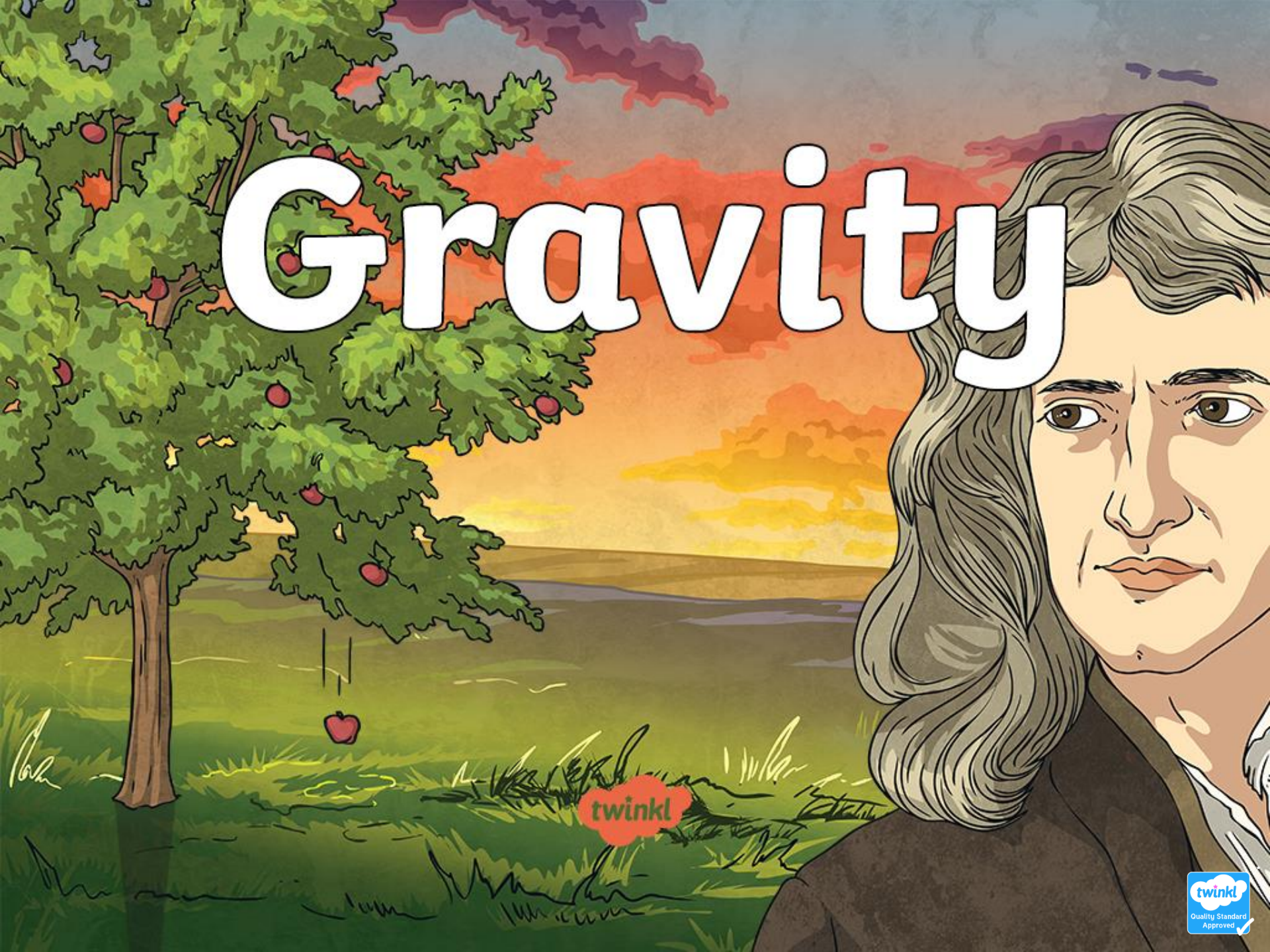
Science

Forces


Gravity
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Aim

- To explore the effect that gravity has on objects and how the first theory of gravity was developed.

Success Criteria

- I can explain the effect of gravity on unsupported objects.
- I can explain Isaac Newton's role in developing a theory of gravity.
- I can accurately measure the force of gravity pulling on objects.

Falling Down

Watch your teacher let go of a bouncy ball. What does it do?

These children are discussing why the bouncy ball falls down rather than falling up, sideways or staying still.

Which child or children do you agree with?

There is no air resistance acting on the ball, so it can go straight down.

The ball falls downwards because gravity is pulling it down.

The ground exerts a force on the ball so the ball is magnetically attracted to the ground.

The bouncy ball falls downwards because it is heavy. If it were lighter, it would float away.

