

[illegible]

Question One (Start on a new Page)**8 Marks**

- a. Express the following in scientific notation, correct to two significant figures. (2)

$$\frac{(7.8 \times 10^4) \times (6.9 \times 10^{-4})^3}{\sqrt{1.2 \times 10^5}}$$

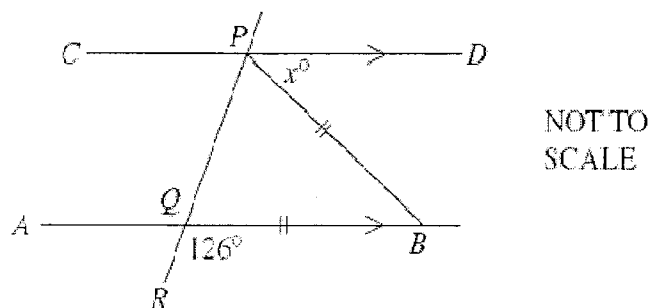
- b. The price of a fishing rod is reduced from \$178 to \$164.
Express this reduction as a percentage. (2)

- c. If $S = \frac{n}{2}[2a + (n-1)d]$, find the value of a when $S = 1650$, $n = 20$
and $d = 5$. Express your answer to the nearest whole number. (2)

- d. Simplify $\sqrt{150} - \sqrt{96} - \sqrt{24}$ (2)

Question Two (Start on a new Page)**8 Marks**

- a. In the diagram, CD is parallel to AB , $PB=QB$, $\angle BQR = 126^\circ$ and $\angle BPD = x^\circ$. Find the value of x , giving reasons. (3)

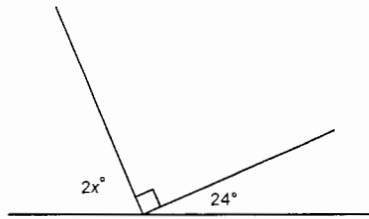


- b. Find solutions to
- (i) $(x-3)(2x+1) = 0$ (2)
- (ii) $x^2 - 5x + 6 = 0$ (2)
- (iii) $5x^2 - 2x - 4 = 0$, giving answers correct to one decimal place. (2)

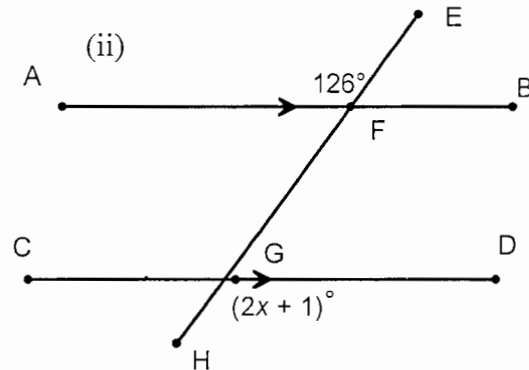
Question Three (Start on a new Page)**8 Marks**

- a. Find the value of the following pronumerals (giving reasons) (4)

(i)



(ii)



- b. Solve for x

(i) $2x + 3 = 4x - 7$ (2)

(ii) $3(4 - x) - (3 - 5x) = 0$ (2)

Question Four (Start on a new Page)**8 Marks**

- a. Write $2\sqrt{x}$ in index form (1)

- b. Rationalise the denominator of $\frac{4}{\sqrt{3}-2}$ (2)

- c. Simplify $\frac{2x^2-10x+12}{x^2-4} \times \frac{3x}{2x^2-6x}$ (2)

- d. In a right angled triangle the hypotenuse is 22cm. If the second side is twice the length of the third side, calculate the **exact** length of the shortest side. (3)

Question Five (Start on a new Page)**8 Marks**

a. Draw neat sketches and state the domain and range of the following graphs.

(i) $y = |x + 2| - 3$ (3)

(ii) $y = -\sqrt{9 - x^2}$ (3)

b. Simplify

(i) $(a^2b^4)^5 \times (a^3b^2)^3$ (1)

(ii) $\frac{5x^2 \times 5x^8}{15x^{10}} + 6x^0$ (1)

Question Six (Start on a new Page)**8 Marks**

a. Factorise

(i) $x^3 - 3x^2 + 2x - 6$ (2)

(ii) $25 - 16x^2$ (1)

(iii) $8x^3 - 125$ (1)

b. Find the value of a and b if $a + \sqrt{b} = \frac{2}{\sqrt{2}+1}$ (2)

c. Solve $|2x - 1| = 6$ (2)

