

Sir Isaac Newton

Sir Isaac Newton was an important scientist and mathematician who is famous for his work on **gravity** and the three laws of motion.



Early Life and Education

Isaac was born on Christmas Day (25th December) 1642 in the village of Woolsthorpe, Lincolnshire. He spent most of his childhood living with his grandmother before being sent to **boarding school**.

Isaac began studying at the University of Cambridge in 1661 where he learnt about the famous Greek thinkers, Aristotle and Plato. However, Isaac soon became interested in the new ideas about science which were becoming popular at the time. Many people were starting to question the old belief that the Earth was the centre of the universe and Isaac was keen to explore new ways of understanding how nature worked.

Did You Know...?

Isaac returned to Lincolnshire for a short while to help his mother to run the family farm. However, he soon found that he was not suited to farm life so he went back to boarding school to continue his education.

Scientific Discoveries

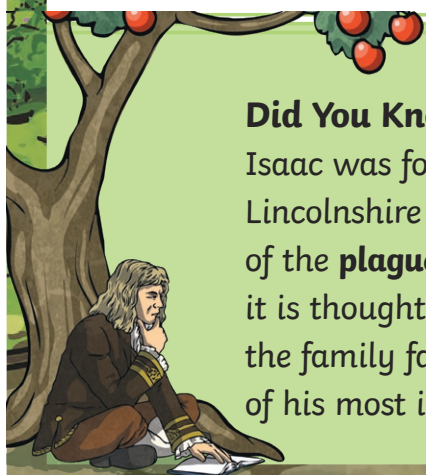
After completing his university studies, Isaac carried out lots of experiments and made some important discoveries. He found that when white light passes through a **prism** it separates into a band of colours. This led him to discover that white light is made up of a mixture of colours.



Many people believe that Isaac discovered gravity while sitting under a tree on his family's farm. It is said that an apple fell from a tree and landed on Isaac's head. He then started to wonder why the apple fell to the ground rather than floating upwards. Isaac also realised that it was gravity that kept the Moon in **orbit** around the Earth.

Did You Know...?

Isaac was forced to move back to Lincolnshire because of an outbreak of the **plague** in Cambridge. However, it is thought that it was at home on the family farm where he made some of his most important discoveries.



After the plague, Isaac began working as a teacher at the University of Cambridge. In 1687, Isaac published his famous book which is known as the 'Principia'.

His book introduced the three laws of motion:

The First Law of Motion

Something that is still will stay still unless it is pushed or pulled.

For example, a football on the ground will not move unless it is kicked.



The Second Law of Motion

If you use more force when pushing or pulling an object, it speeds up more quickly. Objects with a greater mass will need more force when pushing or pulling to make them speed up more quickly.



Third Law of Motion

For every action, there is an opposite reaction because forces work in pairs.

For example, when rowing a boat, we move the water backwards with the paddle and the water reacts by pushing the boat in the opposite direction.



Glossary

boarding school: A school (away from home) where children live during term time.

gravity: A force that pulls objects towards the Earth.

orbit: To repeatedly travel around a star, a planet or a moon.

plague: A dangerous disease which spreads rapidly.

prism: A glass or transparent object which separates white light into a spectrum of colours.

Questions

1. On which famous holiday was Isaac born? Tick one.

- ☐ Easter Sunday
- ☐ New Year's Day
- ☐ Christmas Day
- ☐ Boxing Day

2. Draw **three** lines and complete each sentence.

The first law of motion
states that...

for every action, there is an opposite
reaction because forces work in pairs.

The third law of motion
states that...

if you use more force when pushing
or pulling an object then it speeds up
more quickly.

The second law of motion
states that...

something that is still will stay still
unless it is pushed or pulled.

3. What was the name of Isaac's book published in 1687?

4. Find and copy one word which means the same as 'movement'.

5. Fill in the missing words.

Many people were starting to question the old belief that the _____
was the centre of the _____.

