CHIJ KATONG CONVENT
MID-YEAR EXAMINATION 2016
SECONDARY TWO EXPRESS

MATHEMATICS
PAPER 1

Duration: 1 hour 15 minutes

Classes : 203, 204, 205, 206

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid/tape.

Answer **all** questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The use of an approved scientific calculator is expected, where appropriate.
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 requires 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 50.

FOR EXAMINER'S USE	
Total marks	**/50**

Answer **all** the questions.

1 Solve the inequality $5(x-3)-2(x-6) \leq 4$.

Answer.....[2]

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2 Simplify $3(a-7)^2+4+(a+3)(4-3a)$.

Answer.....[3]

---

3 Solve $4-\dfrac{2}{5(2x-3)}=1$, leaving your answer as a mixed number.

Answer $x =$ .....[2]

4 Simplify $\frac{2y^3}{7} \div \frac{3(y^2)^2}{42}$

Answer.....[2]

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5 Clark rolls a ball across the floor.
The energy the ball has, given as E Joules, is proportional to the square root of the speed, v m/s, at which it travels.

(a) If the ball has 5 Joules of energy when its speed is 0.64 m/s, find an equation for E in terms of v.

Answer (*a*).....[2]

(b) How fast is the ball moving when it has 6.875 Joules of energy?

Answer (*b*).....m/s [2]

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6 These are the third to sixth terms of a sequence.

$(1)^3$ $(-1)^3$ $(-3)^3$ $(-5)^3$

(a) Write down the first term in the sequence.

Answer (*a*).....[1]

(b) Explain with reason, if it is possible for the number, -1000, to be one of the terms in the above sequence.

Answer (*b*) .....

.....[1]

7 **(a)** Factorise $2x^2 + 29x - 48$.

Answer (*a*).....[2]

(b) Factorise completely $3 - 12c^2 - 5 + 10c$.

Answer (*b*).....[3]

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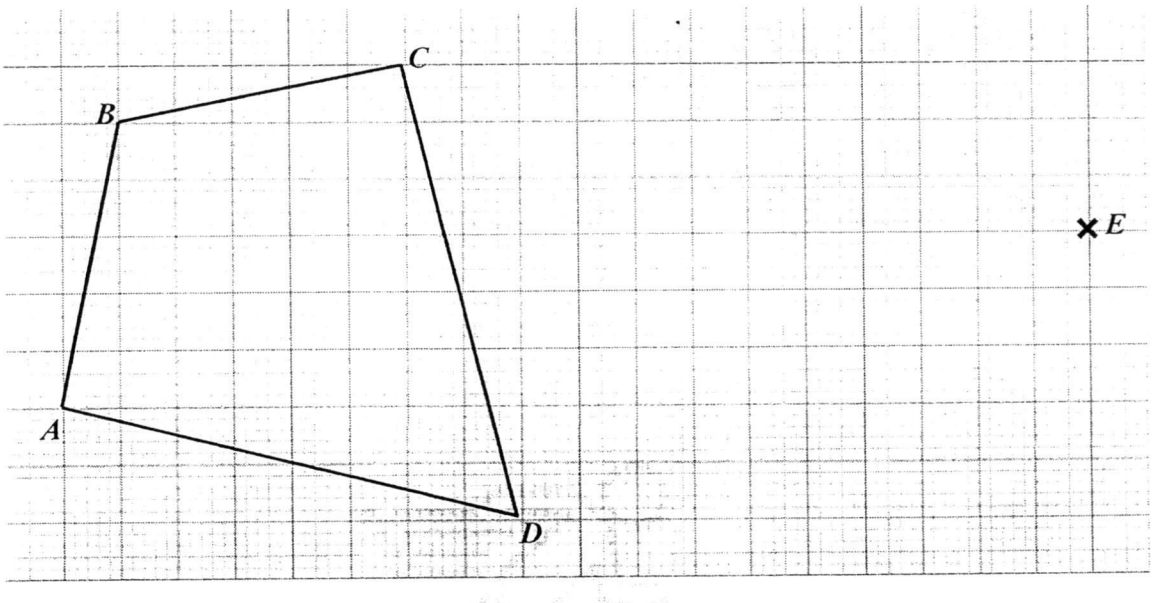
8 Quadrilateral *ABCD* and the point *E* are shown in the diagram. Quadrilateral *ABCD* is congruent to quadrilateral *EFGH*.

