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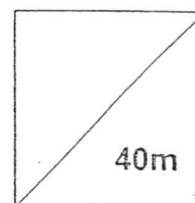
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Name: _____ ()

Class: _____



GREENDALE SECONDARY SCHOOL

Mid - Year Examination 2014

MATHEMATICS**4016/01**

Paper 1

14 May 2014

Secondary 2 Normal Academic

1 hour

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.

Write in dark or blue pen.

You may use a soft pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

If working is needed for any question it must be shown with the answer.

Omission of essential working may result in loss of marks.

You are expected to use a scientific calculator to evaluate explicit numerical expressions.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142, unless the question required the answer in terms of π .

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is **40**.

Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Strand	A	A	A	A	A	A	G	S	S	G
Marks										

This document consists of 10 printed pages, including this cover page.

Mathematical Formulae

Compound interest

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curve surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector Area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

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

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$

Answer **all** questions.

1. Expand and simplify

(a) $-2(2x - 3) + 4x,$ [2]

(b) $5(x - 1) + 3(2x - 5),$ [2]

(c) $(2x - 3)^2.$ [2]

Ans: (a) _____

(b) _____

(c) _____

2. Factorise

(a) $14c - 21,$

[1]

(b) $x^2 - 16y^2,$

[1]

(c) $2y^2 + 9y - 5 .$

[2]

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Ans: (a) _____

(b) _____

(c) _____

3. Simplify

(a) $\frac{8p}{3q} \times \frac{9pq}{2p^2}$, [2]

(b) $\frac{3b^2}{4} \div \frac{12b}{5c}$. [2]

Ans: (a) _____

(b) _____

4. Write $\frac{2x}{3} - \frac{5(x-2)}{3}$ as a single fraction in its simplest form. [2]

Ans: _____

5. Solve the equation.

$$3(7 - r) = 12$$

[2]

Ans: (a) _____

-
6. (a) Solve $4x - 3 \leq 15$.

[2]

- (b) Hence, write down the greatest integer value of x .

[1]

Ans: (a) _____

(b) _____

7. (a) Complete the table of values for $2y = x - 1$.

[2]

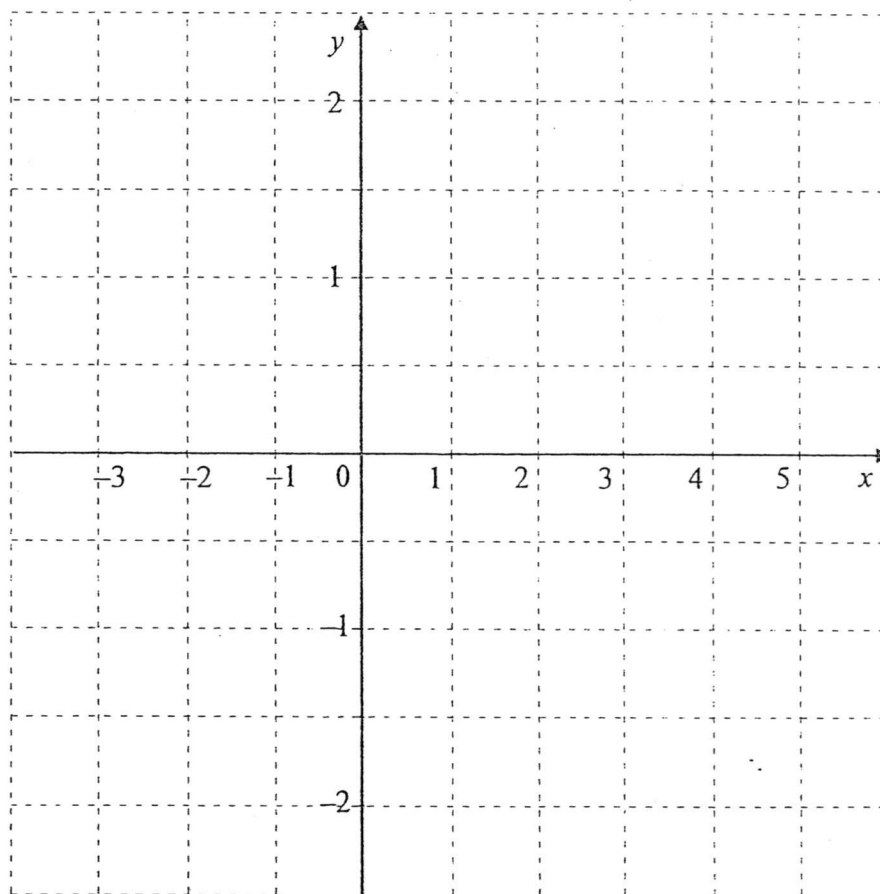
x	-3	-1	1	3	5
y	-2		0	1	

- (b) On the grid below, draw the line $2y = x - 1$.
 (c) Write down the coordinates of the point where this line crosses the y-axis.
 (d) Find the gradient of this line.

