16

Name:_____ ( ) Class:_____ Marks:_____/60

SPRINGFIELD SECONDARY SCHOOL

"BETTER SELF FOR BETTER TOMORROW"

Mid-Year Examination 2016

MATHEMATICS
Paper 1
Secondary 2 Express

6 May 2016 1 hour 30 minutes

Candidates answer on the Question Paper

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the spaces at the top of this page.
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 loss of marks.
Calculators should be used when 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 marks for this paper is 60.

Do not turn over this question paper until you are told to do so.

This question paper consists of 14 printed pages

For Examiner's use

Answer all questions.

For Examiner's use

1 Expand and simplify the following algebraic expressions.

(a) $(2x-3)(3x+1)$

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

(b) $(-3a+\frac{1}{2})^2$

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

(c) $\frac{2}{5}[-(c-d)]$

Answer (c) ..... [2]

For Examiner's use

2 Factorise the following algebraic expressions completely.

(a) $5mn + 10m^3n + 20mn^2$

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

(b) $9x^2y + 3xy - 12x^2y^2 - 4xy^2$

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

(c) $\frac{1}{4}a^2 - \frac{1}{16}b^2$

Answer (c) ..... [2]

For Examiner's use

For Examiner's use

3 Solve the following equations.

(a) $10s^2 + 13s - 3 = 0$

Answer (a) $s =$ ..... , ... [2]

(b) $\frac{7p-1}{2} + 1 = \frac{12p+5}{3}$

Answer (b) $p =$ ..... [3]

For Examiner's use

4 Given the formula $\sqrt{q+2r} = \frac{s}{4}$,

(a) express q as the subject of the formula.

Answer (a) $q =$ ..... [2]

(b) Find the value of q when $r = 2$ and $s = -6$.

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

For Examiner's use

5 Simplify the following algebraic fractions.

(a) $\dfrac{7g^2h}{6fh^3} \div \dfrac{21g^3}{3f^4gh}$

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

(b) $\dfrac{121x^2 - 81y^2}{22x + 18y}$

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

(c) $\dfrac{4m}{n+7} - \dfrac{3mn}{4n^2 + 28n}$

Answer (c) ..... [3]

For Examiner's use

For Examiner's use

6 A pair of simultaneous equations is given by

$$2y = 5x + 8 \quad \text{and} \quad 3x + 2y = 8$$

The tables of values for both equations are shown below.

$2y = 5x + 8$

x	-2	1	2
y	-1	6.5	9

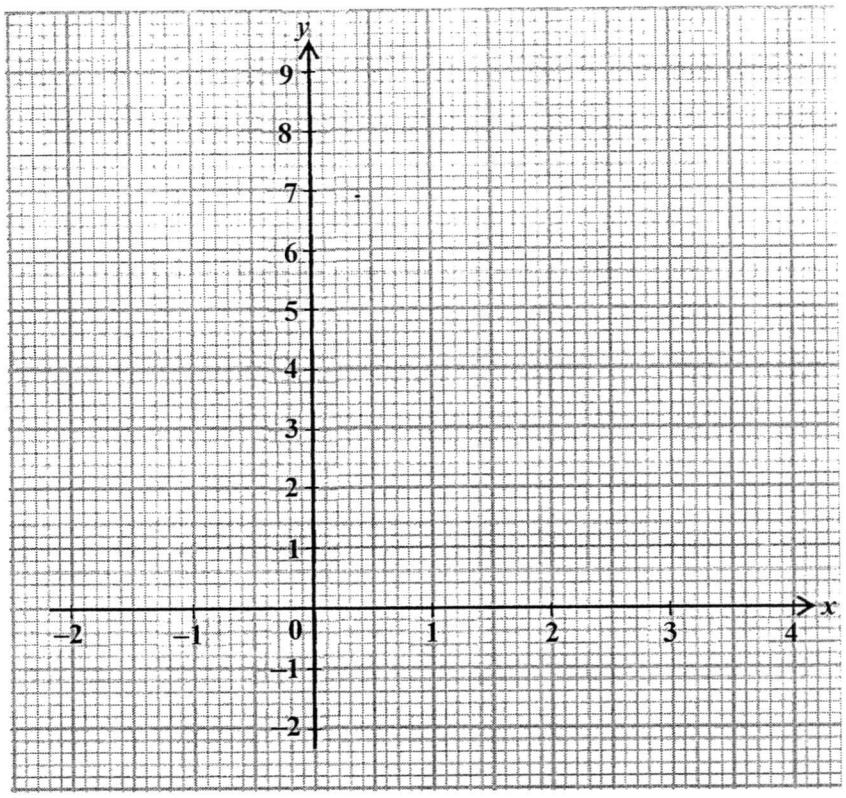
$3x + 2y = 8$

x	-2	2	4
y	a	1	-2

(a) Find the value of a.

