

# Revision Sheet      Worked Solutions

## Level 1:

Q1. i)  $A \begin{smallmatrix} x_1, y_1 \\ (2, -1) \end{smallmatrix}$        $B \begin{smallmatrix} x_2, y_2 \\ (-3, 4) \end{smallmatrix}$

$$\begin{aligned} |AB| &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(-3 - 2)^2 + (4 - (-1))^2} \\ &= \sqrt{(-5)^2 + (5)^2} \\ &= \sqrt{50} \text{ or } \boxed{5\sqrt{2}} \text{ or } \boxed{7.1} \end{aligned}$$

ii)  $C \begin{smallmatrix} x_1, y_1 \\ (-4, -2) \end{smallmatrix}$        $D \begin{smallmatrix} x_2, y_2 \\ (5, 2) \end{smallmatrix}$

$$\begin{aligned} |CD| &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(5 - (-4))^2 + (2 - (-2))^2} \\ &= \sqrt{(9)^2 + (4)^2} \\ &= \boxed{\sqrt{97}} \text{ or } \boxed{9.85} \end{aligned}$$

iii)  $A \begin{smallmatrix} x_1, y_1 \\ (2, -1) \end{smallmatrix}$        $C \begin{smallmatrix} x_2, y_2 \\ (-4, -2) \end{smallmatrix}$

$$\begin{aligned} |AC| &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(-4 - 2)^2 + (-2 - (-1))^2} \\ &= \sqrt{(-6)^2 + (-1)^2} \\ &= \boxed{\sqrt{37}} \text{ or } \boxed{6.08} \end{aligned}$$

iv)  $B \begin{smallmatrix} x_1, y_1 \\ (-3, 4) \end{smallmatrix}$        $D \begin{smallmatrix} x_2, y_2 \\ (5, 2) \end{smallmatrix}$

$$\begin{aligned} |BD| &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(5 - (-3))^2 + (2 - 4)^2} \\ &= \sqrt{(8)^2 + (-2)^2} \\ &= \boxed{\sqrt{68}} \text{ or } \boxed{2\sqrt{17}} \end{aligned}$$

Q2. i)  $A \begin{smallmatrix} x_1, y_1 \\ (2, -1) \end{smallmatrix}$        $B \begin{smallmatrix} x_2, y_2 \\ (-3, 4) \end{smallmatrix}$

$$\begin{aligned} mp &= \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\ &= \left( \frac{2 + (-3)}{2}, \frac{-1 + 4}{2} \right) \\ &= \boxed{\left( -\frac{1}{2}, \frac{3}{2} \right)} \end{aligned}$$

ii)  $C \begin{smallmatrix} x_1, y_1 \\ (-4, -2) \end{smallmatrix}$        $D \begin{smallmatrix} x_2, y_2 \\ (5, 2) \end{smallmatrix}$

$$\begin{aligned} mp &= \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\ &= \left( \frac{-4 + 5}{2}, \frac{-2 + 2}{2} \right) \\ &= \boxed{\left( \frac{1}{2}, 0 \right)} \end{aligned}$$

Q3. i)  $A(2, -1)$   $B(-3, 4)$

$$\begin{aligned}\text{Slope} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{4 - (-1)}{-3 - 2} \\ &= \frac{5}{-5} \\ &= \boxed{-1}\end{aligned}$$

ii)  $C(-4, -2)$   $D(5, 2)$

$$\begin{aligned}\text{Slope} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{2 - (-2)}{5 - (-4)} \\ &= \boxed{\frac{4}{9}}\end{aligned}$$

Q4. i) EQN  $\begin{cases} \text{PT. } (2, -1) \\ \text{SLOPE } 3 \text{ (M)} \end{cases}$

$$\begin{aligned}y - y_1 &= m(x - x_1) \\ y - (-1) &= 3(x - 2) \\ \boxed{y + 1} &= \boxed{3(x - 2)}\end{aligned}$$

or

$$\begin{aligned}y + 1 &= 3x - 6 \\ 3x - y - 6 - 1 &= 0 \\ \boxed{3x - y - 7} &= \boxed{0}\end{aligned}$$

iii) EQN  $\begin{cases} \text{PT. } (2, -1) \\ \text{SLOPE ?} \end{cases}$

$$\begin{aligned}\text{Slope } AD &= \frac{y_2 - y_1}{x_2 - x_1} \quad A(2, -1) \quad D(5, 2) \\ &= \frac{2 - (-1)}{5 - 2} \\ &= 1\end{aligned}$$

