Date 15/2/25 — 2: Resultant of two S.H.Ms at right angles. (Same period but differt ~~in~~ amplitude and phase)

2) Second is when $\phi = \frac{\pi^c}{4}$,

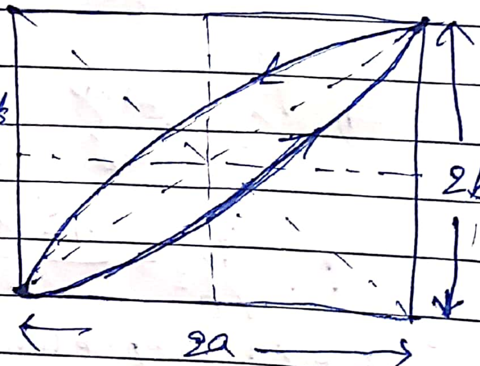
equation $\frac{y^2}{b^2} - \frac{2xy}{ab}\cos\phi + \frac{x^2}{a^2} = \sin^2\phi$

~~reduces to~~ [Resultant of two SHMs at right angle (Same period but deffering in amplitude and phase)] reduces to

$$\frac{y^2}{b^2} - \frac{2xy}{ab}\cdot\frac{1}{\sqrt{2}} + \frac{x^2}{a^2} = \left(\frac{1}{\sqrt{2}}\right)^2$$

$$\frac{y^2}{b^2} - \frac{\sqrt{2}\,xy}{ab} + \frac{x^2}{a^2} = \frac{1}{2}$$

This fig is represent an oblique ellipse.

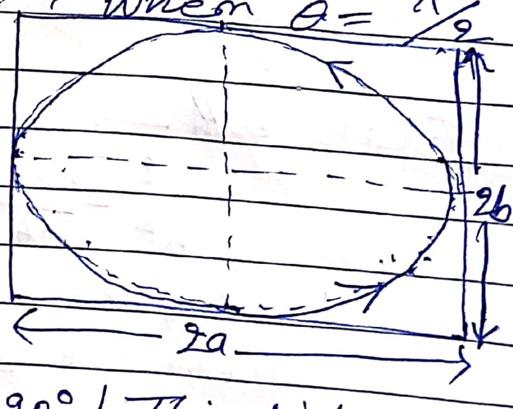


~~as~~

3) next case is third → when $\theta = \pi^c/2$

This value is putting in equation

$$\frac{y^2}{b^2} - \frac{2xy}{ab}\cos\phi + \frac{x^2}{a^2} = \sin^2\phi$$



$$\frac{y^2}{b^2} - \frac{2xy}{ab}\cos 90^\circ + \frac{x^2}{a^2} = \sin 90^\circ$$

$$\frac{y^2}{b^2} + \frac{x^2}{a^2} = 1$$

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

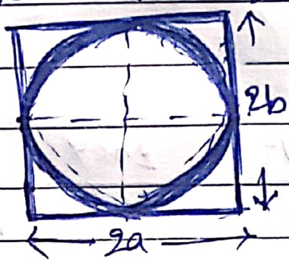
This fig/case is represents an ellipse whose Major and minor axes coincide with the co-ordinate axes.

In Spacial case → If the amplitudes are equal that is $a=b$ then

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1 \quad \text{put } b^2=a^2 \text{ then } \frac{x^2}{a^2}+\frac{y^2}{a^2}=1$$

$$x^2+y^2=a^2$$

This ~~eqn~~ represents a circle radius a. Hence the resultant motion is circular in fig



(4) In ~~fifth~~ Fourth case → $\phi=\frac{3\pi^c}{4}$

this equation is

$$\frac{y^2}{b^2}-\frac{2xy}{ab}\cos 135^\circ+\frac{x^2}{a^2}=\sin 135^\circ$$

$$\text{or } \frac{y^2}{b^2}-\frac{2xy}{ab}\left(\frac{-1}{\sqrt{2}}\right)+\frac{x^2}{a^2}=\left(\frac{1}{\sqrt{2}}\right)^2$$

$$\therefore \frac{y}{b^2}+\frac{\sqrt{2}\,xy}{ab}+\frac{x^2}{a^2}=\frac{1}{2}$$

This eqn represents an oblique ellipse lying in quadrants II and ~~I~~ IV.

(5) Case fifth → When $\phi=\pi^c$. eqn

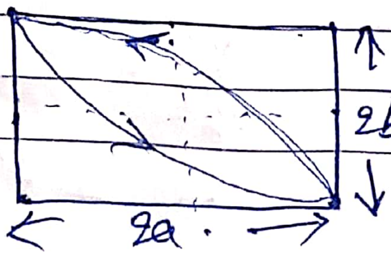
$$\frac{y^2}{b^2}-\frac{2xy}{ab}\cos\phi+\frac{x^2}{y}=\sin\phi$$

Putting the value of ϕ is π^c then ~~we get~~ result is reduce to

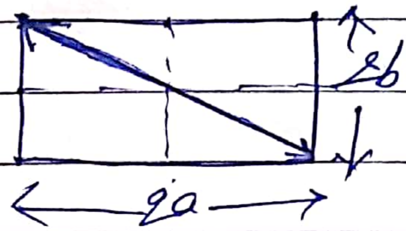
$$\frac{y^2}{b^2}-\frac{2xy}{ab}\cos 180^\circ+\frac{x^2}{a^2}=\sin 180^\circ$$

$$\frac{y^2}{b^2}+\frac{2xy}{ab}+\frac{x^2}{a^2}=0$$

$$\left(\frac{y}{b}+\frac{x}{a}\right)^2=0$$



This equation represents a pair of Coincident straight lines lying in quadrants II and IV in this fig.



All cycle is repeated in the reverse order as shown below figures.