Bowen Secondary School
Mid Year Examination 2016
Secondary 2 Express Mathematics Paper 1

For Examiner's use

1 Express $\frac{3}{x+1} - \frac{5}{3x+2}$ as a single fraction in its simplest form

Answer: (a) _____ [2]

2 A map is drawn to a scale of 1 : 250 000. A vibrant city called Serangoon Street covers an area of 700 km^2. Find, in cm^2, the area representing the city on the map.

Answer: _____ cm^2 [2]

3 It is given that $V = \frac{1}{3}\pi r^2 h$.

(a) Find V when $r = 15$ and $h = 8$. Leave your answer in terms of π.

(b) Express r in terms of V, h and π.

Answer: (a) _____ [1]

(b) _____ [2]

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4 Expand and simplify

(a) $\left(\frac{y}{3}-3\right)^2$

(b) $(2w+3)^2+4w(1-w)$

Answer: (a) _____ [2]

(b) _____ [2]

5 Solve the following equations.

(a) $2(z+3)-5(1-z)=7$

(b) $\frac{x-2}{2x+1}=\frac{1}{4}$

Answer: (a) _____ [2]

(b) _____ [3]

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6 (a) Express $\frac{1}{x-2} \times \frac{6-x-x^2}{1-x}$ as a single fraction

(b) Hence, or otherwise, solve the equation $\frac{1}{x-2} \times \frac{6-x-x^2}{1-x} = 5$.

Answer: (a) _____ [2]

(b) _____ [2]

7 The sum of the squares of three consecutive positive even numbers is 251. Find the middle number.

Answer: _____ [3]

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8 Simplify each of the following.

(a) $\dfrac{3x+9}{x+1} \div \dfrac{(x+3)^2}{x^2+4x+3}$

(b) $\dfrac{1}{x-1} + \dfrac{x-1}{1-x^2}$

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Answer: (a) _____ [2]

(b) _____ [3]

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9 Solve the following simultaneous equation.

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$$2x + 3y = -2.5$$
$$3x - 4y + 25 = 0$$

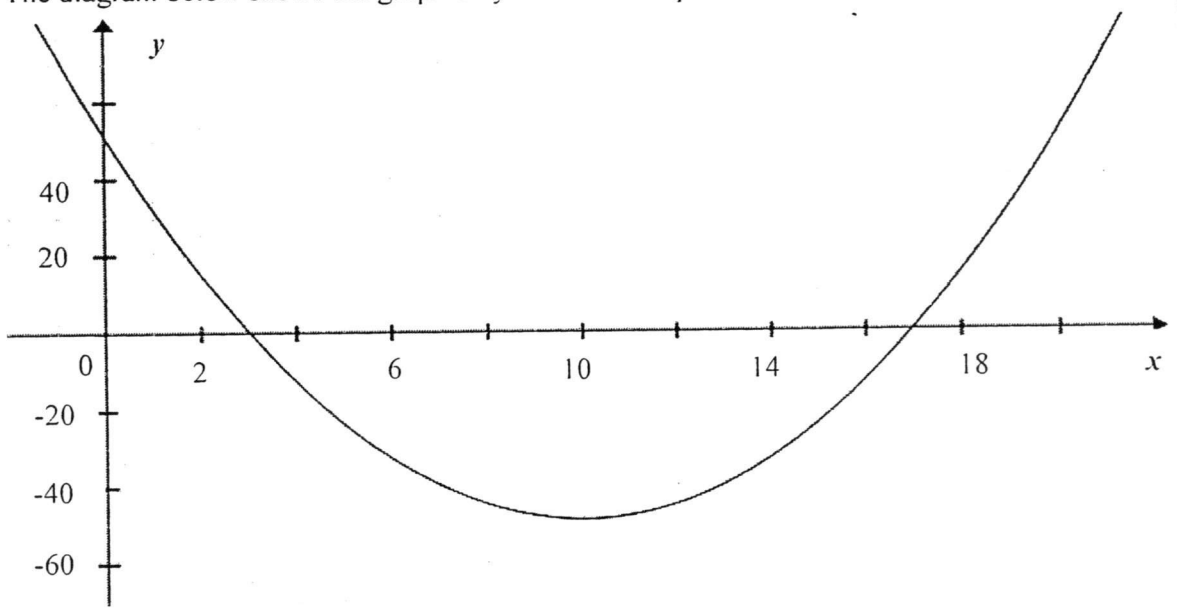
Answer: $x =$, $y =$ [3]

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10 The diagram below shows the graph of $y = x^2 - 20x + p$.

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(a) State the coordinates of the minimum point of the graph.

(b) Use the graph above to find the values of x when $y = -40$.

(c) Find the value of p.

