



Welcome to the  
Forces Mission  
Training Camp

The logo for FMTC, featuring the letters 'FMTC' in a bold, black, sans-serif font. To the right of the letters is a graphic element consisting of a grid of small squares in blue and orange, arranged in a pattern that suggests a digital or networked structure.

**FMTC**



Here you will learn  
everything you need  
to know about forces  
and their effects.



**LIVE**

**BREAKING  
NEWS**

ed live footage, from Peru, where a meteorite is heading straight for Earth...



Here is everything you need to know:

- A meteorite has broke through Earth's atmosphere and landed south of Lake Titicaca in Peru, on the mountain Pachatata.
- Thankfully no one was hurt as it landed in a remote location.
- The meteorite has formed a crater 14.2 m across.
- It is the smallest, youngest, and one of two eye-witnessed impact crater events on Earth.
- The meteorite is largely intact and NHM have sent a recovery team to expedite the remains.
- Due to the location of the meteorite and the challenges involving forces, they have asked for our help.
- We received the following urgent email...

Dear FMTC,

We are writing to enlist your assistance

The National History Museum has been asked to recover the remains of the meteorite. The recovery team will be working in the area which will give us a greater understanding of the event.

After studying the area, we have identified several recovery sites. Some of the recovery team are some of the best in the world and will be working safely and swiftly. You are asked to provide the necessary support.

Can we rely on your advice and offer your expertise on the recovery of the meteorite?

Our recovery team will be working in the area.

Yours sincerely,



Sir Phillip Green  
Director  
Museum of Natural History



Specialists to extract  
the rock and dust

and although the  
back to the museum

take investigations and





Firstly we need to develop our understanding of meteorites..

What do you think a meteorite is?

A meteorite is a piece of rock or metal that has fallen to the Earth's surface from outer space as a meteor.

When meteoroids enter Earth's atmosphere at high speed and burn up, they're called meteors. When a meteoroid survives its trip through the atmosphere and hits the ground, it's called a meteorite.



# Forces training

We need to undertake basic 'forces training' and demonstrate that you have what it takes to help the recovery team.

This is training session 1



Firstly we need to develop our understanding of meteorites...

Watch the first 2 minutes of the following video:

<http://www.creativeeducation.co.uk/video/1399>

Your first training challenge is to match up the keywords with their definitions.



Firstly we need to develop meteorites...

Watch the first 2 minutes of the <http://www.creativeeducation.co>

Your first training challenge keywords with their definition

Please see the worksheet provided called Training Challenge 1

**Training Challenge 1**

Match the key words with their definitions

**Keywords:**

- Acceleration
- Air resistance
- Data
- Deceleration
- Drag
- Evidence
- Friction
- Force
- Weight
- Gravity
- Motion
- Variables
- Water resistance

**Definitions:**

- something which could change in value, such as time or temperature
- bits of information you have gathered about something you are investigating
- attraction between physical objects, easily noticeable when one of the objects is massive, such as the Earth
- something which will affect either the movement or shape of an object
- information or measurements you use to help you come to a conclusion
- a force which resists the motion of objects sliding over each other
- a force which resists motion through a fluid, a fluid being anything that can flow e.g. liquids, gases
- the force on an object due to gravity
- an increase in speed
- a decrease in speed
- a move or change in position
- a force which resists motion through air
- a force which resists motion through water

rooms



Let's see if  
you passed the  
first 'Training  
mission'

The mass of an object is how much 'stuff', or matter it is made of and is measured in grams or kilograms but that mass is not a force, rather it is the weight of something that is the force which is caused by the pull of gravity on the mass of something or someone.

Weight is measured in newtons (N).

A force meter is a piece of equipment used to measure this force.

