Name: ..... Maths Class: .....

SYDNEY TECHNICAL HIGH SCHOOL

YEAR 8 YEARLY ASSESSMENT

Mathematics

October 2012

TIME ALLOWED: 70 minutes

Instructions:

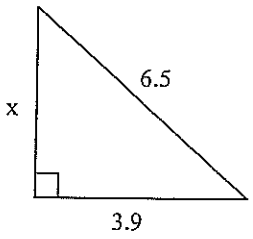
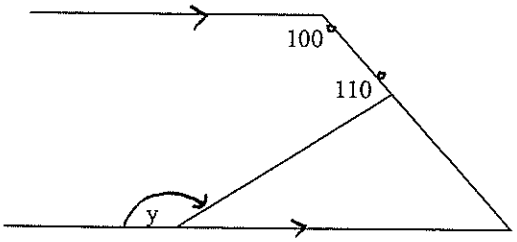
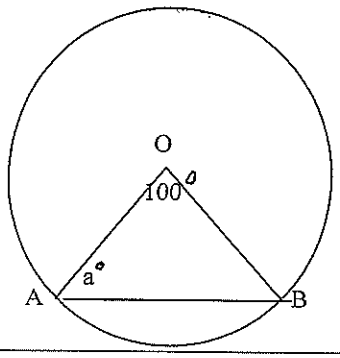
- Write your name and class at the top of this page,
- Calculators may be used in all sections.
- All necessary working must be shown. Marks may not be awarded for careless or badly arranged work.
- PART A is worth 10 marks, part B is worth 50 marks and part C is worth 15 marks

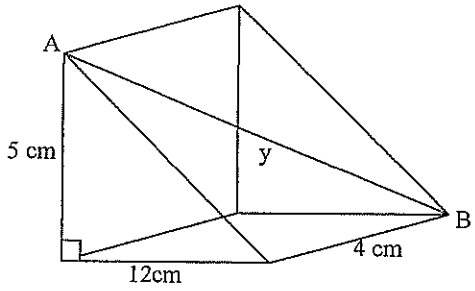
(FOR MARKERS USE ONLY)

TOPIC	PART B		PART C		TOPIC TOTAL
Statistics and Probability	QUEST 1	/10	(a)	/3	/13
Algebra	QUEST 2	/10	(b)	/3	/13
Number Plane	QUEST 3	/10	(c)	/3	/13
Rates and Ratio	QUEST 4	/10	(d)	/3	/13
Equations and Inequalities	QUEST 5	/10	(e)	/3	/13
				PART A	/10
				TOTAL	/75

PART A (10 Marks)

Each question is worth 1 mark.

		ANSWERS ONLY
1	Simplify $3a^2 - 5a^2$	
2	Change 0.125 to a percentage	
3	Use a calculator to find x correct to 1 decimal place:  	
4	Heath paid \$800 for a new computer, but after 3 months, decided to update, and sold it again for \$650. Express his loss as a percentage of his cost price.	
5	Find the value of y in the following diagram (no reasons are necessary):  	
6	Simplify $\frac{15a^3}{3a^2}$	
7	For this circle, O is the centre. The angle OAB (given by a) has a value of 40^0 At right, give a short reason why this is so.  	

8	 In the right triangular prism above, the line AB is y cm long Find the exact value of y (ie leave your answer as an irrational number)	
9	A pool, in the form of a rectangular prism, has dimensions 30m by 6m and a depth of 3 m. It is filled by a hose until it has been given 45 000 L of water. How high up the walls of the pool is the water level?	
10	The letters of the word SCRABBLE are placed individually on cards and placed in a hat. Randomly, a card is drawn. What is the chance it is the letter B ?	

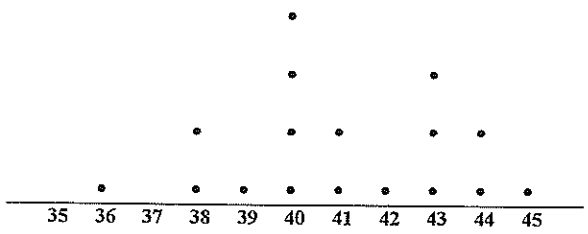
PART B

QUESTION 1: (10 MARKS) - STATISTICS and PROBABILITY

All questions are worth 1 mark unless stated otherwise

ANSWER COLUMN

(a) For the following dot-plot diagram, find the value of the median score:



(b) For the following set of scores, find (i) the range
(ii) the mode

2.1, 1.9, 1.8, 1.9, 2.0, 2.1, 1.9

(i) RANGE=

(ii) MODE =

1 mark each

(c) A red die and a black die are tossed on a table. The number facing up on the red die is written on a piece of paper as the units digit of a two digit number while the number on the black die is written as the tens digit of the two digit number.
What is the probability that the number written on the piece of paper is a multiple of 5?

