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sensation The LIVE Science Centre: DUNDEE

A seven part series exploring the fantastic world of science.

FORCES

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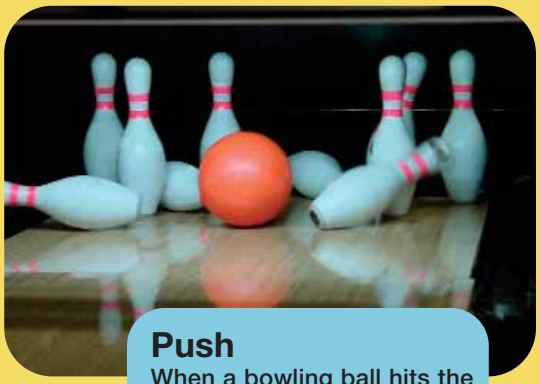
What is a force?

A force is a push or pull. Find out about pushing and pulling forces.

Pull
During a tug-of-war, both teams pull as hard as they can on the rope.

Pull
When a flag is raised up the flag pole, it uses a pulling force on the rope.

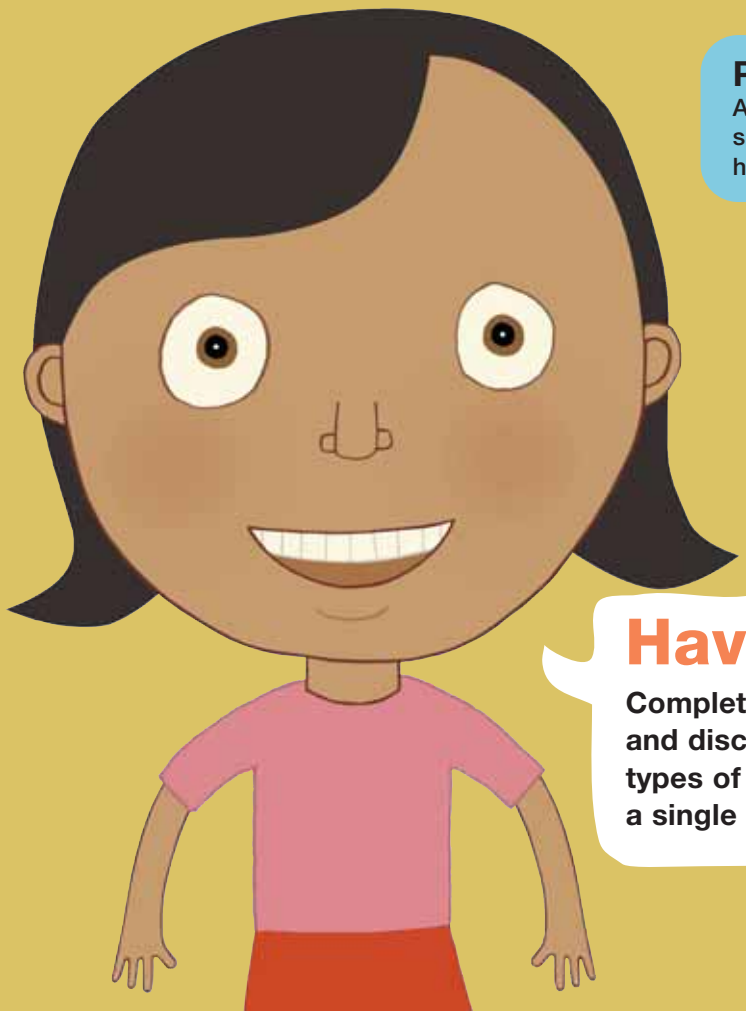


Push
When a bowling ball hits the bowling pins it knocks them over using a pushing force.