Falling Down

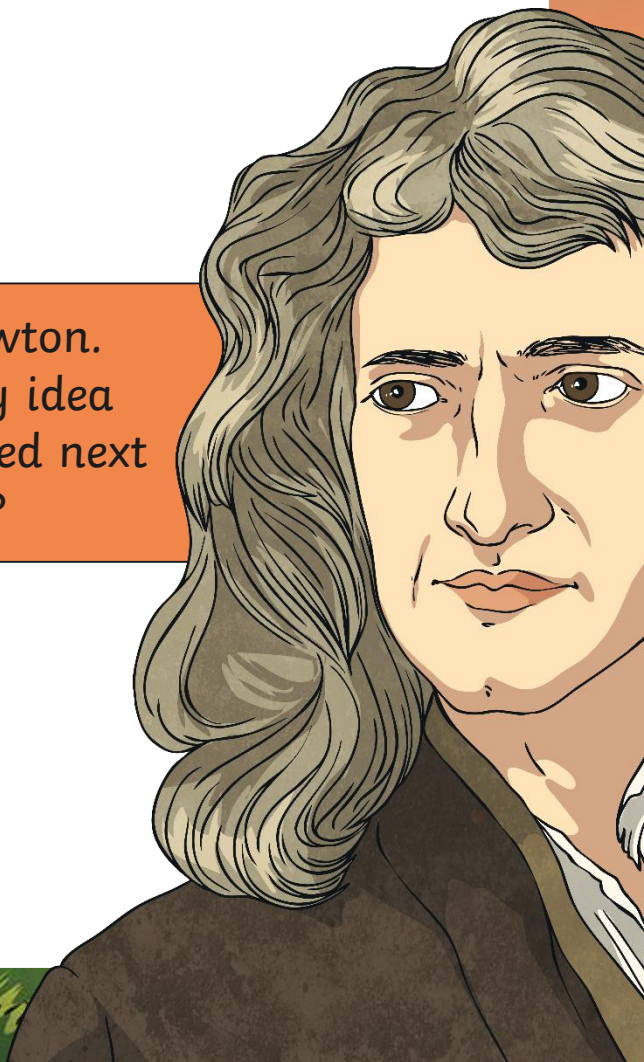
Did you agree with this boy? **Gravity** is the force that means that objects are pulled towards the centre of the Earth.

All objects exert a **gravitational pull**. However, the strength of an object's gravitational pull depends on its **mass**. The Earth is a huge object with an extremely high mass, so its gravitational pull is very strong.

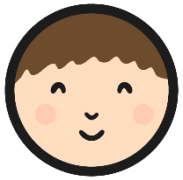
The force of gravity keeps us on the ground. Gravity also causes objects to fall down if they are dropped.

Discovering Gravity

This is Isaac Newton. Do you have any idea why he is pictured next to an apple tree?

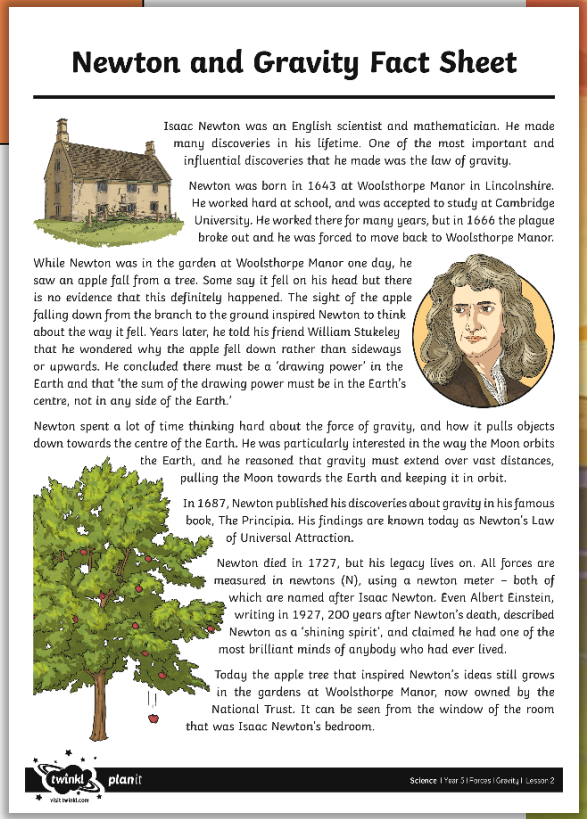


Discovering Gravity



Isaac Newton famously developed his theory of gravity when he saw an apple fall to the ground from an apple tree.

Read your **Newton and Gravity Fact Sheet** about his life and his theory. Then answer the questions on the **Newton and Gravity Activity Sheet**.



