NORTH SYDNEY GIRLS HIGH SCHOOL

Year 10 Yearly Examination 2007

Mathematics

Name:_____ Class: _____

Teacher:_____

Time Allowed: **1½ hours + 5 minutes reading time**

Instructions:

- Answer Part A, the multiple choice questions, on the answer sheet provided.
- Answer Part B on the paper provided.
- Start each part on a new page.
- Attempt every question.
- Show all necessary working.
- Marks may be deducted for incomplete or poorly arranged work.
- Write on one side of the page only.
- Do not use correcting tape or liquid paper.
- Diagrams are not drawn to scale.

At the end of the examination, staple this question paper to the front of your solutions and hand in one bundle.

Part A: 30 Marks			
A1 (11)	**A2(10)**	**A3(7)**	**A4(2)**
Question 1: 12 Marks			
Question 2: 14 Marks			
Question 3: 12 Marks			
Question 4: 14 Marks			
Question 5: 13 Marks			
Total: 95 Marks			

Part A

Answer all the questions on the answer sheet provided. All questions are worth ONE mark each.

1. The number 0·0400 written correct to three significant figures is given by

A. 0·04 B. 0·0400 C. 0·040 D. 0·041

2 $2^{160} \times 2^{40}$ simplifies to

A. 4^{6400} B. 2^{200} C. 4^{200} D. 2^{6400}

3 Evaluate $(\sqrt[3]{30})^2$ correct to two decimal places to obtain

A. 9.65 B. 164.43 C. 3.11 D. 270.00

4 An alternative form for $\frac{1}{2}\sqrt{48}$ is:

A. $2\sqrt{3}$ B. $\sqrt{24}$ C. $8\sqrt{3}$ D. $\frac{\sqrt{48}}{\sqrt{2}}$

5 The difference between the sum of the squares of a and b AND the square of the sum of a and b is

A. $\pm ab$ B. $\pm 2ab$ C. 0 D. dependent on the values of a and b.

6 If $V = \frac{4}{3}\pi r^3$, what is the value of V when $r = 2$, correct to two decimal places?

A 8.38 B 12.57 C 25.13 D 33.51

7 A salesman earns $200 per week plus $40 commission for each item that he sells.
How many items does he need to sell to earn a total of $2640 in two weeks?

A 33 B 56 C 61 D 66

8 Janet's gross income last year was $60 000. She had allowable tax deductions of $5000. Janet paid 1.5% of her taxable income for the Medicare levy.
How much was Janet's Medicare levy?

A. $750 B. $825 C. $900 D. $975

9 The table below is used to calculate monthly loan repayments

Monthly loan repayments (in dollars) per $1000 borrowed

Interest rate % pa	*5 years*	*10 years*	*15 years*	*20 years*
5%	18.87	10.61	7.91	6.60
6%	19.33	11.10	8.44	7.16
7%	19.80	11.61	8.99	7.75
8%	20.28	12.13	9.56	8.36
9%	20.76	12.67	10.14	9.00

Samantha has borrowed $70 000 at 8% per annum for 15 years.
What is her monthly loan repayment?

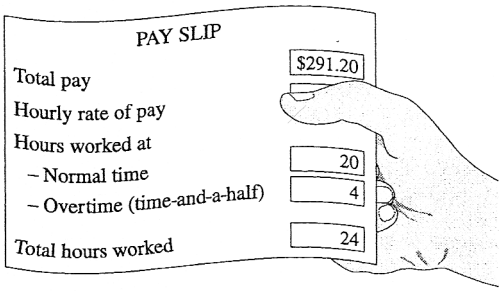
A. $143.40 B. $669.20 C. $8030.40 D. $10038.00

10 The total cost, \$$C$, of a school excursion is given by $C = 2n + 5$, where n is the number of students.

If three extra students go on the excursion, by how much does the total cost increase?

