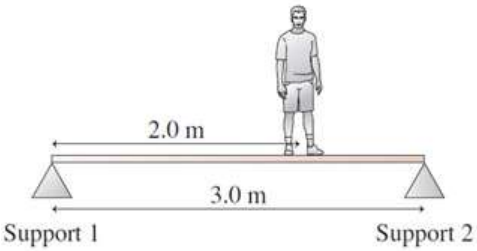
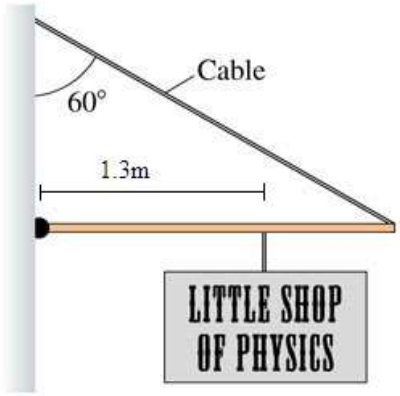
## Sample Test: Chapters 9-11 Test

There are no additional sample tests for parts 1-3 of the exam: review the original sample tests and the actual tests corresponding to those sections. The following is a sample test for part 4 of the final. As usual, the actual test can and will contain material that is not in this sample test.

1. The 3.0-m-long, 100 kg rigid beam in the figure to the right is supported at each end. An 74kg student stands 2.0 m from support 1. Find the magnitudes of the forces exerted by each support.




2. A commercially dubious physics-themed shop is opened in a trendy part of town. A 20 kg sign is suspended from a uniform 10 kg, 2 m long pole, as shown. A cable is attached to the end of the pole to hold the whole thing up.
    a. What is the tension in the cable?
    b. What are the x and y components of the force exerted by the wall on the pole?



3. A record, with radius 15 cm and mass 0.10 kg has been rotating at 33 RPM. (Treat the record as a uniform solid disc. The moment of inertia of a solid disc of mass M and radius R about its central axis is $I = \frac{1}{2}MR^2$). On top of the record, a 0.020 kg mouse sits on the edge (also rotating at 33 RPM). The record player is turned off, so the record can spin freely with negligible friction. The mouse proceeds to walk to the middle of the record. At what rate (in RPM) is the record spinning when he mouse reaches the center of the record?

4. A record (with no mouse this time) is rotating freely in the counterclockwise direction as shown.
    a. What is the direction of the angular momentum vector?
    b. A 3 N force is applied 8 cm from the center of the record at the angle shown. What is the magnitude and direction of the torque vector?