Class	Register No	Name

Bukit Merah Secondary School
Mid – Year Examination 2012
Secondary 1 Express

E

MATHEMATICS

Paper 1

9 May 2012

1h

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your Class, register number and name 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.
The number of marks is given in brackets [ ] at the end of each question or part question.

You are expected to use a scientific calculator to evaluate explicit numerical expressions.
If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.
The total of the marks for this paper is **50**.

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 answer in degrees to one decimal place.
For π, use either your calculator value or 3.142.

Write your calculator model in the space below.

For Examiner's Use

Calculator Model: _____

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1 (a) Express 504 as a product of its prime factors in index notation.

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

(b) Find the smallest positive integer k such that $504k$ is a perfect square.

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

(c) Given that $54 = 2 \times 3^3$, find the highest common factor of 504 and 54.

Answer (c) ..... [1]

---

2 Without the use of a calculator, evaluate the following. Show your working clearly.

(a) $(-5) + [(-2)^3 \times 3 - 1]$

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

(b) $3 \div 3\frac{1}{3} \times \frac{2}{5}$

Answer (b) ..... [2]

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3 Consider the six numbers below.

$$2.\dot{8},\ -4,\ 2\sqrt{2},\ 0,\ \pi,\ \frac{22}{7}$$

(a) Arrange them in ascending order.

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

(b) Write down the

(i) integers,

Answer (b)(i) ..... [1]

(ii) rational numbers.

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

---

4 (a) Express $1\frac{3}{22}$ as a recurring decimal.

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

(b) Evaluate $\frac{(16.3)^2+\sqrt{915}}{\left(\frac{5}{9}\right)^3}$, giving your answer correct to 2 decimal places.

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

(c) Evaluate $\sqrt[3]{\frac{3}{2}}+\frac{1}{2}$ giving your answer correct to 2 significant figures.

Answer (c) ..... [1]

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5 (a) Find the fraction which is exactly halfway between $-3\frac{2}{5}$ and $6\frac{2}{3}$.

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

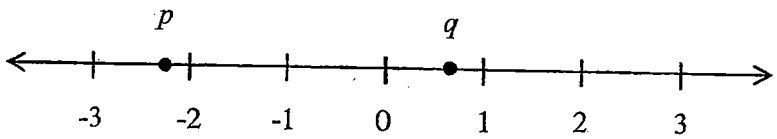
(b) **Estimate** the value of $29.74 + 126.3 \times 0.6315$, giving your answer correct to **one** significant figure.

Answer (b) ..... [2]

---

6 The numbers p and q are indicated on the number line below.

Answer (a) and (b)



Indicate clearly on the same number line the numbers represented by

(a) $-p$ [1]

(b) q^2 [1]

---

7 Given the formula $A = \frac{1}{2}s^2(2s - n)$, find the value of A when $s = 1.5$ and $n = -2$.

Answer ..... [2]

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8 Simplify the following expressions.

(a) $2(m + 2n) - 3(m - 2n)$

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

(b) $\frac{3x}{6xy} \times \frac{(2y)^2}{5}$

Answer (b) ..... [2]

---

9 (a) Simplify the expression $3(x^2 + 2x + 1) + (1 - x)(2x)$.

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

(b) Write down the coefficient of x for your answer in (a).

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

---

10 Factorise the following expressions completely.

(a) $3mn + mn^2$

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

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

Answer (b) ..... [2]

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11 Solve the following equations.

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

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

(b) $\frac{4}{2x+3} + 2 = 5$

Answer (b) $x =$ ..... [2]

---

12 Aidan's father is 5 years older than 3 times his age. Let x be Aidan's age now.

(a) Express the father's age in terms of x.

Answer (a) ..... years old [1]

(b) In 35 years' time, Aidan will be as old as his father now. Write down an equation in x and solve it to find Aidan's age. [2]

Answer (b)

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13 (a) Solve the inequality $\frac{2}{3}x + \frac{3}{4}x \geq 28$.

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

(b) Hence write down the smallest prime number that satisfies the inequality in (a).

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

---

14 Tom has 4 times as many marbles as Jerry. The two boys have less than 50 marbles in total.

(a) Given that Jerry has x marbles, write down an inequality in terms of x.

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

(b) By solving the inequality in (a), find the maximum possible number of marbles Jerry has.

