1. If p and q are the lengths of the perpendiculars from the origin on the lines, $x \csc \alpha - y \sec \alpha = k \cot 2\alpha$ and $x \sin \alpha + y \cos \alpha = k \sin 2\alpha$ respectively, then k^2 is equal to :

1. **(a)** Let $L_1 = x \csc \alpha - y \sec \alpha = k \cot 2\alpha$.

Then $\dfrac{x}{\sin \alpha} - \dfrac{y}{\cos \alpha} = \dfrac{k \cos 2\alpha}{\sin 2\alpha}$

$\Rightarrow x \cos \alpha - y \sin \alpha = \dfrac{k}{2} \cos 2\alpha$

Perpendicular distance from $(0\ 0)$ is

$$p = \left| \dfrac{0 - 0 - \dfrac{k}{2} \cos 2\alpha}{\sqrt{\cos^2 \alpha + \sin^2 \alpha}} \right|$$

$\Rightarrow p = \left| \dfrac{k}{2} \cos 2\alpha \right| \Rightarrow 2p = |\, k \cos 2\alpha\,| \qquad \qquad ...(i)$

$L_2 = x \sin \alpha + y \cos \alpha = k \sin 2\alpha$.

Perpendicular distance from $(0, 0)$ is

$$q = \left| \frac{0 + 0 - k \sin 2\alpha}{\sqrt{\sin^2 \alpha + \cos^2 \alpha}} \right|$$

$\Rightarrow q = |k \sin 2\alpha|$ ...(ii)

Hence $4p^2 + q^2 = k^3$ (from (i) & (ii))