

Contact or Non-Contact Forces

Sort the forces into two lists: contact forces and non-contact forces.

- upthrust
- tension
- magnetic
- air resistance
- electrostatic
- gravity
- reaction
- water resistance
- weight
- friction

Contact Forces	Non-Contact Forces

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Contact Forces	Non-Contact Forces

Forces Glossary

air resistance	This force is also known as drag. It is the force that acts on objects as they fall through the air.
area	The size of a surface.
balanced force	This happens when two forces are of the same size but are acting in opposite directions.
compression	The squashing of particles. Gases can be easily compressed because there are spaces between the particles.
drag	A type of force which acts on an object that is moving through air or water.
equilibrium	Balanced.
extension	This is the increase in length when something like a spring or elastic band stretches.
force	A push, pull or twist. Measured in newtons (N).
friction	This occurs when two objects move past each other. Friction slows objects down.
gravity	The force of gravity prevents everything from floating away from earth.
Hooke's law	A law that states that if you double the force of an object, the extension will also double.
lubrication	Oil is a good lubricant - it reduces the effect of friction.
magnetic field	The area around a magnet.
mass	The amount of stuff (matter) something is made of. Measured in kg.
moment	This is a turning force.
newton	Unit of force, symbol N.
newton meter	An instrument used to measure the force acting on an object.
parachute	Used when jumping out of an aeroplane to slow the fall down. The forces acting on a parachute are often used in exam questions.
Pascals	The unit of pressure (Pa).
pressure	How much force in a certain area. Equation: $\text{pressure} = \text{force} \div \text{area}$.
streamlined	Shaped to travel through air or water with as little resistance as possible.
unbalanced	When two forces are acting on an object and one of the forces is greater than the other.
water resistance	Acts on an object as it moves through water.
weight	This is a force acting on an object's mass. Weight is measured in newtons (N).



Investigating Forces Results Table

Silver

Station	Diagram	Forces Acting
1.		
2.		
3.		

4.		
5.		
6.		

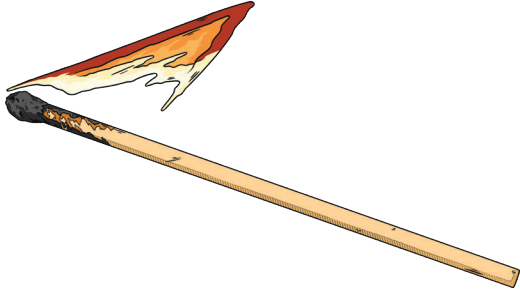
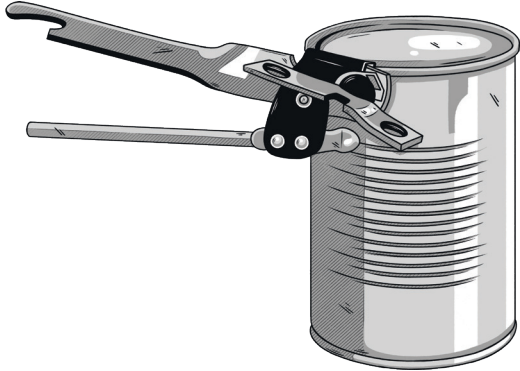

7.		
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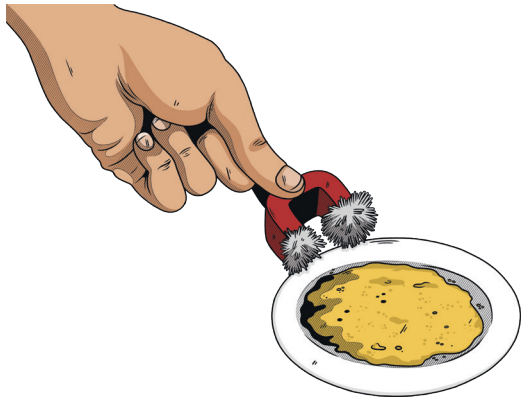
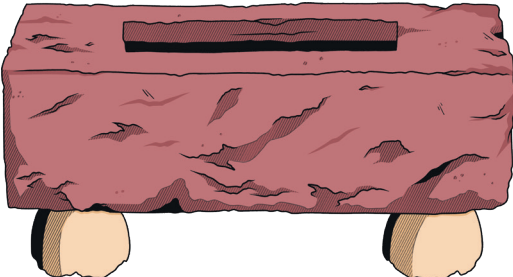
Investigating Forces Results Table Answers

