

**KNOWLEDGE ORGANISER**  
**BIG IDEA: FORCES**  
**TOPIC: TYPES OF FORCES**

Key Word	Definition
<b>force</b>	A force is a push or pull between objects that cause change in speed, direction and/or shape
<b>contact force</b>	Contact forces act between two objects that are physically touching.
<b>non-contact force</b>	Non-contact forces act between two objects that are <b>NOT</b> physically touching.
<b>Newton</b>	Unit for measuring forces (N).
<b>gravity</b>	The amount of force per unit mass on object, it is always a pull force (N/kg)
<b>mass</b>	A measure of the amount of matter an object is made out of (kg)
<b>weight</b>	A measure of the force acting on a mass due to gravity (N)
<b>lubricant</b>	Something that reduces the friction between two surfaces
<b>Newton meter</b>	Instrument used to measure the magnitude of a force
<b>elastic</b>	A material that returns to its original shape/length when the force is removed
<b>Elastic limit</b>	The maximum force applied where a material will go back to its original shape
<b>Directly proportional</b>	If one quantity doubles or triples etc. so does the other.

Type of force	Definition	Contact / non-contact
<b>tension</b>	a pulling force exerted on an object by a string, rope or rod.	contact
<b>friction</b>	a force that acts between two touching surfaces and prevents or resists them moving against each other	contact
<b>upthrust</b>	an upwards force that acts on an object when it is in a fluid (a liquid or gas).	contact
<b>thrust</b>	a driving force exerted by an engine to make an object move	contact
<b>weight</b>	experienced by a mass when it is sufficiently close to another mass it always pulls two objects towards each other. It never pushes them apart.	non-contact
<b>air resistance</b>	An object experiences this force as it moves through air. It acts in the opposite direction to movement and increases the faster the object moves	contact
<b>magnetic</b>	experienced by a magnet or a magnetic material, eg iron, when placed in a magnetic field. This force can pull the two objects together or push them apart.	non-contact
<b>normal contact</b>	When an object pushes on a surface like a table, wall or the ground, the surface pushes back on the object with a balancing force.	contact
<b>electrostatic</b>	experienced by a charged particle in an electric field. This force can be either <b>attractive</b> or <b>repulsive</b> .	non-contact

### Weight

Mass and weight are not the same thing (see definitions). Weight is dependent on the force of gravity whereas mass is not. Therefore, an object will have a different weight on different planets but the same mass. Weight can be calculated using the equation below:

$$\text{Weight} = \text{mass} \times \text{gravity}$$

$$W = m \times g$$

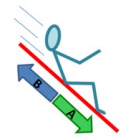
(N)    (kg)    (N/kg)

If an object on Earth has a mass of 5 kg and Earth's gravity is 10 N/kg then:

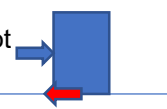
- Weight = mass x gravity
- Weight = 5 kg x 10 N/kg
- Weight = 50 N

### Friction

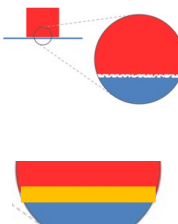
When a moving object slides over a fixed surface a force of friction acts on the object in the direction opposite to its motion.



When pushed or pulled on a surface, by a force that cannot move it, friction acts on the object in the direction opposite to the pushing or pulling force



The friction is caused by the unevenness at a microscopic level of the surfaces in contact. Friction can be reduced by using a lubricant.

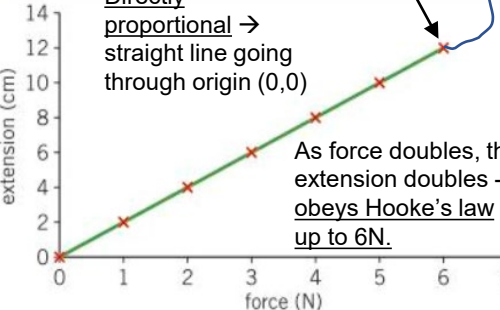


### Hooke's Law

"the force applied is directly proportional to the extension"

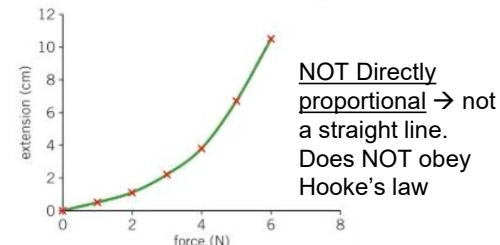
Directly proportional → straight line going through origin (0,0)

Elastic limit reached



As force doubles, the extension doubles - obeys Hooke's law up to 6N.

NOT Directly proportional → not a straight line. Does NOT obey Hooke's law



## Knowledge organiser

Big idea:



**Y8 topic:** Types of Forces

## I have already learned:

**In KS2:** compare how things move on different surfaces. Some forces need contact between two objects but magnetic forces can act at a distance. Magnets attract, repel, attract some materials and not others. Unsupported object fall to Earth due to gravity. The effects of air resistance, water resistance and friction.

**In Y7:** Forces can be represented using arrows as they have both magnitude and direction. Balanced forces cause no change in motion, unbalanced forces cause acceleration.

### **This topic links to:**

**KS4:** P5 Forces, P7 Magnetism and Electromagnetism, P8 Space

**KS5:** 3 Forces and Motion, 5 Newtonian world and astrophysics, 6 Particles and medical physics

## **It is important to study about types of forces because...**

Forces cause change and energy is a measure of that change, so if we understand forces it can help us to understand energy as well.

Understanding the types of forces can help us grasp why things change their motion, direction and/or shape and also predicts objects behaviour.

This knowledge has helped humans build bridges, design aeroplane and even learn how to figure skate, sky dive and bungee jump.

## **Possible careers involving types of forces are...**

Engineer, astrophysicist, race car driver, nuclear physicist, gymnast, physio, game developer, armed forces, architect, tree surgeon, astronaut, geophysicist, construction, pilot, sports player ..... and many, many more