BEATTY SECONDARY SCHOOL
MID-YEAR EXAMINATION 2015

SUBJECT : Mathematics

PAPER : 1

SETTER : Mr Anthony Goh

LEVEL : Secondary 2 Express

DURATION : 1 hour 15 minutes

DATE : 15 May 2015

CLASS :	NAME :	REG NO :

.....

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the spaces on 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.
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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 paper consists of **11** printed pages (including this cover page)

[Turn over

Answer all questions.

1 **(a)** Expand and simplify $(a+3)(2a-3)$.

(b) Simplify $(-4x^2)(4x)^2$.

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

(b) ..... [2]

2 Solve each of the following equations.

(a) $(2p+3)(p-5)=0$,

(b) $x^2=7x$.

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

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

3 Factorise **completely** each of the following expressions.

(a) $5w^2 - 23w + 12$

(b) $50c^2 - 98d^2$

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

(b) ..... [2]

4 Solve $\frac{2}{5z-1} = -\frac{3}{4}$.

Answer $z =$ ..... [2]

5 A map has a scale of 1:400 000.

(a) Given that the actual distance between two locations A and B is 14 km, find the distance, in cm, between A and B on the map.

(b) Given that the area of a garden on the map is 1.5 cm^2, calculate its actual area in km^2.

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

(b) ..... km^2 [2]

6 The kinetic energy, E joules, of a particular object is directly proportional to the square of its velocity v m/s. Given that $E = 75$ joules when $v = 2.5$ m/s, find

(a) the equation connecting E and v,

(b) the value of v, in m/s, when $E = 432$ joules.

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

(b) $v =$ ..... m/s [2]

7 **(a)** Factorize $x^2 - 9$.

(b) Hence, find 2 factors of 2491, other than 1 and 2491.

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

(b) ..... , ... [2]

8 4 workers can complete an assignment in 15 days. Assuming all the workers work at the same rate, find

(a) the number of days taken by 3 workers to complete the assignment,

(b) the number of additional workers needed if the assignment is to be completed in 10 days.

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

(b) ..... additional workers [2]

9 **(a)** Express $\frac{1}{2x+1}+\frac{2}{3x-2}$ as a single fraction in its simplest form.

(b) Simplify $\frac{a^3b^2c^3}{24c^4}\div\frac{a^3b}{8c}$.

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

(b) ..... [2]

4

10 Simplify each of the following expressions.

(a) $\dfrac{2n^2+3n}{16n+24}$,

(b) $\dfrac{e^4f^2-e^3f^3}{e^2f^4-e^3f^3}$.

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

(b) ..... [2]

11 Solve $(x+3)(x-5)=20$.

Answer $x =$ ..... [3]

12 Given that $p = \sqrt{\dfrac{2-q}{3+q}}$,

(a) find the value of p when $q = -\dfrac{5}{2}$,

(b) express q in terms of p.

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

(b) $q =$ ..... [3]

5

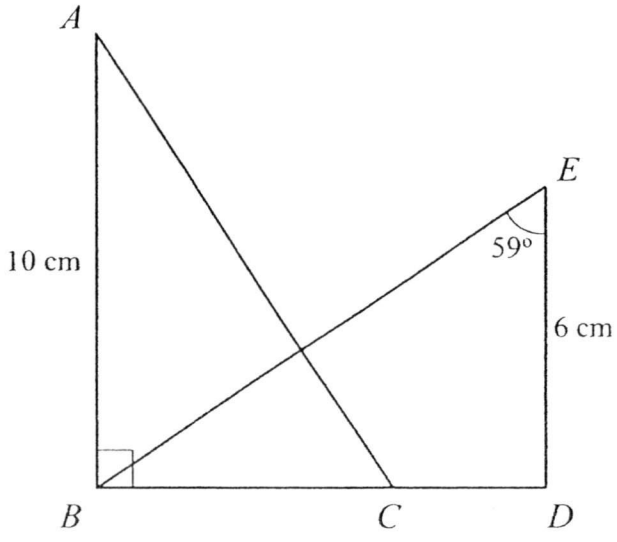
13 In the figure below, ΔABC is congruent to ΔBDE,

$\angle ABC = 90^\circ$, $\angle BED = 50^\circ$, $AB = 10$ cm and $DE = 6$ cm.

Find

(a) $\angle BAC$,

(b) the length of CD.



