

# 2005

## Question 2

- Q2. (a)  $a(1,4)$  and  $b(-2,-1)$  are two points.
- (i) Find the slope of  $ab$ .
  - (ii) Find the equation of  $ab$ .
- (b)  $L$  is the line  $3x - 4y + 7 = 0$  and contains the point  $p(-1,h)$ .
- $M$  is the line  $4x + 3y - 24 = 0$  and contains the point  $q(k,0)$ .
- (i) Find the values of  $h$  and  $k$ .
  - (ii)  $L$  and  $M$  intersect at the point  $r$ .  
Find the coordinates of  $r$ .
  - (iii) Show  $p$ ,  $q$ ,  $r$ ,  $L$  and  $M$  on a coordinate diagram on graph paper.
  - (iv) Prove that  $\angle prq$  is a right angle.
- (c) Prove that a line through the center of a circle perpendicular to a chord bisects the chord.

## Solution

Q2. (a)  $a(1,4)$  and  $b(-2,-1)$  are two points.

(i) Find the slope of  $ab$ .

(ii) Find the equation of  $ab$ .

Must find the slope between  $a(1,4)$  and  $b(-2,-1)$   
 $(x_1, y_1)$        $(x_2, y_2)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{write down formula}$$

$$= \frac{-1 - 4}{-2 - 1} \quad \text{put figures in and take care of the signs}$$

$$= \frac{-5}{-3} = \frac{5}{3}$$

Use the point  $a(1,4)$  and  $m = \frac{5}{3}$  in the formula  $y - y_1 = m(x - x_1)$

$$y - 4 = \frac{5}{3}(x - 1) \quad \text{put figures in}$$

$$3(y - 4) = 5(x - 1) \quad \text{cross multiply by 3}$$

$$3y - 12 = 5x - 5 \quad \text{multiply out brackets}$$

$$-5x + 3y = 7 \quad \text{letters to left numbers to right}$$

$$5x - 3y = -7$$

- (b) L is the line  $3x - 4y + 7 = 0$  and contains the point  $p(-1, h)$ .  
M is the line  $4x + 3y - 24 = 0$  and contains the point  $q(k, 0)$ .
- Find the values of  $h$  and  $k$ .
  - L and M intersect at the point  $r$ .  
Find the coordinates of  $r$ .
  - Show  $p$ ,  $q$ ,  $r$ , L and M on a coordinate diagram on graph paper.
  - Prove that  $\angle prq$  is a right angle.

- (i) L is the line  $3x - 4y + 7 = 0$  and contains the point  $p(-1, h)$ .

Sub in  $x = -1$  and  $y = h$

$$3x - 4y + 7 = 0$$

$$3(-1) - 4h + 7 = 0$$

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

$$-4h = -4$$

$$4h = 4$$

$$h = 1$$

M is the line  $4x + 3y - 24 = 0$  and contains the point  $q(k, 0)$ .

Sub in  $x = k$  and  $y = 0$

$$4x + 3y - 24 = 0$$

$$4k + 3(0) = 24$$

$$4k = 24$$

$$k = 6$$

- (ii) L and M intersect at the point r.  
Find the coordinates of r.

To find the point of intersection use simultaneous equations.

$$3x - 4y = -7$$

$$4x + 3y = 24$$

$$9x - 12y = -21$$

$$16x + 12y = 96$$

$$\hline 25x = 75$$

$$x = 3$$

Put  $x = 3$  back into the top equation

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

$$9 - 4y = -7$$

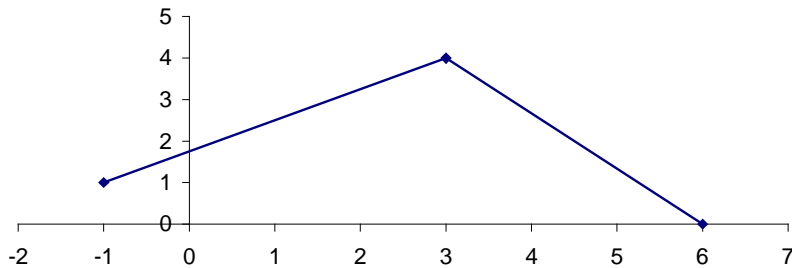
$$-4y = -16$$

$$4y = 16$$

$$y = 4$$

The answer is  $r(3, 4)$

- (iii) Show p, q, r, L and M on a coordinate diagram on graph paper.



- (iv) Prove that  $\angle prq$  is a right angle.

We need to find the slope of pr and then rq

Must find the slope between  $(-1,1)$  and  $(3,4)$   
 $(x_1, y_1)$        $(x_2, y_2)$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

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

Must find the slope between  $(3,4)$  and  $(6,0)$   
 $(x_1, y_1)$        $(x_2, y_2)$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

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

Right angled since  $m_1 m_2 = \left(\frac{3}{4}\right)\left(-\frac{4}{3}\right) = -1$

- (c) Prove that a line through the center of a circle perpendicular to a chord bisects the chord.