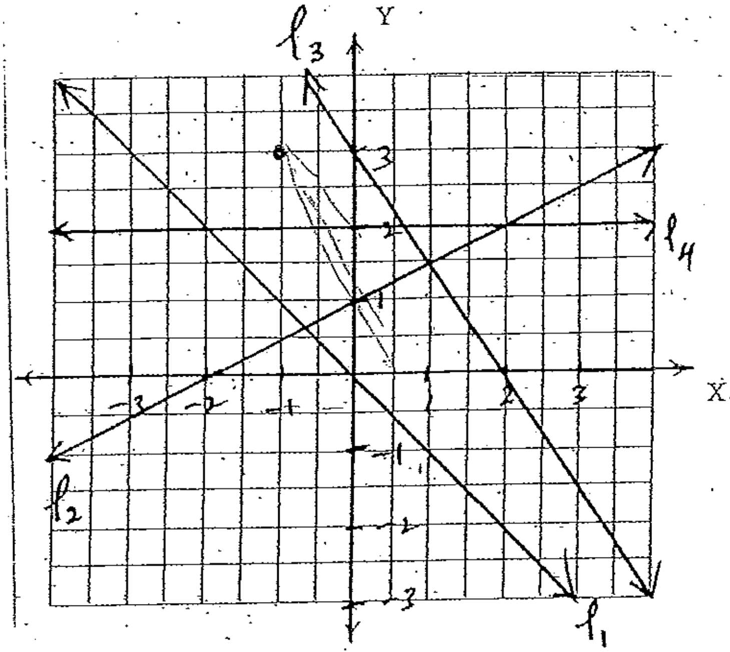
SYDNEY GRAMMAR

1. Given the points $P(-1, 1)$ and $Q(3, -2)$ find:
   (a) The length of the interval PQ.
   (b) The mid-point of interval PQ.
   (c) The gradient of the line joining the two points.
   (d) The equation of the line PQ.

2. 

   Write down the equations of the lines above labelled l_1, l_2, l_3 and l_4.

3. Find (i) the gradient and (ii) the y intercept of the following lines.
   (a) $y = -5x + 2$
   (b) $x - y + 3 = 0$
   (c) $2x + 3y - 9 = 0$

4. Find the equation of the straight line in **general form** that:
   (a) Passes through the origin with gradient equal to $\frac{2}{3}$.
   (b) Has a y-intercept of $(0, -3)$ and a gradient of -2.
   (c) Passes through the point $(-1, 3)$ and has a gradient of $m = -\frac{1}{2}$.

5. (a) Find the gradient of the interval joining the points $A(-2, 5)$, and $B(1, 6)$.
   (b) Find the equation of the line in general form joining A and B.

6. (a) Find the gradient of the line $2x - 3y + 6 = 0$.
   (b) Write down the gradient of any line perpendicular to $2x - 3y + 6 = 0$.
   (c) Find the equation of the line in general form that is perpendicular to the line $2x - 3y + 6 = 0$, and passes through the point $(-1, 3)$.

7. (a) Draw a number line and mark the points $A(4,0)$ and $B(0,3)$ on the plane.
   (b) Draw the triangle AOB, where O is the origin.
   (c) Write down the gradient of AB.
   (d) Find the equation of the line that passes through the origin and is perpendicular to AB.

8. Given the points $A(-2,0)$, $B(2,2)$ and $C(4,-2)$, show that $\angle ABC = 90°$.

9. Prove that the points $P(-1,-3)$,$Q(4,2)$ and $R(1,-1)$ are collinear.

Co-ordinate Geometry

① a) $PQ^2 = (3-(-1))^2 + (-2-1)^2$
$= 16 + 9$
$= 25$
$\therefore PQ = \sqrt{25}$
$= 5$ units

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

c) $M_{PQ} = \frac{y_2 - y_1}{x_2 - x_1}$
$= \frac{-2-1}{3-(-1)}$
$= \frac{-3}{4}$

d) $P(-1,1)$ and $m = \frac{-3}{4}$
$\therefore y - y_1 = m(x - x_1)$
$y - 1 = \frac{-3}{4}(x-(-1))$
$4y - 4 = -3x - 3$
$\therefore 3x + 4y - 1 = 0$

