Power

Mr. Sudbury

Review – Mechanical Energy

Mechanical energy is the combination of kinetic and potential energy

- Kinetic Energy (KE)
- Energy of Motion

$$KE = \tfrac{1}{2}\,mv^2$$

- Potential Energy (PE)
- Energy that is stored and held in readiness.
- It has the POTENTIAL to do work.
- Calculated as Gravitational Potential Energy

$$PE = weight \times h$$
$$PE = mgh$$

Review – Work

- Work is the applied force multiplied by the distance.

$$W = Fd$$

- Or Work is the transfer of energy from one for to another form.

$$Work = \Delta E$$

Power

- How long does it take to do work? $W = Fd$
- Nothing in the formula describes the time it takes.
- **Power** – The rate at which work is done or the rate that energy is transformed. (into what?)
  ◦ Remember that a RATE is anything over time.

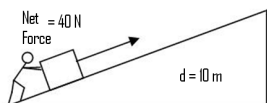$$P = \frac{W}{t} \qquad W = P\,t \qquad t = \frac{W}{P}$$

  ◦ Units for Power are $\frac{Joules}{second}$ or Watts*.

  *Names after James Watt – Inventor of the steam engine.

Comparing Power

- Things that are very "Power full" simply do an amount of work very fast.
- Something with less power may do the same amount of work, just take longer to complete it.

How much Power if t = 5 sec?

$$W = F \bullet d = 400\ J$$

Net Force = 40 N

How much Power if t = 10 sec?

d = 10 m

Power Calculations

- **1)** A crane lifts a load weighing 12,500 N a distance of 18 meters. If it takes the crane 9 seconds to complete the task, how much power does the crane use to lift the load?

- **2)** An elevator lifts a person weighing 625 N a distance of 7 meters. If the elevator uses 85 Watts of power to lift the person, how long does it take?

- 4) A person takes 9 seconds to drag a 45-N box across a road. If the person uses 125 Watts of power, how wide is the road?

$$W = Fd$$

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

Review

- **Work**
- W = Fd
  the force must be in the direction of the motion.
- Measured in Joules
- Work is done when energy is converted from one form to another

- **Power**
- P = W/t
- Power is how fast work is done.
- Measured in Watts