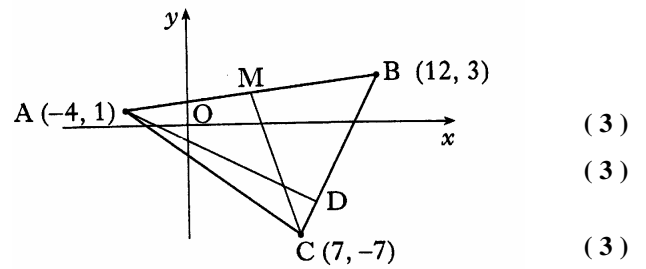


Banker Question: No. 2

A triangle ABC has vertices $A(-4, 1)$, $B(12, 3)$ and $C(7, -7)$.

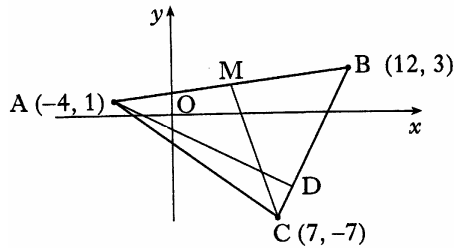
- a) Find the equation of the median CM.
- b) Find the equation of the altitude AD.
- c) Find the co-ordinates of the point of intersection of CM and AD



[Scroll to next page to see solution]

Banker Question: No. 2

Solution.



- a) Find mid-point of AB which is M:

$$M = \left(\frac{-4+12}{2}, \frac{1+3}{2} \right) \rightarrow M(4, 2)$$

Find gradient of CM:

$$m_{CM} = \frac{2-(-7)}{4-7} = \frac{9}{-3} = -3$$

Equation of CM:

$$\begin{aligned} y - (-7) &= -3(x - 7) \rightarrow y + 7 = -3x + 21 \\ &\rightarrow y + 3x - 14 = 0 \end{aligned}$$

- b) Gradient BC:

$$m_{BC} = \frac{3-(-7)}{12-7} = \frac{10}{5} = 2$$

Gradient of AD (perpendicular to BC)

$$\text{using } m_{AD} = -\frac{1}{m_{BC}} \quad m_{AD} = -\frac{1}{2}$$

Hence equation of AD:

$$\begin{aligned} y - 1 &= -\frac{1}{2}(x - (-4)) \rightarrow 2y - 2 = -x - 4 \\ &\rightarrow 2y + x + 2 = 0 \end{aligned}$$

- c) For intersection solve simultaneously:

$$y + 3x - 14 = 0 \quad \dots (1)$$

$$2y + x + 2 = 0 \quad \dots (2)$$

multiply (2) by -3 and add:

$$\begin{aligned} y + 3x - 14 &= 0 \\ -6y - 3x - 6 &= 0 \end{aligned} \rightarrow -5y - 20 = 0 \rightarrow y = -4$$

$$\text{Substitute in (2): } 2(-4) + x + 2 = 0 \rightarrow x = 6$$

Intersection at: (6, -4)

Notes on solution

By looking at the question you should know immediately it is about the straight line.

On further reading you should recognise the words: **'altitude'**, **'median'**, **'intersection'**

Remember **median**:

the line from a **vertex to the mid-point** of

Mid-point of a line:

Average the end points

$$\text{Gradient formula: } m = \frac{y_2 - y_1}{x_2 - x_1}$$

Equation of a line gradient m through (a, b) :

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

You can use either point $C(7, -7)$ or $M(4, 2)$.

Remember **altitude**:

the line from a **vertex which is perpendicular to the** opposite side.

Remember relationship between perpendicular gradients.

$$m_1 \times m_2 = -1 \quad \Leftrightarrow \quad m_1 = -\frac{1}{m_2}$$

Take care with **signs**.

It is always better to add rather than subtract simultaneous equations.