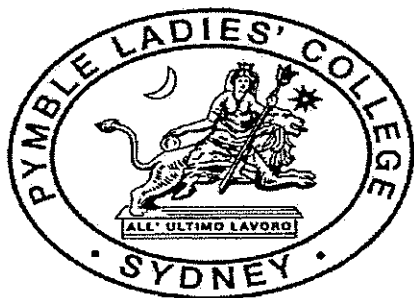


Miss Davis
Mr Morrison
Mrs Tenney
Mrs Wright

Name:

Teacher:.....



2011

TRIAL HIGHER SCHOOL CERTIFICATE
EXAMINATION

General Mathematics

General Instructions

- Reading time – 5 minutes
- Working time – 2½ hours
- Write using black or blue pen
- Approved calculators may be used
- A formula sheet is provided at the back of this paper.

Total Marks – 100

Section I Pages 1-7

22 marks

- Attempt Questions 1–22
- Allow about 30 minutes for this section.

Section II Pages 8-19

78 marks

- Attempt Questions 23–28
- Allow about 2 hours for this section

Mark	/100
Rank	/
Highest Mark	/100

Blank Page

Section 1

22 Marks

Attempt all Questions

Allow about 30 minutes for this section

Use the multiple-choice answer sheet for Questions 1-22

- 1 The board game *Scattergories* uses a 20 sided die with a letter on each side. All letters of the alphabet appear once, with the exception of Q, U, V, X, Y and Z which do not appear at all.

The probability of rolling a vowel with the *Scattergories* die is:

- (A) $\frac{1}{2}$
- (B) $\frac{1}{4}$
- (C) $\frac{5}{26}$
- (D) $\frac{1}{5}$
- 2 A restaurant offers a choice of three entrees, six main meals and four desserts. The number of different meals possible is:
- (A) 13
- (B) 22
- (C) 30
- (D) 72
- 3 A basketballer has a 0.7 chance of scoring a basket from a free throw. If she is fouled and gets two free throws, what is the probability that she scores twice?
- (A) 0.7
- (B) 0.49
- (C) 0.91
- (D) 0.09

- 4 There are six students in a year 9 French class. On Monday, when Owen was absent from school, the other five students sat a listening test and obtained scores with a mean value of 12. After Owen completed the test the class's mean score became 11. What was Owen's mark on the listening test?
- (A) 6
(B) 8
(C) 10
(D) 11
- 5 If $a = -2$ and $b = -4$, the value of $1 - 2a - 3b^2$ is
- (A) -32
(B) -43
(C) -139
(D) 146
- 6 Peter is using the capture-recapture technique to estimate the number of fish in a dam. He took 200 fish out of the dam, tagged them, and then returned the fish back into the dam. Later, Peter caught 50 fish from the dam, 8 of which were tagged. What is the approximate number of fish in the dam?
- (A) 242
(B) 1250
(C) 1600
(D) 80000
- 7 The length of a match is 4 cm, correct to the nearest centimetre. Calculate the percentage error involved in the measurement.
- (A) 0.5 cm
(B) 8%
(C) 12.5%
(D) None of the above

- 8 Kristen invested \$8000 in an account that pays simple interest at 4.5% p.a. How much will be in the account at the end of four years?
- (A) \$1440
(B) \$9440
(C) \$9540.15
(D) \$360
- 9 Belinda works a 40 hour week. In addition, she is paid time and a half for any extra hours worked. Last week she worked a total of 48 hours and was paid \$956.80. Her normal hourly rate of pay is:
- (A) \$13.30
(B) \$15.95
(C) \$18.40
(D) \$19.95
- 10 Solve the equation $2x - 5 = \frac{x + 3}{2}$
- (A) $x = \frac{-7}{3}$
(B) $x = \frac{-2}{3}$
(C) $x = \frac{8}{3}$
(D) $x = \frac{13}{3}$
- 11 $(-3a^2)^4 =$
- (A) $-12a^6$
(B) $-81a^8$
(C) $81a^6$
(D) $81a^8$
- 12 If $8h^3 = 64$, value of $8h^2$ is
- (A) -8
(B) 8
(C) 32
(D) 256

- 13 The Time (T in seconds) for a single swing of the pendulum in a clock is given by the formula

$$T = \sqrt{\frac{L}{9.8}} \quad \text{where } L \text{ is the length of the pendulum.}$$

