TRINITY GRAMMAR SCHOOL
MATHEMATICS DEPARTMENT

YEAR 12
2009 HALF YEARLY EXAMINATION

GENERAL MATHEMATICS

MONDAY, 4ᵀᴴ MAY 2009
8:30am-11:00am
Weighting: 30% towards final grade.

INSTRUCTIONS:
1. Reading time - 5 minutes
2. Working time - TWO AND A HALF Hours
3. Write using black or blue pen
4. Board approved calculators may be used
5. A formulae sheet is provided on pages 27 and 28 of the examination booklet.
6. Write your candidate number and teacher's name on the multiple choice sheet and the 6 answer booklets.
7. Attempt **ALL** questions.
8. Show all necessary working.
9. **Begin** each question in **Section II** in a **new booklet.**
10. Mark values are shown at the side of each question.
11. Hand in all sections, multiple choice sheet and Question paper.

Section I   22 marks
- Attempt Questions 1-22
- Allow about 30 minutes for this section

Section II   78 marks   **TOTAL MARKS – 100**
- Attempt Questions 23-28
- Allow about 2 hours for this section

Section I: Multiple choice	/22
Section II:	
Q23 Equations and Functions	/13
Q24: Area and Volume	/13
Q25: Credit and Loans	/13
Q26: Statistical Distributions	/13
Q27: Trigonometry	/13
Q28: Probability	/13

Total =   /100

Section I

22 marks
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. Fill in the response oval completely.

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 the correct answer by writing the word *correct* and drawing an arrow as follows.

correct

A ✖   B ✖   C ○   D ○

1   The results of a geography test are displayed in a stem-and-leaf plot.

$$
\begin{array}{c|l}
2 & 3\ 3\ 4\ 5 \\
3 & 5\ 6\ 6\ 6\ 7\ 7 \\
4 & 1\ 2 \\
5 & 0\ 0\ 4
\end{array}
$$

What is the range of the data?

(A)   15

(B)   27

(C)   29

(D)   31

2   Which of the following is the correct simplification of $8x^3 - 5x^3$?
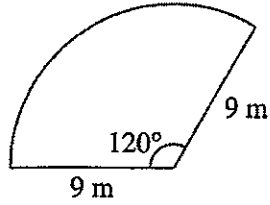
(A) $3x^6$

(B) $3x^3$

(C) $3x$

(D)   3

3   The Great Pyramid of Egypt has a square base of side 230 m. Its perpendicular height is 135 m.
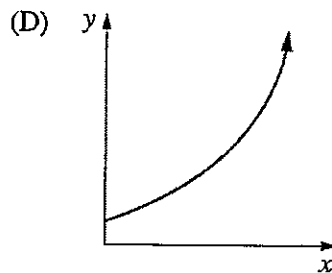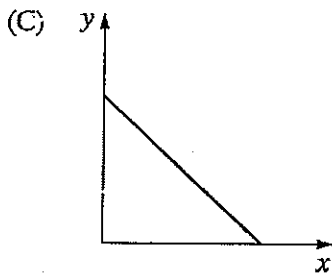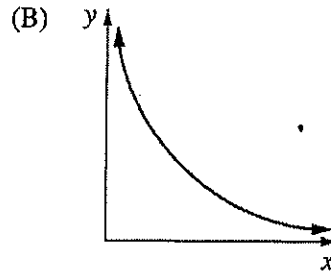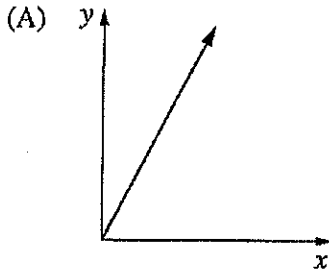
What is the volume of the pyramid?

(A) $10\,350\,\text{m}^3$

(B) $1\,397\,250\,\text{m}^3$

(C) $2\,380\,500\,\text{m}^3$

(D) $7\,141\,500\,\text{m}^3$

4 This is a sketch of a sector of a circle.

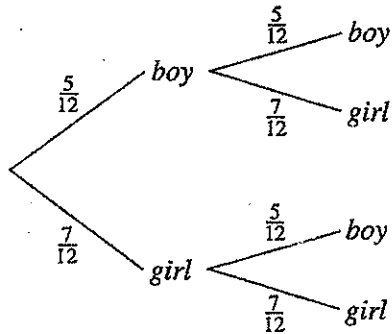Calculate the area of this sector (correct to one decimal place).

(A) 9.4 m²

(B) 18.8 m²

(C) 36.8 m²

(D) 84.8 m²

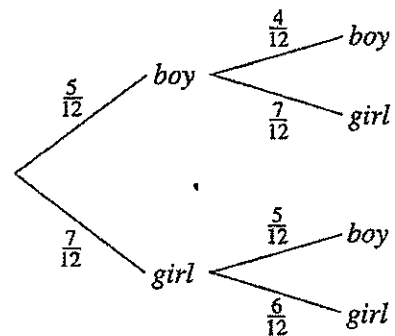**5** Which graph best represents $y = 3^x$?

(A)

(B)

(C)

(D)

6   From 5 boys and 7 girls, two children will be chosen at random to work together on a project.

Which of the following probability trees could be used to determine the probability of choosing a boy and a girl?
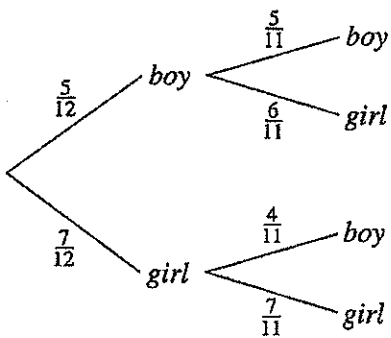
(A)

$\frac{5}{12}$ boy
$\frac{5}{12}$ — boy
$\frac{7}{12}$ — girl

$\frac{7}{12}$ girl
$\frac{5}{12}$ — boy
$\frac{7}{12}$ — girl

(B)

$\frac{5}{12}$ boy
$\frac{4}{12}$ — boy
$\frac{7}{12}$ — girl

$\frac{7}{12}$ girl
$\frac{5}{12}$ — boy
$\frac{6}{12}$ — girl

(C)