Station	Forces Acting
1	The forces acting on the match are... gravity/weight pulling the match down. Pulling force to lift the match up. Friction force between match and matchbox when you strike it.
2	The forces acting on the can are... gravity/weight pulling the can down. Reaction force pushing up from the desk/floor. Friction force between can and the gear of the tin opener. Pushing force when the blade is applied to the can to open it.
3	The forces acting on the cork are... gravity/weight pulling the cork down. Upthrust/buoyancy pushing the cork upwards.
4	The forces acting on the table tennis ball are... gravity/weight pulling the ball down. Air resistance force pushing the ball upwards.
5	The forces acting on the iron filings are... gravity/weight pulling the filings down. Reaction force pushing up from the desk. Magnetic pulling force to attract the filings to the magnet.
6	The forces acting on the eggshells are... reaction force pushing up from the desk/floor. Gravity/weight pulling down on the eggshells. Gravity/weight (of the brick) pushing down on the shells. Tension force in the eggshells.
7	The forces acting on the paper are... gravity/weight pulling down on the paper. Reaction force pushing up from the desk/floor. Electrostatic force pulling on the paper towards the balloon.

Investigating Forces Results Table

Bronze

Station	Diagram	Forces Acting
1.	 <p>Striking a match.</p>	The forces acting on the match are...
2.	 <p>Opening a can with a tin opener.</p>	The forces acting on the can are...
3.	 <p>A cork floating in water.</p>	The forces acting on the cork are...

4.	 <p>A table tennis ball suspended in the air current of a hair dryer.</p>	The forces acting on the table tennis ball are...
5.	 <p>Separating iron filings from cornflakes using a magnet.</p>	The forces acting on the iron filings are...
6.	 <p>A brick balanced on eggshells.</p>	The forces acting on the eggshells are...

7.



A balloon attracting small pieces of paper.

The forces acting on the pieces of paper are...

Investigating Forces Results Table Answers

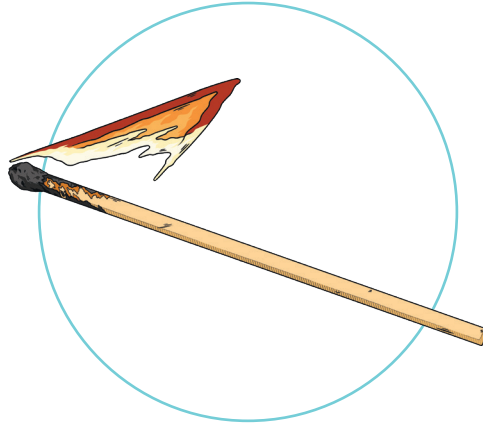
Station	Forces Acting
1	The forces acting on the match are... gravity/weight pulling the match down. Pulling force to lift the match up. Friction force between match and matchbox when you strike it.
2	The forces acting on the can are... gravity/weight pulling the can down. Reaction force pushing up from the desk/floor. Friction force between can and the gear of the tin opener. Pushing force when the blade is applied to the can to open it.
3	The forces acting on the cork are... gravity/weight pulling the cork down. Upthrust/buoyancy pushing the cork upwards.
4	The forces acting on the table tennis ball are... gravity/weight pulling the ball down. Air resistance force pushing the ball upwards.
5	The forces acting on the iron filings are... gravity/weight pulling the filings down. Reaction force pushing up from the desk. Magnetic pulling force to attract the filings to the magnet.
6	The forces acting on the eggshells are... reaction force pushing up from the desk/floor. Gravity/weight pulling down on the eggshells. Gravity/weight (of the brick) pushing down on the shells. Tension force in the eggshells.
7	The forces acting on the paper are... gravity/weight pulling down on the paper. Reaction force pushing up from the desk/floor. Electrostatic force pulling on the paper towards the balloon.

