QUESTIONS: GROUP A

1. Explain whether *work*, in the physics sense, is being done on a suitcase when you (a) pick it up from the floor, (b) carry it at a steady speed on a level street to the bus stop, (c) hold it above the ground while you wait for the bus, and (d) board the bus with the suitcase.

2. What represents the work done when a graph of force versus displacement is constructed?

3. What are three ways to determine the work that is done when a force-versus-displacement graph is not a straight line?

4. If you were to use a machine to increase the produced force, what factor would have to be sacrificed? Give an example.

5. (a) In calculating the work done in rotary motion, what is the expression that takes the place of Δd? (b) What is the equation used in finding the amount of rotary work?

6. For an object moving at a constant speed, list the two expressions for determining the object's power.

GROUP B

7. (a) Using Figure 6-3, determine the average force needed to stretch the spring a distance of 4.0 m. (b) How much work is done in stretching the spring 4.0 m?

8. Use the graph of force versus displacement shown in Figure 6-3 to derive an equation for the work done by the spring.

9. If a machine cannot multiply the amount of work, what is the advantage of using such a machine?

10. A heavy football player climbs a flight of stairs. Halfway up the stairs, a member of the girls' track team rushes past him. Is it possible for both to develop the same amount of power in climbing up the stairs?

11. Find the horsepower rating on a lawn mower or an electric tool. Convert this amount to units of kilowatts.

PROBLEMS: GROUP A

1. A weight lifter heaves a 200.0-kg barbell from the floor to a position directly over his head. If the distance from the floor to his extended arms is 2.50 m, how much work has the weight lifter done?

2. (a) How much work is done in lifting a 750-kg piano vertically 3.0 m to a large set of doors? (b) How much work would be done if the piano was pushed up a frictionless inclined plane to the same set of doors? (c) If the inclined plane was 5.0 m long, how much force would have been needed?

3. How much work is done in pushing a 45.5-kg wooden trunk a distance of 9.75 m across the floor if the coefficient of friction is 0.250?

4. Calculate the work done when a sled is pulled 20.0 m by a force of 105 N exerted on a rope that makes an angle of 50.0° with the horizontal.

5. A pulley system is used to lift the piano mentioned in Problem 2. If a force of 2.0×10^3 N is applied to the piano, and as a result the rope is pulled in 14 m, what is the efficiency of the machine?

6. How much power does a 63.0-kg athlete develop as he climbs a 5.20-m rope in 3.50 s?

7. A 45.0-kg cyclist exerts her full weight on the pedal with each stroke. How much work is done during 100.0 revolutions of the pedals as they turn in a 30.0-cm radius?

8. What is the power rating in kilowatts of a 1.20×10^3-kg elevator that moves

3.50 m from one floor to the one above it in 4.30 s?

9. A 23.0-cm screwdriver is to be used to pry open a can of paint. If the fulcrum is 2.00 cm from the end of the blade and a force of 84.3 N is exerted at the end of the handle, what force is applied to the lid?

10. A pulley system has an efficiency of 87.5%. How much of the rope must be pulled in if a force of 648 N is needed to lift a 105-kg desk 2.46 m?

11. A 175-N bucket of water is to be lifted from the bottom to the top of a 7.30-m well. If a force of 42.0 N is applied at the end of the 36.3-cm handle, how many times must the handle be turned to accomplish this?

12. A 0.50-kW motor moves a lawn tractor at a constant 1.2 m/s. What force is being applied to the tractor?

GROUP B

13. A force of 25.0 N is applied to a 4.50-kg object that is initially at rest. (a) How much work is done during the first 3.00 s of its motion? (b) How much power is developed during this same period of time?

14. A 65-kg crate is pushed at a constant speed up a 3.6-m plane inclined at 24° above the horizontal. If the coefficient of friction is 0.17, how much work is done?

15. A 175-kg flywheel is a uniform disk 1.80 m in diameter. (a) How much work is required to bring it from rest to 94.0 rev/min in 2.00 min? (b) What is the machine's power rating in kilowatts?

16. An elevator motor is rated at 25.0 kW. At what speed could the motor lift an 850.0-kg elevator with three passengers whose masses are 24.3 kg, 45.0 kg, and 64.0 kg?

17. What power must the engine of a 1680-kg car develop to move at a constant speed of 24.5 m/s up a 15° incline if the coefficient of friction between the tires and road is 0.090 0?

18. A 35.4-kg box falls off a truck moving at 40.0 km/h. The box slides to a stop after a distance of 17.5 m. Calculate (a) the force of friction on the box, (b) the work done in stopping it, and (c) the coefficient of friction between the box and pavement.

19. How much work is done in pushing an 85.4-kg grocery cart 2.05×10^2 m if a force is applied at a 40° angle to the horizontal and the coefficient of friction between the wheels and the floor is 0.025 0?