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Geylang Methodist School (Secondary)
Mid-Year Examination 2014

Candidate Name			
Class		Index Number	

MATHEMATICS

2 Express

Paper 1

Candidates answer on the Question Paper. **1 hour**

Setter : Ms Grace Yap **16 May 2014**

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen.
You may use a 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 will result in the loss of marks.
Calculators should be used where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to 3 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.

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
50

This document consists of 10 printed pages.

[Turn over

Total Score: **[50 marks]**
Answer **ALL** questions in this paper.

---

1 Express 4.905378 correct to

(a) the nearest integer,

(b) two decimal places,

(c) four significant figures.

Answer: (*a*)_____[1]

(*b*)_____[1]

(*c*)_____[1]

---

2 Consider the number pattern.

$$\frac{2}{1\times2\times3}=\frac{1}{1}-\frac{2}{2}+\frac{1}{3}$$

$$\frac{2}{2\times3\times4}=\frac{1}{2}-\frac{2}{3}+\frac{1}{4}$$

$$\frac{2}{3\times4\times5}=\frac{1}{3}-\frac{2}{4}+\frac{1}{5}$$

(a) Write down the eighth line in the pattern.

(b) Find the value of $\frac{1}{30}-\frac{2}{31}+\frac{1}{32}$.

Answer: (*a*)_____[1]

(*b*)_____[2]

---

3 If y is directly proportional to $\frac{1}{2}x^2+5$ and $y=14$ when $x=2$,

(a) find an equation connecting x and y,

(b) find the value of y when $x=5$,

(c) calculate the values of x when $y=26$.

Answer: (*a*)_____[2]

(*b*) $y=$_____[1]

(*c*) $x=$_____or_____[2]