Newton and Gravity Fact Sheet

Isaac Newton was an English scientist and mathematician. He made many discoveries in his lifetime. One of the most important and influential discoveries that he made was the law of gravity.

Newton was born in 1643 at Woolsthorpe Manor in Lincolnshire. He worked hard at school, and was accepted to study at Cambridge University. He worked there for many years, but in 1666 the plague broke out and he was forced to move back to Woolsthorpe Manor.

While Newton was in the garden at Woolsthorpe Manor one day, he saw an apple fall from a tree. Some say it fell on his head but there is no evidence that this definitely happened. The sight of the apple falling down from the branch to the ground inspired Newton to think about the way it fell. Years later, he told his friend William Stukeley that he wondered why the apple fell down rather than sideways or upwards. He concluded there must be a 'drawing power' in the Earth and that 'the sum of the drawing power must be in the Earth's centre, not in any side of the Earth.'

Newton spent a lot of time thinking hard about the force of gravity, and how it pulls objects down towards the centre of the Earth. He was particularly interested in the way the Moon orbits the Earth, and he reasoned that gravity must extend over vast distances, pulling the Moon towards the Earth and keeping it in orbit.

In 1687, Newton published his discoveries about gravity in his famous book, The Principia. His findings are known today as Newton's Law of Universal Attraction.

Newton died in 1727, but his legacy lives on. All forces are measured in newtons (N), using a newton meter – both of which are named after Isaac Newton. Even Albert Einstein, writing in 1927, 200 years after Newton's death, described Newton as a 'shining spirit', and claimed he had one of the most brilliant minds of anybody who had ever lived.

Today the apple tree that inspired Newton's ideas still grows in the gardens at Woolsthorpe Manor, now owned by the National Trust. It can be seen from the window of the room that was Isaac Newton's bedroom.

Weight and Mass

People often use the words weight and mass to mean the same thing.

Mass is a measure of the amount of 'stuff' inside an object, and is measured in **kilograms** (kg).

Weight is actually a measure of the strength of gravity acting on an object. It is measured in **newtons** (N).

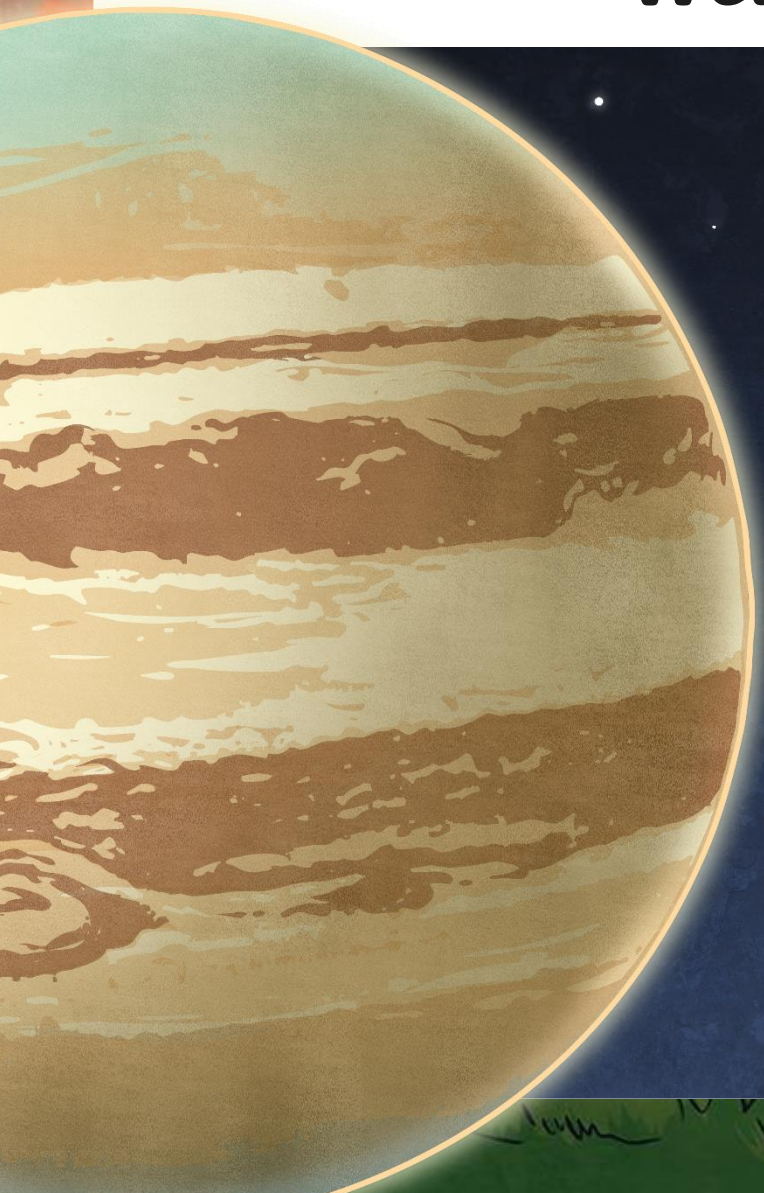
The **weight** of an object is caused by **gravity** pulling it down. Objects with more **mass** have a greater weight, as the force of gravity pulls them down more strongly.

