

The co-ordinates of the vertices of a triangle are $(1,2)$ $(2,3)$ $(3,1)$. Find the co-ordinates of the centre of its circumcircle and circumradius.

Co-ordinates of Δ gle = $A(x_1, y_1)$ $B(x_2, y_2)$ $C(x_3, y_3)$

Here = $A(1, 2)$ $B(2, 3)$ $C(3, 1)$

$O = (x, y)$

$OA = OB = OC = \text{Radius}$

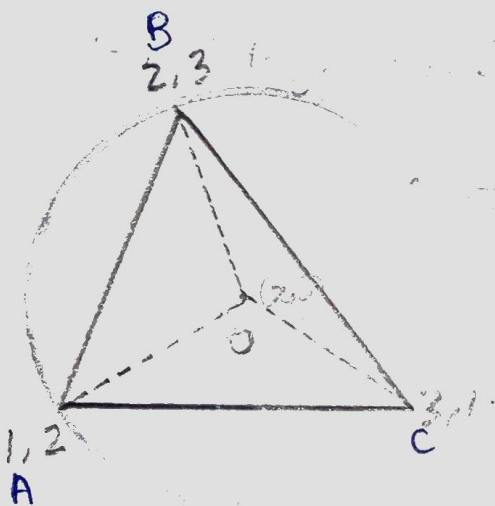
$$OB = \sqrt{(x-2)^2 + (y-3)^2}$$

$$OB^2 = (x-2)^2 + (y-3)^2$$

$$OB^2 = x^2 - 2x \times 2 + 4 + y^2 - 2y \times 3 + 9$$

$$= x^2 - 4x + 4 + y^2 - 6y + 9$$

$$= x^2 - y^2 - 4x - 6y + 13$$



$$\begin{aligned}
 OA^2 &= (x-1)^2 + (y-2)^2 \\
 &= x^2 - 2x + 1 + y^2 - 4y + 4 \\
 &= x^2 + y^2 - 2x - 4y + 5
 \end{aligned}$$

$$\begin{aligned}
 OB^2 &= (x-3)^2 + (y-1)^2 \\
 &= x^2 - 6x + 9 + y^2 - 2y + 1 \\
 &= x^2 + y^2 - 6x - 2y + 10
 \end{aligned}$$

$$OA^2 = OB^2$$

$$x^2 + y^2 - 4x - 6y + 13 = x^2 + y^2 - 2x - 4y + 5$$

$$x^2 - x^2 + y^2 - y^2 - 4x + 2x - 4y + 6y + (13 - 5) = 0$$

$$-2x + 2y + 8 = 0$$

$$2x = 2y + 8$$

$$8 = 2x + 2y$$

$$x + y = 4 \quad \text{--- ①}$$

$$OB^2 = OC^2$$

$$x^2 + y^2 - 4x - 6y + 13 = x^2 + y^2 - 6x - 2y + 10$$

$$x^2 - x^2 + y^2 - y^2 - (-4x + 6x) - (6y + 2y) + (13 - 10) = 0$$
$$+ 2x - 4y + 3 = 0$$

$$2x + 3 = 4y$$

$$4y - 2x = 3 \quad \text{--- ②}$$

$$x + y = 4 \quad \text{or} \quad x + y = 4 \quad \text{--- ①}$$

$$4y - 2x = 3$$

$$2x - 4y = -3 \quad \text{--- ②}$$

$$2x \text{ (1)} = 2x + 2y = 8 \quad \text{--- ③}$$

from (2) - (3) ,

$$\begin{array}{r} 2x - 4y = -3 \\ - 2x + 2y = 8 \\ \hline \end{array}$$

$$= -6y = -11$$

$$y = \frac{-11}{-6} = \frac{11}{6}$$

$$x + y = 4$$

$$x = 4 - y$$

$$= 4 - \frac{11}{6}$$

$$= \frac{24 - 11}{6}$$

$$x = \frac{13}{6}$$