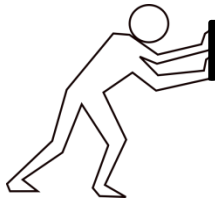


# *FORCES 2*



## Pushes and pulls

### Index:

- Introduction to forces ☐
- Measuring a force ☐
- Gravity ☐
- Friction: introduction ☐
- Friction: Investigation ☐
- Friction: How to reduce friction ☐
- Balanced and unbalanced forces ☐

Name \_\_\_\_\_

Form \_\_\_\_\_

# FORCES Part 1

A force is any kind of **PUSH or PULL** (or twist)

If you see something moving there **MUST**( at some time) have been a force acting on it be a force acting on it.

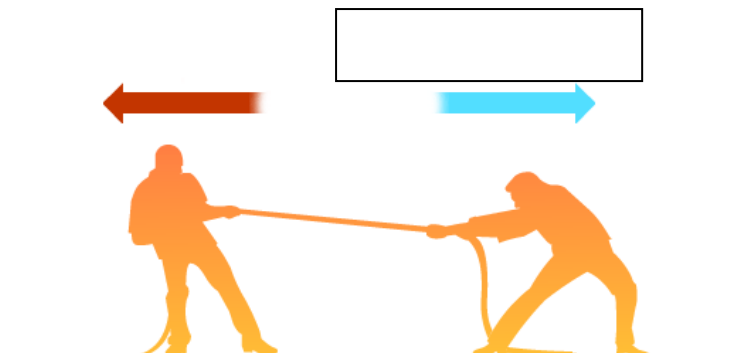
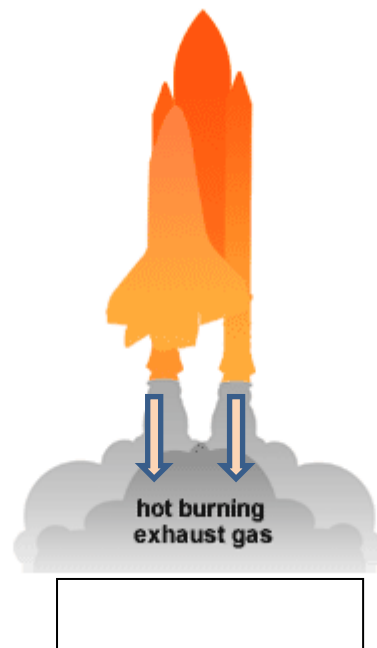
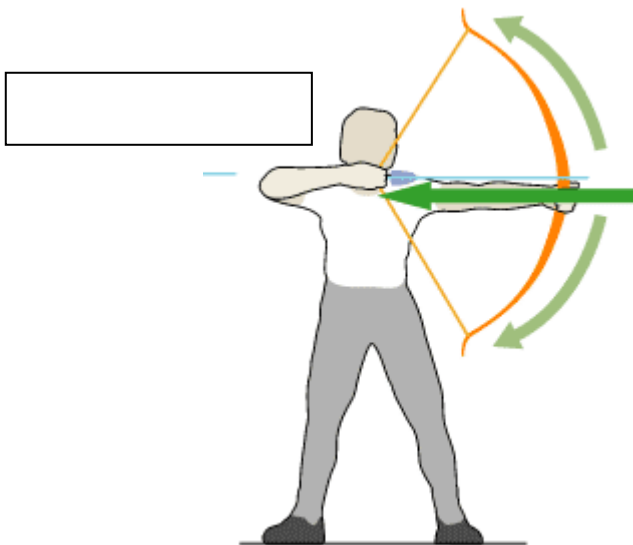
A force is needed to make an object **speed up**