$\frac{5}{12}$ boy
$\frac{5}{11}$ — boy
$\frac{6}{11}$ — girl

$\frac{7}{12}$ girl
$\frac{4}{11}$ — boy
$\frac{7}{11}$ — girl

(D)

$\frac{5}{12}$ boy
$\frac{4}{11}$ — boy
$\frac{7}{11}$ — girl

$\frac{7}{12}$ girl
$\frac{5}{11}$ — boy
$\frac{6}{11}$ — girl
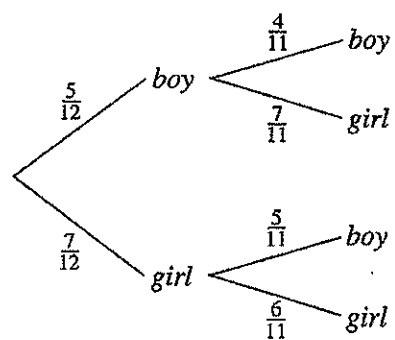
7   At the same time, Alex and Bryan start riding towards each other along a road. The graph shows their distances (in kilometres) from town after t minutes.
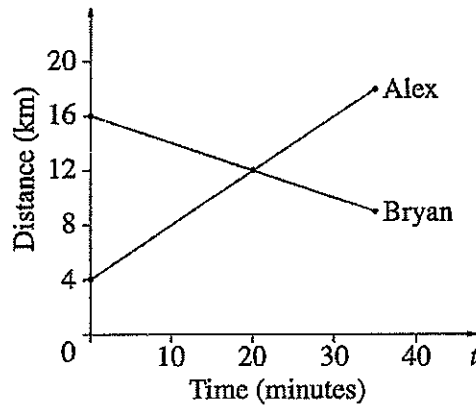
How many kilometres has Alex travelled when they meet?

(A)   4

(B)   8

(C)   12

(D)   20

8   Which scatterplot shows a low (weak) positive correlation?
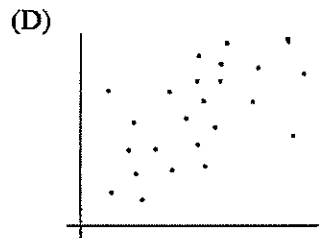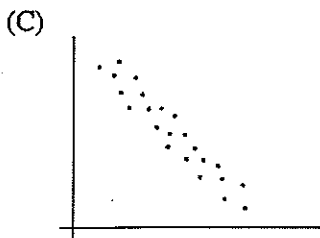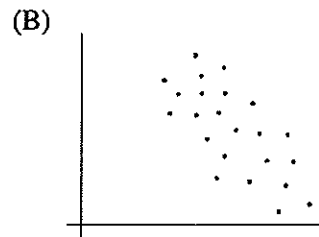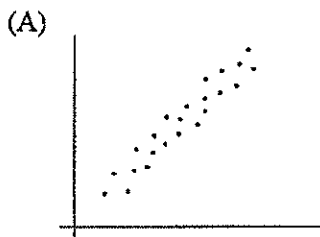
(A)

(B)

(C)

(D)

9   A swimming pool has a length of 6 m and a width of 5 m. The depth of the pool is 1 m at one end and 3.5 m at the other end, as shown in the diagram.
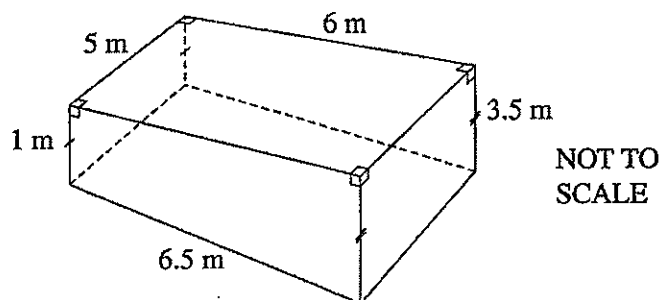
What is the volume of this pool in cubic metres?

(A)   67.5

(B)   105

(C)   109.375

(D)   113.75

10   Joyce measures the length of a piece of wood as 250 mm, correct to the nearest mm.

What is the percentage error in her measurement?

(A)   ±0.002%

(B)   ±0.004%

(C)   ±0.2%

(D)   ±0.4%

11   The council wants to put new grass on a park which is in the shape of an ellipse. If grass costs $7.50 per square metre, what is the total cost to the nearest dollar?
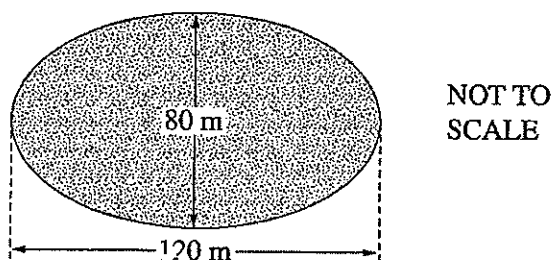
(A) $7 540

(B) $30 159

(C) $56 549

(D) $226 195

Use the following information to answer Questions 12 and 13.

Joy asked the students in her class how many brothers they had. The answers were recorded in a frequency table as follows.

Number of brothers	Frequency
0	5
1	10
2	3
3	1
4	1

12 What is the mean number of brothers?

(A) 1.15

(B) 2

(C) 2.3

(D) 4

13 One of the students is chosen at random. What is the probability that this student has at least two brothers?

(A) 0.10

(B) 0.15

(C) 0.25

(D) 0.75

14
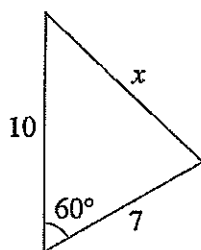
NOT TO SCALE

Which equation should be used to obtain the value of x in this triangle?

(A) $\dfrac{x}{\sin 60°} = \dfrac{7}{\sin 10°}$

(B) $x^2 = 10^2 + 7^2 - 2 \times 10 \times 7 \cos 60°$

(C) $\cos 60° = \dfrac{x^2 + 10^2 - 7^2}{2 \times 10 \times 7}$

(D) $x^2 = 10^2 - 7^2$

15 The dot plots below are drawn on the same scale. They show the class scores in tests taken before and after a unit of work was completed.

