

Work and Power Practice

1. On his way off to college, Huan drags his suitcase 15.0 m from the door of his house to the car at a constant speed with a horizontal force of 95 N.
 - a. How much work does Huan do to overcome friction?

 - b. Against what force does Huan do work?

2. Saanvi, a 30 kg child, climbs a tree to rescue her cat that is afraid to jump 8.0 m to the ground. (Saanvi is evidently fearless.)
 - a. Against what force does Saanvi do work?

 - b. How much work does Saanvi do?

3. Marina does 3.2 J of work to lower the window shade in her bedroom a distance of 0.80 m. How much force must Marina exert?

4. At Six Flags, a ride called the Wicked Cyclone is a giant steel/wooden roller coaster. The height of the first hill is 33 meters. The train of cars has a mass of 4500 kg. (I am actually guessing on the mass, but the height is correct.)
 - a. How much work is required to get the train of cars from the ground to the top of the first hill?

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- b. What power is generated to bring the train of cars up in 30 s?

- c. How fast are the car moving at the bottom of the first hill?

- 5. A box weighing 2000 N is dragged up a 3 m long incline with an applied force of 1500 N. The top of the incline is 1.5 m above the ground.
 - a. When dragging the box along the incline, how much work is done by the applied force?

 - b. What is this work done against? (*Hint: you are fighting two other forces.*)

 - c. If you lifted the box straight up to a height of 1.5m, how much work would you do?

 - d. What force do you do work against when lifting the box?

 - e. Why use a ramp if it requires more work?

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6. Jack (30 kg) and Jill (20 kg) went up the hill to see who could generate the most power when doing work against gravity. They ran up a hill with a vertical height of 12 m. Jack reached the top in 6.8 seconds and Jill reached the top in 5.0 seconds.
- Who did more work?
 - Who was more powerful?
7. Gary holds a 4 N book stationary 2 m above the ground. How much work does Gary do on the book?

Answers:

1. a) 1425 J b) friction 2.a) gravity b) 2400 J 3) 4 N
4. a) 1,485,00 J b) 49,500 W c) 25.7 m/s
5. a) 4500 J b) friction & gravity c) 3000 J d) only gravity e) still requires less force
6. a) Jack = 3600 J & Jill = 2400 J b) Jack = 530 W & Jill = 480 W
7) none. (its not moving, so no displacement, so no work is done.)