(a) Using the point *E*, draw the quadrilateral *EFGH*, given that *EFGH* must not overlap quadrilateral *ABCD*.

Answer (*a*): [2]

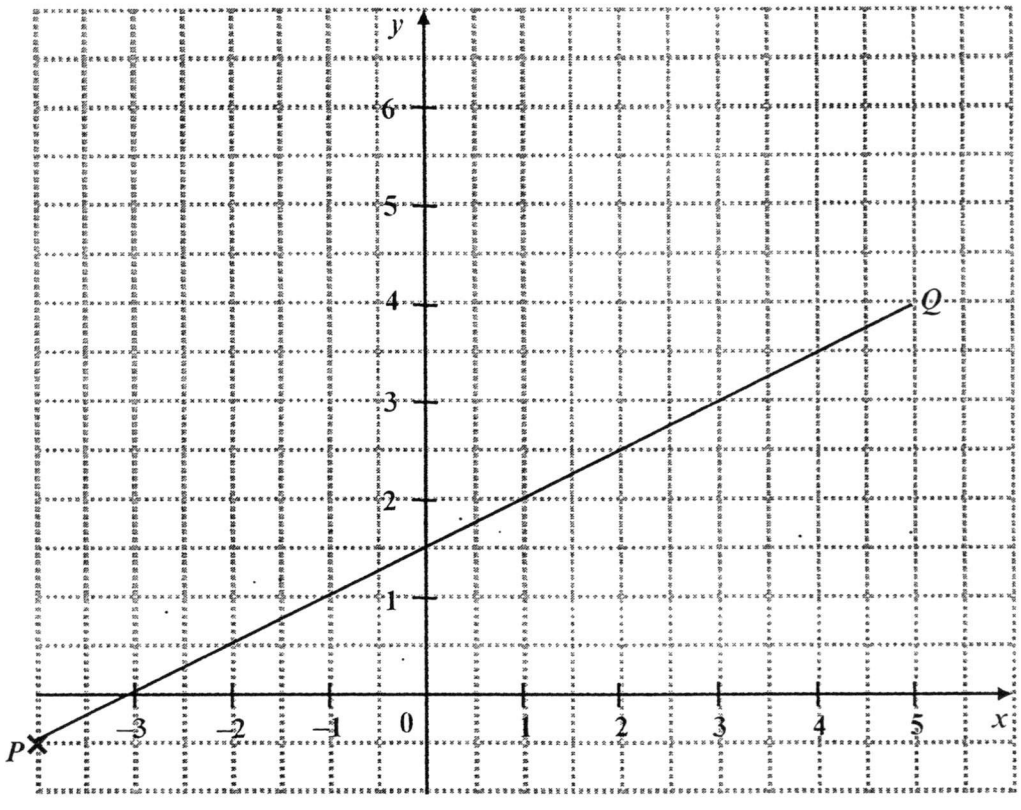


(b) How can you tell that two shapes such as *EFGH* and *ABCD* are congruent?

Answer (*b*) .....

.....[2]

9 The diagram below shows the graph of $3 - 2y + x = 0$.



(a) Write down the coordinates of the point P.

Answer (*a*) P (....., ...)[1]

(b) State the y-intercept of PQ.

Answer (*b*) y-intercept = ...[1]

(c) Complete the table of values below for $4y = 18 - 2x$. [2]

Answer (*c*)

x	−3	−1	1
y			

(d) Draw the line $4y = 18 - 2x$ in the grid. [1]

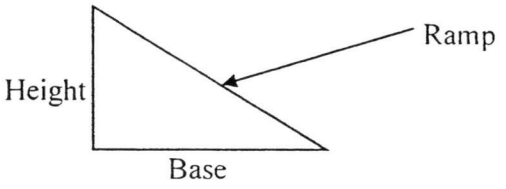
(e) Hence, use the graph above to solve the simultaneous equations.

$$4y = 18 - 2x$$

$$3 - 2y + x = 0$$

Answer (*e*) x = ...y = ...[2]

10 The measurement of two types of ramps are recorded in the table below with the given scale factor. The ramps are modelled using right-angled triangles. The side view of one these triangles is shown below.



Ramp *A*: An exercise ramp in an elderly day care centre.
Ramp *B*: A ramp for cars to drive into a car park from the first floor to the second floor.