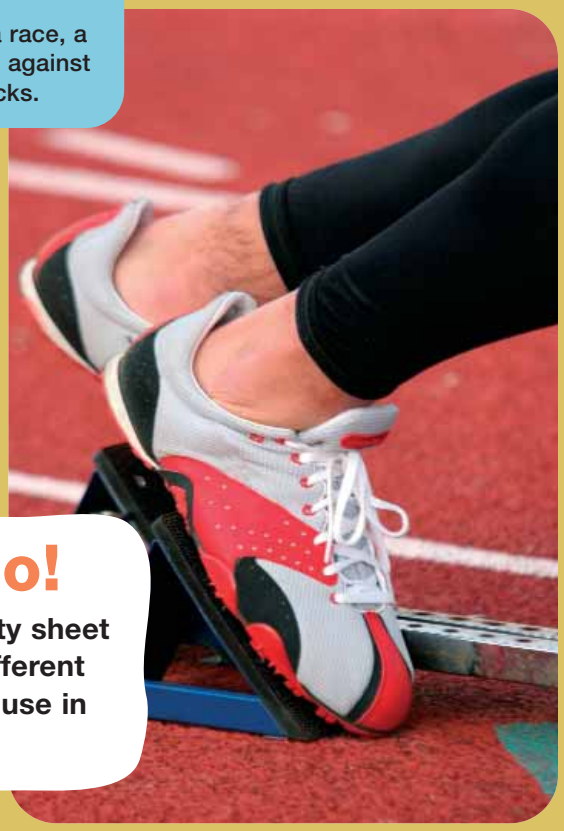
Pull
At Christmas, you pull crackers.

Pulling Forces
Pulling forces are used daily. For example you may pull open a drawer or pull your socks on in the morning.

Pushing Forces
Everyday you will use force to push things. For example pushing a trolley along or pushing your friend on a swing.



Push
At the start of a race, a sprinter pushes against his starting blocks.



Have a go!

Complete the activity sheet and discover the different types of forces you use in a single day!

Different types of force.

Learn more about the different types of force around you.

Gravity

Gravity is a pulling force. Gravity pulls objects towards the centre of Earth. When an apple is ripe, it falls from the tree to the ground due to gravity. After take-off, gravity pulls a high jumper back towards the ground.

Friction is the force that creates resistance when two surfaces come into contact with one another. For example there is friction between car tyres and the road. Friction can be increased to slow down a car by pressing on the brakes. Friction can also be reduced, for example ice skates have very sharp blades to cut across the ice.

Friction

Did you know?

Forces act in pairs. The lift of a plane, pushing it up into the sky is paired with gravity, which pulls the plane back towards the centre of Earth. The thrust of a plane that moves it in the forward direction is paired with drag that slows the plane down.

If both pairs of forces are equal (balanced) the object will stay at rest in the same place. However, if one force is greater than the other, the object will move in the direction of the biggest force.

Have a go!

If you were to drop a ping-pong ball and a golf ball from the same height, which ball would hit the ground first? Have a go and find out for yourself. Remember that gravity pulls all objects towards Earth with the same force. So objects that are a similar shape fall to the ground at the same rate.

Air Resistance

Air resistance is a pushing force. Air resistance pushes against objects that are moving. Air resistance slows down a parachute as it travels back down to Earth. Air resistance can be reduced by using aerodynamic equipment and streamlined clothes like speed skiers have.

Pressure

Pressure is a pushing force. The greater the force of an area, the greater the pressure. If you want to reduce the pressure, you can increase the surface area. For example the caterpillar tracks on an army tank and snow shoes both spread force over a large surface area.

Have a go!

Discover for yourself what happens when you spread a force over a large area. Take one thin straw and try to push it into a potato or an apple. Did the straw stick into the potato? Now take a bundle of about 10 straws and using the same force try to push them into the potato. What happens?

Floating and Sinking

Floating and Sinking. The weight and shape of an object determines whether it floats or sinks. The more air in a material, the more likely it is to float. That's why when you are learning to swim, you wear armbands full of air to help you float on the surface of the water.

Have a go!

Investigate how the shape of an object determines if it floats or sinks for yourself.

Take some plasticine and shape it into a ball, then place it in a tank of water. Does the ball of plasticine float or sink?

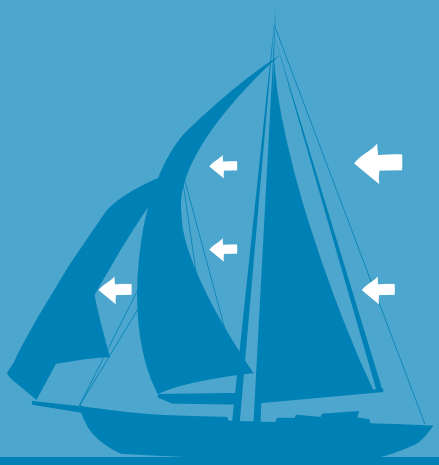
Now, mould the ball of plasticine into a boat and place it in a tank of water. Does the plasticine boat float or sink?