(d) Complete this table for the set of 21 scores listed below it

Class	Class Centre	Tally	frequency
1-5			
6 - 10			
11 – 15			
16 - 20			

1, 7, 15, 4, 4, 9, 10, 16, 17, 6, 14, 18, 6, 6, 14, 14, 17, 17, 5, 11, 17

2 marks

(e) You are given the following frequency distribution table:

Score (x)	f	fx
24	2	
25		75
26	3	
27	7	189
28		140
	$\sum f=$	$\sum fx=$

(i) Complete the table **(2 marks)**

(ii) Find mean and the median

MEAN=

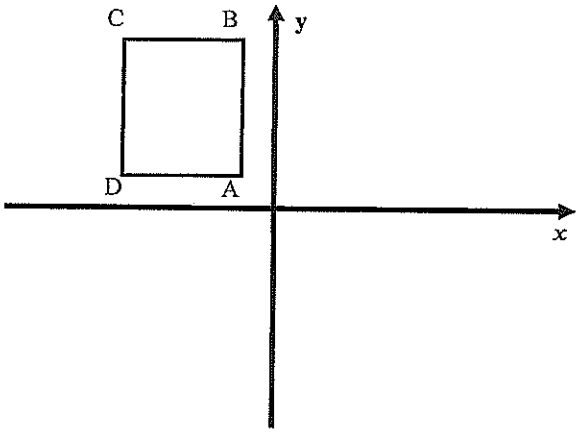
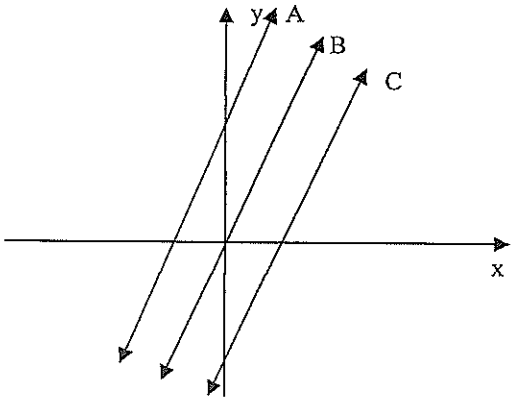
MEDIAN =

1 mark each

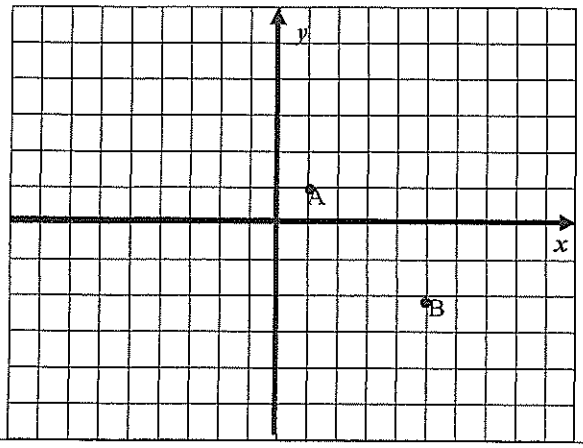
QUESTION 2: (10 MARKS) - ALGEBRA

All necessary working should be shown in the column provided at right.	**ANSWER and WORKING COLUMN**
(a) Simplify $\frac{2m}{3}\times\frac{6m}{10}$	**1 mark**
(b) Simplify $\frac{4a}{3}+\frac{2a}{5}$	**1 mark**
(c) Simplify $(2x^3)^3$	**1 mark**
(d) Simplify $5a+3(a-2)$	**1 mark**
(e) Simplify $\frac{x^2y}{5}\div\frac{xy}{10}$	**1 mark**
(f) Expand and simplify $3-(x-4)$	**1 mark**
(g) Expand and simplify $(2x+3)^2$	**1 mark**
(h) Expand and simplify $4y(y+7)-3y(2-y)$	**2 marks**
(i) Fully factorise $12x^2y-6x^2$	**1 mark**

QUESTION 3: (10 MARKS) – NUMBER PLANE

All questions are 1 mark unless indicated		ANSWER and WORKING COLUMN
(a)	Write down the equation of the line through the point A(3, -1) and parallel to the *x-axis*.	
(b)	On which axis is the point (0, -2) ?	
(c)	The point $(k, -2)$ lies on the line $2x - 3y = 12$. Showing all working at right, find the value of k.	**2 marks**
(d)	In the diagram below, A is the point (-1, 1), and B is (-1, 5) ABCD is a square.  Find the co-ordinates of the point C.	
(e)	On the accompanying number plane, which of the lines A, B, or C is most likely to be $y = 3x - 2$? 	

