Monday. March G - Late Start
$\diamond 5.3$ SUM \& DIFFERENCE IDENTITIES
$\rightarrow$ PRACTICE
5.3 Sum + Difference

Identities

$$
\begin{aligned}
& \sin (a \pm b)=\sin a \cos b \pm \cos a \sin b \\
& \cos (a \pm b)=\cos a \cos b \mp \sin a \sin b \\
& \tan (a \pm b)=\frac{\sin a \cos b \pm \cos a \sin b}{\cos a \cos b \mp \sin a \sin b} \\
& \tan (a \pm b)=\frac{\tan a \pm \tan b}{1 \mp \tan a \tan b}
\end{aligned}
$$

PLAN

$$
\begin{gathered}
(\mathrm{P}+\mathrm{L})(\mathrm{A}+\mathrm{N}) \\
\mathrm{PA}+\mathrm{PN}+\mathrm{LA}+\mathrm{LN}
\end{gathered}
$$

Your plan has been foiled
(1) Examples:
$a-b$
(1)

$$
\begin{aligned}
\frac{\text { Examples }}{} \begin{aligned}
& a-b \\
& \cos 15^{\circ}=\cos \left(45^{\circ}-30^{\circ}\right)=\cos 45^{\circ} \cos 30^{\circ}+\sin 45^{\circ} \sin 30^{\circ} \\
&=\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2}+\frac{\sqrt{2}}{2} \cdot \frac{1}{2} \\
&=\frac{\sqrt{6}}{4}+\frac{\sqrt{2}}{4}=\frac{\sqrt{6}+\sqrt{2}}{4}
\end{aligned}
\end{aligned}
$$

(2)

$$
\begin{aligned}
\sin 285^{\circ} & =\sin \left(225+60^{\circ}\right) \\
& =\sin 225 \cos 60^{\circ}+\cos 225^{\circ} \sin 60^{\circ} \\
& =-\frac{\sqrt{2}}{2} \cdot \frac{1}{2}+\frac{-\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} \\
& =\frac{-\sqrt{2}}{4}-\frac{\sqrt{6}}{4}=\frac{-\sqrt{2}-\sqrt{6}}{4}
\end{aligned}
$$

(3)

$$
\begin{aligned}
& \sin \frac{7 \pi}{12}=\sin \left(\frac{3 \pi}{12}+\frac{4 \pi}{12}\right)=\sin \left(\frac{\pi}{4}+\frac{\pi}{3}\right) \\
&=\sin \frac{\pi}{4} \cos \frac{\pi}{3}+\cos \frac{\pi}{4} \sin \frac{\pi}{3} \\
& \sqrt{7}+\sqrt{6}
\end{aligned}
$$

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

