

Kinetic Energy

- Kinetic energy is the energy of motion

- The amount of kinetic energy an object contains depends on two things:

1. The speed of the object
2. The mass of the object

- The amount of kinetic energy an object contains can be calculated by using the following formula:

$$E_k = \frac{1}{2} m v^2$$

E_k = kinetic energy in Joules (J)

m = mass of the object in Kilograms (kg)

v = speed or velocity of the object in meters per second (m/s)

- If the problem asks you to find speed or mass instead of kinetic energy the following formulas can be used:

$$v = \sqrt{\frac{2E_k}{m}}$$

$$m = \frac{2E_k}{v^2}$$

Examples

1. A car with a mass of 1500kg is moving at a speed of 14 m/s. What is the kinetic energy of the car?

$$m = 1500 \text{ kg}$$

$$v = 14 \text{ m/s}$$

$$E_k = ?$$

$$E_k = \frac{1}{2} m v^2$$

$$E_k = \frac{1}{2} (1500 \text{ kg}) (14 \text{ m/s})^2$$

$$E_k = 147000 \text{ J.}$$

$$E_k = 1.5 \times 10^5 \text{ J}$$

2. A bowling ball is moving at a speed of 2.21 m/s. If the kinetic energy of the bowling ball is 15.7J, what is its mass?

$$v = 2.21 \text{ m/s}$$

$$E_k = 15.7 \text{ J}$$

$$m = ?$$

$$m = \frac{2 E_k}{v^2}$$

$$m = \frac{2 (15.7 \text{ J})}{(2.21 \text{ m/s})^2}$$

$$m = 6.429 \text{ kg}$$

$$m = 6.43 \text{ kg}$$

3. A 15 kg child is sliding down a playground slide. If the child's kinetic energy is 77 J, how fast is the child sliding?

$$m = 15 \text{ kg}$$

$$E_k = 77 \text{ J}$$

$$v = ?$$

$$v = \sqrt{\frac{2 E_k}{m}}$$

$$v = \sqrt{\frac{2 (77 \text{ J})}{15 \text{ kg}}}$$

$$v = 3.20416 \text{ m/s}$$

$$v = 3.2 \text{ m/s}$$