Answer (b) ..... [2]

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15 Consider the sequence 5, 9, 13, 17, 21, 25, ...

(a) Write down the next two terms.

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

(b) Find the general term of the sequence, T_n.

Answer (b) T_n = ... [1]

(c) Hence find the 88^{th} term in the sequence.

Answer (c) T_{88} = ... [1]

(d) Find the smallest term in the sequence which is greater than 100.

Answer (d) ..... [2]

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

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Class	Register No	Name

Bukit Merah Secondary School
Mid – Year Examination 2012
Secondary 1 Express

E

MATHEMATICS

Paper 2

14 May 2012

1h 30min

Additional Materials: Answer Paper (5 sheets)

READ THESE INSTRUCTIONS FIRST

Write your answers and working on the separate Answer Paper provided.
Write your class, register number and name 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.
Begin each question on a fresh page.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is **50**.

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 answer in degrees to one decimal place.
For π, use either your calculator value or 3.142.

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

Write your calculator model in the space below.

Calculator Model: _____

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1 (a) When written as a product of their prime factors,

$$p = 2^7 \times 5^3 \times 13^2$$

$$q = 2^5 \times 13^7$$

Express each of the following as a **product of its prime factors** in index notation.

(i) Highest common factor (HCF) of p and q [1]

(ii) Lowest common multiple (LCM) of p and q [1]

(iii) pq [1]

(iv) $\sqrt[3]{pq}$ [1]

(b) Jerry goes to the gym once every 24 days. Tom goes to the same gym once every 30 days. If they met each other in the gym today, how many days later would they meet at the gym again? [2]

---

2 (a) Given that a is a prime number such that $30 < a < 40$, find the possible values of a. [1]

(b) It is given that x and y are integers such that

$$-3 < x \leq 3 \quad \text{and} \quad -5 \leq y < 3.$$

Find the smallest value of

(i) $x + y$, [1]

(ii) x^2, [1]

(iii) xy. [1]

---

3 (a) Evaluate each of the following correct to 4 significant figures.

(i) $\dfrac{\frac{2}{3}+(0.7+3.6)^4}{1.7^2}$ [1]

(ii) $\sqrt{\dfrac{4}{23}}$ [1]

(b) (i) **Estimate** the value of $34.5 \times \dfrac{6.13}{\sqrt[3]{28.1}}$, giving your answer correct to **one** significant figure. [2]

(ii) Use your answer in (i) to estimate the value of $345 \times \dfrac{6.13}{\sqrt[3]{28.1}}$. [1]

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4 (a) A national park has 1500 visitors on a particular day. This figure has been rounded off to 2 significant figures.

(i) What was the smallest possible number of visitors on that day? [1]

(ii) What was the largest possible number of visitors on that day? [1]

(b) The temperature at the national park drops from 16.6°C at 3pm to –4.2°C at 11pm on the same day.

(i) Find the difference in temperature between 3pm and 11pm. [1]

(ii) Assuming the temperature drops uniformly between 3pm to 11pm, estimate the temperature at 6pm. [2]

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5 (a) Write down and simplify the algebraic expressions for the following statements.

(i) Add $3\left(\frac{1}{2}x+\frac{2}{3}y\right)$ and $(2x-y)\left(\frac{3}{2}\right)$. [2]

(ii) Subtract $8b^2$ from the product of $4a-3b$ and $2b$. [2]

(b) On a farm, there are chickens and goats. Each chicken has 2 legs and each goat has 4 legs. The farmer counted 50 heads and 128 legs.

Let x be the number of chickens on the farm.

(i) Express, in terms of x, the number of goats on the farm. [1]

(ii) Form an equation in x and solve it to find the number of chickens on the farm. [3]

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6 (a) (i) Factorise a^2-ab. [1]

(ii) Use the result in (i) to find the value of $123^2-123\times 23$. [1]

(b) Factorise completely the following expressions.

(i) $10x+15xy-20xz$ [1]

(ii) $mn+2m-2n-4$ [2]

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7 (a) Given the formula $v^2 = u^2 + 2at$, find the value of t when $a = 2, u = -3$ and $v = 4$. [2]

(b) Solve the following equations.

