

# Stephen Hawking

Scientists and Inventors



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# Aim

- To understand Stephen Hawking's theories about black holes and report my findings.

# Success Criteria

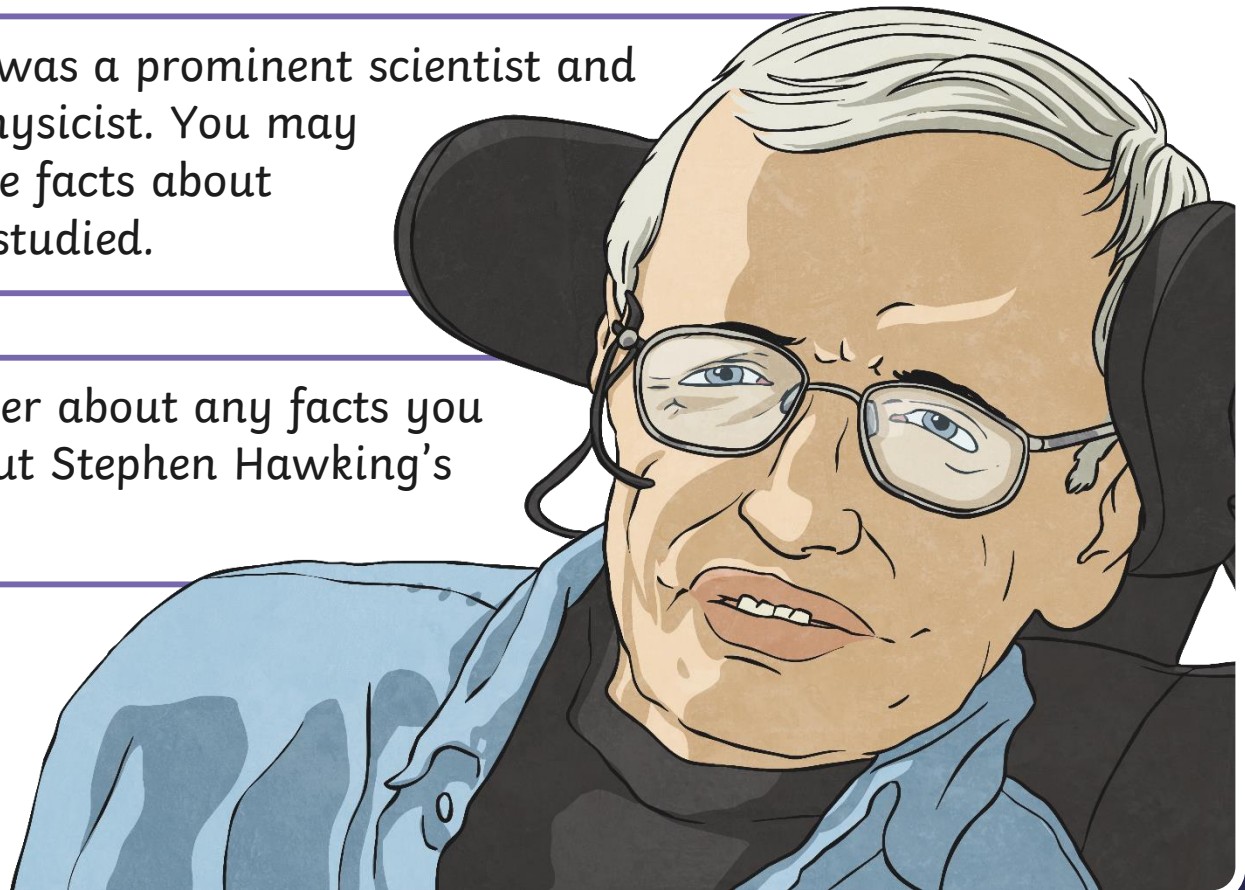
- I can share facts about Stephen Hawking's life.
- I can explain what I already know about black holes.
- I can set up an inquiry to demonstrate the causes of black holes.
- I can report about my findings from an inquiry.

# Stephen Hawking



Stephen Hawking was a prominent scientist and theoretical astrophysicist. You may already know some facts about him and what he studied.

