This year, our autumn term is divided into two exciting and thought-provoking topics. During Autumn 1, we will study Maafa, focusing on Black history and the development and lasting impact of the transatlantic slave trade. The children will explore the experiences of enslaved African people, the motives behind European exploration and colonisation, and the resistance, resilience and achievements of Black individuals and communities.

During Autumn 2, we will study Space, investigating the history of space exploration and the important scientific discoveries and technological developments that have expanded our understanding of the universe. The children will learn about significant missions, events and individuals who have contributed to humanity's exploration of space.

This knowledge organiser contains the essential vocabulary, key facts, people, places and dates that the children will encounter across both topics.

MAAFA

How can we promote dignity, equality and justice in our everyday lives?

Uniform

It is important that all Year 5 and 6 pupils attend school in the correct uniform and PE kit. Please refer to our uniform policy on the school website for full details, or speak to your child's class teacher if you have any questions or queries.

Homework

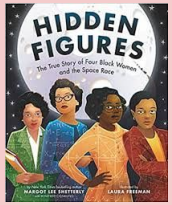
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Communication

ClassDojo continues to be our primary platform for communication. Please use ClassDojo as the first point of contact for any questions, concerns, or comments. Dismissal time is not an appropriate time to address concerns, as our focus must remain on student safety and supervision. Messages sent through ClassDojo will be reviewed and responded to as promptly as possible. Thank you for your understanding and support.

English

Text	Outcome
Hidden Figures	To create a narrative that focuses on description of character and settings.
Coming to England	To create a biography of the key figure Floella Benjamin.







This autumn term, our English and Guided Reading curriculum will focus on three exciting and thought-provoking texts: *Hidden Figures: The True Story of Four Black Women and the Space Race* by Margot Lee Shetterly, *Coming to England* by Floella Benjamin and *Freedom 1783* by Catherine Johnson.

- *Hidden Figures* is an illustrated non-fiction book that tells the inspiring true story of four Black women whose mathematical skills played a vital role in NASA's space missions. Through engaging illustrations and historical detail, the children will explore themes of determination, equality and perseverance while developing their understanding of biography and historical writing.
- *Coming to England* is Floella Benjamin's autobiographical account of her childhood journey from Trinidad to England. Through her experiences, the children will consider themes of belonging, family, migration and resilience while learning about the challenges faced by the Windrush generation.

In guided reading,

- *Freedom 1783* is a powerful historical novel about Nathaniel, an enslaved boy who dreams of freedom. Set during the final years of the transatlantic slave trade, the story will help the children explore themes of injustice, courage, identity and hope while developing their inference, prediction and comparison skills.

We are excited for the children to engage with these important texts and explore a rich range of true stories, historical experiences and inspiring individuals. These books will challenge their thinking, broaden their understanding of the world and strengthen their reading and writing skills.

Maths





This term, we are placing a strong emphasis on key foundational maths skills, including practising times tables, learning to tell the time on an analogue clock, and ensuring accurate number formation. Mastery of times tables supports mental arithmetic and confidence in solving a wide range of problems, while being able to read an analogue clock helps children develop their understanding of time and daily routines. Accurate number formation is essential for clear communication in written maths work and helps prevent errors as calculations become more complex. Regular practice at home, even for short periods, can make a significant difference in your child's progress and confidence in these essential skills.



RE



This autumn term, our Religious Education learning will focus on the first two branches of the Archdiocese of Birmingham's *Discerning Disciples* curriculum: *Creation and Covenant* and *Prophecy and Promise*.

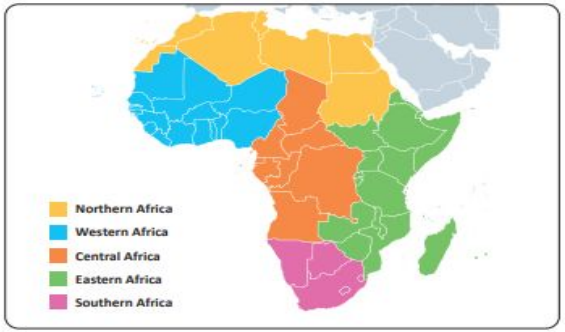
- *Creation and Covenant* explores how God revealed himself to Moses through the burning bush and called him to lead the Israelites. The children will learn about the covenant established at Mount Sinai and consider how the Ten Commandments guided the Israelites in their relationship with God and one another. They will reflect on how God's commandments continue to guide Christians in making loving, fair and responsible choices today.
- *Prophecy and Promise* focuses on the prophets who shared God's message and prepared people for the coming of the Messiah. The children will explore the promises found in Scripture and learn how these were fulfilled through Jesus. As they journey through Advent, they will reflect on Mary's faith and courage, the significance of the birth of Jesus and how Christians prepare to celebrate Christmas.

Through Scripture, discussion, prayer and written activities, the children will deepen their understanding of God's promises and consider how they are called to respond with faith, hope and love.

Maafa

Africa

Africa is the world's second largest continent, and is made up of 54 different countries. Today, more than one billion people live in Africa, including over 3000 different indigenous groups. As well as a diverse range of people, languages and cultures, the continent has a vast range of landscapes and habitats. Sprawling metropolises, rural villages and shanty towns can all be found here, along with grasslands, deserts, swamps and rainforests, which together support thousands of plant and animal species.



Ancient kingdoms

Humans have lived in Africa for millions of years. Great civilisations developed in every part of Africa, including the Kingdom of Benin. The Kingdom of Benin gained wealth and power by trading natural resources, such as gold and ivory, with other African civilisations and European traders. The guild of brass casters created impressive bronze plaques for the *oba*, or king, called the 'Benin Bronzes', which can be seen in museums around the world today.