Acceleration

an increase in speed

Air resistance

a force which resists motion through air

Data

bits of information you have gathered about something you are investigating

Deceleration

a decrease in speed

Drag

a force which resists motion through a fluid, a fluid being anything that can flow e.g. liquids, gases

Evidence

information or measurements you use to help you come to a conclusion

Friction

a force which resists the motion of objects sliding over each other

Force

something which will affect either the movement or shape of an object

Gravity

attraction between physical objects, easily noticeable when one of the objects is massive, such as the Earth

Motion

a move or change in position

Variables

something which could change in value, such as time or temperature

Water resistance

a force which resists motion through water

Weight

the force on an object due to gravity



# Gravity

Watch the following clip on Gravity

⚡ <http://www.bbc.co.uk/education/clips/zhmqxb>

Till 1.37 min

# Gravity

What do you think stops us being sucked into the very centre of the Earth?

Gravity is actually a relatively weak force, much weaker than the forces that hold together the ground or floor we stand on, so it is not strong enough to pull us through to its centre.

The ground provides an 'equal and opposite' balancing force to our weight.

# Gravity

What do you think stops us being sucked into the very centre of the Earth?

Because these separate forces are in balance, we do not fall through the ground. If what we stand on is not strong enough to hold us - like a thin layer of ice on water, or a rotten wood floor for example - then our weight will overcome the resistance that the floor can provide and we fall through it.



# Gravity challenge

Look around the room, you have 60 seconds to write down as many things as they can that are not directly on the ground but that are not touching the ground.

Can they explain what is happening?



# Gravity

While the objects are pushing on the table/bookcase because it they are being pulled down by the gravitational pull of the Earth, the furniture items are providing resistance; we say they are pushing back.

As the forces are balanced, the objects do not move.



## Training Challenge 2: capturing forces

When looking at balanced and unbalanced forces we can use force diagrams, these show the forces acting on the object, the direction and the strength.

Here are some examples:



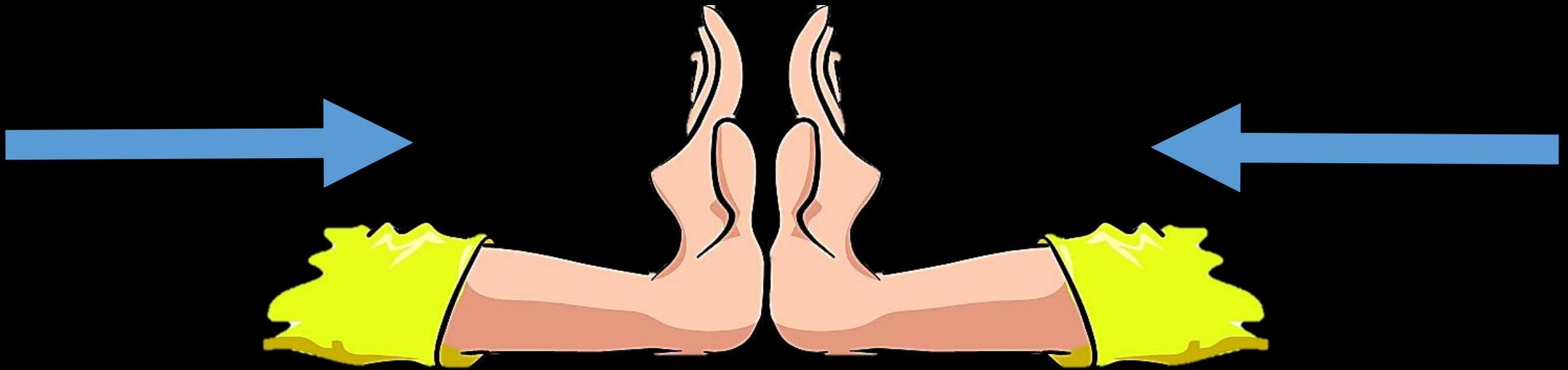
# Force diagrams

Key things to remember when drawing force diagrams

- Forces work in pairs
- Arrows can be used to show which forces are stronger
- With balanced forces the arrows are the same size