6. Where was Isaac believed to have been when he discovered gravity?

7. Why do you think that Isaac was not suited to running the family farm?

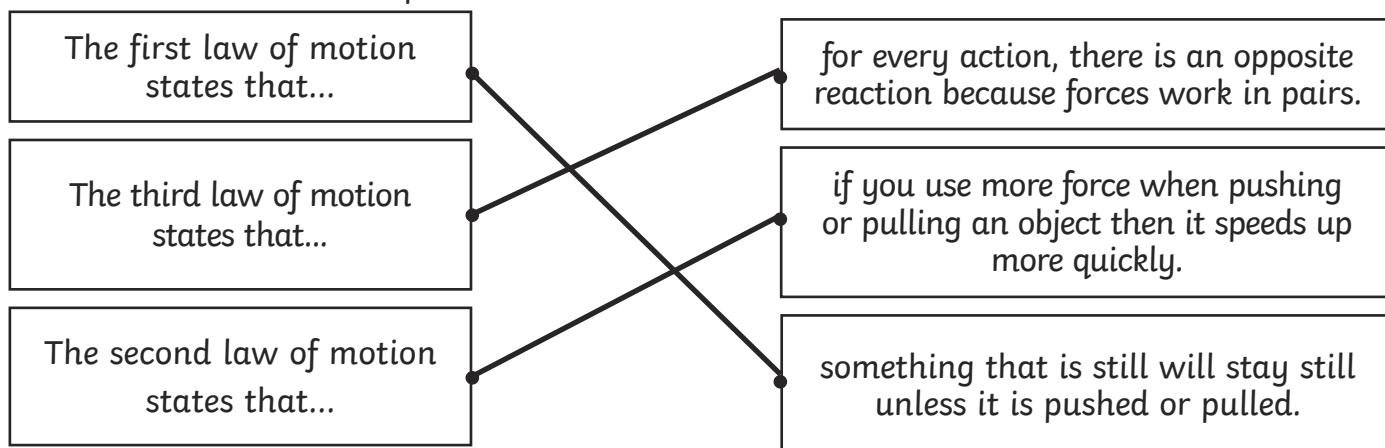
8. Summarise what you have learnt about Isaac Newton.

Answers

1. On which famous holiday was Isaac born? Tick one.

- ☐ Easter Sunday
☐ New Year's Day
☒ **Christmas Day**
☐ Boxing Day

2. Draw **three** lines and complete each sentence.



3. What was the name of Isaac's book published in 1687?

Principia

4. Find and copy one word which means the same as 'movement'.

motion

5. Fill in the missing words.

Many people were starting to question the old belief that the **Earth** was the centre of the **universe**.

6. Where was Isaac believed to have been when he discovered gravity?

Pupils' own responses, such as: Isaac was in the orchard of his family's farm when an apple fell from a tree. This falling apple encouraged him to think about gravity.

7. Why do you think that Isaac was not suited to running the family farm?

Pupils' own responses, such as: Isaac was probably not suited to running the family farm because he was more suited to life as a scientist. Farm life requires lots of physical effort whereas Isaac preferred thinking, researching and conducting scientific experiments.

8. Summarise what you have learnt about Isaac Newton.

Pupils' own responses, such as: Isaac Newton was a very important scientist and mathematician. He grew up in Lincolnshire and studied at the University of Cambridge. He discovered gravity and wrote the three laws of motion. He also made important discoveries about light.

Sir Isaac Newton

Sir Isaac Newton was an influential scientist and mathematician who is famous for his work on gravity and the three laws of motion.

Childhood

Isaac was born on Christmas Day (25th December) 1642 in the village of Woolsthorpe in Lincolnshire. As a child, he was raised by his grandmother before being sent to boarding school. A few years into his education, Isaac returned to Woolsthorpe to help his mother look after the family farm and surrounding land. Nevertheless, it soon became clear that Isaac was not suited to this job so he returned to boarding school to continue his education.



Education

In 1661, Isaac began his university studies at Trinity College, Cambridge. There, he studied the works of the popular ancient Greek scientists and thinkers, Aristotle and Plato. However, Isaac soon became interested in the Scientific Revolution and this caused him to begin questioning some of these traditional ideas.