Bronze plaque

Beginning of the European slave trade

Portugal's involvement

From 1441 onwards, enslaved African people were transported to Portugal and were bought, sold and treated like cattle. This form of enslavement became known as chattel slavery. African tribes sold enslaved people from central Africa to Europe in exchange for luxury goods and guns.

Spain's involvement

In 1492, Christopher Columbus discovered Hispaniola, a Caribbean island, which he claimed for Spain. On a later voyage, he took sugar cane to the Caribbean to create sugar plantations. The indigenous people of Hispaniola suffered greatly when they were enslaved to work on the sugar plantations. A Spanish priest believed that African people would be more suited to work on the plantations, because of their darker skin. African people were then targeted for enslavement.

Britain's role in the Maafa

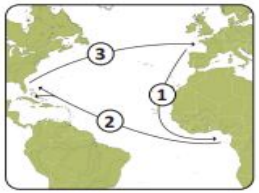
Britain first began transporting enslaved African people in 1562, when Elizabeth I gave John Hawkins, an English naval commander, the permission to do so. By 1650, Britain had seized several West Indies islands from Spain, and was transporting several thousand enslaved African people across the Atlantic Ocean each year. By the early 1800s, this number had increased to 120,000 each year. In total, Britain transported more enslaved African people than any other European country.



John Hawkins

Triangular slave trade

The triangular slave trade was a very profitable system of enslavement, developed to provide labour for plantations in the Americas. It involved three journeys:



① The first journey
Goods, including metal and guns, were transported to the west coast of Africa.

② The second journey
Enslaved African people were transported to the Caribbean and the Americas. This journey was also known as the middle passage.

③ The third journey
Goods produced on the plantations were transported back to Europe.

Life for enslaved African people

African people were forcibly taken from their villages and marched to coastal trading forts on the west coast of Africa. They were locked up in cells before being transported to the Americas. Conditions on board the ships were appalling, and many people died from sickness or disease. Once they arrived in the Americas, they were sold at auction and transported to work on plantations or as domestic servants. Enslaved workers who tried to escape or rebel were severely punished, but acts of resistance were common, as they despised the situation that they had been forced into.

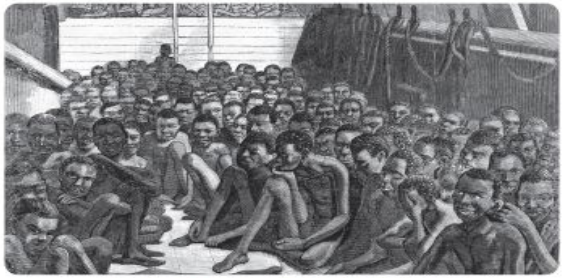


Illustration of the slave deck on the ship, *Wildfire*, 1860

Abolition of slavery

Many people, including plantation owners and traders, profited greatly from the slave trade and were keen for it to continue. British cities, banks and businesses also developed as a result of the money made from the slave trade. However, over time, people came to believe that slavery was wrong. A range of factors, such as enslaved people rebelling against plantation owners in the First Maroon War and the work of abolitionists, eventually led to the end of the slave trade in Britain in 1807. The Slavery Abolition Act was passed in 1833, which made slavery illegal. However, the lives of most emancipated slaves did not improve for many years.

African nations after slavery

After the Berlin West Africa Conference of 1884–1885, was held between 14 European countries, Africa was divided into 50 European colonies. Many European people became extremely wealthy by exploiting Africa and its wealth of natural resources, and the division of Africa marked another struggle that African people faced for their freedom from European control.

Black people in Britain in the 20th century



During the 20th century, Britain recruited thousands of soldiers and workers from the West Indies to help Britain fight in both World Wars and to rebuild the economy afterwards. However, mass arrivals of black people between the 1950s and 1970s caused a rise in racial tensions and prejudice, and black people were treated badly. The Race Relations Act was passed in 1965, to combat prejudices that black and ethnic minority communities faced. It has since been replaced with the Equality Act 2010. This act covers racial discrimination, but also other kinds of intolerance, such as discrimination against gender, disability, sexual orientation or religion.

Great black Britons



Claudia Jones

Many black Britons have achieved amazing things, instigating change and empowering others, while overcoming racial and social barriers in the process.

John Blanke was one of the earliest recorded black people in England after the Roman period, and was a trumpeter in the Tudor court in the 1500s.

Ignatius Sancho was an abolitionist and one of the first black writers to have a wide British readership in the 1700s.

Olaudah Equiano was an abolitionist who wrote a bestselling autobiography in the 1700s.

William Cuffay was a leading figure in the fight for the rights for the working class during the 1800s.

Mary Seacole was a nurse in the 1800s who set up the 'British Hotel' in the Crimea, where she cared for soldiers injured in the Crimean War.

Claudia Jones was a political activist in the 1900s, who is described as the 'mother of the Notting Hill Carnival'.

Olive Morris was a community leader and key organiser of the Black Women's movement in the mid 1900s.

Lenford Kwesi Garrison was an educationalist and activist, who set up the Black Cultural Archives to track the history of black British identity.

Maafa timeline

1441	Portugal starts transporting enslaved African people.
1492	Christopher Columbus discovers Hispaniola.
1562	Britain begins transporting enslaved African people across the Atlantic Ocean.
1728	The First Maroon War begins in Jamaica, where escaped enslaved workers fight British troops for the right to live independently.
c1800	Approximately 120,000 enslaved people are transported, by British ships, to the Caribbean and Americas every year.
1807	The Abolition of the Slave Trade Act is passed.
1831–1832	The largest rebellion of enslaved people takes place in the British Caribbean.
1833	The Slavery Abolition Act is passed.
1884–1885	Africa is divided into 50 European colonies.
1948–1973	Around 500,000 people are invited to Britain from the Caribbean to fill job positions after the Second World War. The first people arrived on a ship called HMT *Empire Windrush*. All of the people arriving in this way become known as the 'Windrush generation'.
1965	The Race Relations Act is passed.
2010	The Equality Act is passed.

