

## Higher Homework - The Straight Line

Q1. (a) Median CM      A(-4,1)    B(12,3)    C(7,-7)

$$\text{Mid}_{AB} = \left( \frac{-4+12}{2}, \frac{1+3}{2} \right) = (4, 2) \quad m_{CM} = \frac{-7-2}{7-4} = \frac{-9}{3} = -3$$

$$y - b = m(x - a)$$

$$y - 2 = -3(x - 4)$$

$$y - 2 = -3x + 12 \Rightarrow \underline{\underline{3x + y - 14 = 0}}$$

(b) Altitude AD

$$m_{CB} = \frac{-7-3}{7-12} = \frac{-10}{-5} = 2 \quad \perp m = -\frac{1}{2} \quad \text{Point} = A(-4,1)$$

$$y - b = m(x - a)$$

$$y - 1 = -\frac{1}{2}(x + 4) \Rightarrow 2(y - 1) = -1(x + 4) \Rightarrow 2y - 2 = -x - 4 \Rightarrow \underline{\underline{x + 2y + 2 = 0}}$$

(c) Point of Intersection of CM and AD

$$3x + y = 14 \quad (x-2) \quad -6x - 2y = -28$$

$$x + 2y = -2$$

$$\underline{\underline{x + 2y = -2}}$$

$$-5x = -30$$

$$x = 6$$

$$3(6) + y = 14$$

$$18 + y = 14$$

$$y = -4$$

Point of Intersection = (6, -4)

Q2. P(-4,5)    Q(-2,-2)    R(4,1)

Equation of PS, altitude from P

Point = P(-4,5)

$$m_{QR} = \frac{1 - (-2)}{4 - (-2)} = \frac{3}{6} = \frac{1}{2} \quad \perp m = -2$$

$$\underline{\underline{y - 5 = -2(x + 4)}}$$

Q3. P(1,1)    Q(-1,0)    R(-2,3)    PQRS parallelogram

$m_{RS}$  and  $m_{PS}$

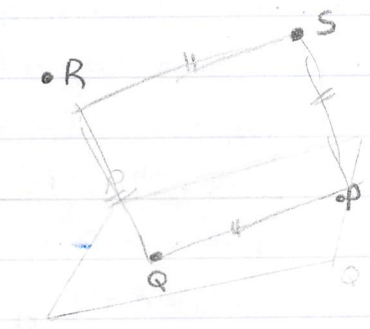
$m_{PQ} = m_{RS}$  because  $PQ \parallel RS$

$$m_{PQ} = \frac{0-1}{-1-1} = \frac{-1}{-2} = \frac{1}{2} \Rightarrow m_{RS} = \underline{\underline{\frac{1}{2}}}$$

$$m_{QR} = m_{PS} = \frac{3-0}{-2-(-1)} = \frac{3}{-1} = -3 \quad m_{PS} = \underline{\underline{-3}}$$

because

$QR \parallel PS$



Q4. A(2,2) B(12,2) C(8,6)

(a)  $l_1$  bisector AB

$$\text{Mid}_{AB} = \left( \frac{2+12}{2}, \frac{2+2}{2} \right) = (7, 2)$$

$$m_{AB} = \frac{2-2}{12-2} = \frac{0}{10} = 0 \quad \perp m = \text{undefined}$$

$\Rightarrow$  Equation of  $l_1$ :  $x = 7$

(b)  $l_2$  bisector AC

$$\text{Mid}_{AC} = \left( \frac{2+8}{2}, \frac{2+6}{2} \right) = (5, 4)$$

$$m_{AC} = \frac{6-2}{8-2} = \frac{4}{6} = \frac{2}{3}$$

$$\perp m = -\frac{3}{2}$$

$\Rightarrow$  Equation of  $l_2$ :  $y - b = m(x - a)$

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

$$2y - 8 = -3x + 15$$

$$l_2: \underline{3x + 2y - 23 = 0}$$

(c) Point of Intersection of  $l_1$  and  $l_2$

$$x = 7 \quad 3x + 2y - 23 = 0$$

$$3(7) + 2y - 23 = 0$$

$$21 + 2y - 23 = 0$$

$$2y = 2$$

$$y = 1$$

Point of intersection = (7, 1)

Q5. (a) (i) Equation of diagonal QS

Rhombus diagonals bisect at right angles

(b) R(5,8) T is midpt

$$m_{PR} = 2 \quad \perp m = -\frac{1}{2} \quad \text{Point} = Q(-2, 4)$$

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

$$2y - 8 = -x - 2$$

$$R(5,8) \xrightarrow{-3, -6} T(2,2) \xrightarrow{-3, -6} \underline{P(-1, -4)}$$

$$\underline{QS: x + 2y - 6 = 0}$$

(ii) T - pt. of intersection PR and QS

$$y - 2x = -2$$

$$y - 2x = -2$$

$$y = 2$$

$$2 - 2x = -2$$

$$2y + x = 6 \quad (\times 2)$$

$$4y + 2x = 12$$

$$-2x = -4$$

$$x = 2$$

Point of intersection = (2, 2)

$$5y = 10$$