Before

After
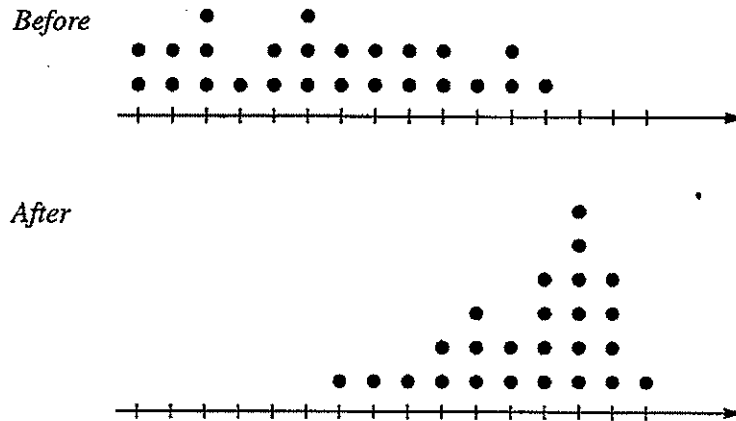
Which statement about the change in scores is correct?

(A)   The mean increased and the standard deviation decreased.

(B)   The mean increased and the standard deviation increased.

(C)   The mean decreased and the standard deviation decreased.

(D)   The mean decreased and the standard deviation increased.

16 George drew a correct diagram that gave the solution to the simultaneous equations $y = 2x - 5$ and $y = x + 6$.

Which diagram did he draw?

(A)

(B)

(C)

(D)
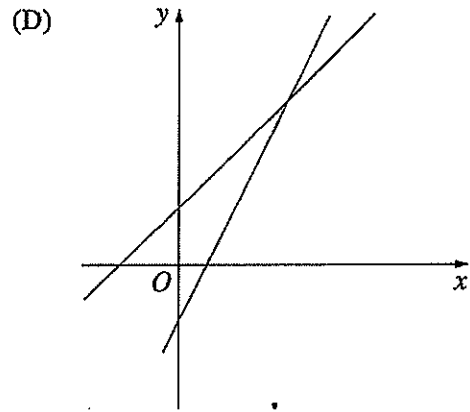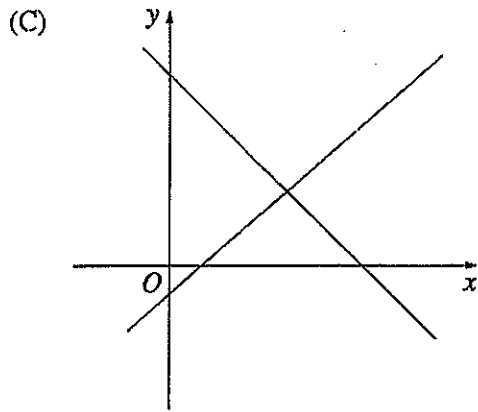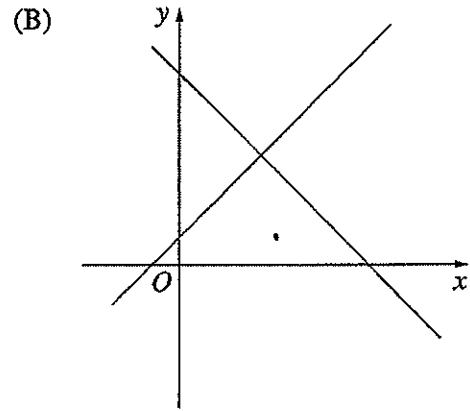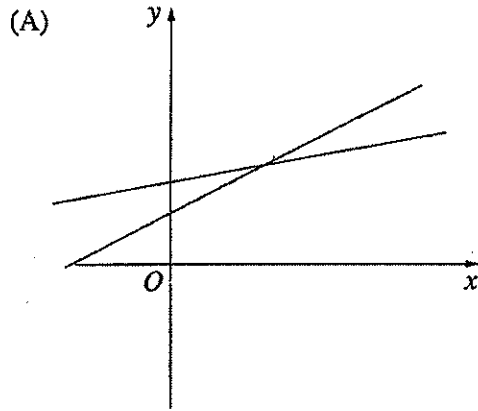
17 Rita purchased a camera for $880 while on holidays in Australia. This price included 10% GST. When she left Australia she received a refund of the GST.

What was Rita's refund?

(A) $80

(B) $88

(C) $792

(D) $800

18 Which of the following correctly expresses T as the subject of $B = 2\pi\left(R + \dfrac{T}{2}\right)$?

(A) $T = \dfrac{B}{\pi} - 2R$

(B) $T = \dfrac{B}{\pi} - R$

(C) $T = 2R - \dfrac{B}{\pi}$

(D) $T = \dfrac{B}{4\pi} - \dfrac{R}{2}$

19 In one year, the population of a city increased by 20%. The next year, it decreased by 10%.

What was the percentage increase in the population over the two years?

(A) 8%

(B) 10%

(C) 15%

(D) 30%

20 Dave's school has computer security codes made up of four digits (eg 0773). Juanita's school has computer security codes made up of five digits (eg 30568).

How many more codes are available at Juanita's school than at Dave's school?

(A) 10

(B) 50

(C) 90 000

(D) 100 000

21 Calculate the length of *AD* (to the nearest metre).
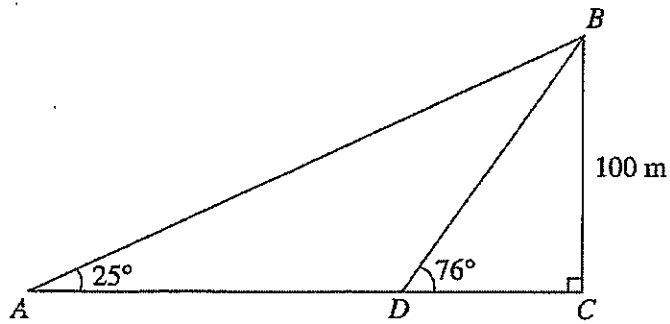
(A) 25 m

(B) 134 m

(C) 190 m

(D) 214 m

22 John knows that

- one Australian dollar is worth 0.62 euros

- one Vistabella dollar ($V) is worth 1.44 euros.

