

Year 9



**Newsome
Academy**
Everyone Exceptional Everyday

Knowledge Organisers

Name:

Team:

Mathematics

Our students will:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

The learning outcomes for this topic are:

- Name simple polygons
- Find lines of or rotational symmetry of a shape
- Create shapes with a given symmetry

- Find the exterior angle of a regular polygon
- Find missing angles in a polygon using the formula for the angle sum
- Find the number of sides of a polygon from an exterior angle

Key Word	Definition
Polygon	A 2D shape with straight edges
Interior	The angle inside a polygon between two of its edges
Exterior	The angle between the edge of a polygon and the adjacent, extended edge
Line of symmetry	A mirror line, the line on which a shape will fold and it's edges match up
Rotational symmetry	Where a shape fits into it's own silhouette if rotated, how many times a shape looks the same on a 360 degree turn
Regular	A polygon where all sides and angles are equal


Additional Resources

MathsWatch: [11](#), [123](#)

Corbett Maths: Videos [32](#), [316](#), [317](#); Worksheets [32](#), [316](#), [317](#)

Careers Focus – Where could this take you?

Artists who create **mosaics** use angles in polygons when designing their pieces. Calculating the angles is vital in ensuring that any shapes will tessellate, a great example of this is the Eden project in Cornwall.



Curriculum Links - Coherence

Required Knowledge:

- 7.08 2D shapes
- 7.20 Measuring and drawing angles
- 7.22 Angles in a triangle
- 8.19 Interior and exterior angles
- 9F.06 Basic angle facts

Applied to:

- 9F.08 Angles on parallel lines
- 10F.15 Bearings
- 10F.21 Trigonometry

Links across school:

- Geometric patterns (Art)

Key Concepts

Sum of Interior Angles = $(n - 2) \times 180$


'n' is the number of sides the polygon has

E.g. What is the sum of the interior angles of 7 sided shape?

$n = 7$

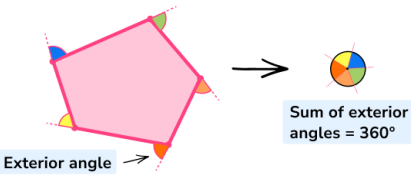
Sum of Interior Angles = $(7 - 2) \times 180^\circ$

= 900°



Exterior angles are angles between a polygon and the extended line from the vertex of the polygon.

Sum of Exterior Angles of a Polygon = 360°

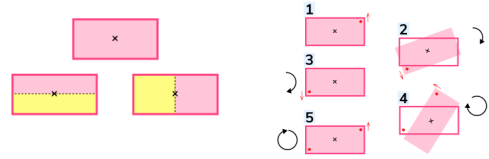


Sum of exterior angles = 360°

Symmetry

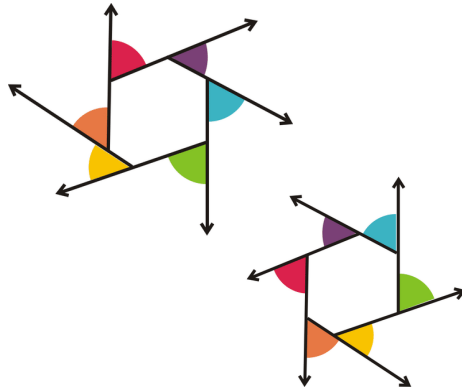
Symmetry is when a line is drawn through a shape to make one side of the line a reflection of the other. It is a property of a 2D polygon or 3D polyhedron.

There are **two different types of symmetry** that you need to be aware of: **lines of symmetry** and **rotational symmetry**. E.g. A rectangle has two lines of symmetry



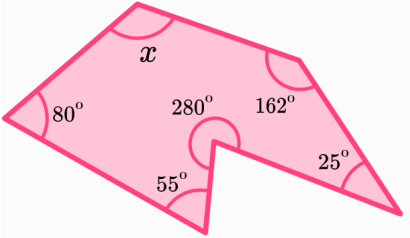
And has order 2 rotational symmetry.

Concept – what it is



Exterior angles should make the interior angle up to 180, it's not the whole angle on the outside of the shape.

Standard Examples



Find the size of the angle marked x.

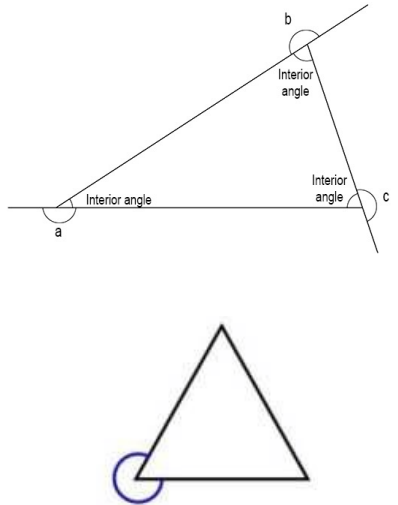
Total angles = $180 \times (6 - 2) = 720$

$80 + 55 + 280 + 25 + 162 = 602$


$720 - 602 = 118$

$x = 118^\circ$

Non-Concept – what it isn't



Non-Standard Examples



Polygon A has **9** sides and an exterior angle of x .

Polygon B has an interior angle of $3x$.

How many sides does polygon B have?

Polygon A: $\frac{360}{9} = 40$

$x = 40$ so $3x = 120$

$180 - 120 = 60$

$\frac{360}{60} = 6$ sides

- Name simple polygons
- Find lines of or rotational symmetry of a shape
- Create shapes with a given symmetry
- Find the exterior angle of a regular polygon
- Find missing angles in a polygon using the formula for the angle sum
- Find the number of sides of a polygon from an exterior angle



Useful Formulae and Hints

All shapes have a rotational symmetry of at least 1. It is not possible to have rotational symmetry order 0.

Sum of the exterior angles = 360 degrees

So

$$\text{Exterior angle} = \frac{360}{\text{number of sides}}$$

and

$$\text{Number of sides} = \frac{360}{\text{exterior angle}}$$

Sum of the interior angles = 180 x (number of sides - 2)

One interior angle = 180 x (number of sides - 2) ÷ number of sides

Exterior + interior angle = 180 degrees

GCSE Questions

19 (a) Work out the size of the exterior angle of a regular 12-sided polygon.

(a)° [2]

(b) Use your answer to part (a) to write down the size of the interior angle of a regular 12-sided polygon.

(b)° [1]

18 The diagram shows a square, a regular hexagon and part of another regular polygon meeting at point P.

Not to scale

(a) Show that the size of one interior angle of a regular hexagon is 120°. [2]

(b) Find the number of sides of the other regular polygon.

(b) [4]

2 (a) Write down the number of lines of symmetry of this hexagon.

(a) [1]

(b) Write down the order of rotation symmetry of this shape.

(b) [1]

(c) A triangle has just one line of symmetry. Write down the mathematical name of this type of triangle.

(c) [1]

(d) Sara says
All parallelograms have 2 lines of symmetry and rotation symmetry of order 2.
Explain why Sara is not correct.

.....

..... [1]

- Identify alternate or corresponding angles
- Find one-step alternate angle solutions
- Find one-step corresponding angle solutions
- Find one-step allied angle solutions
- Find missing angles using a combination of parallel line rules
- Find missing angles using parallel line rules and isosceles triangles

Key Word	Definition
Parallel	Two lines that never meet, even if extended indefinitely
Intersect	Two lines that cross over one another
Perpendicular	Two lines that intersect at a right angle
Alternate	Two angles that are equal, they lie on the interior alternate sides of a line that intersects two parallel lines
Corresponding	Two angles that are equal, they lie on the corresponding sides of a line that intersects two parallel lines (either both above or both below)
Allied	Two angles that sum to 180 degrees, they lie on the interior same side of an intersecting line and two parallel lines

Additional Resources

MathsWatch: [120](#)

Corbett Maths: Videos [25](#) ; Worksheets [25](#)

Careers Focus – Where could this take you?

A Mechanical Engineer will apply angles in parallel lines to different elements of an engine or machine to ensure all the parts move correctly. Even small inaccuracies in the angles could prevent the mechanical devises from working.

Curriculum Links - Coherence

Required Knowledge:

- 7.20 Measuring and drawing angles
- 7.22 Angles in a triangle
- 7.23 Angles on parallel lines
- 9F.06 Basic angle facts
- 9F.07 Angles in polygons

Applied to:

- 10F.15 Bearings

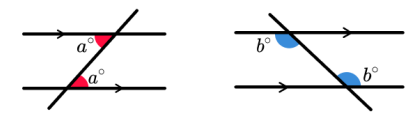
Links across school:

- Geometric patterns (Art)

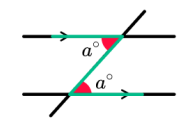
Key Concepts

Alternate Angles

Alternate angles are angles that occur on opposite sides of the transversal line and are the same size.

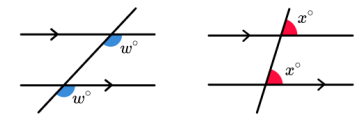


We can often spot interior alternate angles by drawing a Z shape.

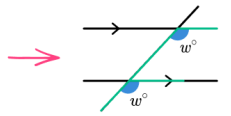


Corresponding Angles

Corresponding angles occur when a transversal line crosses two parallel lines. The pairs of angles formed on the same side of the transversal that are the same size.

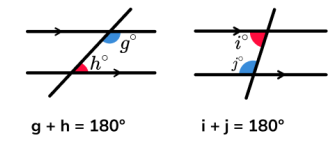


We can often spot corresponding angles by drawing an F shape.

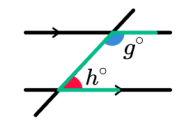


Co-Interior Angles

Co-interior angles occur in between two parallel lines when they are intersected by a transversal. The two angles that occur on the same side of the transversal always add up to 180°.



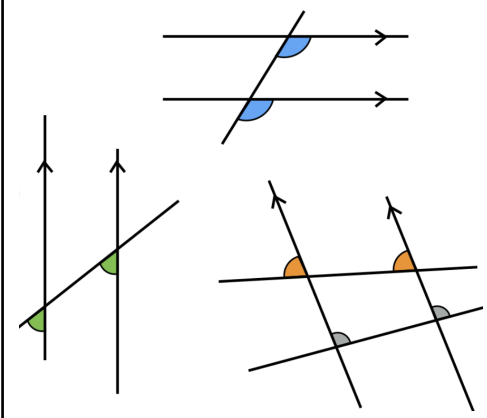
We can often spot co-interior angles by drawing a C shape.



Concept – what it is

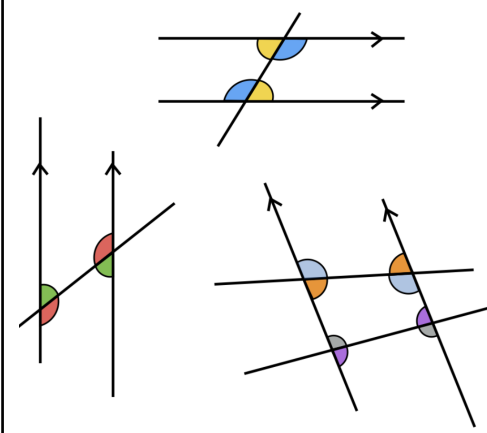
Corresponding angles

Pairs shown in the same colour



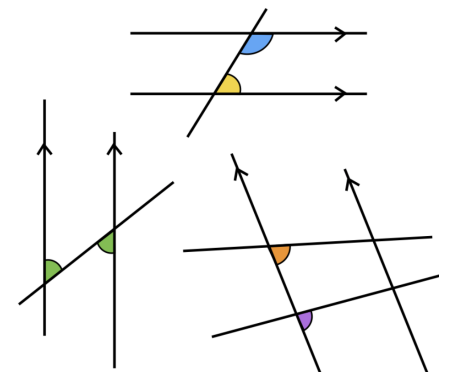
Alternate angles

Pairs shown in the same colour

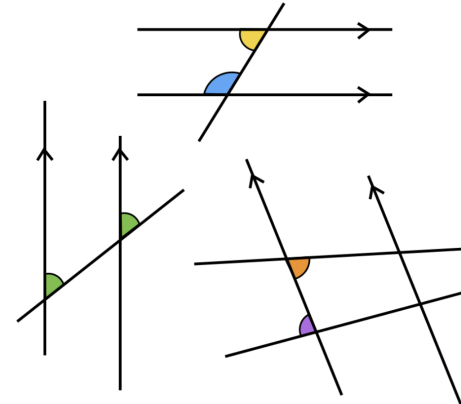


Non-Concept – what it isn't

Not corresponding angles



Not alternate angles

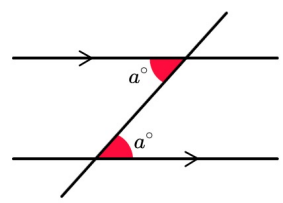


- Identify alternate or corresponding angles
- Find one-step alternate angle solutions
- Find one-step corresponding angle solutions
- Find one-step allied angle solutions
- Find missing angles using a combination of parallel line rules
- Find missing angles using parallel line rules and isosceles triangles

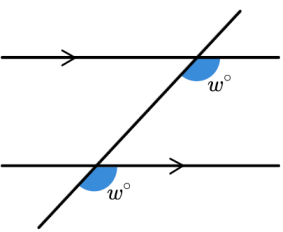


Useful Formulae and Hints

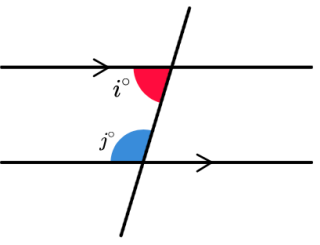
Alternate angles are equal



Corresponding angles are equal

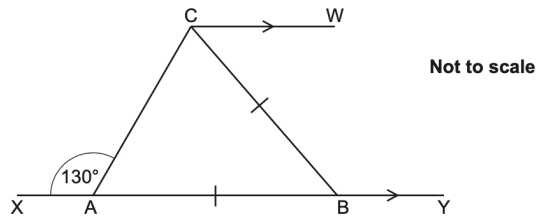


Allied angles add to 180 degrees



GCSE Questions

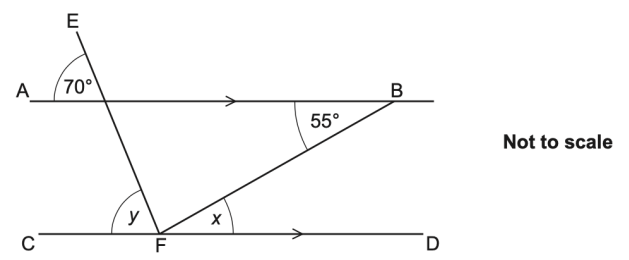
(b) XY and CW are parallel lines.
AB = CB.
Angle CAX = 130°.



