1. (a) Convert 480° to radians (exact answer)

\[ 480° = \frac{480 \times \pi}{180°} \text{ rad} = \frac{8\pi}{3} \text{ rad} \]

(b) Convert 30 radians to degrees (approximate answer, 2 decimal places)

\[ 30 \text{ rad} = 30 \times \frac{180°}{\pi} \approx 1718.87° \]

2. A circular sector has a diameter of 2 ft and a central angle of 135°. Find its arc length in ft, and the area in sq. inches. Provide all exact answers.

\[ \theta = \frac{135°}{4} \text{ rad} \]

\[ \beta = \frac{3\pi}{4} \text{ ft} \]

\[ r = \frac{2}{2} = 1 \text{ ft} \]

\[ \theta = 135° = \frac{3\pi}{4} \text{ rad} \]

\[ A = \frac{1}{2} r^2 \theta = \frac{1}{2} (1)^2 \frac{3\pi}{4} \text{ sq. ft} \]

\[ A = \frac{3\pi}{8} \text{ sq. ft} \]

\[ A = \frac{3\pi}{8} \times 144\text{ sq. in} \]

\[ A = 54\pi \text{ sq. in} \]

3. A circular sector has an area of 7 cm² and a central angle of 150°. Find its arc length (4 decimal places).

\[ A = 7 \text{ cm}^2 \]

\[ \theta = \frac{150°}{6} = \frac{5\pi}{6} \text{ rad} \]

\[ r = \frac{84}{5\pi} \text{ cm} \]

\[ \beta \approx 6.05 \text{ cm} \]

4. Find the exact trig functions of an angle of \( \frac{59\pi}{3} \) radians.

\[ \sin \left( \frac{59\pi}{3} \right) = -\sin \frac{\pi}{3} = -\frac{\sqrt{3}}{2} \]

\[ \cos \left( \frac{59\pi}{3} \right) = \cos \frac{\pi}{3} = \frac{1}{2} \]

\[ \tan \left( \frac{59\pi}{3} \right) = -\tan \frac{\pi}{3} = -\sqrt{3} \]

\[ \cot \left( \frac{59\pi}{3} \right) = -\frac{1}{\sqrt{3}} \]

\[ \sec \left( \frac{59\pi}{3} \right) = 2 \]

\[ \csc \left( \frac{59\pi}{3} \right) = -\frac{2}{\sqrt{3}} \]
4) Find the exact trig functions of an angle of $\frac{59\pi}{3}$ radians.
Show all involved work.

\[
\begin{align*}
\text{Draw } \frac{59\pi}{3} \text{ rad} & \quad \text{Note: } \frac{59\pi}{3} = 20\pi - \frac{\pi}{3} \\
\text{Ref } 4 = \frac{\pi}{3} \text{ rad} & \\
\end{align*}
\]

\[
\begin{align*}
\sin \left( \frac{59\pi}{3} \right) &= -\sin \frac{\pi}{3} = -\frac{\sqrt{3}}{2} \\
\cos \left( \frac{59\pi}{3} \right) &= +\cos \frac{\pi}{3} = \frac{1}{2} \\
\tan \left( \frac{59\pi}{3} \right) &= -\tan \frac{\pi}{3} = -\sqrt{3} \\
\cot \left( \frac{59\pi}{3} \right) &= -\frac{1}{\sqrt{3}} \\
\sec \left( \frac{59\pi}{3} \right) &= 2 \\
\csc \left( \frac{59\pi}{3} \right) &= -\frac{2}{\sqrt{3}}
\end{align*}
\]

5) Find amplitude, period, phase shift, vertical shift and graph one cycle of $y = 3\sin 2x$. Show the exact x-coordinates of the subdivision points of any one cycle.

- $A = 3; \quad B = 2; \quad C = 0; \quad D = 0$
- $\text{amp} = |A| = 3$
- $\text{period} = \frac{2\pi}{B} = \frac{2\pi}{2} = \pi$
- $\text{p.s} = C = 0$
- $\text{v.s} = D = 0$

\[
\begin{align*}
\text{III parent: } & \quad y = \sin x \\
\text{IV } y = 3\sin 2x
\end{align*}
\]
6. Directions are the same as in 5. Graph one cycle of
   \( y = -2 \cos[4(x + \pi)] \). Show all intermediate graphs.

   \( I. \quad A = -2; \quad B = 4; \quad C = -\pi, \quad D = 0 \)
   Ⅳ Build it
   \( \text{amp} = |A| = 2 \)
   \( \text{period} = \frac{2\pi}{B} = \frac{2\pi}{4} = \frac{\pi}{2} \)
   \( p.s. = C = -\pi, \quad -\frac{\pi}{2} \)
   \( v.s. = D = 0 \)

   Ⅲ Parent
   \( y = \cos x \)

7. Directions are the same as in 5, but graph any two cycles of
   \( y = -3 \sin[2\pi(x + 3)] - 2 \). Show all intermediate graphs.

   \( I. \quad A = -3, \quad B = 2\pi, \quad C = -3, \quad D = -2 \)
   Ⅳ Build it
   \( \text{amp} = |A| = 3 \)
   \( \text{period} = \frac{2\pi}{B} = \frac{2\pi}{2\pi} = 1 \)
   \( p.s. = C = -3 \)
   \( v.s. = D = -2 \)

   Ⅲ Parent
   \( y = \sin x \)

8. Directions are the same as in 5, but graph one cycle of
   \( y = 2 \cos(3x - 5\pi) - 1 \). Show all intermediate graphs.

   \( I. \quad A = 2, \quad B = 3, \quad C = \frac{5\pi}{3}, \quad D = -1 \)
   Ⅳ Build it
   \( \text{amp} = |A| = 2 \)
   \( \text{period} = \frac{2\pi}{B} = \frac{2\pi}{3} \)
   \( p.s. = C = \frac{5\pi}{3}, \quad \frac{7\pi}{3} \)
   \( v.s. = D = -1 \)

   Ⅲ Parent
   \( y = \cos x \)

   Subdiv pts: \( x = \frac{5\pi}{3}, \frac{\pi}{3}, \frac{7\pi}{3}, \frac{\pi}{3} \)
3) Directions are the same as in 5, but graph one cycle of 

$$y = 2 \cos (3x - 5\pi) - 1.$$ 
Show all intermediate graphs.

I \[A = 2; \quad B = 3; \quad C = \frac{5\pi}{3}; \quad D = -1\]

\[\text{amp} = |A| = 2\]

\[\text{period} = \frac{2\pi}{B} = \frac{2\pi}{3}\]

\[\rho, s = C = \frac{5\pi}{3}\]

\[V, s = D = -1\]

\[\text{parent } y = \cos x\]

(a) \[y = 2 \cos (3x - 5\pi)\]

(b) \[y = 2 \cos (3x - 5\pi) - 1\]

\[\text{Subdiv pts: } x = \frac{5\pi}{3}, \frac{11\pi}{6}, \frac{13\pi}{6}, \frac{7\pi}{3}\]

9) (a) Find \(\theta\) in the interval \([\frac{\pi}{2}, \frac{3\pi}{2}]\) such that \(\tan \theta = 1\).

Show work.

\[\theta = \frac{5\pi}{4}\]

(b) Find \(\theta\) in the interval \([\frac{15\pi}{2}, 8\pi]\) such that \(\sin \theta = -\frac{1}{2}\).

Show work.

\[\theta = \frac{47\pi}{6}\]