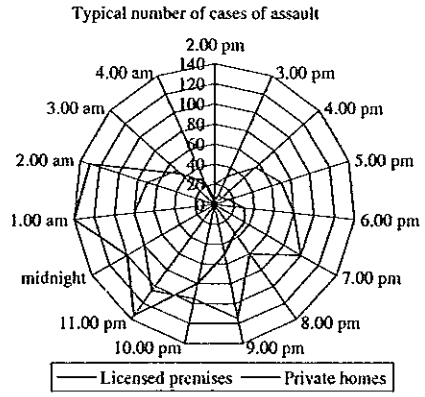
Question 25 (Continued) Sample answer	Syllabus outcomes and marking guide
(ii) Area $= \frac{1}{2} \times 8 \times (5 \times 16)$ $= 84\ m^2$. OR Area $= 5 \times 8 + \frac{1}{2} \times 8 \times 11$ $= 40 + 44$ $= 84\ m^2$.	M5–H2 • Correctly calculates area. OR • Finds the correct numerical expression for the area. . . . . 2 • When using a method involving addition of areas, 1 measurement is incorrect and the area is correct using their values 1
(iii) $EF^2 = 8^2 + 11^2$ $= 185$ $EF = 13.6$ km (*al* 1). Old road $= 13 + 13.6 + 20$ $= 46.6$ km. New road = 32 km. Old road is 14.6 km longer.	M4–P6, P11 • Correctly calculates how much longer. OR • Correctly calculates length of old road and new road. . . . . 2 • Correctly calculates length *EF*. OR • Correctly calculates length of old road from their non-trivial value of *EF* and gives the correct length of the new road 1
(c) Using compound interest formula: $n = ?$ $r = 12\% \div 12 = 1\% = 0.01$ $P = 350\,000$ $A = 500\,000$ $A = P(1 + r)^n$ $500\,000 = 350\,000(1.01)^n$ $1.42857 = 1.01^n$. Using guess and check method: $n = 30$ $1.01^{30} = 1.34$ $n = 35$ $1.01^{35} = 1.416$ $n = 36$ $1.01^{36} = 1.43$ Just under 36 months (3 years). OR Using graphic calculator: $n = ?$ $I = 12$ $PV = 350000$ $PMT = 0$ $FV = -500000$ $P/Y = 12$ $C/Y = 12$. Pressing *n* gives 35.8 months.	FM2–P8, P11 • Correctly calculates the number of months as 'from 35 months to 36 months (inclusive)' . . . . . 2 • Establishes the correct equation to find a value of *n*. OR • Correctly solves their non-trivial equation to find a value of *n*. (Their equation must require a guess and check method.) OR • Correct graphic calculator method given, ignoring the direction of *PV* and *FV* 1

Question 26 Sample answer	Syllabus outcomes and marking guide
(a) (i) Mean = 10.9 Mode = 13 Range = 20	DA5–H4 • All 3 correct . . . . . 2 • Any 2 correct 1
(ii) Any 1 of 11, 13, 15 to 19. (Note: the other numbers make the distribution bimodal.)	DA5–H4, H5, H11 • Gives any 1 of the correct numbers 1
(iii) 30 is the outlier for many reasons such as: • big seas • very hot day • big crowd at the beach	DA5–H11 • Gives a correct score and a logical reason. . . . . 2 • Gives a correct score. OR • Gives a logical reason related to their number. 1
(b) (i) Probability $= 1 - \frac{1}{20}$ $= \frac{19}{20}$.	PB2–P10 • Calculates the correct probability 1
(ii) (1.) P(FF) $= \frac{1}{20} \times \frac{1}{20}$ $= \frac{1}{400}$. (2.) P(F, not F or not F, F or FF) $= \frac{1}{20} \times \frac{19}{20} + \frac{19}{20} \times \frac{1}{20} + \frac{1}{20} \times \frac{1}{20}$ $= \frac{39}{400}$. OR P(no false starts) $= \frac{19}{20} \times \frac{19}{20}$ $= \frac{361}{400}$. P(at least 1 false start) $= 1 - \frac{361}{400}$ $= \frac{39}{400}$.	PB3–H10 • Calculates the correct probability . . . . . 1 • Calculates the correct probability . . . . . 2 • Realises the need for adding 3 possible outcomes. OR • Realises the need for using probability of '1 minus no false starts' 1
(c) (i) A = 75 B = 94 C = 199	PB4–H2, H4 • All 3 values correct . . . . . 2 • Any 2 of the 3 values correct 1
(ii) Percentage $= \frac{105}{180} \times 100$ $= 58.3333\ldots\%$ (Accept 58% to 58.3333...%.)	PB4–H4 • Calculates the correct percentage. OR • CNE 1

Question 26 (Continued)

Sample answer	Syllabus outcomes and marking guide
(iii) Percentage $= \frac{105}{199} \times 100$ $= 52.76\%$. (Accept 52%, 52.7% to 52.8%.)	PB4–H4 • Calculates the correct percentage. OR • CNE ..... 1 OR • Both answers for parts (ii) and (iii) correct, but in the wrong parts 1