Answer (a) $\angle BAC$ = ... [2]

(b) CD = ... cm [2]

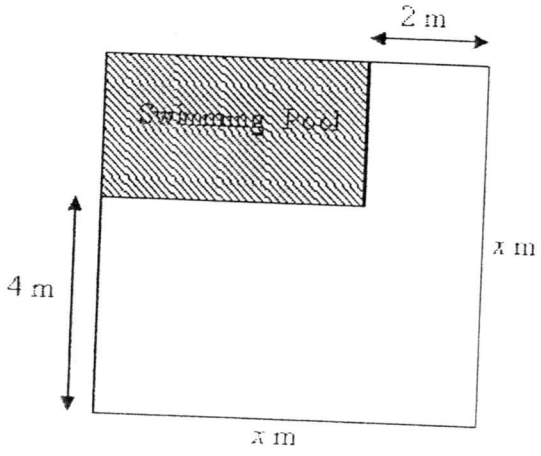
14 Ahmad decided to build a swimming pool in his house on a square plot of land of side x metres.

(a) Write down an expression, in terms of x, for the area of the swimming pool.

(b) The area of the swimming pool was found to be 80 m^2.

Show that $x^2 - 6x - 72 = 0$.

(c) Hence, find the value of x.



Answer (a) Area = ... m^2 [1]

(b) Answer to be shown above [1]

(c) x = ... [2]

End of Paper

ANSWER KEY

1. a) $2a^2+3a-9$ b) $-64x^4$	2. a) $p=-\frac{3}{2}$ or 5 b) $x=0$ or 7	3. a) $(5w-3)(w-4)$ b) $2(5c+7d)(5c-7d)$
4. $z=-\frac{1}{3}$	5. a) 3.5 cm b) 24 km^2	6. a) $E=12v^2$ b) $v=\pm 6$
7. a) $(x+3)(x-3)$ b) 47 and 53	8. a) 20 days b) 2 additional workers	9. a) $\frac{7x}{(2x+1)(3x-2)}$ b) $\frac{b}{3}$
10. a) $\frac{n}{8}$ b) $-\frac{e}{f}$	11. $x=7$ or -5	12. a) 3 b) $\frac{2-3p^2}{p^2+1}$
13. a) 31° b) 4 cm	14. a) $(x-2)(x-4)$ c) 12	

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Answer all questions.

1 **(a)** Expand and simplify $(a+3)(2a-3)$

(b) Simplify $(-4x^2)(4x)^2$

(a) $(a+3)(2a-3) = 2a^2 - 3a + 6a - 9$
$= 2a^2 + 3a - 9$ [B1]

(b) $(-4x^2)(4x)^2 = (-4x^2)(16x^2)$ [M1]
$= -64x^4$ [A1]

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

(b) ..... [2]

2 Solve each of the following equations.

(a) $(2p+3)(p-5) = 0$

(b) $x^2 = 7x$

(a) $(2p+3)(p-5) = 0$
$2p+3=0$ OR $p-5=0$
$p = -\frac{3}{2}$ $p = 5$ [B1]

(b) $x^2 = 7x$
$x^2 - 7x = 0$
$x(x-7) = 0$ [M1]
$x = 0$ or 7 [A1]

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

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

3 Factorise **completely** each of the following expressions.

(a) $5w^2 - 23w + 12$

(b) $50c^2 - 98d^2$

(a) $5w^2 - 23w + 12 = (5w - 3)(w - 4)$ [B1]

(b) $50c^2 - 98d^2 = 2(25c^2 - 49d^2)$ [M1]

$= 2(5c + 7d)(5c - 7d)$ [A1]

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

(b) ..... [2]

4 Solve $\frac{2}{5z-1} = -\frac{3}{4}$

$\frac{2}{5z-1} = -\frac{3}{4}$

$15z - 3 = -8$ [M1]

$15z = -5$

$z = -\frac{1}{3}$ [A1]

Answer $z =$ ..... [2]

8

5 A map has a scale of 1:400 000.

(a) Given that the distance between two locations A and B is 14 km, find the distance, in cm, between A and B on the map.

(b) Given that the area of a garden on the map is 1.5 cm^2, calculate its actual area in km^2.

(a) Map scale = 1 cm : 400 000 cm

= 1 cm : 4 km

$= \frac{1}{4}$ cm : 1 km

Distance on map = $14 \times \frac{1}{4}$ [M1]

= 3.5 cm [A1]

(b) Map scale = 1 cm : 4 km

Area scale = 1 cm^2 : 16 km^2

Actual area = 1.5×16 [M1]

= 24 km^2 [A1]

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

(b) ..... km^2 [2]

6 The kinetic energy, E joules, of a particular object is directly proportional to the square of its velocity v m/s. Given that $E = 75$ joules when $v = 2.5$ m/s, find

(a) the equation connecting E and v,

(b) the value of v, in m/s, when $E = 432$ joules.