or to make it **slow down**

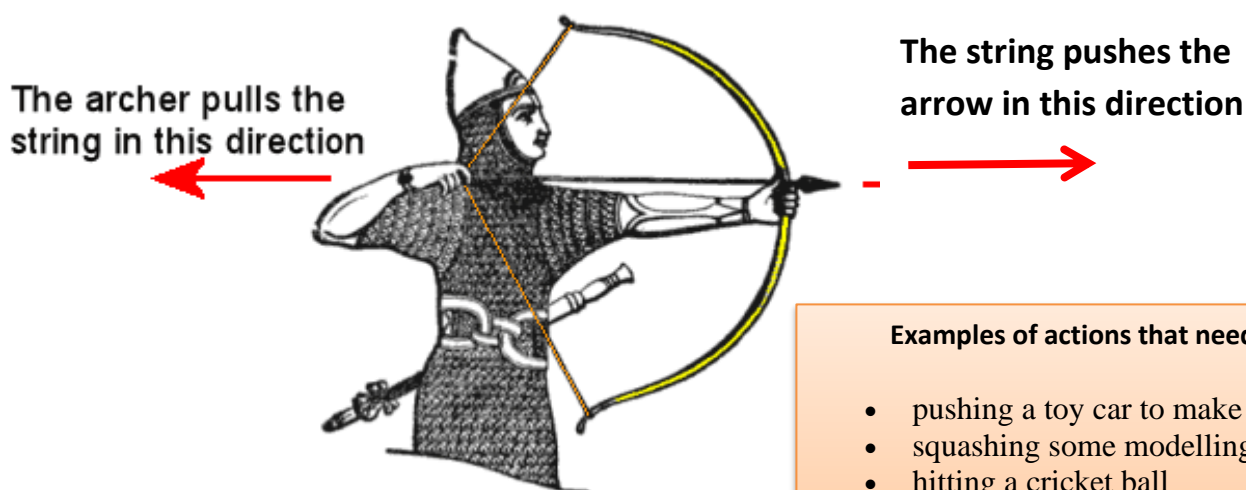
or to make it **change direction**

or to make it **change shape**

Write the word 'Pull' or 'Push' in the box by each diagram



**Forces have a direction. The direction of the force is shown by an ARROW**



**Examples of actions that need a force:**

- pushing a toy car to make it move
- squashing some modelling clay
- hitting a cricket ball
- bending a stick

## Types of Force

Some forces have special names:

- **Magnetism:** is the pull or push produced by a magnet.
- **Gravity:** is the force that gives us weight. Gravity always pulls downwards.
- **Friction:** is the force that slows things down. Friction makes sliding difficult.
- **Upthrust:** is the upward force that makes things float .

## Mini test

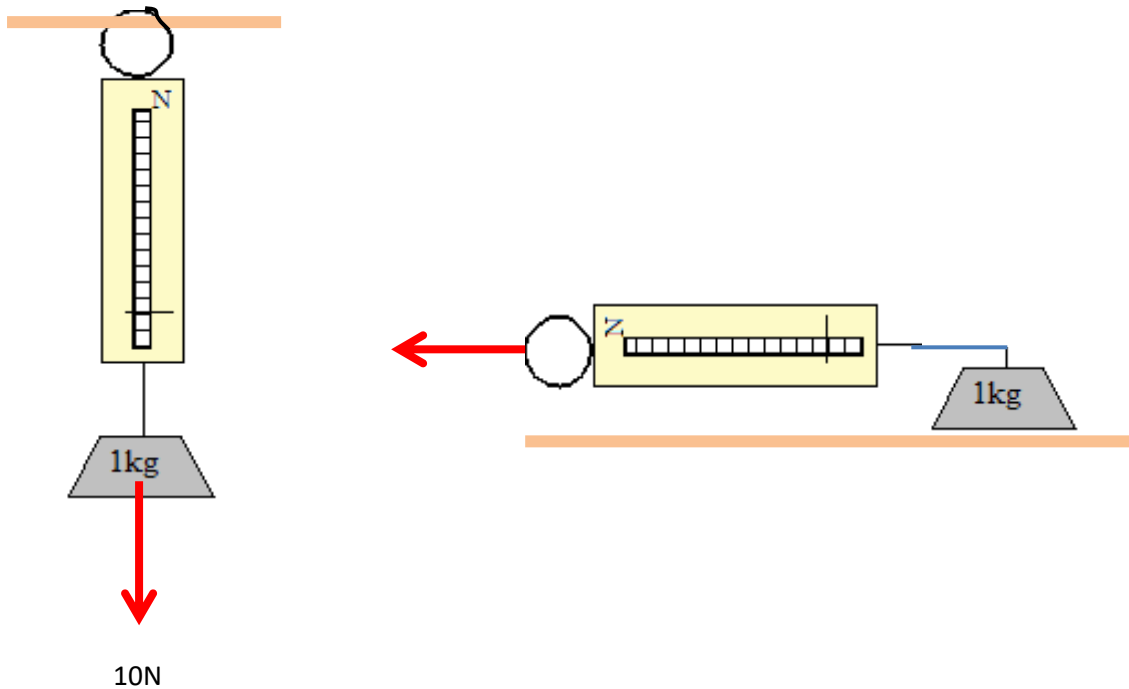
1. A Force is described as a ..... or a .....
2. A force can make an object do four things
  - a) Go faster (speed up)
  - b) .....
  - c) .....
  - d) .....
3. Write down the name of the force that makes it difficult for things to slide: .....
4. Write down the name of the force that pulls things downwards: .....