John changes 25 Australian dollars to Vistabella dollars.

How many Vistabella dollars will he get?

(A) $V 10.76

(B) $V 22.32

(C) $V 28.00

(D) $V 58.06

Question 28 (continued)

(c)   Two unbiased dice, A and B, with faces numbered 1, 2, 3, 4, 5 and 6 are rolled. The numbers on the uppermost faces are noted. This table shows all the possible outcomes.

Die A

		1	2	3	4	5	6
	1	1,1	1,2	1,3	1,4	1,5	1,6
	2	2,1	2,2	2,3	2,4	2,5	2,6
Die B	3	3,1	3,2	3,3	3,4	3,5	3,6
	4	4,1	4,2	4,3	4,4	4,5	4,6
	5	5,1	5,2	5,3	5,4	5,5	5,6
	6	6,1	6,2	6,3	6,4	6,5	6,6

A game is played where the difference between the highest number showing and the lowest number showing on the uppermost faces is calculated.

(i)   What is the probability that the difference between the numbers showing on the uppermost faces of the two dice is one?   1

In the game, the following applies.

Difference	Result
0	Win $3.50
1	Lose $5
2, 3, 4 or 5	Win $2.80

(ii)   What is the financial expectation of the game?   3

(iii)   If Jack pays $1 to play the game, does he expect a gain or a loss, and how much will it be?   1

End of paper

Section II

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

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

All necessary working should be shown in every question.

Marks

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

(a) Calculate $(3 \cdot 21 \times 10^{23}) \times (7 \cdot 34 \times 10^{-21})$. Give your answer in scientific notation.   **1**

(b) A clubhouse uses four long-life light globes for five hours every night of the year. The purchase price of each light globe is $6.00 and they each cost $d per hour to run.

    (i) Write an equation for the total cost ($c) of purchasing and running these four light globes for one year in terms of d.   **2**

    (ii) Find the value of d (correct to three decimal places) if the total cost of running these four light globes for one year is $250.   **1**

    (iii) If the use of the light globes increases to ten hours per night every night of the year, does the total cost double? Justify your answer with appropriate calculations.   **1**

    (iv) The manufacturer's specifications state that the expected life of the light globes is normally distributed with a standard deviation of 170 hours.   **1**

    What is the mean life, in hours, of these light globes if 97.5% will last up to 5000 hours?

Question 23 (continued)

(c) An alcoholic drink has 5.5% alcohol by volume. The label on a 375 mL bottle says it contains 1.6 standard drinks.

(i) How many millilitres of alcohol are in a 375 mL bottle? 2

(ii) It is recommended that a fully-licensed male driver should have a maximum of one standard drink every hour. 2

Express this as a rate in millilitres per minute, correct to one decimal place.

(d) Solve $\dfrac{5x + 1}{2} = 4x - 7$. 3

End of Question 23

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

(a) A cylindrical water tank, of height 2 m, is placed in the ground at a school.

The radius of the tank is 3.78 metres. The hole is 2 metres deep. When the tank is placed in the hole there is a gap of 1 metre all the way around the side of the tank.

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3.78 m

1 m   1 m   2 m
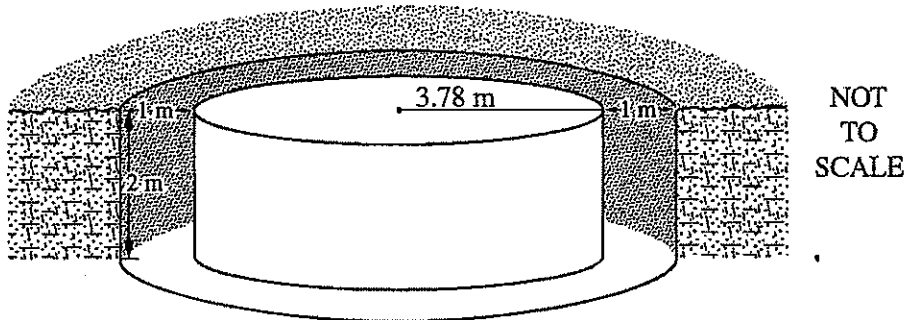
(i)   When digging the hole for the water tank, what volume of soil was removed? Give your answer to the nearest cubic metre.   **3**

(ii) Sprinklers are used to water the school oval at a rate of 7500 litres per hour.   **1**

The water tank holds 90 000 litres when full.

For how many hours can the sprinklers be used before a full tank is emptied?

(iii) Water is to be collected in the tank from the roof of the school hall, which has an area of 400 m^2. During a storm, 20 mm of rain falls on the roof and is collected in the tank.   **2**

How many litres of water were collected?

Question 24 (continued)

(b) In her garden, Keryn has a birdbath in the shape of a hemisphere (half a sphere).   **2**
The internal diameter is 45 cm.

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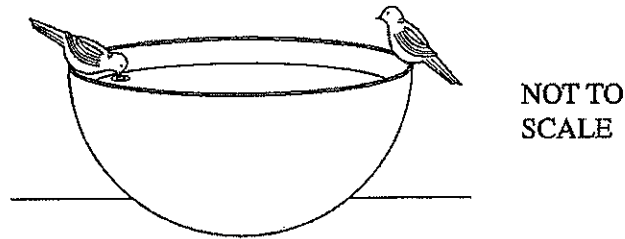
What is the internal surface area of this birdbath? (Give your answer to the
nearest square centimetre.)

(c) In order to find the area of a lake, Bob took some measurements (in metres) and
drew the following diagram.

