# Forces

## What is a force?

Forces are either pushes or pulls. They can be placed into one of two categories: contact or non-contact.

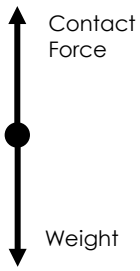
- Contact forces occur when objects or particles touch
- Non-contact forces: objects don't need to touch to interact with the force

| Examples of Forces | |
|---|---|
| Contact | Non-Contact |
| • Friction<br>• Air Resistance<br>• Tension | • Weight<br>• Magnetic<br>• Electrostatic |

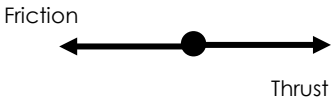
## Force Diagrams

Forces always act in pairs. To represent how forces act on objects you can draw diagrams with arrows.

**E.g. Book on a table**




**E.g. Car Driving**

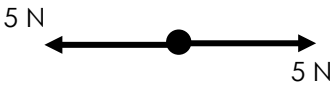



## Unbalanced Forces

Forces are measured in Newtons, N. When one force is bigger than another, the object will experience a resultant force. If a resultant force acting on an object is bigger than 0 N it will either:

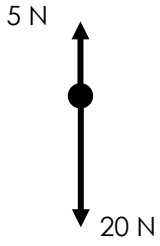
- Change its speed (e.g. accelerate or decelerate)
- Change its direction
- Change the shape of the object

*Resultant force examples:*




Resultant force = 5 N – 5 N
Resultant force = 0 N


Resultant force = 15 N – 5 N
Resultant force = 10 N



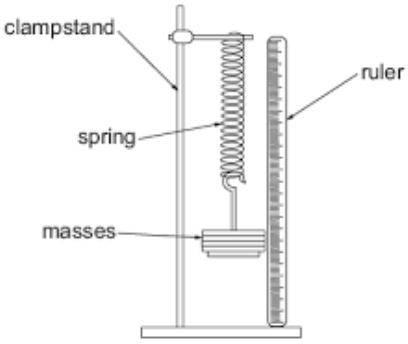

Resultant force = 20 N – 5 N
Resultant force = 15 N

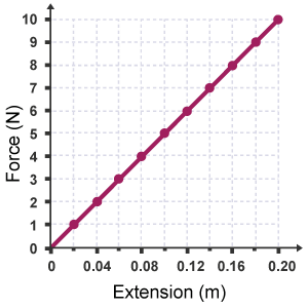
## Investigating Springs

When you apply a force to a spring, the spring will stretch. The amount it stretches by is known as the **extension**.

*How to measure extension:*
Original Spring length = 2 cm
Stretched spring length = 8cm
Extension = 8 cm – 2 cm
Extension = 6 cm

With all elastic objects, the extension of the object is directly proportional to the force being applied.



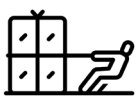

*When you double the force, you double the extension*

## Work Done

When a force is applied to an object, energy will be transferred. This is known as doing work.

You can calculate the force being applied if you know the work being done and the distance.

Force Applied = Work Done x Distance
(N) (J) (m)



## Weight

Objects with mass are pulled downwards to earth due to gravity. This downwards force is known as your weight.

Weight can change in different gravities. For example you are six times lighter on the moon and you have no weight in space.

Weight = Mass x Gravitational Field Strength
(N) (Kg) (N/Kg)

# CORE Questions

***The following are core questions for this topic. Cover the answer section with a sheet of paper and try and quiz yourself. Only try learning 5 at a time, once you know them move on.***

| | | |
|---|---|---|
| 1 | Give two examples of contact forces. | Any two from: friction, air resistance, tension |
| 2 | Give two examples of non-contact forces. | Any two from: magnetic, electrostatic and weight |
| 3 | True or False. Forces are push or pulls which always act in pairs. | True. |
| 4 | Which forces always acts in a downwards direction? | Weight |
| 5 | Name a force which resists the movement of an object. | Friction or a drag force. |
| 6 | State three ways a force can affect an object if the forces are unbalanced. | Change its speed, direction and shape |
| 7 | State the unit forces are measured in. | Newtons, N |
| 8 | A car drives with a force of 80N and the friction is 30N. Calculate the resultant force. | 80 - 30 = 50N |
| 9 | A skydiver is falling with a weight of 100N at a constant speed. Suggest the value of the air resistance force. | 100N. Since the speed is constant they must be balanced. |
| 10 | The force applied to a spring is directly proportional to the extension. Suggest what would happen to the extension of the spring if the force doubles. | The springs extension would double as well |
| 11 | When you collect data which could take any value. Should it be plotted on a line graph or a bar chart? | Line graph |
| 12 | State the unit for measuring weight. | Newtons, N |
| 13 | State the unit for measuring mass. | Kilograms, Kg |
| 14 | Put into an equation: weight, mass and gravity | Weight = Mass x Gravity |
| 15 | A man with a mass of 50Kg is on a planet with a gravitational field strength of 5N/Kg. Calculate his weight. | W = m x g  W = 50 x 5  W = 250N |
| 16 | What is the name of the downwards force that pulls you towards earth? | Weight |
| 17 | State the units for measuring work done. | Joules, J |
| 18 | True or False. Work done means force transferred. | False. It means energy transferred. |
| 19 | Put into an equation: work done, force and distance. | Work Done = Force x Distance |
| 20 | A crane lifts a crate 100m into the air with a force of 10N. Calculate the work done to lift it. | w = f x d  w = 10 x 100  w = 1000J |