11. If the latus rectum of an ellipse is equal to half of minor axis, then find its eccentricity.

Ans:

Given

Latus rectum of an ellipse is equal to half of minor axis.

Consider the equation of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

$\therefore$ Length of major axis $=2a$

Length of minor axis $=2b$

And the length of latus rectum $=\frac{2b^2}{a}$

According to the Sample Question, latus rectum of an ellipse is equal to half of minor axis

$$\frac{2b^2}{a}=\frac{2b}{2}$$

$$\Rightarrow \frac{2b}{a}=1$$

$$\Rightarrow b=\frac{a}{2}$$

$$\because b^2=a^2\left(1-e^2\right)$$

$$\Rightarrow \left(\frac{a}{2}\right)^2=a^2\left(1-e^2\right)$$

$$\Rightarrow \frac{a^2}{4} = a^2\left(1 - e^2\right)$$

$$\Rightarrow 1 - e^2 = \frac{1}{4}$$

$$\Rightarrow e^2 = 1 - \frac{1}{4}$$

$$\therefore e = \frac{\sqrt{3}}{2}$$