(i) $3(x + 4) - 2(3x - 5) = 7$ [2]

(ii) $\frac{4}{4-3x} = \frac{1}{2x+1}$ [2]

---

8 (a) Simplify $\frac{3(2x-3)}{5} + \frac{3x+1}{2}$ as a single fraction. [3]

(b) Hence, or otherwise, solve the inequality $\frac{3(2x-3)}{5} + \frac{3x+1}{2} < 5$. [2]

---

9 The terms of a sequence are given as follows:

$T_1 = 1 = 1$

$T_2 = 3 = 1 + 2$

$T_3 = 6 = 1 + 2 + 3$

$T_4 = 10 = 1 + 2 + 3 + 4$

$T_5 = 15 = 1 + 2 + 3 + 4 + 5$

(a) Write down the next term T_6 in the sequence. [1]

(b) The n^{th} term in the sequence is given by $T_n = \frac{n(n+1)}{2}$.

Show that this formula is true when $n = 6$. [1]

(c) Use the formula to find T_{100}. [1]

(d) Use your answer in (c) to find the value of

$3 + 6 + 9 + 12 + 15 + \cdots + 300$. [1]

(e) Hence find the sum of all the whole numbers from 1 to 300 which are **not** multiples of 3. [2]

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

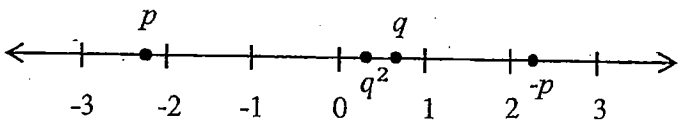
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Mark Scheme for BMSS Sec 1 Express Mathematics Paper 1 MYE 2012

Qn	Answer	Marks
1(a)	Using factor tree or ladder method, $504 = 2^3 \times 3^2 \times 7$	[B1]
1(b)	$k = 2 \times 7 = 14$	[B1]
1(c)	HCF $= 2 \times 3^2 = 18$	[B1]
2(a)	$(-5) + [(-2)^3 \times 3 - 1]$ $= (-5) + [-8 \times 3 - 1]$ $= (-5) + [-25]$ $= -30$	[M1] [A1]
2(b)	$3 \div 3\frac{1}{3} \times \frac{2}{5}$ $= 3 \div \frac{10}{3} \times \frac{2}{5}$ $= 3 \times \frac{3}{10} \times \frac{2}{5}$ $= \frac{9}{25}$	[M1] [A1]
3(a)	$-4,\ 0,\ 2\sqrt{2},\ 2.\dot{8},\ \pi,\ \frac{22}{7}$	[B1]
3(b)(i)	Integers are $-4,\ 0$	[B1]
3(b)(ii)	Rational numbers are $-4,\ 0,\ 2.\dot{8},\ \frac{22}{7}$	[B1]
4(a)	$1\frac{3}{22} = 1.13\dot{6}$	[B1]
4(b)	$\frac{(16.3)^2 + \sqrt{915}}{\left(\frac{5}{9}\right)^3}$ $= 1725.916055$ $= 1725.92$ (2d.p.)	[B1]
4(c)	$\sqrt[3]{\frac{3}{2} + \frac{1}{2}}$ $= 1.644714243$ $= 1.6$ (2s.f.)	[B1]

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5(a)	$\dfrac{\left(-3\frac{2}{5}+6\frac{2}{3}\right)}{2}$ $=1\frac{19}{30}$	[M1] [A1]
5(b)	$29.74+126.3\times0.6315$ $\approx 30+130\times0.63$ (2s.f. – 1 more than required) $=111.9$ $=100$ (1s.f.)	[M1] [A1]
6(a)(b)		[B1 each]
7	When $s=1.5$ and $n=-2$, $A=\frac{1}{2}(1.5)^2(2(1.5)-(-2))$ $=5\frac{5}{8}$ or 5.625	[M1] [A1]
8(a)	$2(m+2n)-3(m-2n)$ $=2m+4n-3m+6n$ $=-m+10n$	[M1] [A1]
8(b)	$\frac{3x}{6xy}\times\frac{(2y)^2}{5}$ $=\frac{3x}{6xy}\times\frac{4y^2}{5}$ $=\frac{2y}{5}$ or $\frac{2}{5}y$	[M1] [A1]
9(a)	$3(x^2+2x+1)+(1-x)(2x)$ $=3x^2+6x+3+2x-2x^2$ $=x^2+8x+3$	[M1] [A1]
9(b)	Coefficient of x is 8.	[B1]
10(a)	$3mn+mn^2=mn(3+n)$	[B1]
10(b)	$3x(2x-y)+6y(y-2x)$ $=3x(2x-y)-6y(2x-y)$ $=(3x-6y)(2x-y)$ $=3(x-2y)(2x-y)$	[M1] [A1]