Station 1

Equipment: matches and matchbox.

Action: strike a match on the matchbox.

Which forces are acting on the objects?

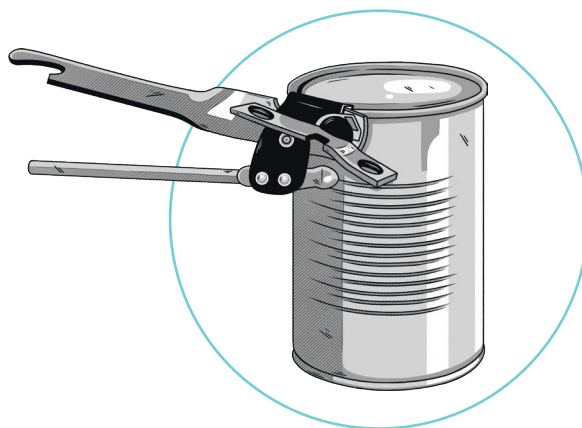


Station 2

Equipment: can and tin opener.

Action: put the tin opener on the can and twist the gear.

Which forces are acting on the objects?

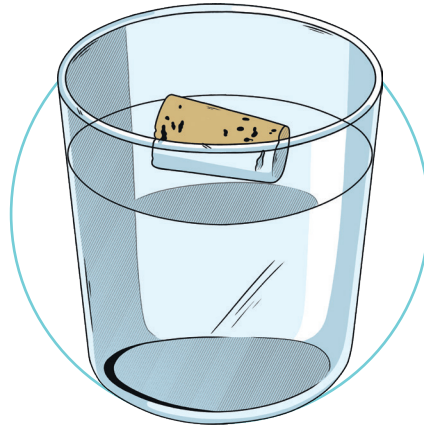


Station 3

Equipment: cork in a large trough of water.

Action: submerge the cork into the water and then let go.

Which forces are acting on the objects?



Station 4

Equipment: hairdryer and ping pong ball.

Action: use the hairdryer to blow cool air upwards. Place the ping pong ball in the air current and see if you can keep it up in the air.

Which forces are acting on the objects?

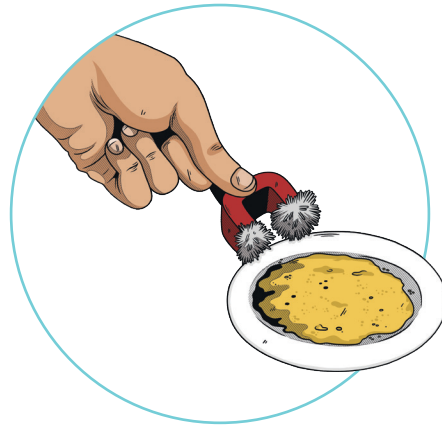


Station 5

Equipment: mixture of crushed cornflakes and iron filings in a plastic zip-lock bag and a bar magnet.

Action: use the magnet through the bag to separate any iron filings.

Which forces are acting on the objects?

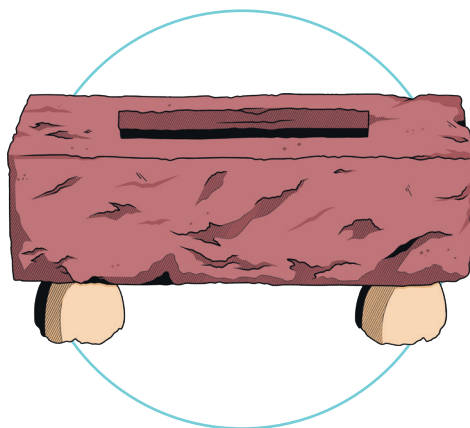


Station 6

Equipment: eggshell halves and house brick.

Action: stand the eggshells so the broken side is on the desk and then carefully place the brick on top of the eggshells.

Which forces are acting on the objects?



Station 7

Equipment: balloon, duster and paper scraps.

Action: rub the balloon surface with the duster cloth and then carefully wave the balloon above the paper scraps.

Which forces are acting on the objects?





Forces Lesson 1:
**Contact and Non-Contact
Forces**



Learning Objective

To identify contact and non-contact forces.