② l_1: $y = -x$
$x + y = 0$

l_2: $y = \frac{1}{2}x + 1$
$2y = x + 2$
$x - 2y + 2 = 0$

l_3: $y = -\frac{3}{2}x + 3$
$2y = -3x + 6$
$3x + 2y - 6 = 0$

l_4: $y = 2$
$y - 2 = 0$

③ a) $y = -5x + 2$
i) gradient $= -5$
ii) y-intercept $= 2$ ie $(0,2)$

b) $y = x + 3$
i) gradient $= 1$
ii) y-intercept $= 3$ ie $(0,3)$

c) $2x + 3y - 9 = 0$
$3y = -2x + 9$
$y = \frac{-2}{3}x + 3$
i) gradient $= \frac{-2}{3}$
ii) y-intercept $= 3$ ie $(0,3)$

④ a) $y = \frac{2}{3}x$
$3y = 2x$
$2x - 3y = 0$

b) $y = -2x - 3$
$2x + y + 3 = 0$

c) $y - y_1 = m(x - x_1)$
$y - 3 = -\frac{1}{2}(x+1)$
$2y - 6 = -x - 1$
$x + 2y - 5 = 0$

⑤ $A(-2,5)$ & $B(1,6)$

a) $M_{AB} = \frac{y_2 - y_1}{x_2 - x_1}$
$= \frac{6-5}{1-(-2)}$
$= \frac{1}{3}$

P.T.O

) b) $A(-2,5)$, $m = \frac{1}{3}$

$$y - y_1 = m(x - x_1)$$
$$y - 5 = \frac{1}{3}(x + 2)$$
$$3y - 15 = x + 2$$
$$x - 3y + 17 = 0$$

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

$$3y = 2x + 6$$
$$y = \frac{2}{3}x + 2$$

$\therefore$ gradient $= \frac{2}{3}$

b) $m_1 m_2 = -1$

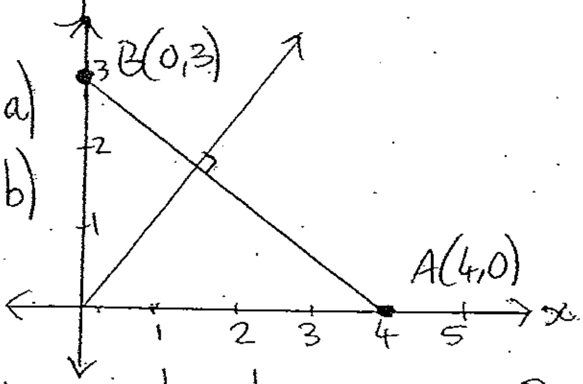
$$\therefore \quad m_2 = \frac{-1}{m_1}$$
$$= \frac{-1}{2/3}$$
$$= \frac{-3}{2}$$

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

$$y - y_1 = m(x - x_1)$$
$$y - 3 = \frac{-3}{2}(x + 1)$$
$$2y - 6 = -3x - 3$$
$$x + 2y - 3 = 0$$

7) a)

b)



c) gradient $AB = \frac{-3}{4}$

d) $m = \frac{4}{3}$ $\therefore$ $y = \frac{4}{3}x$

$$3y = 4x$$
$$4x - 3y = 0$$

8) $$M_{AB} = \frac{2 - 0}{2 - (-2)}$$
$$= \frac{1}{2}$$
$$M_{BC} = \frac{-2 - 2}{4 - 2}$$
$$= -2$$
$$M_{AB} \times M_{BC} = \frac{1}{2} \times -2$$
$$= -1$$

$\therefore$ $AB \perp BC$

$\therefore$ $\angle ABC = 90°$

9) $P(-1,-3)$, $Q(4,2)$, $R(1,-1)$

$$M_{PQ} = \frac{-3-2}{-1-4} = \frac{-5}{-5} = 1, \quad M_{QR} = \frac{2-(-1)}{4-1} = \frac{3}{3} = 1$$

$\therefore$ PQR is a straight line, hence P, Q and R are collinear