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11(a)	$\frac{2x-3}{3}-\frac{3x}{5}=2$ $\frac{5(2x-3)-9x}{15}=2$ $\frac{10x-15-9x}{15}=2$ $\frac{x-15}{15}=2$ $x-15=30$ $x=45$	[M1 – combine into 1 fraction] [M1 – simplify numerator] [A1]
11(b)	$\frac{4}{2x+3}+2=5$ $\frac{4}{2x+3}=3$ $4=3(2x+3)$ $4=6x+9$ $6x=-5$ $x=-\frac{5}{6}$	[M1] [A1]
12(a)	Father's age = $5+3x$	[B1]
12(b)	$x+35=5+3x$ $30=2x$ $x=15$	[M1 – any suitable equation] [A1]
13(a)	$\frac{2}{3}x+\frac{3}{4}x\geq 28$ $\frac{17}{12}x\geq 28$ $17x\geq 336$ $x\geq 19\frac{13}{17}$	[M1] [A1]
13(b)	23	[B1]
14(a)	$x+4x<50$ or $5x<50$ or $x<10$	[B1]
14(b)	$5x<50$ $x<10$ Maximum possible number of marbles = 9	[M1] [A1]

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15(a)	29, 33	[B1]
15(b)	$T_1 = 5$ $T_2 = 5 + 4$ $T_3 = 5 + 4 \times 2$ $T_4 = 5 + 4 \times 3$ $T_5 = 5 + 4 \times 4$ $T_n = 5 + 4(n-1)$ $= 5 + 4n - 4$ $= 4n + 1$	 [B1 – also accept $T_n = 5 + 4n - 4$]
15(c)	$T_{88} = 4(88) + 1 = 353$	[B1]
15(d)	Method 1 (Guess and Check) $T_{25} = 4(25) + 1 = 101$ $T_{24} = 4(24) + 1 = 97$ Therefore smallest term is 101. Or Method 2 (Solving inequality) $4n + 1 > 100$ $4n > 99$ $n > \frac{99}{4}$ $n > 24\frac{3}{4}$ Therefore smallest term is $T_{25} = 4(25) + 1 = 101$	 [M1] [A1] Or [M1] [A1]

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Mark Scheme for BMSS Sec 1 Express Mathematics Paper 2 MYE 2012

Qn	Answer	Marks
1(a)(i)	HCF $= 2^5 \times 13^2$	[B1]
1(a)(ii)	LCM $= 2^7 \times 5^3 \times 13^7$	[B1]
1(a)(iii)	$pq = 2^{12} \times 5^3 \times 13^9$	[B1]
1(a)(iv)	$\sqrt[3]{pq} = \sqrt[3]{2^{12} \times 5^3 \times 13^9}$ $= 2^4 \times 5^1 \times 13^3$ $= 2^4 \times 5 \times 13^3$	[B1]
1(b)	$24 = 2^3 \times 3$ $30 = 2 \times 3 \times 5$ LCM $= 2^3 \times 3 \times 5 = 120$ They will meet again 120 days later.	[M1 – attempt to find LCM] [A1]
2(a)	31, 37	[B1]
2(b)	$x = -2, -1, 0, 1, 2, 3$ $y = -5, -4, -3, -2, -1, 0, 1, 2$	
2(b)(i)	$x + y = (-2) + (-5) = -7$	[B1]
2(b)(ii)	$x^2 = (0)^2 = 0$	[B1]
2(b)(iii)	$xy = (3)(-5) = -15$	[B1]
3(a)(i)	$\frac{\frac{2}{3}+(0.7+3.6)^4}{1.7^2} = 118.528293 = 118.5$ (4s.f.)	[B1]
3(a)(ii)	$\sqrt{\frac{4}{23}} = 0.4170288281 = 0.4710$ (4s.f.)	[B1]
3(b)(i)	$34.5 \times \frac{6.13}{\sqrt[3]{28.1}}$ $\approx 35 \times \frac{6.1}{\sqrt[3]{27}}$ (2s.f. for working – 1 more than required) $= 71.16666667$ $= 70$ (1s.f.)	[M1] [A1]
3(b)(ii)	$345 \times \frac{6.13}{\sqrt[3]{28.1}}$ $= 10 \times 34.5 \times \frac{6.13}{\sqrt[3]{28.1}}$ $\approx 10 \times 70$ (from part (i)) $= 700$	[B1 for using 10×70]
4(a)(i)	1450	[B1]
4(a)(ii)	1549	[B1]