A. \$6 B. \$11 C. \$15 D. \$16

11 Stan worked for 24 hours as shown on his pay slip.

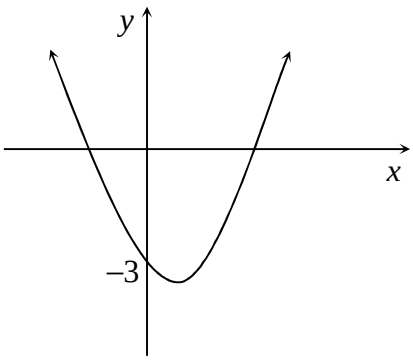


What was his hourly rate of pay?

A. \$11.20 B. \$12.13 C. \$14.56 D. \$18.20

12 Simplify $5x - 4 + 2x - 1$

A. $7x - 5$ B. $7x+5$ C. $7x - 3$ D. $7x + 3$



13 The graph above can only be one of the following equations. Which one is it?

A. $y = -x^2 + 2x - 3$ B. $y = -x^2 + 2x + 3$ C. $y = x^2 - 2x - 3$ D. $y = x^2 +$

14 The solutions of a quadratic equation are -2 and 1. The equation is

A. $2x^2 - x = 0$ B. $x^2 - x + 2 = 0$ C. $x^2 + x + 1 = 0$ D. $2 - x - x^2 = 0$

15 $\frac{(a^4)^4}{a^2}$ simplifies to

A. a^4 B. a^6 C. a^8 D. a^{14}

16 $x^{-1}y^{\frac{1}{4}}$ simplifies to

A. $-x\sqrt[4]{y}$ B. $\frac{-x}{y^4}$ C. $\frac{1}{xy^4}$ D. $\frac{\sqrt[4]{y}}{x}$

17 Given that $s = \frac{1}{2}at^2$, then a is equal to

A. $\frac{t^2}{2s}$ B. $\frac{2s}{t^2}$ C. $\frac{s}{2t^2}$ D. $\frac{\sqrt{2s}}{t}$

18 \$$x$ is divided into two parts in the ratio $m:n$, where $m > n$.
The difference, in dollars, between the parts is given by

A. $x(m-n)$ B. $\frac{x}{m-n}$ C. $\frac{x}{m} - \frac{x}{n}$ D. $\frac{x(m-n)}{m+n}$

19 The line $2x + y = 6$ cuts the x axis at the point given by

A. (3,0) B. (6,0) C (0,3) C. (0,6)

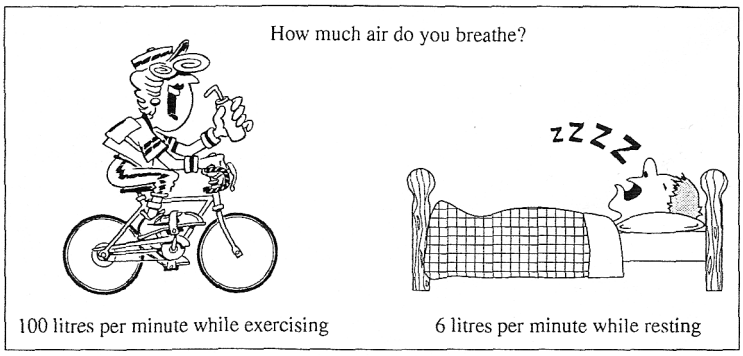
20 If $\sqrt{A} = n$, then $2A$ equals to

A. $2\sqrt{n}$ B. $\sqrt{2n}$ C. $2n^2$ D. $4n^2$

21 Which of the following is a factor of $a^2 - a - ab + b$

A. $a+1$ B. $b-1$ C. $a+b$ D. $a-b$

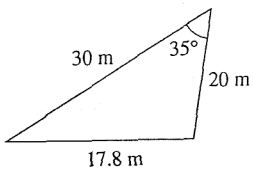
22.



During a ten-minute period Kath is exercising and Jim is resting.
How much more air would Kath breathe than Jim in this time?

A 40 litres B 94 litres C 940 litres D 1060 litres

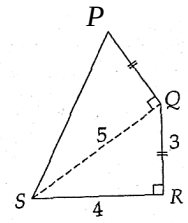
23 What is the area of the triangle below to the nearest square metre?



