

## 4.4) Centres of mass

## Worked example

Sam and Tamsin are sitting on a non-uniform plank  $AB$  of mass 45kg and length 2m.  
The plank is pivoted at  $M$ , the midpoint of  $AB$ .  
The centre of mass of  $AB$  is at  $C$  where  $AC$  is 0.8.  
Sam has mass 70 kg.  
Tamsin has mass 50 kg and sits at  $A$ .  
Where must Sam sit for the plank to be horizontal?

## Your turn

Sam and Tamsin are sitting on a non-uniform plank  $AB$  of mass 25kg and length 4m.  
The plank is pivoted at  $M$ , the midpoint of  $AB$ .  
The centre of mass of  $AB$  is at  $C$  where  $AC$  is 1.8 m.  
Sam has mass 35 kg.  
Tamsin has mass 25 kg and sits at  $A$ .  
Where must Sam sit for the plank to be horizontal?

**3.57 m from end  $A$**

## Worked example

A non-uniform rod  $AB$  is  $6\text{ m}$  long and has weight  $40\text{ N}$ .

It is in a horizontal position resting on supports at points  $C$  and  $D$ , where  $AC = 0.5\text{ m}$  and  $AD = 5\text{ m}$ .

The magnitude of the reaction at  $C$  is four times the magnitude of the reaction at  $D$ .

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

## Your turn

A non-uniform rod  $AB$  is  $3\text{ m}$  long and has weight  $20\text{ N}$ . It is in a horizontal position resting on supports at points  $C$  and  $D$ , where  $AC = 1\text{ m}$  and  $AD = 2.5\text{ m}$ .

The magnitude of the reaction at  $C$  is three times the magnitude of the reaction at  $D$ .

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

**$1.38\text{ m}$  (3 sf)**