



Science

Forces

Air Resistance



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Aim

- To investigate the effects of air resistance.

Success Criteria

- I can explain how air resistance affects moving objects.
- I can plan and conduct an investigation into the effects of air resistance.

Gravity and Falling



You have learnt that **gravity** pulls objects towards the centre of the Earth.

But do you think all objects are pulled as fast as each other?

These two balls are the **same size**, but one has a much **greater mass**.

Do you think they will hit the ground at the **same time** when dropped from a height?



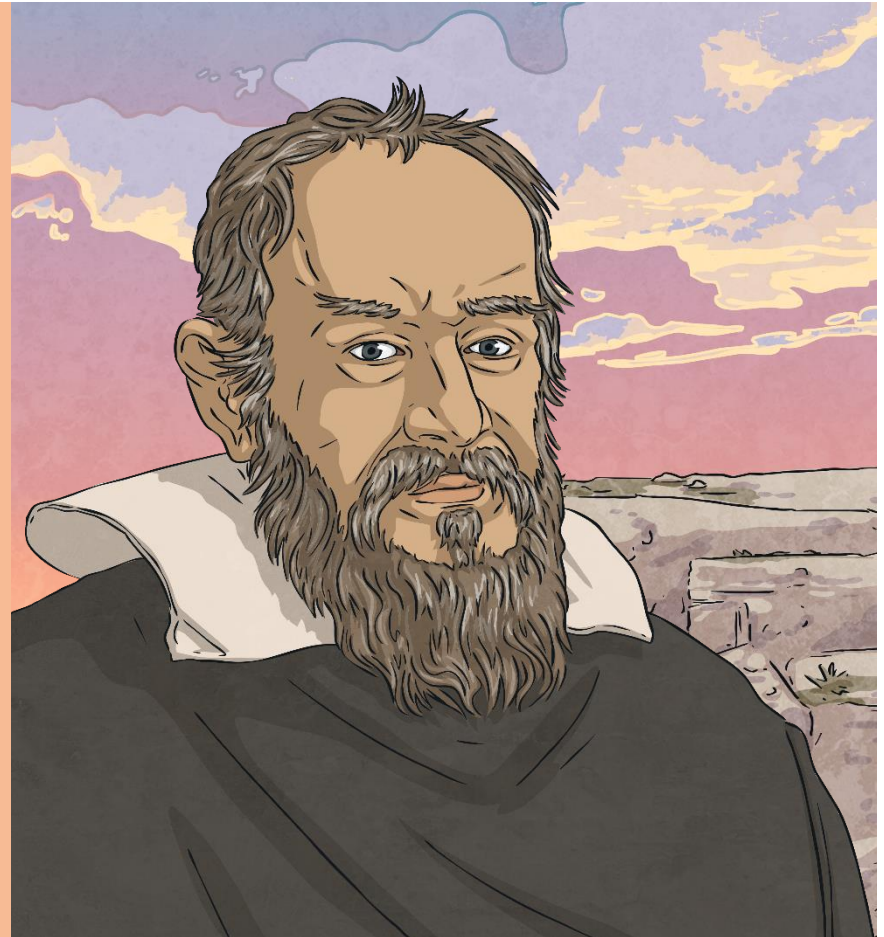
Gravity and Falling

Galileo Galilei (1564-1642) was an Italian scientist and mathematician who wondered about this.

In 1590, he decided to carry out an investigation to find the answer.

He climbed to the top of the Leaning Tower of Pisa with two balls of similar shape and size, but with different masses.

He dropped both of the balls from the top of the tower at the same time. Both balls hit the ground at the same time.



Gravity and Falling

Galileo's experiment proved that **all objects fall at the same rate**, no matter what their mass is.

But this can seem hard to believe!

