Cambridge International AS & A Level

Mathematics 9709

Paper 1 Pure Mathematics 1

Topic 3-Coordinate Geometry

Question No (27)

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Two points A and B have coordinates (1,3) and (9, −1) respectively. The perpendicular bisector of AB intersects the y-axis at the point C. Find the coordinates of C.

Solution

$A(1,3)$, $B(9,-1)$

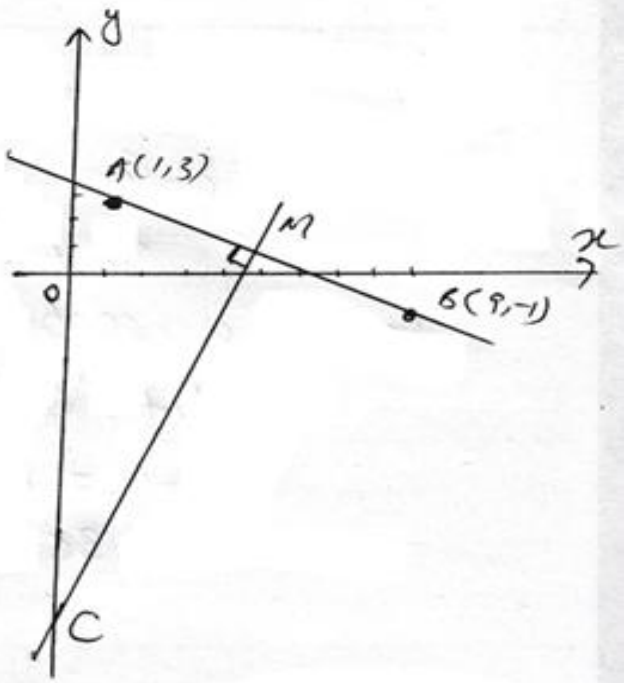
As M is the mid-point of $A(1,3)$ and $B(9,-1)$

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

$$= \left(\frac{1+9}{2}, \frac{3-1}{2}\right)$$

$$= \left(\frac{10}{2}, \frac{2}{2}\right)$$

$$M = (5,1)$$



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

$$= \frac{-1-3}{9-1}$$

$$= -\frac{4}{8}$$

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

As gradient of perpendicular bisector of AB is negative reciprocal of gradient of AB

$\Rightarrow$ gradient of $\perp$ bisector of $AB = 2$

∴ Equation of perpendicular bisector of AB passing through M(5,1) is

$$y - y_1 = m(x - x_1)$$

$$y - 1 = 2(x - 5)$$

$$y - 1 = 2x - 10$$

$$y = 2x - 10 + 1$$

$$y = 2x - 9 \longrightarrow (1)$$

For y-intercept put $x = 0$ in (1)

$$y = -9$$

∴ coordinates of C $(0, -9)$