

1. $\sin 75^\circ$

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

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

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

$$\frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4}$$

$$\boxed{\frac{\sqrt{6} + \sqrt{2}}{4}}$$

2. $\cos \frac{11\pi}{12}$

$$\cos\left(\frac{\pi}{6} + \frac{5\pi}{4}\right)$$

$$\cos \frac{\pi}{6} \cos \frac{5\pi}{4} - \sin \frac{\pi}{6} \sin \frac{5\pi}{4}$$

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

$$\frac{-\sqrt{6}}{4} + \frac{\sqrt{2}}{4}$$

$$\boxed{\frac{-\sqrt{6} + \sqrt{2}}{4}}$$

3. $\sin \frac{13\pi}{12}$

$$\sin\left(\frac{\pi}{4} + \frac{5\pi}{6}\right)$$

$$\sin \frac{\pi}{4} \cos \frac{5\pi}{6} + \cos \frac{\pi}{4} \sin \frac{5\pi}{6}$$

$$\frac{\sqrt{2}}{2} \cdot \frac{-\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2}$$

$$\frac{-\sqrt{6}}{4} + \frac{\sqrt{2}}{4}$$

$$\boxed{\frac{-\sqrt{6} + \sqrt{2}}{4}}$$

$$\begin{aligned}
 4. \quad \cos(-75^\circ) &= \cos(75^\circ) && \begin{matrix} S- \\ C+ \\ T- \end{matrix} \\
 &= \cos(210^\circ - 135^\circ) \\
 &= \cos(210^\circ)\cos(135^\circ) + \sin(210^\circ)\sin(135^\circ) \\
 &= \frac{-\sqrt{3}}{2} \cdot \frac{-\sqrt{2}}{2} + \frac{-1}{2} \cdot \frac{\sqrt{2}}{2} \\
 &= \frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4} \\
 &= \boxed{\frac{\sqrt{6} - \sqrt{2}}{4}}
 \end{aligned}$$

$$\begin{aligned}
 5. \quad \cos \frac{5\pi}{12} &= \cos\left(\frac{2\pi}{3} - \frac{\pi}{4}\right) \\
 &= \cos \frac{2\pi}{3} \cos \frac{\pi}{4} + \sin \frac{2\pi}{3} \sin \frac{\pi}{4} \\
 &= \frac{-1}{2} \cdot \frac{\sqrt{2}}{2} + \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2} \\
 &= \frac{-\sqrt{2}}{4} + \frac{\sqrt{6}}{4} \\
 &= \boxed{\frac{-\sqrt{2} + \sqrt{6}}{4}}
 \end{aligned}$$

$$\begin{aligned}
 6. \quad \tan\left(-\frac{7\pi}{12}\right) &= -\tan\left(\frac{7\pi}{12}\right) \\
 &= -\tan\left(\frac{4\pi}{3} - \frac{3\pi}{4}\right) \\
 &= \frac{\tan\left(\frac{4\pi}{3}\right) - \tan\left(\frac{3\pi}{4}\right)}{1 + \tan\left(\frac{4\pi}{3}\right)\tan\left(\frac{3\pi}{4}\right)} \\
 &= \frac{\sqrt{3} - -1}{1 + \sqrt{3} \cdot -1} \\
 &= \frac{\sqrt{3} + 1}{1 - \sqrt{3}} \\
 &\rightarrow \frac{1 + \sqrt{3}}{1 - \sqrt{3}} \cdot \frac{(1 + \sqrt{3})}{(1 + \sqrt{3})} \\
 &= \frac{1 + 2\sqrt{3} + 3}{1 - 3} \\
 &= \frac{4 + 2\sqrt{3}}{-2} \div -2 \\
 &= -(-2 - \sqrt{3}) \\
 &= \boxed{2 + \sqrt{3}}
 \end{aligned}$$

$\begin{matrix} S- \\ C+ \\ T- \end{matrix}$

FOIL
 FL

7. $\cos 195^\circ$

$\cos(150^\circ + 45^\circ)$

$\cos 150^\circ \cos 45^\circ - \sin 150^\circ \sin 45^\circ$

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

$-\frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4}$

$\boxed{\frac{-\sqrt{6} - \sqrt{2}}{4}}$

8. $\cos(-\pi/12) = \cos(\pi/12)$

$\begin{matrix} S \\ C \\ + \\ - \end{matrix}$

$\cos(\frac{3\pi}{4} - \frac{2\pi}{3})$

$\cos \frac{3\pi}{4} \cos \frac{2\pi}{3} + \sin \frac{3\pi}{4} \sin \frac{2\pi}{3}$