# Measuring Force

The unit of force is the newton (N).

**Forces can be measured using a spring balance**

(A spring balance is sometimes called a **force meter** or **Newton meter**)



Here are some forces I measured:	
What I did	Force (in Newtons)
The weight of my pencil case is:	
The force needed to slide a pencil case along the bench	

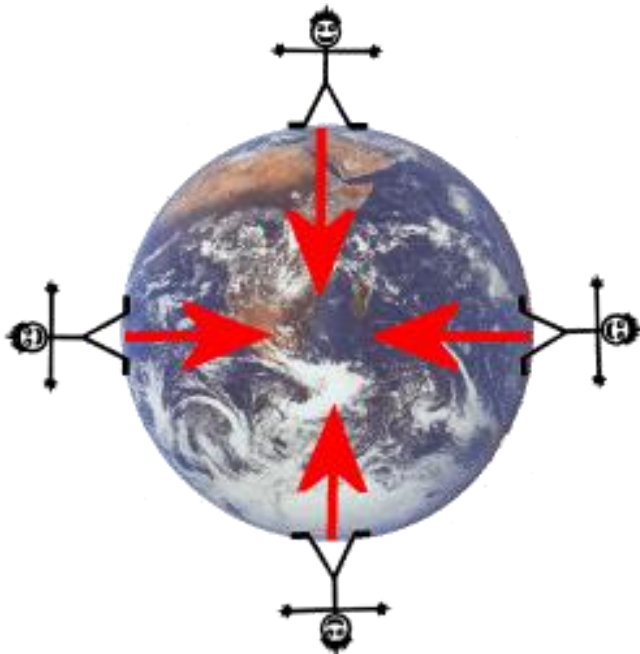
# Gravity

Gravity is a force that pulls all objects towards each other. Gravity is a ***pulling*** force.

**Gravity pulls objects down, towards the centre of the earth**

**Gravity is the force that's gives objects their weight weight**

The red arrows show the direction of the gravitational pull.



Sir Isaac Newton

## ***Some gravity facts:***

- *There IS gravity on the moon... it is 6 times less than the gravity on Earth*
- *There IS gravity in space.... It is just not easy to notice it*
- *Gravity keeps the planets in orbit around the sun*
- *Gravity causes the tides*
- *Gravity was 'discovered' by a scientist called Sir Isaac Newton*

### **Mini test**

1. What instrument is used to measure a force?.....
2. What is the unit of force?.....
3. What is the name of the force that gives objects weight? .....
4. Is gravity a 'Pulling force' or 'pushing force' ?.....i

# FRICTION

Friction is a force that slows things down or tries to stop an object moving

Friction causes **grip**.

Friction causes heat. The brakes on your bike will be hot after they have slowed down the moving wheel.

Without friction your feet would just slip on the ground.

Running shoes need friction to grip the ground

Tyres need friction to grip the road.

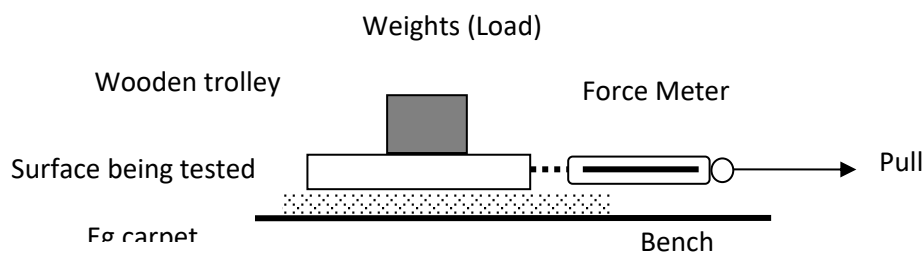
## Carrying out an investigation

- What are you trying to find out?
- How will you do the experiment?
  - What variables will you measure?
  - What variables will you keep the same?
- What is your prediction?
- What are your results?