		Model (in cm)		Actual		Gradient of Ramp
Ramp	Scale factor	Height	Base	Height	Base	
A	1 : 20		7.5 cm	30 cm	1.5 m	
B	2 cm : 5 m	1.2 cm	10 cm	3 m		

(a) For Ramp *B*, the scale factor is given as 2 cm : 5 m. Calculate this scale factor in the form of 1 : *n*.

Answer (*a*).....[2]

(b) Using the information given, complete the table above. [3]

(c) Which ramp is steeper? Explain your answer.

Answer (*c*).....

.....[1]

(d) Give one reason why it is important to consider the gradient of ramps around the neighbourhood.

Answer (*d*).....

.....[1]

11 The distance between two towns, M and G is 40 km. Initially, Mr Singh travelled from M to G at x km/h.

(a) Write down the time taken to travel from M to G.

Answer (*a*) ..... h [1]

(b) On the return journey from G to M, Mr Singh travelled 5 km/h slower. Find the time taken for the return journey.

Answer (*b*) ..... h [1]

(c) Mr Singh took 1 hour and 20 minutes more on the return journey from G to M as compared to the journey from M to G. Form an equation in terms of x and show that it reduces to $x^2 - 5x - 150 = 0$. [3]

Answer (*c*)

(d) Solve the equation $x^2 - 5x - 150 = 0$.

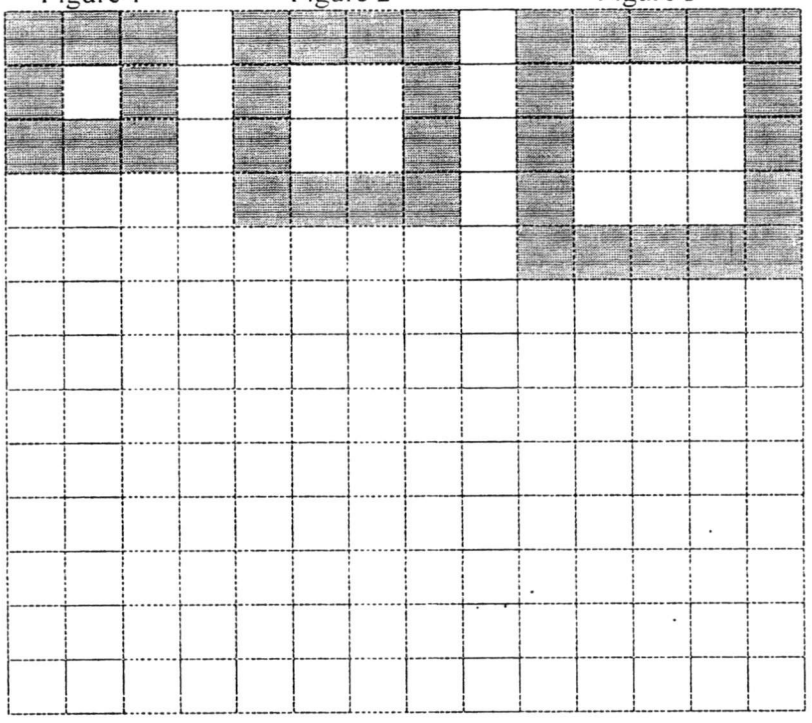
Answer (*d*).....[1]

(e) Find the time taken for the return journey.

Answer (e)..... h [1]

12 The first three patterns of a sequence are given in the grid below.

Figure 1 Figure 2 Figure 3



(a) Shade the appropriate squares in the above grid to illustrate the next two patterns in the sequence. [2]

(b) **(i)** Complete the table below. [2]

Figure (n)	Number of shaded squares	Number of white squares in the centre
1	8	1
2	12	4
3	16	9
4		
5		

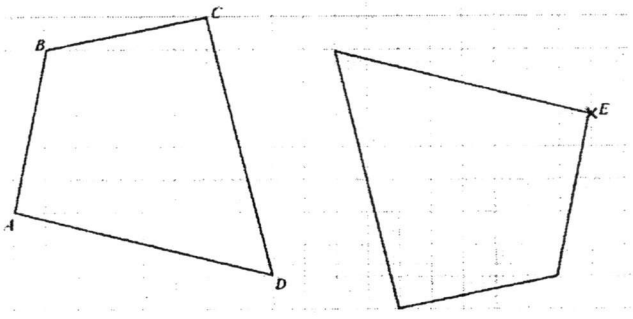
(b) **(ii)** Write down and simplify the expression for the nth term of shaded squares.