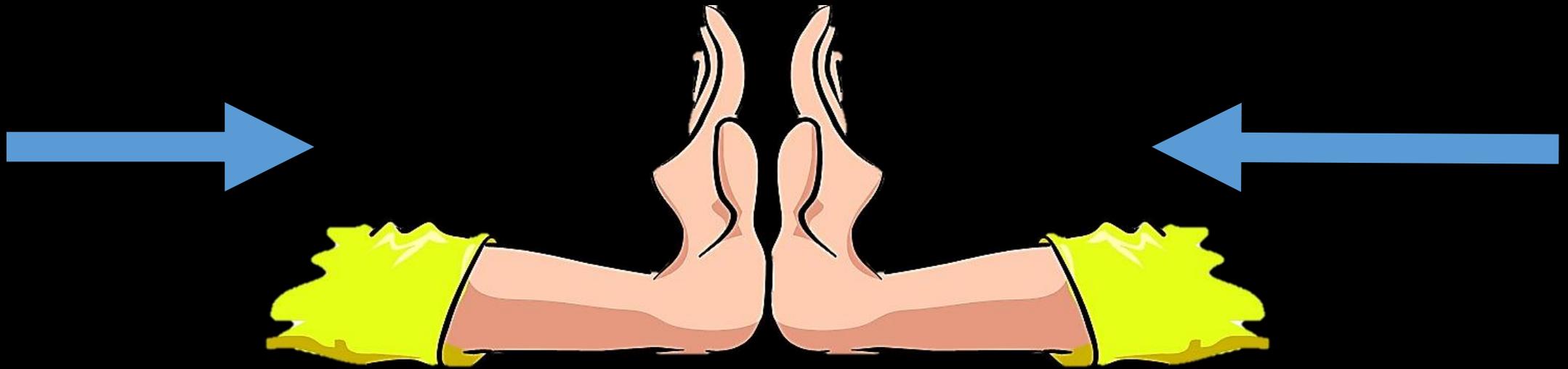
# Force diagrams

Balanced



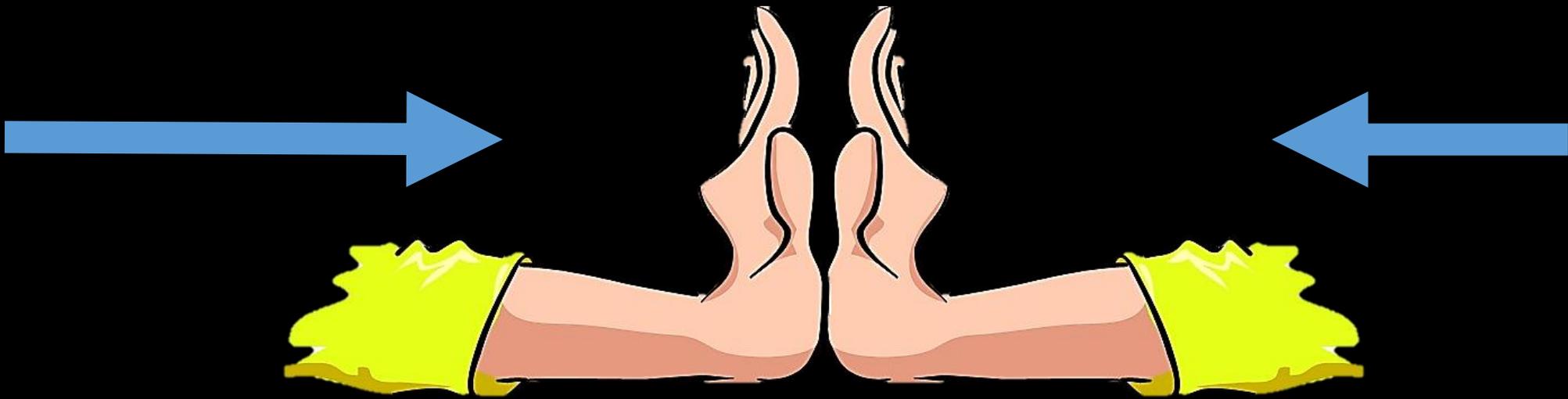
# Force diagrams

Unbalanced

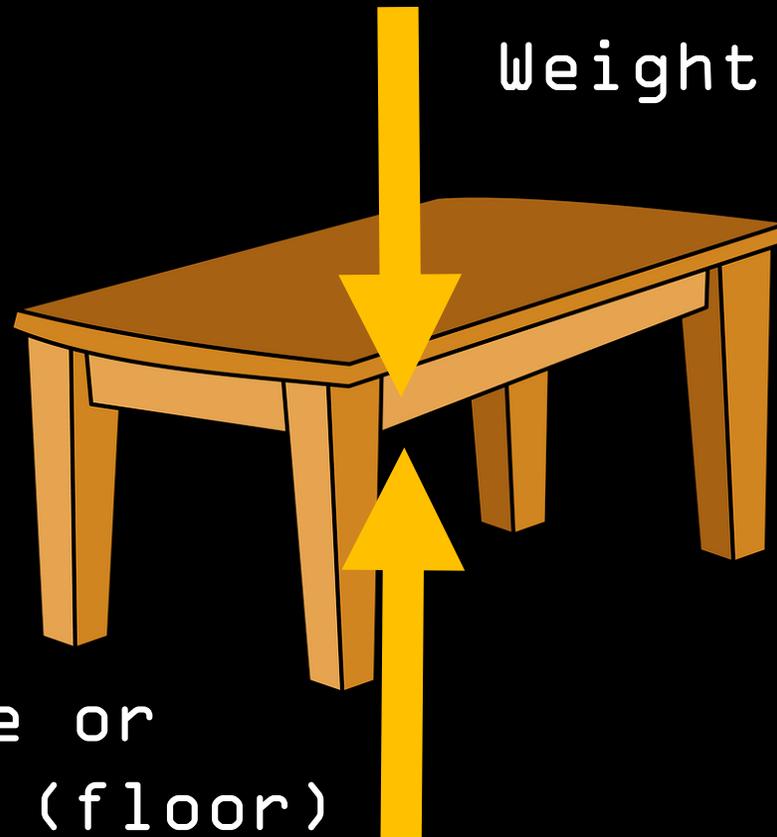


# Force diagrams

Unbalanced



