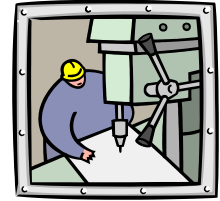


## Work

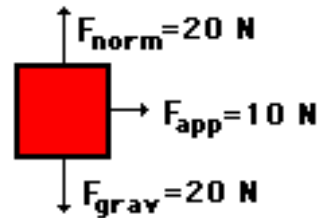
### Work done by a force (no angle).



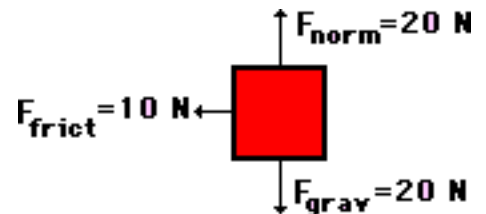
1. How much work is done when you push against a wall with 50 N of force perpendicular to the wall. Assume like most walls, it won't move when you push on it?

2. A 1200 N force is applied parallel to a horizontal surface. It pushes an 80 kg box 2 m across the surface. What work is done?

3. A 10-N force is applied to push a block across a friction free surface for a displacement of 5.0 m to the right. Which forces do work on the box? Calculate the work each force does on the box.

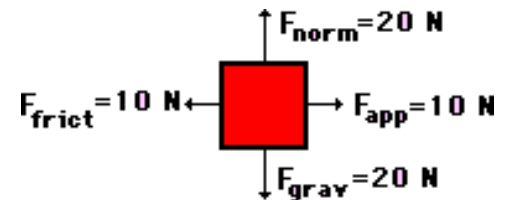


4. A 10-N frictional force slows a moving block to a stop after a displacement of 5.0 m to the right. Which forces do work on the box? Calculate the work each force does on the box.



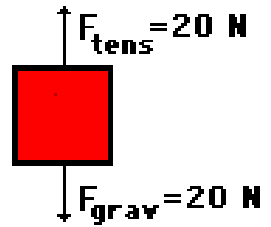
5. A 10-N force is applied to push a block across a frictional surface at constant speed for a displacement of 5.0 m to the right.

- a) Which forces do work on the box?
- b) Calculate the work done on the box by each force.



c) What is the net work,  $W_{net}$ , on the box?

6. A 2-kg object is sliding at constant speed across a friction free surface for a displacement of 5 m to the right.  
Which forces do work on the box?  
Calculate the work each force does on the box.



7. A force of 825 N is needed to push a car across a lot. Two students push the car 35 m.
- How much work is done?
  - After a rainstorm, the force needed to push the car doubled because the ground became soft. By what amount does the work done by the students change?
8. A 2-kg object is pulled upward at constant speed by a 20-N force for a vertical displacement of 5 m. Which forces do work on the box? Calculate the work each force does on the box.
9. A delivery clerk carries a 35-N package from the ground to the fifth floor of an office building, a total height of 15 m. How much work is done by the clerk?
10. What work is done by a forklift raising a 583-kg box 1.2 m?
11. You and a friend each carry identical boxes to a room one floor above you and down the hall. You choose to carry it first up the stairs, then down the hall. Your friend carries it down the hall, then up another stairwell. Who does more work?

12. A student lifts a box of books that weighs 185 N. The box is lifted 0.800 m. How much work does the student do?
13. How much work does the force of gravity do when a 25-N object falls a distance of 3.5 m?
14. An airplane passenger carries a 215-N suitcase up stairs, a displacement of 4.20 m.
- a) How much work does the passenger do?
- b) The same passenger carries the same suitcase back down the same stairs. How much work does the passenger do now?
15. Renatta Gass is out with her friends. Misfortune occurs and Renatta and her friends find themselves getting a *workout*. They apply a cumulative force of 1080 N to push the car 218 m to the nearest fuel station. Determine the work done on the car.
16. Lamar Gant, U.S. powerlifting star, became the first man to deadlift five times his own body weight in 1985. Deadlifting involves raising a loaded barbell from the floor to a position above the head with outstretched arms. Determine the work done by Lamar in deadlifting 300 kg to a height of 0.90 m above the ground.
17. During the Powerhouse lab, Jerome runs up the stairs, elevating his 102 kg body a vertical distance of 2.29 meters in a time of 1.32 seconds at a constant speed. Determine the work done by Jerome in climbing the stair case.
18. A 60,000 kg jet exerts a force of 1,000,000 N over a distance of 70 m. How much work is done by the jet?

19. A runner exerts 2,000 J of work while traveling 10 m along a horizontal stretch of track. How much force did the runner exert?
20. In order to insert a nerf dart into a toy gun, 50 J of energy needed to be exerted. If the dart was inserted 6 cm, then how much force was required to install the nerf dart?
21. A bicyclist exerted 30,000 J of work while traveling with a force of 10,000 N. How much distance was covered by the bicyclist?
22. A 1200 kg car is pushed by 3 people. Each person pushes with a force of 500 N. If the car is pushed 100 m, then how much work is done?
23. A dog pulls a 40 kg wagon with a force of 300 N over distance of 50 m. How much work was done by the dog?
24. A car exerts a force of 10,000 N while driving on a horizontal stretch of road. How much work is done when the car travels 100 m?
25. A bucket is lifted out of a well by a 200 N force. If the well is 30 m deep, then how much work is done in lifting the bucket?