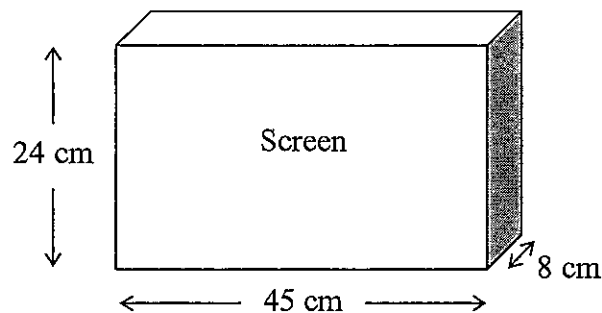
If it takes 4 seconds for a single swing of the pendulum, the length of the pendulum can be determined by:

- (A) $4 \times \sqrt{9.8}$
(B) 16×9.8
(C) 4×9.8^2
(D) 4×9.8
- 14 A biased coin was tossed 50 times and landed on tails 35 times. How many heads would you expect if the same coin was tossed 400 times?

- (A) 120
(B) 140
(C) 200
(D) 280

- 15 The size of a television set is measured as the length of the screen's diagonal, to the nearest centimetre.

Use Pythagoras' theorem to calculate the size of this television.



- (A) 38 cm
(B) 47 cm
(C) 51 cm
(D) 60 cm

16 Tomas has 3000 shares with a market value of \$4.50 per share. The shares paid a dividend of 5% per share. What dividend will Tomas receive?

- (A) \$875
- (B) \$576
- (C) \$675
- (D) \$13 500

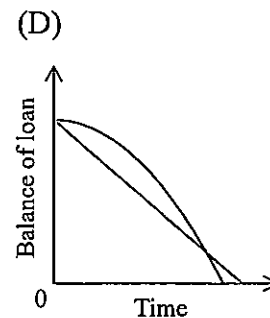
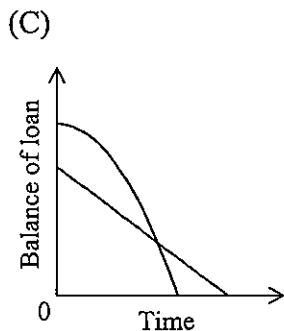
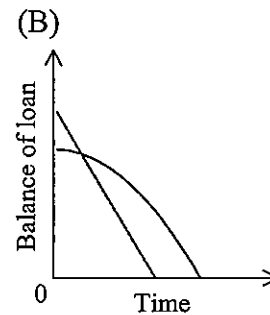
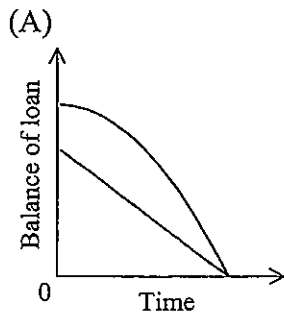
17 The following table shows the results for two classes of students in their language examinations.

Subject	Mean	Standard Deviation
Japanese	50	10
German	55	7

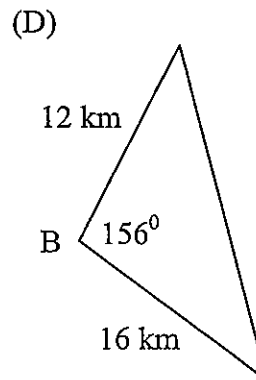
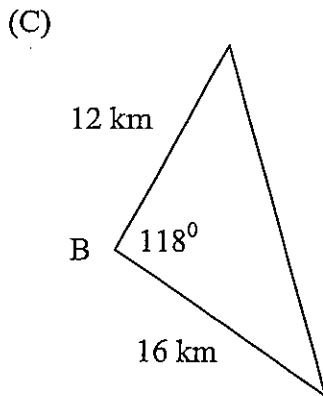
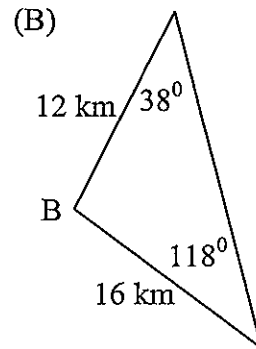
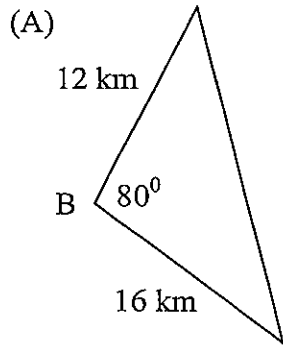
What mark in Japanese is equivalent to a mark of 69 in German?

