

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

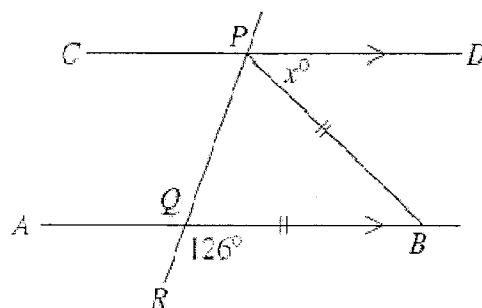
- a. Express the following in scientific notation, correct to two significant figures. (2)

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

- 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)

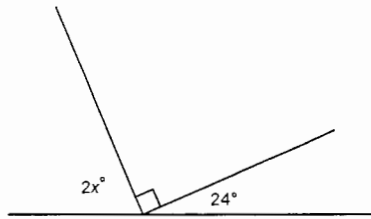


- b. Find solutions to
- (i) $(x-3)(2x+1) = 0$ (2)
- (ii) $x^2 - 5x + 6 = 0$ (2)
- (iii) $5x^2 - 2x - 4 = 0$, giving answers correct to one decimal place. (2)

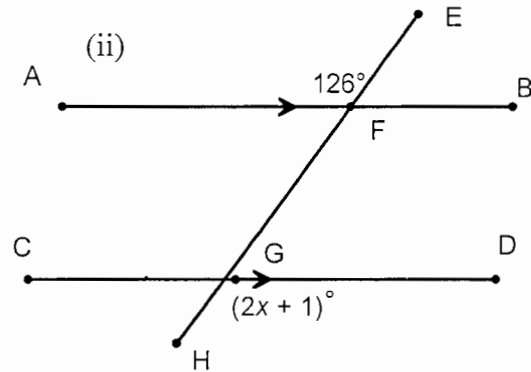
Question Three (Start on a new Page)**8 Marks**

- 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)

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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) iii) $5x^2 - 2x - 4 = 0$

$a = 5$

$b = -2$

$c = -4$

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

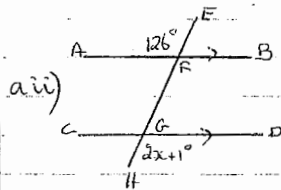
$x = \frac{2 \pm \sqrt{2^2 - 4 \times 5 \times -4}}{2 \times 5}$

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

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

Question 3

a) i) $2x + 90 + 24 = 180^\circ$ (supplementary angles)
 $2x + 114 = 180^\circ$
 $2x = 66^\circ$
 $x = 33^\circ$



a) ii)

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

$\angle BFH = \angle DGH = 2x + 1 = 126$
 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) $22^2 = x^2 + (2x)^2$

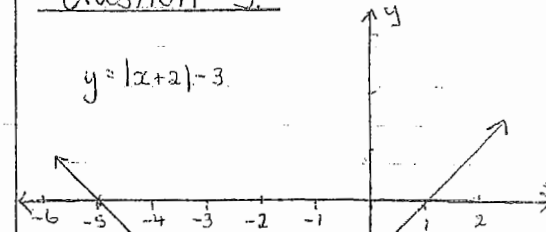
$22^2 = x^2 + 4x^2$

$484 = 5x^2$

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

Question 5

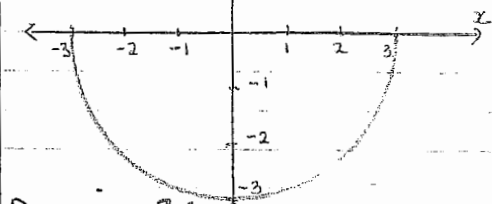
$y = |x+2| - 3$



Domain: all real x

Range: $y \geq -3$

$y = -\sqrt{9-x^2}$



Domain: $-3 \leq x \leq 3$

Range: $-3 \leq y \leq 0$

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

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) $8x^3 - 125$
 $= (2x-5)(4x^2+10x+25)$

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

$a = -2$
 $b = 8$

$|2x-1| = 6$
 $-6 = 2x-1 = 6$
 $-5 = 2x = 7$
 $-2\frac{1}{2} = x = 3\frac{1}{2}$

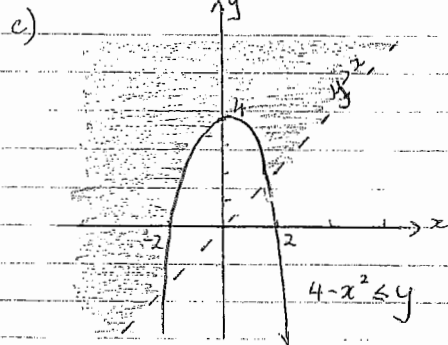
Question 7

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

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

b) $2x+y=8$ (1)
 $3x+2y=13$ (2)
 $(1) \times 2$ ~~(3)~~
 $4x+2y=16$ (3)
 $3x+2y=13$ (2)
 $x=3$

$2x+y=8$
 $2 \times 3 + y = 8$ $x=3$
 $6+y=8$ $y=2$
 $y=2$



Question 8

$f(x) = x^2$ i) $f(-1) = 1$
 $g(x) = x+6$ ii) $[g(x)]^2 = [x+6]^2$
 $= x^2 + 12x + 36$

iii) $x+6=3$
 $x=-9$

iv) $x^2 = x+6$
 $x^2 - x - 6 = 0$
 $(x-3)(x+2) = 0$ $x=3$ $x=-2$

b) $y = 5 - 4x - 2x^2$
 $x = \frac{-b}{2a} = \frac{4}{2 \times (-2)}$ $(-1, 7)$