(i) Complete this sentence.
Angle CAB = 50° because [1]

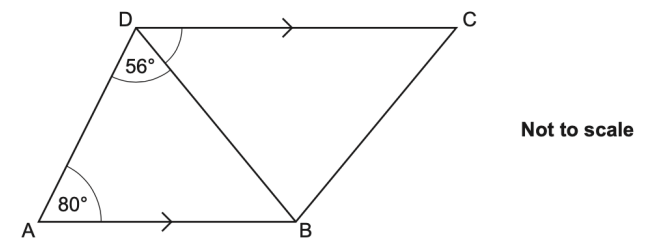
(ii) Work out angle BCW.
Give a reason for each angle you work out.
(b)(ii) [4]

7 AB and CD are parallel lines.
EF and FB are straight lines.



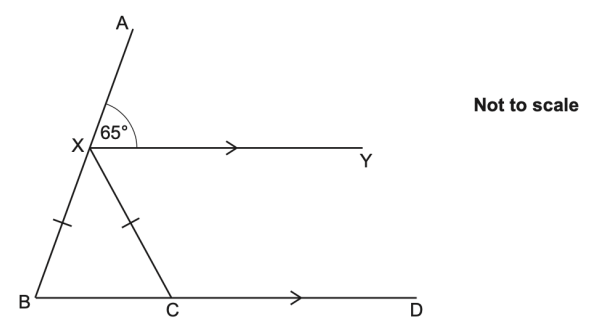
Complete the following statements.
x = 55° because [2]
y = 70° because [2]

7 In the diagram, AB is parallel to DC.



Work out angle BDC.
Give a reason for each angle you work out.
..... [4]

6 XY and BD are parallel lines.
X is a point on AB and C is a point on BD.
XB = XC.



(a) Complete this sentence.
Angle XBC = 65° because [1]
(b) Work out angle BXC.
Give a reason for each angle you work out.
..... [4]

The learning outcomes for this topic are:

- Find multiples of a given value
- Recognise prime numbers from a list
- Find all factors of a given value

- Find the prime factor decomposition of a number
- Find the HCF and LCM of a pair of numbers (from a list)
- Find the HCF and LCM of a pair of numbers (from prime factorisation)

Key Word	Definition
Multiple	The times table of a number e.g. multiples of 7 are 7, 14, 21, 28, ...
Factor	Numbers that divide exactly into a number, these come in pairs e.g. factors of 12 are 1, 12, 2, 6, 3, 4
Prime	A number with exactly two factors, itself and one
Prime factorisation	Splitting a number into a list of prime factors that have the number as their product
HCF	Highest common factor, the largest number that divides exactly into two or more numbers
LCM	Lowest common multiple, the smallest number that is in the times tables of two or more numbers
Index Form	Writing repeated multiplication as a power
Product	Multiplying two or more numbers

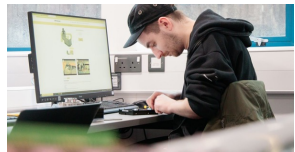
Additional Resources

MathsWatch: [28](#), [78](#), [79](#), [80](#)

Corbett Maths: Videos [216](#), [218](#), [219](#), [220](#), [223](#), [224](#), [225](#); Worksheets [216](#), [218](#), [219](#), [220](#), [223](#), [224](#), [225](#)

Careers Focus – Where could this take you?

Cyber security experts use prime numbers and prime factorisation to create security systems for networks and encryption for apps and websites.



Curriculum Links - Coherence

Required Knowledge:

- 7.02 Multiplying and dividing integers

Applied to:

- F.12 Adding and subtracting fractions
- 9F.19 Direct proportion

Links across school:

- Coding (Computing)

Key Concepts

Factors are numbers that divide an **integer** (a whole number) with **no remainder**.

Factors are always integers and can sometimes be called **divisors**.

Factors have a **commutative property** such that you can switch the order of the calculation and the calculation remains the same; $2 \times 3 = 3 \times 2$

The number of factors can determine other properties of a number, such as whether it is a **prime number** or a **square number**.

To find all of the factors of any integer, we write out all of the **factor pairs** in order.

Multiples are the result of multiplying a number by an integer.
E.g. The first 5 multiples of 7 are: 7, 14, 21, 28, and 35.

Multiples can be integers, decimals, fractions, negative numbers or surds, and can sometimes be called **products**.

In general, if n is any number and x is an integer, m is a multiple of n where:

$$n \times x = m$$

To calculate multiples of a number n , we have to multiply n by an integer. We can list multiples of a number by multiplying n by the position of the value in the list.
E.g. The 9th multiple of 4 is equal to $9 \times 4 = 36$.

Prime numbers are **positive integers** that have only **two factors**, themselves and 1.

This means that you cannot divide a **prime number** by any number apart from 1 or itself, and get an integer answer.

A number that is not prime is called a **composite number**.

The first 8 **prime numbers** are: 2, 3, 5, 7, 11, 13, 17, and 19.

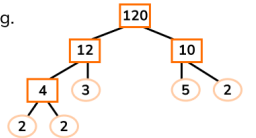
- 1 is not a **prime number** as it has only 1 factor.
- 2 is the only even **prime number**.

To determine whether a number is prime, we need to look for factors of the number, either manually or by using a number trick. If the number has a factor that is not 1 or itself, it is **not prime**.

Factor trees are a way of expressing the factors of a number, specifically the prime factorisation of a number.

Each branch in the tree is split into factors. Once the factor at the end of the branch is a prime number, the only two factors are itself and one so the branch stops and we circle the number.

E.g.



So,
 $120 = 2 \times 2 \times 2 \times 3 \times 5$

$120 = 2^3 \times 3 \times 5$

Concept – what it is

The lowest common multiple (**LCM**) is the smallest integer that belongs to the times table of two or more numbers.

The highest common factor (**HCF**) is the largest integer that two or more numbers can both be divided by.

For 28 and 42

HCF = 14

LCM = 84

Non-Concept – what it isn't

Do not confuse the terms multiple and factor. It's easy to work out the wrong one.

Find the LCM of 28 and 42

$28 = 1 \times 28, 2 \times 14, 4 \times 7$
 $42 = 1 \times 42, 2 \times 21, 3 \times 14, 6 \times 7$

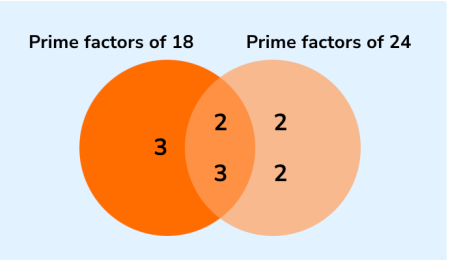
So **LCM = 14**

Remember to choose the highest number for HCF, all numbers can be divided by 1, so that will always be a common multiple, but very rarely the highest.

Standard Examples

Find the HCF and LCM of 18 and 24

Draw the prime factor trees to complete the Venn diagram



HCF = product of the numbers in the intersection = $2 \times 3 = 6$

LCM = product of all the numbers = $3 \times 2 \times 2 \times 3 \times 2 = 72$

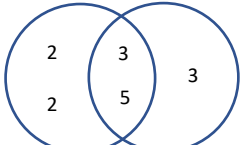
Non-Standard Examples

Two numbers have a HCF of 15 and an LCM of 180

$15 = 3 \times 5$ for the centre of the Venn diagram

$180 \div 15 = 12 = 2 \times 2 \times 3$ for the other sections of the Venn diagram

Putting the numbers into the diagram (remembering not to split the repeated factor of 2) gives **60** and **45**



- Find multiples of a given value
- Recognise prime numbers from a list
- Find all factors of a given value
- Find the prime factor decomposition of a number
- Find the HCF and LCM of a pair of numbers (from a list)
- Find the HCF and LCM of a pair of numbers (from prime factorisation)



Useful Formulae and Hints

Even numbers are numbers that **can be divided by two** without a remainder.

Odd numbers cannot be divided by two without a remainder.

A **prime number** has **exactly two factors, one and itself**.

A **multiple** is a number in the **times table** of the original number.

A **factor** is a number that will **divide exactly** into a number. **Factors** come in **pairs** that multiply together to give the original number.

When finding the **prime factorisation** of a number (also called **product of primes** or **prime factor decomposition**) remember you are looking for **factors** [numbers that **multiply** together] rather than sums.

GCSE Questions

4 (a) Write down each of the following.

(i) An even number.
..... [1]

(ii) A factor of 25.
..... [1]

(iii) A prime number between 10 and 20.
..... [1]

(iv) A cube number.
..... [1]

(b) Find the highest common factor (HCF) of 35 and 91.
..... [2]

2 (a) Write down

(i) a multiple of 13,
..... [1]

(ii) a prime number between 40 and 50.
..... [1]

(b) Find the lowest common multiple (LCM) of 16 and 28.
..... [2]

17 Two model cars, **A** and **B**, are in a race. They start together on the starting line. Assume each car travels at a constant speed.

Car **A** takes 30 seconds to complete each lap of the track.
Car **B** takes a whole number of seconds to complete each lap of the track.
The two cars next cross the starting line together 150 seconds after the start of the race.

Find the **four** possible times that car **B** could take to complete one lap.

You may find this information helpful.

$$150 = 2 \times 3 \times 5 \times 5$$

$$30 = 2 \times 3 \times 5$$

..... seconds [5]

19 Two numbers have these properties.

- Both numbers are greater than 6.
- Their highest common factor (HCF) is 6.
- Their lowest common multiple (LCM) is 60.

Find the two numbers.
..... and [3]

13 (a) Show that the highest common factor (HCF) of 18 and 63 is 9.
..... [2]

(b) Find the lowest common multiple (LCM) of 18 and 63.
..... [2]

18 (a) Write 490 as the product of its prime factors.
..... (a) [2]

(b) Buses to Ayton leave the station every 25 minutes. Buses to Bleefton leave the station every 40 minutes. Buses to both places leave at 9am.

What is the next time buses to Ayton and Bleefton leave the station together?
..... (b) [4]

18 Doctor Jones starts an appointment every 20 minutes. Doctor Warholm starts an appointment every 35 minutes.

The first appointment for both doctors starts at 8.30 am.

What is the next time that they have an appointment start at the same time?
..... [4]

2 (a) Complete this list to show all the factors of 30.

1 2 10 30 [2]

(b) Write down the highest common factor (HCF) of 25 and 30.
..... (b) [1]

- The learning outcomes for this topic are:
- Square numbers (up to two digits)
 - Square root numbers (integer solutions)
 - Calculate squares of numbers

- Find patterns in square numbers
- Find square roots of fractions
- Estimate the value of a square root

Key Word	Definition
Power	The number of times a number is multiplied by itself, e.g. $2 \times 2 \times 2$ would be 2 to the power of 3
Index	The power of a number
Square	Multiplying a number by itself e.g. $5 \times 5 = 25$
Cube	Multiplying a number by itself twice e.g. $5 \times 5 \times 5 = 125$
Square root	The inverse of squaring, show with this symbol $\sqrt{\quad}$
Inverse	The opposite function, takes an output back to an input
Base	The number that is raised to a power, e.g. in 2^3 the 2 is the base and the 3 is the index

Additional Resources

MathsWatch: [29](#), [81](#)

Corbett Maths: Videos [212](#), [213](#), [214](#), [226](#), [227](#), [228](#); Worksheets [212/3](#), [214](#), [226/7](#), [228](#)

Careers Focus – Where could this take you?

A **computer graphics engineer** uses squares and roots when building the algorithms and equations that are used to create images on the screen or to form new illustrations with CGI.

Curriculum Links - Coherence

Required Knowledge:

- 7.02 Multiplying numbers
- 7.05 Squares and the order of operations

Applied to:

- 9F.17 Quadratic expansion
- 10F.11 Compound interest
- 10F.20 Pythagoras' Theorem
- 10F.24 Powers and standard form
- 11F.04 Plotting quadratics

Links across school:

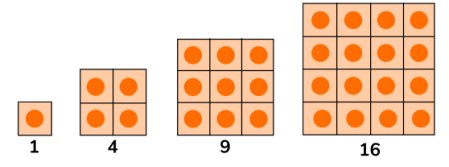
- Motion (Science)

Key Concepts

Square Numbers and Square Roots

A **square number** is a number that is multiplied by itself. When we square a value we always get a positive answer.

E.g.
 4×4 can be written as 4^2
 It is spoken as "4 squared" or "4 to the power of 2"



- The first square number is 1 because $1 \times 1 = 1$.
- The second square number is 4 because $2 \times 2 = 4$
- The third square number is 9 because $3 \times 3 = 9$, and so on.
- The first fifteen square numbers are: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196 and 225.

Square Numbers and Square Roots

The square root of a number is a value that can be multiplied by itself to give the original number.

Square rooting a number is the inverse operation of squaring a number. The square root function looks like this $\sqrt{\quad}$, its mathematical name is the 'radical'. When we square root a value we always get a positive and negative value.

- E.g.
- The square root of 9 is 3 since $3 \times 3 = 9$ $\therefore \sqrt{9} = \pm 3$
 - The square root of 64 is 8 since $8 \times 8 = 64$ $\therefore \sqrt{64} = \pm 8$

Concept – what it is

What is the square of -3 ?

$$(-3)^2 = -3 \times -3 = 9$$

What is the square root of 36?

$$\sqrt{36} = 6 \text{ or } -6$$

Non-Concept – what it isn't

What is the square of -3 ?

$$-3^2 = -3 \times 3 = -9$$

When squaring a negative we get a positive result. Brackets around any negatives are really important when using a calculator

What is the square root of 36?

$$\sqrt{36} = 18$$

Square rooting is not the same as halving. Also, there are always two numbers that square to give the same answer, one positive and one negative

Standard Examples

Work out:

a) 3^2

$$3 \times 3 = 9$$

b) $\sqrt{121}$

$$11 \times 11 = 121$$

$$\text{So } \sqrt{121} = 11$$

Non-Standard Examples

Work out:

a) 0.3^2

$$3 \times 3 = 9$$

$$\text{So } 0.3 \times 0.3 = 0.09$$

b) $\sqrt{\frac{16}{25}}$

$$4 \times 4 = 16$$

$$5 \times 5 = 25$$

$$\text{So } \sqrt{\frac{16}{25}} = \frac{4}{5}$$

- Square numbers (up to two digits)
- Square root numbers (integer solutions)
- Calculate squares of numbers
- Find patterns in square numbers
- Find square roots of fractions
- Estimate the value of a square root



Useful Formulae and Hints

Squaring a number means **multiplying it by itself, NOT** multiplying by two. E.g. the square of 3 is $3^2 = 3 \times 3 = 9$

Square rooting is the **opposite of squaring**. E.g. the square root of 49 is $\sqrt{49} = 7$

Squaring a negative number gives a **positive answer**.

So a **square** number can have **two different square roots**. E.g. if $x^2 = 49$ then $x = 7$ or $x = -7$

Powers count **repeated multiplication** of the same number. E.g. $5 \times 5 \times 5 \times 5 = 5^4$

Roots can be the **inverse** of any **power**. E.g. the inverse of squaring is $\sqrt{\quad}$
The inverse of cubing is $\sqrt[3]{\quad}$
The inverse of the power 4 is $\sqrt[4]{\quad}$

GCSE Questions

12 (a) Find the value of

(i) $\sqrt[3]{216}$,

(a)(i) [1]

(ii) 2^8 .

(ii) [1]

(b) The cube of 3 is added to the square root of 7.
Put a ring around the correct statement.

$\sqrt[3]{3} + 7^2$ $3^3 + 7^2$ $3^3 + \sqrt{7}$ $\sqrt[3]{3} + \sqrt{7}$

[1]

4 Patrick writes down a number.
He says
If I find the square root of that number and then add 15, I get 27.
What number did Patrick write down?

..... [2]

(b) Find the values of z.

$z^2 = 196$

$z = \dots\dots\dots$ or $z = \dots\dots\dots$ [2]

4 Tia thinks of a number.
She finds the square root and subtracts 4.
Her answer is 1.

What number is she thinking of?

..... [2]

5 (a) Complete the following.

(i) $5^2 = \dots\dots\dots$ [1]

(ii) $\sqrt[3]{64} = \dots\dots\dots$ [1]

(b) Work out $2^3 \times \sqrt{49}$.

..... [2]

10 Nadia thinks of a number.
She finds the square root and then divides by 5.
Her answer is 20.

What number is she thinking of?

..... [2]

7 (a) Write down the value of $\sqrt[3]{27}$.

..... [1]

(b) Work out 7^2 .

