

Forces

Definition: Force - strength or energy as an attribute of physical action or movement.

Physics definition: Physics is the study of nature and how matter and energy behave.

POS:

- explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- identify the effects of air resistance, water resistance and friction, that act between moving surfaces
- recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect

Prior learning:

A force is a push or a pull. When an object moves on a surface, the texture of the surface and the object affect how it moves. It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes.

A magnet attracts magnetic material. Iron and nickel and other materials containing these, e.g. stainless steel, are magnetic. The strongest parts of a magnet are the poles. Magnets have two poles – a north pole and a south pole. If two like poles, e.g. two north poles, are brought together they will push away from each other – repel. If two unlike poles, e.g. a north and south, are brought together they will pull together – attract.

For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts.

Links to other science topics:

- States of matter
- Properties and changes of materials

Disciplinary concepts:

Cause and effect - Why do some things speed up and slow down?

Energy – what type of energy is linked to movement?

Common misconceptions:

the heavier the object the faster it falls, because it has more gravity acting on it

forces always act in pairs which are equal and opposite

smooth surfaces have no friction

objects always travel better on smooth surfaces

a moving object has a force which is pushing it forwards and it stops when the pushing force wears out

a non-moving object has no forces acting on it

heavy objects sink and light objects float.

Core Knowledge:

A force causes an object to start moving, stop moving, speed up, slow down or change direction.

Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall.

Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water, or the air and water may be moving over a stationary object.

A mechanism is a device that allows a small force to be increased to a larger force. The pay back is that it requires a greater movement.

The small force moves a long distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover. Pulleys, levers and gears are all mechanisms, also known as simple machines.

Wider Knowledge:

Galileo dropped weights off of the Leaning Tower of Pisa, showing that gravity causes objects of different masses to fall with the same acceleration - <https://www.sciencenews.org/article/galileo-gravity-experiment-atoms-general-relativity-einstein>

Working scientifically:

To carry out a fair test - does the type of string and straw used affect the distance travelled by a balloon?

How does the shape of an object affect the times it takes to travel through water? Fair

Pattern seeking - How does the height / surface of a ramp affect how the car travels along it?

End Goals:

- To understand that objects fall due to gravity pulling them down
- To explore friction, water resistance and air resistance and can explain the effect of these on moving objects.
- To explore levers, gears and pulleys and recognises that these enable a smaller force to have a greater impact.

CPD: Reach out CPD

Science Association / STEM website