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P4 Turning effects of forces

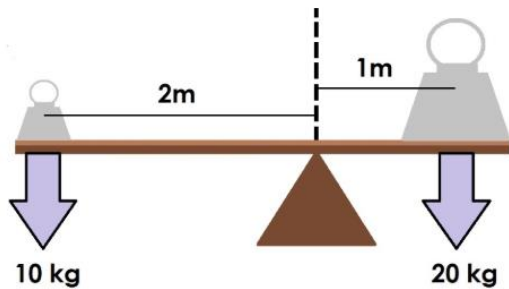
P4.02 The moment of a force



Moment: the quantity that tells us the turning effect of a force about a pivot

- Moment of a force is bigger if the force is bigger
- Moment of a force is bigger if it acts further from the pivot
- Moment of a force is greatest if it acts at 90° to the object it acts on

1. Balancing a beam



- As you push more, force bigger
- Force gets less powerful when it is exerted close to pivot
- To be balanced, the moments of the two forces must cancel each other out

2. Equilibrium

Equilibrium: when a beam is balanced

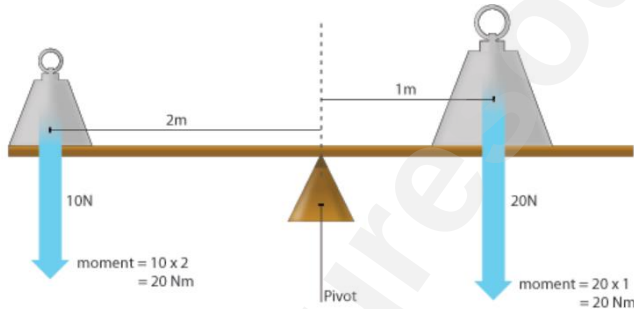
- The forces on it must be balanced (no resultant force)
- Turning effects of the forces on it must also be balanced (no resultant effect)

P4.03 Calculating moments

Moment of a force = the turning effect of a force about a point

= **force x perpendicular distance from pivot to force**

1. Balancing moments



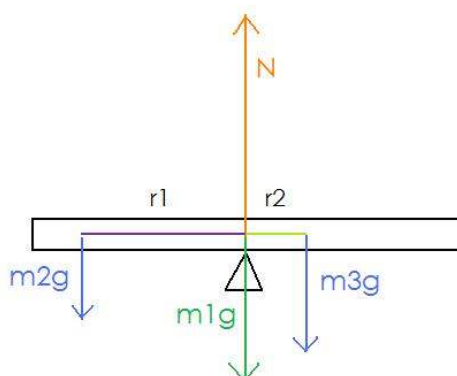
Anticlockwise force
=
Clockwise force

2. The principle of moments

Principle of moments - object is balanced when clockwise and anticlockwise moments are equal

3. In equilibrium

- There must be no resultant force
- Total clockwise moment = total anticlockwise moment



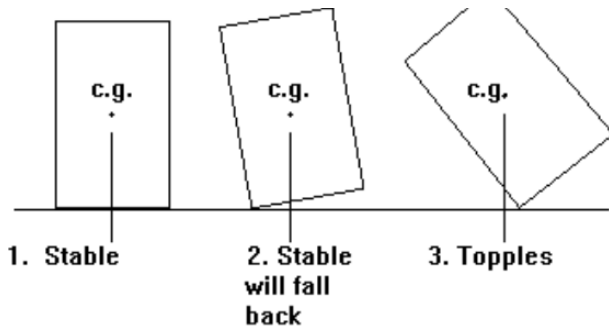
M_1g = the weight of the seesaw itself

N = contact force

Moment of N = zero; distance from pivot is 0

$N = m_2g + m_1g(\text{weight of beam}) + m_3g$

P4.04 Stability and centre of mass



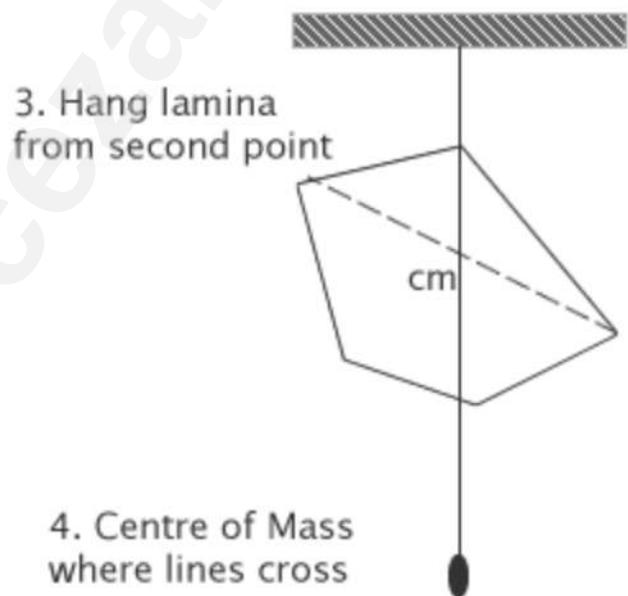
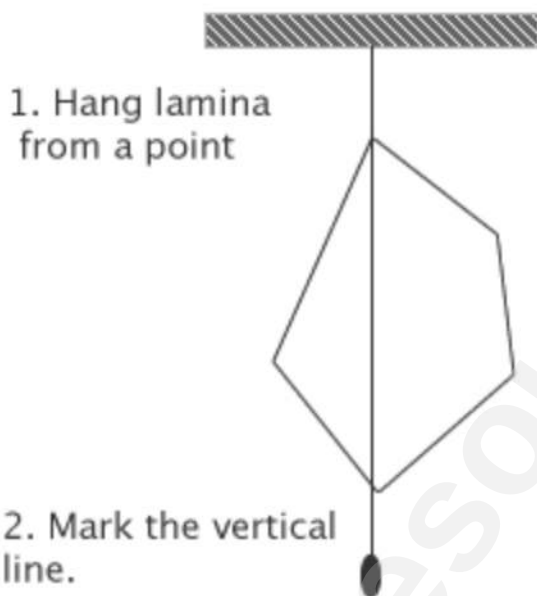
1. Weight acts downwards and contact force acts upwards - In equilibrium
2. Weight is to the left of pivot - anticlockwise moment
3. Weight acts to the right of the pivot - clockwise moment - top over

1. Centre of mass

Centre of mass: where all mass is concentrated at a point

- Symmetrical thingy - centre on axis of symmetry
- To be stable, needs to have wide base with low center

2. Finding centre of mass



- Intersect - centre of mass