

**Title:** Identifying Forces

**Learning objective:** Describe the different forces that can act upon objects.

**Instructions:** Complete each activity either in your exercise book or on lined paper and self-assess all answers.

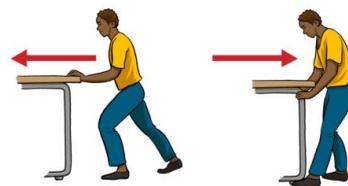
**Do Now:**

1. Name the 3 states of matter (1)
2. State what colour would universal indicator turn in a strong acid (1)
3. State the pH of a neutral substance (1)
4. Name the piece of equipment and state what it is used for (1)
5. Calculate the mean from the following set of results and show your working out.  
12, 13, 15, 14, 12 (1)

**Challenge:** Explain the advantage of using universal indicator over litmus paper

**New Knowledge:**

A force is a push or pull that acts on an object. Forces change objects. They can change their direction, their speed or their shape. We cannot see a force, we see the effect of a change caused by a force when two objects interact. There are two types of forces, contact and non-contact.



**Contact Forces:**

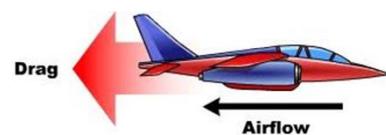
**Friction** – Force opposing motion which is caused by the interaction of surfaces moving over each other releasing thermal energy. For example, if you rub your hands together, you are experiencing friction. Notice how your hands feel warmer. This is because thermal energy is being transferred. This is also why car tyres get hot after a long journey. Friction acts to slow things down.



**Air resistance** - the force exerted by air on an object that moves through the air. For example, a parachute stops the skydiver from landing too quickly by increasing the air resistance to make them slow down. Air resistance is also the reason why a feather will fall more slowly compared to a tennis ball.



**Drag** - Friction force when one object is a liquid or a gas. For example, an aeroplane will experience a type of friction called drag when it is flying. If the drag is too high then this will slow the plane down. We can design objects to have a streamlined shape to reduce this drag force and make them reach a higher speed more quickly.



**Tension** - Force extending or pulling apart. For example, when we complete the tug of war in sports day, the tension force on the rope increases as both sides pull each end.



**Compression** - Force squashing or pushing together. For example, when you squeeze a balloon you increase the compression force.



A normal contact force



the chair pushes the person

**Normal contact force** - The **normal force** is the **force** that surfaces exert to prevent solid objects from passing through each other. All surfaces exert this force on each other. This is why you don't fall straight through your chair. The chair is exerting a force on you.

### Non-contact forces:

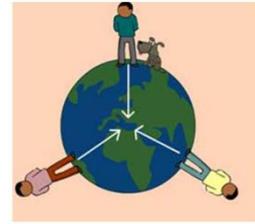
Non-contact forces are when the objects do not have to be physically touching for the force to act and include gravitational force, electrostatic force and magnetic force.

**Gravitational force** - The **gravitational force** is a force that attracts any two objects with mass.

For example, gravitational force exists between the earth and you. This is why you remain standing on the earth's surface because you are being pulled towards its centre. This means that even people who are on the other side of the world also remain standing on earth.

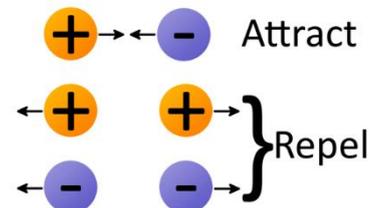
The bigger the mass of the object, the greater this force. If you went to Jupiter, you would be unable to lift your legs and walk due to the strength of the gravitational force.

Weight is the name we give to the force that acts due to this gravitational force. For example, we would say that the person's weight is pulling them towards earth.



**Electrostatic force** – force between charged particles

This is why your hair is attracted to a balloon when you experience static. It is also what keeps electrons orbiting around the nucleus of an atom.



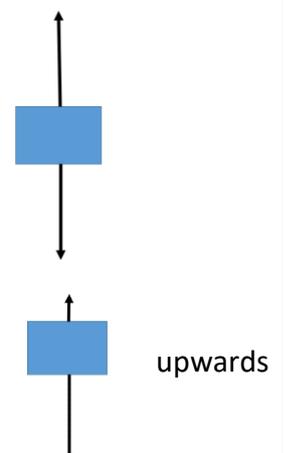
**Magnetic force** – the force exerted between a magnet and a moving, electrically charged particle.



### Free body diagrams

We use a free body diagram to represent the forces acting upon an object. We use an arrow to show the direction of the force and the length of the arrow represents the size of the force

Here, the forces are unbalanced. The downwards force is greater than the force.



Here the forces are balanced. The forward and backwards forces arrows are the same length. We will learn about what effect balanced and unbalanced forces have on objects in two lessons.



**Key knowledge:**

Spend 5 minutes completing 'Look, Cover, Write, Check' of this knowledge, or get someone to quiz you on it.

What is a force	a push or pull.
Name the two types of forces	contact and non-contact forces.
What is contact force	The force when objects are physically touching.
Name 7 contact forces	friction, air resistance, drag, tension, compression, weight and normal contact force.
What is a non contact force	The force when objects are not physically touching.
Name 3 non contact forces	gravitational force, electrostatic force and magnetic force.
What does a free body diagram show	The forces acting on an object.

**Quiz:**

1. What is a force
2. Name the two types of forces
3. What is contact force
4. Name 7 contact forces
5. What is a non contact force
6. Name 3 non contact forces
7. What does a free body diagram show

**Independent Task:**

For the objects in the pictures below;

- a) Draw force arrows on the diagram, to show the size and direction of the forces.
- b) Label these arrows with the names of the forces

1. A stationary duck sitting on a lake.



2. A football that has been kicked and is now moving along the ground.



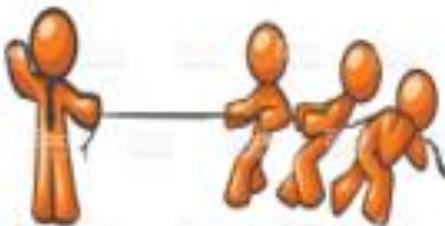
3. A car being driven along a race track.



4. Hot air balloon travelling at a constant height.



5. A tug of war.



6. A submarine travelling at a constant depth.



7. A boy who has jumped into the air.



8. A box being pushed along the ground.



**Answers:**

**Do Now: S.A.**

1. Name the 3 states of matter Solid, liquid and gas.
2. State what colour would UI turn in a strong acid  
Red/ orange
3. State the pH of a neutral substance. pH7
4. Name the piece of equipment. Conical flask and used to mix chemicals.
5. Calculate the mean from the following set of results:  
 $12+ 13+ 15+ 14+ 12= 13.2$   
Challenge: UI is able to tell you if it is a strong or weak acid or alkali.

**Quiz**

1. a push or pull.
2. contact and non-contact forces.
3. The force when objects are physically touching.
4. friction, air resistance, drag, tension, compression, weight and normal contact force
5. The force when objects are not physically touching
6. gravitational force, electrostatic force and magnetic force.
7. The forces acting on an object.