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

(b) On the axes given below, plot the graphs of $2y = 5x + 8$ and $3x + 2y = 8$. [2]



(c) Hence, find the solution to the simultaneous equations $2y = 5x + 8$ and $3x + 2y = 8$.

Answer (c) $x =$ ..... , $y =$ ..... [1]

For Examiner's use

7 Solve the simultaneous equations

$$2x + 5y = 8$$
$$2y - 7 = 3x$$

For Examiner's use

Answer $x =$ ..... , $y =$ ..... [4]

For Examiner's use

8 Given that $x = -1$ is one of the solutions for the equation $9x^2 + kx + 6 = 0$.
Find

(a) the value of k,

Answer (a) $k =$ ..... [2]

(b) the second solution of the equation.

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

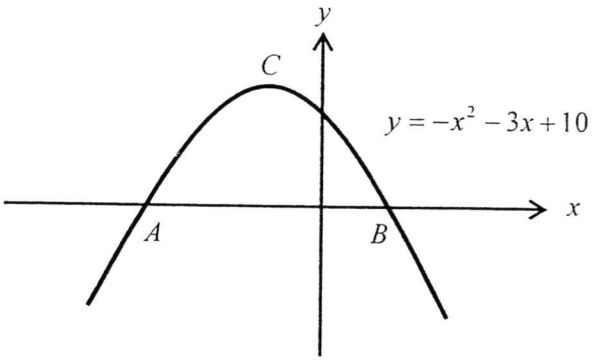
For Examiner's use

9 Given that x is directly proportional to the square root of y and $x = 27$ for a particular value of y.
Find the value of x when the value of y is increased by 800%.

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

For Examiner's use

10 The diagram below shows the quadratic graph $y = -x^2 - 3x + 10$.



(a) Find the coordinates of A and B.

Answer (a) A(..... , ...) [3]

B(..... , ...)

(b) Write down the equation of the line of symmetry of the curve.

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

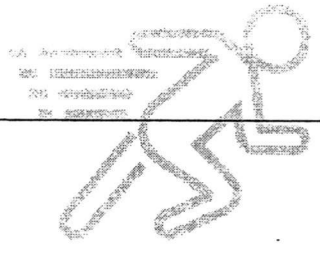
For Examiner's use

(c) Write down the coordinates of the maximum point, C, of the curve.

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

(d) Find the area of triangle ABC.

Answer (b) ..... units^2 [1]



For Examiner's use

11 V is inversely proportional to the square of g. If $V = 1200$ when $g = 3$,

(a) find the value of V when $g = 4$.

Answer $V =$ ..... [3]

(b) A student's answer for V when $g = 2$ is 1000. Without doing any calculations, explain why the answer is wrong.

Answer .....

.....

.....

.....

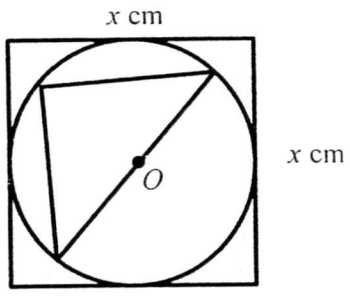
.....

..... [1]

For Examiner's use

For Examiner's use

12 The diagram below is made up of a square, circle and triangle. O is the centre of the circle. The square has sides of length x cm.



Find,

(a) the area of the shaded region in terms of x, taking π to be $\frac{22}{7}$.

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

(b) the area of the triangle in terms of x.

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

For Examiner's use

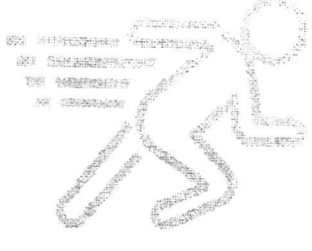
For Examiner's use

(c) If the area of the triangle is 11 cm^2 more than the area of the shaded region, find the value of x.

For Examiner's use

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

End of Paper



Name:_____ ( ) Class:_____ Marks:_____/80

SPRINGFIELD SECONDARY SCHOOL

"BETTER SELF FOR BETTER TOMORROW"

Mid-Year Examination 2016

MATHEMATICS
Paper 2
Secondary 2 Express

11 May 2016 2 hours

Additional Materials: Writing Paper (4 sheets)
Graph Paper (1 sheet)
Electronic Calculator

READ THESE INSTRUCTIONS FIRST

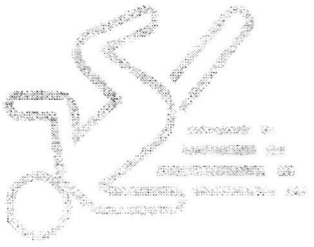
Write your name, class and index number in the spaces at the top of this page.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The use of an approved 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 marks for this paper is 80.

Do not turn over this question paper until you are told to do so.

This question paper consists of 6 printed pages



Answer **all** questions.

1 **(a)** Expand and simplify each of the following expressions.

