



Task 1
March 2015

Preliminary HSC Mathematics

General Instructions

- Working time -- 45 minutes
- Write using black or blue pen
Black pen is preferred
- Board-approved calculators may be used
- Answer questions 1 -- 6 on the answer sheet provided
- Answer questions 7 and 8 on the paper provided
- Start each question on a new page
- Show all necessary working in Questions 7 and 8

Total marks -- 34

Section I

6 marks

- Attempt Questions 1 -- 6
- Allow about 10 minutes for this section

Section II

28 marks

- Attempt Questions 7 and 8
- Allow about 35 minutes for this section

Kambala Preliminary HSC Mathematics -- Task 1 -- March 2015

Section I (6 Marks)

Attempt Questions 1 -- 6

Allow about 10 minutes for this section.

Use the answer sheet for Questions 1 -- 6.

1. Evaluate $\frac{4.32 \times 10^5}{2.01 \times 10^{-3}}$ correct to three significant figures.
(A) 210000000 (B) 214000000 (C) 215000000 (D) 2150000000
2. $(1 - 3\sqrt{3})^2$ is equivalent to:
(A) $2 - 9\sqrt{3}$ (B) $2 - 6\sqrt{3}$ (C) $1 - 6\sqrt{3}$ (D) $28 - 6\sqrt{3}$
3. Which of the following is equal to $\frac{1}{\sqrt{5} - \sqrt{2}}$?
(A) $\frac{\sqrt{5} + \sqrt{2}}{3}$ (B) $\frac{\sqrt{5} + \sqrt{2}}{3 + \sqrt{10}}$
(C) $\frac{\sqrt{5} + \sqrt{2}}{8}$ (D) $\frac{\sqrt{5} + \sqrt{2}}{8}$
4. What are the solutions to $x^2 - 2x = 4$?
(A) $x = -1 \pm \sqrt{5}$ (B) $x = -1 \pm \sqrt{3}$
(C) $x = 1 \pm \sqrt{5}$ (D) $x = 1 \pm \sqrt{3}$

5. Find the values of a and b if $(y+a)^2 = y^2 + by + 64$

(A) $a = -8$
 $b = -8$

(B) $a = 8$
 $b = -16$

(C) $a = 8$
 $b = 16$

(D) $a = -8$
 $b = 16$

6. Which of the following is a simplification of $\frac{x^3 - 27}{x^2 - 9}$?

(A) $\frac{x^2 + 3x + 9}{(x+3)(x-3)}$

(B) $\frac{x^2 + 3x + 9}{x+3}$

(C) $\frac{x^2 + 9}{x+3}$

(D) $\frac{x^2 + 6x + 9}{x+3}$

End of Section I

Section II (28 Marks)

Attempt Questions 7 and 8

Allow about 35 minutes for this section.

Answer each question on the writing paper provided.

Start each question on a new page.

Your responses should include relevant mathematical reasoning and/or calculations.

Question 7 (14 marks) Start on a new page

(a) Express $1.2\bar{3}$ as a fraction. 2

(b) Write $\frac{2}{3+\sqrt{5}}$ with a rational denominator. 2

(c) Simplify $\sqrt{32} + \sqrt{8}$ by expressing it in the form $A\sqrt{2}$. 1

(d) Simplify $20 - 3(4x + 5)$. 2

(e) Factorise completely:

(i) $x^2 - 5x - 6$ 1

(ii) $y^3 + 64$ 2

(iii) $12xy - 9x - 16y + 12$ 2

(f) Simplify $\left(\frac{a^3}{27}\right)^{\frac{1}{3}}$ and write without a negative index. 2

Question 8 (14 marks) Start a new page

(a) Solve the following equations:

(i) $5x^2 + 10x = 0$ 2

(ii) $3x^2 - 8x - 11 = 0$ 2

(b) (i) Expand and simplify $(3x+2)(x-5)$ 2

(ii) Simplify $\frac{x^2+3x+2}{x^2} \times \frac{x^2-7x}{x^2-6x-7}$ 3

(c) Solve the quadratic equation by completing the square given $y^2 + 4y = 12$ 2