Question 27

Sample answer	Syllabus outcomes and marking guide
(a) Number of days = 92. Mean per day $= \frac{3010}{92}$ $= 32.717\ldots$ (Accept 32, 32.7(...), 33.)	DA5–H9 • Gives correct calculation of mean per day ..... 2 • Gives correct number of days. OR • Calculates mean correctly using their value for number of days 1
(b) Let N = number of people murdered. $58\%N = 69$ $0.58N = 69$ $N = 69 \div 0.58$ $N = 118.9(\ldots)$ (Accept 118, 118.9(...), 119.) OR $58\% \Rightarrow 69$ $1\% \Rightarrow 1.1897$ $100\% \Rightarrow 118.9(\ldots)$	M1–P2 • Correctly calculates the number of people ..... 2 • Shows an understanding that 58% is 'equivalent to' 69 murders 1
(c) (i) Strong, positive, linear.	DA7–H11 • Uses any 2 of the 3 correct words ..... 2 • Uses any 1 of the 3 correct words 1
(ii) $17 \leq$ number ≤ 19	DA7–H4, H5 • Predicts a number between the acceptable values 1
(d) (i)  	DA5–H2 • Places 3 dots in the correct place on the graph. OR • Draws a correct line joining where the dots would have been 1
(ii) Ratio = 80:140 or equivalent.	DA5–H4 • Calculates a correct ratio 1

Question 27 (Continued) Sample answer	Syllabus outcomes and marking guide
(iii) Licensed premises = 35. Private homes = 60. Number more = 60 – 35 = 25. (Accept for licensed premises a reading of $33 \leq$ number ≤ 37.)	DA5–H4 • Correctly reads the graph and correctly finds how many more 1
(iv) Number = $\frac{9}{100} \times 6724$ = 605.16 assaults. (Accept 605, 605.1, 605.2.)	M1–P2 • Correctly calculates the required percentage calculation 1
(e) $v^2 = u^2 + 2as$ $v^2 - 2as = u^2$ $\sqrt{v^2 - 2as} = u$.	AM3–H2 • Correctly rearranges to make u the subject ..... 2 • Correctly completes the subtraction. OR • Correctly completes the square root of an incorrect first line 1

Question 28 Sample answer	Syllabus outcomes and marking guide
(a) (i) Median speed was 60 km/h.	DA5–H4 • Correctly finds the median..... 1
(ii) Interquartile range = 80 – 60 = 20.	DA5–H4 • Calculates the interquartile range correctly 1
(iii) 65 km/h or less in this graph indicates 75% of the cars. Number = 75% × 56 = 42.	DA5–H5, H9 • Uses the correct percentage to correctly calculate the number of cars 1
(iv) 65 km/h or less in this graph indicates 50% of the cars. Number = 50% × 84 = 42. ∴ conclusion was correct.	DA5–H11 • Calculates the correct number of cars for Arlis St. and makes the correct conclusion after comparison with answer in part (iii) ..... 2 • Calculates the correct number of cars for Arlis St. OR • Draws a correct conclusion from their incorrect value in Arlis St..... 1
(b) (i) A = \$90 338.20 B = \$90 338.20 (Same value as A.) C = \$542.03 D = \$90 880.23 $E = D$ – \$640 = \$90 240.23.	FM4–H2, H5, H8 • Correctly calculates 4 or 5 values ..... 3 • Correctly calculates 3 values from consistent working ..... 2 • Correctly calculates 2 values from consistent working..... 1
(ii) Graphic calculator solution: $n = ?$ $I = 7.2$ $PV = -90\,240.23$ $PMT = 640$ $FV = 0$ $P/Y = 12$ gives $n = 312.7$. ∴ 313 more lines will be required. OR Formula solution: $r = 0.072 \div 12$ $= 0.006$ $90240.23 = \frac{640(1.006^n - 1)}{0.006 \times 1.006^n}$. Solving by trial and error. (Accept number of lines needed from 310 to 315 inclusive.)	FM5–H5, H8, H11 • Correctly calculates number of lines required (accept from 310 to 315 inclusive) ..... 3 • A reasonable attempt at solving the equation by trial and error ..... 2 • Correctly states values to be substituted into the calculator, disregarding positive and negative signs. OR • Carries out correct substitution into the correct formula..... 1

Question 28 (Continued)

Sample answer	Syllabus outcomes and marking guide
(c) Graphic calculator solution: $n = 25 \times 12 = 300$ $I = 9$ $PV = 0$ $PMT = ?$ $FV = -100000$ $P/Y = 12.$ Gives $PMT = \$89.196$ (Accept \$89 to \$90 inclusive.) OR Formula method: $r = 0.09 \div 12 = 0.0075$ $100000 = M\left(\frac{1.0075^{300} - 1}{0.0075}\right)$ $100000 = 1121.12\ M$ $M = \$89.196$ $= \$89.20.$	FM5–H8 • Correctly calculates the amount required ..... 2 • Uses the correct values in the correct context for all variables except 1. OR • Correctly states values to be substituted into the calculator, disregarding any negative sign. OR • Carries out correct substitution into correct formula. OR • Gives correct solution of equation with 1 error in the substitution 1