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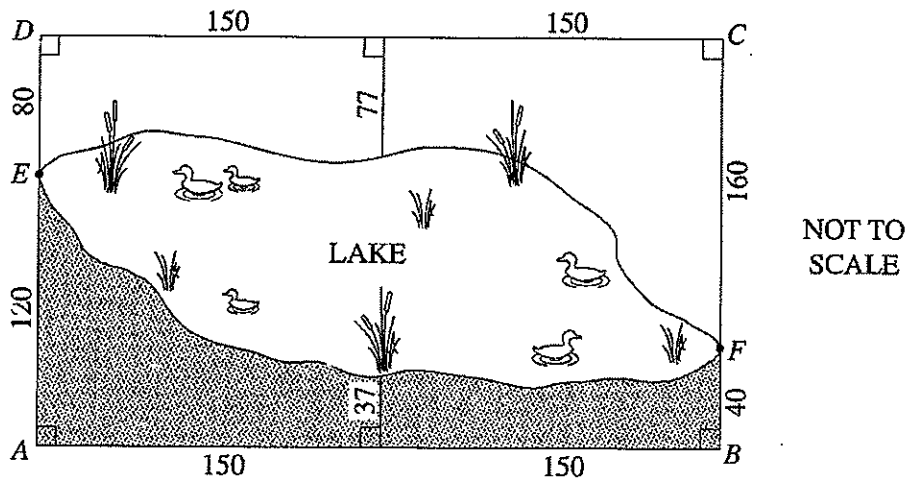
(i) Use Simpson's Rule to find the shaded area *ABFE*.   **2**

(ii) Calculate the area of the lake.   **3**

End of Question 24

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

(a) Aaron decides to borrow $150 000 over a period of 20 years at a rate of 7.0% per annum.

MONTHLY REPAYMENT TABLE						
Principal and interest per $1000 borrowed						
Interest rate (pa)	Term of loan – years					
	5	10	15	20	25	30
6.5%	19.57	11.35	8.71	7.46	6.75	6.32
7.0%	19.80	11.61	8.99	7.75	7.07	6.65
7.5%	20.04	11.87	9.27	8.06	7.39	6.99
8.0%	20.28	12.13	9.56	8.36	7.72	7.34

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(i) Using the Monthly Repayment Table, calculate Aaron's monthly repayment.

2

(ii) How much interest does he pay over the 20 years?

2

(iii) Aaron calculates that if he repays the loan over 15 years, his total repayments would be $242 730.

2

How much interest would he save by repaying the loan over 15 years instead of 20 years?

Question 25 continues on page 18

Question 25 (continued)

(b) David is paid at these rates:

Weekday rate	$18.00 per hour
Saturday rate	Time-and-a-half
Sunday rate	Double time

His time sheet for last week is:

	Start	Finish	Unpaid break
Friday	9.00 am	1.30 pm	30 minutes
Saturday	9.00 am	4.00 pm	1 hour
Sunday	8.00 am	2.00 pm	1 hour

(i) Calculate David's gross pay for last week. **3**

(ii) David decides not to work on Saturdays. He wants to keep his weekly **1**
gross pay the same. How many extra hours at the weekday rate must he
work?

(c) Vicki earns a taxable income of $58 624 from her job with an insurance
company. She pays $14 410.80 tax on this income.

(i) Vicki has a second job which pays $900 gross income per month. **1**

What is Vicki's total annual taxable income from both jobs, assuming that
she has no allowable tax deductions?

(ii) Use the tax table below to calculate the total tax payable on her income **2**
from both jobs.

Taxable income	Tax payable
$0–$6 000	NIL
$6 001–$22 000	18 cents for each $1 over $6 000
$22 001–$55 000	$2 880 plus 30 cents for each $1 over $22 000
$55 001–$66 000	$12 780 plus 45 cents for each $1 over $55 000
$66 001 and over	$17 730 plus 48 cents for each $1 over $66 000

End of Question 25

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

(a) The following graphs have been constructed from data taken from the Bureau of Meteorology website. The information relates to a town in New South Wales.

The graphs show the mean 3 pm wind speed (in kilometres per hour) for each month of the year and the mean number of days of rain for each month (raindays).
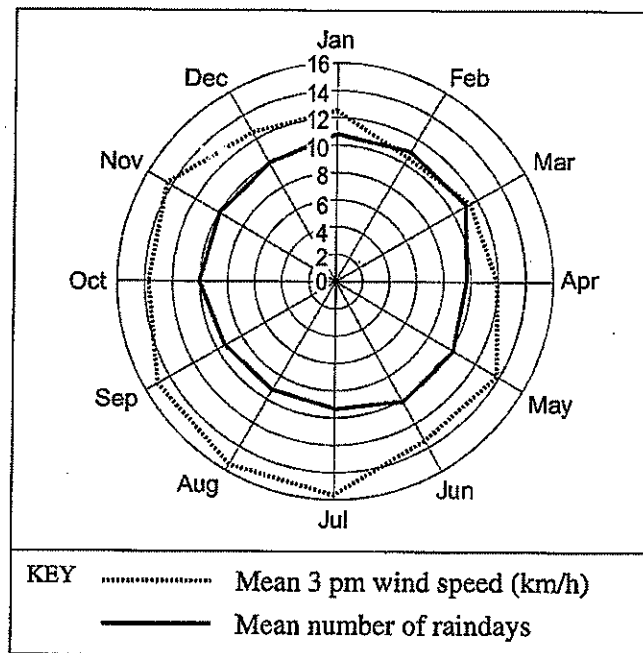
(i)   What is the mean 3 pm wind speed for September?   1

(ii) Which month has the lowest mean 3 pm wind speed?   1

(iii) In which three-month period does the town have the highest number of   1
      raindays?

(iv) Briefly describe the pattern relating wind speed with the number of   2
      raindays for this town. Refer to specific months.

Question 26 continues on page 20

Question 26 (continued)

(b) Armand recorded the weights of a random sample of male students in his Year. The cumulative frequency graph displays the results.
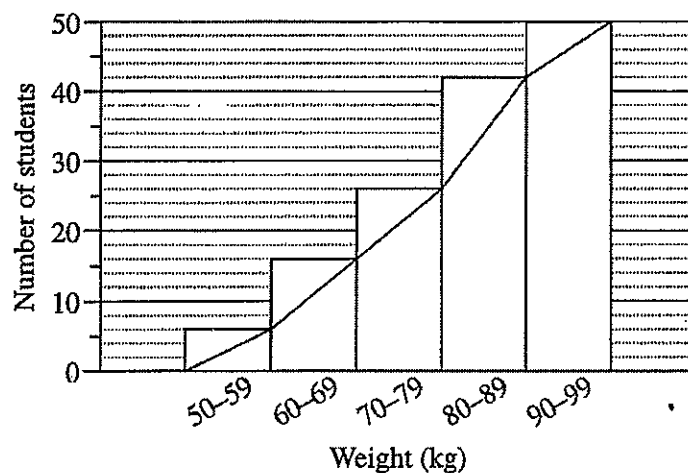
(i) How many of the students surveyed were in the 80–89 kg class? 1

(ii) Estimate the median weight of the students surveyed. 1

(iii) Of the 300 male students in Armand's Year, how many would you expect to weigh less than 70 kg? 2

(iv) 1 In order to select a sample, Armand's friend suggested selecting the first 50 male students in his Year to arrive at school on Monday morning. Explain why this would NOT be a random sample. 1

2 Describe a method that could have been used to select a random sample of the male students. 1

(c) Christina has completed three Mathematics tests. Her mean mark is 72%. 2

What mark (out of 100) does she have to get in her next test to increase her mean mark to 73%?