A 102m^2 B 153m^2

C 172m^2 D 178m^2

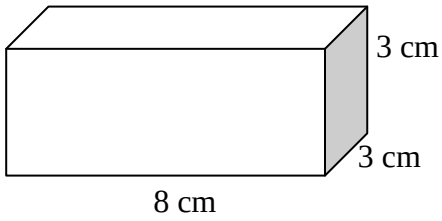
24



What is the perimeter of the above quadrilateral $PQRS$ to the nearest whole number?

A 14 B 15 C 16 D 21

25.



Calculate the surface area of the rectangular prism above in cm^2

A 57 B 72 C 96 D 114

26. Anna divided each length and width of a rectangle into 4 equal parts. From each corner of the rectangle, she cut a right angled triangle with shorter sides being one part of the length and one part of the width. What fraction of the rectangle has been removed?

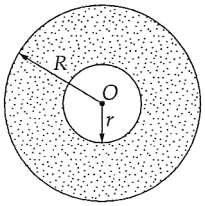
A $\frac{1}{4}$ B $\frac{1}{8}$ C $\frac{1}{16}$ D $\frac{1}{32}$

27 The area of a rectangle, 5cm by 8cm, is enlarged by a factor of $\frac{5}{4}$.

The new perimeter in centimetres is best given by

A 32.5 B 29 C 50 D 16.25

28 The shaded area in the diagram is an annulus. Dimensions are in metres.



O is the centre

Find the area of the annulus, in square metres, when $R = 10$ and $r = 7$

A 18.8 B 28.3 C 160.2 D 265.2

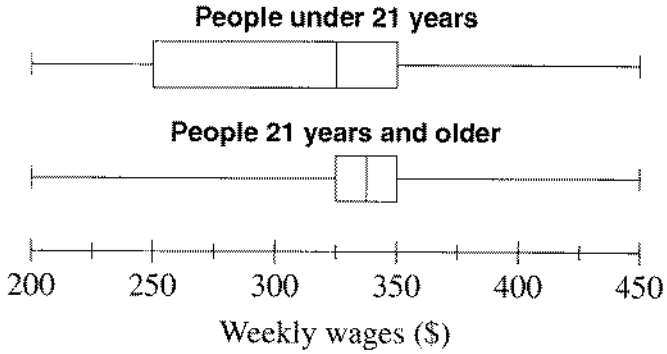
29 Yousef used the following technique to estimate the number of kangaroos living in a particular area.

He caught, tagged and released 50 kangaroos.
Later, he caught 200 kangaroos at random in the same area.
He found that 5 of these 200 kangaroos had been tagged.

Using this technique, what is the best estimate for the total number of kangaroos living in this area?

A 245 B 250 C 2000 D 10 000

30 Two groups of people were surveyed about their weekly wages. The results are shown in the box-and-whisker plots below.



Which of the following statements is true for the people surveyed?

A The same percentage of people in each group earned more than $325 per week

B Approximately, 75% of people under 21 years earned less than $350 per week

C Approximately, 75% of people 21 years and older earned more than $350 per week

D Approximately, 50% of people in each group earned between $325 and $350 per week.

END OF PART A

Part B – Answer these questions on the paper provided

Question 1 [12 Marks] **Marks**

a) Find the points of intersection of the line $y = x^2 - 2x - 1$ and the line $y = -2x$ **2**

