

Find the exact value of each expression.

1. $\sin\left(\frac{7\pi}{6} - \frac{\pi}{3}\right)$

$$\begin{aligned} \sin \frac{7\pi}{6} \cos \frac{\pi}{3} - \cos \frac{7\pi}{6} \sin \frac{\pi}{3} \\ -\frac{1}{2} \cdot \frac{1}{2} - \left(-\frac{\sqrt{3}}{2}\right) \cdot \frac{\sqrt{3}}{2} \\ -\frac{1}{4} + \frac{3}{4} = \frac{2}{4} = \boxed{\frac{1}{2}} \end{aligned}$$

2. $\sin \frac{7\pi}{6} - \sin \frac{\pi}{3}$

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

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

Use the sum and difference formulas to find the exact values of the sine of the angle.

3. $75^\circ = 30^\circ + 45^\circ$

$\sin(30+45)$

$\sin 30 \cos 45 + \cos 30 \sin 45$

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

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

4. $105^\circ = 60^\circ + 45^\circ$

$\sin(60+45)$

$\sin 60 \cos 45 + \cos 60 \sin 45$

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

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

5. $195^\circ = 225^\circ - 30^\circ$

$\sin(225-30)$

$\sin 225 \cos 30 - \cos 225 \sin 30$

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

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

6. $\frac{11\pi}{12} = \frac{3\pi}{4} + \frac{\pi}{6}$

$\sin\left(\frac{3\pi}{4} + \frac{\pi}{6}\right)$

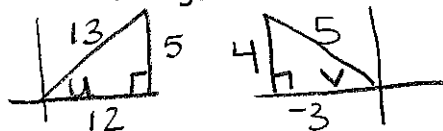
$\sin \frac{3\pi}{4} \cos \frac{\pi}{6} + \cos \frac{3\pi}{4} \sin \frac{\pi}{6}$

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

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

Find the exact value of the trigonometric function given the following:

$$\sin u = \frac{5}{13}, \quad 0 < u < \frac{\pi}{2} \quad \text{and} \quad \cos v = -\frac{3}{5}, \quad \frac{\pi}{2} < v < \pi$$



7. $\sin(u+v)$

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

$$\frac{5}{13} \cdot \left(-\frac{3}{5}\right) + \frac{12}{13} \cdot \frac{4}{5}$$

$$-\frac{15}{65} + \frac{48}{65} = \boxed{\frac{33}{65}}$$

8. $\sin(u-v)$

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

$$\frac{5}{13} \cdot \left(-\frac{3}{5}\right) - \frac{12}{13} \cdot \frac{4}{5}$$

$$-\frac{15}{65} - \frac{48}{65} = \boxed{\frac{-63}{65}}$$