Science Virtual Learning

MPI Physics 210

Rotational Dynamics 5 - Equilibrium 4: Homework for Mastery

April 24, 2020

Lesson: MPI Equilibrium 4 – Homework for Mastery
April 24, 2020

Objective: To practice calculating forces and torques on objects in equilibrium

Homework for Mastery

- There is no lesson this time, only 3 homework problems from the C Section Physics book, Chapter 12.
- Try the problems yourself, then watch the solution video for each.

Homework 1

6. A uniform beam of length 7.60 m and weight 4.50×10^2 N is carried by two workers, Sam and Joe, as shown in Figure P12.6. Determine the force that each person exerts on the beam.

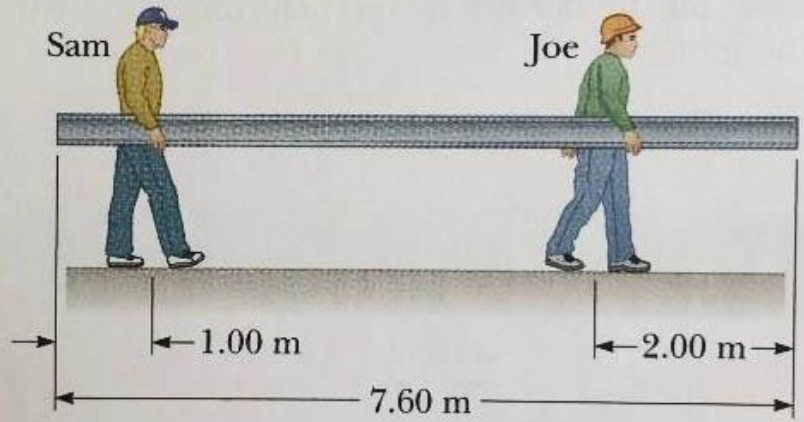

Figure P12.6

- Try to solve the problem yourself, then watch the solution video:
- https://youtu.be/-YERSfewcAA

Homework 2

- Try to solve the problem yourself, then watch the solution video:
- https://youtu.be/oWX2bHil8ec

11. Sir Lost-a-Lot dons his armor and sets out from the castle on his trusty steed (Fig. P12.11). Usually, the drawbridge is lowered to a horizontal position so that the end of the bridge rests on the stone ledge. Unfortunately, Lost-a-Lot's squire didn't lower the drawbridge far enough and stopped it at $\theta = 20.0°$ above the horizontal. The knight and his horse stop when their combined center of mass is $d = 1.00$ m from the end of the bridge. The uniform bridge is $\ell = 8.00$ m long and has mass 2 000 kg. The lift cable is attached to the bridge 5.00 m from the hinge at the castle end and to a point on the castle wall $h = 12.0$ m above the bridge. Lost-a-Lot's mass combined with his armor and steed is 1 000 kg. Determine (a) the tension in the cable and (b) the horizontal and (c) the vertical force components acting on the bridge at the hinge.

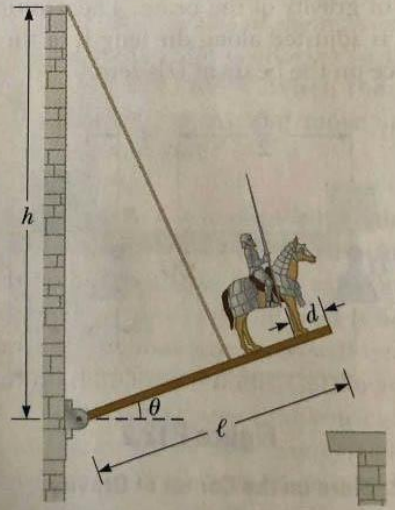

Figure P12.11 Problems 11 and 12.

Homework 3

- Try to solve the problem yourself, then watch the solution video:
- https://youtu.be/8K71DEJ8C1g
- That's it!

14. Q|C A 10.0-kg monkey climbs a uniform ladder with weight 1.20×10^2 N and length $L = 3.00$ m as shown in Figure P12.14. The ladder rests against the wall and makes an angle of $\theta = 60.0°$ with the ground. The upper and lower ends of the ladder rest on frictionless surfaces. The lower end is connected to the wall by a horizontal rope that is frayed and can support a maximum tension of only 80.0 N. (a) Draw a force diagram for the ladder. (b) Find the normal force exerted on the bottom of the ladder. (c) Find the tension in the rope when the monkey is two-thirds of the way up the ladder. (d) Find the maximum distance d that the monkey can climb up the ladder before the rope breaks. (e) If the horizontal surface were rough and the rope were removed, how would your analysis of the problem change? What other information would you need to answer parts (c) and (d)?

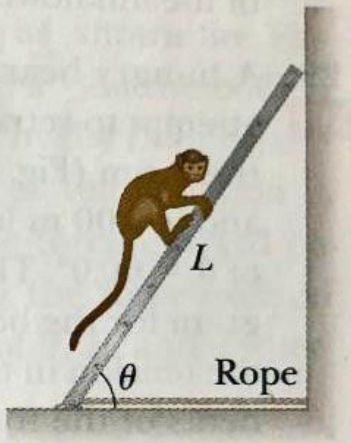

Figure P12.14