[2]

[1]

[1]



Ans: (c) _____

(d) _____

8. The stem-and-leaf diagram below shows the distance travelled to school every week by each student in a class.

Distance travelled	
1	0 1 2 2 5
2	1 1 1 1 5 7 9
3	0 2 3 4 4 4 6 6 7 8
4	1 1 1 3 3 4 8
5	0 1 7

Key: 2|1 represents 21 km

- (a) Find the greatest distance. [1]
- (b) Find the number of students in the class. [1]
- (c) What is the median distance travelled? [1]
- (d) What is the modal distance travelled? [1]

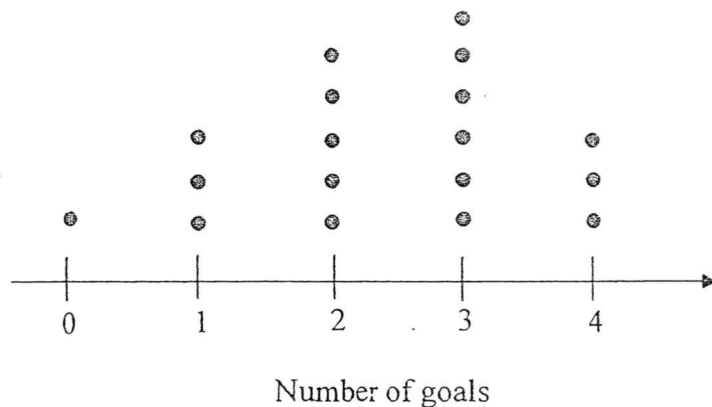
Ans: (a) _____ km

(b) _____

(c) _____ km

(d) _____ km

9. The dot diagram below shows the number of goals scored by a soccer team in a season.



- (a) Using the data from the dot diagram above, complete the frequency table below. [2]

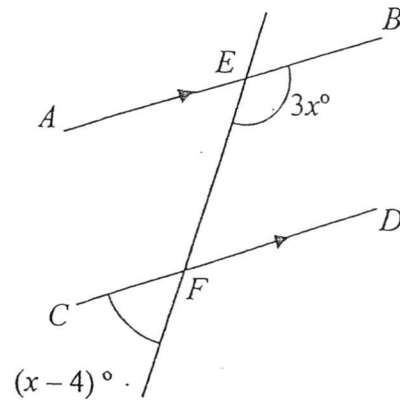
Number of goals	Frequency (f)	fx
0	1	0
1	3	3
2		10
3		
4	3	
Total $f =$		Total $fx =$

- (b) Hence, using the results from (a), calculate the mean number of goals scored by the team in this season. [2]

Ans: (b) _____

- 10 (a) In the diagram, straight lines AEB and CFD are parallel.

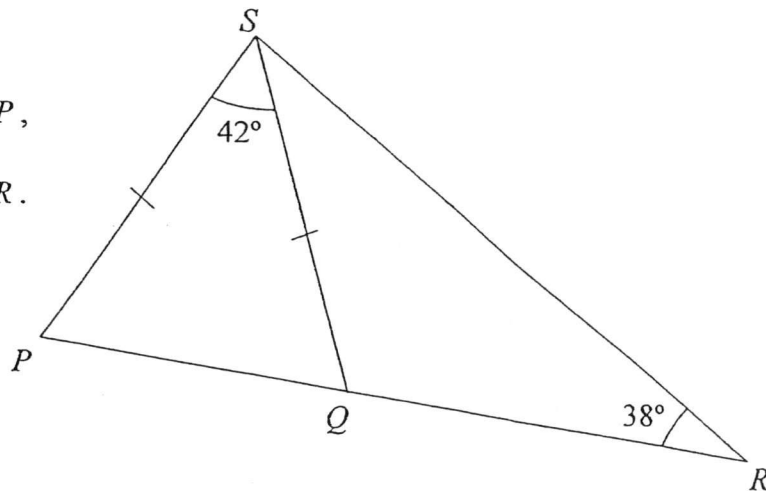
Find, stating with reasons, the value of x .