Success Criteria

- To list some forces.
- To distinguish between contact and non-contact forces.
- To investigate how different forces act.

Starter Task: Ring Magnets

Look at the apparatus that is set up on the desk in front of you.

Write down three questions that you can ask about the apparatus e.g. what are the rings made of?

You have five minutes – be ready to share your questions with the rest of the class.



What Is a Force?

A force is push or pull acting on an object. Forces act in pairs, opposing one another.

We cannot see a force as a physical object, nor can we touch a force. However, we can see the effects that a force has on an object or objects. Forces can make objects change speed, direction or even shape.

Forces – How Many Do You Know?

You have two minutes to name all the forces listed below – some are given as a picture, anagram or have missing letters. Can you solve them all?



gravity



electrostatic



air resistance



water resistance

HUPUTRTS
upthrust

GAMENITC
magnetic

FR_CT_N
friction

T_NS_N
tension

W_GHT
weight


OIAERCTN
reaction

Investigating Forces

Around the room are stations. Each station has some equipment and instructions.

At each station, follow the instructions and then identify the forces acting on the object.

Record your findings on the worksheet.

 **Investigating Forces Results Table**
Silver

Station	Diagram	Forces Acting
1.		
2.		
3.		

BEYOND SCIENCE

Glossary of Forces

Glue the glossary into your notes.

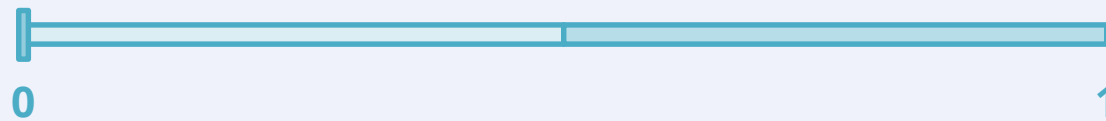
Highlight any of the keywords from the glossary that we have used today.

Forces Glossary	
air resistance	The force that opposes the motion of an object as it moves through the air.
area	The size of a surface.
balanced force	The forces acting on an object are equal in strength and opposite in direction.
compression	The pushing of particles together, compressed matter has a smaller volume.
drag	Force of resistance that acts on a body moving through a fluid.
equilibrium	Balance.
extension	The force that stretches an object, the force that stretches an object is called extension.
force	A push or pull.
friction	The force that opposes the motion of an object when it is in contact with another surface.
gravity	The force of attraction between two objects.
Hooke's law	The force that stretches an object is directly proportional to the extension.
frictionless	A surface where there is no friction.
magnetic field	The area around a magnet where it exerts its force.
mass	The amount of matter in an object.
moment	The turning effect of a force.
newton	The unit of force.
normal contact	The force that acts perpendicular to the surface of contact.
pressure	The force acting on a unit area.
push	The force that pushes an object.
pull	The force that pulls an object.
static friction	The force that prevents an object from moving.
unbalanced	When the forces acting on an object are not equal in strength and opposite in direction.
weight resistance	The force that opposes the weight of an object.
weight resistance	The force that opposes the weight of an object.



Contact and Non-Contact Forces

What might the difference be between a **contact** and **non-contact** force?



Take Notes

A **contact force** occurs when the objects are touching.

Take Notes

A **non-contact force** occurs when the objects are not touching.

Plenary: Keyword Sort

Sort the forces into two lists: contact forces and non-contact forces.

upthrust tension magnetic air resistance friction
electrostatic gravity reaction water resistance weight

Contact Forces	Non-Contact Forces
upthrust air resistance tension reaction water resistance friction weight	electrostatic magnetic gravity

Moving On

Have a go at the exam-style question below.

The question is worth four marks. You will have five minutes to write your answer.



1. Name the downward force acting on the children. [1]
2. Name the opposing force to the force you identified in question 1. [1]
3. After the game, Steven's hand is sore and red. Explain why. [2]

Moving On

How did you do?

Mark your answer using the mark scheme below.

