

14. Prove that $\sin^{-1} \frac{8}{17} + \sin^{-1} \frac{3}{5} = \sin^{-1} \frac{77}{85}$.

Sol. We have, $\sin^{-1} \frac{8}{17} + \sin^{-1} \frac{3}{5} = \sin^{-1} \frac{77}{85}$

$$\begin{aligned}
 \therefore \text{L.H.S} &= \sin^{-1} \frac{8}{17} + \sin^{-1} \frac{3}{5} \\
 &= \tan^{-1} \frac{8}{15} + \tan^{-1} \frac{3}{4} \\
 &= \tan^{-1} \frac{\frac{8}{15} + \frac{3}{4}}{1 - \frac{8}{15} \times \frac{3}{4}} \\
 &= \tan^{-1} \frac{\frac{32 + 45}{60}}{\frac{60 - 24}{60}} \\
 &= \tan^{-1} \frac{77}{36} \\
 &= \sin^{-1} \frac{77}{\sqrt{5929 + 1296}} \\
 &= \sin^{-1} \frac{77}{85} \\
 &= \text{R.H.S.}
 \end{aligned}$$