Weight and Mass

An object's mass will stay the same even if it is in a place with weaker gravity, like the Moon.

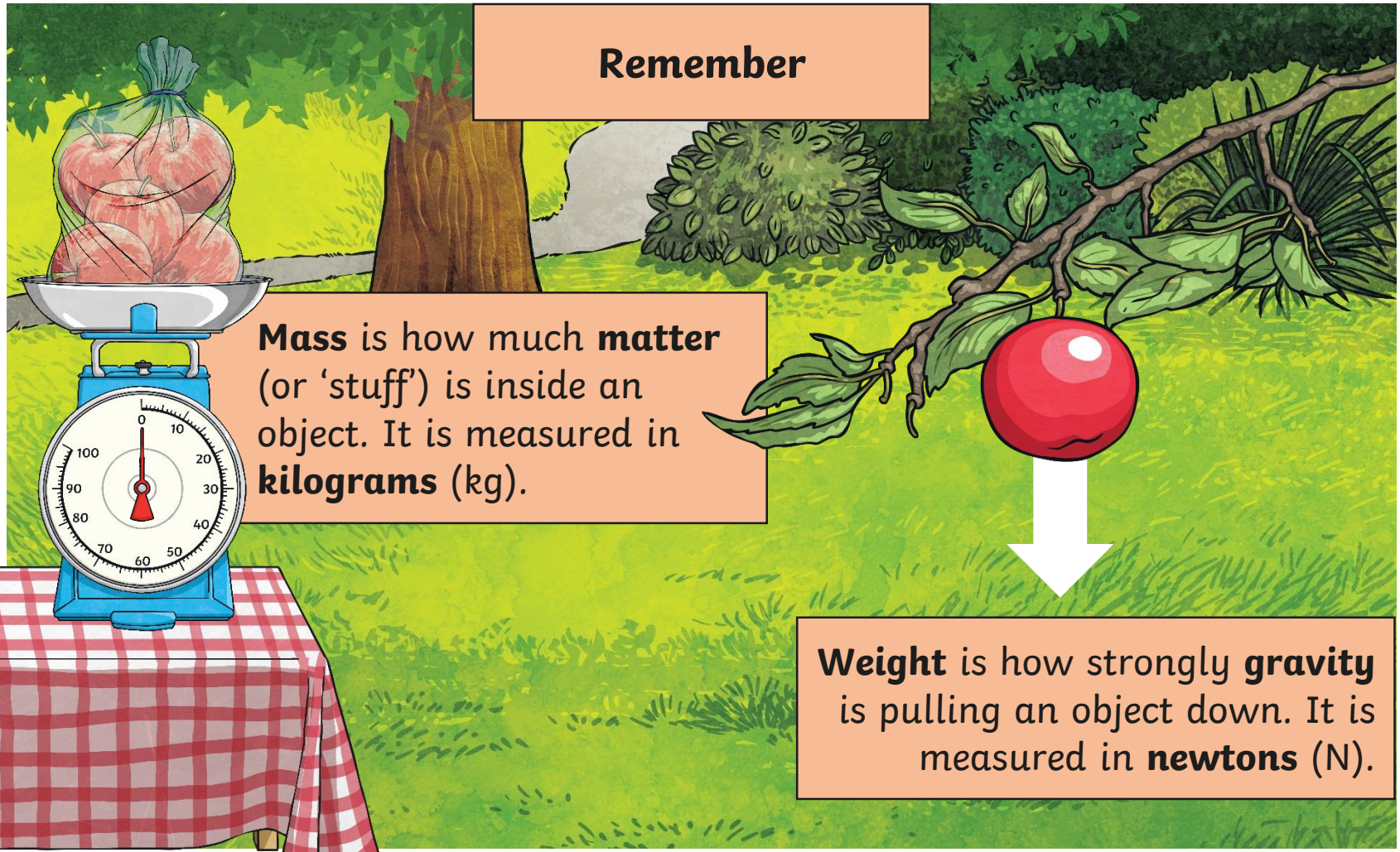
However, an object's **weight** can **change**! If the object were on the Moon, although it would have the same mass, it would weigh much less as the gravity would not be pulling it down as strongly. The Moon's gravity is much weaker than the Earth's.