Answer: (a) _____ [1]

(b) $x =$ _____ or _____ [2]

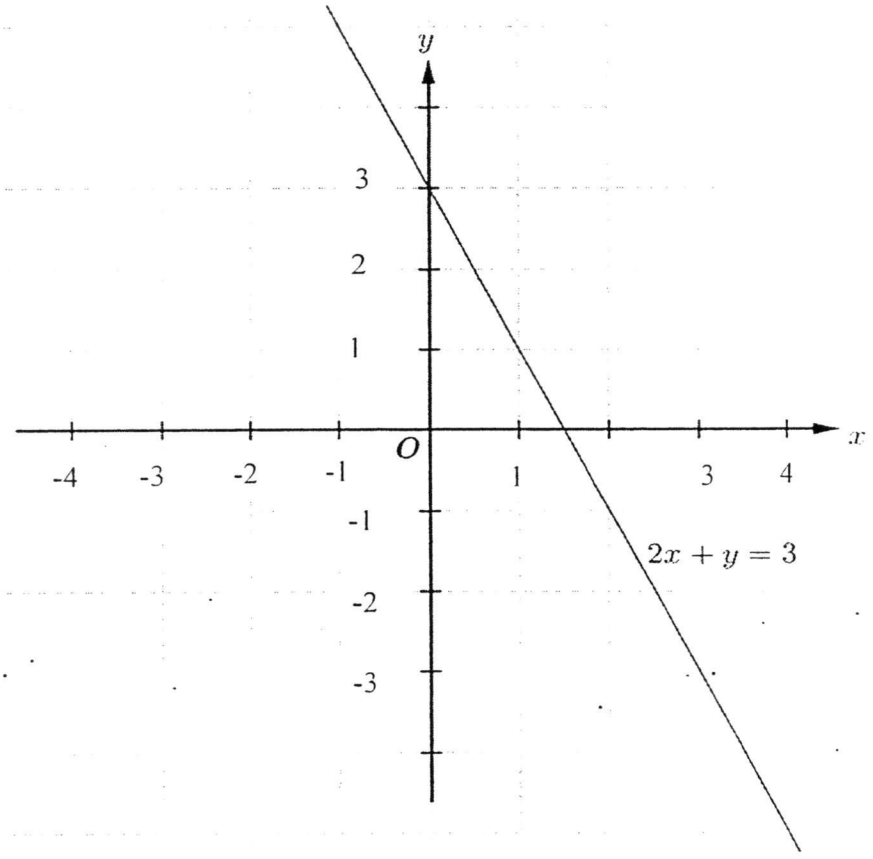
(c) _____ [2]

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11 The graph below shows a line representing the equation $2x + y = 3$.

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(a) Draw and label the line representing the equation $y = \frac{1}{2}x - 2$ on the same diagram above.

(b) Hence, solve the simultaneous linear equation.

$$2x + y = 3$$
$$y = \frac{1}{2}x - 2$$

(c) Write down the equation of a line that passes through the origin, given that the gradient of the line is - 2.

Answer: (a) Draw on diagram [1]

(b) $x =$, $y =$ [2]

(c) $y =$ [1]

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12 A two-digit number is equal to 4 times the sum of its digits. If the digits of the number are reversed, the new number formed is 27 more than the original number. Find the original number.

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Answer: _____ [3]

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13 Factorise each of the following.

(a) $7ax - 21x + 12 - 4a$

(b) $(a+3b)^2 - (2c+d)^2$

(c) $(4x+1)^2 - 2(4x+1) - 15$

Answer: (a) _____ [2]

(b) _____ [2]

(c) _____ [3]

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Answer Scheme

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Qn no.	Answer
1	$\frac{4x+1}{(x+1)(3x+2)}$
2	112 cm^2
3a	600 ¶
3b	r = ±
4a	$-\frac{x^3}{5}-2y^2+9$
4b	$16w+9$
5a	$\frac{6}{7}$
5b	$4\frac{1}{2}$
6a	$\frac{x+3}{x-1}$
6b	2
7	9
8a	3
8b	$\frac{2}{(1-x)(1+x)}$
9	$x=-5, y=2.5$
10a	(10, -50)
10b	$x=7$ *or* $x=13$
10c	$p=91$
11b	$x=2, y=-1$
11c	$y=-2x$
12	36

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Answer **all** the questions

1 An island of area 51.84 km^2 is represented on a map by an area of 0.81 cm^2.

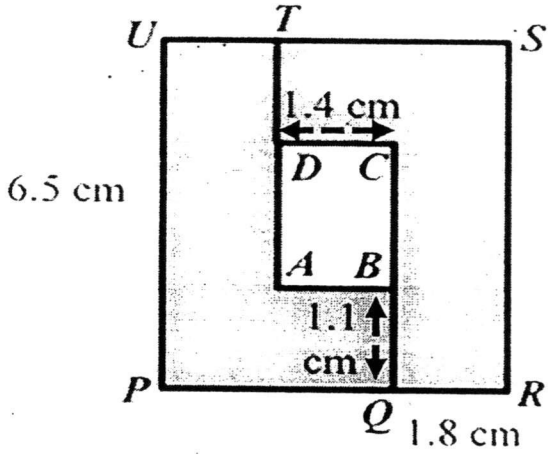
(a) Express the scale of the map in the form 1 : n. [2]