- (b) In the diagram, PQR is a straight line.
 $PS = QS$, $\angle PSQ = 42^\circ$ and $\angle QRS = 38^\circ$.

Find

- (i) $\angle SQP$,
(ii) $\angle QSR$.



Answer (a) $x =$ _____ [3]

(b)(i) $\angle SQP =$ _____ $^\circ$ [1]

(ii) $\angle QSR =$ _____ $^\circ$ [1]

End of Paper

For Examiner's
Use Only

Answer all questions.

1. Expand and simplify

(a) $-2(2x-3)+4x,$

[2]

(b) $5(x-1)+3(2x-5),$

[2]

(c) $(2x-3)^2.$

[2]

$$-2(2x-3)+4x = -4x+6+4x$$

----- M1

$$= 6$$

----- A1

$$5(x-1)+3(2x-5) = 5x-5+6x-15$$

----- M1

$$= 11x-20$$

----- A1

$$(2x-3)^2 = (2x)^2 - 2(2x)(3) + (3)^2$$

----- M1

$$= 4x^2 - 12x + 9$$

----- A1

Ans: (a) _____

(b) _____

(c) _____

For Examiner's
Use Only

2. Factorise

(a) $14c-21,$

[1]

(b) $x^2-16y^2,$

[1]

(c) $2y^2+9y-5.$

[2]

$$14c-21 = 7(2c-3)$$

----- B1

$$x^2-16y^2 = (x+4y)(x-4y)$$

----- B1

$$2y^2+9y-5 = (2y-1)(y+5)$$

----- B2

Ans: (a) _____

(b) _____

(c) _____

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Use Only

3. Simplify

(a) $\frac{8p}{3q} \times \frac{9pq}{2p^2}$ [2]

(b) $\frac{3b^2}{4} + \frac{12b}{5c}$ [2]

$$\frac{8p}{3q} \times \frac{9pq}{2p^2} = \frac{4}{1} \times \frac{3}{1}$$
$$= 12$$

----- M1
----- A1

$$\frac{3b^2}{4} + \frac{12b}{5c} = \frac{3b^2}{4} \left(\frac{5c}{12b} \right)$$
$$= \left(\frac{b}{4} \right) \left(\frac{5c}{4} \right)$$

----- M1

$$= \frac{5bc}{16}$$

----- A1

Ans: (a) _____

(b) _____

4. Write $\frac{2x}{3} - \frac{5(x-2)}{3}$ as a single fraction in its simplest form. [2]

$$\frac{2x}{3} - \frac{5(x-2)}{3} = \frac{2x - 5(x-2)}{3}$$
$$= \frac{2x - 5x + 10}{3}$$

----- M1

$$= \frac{10 - 3x}{3}$$

----- A1

Ans: _____

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Use Only

5. Solve the equation.

$$3(7-r) = 12$$
 [2]

$$3(7-r) = 12$$

$$21 - 3r = 12$$

$$r = \frac{9}{3}$$

$$r = 3$$

----- M1

----- A1

Ans: (a) _____

6. (a) Solve $4x - 3 \leq 15$. [2](b) Hence, write down the greatest integer value of x . [1]

$$4x \leq 18$$

----- M1

$$x \leq \frac{18}{4}$$

$$x \leq 4\frac{1}{2}$$

----- A1

Greatest integer value of $x = 4$ ----- B1

Ans: (a) _____

(b) _____

7. (a) Complete the table of values for $2y = x - 3$.

[2]

x	-3	-1	1	3	5
y	-2	-1 - B1	0	1	2 - B1

- (b) On the grid below, draw the line $2y = x - 1$.

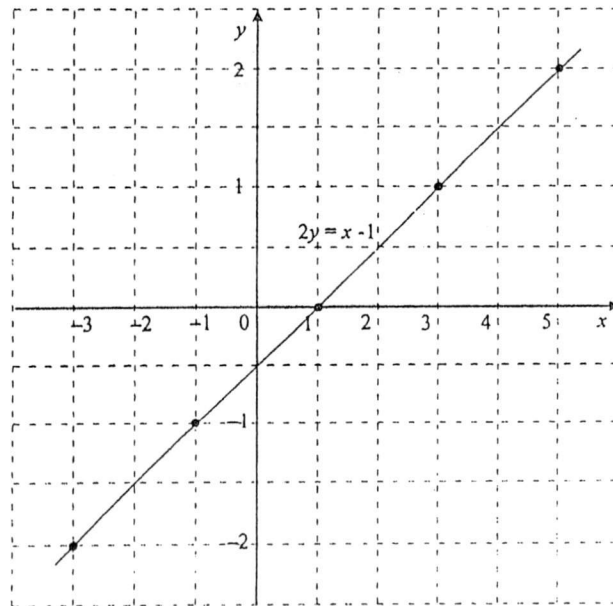
[2]

- (c) Write down the coordinates of the point where this line crosses the y-axis.

