

# Power



Power is a quantity that measures the rate at which work is done or energy is transformed

# Power

- Power is the rate of energy transfer (by any method)
- Power is the rate at which work is done is.
- Like the concepts of energy and work, power has a specific meaning in science that differs from its everyday meaning.
- If the work done on an object is  $W$  in a time interval  $\Delta t$ , then the average power delivered to the object over this time interval is written as follows:

**POWER**

$$P = \frac{W}{\Delta t}$$

**power = work ÷ time interval**

# Power

- It is sometimes useful to rewrite this equation in an alternative form by **substituting the definition of work** into the definition of power:

$$W = Fd$$
$$P = \frac{W}{\Delta t} = F \frac{d}{\Delta t}$$

(The distance moved per unit time is just the speed of the object...rate of change of distance with respect to time...the derivative of position)

# Power

## POWER (ALTERNATIVE FORM)

$$P = Fv$$

$$\text{power} = \text{force} \times \text{speed}$$

- The SI unit of power is the **watt**, W, which is defined to be one joule per second.
- The **horsepower**, hp, is another unit of power that is sometimes used. One horsepower is equal to 746 watts.

# Power

- named after the Scottish engineer **James Watt**.
- The watt is perhaps most familiar to you from your everyday experience with light bulbs.
- A dim light bulb uses about 40 W of power, while a bright bulb can use up to 500 W.

