Static Equilibrium

Mechanical Engineering

The three scalar equations that solve every determinate 2D problem.

A body is in equilibrium when the force sum and the moment sum about any point are both zero.

$$\Sigma F_x = 0 \cdot \Sigma F_y = 0 \cdot \Sigma M = 0$$

Beam on two supports Determinate.	**3 unknowns, 3 equations**
Moments about a pin Fewer unknowns.	**Removes its two forces**
3D rigid body Three force, three moment.	**Six equations**

THE COMMON MISTAKE

× **Always summing moments about the origin**

✓ **Sum about the smartest point**

Moments balance about every point, so pick the one that the most unknowns pass through. Same equation, far less algebra.

Assumes a rigid body and static loading. An accelerating body needs $\Sigma F = ma$ instead.