

$$3. \quad \cos 67.5^\circ$$

$$\cos \left(\frac{135^\circ}{2} \right) \quad \alpha = 135^\circ$$

$$\begin{array}{r} 67.5 \\ \times 2 \\ \hline 135.0 \end{array}$$

$$\begin{array}{r} 33.7 \\ 2 \overline{) 67.5} \end{array}$$

$$= \sqrt{\frac{1 + \cos \alpha}{2}}$$

$$= \sqrt{\frac{1 + \cos 135^\circ}{2}}$$

$$= \sqrt{\frac{1 - \frac{\sqrt{2}}{2}}{2}}$$

$$= \sqrt{\frac{2 - \sqrt{2}}{4}}$$

$$= \frac{\sqrt{2 - \sqrt{2}}}{\sqrt{4}}$$

$$= \boxed{\frac{\sqrt{2 - \sqrt{2}}}{2}}$$

$$4. \quad \sin 15^\circ$$

$$= \sin \left(\frac{30^\circ}{2} \right) \quad \alpha$$

$$\begin{array}{r} 15^\circ \\ \times 2 \\ \hline 30^\circ \end{array}$$

$$\begin{array}{r} 7.5 \\ 2 \overline{) 15.0} \\ \underline{14} \\ 10 \end{array}$$

$$= \sqrt{\frac{1 - \cos \alpha}{2}}$$

$$= \sqrt{\frac{1 - \cos 30^\circ}{2}}$$

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

$$= \sqrt{\frac{2 - \sqrt{3}}{4}}$$

$$= \frac{\sqrt{2 - \sqrt{3}}}{\sqrt{4}}$$

$$= \boxed{\frac{\sqrt{2 - \sqrt{3}}}{2}}$$