(f) Find the distance between the points A(1,1) and B (5,-2) on the diagram below:

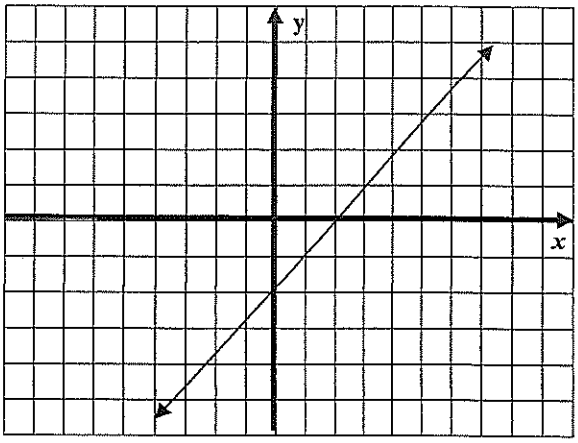


(g) On the diagram at right, the line $y = x - 2$ is drawn.

(i) On the same axes, draw the line $y = 1 - 2x$.

(ii) What are the co-ordinates of the point of intersection of the two lines?

(i)

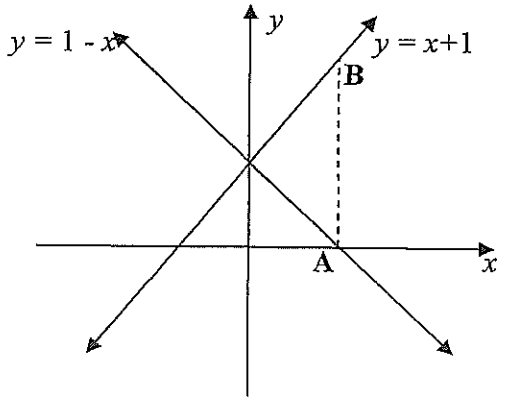


(ii) Point of intersection is: _____

2 marks

(h) In the diagram below, the point A is where the line $y = 1 - x$ cuts the x-axis. B is vertically above A and lies on the line $y = x + 1$.

Find the y-co-ordinate of B.

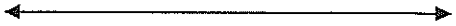


1 mark

QUESTION 4: (10 MARKS) – RATES and RATIO

	All questions are 1 mark unless indicated	ANSWER and WORKING COLUMN
(a)	Convert the ratio $3\frac{1}{2}:\frac{1}{4}$ to a simple ratio with no fractions.	
(b)	Mr Parrish runs 100m in 12 seconds. Convert this to km/hr	
(c)	To make pink paint, red paint is mixed with white in the ratio of 5:2. How much red paint is needed to make 17.5 L of this pink paint mix?	
(d)	5 men take 3 hours to build a fence. If they all work at the same rate, how long would it have taken 2 men to build the same fence?	
(e)	A concrete mixture is made up of cement, sand and blue metal in the ratio $\frac{1}{2}:6:6$ How many shovels of cement are required to make up 50 shovels of concrete?	
(f)	Michael Clarke wins the toss in the Test matches against Sri Lanka in the First and Second Tests. As he walks out to toss the coin in the third test, Richie Benaud says he has a 1 in 3 chance of winning the toss this time because it is a 3-Test series, Ian Chappell says it is 1 in 2 because it is a 2-sided coin while Mark Taylor says it is more like 1 in 8 because the chance of winning the first two in a row was 1 in 4. Who is correct? **A.** Richie **B.** Ian **C** Mark **D** None of them	
(g)	In a box of marbles there are 120 red and 80 black ones. Black ones are put into the box until the ratio is 5:4. How many black ones were added?	**2 marks**
(h)	Water is pumped into a tank at a rate of 30L/hour. How long will it take to fill a 3 cubic metre tank?	**2 marks**

QUESTION 5: (10 MARKS) – EQUATIONS, INEQUALITIES

All questions are 1 mark unless indicated	ANSWER and WORKING COLUMN
(a) Give the inequality for the values of x plotted on the number line below:  	
(b) Solve the following equation, showing all steps: $4(x+5)=31$	
(c) Solve the following equation, showing all steps: $\frac{x}{2}=3x-1$	**2 marks**
(d) Solve the inequality $6x-4\leq 2x+12$ in the space provided at right and <u>plot the solution</u> on the number line provided. 	**2 marks**
(e) Solve for x: $\frac{x+1}{3}=\frac{2x-1}{4}$	**2 marks**

(f) There is an error in one of the lines of the "solution" below, which has led to an incorrect answer.

Identify the line in which the error occurred AND state what the error was.

Question: $3 - x < 2\frac{1}{2}$

Line A: $2(3 - x) < 5$

Line B: $6 - 2x < 5$

Line C: $-2x < -1$

Line D: $x < \frac{1}{2}$

2 marks

PART C

HARDER QUESTIONS

Each question is worth 3 marks

(a) STATISTICS

The following is a back-to-back stem-and-leaf plot showing the performance of 29 year 8 boys in two topic tests.