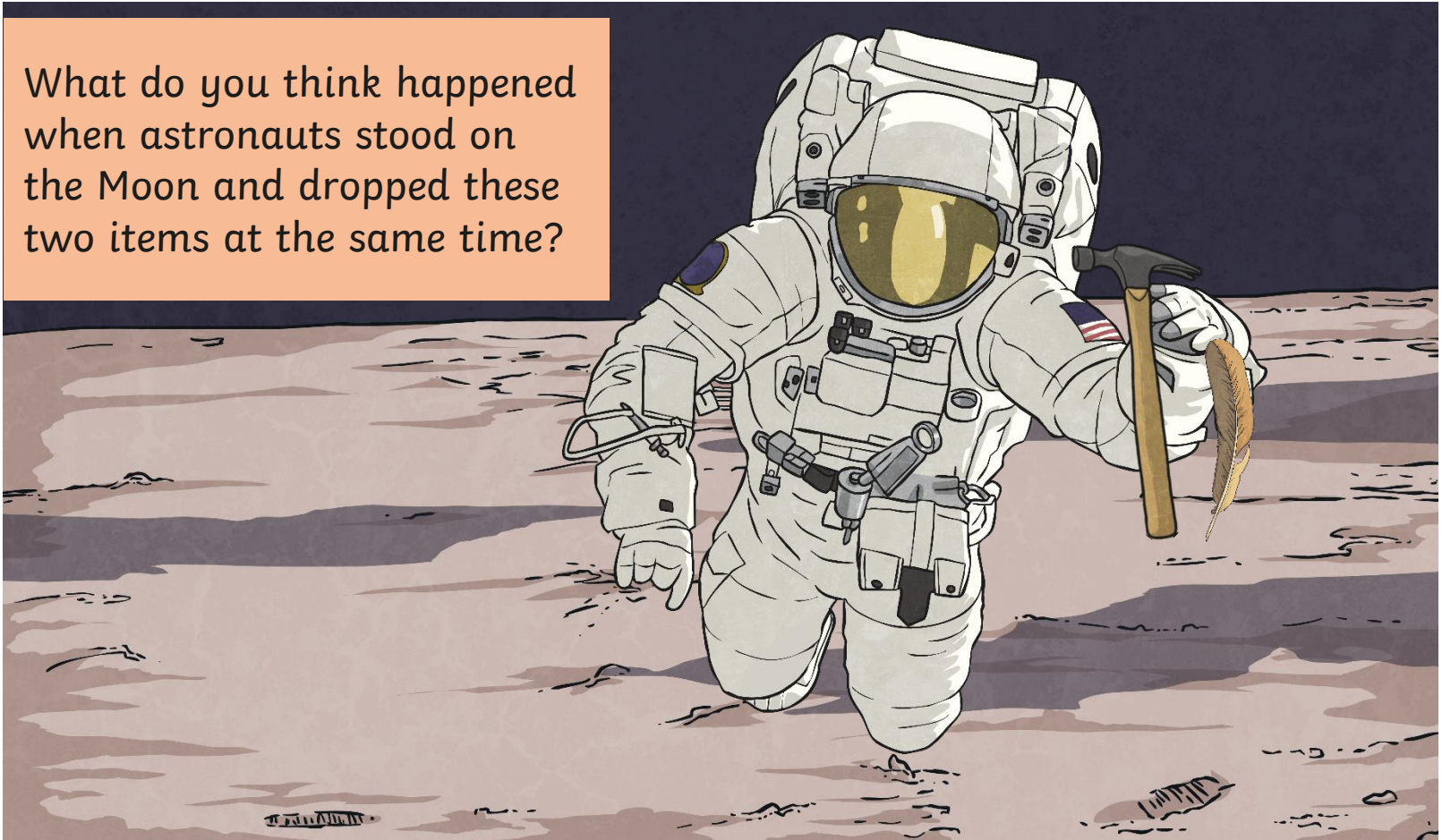
Think about a feather and a hammer. If you dropped both objects at the same time, would they hit the ground at the same time?



