

Student Name: _____



St Catherine's School

Waverley

St. Catherine's School

Year 11 Mathematics

Preliminary Task #1

08- March -2011

Time allowed: 55 minutes

Total marks: ⁶⁰58 marks

Weighting: 15%

INSTRUCTIONS

- There are 2 sections of different values.
- Marks for each part of a question are indicated.
- Each section is to be attempted in a separate booklet.
- All necessary working should be shown.
- **Start each question on a new page.**
- Approved scientific calculators and drawing templates may be used.
- Marks may be deducted for careless or badly arranged work.

SECTION A ALGEBRA (38 Marks)

40

MARKS

Question 1: Expand and simplify the following:

(i) $5a(1-a) - a(2+a)$ 1

(ii) $(x^5 - y^5)(x^5 + y^5)$ 1

Question 2: Factorise the following fully:

(i) $2x^3 + 128$ 2

(ii) $ap^2 - aq^2$ 2

(iii) $x^3 - 7x^2 - 8x + 56$ 2

(iv) $2x^2 - x - 3$ 2

Question 3: Simplify

(i) $\frac{3a-3b}{a-b}$ 1

(ii) $\frac{2x+2}{x+3} \div \frac{x^2-16}{x^2-x-12}$ 3

(iii) $\frac{3}{x^2+x-2} - \frac{5}{x^2-2x-8}$ 3

Question 5:

MARKS

- (i) If $S = \frac{a}{1-r}$ evaluate r when $S=20$ and $a=4.8$ 2
- (ii) If $s = ut + \frac{1}{2}at^2$ find s if $u=4$, $t=5$ and $a=6.2$ 2

Question 6:

- (i) If $2x^2 + 6x = 1$ find x leaving your answers as surds in simplest form 2
- (ii) Solve simultaneously $7a - 5b = 16$ and $2a + 7b = 13$ 2
- (iii) Solve simultaneously $y = 6x^2$ and $y = 4 - 5x$ 2

Question 4: Solve the following equations/inequations

- (i) $6^x = \frac{1}{36}$ 1
- (ii) $\frac{2-x}{2+x} = \frac{3}{4}$ 2
- (iii) $3 - 4(1+2x) > 9$ 2
- (iv) $\sqrt{x^2 + 9} = 5$ 2
- (v) $|2x+1| = 11$ 2
- (vi) $|x-2| \leq 5$ 2
- (viii) $|x-2| = 2x-5$ 2

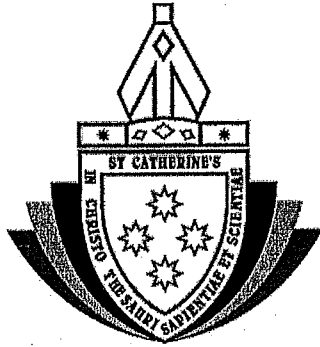
SECTION B (NUMBER) (20 Marks)
START A NEW BOOKLET

	MARKS
Question 1: (i) If the earth travels around the sun at 30Km/sec find the distance it will travel in a day. (Write your answer in scientific notation correct to <u>two significant figures</u>)	2
(ii) Evaluate $\sqrt[3]{\frac{283}{\pi}}$ to <u>three decimal places</u>	1
(iii) Express $0.\dot{2}\dot{3}$ as a fraction in simplest form showing full working	2
(iv) If \$x is increased by 24% and the answer is reduced by 20% find the final amount as a decimal fraction of x	2
Question 2: (i) Simplify $(3\sqrt{5})^3$ leaving the answer as a surd	2
(ii) If $b\sqrt{3} = \frac{2}{\sqrt{3}} - \frac{\sqrt{3}}{2}$ find the value of b	2
(iii) Show that $7 + 4\sqrt{3} + \frac{1}{7+4\sqrt{3}}$ is rational	2
Question 3: (i) Evaluate $\log_6 9 + \log_6 4$	1
(ii) Calculate $\log_{10} 17$ to 3 decimal places	1
(iii) Evaluate $\log_3 \frac{1}{18} - \log_3 \frac{1}{2}$	2
(iv) If $\log_c 5 = x$ and $\log_c 10 = y$ find in terms of x and y	3
(a) $\log_c 50$ (b) $\log_c \frac{1}{2}$ (c) $\log_c 500$	

END OF TASK ©

SECTION A

Student Name: _____



— SOLUTIONS —

St. Catherine's School

Year 11 Mathematics

Preliminary Task #1

08- March -2011

Time allowed: 55 minutes

Total marks: 60 marks

Weighting: 15%

INSTRUCTIONS

- There are 2 sections of different values.
- Marks for each part of a question are indicated.
- Each section is to be attempted in a separate booklet.
- All necessary working should be shown.
- **Start each question on a new page.**
- Approved scientific calculators and drawing templates may be used.
- Marks may be deducted for careless or badly arranged work.