Question Seven (Start on a new Page)**8 Marks**

- a. (i) Find the interior angle sum of a polygon with 11 sides. (1)
- (ii) Find the size of the exterior angle of a regular pentagon. (1)
- b. Solve simultaneously for x and y
- $$\left. \begin{array}{l} 2x + y = 8 \\ 3x + 2y = 13 \end{array} \right\} \quad (3)$$
- c. Shade the region which satisfies both $y > x$ and $4 - x^2 \leq y$. (3)

Question Eight (Start on a new Page)**8 Marks**

- a. Given $f(x) = x^2$ and $g(x) = x + 6$, find
- (i) $f(-1)$ (1)
- (ii) $[g(x)]^2$ (2)
- (iii) value(s) for which $g(x) = -3$ (1)
- (iv) value(s) for which $f(x) = g(x)$ (2)
- b. Find the maximum value of the parabola whose equation is $y = 5 - 4x - 2x^2$. (2)

Sydney Technical High School.

Question 1

a) 7.4×10^{-8}

b) $\frac{14}{178} \times 100 = 7.86\%$
 $= 7.9\%$

c) $S = \frac{n}{2} [2a + (n-1)d]$

$1650 = \frac{20}{2} [2a + (20-1)5]$

$1650 = 10 [2a + 95]$

$165 = 2a + 95$

$2a = 70$

$a = 35$

d) $\sqrt{150} - \sqrt{96} - \sqrt{24}$
 $= \sqrt{25 \times 6} - \sqrt{16 \times 6} - \sqrt{4 \times 6}$
 $= 5\sqrt{6} - 4\sqrt{6} - 2\sqrt{6}$
 $= -\sqrt{6}$

Question 2

a) $\angle PQB = 54^\circ$

$\triangle PQB$ is an isosceles \triangle

$\angle QPB = \angle PQB = 54^\circ$

$x + 54^\circ = 126^\circ$

(corresponding angles in parallel lines)

a) i) $(x-3)(2x+1) = 0$
 $x = 3 \quad x = -\frac{1}{2}$

ii) $x^2 - 5x + 6 = 0$

$(x-2)(x-3) = 0$

$x = 2 \quad x = 3$

b) ii) $5x^2 - 2x - 4 = 0$

$a = 5$

$b = -2$

$c = -4$

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

$x = \frac{2 \pm \sqrt{2^2 - 4 \times 5 \times -4}}{2 \times 5}$

$x = \frac{2 \pm \sqrt{84}}{10}$

$x = 1.1 \text{ or } -0.7$

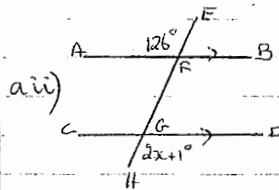
Question 3

a) i) $2x + 90^\circ + 24^\circ = 180^\circ$ (supplementary angles)

$2x + 114^\circ = 180^\circ$

$2x = 66^\circ$

$x = 33^\circ$



a) ii)

$\angle AFE = \angle BFG = 126^\circ$ (vertically opp. \angle s)

$\angle BFH = \angle DGH = 2x + 1^\circ = 126^\circ$

corresponding angles $AB \parallel CD$.