$E = kv^2$

When $E = 75$, $v = 2.5$,

(a) $75 = k(2.5)^2$ [M1]

$k = 12$

$\therefore E = 12v^2$ [A1]

$432 = 12v^2$ [M1]

(b) $v^2 = 36$

$v = 6$ [A1]

Accept $v = -6$ as well, as it is not obvious to the students whether v can be positive or negative.

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

(b) v = ... m/s [2]

7 **(a)** Factorize $x^2 - 9$.

(b) Hence, find 2 factors of 2491, other than 1 and 2491.

(a) $x^2 - 9 = (x+3)(x-3)$ [B1]

(b) $2491 = 2500 - 9$ [M1]

$= 50^2 - 3^2$

$= (50-3)(50+3)$

$= (47)(53)$

$\therefore$ the other 2 factors are 47 and 53. [A1]

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

(b) ..... , ... [2]

[Turn over

8 4 workers can complete an assignment in 15 days. Assuming all the workers work at the same rate, find

(a) the number of days taken by 3 workers to complete the assignment,

(b) the number of additional workers needed if the assignment is to be completed in 10 instead of 15 days.

(a)

Workers	Days	
4	15	
1	$15 \times 4 = 60$	[M1]
3	$60 \div 3 = 20$	[A1]

(b)

Workers	Days	
$3 \times 2 = 6$	$20 \div 2 = 10$	[M1]

$\therefore$ (6-4) = 2 extra workers are needed. [A1]

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

(b) ..... [2]

9 **(a)** Express $\frac{1}{2x+1} + \frac{2}{3x-2}$ as a single fraction in its simplest form.

(b) Simplify $\frac{a^3b^2c^3}{24c^4} \div \frac{a^3b}{8c}$

(a)
$$\frac{1}{2x+1} + \frac{2}{3x-2} = \frac{(3x-2)}{(2x+1)(3x-2)} + \frac{2(2x+1)}{(2x+1)(3x-2)} \quad \text{[M1]}$$
$$= \frac{3x-2+4x+2}{(2x+1)(3x-2)}$$
$$= \frac{7x}{(2x+1)(3x-2)} \quad \text{[A1]}$$

(b)
$$\frac{a^3b^2c^3}{24c^4} \div \frac{a^3b}{8c} = \frac{a^3b^2c^3}{24c^4} \times \frac{8c}{a^3b} \quad \text{[M1]}$$
$$= \frac{b}{3} \quad \text{[A1]}$$

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

(b) ..... [2]

10 Simplify each of the following expressions.

(a) $\dfrac{2n^2+3n}{16n+24}$

(b) $\dfrac{e^4f^2-e^3f^3}{e^2f^4-e^3f^3}$

(a)
$$\frac{2n^2+3n}{16n+24}=\frac{n(2n+3)}{8(2n+3)} \qquad [M1]$$
$$=\frac{n}{8} \qquad [A1]$$

(b)
$$\frac{e^4f^2-e^3f^3}{e^2f^4-e^3f^3}=\frac{e^3f^2(e-f)}{e^2f^3(f-e)} \qquad [M1]$$
$$=-\frac{e(e-f)}{f(e-f)}$$
$$=-\frac{e}{f} \qquad [A1]$$

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

(b) ..... [2]

11 Solve $(x+3)(x-5)=20$.

$(x+3)(x-5)=20$

$x^2-2x-15=20$ [M1]

$x^2-2x-35=0$

$(x-7)(x+5)=0$ [M1]

$x=7$ or -5 [A1]

Answer $x=$ ..... [3]

10

12 Given that $p = \sqrt{\dfrac{2-q}{3+q}}$,

(a) find the value of p when $q = -\dfrac{5}{2}$,

(b) express q in terms of p.

$$p = \sqrt{\frac{2-\left(-\frac{5}{2}\right)}{3+\left(-\frac{5}{2}\right)}}$$

(a) $= \sqrt{\frac{\frac{9}{2}}{\frac{1}{2}}}$ [M1]

$= 3$ [A1]

$$p = \sqrt{\frac{2-q}{3+q}}$$

$$p^2 = \frac{2-q}{3+q} \quad \text{[M1]}$$

$$p^2(3+q) = 2-q$$

(b) $3p^2 + p^2q = 2-q$

$p^2q + q = 2 - 3p^2$ [M1]

$q(p^2+1) = 2-3p^2$

$$q = \frac{2-3p^2}{p^2+1} \quad \text{[A1]}$$

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

(b) $q =$ ..... [3]

