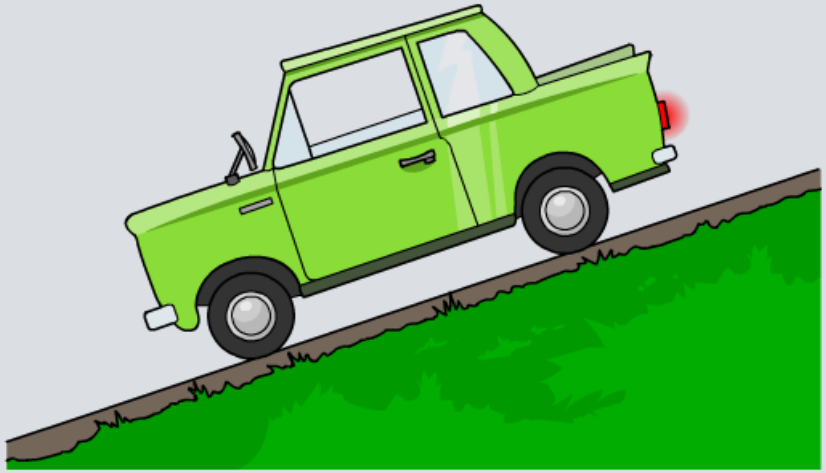
Newton's Second Law



Introducing unbalanced forces

What is Newton's second law?

If the resultant force acting on an object is not zero, all the forces are said to be **unbalanced**.

This forms the basis of **Newton's second law of motion**, which states:

If the forces on an object are unbalanced, two things about the object can change:

- the **speed** of the object may change – it may either increase or decrease
- the **direction** of motion may change.

How is movement calculated from force?

The resultant force acting on an object is related to the object's mass and acceleration. These three factors are linked by the following equation:

force = mass × acceleration

- Resultant force is measured in **newtons** (N).
- Mass is measured in **kilograms** (kg).
- Acceleration is measured in **meters per second per second** (m/s^2).

How do we use Newton's second law?

A car has a mass of 1,000 kg. What force must the car's engine supply to cause an acceleration of 2 m/s^2?

force = mass × acceleration

= 1,000 × 2

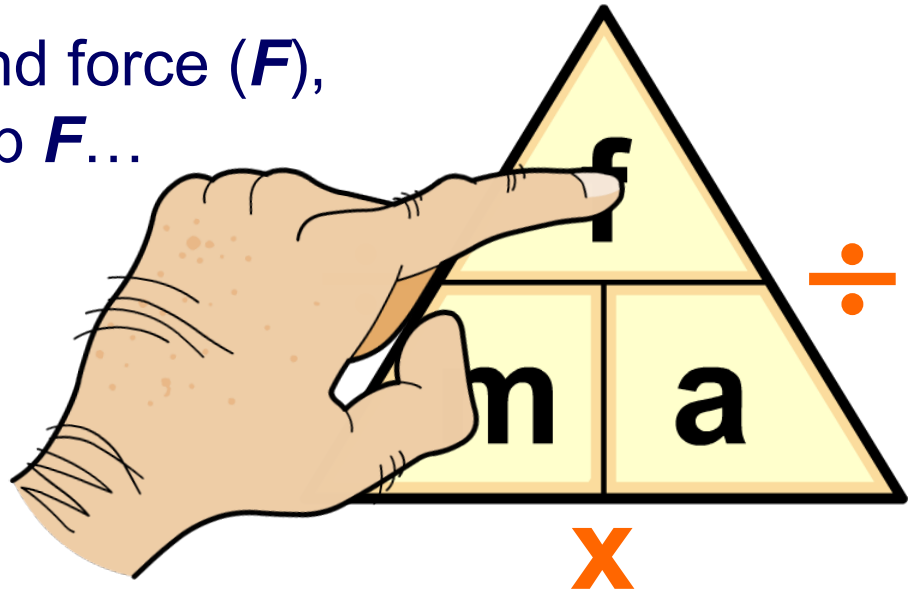
= **2,000 N**

Using a formula triangle

A formula triangle helps you to rearrange a formula. The formula triangle for **force (*F*)**, **mass (*m*)** and **acceleration (a)** is shown below.

Cover the quantity that you are trying to find, which gives the rearranged formula needed for the calculation.

So to find force (***F***), cover up ***F***…



…which gives the formula…

$$F = m \times a$$

How do we use Newton's second law?

A truck has a mass of 12,000 kg. What acceleration is caused by a force of 10,000 N?

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$\text{acceleration} = \frac{\text{force}}{\text{mass}}$$

$$= \frac{10{,}000}{12{,}000}$$

$$= 0.83 \text{ m/s}^2$$

F = ma calculations

You will need this equation to answer the following questions about force, mass and acceleration:

force = mass x acceleration

Click "**start**" to begin.

start