

Cambridge International AS & A Level

Mathematics

9709

Paper 1 Pure Mathematics 1

Topic 3-Coordinate Geometry

Question No (24)

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Question No (24)

The point A has coordinates $(-2,6)$. The equation of the perpendicular bisector of the line AB is $2y = 3x + 5$.

(i) Find the equation of AB.

(ii) Find the coordinates of B.

Solution

On Next Page

①

Given point $A(-2, 6)$ Given Equation of perpendicular bisector of
AB

$$2y = 3x + 5$$

$$y = \frac{3}{2}x + \frac{5}{2} \rightarrow \textcircled{1}$$

compare ① with slope intercept
form of Equation of line

$$y = mx + \frac{5}{2}$$

$$\Rightarrow m = \frac{3}{2}$$

$$(\text{gradient of line AB}) \times (\text{gradient of } \perp \text{ bisector of AB}) = -1$$

$$\text{gradient of AB} \times \frac{3}{2} = -1$$

$$\text{gradient of AB} = -\frac{2}{3}$$

 $\therefore$ Equation of line AB Through $A(-2, 6)$

$$y - y_1 = -\frac{2}{3}(x - x_1)$$

$$y - 6 = -\frac{2}{3}(x - (-2))$$

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

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

$$3y - 18 = -2x - 4$$

$$3y + 2x = 18 - 4$$

$$3y + 2x = 14$$

(ii)

Equation of AB

$$3y + 2x = 14 \quad \text{passing through } C$$

$$3y = -2x + 14$$

$$y = -\frac{2}{3}x + \frac{14}{3} \rightarrow (2)$$

solving equation (1) & (2)

$$\frac{3}{2}x + \frac{5}{2} = -\frac{2}{3}x + \frac{14}{3}$$

$$\frac{3x+5}{2} = -\frac{2x+14}{3}$$

$$3(3x+5) = 2(-2x+14)$$

$$9x+15 = -4x+28$$

$$9x+4x = 28-15$$

$$13x = 13$$

$$x = 1$$

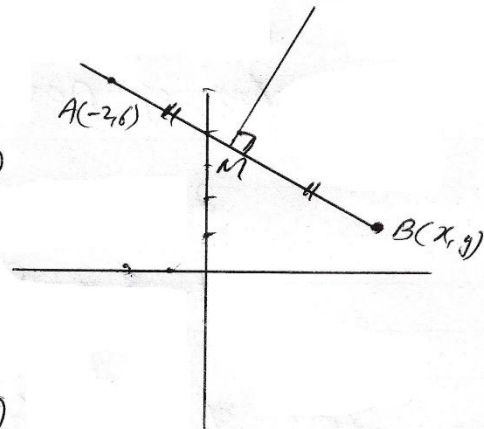
put $x=1$ in Equation (1)

$$y = \frac{3}{2}x + \frac{5}{2}$$

$$y = \frac{3}{2} + \frac{5}{2}$$

$$y = \frac{8}{2} = 4$$

so point n is (1, 4)



Let $B(x, y)$ be the coordinates of B point
Then

$$\text{mid-point of } AB = (1, 4)$$

$$\left(\frac{-2+x}{2}, \frac{6+y}{2} \right) = (1, 4)$$

By comparison

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

$$\frac{6+y}{2} = 4$$

$$-2+x = 2$$

$$6+y = 4 \times 2$$

$$x = 2+2$$

$$6+y = 8$$

$$x = 4$$

$$y = 8-6$$

$$y = 2$$

$\therefore$ coordinates of B $(4, 2)$