The marks for both tests were out of 50.

The marks on the left were for statistics, while those on the right were for equations.

Leaf	STEM	Leaf
0 0 0	5	
9 8 8 5 4 3 2	4	1 5 6 7 7 9 9
9 9 9 8 8 8 7 6 5 4 3	3	2 2 7 8 9 9
9 9 8 7 7 2 0	2	3 3 4 4 5 6 7 7 7 8
8	1	2 2 2 5 5 9

Find the median and range for both sets of scores

STATISTICS Median =

Range =

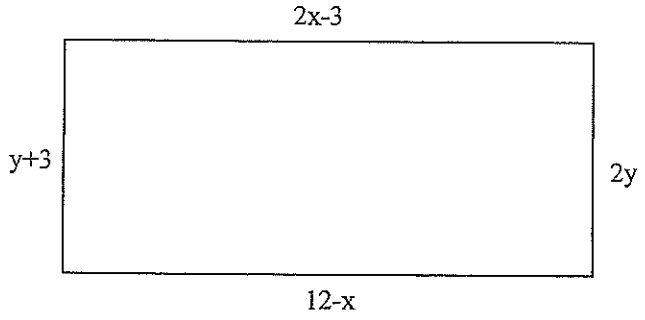
EQUATIONS Median =

Range =

Make a short considered statistical conclusion about the class performances in the two tests

(b) ALGEBRA

(i) Find the perimeter of the figure below in terms of x and y:

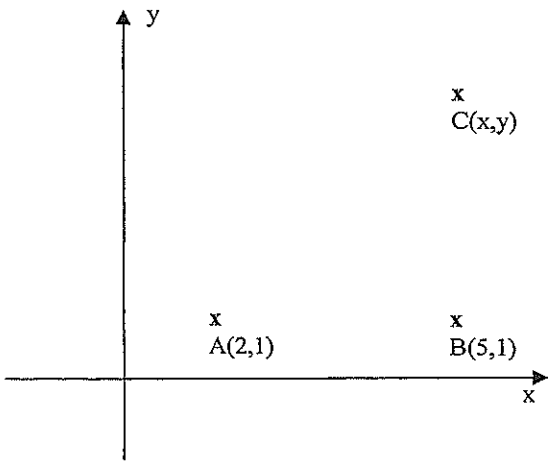


PERIMETER =

(ii) You also know that the figure is a rectangle measured in cm.
Find the values of x and y, and then give the perimeter in cm.

(c) THE NUMBER PLANE

On the number plane shown below, the points A(2,1), B (5,1) and C(x,y) are marked.



The triangle ABC is right-angled at B, and the length of the Hypotenuse AC is 5 units.

Find the co-ordinates of C. ***YOU MUST EXPLAIN ALL OF YOUR WORKING!***

(d) RATES

On a long journey from Closetown to Farville, two cars are travelling along the same deserted road. Car A has just passed a road sign which said "250 km to Farville" while car B has just passed one which said " 300 km to Farville".

Over the entire journey, Car A averages 80 kph while car B averages 100 kph.

(i) How long will it take for car B to catch up to car A?

(ii) How far will they be from Farville at that time?

(e) EQUATIONS

Two primary schools A and B do a survey on student hair colouring.

It is found that $(\frac{1}{5})^{th}$ of all students in School A have blond hair and that in school B this fraction is $\frac{1}{4}$.

School B has 100 fewer students than School A

The total number of blond-haired students in both schools is 65.

(i) Make the opening line of your proof " Let x be the number of students in School A"

Then, set out an equation showing the information above

(ii) Solve the equation

(iii) Answer the question: "How many students are there in School B?"

Name: SOLUTIONS Maths Class: .....

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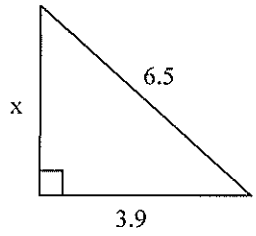
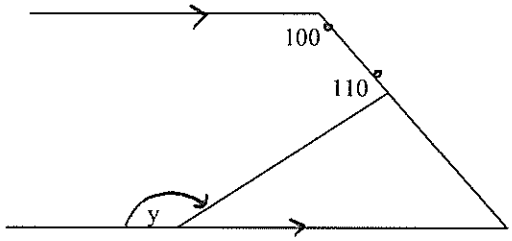
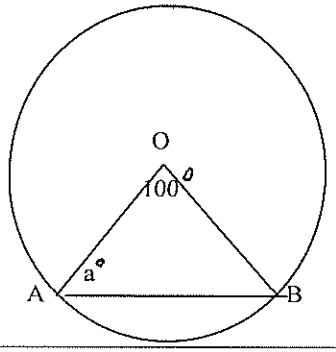
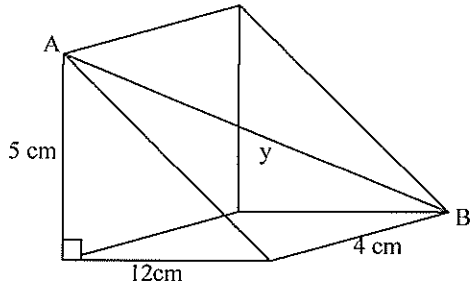
(FOR MARKERS USE ONLY)