13 In the figure below, ΔABC is congruent to ΔBDE, amd

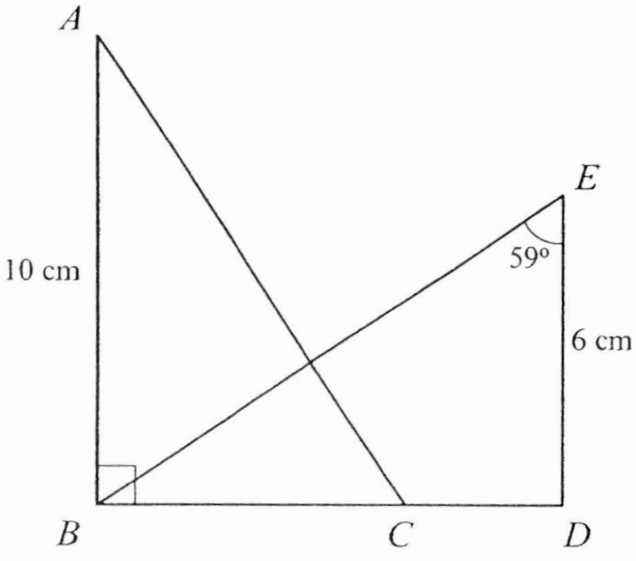
$\angle ABC = 90^\circ$, $\angle BED = 50^\circ$, $AB = 10$ cm and

$DE = 6$ cm.

Find

(a) $\angle BAC$, .

(b) the length of CD.



(a) $\angle DBE = 180^\circ - 90^\circ - 59^\circ$ ($\angle$ sum of Δ)

$= 31^\circ$ [M1]

$\angle BAC = \angle DBE = 31^\circ$ [A1]

(b) ΔABC is congruent to ΔBDE (given).

$BD = AB = 10$ cm

$BC = DE = 6$ cm [M1]

$CD = BD - BC$

$= 10 - 6$

$= 4$ cm [A1]

Answer (a) $\angle BAC$ = ... [2]

(b) CD = ... cm [2]

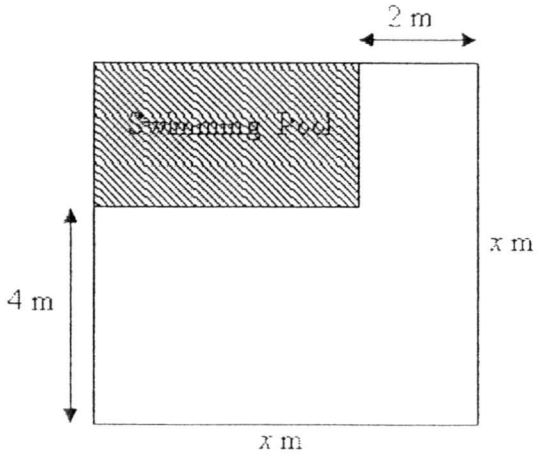
14 Ahmad decided to build a swimming pool in his house on a square plot of land of side x metres.

(a) Write down an expression, in terms of x, for the area of the swimming pool.

(b) The area of the swimming pool was found to be 80 m^2.

Show that $x^2 - 6x - 72 = 0$.

(c) Hence, find the value of x.



(a)
$$\text{Area} = (x-2)(x-4)$$
$$= x^2 - 6x + 8 \qquad \text{[B1]}$$

(b)
$$x^2 - 6x + 8 = 80 \qquad \text{[B1]}$$
$$x^2 - 6x - 72 = 0$$

(c)
$$x^2 - 6x - 72 = 0$$
$$(x-12)(x+6) = 0 \qquad \text{[M1]}$$
$$x = 12 \text{ or } -6 \text{ (reject)}$$
$$= 12 \qquad \text{[A1]}$$

Note: Award 1 Answer mark only if they reject $x = -6$

Answer (a) Area = ... m^2 [1]

(b) Answer to be shown above [1]

(c) x = ... [2]

End of Paper

ANSWER KEY

BEATTY SECONDARY SCHOOL
MID-YEAR EXAMINATION 2015

SUBJECT : Mathematics

PAPER : 2

SETTER : Mrs Samsol

LEVEL : Sec 2 Express

DURATION : 1 hour 30 minutes

DATE : 18 May 2015

CLASS :	NAME :	REG NO :

READ THESE INSTRUCTIONS FIRST

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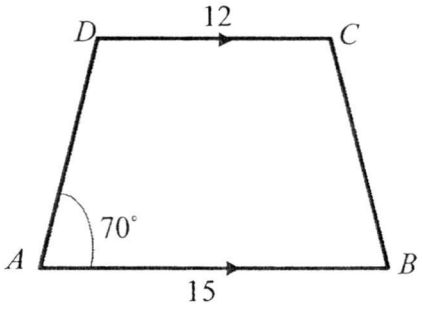
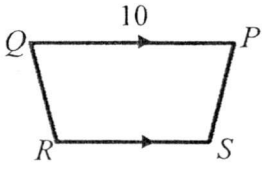
three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

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**.