End of Question 26

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

(a) The following notebook entry was made during a radial survey of a field.

D
304°   96 m   60 m A
                              046°

                                        NOT TO
                                        SCALE
O

53 m   85 m

C B
214°   133°
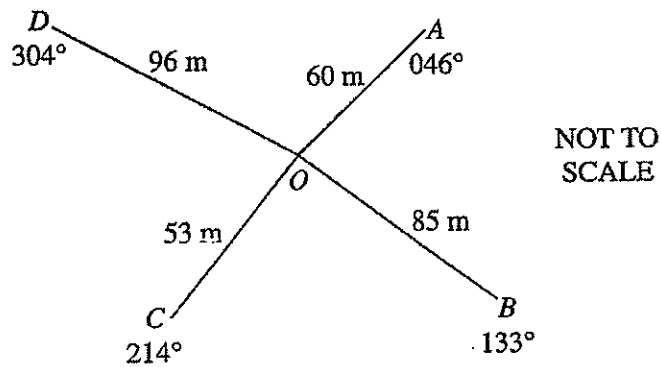
    (i)   What is the size of $\angle AOB$?   **2**

    (ii)   Calculate the area of triangle AOB. Round your answer to the nearest square metre.   **2**

    (iii)   Find the distance from A to B.   **2**

(b) This shape is made up of a right-angled triangle and a regular hexagon.   **3**

2 cm

2 cm

H

NOT
TO
SCALE
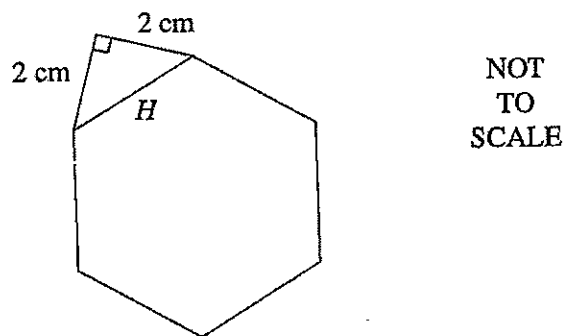
The area of a regular hexagon can be estimated using the formula $A = 2.598H^2$ where H is the side-length.

Calculate the total area of the shape using this formula.

Question 27 (continued)

(c)
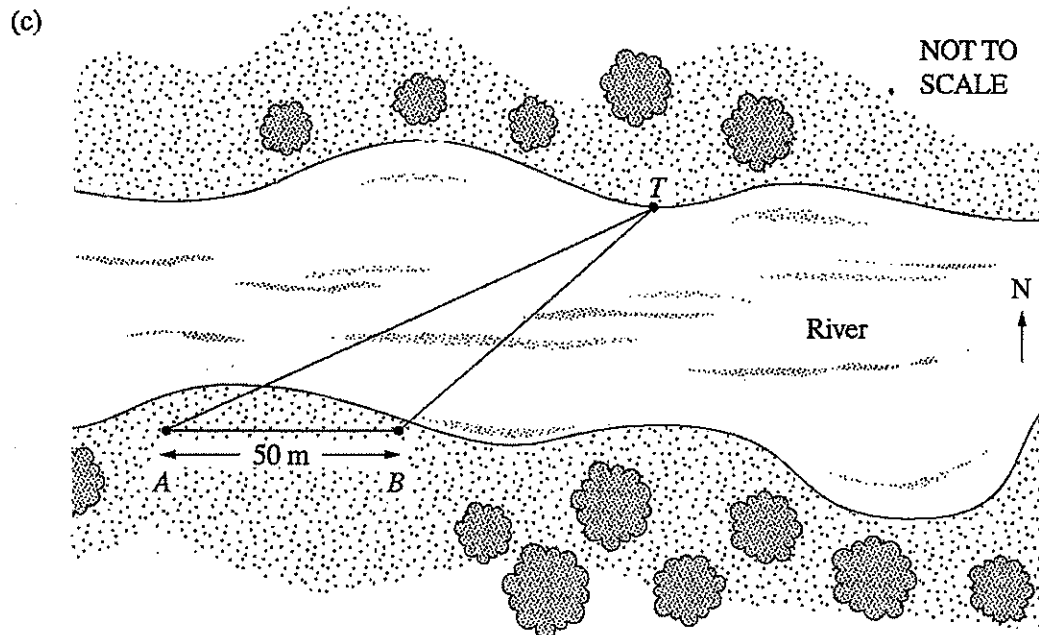
In the diagram above, the following measurements are given:

$\angle TAB = 30°$.

B is 50 m due east of A.

The bearing of T from B is 020°.

Copy or trace $\triangle ABT$ into your answer booklet.

(i) Explain why $\angle ABT$ is 110°.   **1**

(ii) Calculate the distance BT (to the nearest metre).   **3**

End of Question 27

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

(a) Five men and three women are living on an island, but not all will be able to stay.

(i) If one person is selected at random, what is the probability that this person is female?
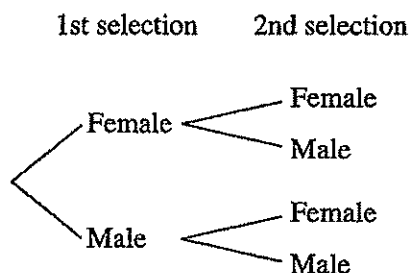
1

(ii) Two people are to be randomly selected to leave the island. ·

1 Copy the tree diagram into your writing booklet, and complete the diagram by writing the probabilities on all the branches.