TOPIC	PART B		PART C		TOPIC TOTAL
Statistics and Probability	QUEST 1	/10	(a)	/3	/13
Algebra	QUEST 2	/10	(b)	/3	/13
Number Plane	QUEST 3	/10	(c)	/3	/13
Rates and Ratio	QUEST 4	/10	(d)	/3	/13
Equations and Inequalities	QUEST 5	/10	(e)	/3	/13
				PART A	/10
				TOTAL	/75

PART A (10 Marks)

Each question is worth 1 mark.

		ANSWERS ONLY
1	Simplify $3a^2 - 5a^2$	$-2a^2$
2	Change 0.125 to a percentage	$12\frac{1}{2}\%$
3	Use a calculator to find x correct to 1 decimal place:  	5.2
4	Heath paid \$800 for a new computer, but after 3 months, decided to update, and sold it again for \$650. Express his loss as a percentage of his cost price.	18.75%
5	Find the value of y in the following diagram (no reasons are necessary):  	150°
6	Simplify $\frac{15a^3}{3a^2}$	$5a$
7	For this circle, O is the centre. The angle OAB (given by a) has a value of 40^0 At right, give a short reason why this is so.  	Base angles of an isosceles triangle (other reasons are ok but they must say this one)

8	 In the right triangular prism above, the line AB is y cm long Find the exact value of y (ie leave your answer as an irrational number)	$\sqrt{185}$
9	A pool, in the form of a rectangular prism, has dimensions 30m by 6m and a depth of 3 m. It is filled by a hose until it has been given 45 000 L of water. How high up the walls of the pool is the water level?	$1/4$ m
10	The letters of the word SCRABBLE are placed individually on cards and placed in a hat. Randomly, a card is drawn. What is the chance it is the letter B ?	$1/4$ or $2/8$

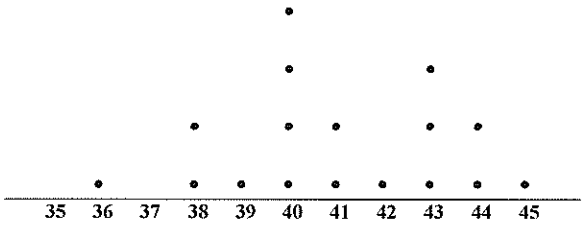
PART B

QUESTION 1: (10 MARKS) - STATISTICS and PROBABILITY

All questions are worth 1 mark unless stated otherwise

ANSWER COLUMN

(a) For the following dot-plot diagram, find the value of the median score:



41

(b) For the following set of scores, find (i) the range
(ii) the mode

2.1, 1.9, 1.8, 1.9, 2.0, 2.1, 1.9

(i) RANGE= 0·3
(Not 1·8 – 2·1)

(ii) MODE = 1·9

1 mark each

(c) A red die and a black die are tossed on a table. The number facing up on the red die is written on a piece of paper as the units digit of a two digit number while the number on the black die is written as the tens digit of the two digit number.
What is the probability that the number written on the piece of paper is a multiple of 5?

1/6

(d) Complete this table for the set of 21 scores listed below it

Class	Class Centre	Tally	frequency
1-5	3	||||	4
6 - 10	8	𝍸 |	6
11 – 15	13	𝍸	5
16 - 20	18	𝍸 |	6

1, 7, 15, 4, 4, 9, 10, 16, 17, 6, 14, 18, 6, 6, 14, 14, 17, 17, 5, 11, 17

1 for f column

1 for c.c. column

2 marks

(e) You are given the following frequency distribution table:

Score (x)	f	fx
24	2	48
25	3	75
26	3	78
27	7	189
28	5	140
	$\sum f = 20$	$\sum fx = 530$

(i) Complete the table **(2 marks)** 1 each Colums.