## Investigating Friction

Aim: To find out which surfaces have the most grip (friction)

### Diagram



### Method (what we did)

We placed some weights on a wooden block and pulled it along the bench using a force meter

We wrote down the force needed to make the block move

We repeated the experiment several times with different surfaces between the trolley and the bench top.

## Results

Type of surface	Force needed to pull the trolley (N)
Bench top	1N
Carpet	2N
Sand paper	3N
Rollers	1N
Floor	1N

Some notes on this experiment

This is what we measured:

The force to pull the block

To keep make it a fair test we kept these factors the same for each experiment:

The load    the person pulling the block

This was my conclusion:

The surface that had the most friction is:.....Sandpaper...

I put this answer because: It took the biggest pull

.....

# How can we reduce friction?



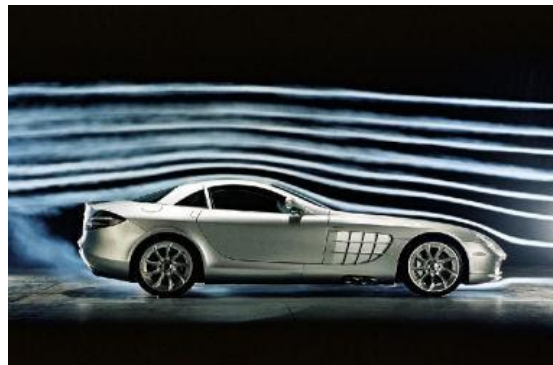
By using bearings



By using lubrication (usually oil)



By having a smooth surface such as skis or ice



By using a streamlined (aerodynamic) shape that air slips over easily

## Mini test

1. What is the name of the force that slows things down? .....
2. Which type of surface has the most friction (rough or smooth)? .....
3. How could you tell if the brakes of a car or bike had been used in the last few minutes? .....
4. Describe one way of reducing friction: .....



**Assessment test FORCES (A)** (There are three sheets in this test)

1. A force is best described as a P \_ \_ \_ or a P \_ \_ \_
- 2 Use lines to join up each description with the force it is describing

**Pulls us towards the ground**

**FRICTION**

**A force that can pull or push**

**GRAVITY**

**A force that slows things down**

**MAGNETISM**

**3. Put a tick by the statements below that are correct:**

There is no gravity on the moon

Gravity pulls things towards the Earth

Gravity from the Sun stops the Earth flying off into space

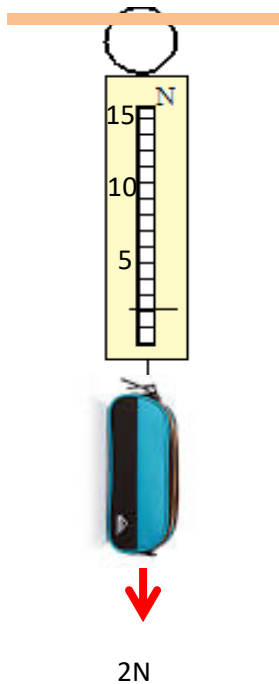
4. The picture of the Earth has a boy (A) standing at the North Pole holding a conker on a string and another boy (B) standing at the South Pole.

**Draw a conker on a string in the hand of boy B.**



A girl is finding out how heavy his pencil case is

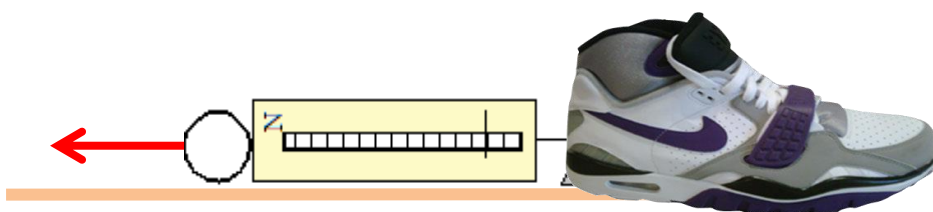
He hangs the pencil case from a force meter



5 What does the N in the diagram stand for? .....

6. What is the name of the force that pulls the pencil case down? .....

7. What the weight of the pencil case ? .....



A boy uses the same force meter to pull his trainer across the bench.

He is pulling in the direction of the arrow.

8. What is the name of the force that makes the trainer grip the ground?

.....

