1. \( ABC \) is a right triangle with the right angle at \( B \). Given that \( A = 54^\circ \) and \( c = 15.3 \text{ cm} \), find \( b \). (two decimal places).

2. \( ABC \) is a right triangle with the right angle at \( A \). Given that \( a = 8 \text{ cm} \) and \( c = 5 \text{ cm} \), find the approximate value of \( C \) (two decimal places), and the exact value of \( \cot B \).

3. Find the exact values of the **first three** trigonometric functions of an angle of \(-480^\circ\).

4. Find a solution for \( \theta \) in the interval \([0^\circ, 90^\circ]\) such that \( 3\cot\theta - 143.5 = 0 \). Provide the approximate answer (four decimal places).

5. Find all solutions of the equation \( 2\tan^2\theta - 6 = 0 \) where \(-270^\circ \leq \theta \leq 540^\circ\).

6. From the top of a lighthouse 260 ft tall, the angle of depression of a small boat on the ocean surface is 43°. Find how far is the boat from the bottom of the lighthouse (two decimal places).

7. A hillside makes an angle of 16° with the horizontal, and there is a 30 ft tall vertical building standing on the top of the hill. From a point 65 ft downhill from the base of the building, along the hill, find the angle of elevation to the top of the building (two decimal places).

8. The area of a rectangle is \( 2/5 \) square inches. Let \( B \) be the acute angle between a diagonal and the longest side, and it is given that \( \tan B = 5/6 \). Find the **exact** perimeter of the rectangle.
1. \[ \cos 54^\circ = \frac{15.3}{b} \]
   \[ \therefore b = \frac{15.3}{\cos(54^\circ)} \approx 26.03 \text{ cm} \]

2. \[ \sin C = \frac{5}{8} \]
   \[ \therefore C = \sin^{-1} \left( \frac{5}{8} \right) \]
   \[ C \approx 38.68^\circ \]
   \[ \text{Find } b \]
   \[ 8^2 = b^2 + 5^2 \]
   \[ 64 = b^2 + 25 \]
   \[ b^2 = 39 \]
   \[ \therefore b = \sqrt[2]{39} \]

3. \[ \sin(-480^\circ) = \pm \sin 60^\circ = -\frac{\sqrt{3}}{2} \]
   \[ \cos(-480^\circ) = \pm \cos 60^\circ = -\frac{1}{2} \]
   \[ \tan(-480^\circ) = \pm \tan 60^\circ = \sqrt{3} \]

4. \[ 3 \cot \theta = 1435 \]
   \[ \cot \theta = \frac{1435}{3} \]
   \[ \therefore \tan \theta = \frac{1}{\cot \theta} = \frac{3}{1435} \]
   \[ \theta \approx 0.1198^\circ \]

5. \[ 2 \tan^2 \theta - 6 = 0 \]
   \[ 2 \tan^2 \theta = 6 \]
   \[ \tan^2 \theta = 3 \]
   \[ \therefore \tan \theta = \pm \sqrt{3} \]

Final: \[ \theta = -240^\circ, -60^\circ, 120^\circ, 300^\circ, 480^\circ, -120^\circ, 60^\circ, 240^\circ, 420^\circ \]
(9 Solutions)
\[ \tan(43^\circ) = \frac{260}{d} \]

\[ \therefore d = \frac{260}{\tan(43^\circ)} \approx 278.82 \text{ ft} \]

\[ \therefore \text{The boat is about 278.82 ft from the bottom of the lighthouse} \]

**STEP 1: Find BC.**

\[ \sin 16^\circ = \frac{BC}{65} \]

\[ \therefore BC = 65 \times \sin 16^\circ \]

\[ \therefore BC \approx 17.91642813 \ldots \]

**STEP 2: Find AB**

\[ \cos 16^\circ = \frac{AB}{65} \]

\[ \therefore AB = 65 \cos 16^\circ \approx 62.48201024 \]

**STEP 3: Find \( \hat{BAD} \) using \( \triangle ABD \).**

\[ \tan \theta = \frac{30 + 17.9164 \ldots}{62.4820 \ldots} \]

\[ \therefore \theta = \tan^{-1} \left( \frac{30 + 17.9164 \ldots}{62.4820 \ldots} \right) \approx 37.48^\circ \]

\[ \therefore \text{The required angle of elevation is about 37.48}^\circ \]

**Area**

\[ \text{Area} = \frac{2}{5} \]

\[ \therefore xy = \frac{2}{5} \]

\[ \text{Solve the system} \]

\[ \frac{y}{x} = \frac{5}{6} \]

\[ \therefore y = \frac{5}{6}x \]

\[ \frac{y}{5} = \frac{2}{5x} \]

\[ y = \frac{2}{5x} \]

\[ \sqrt{\frac{12}{25}} = \frac{2}{5} \]

\[ \text{Perimeter} = 2(x+y) = 2 \left( \frac{2\sqrt{3}}{5} + \frac{\sqrt{3}}{3} \right) = 2 \left( \frac{6\sqrt{3} + 5\sqrt{3}}{15} \right) = \frac{22\sqrt{3}}{15} \text{ inches} \]

~ END OF TEST 2 ~