WORK: An Introduction

**Show your formulas, your work, and your units!**

1. What is work?
2. How are work, force, and distance related?
3. What are the two different units that represent work?
4. What must be true of the force and the motion for work to be done?
5. Draw me a situation where work IS being done. Use arrows to indicate the forces and the motion. Label the arrows.
6. Draw me a situation where work IS NOT being done. Use arrows to indicate the forces and the motion. Label the arrows.
7. A 600N person lifts his 100N carry-on bag upward a distance of 1 meter. They then walk 100 meters towards the terminal. Which of the following situations is true?
   1. The traveler did work ONLY when he lifted the bag.
   2. The traveler did work ONLY when he carried the bag to the terminal.
   3. The traveler did work BOTH when he lifted the bag and when he carried the bag to the terminal.
8. You did 170 joules of work lifting a 140N backpack. How high did you lift that backpack?
9. A woman lifts her 100N child up 1 meter and carries her for a distance of 50meters to her bedroom. How much work did this woman do?
10. You pull your sled through the snow a distance of 500 meters with a force of 200 newtons. How much work did you do?
11. An ant sits on the back of a mouse. The mouse carries the ant across the floor for a distance of 10 meters. Was there work done by the mouse? Explain why or why not.
12. A crane does 62,500 joules of work to lift a boulder a distance of 25 meters. How much did the boulder weigh? *(Hint: the weight of an object is a force)*
13. You lift a 45 N bag of mulch 1.2 meters and carry it a distance of 10 meters to the garden. How much work was done.
14. A 455N gymnast jumps upward a distance of 1.5 meters to reach the uneven l bars. How much work did she do before she even began her routine?

POWER

**Show your formulas, your work, and your units!**

1. What is Power?
2. How are work and power related?
3. What are the units that represent power?
4. A motor does 5,000 joules of work in 20 seconds. What is the power of the motor?
5. A machine does 1,500 joules of work in 30 seconds. What is the power of this machine?
6. A sleigh weights 2,000N and is pulled by a horse a distance of 1.0 km (1,000 meters) in 45 min. What is the power of the horse? (Hint: convert time to seconds)
7. A wagon weights 1,800 N and is pulled by a horse at a speed of 0.40 m/s for 2 seconds. What is the power of the horse?
8. Suppose a force of 100N is used to push an object a distance of 5 meters in 15 seconds. Find the work done and the power done for this situation.
9. A force of 100N is used to move an object a distance of 15 meters with a power of 25 watts. Find the work done and the time it takes to do the work.
10. If a small machine does 2,500 joules of work on an object to move it a distance of 100 meters in 10 seconds, what is the force needed to do the work? What is the power of the machine doing the work?
11. A machine uses a force of 200N to do 20,000 joules of work in 20 seconds. Find the distance the object moved and the power of the machine. (Hint: a joule is the same as a Newton\*meter)
12. *If you get this, you are right where you need to be…*

An 8kg soccer ball starts at rest and is kicked 31.5 meters until it reaches a final velocity of 21m/s in 3 seconds. Assuming that the soccer ball was kicked with a force of 56N (and ignoring any outside friction or air resistance forces), what is the power with which the soccer ball moved?