..... [2]

8 (a) Evaluate.

(i) $\sqrt{121}$

(a)(i) [1]

(ii) 4^{-2}

(ii) [1]

(b) Work out.

$(9 - 3 \times 2)^2$

..... [2]

(c) Fill in the power.

$5^{\square} = 125$

[1]

- Round to powers of 10
- Round to the nearest integer
- Round to a given number of decimal places
- Round to a given number of significant figures
- Estimate the value of a simple one-step calculation
- Estimate the value of a multi-step calculation

Key Word	Definition
Round	to round a number is to express it to a given degree of accuracy
Estimate	to give an approximation of a n actual value
Approximate	nearly correct but not exact)
Significant figures	number of digits in a number giving a required degree of accuracy
Decimal places	the position of a digit after the decimal point
Value	is a calculated amount
Integer	a whole number, including negatives and zero

Additional Resources

MathsWatch: [31](#), [32](#), [90](#), [91](#)

Corbett Maths: Videos: [215](#), [276](#), [277a](#), [277b](#), [278](#), [279a](#)
Worksheet: [215](#), [276](#), [277a](#), [277b](#), [278](#), [279a](#)

Careers Focus – Where could this take you?

I am an electrician. I use Maths in all aspects of my job, from how much material I need to order to complete a job to what my hourly fee is to ensure I make a profit. There is also a lot of Maths used in how circuits work and ensuring voltage and current are safe for homes.

Curriculum Links - Coherence

Required Knowledge:

- Place Value
- Order of operations

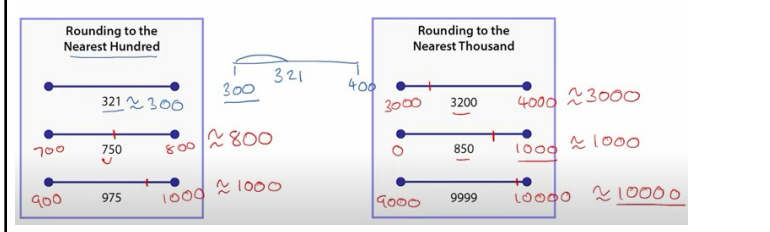
Applied to:

- Writing error intervals
- Limits of accuracy
- Measures
- Money Calculations
- Averages
- Shapes (areas and perimeters)

Links across school:

- Science (use rounding for very large or small figures)
- History (use rounded figures to summarise events)
- PE (rounded measures for sporting events)

Key Concepts



- To round to a decimal place:
1. look at the first digit after the decimal point if rounding to one decimal place or the second digit for two decimal places.
 2. draw a vertical line to the right of the place value digit that is required.
 3. look at the next digit.
 4. if it's 5 or more, increase the previous digit by one.

- In order to round to a given number of significant digits.
1. Locate the significant figure for the degree of accuracy required. The first non-zero digit is the first significant figure.
 2. Look at the next digit to the right, is it 5 or more?
 3. If it is 5 or more - round up by adding 1 to the previous digit. If it is less than 5 - round down by keeping the previous digit the same.
 4. If the degree of accuracy is 10 or more, fill in zeros to make the number the correct size.
-

Concept – what it is

Round 12.34572 to:
(1dp) = 12.3
(2dp) = 12.35
(3dp) = 12.346

Round 34,605 to:
(1sf) = 30,000
(2sf) = 35,000
(3sf) = 34,600

Estimate:

$$\frac{9.74 \times 3.5}{0.52} = \frac{10 \times 4}{0.5} = 80$$

Non-Concept – what it isn't

Round 12.34572 to:
(1dp) = 12.30000
(2dp) = 12.34
(3dp) = 12.357

Round 34,605 to:
(1sf) = 3
(2sf) = 35
(3sf) = 346

Estimate:

$$\frac{9.74 \times 3.5}{0.52} = \frac{10 \times 3.5}{1} = \frac{35}{1} = 35$$

Standard Examples

1.
 - (a) Round 466 to the nearest 10 **470**
 - (b) Round 3786 to the nearest hundred **3800**
 - (c) Round 3786 to one significant figure **4000**
 - (d) Round 0.003054 to two significant figures. **0.0031**
2. By writing each number to one significant figure find an estimate for this calculation.

$$\frac{23.6 \times 38}{1.8} = \frac{20 \times 40}{2} = \frac{800}{2} = 400$$

Non-Standard Examples

1. David drives an average of 46.5 miles per week.
Work out an estimate for the number of miles he drives in a year.
46.5 x 52 ≈ 50 x 50 = 2500
2. Is this an under-estimate or an over-estimate. Give a reason for your answer.
This is an over-estimate as 46.5 has been rounded up more than 52 has been rounded down.

The learning outcomes for this topic are:

- Round to powers of 10
- Round to the nearest integer
- Round to a given number of decimal places
- Round to a given number of significant figures
- Estimate the value of a simple one-step calculation
- Estimate the value of a multi-step calculation



Useful Formulae and Hints

How to Round Numbers:
Decide which is the last digit to keep
Leave it the same if the next digit is
Less than 5 (rounding down)
But increase it by 1 if the next digit is
5 or more (rounding up)

Rounding Decimals:
Rounding to tenths means to leave
one
Number after the decimal point.
Rounding to hundredths means to
leave two numbers after the decimal
point.

- To round to a decimal place:
1. look at the first digit after the decimal point if rounding to one decimal place or the second digit for two decimal places.
 2. draw a vertical line to the right of the place value digit that is required.
 3. look at the next digit.
 4. if it's 5 or more, increase the previous digit by one.

Rounding to significant figures:
The first significant figure is the first
non-zero number.

1. look at the first non-zero digit if rounding to one significant figure
2. look at the digit after the first non-zero digit if rounding to two significant figures
3. draw a vertical line after the place value digit that is required
4. look at the next digit
5. if it's 5 or more, increase the previous digit by one
6. if it's 4 or less, keep the previous digit the same
7. fill any spaces to the right of the line with zeros, stopping at the decimal point if there is one

To estimate a calculation:
Round all figures to one significant
figure. Then perform your calculation.

1dp means one decimal place.
2sf means two significant figures.

GCSE Questions

3 (a) Round 32 629 to the nearest thousand.

(a) [1]

(b) Round 32 629 to 1 significant figure.

(b) [1]

(b) Round 184 329 to the nearest hundred.

(b) [1]

(c) Estimate the value of

$$\frac{23.1 \times 3.9}{8.12}$$

9 (a) Round 7.3065 to 2 decimal places.

(a) [1]

(b) Round each number to 3 significant figures.

(i) 408 231

(b)(i) [1]

(ii) 0.006 137 02

(ii) [1]

15 A shape is formed by cutting a square out of a rectangle.

(a) Work out an estimate for the area of the shape.

.....m²
(3)

(b) Is your answer to part (a) an underestimate or an overestimate?
Give a reason for your answer.

.....
.....
.....
(1)

(Total for Question 15 is 4 marks)

19 Asha worked out $\frac{326.8 \times (6.94 - 3.4)}{59.4}$.

She got an answer of 19.5, correct to 3 significant figures.

Write each number correct to 1 significant figure to decide if Asha's answer is reasonable.

.....
.....
..... [3]

9F.12 Reciprocals, fractions of an amount

Adding and subtracting fractions

The learning outcomes for this topic are:

- Find the reciprocal of a whole number or fraction
- Find a fraction of an amount with an integer solution
- Find a fraction of an amount with a fractional solution

- Add or subtract fractions with a common denominator
- Add and subtract fractions that need to be altered to get a common multiplier
- Add or subtract mixed number fractions

Key Word	Definition
Reciprocal	the inverse of a number, not including zero
Unitary	a single unit
Denominator	the bottom part of a fraction
Numerator	the top part of a fraction
Common denominator	same denominator based on lowest common multiple
Mixed number	a whole number with a proper fraction
Improper fraction	or 'top heavy' fraction, numerator is bigger than the denominator
Proper fraction	numerator is smaller than the denominator

Additional Resources

MathsWatch: [N33](#), [N35](#), [71](#), [76](#)

Corbett Maths: Video: [132](#), [133](#), [137](#), [139](#), [140](#), [145](#)

Worksheet: [132](#), [133](#), [137](#), [139](#), [140](#), [145](#)

Careers Focus – Where could this take you?

I am a **mixologist** and I used fractions and proportions everyday in my job. I experiment using different fractions of ingredient to make brand new drinks and foods.

Curriculum Links - Coherence

Required Knowledge:

- Multiplication / Division
- Shading fractions of a shape
- Simplifying fractions
- Lowest common multiples

Applied to:

- Decimals
- Measures
- Ratios
- Time
- Percentages
- Parallel and perpendicular lines

Links across school:

- Chemistry (mixing compounds)
- Geography (grid references)
- Food Tech (recipe proportions)

Key Concepts

Reciprocals

$\frac{a}{b} \times \frac{b}{a} = 1$

Number 8 → Its Reciprocal $\frac{1}{8}$

Fractions	Reciprocal
$\frac{a}{b}$	$\frac{b}{a}$
$\frac{4}{5}$	$\frac{5}{4}$
$2\frac{2}{3}$	$\frac{3}{8}$

$\frac{1}{4}$ of 40 = 10

$\frac{3}{4}$ of 40 = 30

$\frac{2}{9} + \frac{5}{9} = \frac{7}{9}$ $\frac{7}{9} - \frac{5}{9} = \frac{2}{9}$

$\frac{2}{15} + \frac{3}{5} = ?$ $\frac{21}{4} - \frac{8}{3}$

$\frac{2}{15} + \frac{3 \times 3}{5 \times 3}$ $\frac{63}{12} - \frac{32}{12} = \frac{31}{12}$

$\frac{2}{15} + \frac{9}{15} = \frac{2+9}{15} = \frac{11}{15}$ (Same) $= 2\frac{7}{12}$

Adding Mixed Numbers

$1\frac{1}{2} + 2\frac{1}{2}$

Find LCD and add: $\frac{8}{5} + \frac{5}{2}$

$\frac{8}{5} + \frac{5}{2} = \frac{16}{10} + \frac{25}{10} = \frac{41}{10}$

$4\frac{1}{10}$

Subtract Mixed Numbers

$9\frac{1}{2} - 5\frac{1}{4}$

$= \frac{19}{2} - \frac{21}{4}$ (Change to improper fractions)

$= \frac{19 \times 2}{2 \times 2} - \frac{21}{4}$ (Change to common denominator)

$= \frac{38}{4} - \frac{21}{4}$ (Subtract the numerators)

$= \frac{17}{4} = 4\frac{1}{4}$ (Change to mixed numbers)

Concept – what it is

1. Find $\frac{2}{3}$ of 36 = $\frac{2}{3} \times 36 = 36 \div 3 \times 2 = 24$

$12 + 12 = 24$ $36 \div 3 = 12$

2. Give your answers in its lowest terms: $\frac{7}{15} + \frac{3}{15} = \frac{10}{15} = \frac{2}{3}$

3. Give your answers as a mixed number: $\frac{2}{5} + \frac{3}{4} = \frac{8}{20} + \frac{15}{20} = \frac{23}{20} = 1\frac{3}{20}$

4. $4\frac{3}{5} - 1\frac{1}{2}$

$\frac{23}{5} - \frac{3}{2} = \frac{46}{10} - \frac{15}{10} = \frac{31}{10} = 3\frac{1}{10}$

Standard Examples

1. (a) Write the reciprocal of 5 = $\frac{1}{5}$

(b) Write the reciprocal of $\frac{2}{3} = \frac{3}{2}$ or 1.5

2. Find $\frac{3}{5}$ of 40 = $\frac{3}{5} \times 40 = 40 \div 5 \times 3 = 24$

3. (a) $\frac{7}{10} + \frac{3}{15} = \frac{21}{30} + \frac{6}{30} = \frac{27}{30} = \frac{9}{10}$

(b) $3\frac{1}{4} - 1\frac{1}{2}$

$\frac{13}{4} - \frac{3}{2} = \frac{13}{4} - \frac{5}{4} = \frac{7}{4} = 1\frac{3}{4}$

Non-Concept – what it isn't

1. Find $\frac{2}{3}$ of 36 = $\frac{2}{3} \times 36 = 36 \div 3 = 12$

2. Give your answers in its lowest terms: $\frac{7}{15} + \frac{3}{15} = \frac{10}{30}$

3. Give your answer as a mixed number: $\frac{2}{5} + \frac{3}{4} = \frac{8}{20} + \frac{15}{20} = \frac{23}{20}$

4. $4\frac{3}{5} - 1\frac{1}{2}$

$\frac{20}{5} - \frac{2}{2} = \frac{40}{10} - \frac{10}{10} = \frac{30}{10} = 3$

Non-Standard Examples

1. Line a has a gradient of 3. Line B is perpendicular to line A. What is the gradient of line B. $-\frac{1}{3}$ Jessica wants to attach ribbon around her wardrobe.

2. $1\frac{3}{4}m$

She has 4 metres of ribbon.

How much more does she need? Give your answer as a fraction.

$1\frac{3}{4} + 1\frac{3}{4} + \frac{2}{3} + \frac{2}{3} = \frac{7}{4} + \frac{7}{4} + \frac{2}{3} + \frac{2}{3}$

$= \frac{7}{4} + \frac{7}{4} + \frac{2}{3} + \frac{2}{3} = \frac{21}{12} + \frac{21}{12} + \frac{8}{12} + \frac{8}{12}$

$= \frac{58}{12} = 4\frac{5}{6}$; she will need $\frac{5}{6}m$ more

The learning outcomes for this topic are:

- Find the reciprocal of a whole number or fraction
- Find a fraction of an amount with an integer solution
- Find a fraction of an amount with a fractional solution

- Add or subtract fractions with a common denominator
- Add and subtract fractions that need to be altered to get a common multiplier
- Add or subtract mixed number fractions



Useful Formulae and Hints

Reciprocals are the inverse of a value or a number.
Reciprocal of an integer: put a 1 over it
 Eg: the reciprocal of 5 is $\frac{1}{5}$.
Reciprocal of a fraction: turn the fraction upside down.
 Eg: The reciprocal of $\frac{3}{4}$ is $\frac{4}{3}$.
Fractions of amounts: use a bar diagram.

The denominator tells us how many parts to divide into.
 Finding $\frac{1}{5}$ of an amount is the same as dividing that amount by 5.
 So $\frac{1}{5}$ of 30 = 6
 $30 \div 5 = 6$

The numerator tells us how many parts we want.
 If we're asked to find $\frac{3}{5}$ of an amount, we need 3 parts.
 If $\frac{1}{5}$ of 30 = 6
 Then $\frac{3}{5}$ of 30 = 18
 $6 \times 3 = 18$

Adding fractions: use a common denominator

EXAMPLE

What common denominator should we use?

Mixed Numbers: (for adding you would do the same but add not subtract)

$$3\frac{2}{5} - 1\frac{4}{7} = \frac{17}{5} - \frac{11}{7}$$

change to improper fractions

$$= \frac{17 \times 7}{5 \times 7} - \frac{11 \times 5}{7 \times 5} = \frac{119}{35} - \frac{55}{35}$$

change to the LCD of 35

$$= \frac{119 - 55}{35} = \frac{64}{35}$$

GCSE Questions

2 (a) Work out.

(i) $6\frac{1}{2} + \frac{3}{4}$ (a)(i) [1]

(ii) $\frac{4}{7}$ of 63 (ii) [2]

Karen made 40 cakes.
 She gives $\frac{1}{5}$ of the cakes to Andrew.
 She gives 10% of the 40 cakes to Chris.
 What fraction of the 40 cakes does she have left?