Answer (*b*)(ii).....[1]

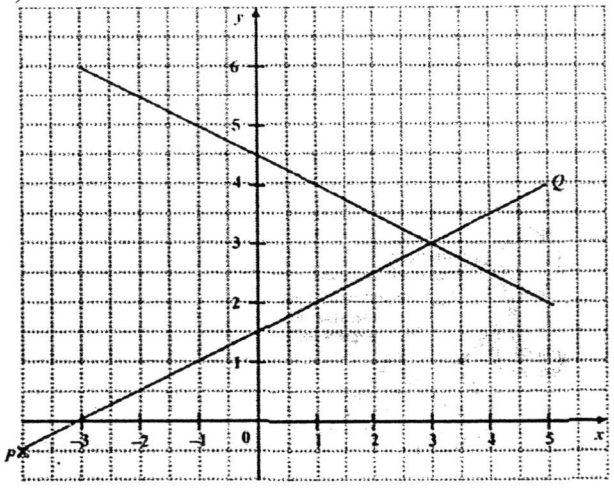
End of Paper

2E Math MYE 2016 Paper 1 Marking Scheme

Qn	Suggested Solution	Remarks
1.	$5(x-3)-2(x-6)\le 4$ $5x-15-2x+12\le 4$ $3x-3\le 4$ $3x\le 7$ $x\le \frac{7}{3}$ $x\le 2\frac{1}{3}$	
2.	$3(a-7)^2+4+(a+3)(4-3a)$ $=3[a^2-2(a)(7)+49]+4+(4a-3a^2+12-9a)$ $=3[a^2-14a+49]+4+(-3a^2+12-5a)$ $=3a^2-42a+147-3a^2+16-5a$ $=-47a+163$	
3.	$4-\frac{2}{5(2x-3)}=1$ $\frac{4(5)(2x-3)-2}{5(2x-3)}=1$ $20(2x-3)-2=5(2x-3)$ $40x-60-2=10x-15$ $30x=62-15$ $x=1\frac{17}{30}$	
4.	$\frac{2y^3}{7}\div\frac{3(y^2)^2}{42}$ $=\frac{2y^3}{7}\times\frac{42}{3y^4}$ $=\frac{2y^3}{7}\times\frac{42}{3y^4}$ $=\frac{4}{y}$	
5.	(a) $E=k\sqrt{v}$ $5=k\sqrt{0.64}$ $k=\frac{5}{\sqrt{0.64}}$ $=6.25$ $\therefore E=6.25\sqrt{v}$ (b) $6.875=6.25\sqrt{v}$ $\sqrt{v}=\frac{6.875}{6.25}$ $=1.1$ $v=(1.1)^2$ $=1.21$ m/s	

Qn	Suggested Solution	Remarks
6.	(a) $(5)^3$ (b) It is NOT possible for -1000 to be one of the terms. -1000 came from $(-10)^3$. However, the sequence is made of odd numbers which are cubed.	Accept 125
7.	(a) $2x^2+29x-48 = (2x-3)(x-16)$ (b) $3-12c^2-5+10c$ $= 3-12c^2-5+10c$ $= 3(1-4c^2)-5(1-2c)$ $= 3(1-2c)(1+2c)-5(1-2c)$ $= (1-2c)[3(1+2c)-5]$ $= (1-2c)(3+6c-5)$ $= (1-2c)(6c-2)$ $= 2(1-2c)(3c-1)$	
8.	(a)  (b) Two figures are congruent if All corresponding angles are equal All corresponding sides are equal	
9.	(a) P (–4, –0.5) (b) y-intercept = 1.5 (c) (d) (e) $x = 3, y = 3$	