(d) Solve the simultaneous equations giving values for both x and y : 3

$$xy = 8$$

$$y = x + 2$$

*End of Section II
End of Assessment*



KAMBALA



34
34

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Total marks - 34

Section I 6 marks

- Attempt Questions 1 - 6
- Allow about 10 minutes for this section

Section II 28 marks

- Attempt Questions 7 and 8
- Allow about 35 minutes for this section

Section I (6 Marks)

Attempt Questions 1 - 6
Allow about 10 minutes for this section.
Use the answer sheet for Questions 1 - 6.

1. Evaluate $\frac{4.32 \times 10^5}{2.01 \times 10^{-3}}$ correct to three significant figures.

$$\begin{array}{r} 214 \overline{) 25373} \\ 210 \\ \hline 5373 \\ 420 \\ \hline 1173 \\ 108 \\ \hline 93 \\ 90 \\ \hline 30 \\ 30 \\ \hline 0 \end{array}$$

- (A) 210000000 (B) 214000000 (C) 215000000 (D) 2150000000

2. $(1-3\sqrt{3})^2$ is equivalent to:

(A) $2-9\sqrt{3}$ (B) $2-6\sqrt{3}$ (C) $1-6\sqrt{3}$ (D) $28-6\sqrt{3}$

$$(1-3\sqrt{3})^2 = 1^2 - 6\sqrt{3} + (9 \times 3) = 1 - 6\sqrt{3} + 27 = 28 - 6\sqrt{3}$$

3. Which of the following is equal to $\frac{1}{\sqrt{5}-\sqrt{2}}$?

- (A) $\frac{\sqrt{5}+\sqrt{2}}{3}$ (B) $\frac{\sqrt{5}+\sqrt{2}}{3+\sqrt{10}}$
(C) $\frac{\sqrt{5}+\sqrt{2}}{8}$ (D) $\frac{\sqrt{5}+\sqrt{2}}{8}$
- $$\frac{1}{\sqrt{5}-\sqrt{2}} \times \frac{\sqrt{5}+\sqrt{2}}{\sqrt{5}+\sqrt{2}} = \frac{\sqrt{5}+\sqrt{2}}{5-2} = \frac{\sqrt{5}+\sqrt{2}}{3}$$

4. What are the solutions to $x^2-2x-4=0$?

- (A) $x=-1 \pm \sqrt{5}$ (B) $x=-1 \pm \sqrt{3}$
(C) $x=1 \pm \sqrt{5}$ (D) $x=1 \pm \sqrt{3}$

$$x^2 - 2x - 4 = 0$$

$$x^2 - 2x + 1 = 5$$

$$(x-1)^2 = 5$$

$$x-1 = \pm \sqrt{5}$$

$$x = 1 \pm \sqrt{5}$$

$$x = \frac{2 \pm \sqrt{4-16}}{2} = \frac{2 \pm \sqrt{-12}}{2} = 1 \pm \sqrt{3}$$

5. Find the values of a and b if $(y+a)^2 = x^2 + by + 64$

(A) $a = -8$
 $b = -8$

(B) $a = 8$
 $b = -16$

(C) $a = 8$ $a = -8$
 $b = 16$ $a = -16$

(D) $a = -8$
 $b = 16$

Also another possible solution

6. Which of the following is a simplification of $\frac{x^3 - 27}{x^2 - 9}$?

(A) $\frac{x^2 + 3x + 9}{(x+3)(x-3)}$

(B) $\frac{x^2 + 3x + 9}{x+3}$

(C) $\frac{x^2 + 9}{x+3}$

(D) $\frac{x^2 + 6x + 9}{x+3}$

$\frac{(x-3)(x^2+3x+9)}{(x+3)(x-3)}$

End of Section I

$a = 8$
 $(y+a)^2 = y^2 + 16y + 64$

$y^2 + 2ay + a^2$

$a = 8$

$16y$

$(y+8)$

$a y^2 + 16y + 64$

$(x-3)(x^2+3x+9)$

$(x+3)(x-3)$

(x^2+3x+9)

$x+3$

Section II (28 Marks)

Attempt Questions 7 and 8

Allow about 35 minutes for this section.