13 (a) Calculate.

$$\frac{3}{5} + \frac{5}{8}$$

Give your answer as a mixed number in its simplest form.

(a) [3]

3 (a) Complete each statement.

(i) $\frac{3}{7} = \frac{\dots\dots}{28}$ [1]

(ii) $4\frac{1}{2} = \frac{\dots\dots}{2}$ [1]

(b) Work out.

$$\frac{2}{3} - \frac{1}{5}$$

(b) [2]

7 Work out the following, giving each answer as a fraction.

(a) $1\frac{3}{4} + \frac{1}{2}$

(a) [1]

The distance from Newtown to Milton is $7\frac{2}{3}$ miles.

The distance from Milton to Redville is $2\frac{2}{5}$ miles

Work out the distance from Newtown to Redville.

Key Word	Definition
Denominator	the bottom part of a fraction
Numerator	the top part of a fraction
Reciprocal	the inverse of a value or number, not zero
Cancel	divide numerator and denominator by highest common factor
Simplify	write a fraction in the smallest possible terms
Product	to multiply


Additional Resources

MathsWatch: [73](#), [74](#)

Corbett Maths: Video: [134](#), [139](#), [140](#), [142](#)
Worksheet: [134](#), [139](#), [140](#), [142](#)

Careers Focus – Where could this take you?

I am a welder and I use my skills in construction to join different metals together using heat and electricity. My job requires a lot of precise measurements and calculations as my work can be used in all sorts of complex machinery.



Curriculum Links - Coherence

Required Knowledge:

- Multiplying
- Highest common factor
- Division
- Reciprocals

Applied to:

- Fractions of amounts
- Vectors
- Transformations
- Algebraic fractions

Links across school:

- Food technology (working to recipes)
- Art (working with fractional shapes, patterns, position and movement)
- Physics (fractions in electrical circuits, rates of change)

Key Concepts

Multiply the numerator of the fraction by the whole number

$$2 \times \frac{3}{11} = \frac{6}{11}$$

Keep the denominator the same

$$\frac{12}{3} \div \frac{2}{3} = \frac{12}{1} \times \frac{3}{2} = \frac{36}{2} = 18$$

$$\frac{9}{17} \div 3 = \frac{9}{17} \div \frac{3}{1} = \frac{9}{17} \times \frac{1}{3} = \frac{9 \times 1}{17 \times 3} = \frac{9}{51} = \frac{9 \div 3}{51 \div 3} = \frac{3}{17}$$

Multiplying Fractions

$$\frac{2}{4} \times \frac{3}{6} = \frac{6}{24} = \frac{1}{4}$$

$$\frac{4}{11} \div \frac{5}{9} = \frac{4}{11} \times \frac{9}{5} = \frac{36}{55}$$

$$\frac{2}{4} \times \frac{3}{6} = \frac{6}{24} = \frac{1}{4}$$

Multiply the numerators. Multiply the Denominators.

$$1\frac{1}{2} \times 2\frac{1}{5} = 3\frac{3}{10}$$

Do the multiplication as Improper Fractions

$$\frac{3}{2} \times \frac{11}{5} = \frac{33}{10}$$

Simplify the fraction by dividing the numerator and denominator by their largest common factor.

$$5\frac{3}{5} \div 2\frac{1}{3}$$

convert mixed numbers to fractions

$$\frac{28}{5} \div \frac{7}{3}$$

divide and simplify

$$\frac{28}{5} \div \frac{7}{3} = \frac{28}{5} \times \frac{3}{7} = \frac{28 \times 3}{5 \times 7} = \frac{12}{5}$$

convert back to a mixed number

$$2\frac{2}{5}$$

Concept – what it is

$$\frac{2}{5} \div \frac{2}{3} = \frac{2}{5} \times \frac{3}{2} = \frac{2 \times 3}{5 \times 2} = \frac{6}{10} = \frac{3}{5}$$

take the reciprocal of the divisor

$$\frac{4}{7} \div 2 = \frac{4}{7} \times \frac{1}{2} = \frac{4 \times 1}{7 \times 2} = \frac{4}{14} = \frac{2}{7}$$

Standard Examples

- $\frac{2}{5} \times 7 = \frac{2}{5} \times \frac{7}{1} = \frac{2 \times 7}{5 \times 1} = \frac{14}{5} = 2\frac{4}{5}$
- $\frac{5}{6} \div 3 = \frac{5}{6} \div \frac{3}{1} = \frac{5}{6} \times \frac{1}{3} = \frac{5 \times 1}{6 \times 3} = \frac{5}{18}$
- $5 \div \frac{3}{4} = \frac{5}{1} \div \frac{3}{4} = \frac{5}{1} \times \frac{4}{3} = \frac{5 \times 4}{1 \times 3} = \frac{20}{3} = 6\frac{2}{3}$
- $\frac{2}{3} \times \frac{5}{7} = \frac{2 \times 5}{3 \times 7} = \frac{10}{21}$
- $\frac{5}{8} \div \frac{1}{4} = \frac{5}{8} \times \frac{4}{1} = \frac{5 \times 4}{8 \times 1} = \frac{20}{8} = 2\frac{1}{2}$
- $3\frac{1}{2} \times 2\frac{5}{6} = \frac{7}{2} \times \frac{17}{6} = \frac{7 \times 17}{2 \times 6} = \frac{119}{12} = 9\frac{11}{12}$
- $3\frac{1}{2} \div 2\frac{5}{6} = \frac{7}{2} \div \frac{17}{6} = \frac{7}{2} \times \frac{6}{17} = \frac{7 \times 6}{2 \times 17} = \frac{42}{34} = 1\frac{4}{17}$

Non-Concept – what it isn't

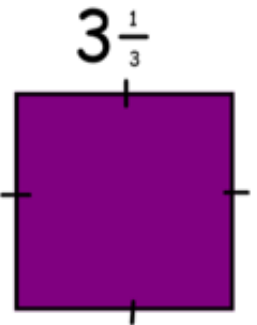
When multiplying fractions students cross multiply instead of row multiplying

Eg.

$$\frac{2}{3} \times \frac{5}{7} = \frac{2 \times 7}{3 \times 5} = \frac{14}{15}$$

Non-Standard Examples

Find the area of the shape below:



$$3\frac{1}{3} \times 3\frac{1}{3} = \frac{10}{3} \times \frac{10}{3} = \frac{10 \times 10}{3 \times 3} = \frac{100}{9} = 11\frac{1}{9}$$

9F.13 Multiplying and dividing fractions

- The learning outcomes for this are:**
- Multiply a fraction by an integer or vice versa
 - Divide a fraction by an integer or vice versa
 - Multiply a pair of fractions (no cancelling)

- Divide a pair of fractions (no cancelling)
- Multiply a pair of mixed number fractions
- Divide a pair of mixed number fractions



Useful Formulae and Hints

Remember an integer can be turned into a fraction if you write a one underneath it.

Multiplying a pair of fractions:
Multiply the numerators
Multiply the denominators
Simplify your answer by cancelling down (dividing numerator and the denominator by the highest common factor)

Dividing a pair of fractions:
Multiply by the reciprocal instead.

$$\frac{8}{10} \div \frac{2}{3} = 1 \frac{4}{20}$$

Rotate the 2nd pair of Fractions

$$\frac{8}{10} \times \frac{3}{2} = \frac{24}{20} = 1 \frac{4}{20}$$

Multiplying and dividing with mixed numbers:
Convert your mixed numbers into improper fractions first then apply the methods outlined above.

Eg. For dividing

$$5\frac{2}{3} \div 2\frac{1}{3}$$

convert mixed numbers to fractions

$$\frac{28}{5} \div \frac{7}{3}$$

divide and simplify

$$\frac{28}{5} \div \frac{7}{3} = \frac{28}{5} \cdot \frac{3}{7} = \frac{28 \cdot 3}{5 \cdot 7} = \frac{12}{5}$$

convert back to a mixed number

$$2\frac{2}{5}$$

GCSE Questions

2 Work out.

(a) $\frac{1}{2}$ of 12 (a) [2]

(b) $8 \times \frac{1}{5}$
Give your answer as a mixed number. (b) [2]

(c) Isaac and Maya eat part of a pizza.
Isaac eats $\frac{1}{6}$ of the pizza.
Maya then eats $\frac{3}{5}$ of the remaining pizza.
What fraction of the original pizza is left?

(b) Work out $3\frac{1}{2} \div 2\frac{4}{5}$

Work out

$$3\frac{3}{4} \times 2\frac{2}{3}$$

- $\frac{x}{y} \times \frac{3}{5}$
- $\frac{x}{y} \times \frac{3}{6}$
- $\frac{x}{y} \times \frac{3}{6x}$
- $\frac{x}{xy} \times \frac{3}{6}$

9. $\frac{7x}{xy} \div \frac{6y}{3}$

14 Work out $\frac{2}{15} \times \frac{15}{22}$.
Give your answer in its lowest terms.

(b) Work out $\frac{3}{4} \times \frac{1}{5}$ Work out $2\frac{1}{4} \div \frac{3}{5}$

Work out $60 \times \frac{2}{3}$ Work out $1\frac{7}{8} \times 5\frac{1}{3}$

If the area of the rectangle is $19\frac{1}{4}$.
Find the length of the rectangle

$3\frac{1}{2}$ cm

- Describe what a quadratic sequence is
- Find the nth term rule of a simple quadratic sequence
- Generate a quadratic sequence from its nth term rule



Useful Formulae and Hints

Finding the nth term rule of a quadratic sequence

- 1) Find the first difference
- 2) Find the second difference
- 3) Half the second difference to find the coefficient of n^2
- 4) Write the square numbers
- 5) Multiply the square numbers if there is a coefficient of n^2 that isn't 1
- 6) Subtract the squares from the original sequence to create a new, linear sequence
- 7) Find the nth term rule of the new sequence
- 8) Put the n^2 and linear parts together

GCSE Questions

Here are the first five terms of a different quadratic sequence.

0 2 6 12 20

(b) Find an expression, in terms of n , for the n th term of this sequence.

.....
(2)

(Total for Question 16 is 6 marks)

22 Here are the first five terms of a sequence.

4 11 22 37 56

Find an expression, in terms of n , for the n th term of this sequence.

.....
(Total for Question 22 is 3 marks)

16 Here are the first five terms of a quadratic sequence.

10 21 38 61 90

Find an expression, in terms of n , for the n th term of this sequence.

.....
(Total for Question 16 is 3 marks)

16 Here are the first six terms of a quadratic sequence.

-1 5 15 29 47 69

Find an expression, in terms of n , for the n th term of this sequence.

.....
(Total for Question 16 is 3 marks)

20 Here are the first five terms of a sequence.

-1 0 3 8 15

Find an expression, in terms of n , for the n th term of this sequence.

.....
(Total for Question 20 is 2 marks)

The learning outcomes for this topic are:

- Simplify a ratio
- Share an amount into a ratio
- Find an equivalent ratio given one value

- Solve best value problems
- Find an equivalent ratio given a difference
- Find missing values using direct proportion

Key Word	Definition
Proportion	the number of parts per the whole amount
Direct proportion	two quantities in a constant ratio, both multiply or divide by the same amount
Unitary	find the value of one, a single unit
Ratio	a method of comparing parts, a representation of proportion
Share	dividing an amount into a ratio
Simplify	writing a ratio that shows the same proportion in smaller parts
Equivalent	two ratios that show the same proportion with different parts
Parts	the numbers in a ratio

Additional Resources

MathsWatch: [38](#), [39](#), [41](#), [42](#), [106](#), [165a](#), [165b](#), [165c](#), [200a](#), [200b](#), [200c](#)

Corbett Maths: Video [210](#), [255a](#), [269](#), [269a](#), [269b](#), [269c](#), [269d](#), [270](#), [271](#), [271a](#); Worksheet [210](#), [255a](#), [269](#), [269a](#), [270](#), [271](#), [271a](#)

Careers Focus – Where could this take you?

Hydrologists are responsible for solve water related problems across the whole of society. They will study the proportion of chemicals and minerals in water to ensure it is carefully controlled.

Curriculum Links - Coherence

Required Knowledge:

- 7.18 Simplifying ratios
- 8.03 Equivalent fractions
- 8.12 Unit cost and best buys
- 8.27 Direct proportion

Applied to:

- 9H.12 Compound measures
- 10H.04 Trigonometry
- 10H.05 Similarity
- 11H.02 Direct and inverse proportion
- 11H.10 Vector geometry

Links across school:

- Practical repeats (Science)
- Population (Geography)
- Practical kitchen skills (Food Technology)

Key Concepts

Dividing Ratios

Dividing ratios is a way of sharing a quantity in given parts of a ratio.

E.g. A bag contains 24 sweets. Three friends share the sweets in the ratio of 1:2:3. How many sweets does each person get?

If person A gets 1 share, person B gets 2 shares and person C gets 3 shares, each time the parts are shared, we are using 1+2+3=6 parts.

Each share is therefore worth 24÷6=4.

If A gets 1 share, B gets 2 shares and C gets 3 shares, we have

This gives us the ratio 4:8:12.

Ratio to Fractions

A ratio compares how much of one thing there is compared to another. It can be written using a ':', the word 'to' or as a fraction.

In order to convert ratios to fractions when we have the ratio a:b, where both values are parts of the total, we can say that for the ratio:

$$\frac{a}{a+b} \text{ and } \frac{b}{a+b}$$

E.g. In the diagram below is a bar model that represents the ratio of blue:red as 3:2 (3 to 2). There are 3 blue blocks, 2 red blocks which means there are 5 blocks in total.

The fraction for blue is $\frac{3}{2+3} = \frac{3}{5}$.

The fraction for red is $\frac{2}{2+3} = \frac{2}{5}$.

Proportion

Proportion is a type of relationship between two variables linked by a constant.

There are two types of proportion; direct proportion and inverse proportion. They can also be referred to as direct variation and inverse variation.

Direct proportion

If there is a directly proportional relationship between two variables then as one variable increases, so does the other.

E.g. As the number of apples increases, the cost also increases.

Inverse proportion

If there is an inversely proportional relationship between two variables then as one variable increases, the other variable decreases.

E.g. As the number of workers increases, the time it takes to complete the work decreases.

Simplifying Ratios

Simplifying ratios is a way of cancelling down **common factors**, to reduce a ratio to the **smallest quantities**, with the **constant of proportionality** staying the same.

E.g. Here are 12 red counters and 16 blue counters.

Each of the four rows contains 3 red counters and 4 blue counters. This allows us to simplify the ratio 12:16 into its **simplest form** 3:4 as they are **proportionally the same**.

Ratio Problem Solving

A ratio is a **relationship between two or more quantities**. They are usually written in the form *a:b* where *a* and *b* are two quantities. When **problem solving** with a ratio, the key facts that you need to know are:

- What is the **ratio** involved?
- What **order** are the quantities in the ratio?
- What is the **total amount** / what is the **part of the total** amount known?
- What are you trying to **calculate**?

As with all problem solving, there is **not one unique method** to solve a problem but we can use some techniques to help us solve problems with ratios.

n:1 form

You may be asked to express a ratio in the form "n:1" or "1:n". This would involve scaling the ratio so that one of the parts is 1.

For example,

Express the ratio 12:4 is the ratio of n:1. This would mean we have to scale the four so that it becomes 1. We can do this by dividing both parts of the ratio by 4 to become 3:1, with n=3.



- Simplify a ratio
- Share an amount into a ratio
- Find an equivalent ratio given one value
- Solve best value problems
- Find an equivalent ratio given a difference
- Find missing values using direct proportion



Useful Formulae and Hints

Always read ratio questions carefully:

Are you sharing an amount into a ratio?

