

CHAPTER 6

1. A tow rope is used to pull a 1750-kg car, giving it an acceleration of 1.35 m/s^2 . What force does the rope exert?
2. A racing car undergoes a uniform acceleration of 4.00 m/s^2 . If the net force causing the acceleration is $3.00 \times 10^3 \text{ N}$, what is the mass of the car?
3. A 5.2-kg bowling ball is accelerated from rest to a velocity of 12 m/s as the bowler covers 5.0 m of approach before releasing the ball. What force is exerted on the ball during this time?
4. A high jumper, falling at 4.0 m/s , lands on a foam pit and comes to rest, compressing the pit 0.40 m. If the pit is able to exert an average force of 1200 N on the high jumper in breaking the fall, what is the jumper's mass?
5. On Planet X, a 50-kg barbell can be lifted by exerting a force of only 180 N.
 - a. What is the acceleration of gravity on Planet X?
 - b. If the same barbell is lifted on Earth what minimal force is needed?
6. A proton has a mass of $1.672 \times 10^{-27} \text{ kg}$. What is its weight?
7. A force of 20 N accelerates a 9.0-kg wagon at 2.0 m/s^2 along the sidewalk.
 - a. How large is the frictional force?
 - b. What is the coefficient of friction?
8. A 2.0-kg brick has a sliding coefficient of friction of 0.38. What force must be applied to the brick for it to move at a constant velocity?
9. In bench pressing 100 kg, a weight lifter applies a force of 1040 N. How large is the upward acceleration of the weights during the lift?
10. An elevator that weighs $3.0 \times 10^3 \text{ N}$ is accelerated upward at 1.0 m/s^2 . What force does the cable exert to give it this acceleration?
11. A person weighing 490 N stands on a scale in an elevator.
 - a. What does the scale read when the elevator is at rest?
 - b. What is the reading on the scale when the elevator rises at a constant velocity?
 - c. The elevator slows down at -2.2 m/s^2 as it reaches the desired floor. What does the scale read?
 - d. The elevator descends, accelerating at -2.7 m/s^2 . What does the scale read?
 - e. What does the scale read when the elevator descends at a constant velocity?
 - f. Suppose the cable snapped and the elevator fell freely. What would the scale read?
12. A pendulum has a length of 1.00 m.
 - a. What is its period on Earth?
 - b. What is its period on the moon where the acceleration due to gravity is 1.67 m/s^2 ?
13. The period of an object oscillating on a spring is
$$T = 2\pi \sqrt{\frac{m}{k}}$$
where m is the mass of the object and k is the spring constant, which indicates the force necessary to produce a unit elongation of the spring. The period of a simple pendulum is
$$T = 2\pi \sqrt{\frac{l}{|g|}}$$
 - a. What mass will produce a 1.0-s period of oscillation if it is attached to a spring with a spring constant of 4.0 N/m ?
 - b. What length pendulum will produce a period of 1.0 s?
 - c. How would the harmonic oscillator and the pendulum have to be modified in order to produce 1.0-s periods on the surface of the moon where g is 1.6 m/s^2 ?
14. When a 20-kg child steps off a 3.0-kg stationary skateboard with an acceleration of 0.50 m/s^2 , with what

acceleration will the skateboard travel in the opposite direction?

- 15.** A 10.0-kg mass, m_1 , on a frictionless table is accelerated by a 5.0-kg mass, m_2 , hanging over the edge of the table. What is the acceleration of the mass along the table?
- 16.** A brick layer applies a force of 100 N to each of two handles of a wheelbarrow. Its mass is 20 kg and it is loaded with 30 bricks, each of mass 1.5 kg. The handles of the wheelbarrow are 30° from the horizontal, and the coefficient of friction is 0.20. What initial acceleration is given the wheelbarrow?