This paper consists of 5 printed pages (including this cover page)

1 Trapezium $ABCD$ is similar trapezium $PQRS$.
Given that $AB = 15$ cm, $DC = 12$ cm, $PQ = 10$ cm and $\angle DAB = 70^\circ$.





(a) Identify the side in trapezium $ABCD$ that corresponds to the side QR in trapezium $PQRS$. [1]

(b) Find

(i) $\angle PSR$, [1]

(ii) the length of RS. [2]

---

2 A park has an area of 6.4 km^2. It is represented by an area of 0.4 cm^2 on map A.

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

(b) The length of a road on map A is 11 cm. Find its actual length in km. [1]

(c) Find the area, in cm^2, of the park drawn on map B whose scale is 1: 50 000. [2]

---

3 **(a)** Car A travels at a speed of $(4u^2 + 3u)$ km/h for 2.5 hours.
Car B travels at a speed of $(u^2 + 6u - 1)$ km/h for 2 hours.
Find an expression in terms of u, for the total distance travelled by cars A and B.
Simplify your answer. [3]

(b) Given the formula $P = \dfrac{5b - a}{2a + 1}$, make a the subject. [3]

---

4 **(a)** It is given that $x = 3$ is a root of the equation $5x^2 + kx - 6 = 0$, where k is a constant.

(i) Find the value of k. [2]

(ii) Find the other root of the equation. [2]

(b) Express $\dfrac{x-1}{x^2-x-6} - \dfrac{2}{x+2}$ as a single fraction. [3]

---

5 **(a)** Factorise fully

(i) $36x^2 - 16$, [2]

(ii) $2pq - 8p - 20 + 5q$. [2]

(b) Given that $a^2 - b^2 = 24$ and $a + b = 8$, find the value of $3a - 3b$. [3]

---

6 **(a)** It is given that A is directly proportional to the cube of r.
Describe the change in the value of A when the value of r is doubled.
Show working to support your answer. [2]

(b) d is inversely proportional to x^n. The table below shows some values of x and the corresponding values of d.

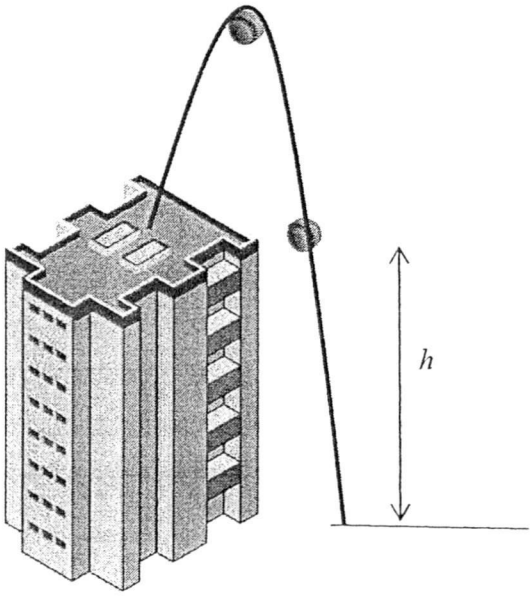
x	1	2	5
d	40	10	a

Find the value of n and of a. [3]

---

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

A ball is thrown from the top of a building.
Its vertical height h, in metres, above the ground at time t seconds during the flight is represented by the equation $h = 20 + 5t - t^2$.



Some corresponding values of t and h are given in the following table.

t	0	1	2	3	4	5	6	7
h	20	24	26	p	24	20	14	6

(a) Calculate the value of p. [1]

(b) Using a scale of 2 cm to represent 1 second, draw a horizontal t-axis for $0 \le t \le 8$.

Using a scale of 1 cm to represent 2 m, draw a vertical h-axis for $0 \le h \le 30$.

On your axes, plot the points given in the table and join them with a smooth curve. [3]

(c) Use your graph to estimate

(i) the maximum height of the ball from the ground, [1]

(ii) the time when the ball is 18 m above the ground. [1]

(d) Explain how you can use your graph to estimate the time when the ball hits the ground. [1]

(e) State the equation of the line of symmetry of the curve. [1]

8 **(a)** Expand and simplify $3\left(\frac{1}{2}x+5\right)^2-2\left(\frac{1}{3}x-2\right)$. [3]

(b) Simplify

(i) $\frac{5a^3b}{9b^2c}\div\frac{10a}{3b}$, [2]

(ii) $\frac{2pq+3q}{q^2}\times\frac{2p^2-p-3}{4p^2-9}$. [3]