Do you know one part, or a difference, and are looking for an equivalent ratio?

Are you writing in the form 1:n or n:1?

Are you combining two ratio, by giving the shared part the same value?

Are you simplifying a ratio (remembering you can't have decimals in a simplified ratio)?

Remember that a ratio represents a proportion. It compares two parts of a whole. They work just like fractions, if one part is **multiplied or divided**, then the **other side must change in the same way** to maintain the proportions.

GCSE Questions

2 There are 60 people in a choir.
Half of the people in the choir are women.

The number of women in the choir is 3 times the number of men in the choir.
The rest of the people in the choir are children.

the number of children in the choir : the number of men in the choir = $n : 1$

Work out the value of n .
You must show how you get your answer.

$n = \dots\dots\dots$

(Total for Question 2 is 4 marks)

14 A group of people went to a restaurant.
Each person chose one starter and one main course.

starter	main course
soup	lasagne
prawns	curry

the number of people who chose soup : the number of people who chose prawns = $2 : 3$

Of those who chose soup,
the number of people who chose lasagne : the number of people who chose curry = $5 : 3$

Of those who chose prawns,
the number of people who chose lasagne : the number of people who chose curry = $1 : 5$

What fraction of the people chose curry?
You must show how you get your answer.

$\dots\dots\dots$

(Total for Question 14 is 4 marks)

2 In a village

the number of houses and the number of flats are in the ratio $7 : 4$
the number of flats and the number of bungalows are in the ratio $8 : 5$

There are 50 bungalows in the village.

How many houses are there in the village?

$\dots\dots\dots$

(Total for Question 2 is 3 marks)

4 There are only blue pens, green pens and red pens in a box.

The ratio of the number of blue pens to the number of green pens is $2 : 5$
The ratio of the number of green pens to the number of red pens is $4 : 1$

There are less than 100 pens in the box.

What is the greatest possible number of red pens in the box?

$\dots\dots\dots$

(Total for Question 4 is 3 marks)

5 Rosie, Matilda and Ibrahim collect stickers.

number of stickers : number of stickers : number of stickers = $4 : 7 : 15$
Rosie has : Matilda has : Ibrahim has

Ibrahim has 24 more stickers than Matilda.

Ibrahim has more stickers than Rosie.
How many more?

$\dots\dots\dots$

(Total for Question 5 is 3 marks)

12 The points A, B, C and D lie in order on a straight line.

$AB : BD = 1 : 5$
 $AC : CD = 7 : 11$

Work out $AB : BC : CD$

$\dots\dots\dots : \dots\dots\dots : \dots\dots\dots$

(Total for Question 12 is 3 marks)

8 The perimeter of a right-angled triangle is 72 cm.
The lengths of its sides are in the ratio $3 : 4 : 5$

Work out the area of the triangle.

$\dots\dots\dots$ cm²

(Total for Question 8 is 4 marks)

- Calculate speed
- Find a missing distance or time
- Use the mass, density, volume formula

- Use the force, pressure, area formula
- Compare speeds in different units of measurement
- Calculate average speed over a multi-stage journey

Key Word	Definition
Time	usually measured in seconds – for metres per second – or hours – for miles per hour or kilometres per hour
Distance	a measure of how far something has travelled, usually m, km or miles
Speed	a measure of how quickly distance is changing per unit of time, $S = D/T$
Rate	the speed at which something is changing
Acceleration	the rate at which speed is changing
Velocity	speed with a direction, positive for forwards and negative for backwards
Mass	a measure of the matter an object contains, usually grams or kilograms
Density	a measure of the mass per unit of volume
Volume	a measure of the capacity – amount of space within – a shape
Force	a push or pull
Pressure	the amount of force applied to an area
Area	a measure of the 2D space within a shape

Careers Focus – Where could this take you?



An **acoustic consultant** focus on how sound is produced, controlled and transmitted. They use density to find materials that insulate the sound and improve its quality.



Curriculum Links - Coherence



Required Knowledge:

- 7.02 Multiplying and dividing
- 8.10 Speed, distance, time
- 8.11 Compound units
- 8.18 Rearranging formulae

Applied to:

- 10H.15 Limits of accuracy
- 11H.05 Distance-time graphs

Links across school:

- Science – mass and density, velocity and equations of motion
- PE – speed in athletics

Key Concepts

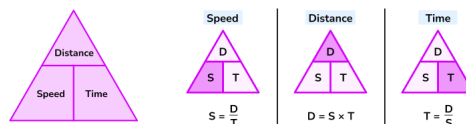
Speed distance time

Speed, distance, time is a topic about the relationship between these three measures as shown by the formula below.

$$\text{Speed} = \text{Distance} \div \text{Time}$$

"Speed equals distance divided by time"

This formula can also be rearranged to calculate distance or calculate time given the other two measures. An easy way to remember the formula and the different rearrangements is to use this speed distance time triangle.



Pressure force area

Pressure, force and area are physical properties.

Area is a measure of the size of space a flat shape takes up. The derived SI unit for area is the square metre (m^2).

Pressure is a compound measure, defined as the force per unit area. The standard unit of pressure is Pascals (Pa) where $1 Pa = 1 N/m^2$

Force is the energy attributed to a movement or physical action. Force is measured in the standard unit Newtons (N).

To calculate either the pressure, force or area of an object, we use the pressure formula:

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

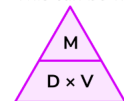
Mass Density Volume

Mass, density and volume are physical properties of objects.

To calculate the mass, density or volume of an object, we use the formula:

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

This can be written as a formula triangle:



where M is the mass, D is the density, and V is the volume of an object.

Concept – what it is

A car is travelling at 40 mph for 45 minutes.

How far has it travelled?

First turn the minutes into hours so that the units match

$$45 \div 60 = 0.75$$

Then multiply the speed by the time to find the distance

$$40 \times 0.75 = 30 \text{ miles}$$

Non-Concept – what it isn't

A car is travelling at 40 mph for 45 minutes.

How far has it travelled?

$$40 \times 45 = 1800 \text{ miles}$$

Not matching the units before calculating

$$40 \times 0.45 = 18 \text{ miles}$$

Converting the minutes into hours incorrectly, thinking it is just a decimal instead of divide by 60.

Standard Examples

John travelled **30 km** in **90 minutes**.

Nadine travelled **52.5 km** in **2.5 hours**.

Who had the greater average speed?

You must show your working.

$$\text{Speed} = \text{distance} \div \text{time}$$

$$90 \text{ minutes} = 1.5 \text{ hours}$$

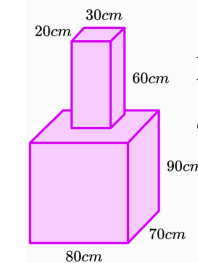
$$\text{John} = 30 \div 1.5 = 20 \text{ km/h}$$

$$\text{Nadine} = 52.5 \div 2.5 = 21 \text{ km/h}$$

Nadine has the greater average speed.

Non-Standard Examples

A sculpture is formed from a cuboid resting on top of another cuboid.



The sculpture is made from granite. The granite has a density of 2.6 g/cm^3 .

Calculate the total mass of the sculpture in tonnes.

$$20 \times 30 \times 60 = 36\,000 \text{ and } 80 \times 70 \times 90 = 504\,000$$

$$36\,000 + 504\,000 = 540\,000$$

$$\text{Mass} = D \times V = 2.6 \times 540\,000 = 1\,404\,000 \text{ g}$$

$$1404000 \text{ g} = 1404 \text{ kg} = 1.404 \text{ tonnes}$$

The learning outcomes for this topic are:

- Calculate speed
- Find a missing distance or time
- Use the mass, density, volume formula

- Use the force, pressure, area formula
- Compare speeds in different units of measurement
- Calculate average speed over a multi-stage journey



Useful Formulae and Hints

Force = pressure \div area
Area = pressure \div force
Pressure = force \times area

Density = mass \div volume
Volume = mass \div density
Mass = density \times volume

Speed = distance \div time
Time = distance \div speed
Distance = speed \times time

Remember that average speed (or combined density) is not as simple as finding the mean of two or more speeds. Instead:

Average speed = total distance \div total time

Combined density = total mass \div total volume

Each individual distance/time/mass/volume needs to be calculated so that they can be totaled and used together in the final calculation.

Additional Resources

MathsWatch: [142](#)

Corbett Maths: Videos [299](#), [384](#), [385](#);
Worksheets [299](#), [384](#), [385](#)

GCSE Questions

The pressure in a tyre is 30 pounds per square inch.
Convert the pressure into kilograms per square centimetre.

Use 1 pound = 0.45 kilograms
and
1 inch = 2.54 centimetres

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

A force of 40 Newtons is applied to an area of 3.2 square metres.

Work out the pressure.

Give the units of your answer.

Liam drives his car.

He drives the first 9 miles in 9 minutes.

He then drives at an average speed of 70 miles per hour for 1 hour 36 minutes.

He finds this information about his car.

Average speed	Miles travelled per gallon
65 miles per hour or less	50
More than 65 miles per hour	40

Use the information to show that his car uses less than 3 gallons of petrol for the drive.

The volume of a medal is 45 cm³
The medal is made from copper and tin.

volume of copper : volume of tin = 22 : 3

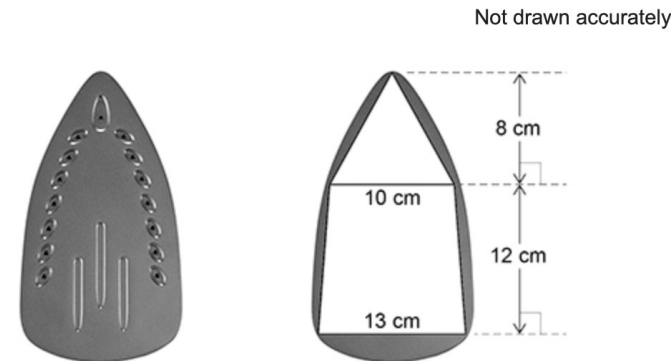
The density of copper is 8.96 g / cm³

The density of tin is 7.31 g / cm³

Work out the mass of the medal.

Ralf has an iron.

He models the base as a triangle joined to a trapezium.



(a) The iron applies a force of 25 newtons (N)

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the pressure using Ralf's model.

Priya and Joe travel the same 16.8 km route.

Priya starts at 9.00 am and walks at a constant speed of 6 km/h

Joe starts at 9.30 am and runs at a constant speed.

Joe overtakes Priya at 10.20 am

At what time does Joe finish the route?

The learning outcomes for this topic are:

- Calculate a percentage of an amount
- Calculate simple interest
- Increase an amount by a percentage

- Decrease an amount by a percentage
- Calculate compound interest
- Find the original amount before a percentage change

Key Word	Definition
Percentage	a proportion where 100 represents a whole
Increase	to grow in size, add
Decrease	to reduce in size, subtract
Interest	a percentage added to a loan or savings account
Depreciate	another word for decrease
Multiplier	a decimal that will find/increase/decrease by a percentage when multiplied by a quantity
Compound	interest system where the interest is added on before the next round of interest is calculated
Simple	interest system where interest is calculated separately and added at the end

Additional Resources



MathsWatch: [86](#), [87](#), [88](#), [89](#), [108](#), [109](#), [110](#), [111](#), [164](#)

Corbett Maths: Videos [234](#), [235](#), [236](#), [236a](#), [237](#), [238](#), [239](#), [240](#); Worksheets [234](#), [235](#), [236](#), [236a](#), [237](#), [238](#), [239](#), [240](#)

Careers Focus – Where could this take you?



Games designers combine their artistic and mathematical skills in their work. Their job entails building prototypes, creating interactive narration and developing a game's mechanics.



Curriculum Links - Coherence



Required Knowledge:

- 7.15 Fractions, decimals and percentages
- 7.17 Calculating percentages
- 8.13 Simple interest

Applied to:

- 10H.05 Similar triangles
- 11H.02 Direct and inverse proportion

Links across school:

- Geography – percentage increase and decrease in temperatures, populations etc
- Science

Key Concepts

Percentage of an Amount

A **percentage of an amount** allows us to calculate a percentage of a given number by either calculating simple percentages such as 10% and 1% and building the percentage up from there, or by using a percentage multiplier.

E.g. Find **21%** of **£500**.

Using simple percentages

100% is the original amount.

10% = £50

1% = £5

21% of £500 = 2 x £50 + £5
= £105

Using percentages multipliers

$$21\% = \frac{21}{100} = 0.21$$

$$21\% \text{ of } £500 = 0.21 \times 500 = £105$$

Percentage Increase

Percentage increase means **adding a given percentage of a value onto the original value**. To do this we can either calculate the given percentage of the value and then add it on to the original value or use a percentage multiplier.

E.g.
Increase £50 by 10%

Add on percentage:	Multiplier:
10% of £50 = £5 £50 + £5 = £55	£50 x 1.1 = £55

Percentage Decrease

Percentage decrease means **subtracting a given percentage of a value from the original value**. To do this we can either calculate the given percentage of the value and then subtract it from the original or use a percentage multiplier.

E.g.
Decrease £50 by 10%

Subtract percentage:	Multiplier:
10% of £50 = £5 £50 - £5 = £45	£50 x 0.9 = £45

Reverse Percentages

Reverse (or inverse) percentages means working backwards to find an original amount, given a percentage of that amount.

E.g.

45% of a number is 36. Find the original number.

$$\begin{array}{ccc}
 & 45\% = 36 & \\
 \div 45 & \downarrow & \div 45 \\
 & 1\% = 0.8 & \\
 \times 100 & \downarrow & \times 100 \\
 & 100\% = 80 &
 \end{array}$$

Percentage Change

When we calculate percentage change, we are calculating by what percentage of its original value something has increased or decreased.

To do this we use the percentage change formula:

$$\text{Percentage change} = \frac{\text{Change}}{\text{Original}} \times 100$$

Compound interest

$$\text{amount of money after } x \text{ years} = \text{amount} \times \text{multiplier}^x$$

- Calculate a percentage of an amount
- Calculate simple interest
- Increase an amount by a percentage

- Decrease an amount by a percentage
- Calculate compound interest
- Find the original amount before a percentage change



Useful Formulae and Hints

$$\text{Percentage change} = \frac{\text{Change}}{\text{Original}}$$

Profit and loss are calculated in the exact same way as percentage change is calculated, the terms are just specific to the context of the question

For repeated percentage change, compound change, we use the formula

$$\text{New} = \text{Original} \times \text{multiplier}^{\text{repeats}}$$

A multiplier is found by adding or subtracting the percentage interest/less to 100% and then converting to a decimal. Generally the number of 'repeats' is the number of years, but it signifies how many times the interest is being added.

For simple interest

$$\text{New} = \text{Original} + \text{interest} \times \text{repeats}$$

When finding an original amount, or when we are given an amount that represents a percentage other than 100, we should consider how to calculate 1% first and then use this to find the original (100%).

GCSE Questions

When you earn money you pay income tax.
The amount you pay depends on how much you earn that year.
You pay
0% on the first £12 500 you earn
20% on the next £37 500 you earn
40% on the next £112 500 you earn.
One year, Kim paid £9260 income tax.
Work out how much she earned that year.

The value of a new car is £18 000
The value of the car decreases by
25% in the first year
12% in each of the next 4 years.
Work out the value of the car after 5 years.

The price of a computer is reduced by 17.5%
The reduced price is £264
By how much is the price reduced?

w is a positive number.
 x is 10% more than w .
 y is 10% less than x .
Which statement is true?
Tick **one** box.

$w < x$ and $w < y$

$w < x$ and $w = y$

$x > y$ and $w > y$

$x > y$ and $w = y$

Work out 320 as a percentage of 80
Circle your answer.

