OUR LADY OF THE SACRED HEART COLLEGE
KENSINGTON

STUDENT – NAME / NUMBER _____

MATHEMATICS TEACHER _____

Year 11

Mathematics

March, 2007

Time allowed: 45 minutes

Assessed Outcomes

P3: Performs routine arithmetic and algebraic manipulation involving surds, simple rational expressions and equations

P4: chooses and applies appropriate arithmetic & algebraic techniques

Directions to Candidates

- Attempt all questions
- **START EACH QUESTION ON A <u>NEW</u> PAGE**
- Show all necessary working on the paper
- Marks may be deducted for careless or badly arranged work
- Calculators may be used
- Good Luck!!

QUESTION 1 (12 MARKS)   Marks

(a) Determine $12\frac{1}{2}\%$ of $4\frac{3}{4}$ hours and answer to the nearest second   2

(b) (i) Express 3.709×10^4 in ordinary decimal form   2

  (ii) Express 0.001256 in scientific notation

(c) Arrange the numbers $1.73,\ \sqrt{3},\ 1\frac{8}{11},\ \frac{\Pi}{2}$ in ascending order of magnitude   1

(d) Evaluate

  (i) $\left|-5\times 3\right| - \left|5\times 2\right| - \left|8\right|$ 3

  (ii) $\sqrt{10^2 - 8^2}$

  (iii) $45 - 15 \div 3 + 2$

(e) Use your calculator to find the value of:

  (i) $\dfrac{27.9 \times (5.68)^2}{\sqrt{67.92}}$ correct to 3 significant figures   2

  (ii) $\dfrac{(1.467) \times (5.68)^2}{\sqrt{67.92}}$ correct to 3 decimal places

(f) Express $0.2\dot{3}\dot{4}$ as a fraction in its simplest form   3

(g) Find the exact value of $\dfrac{a^4 c}{b^4}$ where $a = (\frac{2}{3})^2, b = (\frac{4}{3})^4\ and\ c = (\frac{8}{3})^7$ 3

QUESTION 2 (7 MARKS)

   (a) Express as a surd in its simplest form: 3

        (i) $\sqrt{450}$

        (ii) $\left(4\sqrt{3}-2\sqrt{2}\right)^2$

        (iii) $2\sqrt{32}+5\sqrt{18}+3\sqrt{2}$

   (b) Express the following with a rational denominator in simplest form   3

        (i) $\dfrac{\sqrt{6}}{\sqrt{2}}$

        (ii) $\dfrac{1-3\sqrt{3}}{2\sqrt{3}-1}$

QUESTION 3

   (a) Simplify: 3

        (i) $2x^2 \times 3a^3 \times 5a^5$

        (ii) $\dfrac{-2(a^3b)^3}{(2a^3)^2}$

   (b) Simplify: 5

        (i) $3(2x-y)-(5x+y)$

        (ii) $\dfrac{10x}{12}-\dfrac{x}{6}$

        (iii) $\dfrac{8a-4b}{4}$

        (iv) $\dfrac{4x^2-4xy}{2x^2-2y^2}$

   (c) Factorise completely:

        (i) $4x^2-9$

        (ii) $2x^2+5x-12$

        (iii) $16x^3-54$

QUESTION 4   6

Solve:

   (a) $3x+5=17$

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

   (c) $\dfrac{2x}{3}+x=\dfrac{1}{2}$

Question	Solution	Criteria	
1(a)	$12.5 \div 100 \times 4\frac{3}{4}$ $= 35\,\min s\,38\sec s$ Or $2138s$	• 1mk • 1mk correct answer	P4
1(b)(i)	37090	• 1mk	P4
1(b)(ii)	1.256×10^{-3}	• 1mk	P4
1(c)	$1.73 \quad \sqrt{3} \quad 1\frac{8}{11} \quad \frac{\pi}{2}$ $1.730 \quad 1.732 \quad 1.727 \quad 1.57$ $\frac{\pi}{2} \quad 1\frac{8}{11} \quad 1.73 \quad \sqrt{3}$	• 1mk correct answer	P3
1(d)(i)	$\|-5 \times 3\| - \|5 \times 2\| - \|8\|$ $= \|-15\| - \|10\| - \|8\|$ $= 15 \quad -10 \quad -8$ $= -3$	• 1mk correct 3rd line	P3
1(d)(ii)	$\sqrt{36}$ $= 6$	• 1mk for 36	P3
1(d)(iii)	42	• 1mk correct answer	P3
1(e)(i)	109.2199658 $= 109$ or 1.09×10^2	• 1mk correct answer	P3
1(e)(ii)	5.742856265 $= 5.743$	• 1mk correct answer	P3
1(f)	Let $x = 0.2\dot{3}\dot{4}$ $x = 0.23434.....$ $10x = 2.3434....$ $1000x = 234.343434$ $990x = 232$ $x = \frac{232}{990}$ $x = \frac{116}{495}$	• 1mk recurring decimal • 1mk attempting to obtain $10x$ OR $100x$ OR $1000x$ AND SUBTRACT • 1mk rational (doesn't have to be lowest denominator)	P3
1(g)	$\left[\left(\frac{2}{3}\right)^2\right]^4 \left[\left(\frac{8}{3}\right)^7\right] \div \left[\left(\frac{4}{3}\right)^4\right]^4$ $= \frac{2^8}{3^8} \times \frac{8^7}{3^7} \div \frac{4^{16}}{3^{16}}$	• 1mk multiplying indices	P3

