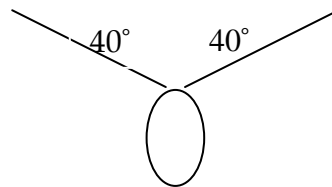


## Chapter 4 Take-Home Test

Show all work with units and make sketches. Watch significant digits and include units with all answers.

1. A 6.0-kg object undergoes an acceleration of  $2.0 \text{ m/s}^2$ . (a) What is the magnitude of the resultant force acting on it? (b) If this same force is applied to a 4.0-kg object, what acceleration is produced?

2. Find the tension in the two wires that support the 100.0-N light fixture. Each wire makes a  $40.0^\circ$  angle from the ceiling.



3. Two mules are pulling a barge up a canal to the east. Each exerts a force of 600.0 N directed at a  $30.0^\circ$  angle relative to the forward motion of the barge. If the barge moves with constant velocity, find the resistive force,  $\mathbf{F}$ , exerted on the boat by the water.
4. A dockworker loading crates on a ship finds that a 20.0-kg crate, initially at rest on a horizontal surface, requires a 75-N horizontal force to set it in motion. However, after the crate is in motion, a horizontal force of 60.0 N is required to keep it moving with a constant speed. Find the coefficients of static and kinetic friction between crate and floor. (10)

5. A television commercial for a pickup, the Chevy Silverado HD2500, shows the power of the truck when it pulls a backhoe horizontally out of a quagmire (that's a muddy area). The specifications for the truck, as published by the manufacturer, state that it has a maximum towing capacity (pulling force) of  $1.20 \times 10^4$  lbs. A backhoe, similar to that shown in the commercial, is the Tata-Hitachi EX100, which, according to the manufacturer, has a mass of  $1.10 \times 10^3$  kg. Note:  $1 \text{ lb} = 4.448 \text{ N}$ .



- a. Draw a free-body diagram labeling the forces acting on the backhoe, including friction.
- b. If the coefficient of friction between the treads on the backhoe and the mud is 0.360, what is the acceleration of the backhoe during the pull (assuming the truck pulls with maximum force)?
- c. In the next scene the truck is shown pulling the backhoe up an incline of about  $12.5^\circ$ . Redraw your free-body diagram and find the new acceleration of the backhoe.
6. On a separate sheet of paper sketch the crane and hanging weight set-ups in the room. Calculate the unknown mass.