

Finding the EXACT value of an expression.

$$\begin{aligned}
 \text{i) } & \sin\left(-\frac{2\pi}{3}\right) + \cos^2\left(\frac{11\pi}{6}\right) \\
 & \sin(-120^\circ) + \cos^2(330^\circ) \\
 & -\frac{\sqrt{3}}{2} + \left(\frac{\sqrt{3}}{2}\right)^2 \\
 & -\frac{\sqrt{3}}{2} + \frac{3}{4} \\
 & = -\frac{2\sqrt{3}}{4} + \frac{3}{4} = -\frac{2\sqrt{3}-3}{4}
 \end{aligned}$$

$$\begin{aligned}
 \text{ii) } & \csc\left(\frac{\pi}{3}\right) + \cot\left(\frac{11\pi}{4}\right) \quad \cot = \frac{1}{\tan} \\
 & \sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2} \quad \tan\left(\frac{11\pi}{4}\right) = -1 \quad \tan = \frac{\sin}{\cos} \\
 & \csc\frac{\pi}{3} = \frac{2}{\sqrt{3}} \quad \cot\frac{11\pi}{4} = -1 \quad \cot = \frac{\cos}{\sin} \\
 & = \frac{2}{\sqrt{3}} - 1 \\
 & \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3} - 1 \quad \leftarrow -\frac{3}{3} \\
 & = \frac{2\sqrt{3}-3}{3}
 \end{aligned}$$

$$3) \frac{\cot\left(\frac{\pi}{3}\right) + \cos\left(\frac{11\pi}{3}\right)}{\csc(-240^\circ)}$$

$$\frac{\frac{\cos \frac{\pi}{3}}{\sin \frac{\pi}{3}} + \cos \frac{11\pi}{3}}{\frac{1}{\sin(-240^\circ)}}$$

$$\frac{\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} + \frac{1}{2}}{\frac{1}{\frac{\sqrt{3}}{2}}} = \frac{\frac{1}{2} \div \frac{\sqrt{3}}{2} + \frac{1}{2}}{\frac{2}{\sqrt{3}}}$$

$\frac{1}{2} \div \frac{\sqrt{3}}{2} = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

$\frac{1}{2} \cdot \frac{2}{\sqrt{3}} = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

$$\Rightarrow \frac{\frac{\sqrt{3}}{3} + \frac{1}{2}}{\frac{2\sqrt{3}}{3}}$$

$$= \frac{2\sqrt{3}}{6} + \frac{3}{6} \Rightarrow \frac{2\sqrt{3}+3}{6}$$

$$\frac{2\sqrt{3}+3}{6} \cdot \frac{2\sqrt{3}}{2\sqrt{3}}$$

$$\frac{2\sqrt{3}+3}{6} \cdot \frac{3}{2\sqrt{3}} \Rightarrow \frac{6\sqrt{3}+9}{12\sqrt{3}} = \frac{2\sqrt{3}+3}{4\sqrt{3}}$$