Question	Solution	Criteria	
	$= \frac{2^8}{3^8} \times \frac{(2^3)^7}{3^7} \times \frac{3^{16}}{(2^2)^{16}}$ $= \frac{2^8}{3^8} \times \frac{2^{21}}{3^7} \times \frac{3^{16}}{2^{32}}$ $= \frac{2^{29}}{3^{15}} \times \frac{3^{16}}{2^{32}}$ $= \frac{3}{2^3}$ $= \frac{3}{8}$	• 1mk inverting fraction • 1mk $\frac{3}{2^3}$ or $\frac{3}{8}$ or 0.375	
2(a)(i)	$\sqrt{450}$ $= \sqrt{9 \times 50}$ $= \sqrt{9 \times 25 \times 2}$ $= 3 \times 5 \times \sqrt{2}$ $= 15\sqrt{2}$	• 1mk 2nd last line	P3
2(a)(ii)	$\left(4\sqrt{3} - 2\sqrt{2}\right)\left(4\sqrt{3} - 2\sqrt{2}\right)$ $= 16.3 - 8\sqrt{6} - 8\sqrt{6} + 4.2$ $= 48 - 16\sqrt{6} + 8$ $= 56 - 16\sqrt{6}$	• 1mk correct expansion (Line 2)	P3
2(a)(iii)	$2\sqrt{32} + 5\sqrt{18} + 3\sqrt{2}$ $= 2\sqrt{16 \times 2} + 5\sqrt{9 \times 2} + 3\sqrt{2}$ $= 2 \times 4 \times \sqrt{2} + 5 \times 3 \times \sqrt{2} + 3\sqrt{2}$ $= 8\sqrt{2} + 15\sqrt{2} + 3\sqrt{2}$ $= 26\sqrt{2}$	• 1mk correct Line 3	P3
2(b)(i)	$\frac{\sqrt{6}}{\sqrt{2}}$ $= \sqrt{3}$	• 1mk correct answer	P3
2(b)(ii)	$\frac{\left(1 - 3\sqrt{3}\right)}{\left(2\sqrt{3} - 1\right)} \times \frac{\left(2\sqrt{3} + 1\right)}{\left(2\sqrt{3} + 1\right)}$ $= \frac{2\sqrt{3} + 1 - 6.3 - 3\sqrt{3}}{4.3 - 1}$ $= \frac{-17 - \sqrt{3}}{11}$	• 1mk multiplying by the conjugate • 1mk correct expansion	P3
3(a)(i)	$30x^2 a^8$	• 1mk correct answer	P3

3(a)(ii)	$-\dfrac{2(a^3b)^3}{(2a^3)^2}$ $=-\dfrac{2a^9b^3}{4a^6}$ $=-\dfrac{a^3b^3}{2}$	• 1mk correct multiplying of indices • 1mk correct cancelling of indices AND fraction	P3
3(b)(i)	$3(2x-y)-(5x+y)$ $=6x-3y-5x-y$ $=x-4y$	• 1mk correct expansion using a negative	P4
3(b)(ii)	$\dfrac{10x}{12}-\dfrac{x}{6}$ $=\dfrac{5x}{6}-\dfrac{x}{6}$ $=\dfrac{4x}{6}$ $=\dfrac{2x}{3}$	• 1mk $\dfrac{4x}{6}$ or $\dfrac{2x}{3}$	P4
3(b)(iii)	$\dfrac{8a-4b}{4}$ $=\dfrac{4(2a-b)}{4}$ $=2a-b$	• 1mk correct factorisation	P4
3(b)(iv)	$\dfrac{4x^2-4xy}{2x^2-2y^2}$ $=\dfrac{4(x^2-xy)}{2(x^2-y^2)}$ $=\dfrac{2(x)(x-y)}{(x-y)(x+y)}$ $=\dfrac{2x}{x+y}$	• 1mk Correct factorisation BOTH common and difference of 2 squares • 1mk correct answer (or cancelling)	P4
3(c)(i)	$4x^2-9$ $=(2x)^2-3^2$ $=(2x-3)(2x+3)$	• 1mk difference of 2 squares	P4
3(c)(ii)	$2x^2+5x-12$ $=\dfrac{(2x+8)(2x-3)}{2}$ $=\dfrac{2(x+4)(2x-3)}{2}$ $=(x+4)(2x-3)$	• 1mk correct factor • 2mk BOTH correct	P4

3(c)(iii)	$16x^3-54$ $=2(8x^3-27)$ $=2\left[(2x)^3-3^3\right]$ $=2(2x-3)(4x^2+6x+9)$	• 1mk common facor • 1mk correct **expansion** of difference of two cubes	P4
4(a)	$3x+5=17$ $\quad 3x=17-5$ $\quad 3x=12$ $\quad x=\dfrac{12}{3}$ $\quad x=4$	• 1mk correct collection of like terms • 1mk correct answer	P3
4(b)	$\dfrac{3x}{2}-\dfrac{(x+2)}{3}=2$ $6\times\dfrac{3x}{2}-6\times\dfrac{(x+2)}{3}=2\times6$ $9x-2(x+2)=12$ $9x-2x-4=12$ $\quad\quad 7x=16$ $\quad\quad x=\dfrac{16}{7}$	• 1mk multiplying by 6 • 1mk correct answer	P3
4(c)	$\dfrac{2x}{3}+x=\dfrac{1}{2}$ $6\times\dfrac{2x}{3}+6\times x=\dfrac{1}{2}\times6$ $4x+6x=3$ $\quad 10x=3$ $\quad\quad x=\dfrac{3}{10}$	• 1mk x by 6 • 1mk correct answer	P3