1. (a) Convert $28^\circ 43' 37''$ into degrees and decimal degrees (two decimal places) 
(b) Convert $475.813^\circ$ into degrees, minutes, and seconds.

2. Given that the point $P(4, -3)$ is on the terminal side of some angle $\theta$ in the standard position, find the exact values of the last three trigonometric functions of $\theta$. Simplify your answers.

3. Given $\cot \beta = \frac{2}{5}$ with $\beta$ in quadrant III, find the exact values of the first three trigonometric functions of $\beta$. Use any method to solve this problem. Show complete work.

4. Given $\sec \theta = -\frac{5}{\sqrt{2}}$ with $\theta$ in quadrant II find the exact value of $\csc \theta$. Use only the trigonometric identities to solve this problem (No $x$-$y$-$r$ calculations).

5. Given $\csc \alpha = -\frac{7}{3}$ with $\alpha$ in quadrant IV find the exact values of $\cos \alpha$ and $\tan \alpha$. Use only the trigonometric identities to solve this problem (No $x$-$y$-$r$ calculations). Simplify the answers.

6. Draw an angle of $810^\circ$ in the standard position. Then use a suitable $x-y-r$ calculation to find all trig functions of $810^\circ$. Must show the $x$, $y$, $r$ values, and the steps of your calculation, not just the final answer.

7. Evaluate $2\sin^3(-270^\circ) - 3\cot^5(-810^\circ) - 5\sec^3(900^\circ)$. Show each line of your calculation carefully and methodically.

8. The equation of the terminal side of some angle $\theta$ in the standard position is given by $\frac{x}{3} + \frac{y}{2} = 0$, $x \leq 0$. Find the exact value of $\sec \theta$. Make sure to draw a correct diagram. Simplify your answer.

9. $ABC$ is a right triangle with the right angle at $A$. Let $D$ be the foot of the altitude from $A$ to the side $BC$. Given that $AB = 4\sqrt{3}$ cm and $AC = \sqrt{2}$ cm, find $AD$. Provide the exact answer.
1. (a) \[ 28^\circ 43' 37'' = 28^\circ + \frac{43}{60} + \frac{37}{3600} \approx 28.73^\circ \]
(b) \[ 475.813^\circ = 475^\circ + (0.813 \times 60)' = 475^\circ + 48' + (0.78 \times 60)'' \approx 475^\circ 48' 47'' \]

2. \[ x = 4; \quad y = -3; \quad r = ? \]
\[ \text{Cot } \theta = \frac{x}{y} = \frac{-4}{3} \]
\[ r = \sqrt{x^2 + y^2} \]
\[ r = \sqrt{4 + (-3)^2} \]
\[ r = \sqrt{25} \]
\[ r = 5 \]
\[ \text{Sec } \theta = \frac{r}{x} = \frac{5}{4} \]
\[ \text{Cosec } \theta = \frac{r}{y} = \frac{5}{3} \]

3. Given: \( \text{Cot } \beta = \frac{2}{5} \) \( \& \beta \) in III

Find: \( \sin \beta, \cos \beta \), and \( \tan \beta \)

\[ \text{Cot } \beta = \frac{x}{y} = \frac{-2}{5} \]

\[ r = \sqrt{x^2 + y^2} = \sqrt{(-2)^2 + (-5)^2} = \sqrt{4 + 25} = \sqrt{29} \]
\[ \sin \beta = \frac{y}{r} = \frac{-5}{\sqrt{29}} \]
\[ \cos \beta = \frac{x}{r} = \frac{-2}{\sqrt{29}} \]
\[ \tan \beta = \frac{y}{x} = \frac{5}{2} \]

4. Given: \( \sec \theta = \frac{-5}{\sqrt{2}} \) with \( \theta \) in II

Find: \( \csc \theta \)

Answer: (STEP 1) \( \cos \theta = \frac{1}{\sec \theta} = \frac{1}{\frac{-5}{\sqrt{2}}} = -\frac{\sqrt{2}}{5} \)

(STEP 2) Use: \( \sin^2 \theta + \cos^2 \theta = 1 \)
\( \sin^2 \theta + \left(-\frac{\sqrt{2}}{5}\right)^2 = 1 \)
\( \sin^2 \theta + \frac{2}{25} = 1 \)
\( \sin^2 \theta = 1 - \frac{2}{25} = \frac{23}{25} \)
\( \sin \theta = \pm \frac{\sqrt{23}}{25} \)
\( \therefore \sin \theta = \frac{\sqrt{23}}{25} \)