~ End of Paper ~

Answer Key

1(a) BC

1(b)(i) 110° (ii) 8 cm

2(a) 1 : 400 000 (b) 44 km (c) 25.6 cm^2

3(a) $(12u^2 + 19.5u - 2)$ km (b) $a = \dfrac{5b - P}{2P + 1}$

4(a)(i) $k = -13$ (ii) $x = -\dfrac{2}{5}$

(b) $\dfrac{5 - x}{(x-3)(x+2)}$

5(a)(i) $4(3x + 2)(3x - 2)$ (ii) $(q - 4)(2p + 5)$

(b) 9

6(a) A increases by 8 times of the original value.
(b) 1.6

7(a) 26 (c)(i) 26.1 to 26.3 (ii) 5.3 to 5.5 (d) 7.5 to 7.7 (e) $x = 2.5$

8(a) $\dfrac{3}{4}x^2 + \dfrac{43}{3}x + 79$

(b)(i) $\dfrac{a^2}{6c}$

(ii) $\dfrac{p+1}{q}$

Mid-Year Exam 2015
Mathematics / Paper 2
Sec 2 Express
Setter : Mrs Samsol

Mark Scheme

Deduct 1 mark overall for no units given for 1(b)(i), 3(a) , 7(c)(i),7(c)(ii)

No	Workings	Marks	Remarks
1(a)	BC	B1	B0 if CB is given
1(b)(i)	$\angle PSR = \angle ADC = 180^\circ - 70^\circ$ int $\angle$s) $= 110^\circ$	B1	**B0 if sum of quad is used.** **B0 if incorrect corresponding angle is stated even if answer given is 110^0**
1(b)(ii)	$\frac{RS}{CD} = \frac{PQ}{AB}$ $\frac{RS}{12} = \frac{10}{15}$ $RS = \frac{10}{15} \times 12$ $= 8$ cm	M1 A1	
2(a)	$0.4\ cm^2 : 6.4\ km^2$ $1\ cm^2 : 16\ km^2$ 1 cm : 4 km 1 cm : 400 000 cm 1 : 400 000	M1 A1	
2(b)	Actual length = 11 x 4 = 44 km	B1	B0 if no units or wrong units
2(c)	Map B : 1 cm : 50 000 cm 1 cm : 0.5 km $1\ cm^2 : 0.25\ km^2$ Map area $= \frac{6.4}{0.25}$ $= 25.6\ cm^2$	M1 A1	A0 if no units or wrong units

16 1

3(a)	Total distance $= 2.5(4u^2+3u)+2(u^2+6u-1)$ $= 10u^2+7.5u+2u^2+12u-2$ $= (12u^2+19.5u-2)$ km	M1 M1 A1	
3(b)	$P=\frac{5b-a}{2a+1}$ $P(2a+1)=5b-a$ $2aP+P=5b-a$ $2aP+a=5b-P$ $a(2P+1)=5b-P$ $a=\frac{5b-P}{2P+1}$	M1 M1 (factorisation) A1	
4(a)(i)	$5(3)^2+3k-6=0$ $3k=-39$ $k=-13$	M1 A1	
4(a)(ii)	$5x^2-13x-6=0$ $(5x+2)(x-3)=0$ $x=-\frac{2}{5}$ or $x=3$ (reject)	M1 A1	If $k = 13$, give M1√ for correct factorisation
4(b)	$\frac{x-1}{x^2-x-6}-\frac{2}{x+2}$ $=\frac{x-1}{(x-3)(x+2)}-\frac{2}{x+2}$ $=\frac{x-1}{(x-3)(x+2)}-\frac{2(x-3)}{x+2}$ $=\frac{x-1-2x+6}{(x-3)(x+2)}$ $=\frac{5-x}{(x-3)(x+2)}$	M1 (factorise) M1 (Correct expansion) A1	

5(a)(i)	$36x^2 - 16$ $= 4(9x^2 - 4)$ $= 4(3x + 2)(3x - 2)$	M1 A1	
5(a)(ii)	$2pq - 8p - 20 + 5q$ $= 2p(q - 4) - 5(4 - q)$ $= 2p(q - 4) + 5(q - 4)$ $= (q - 4)(2p + 5)$	M1 A1	Rearranging may be done at the first step : $2pq - 8p + 5q - 20$ $= 2p(q - 4) + 5(q - 4)$ M1 Give M0 if $2p(q - 4)[-5(4 - q)]$ is seen
5(b)	$a^2 - b^2 = 24$ $(a + b)(a - b) = 24$ $8(a - b) = 24$ $a - b = 3$ $3a - 3b = 3(a - b)$ $= 3(3)$ $= 9$	M1 M1 A1	
6(a)	Let A=k r^3 A=k $(2r)^3$ A=8kr^3 A is 8 times of the original value. or A increases by 700% or increases by 7 times .	M1 A1	
6(b)	Let d = $d = \frac{k}{x^n}$ $40 = \frac{k}{1}$ $k = 40$ Sub $x = 2$ and $d = 10$ $10 = \frac{40}{2^n}$ $2^n = 4 = 2^2$ $n = 2$ $a = \frac{40}{5^2} = \frac{8}{5}$ or 1.6	B1 B1 B1	