- (A) 70
- (B) 60
- (C) 57
- (D) 65

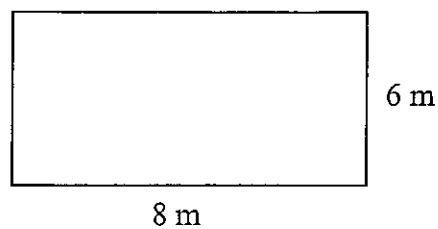
18 Two families borrow different amounts of money on the same day. The Flintstone family has a flat rate loan. The Rubble family has a reducing balance loan and repays the loan earlier than the Flintstone family. Which graph best represents this situation?



- 19 Two yachts sailed in a straight line from a buoy B . One sailed 12kms in the direction 038° T and the other sailed 16km in the direction 118° T. Which diagram is consistent with this information?



- 20 The dimensions of this rectangle were measured and recorded, correct to the nearest metre.



What is the smallest the area of this rectangle could actually be?

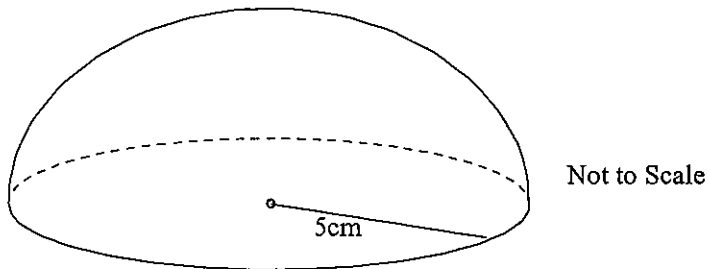
- (A) 41.00 m^2
 (B) 41.25 m^2
 (C) 48.00 m^2
 (D) 55.25 m^2

- 21 The table shows part of the reducing balance loan table for a \$45,000 loan at 6%p.a. reducible interest. The monthly instalment is \$520.00.

Number of months	Principal	Interest	Amount owing before repayment	Balance
1	\$45 000	\$225	\$45 225	\$44 705
2	\$44 705			

What would be the balance at the end of the second month?

- (A) \$47 162.30
(B) \$44 408.53
(C) \$46 867.30
(D) \$44 703.53
- 22 A snow dome is in the shape of a hemisphere with a radius of 5 cm. Eloise is giving the snow dome as a gift and has to choose the most appropriate size wrapping paper.



Which of the following sizes of wrapping paper is the smallest that will completely wrap the entire gift?

- (A) 13 cm \times 13 cm
(B) 15 cm \times 15 cm
(C) 26 cm \times 26 cm
(D) 30 cm \times 30 cm

Section II**78 Marks****Attempt Questions 23-28****Allow about 2 hours for this section**

Answer each question in the appropriate writing booklet. Extra writing booklets are available.

All necessary working should be shown in every question.

Question 23 (13 marks) Use a SEPARATE Writing Booklet.**Marks**

- (a) Medical research workers have developed a new test for performance enhancing drugs. They are trialling the drug on members of the general community. The results of the trial are shown in the table.

	Test Indicated Drugs Used	Test Indicted Drugs Not Used	Total
People who use drugs	48	7	55
People who don't use drugs	5	A	B
Total	53	C	120

- (i) Complete the three missing values **A**, **B** and **C** 2
- (ii) For what fraction of the people tested was the test result incorrect? 1
- (iii) For what percentage of the people who used drugs did the test indicate that they didn't use drugs? 1
- (b) A local rugby league club is conducting a fund raising raffle. The profit ($\$P$) made on a raffle can be calculated using the formula $P = \frac{4n}{3} - 700$ where n is the number of tickets sold.
- (i) How much profit is made if 1000 tickets were sold? 1
- (ii) Calculate the number of tickets sold if a profit of \$1100 was made. 1
- (iii) How many tickets need to be sold to break even? 1

Question 23 continues on page 9.

Question 23 (continued).

Marks

(c) Make b the subject of the formula $A = 4a^2 + 6ab$.

