

Unit 7 – Work and Energy

Do you know the meaning of work?

Everyday meaning of work is different than the science definition of work.

Work – a change (or transfer) of energy.

$$W = \Delta E$$

Mechanical work (transfer of energy) occurs when a force is applied through a displacement.

$$W = F\Delta d$$

where: W = work (J)
 F = force (N)
 Δd = displacement (m)

ex.

A force of 25 N accelerates a cart across a frictionless surface from rest to a velocity of 8 m/s in a time of 2.5 s. How much work is done?

ex.

A student lifts a box of books that has a mass of 15 kg up 0.8 m.
How much work does the student do?

*If the force opposes the direction of the motion, negative work is done.

ex.

How much work is done on an 8 kg wagon rolling along a flat sidewalk if a force of 60 N opposite to its direction of motion brings it to rest in 2 seconds?

*If the force is perpendicular to the displacement (direction of motion), no work is done, $W = 0 \text{ J}$.

ex.

walking forward while holding an object up, circular motion

*Only the component of the force in the direction of the displacement (the direction of the motion) does work.

ex.

A fisherman pulls a boat along a dock using a rope at an angle of 60° with the horizontal. How much work does he do if he exerts a force of 255 N along the rope, pulling the boat 30 m?