(ii) Find mean and the median

MEAN=

26.5

MEDIAN =

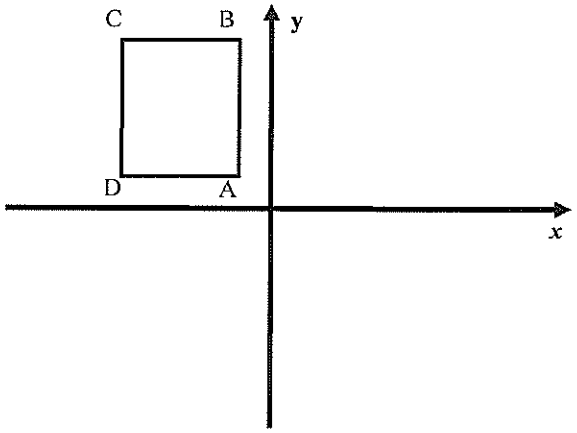
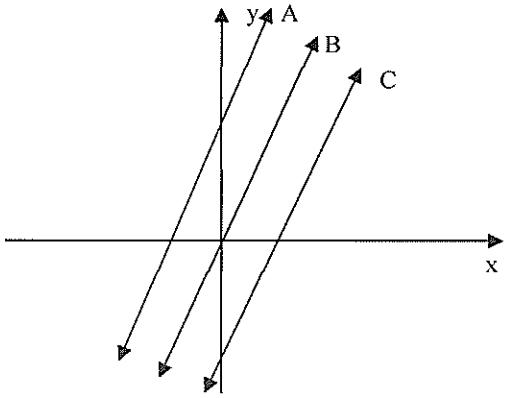
27.

1 mark each

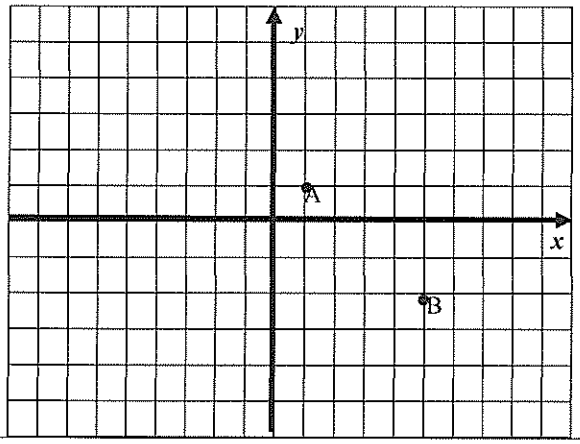
QUESTION 2: (10 MARKS) - ALGEBRA

All necessary working should be shown in the column provided at right.	**ANSWER and WORKING COLUMN**
(a) Simplify $\frac{2m}{3} \times \frac{6m}{10}$	$2m^2/5$ **1 mark**
(b) Simplify $\frac{4a}{3} + \frac{2a}{5}$	$26a/15$ **1 mark**
(c) Simplify $(2x^3)^3$	$8x^9$ **1 mark**
(d) Simplify $5a + 3(a-2)$	$8a - 6$ **1 mark**
(e) Simplify $\frac{x^2y}{5} \div \frac{xy}{10}$	$2x$ **1 mark**
(f) Expand and simplify $3-(x-4)$	$7 - x$ **1 mark**
(g) Expand and simplify $(2x+3)^2$	$4x^2 + 12x + 9$ **1 mark**
(h) Expand and simplify $4y(y+7) - 3y(2-y)$	$4y^2 + 28y - 6y + 3y^2$ ← (1) $= 7y^2 + 22y$ ← (1) **2 marks**
(i) Fully factorise $12x^2y - 6x^2$	$6x^2(2y-1)$ [NO OTHER ANSWER] **1 mark**

QUESTION 3: (10 MARKS) – NUMBER PLANE

	All questions are 1 mark unless indicated	**ANSWER and WORKING COLUMN**
(a)	Write down the equation of the line through the point A(3, -1) and parallel to the *x-axis*.	$y = -1$
(b)	On which axis is the point (0, -2) ?	y-axis.
(c)	The point $(k, -2)$ lies on the line $2x - 3y = 12$. Showing all working at right, find the value of k.	$2k + 6 = 12$ (1) $k = 3$ (1) **2 marks**
(d)	In the diagram below, A is the point (-1, 1), and B is (-1, 5) ABCD is a square.  Find the co-ordinates of the point C.	C (-5, 5)
(e)	On the accompanying number plane, which of the lines A, B, or C is most likely to be $y = 3x - 2$? 	C

(f) Find the distance between the points A(1,1) and B (5,-2) on the diagram below:



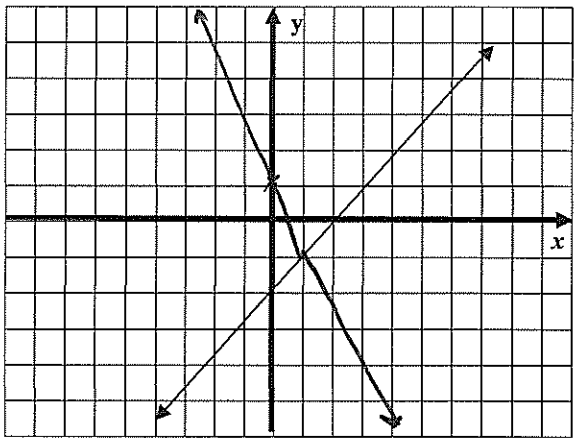
5

(g) On the diagram at right, the line $y = x - 2$ is drawn.