(i) $(y+7x)(2y-x)$ [2]

(ii) $(6a-1)(a+3)-a(a+1)$ [3]

(iii) $p-(p-1)^2$ [3]

(b) **(i)** Expand and simplify $\left(x+\frac{1}{x}\right)^2$. [2]

(ii) Hence, given that $x^2+\frac{1}{x^2}=5$, find the value of $\left(x+\frac{1}{x}\right)^2$. [1]

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2 **(a)** Factorise each of the following expressions completely.

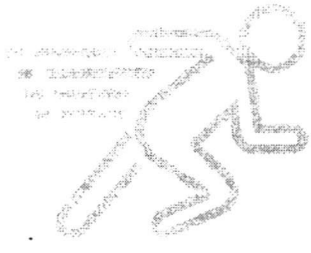
(i) $5g^2h^3-5gh^2$ [1]

(ii) $4m^2n^2-4mn+1$ [1]

(iii) $x^2-4y^2-xy+2y^2$ [3]

(b) **(i)** Factorise $2a^2-a-1$. [1]

(ii) Hence, find two factors of $2(10000)-100-1$. [2]



3 Simplify the following fractions.

(a) $\dfrac{c^2 - d^2}{2c - 2d}$ [2]

(b) $\dfrac{14f}{g^2} \div \dfrac{7f^2}{2fg}$ [2]

(c) $\dfrac{2}{2k^2 + 3k + 1} - \dfrac{2}{2k + 1}$ [3]

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4 **(a)** Make x the subject of the following formulae.

(i) $\sqrt{V + 2x} = h$ [3]

(ii) $\dfrac{a}{x} \div b^2 = c$ [3]

(b) Jeremy has \$5000. He wants to deposit this money into a savings account to earn some interest. He compares the savings accounts offered by two banks, Huat Ah Bank and Value Bank, to see which bank gives a better deal.

Bank	**Information**
Huat Ah Bank	If \$$P$ is deposited into a Huat Ah Bank account initially, then after n years, the total amount of money \$$A_H$ in the account would be given by $A_H = P(1.02)^n$. (Assuming that no further deposits are made.)
Value Bank	If \$$P$ is deposited into a Value Bank account initially, then after n years, the total amount of money \$$A_V$ in the account would be given by $A_V = P(1 + 0.02n)$. (Assuming that no further deposits are made.)

(i) If Jeremy wants to put his \$5000 in one of these bank accounts for 5 years, which bank should he choose? Justify your answer with appropriate calculations. [3]

(ii) How much money must Jeremy deposit into Huat Ah Bank in order to have a total of \$6500 after 3 years? Round off your answer to the nearest dollar. [2]

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5 **(a)** **(i)** Solve the simultaneous equations $x + 3y = 5$ and $7x - 6y = -19$. [4]

(ii) Name the method you used to solve **(a)(i)**. [1]

(b) Explain why the simultaneous equations $2a + b = 4$ and $4a + 2b = 8$ have infinitely many solutions. [1]

(c) A pair of simultaneous equations is given by

$$3a - b = 12 \quad \text{and} \quad \frac{a}{3} - \frac{b}{4} = 2$$

Amy claims that the solution to the simultaneous equations is $a = 4.8$, $b = 2.4$.

Explain how she can check if her answer is correct.
Hence, explain whether her answer is correct. [3]

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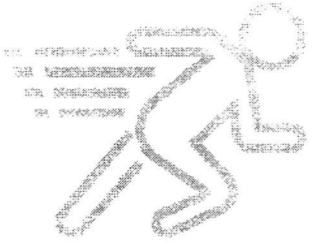
6 **(a)** If $x = 1$ and $y = 2$ is the solution of the simultaneous equations

$$ax - by = 1$$
$$ay + bx = 17,$$

find the value of a and b. [4]

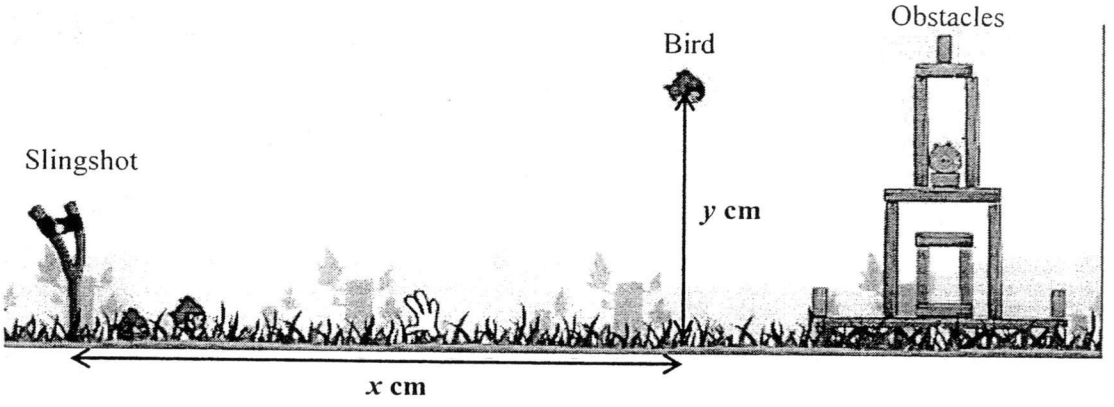
(b) Jason and Benson are walking at different speeds. If they walk in the same direction, Jason would be 3 km in front of Benson after 3 hours. If they walk in opposite directions, Jason would be 10 km away from Benson after 2 hours.

