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

1. \( ABC \) is a right triangle with the right angle at \( B \). Given that \( A = 32^\circ \) and \( a = 20 \text{ cm} \), find \( b \). (two decimal places).

2. In the triangle \( ABC \), \( a = 2.5 \text{ cm} \), \( b = 3.7 \text{ cm} \), and \( C = 35^\circ \). Find \( c \) (two decimal places).

3. \( ABC \) is a right triangle with the right angle at \( B \). Given that \( b = 25 \) and \( c = 7 \), find the approximate value of \( A \) (two decimal places), and the exact value of \( \cot C \).

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

5. Find all values of \( \theta \) between \( 0^\circ \) and \( 360^\circ \) satisfying \( \cot \theta = 0.0053 \) (four decimal places). Show all work.

6. From the top of a lighthouse 230 ft tall, the angle of depression of a small boat on the ocean surface is \( 41^\circ \). Find how far is the boat from the bottom of the lighthouse (two decimal places).

7. The angle of elevation from the bottom of a small building to the top of a nearby taller building is \( 46^\circ \). Also the angle of depression from the top of the smaller building to the bottom of the taller building is \( 14^\circ \). If one building is 28 meters taller than the other, find the height of the taller building (two decimal places).

8. The two diagonal lengths of a parallelogram are \( 20 \text{ in} \) and \( 16 \text{ in} \), and one of the sides is equal to \( 12 \text{ in} \). Find the other unequal side of the parallelogram (four decimal places).

9. Find the exact solutions for \( \theta \): \( 4\sin^2 \theta - 3 = 0 \) where \(-270^\circ \leq \theta \leq 360^\circ\).
1. \[ \sin 32^\circ = \frac{20}{b} \] 
   \[ \therefore b = \frac{20}{\sin 32^\circ} \approx 37.74 \text{ cm} \]

2. Use Law of Cosines:
   \[ c^2 = a^2 + b^2 - 2ab \cos C \]
   \[ \therefore c^2 = 2.5^2 + 3.7^2 - 2 \times 2.5 \times 3.7 \times \cos (35^\circ) \]
   \[ \therefore c = \sqrt{2.5^2 + 3.7^2 - 2 \times 2.5 \times 3.7 \times \cos (35^\circ)} \]
   \[ \therefore c \approx 2.19 \text{ cm} \]

3. \[ \cos A = \frac{7}{25} \]
   \[ \therefore A = \cos^{-1} \left( \frac{7}{25} \right) \]
   \[ \therefore A \approx 73.74^\circ \]
   \[ \therefore \cot C = \frac{24}{7} \]

4. First Draw \(-480^\circ\) & find reference 4
   \[ \sin (-480^\circ) = \frac{1}{2} \sin 60^\circ = -\frac{\sqrt{3}}{2} \]
   \[ \cos (-480^\circ) = \frac{1}{2} \cos 60^\circ = -\frac{1}{2} \]
   \[ \tan (-480^\circ) = \frac{1}{2} \tan 60^\circ = \sqrt{3} \]

5. \[ \cot \theta = 0.0053 \]
   \[ \therefore \tan \theta = \frac{1}{0.0053} \]
   \[ \therefore \text{one soln for } \theta : \quad \theta = \tan^{-1} \left( \frac{1}{0.0053} \right) \approx 89.6963^\circ \]
   \[ \therefore \text{All solutions between } 0^\circ \& 360^\circ \text{ are: } \theta \approx 89.6963^\circ \text{ and } 263.6963^\circ \]

6. \[ \tan 41^\circ = \frac{230}{d} \]
   \[ \therefore d = \frac{230}{\tan 41^\circ} \approx 264.58 \text{ ft} \]
   \[ \therefore \text{The boat is about } 264.58 \text{ ft from the base of the lighthouse} \]
**STEP 1:** Find \( AD \) using \( \triangle ACD \) & Law of Sines:

\[
\frac{AD}{\sin 44^\circ} = \frac{28}{\sin 32^\circ}
\]

\[
\therefore AD = \frac{28 \sin 44^\circ}{\sin 32^\circ} \approx 36.7045...
\]

**STEP 2:** Find \( BD \), using \( \triangle ABD \):

\[
\sin 14^\circ = \frac{BD}{36.7045...} \quad \therefore BD = (36.7045...) \sin 14^\circ \approx 8.8796...
\]

**STEP 3:** \( BC = (28 + 8.87... \approx 36.88 \text{ ft} \)

**STEP 1:** Find \( \triangle AEB \) using Law of Cosines:

\[
12^2 = 10^2 + 8^2 - 2(10)(8) \cos \theta
\]

\[
\therefore \cos \theta = \frac{10^2 + 8^2 - 12^2}{2 \times 10 \times 8} \approx 0.125
\]

\[
\theta \approx \cos^{-1}(0.125) \approx 82.8192^\circ...
\]

**STEP 3:** Find \( BC \) using \( \triangle BCE \) & Law of Cosines again:

\[
\alpha = 180^\circ - \theta = 180^\circ - 82.81^\circ \ldots \approx 97.18^\circ...
\]

\[
\therefore BC^2 = 10^2 + 8^2 - 2(10)(8) \cos(97.18^\circ..)
\]

\[
\therefore BC = \sqrt[2]{10^2 + 8^2 - 2 \times 10 \times 8 \times \cos(97.18^\circ..)} \approx 13.5647 \text{ in}
\]

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

\[
\therefore \sin^2 \theta = \frac{3}{4}
\]

\[
\sin \theta = \pm \sqrt{\frac{3}{4}}
\]

\[
\therefore \theta = -120^\circ, -60^\circ, 240^\circ, 300^\circ, -240^\circ, 60^\circ, 120^\circ.
\]

**Final Answer:** \( \theta = -120^\circ, -60^\circ, 240^\circ, 300^\circ, -240^\circ, 60^\circ, 120^\circ. \) (7 Solutions)