x	–3	–1	1
y	6	5	4



Qn	Suggested Solution	Remarks
10.	(a) 2cm : 5m 2 cm : 500 cm 1 : 250 (b) Model (cm) / Actual / Grad of Height | Base | Height | Base | Ramp 1.5cm | 7.5cm | 30cm | 1.5 m | $\frac{1.5}{7.5}=0.2$ 1.2cm | 10cm | 3m | 25 m | $\frac{1.2}{10}=0.12$ Ramp A 20 : 1 $30 : \frac{30}{20}$ $\therefore$ Ht on model = 1.5 cm Ramp B 2cm : 5m $10\text{cm} : \frac{10\times 5}{2}$ $\therefore$ Actual base = 25m (c) Ramp A is steeper as the gradient of 0.2 is more than Ramp B's gradient of 0.12. (d) Ramps are meant to make travelling from a lower to higher or higher to lower level more accessible. The steeper it is, the more difficult it is to get from one point to another.	
11.	(a) $\frac{40}{x}$ h (b) $\frac{40}{x-5}$ h (c) $\frac{40}{x-5}=\frac{40}{x}+1\frac{20}{60}$ $\frac{40}{x-5}=\frac{40}{x}+\frac{4}{3}$ $\frac{40}{x-5}=\frac{120+4x}{3x}$ $40(3x)=(x-5)(120+4x)$ $120x=120x+4x^2-600-20x$ $4x^2-20x-600=0$ $x^2-5x-150=0$ (d) $x^2-5x-150=0$ $(x-15)(x+10)=0$ $x=15$ or $x=-10$ (rej)	If answer not rejected here, it should be rejected in (e).

Qn	Suggested Solution	Remarks
	(e) Time taken $= \frac{40}{15-5}$ h $= 4$ h	
12.	See below	

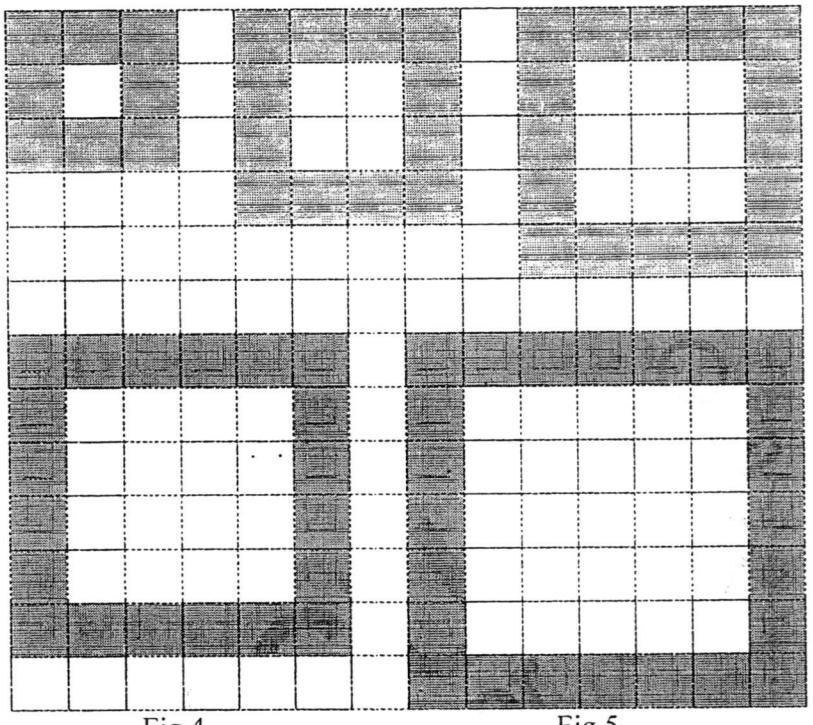


Fig 4 Fig 5

Figure	Number of shaded squares	Number of white squares in the centre
1	8	1
2	12	4
3	16	9
4	20	16
5	24	25

Number of shaded squares

$T_n = 8 + 4(n - 1)$

$= 4n + 4$ or $4(n + 1)$ [no marks if not simplified]

CHIJ KATONG CONVENT
MID-YEAR EXAMINATION 2016
SECONDARY TWO EXPRESS

MATHEMATICS
PAPER 2

Duration: 1 hour 15 minutes

Additional Materials: Graph paper (1 sheet)

Classes: 203, 204, 205, 206

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid/tape.

Answer **all** questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The use of an approved scientific calculator is expected, where appropriate.
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 requires 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 50.

Answer **all** the questions.

1 Solve the following equations.

(a) $(x-4)^2 = x-2$ [2]

(b) $16a^2 + 104a = -169$ [2]

---

2 **(a)** For the given algebraic expression of $z = 5 + \frac{2y-4x}{8x}$, make y the subject. [2]

(b) Hence, find the value of y when $x = 10$ and $z = \frac{1}{2}$. [2]

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3 Given that y is inversely proportionate to the square of $(x+2)$,

(a) Express y in terms of x and k, where k is a constant. [1]

(b) Given that $x = 4$ when $y = 2$, find an equation connecting y to x. [2]

(c) Hence, find the value of x when $y = 4$. [2]

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4 Solve the following simultaneous equations.

