Draw the circle with centre at **O** and radius
R = OA
This is known as the circumradius

Solution:
We know that **D**, **E**, **F** are the midpoints of the triangle of sides BC, CA, AB respectively

$$\mathbf{D} = \begin{pmatrix} \frac{-7}{2} \\ \frac{1}{2} \end{pmatrix} \tag{1}$$

$$\mathbf{E} = \begin{pmatrix} -1 \\ -3 \end{pmatrix} \tag{2}$$

$$\mathbf{F} = \begin{pmatrix} \frac{-3}{2} \\ \frac{5}{2} \end{pmatrix} \tag{3}$$

Let OD, OE, OF are the perpendicular bisectors of the triangle of sides BC, CA, AB respectively
Equation of OD,

$$OD = \begin{pmatrix} \frac{-7}{2} + t \\ \frac{1}{2} + \frac{t}{11} \end{pmatrix} \tag{4}$$

Equation of OE,

$$OE = \begin{pmatrix} -1 + s \\ -3 - s \end{pmatrix} \tag{5}$$

The point of intersection of OD and OE is **O**;
Therefore,

$$\mathbf{O} = \begin{pmatrix} \frac{-53}{12} \\ \frac{5}{12} \end{pmatrix} \tag{6}$$

Radius of circle with centre **O**

$$R = \|\mathbf{OA}\| \;=\; \frac{\sqrt{4514}}{12} \tag{7}$$

Therefore;
The equation of circle is

$$\left(x - \frac{(-53)}{12}\right)^2 + \left(y - \frac{5}{12}\right)^2 = \left(\frac{\sqrt{4514}}{12}\right)^2 \tag{8}$$

This circle is circumcircle.

Triangle with its Circumcircle