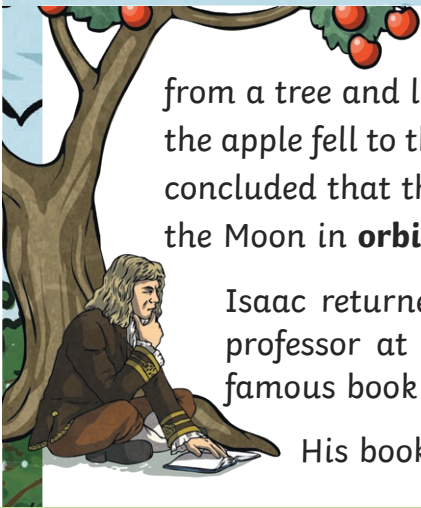
What was the Scientific Revolution?

The Scientific Revolution took place in the 16th and 17th centuries. It was a time when people began to use experimental scientific methods to understand how nature works and to think of nature as a machine. The new ideas of the Scientific Revolution questioned the popular ancient Greek ideas that saw the Earth as the centre of the universe.

Scientific Discoveries

Isaac spent a lot of time at home in Lincolnshire after completing his university studies due to an outbreak of the plague in Cambridge. He carried out lots of experiments while he was there and he made some important discoveries about light. Isaac found that when white light passes through a **prism**, it separates into a band of colours. This led him to discover that white light is made up of a mixture of colours.

Many people believe that Isaac made his greatest scientific breakthrough when sitting under a tree in an orchard on his family farm. It is said that an apple fell



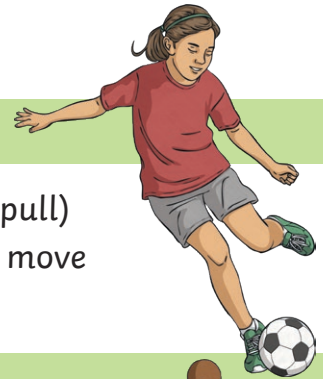
from a tree and landed on Isaac's head which caused him to think about why the apple fell to the ground rather than floating upwards. He then, apparently, concluded that the same force — which he called gravity — was also keeping the Moon in **orbit** around the Earth.

Isaac returned to Cambridge after the plague and began teaching as a professor at the University of Cambridge. In 1687, Isaac published his famous book which is commonly known as the 'Principia'.

His book introduced the three laws of motion:

First Law

Something that is still will stay still unless a force (a push or pull) is applied to it. For example, a football on the ground will not move unless it is kicked.



Second Law

If you apply more force to an object, it **accelerates** more quickly. Similarly, if an object has greater mass, more force will be needed to accelerate it. For example, a shopping trolley with a smaller weight will require less force to accelerate than a shopping trolley with greater weight.



Third Law



Forces work in pairs: for each force applied, another force will act in the opposite direction. For example, when rowing a boat, we move the water backwards with the paddle and the water reacts by pushing the boat in the opposite direction.

Later Years

Isaac became president of a major scientific group called the Royal Society. In 1705, he was knighted by Queen Anne; this gave him the title of 'Sir'. He was also elected as a Member of Parliament (MP).

Glossary

accelerate: When an object begins to move more quickly.

orbit: To repeatedly travel around a star, a planet or a moon.

prism: A glass or transparent object which separates white light into a spectrum of colours.

Questions

1. Which family member was Isaac raised by as a child? Tick one.

- ☐ his grandfather
- ☐ his father
- ☐ his grandmother
- ☐ his aunt

2. Draw **four** lines and match each event to the correct year.

1642

1705

1661

1687

Isaac began studying at Trinity College, Cambridge.

Isaac published his famous book, 'Principia'.

Isaac was knighted by Queen Anne.

Isaac was born in Woolsthorpe, Lincolnshire.

3. Fill in the missing words.

Issac found that when _____ light passes through
a _____ it separates into a band of colours.

4. Look at the section called **Education**.

Find and copy one word which means the same as 'long-established'.

5. Which fruit is said to have inspired Isaac to discover the force of gravity?

6. Look at the section called '**What was the Scientific Revolution?**'

Explain why you think this has been included in the text.

