**Figure 3.1**

**Problem 5.1**

**Calculate the mass necessary to balance the beam shown.**

\[
\text{Mass} = 400 \text{ kg}
\]

\[
\begin{align*}
4.00 \text{ m} & \quad 8.00 \text{ m} \\
\end{align*}
\]

**Theory**

For an object in static equilibrium, \( \sum M = 0 \)

Where \( M \) is the moment produced by each force about the pivot \( Q \).

**Assumption**

The mass of the beam is negligible.

**Solution**

Summing moments about \( Q \), CCW positive (let \( g = \text{accel. of gravity} \))

\[
\sum M = (\text{mass}) g (4.00 \text{ m}) - (40.0 \text{ kg} g)(8.00 \text{ m}) = 0
\]

\[
\text{Step-by-step solution}
\]

\[
\text{Mass} = \frac{(40.0 \text{ kg})(8.00 \text{ m})}{4.00 \text{ m}} = 80.0 \text{ kg}
\]

**Problem 5.4**

Solve the following equation for \( s \):

\[ s^2 + 5s + 6 = 0 \]

**Theory**

Apply quadratic formula.

\[
s = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]

Where \( as^2 + bs + c = 0 \)

**Solution**

\[
\begin{align*}
\text{s} & = \frac{-5 \pm \sqrt{5^2 - 4(1)(6)}}{2(1)} \\
& = \frac{-5 \pm \sqrt{25 - 24}}{2} \\
& = \frac{-5 \pm 1}{2} \\
& = -3, -2
\end{align*}
\]

In this example, no assumptions or diagram is needed

---