[1]

- (d) Find the gradient of this line.

[1]



M1- Plot points correctly
A1- Draw line and label

Ans: (c) (0, -0.5) B1

(d) 0.5 B1

8. The stem-and-leaf diagram below shows the distance travelled to school every week by each student in a class.

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[1]

Distance travelled	
1	0 1 2 2 5
2	1 1 1 1 5 7 9
3	0 2 3 4 4 4 6 6 7 8
4	1 1 1 3 3 4 8
5	0 1 7

Key: 2|1 represents 21 km

- (a) Find the greatest distance.

[1]

- (b) Find the number of students in the class.

[1]

- (c) What is the median distance travelled?

[1]

- (d) What is the modal distance travelled?

[1]

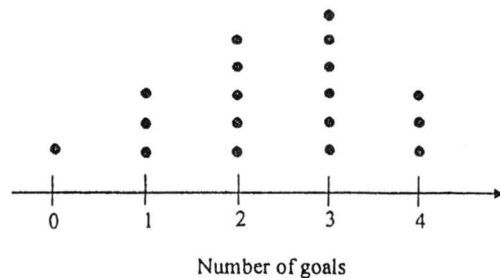
Ans: (a) 57 B1 km

(b) 32 B1

(c) 34 B1 km

(d) 21 B1 km

9. The dot diagram below shows the number of goals scored by a soccer team in a season.



- (a) Using the data from the dot diagram above, complete the frequency table below. [2]

Number of goals	Frequency (f)	fx
0	1	0
1	3	3
2	5	10
3	6	18
4	3	12
Total $f = 18$		Total $fx = 43$

1 mark for every 2 correct answers

- (b) Hence, using the results from (a), calculate the mean number of goals scored by the team in this season. [2]

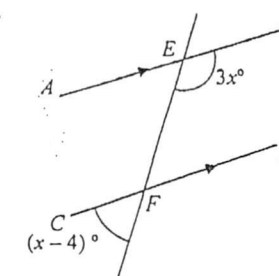
$$\text{Mean} = \frac{\sum fx}{\sum f} = \frac{43}{18} = 2.39$$

----- M1
----- A1

Ans: (b) _____

- 10 (a) In the diagram, straight lines AEB and CFD are parallel.

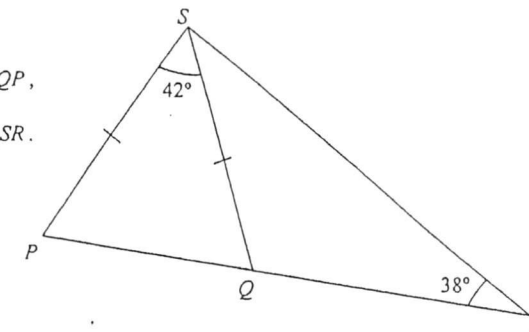
Find, stating with reasons, the value of x .



- (b) In the diagram, PQR is a straight line. $PS = QS$, $\angle PSQ = 42^\circ$ and $\angle QRS = 38^\circ$.

Find

- (i) $\angle SQP$,
(ii) $\angle QSR$.



$$3x^\circ + (x - 4)^\circ = 180^\circ \quad \text{-----M1}$$

Reason: Angles on a straight line = 180° -----M1

$$x = 44 \quad \text{-----A1}$$

$$\angle SQP = \frac{180 - 42}{2} = 69^\circ \quad \text{-----B1}$$

$$\angle QSR = 180^\circ - 69^\circ - 38^\circ - 42^\circ = 31^\circ \quad \text{-----B1}$$

Answer (a) $x =$ _____ [2]

(b)(i) $\angle SQP =$ _____ $^\circ$ [1]

(ii) $\angle QSR =$ _____ $^\circ$ [1]

End of Paper

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Section A

Answer all questions.