The boy pulled 4 different trainers along the bench and measured the amount of force needed to pull each trainer

**Here are the results of his experiment**

<b>Type of surface</b>	<b>Force needed to pull the trainer</b>
Trainer 1	3N
Trainer 2	5N
Trainer 3	2N
Trainer 4	1N

**9. Which is the biggest force? .....**

**10. Which trainer had the most grip ? .....**

## Assessment test FORCES (B)

(There are three sheets in this test)

2. A force is best described as a \_\_\_\_ or a \_\_\_\_
3. Pick the correct answer from the list of words below the question
- a) The force which slows down a moving car is called:.....
  - b) The force which pulls us towards the ground is called:.....
  - c) What instrument do we use to measure force? .....
  - d) What is the unit of force? (how do we measure force)? .....

**Newton**

**Friction**

**Gravity**

**Spring Balance**

### 3. Put a tick by the statements below that are correct:

Gravity causes objects to have weight

There is no gravity on the moon

Gravity acts towards the centre of the earth

Gravity gets less as we move away from the Earth

The Moon's gravity causes us to have tides

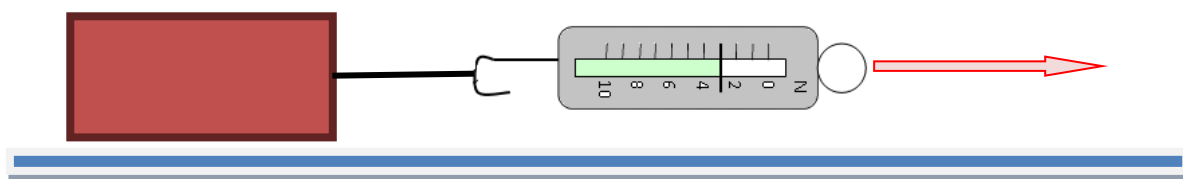
Gravity keeps the Earth in orbit around the sun

4. The picture of the Earth has a boy (A) standing at the North Pole holding a conker on a string and another boy (B) standing at the South Pole.

**Draw a conker on a string in the hand of boy B.**



5. A boy is measuring the force needed to pull a brick across the bench



How big is the force (in newtons) needed to pull the brick?. .....

What is the name of the instrument he is using? .....

What could the boy do to make it easier to pull the brick?

.....

6. Describe one way that friction is a useful force (how can friction help you)?

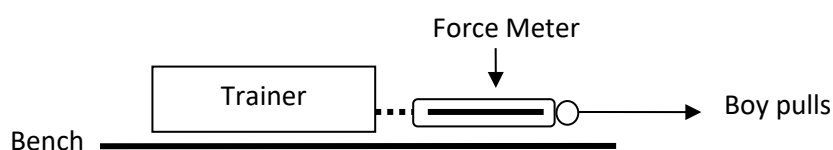
.....

7. Describe one way that friction is not good (when is friction a nuisance or bad)?

.....

**Some children carried out an experiment to see which trainer had the most grip on the bench**

**Diagram**



They pulled the trainer across the bench and measured the force needed to make the trainer move. They repeated the experiment for each of the trainers.

**Results**

Type of surface	Force needed to pull the trainer
Trainer 1	3N
Trainer 2	5N
Trainer 3	2N
Trainer 4	1N

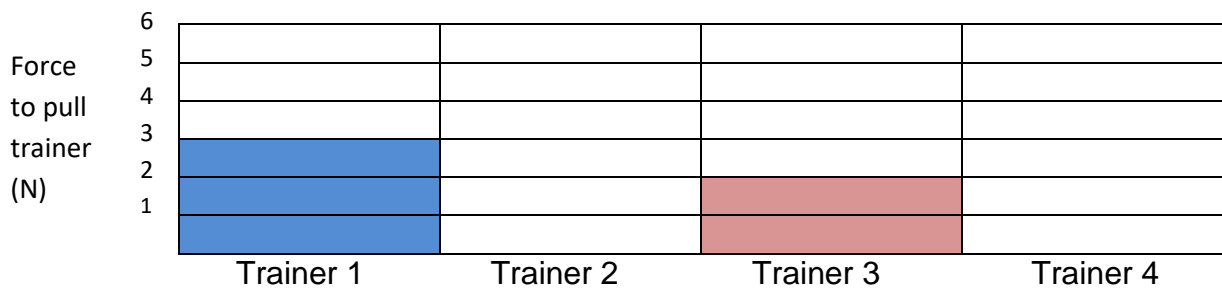
8. Complete this sentence:

**Conclusion:** The trainer that had the most grip was trainer number .....

I know this because.....

