32. The number of solutions of $\sin^{-1} x + \sin^{-1}(1+x) = \cos^{-1} x$ is/are :

(a) 0   (b) 1   (c) 2   (d) infinite

$\sin^{-1}(1+x)$ is defined for $x < 0$ and $\sin^{-1} x = \dfrac{\pi}{2} - \cos^{-1} x \ \forall \ -1 \le x \le 1$.

The given equation is $\sin^{-1} x + \sin^{-1}(1+x) = \cos^{-1} x$

which can be written as

$$\dfrac{\pi}{2} - \cos^{-1} x + \dfrac{\pi}{2} - \cos^{-1}(1+x) = \cos^{-1} x$$

$\Rightarrow \quad \pi - \cos^{-1}(1+x) = 2\cos^{-1} x$

$\Rightarrow \quad \cos^{-1}(-1-x) = 2\pi - \cos^{-1}(2x^2 - 1)$

$\Rightarrow \quad \cos^{-1}(-1-x) + \cos^{-1}(2x^2 - 1) = 2\pi$

$\Rightarrow \quad \cos^{-1}(-1-x) = \cos^{-1}(2x^2 - 1) = \pi$

$\Rightarrow \quad -1 - x = 2x^2 - 1 = -1$

$\Rightarrow \quad x = 0$

which implies that the total number of solutions $\sin^{-1} x + \sin^{-1}(1+x) = \cos^{-1} x$ is only one.