

Name _____ Date: _____ Period: _____

Mixed Work, Power and Mechanical Advantage Problems

Directions: Solve the following problems. Remember to show your calculations!!

© Bottom of Page
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① $POWER = \frac{WORK}{TIME}$



Power = Watts
Work = Joules
Time = Seconds

② $Work = Force \times Distance$



Joules Newtons meters

① 1. While rowing in a race, John does 3960 J of work on the oars in 60.0s. What is his power output in watts?

② 2. A worker applies an effort force of 68 N to open a window with a resistance force of 760 N. What is the crowbar's MA?

③ 3. It takes 100 J of work to lift an elevator 18m. If this is done in 20 s, what is the average power of the elevator during the process?

④ 4. Suppose you are moving a box of books. Calculate your power output if you exert a force of 60.0 N to push the box 12.0 m in 20.0 s. Hint: Calculate work first, then calculate power!

⑤ 5. A crane uses an average force of 5200 N to lift a girder 25 m. How much work does the crane do on the girder?

⑥ 6. Find the resistance force of a machine with jack with a mechanical advantage of 15.5 and an input force of 54.5 N.

⑦ 7. An apple weighing 1 N falls through a distance of 1 m. How much work is done on the apple by the force of gravity?

© Mechanical Advantage (2 equations)

$\frac{\text{Input distance (m)}}{\text{Output distance (m)}}$ OR $\frac{\text{Output Force (N)}}{\text{Input Force (N)}}$

Input = effort = what is done to machine
Output = resistance = what machine does

- Ⓑ 8. The brakes on a bicycle apply 125 N of frictional force to the wheels as the bicycle travels 14.0 m. How much work have the brakes done on the bicycle?
- Ⓑ 9. While rowing in a race, John uses his arms to exert a force of 165 N per stroke while pulling the oar 0.800 m. How much work does he do?
- Ⓒ 10. Calculate the mechanical advantage of a ramp that is 6.0 m long and 1.5 m high. *Hint: Input is the length.*
- Ⓑ 11. A tractor exerts a force of 20,000 newtons to move a trailer 8 meters. How much work was done on the trailer?
- Ⓑ 12. How long does it take for a 475 watt machine to do 2800 J of work? *Hint: Solve for time (s)!*
- Ⓑ Ⓐ 13. A car exerts a force of 500 newtons to pull a boat 100 meters in 10 seconds. How much power does the car use? *Hint: Solve for work first. Then, solve for power.*
- Ⓒ 14. A 3-meter-long ramp is used to lift a piano to a moving truck, which is 1 meter off the ground. What is the mechanical advantage of the ramp? *Hint: input is the length.*