What can forces do?

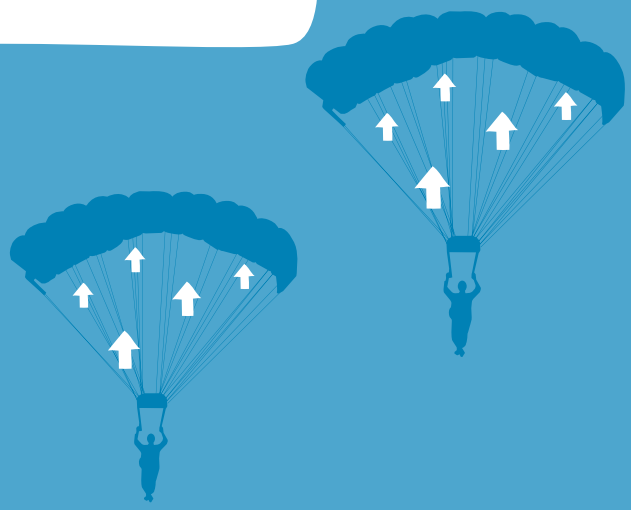
Learn more about the effects of force using the examples below.

Forces can make objects change direction. The direction of a cricket ball can be changed by hitting it with a bat.

The force of the wind in the sails can be used to change the direction of a boat.



Forces can slow things down. Opening a parachute slows down the jumper because it increases the air resistance.



Forces can speed things up. The more force the cyclist uses to turn the pedals, the faster the bike travels forwards.

Forces can make objects change shape. The force of your body weight means that you can leave footprints in the snow.

By kicking a football hard you can change its shape.

Forces can make things turn. You can use force to turn the wheel of a car, or use a spanner to tighten a nut and bolt.

Did you know?

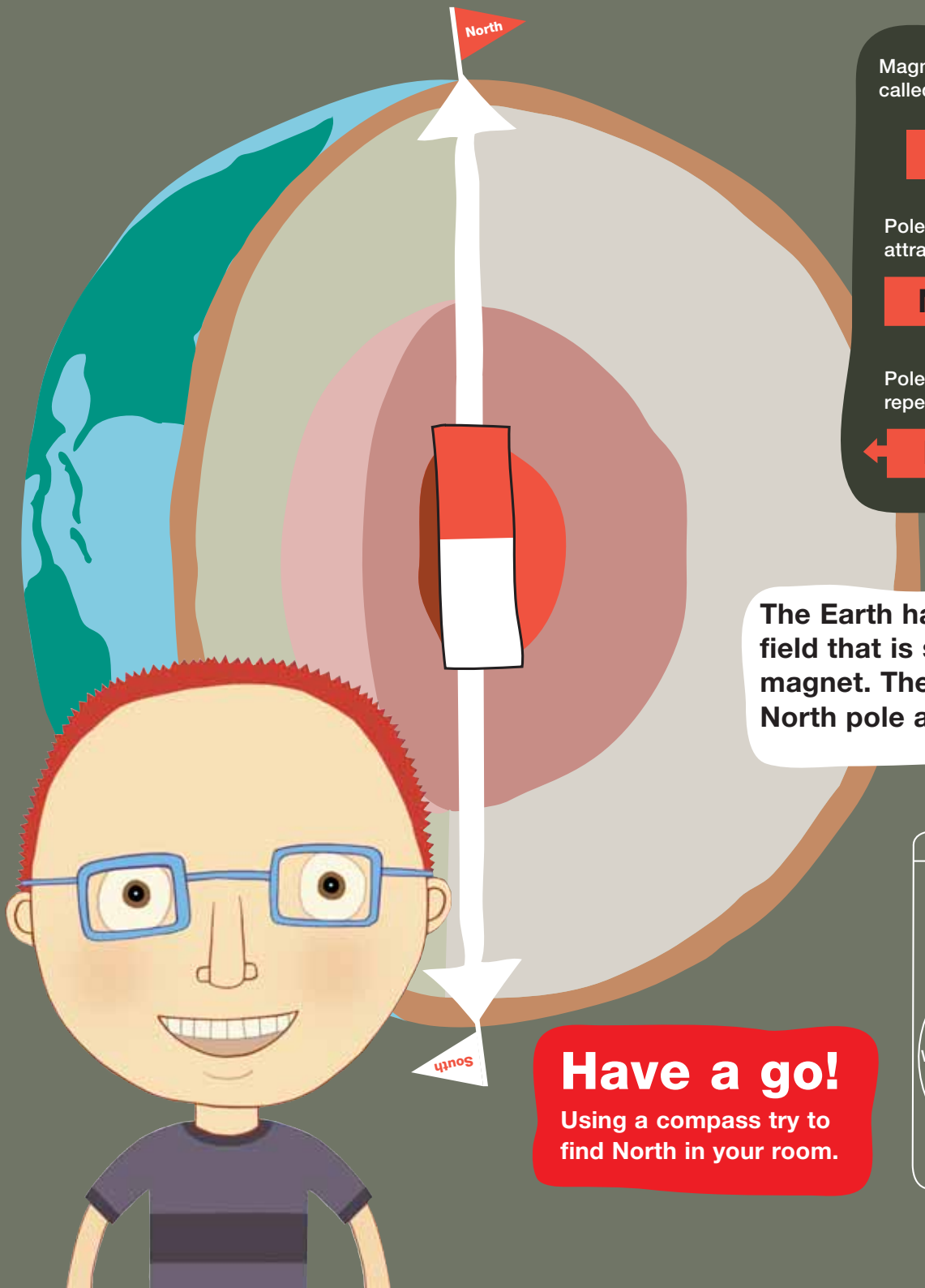
The fastest serve by a tennis player was recorded by Andy Roddick, who used enough force to serve the ball at a speed of 246 kph (153 mph).