(i) On the same axes, draw the line $y = 1 - 2x$.

(ii) What are the co-ordinates of the point of intersection of the two lines?

(i)

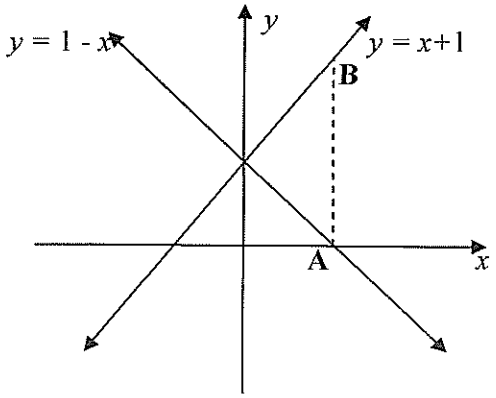


(ii) Point of intersection is: (1, −1)

Do not accept the answer without parentheses **2 marks**

(h) In the diagram below, the point A is where the line $y = 1 - x$ cuts the x-axis. B is vertically above A and lies on the line $y = x + 1$.

Find the y-co-ordinate of B.



A is (1, 0)

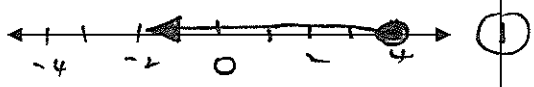
B is (1, 2)

1 mark

QUESTION 4: (10 MARKS) – RATES and RATIO

	All questions are 1 mark unless indicated	ANSWER and WORKING COLUMN
(a)	Convert the ratio $3\frac{1}{2}:\frac{1}{4}$ to a simple ratio with no fractions.	14 : 1
(b)	Mr Parrish runs 100m in 12 seconds. Convert this to km/hr	30 kph.
(c)	To make pink paint, red paint is mixed with white in the ratio of 5:2. How much red paint is needed to make 17.5 L of this pink paint mix?	12.5 L
(d)	5 men take 3 hours to build a fence. If they all work at the same rate, how long would it have taken 2 men to build the same fence?	7 ½ hours
(e)	A concrete mixture is made up of cement, sand and blue metal in the ratio $\frac{1}{2}:6:6$ How many shovels of cement are required to make up 50 shovels of concrete?	2 Shovels
(f)	Michael Clarke wins the toss in the Test matches against Sri Lanka in the First and Second Tests. As he walks out to toss the coin in the third test, Richie Benaud says he has a 1 in 3 chance of winning the toss this time because it is a 3-Test series, Ian Chappell says it is 1 in 2 because it is a 2-sided coin while Mark Taylor says it is more like 1 in 8 because the chance of winning the first two in a row was 1 in 4. Who is correct? **A.** Richie **B.** Ian **C** Mark **D** None of them	B
(g)	In a box of marbles there are 120 red and 80 black ones. Black ones are put into the box until the ratio is 5:4. How many black ones were added?	5 : 4 = 120 : 96 } (1) 16 (1) **2 marks**
(h)	Water is pumped into a tank at a rate of 30L/hour. How long will it take to fill a 3 cubic metre tank?	(1) → 3000 L @ 30 L/hr = 100 hrs (1) **2 marks**

QUESTION 5: (10 MARKS) – EQUATIONS, INEQUALITIES

All questions are 1 mark unless indicated	ANSWER and WORKING COLUMN
(a) Give the inequality for the values of x plotted on the number line below:  	$x > -2$
(b) Solve the following equation, showing all steps: $4(x+5)=31$	$4x+20=31$ $4x=11$ $x=11/4$
(c) Solve the following equation, showing all steps: $\frac{x}{2}=3x-1$	$x=6x-2$ (1) $5x=2$ $x=2/5$ (1) ((1) for 5/2) **2 marks**
(d) Solve the inequality $6x-4\le 2x+12$ in the space provided at right and <u>plot the solution</u> on the number line provided.	$4x-4\le 12$ $4x\le 16$ $x\le 4$ (1)  (1) **2 marks**
(e) Solve for x: $\frac{x+1}{3}=\frac{2x-1}{4}$	$4x+4=6x-3$ ← (1) $2x=7$ $x=7/2$ ← (1) (1) for 2/7 **2 marks**

(f) There is an error in one of the lines of the "solution" below, which has led to an incorrect answer.

Identify the line in which the error occurred AND state what the error was.

Question: $3 - x < 2\frac{1}{2}$

Line A: $2(3 - x) < 5$

Line B: $6 - 2x < 5$

Line C: $-2x < -1$

Line D: $x < \frac{1}{2}$

Line D (1)

you must change the inequality sign when you divide by a negative (1)

2 marks

PART C

HARDER QUESTIONS

Each question is worth 3 marks

(a) STATISTICS

The following is a back-to-back stem-and-leaf plot showing the performance of 29 year 8 boys in two topic tests.