Talk to your partner about any facts you already know about Stephen Hawking's life and work.



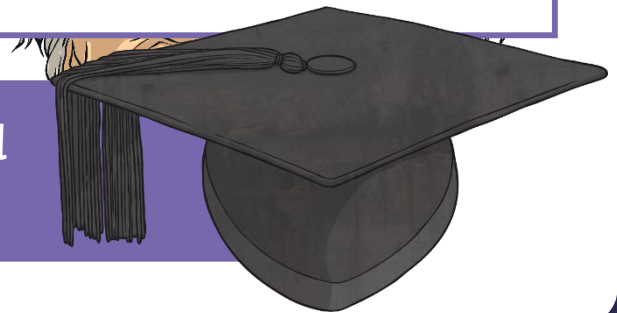
# Hawking's Life

Stephen Hawking was born in Oxford on 8<sup>th</sup> January 1942. He grew up with his parents, his brother and sisters.

At school, Hawking enjoyed science and maths and he was nicknamed 'Einstein' by his friends. He wanted to study maths at the University of Oxford, but Oxford didn't offer a maths degree at that time. Instead, Hawking chose to study physics and chemistry.

Hawking found the work at university very easy. He joined the college boat club and was known as a daredevil because of the risks he took when rowing the boats.

After graduating from Oxford, Hawking studied for his PhD at the University of Cambridge.