Gravity and Falling



What do you think happened when astronauts stood on the Moon and dropped these two items at the same time?



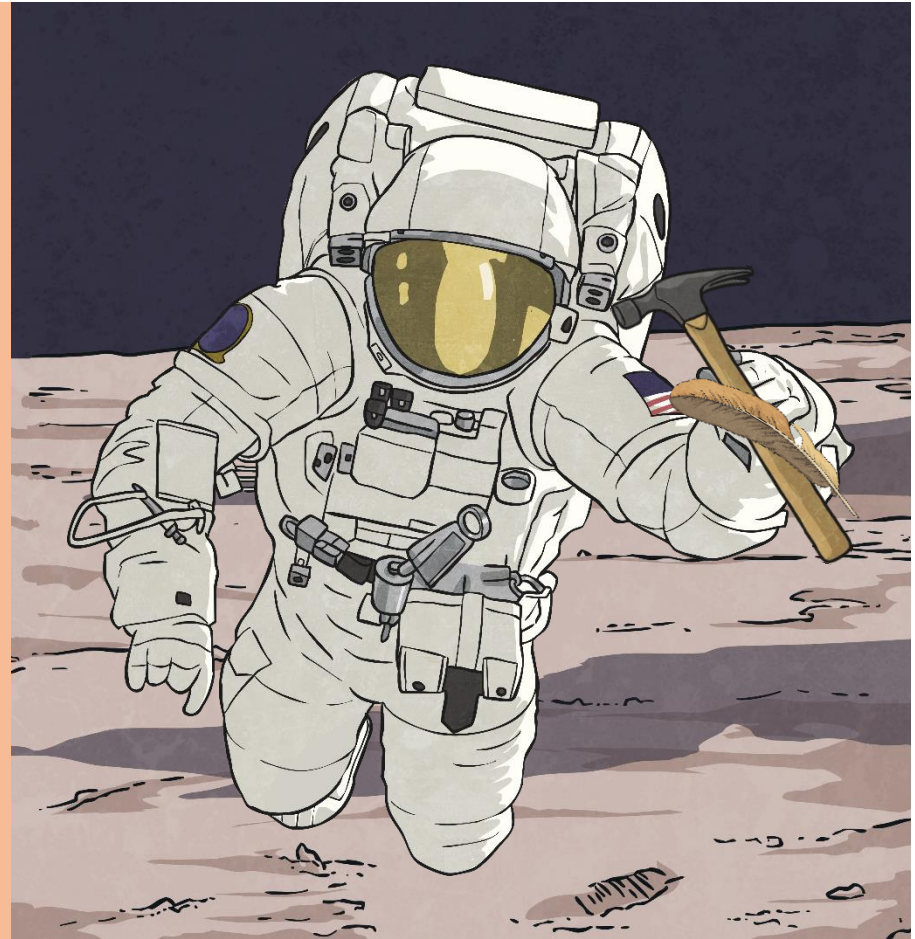
Gravity and Falling

The feather and the hammer hit the surface of the Moon at the **same time!**

This proves that Galileo's findings are correct.

Can you think why the two objects might fall at the same speed on the Moon but the feather falls so much more slowly on Earth?

What is different about the Moon and the Earth that could cause this to happen?



Air Resistance

There is **no air** on the Moon.

Air pushes against any object moving through it. This is known as **air resistance**.

On Earth, air resistance acts on both objects.

The feather has a large surface area in comparison to its mass. The hammer has a small surface area in comparison to its mass. Air resistance therefore has a greater upwards force on the feather.

