KINETIC ENERGY

And Work-Energy Theorem

Kinetic Energy

- **Definition**: The Energy possessed by an object due to its motion.

$$\mathbf{E_k = \frac{1}{2} mv^2}$$

- Important Factors:
  - m is mass in Kg
  - v is speed in m/s
  - E is energy in Joules: 1 J = 1 Kg m^2/s^2

Kinetic Energy

- **Definition**: The Energy possessed by an object due to its motion.

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- Important Factors:

NOTE! If an object's *speed* DOUBLES, then its kinetic energy will increase by a factor of _____**four**_____

NOTE! If an object's *mass* DOUBLES, then its kinetic energy will increase by a factor of _____**two**_____

$E_k = ½ mv^2$

1. Calculate the kinetic energy of a 1200 Kg car travelling along Bramalea road at 17 m/s (60 Km/h)?
   – Answer: 1.7×10^5 J

2. If the speed of the car is doubled what will be the new kinetic energy ?
   – Answer: 6.8×10^5 J

Kinetic Energy & Work

- **Work-Energy Theorem**:
  The total work done on an object is equal to the object's change in kinetic energy!!

$$W = \Delta E_k$$

$$W = E_{kf} - E_{ki}$$

Work = Final Energy – Initial Energy

$$W = \Delta E_k = E_{kf} - E_{ki}$$

- A skateboarder with a mass of 65.0 Kg increases his speed from 1.75 m/s to 4.20 m/s as he rolls down a ramp.
  a) What is the initial kinetic energy?
  b) What is the final kinetic energy?
  c) What is the change in kinetic energy?
  d) What is the work done on the skateboarder?

$W = \Delta E_k = E_{kf} - E_{ki}$

- A weightlifter drops a 50.0 Kg bar from a height of 1.50 m. Assume that the force of gravity is the only force acting on the bar.
  a) What is the *initial* Kinetic Energy of the bar?
  b) What do we need to know to find the final Kinetic Energy of the bar (just before it hits the ground)?
  c) What is the work done on the bar?
  d) What is the *final* Kinetic Energy of the bar (just before it hits the ground)?

- **NOTE**: Use $W=F\Delta d$ to find the work done by gravity on the bar.