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 $A$. Given that $B = 34^\circ$ and $b = 11.5$ cm, find $a$. (two decimal places).

2. $ABC$ is a right triangle with the right angle at $A$. Given that $a = 12$ cm and $b = 5$ cm, find the exact value of $Sec B$, and the approximate value of $C$ (two decimal places). Clearly mark your two final answers in two separate boxes.

3. Find the exact values of the first three trigonometric functions of an angle of $-840^\circ$.

4. Find all solutions of the equation $4Cos^2\theta - 3 = 0$ where $-180^\circ \leq \theta \leq 630^\circ$.

5. Find all solutions of the equation $2Tan(2\theta) + 6 = 0$ where $-180^\circ \leq \theta \leq 270^\circ$.

6. From the top of a lighthouse 350 feet tall, the angle of depression of a small boat on the ocean surface is $32^\circ$. Find how far is the boat from the top of the lighthouse (two decimal places).

7. Two vertical buildings are located on the ground, facing each other. The taller building is 100 feet tall. From the top of the shorter building, the angle of elevation to the top of the taller building is $50^\circ$. From the top of the shorter building the angle of depression to the bottom of the taller building is $20^\circ$. Find the height of the shorter building (two decimal places).

8. $ABC$ is a right triangle with the right angle at $C$. From the vertex $C$, a perpendicular line is drawn to the side $AB$, meeting the side at $D$. Given that $CD = 4$ cm and the area of the triangle $ABC$ is $20$ cm$^2$, find $AD$. Provide the exact answer. See the following figure.
1. \[ \cos C = \frac{5}{12} \]
\[ \therefore C = \cos^{-1}\left(\frac{5}{12}\right) \]
\[ C \approx 65.38^\circ \]
\[ c^2 = 119 \]
\[ \therefore c = \sqrt{119} \]

3. Draw \(-840^\circ\) and find \(\theta\)
\[ \text{Ref } \theta = 60^\circ \]
\[ \sin(-840^\circ) = \frac{\sqrt{3}}{2} \sin 60^\circ = -\frac{\sqrt{3}}{2} \]
\[ \cos(-840^\circ) = \frac{1}{2} \cos 60^\circ = -\frac{1}{2} \]
\[ \tan(-840^\circ) = \sqrt{3} \tan 60^\circ = +\sqrt{3} \]

4. \[ 4 \cos^2 \theta - 3 = 0 \]
\[ 4 \cos^2 \theta = 3 \]
\[ \cos^2 \theta = \frac{3}{4} \]
\[ \therefore \cos \theta = \pm \frac{\sqrt{3}}{2} \]
\[ \theta = -150^\circ, 150^\circ, 210^\circ, 510^\circ, 570^\circ \]
\[ \therefore \text{only nine solutions: } \theta = -150^\circ, 150^\circ, 210^\circ, 510^\circ, 570^\circ, -30^\circ, 30^\circ, 330^\circ, 390^\circ \]

5. \[ 2 \tan(2\theta) + 6 = 0 \]
\[ \therefore 2 \tan(2\theta) = -6 \]
\[ \tan(2\theta) = -3 \]

Now solve for \(2\theta\):
\[ \text{Ref } \theta = \tan^{-1}(3) \]
\[ \approx 71.6^\circ \]

-360^\circ \leq 2\theta \leq 540^\circ

\[ \therefore 2\theta \approx -71.6^\circ, -215.6^\circ, 108.4^\circ, 288.4^\circ, 468.4^\circ \]

-35.8^\circ, -125.8^\circ, 54.2^\circ, 144.2^\circ, 234.2^\circ

\[ \therefore \text{only 5 solutions} \]
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6. \[ \sin 32^\circ = \frac{350}{d} \]
   \[ d \sin (32^\circ) = 350 \]
   \[ d = \frac{350}{\sin(32^\circ)} \approx 660.48 \text{ ft} \]
   \[ \therefore \text{The boat is about 660.48 ft from the top of the lighthouse} \]

7. Use \( \triangle ACE: \tan 50^\circ = \frac{CE}{d} \)
   \[ \therefore CE = d(\tan 50^\circ) \quad (1) \]

   Use \( \triangle ADE: \tan 20^\circ = \frac{DE}{d} \)
   \[ \therefore DE = d(\tan 20^\circ) \quad (2) \]

   Add lines (1) and (2):
   \[ CE + DE = d(\tan 50^\circ + \tan 20^\circ) \]
   \[ 100 = d(\tan 50^\circ + \tan 20^\circ) \]
   \[ d = \frac{100}{(\tan 50^\circ + \tan 20^\circ)} \approx 64.2787 \text{...} \]

   Plug back in (2):
   \[ \therefore DE = (64.2787...)(\tan 20^\circ) \approx 23.40 \text{ ft} \]

8. Area \( \triangle ABC = \frac{1}{2} \text{(base)} \times \text{(height)} \)
   \[ 20 = \frac{1}{2} \times (AB)(4) \]
   \[ 20 = 2AB \]
   \[ AB = 10 \quad \therefore x + y = 10 \quad (1) \]

   From \( \triangle ACD: \tan \theta = \frac{4}{x} \quad (2) \]

   From \( \triangle BCD: \tan \theta = \frac{y}{4} \quad (3) \]

   Solve these two eqns

   By (2) and (3):
   \[ \frac{4}{x} = \frac{y}{4} \]
   \[ \therefore xy = 16 \quad (4) \]

   By (1), \( y = 10 - x \). Plug back in (4):
   \[ xc(10 - xc) = 16 \quad 10x - xc^2 = 16 \]
   \[ x^2 - 10x + 16 = 0 \quad (x - 2)(x - 8) = 0 \]
   \[ \therefore x = 2 \text{ or } x = 8 \]
   \[ \therefore AD = 2 \text{ cm or } AD = 8 \text{ cm} \]