1. A submarine is 95m below the surface of the sea.
- (a) A helicopter is directly above the submarine and 881m above the surface of the sea. Find the height of the helicopter above the submarine. [1]
- (b) A bird is 150m above the submarine. Find the height of the bird above the surface of the sea. [1]
- (c) Find the height of the helicopter above the bird. [1]

2. A road is 0.2 km long. It is represented by a distance of 4 cm on a map.
- (a) Express the scale of the map in the form $1 : n$. [2]
- (b) If a drain on the map is 0.25 km long, find its length on the map. [2]
- (c) On the map, the area of a forest is 10 cm^2 . Calculate the real area of the forest in square kilometres. [2]

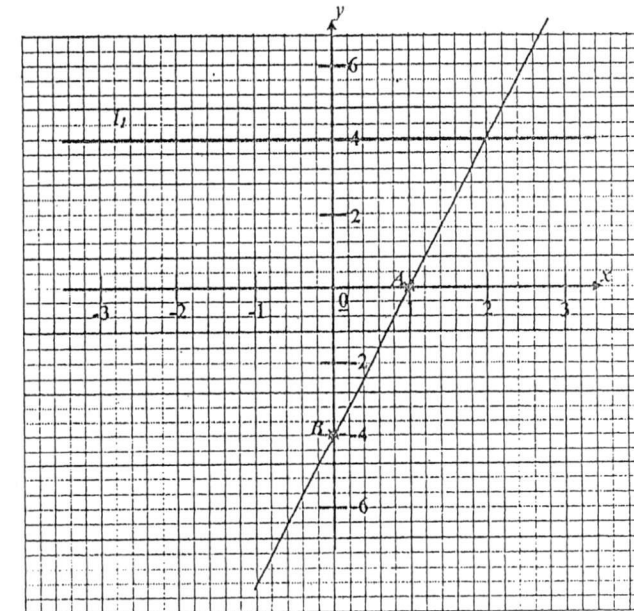
3. (a) Factorise $x^2 + 5x + 6$. [2]
- (b) Hence, simplify $\frac{x^2 + 5x + 6}{x^2 - 4}$. [2]

4. Solve the following equations.
- (a) $4(x - 7) - 3(2x + 1) = 15$, [3]
- (b) $\frac{2x}{5} - \frac{x}{3} = 3$, [2]
- (c) $\frac{x+1}{3} + 2x = 10$. [3]

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5. A bus can carry p passengers seated and 12 passengers standing.
- (a) Write an expression, for the maximum number of passengers that can be carried on b buses. [1]
- (b) Given that $p = 52$, find the least number of buses required to carry 500 passengers. [2]

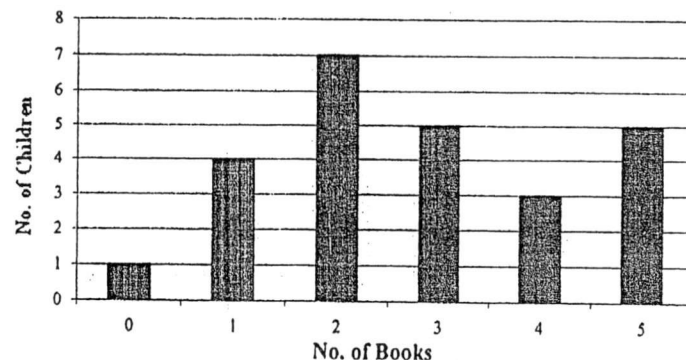
6.



Using the graph given above, answer the following questions.

- (a) find the coordinates of point A, [1]
- (b) find the coordinates of point B, [1]
- (c) find the equation and the gradient of line l_1 , [2]
- (d) calculate the gradient of line AB, [1]
- (e) find the coordinates where line AB meets line l_1 . [1]

7. A group of 25 children were asked how many books they had read last month. The results of the survey are shown in the bar chart below.



- (a) How many children read at least 3 books? [1]
(b) What is the percentage of children who read less than 2 books? [2]
(c) Find the total number of books read by the group of 25 children. [2]

Section B

Choose 2 out of 3 questions.

8. Answer the whole question on a piece of graph paper.

The following table shows some corresponding values of x and y for the function $y = 2x - 5$.

x	-2	-1	0	1	2
y	-9	a	-5	-3	-1

- (a) Find the value of a . [1]
(b) Using 4 cm to represent 1 unit on the x -axis and 2 cm to represent 1 unit on the y -axis, draw the graph of $y = 2x - 5$ for $-2 \leq x \leq 2$. [3]
(c) From your graph, find the value of y when $x = -1.5$. [1]

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9. The table below shows the masses, in kilograms, of 20 people.