$$\begin{aligned}\text{Eqn: } y - y_1 &= m(x - x_1) \\ y - (-1) &= 1(x - 2) \\ \boxed{y + 1} &= \boxed{1(x - 2)}\end{aligned}$$

or

$$\boxed{x - y - 3} = \boxed{0}$$

ii) EQN  $\begin{cases} \text{PT. } (-4, -2) \\ \text{SLOPE } \frac{2}{3} \end{cases}$

$$\begin{aligned}y - y_1 &= m(x - x_1) \\ y - (-2) &= \frac{2}{3}(x - (-4)) \\ \boxed{y + 2} &= \boxed{\frac{2}{3}(x + 4)}\end{aligned}$$

or

$$\begin{aligned}3(y + 2) &= 2(x + 4) \\ 3y + 6 &= 2x + 8 \\ 2x - 3y + 8 - 6 &= 0 \\ \boxed{2x - 3y + 2} &= \boxed{0}\end{aligned}$$

iv) EQN  $\begin{cases} \text{PT. } (5, 2) \\ \text{SLOPE ?} \end{cases}$

$$\text{Slope } CD = Q3(ii) = \frac{4}{9}$$

$$\begin{aligned}\text{Eqn: } y - y_1 &= m(x - x_1) \\ y - 2 &= \frac{4}{9}(x - 5) \\ 9(y - 2) &= 4(x - 5) \\ 9y - 18 &= 4x - 20 \\ 4x - 9y - 20 + 18 &= 0 \\ \boxed{4x - 9y - 2} &= \boxed{0}\end{aligned}$$

## Level 2:

Q5.

k:  $2x - 3y + 6 = 0$

i)  $(2, 1): 2(2) - 3(1) + 6 \stackrel{?}{=} 0$

$$4 - 3 + 6 \stackrel{?}{=} 0$$

$$7 \neq 0$$

$\Rightarrow$  Not on line

iii) x-axis ( $y=0$ )

$$2x - 3y + 6 = 0$$

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

$$\frac{2x}{2} = \frac{-6}{2}$$

$$x = -3$$

$$\Rightarrow \boxed{(-3, 0)}$$

y-axis ( $x=0$ )

$$2x - 3y + 6 = 0$$

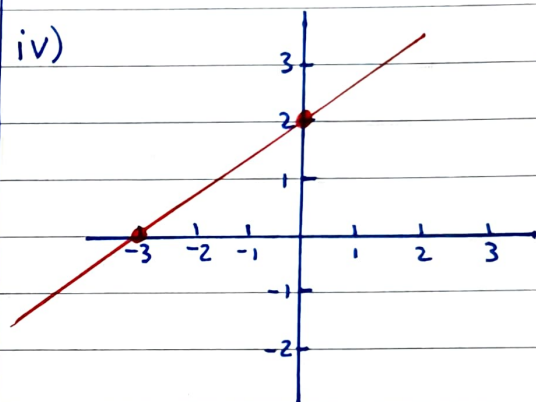
$$2(0) - 3y + 6 = 0$$

$$\frac{-3y}{-3} = \frac{-6}{-3}$$

$$y = 2$$

$$\Rightarrow \boxed{(0, 2)}$$

ii) Any point that subs into equation to give LHS=RHS  
e.g.s.  $(3, 4)$   $(-3, 0)$   $(0, 2)$   $(6, 6)$



Q6.

p:  $x + 2y - 8 = 0$

i)  $(5, -2): (5) + 2(-2) - 8 \stackrel{?}{=} 0$

$$5 - 4 - 8 \stackrel{?}{=} 0$$

$$-7 \neq 0$$

$\Rightarrow$  Not on line

iii) x-axis ( $y=0$ )

$$x + 2y - 8 = 0$$

$$x + 2(0) - 8 = 0$$

$$x = 8$$

$$\Rightarrow \boxed{(8, 0)}$$

y-axis ( $x=0$ )