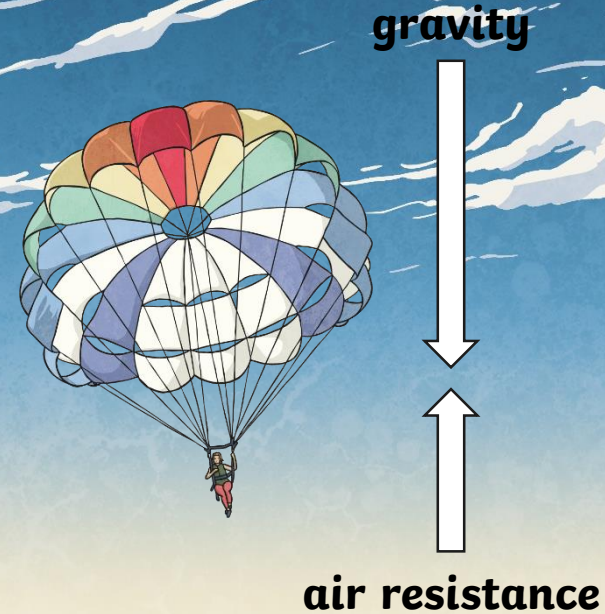
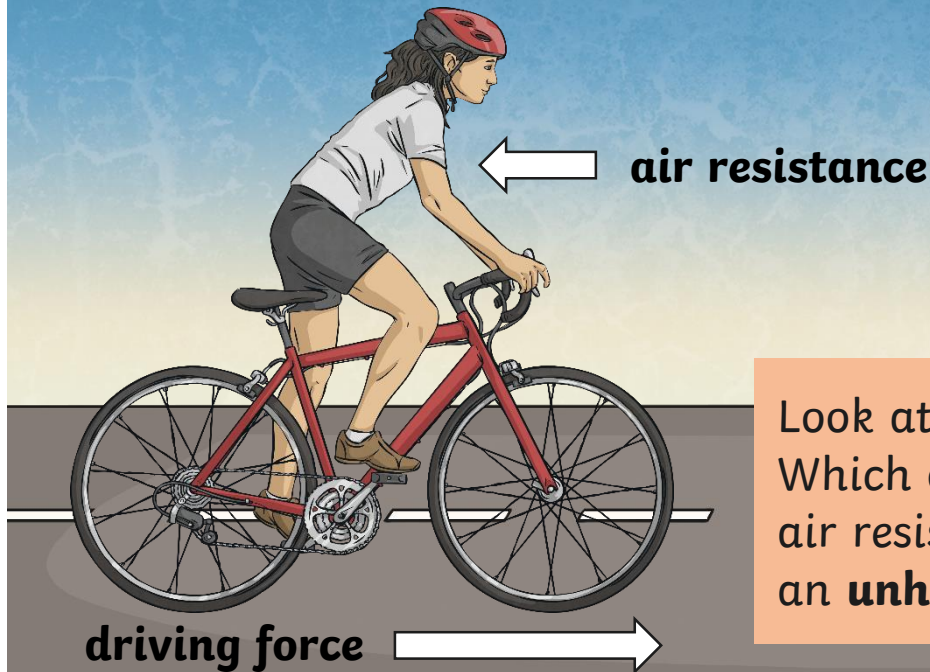
Since there is no air on the Moon, there is no **air resistance** to push against the feather, so the two objects fall at the **same speed**.