7. Why did Isaac spend so much time in rural Lincolnshire?

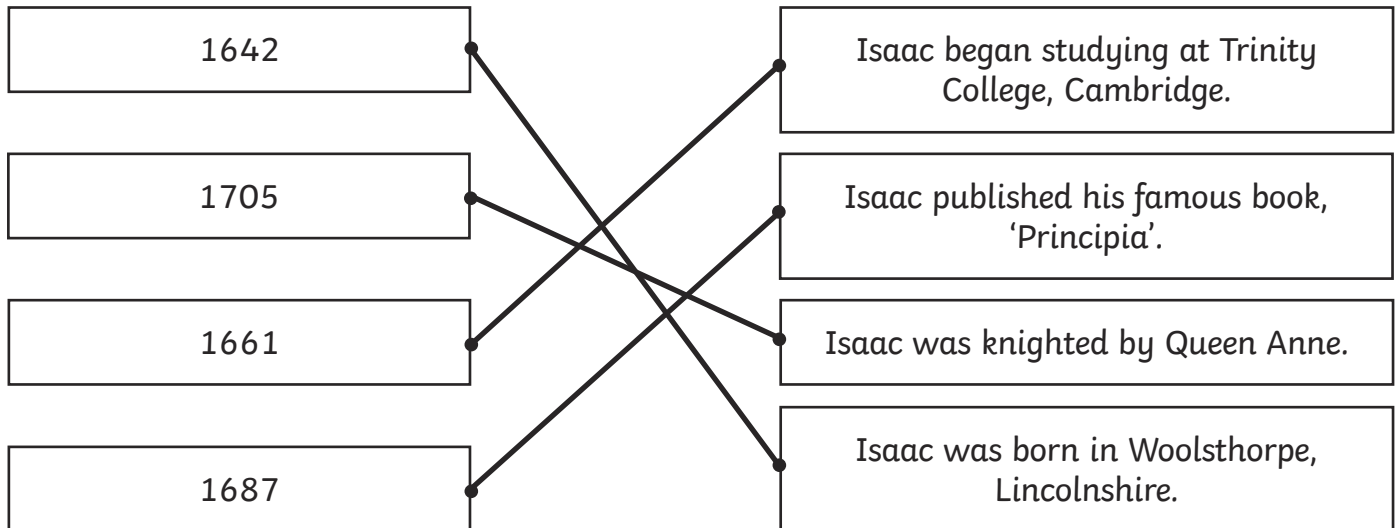
8. Explain why you think that Isaac was awarded a knighthood by Queen Anne.

Answers

1. Which family member was Isaac raised by as a child? Tick one.

- ☐ his grandfather
☐ his father
☒ **his grandmother**
☐ his aunt

2. Draw **four** lines and match each event to the correct year.



3. Fill in the missing words.

Isaac found that when **white** light passes through
a **prism** it separates into a band of colours.

4. Look at the section called **Education**.

Find and copy one word which means the same as 'long-established'.

traditional

5. Which fruit is said to have inspired Isaac to discover the force of gravity?

apple

6. Look at the section called '**What was the Scientific Revolution?**'

Explain why you think this has been included in the text.

Pupils' own responses, such as: I think this section has been included in the text so that the reader can understand what the Scientific Revolution was. The movement played an important role in Isaac's scientific discoveries and is important to his story.

7. Why did Isaac spend so much time in rural Lincolnshire?

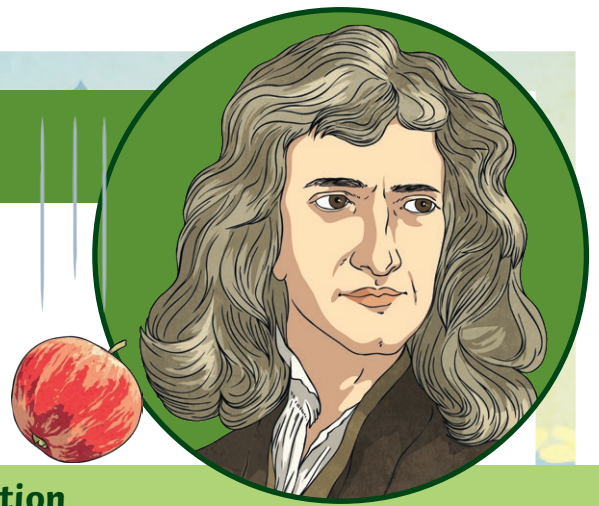
Pupils' own responses, such as: Isaac spent time in Lincolnshire because there was a plague outbreak in Cambridge. It would have been safer in Lincolnshire as there would have been less chance of becoming ill with the plague.