The marks for both tests were out of 50.

The marks on the left were for statistics, while those on the right were for equations.

Leaf	STEM	Leaf
0 0 0	5	
9 8 8 5 4 3 2	4	1 5 6 7 7 9 9
9 9 9 8 8 8 7 6 5 4 3	3	2 2 7 8 9 9
9 9 8 7 7 2 0	2	3 3 4 4 5 6 7 7 7 8
8	1	2 2 2 5 5 9

Find the median and range for both sets of scores

STATISTICS Median = 38 Range = 32 } (1)

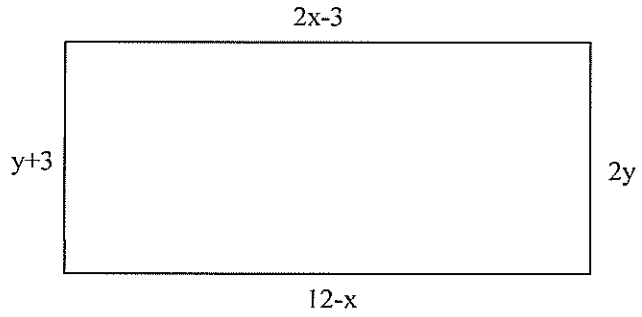
EQUATIONS Median = 27 Range = 37 } (1)

Make a short considered statistical conclusion about the class performances in the two tests

The class was better at and for more consistent at STATISTICS than EQUATIONS

(b) ALGEBRA

(i) Find the perimeter of the figure below in terms of x and y:



PERIMETER = $x + 9 + 3y + 3 = x + 3y + 12$ (1)

(ii) You also know that the figure is a rectangle measured in cm.
Find the values of x and y, and then give the perimeter in cm.

$2x - 3 = 12 - x$ and $2y = y + 3$

$3x = 15$

$x = 5$

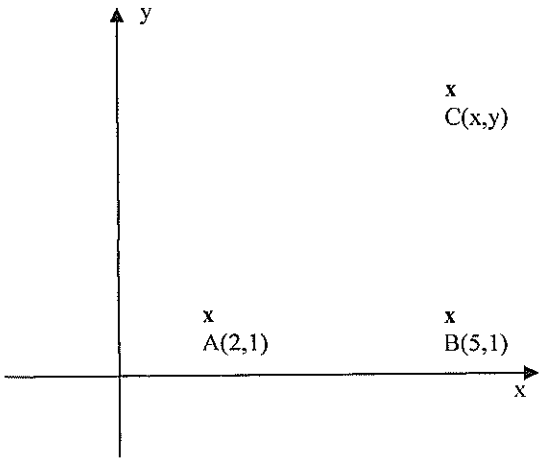
$y = 3$ (1)

(1)

PERIMETER = 26 cm.

(c) THE NUMBER PLANE

On the number plane shown below, the points A(2,1), B (5,1) and C(x,y) are marked.



The triangle ABC is right-angled at B, and the length of the Hypotenuse AC is 5 units.

Find the co-ordinates of C. ***YOU MUST EXPLAIN ALL OF YOUR WORKING!*** (1)

Since AC = 5 and AB = 3 then BC = 4 (right angled Δ)

∴ C is (5, 5)

(1) (1)

(d) RATES

On a long journey from Closetown to Farville, two cars are travelling along the same deserted road. Car A has just passed a road sign which said "250 km to Farville" while car B has just passed one which said " 300 km to Farville".

Over the entire journey, Car A averages 80 kph while car B averages 100 kph.

(i) How long will it take for car B to catch up to car A?

Needs to catch up 50 km @ 20 kph.

∴ It takes 2½ hours (1)

(ii) How far will they be from Farville at that time?

Car A travels 2½ × 80 = 200 km (1)

∴ 50 km from Farville (1)

(e) EQUATIONS

Two primary schools A and B do a survey on student hair colouring.

It is found that $(\frac{1}{5})^{th}$ of all students in School A have blond hair and that in school B this fraction is $\frac{1}{4}$.

School B has 100 fewer students than School A

The total number of blond-haired students in both schools is 65.

(i) Make the opening line of your proof " Let x be the number of students in School A"

Then, set out an equation showing the information above

(ii) Solve the equation

(iii) Answer the question: "How many students are there in School B?"

let the no of students in School A be x.

$\therefore \frac{x}{5} + \frac{1}{4}(x - 100) = 65$ (1)

$\therefore 4x + 5x - 500 = 1300$

$\therefore 9x = 1800$

$x = 200$ (1)

$\therefore$ There are 100 students in School B (1)