Let Jason's speed be x km/h and Benson's speed be y km/h. Assuming that their speeds are constant, find the speed of Jason and Benson. [4]



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

In the popular mobile game Angry Birds, players use a slingshot to launch birds at obstacles, with the aim of destroying these obstacles.



The path of a bird that is released from a slingshot can be described by the equation $y = -2x^2 + 7x + 4$, where y cm is the vertical height of the bird from the ground and x cm is the horizontal distance of the bird from the slingshot.

(a) Copy and complete the table of values below.

x	0	1	1.5	2	2.5	3	4
y	4	9	10			7	0

[2]

(b) Using a scale of 4 cm : 1 unit for the x-axis and 2 cm : 1 unit for the y-axis, plot the graph of $y = -2x^2 + 7x + 4$ for $0 \le x \le 4$. [4]

(c) If there are no obstacles in the way, the angry bird will land on the ground at a certain position. State the coordinates of this position. [1]

(d) An obstacle is placed at the coordinates (3.5, 2). Using the graph, state and explain whether the bird collides with this obstacle. [2]

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8 **(a)** Solve $2x^2 - 5x + 4 = 6 - 2x$. [3]

(b) A rectangle has length $(a + 6)$ cm and breadth $(-a + 6)$ cm. The rectangle has an area of $5a$ cm^2.

(i) Form an equation in a and show that it reduces to $a^2 + 5a - 36 = 0$. [2]

(ii) Hence, find the perimeter of the rectangle. [3]

---

9 **(a)** Given that y is directly proportional to x^2 and $y = 18$ when $x = 3$, find

(i) an equation connecting y and x, with y as the subject of the formula. [2]

(ii) the value of y when $x = 5$. [1]

(b) Ahmad is undergoing Basic Military Training as part of his National Service (NS). During this training, he is required to dig trenches, which provides some protection from enemy fire. He finds that in general, 3 men will need 5 hours to dig 4 trenches.

Assuming that all the men work at the same rate, calculate

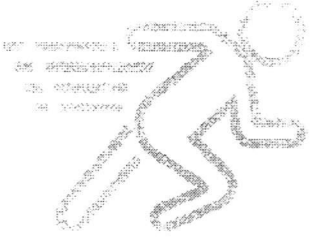
(i) the number of hours needed for 3 men to dig 1 trench, [1]

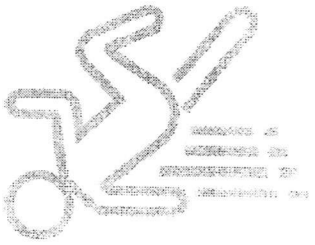
(ii) the number of hours needed for 1 man to dig 1 trench, [1]

(iii) the number of trenches that 20 men can dig in 3 hours. [2]

(c) Chen Bing, a farmer in China, has enough grains to feed his 400 chickens for 8 weeks. Unfortunately, his neighbour's grain store caught fire and was burnt down. His neighbour has to borrow grains from Chen Bing to feed 240 chickens. How long can the grains last both the farmers? [2]

END OF PAPER





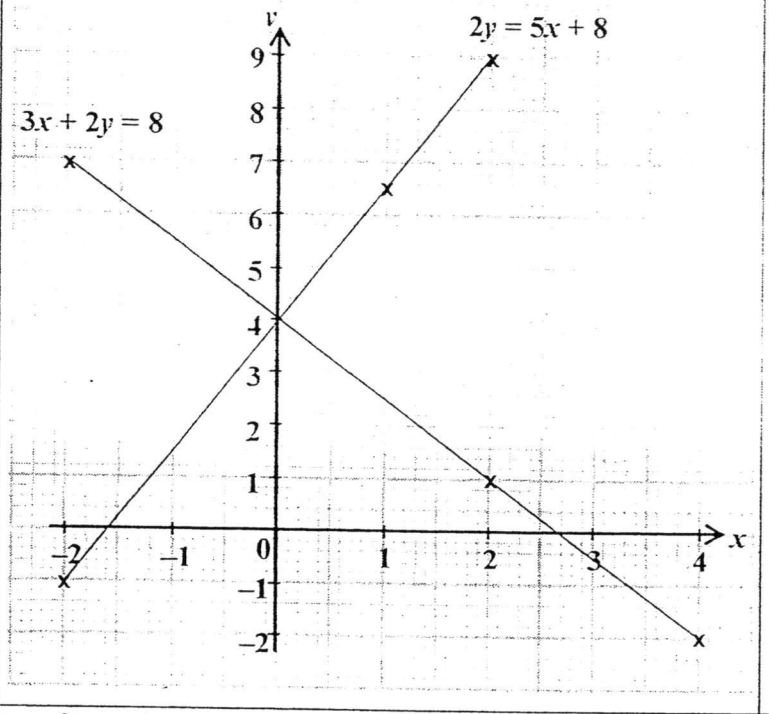
Springfield Secondary School
Mathematics Department