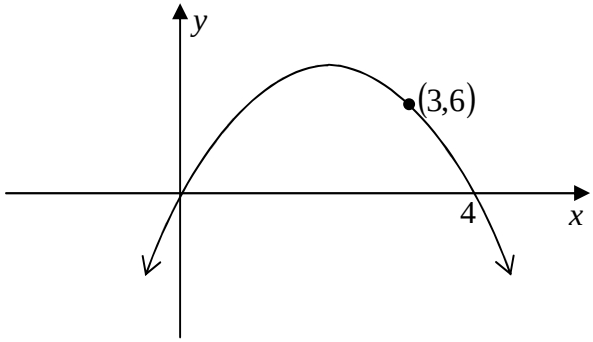
b) Sketch the graph of

(i) $y = (x-1)^2 + 1$ **2**

(ii) $(x-4)^2 + (y+6)^2 = 4$ **2**

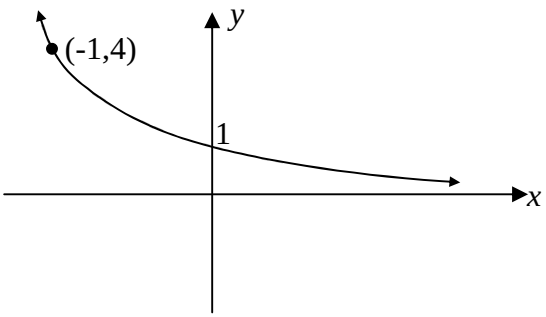
(c) Find the equation of each graph.

(i)



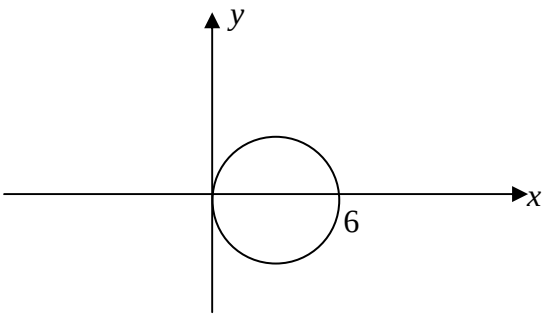
2

(ii)



2

(iii)



2

[The centre of this circle lies on the x axis]

Question 2 [14 Marks] Start a new page

(a) A square field has an area of $250000m^2$.

(i) Express this area in hectares **1**

(ii) Find the perimeter of the field in metres. **1**

(b)

(i) Indicate with reasoning which is the better relative performance of the two scores.

	SCORE	MEAN	STANDARD DEVIATION
Clare	60	50	5
Sophie	65	50	8

2

(ii) Sandra took 5 tests in each of two subjects throughout the year as shown below.

English: 65 , 85, 75, 67, 83,

Mathematics 65, 60, 72, 45, 20.

Find the mean and median for each set of scores and decide which, if either, gives the better indicator of overall performance in each subject. Justify your response. **5**

(c) A spherical satellite has a diameter of 4 metres. Calculate its surface area to one decimal place. **2**

(d) A rectangular pyramid with a 8 metre by 6 metre base has a height of 4 metres.

The triangular faces of the pyramid have heights of either $4\sqrt{2}$ m or 5 m

This solid is now sliced *vertically* from the apex of the pyramid to a diagonal of the base to divide the pyramid into two congruent triangular pyramids.

Calculate the exact total surface area of the two triangular pyramids. **3**

Question 3 [12 Marks] Start a new page

(a) Two dice are thrown and the sum of the two numbers appearing uppermost is noted.

(i) Draw a diagram to display the Sample Space. **2**

Find the probability that the sum of the numbers is

(ii) 2 or 4 **1**

(iii) 7 **1**

(iv) not a 7 **1**

(b) Four coloured tickets labelled Red 1, Red 2, White and Blue, are placed into an empty box and two consecutive withdrawals from the box are made without replacement.

(i) Represent this probability experiment on a tree diagram **2**

Find the probability that the tickets selected are

(ii) a white ticket followed by a blue ticket **1**

(iii) both red tickets **1**

(c) A Sports Club has 100 members. 46 members use the gym and 64 members use the swimming pool. Some of these members use both facilities while 10 members use neither facility. A members name is drawn at random and a prize of a pair of running shoes is given. Using a Venn diagram or otherwise, find the probability that the person selected uses only the pool out of the two available facilities. **3**

