

Work/Simple Machines Worksheet – Answers

1. *Work is when a force is applied over a distance.*
2. *An example of when work is not done would be when a force is applied and there is no movement or distance covered – such as pushing a wall or another object.*
3. *The equation or formula for WORK is $W = F \times d$*
4. The symbols (variables) stand for the following $W =$ work; $F =$ Force; $d =$ Distance
5. *A Machine is any apparatus or device that has several parts and is used to perform some kind of work.*
6. *A simple machine is a device that changes the direction of force or its magnitude.*
7. *The 6 types of simple machines are: the lever, the inclined plane, the pulley, the wedge, the screw, and the wheel and axel.*
8. Machines cannot increase the amount of work, they only make the work easier to do.
9. A device does not have to contain a motor to be a machine.
10. When a machine is used, less force is needed to do the work, but that force must be applied over a greater distance.
11. *The Law of Conservation of Energy states that Energy cannot be created or destroyed – only transformed.*
12. *Work output does not equal work input due to friction and the generation of heat. There is always friction in machines due to moving parts and this lowers the efficiency and requires that more work must be put in than the work that comes out.*

Solving problems using $W = F \times D$

1. A book weighing 1.0N lifted 2m **would have 2Nm of work done** ($W = 1\text{N} \times 2\text{m}$).
2. The box requiring 15N and pushed 3 m **would require 45Nm of work** ($W = 15\text{N} \times 3\text{m}$).
3. If it required 50 Joules of work to move 5m, you would take the work and divide it by the distance traveled to get the force ($F = W \div D$) – $F = 50\text{Nm} \div 5\text{m} = \mathbf{10\text{N}}$.
4. How far was the rock lifted could be found by dividing the Work by the force needed to lift the rock. ($D = W \div F$) – $D = 150\text{J} \div 100\text{N} = \mathbf{1.5\text{m}}$.
5. **There would be 2000J (Nm) of work done** since ($W = F \times D$) $W = 500\text{N} \times 4\text{m} = 2000\text{nm (J)}$.
6. If the young man exerted 9000N of force but the car did not move, **there was no work done** since $w = F \times D$ and since Distance is zero, the product of zero and any force is zero.