1. Name the downward force acting on the children. [1]
 - **weight (accept gravity)**
2. Name the opposing force to the force you identified in question 1. [1]
 - **reaction force**
3. After the game, Steven's hand is sore and red. Explain why. [2]
 - **Friction (between the rope and his hand);**
 - **has produced heat against his skin.**





KS3 Forces Lesson 1: Contact and Non-Contact Forces Teaching Ideas

Learning Objective:

To identify contact and non-contact forces.

Success Criteria:

- To list some forces.
- To distinguish between contact and non-contact forces.
- To investigate how different forces act.

Context:

This is the first lesson of the KS3 Forces topic. In this lesson, students are introduced to the definition of a force and some examples of the different forces. They complete a carousel of investigations to look at the action of some different forces before creating a mini-glossary of the different forces and sorting them by contact and non-contact types of forces.

Resources

retort stand and ring magnets
matches and matchbox
cans e.g. baked beans
tin opener
cork
trough of water
hairdryer
table tennis ball
mixture of crushed cornflakes and iron filings in a clear zip-lock bag
bar magnet
eggshells (halves, washed)
house brick
balloon (inflated and tied)
small 1cm squares of paper
duster cloth
mini-whiteboards and pens (optional)

Starter

Before the lesson, if possible, set up your equipment for the starter task.

Using a set of ring magnets and two poles, set up two versions. In the first version, have each magnet aligned with the same pole facing upwards – they should all attract and fall together at the bottom of the pole. On the second version, alternate in pairs which pole is facing upwards – they should attract in pairs, but each pair should repel the next and appear suspended above the previous pair.

The slide challenges students to write down three questions they would ask about the apparatus. There is a five-minute timer on the slide to support this activity. Once the students have written their questions, take feedback from the group and ask other students to suggest possible answers to their peers' questions. This activity will allow you to gain some insight into the group's prior knowledge of the topic of forces and magnetism, whilst enabling you the opportunity to identify and address any misconceptions which may arise during the discussion.

Students might ask questions such as: How are the rings suspended/floating? What are the rings made of? Are they magnetic? Is there any electricity? Why do some rings float and others stick together?

Main Activities

What Is a Force?

Read through the information on the slide or ask a student to read it aloud for the class. You may ask students to write a definition of a force into their notes.

Forces – How Many Do You Know?

Ask students to work independently to identify as many forces as they can from the clues given. You may ask them to list them into their notes or perhaps using mini-whiteboards and pens. The clues are given as anagrams, missing vowels or picture prompts. A two-minute timer is included on the slide to support the timing of this activity. Answers will appear on a mouse click.

Investigating Forces

We recommend that you have taken the time to read through each of the station instructions and set up the stations and equipment in advance of your lesson. You may choose to omit certain stations, e.g. matches or can opener, depending on your group's maturity and a personalised risk assessment of your group and location where the activity is being used, but also based on the availability of equipment.

Briefly explain each station to your groups and show them the [Investigating Forces Station Task Cards](#) where they can find the task instructions. You may not need to demonstrate each individual station depending on the ability of your group. Ask students to move around the stations, either freely in a set time such as 15 minutes or on rotation to a bell or whistle e.g. every three minutes. Students will need to look at the equipment and carry out the action as instructed on the station card. They will then need to record their observations of the forces they think are acting. There is space to record their observations on the [Investigating Forces Results Table Middle Ability Worksheet](#). There is also a lower-ability differentiated version which includes illustrations of the equipment and sentence starter prompts.

Glossary of Forces

Using the [Forces Glossary Poster](#), ask students to highlight the keywords they have encountered in the lesson today.

Contact and Non-Contact Forces

Ask students what they might think the difference between contact and non-contact forces are. There is a one-minute visual timer included on the slide to support this activity.

After the time has elapsed, take feedback from some students and then definitions can be shown on the slide on a mouse click. You may want students to make a note of the different types of forces.

Plenary

Contact and Non-Contact Forces

Ask the students to sort the list of forces into two columns: contact forces and non-contact forces. You may ask students to copy and complete the table into their books before self-assessing. Alternatively, you may ask students to complete the activity on a mini-whiteboard or on the

Answers will appear on mouse click for self- or peer-assessment.

Moving On:

There is a practice exam question supported by a visual timer and full mark scheme for self- or peer-assessment.