8. Explain why you think that Isaac was awarded a knighthood by Queen Anne.

Pupils' own responses, such as: Isaac was probably awarded a knighthood from Queen Anne due to his pioneering scientific discoveries into light and motion. His book 'Principia' would have been a great achievement and taught people a lot about science and mathematics.

Sir Isaac Newton

Sir Isaac Newton was an influential physicist and mathematician who played a key role in the Scientific Revolution. He is famous for his pioneering work on the three laws of motion which introduced the concept of gravity.



Childhood

Isaac was born on Christmas Day (25th December) 1642 in the village of Woolsthorpe, Lincolnshire. Following his mother's remarriage when he was around three years old, Isaac was raised by his grandmother. He was sent to boarding school but returned when his mother asked him, as her eldest son, to manage the family farm and the surrounding estate. However, it soon became apparent that Isaac was not suited to this rural role so he returned to boarding school where he continued studying in preparation for university.

Education

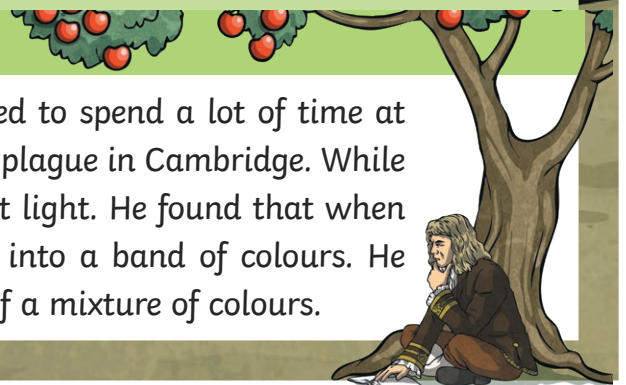
In 1661, Isaac enrolled at the prestigious Trinity College, Cambridge. Initially, Isaac studied the works of traditional scientists and philosophers: such as the ancient Greek thinkers, Aristotle and Plato. However, Isaac soon became interested in the emerging Scientific Revolution: a movement which hugely influenced his views on nature and science. On the cover of one of his scientific notebooks, Isaac wrote, 'Plato is my friend, Aristotle is my friend, but my best friend is truth.'

What was the Scientific Revolution?

The Scientific Revolution was a movement that took place during the 16th and 17th centuries. People involved in the Scientific Revolution were interested in using experimental scientific methods to understand how nature works and began to think of nature as a machine. This questioned the popular ancient Greek ideas that were mainly concerned with the elements and viewed the Earth as the centre of the universe.

Scientific Discoveries

After graduating from university, Isaac was forced to spend a lot of time at home in Woolsthorpe owing to an outbreak of the plague in Cambridge. While there, he conducted some important studies about light. He found that when white light passes through a prism, it separates into a band of colours. He concluded from this that white light is made up of a mixture of colours.



Sir Isaac Newton

According to a well-known story, Isaac first made what is often considered as his greatest scientific breakthrough when sitting under a tree in an orchard on his family farm. It is said that an apple fell from a tree and landed on Isaac's head, causing him to ponder the reason that the apple fell to the ground rather than floating upwards. He then, supposedly, concluded that the same force that pulled the apple to the ground was also keeping the Moon in orbit around the Earth and the greater the mass of an object, the greater the gravitational pull. While researching gravity and motion, Isaac also made some important contributions to the field of mathematics.

Only four years after graduating, Isaac was appointed as a professor at the University of Cambridge. In 1687, Isaac published his famous work, commonly known as the 'Principia' in which he details his laws of motion. Isaac devised three laws to explain how objects move when forces act upon them:

First Law

The first law of motion states that something that is still will stay still unless a force is applied to it. For example, a football on the ground will not move unless it is kicked.



Second Law

The second law of motion states that if you apply more force to an object, it is accelerated at a higher rate. Similarly, if an object has a greater mass, more force will be needed to accelerate it. For example, a shopping trolley with a smaller mass will require less force to accelerate than a shopping trolley with a greater mass.



Third Law



The third law of motion explains that forces work in pairs: for each force applied, another force will act in the opposite direction. For example, when rowing a boat, we move the water backwards with the paddle and the water reacts with equal force, pushing the boat in the opposite direction.