Magnetic force.

Learn more about magnets and their forces.

Magnets pull (attract) certain metals. Metals that are pulled towards a magnet are called magnetic. For example iron, steel and nickel are all magnetic metals. Other metals such as aluminium, tin and copper are not magnetic.

Iron filings being pulled towards the poles of two bar magnets.



Magnets have two poles called North (N) and South (S).

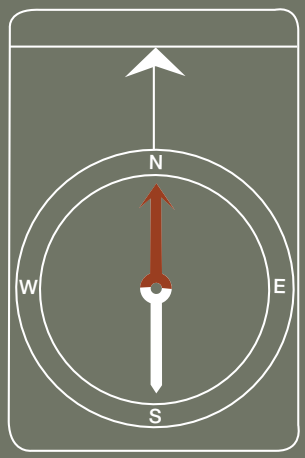
Poles that are opposite attract each other.

Poles that are the same repel each other.

The Earth has a magnetic field that is similar to a bar magnet. They both have a North pole and a South pole.

Have a go!

Using a compass try to find North in your room.



Have a go!

Forces acting on a car.

Make a copy of the activity sheet.
Investigate the different forces that act on a car.

Name: _____

For this experiment you will need the following equipment:

Toy car
Short ramp (piece of board propped up on some books)
Different surfaces, for example: sandpaper, carpet, vinyl
Stopwatch

What to do:

Using the stopwatch, time how long it takes the car to travel down the ramp.
Enter the time in the table below.

Type of Surface	Time (seconds)

Now cover the ramp with a different surface, for example a piece of carpet, and time how long it takes for the car to travel down the ramp.

What were your results?

Did the car take the same length of time to travel down the different surfaces?
Why did this happen?
What forces were acting on the car?

Ideas for more experiments.

Try adding some weights to the car. How does the extra weight affect the car?
Try some fairy liquid on the vinyl surface. What happens to the car?

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Have a go!

What forces do I use during the day?

Make a copy of the activity sheet. Write down the different types of forces you use during the day while you are at school and at home.

Name: _____

Today I have used the following types of force:

Force	Activity
eg. Push	Opened the door.

Design: www.d8web.co.uk

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