$$x + 2y - 8 = 0$$

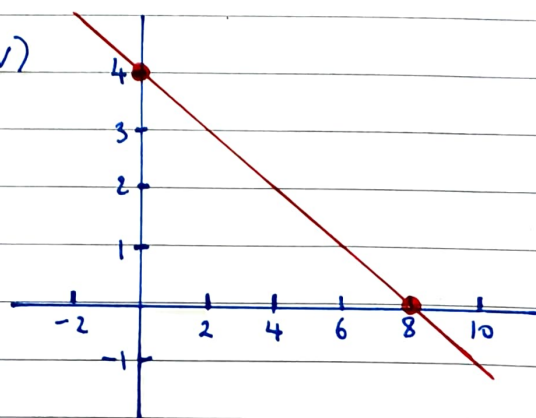
$$0 + 2y - 8 = 0$$

$$\frac{2y}{2} = \frac{8}{2}$$

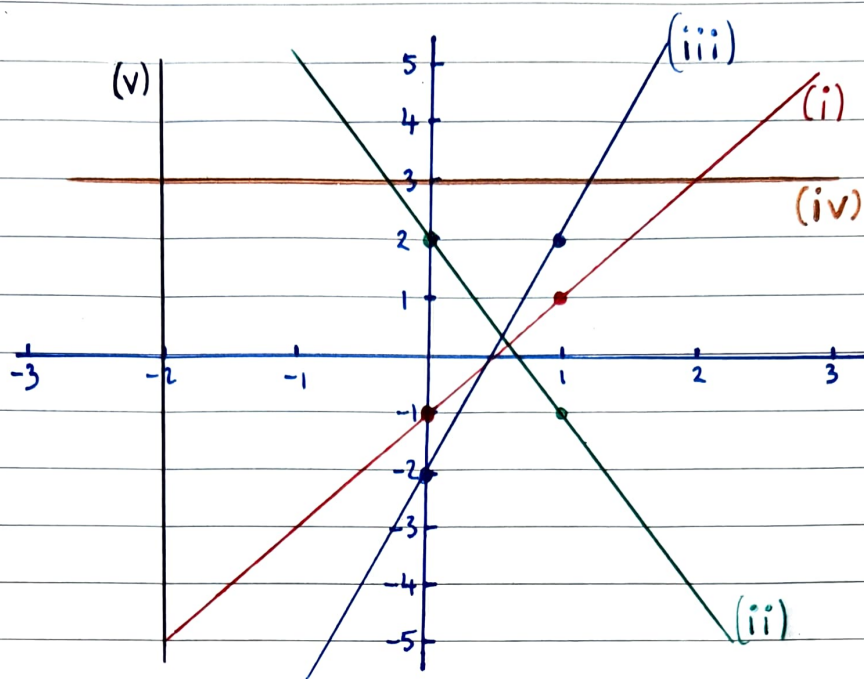
$$y = 4$$

$$\Rightarrow \boxed{(0, 4)}$$

ii) Any point that subs into equation to give LHS=RHS  
e.g.s.  $(2, 3)$   $(4, 2)$   $(6, 1)$   $(8, 0)$



Q7.



Q8. i)  $y = 5x - 3$   
 $y = mx + c$   
 $\Rightarrow \text{Slope} = \boxed{5}$

ii)  $2x - y - 1 = 0$   
 $\text{Slope} = \frac{-x}{y}$   
 $= \frac{-2}{-1}$   
 $= \boxed{2}$

iii)  $3x + 2y + 8 = 0$   
 $\text{Slope} = \frac{-x}{y}$   
 $= \boxed{-\frac{3}{2}}$

iv)  $2x + 5y = 3$   
 $\text{Slope} = \frac{-x}{y}$   
 $= \boxed{-\frac{2}{5}}$

Q9. i) y intercept = 1  
 $\text{Slope} = \frac{2}{1} = 2$   
 $\Rightarrow \text{Eqn: } \boxed{y = 2x + 1}$

ii) y intercept = -1  
 $\text{Slope} = \frac{1}{1} = 1$   
 $\Rightarrow \text{Eqn: } \boxed{y = x - 1}$

iii) y intercept = -1  
 $\text{Slope} = \frac{-2}{1} = -2$   
 $\Rightarrow \text{Eqn: } \boxed{y = -2x - 1}$



Q10.  $A: 2x + 3y = 12$   
 $B: 7x - 2y = 17$

$$\begin{array}{rcl} A \times 2: & 4x + 6y & = 24 \\ B \times 3: & 21x - 6y & = 51 \\ \hline & 25x & = 75 \\ & 25 & 25 \end{array}$$

$$x = 3$$

Using A:

$$A: 2(3) + 3y = 12$$

$$3y = 12 - 6$$

$$\frac{3y}{3} = \frac{6}{3}$$

$$y = 2$$

$$\Rightarrow \boxed{(3, 2)}$$

Level 3:

Q12. Slope of  $2x - y + 3 = 0$

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

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

$$= 2$$

$$\Rightarrow \text{Parallel Slope} = \boxed{2}$$

Q14. Slope of  $4x + y - 1 = 0$

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

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

$$= -4$$

$$\Rightarrow \text{Parallel Slope} = \boxed{-4}$$

Q11.  $A: 3x + 2y = -6$   
 $B: 5x + 4y = -8$

$$\begin{array}{rcl} A \times 2: & 6x + 4y & = -12 \\ B: & (-)5x + 4y & = (+) -8 \\ \hline & x & = -4 \end{array}$$

Using A:

$$A: 3x + 2y = -6$$

$$3(-4) + 2y = -6$$

$$-12 + 2y = -6$$

$$2y = -6 + 12$$

$$\frac{2y}{2} = \frac{6}{2}$$

$$y = 3$$

$$\Rightarrow \boxed{(-4, 3)}$$

Q13. Slope of  $3x + y - 4 = 0$

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

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

$$= -3$$

$$\Rightarrow \perp \text{ Slope} = \boxed{+\frac{1}{3}}$$

FLIP + CHANGE

Q15. Slope of  $x - 5y + 2 = 0$

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

$$= -\frac{-1}{-5}$$

$$= -\frac{1}{5}$$

$$\Rightarrow \perp \text{ Slope} = -\frac{5}{1} = \boxed{-5}$$

FLIP + CHANGE

Q16. i)  $A(x_1, y_1) = A(1, -2)$   $B(x_2, y_2) = B(7, 4)$

$$mp = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$= \left( \frac{1+7}{2}, \frac{-2+4}{2} \right)$$

$$= \boxed{(4, 1) = C}$$

ii) EQN  $\rightarrow$  PT. (6, -2)  
 $\rightarrow$  Slope?

$$\text{Slope AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{4 - (-2)}{7 - 1}$$

$$= \frac{6}{6} = 1$$

$$\Rightarrow \text{Parallel} = 1$$

$$\text{Eqn: } y - y_1 = m(x - x_1)$$

$$y - (-2) = 1(x - 6)$$

$$\boxed{y + 2 = 1(x - 6)}$$

or  $y + 2 = x - 6$

$$\boxed{x - y - 8 = 0}$$

iii) EQN  $\rightarrow$  PT. (4, 1)  
 $\rightarrow$  Slope?

$$\text{Slope AB} = 1$$

$$\Rightarrow \perp \text{ Slope} = -1$$

$$\text{Eqn: } y - y_1 = m(x - x_1)$$

$$y - 1 = -1(x - 4)$$

$$y - 1 = -x + 4$$

$$\boxed{x + y - 5 = 0}$$

Q17.

i) EQN  $\rightarrow$  PT. (2, -3)  
 $\rightarrow$  Slope?

$$\text{Slope EF} = \frac{y_2 - y_1}{x_2 - x_1} \quad E(x_1, y_1) = E(-4, 2) \quad F(x_2, y_2) = F(-2, -1)$$

$$= \frac{-1 - 2}{-2 - (-4)} = \frac{-3}{2}$$

$$\Rightarrow \text{Parallel} = \frac{-3}{2}$$

$$\text{Eqn: } y - y_1 = m(x - x_1)$$

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

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

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

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

$$\boxed{3x + 2y = 0}$$

ii) EQN  $\rightarrow$  PT. (-4, 2)  
 $\rightarrow$  Slope?

$$\text{Slope DF} = \frac{y_2 - y_1}{x_2 - x_1} \quad D(x_1, y_1) = D(2, -3) \quad F(x_2, y_2) = F(-2, -1)$$

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

$$\Rightarrow \perp \text{ Slope} = +\frac{2}{1} = 2$$

$$\text{Eqn: } y - y_1 = m(x - x_1)$$

$$y - 2 = 2(x - (-4))$$

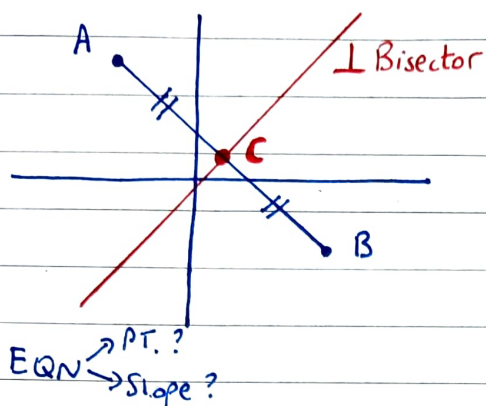
$$\boxed{y - 2 = 2(x + 4)}$$

or  $y - 2 = 2x + 8$

$$\boxed{2x - y + 10 = 0}$$

# Level 4:

Q18.



