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 NEW 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) $|-5\times3|-|5\times2|-|8|$ 3

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

(iii) $45-15\div3+2$

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

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

(ii) $\frac{(1.467)\times(5.68)^{2}}{\sqrt{67.92}}$ 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 $\frac{a^{4}c}{b^{4}}$ where $a=(\frac{2}{3})^{2}, b=(\frac{4}{3})^{4}$ *and* $c=(\frac{8}{3})^{7}$ 3

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QUESTION 2 (7 MARKS)

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

(i) $\sqrt{450}$

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

(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) $16x^3-54$

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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)	$\lvert -5\times 3\rvert - \lvert 5\times 2\rvert - \lvert 8\rvert$ $= \lvert -15\rvert - \lvert 10\rvert - \lvert 8\rvert$ $= 15 - 10 - 8$ $= -3$	• 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 $x = 0.2\dot{3}4$ $x = 0.23434.....$ $10x = 2.3434....$ $1000x = 234.343434$ $990x = 232$ $x = \frac{232}{990}$ $x = \frac{116}{495}$	• 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)	$\left[\left(\frac{2}{3}\right)^2\right]^4 \times \left[\left(\frac{8}{3}\right)\right]^7 \div \left[\left(\frac{4}{3}\right)^4\right]^4$ $= \frac{2^8}{3^8} \times \frac{8^7}{3^7} \div \frac{4^{16}}{3^{16}}$	• 1mk multiplying indices	P3

	$= \frac{2^8}{3^8} \times \frac{\left(2^3\right)^7}{3^7} \times \frac{3^{16}}{\left(2^2\right)^{16}}$ $= \frac{2^8}{3^8} \times \frac{2^{21}}{3^7} \times \frac{3^{16}}{2^{32}}$ $= \frac{2^{29}}{3^{15}} \times \frac{3^{16}}{2^{32}}$ $= \frac{3}{2^3}$ $= \frac{3}{8}$	• 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)	$30x^2a^8$	• 1mk correct answer	P3

3(a)(ii)	$-\frac{2(a^3b)^3}{(2a^3)^2}$ $=-\frac{2a^9b^3}{4a^6}$ $=-\frac{a^3b^3}{2}$	• 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)	$\frac{10x}{12}-\frac{x}{6}$ $=\frac{5x}{6}-\frac{x}{6}$ $=\frac{4x}{6}$ $=\frac{2x}{3}$	• 1mk $\frac{4x}{6}$ or $\frac{2x}{3}$	P4
3(b)(iii)	$\frac{8a-4b}{4}$ $=\frac{4(2a-b)}{4}$ $=2a-b$	• 1mk correct factorisation	P4
3(b)(iv)	$\frac{4x^2-4xy}{2x^2-2y^2}$ $=\frac{4(x^2-xy)}{2(x^2-y^2)}$ $=\frac{2(x)(x-y)}{(x-y)(x+y)}$ $=\frac{2x}{x+y}$	• 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)	$2x^2+5x-12$ $=\frac{(2x+8)(2x-3)}{2}$ $=\frac{2(x+4)(2x-3)}{2}$ $=(x+4)(2x-3)$	• 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)	$3x+5=17$ $3x=17-5$ $3x=12$ $x=\frac{12}{3}$ $x=4$	• 1mk correct collection of like terms • 1mk correct answer	P3
4(b)	$\frac{3x}{2}-\frac{(x+2)}{3}=2$ $6\times\frac{3x}{2}-6\times\frac{(x+2)}{3}=2\times6$ $9x-2(x+2)=12$ $9x-2x-4=12$ $7x=16$ $x=\frac{16}{7}$	• 1mk multiplying by 6 • 1mk correct answer	P3
4(c)	$\frac{2x}{3}+x=\frac{1}{2}$ $6\times\frac{2x}{3}+6\times x=\frac{1}{2}\times6$ $4x+6x=3$ $10x=3$ $x=\frac{3}{10}$	• 1mk x by 6 • 1mk correct answer	P3