Mid-Year Exam Paper 1 2016 Level: Sec 2 Express

Qn	Answer	Marks	Remarks
	Total Marks: [60 Marks]		
1a	$(2x-3)(3x+1) = 6x^2 + 2x - 9x - 3$ $= 6x^2 - 7x - 3$	[M1] [A1]	
1b	$(-3a+\frac{1}{2})^2 = (-3a)^2 + 2(-3a)\left(\frac{1}{2}\right) + \left(\frac{1}{2}\right)^2$ $= 9a^2 - 3a + \frac{1}{4}$	[M1] [A1]	Accept term by term multiplication.
1c	$\frac{2}{5}[-(c-d)] = \frac{2}{5}(-c+d)$ $= -\frac{2}{5}c + \frac{2}{5}d$	[M1] [A1]	
2a	$5mn + 10m^3n + 20mn^2 = 5mn(1 + 2m^2 + 4n)$	[B1]	
2b	$9x^2y + 3xy - 12x^2y^2 - 4xy^2 = 3xy(3x+1) - 4xy^2(3x+1)$ $= (3x+1)(3xy - 4xy^2)$ $= xy(3x+1)(3-4y)$	[M1] [M1] [A1]	
2c	$\frac{1}{4}a^2 - \frac{1}{16}b^2 = \left(\frac{1}{2}a\right)^2 - \left(\frac{1}{4}b\right)^2$ $= \left(\frac{1}{2}a + \frac{1}{4}b\right)\left(\frac{1}{2}a - \frac{1}{4}b\right)$	[M1] [A1]	
3a	$10s^2 + 13s - 3 = 0$ $(5s-1)(2s+3) = 0$ $5s - 1 = 0$ or $2s + 3 = 0$ $5s = 1$ or $2s = -3$ $s = \frac{1}{5}$ or $s = -\frac{3}{2}$	[M1] [A1]	

3b	$\frac{7p-1}{2}+1=\frac{12p+5}{3}$ $\frac{7p-1+2}{2}=\frac{12p+5}{3}$ $\frac{7p+1}{2}=\frac{12p+5}{3}$ $3(7p+1)=2(12p+5)$ $21p+3=24p+10$ $24p-21p=3-10$ $3p=-7$ $p=-\frac{7}{3}$	[M1] [M1] [A1]	
4a	$\sqrt{q+2r}=\frac{s}{4}$ $q+2r=\left(\frac{s}{4}\right)^2$ $q+2r=\frac{s^2}{16}$ $q=\frac{s^2}{16}-2r$	[M1] [A1]	
4b	$q=\frac{s^2}{16}-2r$ $q=\frac{(-6)^2}{16}-2(2)$ $=\frac{36}{16}-4$ $=-\frac{7}{4}$	[M1] [A1]	
5a	$\frac{7g^2h}{6fh^3}\div\frac{21g^3}{3f^4gh}$ $=\frac{7g^2h}{6fh^3}\times\frac{3f^4gh}{21g^3}$ $=\frac{f^3}{6h}$	[M1] [A1]	

5b	$\dfrac{121x^2-81y^2}{22x+18y}$ $=\dfrac{(11x)^2-(9y)^2}{2(11x+9y)}$ $=\dfrac{(11x+9y)(11x-9y)}{2(11x+9y)}$ $=\dfrac{(11x-9y)}{2}$	 [M1] [M1] [A1]	[M1] each for correct factorisation of numerator and denominator
5c	$\dfrac{4m}{n+7}-\dfrac{3mn}{4n^2+28n}$ $=\dfrac{4m}{n+7}-\dfrac{3mn}{4n(n+7)}$ $=\dfrac{4m(4n)-3mn}{4n(n+7)}$ $=\dfrac{16mn-3mn}{4n(n+7)}$ $=\dfrac{13mn}{4n(n+7)}$ $=\dfrac{13m}{4(n+7)}$	 [M1] [M1] [A1]	
6(a)	When $x = -2$, $3(-2)+2y=8$ $-6+2y=8$ $2y=8+6$ $2y=14$ $y=7$ $\therefore a=7$	 B1	