56	64	71	63	78
59	68	64	58	56
62	73	72	54	78
52	67	78	66	79

- (a) Copy and complete an ordered stem and leaf diagram for this data. [3]

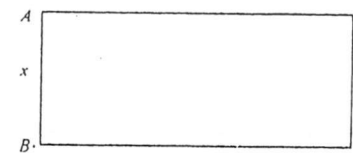
Masses	
5	2
6	
7	

- (b) Find the median mark. [1]
(c) What is the percentage of people who are less than 70kg? [1]

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10. The diagram shows a rectangle, $ABCD$, with $AB = x$ centimetres. The area of the rectangle is 44 cm^2 .

- (a) Find expressions, in terms of x , for
(i) the length of AD , [1]
(ii) the perimeter, P centimetres, of the rectangle. [1]
(b) The perimeter of the rectangle is 27 cm.
Show that $2x^2 - 27x + 88 = 0$. [2]
(c) If $AB = x$ centimetres, and $AC = (x - 2)$ centimetres now, write down an expression, in terms of x , for the area of the rectangle. [1]



End-of-Paper

Mid-Year Exam 2014
Secondary 2 (Normal Academic) Mathematics Paper 2

1	(a)	$881 + 95 = 976 \text{ m}$ -----B1	6	(a)	$(1, 0)$ ----- B1						
	(b)	$150 - 95 = 55 \text{ m}$ -----B1		(b)	$(0, -4)$ ----- B1						
	(c)	$881 - 55 = 826 \text{ m}$ -----B1		(c)	$y = 4$ ----- B1 Gradient = 0 ----- B1						
2	(a)	$0.2 \text{ km} = 20000 \text{ cm}$ ----- M1 4: 20000 1:5000 ----- A1		(d)	Gradient = 4 ----- B1						
	(b)	$1 \text{ cm} = 0.05 \text{ km}$ ----- M1 $5 \text{ cm} = 0.25 \text{ km}$ ----- A1		(e)	$(2, 4)$ ----- B1						
	(c)	$1 \text{ cm}^2 = 0.0025 \text{ km}^2$ ----- M1 $10 \text{ cm}^2 = 0.025 \text{ km}^2$ ----- A1	7	(a)	$5+3+5 = 13$ ----- B1						
3	(a)	$(x+3)(x+2)$ ----- B2		(b)	$\frac{5}{25} \times 100\%$ ----- M1 $= 20\%$ ----- A1						
	(b)	$\frac{(x+3)(x+2)}{(x-2)(x+2)}$ ----- M1 $\frac{(x+3)}{(x-2)}$ ----- A1	8	(a)	$a = -7$ ----- B1						
4	(a)	$4x - 28 - 6x - 3 = 15$ ----- M1 $x = \frac{15+31}{-2}$ ----- M1 $x = \frac{46}{-2} = -23$ ----- A1		(b)	1 mark: Plot all points 1 mark: Draw line within range and label 1 mark: Correct scale						
	(b)	$\frac{6x-5x}{15} = 13$ ----- M1 $x = 45$ ----- A1		(c)	$y = -8$ ----- B1						
	(c)	$x+1 = 3(10-2x)$ ----- M1 $7x = 29$ ----- M1 $x = \frac{29}{7} = 4\frac{1}{7}$ ----- A1	9	(a)	1 mark: Legend 1 mark: Table with ordered numbers 1 mark: Correct sequence						
5	(a)	1 bus = $(p+12)$ b buses = $b(p+12)$		Masses							
	(b)	1 bus = $(52+12) = 64$ people No. of buses = $\frac{500}{64}$ ----- M1 $= 7.81 = 8$ buses ----- A1		<table><tr><td>5</td><td>2 4 6 6 8 9</td></tr><tr><td>6</td><td>2 3 4 4 6 7 8</td></tr><tr><td>7</td><td>1 2 3 8 8 8 9</td></tr></table> Key: 5 2 represents 52 kg		5	2 4 6 6 8 9	6	2 3 4 4 6 7 8	7	1 2 3 8 8 8 9
5	2 4 6 6 8 9										
6	2 3 4 4 6 7 8										
7	1 2 3 8 8 8 9										

9 (b)	Median = $\frac{64 + 66}{2} = 65$ -- B1	
9 (c)	$\frac{13}{20} \times 100\%$ $= 65\%$ ----- A1	
10(ai)	$\frac{44}{x}$	B1
10(aii)	$2(x + \frac{44}{x})$	B1
10(b)	$2x + \frac{88}{x} = 27$	
	$\frac{88}{x} = 27 - 2x$	M1
	$2x^2 - 27x + 88 = 0$	A1
10(c)	$x(x - 2)$	B1