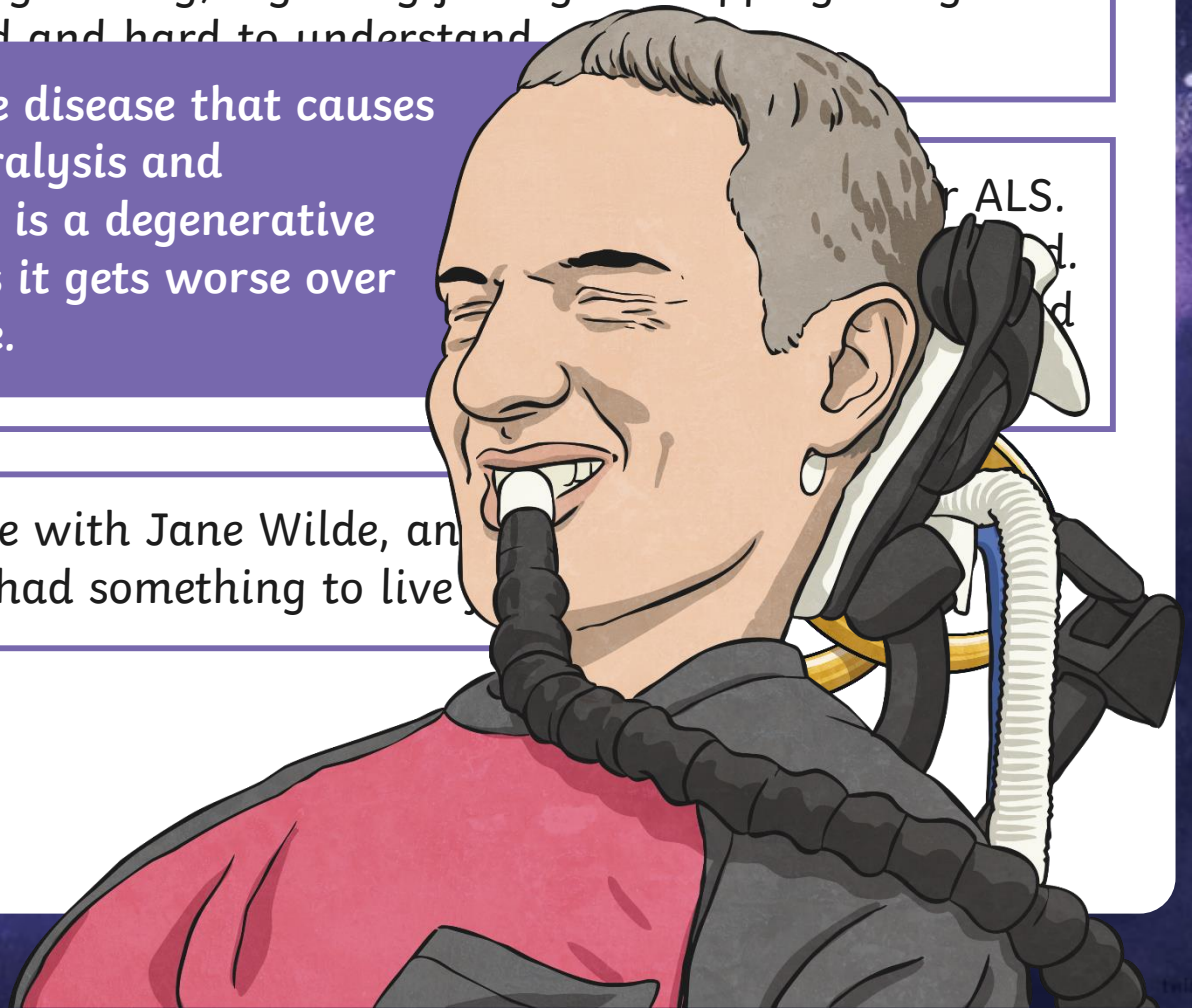


# Hawking's Life

It was at Cambridge that Hawking first developed problems with his health. He became very clumsy, regularly falling or dropping things. His speech became slurred and hard to understand.

ALS: A motor neurone disease that causes muscle weakness, paralysis and respiratory failure. It is a degenerative disease, which means it gets worse over time. There is no cure.

He met and fell in love with Jane Wilde, and Hawking felt that he had something to live for.



# Hawking's Life

◆ Stephen Hawking lived a full life despite his disabilities.

◆ He used a wheelchair to move around and a computer with a voice synthesizer to talk.

◆ His condition did continue to deteriorate, though, and this renowned scientist sadly died on 14<sup>th</sup> March 2018, aged 76.

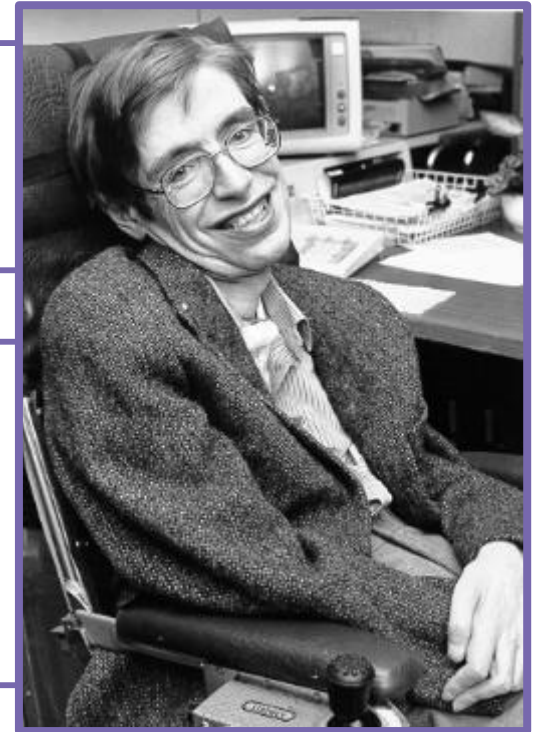


# Hawking's Life

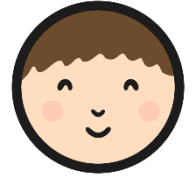
Stephen Hawking is remembered as one of the greatest scientists that ever lived.

His theories, such as those concerning black holes, have changed the way we understand the universe.

His many books have helped millions to understand difficult scientific concepts and he has inspired people around the world with his passion for science and his ability to overcome difficulties.



