

Determinacy & Redundancy

Mechanical Engineering

Whether statics alone can solve a structure, or whether it cannot.

If the unknown reactions match the available equilibrium equations, statics solves it. Otherwise it does not.

2D body: $r = 3$ · plane truss: $m + r = 2j$

$m = 13, j = 8, r = 3$

Plane truss.

$16 = 16$, determinate

Beam on 3 supports

Needs deflection.

Redundant once

Only two reactions

It moves.

A mechanism, not a frame

THE COMMON MISTAKE

× **Counting equations and stopping there**

✓ **Check the arrangement too**

Three parallel or three concurrent reactions satisfy the count and still leave the body free to move. Geometry can make a structure unstable.

Redundant structures are usually stiffer and safer, but solving them needs material stiffness as well as statics.