

<b>QUESTION ONE</b> (22 Marks)	Marks
(a) Evaluate $\sqrt{\frac{36.41+19.57}{23.62-11.39}}$ , correct to 3 significant figures.	2
(b) Express $0.5\frac{g}{4}$ as a fraction in its simplest terms.	2
(c) Write 217000000 in scientific notation.	1
(d) Simplify $ -6-2 $	1
(e) Increase \$450 by 18%.	1
(f) Simplify the following	
(i) $\sqrt{18}+3\sqrt{12}-2\sqrt{50}$	2
(ii) $2\sqrt{6}\times 4\sqrt{15}$	2
(g) Expand and simplify the following	
(i) $\sqrt{6}(3\sqrt{6}-2\sqrt{5})$	1
(ii) $(7-2\sqrt{5})(7+2\sqrt{5})$	1
(iii) $(2\sqrt{5}+3)^2$	2
(h) Simplify each of the following by rationalising the denominator.	
(i) $\frac{10}{3\sqrt{2}}$	2
(ii) $\frac{\sqrt{10}-\sqrt{6}}{\sqrt{10}+\sqrt{6}}$	3
(i) Given $\sqrt{80}-\sqrt{20}=\sqrt{x}$ , find $x$ .	2

**QUESTION TWO** (19 Marks) **Start a new page**

Marks

(a) Expand and simplify the following

(i)  $(5a-2)(3a+1)$  1

(ii)  $\left(t-\frac{1}{t}\right)\left(t-\frac{1}{t}\right)$  1

(b) Simplify the following

(i)  $\frac{(2a^4)^5}{4a^2}$  2

(ii)  $(16y)^{\frac{1}{4}} \times (4y^2)^{\frac{1}{2}}$  2

(c) Write  $x\sqrt{x}$  in index form. 1

(d) Factorise the following

(i)  $y^2 - 16y - 80$  1

(ii)  $4x^2 + 9x - 28$  1

(iii)  $2k^3 - 16k^2 - 3k + 24$  2

(iv)  $t^3 + 27$  1

(e) Simplify the following

(i)  $\frac{5x-10}{5}$  1

(ii)  $\frac{x-5}{3x} + \frac{x-3}{5x}$  3

(iii)  $\frac{2x^2+x-15}{x^2+3x-28} \div \frac{6x^2-15x}{x^2-49}$  3

**QUESTION THREE** (9 Marks) Start a new page

(a) Solve for  $x$

(i)  $20x - 35 = 13x - 21$  **1**

(ii)  $\frac{2x+1}{5} = -3$  **2**

(iii)  $2 + 5(x-1) = 5x - (x-2)$  **3**

(iv)  $\frac{x+4}{3x} = 7 + \frac{1}{x}$  **3**

**END OF PAPER**

Question 1

$$a) \sqrt{\frac{36.41 + 19.57}{23.62 - 11.39}} \div 2.139455367$$

$$= 2.14 \text{ to 3 sig. fig.}$$

$$b) \text{ Let } x = 0.\dot{5}4$$

$$x = 0.545454\dots$$

$$100x = 54.545454\dots$$

$$99x = 54$$

$$x = \frac{54}{99}$$

$$= \frac{6}{11}$$

$$\therefore 0.\dot{5}4 = \frac{6}{11}$$

$$c) 21700000000 = 2.17 \times 10^9$$

$$d) |-6-2| = |-8|$$

$$= 8$$

$$e) \text{ Increased amount}$$

$$= (100 + 18)\% \text{ of } \$450$$

$$= 118\% \text{ of } \$450$$

$$= 1.18 \times \$450$$

$$= \$531$$

$$f) (i) \sqrt{18} + 3\sqrt{12} - 2\sqrt{50}$$

$$= \sqrt{9} \times \sqrt{2} + 3\sqrt{4} \times \sqrt{3} - 2\sqrt{25} \times \sqrt{2}$$

$$= 3\sqrt{2} + 3 \times 2\sqrt{3} - 2 \times 5\sqrt{2}$$

$$= 3\sqrt{2} + 6\sqrt{3} - 10\sqrt{2}$$

$$= 6\sqrt{3} - 7\sqrt{2}$$

$$(ii) 2\sqrt{6} \times 4\sqrt{5} = 8\sqrt{30}$$

$$= 8 \times \sqrt{9} \times \sqrt{10}$$

$$= 8 \times 3\sqrt{10}$$

$$= 24\sqrt{10}$$

$$g) (i) \sqrt{6}(3\sqrt{6} - 2\sqrt{5}) = 3\sqrt{36} - 2\sqrt{30}$$

$$= 3 \times 6 - 2\sqrt{30}$$

$$= 18 - 2\sqrt{30}$$

$$(ii) (7 - 2\sqrt{5})(7 + 2\sqrt{5}) = 7^2 - (2\sqrt{5})^2$$

$$= 49 - 4 \times 5$$

$$= 49 - 20$$

$$= 29$$

$$(iii) (2\sqrt{5} + 3)^2 = (2\sqrt{5} + 3)(2\sqrt{5} + 3)$$

$$= 4\sqrt{25} + 6\sqrt{5} + 6\sqrt{5} + 9$$

$$= 4 \times 5 + 12\sqrt{5} + 9$$

$$= 29 + 12\sqrt{5}$$

$$h) (i) \frac{10}{3\sqrt{2}} = \frac{10}{3\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$$