Glossary

abolitionist	A person who fights to ban something, such as slavery.
auction	A public sale, where goods are sold to the person who bids the most money.
chattel slavery	A form of enslavement, where people are kept as another person's property and are treated very badly.
colonisation	The act of sending people to live in, govern and control another country and its indigenous people, forming a colony.
emancipation	To be set free from legal, social or political restrictions, such as slavery.
enslavement	To have one's freedom taken away and to be forced to work for no money.
indigenous	To naturally exist in a country or area, rather than arriving from somewhere else.
maafa	A Swahili word meaning 'great catastrophe'. The name Maafa is used to describe the African Holocaust and the history and effects of the transatlantic slave trade.
plantation	A large estate where crops, such as sugar cane or tobacco, are grown.
trading forts	A place designed for the storage, buying and selling of goods.
West Indies	A group of islands surrounded by the North Atlantic Ocean and the Caribbean Sea. More commonly known as the Caribbean.

Forces and Mechanisms

Forces

A force is a push or a pull that makes something move, change speed or change shape. Forces act in pairs that oppose each other. A force can be either a contact force or a non-contact force.



Contact forces

A contact force is a force that acts between two objects that touch. Contact forces include:

friction	A force between two surfaces as they move across each other that always slows an object down.
air resistance	A frictional force that acts to slow an object's movement when it moves through air.
water resistance	A frictional force that acts to slow an object's movement when it moves through water.

Non-contact forces

A non-contact force acts between two objects that do not touch. Non-contact forces include:

magnetism	The attraction and repulsion between two magnets or between a magnet and magnetic materials.
gravitational force	A pulling force between objects that have mass.

Gravitational force or gravity

All objects have gravity because all objects have mass. Usually, the gravitational force between two objects is very weak because the objects are small. Gravitational force becomes larger as an object's mass increases. Gravity gives an object weight.

Earth's gravity pulls objects towards its centre. Earth's gravitational force is strong because Earth has a large mass. Gravity keeps objects on the surface of the Earth and pulls all unsupported objects to the ground.



The force of gravity is weaker on the Moon than on the Earth because the Moon has less mass. Gravity on the Moon is about one-sixth of that on Earth.



The Sun has a strong gravitational force because its mass is so large. This force keeps the planets in our solar system travelling in a curved path, called an orbit, around the Sun.



Mass and weight

Many people commonly mix up and misuse the words mass and weight, even though they have different meanings and units of measurement.

Mass is the amount of matter that an object or substance contains. It can never be zero and is the same wherever it is, even in space.

Mass is measured in grams (g) or kilograms (kg) using a scale or the kg scale on a force meter.



Weight is a measure of gravitational force. The weight of an object can vary depending on where it is. For example, gravitational force on the Moon is less than that on Earth, so an object weighs less on the Moon.

Weight is measured in newtons (N) using a force meter.



Frictional forces

Friction is in all places where two surfaces meet. It acts in the opposite direction to movement and always slows an object down. The amount of friction depends on the materials from which the surfaces are made. Friction can be increased by adding tread patterns to tyres and the soles of shoes. Friction can be decreased by smoothing surfaces or using a lubricant, such as oil.



Air resistance

Air resistance is a type of friction that always acts against the direction of movement. It is caused by air particles hitting an object and slowing it down. Objects with a large surface area will hit more particles, and therefore have more air resistance, than objects with a smaller surface area.

Increasing air resistance

Some objects are designed to increase air resistance. Parachute canopies have a large surface area, which increases air resistance and slows down the parachutist's descent.



Decreasing air resistance

Some objects are designed to decrease air resistance. This fighter jet has a small surface area and a streamlined shape which decreases air resistance and allows the plane to move quickly through the air.



Water resistance

Water resistance is another type of friction that always acts against the direction of movement. It is caused by water particles hitting an object and slowing it down. Objects with a large surface area will hit more particles, and therefore have more water resistance, than objects with a smaller surface area.

Increasing water resistance

Scuba flippers have a large surface area to increase water resistance as the diver pushes against the water to move forward.



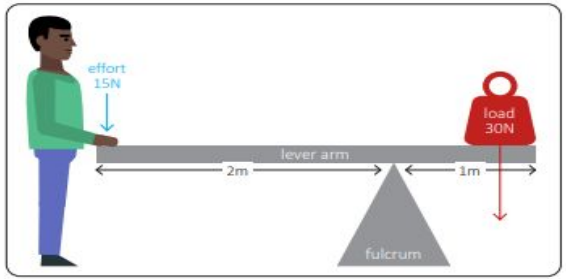
Decreasing water resistance

The front of a submarine has a small surface area and is streamlined to reduce water resistance.



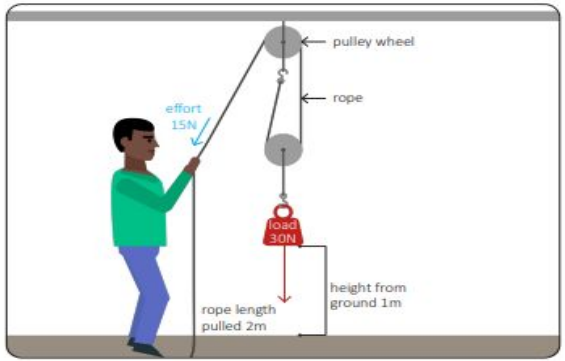
Levers

Levers are simple machines that can be used to provide a mechanical advantage, so a smaller force can have a greater effect. They consist of a lever arm, a fulcrum, a load to lift and an effort force. Levers make it easier to lift a load. For example if the distance between the fulcrum and the effort is double the distance between the fulcrum and the load, the effort needed will be halved.