Question 4 [14 Marks] Start a new page

(a) Find the exact value of

(i) $\cos 150°$ **1**

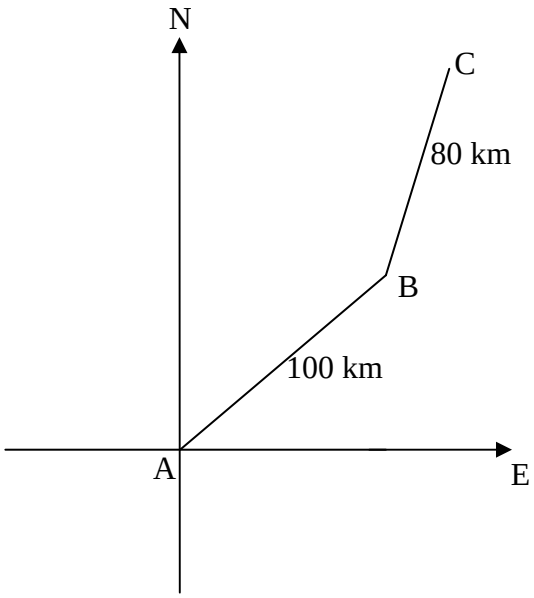
(ii) $\sin 135°$ **1**

(b) Solve for $0 \le \theta° \le 180$ to the nearest degree.

(i) $\sin \theta° = \frac{1}{3}$ **2**

(ii) $\sin(90 - \theta)° = -\frac{1}{3}$ **2**

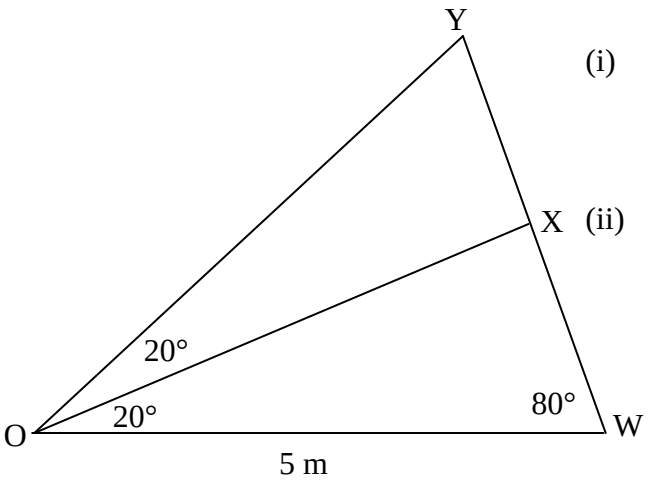
(c) A ship sails from Port A for $100km$ on a bearing of NE to a Port B. It then sails on a bearing of $020°$ for $80km$ to its destination C.



(i) Represent the information given above in a triangle ABC including the value of angle ABC. **3**

(ii) Find the shortest distance between its starting and finishing points of the ship to the nearest kilometre. **2**

(d) A wall YW, inclined at $80°$ to the ground OW at W, is supported by two poles OX and OY, where OW is 5 metres . These poles are inclined as shown below.



(i) State the length of OX giving a brief reason for your answer. **1**

(ii) Hence, or otherwise, find the length of XY to one decimal place. **2**

Question 5 [13 Marks] Start a new page

(a) Change the subject of the formula to the letter indicated in brackets

(i) $T = \frac{1}{a}\sqrt{\frac{b}{c}}$ $[c]$ **2**

(ii) $y = \frac{A}{A+4}$ $[A]$ **3**

(b) What values of x and y which can not be used in the following equation?

$$y = \frac{1}{x\ -4}$$ **2**

(c) (i) Let $u = 2^x + 1$ and hence express $(2^x+1)^2 - (2^x+1)$ in terms of u. **1**

(ii) Hence solve for x the equation $(2^x+1)^2 - (2^x+1) = 6$ **2**

(d) If $x + y = a$ and $\frac{1}{x} + \frac{1}{y} = b$ where $x, y > 0$,

Show that $(x-y)^2 = \frac{ba^2 - 4a}{b}$ **3**

END OF TEST

Name:_____ **Class:**_____
Teacher:_____

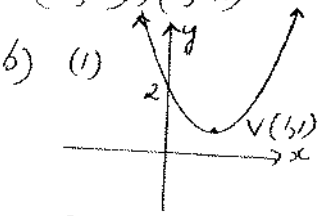
Part A: Multiple choice answer sheet.
Completely colour the circle representing your answer.
Use pencil only.