$$\frac{x}{3} + \frac{y}{4} = \frac{1}{2}$$
$$-4y - 5x = 6$$ [5]

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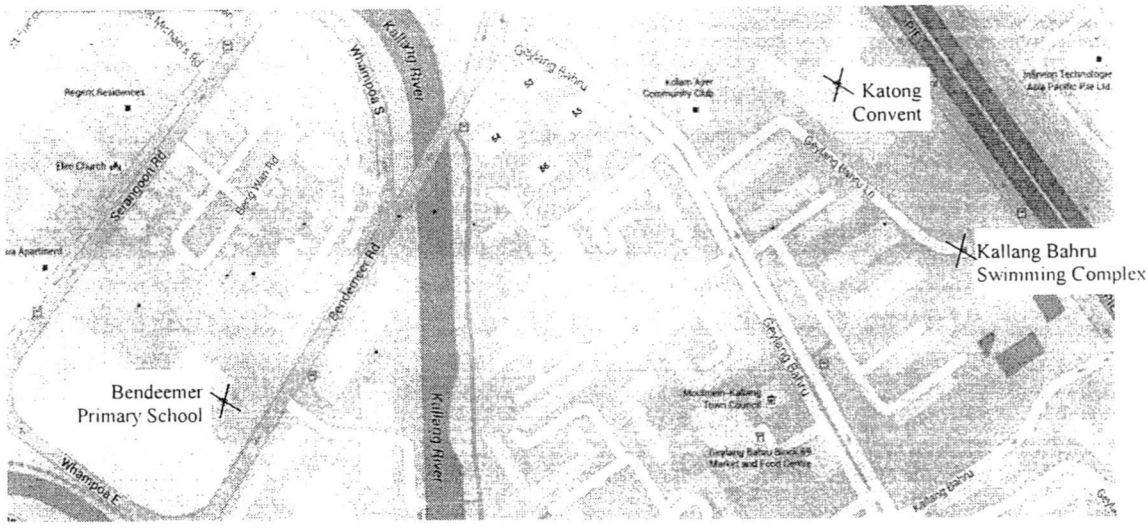
5 Simplify the following expression.

$$\frac{4x^2 - 11x - 3}{4x+1} - \frac{-2x^2 - 5x - 3}{2x+3}$$ [3]

6 During the annual Katong Convent Amazing Race, a group of contestants had to travel using the following route:

Katong Convent	→	Bendemeer Primary School	→	Kallang Basin Swimming Complex	→	Katong Convent
Start						End

The following map with a scale of 1 cm representing 100 m is provided to each contestant.



On this map, location points are marked with a cross '×'.

(a) Using the map, draw a straight line from Katong Convent to Bendemeer Primary School. State the map distance between the two schools, and hence calculate the actual distance, expressing your answer in km. [2]

(b) State the straight-line total map distance of the complete route, and calculate the total actual distance of this route. [2]

(c) Calculate the total amount of time required to complete the route if the contestants walk at 4km/h. Express your answer correct to the nearest minute. [2]

(d) Is your answer in (c) true in real life? Support your answer with valid explanations. [1]

7 Mary makes pancakes of increasing mass with the required mass of ingredients as shown in the table below:

Attempt no.	Mass of pancake (g)	Mass of flour (g)	Mass of water (g)	Mass of egg (g)
1	20	8	7	5
2	25	11	q	5
3	30	p	11	5
4	35	17	13	5
5	40	20	15	5

(a) Using the given information in the table above, state the value of p and q. [2]

(b) Find the general term, T_n, to represent the mass of the pancake on the nth attempt. [2]

(c) Given that the mass of water used on a certain attempt was 33 g, find the mass of the pancake (in grams). [2]

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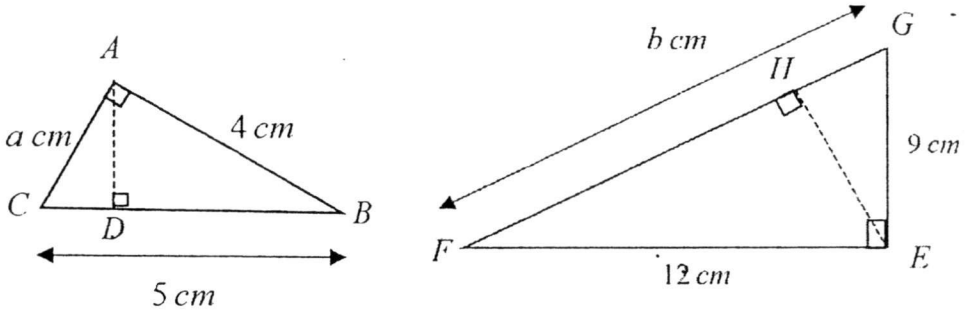
8 In the following diagram, triangle ABC is similar to triangle EFG.



