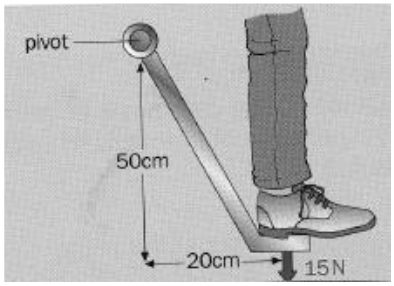
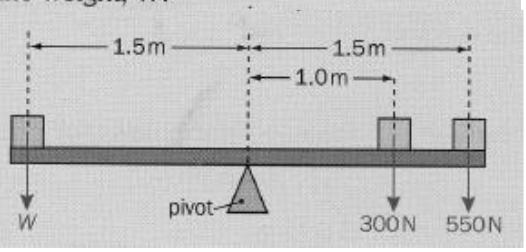
Moments - 1

1. Calculate the moment of the pushing force on the pedal in the diagram.

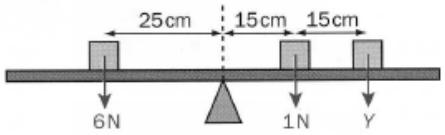


2.
(a)

The seesaw in the diagram is balanced. Use the principle of moments to calculate the weight, *W*.



(b)
The diagram shows a rule balanced at its centre of gravity. What is the missing value Y?



3.

A uniform metre rule is balanced horizontally on a knife-edge at its 350 mm mark, by placing a 3.0 N weight on the rule at its 10 mm mark.

a Sketch the arrangement and calculate the weight of the rule.

b Calculate the support force on the rule from the knife-edge.

4.

A metre rule of weight 1.0 N is pivoted on a knife-edge at its centre of mass, supporting a weight of 5.0 N and an unknown weight *W* as shown in Figure 3. To balance the rule horizontally with the unknown weight on the 250 mm mark of the rule, the position of the 5.0 N weight needs to be at the 810 mm mark.

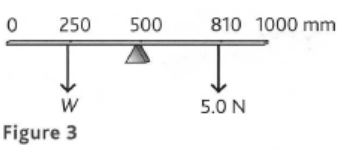


Figure 3

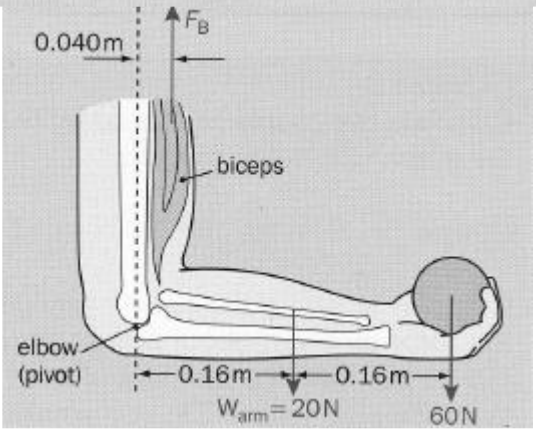
a Calculate the unknown weight.

b Calculate the support force on the rule from the knife-edge.

5.

The diagram shows the forces acting on your forearm when you hold a weight with your arm horizontal. Your elbow joint acts as a pivot:

The clockwise moments produced by the weight of your arm and the weight in your hand must be balanced by an anti-clockwise moment from your biceps muscle.
Use the principle of moments to calculate the force exerted by your biceps, F_B.



6.

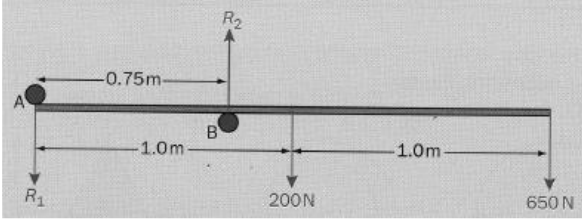
A uniform beam XY of weight 1200 N and of length 5.0 m is supported horizontally on a concrete pillar at each end. A person of weight 500 N sits on the beam at a distance of 1.5 m from end X.

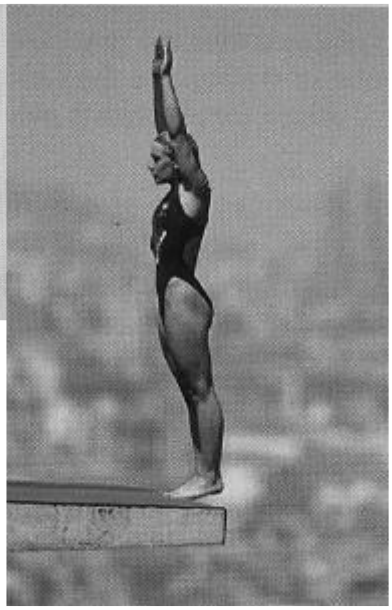
a Sketch a free body force diagram of the beam.

b Calculate the support force on the beam from each pillar.

7.

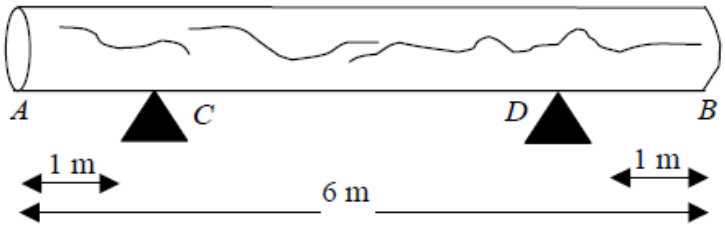
A diver weighing 650 N stands at the end of a uniform 2.0 m long diving board of weight 200 N. What are the reaction forces at the supports A and B, if the board is balanced as shown in the diagram?





8.

Figure 4



A large log AB is 6 m long. It rests in a horizontal position on two smooth supports C and D, where $AC = 1$ m and $BD = 1$ m, as shown in Figure 4. David needs an estimate of the weight of the log, but the log is too heavy to lift off both supports. When David applies a force of magnitude 1500 N vertically upwards to the log at A, the log is about to tilt about D.

(a) State the value of the reaction on the log at C for this case.

Assuming the log as a uniform rod,

(b) estimate the weight of the log.