Weight and Mass

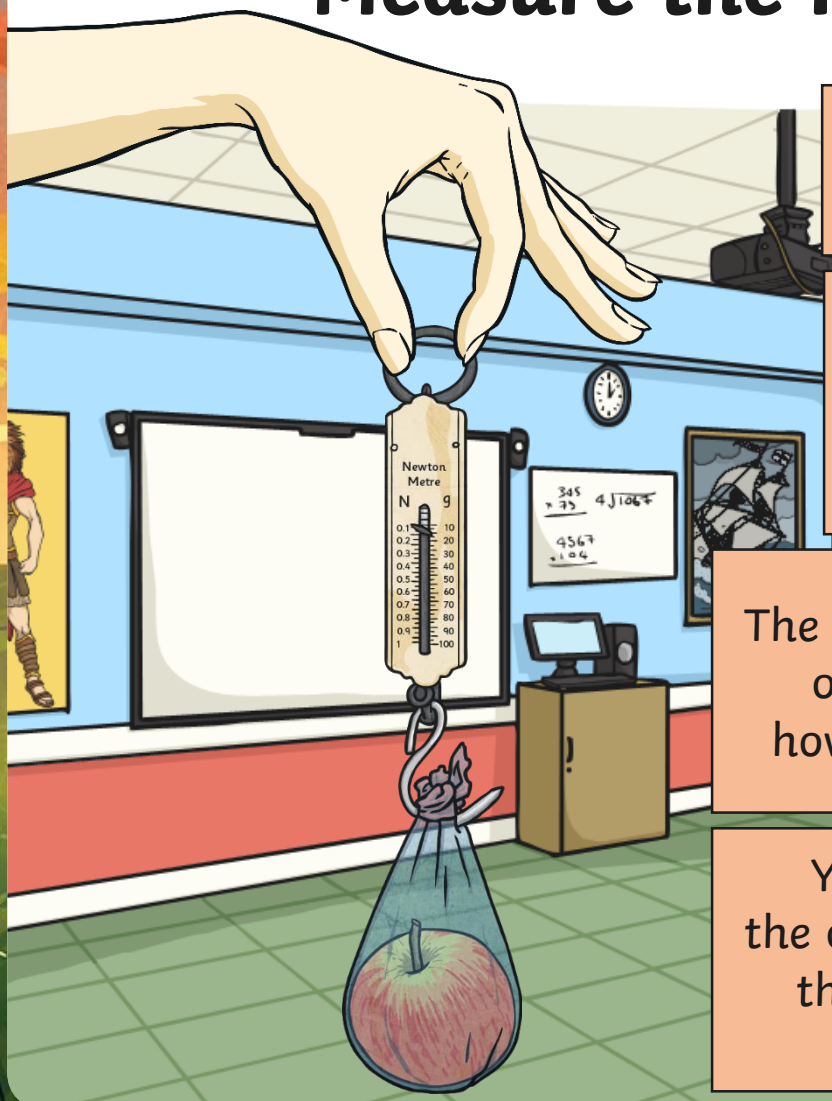


Jupiter is a much bigger planet than Earth so it has a stronger gravitational pull. Although an object would have the same **mass** on Jupiter as anywhere else, it would **weigh** much more due to the gravity pulling it more strongly.

Weight and Mass



Measure the Force of Gravity



You are going to measure the **weight** and **mass** of different objects.

The weight of an object is measured using a **newton meter**. Remember, weight is a measure of how strongly gravity is pulling on the object.

The mass of an object is measured using a set of **scales**. Remember, mass is a measure of how much matter (or 'stuff') is in the object.

You can find an object's weight by placing the object in a bag and hanging the bag from the newton meter to measure how strongly gravity is acting on the object.