# Black Holes



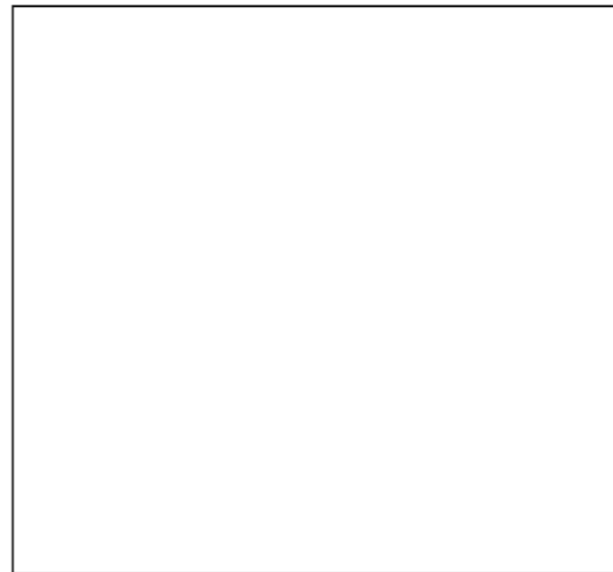
Draw a diagram on your **Black Holes Activity Sheet** and add labels to explain what you already know about black holes.

Don't worry if you don't know much about them – just draw and label what you can.

## What Are Black Holes?

What do you already know about black holes? Think about what they look like, what they do and where they might be found.

Draw a diagram of what you think a black hole is like and add labels to describe it.



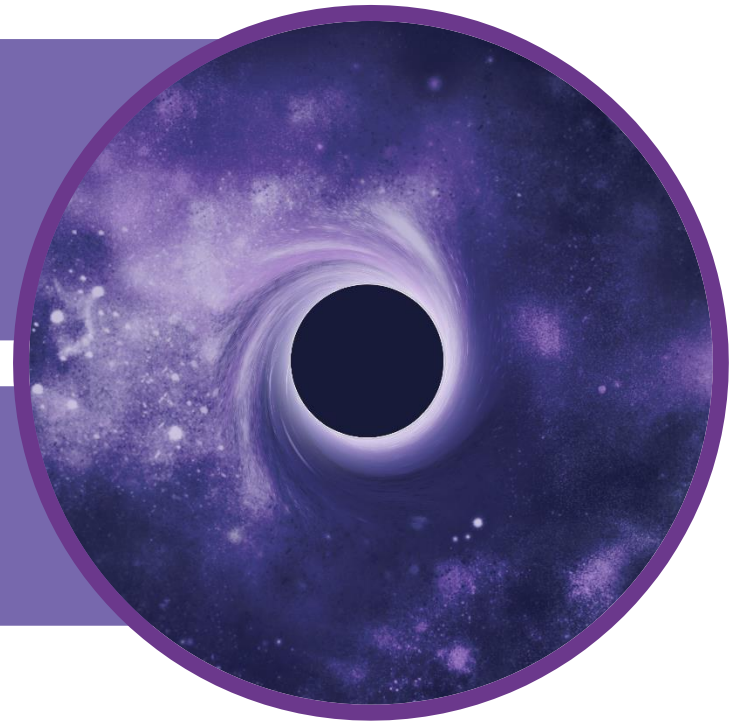


# Black Hole Theories

◆ Hawking developed theories about how black holes are formed, how they behave and where they can be found in the universe. This is one of his theories:

◆ A black hole is a place where gravity has got so strong that it pulls matter down into it and doesn't let any of this matter escape, not even light.

◆ Anything too close to a black hole will be sucked down into it and trapped forever.