Answer each question on the writing paper provided.

Start each question on a new page.

Your responses should include relevant mathematical reasoning and/or calculations.

Question 7 (14 marks) Start on a new page

(a) Express 1.23 as a fraction.

2

(b) Write $\frac{2}{3+\sqrt{5}}$ with a rational denominator.

2

(c) Simplify $\sqrt{32} + \sqrt{8}$ by expressing it in the form $A\sqrt{2}$.

1

(d) Simplify $20 - 3(4x + 5)$.

2

$20 - 12x - 15$
 $= 5 - 12x$

(e) Factorise completely:

(i) $x^2 - 5x - 6$
 $x^2 + x - 6x - 6$
 $x(x+1) - 6(x+1)$
 $= (x+1)(x-6)$

1

(ii) $y^3 + 64$
SUM OF CUBES

2

(iii) $12xy - 9x - 16y + 12$
 $3x(4y-3) - 4(4y-3)$
 $(4y-3)(3x-4)$

2

(f) Simplify $\left(\frac{a^3}{27}\right)^{\frac{1}{3}}$ and write without a negative index.

2

Question 8 (14 marks) Start a new page

(a) Solve the following equations:

(i) $5x^2 + 10x = 0$ 2
 $5x(x+2) = 0$

(ii) $3x^2 - 8x - 11 = 0$ 2
 $3(1) - 8(-1) - 11 = 0$
 $3 + 8 - 11 = 0$

(b) (i) Expand and simplify $(3x+2)(x-5)$: 2
 $3x^2 - 3x - 10x - 10$
 $= 3x(x-1) - (x-1)$

(ii) Simplify $\frac{x^2+3x+2}{x(x)} \times \frac{x^2-7x}{x(x-7)(x+1)}$ 3
 $\frac{(x+2)(x+1)}{x(x)} \times \frac{x(x-7)}{(x-7)(x+1)}$

(c) Solve the quadratic equation by completing the square given $y^2 + 4y = 12$. 2
 $y^2 + 4y + (\frac{4}{2})^2 = 12 + (\frac{4}{2})^2$
 $(y+2)^2 = 16$
 $y+2 = \pm\sqrt{16}$
 $y = 6, -6$

(d) Solve the simultaneous equations giving values for both x and y : 3
 $xy = 8$
 $y = x+2$

End of Section II
 End of Assessment

Preliminary Mathematics

Task 1
 March 2015

Section I

Multiple-Choice Answer Sheet
 Circle the answer of your choice.

1.	A	B	<input checked="" type="radio"/> C	D
2.	A	B	C	<input checked="" type="radio"/> D
3.	<input checked="" type="radio"/> A	B	C	D
4.	A	B	<input checked="" type="radio"/> C	D
5.	A	B	<input checked="" type="radio"/> C	D
6.	A	<input checked="" type="radio"/> B	C	D

QUESTION 7

14
14

a) Let 1.23 be x

$$\therefore x = 1.232323$$

Let 123.23 be $100x$

$$\therefore 100x = 123.232323$$

$$100x - x = 123.23 - 1.23$$

$$99x = 122$$

$$x = \frac{122}{99}$$

b) $\frac{2}{3 + \sqrt{5}} \times \frac{3 - \sqrt{5}}{3 - \sqrt{5}}$

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

$$= \frac{6 - 2\sqrt{5}}{9 - 5} = \frac{6 - 2\sqrt{5}}{4} = \frac{x(3 - \sqrt{5})}{x(2)}$$

