

Yr 11 Mathematics - Task 1 (2004)



GIRRAWEEEN HIGH SCHOOL

YEAR 11 - TASK 1

2004

MATHEMATICS

2 UNIT

Time allowed – 90 minutes

DIRECTIONS TO CANDIDATES

- Attempt ALL questions.
- All necessary working should be shown in every question. Marks may be deducted for careless or badly arranged work.
- Board-approved calculators may be used.
- Start each question on a *new* sheet of paper.

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Question 1 (16 marks)

- (a) Find $\sqrt{\frac{3}{7^2}} + 4(5)^3$ correct to 2 decimal places. 2
- (b) Evaluate $\sqrt{\frac{83.1}{0.2 + 5.4 + 1.3}}$ correct to 3 significant figures. 2
- (c) Write in scientific notation.
- (i) 364 000 2
- (ii) 0.000912 2
- (d) Simplify $2\sqrt{12}$. 2
- (e) If $\sqrt{800} = x\sqrt{2}$, find the value of x . 2
- (f) Write $64^{-\frac{2}{3}}$ as a rational number. 2
- (g) Find $(5.7 \times 10^{13}) \times (4.9 \times 10^{22})$. Write your answer in scientific notation. 2

Question 2 (16 marks)

- (a) Expand and simplify
- (i) $4a(a - 2b) - 2a(b - 3a)$ 2
- (ii) $(3y - 1)(3y + 1)$ 2
- (iii) $(x - 5)(x^2 + 5x + 25)$ 2
- (iv) $(5t + 3)^2$ 2
- (v) $(2x - 3)(x + 8)$ 2
- (b) If $d = \frac{c}{\sqrt{a^2 + b^2}}$. Find the exact value of d with a rational denominator if
 $a = 2, b = -1, c = 3,$ 2
- (c) If $A = \frac{1}{2}r^2\theta$. Find the value of θ , when $A = 12$ and $r = 4$. 2
- (d) If $V = \pi r^2 h$. Find the exact value of r when $V = 9$ and $h = 16$. 2

Question 3 (14 marks)

- (a) Factorise.
- (i) $m^2 + 14m - 32$ 2
- (ii) $x^3 + x^2 + 3x + 3$ 2
- (iii) $b^3 - 8$ 2
- (iv) $3y^2 + 5y - 2$ 3
- (v) $z^2 - (1 + w)^2$ 3
- (b) Complete the square on, $x^2 - 18x + \square$? 2

Question 4 (23 marks)

- (a) Simplify.
- (i) $\sqrt{27} - \sqrt{12}$ 2
- (ii) $\sqrt{32} - 3\sqrt{2} + 2\sqrt{50}$ 2
- (iii) $\frac{\sqrt{2}}{\sqrt{8}}$ 2
- (b) Expand and simplify.
- (i) $2\sqrt{3}(2 - \sqrt{12})$ 2
- (ii) $(2\sqrt{2} - \sqrt{3})^2$ 3
- (c) Express with a rational denominator.
- (i) $\frac{5}{\sqrt{2}}$ 2
- (ii) $\frac{\sqrt{3}}{\sqrt{2} - 7}$ 3
- (iii) $\frac{\sqrt{3}}{\sqrt{5} + 2\sqrt{6}}$ 3
- (d) Express as a single fraction with rational denominator.
- $\frac{\sqrt{2} - \sqrt{7}}{\sqrt{2} + \sqrt{3}} \times \frac{2}{\sqrt{2} - \sqrt{3}}$ 4

Question 5 (20 marks)

- (a) Simplify
- (i) $\frac{4a}{7} \times \frac{21}{5a^2}$ 2
- (ii) $\frac{5}{x^2 - 1} \div \frac{2}{x - 1}$ 2
- (iii) $\frac{3}{b + 2} \times \frac{b^2 + 2b}{6a - 3}$ 3
- (iv) $\frac{3ab^2}{5xy} \div \frac{12ab - 6a}{x^2y + 2xy^2}$ 3
- (b) Simplify
- (i) $\frac{a + 4}{3} - \frac{a}{4}$ 2
- (ii) $\frac{1}{a^2 + 2a + 1} + \frac{1}{a + 1}$ 2
- (iii) $x - \frac{x^2}{x + 2}$ 3
- (iv) $\frac{1}{x - 1} - \frac{2}{x}$ 3

