Kinetic Energy

11SCI - Mechanics

Finn LeSueur

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Starter (2016 Exam)

Rhiana is riding a horse along New Brighton Beach. **Each** of the horse's hooves have a surface area of $0.0044m^2$ which sink into the sand when the horse stops. The horse exerts a pressure of $200155Pa$.

Calculate the weight of the horse.

Answer

A horse has four hooves, so the total surface area that the horse is exerting pressure through is:

$$A = 0.0044 \times 4 = 0.0176m^2$$

Recall that **weight is a force**, so we can rearrange $P = \frac{F}{A}$ for F.

$$F = P \times A$$
$$F = 200155 \times 0.0176 = 3522.728N$$

Kinetic Energy

What is Kinetic Energy?

Kinetic energy is the energy that an object posesses due to its **velocity**!

What Other Types of Energy Are There?

There are many types of energy in the universe:

- Gravitational potential energy
- Heat energy
- Sound energy
- Light energy
- Elastic potential energy
- Electrical energy

What do they have in common?

- All energy is measured in **Joules** (J).
- A change in energy is called **work** (measured in Joules).

Conservation of Energy

- Energy cannot be created or destroyed, only transformed.
- This means that gravitational potential energy can be transformed into kinetic energy, and kinetic energy into other forms of energy. It is always *taken* from somewhere, never created from nothing.

Calculating Kinetic Energy

Kinetic energy depends on the **mass** and **velocity** of an object.

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

What does v^2 mean?

- It means $v \times v$
- This means we can also write the equation like this, if you find it easier:

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

Example 1

Mr LeSueur rides his bike to work at $32km/h$ ($8.89ms^{-1}$). Both he and his bike have a combined mass of $80kg$. **Calculate his kinetic energy**.

Answer We know $m = 80kg$ and $v = 8.89ms^{-1}$, and we are looking for E_k.

$$E_k = \frac{1}{2} \times 80 \times 8.89^2$$
$$E_k = 3161.284J$$

Example 2

Sophie is skiing down Upper Fascination at Mt Hutt, and is trying to go really fast. Her combined mass is $60kg$ and she is moving at $60km/h$ ($16.67ms^{-1}$). **Calculate her kinetic energy**.

Answer We know $m = 60kg$ and $v = 16.67ms^{-1}$, and we are looking for E_k.

$$E_k = \frac{1}{2} \times 60 \times 16.67^2$$
$$E_k = 8336.667J$$

Extra Work

- **Homework:** Education Perfect due Monday 29th 11:25am
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