Pulleys

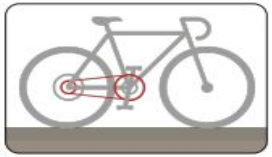
Pulleys are simple machines that can be used to provide a mechanical advantage. They consist of one or more grooved wheels and a rope. Pulleys make it easier to lift a load. For example, when two wheels are used in a pulley, the force needed to lift the load halves. At the same time, the length of rope needed to lift the load 1m off the ground doubles to 2m.



Gears

Gears are wheels with teeth around their edge. They can be connected directly together, so their teeth mesh and they turn in opposite directions. They can also be connected by a chain to turn in the same direction. Gears of different sizes with different numbers of teeth can can create a mechanical advantage. For example, in a mechanism made with a large gear with 12 teeth and a small gear with 6 teeth, the small gear will rotate twice as fast as the large gear but with half the amount of force. Bicycles have different gears. Choosing the right combination of gears can provide a mechanical advantage for the cyclist.

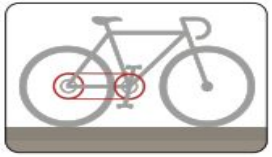
A cyclist can go faster on the flat by using a large gear to pedal slowly attached to a smaller gear at the back, which turns the back wheel quickly.



A cyclist can ride up a hill by using a small gear that is easier to pedal attached to a larger gear, which turns the back wheel slowly but with more force.



Using gears of the same size with the same number of teeth does not give a mechanical advantage because both gears turn with the same force and at the same speed.



Glossary

mechanical advantage	A measurement of how much a machine multiplies a force, so a smaller force can have a greater effect.
particle	A single piece of matter that is too small to be seen.
streamline	Having a shape that can move quickly and effectively through a liquid or a gas.

Trailblazers, Barrier Breakers

Many black artists have used their art to express their thoughts, experiences and emotions. The artworks shown, cover the period from 1867, when the civil rights movement in the USA had just formed to combat racial discrimination, up to the present day. These pioneering black artists have led the way for others to share their experiences through art.

Edmonia Lewis

(c1844–1907)

Edmonia Lewis was born in New York, USA and was the first black woman to be recognised as an accomplished sculptor. The abolitionist movement greatly influenced her art.

Forever Free (1867) by Edmonia Lewis shows two people who had been enslaved but are now free. The sculpture sends a message of triumph over adversity and of hope for the future for African American people.



Forever Free

Henry Ossawa Tanner

(1859–1937)

Henry Ossawa Tanner, born in Pittsburgh, USA, was the first African American painter to achieve international fame and recognition in the Fine Arts world. The lives of African American people influenced his work.

The Banjo Lesson (1893) by Henry Ossawa Tanner shows an elderly man teaching a young child the banjo, symbolising the resilience, intellect and caring nature of the once enslaved African American people.



The Banjo Lesson

Augusta Savage

(1892–1962)

Augusta Savage was born in Florida, USA. She was the first African American woman to open an art gallery to showcase work by black artists. She aimed to promote black arts and community in her work.

The Harp (1939) by Augusta Savage shows the strings of a harp replaced with 12 singing African American youths, symbolising the powerful musical contribution that African American people have made throughout history.



The Harp

Gordon Parks

(1912–2006)

Gordon Parks, born in Kansas, USA, became a self-taught photographer. He suffered racial abuse as a child, and so used photography to document poverty and racial segregation experienced by black people.

The Fontenelles at the Poverty Board (1967) by Gordon Parks shows a poor, black family in New York, symbolising the hardship many endured in the USA.



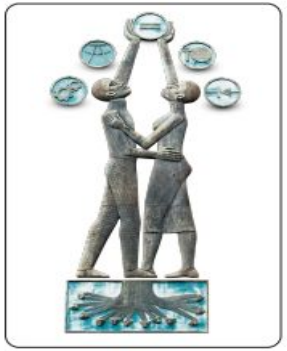
The Fontenelles at the Poverty Board

Elizabeth Catlett

(1915–2012)

Elizabeth Catlett was born in Washington, USA. She was an activist whose art was influenced by Mexican artist's murals whose work presented public messages.

Students Aspire (1977) by Elizabeth Catlett is a relief showing two African American students. It acts as a call for cooperation and racial and gender equality.



Students Aspire

Yinka Shonibare

(1962–present)

Yinka Shonibare was born in London but grew up in Nigeria. He explores the relationship between Africa and Europe, their connected history and culture, through his art.

Nelson's Ship in a Bottle (2010) by Yinka Shonibare was the first commission for Trafalgar Square by a black artist. It symbolises and celebrates the story of multiculturalism in London.



Nelson's Ship in a Bottle

Barbara Walker

(1964–present)

Barbara Walker was born in Birmingham, England. Issues of race and gender influence her work.

Vanishing Point 7 (2018) by Barbara Walker explores how the art of black people has been underrepresented in public collections of artworks through history.



Vanishing Point 7

Hurvin Anderson

(1965–present)

Hurvin Anderson was born in Birmingham, England, to Jamaican parents. The lives of Afro-Caribbean migrants living in England influence his art.

Peter's Sitters 3 (2009) by Hurvin Anderson connects his Caribbean heritage with life in England. Colour symbolises his Caribbean heritage, while the barbershop symbolises an important aspect of life in England to Afro-Caribbean immigrants.



Peter's Sitters 3

Turgo Bastien

(1968–present)

Turgo Bastien was born in Haiti in the Caribbean. He uses art to represent black and Haitian culture and teach people about the world around them.

Another Call from Africa (2009) by Turgo Bastien uses bright colours and African masks to celebrate African culture. Masks play an important spiritual and religious role in African societies and are therefore a significant feature within Turgo Bastien's work.



Another Call from Africa

Chris Ofili

(1968–present)

Chris Ofili was born in Manchester, England. He now lives on the island of Trinidad in the Caribbean. His art documents and celebrates the experiences of black people, including challenging racism.