Qn	Solutions	Marks	Comments+Criteria
1.	i) $5a(1-a) - a(2+a)$ $= 5a - 5a^2 - 2a - a^2 = 3a - 6a^2$	1	
	ii) $(x^5 - y^5)(x^5 + y^5) = x^{10} - y^{10}$	1	
2.	i) $2x^3 + 128 = 2(x^3 + 64)$ $= 2(x+4)(x^2 - 4x + 16)$	2	
	ii) $ap^2 - aq^2 = a(p^2 - q^2)$ $= a(p+q)(p-q)$	2	
	iii) $x^3 - 7x^2 - 8x + 56$ $= x^2(x-7) - 8(x-7)$ $= (x-7)(x^2 - 8)$	2	
	iv) $2x^2 - x - 3$ $= (2x - 3)(x + 1)$	1	
3.	i) $\frac{3a-3b}{a-b} = \frac{3(a-b)}{(a-b)} = 3$	1	
	ii) $\frac{2x+2}{x+3} \div \frac{x^2-16}{x^2-x-12}$ $= \frac{2(x+1)}{x+3} \times \frac{(x-4)(x+3)}{(x-4)(x+4)}$ $= \frac{2(x+1)}{x+4}$	3	

Qn	Solutions	Marks	Comments+Criteria
3	$\text{iii) } \frac{3}{x^2+x-2} - \frac{5}{x^2-2x-8}$ $= \frac{3}{(x+2)(x-1)} - \frac{5}{(x-4)(x+2)}$ $= \frac{3(x-4) - 5(x-1)}{(x+2)(x-1)(x-4)}$ $= \frac{-2x}{(x+2)(x-1)(x-4)}$	3	
4	<p>i) $6^x = \frac{1}{36} = 6^{-2}$ $\therefore x = -2$</p> <p>ii) $\frac{2-x}{2+x} = \frac{3}{4}$ $4(2-x) = 3(2+x)$ $8-4x = 6+3x$ $-7x = -2$ $x = \frac{2}{7}$</p> <p>iii) $3 - 4(1+2x) > 9$ $3-4-8x > 9$ $-8x > 9+1$ $-8x > 10$ $x < -1\frac{1}{4}$</p> <p>iv) $\sqrt{x^2+9} = 5$ <i>squaring</i> $x^2+9 = 25$ $x^2 = 16$ $x = \pm 4$</p>	1 2 2	

Qn	Solutions	Marks	Comments+Criteria
4	<p>v) $2x+1 = 11$ $\therefore 2x+1 = 11$ or $2x+1 = -11$ $2x = 10$ $2x = -12$ $x = 5$ or $x = -6$</p> <p>vi) $x-2 \leq 5$ $-5 \leq x-2 \leq 5$ $-3 \leq x \leq 7$</p> <p>viii) Consider $x-2 = 2x-5$ $x-2 = 2x-5$ $-x = -3$ $x = 3$ <i>check solution</i> $3-2 = 2 \times 3 - 5$ ✓</p> <p><i>now consider</i> $x-2 = -(2x-5)$ $x-2 = -2x+5$ $3x = 7$ $x = 2\frac{1}{3}$ <i>check solution</i> $2\frac{1}{3}-2 = 2 \times 2\frac{1}{3} - 5$ False</p> <p>$\therefore x = 3$ is only solution</p>	2 2 2	

SECTION B

Qn	Solutions	Marks	Comments+Criteria
1	i) distance = $30 \times 60 \times 60 \times 24$ = 2.6×10^6 km	2	
	ii) $\sqrt[3]{\frac{283}{\pi}} = 4.483$ (3 d.p.)	1	
	iii) $x = 0.\dot{2}3$ $100x = 23.\dot{2}3$ $x = .\dot{2}3$ subtracting $99x = 23$ $\Rightarrow x = \frac{23}{99}$	2	
	iv) $\$x \times 1.24 \times 0.8 = \$0.992x$	2	
2	i) $(3\sqrt{5})^3 = 3^3 \times (\sqrt{5})^3 = 27 \times 5\sqrt{5}$ = $135\sqrt{5}$	2	
	ii) $\frac{2}{\sqrt{3}} - \frac{\sqrt{3}}{2} = \frac{2\sqrt{3}}{3} - \frac{\sqrt{3}}{2}$ = $\frac{4\sqrt{3} - 3\sqrt{3}}{6}$ = $\frac{\sqrt{3}}{6} = b\sqrt{3}$ $\therefore b = \frac{1}{6}$	2	
	iii) $7+4\sqrt{3} + \frac{1}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}}$ = $7+4\sqrt{3} + \frac{7-4\sqrt{3}}{1} = 14$ Rational	2	

Qn	Solutions	Marks	Comments+Criteria
3	i) $\log_6 9 + \log_6 4 = \log_6 36 = 2$	1	
	ii) $\log_{10} 17 = 1.230$ (3 d.p.)	1	
	iii) $\log_3 \frac{1}{18} - \log_3 \frac{1}{2}$ = $\log_3 \left(\frac{1}{18} \times \frac{2}{1}\right) = \log_3 \frac{1}{9} = -2$	2	
iv)	a) $\log_c 5 = x$ $\log_c 10 = y$ $\therefore \log_c 50 = \log_c 5 + \log_c 10$ = $x + y$	1	
	b) $\log_c \frac{1}{2} = \log_c 5 - \log_c 10$ = $x - y$	1	
	c) $\log_c 500 = \log_c 5 + \log_c 100$ = $\log_c 5 + 2\log_c 10$ = $x + 2y$	1	