South Sydney High School
Preliminary Mathematics
Second Assessment March 2000

Instructions :

Time Allowed: 2 Periods

1. All questions may be attempted.
2. All necessary working should be shown.
3. Marks may be deducted for poorly arranged or missing working.
4. Approved calculators may be used.
5. Start each question on a **new page.**

Question 1 (12 marks)

Marks

(a)   Calculate $\dfrac{171.8}{14.3 \times 5.7}$ correct to two decimal places.

2

(b)   Find the value of $13^{-1.2}$ correct to two significant figures.

2

(c)   Express $\dfrac{3}{11}$ as a recurring decimal.

1

(d)   The speed of light is 299 725 kilometres per second.
Write this number in scientific notation.

2

(e)   Express $0.2\dot{3}$ as a simple fraction.

3

(f)   The volume V of a sphere is given by $V = \dfrac{4}{3}\pi r^3$. If a sphere has a
volume of 5 cm^3, find the radius correct to two decimal places.

2

Question 2 (24 marks)   <u>**Marks**</u>

(a)   Solve the following :   **8**

(i) $3 - (4 - x) = 5x$

(ii) $\dfrac{2x}{3} - \dfrac{x}{5} = 1$

(iii) $5x^2 - 9x - 2 = 0$

(iv) $3x^2 - 6x + 1 = 0$ (give answers correct to two decimal places).

(b)   Factorise completely :   **8**

(i) $3x^2 - 6x$ (ii) $2x^2 - 7x - 15$

(iii) $4x^2 - 16$ (iv) $a^3 + 27$

(v) $2x + 8y - 7xz - 28yz$

(c)   Simplify: **8**

(i) $4 - (2 - x)$ (ii) $(2 - 3x) - (5 - 4x)$

(iii) $\dfrac{x}{3} + \dfrac{3x - 1}{2}$ (iv) $\dfrac{x^3 - 8}{x^2 - 4} \div \dfrac{1}{x + 2}$

Question 3 (23 marks)

(a)   Simplify :   **6**

(i) $\sqrt{27} - \sqrt{3}$ (ii) $\left(3\sqrt{5} - \sqrt{2}\right)\left(3\sqrt{5} + \sqrt{2}\right)$

(iii) $\sqrt{7} \times \sqrt{63}$

(b)   (i) Express $\sqrt{45} + \sqrt{80}$ in the form $a\sqrt{5}$ and evaluate a.   **2**

(ii) Express $\dfrac{4 + \sqrt{3}}{2 + \sqrt{3}}$ in the form $b - 2\sqrt{3}$ and evaluate b.   **3**

(c)   Express as the following with a rational denominator :   7

(i) $\dfrac{2}{\sqrt{3}}$ (ii) $\dfrac{8}{3-\sqrt{5}}$

(iii) $\dfrac{1}{3-\sqrt{2}}+\dfrac{1}{3+\sqrt{2}}$ (iv) $\dfrac{\sqrt{32}-\sqrt{8}}{3\sqrt{2}}$

(d)   Expand and simplify : $\left(2\sqrt{3}-\sqrt{5}\right)^2$ 2

(e)   Prove that $\dfrac{3-2\sqrt{2}}{3+2\sqrt{2}}+\dfrac{3+2\sqrt{2}}{3-2\sqrt{2}}$ represents a rational number.   3

Question 4 (8 marks)

(a)   **Without** the use of a calculator simplify (showing all working) :   4

(i) $8^{-\frac{2}{3}}\times4^{\frac{3}{2}}$ (ii) $27^{\frac{1}{3}}\times8^{0}\times16^{-\frac{1}{2}}$

(b)   Express without negative exponents : $4x^{-2}\div2x$ 2

(c)   Simplify : $(8a^6)^{\frac{1}{3}}\times3a^2$ 2

Question 5 (10 marks)

(a) Solve the simultaneous equations :   2

$2x+y=7$
$x-2y=1$

(b)   Simplify $|-5|-|8|$ 1

(c)   Solve :   (i) $|x+3|=2x-1$ 3

                      (ii) $-3x<12$ 1

(d)   Graph the solution of $|x+2|\le3$ on a number line.   3

Endofpaper

Solutions to March 2000 Assessment Test

Question 1

(a) 2.11 (to 2 d.p.) ✔ ✔

(b) 0.046 (to 2 s.f.) ✔ ✔ or 4.6×10^{-2}

(c) $0.2\dot{7}$ ✔

(d) 2.99725×10^{5} ✔ ✔

(e) Let $x = 0.2323...$ (i)