# Black Hole Theories

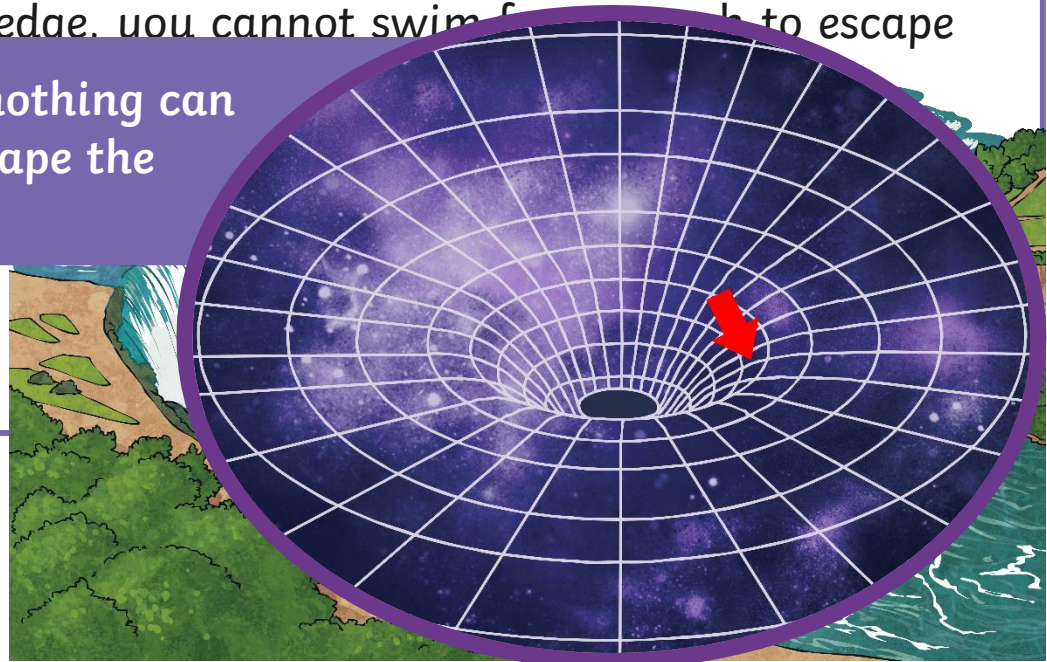
◆ This is how matter is pulled into a black hole.

◆ The edge of a black hole is called the event horizon.

◆ You can swim away just enough so that you don't go over the edge, but as you get nearer to the edge, you cannot swim fast enough to escape.

◆ Past the event horizon, nothing can travel fast enough to escape the black hole.

◆ You will be pulled over the edge of the waterfall.



# Black Hole Inquiry



I will explain each inquiry, then you will follow the instructions on your **Black Hole Inquiries Instructions** sheet to carry out the two demonstrations.

Think about black holes and how Stephen Hawking explained his theories.

Once you have completed the inquiries you will prepare a presentation about his theories and how they are formed.

## Black Hole Inquiries Instructions

To understand Stephen Hawking's theories about black holes.

Follow these instructions to set up two inquiries to demonstrate how black holes are formed and how they behave.

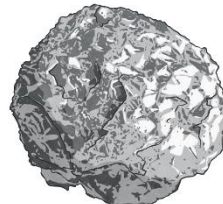
### Black Hole Inquiry 1: How They Are Formed

Inflate a balloon so that it is approximately 10cm in diameter.

Wrap the balloon in several layers of tinfoil.

Carefully pop the balloon with a pin.

Squash and squeeze the foil layers around the popped balloon.



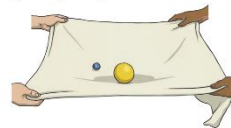
### Black Hole Inquiry 2: How They Behave

2 or 3 members of your group should hold the edges of a piece of stretchy fabric so that it is stretched taut horizontally.

Another member of your group should roll a marble across the fabric. Observe how it travels.

Now place a heavy ball in the centre of the fabric. How does it alter the shape of the fabric?

Roll the marble across the fabric again, and observe how it travels differently now that the heavy ball is there. Experiment with rolling it slowly and quickly.



# Black Hole Inquiry 1



This shows how gravity compresses the star's matter around the collapsed core. The dead star has the same amount of matter, but it is compressed to a small point. This means it has greater density than the original star.

Imagine that the star has reached the end of its life and the core has

This is how a black hole can be formed.

The dense ball of matter exerts a large gravitational pull on all objects around it.