$-\frac{\sqrt{2}}{2} \cdot -\frac{1}{2} + \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2}$

$\frac{\sqrt{2}}{4} + \frac{\sqrt{6}}{4}$

$\boxed{\frac{\sqrt{2} + \sqrt{6}}{4}}$

9. $\sin(-15^\circ) = -\sin(15^\circ)$

$\begin{matrix} S \\ C \\ + \\ - \end{matrix}$

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

$= -(\sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ)$

$= -\left(\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \cdot \frac{1}{2}\right)$

$= -\left(\frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4}\right)$

$= -\frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4}$

$\frac{-\sqrt{6} + \sqrt{2}}{4}$

$$10. \sin \frac{5\pi}{12}$$

$$\sin\left(\frac{\pi}{4} + \frac{\pi}{6}\right)$$

$$\sin \frac{\pi}{4} \cos \frac{\pi}{6} + \cos \frac{\pi}{4} \sin \frac{\pi}{6}$$

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

$$\frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4}$$

$$\boxed{\frac{\sqrt{6} + \sqrt{2}}{4}}$$

$$11. \tan\left(-\frac{5\pi}{12}\right) = -\tan\left(\frac{5\pi}{12}\right)$$

$$-\tan\left(\frac{2\pi}{3} - \frac{\pi}{4}\right)$$

$$-\frac{\tan \frac{2\pi}{3} - \tan \frac{\pi}{4}}{1 + \tan \frac{2\pi}{3} \tan \frac{\pi}{4}}$$

$$1 + \tan \frac{2\pi}{3} \tan \frac{\pi}{4}$$

$$-\frac{-\sqrt{3} - 1}{1 + (-\sqrt{3}) \cdot 1}$$

$$1 + (-\sqrt{3}) \cdot 1$$

$$\frac{(-1 - \sqrt{3})(1 + \sqrt{3})}{1 - \sqrt{3}(1 + \sqrt{3})} \text{ FOIL}$$

$$1 - \sqrt{3}(1 + \sqrt{3}) \text{ FL}$$

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

$$1 - 3$$

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

$$\rightarrow -2$$

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

$$2$$

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

S -
C +
T -

12. $\cos\left(\frac{7\pi}{12}\right)$

$$\cos\left(\frac{\pi}{4} + \frac{\pi}{3}\right)$$

$$\frac{3\pi}{12} + \frac{4\pi}{12}$$

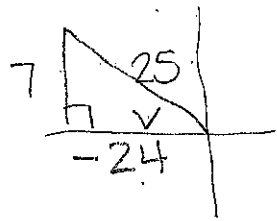
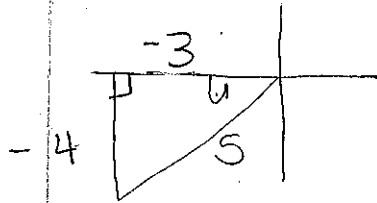
$$\cos\frac{\pi}{4} \cos\frac{\pi}{3} - \sin\frac{\pi}{4} \sin\frac{\pi}{3}$$

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

$$\frac{\sqrt{2}}{4} - \frac{\sqrt{6}}{4}$$

$$\boxed{\frac{\sqrt{2} - \sqrt{6}}{4}}$$

13 over →



$$\begin{aligned} 7^2 + x^2 &= 25^2 \\ 49 + x^2 &= 625 \\ x^2 &= 576 \\ x &= 24 \end{aligned}$$

13. a.) $\sin(u-v)$

$$\sin u \cos v - \cos u \sin v$$

$$\frac{-4}{5} \cdot \frac{-24}{25} - \frac{-3}{5} \cdot \frac{7}{25}$$

$$\frac{96}{125} + \frac{21}{125}$$

$$\boxed{\frac{117}{125}}$$

b.) $\cos(u-v)$

$$\cos u \cos v + \sin u \sin v$$

$$\frac{-3}{5} \cdot \frac{-24}{25} + \frac{-4}{5} \cdot \frac{7}{25}$$

$$\frac{72}{125} - \frac{28}{125}$$

$$\boxed{\frac{44}{125}}$$

c.) $\tan(u+v)$

$$\frac{\tan u + \tan v}{1 - \tan u \tan v} = \frac{\frac{-4}{5} + \frac{7}{25}}{1 - (\frac{-4}{5})(\frac{7}{25})}$$

$$\frac{\frac{4}{3} - \frac{7}{24}}{1 + \frac{4}{3}(\frac{7}{24})} = \frac{25/24}{1 + \frac{7}{18}} = \frac{25/24}{25/18} = \boxed{\frac{3}{4}}$$