7(a)	$p = 26$	B1	
7(b)	Refer to graph	G1:Correct scale and **correct label of both axes** G1:All points plotted correctly G1:Smooth curve	
7(c)(i)	26.25 m (Accept 26.1 to 26.5)	B1	
7(c)(ii)	5.4 s (Accept 5.3 to 5.5)	B1	
7(d)	Extend the graph until it meets the t-axis. The t-value is the time required.	B1	
7(e)	$t = 2.5$	B1	
8(a)	$3\left(\frac{1}{2}x+5\right)^2 - 2\left(\frac{1}{3}x-2\right)$ $= 3\left(\frac{1}{4}x^2+5x+25\right)-\frac{2}{3}x+4$ $=\frac{3}{4}x^2+15x+75-\frac{2}{3}x+4$ $=\frac{3}{4}x^2+\frac{43}{3}x+79$	M1 M1 A1	
8(b)(i)	$\frac{5a^3b}{9b^2c}\div\frac{10a}{3b}$ $=\frac{5a^3b}{9b^2c}\times\frac{3b}{10a}$ $=\frac{a^2}{6c}$	M1 A1	
8(b)(ii)	$\frac{2pq+3q}{q^2}\times\frac{2p^2-p-3}{4p^2-9}$ $=\frac{q(2p+3)}{q^2}\times\frac{(2p-3)(p+1)}{(2p+3)(2p-3)}$ $=\frac{p+1}{q}$	M1 (factorization of numerator) M1 (factorization of numerator) A1	

For Examiner's use

1. Express 112% as
   (a) a decimal,
   (b) a mixed number in the lowest term,
   (c) an improper fraction in the lowest term.

Answer (a) _____ [1]

(b) _____ [1]

(c) _____ [1]

2. Solve the equation $\frac{x+3}{4} = \frac{2x-3}{5}$.

Answer $x =$ _____ [2]

3. Consider the pattern

$$1^2 - 0^2 = 1$$
$$2^2 - 1^2 = 3$$
$$3^2 - 2^2 = 5$$
$$4^2 - 3^2 = 7$$
$$\vdots$$
$$x^2 - y^2 = 101$$
$$\vdots$$

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

(b) Find the integer values of x and y which satisfy the equation $x^2 - y^2 = 101$.

Answer (a) _____ [1]

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

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For Examiner's use

4. (a) Round off the following numbers correct to 3 significant figures.
(i) 1.998
(ii) 3.002

(b) Hence, estimate the value of $\frac{1.998 \times 3.002}{\sqrt[3]{217}}$.

Answer (a) (i) _____ [1]

(ii) _____ [1]

(b) _____ [2]

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

Answer _____ cm^2 [2]

6. Simplify $\frac{20n^3}{3m^3} \times \frac{6m^2n}{25n^4}$, giving your answer in the lowest terms.

Answer _____ [2]

For Examiner's use

For Examiner's use

7. The volume of air, $V\ cm^3$, inside a bicycle pump is inversely proportional to the cube root of the air pressure, P units. It is given that the air pressure is 1728 units when 15 cm^3 of air is pumped. Find

(a) an equation connecting V and P.

Answer (a) _____ [2]

(b) the volume of air that is pumped when the pressure is 216 units.

Answer (b) _____ cm^3 [1]

(c) the air pressure when 22.5 cm^3 of air is pumped.

Answer (c) _____ units [1]

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

Answer _____ [2]

19

For Examiner's use

For Examiner's use

9. Given that $A = \frac{1}{2}h(a+b)$,

(a) find the value of A when $h = 4$, $a = 5$ and $b = 7$,

(b) express h in terms of A, a and b.

Answer (a) $A =$ _____ [1]

(b) _____ [2]

10. (a) Factorize $w^2 - 13w + 36$.

(b) (i) Factorize $u^2 - v^2$.

(ii) Given that $u - v = 8$ and $u^2 - v^2 = 28$, find the value of $u + v$.