No Woman, No Cry (1998) by Chris Ofili depicts Doreen Lawrence. Her son, Stephen Lawrence, was killed in a racist attack in London in 1993. Pictures of her son appear in her teardrops in the painting. The painting aimed to highlight the effect of racial discrimination, which still existed at the time of Stephen Lawrence's death.



No Woman, No Cry

Art analysis

Art analysis involves a person, the viewer, looking at a piece of art carefully and critically. A person does this by exploring aspects of the artwork, including, colour, tonal range, light sources and shadows, setting and the arrangement and dominance of objects and people. For example, if the viewer analyses tonal range, they might identify the range of dark tones, mid-tones and highlights that have been used in the artwork and why they think the artist used these tones.

The purpose of art analysis is to allow viewers to explore the different aspects of an artist's work to help them to understand why the artist created the piece and what it means.

Glossary

analysis	The act of studying something in detail.
civil rights	The rights that every person has in a society, whatever their race, sex or religion.
heritage	The features, such as traditions, beliefs and languages that belong to a society's culture from the past, which has historical importance today.
immigrant	A person who has come to live permanently in a different country.
multiculturalism	The belief that different cultures within a society are all of equal importance.
pioneer	A person who is one of the first people to do something.
racial discrimination	Unfair treatment of someone because of their race.
symbolise	To represent by symbols.
trailblazer	The first person to do something, who then inspires other people to achieve the same or similar.

Space

What responsibility do scientists have to use their knowledge for good?

Uniform

It is important that all Year 5 and 6 pupils attend school in the correct uniform and PE kit. Please refer to our uniform policy on the school website for full details, or speak to your child's class teacher if you have any questions or queries.

Homework

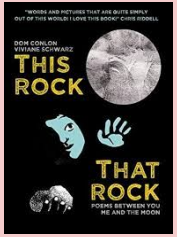
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English

Text	Outcome
This Rock, That Rock	To create a narrative poem with illustration, focusing on emotive language.
The NASA advert	To create a persuasive advert.





This autumn term, our English and Guided Reading curriculum will focus on three engaging space-themed texts and resources: This Rock, That Rock by Dom Conlon, NASA's We Are Going advertisement and The Kid Who Came from Space by Ross Welford.

This Rock, That Rock is an imaginative collection of poems inspired by the Moon and space. The children will explore how poets use imagery, rhythm, repetition, structure and figurative language to capture the wonder of the universe. They will then apply these techniques when creating and performing their own space-themed poetry.
NASA's We Are Going advertisement celebrates space exploration and humanity's return to the Moon. The children will examine how persuasive vocabulary, commands, slogans, rhetorical questions and powerful imagery are used to inform, excite and inspire an audience. They will use these features to plan and produce their own persuasive writing.

In Guided Reading:

The Kid Who Came from Space by Ross Welford will be studied over six weeks. This exciting science-fiction adventure follows Ethan as he searches for his missing twin sister with the help of an unusual new friend. Through the novel, the children will explore themes of family, friendship, courage and determination while developing their retrieval, inference, prediction, summarising and comparison skills.

We are excited for the children to explore poetry, persuasive media and science-fiction writing through these engaging resources. The texts will inspire their imaginations, broaden their vocabulary and strengthen their confidence as readers and writers.

Maths





This term, we are placing a strong emphasis on key foundational maths skills, including practising times tables, learning to tell the time on an analogue clock, and ensuring accurate number formation. Mastery of times tables supports mental arithmetic and confidence in solving a wide range of problems, while being able to read an analogue clock helps children develop their understanding of time and daily routines. Accurate number formation is essential for clear communication in written maths work and helps prevent errors as calculations become more complex. Regular practice at home, even for short periods, can make a significant difference in your child's progress and confidence in these essential skills.



RE



This autumn term, our Religious Education learning will focus on the first two branches of the Archdiocese of Birmingham's *Discerning Disciples* curriculum: *Creation and Covenant* and *Prophecy and Promise*.

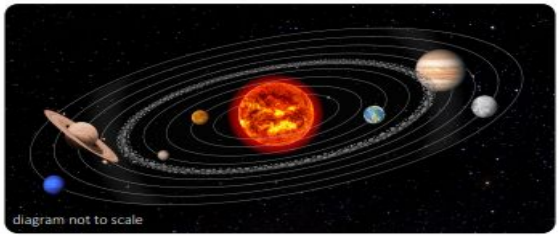
- *Creation and Covenant* explores how God revealed himself to Moses through the burning bush and called him to lead the Israelites. The children will learn about the covenant established at Mount Sinai and consider how the Ten Commandments guided the Israelites in their relationship with God and one another. They will reflect on how God's commandments continue to guide Christians in making loving, fair and responsible choices today.
- *Prophecy and Promise* focuses on the prophets who shared God's message and prepared people for the coming of the Messiah. The children will explore the promises found in Scripture and learn how these were fulfilled through Jesus. As they journey through Advent, they will reflect on Mary's faith and courage, the significance of the birth of Jesus and how Christians prepare to celebrate Christmas.

Through Scripture, discussion, prayer and written activities, the children will deepen their understanding of God's promises and consider how they are called to respond with faith, hope and love.

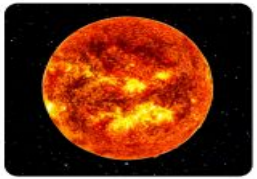
Earth and Space

The Solar System

The Solar System consists of eight planets that orbit around the Sun.



The Sun



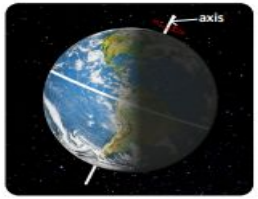
The Sun is a 4.5 billion-year-old star. It is a huge, hot ball of gas that rotates on its axis once every 27 Earth days. The Sun is the only source of light and heat in the Solar System. Without it, life as we know it would not exist on Earth.

