

WORK AND POWER NOTES



Key

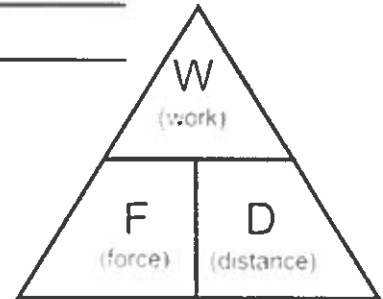
Work is done when a Force that is applied to an object moves that object.

What are some examples of work?

Moving a box, pushing a lawn mower,

To calculate work, we would use the formula

$$\text{Work} = \text{FORCE} \times \text{DISTANCE}$$



A force of 6 n is used to push a couch 8.2 meters. How much work was done?

$$W = F \times D = 6 \text{ N} (8.2 \text{ m}) = 49.2 \text{ N} \cdot \text{m} \text{ or } 49.2 \text{ J}$$

A Newton-meter is the same thing as a joule $1 \text{ N} \cdot \text{m} = 1 \text{ j}$

Therefore, the unit for work will be the joule.



A boy lifts a 30N dragon 2 m above the ground. How much work did the boy do on the dragon?

$$W = F \times D = 30 \text{ N} (2 \text{ m}) = 60 \text{ J}$$



Work requires a force to be applied that causes movement in the same direction as the force.



A man exerts 100 n of force attempting to lift a weight, but it will not move. How much work is doing?

So, if there is no movement, there is no work being done





is the rate at which work is done.

$$\text{Power} = \frac{\text{Work}}{\text{Time}}$$

OR

$$\text{Power} = \frac{\text{Force} \times \text{Distance}}{\text{Time}}$$



A tow truck exerts a force of 11,000 N to pull a car out of a ditch. It moves the car a distance of 5m in 25 seconds. What is the power of the tow truck?

$$P = \frac{F \times D}{T} = \frac{11,000 \text{ N} (5 \text{ m})}{25 \text{ s}} =$$



The unit for Power is known as the Watt. $1 \text{ W} = 1 \text{ J/s}$

Two students carry a 10 N textbook up a flight of stairs to a height of 10 meters. Student A walks up the stairs in 20 seconds. Student B runs up the stairs in 10 seconds.



Which student did more work?

$$\text{Student A } W = F \times D = 10 \text{ N} (10 \text{ m}) = 100 \text{ J}$$

$$\text{Student B } W = F \times D = 10 \text{ N} (10 \text{ m}) = 100 \text{ J}$$

Each student did the same amount of work.



Which student was more powerful?

$$\text{Student A } P = \frac{W}{T} = \frac{100 \text{ J}}{20 \text{ s}} = 5 \text{ W}$$

$$\text{Student B } P = \frac{W}{T} = \frac{100 \text{ J}}{10 \text{ s}} = 10 \text{ W}$$

Student B was more powerful by 5 Watts.