1

(d) The following table shows the monthly repayments for each \$1000 borrowed by individuals. Benjamin wished to borrow \$350 000 at 8% p. a. over 25 years.

Interest Rate (% p.a.)	Period of loan (In years)				
	5	10	15	20	25
7	\$19.80	\$11.61	\$9.00	\$7.75	\$7.07
8	\$20.28	\$12.13	\$9.56	\$8.36	\$7.72
9	\$20.78	\$12.67	\$10.14	\$9.00	\$8.39
10	\$21.25	\$13.22	\$10.75	\$9.65	\$9.10

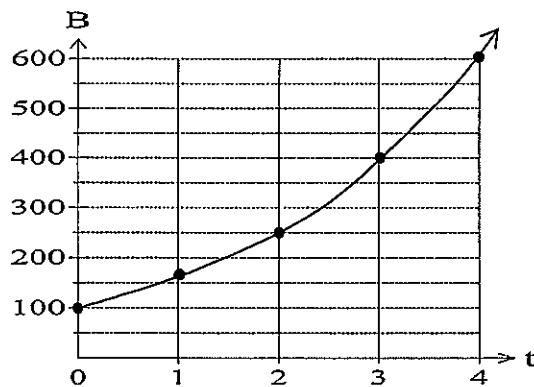
(i) Use the table to calculate Benjamin's monthly payment on this loan.

2

(ii) Calculate the total amount Benjamin will repay on this loan.

1

(e) The graph shows the number of bacteria B , present in a culture at any time, t hours.



(i) What was the initial population in the culture?

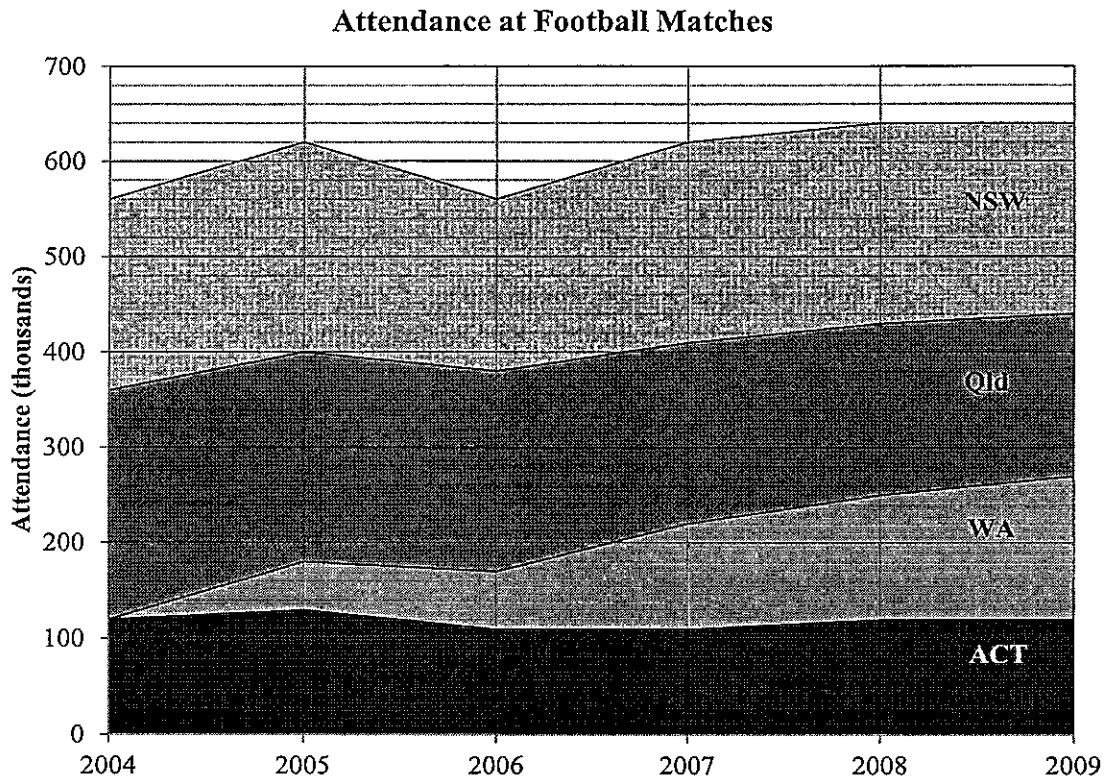
1

(ii) What is the increase in the number of bacteria in the culture in the third second?