6(b)		B1 for each graph -	
6(c)	$x = 0, y = 4$	B1	
7	$2x + 5y = 8 - - - (1)$ $2y - 7 = 3x - - - (2)$ $From (2): 3x - 2y = -7 - - - (3)$ $(1) \times 3: 6x + 15y = 24 - - - (4)$ $(3) \times 2: 6x - 4y = -14 - - - (5)$ $(4) - (5): 15y - (-4y) = 24 - (-14)$ $19y = 38$ $y = 2$ Sub $y = 2$ into (2): $x = \frac{2(2) - 7}{3}$ $= \frac{4 - 7}{3}$ $= \frac{-3}{3}$ $= -1$	[M1] [M1] [A1] [A1]	Accept Substitution method. M1 – Make one variable the subject M1 – correct substitution

8a	$9x^2 + kx + 6 = 0$ $9(-1)^2 + k(-1) + 6 = 0$ $9(1) - k + 6 = 0$ $9 - k + 6 = 0$ $-k + 15 = 0$ $-k = -15$ $k = 15$	[M1] [A1]	
8b	$9x^2 + 15x + 6 = 0$ $(3x + 2)(3x + 3) = 0$ $3x = -2$ or $3x = -3$ $x = -\frac{2}{3}$ or $x = -1$ Therefore, $x = -\frac{2}{3}$ is the other solution.	[M1] [A1]	
9	$x = k\sqrt{y}$ Let $x = 27$ and $y = y_1$ $\therefore 27 = k\sqrt{y_1}$ When y is increased by 800% → y becomes $9y$ $k\sqrt{9y} = 3k\sqrt{y}$ $\therefore x = 27 \times 3$ $= 81$	 [M1] [A1]	
10a	$-x^2 - 3x + 10 = 0$ $(-x + 2)(x + 5) = 0$ $(-x + 2) = 0$ or $(x + 5) = 0$ $x = 2$ or $x = -5$ $\therefore A(-5,0), B(2,0)$	[M1] [M1] [A1]	
10b	Mid – point $= \frac{2-(-5)}{2}$ $= \frac{7}{2}$ x – coordinate of $C = -5 + \frac{7}{2}$ $= -\frac{3}{2}$ $\therefore$ The equation of the line of symmetry is $x = -\frac{3}{2}$.	 [M1] [A1]	Accept $x = -1.5$

10c	$y-\text{coordinate of } C = -\left(-\frac{3}{2}\right)^2 - 3\left(-\frac{3}{2}\right)+10$ $= -\frac{9}{4}+\frac{9}{2}+10$ $= 12\frac{1}{4}$ $\therefore$ The coordinates of the maximum point is $\left(-\frac{3}{2}, 12\frac{1}{4}\right)$	[B1]	Accept (-1.5, 12.25)
10d	Area of triangle $ABC = \frac{1}{2}\times 7\times 12\frac{1}{4}$ $= 42\frac{7}{8}\text{ units}^2$	[B1]	Accept 42.875 units^2
11a	$V = \frac{k}{g^2}$ $1200 = \frac{k}{3^2}$ $1200 = \frac{k}{9}$ $k = 1200\times 9$ $k = 10800$ $V = \frac{10800}{g^2}$ When $g = 4$, $V = \frac{10800}{4^2}$ $= 675$	[M1] [A1] [B1]	
11b	Since V is inversely proportional to g, when g decreases (3 to 2), V should increase. However, instead of increasing, the value of V decreases (from 1200 to 1000). Thus, the answer is wrong.	[B1]	

12a	Area of square $= x^2 \text{cm}^2$ Area of circle $= \pi\left(\frac{x}{2}\right)^2$ $= \left(\frac{22}{7}\right)\left(\frac{x^2}{4}\right)$ $= \frac{11x^2}{14}\text{cm}^2$ Area of shaded region $= x^2 - \frac{11x^2}{14}\text{cm}^2$ $= \frac{3}{14}x^2\text{cm}^2$	[M1] [A1]	
12b	Area of triangle $= \frac{1}{2} \times x \times \frac{x}{2}$ $= \frac{x^2}{4}\text{cm}^2$	[M1] [A1]	
12c	$\frac{x^2}{4} - \frac{3}{14}x^2 = 11$ $\frac{x^2}{28} = 11$ $x^2 = 11 \times 28$ $x^2 = 308$ $x = \pm\sqrt{308}$ $\therefore x = \sqrt{308}$ ($x > 0 \because x$ is a length) $x = 17.5$ (3s.f)	[M1] [A1]	

Springfield Secondary School
Secondary 2 Express Mathematics
Mid-Year Examination 2016 Paper 2 Mark Scheme

