CLASS EXAMPLE

\[ \begin{align*}
\text{Mech 234-101} & \\
\text{Milano} & \\
\text{p.} 287 & \\
\text{p.} 287 & \\
\text{10/3} & \\
\end{align*} \]

\[ \begin{align*}
\text{KIPS} & = \text{Kilo Pounds} \\
& = 1000 \text{ lbf} \\
10.8 \text{ KIPS} & = 10,800 \text{ lbf}
\end{align*} \]

**Step 1** Sketch a F.B.D. with reactions. Assume dir. for these. State your sign convention.

**Step 2** Solve for reactions by applying

\[ \begin{align*}
\sum F_x & = 0 \\
\sum F_y & = 0 \\
\sum M & = 0
\end{align*} \]

**Step 3** Add assumed dir. vectors on each member for tension or compression.

**Rule of Thumb:** Lower members for this one may be compression, upper members appear "stretched" or in tension.

**Step 4** Solve for internal forces using joint method. Isolate each joint separately and apply \( \sum F_x = 0 \) and \( \sum F_y = 0 \).

\[ \begin{align*}
\delta F_x & = 0 \\
\delta F_y & = R_{AX} + R_{AY} - 10.8k - 10.8k = 0 \\
\delta M & = 0
\end{align*} \]

\[ R_{AX} = -38.4 + 10.8 + 10.8 = -16.8k \]

\[ R_{AY} = 16.8k \]

\[ \text{Dir: Opp. to assumed} \]
Now for internal forces in each member. Assume $T = C$.

Begin at any joint with least unknowns to solve.

Your choice!

\[ \begin{align*}
J_T. A & : F_{AB} ? \quad \text{(You'll need a hypotenuse for proportions, or angle for pin)} \\
& \quad \text{or } \theta = \arctan \frac{12}{22.5} = 28.07^\circ \\
& \quad \mathbf{F}_{AB} = 35.7 \text{kips C} \\
& \quad \mathbf{F}_{AB} = 31.5 \text{kips T} \\
\end{align*} \]

\[ \begin{align*}
J_T. B & : F_{AB} = 31.5 \text{kips} \\
& \quad \mathbf{F}_{AB} = 31.5 \text{kips} \\
& \quad \mathbf{F}_{BD} = 10.8 \text{kips C} \\
& \quad \mathbf{F}_{DC} = 33.3 \text{kips C} \\
\end{align*} \]
DOUBLE CHECK

\[ \Delta F_x = 0 = -F_{BC} + \frac{35}{37}(F_{DC}) \]
\[ -31.5^k + \frac{35}{37}(33.3^k) = 0 \checkmark \]
\[ \Delta F_y = 0 = -10.8^k + \frac{12}{37}(F_{DC}) \]
\[ -10.8^k + \frac{12}{37}(33.3^k) = 0 \checkmark \]

**Chart Your Results to Be Sure You Solved Every Member.**

<table>
<thead>
<tr>
<th>Member</th>
<th>Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>31.5^k T</td>
</tr>
<tr>
<td>BC</td>
<td>31.5^k T</td>
</tr>
<tr>
<td>AD</td>
<td>35.7^k C</td>
</tr>
<tr>
<td>BD</td>
<td>10.8^k C</td>
</tr>
<tr>
<td>DC</td>
<td>33.3^k C</td>
</tr>
</tbody>
</table>

**Be Sure You Identify Each Member as Tension or Compression.**

If you can solve one truss, you can solve any truss.

GM