

Answer on Question #70226, Physics / Mechanics | Relativity |

Question

Two workers are moving a 20kg,10m scaffolding pole. One stands at the end, the other stands 2.0m from the other end. Calculate the force exerted by the worker standing at the end in holding the pole.

Solution

$$\begin{aligned}M &= 20kg \\L &= 10m \\l &= 2m \\g &= 10ms^{-2} \\F_1 &=?\end{aligned}$$

The pole is in equilibrium. That is why the **two conditions** for the equilibrium of a rigid body have to be satisfied.

First condition: the vector sum of forces on the body must be zero.

In our case it means that

$$F_1 + F_2 = Mg, \tag{1}$$

where F_1, F_2 beinf the forces exerted by the each worker.

Second condition: the vector sum of torques on the body must be zero.

Writing this condition for a center of mass point we have:

$$F_1 \frac{L}{2} = F_2 \left(\frac{L}{2} - l \right), \tag{2}$$

Solving equations (1) and (2) we find

$$F_1 = 75N$$

Answer: $F_1 = 75N$

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