1.) A right triangle has a hypotenuse of length 10 centimeters. If one angle is 40°, find the length of each leg.

\[
\sin \theta = \frac{a}{H} \\
\sin 40° = \frac{a}{10} \\
a = 10 \sin 40° = 6.43 \\
b = 10 \cos 40° = 7.66
\]

2.) A person in a small boat, offshore from a vertical cliff known to be 100 feet in height, takes a sighting of the top of the cliff. If the angle of elevation is found to be 25°, how far offshore is the boat?

\[
\tan 25° = \frac{100}{x} \\
x = \frac{100}{\tan 25°} = 214.45 \\
\]

3.) A hot air balloon, suspended in the air at a height of 350 feet, lies directly over a line from Target Field to TCF Bank Stadium. If the angle of depression from the helicopter to Target Field is 25° and from the helicopter to TCF Bank Stadium is 7°, find the distance between Target Field and TCF Bank Stadium.

\[
\tan(90° - 7°) = \frac{x}{350} \\
x = 350 \tan 73° = 2,950.5 \\
750 \tan 63° = y \\
y = 750 \tan 63° = 3,601.1
\]

Law of Sines: \( \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \)

Law of Cosines: \( a^2 = b^2 + c^2 - 2bc \cos \theta \)

<table>
<thead>
<tr>
<th>Given</th>
<th>Objective</th>
<th>Law of Sines or Cosines?</th>
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<tbody>
<tr>
<td>SSA 2 sides, 1 opposite angle</td>
<td>Other opposite angle</td>
<td>Law of Sines</td>
</tr>
<tr>
<td>SAS 2 sides, 1 included angle</td>
<td>Side opposite angle</td>
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</tr>
<tr>
<td>SSS 3 sides</td>
<td>any angle</td>
<td>Law of Sines</td>
</tr>
<tr>
<td>AAS 2 angles, 1 opposite side</td>
<td>other opposite side</td>
<td>Law of Sines</td>
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</tbody>
</table>

4.) An aircraft is spotted by two observers who are 1000 feet apart. As the airplane passes over the line joining them, observer 1 takes a sighting of the angle of elevation to the plane as 40° and observer 2 takes a sighting of the angle of elevation to the plane as 35°. How high is the airplane?

\[
\frac{\sin 35°}{x} = \frac{\sin 40°}{1000} \\
x = \frac{1000 \sin 35°}{\sin 40°} = 811.7
\]

5.) When a boy stands on the bank of a river and looks across to the other bank, the angle of depression is 12°. If he climbs to the top of a 10-ft tree and looks across to the other bank, the angle of depression is 15°. What is the distance from the first position of the boy to the other bank of the river? How wide is the river?

\[
\frac{\sin 15°}{10} = \frac{\sin 12°}{x} \\
x = \frac{10 \sin 15°}{\sin 12°} = 184.6 \\
\frac{\sin 15°}{10 + y} = \frac{\sin 12°}{y} \\
y = \frac{10 \sin 15° - 10 \sin 12°}{\sin 12°} = 38.37 \\
x = 190.52
\]