1

End of Question 23.

- (a) The area chart below shows the attendance at Football matches in four states from 2004 to 2009.



- (i) What were the attendances in the NSW in 2005? 1
- (ii) Compare the trends in the attendances in the ACT and WA over the period 2004 to 2009. 2
- (b) Diane invested \$1000 in an account which pays compound interest monthly. To calculate the amount that her investment would grow to by the end of the investment period, she evaluated the following:

$$A = 1000 (1.007)^{48}.$$

- (i) What was the annual rate of interest of the loan? 1
- (ii) What was the term of the loan? 1

Question 24 continues on page 11.

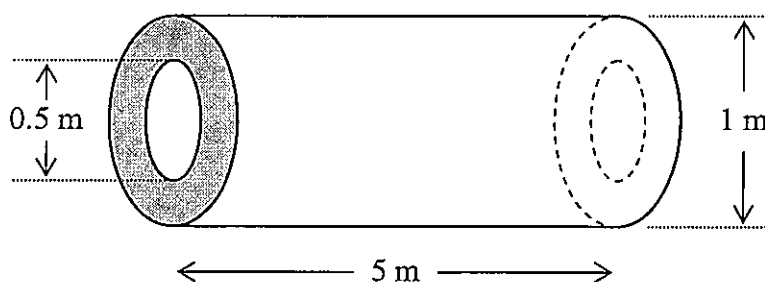
Question 24 (continued).

Marks

- (c) The intensity of light illumination (L) on a movie screen varies inversely with the square of the distance (D) from the projector to the screen. If the illumination when the projector is 40 m from the screen is 25 units, what is the illumination when the projector is placed 20 m from the screen?

3

- (d) A circular concrete pipe has dimensions as shown.



- (i) Find the area of the shaded end. Leave your answer in terms of π .
- (ii) Find the volume of the concrete used to make this pipe, in cubic metres. Answer correct to nearest cubic metre.
- (iii) If the concrete density is 0.85 tonnes per cubic metre, what is the weight of the pipe?

2

2

1

End of Question 24.

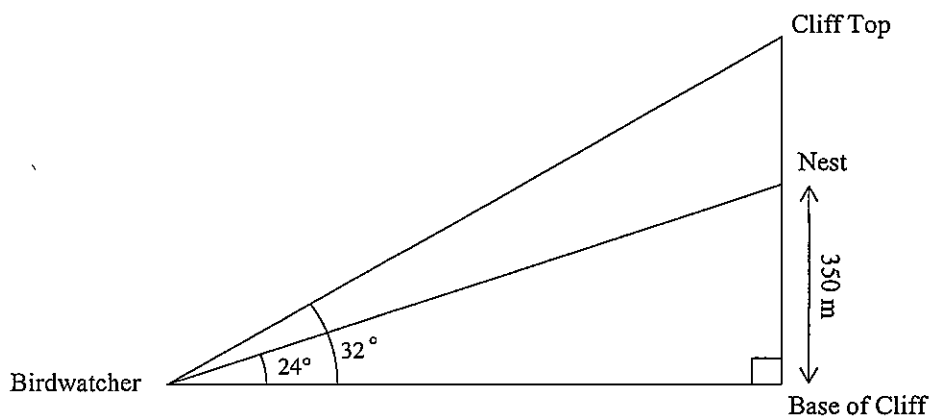
Question 25 (13 marks) Use a **SEPARATE** Writing Booklet.

Marks

- (a) The back to back stem and leaf plot shows the ages of 25 actors and 25 actresses when they received their award for Best Actor or Best Actress.

Actors (male)	Stem	Actresses (female)
	2	1 4 6 6 6
9 8 7 5 3 2 1	3	0 0 1 1 3 3 4 4 4 5 7
8 8 7 7 6 4 3 3 2 2 1 0	4	1 1 1 1 9
6 5 1	5	
2 0	6	0 1
6	7	4
	8	0

- (i) What is the median age of the male award winners? 1
- (ii) Determine the modal age of the female award winners 1
- (iii) Which group has the smaller range? Show a calculation to justify your answer. 2
- (iv) Which group has the larger skew and is it positive or negative? Give a reason to support your answer. 2
- (b) The diagram represents a birdwatcher who sights a nest 350 m up a vertical cliff at an angle of elevation of 24° .



