Trigonometry is the study of triangles, specifically right triangles.

**Trigonometric Functions**
The six trigonometric functions are sine (sin), complementary sine (cos), tangent (tan), complementary secant (cosec or csc), secant (sec), and complementary tangent (cot).

**Trigonometric Angle**
An angle in trigonometry can be represented by θ, A, B, C or α, β, γ etc. (0 < θ < 90°)

![Figure 1](image)

The memorization of this mnemonic can be useful for remembering the phrase: “Some Officers Have Curly Auburn Hair Til Old Age”

\[
\begin{align*}
\sin \theta & = \frac{\text{opp}}{\text{hyp}} = \text{SOH} \\
\cos \theta & = \frac{\text{adj}}{\text{hyp}} = \text{CAH} \\
\tan \theta & = \frac{\text{opp}}{\text{adj}} = \text{TOA} \\
\csc \theta & = \frac{\text{hyp}}{\text{opp}} \\
\sec \theta & = \frac{\text{hyp}}{\text{adj}} \\
\cot \theta & = \frac{\text{adj}}{\text{opp}}
\end{align*}
\]

**Example 1**: For 0 < θ < 90°, given \(\sin \theta = 4/5\). Determine the other trigonometric functions.

Step 1: Draw a figure showing θ, hyp, adj, and opp.

Step 2: Determine one unknown using the Pythagorean Theorem \(c^2 = a^2 + b^2\)

Step 3: Determine each using the above ratios.

\[
\begin{align*}
\sin \theta & = _______ \\
\cos \theta & = _______ \\
\tan \theta & = _______ \\
\csc \theta & = _______ \\
\sec \theta & = _______ \\
\cot \theta & = _______
\end{align*}
\]
Trigonometry

Pythagorean Identities: Verify using example 1.
\[ \sin^2 \theta + \cos^2 \theta = 1 \]
\[ \tan^2 \theta + 1 = \sec^2 \theta \]
\[ \cos^2 \theta + 1 = \csc^2 \theta \]

Even/Odd Functions
\[ \cos \theta \text{ and } \sec \theta \text{ are even functions, i.e. } \cos(-\theta) = \cos \theta \text{ and } \sec(-\theta) = \sec \theta \]
\[ \sin \theta, \tan \theta, \csc \theta, \text{ and } \cot \theta \text{ are odd functions, i.e. } \sin(-\theta) = -\sin \theta, \text{ etc.} \]

Degrees to Radian Formula
If \( \theta \) in an angle in degrees and \( r \) is an angle in radians, then
\[ \pi/180 = r/\theta \quad \theta = 180r/\pi \quad r = \pi \theta/180 \]

Example 2: Convert the following:
  
  a. 3 \( \pi/2 \) into degrees
  b. 130° into radians
  c. 270° into radians
  d. 3\( \pi/4 \) into degrees

Table 1: Using the conversion from degree to radian, fill in the column of angle in radians.

<table>
<thead>
<tr>
<th>Angle (r)</th>
<th>Angle (°)</th>
<th>sin</th>
<th>cos</th>
<th>tan</th>
<th>csc</th>
<th>sec</th>
<th>cot</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>n.d.</td>
<td>1</td>
<td>n.d.</td>
<td></td>
</tr>
<tr>
<td>30°</td>
<td>1/2</td>
<td>( \sqrt{3}/2 )</td>
<td>1/( \sqrt{3} )</td>
<td>2</td>
<td>2/( \sqrt{3} )</td>
<td>( \sqrt{3} )</td>
<td></td>
</tr>
<tr>
<td>45°</td>
<td>1/( \sqrt{2} )</td>
<td>1/( \sqrt{2} )</td>
<td>1</td>
<td>( \sqrt{2} )</td>
<td>( \sqrt{2} )</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>60°</td>
<td>( \sqrt{3}/2 )</td>
<td>1/2</td>
<td>( \sqrt{3} )</td>
<td>2/( \sqrt{3} )</td>
<td>2</td>
<td>1/( \sqrt{3} )</td>
<td></td>
</tr>
<tr>
<td>90°</td>
<td>1</td>
<td>0</td>
<td>n.d.</td>
<td>1</td>
<td>n.d.</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>