To find C  $A(x_1, y_1)$   $B(x_2, y_2)$

$$mp = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$= \left( \frac{-2 + 3}{2}, \frac{4 + (-2)}{2} \right)$$

$$= \left( \frac{1}{2}, 1 \right)$$

$$\text{Slope } AB = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{-2 - 4}{3 - (-2)} = -\frac{6}{5}$$

$$\Rightarrow \perp \text{ Slope} = +\frac{5}{6}$$

$$\text{Eqn: } y - y_1 = m(x - x_1)$$

$$\boxed{y - 1 = \frac{5}{6} \left( x - \frac{1}{2} \right)}$$

OR

$$6(y - 1) = 5 \left( x - \frac{1}{2} \right)$$

$$6y - 6 = 5x - \frac{5}{2}$$

$$12y - 12 = 10x - 5$$

$$\boxed{10x - 12y + 7 = 0}$$

$$\text{Q19. } (-1, h) \text{ on } 3x - 4y + 7 = 0$$

$$\text{i) } \Rightarrow 3(-1) - 4(h) + 7 = 0$$

$$-3 - 4h + 7 = 0$$

$$-4h + 4 = 0$$

$$\frac{-4h}{-4} = \frac{-4}{-4}$$

$$\boxed{h = 1}$$

$$(k, 0) \text{ on } 4x + 3y - 24 = 0$$

$$\Rightarrow 4(k) + 3(0) - 24 = 0$$

$$\frac{4k}{4} = \frac{24}{4}$$

$$\boxed{k = 6}$$

$$\text{ii) } A: 3x - 4y = -7$$

$$B: 4x + 3y = 24$$

$$A \times 3: 9x - 12y = -21$$

$$B \times 4: 16x + 12y = 96$$

$$\frac{25x}{25} = \frac{75}{25}$$

$$x = 3$$

Using A:

$$3(3) - 4y = -7$$

$$\frac{-4y}{-4} = \frac{-16}{-4}$$

$$y = 4$$

$$\Rightarrow \text{Ans: } \boxed{(3, 4)}$$

$$\text{iii) Slope PR} = \frac{y_2 - y_1}{x_2 - x_1} \quad P(-1, 1) \quad R(3, 4)$$

$$= \frac{4 - 1}{3 - (-1)} = \frac{3}{4}$$

$$\text{Slope RQ} = \frac{y_2 - y_1}{x_2 - x_1} \quad R(3, 4) \quad Q(6, 0)$$

$$= \frac{0 - 4}{6 - 3} = -\frac{4}{3}$$

$$\frac{3}{4} \times -\frac{4}{3} = -1$$

$$\Rightarrow PR \perp RQ$$

$$\Rightarrow \angle PRQ = 90^\circ$$

Q20. i)  $A(2, -3) \quad B(-2, 1)$

$$mp = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$= \left( \frac{2 + (-2)}{2}, \frac{-3 + 1}{2} \right)$$

$$= \boxed{(0, -1)} = C$$

ii) EQN  $\rightarrow$  PT.  $(0, -1)$   
Slope?

$$\text{Slope AB} = \frac{y_2 - y_1}{x_2 - x_1}$$

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

$$\Rightarrow \perp \text{ Slope} = +1$$

$$\text{Eqn: } y - y_1 = m(x - x_1)$$

$$y - (-1) = 1(x - 0)$$

$$y + 1 = x$$

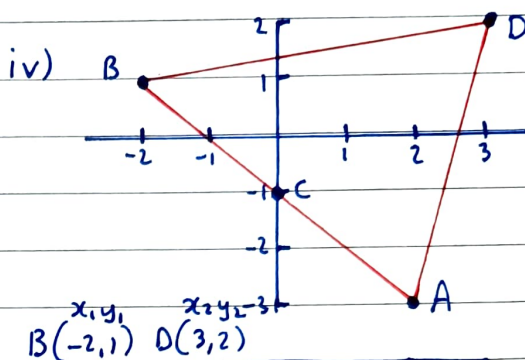
$$\boxed{x - y - 1 = 0}$$

$$\text{iii) } (3, 2) \text{ on } x - y - 1 = 0$$

$$\Rightarrow 3 - 2 - 1 \stackrel{?}{=} 0$$

$$1 - 1 \stackrel{?}{=} 0$$

$$0 = 0 \Rightarrow \text{ON}$$



$$|BD| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(3 - (-2))^2 + (2 - 1)^2}$$