Squash and squish the matter around the point



# Black Hole Inquiry 2



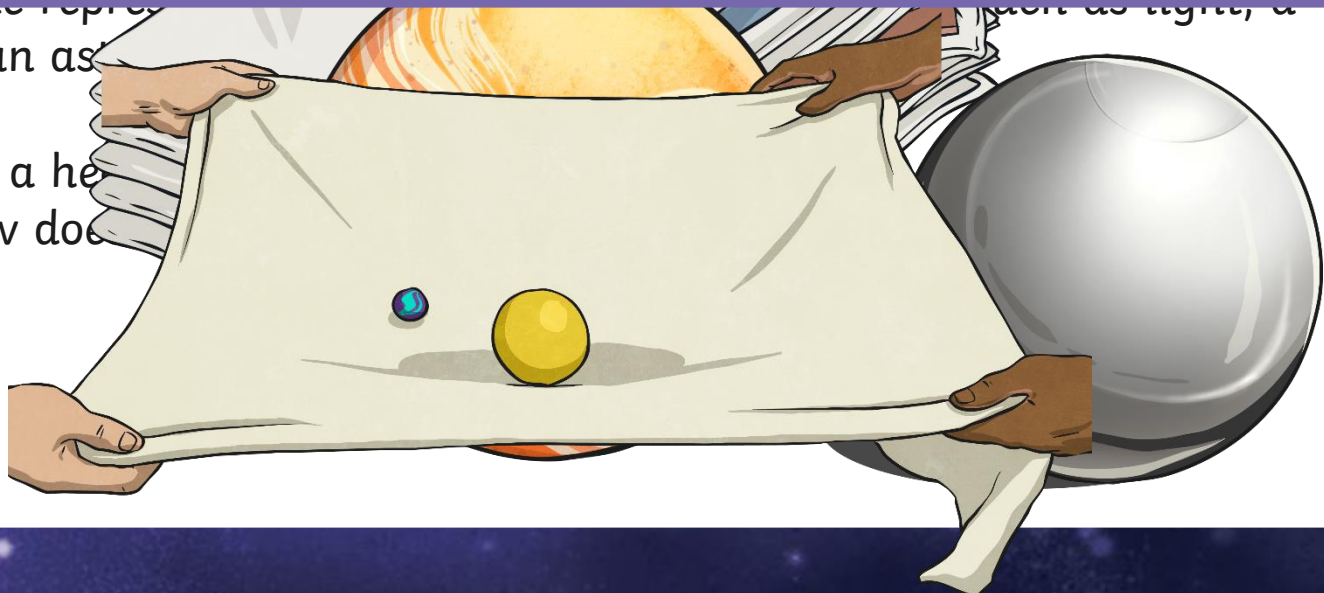
Notice how the heavy ball pulls the fabric down to form a hole or a well that pulls the marble down. Once it is in the hole, it cannot escape.

observe how it travels differently now that

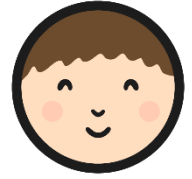
This is how black holes pull objects into themselves, and demonstrates why objects cannot escape from black holes.

This marble represents a planet or an asteroid. The heavy ball is as light as light, a

◆ Now place a heavy ball on the fabric. How does the fabric



# Report on Your Findings



Use your **Black Hole Report Activity Sheet** to report on your findings and how they relate to Hawking's theories about black holes.

★	★★	★★★ <b>Black Hole Report</b>																		
		To report my findings about black holes. 																		
<p>Stephen Hawking was a world expert on black holes to explain how they are formed and how they behave.</p>	<p>Stephen Hawking was a world expert on black holes to explain how they are formed and how they behave.</p>	<p>Stephen Hawking was a world expert on black holes and found out many things about them. Use your findings from your inquiry into black holes to explain how they are formed and how they behave.</p>																		
<p>How are black holes formed? Draw a diagram here. Add labels to explain what your observations tell us about black holes.</p>	<p>How are black holes formed? Explain what this tells us about black holes.</p>	<p>How are black holes formed? Explain what you observed and what this tells us about black holes.</p>																		
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<p>Draw a labelled diagram of your observations here.</p>	<p>Draw a labelled diagram of your observations here.</p>	<p>Draw a labelled diagram of your observations here.</p>																		
<table border="1"><tr><td>balloon</td><td>foil</td><td>star</td></tr><tr><td>marble</td><td>ball</td><td>curve</td></tr></table>	balloon	foil	star	marble	ball	curve	<table border="1"><tr><td>balloon</td><td>foil</td><td>star</td></tr><tr><td>marble</td><td>ball</td><td>curve</td></tr></table>	balloon	foil	star	marble	ball	curve	<table border="1"><tr><td>balloon</td><td>foil</td><td>star</td></tr><tr><td>marble</td><td>ball</td><td>curve</td></tr></table>	balloon	foil	star	marble	ball	curve
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		<p>Science   Year 6   Scientists and Inventors   Stephen Hawking   Lesson 1</p>																		

