Question 1: Consider two vectors $\vec{\mathbf{r}}_{P,F} = x\hat{\mathbf{i}}$ with x > 0 and $\vec{\mathbf{F}} = F_x\hat{\mathbf{i}} + F_z\hat{\mathbf{k}}$ with $F_X > 0$ and $F_Z > 0$. The cross product $\vec{\mathbf{r}}_{P,F} \times \vec{\mathbf{F}}$ points in the

1) + x-direction

2) -x-direction

3) +y-direction

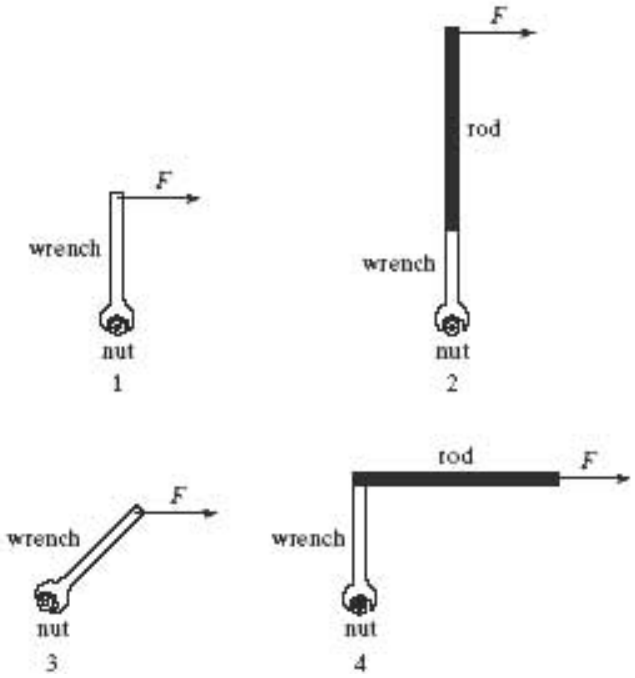
4) -y-direction

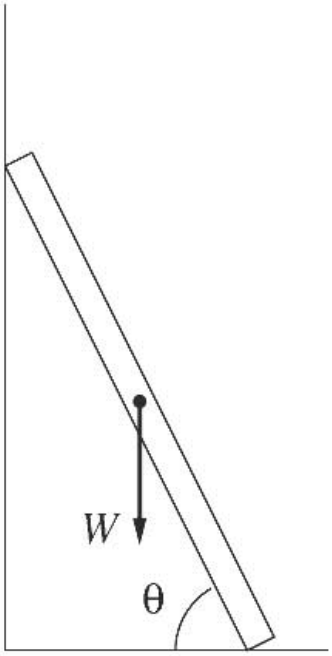
5) +z-direction

6) -z-direction

7) None of the above directions

You are using a wrench and trying to loosen a rusty nut. Which of the arrangements shown is most effective in loosening the nut? List in order of descending efficiency the following arrangements:





A uniform ladder (one whose center of mass is at its geometrical center) of weight W leans against a wall at an angle $\theta \approx 60°$ up from the ground. The coefficient of friction between the ladder and the ground is μ_G and between the ladder and the wall is μ_W. The magnitudes of these two coefficients are about equal.

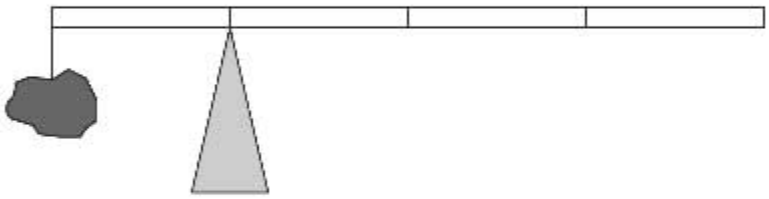
In order to keep the ladder from slipping:

1. μ_G is less important than μ_W
2. μ_W is less important than μ_G
3. μ_G and μ_W are about equally important
4. not enough information is given to answer the question.

You are trying to open a door that is stuck by pulling on the doorknob in a direction perpendicular to the door. If you instead tie a rope to the doorknob and then pull with the same force, is the torque you exert increased?

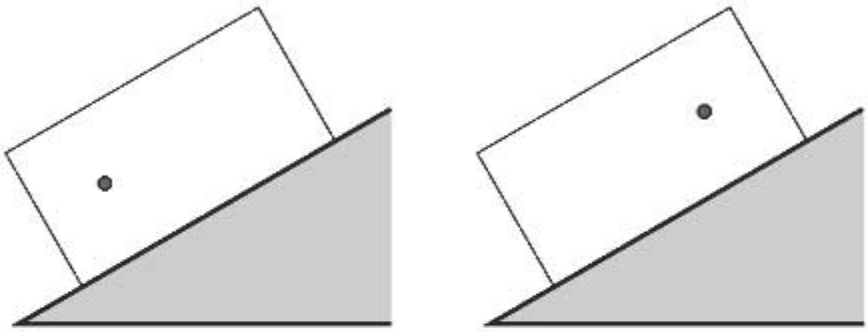
1. yes
2. no

A 1-kg rock is suspended by a massless string from one end of a 1-m measuring stick. What is the weight of the measuring stick if it is balanced by a support force at the 0.25-m mark?