(b) Explain what the scale in (a) means. [1]

(c) Two points on the island are 0.8 cm apart on the map. Calculate the actual distance between these two points in metres. [2]

(d) Calculate the area of the island represented on another map with a scale of 1 cm to 5 km. [2]

2 (a) In the diagram below, $PQBATU$ is congruent to $STDCQR$. Given $BQ = 1.1$ cm, $CD = 1.4$ cm , $PU = 6.5$ cm and $QR = 1.8$ cm, find



(a) the length of BC, [1]

(b) the area of the shaded portion. [2]

3 Given that y is inversely proportional to the cube root of x and that $y = 6$ when $x = 8$. Find

(a) the equation connecting y and x, [2]

(b) the value of y when $x = 216$, [1]

(c) the value of x when $y = 8$. [2]

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4 Ali's car can travel $2.5x$ kilometres for every litre of petrol used. He used 100 litres of petrol in the month of March.

(a) Write down an expression for the distance Ali's car travelled in March. [1]

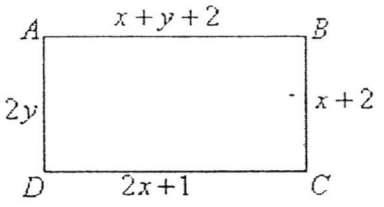
Joe's car can travel $(x^2 - 3.42)$ kilometres for every litre of petrol used.

(b) Write down an expression for the distance travelled by Joe's car if he used 100 litres of petrol. [1]

(c) Joe's car can travel 8 kilometres more than Ali's car, if 100 litres of petrol is used. Form an equation in x and show that it reduces to $2x^2 - 5x - 7 = 0$. [2]

(d) Solve this equation to find the distance travelled by Joe's car for every litre of petrol used. [3]

5 The diagram below shows a rectangle, $ABCD$ such that, $AB = x + y + 2$, $AD = 2y$, $DC = 2x + 1$, $BC = x + 2$. All dimensions are in cm.



(a) Write down two equations connecting x and y. Make x the subject for both equations. [3]

(b) Solve the two simultaneous equations. [2]

(c) Find the perimeter of the rectangle. [2]

6 (a) What polynomial must be subtracted from $2x^3 + 3x^2 - 5x + 8$ to give $2(5x - 4)^2$? [3]

(b) Express $\frac{4x}{(x-9)^2} + \frac{5x+1}{9-x}$ as a fraction with a single denominator. [3]

7 (a) Factorise $x^2 - y^2$. [1]

(b) Hence, factorise $(4r^2 - 5)^2 - 16$ completely. [3]

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8 (a) Make m the subject of the given formula: [3]

$$H = 4r\sqrt{m^2 + n}$$

(b) Evaluate H if $m = -4$, $n = 10$ and $r = 3$. [1]

9 **Answer the whole of this question on a sheet of graph paper.**

The variables x and y are connected by the equation $y = x^2 - x - 2$.

Some corresponding values of x and y are given in the table below.

x	−3	−2	−1	0	1	2	3	4
y	10	p	0	−2	−2	0	4	10

(a) Write down the value of p. [1]

(b) Using a scale of 2 cm to represent 1 unit, draw a horizontal x-axis for $-3 \le x \le 4$.. [3]

Using a scale of 1 cm to represent 1 unit, draw a vertical y-axis for $-2 \le y \le 10$.

On your axes, plot the points given in the table and join them with a smooth curve.

(c) From your graph, find

(i) the minimum point of the graph. [1]

(ii) the y-intercept of the graph. [1]

(iii) the line of symmetry [1]

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1	a	1: 800 000
	b	1 cm on the map represents an actual length /distance of 800 000 cm.
	c	6400 m
2	a	4.3 cm
	b	26.48 cm^2
3	a	$y = \frac{12}{\sqrt[3]{x}}$
	b	$y = 2$
	c	3.375 or $3\frac{3}{8}$
4	a	$250x$ km
	b	$100x^2 - 342$ km
	c	$100x^2 - 250x - 350 = 0$ $2x^2 - 5x - 7 = 0$
	d	8.83 m
5	a	$x = 2y - 2$
	b	$x = 4$
	c	30 cm
6	a	$2x^3 - 47x^2 + 75x - 24$
	b	$\frac{-5x^2 + 48x + 9}{x - 9}$
7	a	$(x - y)(x + y)$
	b	$(2r + 1)(2r + 1)(2r + 3)(2r - 3)$
8	a	$m = \pm\sqrt{\frac{H}{16r^2} - n}$
	b	61.2
9	ci	x =0.5 , y = -2.2 or -2.4
	cii	y-intercept is -2
	ciii	$x = 0.5$

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