

4.5) Tilting

Worked example

A uniform beam AB , of mass 54kg and length 8m , rests horizontally on supports C and D where $AC = 2\text{ m}$ and $CD = 7\text{ m}$.

When an object is placed at A , the beam is on the point of tilting about C .

Determine the mass of the object.

Your turn

A uniform beam AB , of mass 45kg and length 16m , rests horizontally on supports C and D where $AC = 5\text{ m}$ and $CD = 9\text{ m}$.

When an object is placed at A , the beam is on the point of tilting about C .

Determine the mass of the object.

27 kg

Worked example

A non-uniform rod AB , of length 5 m and weight 80 N, is suspended from a pair of light cables attached to C and D where $AC = 2$ m and $BD = 1$ m.

When a weight of 50 N is hung from A the rod is on the point of rotating.

Find the distance of the centre of mass of the rod from A .

Your turn

A non-uniform rod AB , of length 10 m and weight 40 N, is suspended from a pair of light cables attached to C and D where $AC = 3$ m and $BD = 2$ m.

When a weight of 25 N is hung from A the rod is on the point of rotating.

Find the distance of the centre of mass of the rod from A .

4.875 m

Worked example

A beam AB has length 25 m . The beam rests horizontally in equilibrium on two smooth supports at the points P and Q , where $AP = 4\text{ m}$ and $QB = 5\text{ m}$.

When an adult of mass 60 kg stands on the beam at A , the beam remains in equilibrium and is on the point of tilting about P .

When the same child stands on the beam at B , the beam remains in equilibrium and is on the point of tilting about Q .

The child is modelled as a particle and the beam is modelled as a non-uniform rod.

- Find the mass of the beam
- Find the distance of the centre of mass of the beam from A

Your turn

A beam AB has length 15 m . The beam rests horizontally in equilibrium on two smooth supports at the points P and Q , where $AP = 2\text{ m}$ and $QB = 3\text{ m}$.

When a child of mass 50 kg stands on the beam at A , the beam remains in equilibrium and is on the point of tilting about P .

When the same child stands on the beam at B , the beam remains in equilibrium and is on the point of tilting about Q .

The child is modelled as a particle and the beam is modelled as a non-uniform rod.

- Find the mass of the beam
- Find the distance of the centre of mass of the beam from A

a) 25 kg

b) 6 m