



Work done by a force

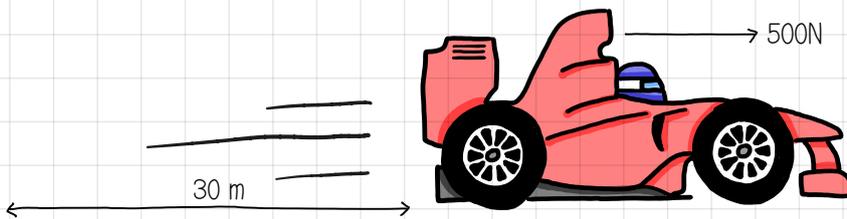
- ① Define work as the term is used in physics
- ② Calculate the work done by a force acting on an object.

Work done by a force

 Work is done whenever **energy** is **transferred** from one store to another.

 Examples of work done include:
Mechanical work involving the use of a force to move an object.
Electrical work involving current transferring energy from a power source to a component e.g a lamp.

 Here is a racing car. The motor in the car is applying a force.



chemical energy store in petrol $\xrightarrow{\text{energy transferred}}$ kinetic energy store (movement)

 There is friction between the tyres and the road, so some energy is lost to the thermal energy store in the tyres and the road (they get warmer).

 The equation to calculate the work done is:

$$\begin{array}{ccccccc} \text{work done} & = & \text{force} & \times & \text{distance} & \text{ or } & \boxed{W = Fs} \\ \downarrow & & \downarrow & & \downarrow & & \\ \text{joules (J)} & & \text{Newtons (N)} & & \text{metres (m)} & & \end{array}$$

You need to learn this equation for the exam

Calculating work done

Calculate the work done by a motor when it applies a force of 500N over a distance of 30m.

1. Use the equation $W = Fs$
2. Substitute in the values of the equation.
3. $W = 500 \times 30$
4. 15000J (or 15 kJ)

 This shows us that 15kJ of energy has been transferred from the chemical store in the petrol to the kinetic energy store of the car and the thermal energy stores of the road and tyres.

Work done by a force...



Work is also done when a car brakes. The brake moves into contact with the wheel to cause it slow down. As this happens the brakes heat up. So energy is transferred from the kinetic energy of the car to the thermal energy of the brakes. As a result the car slows down.

Practice question #1

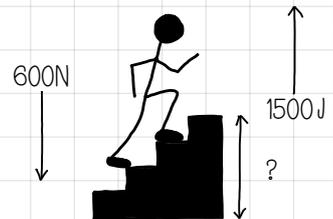


During braking, a force of 2 000 N is applied to the brakes of a car. The car takes 40m to stop. Calculate the work done.

1. Use the equation $W = Fs$
2. Substitute in the values of the equation.
3. $W = 2000N \times 40m$
4. 80000 J (80 kJ)

Practice question #2

A person of weight 600N climbs a set of stairs. The amount of work done against gravity by the person climbing the stairs is 1500 J. Calculate the height climbed.



1. Use the equation $W = Fs$
2. Substitute in the values of the equation.
3. $1500 = 600s$
4. To calculate s , divide the number on the left by the number on the right.
5. $s = 1500 \div 600$
6. $s = 2.5m$