Question 6 (15 marks)

- (a) Simplify. $\frac{2xy + 2x - 6 - 6y}{4x^2 - 16x + 12}$ 4
- (b) Simplify. $\frac{2p^2 - 3p - 2}{8p^3 + 1}$ 4
- (c) Write $0.\dot{3}0\dot{4}$ as a rational number. 3
- (d) Write $1.6\dot{2}\dot{7}$ as a rational number. 4

Solutions.

Yr 11 - Mathematics

TASK 1 (2004)

Q1 a) $500.2474 \dots$

$= 500.25$ (2 dec. pl.)

b) $4.368818 \dots$

$= 4.37$ (3 sign figs.)

c) (i) 3.64×10^5

(ii) 9.12×10^{-4}

d) $2.2\sqrt{3}$

$= 4\sqrt{3}$

e) $\sqrt{800} = \sqrt{400 \times 2}$

$= 20\sqrt{2}$

$\therefore x = 20$

f) $64^{\frac{2}{3}} = \sqrt[3]{64^2} = 16$

g) 2.793×10^{36}

Q2 a) (i) $4a(a-2b) - 2a(b-3a)$

$= 4a^2 - 8ab - 2ab + 6a^2$

$= 10a^2 - 10ab$

(ii) $(3y-1)(3y+1)$

$= 9y^2 - 1$

(iii) $(x-5)(x^2+5x+25)$

$= x^3 - 5^3$

$= x^3 - 125$

(iv) $(5t+3)^2 = 25t^2 + 30t + 9$

(v) $(2x-3)(x+8) = 2x^2 + 16x - 3x - 24$

$= 2x^2 + 13x - 24$

b) $d = 3$

$\sqrt{2^2 + (-1)^2} = \sqrt{5} \times \sqrt{5}$

$= 3\sqrt{5}$

$= 5$

c) $12 = \frac{1}{2}(4)\theta$

$24 = 16\theta$

$\theta = \frac{24}{16}$

$\theta = 1.5$ or $1\frac{1}{2}$

d) $9 = \pi r^2(16)$

$r^2 = 9$

$r = \pm \sqrt{9} = \pm 3$

$r = \pm \sqrt{\frac{9}{16\pi}} = \pm \frac{3}{4\sqrt{\pi}}$

Q3 a) (i) $m^2 + 14m - 32$

$= (m+16)(m-2)$

(ii) $x^3 + x^2 + 3x + 3$

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

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

Q3 a) (iii) $b^3 - 8$

$= (b-2)(b^2+2b+4)$

(iv) $3y^2 + 5y - 2$

$= 3y^2 + 6y - y - 2$

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

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

(v) $z^2 - (1+w)^2$

$= (z - (1+w))(z + (1+w))$

$= (z-1-w)(z+1+w)$

b) $x^2 + 18x + 81$

$= (x+9)^2 = 81$

Q4 a) (i) $\sqrt{27} - \sqrt{12}$

$= 3\sqrt{3} - 2\sqrt{3}$

$= \sqrt{3}$

(ii) $\sqrt{32} - 3\sqrt{2} + 2\sqrt{50}$

$= 4\sqrt{2} - 3\sqrt{2} + 2\sqrt{25 \times 2}$

$= \sqrt{2} + 10\sqrt{2}$

$= 11\sqrt{2}$

(iii) $\frac{\sqrt{2}}{\sqrt{8}} = \frac{\sqrt{2}}{2\sqrt{2}} = \frac{1}{2}$

b) (i) $2\sqrt{3}(2-\sqrt{2})$

$= 4\sqrt{3} - 2\sqrt{3 \times 2}$

$= 4\sqrt{3} - 12$

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

$= 8 - 4\sqrt{6} + 3$

$= 11 - 4\sqrt{6}$

c) (i) $\frac{5}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{5\sqrt{2}}{2}$