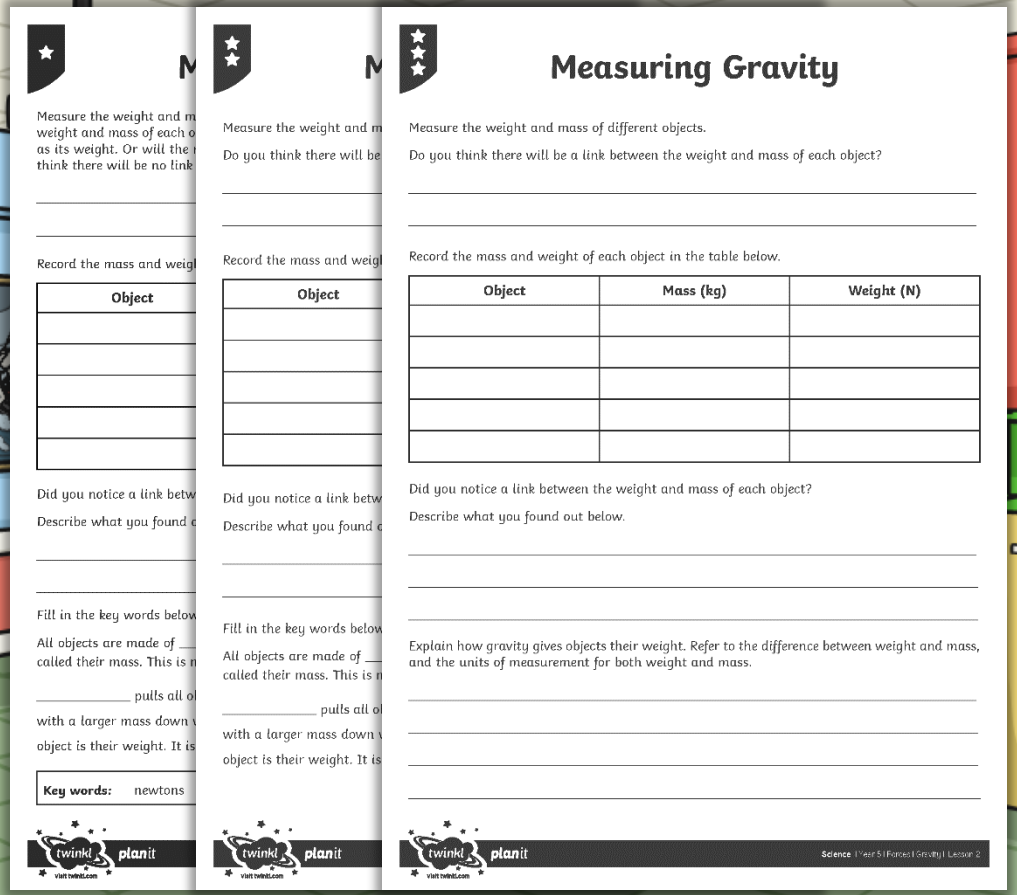
Measure the Force of Gravity

Do you think that there will be a link between an object's

Did you measure the weight and mass of each object accurately?

Was it easy or hard to get an accurate measurement?

your results. Then use your results to form a conclusion.



Measuring Gravity

Measure the weight and mass of different objects.

Do you think there will be a link between the weight and mass of each object?

Record the mass and weight of each object in the table below.

Object	Mass (kg)	Weight (N)

Did you notice a link between the weight and mass of each object?

Describe what you found out below.

Explain how gravity gives objects their weight. Refer to the difference between weight and mass, and the units of measurement for both weight and mass.