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

$$= \sqrt{26}$$

$$A(2, -3) \quad D(3, 2)$$

$$|AD| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

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

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

$$= \sqrt{26}$$

$$|BD| = |AD| = \sqrt{26}$$

$$\Rightarrow \triangle ABD \text{ is isosceles}$$



Q21. i)  $P(x_1, y_1) = P(1, -3)$   $S(x_2, y_2) = S(2, -1)$

$$\text{Slope } PS = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - (-3)}{2 - 1} = 2$$

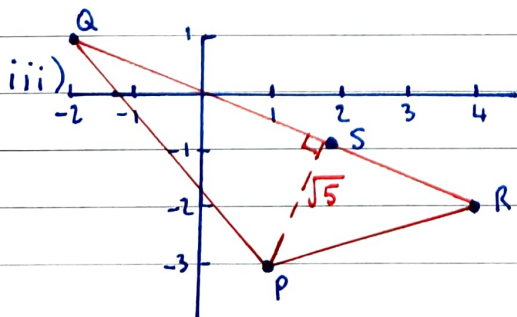
$Q(x_1, y_1) = Q(-2, 1)$   $R(x_2, y_2) = R(4, -2)$

$$\text{Slope } QR = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 1}{4 - (-2)} = -\frac{1}{2}$$

$$2 \times -\frac{1}{2} = -1 \Rightarrow PS \perp QR.$$

ii)  $Q(x_1, y_1) = Q(-2, 1)$   $R(x_2, y_2) = R(4, -2)$

$$\begin{aligned} |QR| &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(4 - (-2))^2 + (-2 - 1)^2} \\ &= \sqrt{(6)^2 + (-3)^2} \\ &= \boxed{\sqrt{45}} \text{ or } \boxed{3\sqrt{5}} \text{ or } \boxed{6.7} \end{aligned}$$



$$\begin{aligned} \text{Area} &= \frac{1}{2} bh \\ &= \frac{1}{2} (\sqrt{45}) (\sqrt{5}) \\ &= \boxed{\frac{15}{2}} \text{ or } \boxed{7.5} \end{aligned}$$

Q22.

|                                |                               |
|--------------------------------|-------------------------------|
| i) x-axis ( $y=0$ )            | -axis ( $=0$ )                |
| $3x - 5y + 15 = 0$             | $3x + 4y - 12 = 0$            |
| $3x - 5(0) + 15 = 0$           | $3x + 4(0) - 12 = 0$          |
| $\frac{3x}{3} = \frac{-15}{3}$ | $\frac{3x}{3} = \frac{12}{3}$ |

|                                   |                                  |
|-----------------------------------|----------------------------------|
| $x = -5$                          | $x = 4$                          |
| $\Rightarrow C = \boxed{(-5, 0)}$ | $\Rightarrow D = \boxed{(4, 0)}$ |

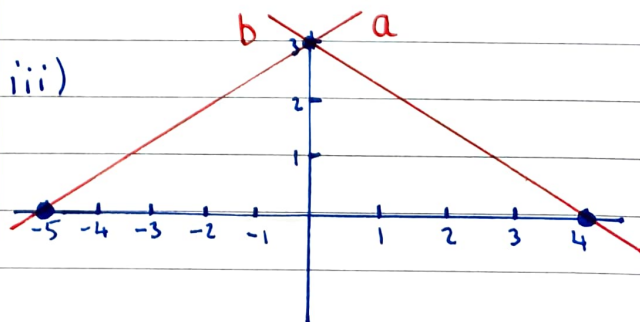
ii) A:  $3x - 5y = -15$   
 B:  $3x + 4y = 12$   

$$\begin{array}{r} -9y = -27 \\ \hline -9 \quad -9 \end{array}$$
  
 $y = 3$

Using A:

$$\begin{aligned} 3x - 5(3) &= -15 \\ 3x - 15 &= -15 \\ \frac{3x}{3} &= \frac{0}{3} \end{aligned}$$

$$x = 0 \Rightarrow E = \boxed{(0, 3)}$$



iv) Area =  $\frac{1}{2} bh$   

$$= \frac{1}{2} (9)(3)$$
  

$$= \boxed{\frac{27}{2}} \text{ or } \boxed{13.5}$$