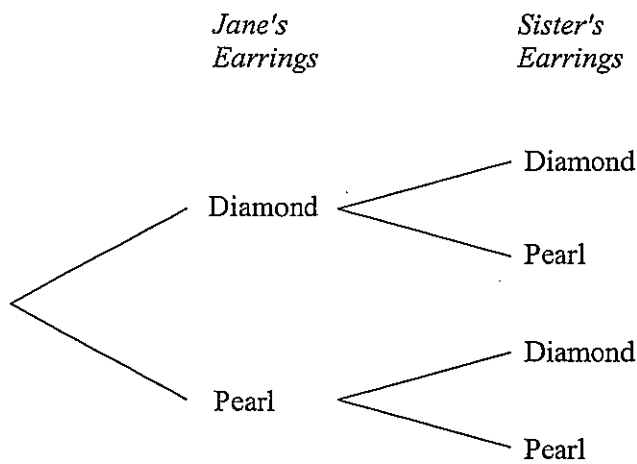
- If the angle of elevation to the top of the cliff is 32° , how far below the cliff top is the nest? Answer correct to the nearest metre. 3

Question 25 continues on page 13.

- (c) Jane owns three pairs of pearl and four pairs of diamond earrings. She chooses a pair for herself and then chooses another pair at random, from the remaining earrings, and gives them to her sister.

- (i) Copy the tree diagram into your writing booklet.

Complete the tree diagram by writing the correct probability on each branch. 2



- (ii) Calculate the probability that both pairs of earrings are the same type? 2

End of Question 25.

Question 26 (13 marks) Use a **SEPARATE** Writing Booklet.

Marks

- (a) There are 16 players in the training squad for a volleyball team.
- (i) The coach chooses two players to be the captain and vice-captain. How many arrangements of captain and vice-captain are possible? **1**
 - (ii) Four players are chosen to make up the rest of the team. How many combinations of the four players are possible after the captain and vice-captain have been chosen? **1**
- (b) The cash price for a computer is \$1990. The computer was bought on terms for 20% deposit and \$36 per week for one year. What is the saving if it had been bought for cash? **2**

- (c) In a game of *Heads and Tails*, 2 fair coins are tossed. The results are shown in the table below.

	Heads	Tails
Heads	H H	H T
Tails	H T	T T

A player wins 50c if the result is two tails and \$3 if the result is 2 heads. All other outcomes result in a loss of \$2.

- (i) What is the probability of winning \$3. **1**
- (ii) What is the probability of losing a game? **1**
- (iii) What is the financial expectation of the game? **2**

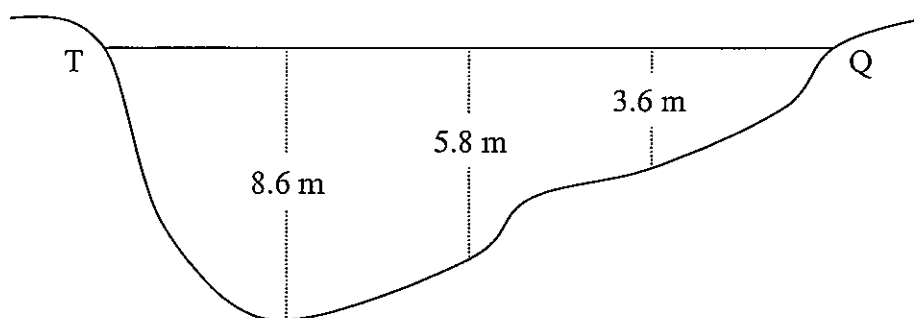
Question 26 continues on page 15.

Question 26 (continued).

Marks

- (d) Jacob has a credit card which has an interest rate of 18.5% per annum.
- (i) Convert the interest rate to a daily percentage rate (correct to 2 decimal places). **1**
- (ii) Jacob has an outstanding balance of \$1250 for a period of fifteen days. How much interest is he charged? **1**

- (e) The diagram shows a plan for a lake.



At equal intervals along the 80m pathway TQ, offset measurements were taken in metres to various points on the lake's boundary.

- Use two applications of Simpson's rule to find an approximation to the area of the lake. Give your answer correct to the nearest m^2 . **3**

End of Question 26.