Air Resistance



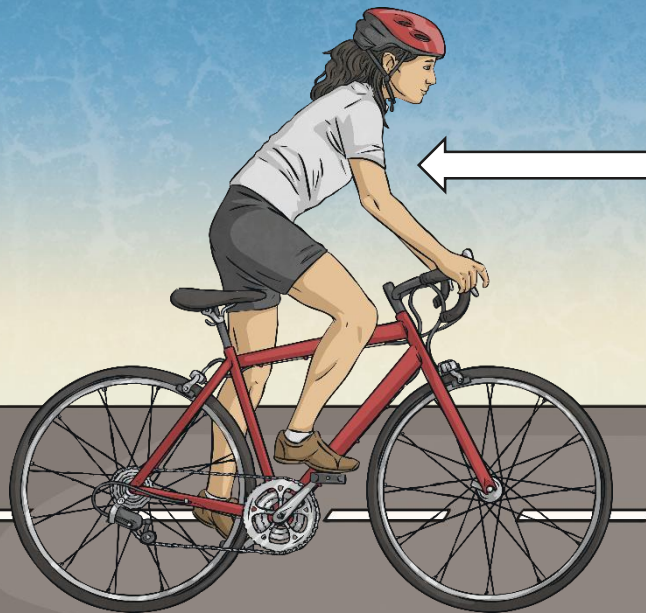
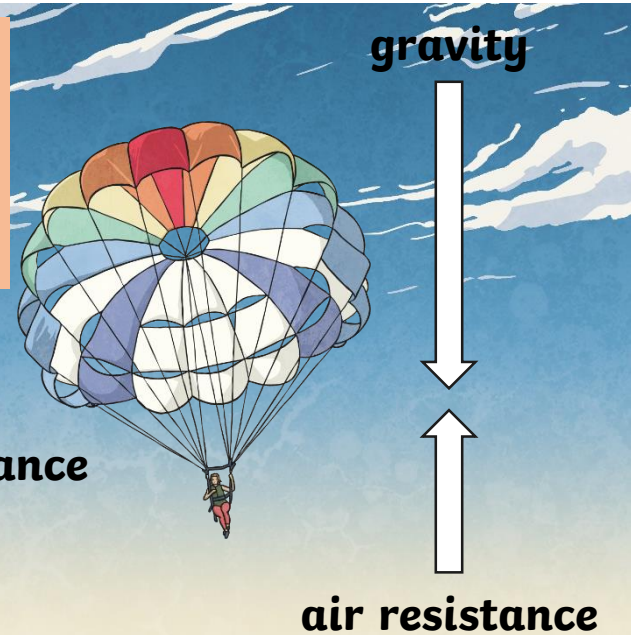
Air resistance can be a useful force, but it can also be unhelpful in certain situations.



Look at the two diagrams below. Which one shows a **useful** effect of air resistance, and which one shows an **unhelpful** effect of air resistance?

Air Resistance

Air resistance pushes up on the parachute, **opposing** the force of **gravity** and making the parachute and the person fall more slowly. This is a **useful** effect.



But **air resistance** pushes the cyclist back, **opposing** the **cyclist's force** from them pedalling the bicycle and making the bicycle travel more slowly. This is an **unhelpful** effect.

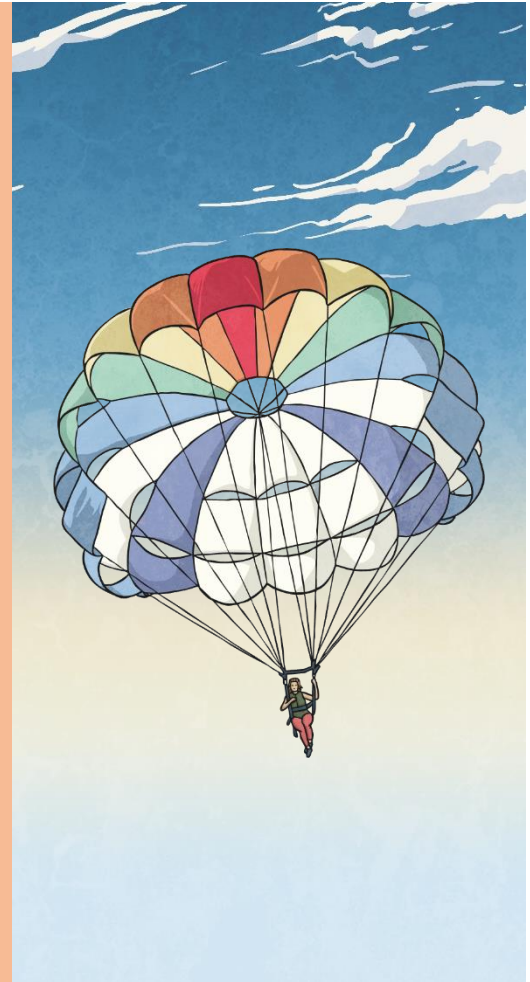
The Perfect Parachute



The Super Skydiving Company are redesigning the parachute they use to allow people to perform skydives from aeroplanes. They want to make sure that the parachute they use allows their customers to fall from the aeroplane as **slowly** and **safely** as possible.