(a) Calculate the scale factor that enlarges triangle ABC onto triangle EFG. [2]

(b) Calculate the value of a and b. [2]

(c) Triangle ABC and triangle EFG can be scaled up to form a larger similar triangle IJK.

(i) Find scale factor X (for triangle ABC) and scale factor Y (for triangle EFG) which maps each triangle onto the smallest possible triangle IJK if X and Y are integers. [2]

(ii) Find the perimeter of triangle IJK. [2]

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

9 The table below gives some values of x and the corresponding values of y, where $y = -x^2 - x + 6$, for $-4 \leq x \leq 3$.

x	-4	-3	-2	-1	0	1	2	3
y	-6	0	4	6	a	4	0	b

(a) Find the value of a and b. [1]

(b) (i) Using 2 cm to represent 1 unit on the x axis and 1 cm to represent 1 unit on the y axis, draw the graph of $y = -x^2 - x + 6$ for $-4 \leq x \leq 3$. [3]

(ii) Draw the line of symmetry and state its equation. [2]

(c) The line $y = x + 3$ intersects the curve $y = -x^2 - x + 6$.

(i) Using the table of values below, draw $y = x + 3$ for $-4 \leq x \leq 3$ on the same graph. [1]

x	-4	0	3
y	-1	3	6

(ii) Hence, state the coordinates of the point(s) of intersection between $y = -x^2 - x + 6$ and $y = x + 3$. [1]

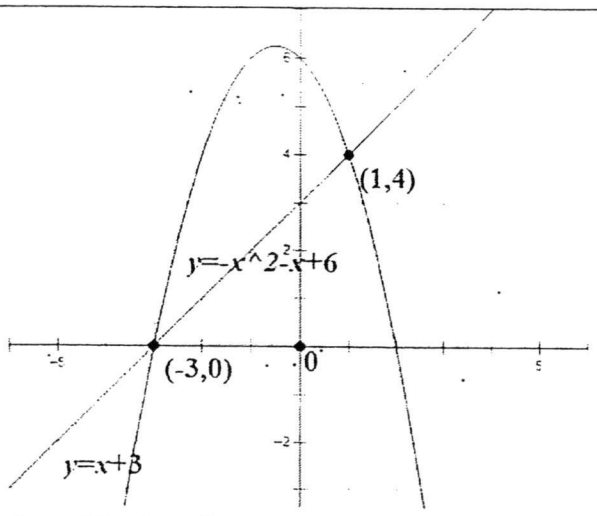
END OF PAPER

1	(a)	$(x-4)^2 = x-2$ $(x-4)^2 - x + 2 = 0$ $x^2 - 8 + 16 - x + 2 = 0$ $x^2 - 9x + 18 = 0$ $(x-6)(x-3) = 0$ $\therefore x = 6$ or $x = 3$	[M1] [A1]
	(b)	$16a^2 + 104a = -169$ $16a^2 + 104a + 169 = 0$ $(4a)^2 + 2(4a)(13) + (13)^2 = 0$ $(4ax + 13)^2 = 0$ $\Rightarrow 4x + 13 = 0$ $\therefore x = -3\frac{1}{4}$	[M1] [A1]
2	**(a)**	$z = 5 + \frac{2y - 4x}{8x}$ $z = \frac{40x + 2y - 4x}{8x}$ $z = \frac{36x + 2y}{8x}$ $8xz = 36x + 2y$ $y = \frac{8xz - 36x}{2}$ $y = 4xz - 18x$	[M1] [A1]
	(b)	Sub $x = 10, z = \frac{1}{2}$, $y = 4(10)(\frac{1}{2}) - 18(10)$ $y = -160$	[M1] [A1]
3	**(a)**	$y \propto \frac{1}{(x+2)^2}$ $y = \frac{k}{(x+2)^2}$	[B1]

