

Q: Find $\sin 75^\circ$.

A: $\sin 75^\circ$

$$= \sin(30^\circ + 45^\circ)$$

$$= \sin 30^\circ \times \cos 45^\circ + \cos 30^\circ \times \sin 45^\circ$$

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

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

$$= \frac{1 + \sqrt{3}}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} \quad (\text{denominator rationalisation})$$

$$= \frac{\sqrt{2} + \sqrt{6}}{4} \quad (\text{exact value})$$

$$= 0.9659 \quad (\text{approx. for verification on a calculator}).$$