



KAMBALA



34  
315

Yr 8

Task 1  
March 2015

# Preliminary HSC Mathematics

## General Instructions

- Working time – 45<sup>50</sup> 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

Section I (6 Marks)

Attempt Questions 1 – 6

Allow about 10 minutes for this section.

Use the answer sheet for Questions 1 – 6.

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215000000

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:  $(1-3\sqrt{3})(1-3\sqrt{3})$

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

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

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)  $\frac{\sqrt{5}+\sqrt{2}}{8}$

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

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

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

$x^2 - 2x + 1 = 4 + 1$   
 $(x-1)^2 = 5$   
 $x-1 = \pm \sqrt{5}$   
 $x = 1 \pm \sqrt{5}$

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

$x^2 - 2x - 4 = 0$   
 $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-4)}}{2 \times 1} = \frac{2 \pm \sqrt{4+16}}{2} = \frac{2 \pm \sqrt{20}}{2} = 1 \pm \sqrt{5}$

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

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

$$a = 8$$

(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

1634

$$(y+8)$$

$$a y^2 + 16y + 64$$

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

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

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

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

$$x+3$$

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

End of Section I

$$a = 8$$

$$(y + \frac{8}{a})^2 = y^2 + 16y + 64$$

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  $1.\dot{2}\dot{3}$  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

$$20 - 12x - 15$$

$$= 5 - 12x$$

(e) Factorise completely:

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

$$x^2 + x - 6x - 6$$

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

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

(ii)  $y^3 + 64$  2

SUM OF CUBES

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

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

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

(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  
 $3x^2 - 3x - 10x - 10$   
 $= 3x(x-1) - 1(x-1)$   $3x^2 - 13x - 10$   
 $3x^2 - 15x + 2x - 10$   
 $3x(x-5) + 2(x-5)$   
 $(x-5)(3x+2)$

(ii) Simplify  $\frac{x^2+3x+2}{x^2} \times \frac{x^2-7x}{x^2-6x-7}$  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  
 $y^2 + 4y + (\frac{4}{2})^2 = 12 + (\frac{4}{2})^2$   $(y+2)^2 = 16$   
 $y^2 + 4y + 4 = 16$   $y+2 = \pm\sqrt{16}$   
 $y = 6, -6$   
 $y+2 = \pm 4$

(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

a) Let 1.23 be  $x$

$$\therefore x = 1.232323 \dots$$

Let 123.23 be  $100x$

$$\therefore 100x = 123.232323 \dots$$

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

$$99x = 122$$

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

b)

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

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

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

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

c)  $\sqrt{32} + \sqrt{8}$   
 $= (\sqrt{16} \sqrt{2}) + (\sqrt{4} \sqrt{2})$   
 $= 4\sqrt{2} + 2\sqrt{2}$   
 $= 6\sqrt{2}$

d)  $20 - 3(4x + 5)$   
 $20 - 12x - 15$   
 $5 - 12x$

ii)  $x^2 - 5x - 6$   
 $(x - 6)(x + 1)$

ii)  $y^3 + 64$   
 $= (y + 4)(y^2 - 4y + 16)$

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

4)  $\left(\frac{27}{a^3}\right)^{\frac{1}{3}}$   
 $= \sqrt[3]{\frac{27}{a^3}}$   
 $= \frac{3}{a}$

# QUESTION 8

14

(4)

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

$5x(x+2) = 0$

$\therefore$  if  $5x = 0$

$x = 0$

$\therefore$  if  $x+2 = 0$

$x = -2$

$\therefore x = 0$  or  $-2$

ii)  ~~$3x^2 - 8x - 11 = 0$~~   
 ~~$\frac{(-8) \pm \sqrt{(-8)^2 - 4(3x-11)}}{2 \times 3}$~~   
 ~~$= \frac{8 \pm \sqrt{64 - 4(-33)}}{6}$~~

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

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

USE PSF!!

$3x - 11 = -33$  P

$s = 3, 11$

DO THIS BY FACTORISER.

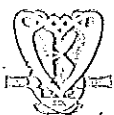
~~$\frac{(-8) \pm \sqrt{(-8)^2 - 4(3x-11)}}{2 \times 3}$~~   
 ~~$= \frac{8 \pm \sqrt{64 - 4(-33)}}{6}$~~   
 ~~$= \frac{8 \pm \sqrt{64 + 132}}{6}$~~   
 ~~$= \frac{8 \pm \sqrt{196}}{6}$~~   
 ~~$= \frac{8 \pm 14}{6}$~~

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

~~$= \frac{8 + 14}{6}$~~   
 ~~$= \frac{x(4+7)}{x(3)}$~~   
 ~~$\frac{4+7}{3}$~~

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





## QUESTION 8

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

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

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

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

$x = 2$   
 $y = 4$