(i)x100 $100x = 23.2323...$ (ii) ✔

(ii)−(i) $99x = 23$ ✔

$\therefore x = \dfrac{23}{99}$ ✔

(f) $5 = \frac{4}{3}\pi r^3$

$r = \sqrt[3]{\dfrac{15}{4\pi}} = 1.06$ (to 2 d.p.) ✔ ✔

Question 2

(a) (i) $3 - 4 = 5x - x$ ✔

$4x = -1 \Rightarrow x = -\frac{1}{4}$ ✔

(ii) $10x - 3x = 15$ ✔

$x = \dfrac{15}{7} = 2\frac{1}{7}$ ✔

(iii) $(5x + 1)(x - 2) = 0$ ✔

$x = -\dfrac{1}{5}$ or 2 ✔

(iv) $x = \dfrac{6 \pm \sqrt{36 - 12}}{6}$ ✔

$= 1.82$ or 0.18 (to 2 d.p.) ✔

(b) (i) $3x(x - 2)$ ✔

(ii) $(2x + 3)(x - 5)$ ✔

(iii) $4(x + 2)(x - 2)$ ✔ ✔

(iv) $(a + 3)(a^2 - 3x + 9)$ ✔ ✔

(v) $2(x + 4y) - 7z(x + 4y)$ ✔

$= (x + 4y)(2 - 7z)$ ✔

(c) (i) $4 - 2 + x$ ✔

$= x + 2$ ✔

(ii) $2 - 3x - 5 + 4x$ ✔

$= x - 3$ ✔

(iii) $\dfrac{2x + 9x - 3}{6} = \dfrac{11x - 3}{6}$ ✔ ✔

(iv) $\dfrac{(x - 2)(x^2 + 2x + 4)}{(x + 2)(x - 2)} \times \dfrac{(x + 2)}{1}$ ✔

$= x^2 + 2x + 4$ ✔

Question 3

(a) (i) $3\sqrt{3} - \sqrt{3} = 2\sqrt{3}$ ✔ ✔

(ii) $\left(3\sqrt{5}\right)^2 - \left(\sqrt{2}\right)^2$ ✔

$= 45 - 2 = 43$ ✔

(iii) $\sqrt{7} \times 3\sqrt{7} = 21$ ✔ ✔

(b) (i) $3\sqrt{5} + 4\sqrt{5} = 7\sqrt{5}$ ✔

$\therefore a = 7$ ✔

(ii) $\dfrac{4 + \sqrt{3}}{2 + \sqrt{3}} \times \dfrac{2 - \sqrt{3}}{2 - \sqrt{3}}$

$= \dfrac{8 - 3 + 2\sqrt{3} - 4\sqrt{3}}{4 - 4}$ ✔

$= 5 - 2\sqrt{3}$ ✔

$\therefore b = 5$ ✔

(c) (i) $\dfrac{2\sqrt{3}}{3}$ ✔

(ii) $\dfrac{8\left(3+\sqrt{5}\right)}{3^2-5} = 2\left(3+\sqrt{5}\right)$ ✔ ✔

(iii) $\dfrac{3+\sqrt{2}+3-\sqrt{2}}{3^2-2} = \dfrac{6}{7}$ ✔ ✔

(iv) $\dfrac{4\sqrt{2}-2\sqrt{2}}{3\sqrt{2}} = \dfrac{2\sqrt{2}}{3\sqrt{2}} = \dfrac{2}{3}$ ✔ ✔

(d) $\left(2\sqrt{3}\right)^2 - 4\sqrt{15} + \left(\sqrt{5}\right)^2$ ✔

$= 12 - 4\sqrt{15} + 5 = 17 - 4\sqrt{15}$ ✔

(e) $\dfrac{\left(3-2\sqrt{2}\right)^2 + \left(3+2\sqrt{2}\right)^2}{\left(3+2\sqrt{2}\right)\left(3-2\sqrt{2}\right)}$ ✔

$= \dfrac{9 - 12\sqrt{2} + 8 + 9 + 12\sqrt{2} + 8}{9 - 8}$ ✔

$= 34$ which is rational. ✔

Question 4

(a) (i) $\dfrac{1}{8^{\frac{2}{3}}} \times 8 = \dfrac{8}{4} = 2$ ✔ ✔

(ii) $3 \times 1 \times \dfrac{1}{4} = \dfrac{3}{4}$ ✔ ✔

(b) $\dfrac{4}{x^2} \times \dfrac{1}{2x} = \dfrac{2}{x^3}$ ✔ ✔

(c) $2a^2 \times 3a^2 = 6a^4$ ✔ ✔

Question 5

(a) $4x + 2y = 14$ .... (i)

$x - 2y = 1$ .... (ii)

(i) + (ii)

$5x = 15 \Rightarrow x = 3$ ✔

$y = 1$ ✔

(b) -3 ✔

(c) (i) $x + 3 = 2x - 1$

$x = 4$ ✔   or

$-(x+3) = 2x - 1$

$3x = -2$

$\therefore x = -\dfrac{2}{3}$ (Test and invalid) ✔

$\therefore x = 4$ is the only answer ✔

(ii) $x > -4$ ✔

(d) $-3 \le x + 2 \le 3$

$-5 \le x \le 1$ ✔

 ✔