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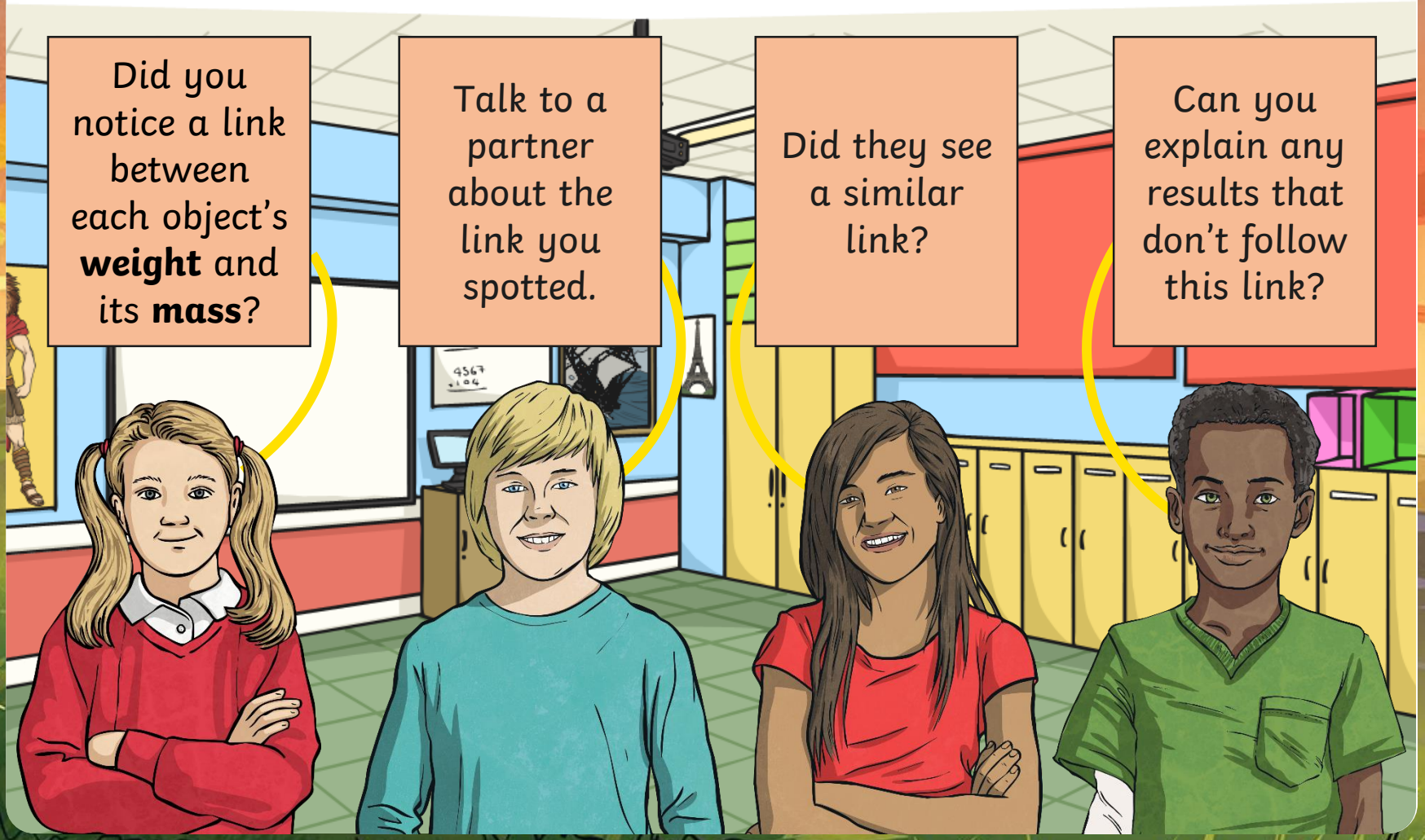
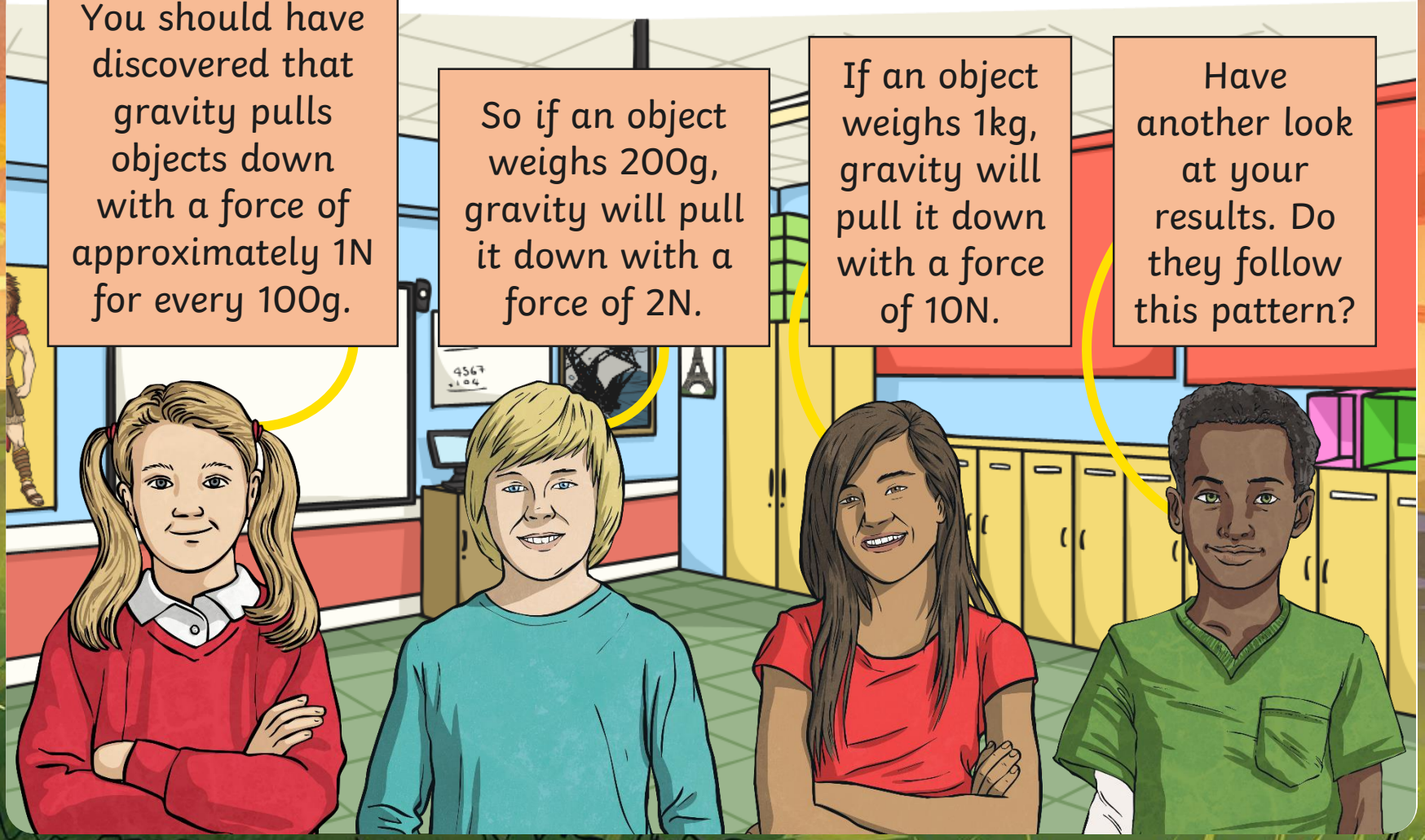
Science | Year 5 | Forces | Gravity | Lesson 2