Later Years

In 1703, Isaac was elected as the President of the Royal Society (a major scientific group) and, in 1705, he was knighted by Queen Anne. Isaac was also elected as a Member of Parliament (MP) and given the post of Warden of the Royal Mint — where he supervised the manufacture of British coins.

Questions

1. Isaac is best known for his work in which areas? Tick **two**.

- ☐ farming
- ☐ science
- ☐ medicine
- ☐ mathematics

2. Number the events from 1-5 to show the order in which they happen in. The first one has been done for you.

- ☐ Isaac began his education at Trinity College, Cambridge.
- ☐ Isaac was elected as President of the Royal Society.
- 1** ☐ Isaac was born in Woolsthorpe, Lincolnshire.
- ☐ Isaac published his book, 'Principia'.
- ☐ Isaac was sent to boarding school.

3. Look at the section called **Education**.

Find and copy one word which means the same as 'at first'.

4. Which **two** ancient Greek thinkers did Isaac study at Trinity College?

- _____
- _____

5. Fill in the missing words.

People involved in the Scientific _____ were concerned
with _____ scientific methods to understand how nature works.

6. Explain how you think that Isaac would have felt about having to move back to rural Lincolnshire during the plague outbreak in Cambridge.

7. Predict how you think people of the time would have responded to the publication of Isaac's 'Principia'.

8. **...when rowing a boat, we move the water backwards with the paddle and the water reacts with equal force, pushing the boat in the opposite direction.**

Provide another example of the third law of motion.

9. **Isaac wrote, 'Plato is my friend, Aristotle is my friend, but my best friend is truth.'**

Explain what you think is meant by this quote.

10. Summarise Isaac's achievements in 25 words or fewer.

Answers

1. Isaac is best known for his work in which areas? Tick **two**.

- ☐ farming
- ☒ **science**
- ☐ medicine
- ☒ **mathematics**

2. Number the events from 1-5 to show the order in which they happen in. The first one has been done for you.

3 Isaac began his education at Trinity College, Cambridge.

5 Isaac was elected as President of the Royal Society.

1 Isaac was born in Woolsthorpe, Lincolnshire.

4 Isaac published his book, 'Principia'.

2 Isaac was sent to boarding school.

3. Look at the section called **Education**.

Find and copy one word which means the same as 'at first'.

initially

4. Which **two** ancient Greek thinkers did Isaac study at Trinity College?

Aristotle

Plato

5. Fill in the missing words.

People involved in the Scientific **Revolution** were concerned with **experimental** scientific methods to understand how nature works.

6. Explain how you think that Isaac would have felt about having to move back to rural Lincolnshire during the plague outbreak in Cambridge.

Pupils' own responses, such as: Isaac may have felt frustrated that he had to move back to rural Lincolnshire because he had not enjoyed the rural role that he had experienced earlier in his life and he may have missed life in Cambridge. However, he may also have felt safe in the countryside knowing that he was away from the plague outbreak.

7. Predict how you think people of the time would have responded to the publication of Isaac's 'Principia'.

Pupils' own responses, such as: People at the time may have been impressed with Isaac's ground-breaking ideas and inspired by his discoveries. However, some people may have been shocked by how different his ideas were from those of the traditional Greek thinkers.

8. ...when rowing a boat, we move the water backwards with the paddle and the water reacts with equal force, pushing the boat in the opposite direction.

Provide another example of the third law of motion.

Pupils' own responses, such as: Another example of the third law of motion could be when you let go of a balloon: the air pushes down and the balloon reacts by moving upwards.

9. Isaac wrote, 'Plato is my friend, Aristotle is my friend, but my best friend is truth.'

Explain what you think Isaac meant by this.

Pupils' own responses, such as: Isaac could have meant that he respected the work of Aristotle and Plato but he also believed that it was important to keep searching for the truth. He was not afraid to look for new answers to problems that may not agree with the beliefs of these ancient thinkers.

10. Summarise Isaac's achievements in 25 words or fewer.

Pupils' own responses, such as: Isaac was a highly influential scientist and mathematician. He made ground-breaking discoveries into gravity, motion and light which are still relevant to this day.