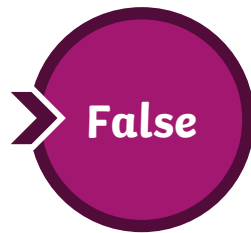
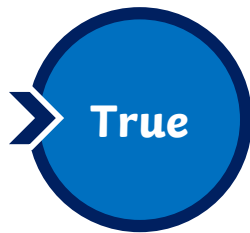
# Stephen Hawking



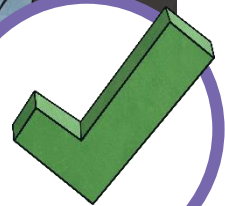
## True or False?

Using what you have learned in today's lesson, decide if these statements about Stephen Hawking are true or false.

- Stephen Hawking was born with a disability called ALS.



Well done!



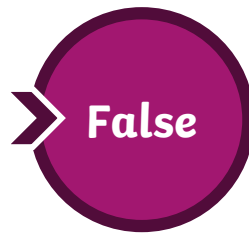
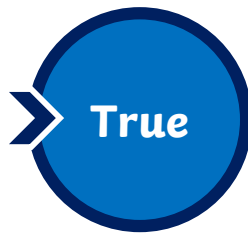
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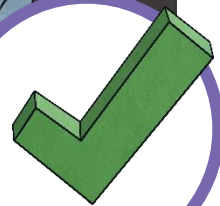
## True or False?

Using what you have learned in today's lesson, decide if these statements about Stephen Hawking are true or false.

- Hawking was a member of the boat club at university.



Well done!





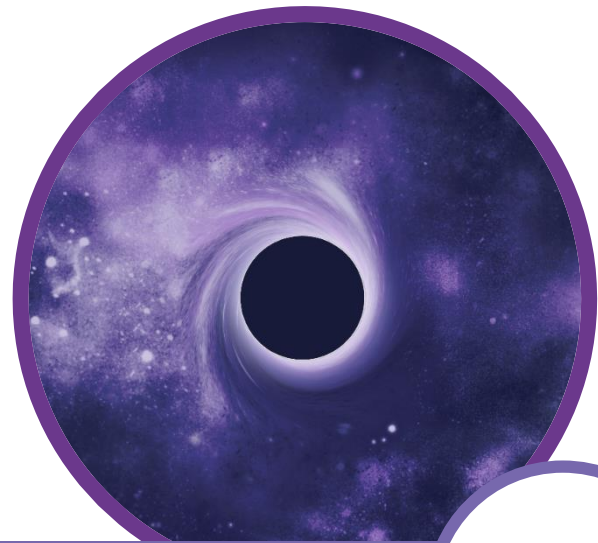
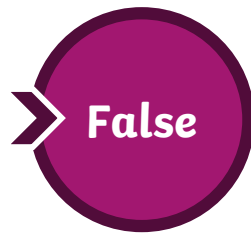
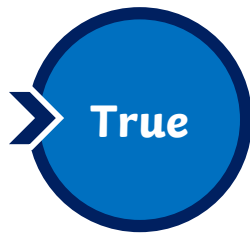
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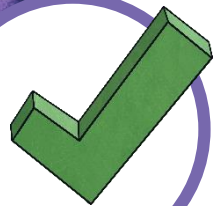
## True or False?

Using what you have learned in today's lesson, decide if these statements about Stephen Hawking are true or false.

- Hawking is renowned as a world expert on black holes.



Well done!



