IMPORTANT: Do not attempt to write or workout any answer on this piece of paper, as it will not be graded.

1. (a) Convert 480° to radians (exact answer)  
(b) Convert 3 radians to degrees (two decimal places)

2. In the triangle $ABC$, $B = 32°$, $C = 42°$, and $a = 3.5$ cm. Find $c$ (two decimal places).

3. In the triangle $ABC$, $a = 4$ cm, $b = 3$ cm, and $c = 6$ cm. Find $B$ (two decimal places).

4. In the triangle $ABC$, $a = 3$ cm, $b = 2\sqrt{3}$ cm, and $C = 150°$. Find the exact value of $c$. Simplify your answer.

5. Find the exact values of the first three trigonometric functions of an angle of $\frac{59\pi}{3}$ radians.

6. The radius of a circular sector is 16 inches and its central angle is 150°. Find the exact value of its arc length.

7. The area of a circular sector is $2/3$ square feet and its arc length is equal to 16 inches. Find the approximate central angle in degrees (two decimal places).

8. Find all solutions of the equation $3\sec^2\theta - 4 = 0$ where $-\pi/2 \leq \theta \leq 2\pi$.

9. The two diagonals of a parallelogram are 16 inches and 12 inches. The area of the parallelogram is 48 square inches. Find any angle between the longest diagonal and the longest side of the parallelogram (two decimal places).
1. (a) $480^\circ = \frac{8}{3} \times \frac{\pi}{360^\circ} \text{ rad} = \frac{8\pi}{3} \text{ rad}$

(b) $3 \text{ rad} = 3 \times \frac{180^\circ}{\pi} \approx 171.89^\circ$

2. $A = 180^\circ - (32^\circ + 42^\circ) = 106^\circ$

\[
\frac{c}{\sin 42^\circ} = \frac{3.5}{\sin 106^\circ}
\]

\[
\therefore c = \frac{3.5 \sin (42^\circ)}{\sin (106^\circ)} \approx 2.44 \text{ cm}
\]

3. $b^2 = a^2 + c^2 - 2ac \cos B$

\[
2ac \cos B = a^2 + c^2 - b^2
\]

\[
\therefore \cos B = \frac{a^2 + c^2 - b^2}{2ac} = \frac{(4^2 + 6^2 - 3^2)}{(2 \times 4 \times 6)} \approx 0.8958...
\]

\[
\therefore B = \cos^{-1}(0.8958...) \approx 26.38^\circ
\]

4. $c = \sqrt[3]{b}$

\[
\therefore c = \sqrt[3]{b} - 2 \cdot 3 \cdot \cos C
\]

\[
\therefore C = 3^2 + (2 \sqrt{3})^2 - 2(3)(2\sqrt{3}) \cos (150^\circ)
\]

\[
C^2 = 9 + 12 - 2(3)(2\sqrt{3})(-\sqrt{3})
\]

\[
C^2 = 9 + 12 + 18 = 39
\]

\[
\therefore C = \sqrt{39} \quad \therefore C = \sqrt{39} \text{ cm}
\]

5. $\text{angle} = \frac{59\pi}{3} \text{ rad} = (\frac{20\pi - \pi}{3}) \text{ rad} = 20\pi \text{ rad} - 60^\circ$

\[
\therefore \sin \left(\frac{59\pi}{3}\right) = \pm \sin 60^\circ = -\frac{\sqrt{3}}{2}
\]

\[
\cos \left(\frac{59\pi}{3}\right) = \pm \cos 60^\circ = \frac{1}{2}
\]

\[
\tan \left(\frac{59\pi}{3}\right) = \pm \tan 60^\circ = -\sqrt{3}
\]

6. $r = 16 \text{ in}$

\[
\theta = \frac{5\pi}{6}
\]

\[
\therefore \theta = \frac{40\pi}{3} \text{ inches}
\]

\[
\therefore \theta = \frac{5\pi}{6}
\]
7. \( A = \frac{1}{2} r^2 \theta \) gives \( 96 = \frac{1}{2} r^2 \theta \) \( \Rightarrow \) \( r = \frac{16}{\theta} \). Plug back in (2) \( \Rightarrow \ \theta = \frac{128}{96} \) \( \text{Rad} = \frac{128 \times 180}{96 \pi} \approx 76.39^\circ \)

8. \( 3 \sec^2 \theta - 4 = 0 \) with \( -\frac{5\pi}{2} \leq \theta \leq 2\pi \)

\( 3 \sec^2 \theta = 4 \)

\( \sec^2 \theta = \frac{4}{3} \)

\( \sec \theta = \pm \frac{\sqrt{3}}{2} \)

\( \cos \theta = \pm \frac{3}{2} \)

\( \theta = \mp \frac{7\pi}{6}, \mp \frac{5\pi}{6}, \mp \frac{5\pi}{6}, \mp \frac{7\pi}{6} \)

9 solutions: \( \theta = \mp \frac{7\pi}{6}, \mp \frac{5\pi}{6}, \mp \frac{5\pi}{6}, \mp \frac{7\pi}{6} \)

9. Area of \( \triangle ABE = \frac{1}{2} (48) = 12 \) \( \text{in}^2 \)

\( \Rightarrow \frac{1}{2} (8)(6) \sin \alpha = 12 \)

\( \Rightarrow \sin \alpha = \frac{24}{8(13.53...)} = \frac{3}{2} \)

\( \Rightarrow \alpha = 30^\circ \) or \( 150^\circ \)

But \( \alpha \) must be obtuse \( \Rightarrow \alpha = 150^\circ \)

Now use Law of Cosines for \( \triangle ABE \) to find \( x = AB \).

\( x^2 = 8^2 + 6^2 - 2(8)(6) \cos 150^\circ \)

\( \Rightarrow x = \sqrt{8^2 + 6^2 - 2(8)(6) \cos 150^\circ} \)

\( \Rightarrow x \approx 13.53... \)

Now area of \( \triangle ABE = 12 = \frac{1}{2} (8)(13.53...) \sin \theta \)

\( \Rightarrow \sin \theta = \frac{24}{8(13.53...)} = \frac{3}{13.53...} \approx 0.22168... \)

\( \Rightarrow \theta \approx 12.81^\circ \) or \( 167.19^\circ \)

But \( \theta \) must be acute \( \Rightarrow \theta = 12.81^\circ \)