You are going to investigate a helpful effect of **air resistance** by finding the best design for their new parachute.

The perfect parachute will be the one that makes a person fall the **slowest**. It will cause **air resistance** to push it up with the **biggest force**.



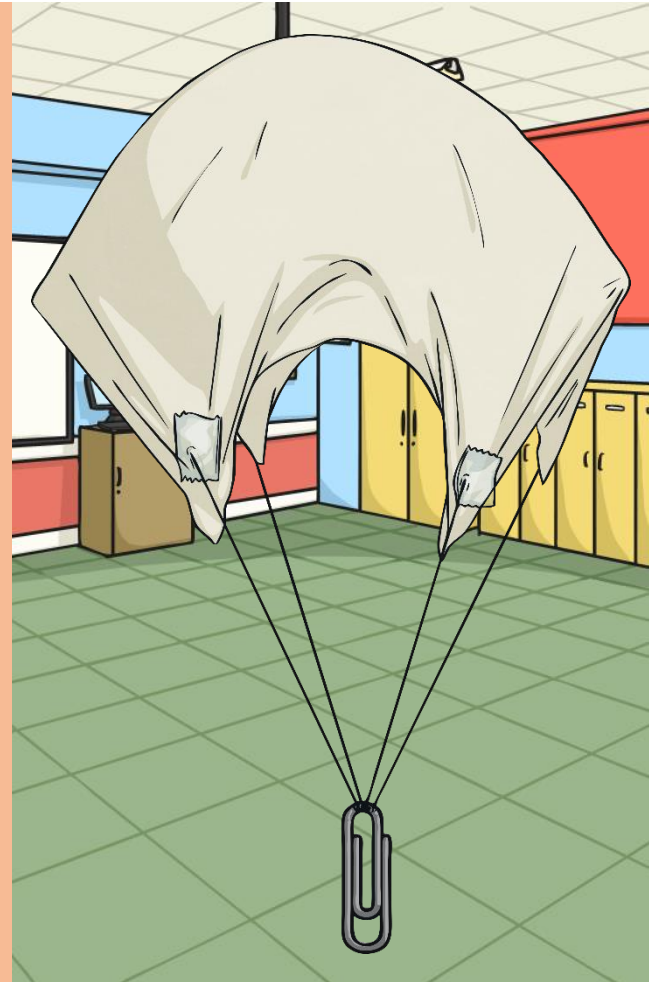
The Perfect Parachute



You will make three parachutes and drop them from a height. Each of the three parachutes should be slightly different.

You will observe which of your parachutes falls the **most slowly**. This parachute will have the most **air resistance** pushing it up.

Construct your parachutes using a sheet of plastic or card. Tie or tape string to the corners, and tie or tape the four pieces of string to an object such as a toy figure, paper clip or piece of modelling clay.



The Perfect Parachute



How many variables did you think of?
Did you come up with any of these?

Object
attached
to the
parachute

Shape of
parachute

Size of
parachute

Length of
string to
attach the
object

Height
of drop



The Perfect Parachute



Once you have identified the different variables of your

Did you plan and carry out a fair test? Explain your answer.

and complete your **results** on the Activity Sheet.

Perfect

To investigate _____

You have been asked to redesign a parachute and see which type of parachute each time.

Variable that I will change about my parachute is _____

Variable that I will measure: _____

Why is it important to keep the other variables the same? _____

Write a prediction of what you think will happen. Make reference to air resistance in your prediction.