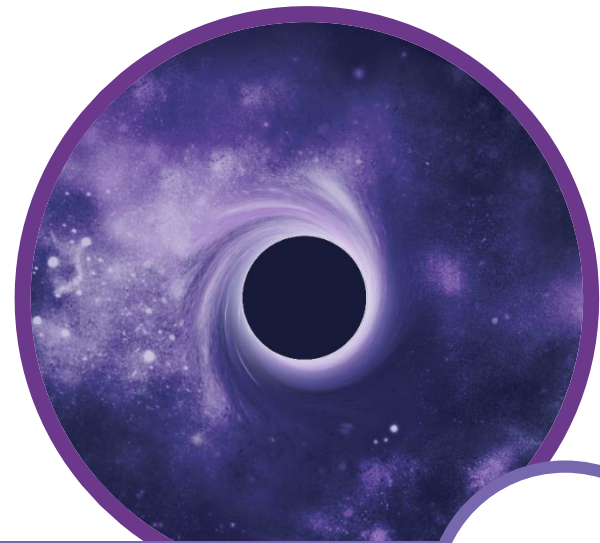
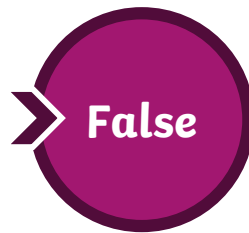
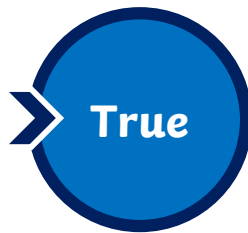
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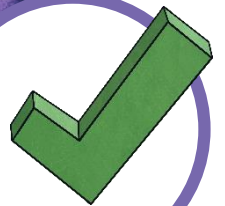
## True or False?

Using what you have learned in today's lesson, decide if these statements about Stephen Hawking are true or false.

- Hawking theorised that there is a black hole at the centre of our galaxy.



Well done!



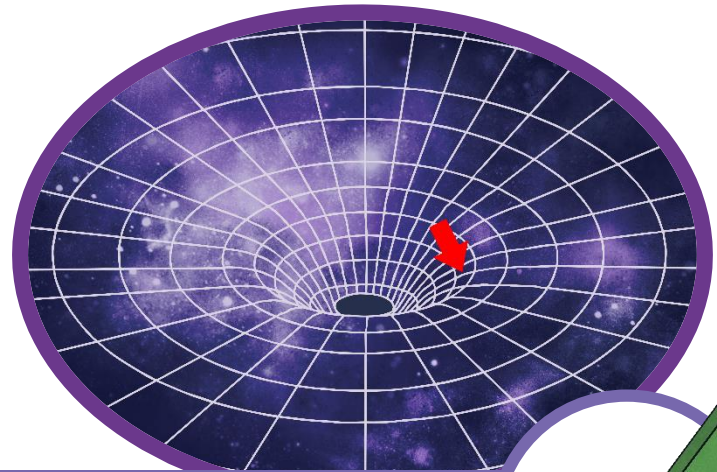
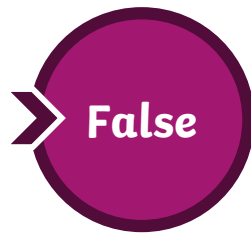
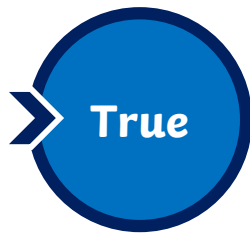
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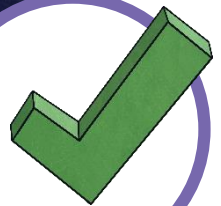
## True or False?

Using what you have learned in today's lesson, decide if these statements about Stephen Hawking are true or false.

- The gravity of a black hole is so strong that only light can escape from one.



Well done!



# Aim



- To understand Stephen Hawking's theories about black holes and report my findings.

# Success Criteria

- I can share facts about Stephen Hawking's life.
- I can explain what I already know about black holes.
- I can set up an inquiry to demonstrate the causes of black holes.
- I can report about my findings from an inquiry.

A vibrant nebula in shades of purple and blue, with a central black circle containing the twinkl logo. The nebula has a swirling, tunnel-like appearance, drawing the eye towards the center. The background is filled with numerous small, bright stars and larger, glowing clusters of light.

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