$$= \frac{3 - \sqrt{5}}{2}$$

c) $\sqrt{32} + \sqrt{8}$
 $= (\sqrt{16} \sqrt{2}) + (\sqrt{4} \sqrt{2})$

$$= 4\sqrt{2} + 2\sqrt{2}$$

$$= 6\sqrt{2}$$

d) $20 - 3(4x + 5)$

$$20 - 12x - 15$$

$$5 - 12x$$

e) $x^2 - 5x - 6$

$$(x - 6)(x + 1)$$

ii) $y^3 + 64$

$$= (y + 4)(y^2 - 4y + 16)$$

iii) $12xy - 9x - 16y + 12$

$$3x(4y - 3) - 4(4y - 3)$$

$$= (4y - 3)(3x - 4)$$

f) $\left(\frac{27}{a^3}\right)^{\frac{1}{3}}$

$$= \sqrt[3]{\frac{27}{a^3}}$$

$$= \frac{3}{a}$$

QUESTION 8

14
14

ai) $5x^2 + 10x = 0$

$$5x(x + 2) = 0$$

$$\therefore \text{if } 5x = 0$$

$$x = 0$$

$$\therefore \text{if } x + 2 = 0$$

$$x = -2$$

$$\therefore x = 0 \text{ or } -2$$

ii) ~~$3x^2 - 8x - 11 = 0$
 $= \frac{-(-8) \pm \sqrt{(-8)^2 - 4(3x - 11)}}{2 \times 3}$~~

~~$$= \frac{8 \pm \sqrt{64 - 4(-33)}}{6}$$~~

~~$$3x^2 - 8x - 11 = 0$$~~

~~$$3x^2 - 8x = 11$$~~

~~$$x^2 - \frac{8}{3}x + (-11) = 0$$~~

~~$$= \frac{8 \pm \sqrt{64 - 4(-33)}}{2 \times 3}$$~~

~~$$= \frac{8 \pm \sqrt{64 + 132}}{6}$$~~

~~$$= \frac{8 \pm \sqrt{196}}{6}$$~~

~~$$= \frac{8 \pm 14}{6}$$~~

~~$$= \frac{x(4+7)}{x(3)} = \frac{4+7}{3}$$~~

$$\therefore x = -1 \text{ or } \frac{11}{3}$$

~~$a = 3$
 $b = -8$
 $c = -11$~~

USE RSE!!

$$3x - 11 = -33$$

$$s = 3, 11$$

DO THIS BY FACTORISING.

$$a = 3$$

$$b = -8$$

$$c = -11$$

QUESTION 8

b) $(3x+2)(x-5)$ ✓
 $= 3x^2 - 15x + 2x - 10$ ✓
 $= 3x^2 - 13x - 10$

i) $\frac{(x+1)(x+2)}{x(x)} \times \frac{x(x+7)}{(x+7)(x+1)}$ ✓
 $= \frac{x+2}{x} \times \frac{1}{1}$ ✓
 $= \frac{x+2}{x}$ ✓

c) $y^2 + 4y = 12$
 $y^2 + 4y + (2)^2 = 12 + (2)^2$ ✓
 $y^2 + 4y + 4 = 16$ ✓
 $(y+2)^2 = 16$
 $y+2 = \pm \sqrt{16}$ ✓
 $y+2 = \pm 4$
 $y = \pm 4 - 2$
 $y = 2 \text{ OR } -6$

d) $xy = 8$ ① sub $x = -4$ in ①
 $y = x+2$ ② $y = -4 + 2$
 sub ② into ① $y = -2$
 $x(x+2) = 8$ sub $x = 2$ in ①
 $x^2 + 2x = 8$ $y = 2+2$
 $x^2 + 2x - 8 = 0$ $y = 4$
 $(x+4)(x-2) = 0$
 \therefore when $x+4 = 0$
 $x = -4$
 \therefore when $x-2 = 0$
 $x = 2$

~~scribbled out work~~

$x = -4$	$x = 2$
$y = -2$	$y = 4$