It probably had a better grip because .....

**Complete the bar chart for the results**



## FORCES Part 2

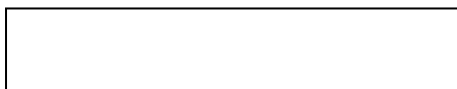
### Balanced and Unbalanced forces

Forces usually work in pairs

If the forces are not equal (unbalanced) then an object will *speed up* or *slow down*.

If the forces are balanced (equal) then the object will not move (or stay moving at a steady speed)

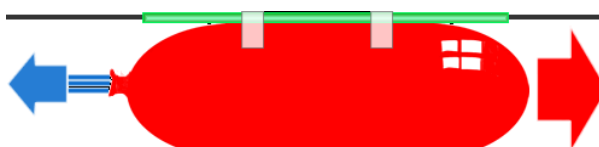
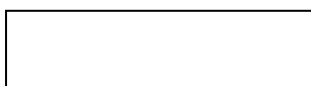
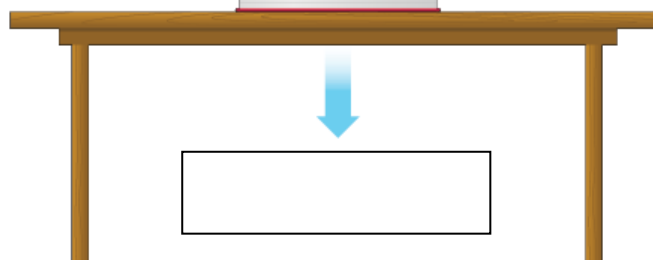
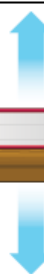
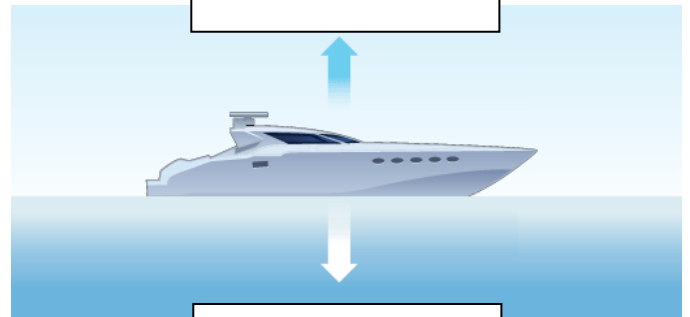
**Add the labels Thrust, Air resistance, Friction or Gravity to box by each arrow**



**Note:**

**Air resistance** (or drag) is a type of friction

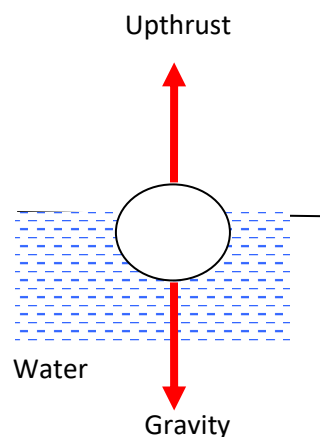
Air resistance will slow down an object moving through the air.



# Upthrust

## A ball floating in water

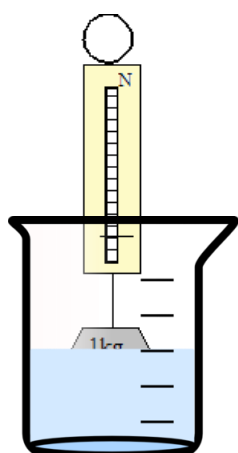
The force of **upthrust** keeps a ball floating  
If the upthrust is not large enough the ball sinks



We weighed several objects in air and also in water

For each object we calculated the difference in weight.

**Diagram**



**Results:**

Object	Weight in air N	Weight in water N	Difference in weight = Upthrust N

Why do you think an object weighs less in water?

.....



