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Problem set 4

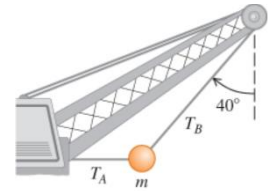
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▪ Mass and weight

After an annual checkup, Duffy leaves his vet's office, where he weighed 256 N. Duffy then gets into an elevator that, conveniently, has a scale. Find the magnitude and direction of the elevator's acceleration if the scale reads (a) 290 N and (b) 222 N.

▪ Using Newton's First Law: Particles in Equilibrium

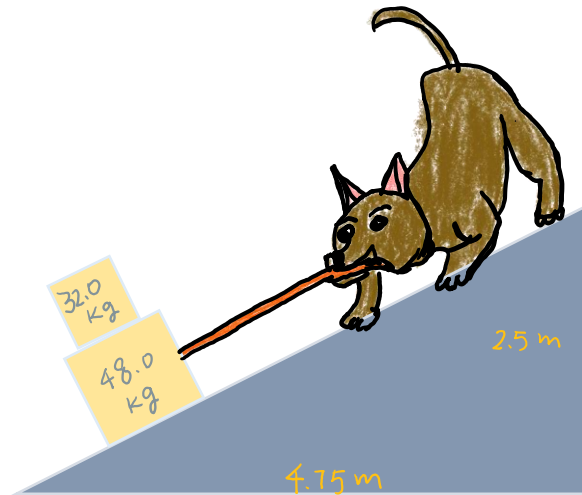
A large wrecking ball is held in place by two light steel cables. If the mass of the wrecking ball is 3620 kg, what are (a) the tension  $T_B$  in the cable that makes an angle of  $40^\circ$  with the vertical and (b) the tension  $T_A$  in the horizontal cable?



▪ Friction Forces

1. Duffy is lowering two boxes, one on top of the other, down a ramp by pulling on a rope parallel to the surface of the ramp. Both boxes move together at a constant speed of 15.0 cm/s. The coefficient of kinetic friction between the ramp and the lower box is 0.444, and the coefficient of static friction between the two boxes is 0.800.

- What force does Duffy need to exert to accomplish this?
- What are the magnitude and direction of the friction force on the upper box?



2. A 6.00-kg box sits on a ramp that is inclined at  $37.0^\circ$  above the horizontal. The coefficient of kinetic friction between the box and the ramp is  $\mu_k = 0.30$ . What horizontal force is required to move the box up the incline with a constant acceleration of  $3.60 \text{ m/s}^2$ ?