





Work & Power

How the world works....

Define / Describe WORK

- Work is done when a force causes an object to move in the direction that the force is applied.
- The formula for work is: $W = F \times D$
- If there is no movement, there is no work

Work or Not?

Work or Not Work?	Direction of force	Direction of motion	Does work?
	→	→	Yes
	↑	→	No
	↑	↑	Yes
	→	→	Yes

Joules?

- Work is measured in **Joules**.
- **Rule for Work**
- Work (Joules) = Force (Newtons) X Distance (meters)
 $W = F \times d$
- **Example to calculate Work**
- **Question:** A weightlifter raises weights of 2000 Newtons from the floor to a height of 2 meters. How much work has been done?
- **Answer:**
- $W = F \times d$
 $W = 2000 \times 2$
 $W = 4000 \text{ Joules}$

What is Energy?

- **Energy** - ability to cause change; can change the speed, direction, shape, or temperature of an object

What is Power?

Power is the rate at which work is done. Power is measured in **Watts**.

- **Rule for Power**
- Power (Watts) = Work (Joules) / Time (seconds)
 $P = W / T$
- **Example of calculating Power**
- **Question:** A weightlifter lifted 2000 Newtons to a height of 2 meters. This 4000 Joules of work. What is the power output if this was done in 2 seconds?
- **Answer:**
- $P = W / T$
 $= 4000 / 2$
 $= 2000 \text{ Watts}$

Two things must happen for work to be done.

- A force must be applied to an object
- The object must move in the same direction as the force.

What is the purpose of a machine?

- To make work easier.

How do machines make work easier?

Any change in the size of the force changes the distance. No machine can increase both force and distance.

1. Multiply force which decreases distance the load moves.
2. Multiply the distance which decreases force.
3. Or, they leave force and distance alone but change the direction in which the load moves.

How do machines make work easier?

- They can change the amount of force
- They can change the distance

(Remember that $\text{Work} = \text{Force} \times \text{Distance}$)

- They can also change the direction

MORE \longrightarrow

What is mechanical advantage?

The number of times a machine multiplies the effort force.

What are the 3 types of simple machines?

- There are three simple machines: the lever, the pulley, and the inclined plane
- The wheel and axle, the wedge, and the screw are modifications of the three simple machines.

What is a compound (or complex) machine?

- A machine made up of two or more simple machines.

Works Cited

- Notes were adapted from The Science Class web site at www.science-class.net and from Queensland Science Teachers at <http://qldscienceteachers.tripod.com/junior/physics/work.html>