1. ABC is a right triangle with the right angle at B. Given that \( b = 2.7 \text{ cm} \) and \( \theta = 35^\circ \), find \( a \). (one decimal place)

\[
\sin 35^\circ = \frac{a}{2.7} \\
\therefore a = 2.7 \times \sin 35^\circ \\
\therefore a \approx 1.5 \text{ cm}
\]

2. PQR is a right triangle with the right angle at R. Given that \( \theta = 60^\circ \) and \( q = 48 \text{ in} \), find \( p \) and the area of the triangle PQR. Provide exact, simplified answers.

\[
\tan 60^\circ = \frac{48}{p} \\
\therefore p = \frac{48}{\tan 60^\circ} \\
\therefore p = \frac{48}{\sqrt{3}} = \frac{48\sqrt{3}}{3} = 16\sqrt{3} \text{ in}
\]

\[
\text{Area} = \frac{1}{2} \times \text{base} \times \text{height} \\
\therefore \text{Area} = \frac{1}{2} \times 8\sqrt{3} \times 48 \\
\therefore \text{Area} = 384\sqrt{3} \text{ in}^2
\]

3. Use the reference angle to find the exact values of the trig functions of an angle of \(-1200^\circ\).

Ref \( \theta = 60^\circ \)

\[
\sin(-1200^\circ) = -\sin 60^\circ = \frac{-\sqrt{3}}{2} \\
\cos(-1200^\circ) = -\cos 60^\circ = -\frac{1}{2} \\
\tan(-1200^\circ) = +\tan 60^\circ = \sqrt{3}
\]

\[
\csc(-1200^\circ) = \frac{-2}{\sqrt{3}} \\
\sec(-1200^\circ) = -2 \\
\cot(-1200^\circ) = \frac{1}{\sqrt{3}}
\]

4. Find a value for \( \theta \) between \( 0^\circ \) and \( 90^\circ \) satisfying \( \cot \theta = 10.2 \)

\[
\cot \theta = 10.2 \\
\therefore \tan \theta = \frac{1}{10.2} \\
\therefore \theta = \tan^{-1}\left(\frac{1}{10.2}\right) \\
\therefore \theta \approx 5.399339^\circ
\]
4. Find a value for $\theta$ between $0^\circ$ and $90^\circ$ satisfying $\cot \theta = 10.2$

\[
\cot \theta = 10.2
\]
\[
\therefore \tan \theta = \frac{1}{10.2}
\]
\[
\therefore \theta = \tan^{-1} \left( \frac{1}{10.2} \right)
\]
\[
\therefore \theta \approx 5.599339^\circ...
\]

5. The length of a rectangle is 12 in, and one of the angles between its diagonals is $100^\circ$. Find the area of the rectangle (two decimal places)

Find $y$:

- Use right $\Delta$ ABC

\[
\tan 40^\circ = \frac{y}{12}
\]
\[
\therefore y = 12 \tan 40^\circ
\]
\[
\therefore y \approx 10.669...
\]

Area of the rectangle

\[
= \text{length} \times \text{width}
\]
\[
= 12 \times (10.069...)
\]
\[
\approx 120.83 \text{ in}^2
\]
6. From the top of a lighthouse 50 ft tall, the angle of depression to a small boat on the ocean surface is 28°. Find how far is the boat from the top of the lighthouse. (2 decimal places)

\[
\sin 28° = \frac{50}{x} \\
\therefore x = \frac{50}{\sin 28°} \approx 106.50 \text{ ft}
\]

The boat is approximately 106.50 ft from the top of the lighthouse.

7. Two buildings, 50 ft tall and 138 ft tall are standing on the ground some feet apart. The angle of depression from the top of the shorter building to the base of the taller building is 10°. Find the angle of elevation from the top of the shorter building to the top of the taller building (two decimal places).

\[
\text{Find } BE:\quad \tan 10° = \frac{50}{BE} \\
\therefore BE = \frac{50}{\tan 10°} \approx 283.564091...
\]

\[
\text{Find } \theta:\quad \tan \theta = \frac{88}{283.56...} \\
\therefore \theta = \tan^{-1} \left( \frac{88}{283.56...} \right) \approx 17.24°
\]

The required angle of elevation is about 17.24°.
A hill makes an angle of 22° with the horizontal, and a vertical building is standing on the hillside. From a point on the hillside 25 ft uphill (along the hill) from the base of the building, the angle of elevation to the top of the building is 41°. Find the height of the building (two decimal places).

Find AD:
\[ \sin 22° = \frac{AD}{25} \]
\[ AD = 25 \times \sin 22° \]
\[ AD \approx 9.365... \]

Find CD:
\[ \cos 22° = \frac{CD}{25} \]
\[ CD = 25 \cos 22° \]
\[ CD \approx 23.17... \]

Find BD:
\[ \tan 41° = \frac{BD}{23.17...} \]
\[ BD = (23.17...) \tan 41° \]
\[ BD \approx 20.1497... \]

\[ AB = AD + BD \]
\[ \approx (9.365...) + (20.1497...) \]
\[ AB \approx 29.51 \text{ ft} \]

\[ \therefore \text{The building is approximately 29.51 ft tall.} \]

Find a value for \( \theta \) satisfying \( \sin (2\theta - 5°) \cdot \sec (3\theta + 10°) = 1 \).

Show complete work. \( \therefore \sin (2\theta - 5°) \cdot \sec (3\theta + 10°) = 1 \)

\[ \therefore \sin (2\theta - 5°) = \cos (3\theta + 10°) \]

Set: \( (2\theta - 5°) + (3\theta + 10°) = 90° \)

\[ 5\theta + 5° = 90° \]
\[ 5\theta = 85° \]
\[ \theta = 17° \]