$2x + 1 = 126^\circ$

$2x = 125^\circ$

$x = 62.5^\circ$

b) i) $2x + 3 = 4x - 7$

$10 = 2x$

$x = 5$

b) ii) $3(4-x) - (3-5x) = 0$

$12 - 3x - 3 + 5x = 0$

$9 + 2x = 0$

$2x = -9$

$x = -4\frac{1}{2}$

Question 4

a) $2\sqrt{x} = 2x^{\frac{1}{2}}$

b) $\frac{4}{\sqrt{3}-2} \times \frac{\sqrt{3}+2}{\sqrt{3}+2} = -4\sqrt{3}-8$

c) $\frac{2x^2 - 10x + 12}{x^2 - 4} \times \frac{3x}{2x^2 - 6x}$

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

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

d) $22^2 = x^2 + (2x)^2$

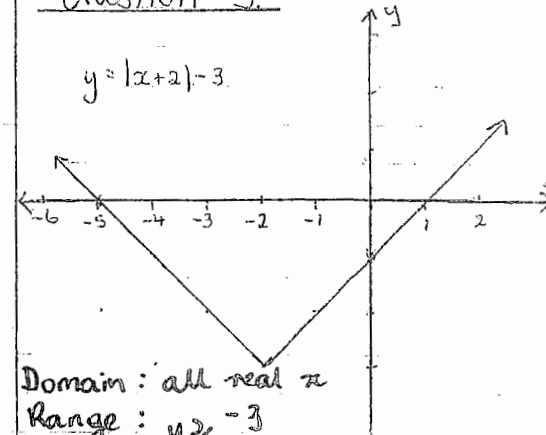
$22^2 = x^2 + 4x^2$

$484 = 5x^2$

$x = \sqrt{\frac{484}{5}} \text{ or } \frac{22}{\sqrt{5}} \text{ or } \frac{22\sqrt{5}}{5}$

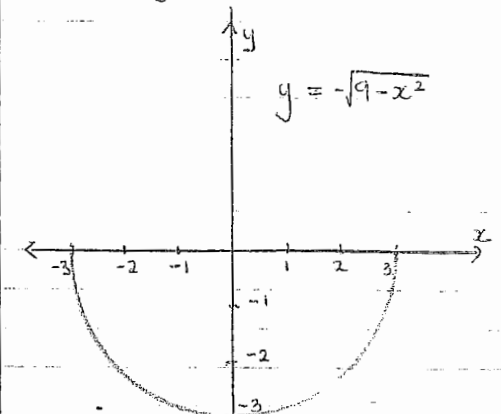
Question 5

$y = |x+2| - 3$



Domain: all real x

Range: $y \geq -3$



Domain $-3 \leq x \leq 3$

Range $-3 \leq y \leq 0$

b) i) $(a^2b^4)^5 \times (a^3b^2)^3 =$
 $= a^{10}b^{20} \times a^9b^6$
 $= a^{19}b^{26}$

b) ii) $\frac{5x^2 \times 5x^8}{15x^{10}} + 6x^0$
 $= \frac{25x^{10}}{15x^{10}} + 6 \times 1$

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

Question 6

$$i) x^3 - 3x^2 + 2x - 6$$

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

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

$$ii) 25 - 16x^2$$

$$= (5-4x)(5+4x)$$

$$iii) 8x^3 - 125$$

$$= (2x-5)(4x^2+10x+25)$$

$$\frac{2}{\sqrt{2}+1} \times \frac{\sqrt{2}-1}{\sqrt{2}-1} = 2\sqrt{2}-1$$

$$= -2 + \sqrt{8}$$

$$a = -2$$

$$b = 8$$

$$|2x-1| = 6$$

$$-6 = 2x-1 = 6$$

$$-5 = 2x = 7$$

$$-2\frac{1}{2} = x = 3\frac{1}{2}$$

Question 7

$$i) (n-2) \times 180^\circ =$$

$$(11-2) \times 180^\circ = 1620^\circ$$

$$ii) 360^\circ \div 5 = 72^\circ$$

$$b) 2x+y=8 \quad (1)$$

$$3x+2y=13 \quad (2)$$

$$(1) \times 2 \quad \text{to}$$

$$4x+2y=16 \quad (3)$$

$$3x+2y=13 \quad (2)$$

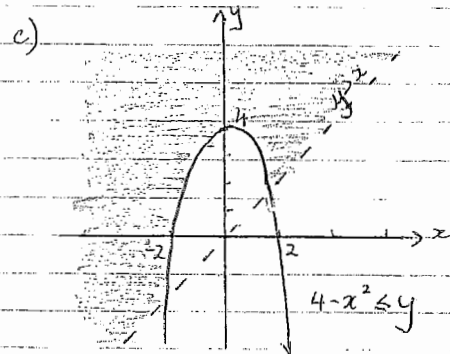
$$x=3$$

$$2x+y=8$$

$$2 \times 3 + y = 8 \quad x=3$$

$$6+y=8 \quad y=2$$

$$y=2$$



Question 8

$$f(x) = x^2 \quad i) f(-1) = 1$$

$$g(x) = x+6 \quad ii) [g(x)]^2 = [x+6]^2$$

$$= x^2 + 12x + 36$$

$$iii) x+6=3$$

$$x=-9$$

$$iv) x^2 = x+6$$

$$x^2 - x - 6 = 0$$

$$(x-3)(x+2) = 0 \quad x=3 \quad x=-2$$

$$b) y = 5 - 4x - 2x^2$$

$$x = \frac{-b}{2a} = \frac{4}{2 \times 2} \quad (-1, 7)$$