25% 75% 300% 400%

(Total 1 mark)

Circle the calculation that decreases 250 by 15%

$250 \div 1.15$ 250×0.15 250×0.85 $250 \div 0.85$

(Total 1 mark)

Mirek invests £6000 at a compound interest rate of 1.5% per year.
He wants to earn more than £1000 interest.
Work out the **least** time, in whole years, that this will take.

- Find missing angles on a line or around a point
- Find missing angles in a triangle
- Calculate missing angles in a quadrilateral
- Use isosceles triangle rules
- Use rules for special quadrilaterals
- Find angles in multi-step problems

Key Word	Definition
Line	a straight line where all angles meet at a single point; an angle sum of 180 degrees
Point	a single point of intersection of multiple lines; an angle sum of 360 degrees
Triangle	a 2D shape with three sides; an angle sum of 180 degrees
Isosceles	a triangle with two sides that are equal and two angles that are equal
Equilateral	a triangle with three sides that are equal and three angles that are equal; all angles are 60 degrees
Quadrilateral	a 2D shape with four sides; an angle sum of 360 degrees
Sum	a total, an addition

Additional Resources

MathsWatch: [45](#), [46a](#), [46b](#), [121](#), [122](#)

Corbett Maths: Videos [29](#), [30](#), [31](#), [33](#), [35](#), [37](#), [39](#); Worksheets [29](#), [30/5/9](#), [31](#), [33](#), [37](#)

Careers Focus – Where could this take you?

A financial trader buys and sells shares, bonds and assets for investors, including banks and their clients. You set prices and execute trades seeking to maximise profits and minimise risk.

Curriculum Links - Coherence

Required Knowledge:

- 7.01 Adding and subtracting
- 7.20 Measuring and drawing angles
- 7.22 Angles in a triangle

Applied to:

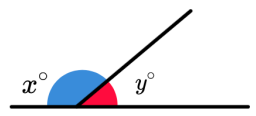
- 9H.15 Angles in a polygon
- 9H.16 Angles in parallel lines
- 11H.01 Circle theorems

Links across school:

- Geography – angles in a pie chart

Key Concepts

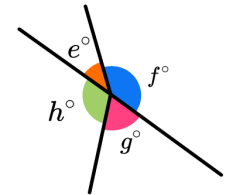
Angles on a straight line



$$x + y = 180^\circ$$

(The sum of angles on a straight line equals 180°)

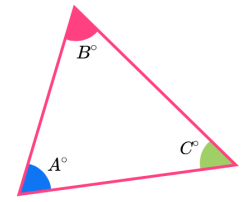
Angles around a point



$$e + f + g + h = 360^\circ$$

(The sum of angles around a point equals 360°)

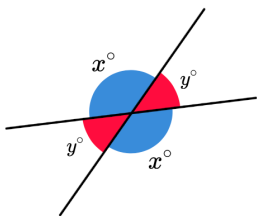
Angles in a triangle



$$A + B + C = 180^\circ$$

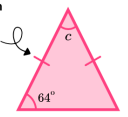
(The sum of angles in a triangle equals 180°)

Vertically Opposite angles



(Vertically opposite angles are the same size)

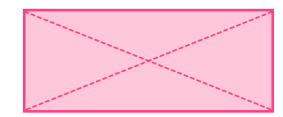
These lines mean that these two sides are equal.



isosceles triangle

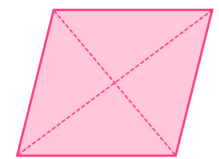
When two sides of a triangle are equal, the angles at the ends of those sides will also be equal.

Rectangle:



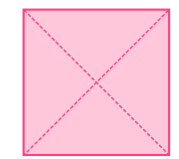
- All the properties of a parallelogram and
- All edges meet at right angles

Rhombus:



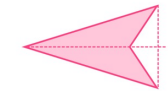
- All properties of a parallelogram and
- All sides are equal in length
- The diagonals form 4 congruent triangles

Square:



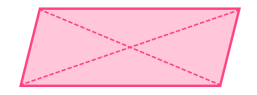
- All the properties of a rectangle and a rhombus and
- The diagonals form 4 isosceles triangles

Arrowhead:



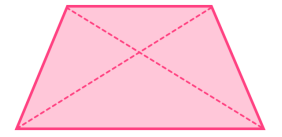
- Diagonals bisect at 90 degrees external to the shape (if symmetrical)
- One pair of congruent angles (if symmetrical)
- One reflex interior angle

Parallelogram:



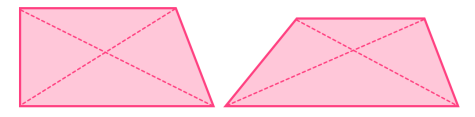
- Opposite angles are the same (congruent)
- Opposite sides are the same
- Two pairs of supplementary angles (co-interior)
- Vertically opposite angles at the intersection of the diagonals

Isosceles trapezium:



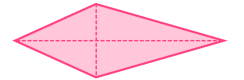
- All properties of a trapezium and
- Two pairs of congruent angles

Trapezium:



- Angles at the intersection of the diagonals are vertically opposite.
- One pair of parallel sides, therefore two pairs of supplementary angles (co-interior)

Kite:



- The diagonals are perpendicular lines
- One pair of opposite angles are congruent



The learning outcomes for this topic are:

- Find missing angles on a line or around a point
- Find missing angles in a triangle
- Calculate missing angles in a quadrilateral
- Use isosceles triangle rules
- Use rules for special quadrilaterals
- Find angles in multi-step problems



Useful Formulae and Hints

Angles on a straight line add to 180 degrees

Angles around a point add to 360 degrees

Angles in a triangle add to 180 degrees

Angles in a quadrilateral add to 360 degrees

The base angles of an isosceles triangle are equal (remember that this does not mean the angles at the bottom of the diagram, it means the two angles at the bases of the equal sides)

For angles to be on a **straight line** that must **meet at a single point**. Different angles at different points along the line will have **separate 180 sums**.

A **small square** in a corner is the symbol that denotes a **right angle** (90 degrees)

GCSE Questions

AB is a straight line.

Not drawn accurately

Work out the size of angle x .

Here is a **sketch** of a quadrilateral.

All lengths are in centimetres.

Not drawn accurately

Tick **one** box for each statement.

	True	May be true	Not true
The quadrilateral is a rectangle			
The quadrilateral is a parallelogram			
The quadrilateral is a rhombus			
The quadrilateral is a kite			

(Total 3 marks)

Here is a quadrilateral.

Not drawn accurately

$a = 90^\circ$ and $a : b = 5 : 3$

$x : y = 1 : 3$

Show that $b = x$

Not drawn accurately

Work out the size of angle x .

The learning outcomes for this topic are:

- Calculate the exterior angle of a regular polygon
- Find an interior or exterior angle given the other
- Find a missing angle inside an irregular polygon

- Calculate the number of sides of a regular polygon from an exterior angle
- Solve problems with joined polygons
- Use an exterior angle to check whether a shape is regular

Key Word	Definition
Exterior	the angle between the side of a shape and an extended side; $360 \div \text{sides}$
Interior	the angles inside the polygon
Angle sum	the total of all the interior angles of the polygon
Polygon	a 2D shape with straight edges
Regular	a polygon where all the sides are the same length and all the angles are equal
Irregular	a polygon that is not regular, not all of the sides are equal and not all of the angles are equal


Additional Resources

MathsWatch: [123](#)

Corbett Maths: Videos [32](#) ; Worksheets [32](#)

Careers Focus – Where could this take you?

Insurance underwriters decide if applications for insurance cover should be accepted and, if so, what the terms and conditions should be. An insurance writer assesses the risk of insuring a person or company by working closely with actuaries, brokers and risk and claims managers.



Curriculum Links - Coherence

Required Knowledge:

- 7.01 Adding and subtracting
- 7.20 Measuring and drawing angles
- 7.22 Angles in a triangle
- 8.19 Interior and exterior angles

Applied to:

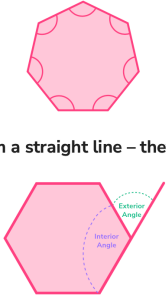
- 9H.16 Angles in parallel lines
- 11H.01 Circle theorems

Links across school:

- Art – angles in shapes

Key Concepts

Interior angles are the angles inside a shape. They are the angles within a polygon made by two sides:



Interior and exterior angles form a straight line – they add to 180° :

Interior Angles of Polygons

Sum of Interior Angles = $(n - 2) \times 180$


'n' is the number of sides the polygon has

E.g. What is the sum of the interior angles of 7 sided shape?

$n = 7$

Sum of Interior Angles = $(7 - 2) \times 180^\circ$

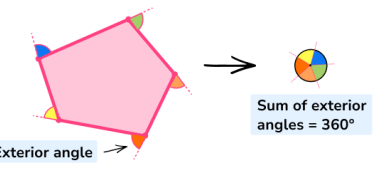
$= 900^\circ$



Exterior Angles of Polygons

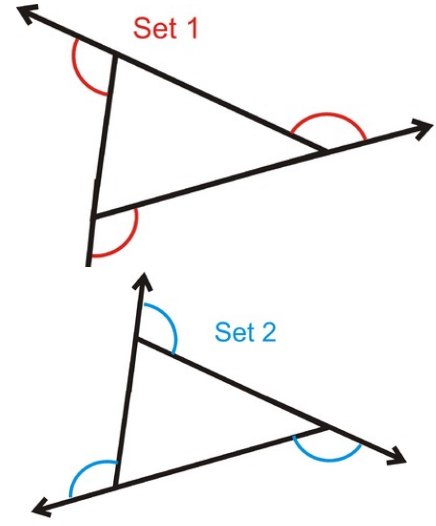
Exterior angles are angles between a polygon and the extended line from the vertex of the polygon.

Sum of Exterior Angles of a Polygon = 360°



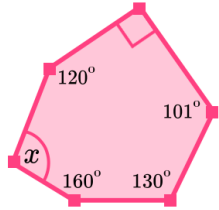
Sum of exterior angles = 360°

Concept – what it is



Standard Examples

The diagram shows a polygon. Find the size of angle x .



Sum of interior angles = $(n - 2) \times 180^\circ$

Sum of interior angles for a hexagon = $(6 - 2) \times 180^\circ$

Sum of interior angles for a hexagon = 720°

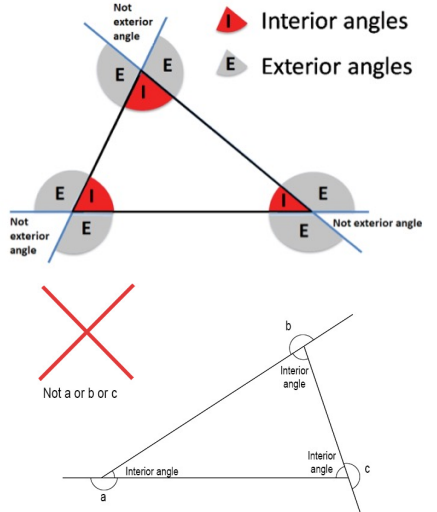
$$120 + 90 + 101 + 130 + 160 + x = 720$$

$$601 + x = 720$$

$$x = 119$$

The size of angle is 119° .

Non-Concept – what it isn't



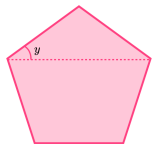
Interior angles

Exterior angles

Not a or b or c

Non-Standard Examples

Shown is a regular pentagon. Find y .



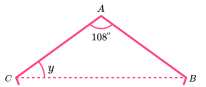
Angle y is equal to 36° .

Sum of interior angles = $(n - 2) \times 180^\circ$

Sum of interior angles for a decagon = $(5 - 2) \times 180^\circ$

Sum of interior angles for a decagon = 540°

As the polygon is regular you can find the size of one interior angle by:
 $540^\circ \div 5 = 108$



As the polygon is regular $AC = AB$

Therefore ABC is an **isosceles** triangle where angles ACB and ABC are equal to one another and are therefore both y .

We know that the interior angles of a triangle add to 180° .

The learning outcomes for this topic are:

- Calculate the exterior angle of a regular polygon
- Find an interior or exterior angle given the other
- Find a missing angle inside an irregular polygon

- Calculate the number of sides of a regular polygon from an exterior angle
- Solve problems with joined polygons
- Use an exterior angle to check whether a shape is regular



Useful Formulae and Hints

The sum of the interior angles of any regular polygon =

$$180 \times (\text{sides} - 2)$$

An individual interior angle of a regular polygon =

$$180 \times (\text{sides} - 2) \div \text{sides}$$

The sum of the exterior angles for any regular polygon is 360 degrees

A single exterior angle of a regular polygon =

$$360 \div \text{sides}$$

An interior and exterior angle form a straight line, so sum to 180 degrees

$$\text{Interior angle} + \text{exterior angle} = 180$$

An exterior angle is formed between an edge and the line formed by extending an adjacent edge. It is **NOT** the angle on the outside of the shape at a given corner.

GCSE Questions

This hexagon has two lines of symmetry.

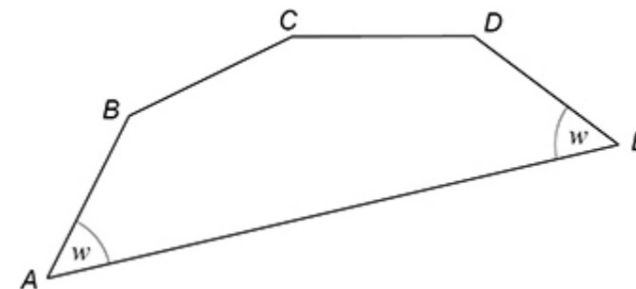
Not drawn accurately



Work out the size of angle y .

AB , BC , CD and DE are four of the sides of a regular decagon.

Not drawn accurately



Work out the size of angle w .

Part of a regular polygon with 15 sides is shown.

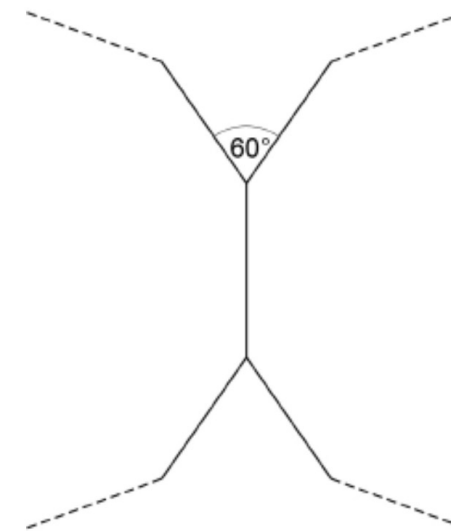
Not drawn accurately



Work out the size of an **interior** angle.

Two congruent regular polygons are joined together.

Not drawn accurately



Work out the number of sides on each polygon.

Our students will:

- read easily, fluently and with good understanding
- develop the habit of reading widely and often, for both pleasure and information
- acquire a wide vocabulary, an understanding of grammar and knowledge of linguistic conventions for reading, writing and spoken language
- appreciate our rich and varied literary heritage
- write clearly, accurately and coherently, adapting their language and style in and for a range of contexts, purposes and audiences
- use discussion in order to learn; they should be able to elaborate and explain clearly their understanding and ideas
- are competent in the arts of speaking and listening, making formal presentations, demonstrating to others and participating in debate.