2

1st selection   2nd selection

```
                          ┌─── Female
               ┌ Female ──┤
               │          └─── Male
              ─┤
               │          ┌─── Female
               └ Male ────┤
                          └─── Male
```

2 Calculate the probability that the selection includes exactly one female.

2

(iii) Antoinette is one of the women on the island. Before the two people are randomly selected to leave, Antoinette calculates her chance of remaining on the island. She concludes that she has a good chance of remaining.

2

Do you agree? Justify your answer.

(b) Give an example of an event that has a probability of exactly $\frac{3}{4}$.

1

Question 28 continues on page 24

Year 12 General

Half Yearly Exam

Solutions

2009.

Multiple Choice.

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

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

Multiple Choice Solutions

1. Range = Highest - Lowest

   = 54 - 23

   = 31 (D)

2. $8x^3 - 5x^3$ (Like Terms) = $3x^3$ (B)

3. $V = \frac{1}{3} A \times h$

   $= \frac{1}{3} (230^2) \times 135$

   $= 2\ 380\ 500\ m^3$ (C)

4. $A = \frac{\theta}{360} \times \pi r^2$ | FORMULA SHEET |

   $= \frac{120}{360} \times \pi$

   $= 84.8\ m^2$ (D)

5. $y = 3^x$ Exponential curve increasing as x gets larger. (D)

6. (D)

7. Alex has travelled $12 - 4\ km = 8km$ (B)

8. (D)

9. $V = Ah$

   $= \left\{ \left(\frac{h}{2}(a+b) \right) \times h \right\}$ → $= \left\{ \left[\frac{6}{2}(1+3.5) \right] \times 5 \right.$

   $= 67.5 m^3$ (A)

18. $B = 2\pi \left(R + \dfrac{T}{2} \right)$

$\dfrac{B}{2\pi} = R + \dfrac{T}{2}$

$\dfrac{B}{2\pi} - R = \dfrac{T}{2}$

$\dfrac{2B}{2\pi} - 2R = T$

$T = \dfrac{B}{\pi} - 2R$ (A)

19. Choose any number. ie 100

$100 \times \dfrac{120}{100} \times \dfrac{90}{100} = 108$ (A)

20. Dave : $10^4 = 10\,000$

Juanita : $10^5 = 100\,000$

More codes $= 100\,000 - 10\,000$

$= 90\,000$ (C)

21. $\tan 25° = \dfrac{100}{AC}$ $AD = AC - DC$

$\tan 76° = \dfrac{100}{DC}$ $= \dfrac{100}{\tan 25} - \dfrac{100}{\tan 76}$

$= 190m$ (C)

22. $1\,AUS = 0.62\,€$ $25\,AUS = 25 \times 0.62\,€$

$1V = 1.44\,€$ $= 15.5\,€$

$15.5\,€ = \dfrac{15.5}{1.44}\,V$

$= 10.76V$ · (A)

Question 23

(a) 2.35614×10^3 ①   Accept 2.356×10^3

(b) (i) $C = \$6 + 5 \times 365 \times \$d$ (for 1 light globe)

         <u>note</u>: (N° of days in yr
                 could be given as
                 $365\frac{1}{4}$).

        for 4 light globes

          $C = \$24 + 7300 \times \$d.$

          $C = 24 + 7300d.$ ②
              ①   ①

(ii)   If $C = 250$

       $250 = 24 + 7300d$

       $226 = 7300d$ ①

       $d = 3¢$ per hour or equivalent.
                  OR 0.031

(iii)   Total cost will ^{not} double !!   ◄—— AWARD
                                              1 MARK

       $C = \$24 + 7300^{\times 2}d$ where $d = 0.03$ IF

       $C = \$24 + 7300 \times 2 \times 0.03$ CoST IS

       $= \$462$ ✓   ①   FOUND
                                              < 500

(iv)   2 SD's above mean.

               $\therefore 5000 - 2(170) = 4660.$

                                       ①

      2.5%   95%   2.5%

(c)   Over page.

(c) (i) $\dfrac{5.5}{100} \times 375 = 20.625$ mLs ②

(ii) 1.6 standard drinks $= 20.625$ mLs

1 standard drink $= \dfrac{20.625}{1.6}$

$= 12.89$ mLs (2dp) / hour.

$= 0.21$ mLs (2dp) / minute.

②

(d) $5x + 1 = 2(4x - 7)$ (1)

$5x + 1 = 8x - 14$ (1)

$3x = 15$

$\boxed{x = 5}$ ③

Question 24

a) (i) $r = 3.78 + 1m$

   $= 4.78m$ ①

   $Vol = \pi r^2 h$

   $= \pi \times 4.78^2 \times 2$ ①

   $= 143.56\ldots$

   $= 144 m^3$ ①

(ii) $90\,000 \div 7500 = 12\ hours.$ ①

(iii) $Vol = 400m^2 \times 0.02m$ ① $[20mm = 0.02m]$

   $= 8m^3$

   $= 8 \times 1000L$

   $= 8000L.$ ①

b) $SA = 4\pi r^2 \div 2$ (Half Sphere) $r = 22.5cm.$

   $= \dfrac{4 \times \pi \times 22.5^2}{2}$ ①

   $= 3180.86\ldots$

   $= 3181\,cm^2$ ①

c)(i) $A \approx \dfrac{h}{3}\{d_F + 4d_m + d_L\}$

   $= \dfrac{150}{3}\{120 + 4(37) + 40\}$ ①

   $= 15400\,m^2$ ①

(ii) other area above lake

   $\approx \dfrac{150}{3}\{80 + 4(77) + 160\}$

   $= 27\,400.$ ①   [Method]

   Area lake $= (200 \times 300) -$ ①

   $(15400 + 27400)$

   $= 60\,000 - 42\,800$

   $= 17\,200\,m^2$ ①

Question 25

(a) i) $150 \times 7.75 = \$1162.50/\text{month}$ ① ①

ii) $\$1162.50 \times 12 \times 20 = \$279\ 000$ ①

Interest $= \$279\ 000 - \$150\ 000$

$= \$129\ 000$ ①

iii) Interest saved $= \$129\ 000 - \$92\ 730$ ①

$= \$36\ 270$. ①

b) i) $4 \times \$18 = \$72$
$6 \times 1.5 \times \$18 = \$162$ } ②
$5 \times 2 \times \$18 = \$180$