Answer (a) _____ [1]

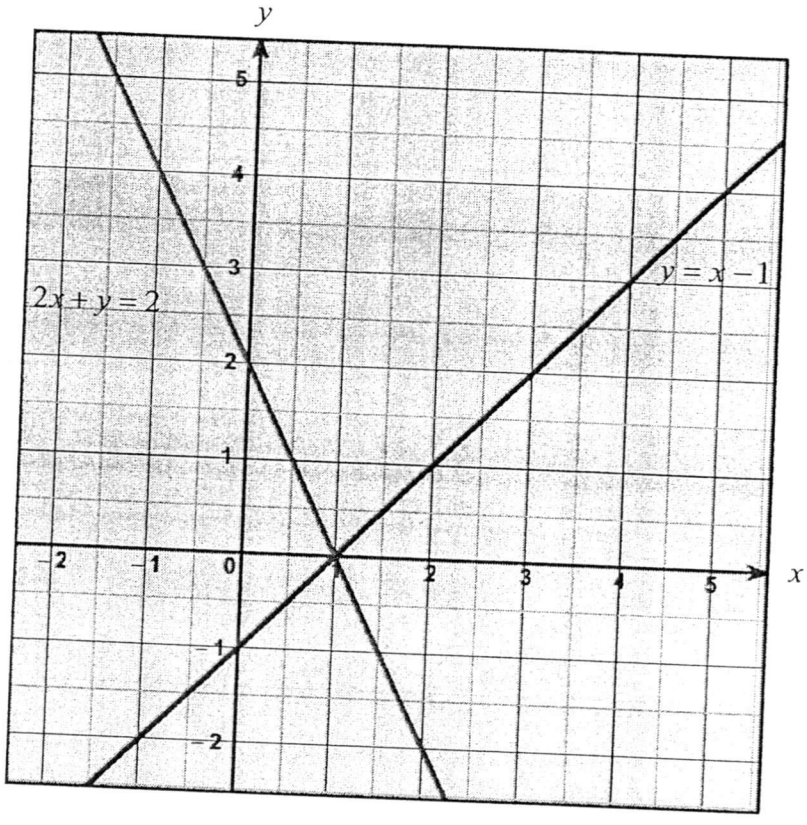
(b) (i) _____ [1]

(ii) _____ [2]

For Examiner's use

For Examiner's use

11. The graph below shows the lines $y = x - 1$ and $2x + y = 2$.



(a) State the solution of the simultaneous equations $y = x - 1$ and $2x + y = 2$.

Answer (a) $x =$ _____ , $y =$ _____ [2]

(b) On the same grid above, draw and label clearly the line $y = 2$. [1]

(c) Find the area of the polygon enclosed by the 3 lines, $y = x - 1$, $2x + y = 2$ and $y = 2$. Leave your answer in square units.

Answer (c) _____ units^2 [1]

12. Solve $2x + y = 5$ and
$x + 2y = 7$.

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

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For Examiner's use

13. Solve the following equations.

(a) $(x-5)^2 = 100$

(b) $y^2 + 3y - 700 = 0$

Answer (a) $x =$ _____ [2]

(b) $y =$ _____ [2]

14. If 5 men take 6 days to complete a task,

(a) how many days would 3 men take,

(b) how many men would be needed to complete the task in 2 days?

Answer (a) _____ days [2]

(b) _____ men [2]

For Examiner's use

For Examiner's use

15. Expand and simplify

(a) $(2a+3)^2+4a(1-a)$

Answer (a) _____ [2]

(b) $\left(\frac{x^2}{3}-3\right)^2$

Answer (b) _____ [2]

(c) $(2y-1)^2-(3y+1)(4y-1)$

Answer (c) _____ [2]

End of paper

For Examiner's use

Answer key

1a.	1.12
1b.	$1\frac{3}{25}$
1c.	$\frac{28}{25}$
2.	9
3a.	$7^2 - 6^2 = 13$
3b.	$x = 51,\ y = 50$
4a.	(i) 2.00 (ii) 3.00
4b.	1
5.	112 cm^2
6.	$\frac{8}{5m}$
7a.	$V = \frac{180}{\sqrt[3]{P}}$
7b.	30 cm^3
7c.	512 units
8.	$\frac{7x+4}{(x+1)(3x+2)}$
9a.	24
9b.	$h = \frac{2A}{a+b}$
10a.	$(w-4)(w-9)$
10b.	(i) $(u-v)(u+v)$ (ii) 3.5
11a.	$x = 1,\ y = 0$

11c.	3 units^2
12.	$x = 1,\ y = 3$
13a.	$x = 15$ or -5
13b.	$y = 25$ or -28
14a.	10
14b.	15
15a.	$16a + 9$
15b.	$\frac{x^4}{9} - 2x^2 + 9$
15c.	$-8y^2 - 5y + 2$