Question 27 (13 marks) Use a SEPARATE Writing Booklet.

Marks

- (a) A machine fills packets of lollies. The mean number of lollies in each packet is 40 with a standard deviation of two lollies and the number of lollies is normally distributed. Harry claims that he bought a packet which had 48 lollies in it. Discuss Harry's claim, justifying your answer with mathematical calculations. **2**

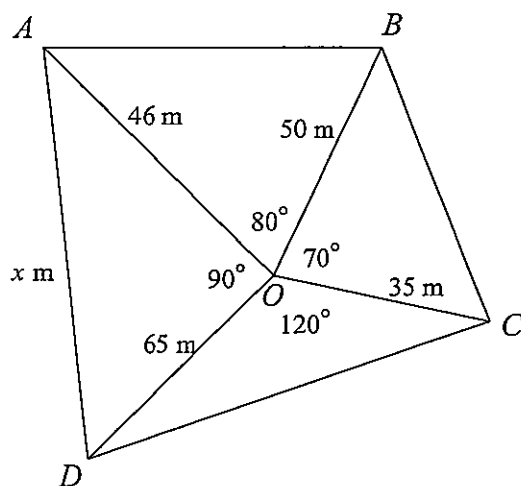
- (b) Josie is using straight line depreciation to calculate the depreciated value of her business machinery.

<i>New value</i>	\$70 000
<i>Value at 3 years old</i>	\$28 000

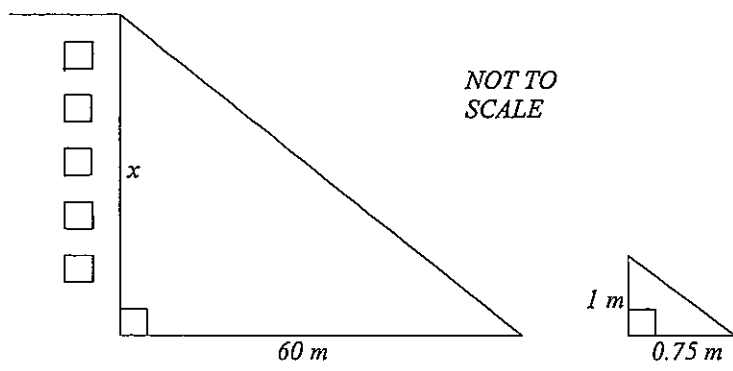
- (i) What is the value of the taxation deduction Josie has been able to claim for depreciation each year? **1**
- (ii) Calculate the annual rate of straight line depreciation Josie is using. **1**
- (iii) Calculate the salvage value of the machinery when it is 3 years old, if Josie was depreciating it at 25% p.a. with the declining balance method of depreciation. **1**
- (iv) If Josie had chosen to use declining balance depreciation at the rate of 25% p.a., how much could she have claimed off her tax for depreciation in the third year? **2**

Question 27 continues on page 17.

- (c) A radial survey was undertaken to find the area of an irregular field. The measurements are provided on the diagram below.



- (i) Calculate the distance AD (x) on the radial survey. Answer correct to the nearest metre. 2
- (ii) Calculate the area of section COD . Answer correct to one decimal place. 2
- (d) A building casts a shadow of 60 metres. At the same time a 1 metre stick casts a shadow of 0.75 metres as shown in the diagram.



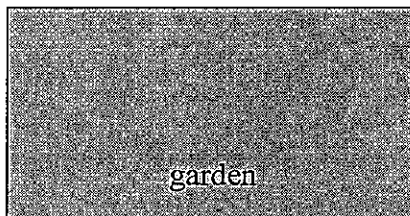
- Find the height of the building? 2

End of Question 27.

Question 28 (13 marks) Use a **SEPARATE** Writing Booklet.