	(b)	$2 = \dfrac{k}{(4+2)^2}$ $k = 2 \times 36$ $k = 72$ $\therefore y = \dfrac{72}{(x+2)^2}$	[M1] [A1]
	(c)	$4 = \dfrac{72}{(x+2)^2}$ $x + 2 = \pm\sqrt{18}$ $x = -2 \pm \sqrt{18}$ $\therefore x = -6.24$ or $x = 2.24$	[M1] [A1]
4		$\dfrac{x}{3} + \dfrac{y}{4} = \dfrac{1}{2}$ ------(1) $-4y - 5x = 6$ ----(2) From (1), $4x + 3y = 6$ $x = \dfrac{6-3y}{4}$ ----(3) Sub (3) into (2), $-4y - 5(\dfrac{6-3y}{4}) = 6$ $-16y - 30 + 15y = 24$ $\therefore y = -54$ ----(4) Sub (4) into (1) $\dfrac{x}{3} + \dfrac{(-54)}{4} = \dfrac{1}{2}$ $\dfrac{x}{3} = \dfrac{56}{4}$ $\therefore x = 42$	 [B1] [M1] [A1] [M1] [A1]

5		$\frac{4x^2-11x-3}{4x+1}-\frac{-2x^2-5x-3}{2x+3}$ $=\frac{(4x+1)(x-3)}{4x+1}-\frac{(-x-1)(2x+3)}{2x+3}$ $=x-3+x+1$ $=2x-2$	[M1] [M1] [A1]
6	(a)	Map distance = 9.6cm Actual distance = 9.6 × 100m = 0.96km Accept map distance of 9.5 – 9.7cm Accept actual distance between 0.95 – 0.97km.	[B1] [B1]
	(b)	Map distance = (9.6 + 10.5 + 2.9)cm = 23cm Actual distance of route = $23\times100\text{m}\times\frac{1\text{km}}{1000\text{m}}=2.3\text{km}$ Accept map distance values of ± 0.1cm and the corresponding actual distance.	[B1] [B1]
	(c)	Total time = 2.3km ÷ 4km/h = 0.575hr = 35 min (to nearest minute) Accept variants in total travelling time based on valid answers in Qn 6(b).	[M1] [A1]
	(d)	No. Award 1m for 'no' and valid explanation. Accept any answer that discusses obstacles such as traffic, obstructive buildings, differences in walking speed, actual distances being longer due to pavement detours. NOT ACCEPTED: Weather	[B1]
7	(a)	$p=14$ $q=9$	[B1] [B1]

	(b)	$T_1 = 20 = 8 + 7 + 5$ $T_2 = 25 = 8 + (3 \times 1) + 7 + (2 \times 1) + 5$ $T_3 = 30 = 8 + (3 \times 2) + 7 + (2 \times 2) + 5$ $T_n = 8 + [3 \times (n-1)] + 7 + [2 \times (n-1)] + 5$ $= 8 + 3n - 3 + 7 + 2n - 2 + 5$ $= 5n + 15$		[M1] [A1]
	(c)	$33 = 7 + [2(n-1)]$ $= 7 + 2n - 2$ $= 2n + 5$ $\therefore n = 14$ $T_{14} = 5(14) + 15$ $= 85$ Mass of pancake is 85g DO NOT award 1m for '85' only as units required.		[M1] [A1]
8	**(a)**	Scale factor $= \frac{EF}{AB}$ $= \frac{12cm}{4cm}$ $= 3$		[M1] [A1]
	(b)	$a = 9 \div 3 = 3$ $b = 5 \times 3 = 15$		[B1] [B1]
	(c)	**(i)**	$AB : EF$ 4 : 12 1 : 3 LCM = 3 Next lowest common multiple = 6 $\therefore$ X = 6 Y = 6 ÷ 3 = 2	[B1] [B1]
		(ii)	Perimeter = Perimeter of ABC × Scale Factor X = (3 + 4 + 5) cm × 6 = 72 cm Award 1m for correct method of multiplying perimeter of triangle ABC or	[M1] [A1]

			triangle EFG by corresponding scale factors.	
9	(a)		$a = 6$ $b = -6$ Award 1m for both correct values.	[B1]
	(b)	(i)	 Award 2m for all points correctly plotted. Award 1m for smooth curve.	[B1] [B1] [B1]
		(ii)	$x = -0.5$ Award 1m for correct drawing of line of symmetry $x = -0.5$.	[B1] [B1]
	(c)	(i)	Award 1m for accurate line $y = x + 3$.	[B1]
		(ii)	$(-3,0)$. $(1,4)$ Award 1m for both correct coordinates.	[B1]