$$= \frac{10\sqrt{2}}{3 \times 2}$$

$$= \frac{5\sqrt{2}}{3}$$

$$(ii) \frac{\sqrt{10} - \sqrt{6}}{\sqrt{10} + \sqrt{6}} = \frac{(\sqrt{10} - \sqrt{6})}{(\sqrt{10} + \sqrt{6})} \times \frac{(\sqrt{10} - \sqrt{6})}{(\sqrt{10} - \sqrt{6})}$$

$$= \frac{(\sqrt{10} - \sqrt{6})(\sqrt{10} - \sqrt{6})}{10 - 6}$$

$$= \frac{\sqrt{100} - \sqrt{60} - \sqrt{60} + \sqrt{36}}{4}$$

$$= \frac{10 - 2\sqrt{60} + 6}{4}$$

$$= \frac{16 - 2\sqrt{4} \times \sqrt{15}}{4}$$

$$= \frac{16 - 4\sqrt{15}}{4}$$

$$= \frac{4(4 - \sqrt{15})}{4}$$

$$= 4 - \sqrt{15}$$

$$\begin{aligned}
 \text{c) } \sqrt{80} - \sqrt{20} &= \sqrt{x} \\
 \sqrt{80} - \sqrt{20} &= \sqrt{16 \times 5} - \sqrt{4 \times 5} \\
 &= 4\sqrt{5} - 2\sqrt{5} \\
 &= 2\sqrt{5} \\
 &= \sqrt{4 \times 5} \\
 &= \sqrt{20} \\
 \therefore x &= 20
 \end{aligned}$$

### Question 2

$$\begin{aligned}
 \text{a) (i) } (5a-2)(3a+1) &= 15a^2 + 5a - 6a - 2 \\
 &= 15a^2 - a - 2
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) } (t - \frac{1}{t})(t - \frac{1}{t}) &= t^2 - 1 - 1 - \frac{1}{t^2} \\
 &= t^2 - 2 - \frac{1}{t^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{b) (i) } \frac{(2a^4)^5}{4a^2} &= \frac{32a^{20}}{4a^2} \\
 &= 8a^{18}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) } (16y)^{\frac{1}{4}} \times (4y^2)^{\frac{1}{2}} &= (16y)^{\frac{1}{4}} \times 2y \\
 &= \frac{1}{2} y^{\frac{1}{4}} \times 2y \\
 &= y^{\frac{1}{4}} \times 2y \\
 &= \sqrt[4]{y^3}
 \end{aligned}$$

$$\begin{aligned}
 \text{c) } x\sqrt{x} &= x \times \sqrt{x} \\
 &= x \times x^{\frac{1}{2}} \\
 &= x^{\frac{3}{2}}
 \end{aligned}$$

$$\text{d) (i) } y^2 - 16y - 80 = (y-20)(y+4)$$

$$\begin{aligned}
 \text{(ii) } 4x^2 + 9x - 28 & \quad P = 4x - 28 \\
 &= 4x^2 + 16x - 7x - 28 \quad = -112 \\
 &= 4x(x+4) - 7(x+4) \quad S = 9 \\
 &= (4x-7)(x+4) \quad F = 16, -7
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii) } 2k^3 - 16k^2 - 3k + 24 & \\
 &= 2k^2(k-8) - 3(k-8) \\
 &= (2k^2-3)(k-8)
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv) } t^3 + 27 &= t^3 + 3^3 \\
 &= (t+3)(t^2-3t+9)
 \end{aligned}$$

$$\begin{aligned}
 \text{e) } \frac{5x-10}{5} &= \frac{5(x-2)}{5} \\
 &= (x-2)
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) } \frac{x-5}{3x} + \frac{x-3}{5x} &= \frac{5(x-5) + 3(x-3)}{15x} \\
 &= \frac{5x-25+3x-9}{15x} \\
 &= \frac{8x-34}{15x}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii) } \frac{2x^2+x-15}{x^2+3x-28} & \div \frac{6x^2-15x}{x^2-49} \\
 &= \frac{(2x-5)(x+3)}{(x+7)(x-4)} \times \frac{(x-7)(x+7)}{3x(2x-5)} \\
 &= \frac{(x+3)(x-7)}{3x(x-4)}
 \end{aligned}$$

### Question 3

$$a) (i) 20x - 35 = 13x - 21$$

$$7x = 14$$

$$x = 2$$

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

$$2x+1 = -15$$

$$2x = -16$$

$$x = -8$$

$$(iii) 2 + 5(x-1) = 5x - (x-2)$$

$$2 + 5x - 5 = 5x - x + 2$$

$$5x - 3 = 4x + 2$$

$$x = 5$$

$$(iv) \frac{x+4}{3x} = 7 + \frac{1}{x}$$

$$(x+4) = 7 \times 3x + 3$$

$$x+4 = 21x+3$$

$$-20x = -1$$

$$x = \frac{1}{20}$$