Marks

- (a) A farmer has a garden which is enclosed by 16 metres of fencing.



x metres

- (i) If the length of the rectangular field is x metres, show that the area of the rectangular garden is given by $A = 8x - x^2$. 2
- (ii) By considering the different possible lengths (x) of the rectangular garden, complete the table of values provided in your writing booklet. 1

<i>Length</i> (x)	0	1	3	5	6	8
<i>Area</i> (A)			15			0

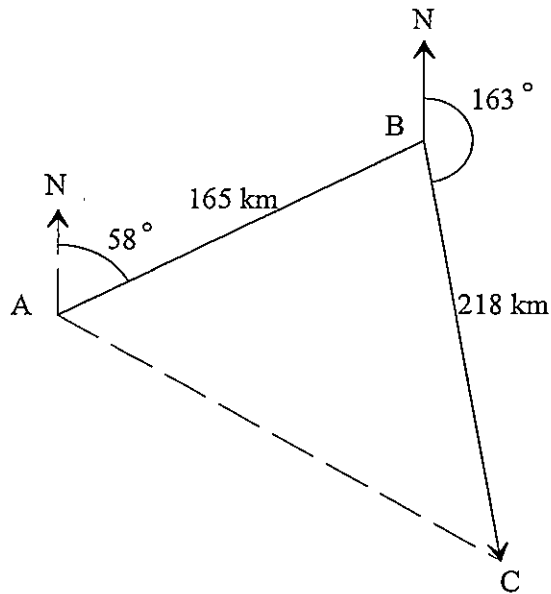
- (iii) Use the graph paper provided in your writing booklet to draw a neat graph of the Area (A) of the garden against its length (x). 2
- (iv) From your graph, find the dimensions of the garden that will maximise the area. 2
- (b) (i) Harriet inherits \$120 000 and invests it at 12% p.a. compounded annually. How much will her investment accumulate to after 20 years? 1
- (ii) At the same time Sylvester starts his investment plan. He makes a monthly payment of \$1000, with interest of 12% p.a. compounded monthly. 2
- Who has the better financial result at the end of 20 years? Show working to justify your answer.

Question 28 continues on page 19.

Question 28 (continued).

Marks

- (c) A ship sails 165 km from port A to port B on a bearing of 058° T. It then turns and sails 218 km to port C, on a bearing of 163° T.



- (i) Show that the size of $\angle ABC$ is 75° . 1
- (ii) When the ship is at port C, how far is it from port A? Answer to the nearest kilometre. 2

End of Question 28.

End of Paper.

HIGHER SCHOOL CERTIFICATE EXAMINATION
General Mathematics

FORMULAE SHEET

Area of an annulus

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

R = radius of outer circle

r = radius of inner circle

Area of an ellipse

$$A = \pi ab$$

a = length of semi-major axis

b = length of semi-minor axis

Area of a sector

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

θ = number of degrees in central angle

Arc length of a circle

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

θ = number of degrees in central angle

Simpson's rule for area approximation

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

h = distance between successive measurements

d_f = first measurement

d_m = middle measurement

d_l = last measurement

Surface area

Sphere $A = 4\pi r^2$

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

r = radius

h = perpendicular height

Volume

Cone $V = \frac{1}{3}\pi r^2 h$

Cylinder $V = \pi r^2 h$

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

Sphere $V = \frac{4}{3}\pi r^3$

r = radius

h = perpendicular height

A = area of base

Sine rule

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

Area of a triangle

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

Cosine rule

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

or

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

FORMULAE SHEET

Simple interest

$$I = Prn$$

P = initial quantity

r = percentage interest rate per period, expressed as a decimal

n = number of periods

Compound interest

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

A = final balance

P = initial quantity

n = number of compounding periods

r = percentage interest rate per compounding period, expressed as a decimal

Future value (A) of an annuity

$$A = M \left\{ \frac{(1+r)^n - 1}{r} \right\}$$

M = contribution per period, paid at the end of the period

Present value (N) of an annuity

$$N = M \left\{ \frac{(1+r)^n - 1}{r(1+r)^n} \right\}$$

or

$$N = \frac{A}{(1+r)^n}$$

Straight-line formula for depreciation

$$S = V_0 - Dn$$

S = salvage value of asset after n periods

V_0 = purchase price of the asset

D = amount of depreciation apportioned per period

n = number of periods

Declining balance formula for depreciation

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

S = salvage value of asset after n periods

r = percentage interest rate per period, expressed as a decimal

Mean of a sample

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{\sum fx}{\sum f}$$

\bar{x} = mean

x = individual score

n = number of scores

f = frequency

Formula for a z-score

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

s = standard deviation

Gradient of a straight line

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

Gradient-intercept form of a straight line

$$y = mx + b$$

m = gradient

b = y-intercept

Probability of an event

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

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