# Force diagrams

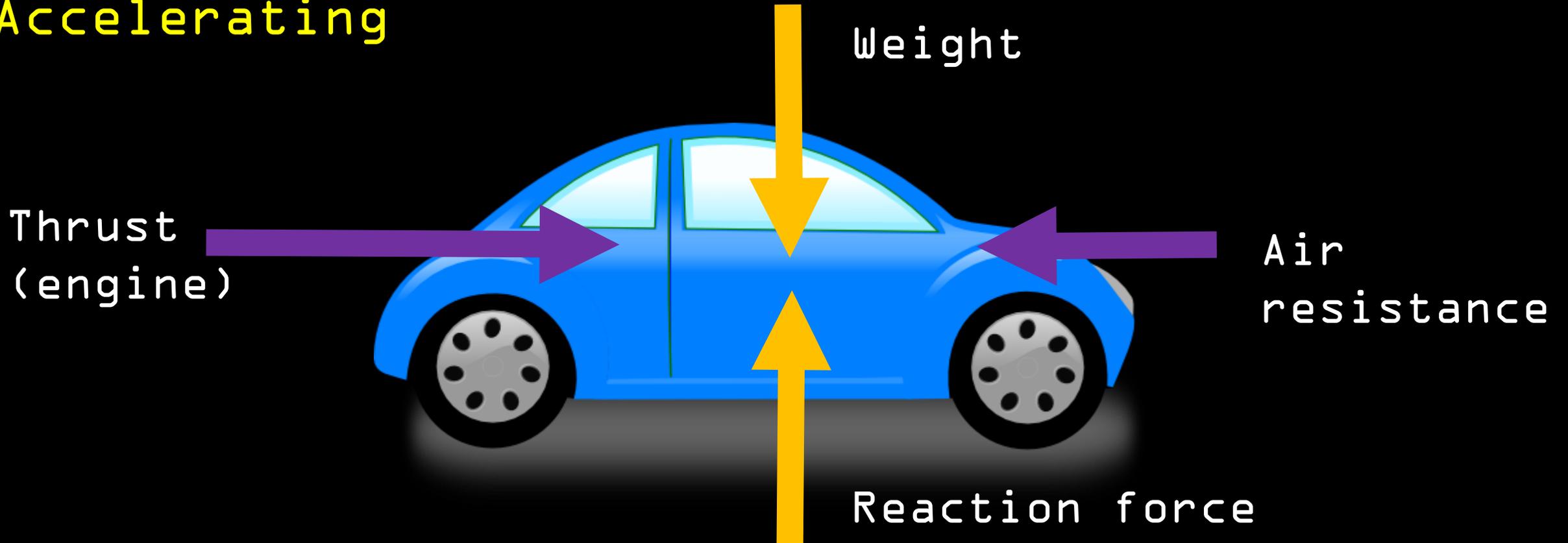


Remember: the weight of something is the force which is caused by the pull of gravity on the mass of something or someone.

Reactive force or support force (floor)

