$$
\begin{aligned}
\cos 2 \theta & =\cos \binom{\theta+\theta}{\alpha} \\
& =\cos \theta \cos \theta-\sin \theta \sin \theta \\
\cos 2 \theta & =\cos ^{2} \theta-\sin ^{2} \theta
\end{aligned}
$$

$$
\cos 2 \theta=\cos ^{2} \theta-\sin ^{2} \theta
$$

$$
=1-\sin \partial \theta-\sin ^{2} \theta
$$

$$
\cos 2 \theta=1-2 \sin ^{2} \theta
$$

$$
\cos 2 \theta=\cos ^{2} \theta-\sin ^{2} \theta
$$

$$
=\cos ^{2} \theta-\left(1-\cos ^{2} \theta\right)
$$

$$
\begin{aligned}
\sin 2 \theta & =\sin (\theta+\theta) \\
& =\sin \theta \cos \theta+\cos \theta \\
\sin 2 \theta & =2 \sin \theta \cos \theta
\end{aligned}
$$

$$
=\cos ^{2} \theta-1+\cos ^{2} \theta
$$

$$
\cos 2 \theta=2 \cos ^{2} \theta-1
$$

$$
\begin{aligned}
\tan 2 \theta & =\tan (\theta+\theta) \\
& =\frac{\tan \theta+\tan \theta}{1-\tan \theta \tan \theta} \\
\tan 2 \theta & =\frac{2 \tan \theta}{1-\tan ^{2} \theta}
\end{aligned}
$$

$$
\begin{aligned}
& \begin{aligned}
& \begin{aligned}
& \text { If } \sin \theta=\frac{2}{3} \\
& \text { Find } \\
& \text { a. } \begin{aligned}
\sin 2 \theta & =2 \sin \theta \cos \theta \\
& =2\left(\frac{2}{3}\right)\left(\frac{\sqrt{5}}{3}\right)
\end{aligned} \begin{aligned}
& 0^{\circ}<\theta<90^{\circ} \\
&\left(\frac{2}{3}\right)^{2}+\cos ^{2} \theta=1 \\
& \cos 2 \theta=\frac{5}{9} \\
& \sin 2 \theta=\frac{4 \sqrt{5}}{9}
\end{aligned}
\end{aligned} \quad \begin{aligned}
\cos \theta=\frac{\sqrt{5}}{3}
\end{aligned}
\end{aligned} \\
& \begin{aligned}
\mid b_{1} \cos \partial \theta & =\cos ^{2} \theta-\sin ^{2} \theta \\
& =\left(\frac{\sqrt{5}}{3}\right)^{2}-\left(\frac{2}{3}\right)^{2} \\
& =\frac{1}{9} \quad
\end{aligned} \begin{aligned}
& =2\left(\frac{\sqrt{5}}{3}\right)^{2}-1 \\
& =2\left(\frac{5}{9}\right)-1 \\
& =\frac{10}{9}-\frac{9}{9} \\
& =\frac{1}{9}
\end{aligned} \\
& \tan 2 \theta=\frac{2 \tan \theta}{1-\tan ^{2} \theta} \\
& \tan \theta=\frac{\frac{2}{3}}{\frac{\sqrt{5}}{3}} \\
& =\frac{2}{3} \cdot \frac{2}{\sqrt{5}} \\
& =\frac{2}{\sqrt{5}} \\
& =\frac{2\left(\frac{2 \sqrt{5}}{5}\right)}{1-\left(\frac{2 \sqrt{5}}{5}\right)^{2}} \\
& 1-2 \sin ^{2} \theta \\
& 1-2\left(\frac{2}{3}\right)^{2} \\
& 1-2\left(\frac{4}{5}\right) \\
& \frac{9}{9}-\frac{8}{9} \\
& \frac{1}{9} \\
& \tan \theta=\frac{2 \sqrt{5}}{5} \\
& =\frac{\frac{4 \sqrt{5}}{5}}{1-\frac{38}{275} \frac{4}{5}} \\
& =\frac{4 \sqrt{5}}{5} \frac{1}{5}=\frac{4 \sqrt{5}}{5} \cdot \sum_{1}=4 \sqrt{5}
\end{aligned}
$$

$$
\begin{aligned}
\sin \frac{7 \pi}{12} & =\sin 105^{\circ}=\sin \frac{210^{\circ}}{2} \\
\sin \frac{\alpha}{2} & = \pm \sqrt{\frac{1-\cos \alpha}{2}} \\
\sin \frac{210}{2} & =\sqrt{\frac{1-\cos 210^{\circ}}{2}}=\sqrt{\frac{1-\left(-\frac{\sqrt{3}}{2}\right)}{2}} \\
& =\sqrt{\frac{\frac{2}{2}+\frac{\sqrt{3}}{2}}{2}}=\sqrt{\frac{\frac{2+\sqrt{3}}{2}}{\frac{2}{1}}}=\sqrt{\frac{2+\sqrt{3}}{4}}=\frac{\sqrt{2+\sqrt{3}}}{\sqrt{4}}
\end{aligned}=\frac{\sqrt{2+\sqrt{3}}}{2} .
$$

$2 b$

$$
\begin{aligned}
& \begin{aligned}
\cos 67,)^{\circ} & =\cos \frac{135^{\circ}}{2} \quad \alpha=135^{\circ} \\
\cos \frac{\alpha}{2}= \pm \sqrt{\frac{1+\cos \alpha}{2}} & =\sqrt{\frac{1+\cos 135^{\circ}}{2}} \\
& =\sqrt{\frac{1+\left(-\frac{\sqrt{2}}{2}\right)}{2}}=\sqrt{\frac{\frac{2-\sqrt{2}}{2}}{2}}=\sqrt{\frac{2-\sqrt{2}}{4}} \\
& =\frac{\sqrt{2-\sqrt{2}}}{2}
\end{aligned}
\end{aligned}
$$

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