1.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	16.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
2.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	17.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
3.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	18.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
4.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	19.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	20.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	21.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	22.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	23.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	24.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	25.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	26.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	27.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	28.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
14.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	29.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
15.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	30.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

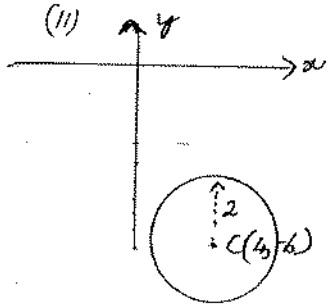
SOLUTIONS
YR 10 74 YEARLY
EXAM 2007

1a) $y = x^2 - 2x - 1$ (i)
$y = -2x$ (ii)
(i) → (ii)
$x^2 - 2x - 1 = -2x$
$x^2 - 1 = 0$
$x = \pm 1$
$(-1, 2), (1, -2)$

b) (i)



(ii)



c)(i) Let $y = ax(x-4)$
and $x = 3$
$y = 6$
$6 = 3a \times -1$
$a = -2$
i.e. $y = -2x(x-4)$
$(y = 8x - 2x^2)$

(ii) Let $y = ka^{-x}$
and $x = 0$
$y = 0$
$1 = k.1$
$y = a^{-x}$
and $x = -1$
$y = 4$
$4 = a^1$
$\therefore y = 4^{-x}$

(iii) $C(3,0)$, $r = 3$
$(x-3)^2 + y^2 = 9$

QUESTION 2

a) (i) 25 ha
(ii) 2000 m

b)(i) Clare as she is
25 Ds above the mean
whereas Sophie is less than
25 Ds (1.875) above the
mean.

(ii)

	E	M
$\bar{x}$	75	52.4
MED	75	60

English: equal indicators
Mathematics: median as
the mean is depressed by
the low outlier scores

c) $SA = 4\pi r^2$
$= 4.\pi 2^2$
$= 16\pi$
$\doteqdot 50.3$ $\approx 50.3 m^2$

d)

Let A be the surface area
of one pyramid

A = Area of Base + Area of Front face + Area of two other faces + area of last face
$= \frac{1}{2} \times 6 \times 8 + \frac{1}{2} \times 4 \times 10 + \frac{1}{2} \times 6 \times 4\sqrt{2} + \frac{1}{2} \times 8 \times 5$
$= 24 + 20 + 12\sqrt{2} + 20$
$= 64 + 12\sqrt{2}$

$2A$ (Total of 2 pyramids) $= 128 + 24\sqrt{2}$

Question 3

a)(i)

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

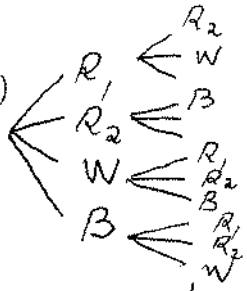
36 outcomes

(ii) $\frac{1}{9}$

(iii) $\frac{1}{6}$

(iv) $\frac{5}{6}$

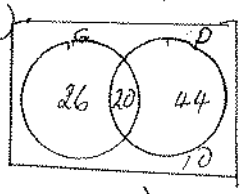
b)(i)



(ii) $P(WB) = \frac{1}{12}$

(iii) $P(R_1R_2 \text{ or } R_2R_1) = \frac{1}{6}$

c)



$P(\text{pool person}) = \frac{11}{25}$ $(\frac{44}{100})$

Question 4

a) (i) $-\frac{\sqrt{3}}{2}$

(ii) $\frac{1}{\sqrt{2}}$

b)(i) $\sin\theta^\circ = \frac{1}{3}$

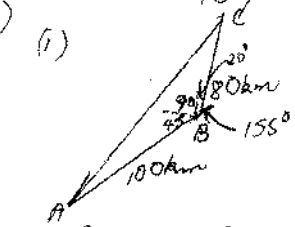
$\theta^\circ = 19^\circ, 161^\circ$

(ii) $\sin(90-\theta)^\circ = -\frac{1}{3}$

$\cos\theta = -\frac{1}{3}$

$\theta = 109$

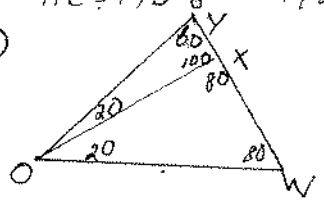
c) (i)