S/N			Solutions	Marks	Remarks
1	a	i	$(y+7x)(2y-x)$ $=2y^2-xy+14xy-7x^2$ $=2y^2+13xy-7x^2$	 M1 A1	 Or B2
		ii	$(6a-1)(a+3)-a(a+1)$ $=6a^2+18a-a-3-a^2-a$ $=5a^2+16a-3$	 M1, M1 A1	 M1 for each correct expansion
		iii	$p-(p-1)^2$ $=p-(p^2-2p+1)$ $=p-p^2+2p-1$ $=3p-p^2-1$	 M1 M1 A1	
	b	i	$\left(x+\frac{1}{x}\right)^2$ $=x^2+2(x)\left(\frac{1}{x}\right)+\left(\frac{1}{x}\right)^2$ $=x^2+2+\frac{1}{x^2}$	 M1 A1	M1 can be given for correct use of multiplication frame as well.
		ii	$\left(x+\frac{1}{x}\right)^2=x^2+\frac{1}{x^2}+2=5+2=7$	B1	
2	a	i	$5g^2h^3-5gh^2=5gh^2(gh-1)$	B1	
		ii	$4m^2n^2-4mn+1=(2mn-1)^2$	B1	
		iii	$x^2-4y^2-xy+2y^2$ $=(x+2y)(x-2y)-y(x-2y)$ $=(x-2y)(x+2y-y)$ $=(x-2y)(x+y)$	 M1, M1 A1	 M1 for each correct factorisation
	b	i	$2a^2-a-1=(2a+1)(a-1)$	B1	
		ii	$2(10000)-100-1$ $=2(100)^2-100-1$ **OR** recognising that $a=100$. $=[2(100)+1][100-1]$ The two factors are $2(100)+1=201$ and $100-1=99$.	 M1 A1	A1: Accept both numerical value and expression.
3	a		$\frac{c^2-d^2}{2c-2d}$ $=\frac{(c+d)(c-d)}{2(c-d)}$ $=\frac{c+d}{2}$	 M1 A1	

	b		$\frac{14f}{g^2} \div \frac{7f^2}{2fg}$ $= \frac{14f}{g^2} \times \frac{2fg}{7f^2}$ $= \frac{4}{g}$	M1 A1	-
	c		$\frac{2}{2k^2+3k+1} - \frac{2}{2k+1}$ $= \frac{2}{(2k+1)(k+1)} - \frac{2(k+1)}{(2k+1)(k+1)}$ $= \frac{2-2(k+1)}{(2k+1)(k+1)}$ $= \frac{2-2k-2}{(2k+1)(k+1)}$ $= \frac{-2k}{(k+1)(2k+1)}$	M1, M1 A1	M1 for factorisation of $2k^2+3k+1$ M1 for changing of denominator
4	**a**	**i**	$\sqrt{V+2x} = h$ $V+2x = h^2$ $2x = h^2 - V$ $x = \frac{h^2-V}{2}$	M1 M1 A1	
		ii	$\frac{a}{x} - b^2 = c$ $a - b^2x = cx$ OR $\frac{a}{x} = c + b^2$ $a = cx + b^2x$ $a = (c+b^2)x$ $x = \frac{a}{c+b^2}$	M1 M1 A1	
	b	**i**	If Jeremy deposits \$5000 into Huat Ah Bank for 5 years, he would have a total of $A_H = P(1.02)^n$ $= 5000(1.02)^5$ $= 5520.40$ If Jeremy deposits \$5000 into Value Bank for 5 years, he would have a total of $A_V = P(1+0.02n)$ $= 5000(1+0.02\times5)$ $= 5500$ He should choose Huat Ah Bank as it would give better returns.	 M1 M1 A1	M1 for correct use of formulae

		ii	$A_H = P(1.02)^n$ $6500 = P(1.02)^3$ $P = 6500 \div 1.02^3$ $P = 6125$ (to the nearest dollar)	M1 A1	
5	a	i	$x + 3y = 5$ --------① $7x - 6y = -19$ --------② By Elimination: ①$\times 7$: $7x + 21y = 35$ -------③ ③ − ②: $7x + 21y - (7x - 6y) = 35 - (-19)$ $7x + 21y - 7x + 6y = 35 + 19$ $27y = 54$ $y = 2$ Sub $y = 2$ into ①: $x + 3(2) = 5$ $x + 6 = 5$ $x = -1$ By Substitution: From ①: $x = 5 - 3y$ -------③ Sub ③ into ②: $7(5 - 3y) - 6y = -19$ $35 - 21y - 6y = -19$ $35 - 27y = -19$ $-27y = -54$ $y = 2$ Sub $y = 2$ into ①: $x + 3(2) = 5$ $x + 6 = 5$ $x = -1$	 M1 M1 A1 A1 (M1) (M1) (A1) (A1)	M1 for multiplying by appropriate number M1 for appropriate subtraction of equations M1 for correct changing of subject M1 for correct substitution
		ii	Elimination or substitution (based on answer in (a)(i))	B1	
	b		This is because when the equation $2a + b = 4$ is multiplied by 2, $2(2a + b) = 2(4)$ $4a + 2b = 8$ The result is the second equation. i.e. they are equivalent.	B1	B1 for recognising that the equations are equivalent.
	c		She can check if her answer is correct by substituting the values of x and y into both equations. Her answer is correct if the values satisfy both equations. $3(4.8) - 2.4 = 14.4 - 2.4 = 12$ $\therefore a = 4.8, b = 2.4$ satisfies the equation $3a - b = 12$.	M1 M1	M1, M1 for word explanations OR M1 for substituting into both equations