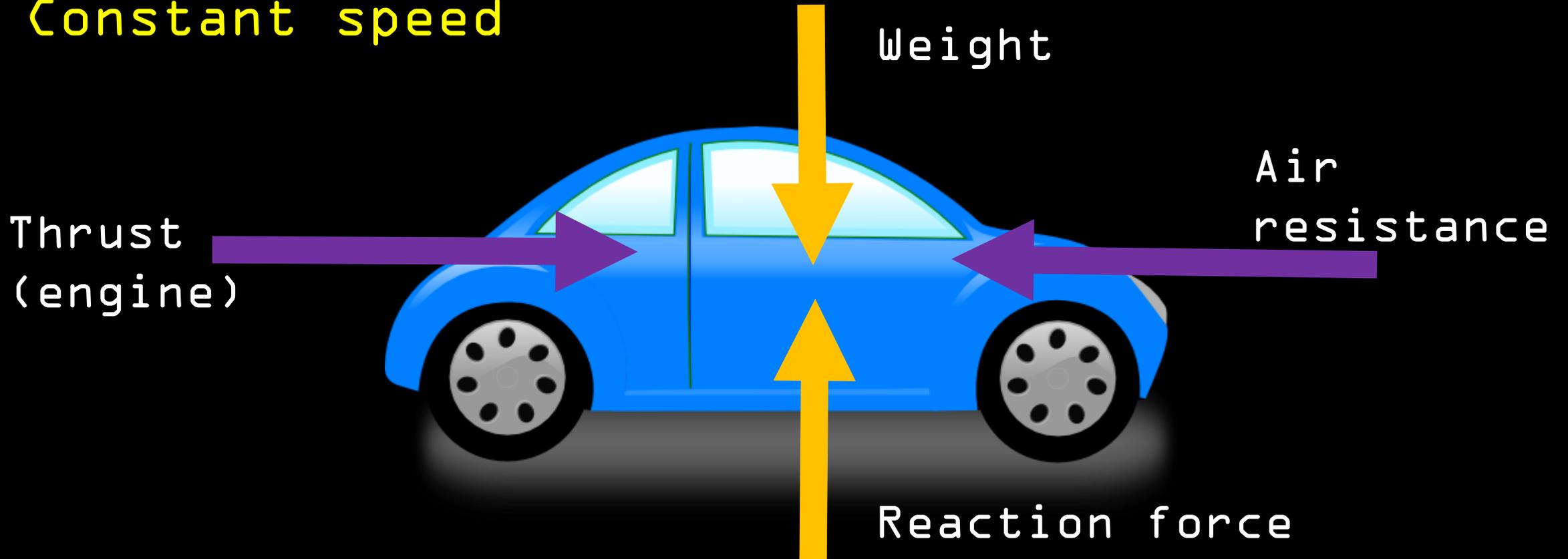
# Force diagrams

Accelerating



# Force diagrams

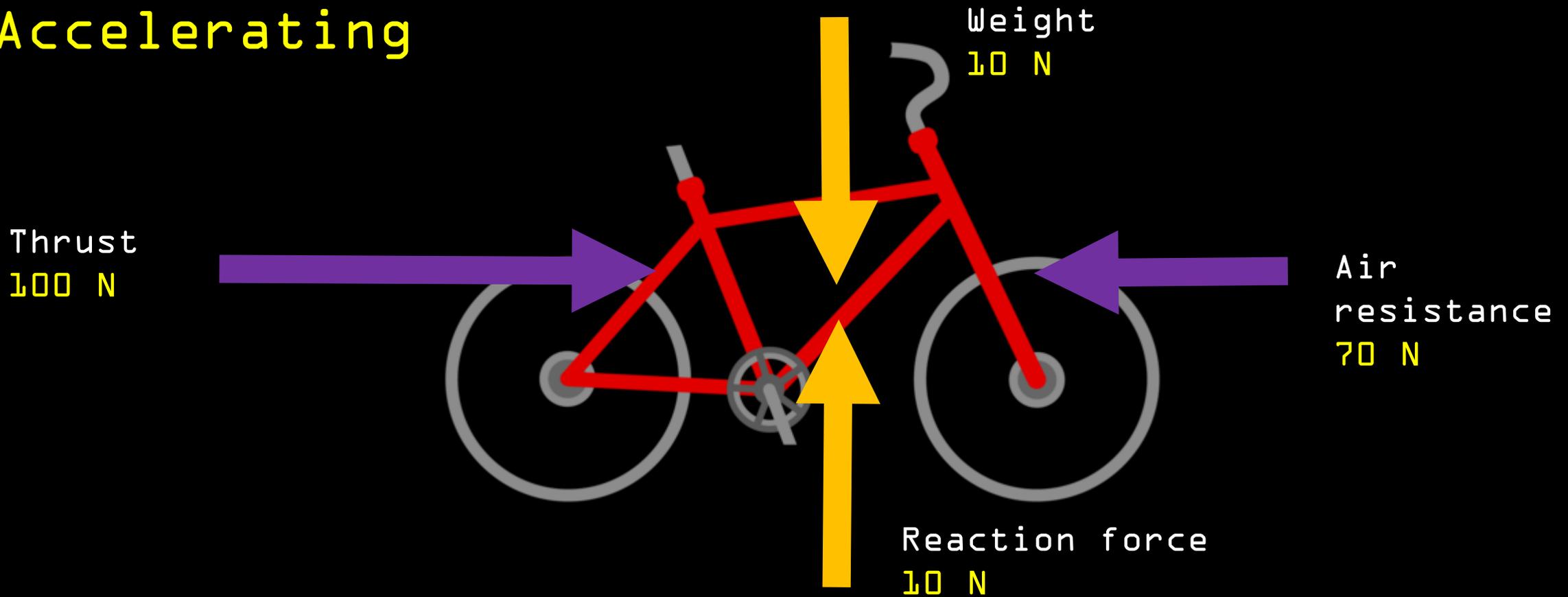
Constant speed





# Force diagrams and Newtons

Accelerating

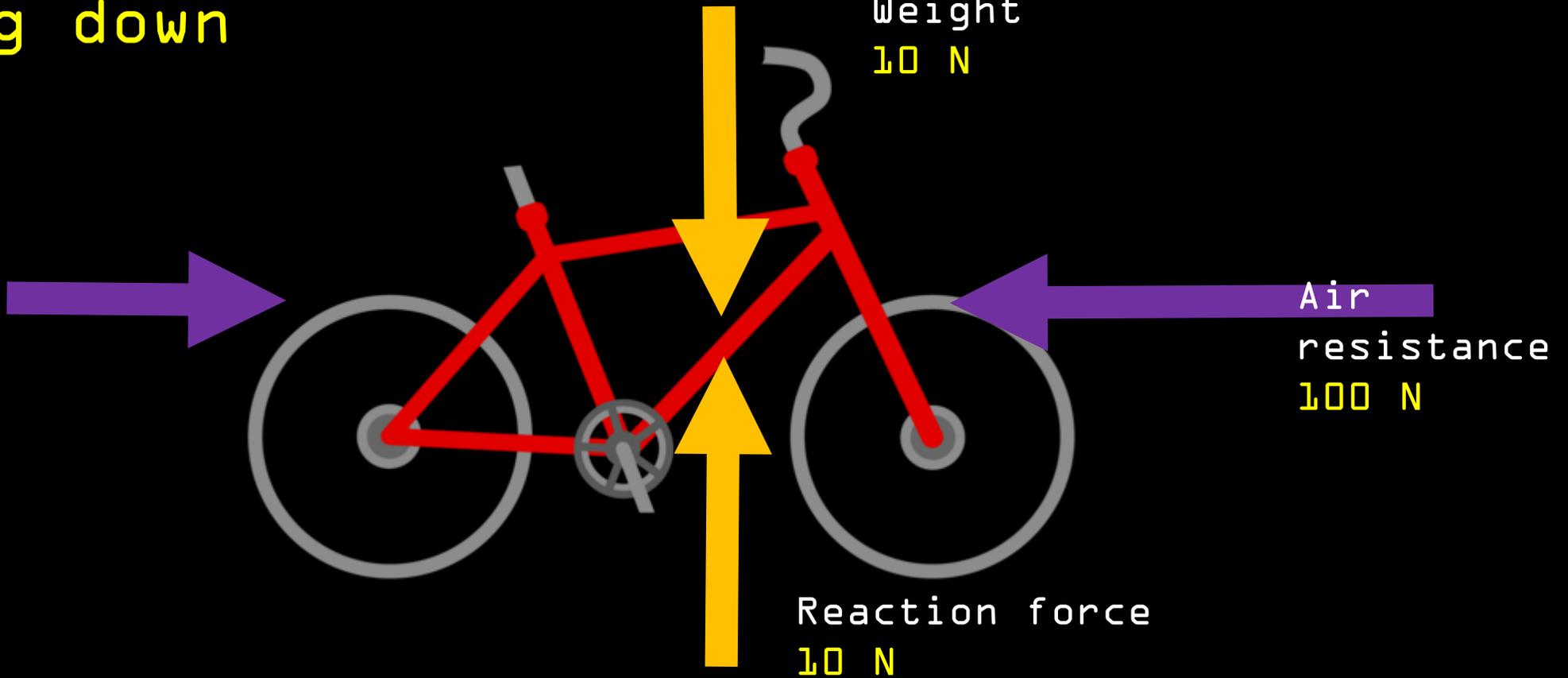




# Force diagrams and Newtons

Slowing down

Thrust  
50 N



Weight  
10 N

Air  
resistance  
100 N

Reaction force  
10 N

# Training Challenge 2

Look at the following photographs:

- 1) What forces are present?
- 2) Where would you put the arrows?
- 3) Are they balanced or unbalanced?





# Training Challenge 3: capturing forces

Draw a force diagram for the following statements:

1) The weight of the ball results in gravity being a stronger force than the resistance of the paper table. UNBALANCED

2) Friction in the brakes has stopped the bike on the slope. Gravity is exerting an equal force. BALANCED

3) The car is accelerating down the slope. Gravity is greater than friction. UNBALANCED

Challenge: Try and create one of your own.