Fill in the table, including the headings:

Parachute 1		
Parachute 2		
Parachute 3		

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Science | Year 5 | Forces | Air Resistance | Lesson 3

Super Skydiving Company



Super Skydiving Report

You now need to **explain** your findings to the Super Skydiving Company.

Let them know the best design for their new parachute and explain why it works well.

In your answer, make sure to explain how air resistance affects moving objects.

I can explain how air resistance affects moving objects.

any are waiting for your report! How should they redesign their parachute to make it fall slowly? Use your what their parachute should look like or be made of in order to create the most air resistance.

question for the new parachute.

Complete these sentences to explain which parachute fell the slowest, and why. Our results show that the parachute that was the slowest was

This parachute created the most air resistance because

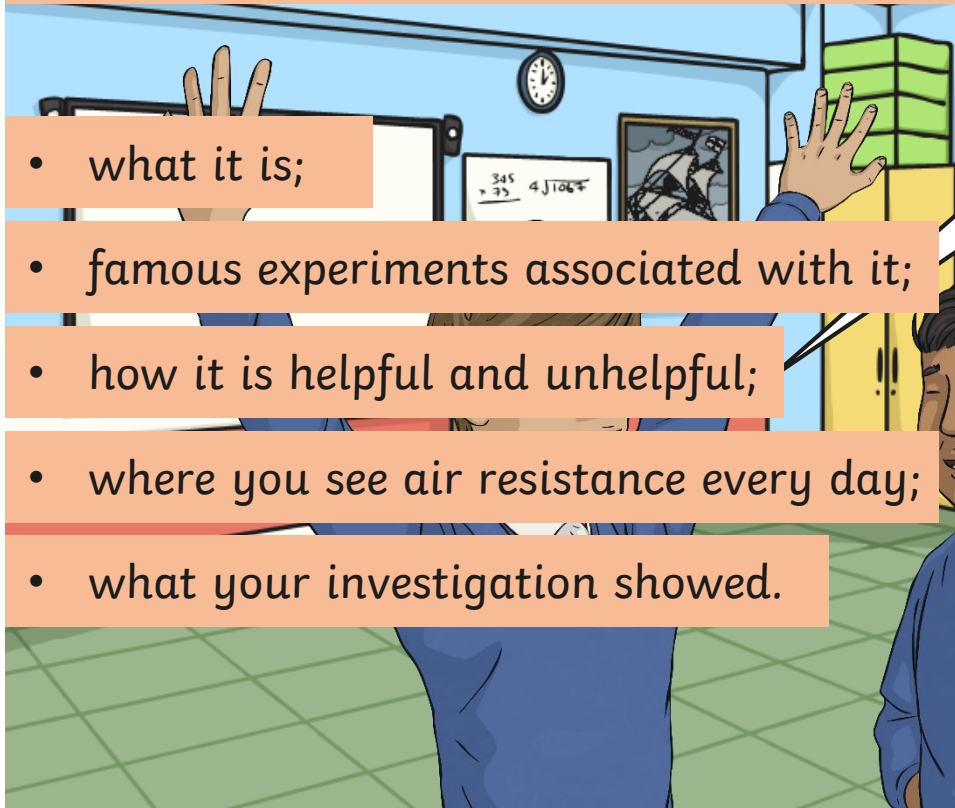
Use these words and phrases in your explanation

bigger force more air resistance gravity thicker push
stronger wider thinner smaller narrower space less

Talk about It



This word bank may help you:



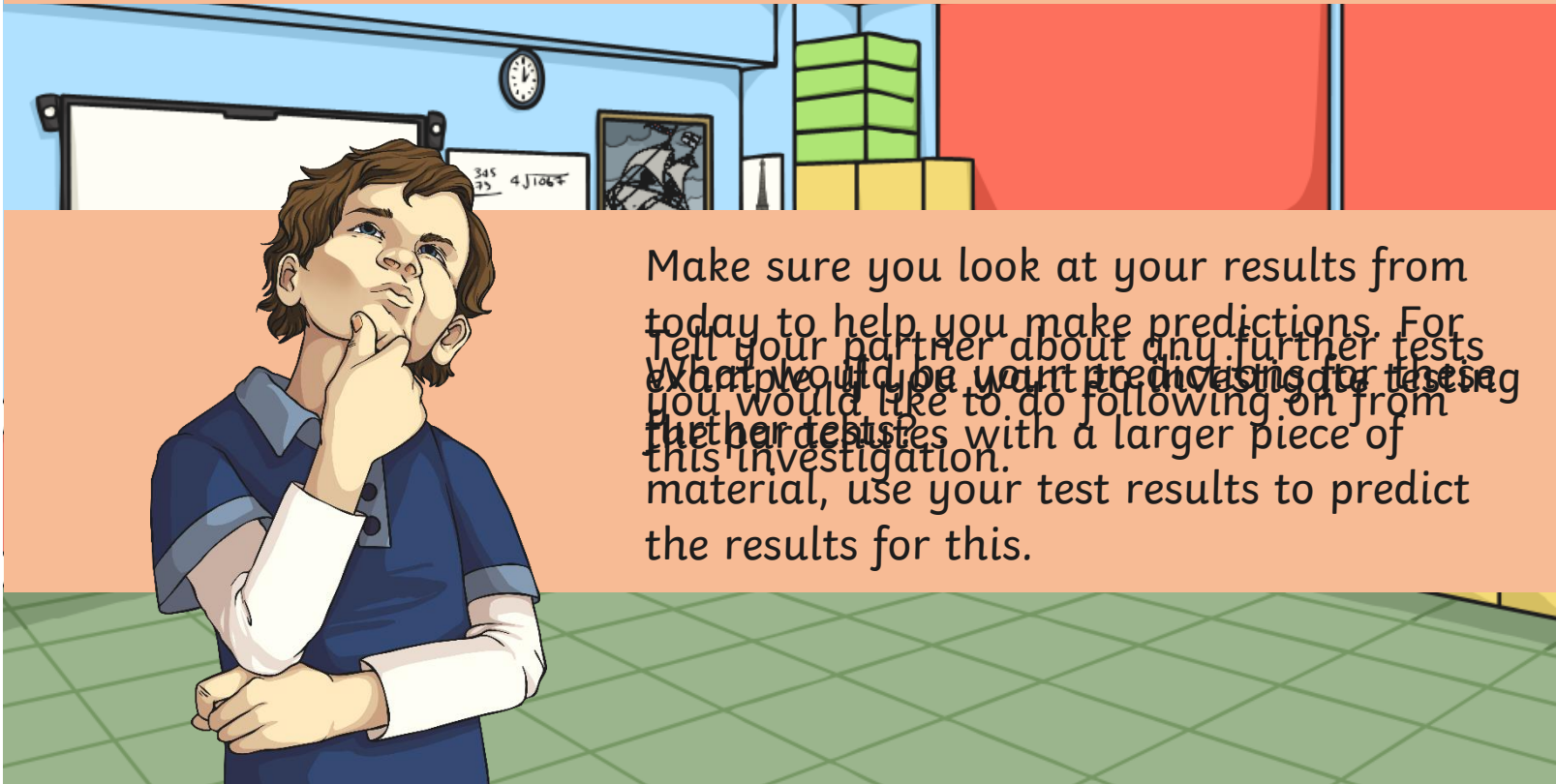
- what it is;
- famous experiments associated with it;
- how it is helpful and unhelpful;
- where you see air resistance every day;
- what your investigation showed.

gravity prediction
air resistance investigation
Galileo Galilei measure
mass observe
parachute variables
force results

Further Tests



Think about the investigation you completed today. Look at your results.



Make sure you look at your results from today to help you make predictions. For
Tell your partner about any further tests
What would be your predictions for these?
you would like to do following on from
further tests with a larger piece of
this investigation.
material, use your test results to predict
the results for this.

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