

Moments

A Level Maths · Knowledge organiser



KEY DEFINITIONS

Moment

The turning effect of a force: force $\times$ perpendicular distance from the pivot.

Equilibrium

No resultant force and no resultant moment.

Uniform rod

Its weight acts at its midpoint.

On the point of tilting

The reaction at the other support becomes zero.

KEY FORMULAS

Moments

$$\text{moment} = F \times d_{\perp};$$

$$\text{equilibrium: } \sum F = 0, \sum M = 0$$

WORKED EXAMPLE

A uniform plank AB of length 4 m and weight 200 N rests on supports at A and B. A person of weight 600 N stands 1 m from A. Find the reactions.

1. Moments about A: $4R_B = 200 \times 2 + 600 \times 1 = 1000$, so $R_B = 250$ N

2. Resolving: $R_A + R_B = 800$, so $R_A = 550$ N

Answer: $R_A = 550$ N and $R_B = 250$ N

YOU SHOULD BE ABLE TO...

- Calculate the moment of a force about a point and find the resultant moment of several forces acting on a rod or lamina.
- Solve problems with rigid bodies in equilibrium by resolving forces and taking moments about a suitable point, such as a plank on two supports.
- Find the position of the centre of mass of a non-uniform rod by taking moments, and use it to solve equilibrium problems.
- Solve problems where a rod is on the point of tilting about a support, using the fact that the reaction at the other support is zero.
- Solve ladder problems by taking moments and resolving forces, with a rough or smooth floor and wall, to find reactions and conditions for equilibrium.

COMMON MISTAKES

- ✗ Moments: wrong distances and forces missing from the diagram
- ✗ Weight of a uniform rod placed at an end
- ✗ Perpendicular distance not used
- ✗ 'about to tilt' reaction left non-zero