4 The variables x and y are connected by the equation $y - 3x = -2$.

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

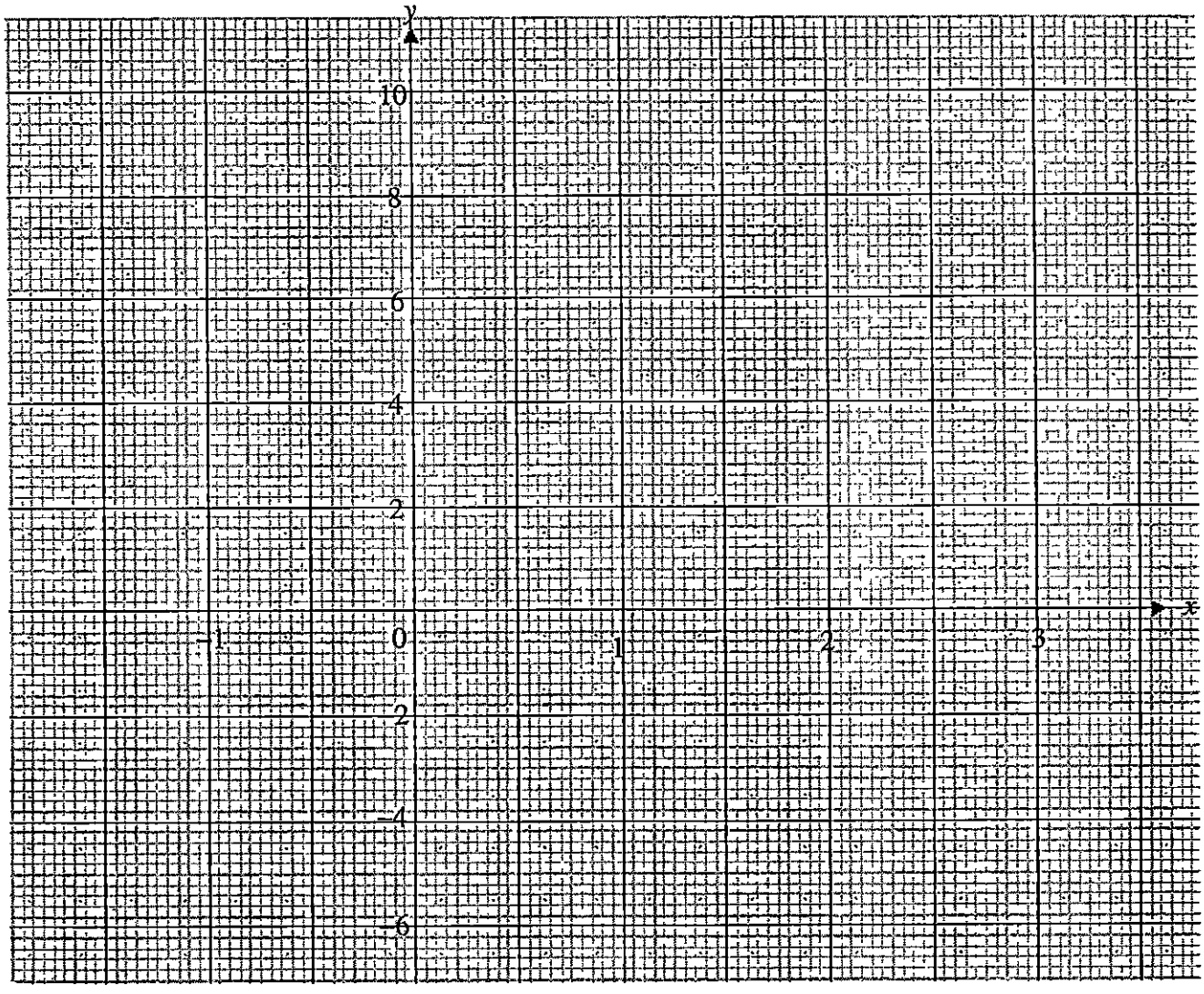
x	-1	0	2
y	p	-2	q

(a) Find the value of p and of q.

(b) Draw the graph of $y - 3x = -2$ on the axes given below. [1]

(c) On the same axes, draw and label the line $x = 2$. [1]

(d) Find the area of the figure bounded by the lines $y - 3x = -2$, $x = 2$ and $y = -2$.



Answer: (*a*) $p =$_____ $q =$ _____[2]

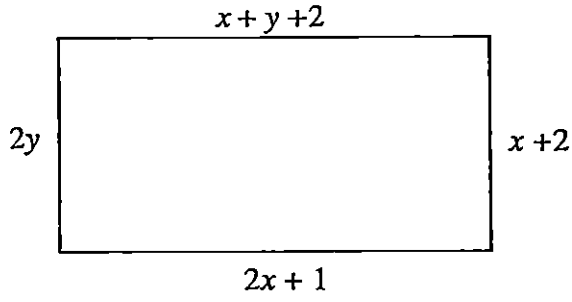
(*d*) _____units^2[1]

5 The figure shows a rectangle with its sides as indicated. The sides are given in centimetres.

Find

(a) the value of x and of y,

(b) the area of the rectangle.



Answer: (*a*) $x =$ _____

$y =$ _____[3]

(*b*) _____cm^2[2]

6 Expand and simplify each of the following expressions.

(a) $(6w + y^3)(3w - 2y^3)$

(b) $3x(x - 6) - (2x + 5)(-x + 3)$

Answer: (*a*)_____[2]

(*b*)_____[4]

7 Expand and simplify each of the following expressions using suitable special algebraic identities.

(a) $(-3a-7b)^2$

(b) $2(ab+3)^2-9$

Answer: (*a*)_____[2]

(*b*)_____[3]

---

8 **(a)** Simplify $x^2-(x-a)(x+a)$.

(b) Using your answer to **(a)**, write down the value of $17948^2 - 17945 \times 17951$ without using a calculator.

Answer: (*a*)_____[2]

(*b*)_____[2]

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9 Simplify the following algebraic expressions.

(a) $\dfrac{18a^4b^5}{81a^2b^8}$

(b) $\dfrac{h^2-1}{h^2-3h+2} \div \dfrac{3h+6}{h-2}$

Answer: (*a*)_____[1]

(*b*)_____[3]

10 Factorise fully the following expression.

(a) $ab + 4a + 3b + 12$

(b) $9x^2 - \frac{4}{81}y^2$

(c) $8x^2 + 4x - 60$

Answer: (*a*)_____[2]

(*b*)_____[2]

(*c*)_____[2]

11 Given that $\sqrt{\frac{1-s}{s+r}} = p$,

(a) express s in terms of p and r,

(b) find the value of s if $p = 1$ and $r = 2$.

