1. (a) Convert 24° 28' 37" into degrees and decimal degrees (two decimal places)  
(b) Convert 132.513° into degrees, minutes, and seconds.

2. Given that the point $P(7, -24)$ 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 $\cot \beta = \frac{4}{5}$ 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 $\sec \theta = -\frac{8}{\sqrt{3}}$ with $\theta$ in quadrant III find the exact value of $\csc \theta$. Use only the trigonometric identities to solve this problem (No x-y-r calculations). Simplify the answer.

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

6. Draw an angle of $1170^\circ$ in the standard position. Then use a suitable $x-y-r$ calculation to find all trig functions of $1170^\circ$. Must show the $x$, $y$, $r$ values, and the steps of your calculation, not just the final answer.

7. Evaluate $2\sin^3(-270^\circ) + 4\sec^5(540^\circ) + 3\cot^2(-450^\circ)$. Show each line of your calculation carefully and methodically.

8. Find any one solution to the following trigonometric equation. Make sure to show each step of calculation carefully and methodically: $\cos(3\theta + 5^\circ) \sin(7^\circ - 2\theta) - 1 = 0$

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 $BC = 6 \, cm$ and $AB = 2 \, cm$, find the exact value of $CD$. Provide the exact and simplified answer.
1. (a) \[ 24^\circ \ 28' \ 37'' = 24^\circ + \frac{28}{60}^\circ + \frac{37}{3600}^\circ \approx 24.48^\circ \]

(b) \[ 132.513^\circ = 132^\circ + (0.513 \times 60)' = 132^\circ + 30' + (0.78 \times 60)'' \]
\[ \approx 132^\circ 30' 47'' \]

2. \[ P(7,-24) \]
\[ x = 7; \ y = -24; \ r = ? \]
\[ \cot \theta = \frac{x}{y} = -\frac{7}{24} \]
\[ \sec \theta = \frac{r}{x} = \frac{25}{7} \]
\[ \csc \theta = \frac{r}{y} = -\frac{25}{24} \]

3. Given: \[ \cot \beta = \frac{4}{5} \text{ with } \beta \text{ in III} \]
\[ \cot \beta = \frac{4}{5} = \frac{x}{y} \]
\[ \therefore \text{pick } x = -4 \text{ and } y = -5; \ r = ? \]
\[ r = \sqrt{x^2 + y^2} = \sqrt{(-4)^2 + (-5)^2} = \sqrt{16 + 25} = \sqrt{41} \]
\[ \therefore \sin \beta = \frac{y}{r} = \frac{-5}{\sqrt{41}}; \ \cos \beta = \frac{x}{r} = \frac{-4}{\sqrt{41}}; \ \tan \beta = \frac{y}{x} = \frac{-5}{-4} = \frac{5}{4} \]

4. Given: \[ \sec \theta = -\frac{8}{3} \text{ with } \theta \text{ in III} \]
Find: \[ \csc \theta \]

**STEP 1:** \[ \cos \theta = \frac{1}{\sec \theta} = \frac{1}{-\frac{8}{3}} = -\frac{3}{8} \]

**STEP 2:** Use: \[ \sin^2 \theta + \cos^2 \theta = 1 \]
\[ \therefore \sin^2 \theta + \left(-\frac{3}{8}\right)^2 = 1 \]
\[ \sin^2 \theta + \frac{9}{64} = 1 \]
\[ \sin^2 \theta = 1 - \frac{9}{64} = \frac{55}{64} \]
\[ \therefore \sin \theta = \pm \frac{\sqrt{55}}{8} \]
\[ \therefore \sin \theta = -\frac{\sqrt{55}}{8} \]

**STEP 3:** \[ \csc \theta = \frac{1}{\sin \theta} = \frac{1}{-\frac{\sqrt{55}}{8}} = -\frac{8}{\sqrt{55}} \]
\[ \therefore \csc \theta = -\frac{8}{\sqrt{55}} \]
5. Given: \( \csc \alpha = \frac{5}{3} \) with \( \alpha \) in \( \Pi \\
\text{Find: } \sec \alpha \text{ and } \tan \alpha \\
\text{STEP 1: Use: } \csc^2 \alpha = 1 + \cot^2 \alpha \\
\therefore \left( \frac{5}{3} \right)^2 = 1 + \cot^2 \alpha \\
\frac{25}{9} = 1 + \cot^2 \alpha \\
\frac{25}{9} - 1 = \cot^2 \alpha \\
\frac{16}{9} = \cot^2 \alpha \\
\therefore \cot \alpha = \pm \sqrt{\frac{16}{9}} \\
\therefore \cot \alpha = \pm \frac{4}{3} \\
\text{STEP 2:} \\
\tan \alpha = \frac{1}{\cot \alpha} \\
\therefore \tan \alpha = \frac{1}{\left( \frac{-4}{3} \right)} \\
\tan \alpha = -\frac{3}{4} \\
\text{STEP 3:} \\
\sin \alpha = \tan \alpha \\
\therefore \sin \alpha = \frac{-3}{4} \\
\therefore \cos \alpha = \frac{\cos \alpha}{\sin \alpha} \\
\therefore \cos \alpha = \frac{\frac{3}{5}}{-\frac{3}{4}} \\
\therefore \cos \alpha = -\frac{4}{5} \\

6. Draw 1170°: \\
\sin (1170°) = \frac{y}{r} = \frac{1}{1} = 1 \\
\cos (1170°) = \frac{x}{r} = 0 = 0 \\
\tan (1170°) = \frac{y}{x} = \frac{1}{0} = \text{undef} \\
\csc (1170°) = \frac{1}{1} = 1 \\
\sec (1170°) = \frac{1}{0} = \text{undef} \\
\cot (1170°) = 0 = 0 \\

7. \( 2 \sin^3 (-270°) + 4 \sec^5 (540°) + 3 \cot^2 (-450°) \) \\
= \( 2(1)^3 + 4(-1)^5 + 3(0)^2 \) \\
= \( 2(1) + 4(-1) + 3(0) \) \\
= -2 \\

8. \( \csc (\theta + 5°) \), \( \sin (7-2\theta) \) = 1 \\
\therefore \csc (\theta + 5°) = \frac{1}{\sin (7-2\theta)} \\
\therefore \csc (\theta + 5°) = \csc (7-2\theta) \\
\therefore \text{One solution is obtained by setting the 2 angles equal} \\
\theta + 5° = 7-2\theta \\
\therefore 5\theta = 2° \\
\therefore \theta = \frac{2°}{5} \)
Use similar \( \triangle \)s.

The \( \triangle ABC \) and \( \triangle ABD \) are similar.

\[
\begin{align*}
\frac{AB}{BD} &= \frac{BC}{AB} \\
\frac{2}{6-x} &= \frac{6}{2} \\
(2)(2) &= 6(6-x) \\
4 &= 36 - 6x \\
6x &= 32 \\
x &= \frac{32}{6} \\
\therefore x &= \frac{16}{3} \text{ cm.}
\end{align*}
\]