The planets

There are eight planets in the Solar System. The planets closer to the Sun (Mercury, Venus, Earth and Mars) are terrestrial planets because they are made of rock. They are hotter and have a shorter orbit and a shorter year than the planets farther away. Planets that are farther from the Sun (Jupiter, Saturn, Uranus and Neptune) are made of gas and are called gas giants. They are colder and have a larger orbit and a longer year than the closer planets.



The Earth



The Earth is the third planet from the Sun in the Solar System and is the only one to support life. The Earth rotates on an axis at a tilt of 23.5°. One rotation takes 24 hours, which is one day. The Earth orbits the Sun once every 365.25 days, which is a year.

Models of the Solar System

Geocentric model

In the past, many philosophers and scientists believed the Solar System was geocentric, meaning that the Earth was at the centre, orbited by the Sun and the other planets. The observations and common sense of Aristotle, the mathematics of Ptolemy and the scientific methods of Alhazen supported this theory. The geocentric model was accepted for 1500 years.



Aristotle,
c384–c322 BC



Claudius Ptolemy,
AD c100–c170



Alhazen,
AD c965–c1040

Heliocentric model

In the 16th century, Nicolaus Copernicus suggested the heliocentric model, with the Sun at the centre of the Solar System and the Earth and other planets orbiting around it. Even though this was an unpopular theory at the time, the observations of Galileo Galilei and the scientific laws of Sir Isaac Newton proved that the heliocentric model was correct.



Nicolaus Copernicus,
1473–1543



Galileo Galilei,
1564–1642



Sir Isaac Newton,
1643–1727

The planets and stars are spheres



Each planet and star is spherical because gravity, created by their large mass, pulls all material towards their centre and compresses it into the most compact shape, a sphere.

Beliefs about the shape of the Earth

Many ancient civilisations believed the Earth was flat and shaped like a floating disc, a cylinder or even a square.

In ancient Greece, around 500 BC, the philosopher, Pythagoras, thought a sphere was the perfect shape, so the Earth must be a sphere.

Aristotle proved the Earth was a sphere when he observed a ship sailing away to sea. He noticed that the bottom of the ship disappeared first and the sail last. If the Earth were flat, the whole ship would have looked gradually smaller as it sailed away.



Modern technology has provided further evidence that the Earth is spherical. For example, the famous *Earthrise* photograph was taken from the spacecraft *Apollo 8* during the crew's first orbit around the Moon.



Earthrise, 1968

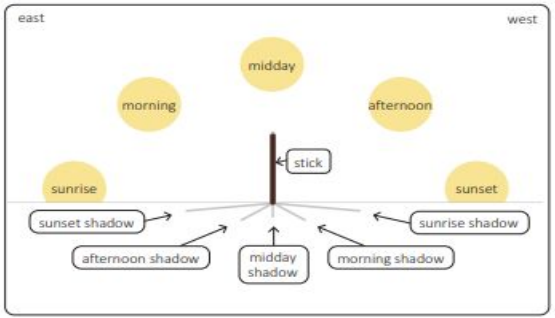
Daytime and night time

As the Earth rotates, it is daytime in the places that face towards the Sun, and night time in the places that face away from the Sun.

During the day, the Sun appears to rise in the east, move across the sky in an arc and set in the west. However, this is due to the Earth rotating and not the Sun moving.

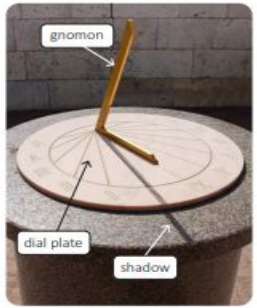
The changing angle of the sunlight during the day changes the direction and length of shadows cast by objects on Earth.





Sundials

Sundials are the earliest form of timekeeping device. They have two parts, a flat **dial plate** marked with Roman numerals or numbers, and a **gnomon** that tilts at the same angle as the Earth's axis and points to true north. Sundials are placed outside and the shadow cast by the gnomon falls on the dial plate and shows the time.

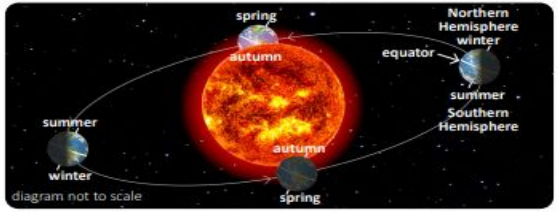


Day length and seasons

The tilt of the Earth on its axis, its daily rotation and its yearly orbit also create different day lengths and seasons.

When the Northern Hemisphere is tilted away from the Sun, it gets little direct sunlight, so daytime is short, night time is long, and the weather is cold. In the Arctic Circle, it never gets light.

At the same time, when the Southern Hemisphere is tilted towards the Sun, it gets a lot of direct sunlight. Daytime is long, night time is short, and the weather is warm. In Antarctica, it is always light. As the Earth continues its orbit, the seasons change throughout the year.



During Earth's orbit, countries in the tropics that are on or near the equator have the same amount of direct sunlight all year round. This means the length of daytime and night time is similar, and they have warm temperatures all year. They only have two seasons: a rainy season and a dry season.

Times around the world

The Earth's rotation on its axis creates different times around the world. For example, if it is 12:30 on Friday in London, United Kingdom, it is 07:30 in New York, United States of America. At the same moment, it is 00:30 on Saturday in Auckland, New Zealand.



The Moon

The Moon is 385,000km away from Earth and has a diameter of 3500km. It orbits the Earth once every 27.3 days, which is around one month. It also rotates on its axis once every 27.3 days, so we only see one side of the Moon from Earth. The Moon is not a natural light source; it reflects the Sun's light.



