Problems

7.2 Work, the Transfer of Energy

12. A toddler pushes a chair at a constant speed with a force of 25.0 N for a distance of 2.5 m. How much work is the child doing on the chair?

13. A businesswoman is applying a force of 12.0 N [upwards] to carry her briefcase for a horizontal distance of 200.0 m. How much work is she doing on the briefcase?

14. Some physicists with nothing better to do measured the force that teachers were applying to a rope during a staff-student tug of war. The force that was applied by the teachers was 6000 N. How much work did they do on the other team during the two minutes in which they did not move at all?

15. 4050 J of work was done on a pile of snow to move it 3.4 m. What force must have been applied by the snow plow to do this work?

16. How far is an arrow drawn horizontally in a bow if 1020 J of work was done on it by an average applied force of 2525 N?

17. The toddler in Problem 12 still applies the same 25.0 N force to the chair over a distance of 2.5 m, but this time the chair is being pushed across a smooth floor against a force of friction (resistance of 10.0 N). How much work is being done now?

18. A father is pulling his two girls in their toboggan with a force of 500 N for a distance of 22 m. Calculate the work that would be done by the father in each of the following cases.
    a) The snow provides no friction.
    b) One of the children drags her hands in the snow, producing a frictional force of 500 N.
    c) What visible difference would you see in the motion between a) and b)?

19. How much work is done on a 750 kg load of bricks by a bricklayer if he carried the bricks upward to a height of 8.2 m to repair a chimney?

20. If the bricklayer in Problem 19 decided to use a motor-driven rope lift that can do 2000 J of work, what mass of bricks could be lifted to the 8.2 m height?

21. A woman pushes a shopping cart with a force of 75 N at a constant speed of 0.75 m/s for an hour around a grocery store. How much work does she do on the cart?

22. The school caretaker is applying a 200 N force 45° to the horizontal to push a lawn mower a horizontal distance of 20.0 m, as shown in Fig. 7.24. How much work does he do on the lawn mower, assuming no friction?

Fig. 7.24