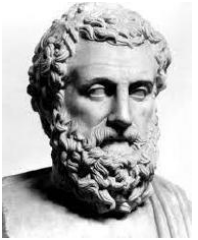
The aims of the sequence of learning are to ensure that all students:

- Present an independently researched and written speech/presentation to an audience in a formal setting
- Listen and respond to questions, from the audience, appropriately and in detail.
- Consider the use and effect of language choices - Standard English, persuasion, tone and voice

Keyword	Definition
Rhetoric	Effective or persuasive writing or speaking.
Anaphora	Starting each sentence with the same words.
Antithesis	Direct opposites.
Injustice	If something is unfair
Analogy	A comparison between one thing and another, typically for the purpose of explanation or clarification.
Imperatives	A verb that is a command.
Direct address	Use of a pronoun (you) to address the audience.
Hyperbole	Exaggeration to emphasise a point or idea.
Metaphor	A figure of speech that describes an object or action in a way that isn't literally true but helps explain an idea or make a comparison.
Simile	When you compare something to something else using the words 'like' or 'as'.
Superlatives	An exaggerated or hyperbolic expression of praise e.g., biggest, fastest

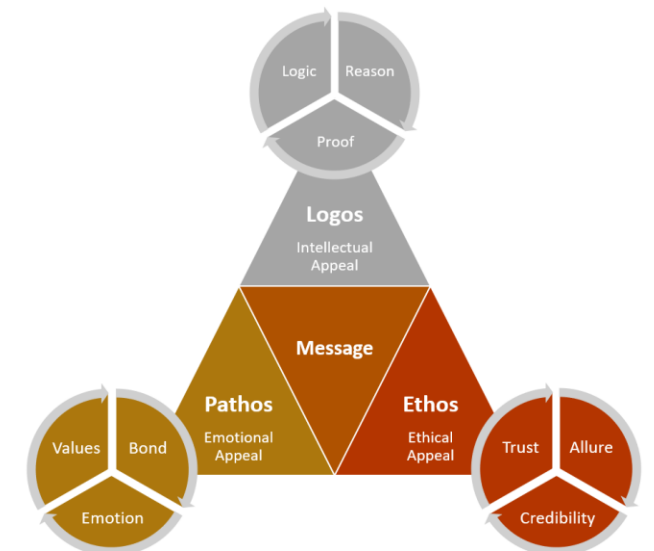
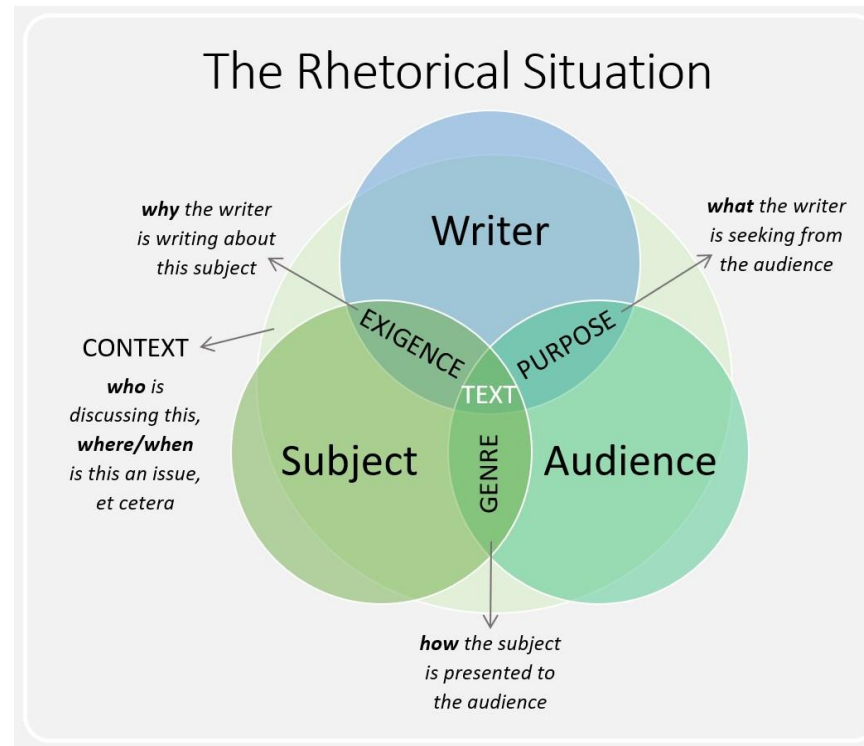
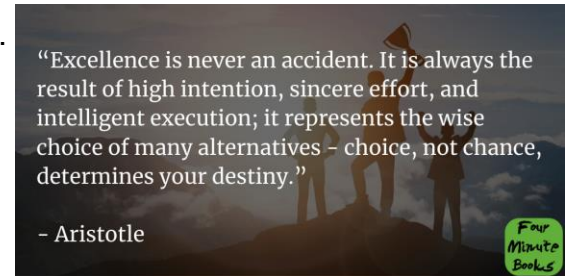
Key Concepts

Aristotle's Treatise of Rhetoric: Greek philosopher Aristotle stated that there are three types of persuasive speech – forensic/judicial rhetoric, demonstrative rhetoric and deliberative rhetoric and he saw these features as underpinning all good persuasive language.




Modes of Persuasion

- **Ethos:** is a way of convincing your audience of your credibility as a writer. Some credibility can be, in a way, built-in.
- **Pathos:** most simply, pathos is the appeal to our human emotions.
- **Logos:** logos is the appeal to our logical side.



- Present an independently researched and written speech/presentation to an audience in a formal setting
- Listen and respond to questions, from the audience, appropriately and in detail.
- Consider the use and effect of language choices - Standard English, persuasion, tone and voice

Retrieval Practice 	
Questions	Answers
What is an Analogy?	Using a different process to metaphorically explain something. For example: using the analogy of football training to explain how you need to practise to get better at something
What is Syllogism?	Using two or more facts to support the clear conclusion that comes after them.
How are personal pronouns used?	Words used to replace nouns that refer to people. Used in rhetoric to develop a relationship with the audience (especially I, you and we).
What is an anecdote?	A short story/experience used to explain an example.
What is alliteration?	Repeating the same sound at the start of multiple words.
What are facts used for?	True information used to prove ideas.
What is giving your 'opinion'?	What people think or feel about a topic.
How are rhetorical questions used?	Asking a question but not expecting your audience to answer.
Explain what emotive language is.	Words, phrases and images used to make an audience feel emotions (like guilt or sympathy).
What are statistics?	Numerical figures/information used to support ideas
Explain a tricolon	Use of a list of three, or repetition of something three times, to emphasise a point.

Career Focus - Where could this take you?



You need to be a confident speaker when arguing a case in court, negotiating settlements and explaining complex information to clients. You'll have to use persuasive, clear and succinct language. Public speaking is also required in the role of a barrister. To hone this skill while at university, volunteer as the spokesperson in group activities or get involved in debate teams.

Challenge Activities

1. Research who Martin Luther King was and design a fact file on him.
2. Watch the following clip: ['Learn to Analyze Martin Luther King Jr.s Speech by breaking down the text into shapes'](#) and then analyse one or more of the speeches from the additional resources section and analyse it in the form of writing or make a video clip.
3. Watch the following clip: ['Rhetorical Analysis of MLK's Speeches'](#) in order to appreciate how important it is to research your topic for your speech before writing it. Now, research your topic choice and when crafting your speech, see how many rhetorical devices you can include.

Topic Links

This topic links to:

- Drama – performing and confidence
- MFL – preparation for GCSE Speaking Test
- RE – Rev. Martin Luther King preaching

Additional Resources

To further practise and develop your knowledge see:

- Century Tech – writing techniques for non-fiction writing
- YouTube – video – [Malala](#), [Winston Churchill](#), [Barack Obama](#)



Our students will:

- develop **scientific knowledge and conceptual understanding** through the specific disciplines of biology, chemistry and physics
- develop understanding of the **nature, processes and methods of science** through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the **uses and implications** of science, today and for the future.



- The aims of the sequence of learning are to ensure that all students:
- describe the different types of bonding
 - explain how bonding affects the structure and properties of substances

Keyword	Definition
Metal	Element that loses electrons to form positive ions
Non-metal	Element that gains electrons to form negative ions
Ion	An atom that has lost or gained electrons and now has a charge
Ionic bond	A bond formed from the electrostatic attraction between ions
Electrostatic	Strong force between positive and negative ions
Covalent bond	A bond between non-metals where electrons are shared
Molecule	A substance made from atoms bonded together
Intermolecular force	Weak force of attraction between simple molecules
Giant lattice	A 3D structure of many atoms/ions bonded together
Metallic bond	A bond between metals where positive ions are surrounded by a sea of delocalised electrons
Delocalised electron	An electron that is no longer connected to a single atom or bond.
Polymer	Long chain molecules made up of repeating units called monomers.

Covalent Bonding

A covalent bond forms when two non-metal **atoms** share a pair of **electrons**. The electrons involved are in the outer shells of the atoms. An atom that shares one or more of its electrons will complete its outer shell. Covalent bonds are **strong** – a lot of energy is needed to break them.

Substances with covalent bonds often form **molecules** with low melting and boiling points, such as hydrogen and water. These substances have strong covalent bonds **within the molecules (between the atoms)**, but weak intermolecular forces **between the molecules**.

Giant Covalent

Giant covalent structures contain very many **atoms**, each joined to adjacent atoms by **covalent bonds**. The atoms are usually arranged into giant regular **lattices** – extremely strong structures because of the many bonds involved.

The graphic shows the molecular structure of **graphite** and **diamond** (two **allotropes** of carbon).

Very high melting points – this is because a lot of strong covalent bonds must be broken.

Variable electrical conductivity – diamond does not **conduct** electricity, whereas graphite contains free **electrons** so it does conduct electricity.

Ionic Bonding

When metals react with non-metals, **electrons** are transferred from the metal atoms to the non-metal atoms, forming **ions**. The resulting compound is called an **ionic compound**.

In all of these reactions, the metal atoms give electrons to the non-metal atoms. The **metal atoms become positive ions** and the **non-metal atoms become negative ions**.

There is a strong **electrostatic** force of attraction between these oppositely charged ions – this is called an **ionic bond**.

Metallic Bonding

Metals consist of giant structures of **atoms** arranged in a regular pattern.

The **electrons** from the outer shells of the metal atoms are **delocalised**, and are free to move through the whole structure. This sharing of delocalised electrons results in strong **metallic bonding**.

- they are electrical **conductors** because their delocalised electrons carry electrical charge through the metal
- they are good conductors of thermal energy because their delocalised electrons transfer energy
- they have high **melting points** and **boiling points**



Retrieval Practice

Questions	Answers
What is an ionic bond?	The force of attraction between positive and negative ions.
What is a covalent bond?	A shared pair of electrons between atoms in a molecule.
What is a metallic bond?	A strong attraction between positive metal ions and negative delocalised electrons.
Why do atoms form bonds?	To gain a full outer shell and become more stable.
Why do ionic substances have high melting points?	There are strong electrostatic forces between oppositely charged ions - a lot of energy is needed to overcome these forces.
When can ionic substances conduct electricity?	When the ionic substance is molten (liquid) or dissolved so the ions are free to move and carry a charge.
Why do simple covalent substances have low melting points?	Low melting and boiling points - forces of attraction between the molecules (intermolecular forces) are very weak - not a lot of energy is needed to overcome them.
Why are giant covalent substances strong?	The structure is tightly held together by strong covalent bonds.
Why can metals conduct electricity?	They are good conductors of electricity because they have delocalised electrons that can carry a charge.
Give a limitation of using a cross and dot diagram to show bonding	This does not show the 3D shape of the molecule.
What is a fullerene and what are their uses?	Hollow shaped molecules that can be used as a drug delivery system, catalyst or as lubricants.
What is a nanotube and what are their properties?	They are cylindrical fullerenes with high tensile strength and conduct electricity.



Career Focus - Where could this take you?



I am a materials scientist. I study and analyse the chemical properties and structure of a range of man-made and natural substances. We can produce brand new products and applications that make technology more advanced. Examples include tooth filings, telescope lenses, biodegradable plastics and much more! We are usually based in a laboratory where we spend our days experimenting with lots of materials. We need to be good analysers and have a good understanding of chemistry.



Challenge Activities

1. Make flashcards for the definitions and retrieval practice questions.
2. Make a mindmap for this topic. Remember to include keywords and the links between information.
3. Research the development of nanoscience and turn the information into a leaflet.
4. Research how graphene and other carbon compounds have revolutionised technology.
5. Find out more about material scientists and what they do. What qualifications would you need for this career? What is the salary?
6. Construct a fact file about a famous historical scientist that helped us to understand more about bonding.

Topic Links



This topic links to other science topics such as:

- Atomic Structure
- Energy
- States of Matter

We will also be practising how to:

- Analyse data to identify substances
- Compare bonding in different types of materials
- Define key words

Additional Resources



To further practise and develop your knowledge see:

- Educake - <https://www.educake.co.uk/>
- BBC Bitesize - <https://www.bbc.co.uk/bitesize/topics/z33rrwx>
- YouTube Cognito - https://www.youtube.com/watch?v=5l_1jRGSR9E&list=RDCMUCaGF4KXZrjou9kOx6ezG2w&start_radio=1


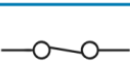

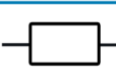








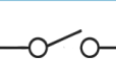

The aims of the sequence of learning are to ensure that all students:

- describe current, potential difference and resistance
- explain how components work in a circuit

- compare series and parallel circuits
- Explain how the national grid works

Keyword	Definition
Ammeter	For measuring current (A)
Cell/Battery	Supplies energy to the circuit
Conductor	Substances that allow electricity to flow through them freely.
Current	The flow of electrical charge
Electrons	Move through the circuit (current)
Potential difference (voltage)	The push of electrical charge
Series circuit	A circuit where the current flows through all the components
Parallel circuit	A circuit with branches so the current divides
Resistance	Slows down the flow of electricity
Voltmeter	For measuring PD/Voltage (V)
LDR	Light dependent resistor
Thermistor	Temperature dependent resistor
Alternating Current	Current that flows back and forth
Direct Current	Current that flows in one direction
National Grid	Transfers electricity from power stations to buildings

Circuit Symbols

cell		closed switch		fuse	
resistor		ammeter		LDR	
battery		voltmeter		LED	
variable resistor		bulb		thermistor	
open switch		diode			

Calculating Resistance

$$\text{voltage (V)} = \text{current (A)} \times \text{resistance (\Omega)} \quad V = IR$$

In a series circuit

Current When resistors are connected in series, the current through each resistor is the same.

Voltage V (or potential difference) When resistors are connected in series, the total of all the voltages (sometimes referred to as potential difference) across each component is equal to the voltage across the power supply.

Resistance The total resistance R of two or more **resistors** connected in series is the sum of the individual resistances of the resistors.

In a parallel circuit

Current When resistors are connected in parallel, the current from the power supply is equal to the sum of the currents through each branch of the circuit.

Voltage In a parallel circuit, the voltage across each branch of the circuit equals the supply voltage.

Resistance When resistors are connected in parallel, total resistance, R , is calculated using the equation:

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}$$

Equations

Equations

Charge:

$$Q = It$$

Potential difference:

$$V = IR$$

Energy transferred:

$$E = Pt$$

Energy transferred:

$$E = QV$$

Power:

$$P = VI$$

Power:

$$P = I^2R$$

Maths

$$1\text{kW} = 1000\text{W}$$

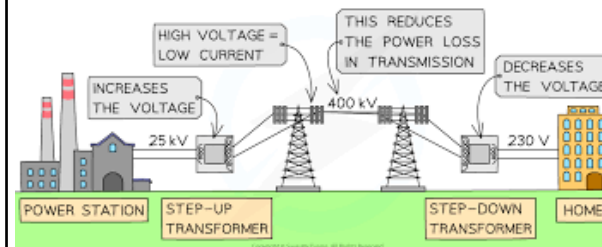
$$0.5\text{kW} = 500\text{W}$$

$$50\,000\text{W} = 50\text{kW}$$

The National Grid

The National Grid is a system of **cables** and **transformers**. They transfer electrical power from the power station to where it is needed. Power stations are able to change the amount of electricity that is produced to meet the demands.