(ii) $\frac{\sqrt{3}}{\sqrt{2-7}} \times \frac{\sqrt{2+7}}{\sqrt{2+7}} = \frac{\sqrt{6+7\sqrt{3}}}{2-49}$

$= \frac{\sqrt{6+7\sqrt{3}}}{-47}$

(iii) $\frac{\sqrt{3}}{\sqrt{5+2\sqrt{6}}} \times \frac{\sqrt{5-2\sqrt{6}}}{\sqrt{5-2\sqrt{6}}}$

$= \frac{\sqrt{5-2\sqrt{18}}}{5-24}$

$= \frac{\sqrt{5-6\sqrt{2}}}{-19}$

d) $\frac{\sqrt{2-\sqrt{7}}}{\sqrt{2+\sqrt{3}}} \times \frac{2}{\sqrt{2-\sqrt{3}}}$

$= \frac{2\sqrt{2-2\sqrt{7}}}{2-3}$

$= \frac{2\sqrt{2-2\sqrt{7}}}{-1}$

$= 2\sqrt{2-2\sqrt{7}}$

Q5 a) (i) $\frac{4x}{x} \times \frac{2x^3}{5a^2} = \frac{12}{5a}$

(ii) $\frac{5}{x^2} \cdot \frac{2}{x-1}$

$= \frac{5 \cdot 2}{(x+1)(x-1)} \cdot \frac{2}{x}$

$= \frac{5}{2(x+1)} \cdot \frac{5}{2x+2}$

(iii) $\frac{3}{b+2} \times \frac{b^2+2b}{6a-3}$

$= \frac{3}{b+2} \times \frac{b(b+2)}{3(2a-1)}$

$= \frac{b}{2a-1}$

(iv) $3ab^2 \cdot \frac{12ab-6a}{5xy}$

$= \frac{3ab^2 \cdot xy + 2xy^2}{5xy} \times \frac{xy(x+2y)}{2b^2(2b-1)}$

$= \frac{b^2(x+2y)}{10(2b-1)}$

OR $= \frac{bx+2by}{20b-10}$

b) (i) $\frac{a+4}{3} \cdot \frac{9}{4}$

$= \frac{4(a+4) \cdot 3a}{12}$

$= \frac{4a+16-3a}{12}$

$= \frac{a+16}{12}$

(2)

(i) $\frac{1}{a^2+2a+1} \cdot \frac{1}{a+1}$

$= \frac{1}{(a+1)^2} \cdot \frac{1}{a+1}$

$= \frac{1}{(a+1)^3}$

$= \frac{a+2}{(a+1)^2}$

(ii) $x - \frac{x^2}{x+2} = \frac{x(x+2) - x^2}{x+2}$

$= \frac{x^2+2x-x^2}{x+2}$

$= \frac{2x}{x+2}$

(iii) $\frac{1}{x-1} - \frac{2}{x} = \frac{x-2(x-1)}{x(x-1)}$

$= \frac{x-2x+2}{x(x-1)}$

$= \frac{2-x}{x(x-1)}$

Q6 a) $\frac{2xy+2x-6-by}{4x^2-16x+12}$

$= \frac{2x(y+1)-6(y+1)}{4(x^2-4x+3)}$

$= \frac{(y+1)(2x-6)}{4(x-3)(x-1)}$

$= \frac{2(y+1)(x-3)}{2(x-1)(x-3)}$

$= \frac{y+1}{x-1}$

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

Q6 Cont.

b) $\frac{2p^2-3p-2}{8p^2+1} \cdot \frac{2p-1}{p-2}$

$= \frac{(2p+1)(p-2)}{(2p+1)(4p^2-2p+1)}$

$= \frac{p-2}{4p^2-2p+1}$

c) $x = 0.304$

$x = 0.304304...$

$1000x = 304.304304...$

$1000x - x = 304.304... - 0.304...$

$999x = 304$

$x = \frac{304}{999}$

d) $x = 1.627$

$x = 1.62727...$

$10x = 16.2727...$

$1000x = 1627.2727...$

$1000x - 10x = 1627.2727... - 16.2727...$

$990x = 1627 - 16$

$990x = 1611$

$x = \frac{1611}{990}$

$x = 1\frac{61}{110}$