Finding a Link



Finding a Link



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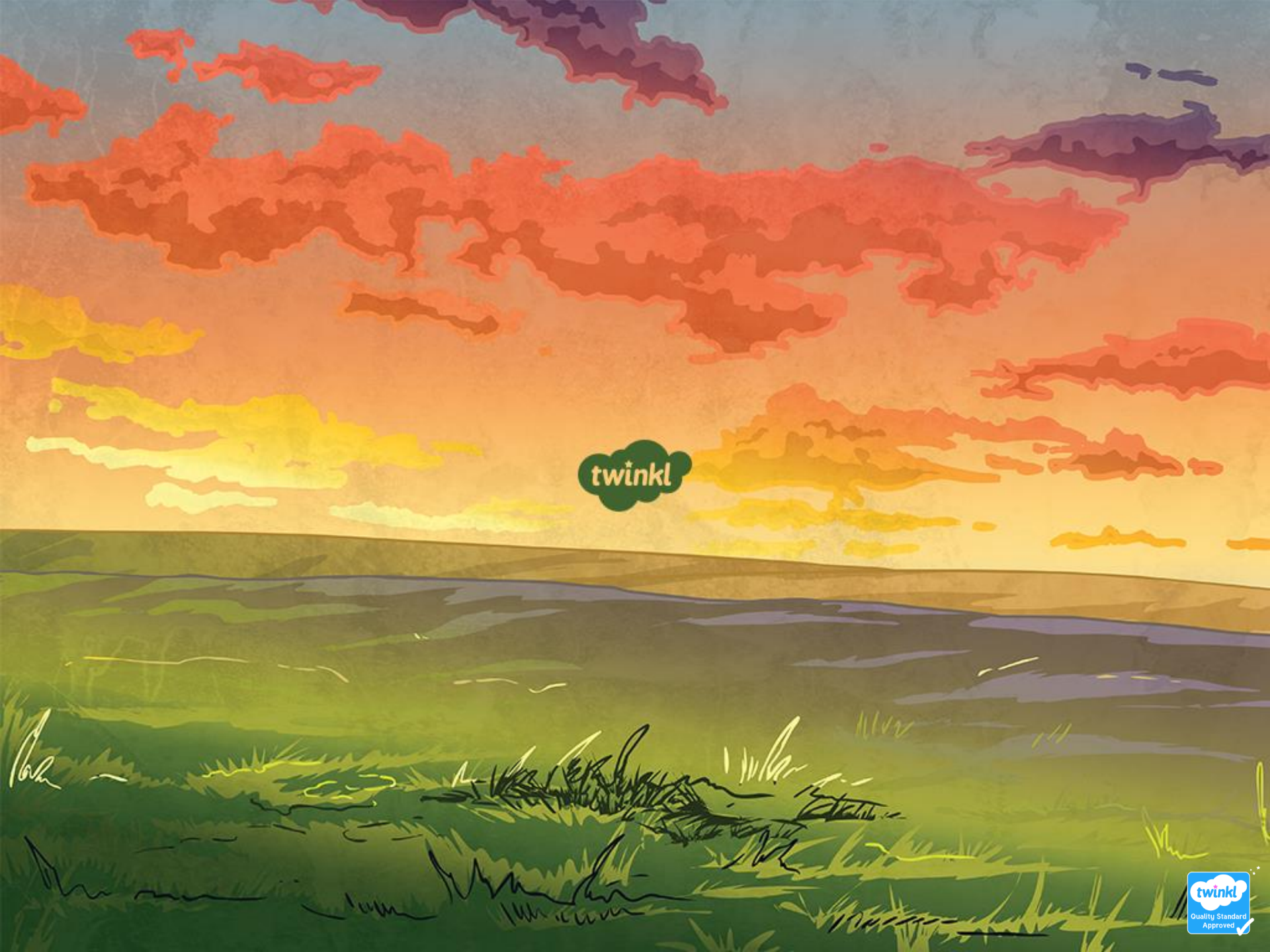
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