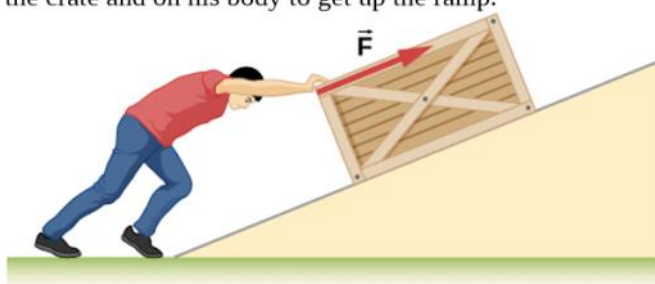


## HW\_6\_Work\_and\_Kinetic\_Energy\_Ch\_7

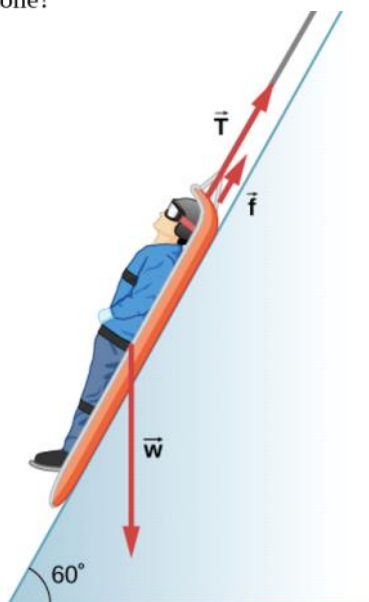
**Problems: 23, 27, 0, 41, 47, 51, 60, 61, 66, 68, 71, 79, 80, Total = 13**

23. How much work does a supermarket checkout attendant do on a can of soup he pushes 0.600 m horizontally with a force of 5.00 N?

27. Calculate the work done by an 85.0-kg man who pushes a crate 4.00 m up along a ramp that makes an angle of  $20.0^\circ$  with the horizontal (see below). He exerts a force of 500 N on the crate parallel to the ramp and moves at a constant speed. Be certain to include the work he does on the crate and on his body to get up the ramp.



30. Suppose the ski patrol lowers a rescue sled and victim, having a total mass of 90.0 kg, down a  $60.0^\circ$  slope at constant speed, as shown below. The coefficient of friction between the sled and the snow is 0.100. (a) How much work is done by friction as the sled moves 30.0 m along the hill? (b) How much work is done by the rope on the sled in this distance? (c) What is the work done by the gravitational force on the sled? (d) What is the total work done?



41. Engineers desire to model the magnitude of the elastic force of a bungee cord using the equation

$$F(x) = a \left[ \frac{x + 9 \text{ m}}{9 \text{ m}} - \left( \frac{9 \text{ m}}{x + 9 \text{ m}} \right)^2 \right],$$

where  $x$  is the stretch of the cord along its length and  $a$  is a constant. If it takes 22.0 kJ of work to stretch the cord by 16.7 m, determine the value of the constant  $a$ .

47. Calculate the kinetic energies of (a) a 2000.0-kg automobile moving at 100.0 km/h; (b) an 80.-kg runner sprinting at 10. m/s; and (c) a  $9.1 \times 10^{-31}$ -kg electron moving at  $2.0 \times 10^7$  m/s.

51. A car's bumper is designed to withstand a 4.0-km/h (1.1-m/s) collision with an immovable object without damage to the body of the car. The bumper cushions the shock by absorbing the force over a distance. Calculate the magnitude of the average force on a bumper that collapses 0.200 m while bringing a 900-kg car to rest from an initial speed of 1.1 m/s.

60. A 2.0-kg block starts with a speed of 10 m/s at the bottom of a plane inclined at  $37^\circ$  to the horizontal. The coefficient of sliding friction between the block and plane is  $\mu_k = 0.30$ . (a) Use the work-energy principle to determine how far the block slides along the plane before momentarily coming to rest. (b) After stopping, the block slides back down the plane. What is its speed when it reaches the bottom? (Hint: For the round trip, only the force of friction does work on the block.)

61. When a 3.0-kg block is pushed against a massless spring of force constant constant  $4.5 \times 10^3$  N/m, the spring is compressed 8.0 cm. The block is released, and it slides 2.0 m (from the point at which it is released) across a horizontal surface before friction stops it. What is the coefficient of kinetic friction between the block and the surface?

66. A sled starts from rest at the top of a snow-covered incline that makes a  $22^\circ$  angle with the horizontal. After sliding 75 m down the slope, its speed is 14 m/s. Use the



- 66.** A sled starts from rest at the top of a snow-covered incline that makes a  $22^\circ$  angle with the horizontal. After sliding 75 m down the slope, its speed is 14 m/s. Use the work-energy theorem to calculate the coefficient of kinetic friction between the runners of the sled and the snowy surface.
- 68.** What is the cost of operating a 3.00-W electric clock for a year if the cost of electricity is \$0.0900 per  $\text{kW} \cdot \text{h}$ ?
- 71.** (a) What is the average useful power output of a person who does  $6.00 \times 10^6 \text{ J}$  of useful work in 8.00 h?  
(b) Working at this rate, how long will it take this person to lift 2000 kg of bricks 1.50 m to a platform? (Work done to lift his body can be omitted because it is not considered useful output here.)
- 79.** An electron in a television tube is accelerated uniformly from rest to a speed of  $8.4 \times 10^7 \text{ m/s}$  over a distance of 2.5 cm. What is the power delivered to the electron at the instant that its displacement is 1.0 cm?
- 80.** Coal is lifted out of a mine a vertical distance of 50 m by an engine that supplies 500 W to a conveyer belt. How much coal per minute can be brought to the surface? Ignore the effects of friction.