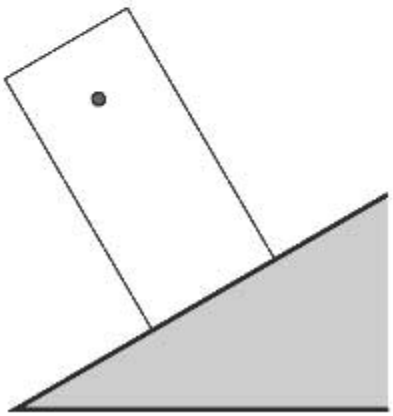
1. 0.25 kg
2. 0.5 kg
3. 1 kg
4. 2 kg
5. 4 kg
6. impossible to determine

A box, with its center-of-mass off-center as indicated by the dot, is placed on an inclined plane. In which of the four orientations shown, if any, does the box tip over?

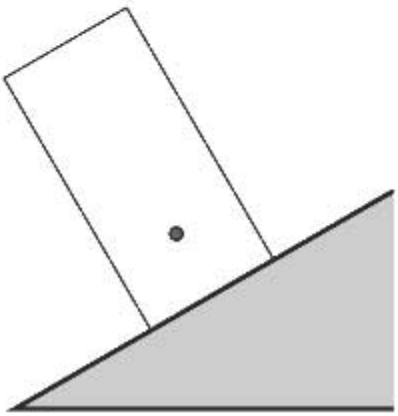


A

B

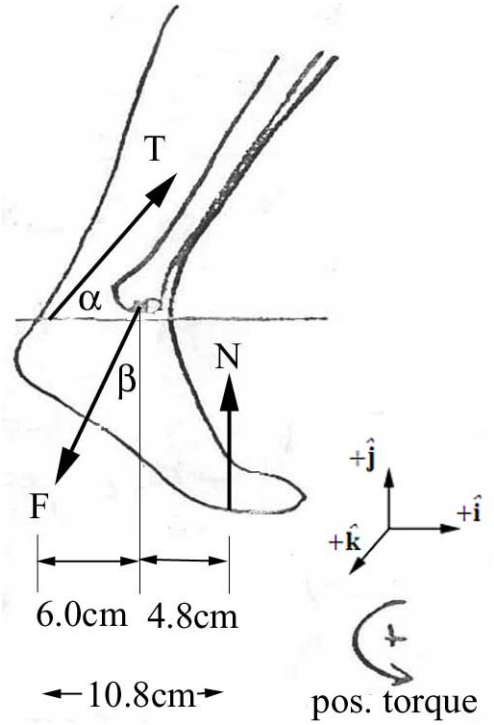


C



D

Concept Questions October 10, 2003



You would like to compute the magnitude of the tension of the Achilles tendon. About which point should you calculate the torque?

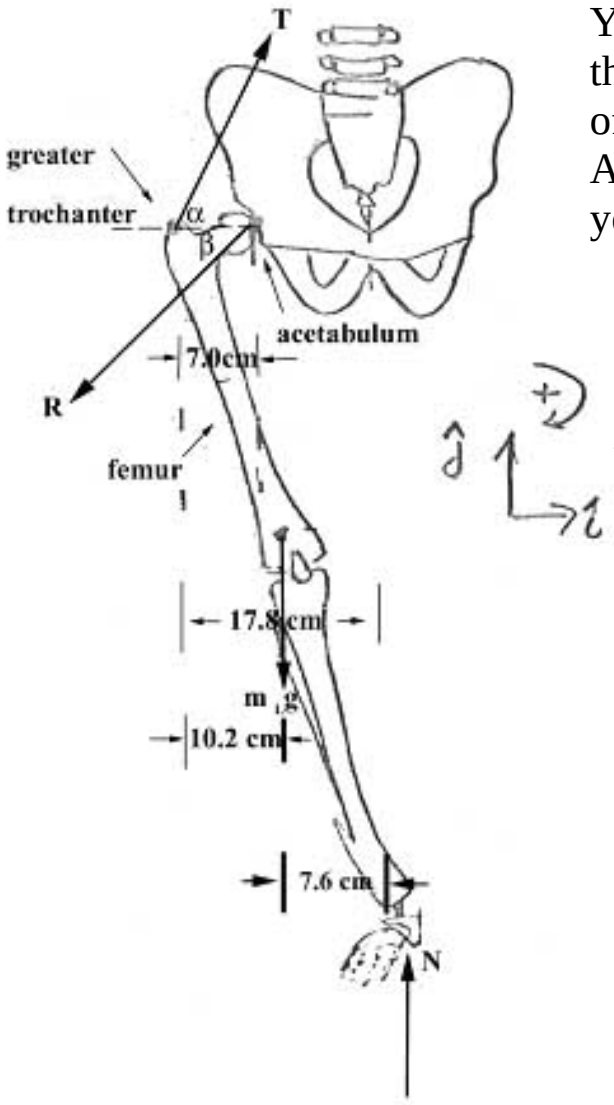
a) the center of mass of the ankle

b) The contact point with the ground

c) The point where the tibia bone acts on the ankle

d) The point where the tendon acts

e) None of the above



You would like to compute the magnitude of the tension of the hip abductor muscles. About which point should you calculate the torque?

a) the center of mass of the leg

b) The contact point with the ground

c) The point of contact between the acetabulum and the femur

d) The point where the hip abductor muscles acts

e) None of the above