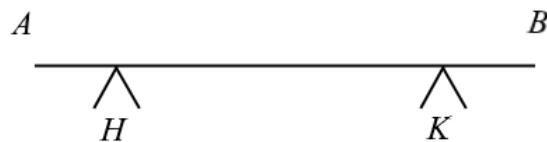


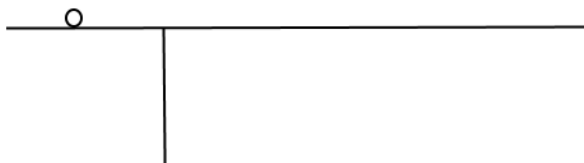
Section 1: The moment of a force

Exercise level 3 (Extension)

- A horizontal plank has two particles, of masses m_1 and m_2 , resting upon it distant respectively x and y from one end. Let P be a general point, a distance a from the same end.
 - Find an expression for the total moment of weight due to the two masses about the point P .
 - Find an expression for a that gives minimum magnitude of that moment. Show that the point P_0 of minimum moment is always between the resting points of the two masses.
- Paula and Quentin have masses 60 and 90 kg respectively. They stand on a rigid uniform plank AB , of length 6 metres and mass 20 kg, supported on two trestles H and K , as shown in the diagram. $AH = 1$ metre, and $BK = 1$ metre.



- Paula stands right at the end B and Quentin stands midway between H and K . Find the reactions at the trestles H and K .
 - Is it possible for Quentin to move slowly towards and reach trestle K while the plank remains horizontal?
 - Now the trestle at H is moved so that it is at the midpoint of the plank. Paula again stands at end B . Determine the region of the plank where Quentin can stand so that the plank may remain horizontal.
- The diagram shows a uniform plank which rests horizontally on a garden fence and maintains contact under a horizontal rail. The coefficient of friction between the plank and the top of the fence is μ_1 and between the plank and the rail is μ_2 . The plank is of length 2 metres, it projects 20 cm beyond the rail and the distance between fence and rail is 30 cm. The weight of the plank is 40 N.



- Find the horizontal force just sufficient to move the plank to the left.
- Once the plank begins to move, is the force just sufficient to continue to move it increased or decreased?