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4(b)(i)	Difference in temp $= 16.6 - (-4.2)$ $= 16.6 + 4.2$ $= 20.8\,°C$	[B1]
4(b)(ii)	Temp at 6pm $= 16.6 - \frac{20.8}{8} \times 3$ $= 8.8\,°C$	[M1] [A1]
5(a)(i)	$3\left(\frac{1}{2}x + \frac{2}{3}y\right) + (2x - y)\left(\frac{3}{2}\right)$ $= \frac{3}{2}x + 2y + 3x - \frac{3}{2}y$ $= \frac{9}{2}x + \frac{1}{2}y$ or $\frac{9x+y}{2}$	[M1] [A1]
5(a)(ii)	$(4a - 3b)(2b) - 8b^2$ $= 8ab - 6b^2 - 8b^2$ $= 8ab - 14b^2$	[M1] [A1]
5(b)(i)	Number of goats $= 50 - x$	[B1]
5(b)(ii)	$2x + 4(50 - x) = 128$ $2x + 200 - 4x = 128$ $-2x = 128 - 200$ $-2x = -72$ $x = 36$	[M1] [M1] [A1]
6(a)(i)	$a^2 - ab = a(a - b)$	[M1]
6(a)(ii)	$123^2 - 123 \times 23$ $= 123(123 - 23)$ $= 123 \times 100$ $= 12300$	[B1 for using $123 \times 100 =$ 12300]
6(b)(i)	$10x + 15xy - 20xz = 5x(2 + 3y - 4z)$	[B1]
6(b)(ii)	$mn + 2m - 2n - 4$ $= m(n + 2) - 2(n + 2)$ $= (m - 2)(n + 2)$	[M1] [A1]

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7(a)	When $a = 2, u = -3$ and $v = 4$ $(4)^2 = (-3)^2 + 2(2)t$ $16 = 9 + 4t$ $4t = 7$ $t = \frac{7}{4}$ $t = 1\frac{3}{4}$	[M1] [A1]
7(b)(i)	$3(x + 4) - 2(3x - 5) = 7$ $3x + 12 - 6x + 10 = 7$ $-3x + 22 = 7$ $-3x = -15$ $x = 5$	[M1] [A1]
7(b)(ii)	$\frac{4}{4 - 3x} = \frac{1}{2x + 1}$ $4(2x + 1) = 1(4 - 3x)$ $8x + 4 = 4 - 3x$ $11x = 0$ $x = 0$	[M1] [A1]
8(a)	$\frac{3(2x - 3)}{5} + \frac{3x + 1}{2}$ $= \frac{6(2x - 3) + 5(3x + 1)}{10}$ $= \frac{12x - 18 + 15x + 5}{10}$ $= \frac{27x - 13}{10}$	[M1] [M1] [A1]
8(b)	$\frac{3(2x - 3)}{5} + \frac{3x + 1}{2} < 5$ $\frac{27x - 13}{10} < 5$ $27x - 13 < 50$ $27x < 63$ $x < \frac{63}{27}$ $x < 2\frac{1}{3}$	[M1] [A1]

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9(a)	$T_6 = 21 = 1 + 2 + 3 + 4 + 5 + 6$	[B1]
9(b)	When $n = 6$, $\frac{n(n+1)}{2} = \frac{6\times7}{2} = 21$ (shown)	[B1 for showing $\frac{6\times7}{2} = 21$]
9(c)	$T_{100} = \frac{100(100+1)}{2} = 5050$	[B1]
9(d)	$3 + 6 + 9 + 12 + 15 + \cdots + 300$ $= 3(1 + 2 + 3 + 4 + 5 + \cdots + 100)$ $= 3T_{100}$ $= 3(5050)$ $= 15150$	[B1]
9(e)	Sum $= (1 + 2 + 3 + \cdots + 300) - (3 + 6 + 9 + \cdots + 300)$ $= T_{300} - 15150$ $= \frac{300(300+1)}{2} - 15150$ $= 30000$	[M1] [A1]

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