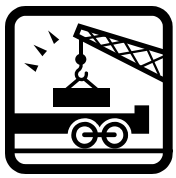
Physical Science Name:_____ Period: __ Date: ____



Pump it up! Work & Power Problems

Directions: Complete the following problems using the equations for work and power.

$W = Fd$ (SI unit is Joule (J))	$P = \frac{W}{t}$ (SI unit is Watt (W))

1. You must exert a force of 4.5 N on a book to slide it across a table. You move it .5 meters. How much work have you done?

2. Your roller blade brakes apply 5.6 N of frictional force as you travel 2 meters. How much work have the brakes done?

3. The world's most powerful tugboats are built in Finland. One of these boats can do 9.8×10^7 J of work through a distance of 35 m. What is the force exerted by the tugboat?

4. A child pulls a sled up a snow-covered hill. In the process, the child does 405 J of work on the sled. If she walks a distance of 15 m up the hill, how large a force does she exert on the sled?

5. What requires more work? Lifting a 50 kg sack a vertical distance of 2 m or lifting a 25 kg sack a vertical distance of 4 m?

6. A mover is loading a 253 kg crate of hammers onto a truck. The upward force on the crate is 2470 N, and 3650 J of work are required to raise the crate from the pavement to the truck bed. How far is the crate lifted?

7. A popular and dangerous circus act is the human cannonball, in which a person is shot from a cannon. Suppose the cannon has a barrel that is 3.05 m long and 1.67×10^4 J of work is done to accelerate the acrobat. What is the force exerted by the cannon on the acrobat?

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8. A race car with a 255 hp (1.90×10^5 W) engine is able to accelerate from rest to its top speed in 9.00 s. How much work does the car's engine do in this interval of time?

9. Suppose a weightlifter's power output is 178 W during the time he does 3310 J of work on the weights. How long does it take the weightlifter to raise the weights?

10. A runner exerts a force of 334 N against the ground while running a distance of 50.0 m. The runner's power output over this distance is 3.71 W. How much time does it take the runner to travel 50.0 m?

11. Lithuania's major nuclear power plant has one of the world's most powerful generators, which has a power output of 1.45×10^9 W. How long must this generator run if it is to provide the energy to do 4.35×10^{11} J of work?

12. A certain crane is able to lift 2.20×10^6 kg. If the crane is able to raise this mass a distance of 20.0 m by doing 4.32×10^8 J of work in 35.0 s, how much power has the crane provided?

13. The space shuttle, which was first launched on April 12, 1981, is the world's first reusable space vehicle. The shuttle is placed in orbit by 3 engines that do 1.4×10^{13} J of work in 8.5 min. What is the power output of these engines?

14. One horsepower (1 hp) is the unit of power based on the work that a horse can do in 1 s. This is defined, in English units, as a force of 550 lb that can move an object 1 ft in 1 s. In SI, 1 hp equals 745.7 W. Suppose you have a horse that has a power output of 750 W. How much work does this horse do in 0.50 s?