## Forces 2 assessment test

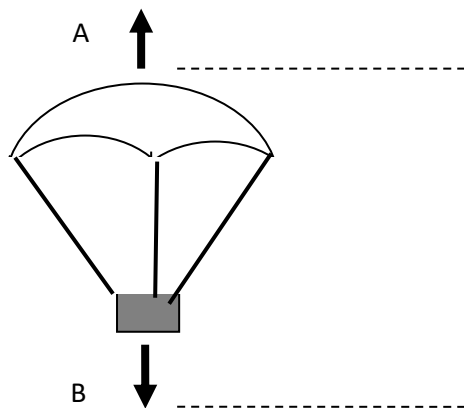
Name:.....

1. Pick the correct answer from the list of words below the question

- e) The force which slows down a moving car is called:.....
- f) The force which pulls us towards the ground is called:.....
- g) The force that keeps a ball floating on water is called:.....

<b>Mass</b>	<b>Gravity</b>	<b>Heat</b>
<b>Upthrust</b>	<b>Friction</b>	<b>Temperature</b>

2. The diagram shows a box falling on a parachute.  
It is falling at a steady speed towards the earth.

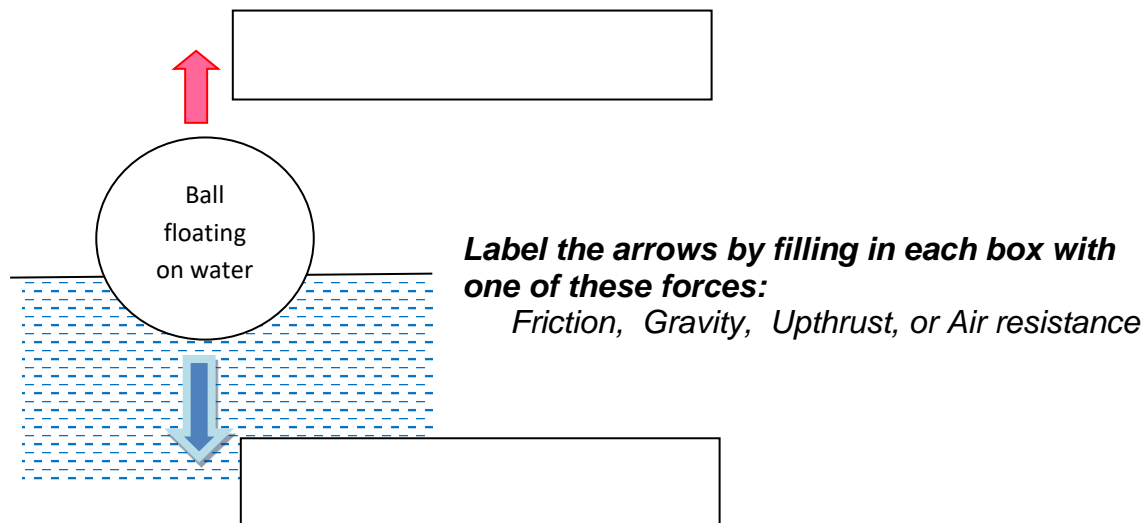


There are two forces shown on the diagram using arrows

a) Write down the NAME of each force on the line near the arrow.  
(Use one of the words below)

<b>Gravity</b>	<b>Air resistance</b>	<b>Heat</b>	<b>Wind</b>	<b>Magnetism</b>
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3.. The diagram shows a ball floating on water.



4. When some of the air was let out of the ball it became lower in the water and then sank.

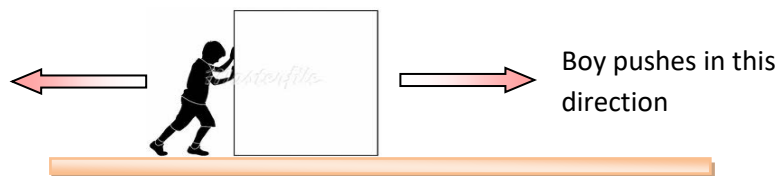
**Why did it sink? Put a tick by the best answer below:**

The ball was heavier

The upthrust on the ball was less

Someone was probably pushing the ball down

5.



A boy is pushing a block across his drive. He is pushing towards the right

a. In which direction will the box move? LEFT or RIGHT (circle the correct answer)

b. There is another force pushing to the left which make the box difficult to move.  
What is the name of that force? FRICTION or GRAVITY (circle the correct answer)

c. Add another force arrow to show gravity acting on .the block

d. There is one other force on the block (making four all together)  
In which direction will this fourth force be acting?