			$\frac{4.8}{3}-\frac{2.4}{4}=1.6-0.6=1$ $\therefore a=4.8, b=2.4$ does **not** satisfy the equation $\frac{a}{3}-\frac{b}{4}=2$. Her answer is <u>not correct</u> as $a=4.8$, $b=2.4$ does not satisfy $\frac{a}{3}-\frac{b}{4}=2$.	A1	(shown numerically), M1 for evaluating whether the values satisfy the equations.
6	a		Substitute $x=1$ and $y=2$ into each equation. $a(1)-b(2)=1$ $a-2b=1---(1)$ $a(2)+b(1)=17$ $2a+b=17---(2)$ From (1): $a=1+2b---(3)$ Sub (3) into (2): $2(1+2b)+b=17$ $2+4b+b=17$ $5b=15$ $b=3$ Sub $b=3$ into (3): $a=1+2(3)=7$ $a=7, b=3$	M1 M1 M1 A1 (both x and y)	M1 for substituting values of x and y into both equations. <u>Substitution</u> M1 for changing subject of formula, M1 for substituting <u>Elimination</u> M1 for multiplying by appropriate number, M1 for correct subtraction/ addition of equations
	b		$3x-3y=3---(1)$ $2x+2y=10---(2)$ $(1)\times 2: 6x-6y=6---(3)$ $(2)\times 3: 6x+6y=30---(4)$ $(3)-(4): -6y-6y=6-30$ $-12y=-24$ $y=2$ Sub $y=2$ into (1): $3x-3(2)=3$ $3x-6=3$ $3x=9$ $x=3$ Jason's speed = 3 km/h Benson's speed = 2 km/h	M1 M1 A1 A1	Accept substitution method.

7	a		x 0 1 1.5 2 2.5 3 4 y 4 9 10 10 9 7 0	B1 B1	
	b		B1 for scale B1 for 3 correctly plotted points B1 for 4 more correctly plotted points B1 for smooth curve	B1 B1 B1 B1	
	c		(4, 0)	B1	
	d		The graph does not pass through the point (3.5, 2), hence the bird does not collide with the obstacle. (B1 only, if student plotted (3.5,2) on the axes without any explanation.) (B1 if the graph, due to some error, does pass through (3.5, 2), and student correctly inferred that bird does collide with the obstacle)	B2	0 m if no explanation
8	a		$2x^2 - 5x + 4 = 6 - 2x$ $2x^2 - 5x + 2x + 4 - 6 = 0$ $2x^2 - 3x - 2 = 0$ $(x-2)(2x+1) = 0$ $x - 2 = 0$ or $2x + 1 = 0$ $x = 2$ or $x = -\frac{1}{2}$	M1 M1 M1	
	b	i	$(a+6)(-a+6) = 5a$ $-a^2 + 36 = 5a$ $a^2 + 5a - 36 = 0$	M1 A1 Given	
		ii	$(a+9)(a-4) = 0$ $a + 9 = 0$ or $a - 4 = 0$ $a = -9$ or $a = 4$ Reject $a = -9$ as the length cannot be negative ($a + 6 = -3$). Length = $a + 6 = 4 + 6 = 10$ cm Breadth = $-a + 6 = -4 + 6 = 2$ cm Perimeter = $10 + 10 + 2 + 2 = 24$ cm	M1 M1 A1	
9	a	i	$y = kx^2$ $y = 18$ when $x = 3$: $18 = k(3)^2$ $k = 2$ $y = 2x^2$	M1 A1	
		ii	$y = 2x^2 = 2(5)^2 = 50$	B1	
	b	i	5 / 4 = 1.25	B1	
		ii	1.25 × 3 = 3.75	B1	
		iii	1 man takes 3.75 hours to dig 1 trench. 1 man takes 1 hour to dig 1/3.75 = 4/15 of a trench. 20 men take 1 hour to dig 20 × 4/15 = 16/3 trenches. 20 men take 3 hours to dig 16 trenches.	M1 A1	

			OR In 3 hours, 1 man can dig 3/3.75 = 0.8 trenches In 3 hours, 20 men can dig 20 × 0.8 = 16 trenches OR $\frac{20}{3.75} \times 3$ $= 16$	(M1, A1) (M1, A1)	
	c		Chen Bing and his neighbour have a total of 640 chickens. The feed is enough to last 400 chickens for 8 weeks. Thus, it is enough to last 1 chicken for 400 × 8 = 3200 weeks. Thus, it is enough to last 640 chickens for 3200/640 = 5 weeks.	M1 A1	

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