Total $= \$414$ ①

ii) $\$162 \div 18 = 9$ hours extra. ①   or $6 \times \frac{1}{2} = 9$.

c) i) $\$58\ 624 + (900 \times 12) = \$69\ 424$ ①

ii) Tax Payable $= \$17\ 730 + \left[(69\ 424 - 66\ 000) \times 0.48\right]$ ①

$= \$19\ 373.52$ ①

Question 26

a) i) 15 km/hr (1)

   ii) Feb. (1)

   iii) Jan, Feb, Mar (1)

   iv) When wind speed increases, rainfall decreases (1) Relative
        on average. i.e. Jul — Oct wind speed was (1) marks
        at its max, but rainfall was at a minimum.

b) i) 16 students (1)

   ii) 77 kg [Accept 76 — 78]. (1)

   iii) Out of 50 in the sample 16 were < 70kg

        $$\frac{16}{50} \, {}^{\times 6}_{\times 6} = \frac{x}{300}$$ (1)

        would expect 96 students approx < 70kg (1)

   iv) 1. Random selection is not an ordered selection.
           It is a sample where each student would have
           equally likely chance of being selected. Not (1)
           in this case.   or

        2. Systematic or Stratified.   Reference to
            Different examples (1)   order.

c) Total scores   3 × 72 = 216 (1) 292 — 216 = 76%. (1)
                   4 × 73 = 292 .

Question 27

a) i) $\angle AOB = 133 - 46$ ①

$= 87°$. ①

ii) Area $= \frac{1}{2}ab\sin C$

$= \frac{1}{2}(60)(85) \times \sin 87°$ ①

$= 2546.50\ldots$

$= 2547m^2$ ①

iii) Using Cosine Rule: $a^2 = b^2 + c^2 - 2bc \cos A$.

$AB^2 = 60^2 + 85^2 - 2(60)(85)\cos 87°$ ①

$= 10291.17 \ldots$
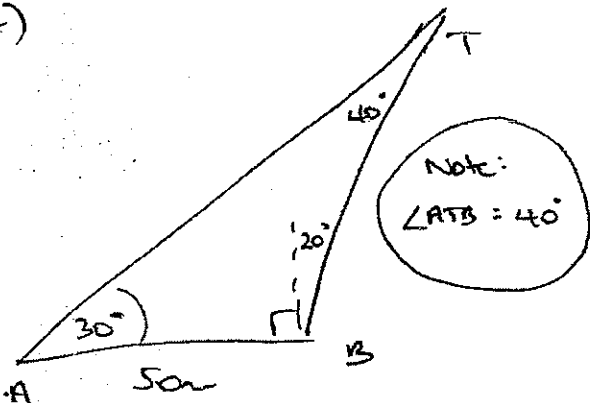
$= 101.45m$ (2dp). ①

b) $H^2 = 2^2 + 2^2$ (Pyth. Thm)

$H = \sqrt{8}$ cm. ①

$A = 2.598 \times \sqrt{8}^2 + \frac{1}{2}(b \times h)$

$= 2.598 \times 8 + \frac{1}{2}(2 \times 2)$ ①

$= 20.784 + 2$

$= 22.784 cm^2$. ①

c)

Note: $\angle ATB = 40°$

i) $\angle ABT = 90 + 20°$ (Bearing) ①

$= 110°$

ii) $\frac{BT}{\sin 30°} = \frac{50}{\sin 40°}$ ①

$BT = \frac{50 \times \sin 30°}{\sin 40°}$ ①

$= 38.89m$ (2dp)

ROUNDING PENALTY ①

$= 39m$ (nearest m)

Question 28

(a) i) $P(\text{female}) = \frac{3}{8}$ (0.375) ①

ii) 1.
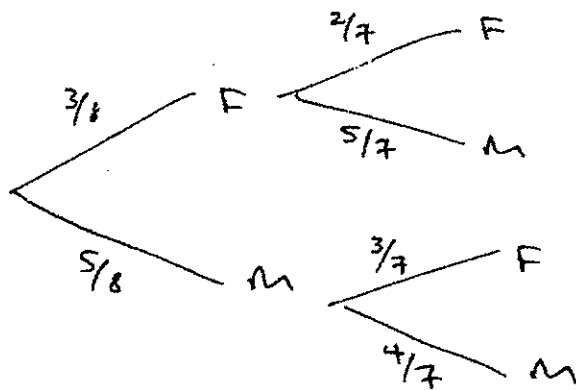
① FIRST SELECTION

① SECOND SELECTION.

2. $P(\text{Exact 1 female}) = P(FM) \text{ or } P(MF)$

$$= \left(\frac{3}{8} \times \frac{5}{7}\right) + \left(\frac{5}{8} \times \frac{3}{7}\right) \quad ①$$

$$= \frac{15}{56} + \frac{15}{56}$$

$$= \frac{30}{56}$$

$$= \frac{15}{28}. \quad \Bigg\} ①$$

only ① if $\frac{15}{56}$

iii) Yes. ①

Probability that Antoinette is selected

$$= \frac{1}{8} \times \frac{1}{7} \quad ①$$

$$= \frac{1}{56}. \quad \text{which is a low prob.}$$

(b) Choosing a red marble from a bag that contains 3 red + 1 blue marbles. ① Various

(c) i) $P(\text{diff. D are}) = \dfrac{10}{36}$

$\qquad\qquad\qquad = \dfrac{5}{18}.$ $\Big\}$ ①

ii) Financial expectation

$= \left(\$3.50 \times \left(\dfrac{6}{36} \right) \right)$ ① $- \$5 \left(\dfrac{5}{18} \right) \left(+ \$2.80 \left(\dfrac{20}{36} \right) \right)$ ①

$= \$0.75$ ①

iii) Jack will expect a loss

Loss $= \$1 - \$0.75$

$\qquad = \$0.25$ on average for each ①
$\qquad\qquad$ game he plays.