Answer: (*a*)_____[3]

(*b*)_____[1]

------- End of Paper -------

Answer Keys (Paper 1)

1a	5	8a	a^2
1b	4.90	8b	9
1c	4.900	9a	$\frac{2a^2}{9b^3}$
2a	40	9b	$\frac{h+1}{3(h+2)}$
2b	$\frac{1}{14880}$	10a	$(a+3)(a+4)$
3a	$y=2(\frac{1}{2}x^2+5)$	10b	$(3x-\frac{2}{9}y)(3x+\frac{2}{9}y)$
3b	$y=35$	10c	$4(2x-5)(x+3)$
3c	$x=\pm 4$	11a	$s=\frac{1-p^2r}{p^2+1}$
4a	$p=-5, q=4$	11b	$s=-\frac{1}{2}$
4d	6 units^2		
5a	$x=4, y=3$		
5b	54cm^2		
6a	$18w^2-9wy^3-2y^6$		
6b	$5x^2-19x-15$		
7a	$9a^2+42a+29a^2$		
7b	$2a^2b^2+12ab+9$		

Marking Scheme (Paper 1)

Qn	Workings / Answers	Marks	Remarks
1a	5	1	
1b –	4.91	1	
1c	4.905	1	
2a	$\frac{2}{8\times9\times10}=\frac{1}{8}-\frac{2}{9}+\frac{1}{10}$	1	
2b	$\frac{2}{30\times31\times32}=\frac{2}{29760}$ $=\frac{1}{14880}$	1 1	
3a	$k=\frac{y}{\frac{1}{2}x^2+5}$ $k=\frac{14}{\frac{1}{2}(2)^2+5}$ $k=2$ $y=2(\frac{1}{2}x^2+5)$ or $2=\frac{y}{\frac{1}{2}x^2+5}$	1 1	
3b	$2=\frac{y}{\frac{1}{2}x^2+5}$ $y=2[\frac{1}{2}(25)+5]$ $y=35$	1	
3c	$y=2(\frac{1}{2}x^2+5)$ $26=2(\frac{1}{2}x^2+5)$ $\frac{1}{2}x^2+5=13$ $\frac{1}{2}x^2=8$ $x^2=16$ $x=\pm4$	1,1	1 for ± sign , 1 for answer
4a	$p=-5$ $q=4$	1 1	
4b 4c	Refer to graph Refer to graph		

4d	Area $= \frac{1}{2} \times 2 \times 6$ $= 6$ units^2	1	
5a	$x + y + 2 = 2x + 1$ $1 = x - y$ -------(1) $2y = x + 2$ $2y - 2 = x$ --------(2) sub (2) into (1) $1 = 2y - 2 - y$ $3 = y$ sub $y = 3$ into (2) $2(3) - 2 = x$ $4 = x$	 1 1 1	
5b	Area $= (2x + 1)(x + 2)$ $= [2(4) + 1][4 + 2]$ $= 54\text{cm}^2$	 1 1	
6a	$(6w + y^3)(3w - 2y^3)$ $= 18w^2 - 12wy^3 + 3wy^3 - 2y^6$ $= 18w^2 - 9wy^3 - 2y^6$	 1 1	
6b	$3x(x - 6) - (2x + 5)(-x + 3)$ $= 3x^2 - 18x - [-2x^2 + 6x - 5x + 15]$ $= 3x^2 - 18x + 2x^2 - x - 15$ $= 5x^2 - 19x - 15$	 1,1 1 1	
7a	$(-3a - 7b)^2$ $= (-3a)^2 - 2(-3a)(7b) + (7b)^2$ $= 9a^2 + 42ab + 49b^2$	 1 1	
7b	$2(ab + 3)^2 - 9$ $= 2[(ab)^2 + 2(ab)(3) + (3)^2] - 9$ $= 2a^2b^2 + 12ab + 18 - 9$ $= 2a^2b^2 + 12ab + 9$	 1 1 1	
8a	$x^2 - (x - a)(x + a)$ $= x^2 - [x^2 - a^2]$ $= x^2 - x^2 + a^2$ $= a^2$	 1 1	
8b	$17948^2 - 17945 \times 17951$ $= 17948^2 - [17948^2 - 3^2]$ $= 3^2$ $= 9$	 1 1	

