

Work and Power

1. Agatha lifts her toys into a tree house in a homemade elevator the mass of which is 2.5 kg. The tree house is 8.0 meters above the ground. How much work does she do when she lifts 5.0 kg of toys into the house? When she lifts 20.0 kg?
2. Suppose Agatha raises the 5.0 kg load in 5 sec. How much power did she use doing this work? How much power was needed to raise the 20.0 kg mass in 12.0 sec?
3. A student's job requires that she carry 25 kg masses up three flights of stairs that are each 5.0 meters high. Timing herself one day, she finds that she can climb the stairs in 12.4 sec at 9 am, 15.8 sec at noon, and 24.3 sec at 5 pm. How much work does she do in each case? How much power does she produce in each case?
4. In a record breaking lift, a weight lifter presses 222.2 kg. In doing so, he raised the weights 2.2 meters from the floor to a position above his head. How much work did he perform in this event?
5. During a major downtown fire, the Bellmore Fire Department pumped 400,000 liters of water to the 27th floor of a building 96 meters above the street. How much work was done in the process? (1 liter of water = 1 kg mass).
6. A crane lifts a marble block with a mass of 500 kg to a height of 50 meters in 2.5 minutes. What is the power output of the crane?
7. A pile driver drops a mass of 1,250 kg from a height of 12.8 meters each time it falls on a steel column. The resistance offered against this force by the ground is 2.5×10^5 N. How far is the column driven into the ground each time?
8. A 3.0 hp motor is used to raise iron ore from a mine. In each trip, a bucket of ore whose total mass is 150 kg is raised a distance of 10 meters. How long does it take to raise the bucket?
9. Tom and Jerry are using a pulley system to lift their new 420 kg piano to the third floor of their house, 28.4 meters above the ground. Each of them is able to develop a sustained power of .25 hp. How long will the job take? (1 hp = 746 watts)
10. The power output of a new truck is being tested. The truck manages exert a steady pull of 15,522 N as it travels at a speed of 14 km/hr. How much power is the truck developing?