ST SPYRIDON COLLEGE

Mathematics

Weighting: 25%

Working time: 50 minutes

Total marks: 24

Topic examined:
Basic Arithmetic and Algebra

Outcomes assessed: P3 and P4

General instructions:
• Write using blue or black pen
• Board-approved calculators and templates may be used
• All necessary working should be shown in every question
• Questions are of equal value
• Full marks may not be awarded for careless or badly arranged work
• Questions are not necessarily arranged in order of difficulty
• Begin each question on a new page

Total marks (24)
Attempt Questions 1 – 2
Questions are of equal value
Answer each question on a SEPARATE page.

Question 1 (12 Marks)

<div align="right">**Marks**</div>

(a). Find the value of $\dfrac{5.3 \times 10^{-3}}{7.8 \times 10^{-2}}$ correct to three significant figures.   2

(b) Evaluate the expression $\dfrac{AC}{B^2}$ where $A = (0.1)^3$, $B = (0.2)^2$ and $C = \sqrt{0.04}$.   2

(c) Rationalise the denominator of $\dfrac{4}{1 - \sqrt{3}}$ and simplify.   2

(d) Suppose $x = 0.4\overline{63} = 0.463636363\ldots\ldots$ is a recurring decimal.

Write x as a rational number (that is in the form $\dfrac{a}{b}$ where a and b are integers) and in

its simplest form.   2

(e) Simplify fully:

(i) $\sqrt{80} + \sqrt{125} - 2\sqrt{45}$ 2

(iii) $\dfrac{a^5 b^4}{ab^3} \times \dfrac{ab}{a^3 b^7} \div \dfrac{1}{ab^2}$.   2

Question 2 (12 marks)   *Begin a new page*

(a)   Solve $3x^2 - 4x - 1 = 0$, using the quadratic formula.

         2

(b)   Solve simultaneously $\begin{cases} 4x - y = 3 \\ 10x + 3y = 2 \end{cases}$

         3

(c)   Solve for x:

    (i) $\dfrac{x-1}{5} \leq 3x + 2$

         2

    (ii) $\dfrac{x}{3} - \dfrac{2x+1}{4} = 5$

         3

(d)   Factorise fully: $2x^2 + 3x - 2$

         2

End of Examination

YEAR 11 MATHS 2006
Prelim. Task 1.
Question 1

(a)
$$0.0679 \quad (2)$$

(b) $\dfrac{(0.1)^3 \times \sqrt{0.04}}{(0.2)^2}$

$= \dfrac{\left(\frac{1}{10}\right)^3 \times \sqrt{\frac{4}{100}}}{\left(\frac{2}{10}\right)^2}$

$= \dfrac{\frac{1}{1000} \times \frac{2}{10}}{\frac{16}{10000}}$

$= \dfrac{\frac{2}{10000}}{\frac{16}{10000}}$

$= \dfrac{2}{10000} \times \dfrac{10000}{16}$

$= \dfrac{1}{8} \quad (2)$

(c) $\dfrac{4}{1-\sqrt{3}} \times \dfrac{1+\sqrt{3}}{1+\sqrt{3}}$

$= \dfrac{4+4\sqrt{3}}{1-3} = -2-2\sqrt{3}$

$= -2\sqrt{3} \quad (2)$

(d)
let $x = 0.4636363\ldots$ — ①
$10x = 4.6363$ — ②
$100x = 46.363$ — ③
$1000x = 463.6363$ — ④

④ − ②
$990x = 459$

$\therefore x = \dfrac{459}{990} = \dfrac{51}{110} \quad (2)$

(e)(i) $\sqrt{80} + \sqrt{125} - 2\sqrt{45}$

$= \sqrt{16 \times 5} + \sqrt{25 \times 5} - 2\times\sqrt{9 \times 5}$
$= 4\sqrt{5} + 5\sqrt{5} - 6\sqrt{5}$
$= 3\sqrt{5} \quad (2)$

(ii) $\dfrac{a^5 b^4}{ab^3} \times \dfrac{ab}{a^3 b^7} \times \dfrac{ab^2}{1}$

$= \dfrac{a^7 b^7}{a^4 b^{10}}$

$= \dfrac{a^3}{b^3} \quad \text{or} \quad \left(\dfrac{a}{b}\right)^3 \quad (2)$

Question 2

(a) $3x^2 - 4x - 1 = 0$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \dfrac{-4 \pm \sqrt{(-4)^2 - 4\times 3 \times -1}}{2 \times 3}$

$= \dfrac{4 \pm \sqrt{16 + 12}}{6}$

$= \dfrac{4 \pm \sqrt{28}}{6}$

$= \dfrac{4 \pm 2\sqrt{7}}{6}$

$= \dfrac{2 \pm \sqrt{7}}{3} \quad (2)$

(b) $4x - y = 3$ — ①
$10x + 3y = 2$ — ②

multiply equation ① by 3
$12x - 3y = 9$ — ③

② + ③
$22x = 11$

$x = \dfrac{11}{22}$

$\boxed{x = \frac{1}{2}}$

Now subst. $x = \frac{1}{2}$ into ①

$2 - y = 3$
$-y = 1$
$\boxed{y = -1}$

$\boxed{x = \frac{1}{2}, \quad y = -1}$

(c)(i) $\dfrac{x-1}{5} < 3x + 2$

$x - 1 < 15x + 10$

$-14x < 11$

$\boxed{x \geqslant \dfrac{-11}{14}} \quad (2)$

(ii) $\dfrac{x+4}{3} = \dfrac{2x + 1}{4} - 5$

$4x - 6x - 3 = 60$
$-2x - 3 = 60$
$-2x = 63$
$x = \dfrac{-63}{2}$
$\boxed{x = -31.5}$

(d) $2x^2 + 3x - 2$
$= (3x + 4)(2x - 1)$
$= (x + 2)(2x - 1) \quad (2)$