(STEP 3) Use: \( \csc \theta = \frac{1}{\sin \theta} \)
\( \therefore \csc \theta = \frac{5}{\sqrt{23}} \)
5. Given: \( \csc \alpha = \frac{-2}{3} \) and \( \alpha \) in IV
Find: \( \sec \alpha \) and \( \tan \alpha \)

Answer: (STEP 1)
Use: \( \csc^2 \alpha = 1 + \cot^2 \alpha \)
\[
\left( \frac{-2}{3} \right)^2 = 1 + \cot^2 \alpha \\
\frac{4}{9} = 1 + \cot^2 \alpha \\
\frac{4}{9} = \cot^2 \alpha \\
\therefore \cot \alpha = \pm \frac{2}{3} \\
\therefore \cot \alpha = \frac{2}{3} \\
\therefore \cot \alpha = -2 \frac{\sqrt{10}}{3}
\]

(SITE 2)
Use: \( \tan \alpha = \frac{1}{\cot \alpha} = \frac{-3}{2} \)

(SITE 3)
Use: \( \sin \alpha = \frac{\sin \alpha}{\cos \alpha} = \tan \alpha \)
\[
\therefore \cos \alpha = \frac{\sin \alpha}{\tan \alpha} = \frac{\left( \frac{-3}{7} \right)}{\left( \frac{-3}{2} \right)} = \frac{2\sqrt{10}}{7}
\]

6. \( \sin \left( 810^\circ \right) = \frac{y}{r} = \frac{2}{2} = 1 \)
\( \cos \left( 810^\circ \right) = \frac{x}{r} = \frac{0}{2} = 0 \)
\( \tan \left( 810^\circ \right) = \frac{y}{x} = \frac{2}{0} = \text{undefined} \)
\( \cot \left( 810^\circ \right) = \frac{x}{y} = \frac{2}{2} = 0 \)
\( \sec \left( 810^\circ \right) = \frac{r}{x} = \frac{2}{2} = 1 \)
\( \csc \left( 810^\circ \right) = \frac{r}{y} = \frac{2}{2} = 1 \)

7. \( 2 \sin^3 (-270^\circ) - 3 \cot^5 (-810^\circ) - 5 \sec^3 (900^\circ) \)
\[
= 2 \left[ \sin (-270^\circ) \right]^3 - 3 \left[ \cot (-810^\circ) \right]^5 - 5 \left[ \sec 900^\circ \right]^3 \\
= 2 (1)^3 - 3(-1)^5 - 5(-1)^3 \\
= 2 - 0 + 5 \\
= 7
\]
\[
\therefore 2 \sin^3 (-270^\circ) - 3 \cot^5 (-810^\circ) - 5 \sec^3 (900^\circ) = 7
\]
8. \[ \frac{x}{3} + \frac{y}{2} = 0 \] with \( x \leq 0 \).

Solve for \( y \):
\[ \frac{y}{2} = -\frac{x}{3} \]
\[ y = -\frac{2x}{3} \]
where \( x \leq 0 \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>-3</td>
<td>2</td>
</tr>
</tbody>
</table>

\( x = -3 \); \( y = 2 \); \( r = ? \).

\[ r = \sqrt{x^2 + y^2} \]
\[ r = \sqrt{(-3)^2 + (2)^2} \]
\[ r = \sqrt{13} \]

\[ \sec \theta = \frac{r}{x} \]
\[ \sec \theta = -\frac{\sqrt{13}}{3} \]

9. **Finding AD:** There are about 2, or 3 different ways of doing this problem. One method is to use the Pythagorean Theorem. Another method is to use the Law of Similar Triangles.

**Similar Triangles Method**

Note that \( \triangle ABD \) is similar to \( \triangle ABC \). The reason is that they share the same set of angles.

\[ \frac{4\sqrt{3}}{x} \]
\[ \frac{\sqrt{2}}{x} \]
\[ \therefore \frac{AB}{x} = \frac{BC}{\sqrt{2}} \]
\[ \therefore \frac{4\sqrt{3}}{x} = \frac{BC}{\sqrt{2}} \]
\[ \therefore x(BC) = 4\sqrt{3} \cdot \sqrt{2} \]
\[ x = \frac{4\sqrt{6}}{BC} \]

So, all you have to find is \( BC \):

Use Pyth. Thm on \( \triangle ABC \).
\[ BC^2 = (4\sqrt{3})^2 + (\sqrt{2})^2 = 48 + 2 = 50 \]
\[ BC = \sqrt{50} = 5\sqrt{2} \]
\[ x = \frac{4\sqrt{6}}{BC} = \frac{4\sqrt{6}}{5\sqrt{2}} = \frac{4\sqrt{3}}{5} \]
\[ \therefore AD = \frac{4\sqrt{3}}{5} \text{ cm.} \]