9a	$\frac{18a^4b^5}{81a^2b^8} = \frac{2a^2}{9b^3}$	1	
9b	$\frac{h^2-1}{h^2-3h+2} \div \frac{3h+6}{h-2}$ $= \frac{(h+1)(h-1)}{(h-2)(h-1)} \times \frac{h-2}{3(h+2)}$ $= \frac{h+1}{3(h+2)}$	 1,1 1	
10a	$ab + 4a + 3b + 12$ $= a(b+4) + 3(b+4)$ $= (a+3)(b+4)$	 1 1	
10b	$9x^2 - \frac{4}{81}y^2$ $= (3x)^2 - (\frac{2}{9}y)^2$ $= (3x - \frac{2}{9}y)(3x + \frac{2}{9}y)$	 1 1	
10c	$8x^2 + 4x - 60$ $= 4(2x^2 + x - 15)$ $= 4\,(2x-5)(x+3)$	 1 1	
11a	$\sqrt{\frac{1-s}{s+r}} = p$ $\frac{1-s}{s+r} = p^2$ $1 - s = p^2s + p^2r$ $1 - p^2r = p^2s + s$ $s(p^2+1) = 1 - p^2r$ $s = \frac{1-p^2r}{p^2+1}$	 1 1 1	
11b	$s = \frac{1-p^2r}{p^2+1}$ $s = \frac{1-(1)^2(2)}{1^2+1}$ $s = -\frac{1}{2}$	 1	

Geylang Methodist School (Secondary)
Mid – Year Examination 2014

MATHEMATICS

Paper 2 **2 Express**

Additional materials : Writing Papers **1 hour 30 minutes**
One sheet of graph paper

Setter : Mr Cheng Xin Jin **15 May 2014**

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen in both sides of the paper.
You may use a 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 will result in the loss of marks.
Calculators should be used where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to 3 significant figures. Give answers in degrees to one decimal place.

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.

Total Score: **[50 marks]**
Answer **ALL** questions in this paper.

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1 **(a)** Find the lowest number k, such that $224k$ is a perfect square. [2]

(b) 3 bells toll at intervals of 12, 15, 42 minutes respectively. If the bells toll together at 2pm on Monday, when will be the next time the bells toll together? [3]

2 Solve the simultaneous equations.

$$\frac{1}{2}x-\frac{1}{3}y-1=0,$$

$$x+6y+8=0.$$ [4]

3 **(a)** Factorise completely $81m^4-16n^4$. [3]

(b) Simplify $\dfrac{4u^2-36-u^2t+9t}{u^2+4u-21}$. [4]

(c) Expand and simplify $\left(\frac{1}{2}x+4\right)^2-x\left(4-\frac{9}{x}\right)$. [4]

4 It is given that y is directly proportional to $(x-2)^3$ and $x=7$ when $y=375$. Find

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

(b) the value of y when $x=5$, [1]

(c) the value of x when $y=24$. [2]

5 If $p = \frac{6}{3x+2}$ and $pq = \frac{2}{9x^2-4}$, find q in terms of x. [3]

6 The speed of a bullet from a gun is inversely proportional to the square root of its mass. When the mass is 36g, the speed is 640 m/s.

(a) Express the speed S, of the bullet in terms of its mass m. [3]

(b) Find the mass of the bullet when the speed is 420 m/s. Leave your answer in 3 significant figures. [2]

7 Subscribers to a Cable TV service pay a monthly subscription rate of \$18.00 and an additional amount for every channel that they subscribe according to the table shown below. For the first five channels subscribed, they need to pay \$8.50 for each channel. Thereafter, for each additional channel, they need to pay \$6.50.

	1 to 5 channels	6 or more channels
Monthly cost for each channel	\$8.50	\$6.50

(a) Rita subscribed to eight channels. Calculate her total monthly bill. [1]

(b) Marilyn's total monthly bill was \$119. Find the number of channels she subscribed to. [2]

(c) The number of viewers for one of the channels, Cinemax, was 245,000 in August.