Phases of the Moon

As the Moon orbits, we see differing amounts of the Moon's lit side from Earth. These are known as the phases of the Moon.



Solar and lunar eclipse

A **solar eclipse** is when the Moon passes directly between the Earth and the Sun, blocking our view of the Sun and casting a shadow on part of the Earth.

A **lunar eclipse** is when the Earth is in line between the Moon and the Sun and casts a shadow on the Moon.

Glossary

axis	An imaginary line that runs through the centre of an object, such as a planet, about which it rotates.
orbit	The stable, circular path of an object revolving around a central mass with gravitational force, such as the planets revolving around the Sun, or the Moon revolving around the Earth.

Investigating Our World

Ordnance Survey maps

Ordnance Survey are Britain's national mapping agency. People use map symbols, six-figure grid references and compass directions to analyse and compare places and features on Ordnance Survey maps.

Map scales

The scale on a map gives the relationship between the size of an object on the map and its size in real life. For example, a scale of 1:25,000 means that 1cm on a map is equal to 25,000cm, or 250m, in real life. So 4cm on the map is equal to 1km. On Ordnance Survey Explorer maps, the scale is 1:25,000, and the grid lines are 4cm apart, making each square 1km² in real life.

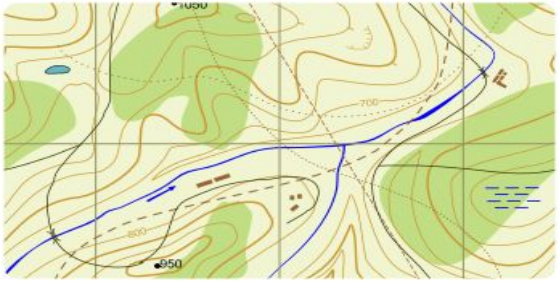


scale bar

Contour lines

Hills, slopes and mountains are represented on a map using contour lines. By studying the contour lines on a map, you can work out the topography of an area.

Contour lines are brown lines on an Ordnance Survey map. They are a two-dimensional representation of the landscape. If contour lines are close together on the map, the land is steep. If they are far apart, the land is flat or gradually sloping. They form a circle at the peak of a hill or mountain.



Comparing human geography

Data, including the population, population density, literacy levels, wealth, life expectancy and religion, is used to compare the human geography of the continents. For example, the continent of Africa has a larger population than Australia. Africa's population is 1340 million. The population of Australia is 43 million.



Lagos, the most populated city in Africa

Capital cities of the world

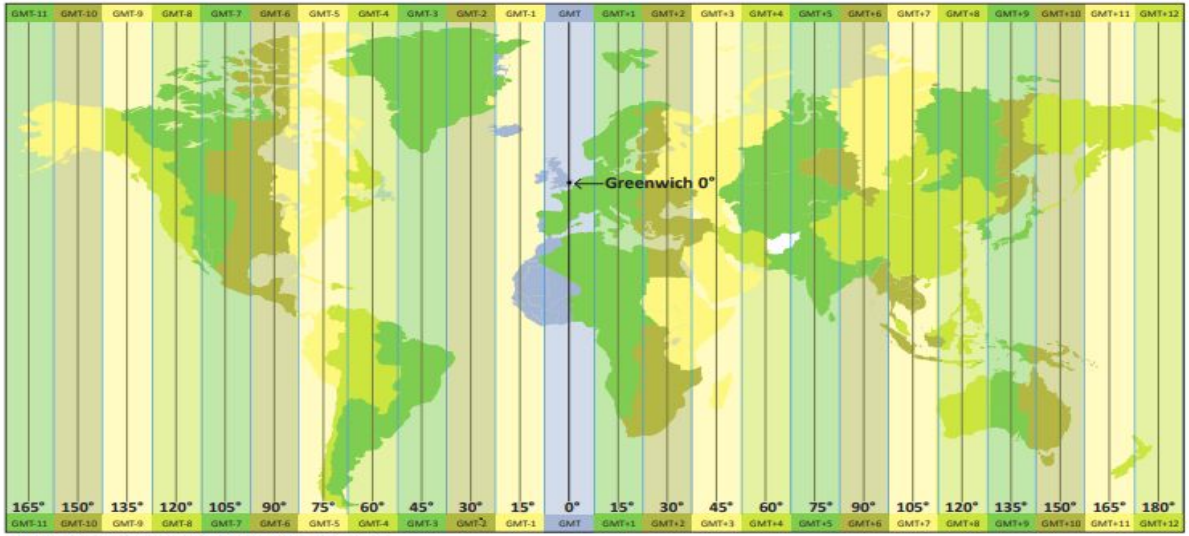
Capital cities are usually the seat of a country's government. They are large settlements with a wide range of human features and transport links and are usually a centre for business and trade. For example, Vienna is the capital city of Austria, on the continent of Europe. It is the country's centre for industry, trade and culture. There is a range of transport links in the city, including a train and underground network, a tram system, and a road system for buses, taxis and cars.



Vienna skyline

Time zones

The time is different in different countries around the world. The world is split into 24 meridians. These are lines of longitude that run from the North Pole to the South Pole. The Prime Meridian is the starting point for all the other meridians. Its position is 0°. It runs through Greenwich, in England. All times around the world are calculated from the Prime Meridian. The time at the Prime, or Greenwich, Meridian is known as Greenwich Mean Time, abbreviated to GMT. If meridians are to the east of Greenwich on a map, hours are added to GMT. If they are to the west of Greenwich, hours are taken away from GMT. Times zones are labelled to show how many hours they are ahead of, or behind, the Prime Meridian, for example GMT+1 or GMT-1.