(ii) $AC^2 = 100^2 + 80^2 - 2 \times 100 \times 80 \times \cos 155$

$AC \doteq 175.8$ 175.8 km

d)



(i) OX is 5m as $\triangle OXW$ is isosceles as $\angle OXW = \angle OWX = 80^\circ$ and so $OX = OW$

(ii) $\frac{XY}{\sin 20^\circ} = \frac{OX}{\sin 60^\circ}$

$\frac{XY}{\sin 20^\circ} = \frac{5}{\sin 60^\circ}$

$XY = \frac{5\sin 20^\circ}{\sin 60^\circ}$

$\therefore 2.0$

Question 5

a)(i) $I = \frac{1}{a}\sqrt{\frac{b}{c}}$

$aI = \sqrt{\frac{b}{c}}$

$\frac{c}{b} = \frac{1}{a^2I^2}$

$c = \frac{b}{a^2I^2}$

(ii) $y = \frac{A}{A+4}$

$Ay + 4y = A$

$A - Ay = 4y$

$A(1-y) = 4y$

$A = \frac{4y}{1-y}$ OR $-\frac{4y}{y-1}$

(Q5 b)

$x \neq 4$ ie $x = 4$ CAN NOT BE USED

$y \neq 0$ ie $y = 0$ CAN NOT BE USED

c) (i) $u^2 - u$

(ii) $u^2 - u - 6 = 0$

$(u-3)(u+2) = 0$

$u = -2$ or 3

$2^x + 1 = -2$ or 3

$2^x = 2$

$x = 1$ only

d) $x + y = a \qquad \frac{1}{x} + \frac{1}{y} = b$

$\frac{x+y}{xy} = b$

Now $(x-y)^2 = (x+y)^2 - 4xy$

$= a^2 - 4\left(\frac{a}{b}\right)$

$= \frac{ba^2 - 4a}{b}$

Name: Solutions **Class:** MATHEMATICS

Teacher:

2007 YR 10 YEARLY

Part A: Multiple choice answer sheet.
Completely colour the circle representing your answer.
Use pencil only.

1.	Ⓐ	●	Ⓒ	Ⓓ	16.	Ⓐ	Ⓑ	Ⓒ	●
2.	Ⓐ	●	Ⓒ	Ⓓ	17.	Ⓐ	●	Ⓒ	Ⓓ
3.	●	Ⓑ	Ⓒ	Ⓓ	18.	Ⓐ	Ⓑ	Ⓒ	●
4.	●	Ⓑ	Ⓒ	Ⓓ	19.	●	Ⓑ	Ⓒ	Ⓓ
5.	Ⓐ	●	Ⓒ	Ⓓ	20.	Ⓐ	Ⓑ	●	Ⓓ
6.	Ⓐ	Ⓑ	Ⓒ	●	21.	Ⓐ	Ⓑ	Ⓒ	●
7.	Ⓐ	●	Ⓒ	Ⓓ	22.	Ⓐ	Ⓑ	●	Ⓓ
8.	Ⓐ	●	Ⓒ	Ⓓ	23.	Ⓐ	Ⓑ	●	Ⓓ
9.	Ⓐ	●	Ⓒ	Ⓓ	24.	Ⓐ	Ⓑ	●	Ⓓ
10.	●	Ⓑ	Ⓒ	Ⓓ	25.	Ⓐ	Ⓑ	Ⓒ	●
11.	●	Ⓑ	Ⓒ	Ⓓ	26.	Ⓐ	●	Ⓒ	Ⓓ
12.	●	Ⓑ	Ⓒ	Ⓓ	27.	Ⓐ	●	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	●	Ⓓ	28.	Ⓐ	Ⓑ	●	Ⓓ
14.	Ⓐ	Ⓑ	Ⓒ	●	29.	Ⓐ	Ⓑ	●	Ⓓ
15.	Ⓐ	Ⓑ	Ⓒ	●	30.	Ⓐ	●	Ⓒ	Ⓓ