(i) In September, the number of viewers increased to 298,000. Calculate the percentage increase in viewership. [1]

(ii) The number of viewers in August is a 25% increase of July's figure. Calculate the number of viewers in July. [1]

8 Two numbers are chosen at random. When 5 times of the first number is added to 3 times of the second number, I get 31. When 19 is added to the second number, I obtain a number that is twice the first number. Find the two numbers. [4]

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

The table below gives some values of x and the corresponding values of y, where $2y = x + 4$ for $0 \leq x \leq 6$.

x	0	2	5
y	2	3	a

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

(b) Using a scale of 2 cm to 1 unit on the x axis, and 2 cm to 1 unit on the y axis, plot the graph of $2y = x + 4$. [3]

(c) On the same axis, draw the graph of $y = 2x - 4$. [2]

(d) Hence, by using your graphs, solve the simultaneous equations

$$4 + x = 2y,$$

$$2x - 4 - y = 0.$$ [2]

End of paper

Exam Solutions

1a) $2^5 \times 7 \times 2 \times 7 = 2^6 \times 7^2$ (perfect square) [M1]

$2 \times 7 = 14$ [A1]

1b) [M1]

2	12 15 42
3	6 15 21
2	2 5 7
5	1 5 7
7	1 1 7
	1 1 1

LCM = $2^2 \times 3 \times 5 \times 7 = 420$ mins = 7 hrs [M1]

Time is 9pm [A1]

2) $\frac{1}{2}x - \frac{1}{3}y - 1 = 0$

$3x - 2y = 6$----------(1)

$x + 6y + 8 = 0$

$x = -6y - 8$----------(2)

Sub (2) in (1)

$3(-6y - 8) - 2y = 6$ [M1]

$y = -1.5$ [A1]

Sub $y = -1.5$ into (2) [M1]

$x = 9 - 8 = 1$ [A1]

3a) $81m^4 - 16n^4 = (9m^2 + 4n^2)(9m^2 - 4n^2)$ [M1]

$=(9m^2 + 4n^2)(3m + 2)(3m - 2)$ [A2]

3b) $\frac{4u^2-36-u^2t+9t}{u^2+4u-21} = \frac{(4-t)(u^2-9)}{(u+7)(u-3)}$ [M2]

$= \frac{(4-t)(u-3)(u+3)}{(u+7)(u-3)}$ [M1]

$= \frac{(4-t)(u+3)}{u+7}$ [A1]

3c) $\left(\frac{1}{2}x+4\right)^2 - x(4-\frac{9}{x}) = \frac{1}{4}x^2+4x+16-4x+9$ [M3] 2 marks for first expression

$= \frac{1}{4}x^2+25$ [A1]

4a) $y = k(x-2)^3$

$375 = k(7-2)^3 \qquad k = 3$ [M1]

$y = 3(x-2)^3$ [A1]

4b) $y = 3(5-2)^3 \qquad y = 81$ [A1]

4c) $24 = 3(x-2)^3$

$(x-2)^3 = 8$

$x-2 = 2$ [M1]

$x = 4$ [A1]

5a)If $p = \frac{6}{3x+2}$ and $pq = \frac{2}{9x^2-4}$, find q in terms of x.

$p = \frac{2}{q(9x^2-4)}$

$\frac{2}{q(9x^2-4)} = \frac{6}{3x+2}$ [M1]

$3q = \frac{3x+2}{(3x+2)(3x-2)}$ [M1]

$q = \frac{1}{3(3x-2)}$ [A1]

6a) $s = \frac{k}{\sqrt{m}}$ [M1]

$k = 3840$ [M1]

$s = \frac{3840}{\sqrt{m}}$ [A1]

6b) $420 = \frac{3840}{\sqrt{m}}$

$\sqrt{m} = \frac{3840}{420}$ [M1]

$m = 83.6g$ (3 sig fig) [A1]

7a) $80 [A1]

7b) $119 - 18 = 101$

$\frac{101-42.5}{6.50} = 9$ [M1]

9 + 5 = 14 channels [A1]

7ci) $\frac{53000}{245000} \times 100\% = 21.6\%$ [A1]

7cii) $125\% = 245000$

$100\% = 196000$ [A1]

8. First number -> x

2nd number -> y

$5x + 3y = 31$ ---------- (1)

$y = 2x - 19$ ----------(2) [M1]

$5x + 3(2x - 19) = 31$ [M1]

$x=8 \quad y=-3$ [A2]