* this map is simplified and shows approximate time zones

Climate zones

A climate zone is an area of the world with a distinct climate. There are five main climate zones, polar, temperate, Mediterranean, desert and tropical. The polar climate is the world's coldest climate, and the desert climate is the world's hottest. A temperate climate has warm summers and cool, snowy winters. The Mediterranean climate has hot summers and mild, wet winters. The tropical climate has a lot of rain and hot temperatures all year round. On mountains, the climate varies. As the altitude (height above sea level) increases, the temperature decreases and the climate becomes wetter and windier. Many mountain peaks are covered with snow all year round.

Vegetation belts

A vegetation belt is an area where certain species of plants grow because of the climate. Soil and the height of the land are other factors that affect the types of plants that grow in vegetation belts. There are five main vegetation belts, including desert, forest, grassland, ice sheet and tundra.

Biomes

A biome is a large ecosystem that has characteristic features, such as the climate and landscape. Plants and animals live there that are adapted to the environment. There are five main biome types, including aquatic, desert, forest, grassland and tundra.



Motorway transport network

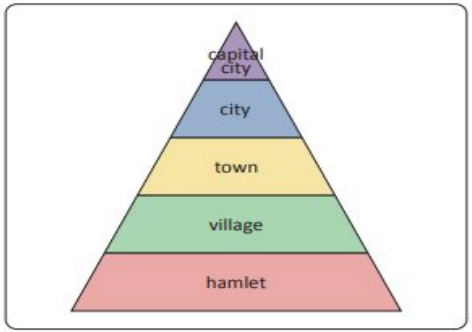
A motorway is a main road with multiple lanes built for fast travel over long distances. In the United Kingdom, they run north to south and east to west across the country. Motorways connect towns, cities and transport links, such as A roads, airports or ferry terminals. Motorways allow people and goods to move quickly around the country.



M1 motorway in Yorkshire

Settlement hierarchy

Settlement hierarchy is a way of grouping and ranking settlements according to their type, significance, number and size. The main types of settlement in the United Kingdom are capital cities, cities, towns, villages and hamlets. The most significant type of settlement is at the top of the diagram, and the least significant is at the bottom. Settlements get bigger, have a larger population and have more facilities, workplaces and transport links as they go up the settlement hierarchy. The number of each type of settlement increases as they go down the settlement hierarchy.



settlement hierarchy diagram

Characteristics of settlements

Capital cities are the largest type of settlement. Millions of people live and work in capital cities. They contain the largest number and the widest range of human features. Cities are large settlements. Millions of people can live and work in cities. Towns are smaller than cities and do not usually have a cathedral. Thousands of people live and work in towns. Villages are small settlements with a church. Usually, a few hundred people live in a village. Hamlets are small settlements without a church. Less than one hundred people live in hamlets. They contain a very small number of houses and normally have no shops, cafés or other facilities.



Glasgow, a city in Scotland



Ossett, a town in England



Beddgelert, a village in Wales



Listooder, a hamlet in Northern Ireland

Glossary

climate	The general weather conditions found in a place over a period of time.
ecosystem	An environment, including the plants and animals that live and interact within that environment.
life expectancy	The number of years that a person is likely to live.
population density	The number of people living in an area.
topography	The physical appearance of an area of land, especially relating to its shape and surface.

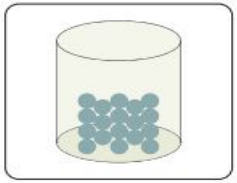
Moving Mechanisms

States of matter

There are three states of matter: solid, liquid and gas. In each state, the particles are arranged differently.

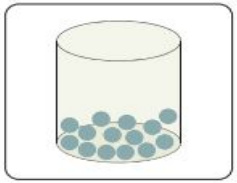
Solid

In a solid, particles are arranged in a regular pattern and packed tightly together. This means that solids keep their shape and cannot be compressed.



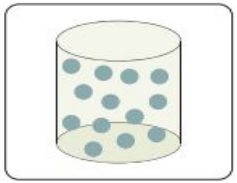
Liquid

In a liquid, the particles are arranged randomly and close together. There are a few gaps between particles, but liquids cannot be compressed.



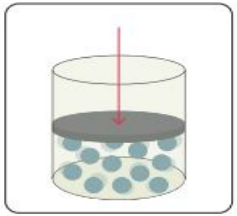
Gas

In a gas, the particles are arranged randomly and are far apart. This means that gases can be compressed.



Air pressure

As particles in the air move in any direction, they bump into each other and the sides of their container. Every time an air particle bumps into the side of a container, it creates air pressure. The more often particles hit the container sides, the higher the air pressure. Air pressure can be increased by squashing, or compressing, air into a smaller space.



Pneumatics

Compressing air increases air pressure and the amount of energy stored in it. This stored energy can be put to practical use to make things move. This is called pneumatics. The energy in the compressed air can be used to do work, such as making a piston move. This car lift uses a piston mechanism.

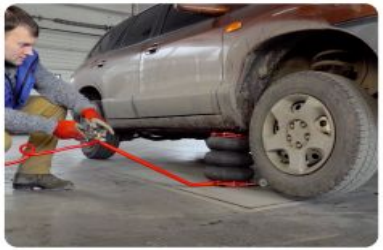


Air is sucked from the atmosphere and squashed in a compressor. The compressed air is stored under high pressure in a reservoir. When the in valve between the reservoir and the actuator is closed, air cannot move out of the reservoir and the piston remains down.



When the in valve is opened, the air under high pressure moves into the actuator and forces the piston to rise, lifting the car up. The air is released through the out valve to lower the piston back down again.

Machines use pneumatics to create the force needed to lift vehicles, force paint out at high speed and break up pavements.







Advantages of pneumatic systems

- light and compact
- low maintenance
- flexible, efficient and safe
- do not create sparks
- leaks are not messy

Glossary

actuator	Part of a machine that moves something.
compress	To press something into a smaller space.
particle	A single piece of matter too small to be seen.