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P8 Work and power

P8.01 Doing work

Work done = energy transferred

- Pushing shopping cart at first - give energy - kinetic energy increases
- Apple falling from a tree - gravity - kinetic energy increases
- Bicycle braking - friction, reduce kinetic energy - thermal energy increases

1. How much work?

- The greater the force, the more work it does
- The further it moves, the more work it does

P8.02 Calculating work force

Work done by a force = force x distance moved by the force in the direction of the force

$$W = F \times d$$

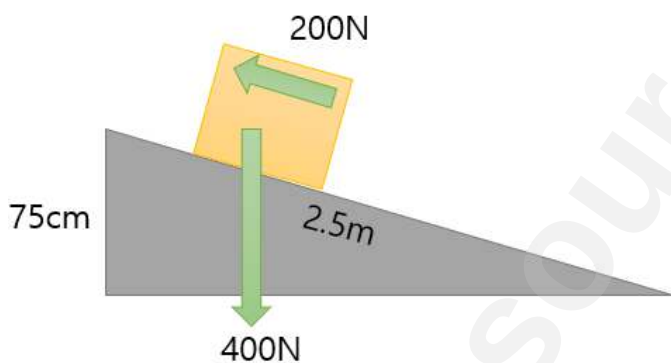
Joule: 1J is the energy transferred by a force of 1N when it moves 1m in the direction of a force

Work unit = J

- Force unit = N
- Distance = m

1. Work done and mgh

girl pushes with 200N force, the box weighing 400N.



how much work does she do?

$$W = F \times D$$

$$W = 200\text{N} \times 2.5\text{m}$$

$$W = 500\text{J}$$

How much g.p.e does the box gain?

$$W = F \times D$$

$$W = 400\text{N} \times 0.75\text{m}$$

$$W = 300\text{J}$$

"Distance moved by the force in the direction of the force"

2. forces doing no work

- Sitting in a chair
- My weight mg is downward, contract force stops me falling
- Neither of these forces is doing any work for me

3. Work done and energy transferred

$$W = \Delta E$$

- Force works - energy transfers from one to other
- The amount of work done = ΔE

P8.03 Power

Power: how fast you work / the rate which energy is transferred

1. Fast working

- Lift a **heavier** object in the same time
- Lift the object more **quickly**

P8.04 Calculating power

$$\text{Power} = \frac{\text{Work done}}{\text{Time taken}} \quad P = \frac{W}{t} \quad P = \frac{\Delta E}{t}$$

Watt = the power when 1J of work is done in 1 s

1W = 1J/s

- Power unit = W
- Work done = J
- Time taken s