For example, more energy may be needed in the evenings when people come home from work or school. Electricity is transferred at a low current, but a high voltage so less energy is being lost as it travels through the cables.





- describe current, potential difference and resistance
- explain how components work in a circuit

- compare series and parallel circuits
- Explain how the national grid works



Retrieval Practice

Questions	Answers
What is a circuit?	A network of components connected by wires.
What is a circuit symbol?	A simple picture to represent a component.
What is an electrical conductor?	A material that allows current to flow through it.
Why do metals conduct electricity?	Because they have free delocalised electrons which can move.
What is the symbol for charge?	Q
What is the unit for charge?	Coulombs C
What is the name of the force that causes charges to be attracted or repelled?	Electrostatic force
What formula relates charge, current and time?	$Q=It$
What is current?	How much charge passes a certain point each second.
What is the symbol for current?	I (amps)
What is an ammeter?	The component that measures current in a circuit.
What is a series circuit?	A circuit made from only 1 loop.
What is a parallel circuit?	A circuit made from multiple loops and junctions
How does current behave in a series circuit?	It is the same throughout the circuit.
How does current behave in a parallel circuit?	It splits at junctions so is different in different loops.
What is potential difference?	The amount of energy that each coulomb of charge carries.

Career Focus - Where could this take you?



I am an electrician. I fit, service and repair electrical machines, wires and equipment. I have a good understanding of circuits and how electricity works, as well as being a good problem solver and skilled with my hands. I can work in homes and businesses as well as other locations such as streets and shopping centres. There are several available career paths for electricians including apprenticeships and college courses. Career progression can lead onto designing, project management or running your own business.

Challenge Activities



1. Make flashcards for the definitions and retrieval practice questions.
2. Make a mindmap for this topic. Remember to include keywords and the links between information.
3. Research series and parallel circuits and turn the information into a leaflet.
4. Research resistance in a circuit and how diodes work.
5. Find out more about electricians and what they do. What qualifications would you need for this career? What is the salary?
6. Construct a fact file about a famous historical scientist that helped us to understand more about electricity.

Topic Links



This topic links to other science topics such as:

- Organisation – the heart
- Bonding
- Forces

We will also be practising how to:

- Conduct investigations into resistance
- Rearranging equations
- Constructing graphs using data
- Evaluating practical work

Additional Resources



To further practise and develop your knowledge see:

- Educake - <https://www.educake.co.uk/>
- BBC Bitesize – <https://www.bbc.co.uk/bitesize/guides/zgvq4qt/revision/1>
- YouTube Cognito - <https://www.youtube.com/watch?v=R3hdaLpq2AA>

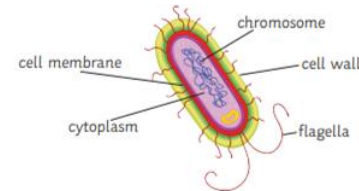
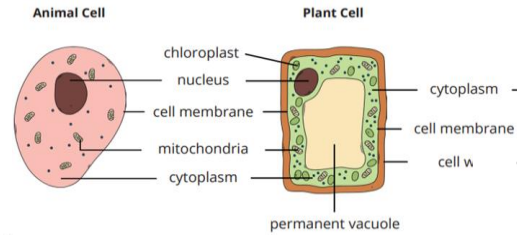
The aims of the sequence of learning are to ensure that all students are able:

- to describe the structure of an animal and plant cells including identifying organelles and their functions
- to explain how animal and plant cells are specialised cells
- to describe how use a microscope to observe plants cells
- to describe the 3 types of cell transport (diffusion, active transport and osmosis)

Keyword	Definition
Cell	Basic unit of life.
Cell membrane	Controls the movement of substances in and out of the cell.
Nucleus	Contains genetic information and controls the activity of the cell
Cytoplasm	Jelly-like substance where chemical reactions take place.
Mitochondria	Where respirations takes place. Releases energy.
Chloroplasts	Contains the green pigment chlorophyll, the site of photosynthesis.
Vacuole	Contains cell sap and supports the cell.
Cell wall	Provides support to plant cells.
Specialised cell	Cells designed to carry out a particular role in the body.
Diffusion	The movement of particles from an area of high concentration to an area of low concentration.
Active transport	The movement of particles from an area of low concentration to an area of high concentration.
Osmosis	The movement of water from an area of high concentration to an area of low concentration, through a partially permeable membrane.

Cell structure

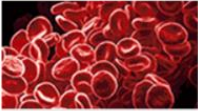
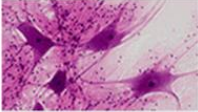

Cells of animals, plants and fungi are called **eukaryotic cells**. They contain membrane bound organelles such as a nucleus and mitochondria.



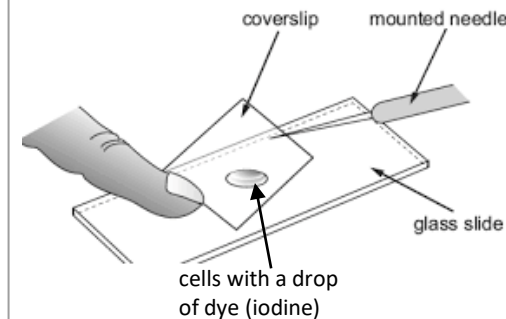
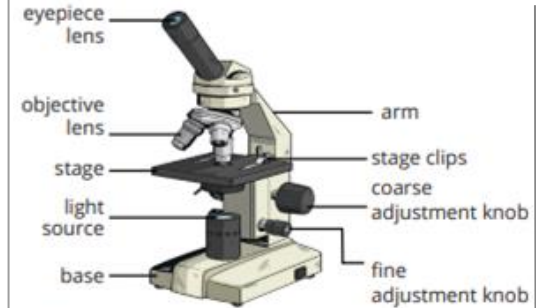
Bacterial cells are called **prokaryotic cells**. Bacteria are made of single cells. Their cell structure is simpler than the cells of eukaryotes and cells are smaller, most are $0.2\ \mu\text{m} - 2.0\ \mu\text{m}$. These cells do not contain membrane bound **organelles** such as a nucleus and mitochondria.

Specialised Cells

Humans are multicellular. That means we are made of lots of cells, not just one cell. The cells in many multicellular animals and plants are specialised, so that they can share out the processes of life. They work together like a team to support the different processes in an organism.

Image	Type of animal cell	Function	Special features
	Red blood cells	To carry oxygen	<ul style="list-style-type: none"> • Large surface area, for oxygen to pass through • Contains haemoglobin, which joins with oxygen • Contains no nucleus
	Nerve cells	To carry nerve impulses to different parts of the body	<ul style="list-style-type: none"> • Long • Connections at each end • Can carry electrical signals
	Root hair cell	To absorb water and minerals	<ul style="list-style-type: none"> • Large surface area

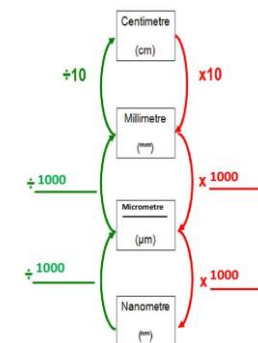
Using a light microscope



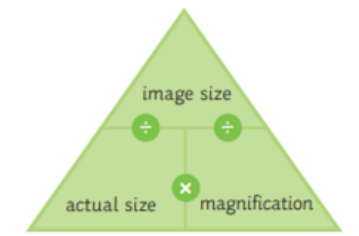
Method:

- Prepare a slide. Use dye to stain.
- Plug in microscope and turn on light.
- Place slide on stage and hold with clips.
- On the lowest magnification objective lens move the stage as close to the lens as possible
- Focus the image using the focusing wheel.
- Then turn up the magnification by turning to a higher power objective lens.
- Draw a labelled diagram of sample.

Math skills



Magnification calculation:
Magnification = image size / actual size

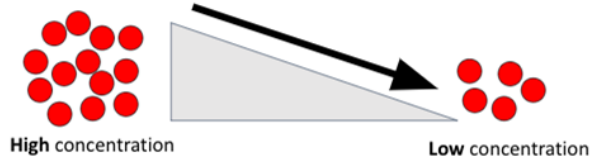


The aims of the sequence of learning are to ensure that all students are able:

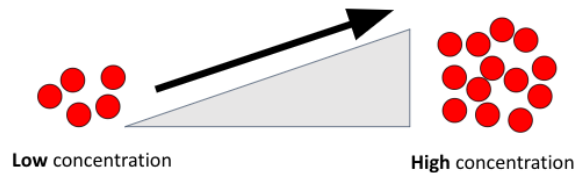
- to describe the structure of an animal and plant cells including identifying organelles and their functions
- to explain how animal and plant cells are specialised cells
- to describe how use a microscope to observe plants cells
- to describe the 3 types of cell transport (diffusion, active transport and osmosis)

Cell transport

Diffusion
(does not require energy)



Active transport
(Requires energy from respiration)



Cell division

A type of cell division called mitosis ensures that when a cell divides each new cell produced has the same genetic information.

DNA exists as a double helix in a cell's nucleus within structures called **chromosomes**. In a human cell there are 24 pairs of chromosomes (total of 48 chromosomes). Each section of a chromosome contains the code to produce a particular protein is called a **gene**.

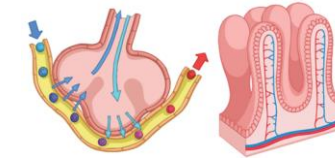


Cells divide via **the cell cycle** and **mitosis** when

- an organism grows
- an organism becomes damaged and needs to produce new cells

It is essential that any new cells produced contain genetic information that is identical to the parent cell.

Exchange in animals and plants

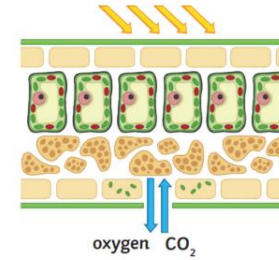


Gas exchange: Lungs

Alveoli have large surface area, short diffusion pathway and good blood supply.

Food absorption: Small intestine

Millions of villi increase surface area for food to be absorbed. They have a short diffusion pathway and good blood supply.



Gas exchange: Leaves

Carbon dioxide enters and oxygen exits leaves through stomata. Guard cells open and close to help control water loss. The surface of the leaf is flattened to increase the surface area for more gas exchange by diffusion.

Cell transport - Osmosis

Osmosis is the **diffusion** of water molecules, from a region where the water molecules are in higher concentration, to a region where they are in lower concentration, through a **partially permeable** membrane.

A dilute **solution** contains a high concentration of water **molecules**, while a concentrated solution contains a low concentration of water molecules.

Required practical - the effect of osmosis on plant tissue

Investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue.

- Independent variable – concentration
- Dependent variable – change in mass
- Control variables – volume of solution, temperature, time and surface area

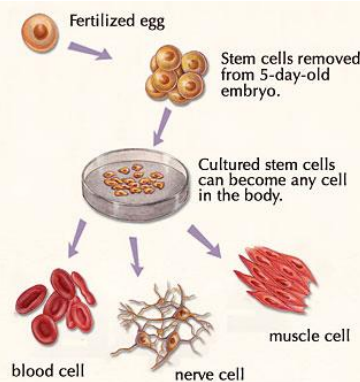
The potato in the pure water will gain mass



The potato in the sugar solution will lose mass

Stem cells

Stem cells are cells that have not undergone **differentiation**. A cell which has not yet become **specialised** is called undifferentiated.



Keyword

Definition

DNA

The genetic information found in the nucleus. The DNA exists as a double helix inside structures known as chromosomes.

Chromosomes

Humans have 24 pairs of chromosomes made up of DNA and sub-divided into genes.

Gene

A section of a chromosome that codes for a protein.

Cell cycle

The stages that a growing and dividing cell goes through. Stage 1 - cell grows, organelles and chromosomes copied. Stage 2 - Mitosis (nucleus divides). Stage 3 - cell divides to form 2 identical daughter cells

Mitosis

Cell division for growth and repair that produces identical daughter cells

Embryonic stem cells

Stem cells that develop from a fertilised egg. Can differentiate into ANY cell.


Adult stem cell

Stem cells found in specific locations that can only differentiate into a few different types of cells

- to describe the structure of an animal and plant cells including identifying organelles and their functions
- to explain how animal and plant cells are specialised cells
- to describe how use a microscope to observe plants cells
- to describe the 3 types of cell transport (diffusion, active transport and osmosis)


Retrieval Practice	
Questions	Answers
What is an organelle?	Specialised structures that perform various jobs inside cells.
What is the function of the nucleus?	Contains genetic information (DNA) that controls cell activities.
What is the function of the cell membrane?	To control what enters and leaves the cell.
What is the function of the cytoplasm?	Where chemical reactions take place.
What is the function of mitochondria?	The site of respiration - where energy is released.
What is the function of the cell wall?	To strengthen and support plant cells.
What is the function of chloroplasts?	Contains chlorophyll to absorb light energy for photosynthesis.
How is a red blood cell adapted to its function?	No nucleus, large surface area and contains haemoglobin to allow the red blood cell to transport oxygen around the body.
How is a root hair cell adapted to its function?	Large surface area for absorption of water and minerals, lots of mitochondria for active transport of minerals.
How is diffusion different to active transport?	In diffusion, particles move from a high to low concentration and it doesn't require energy. In active transport, particles move from a low to high concentration and it does require energy.
What happens when a plant cell is put into different concentrations of sugar solution?	In low sugar concentrations and pure water the plant cells increase in mass as water moves in via osmosis. The opposite happens in high sugar concentrations.
Describe the cell cycle and mitosis.	Stage 1 - DNA/organelles are copied. Stage 2 - Mitosis (nucleus divides). Stage 3 - cell divides into 2 identical cells
What is the difference between embryonic and adult stem cells?	Embryonic cells can differentiate into ANY cell whereas adult stem cells can only differentiate into a few different cells.

Career Focus - Where could this take you?





I am a pathologist. This is a medical healthcare provider who examines bodies and body tissues, I am also responsible for performing lab tests. I help other healthcare providers reach diagnoses and I play an important role in the treatment team. I could work in an NHS or private hospital or in a laboratory. My job is exciting and fulfilling because I get to use my problem solving and analytical skills to come up with a better solution to fight viruses, infections, and other life-threatening conditions.

Challenge Activities



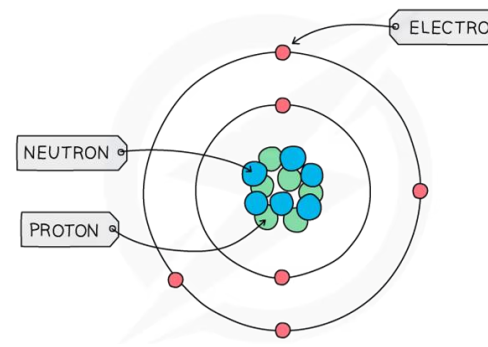
1. Make flashcards for the definitions and retrieval practice questions.
2. Make a mindmap for this topic. Remember to include keywords and the links between information.
3. Research specialised cells found in both animals and plants and turn the information into a leaflet.
4. Research how a bacterial cell is different to a plant or animal cell.
5. Find out more about pathologists and what they do. What qualifications would you need for this career? What current research is being done? What is the salary?
6. Construct a fact file about a famous historical scientist that helped us to understand more about cells.

Topic Links	Additional Resources
 <p>This topic links to other science topics such as</p> <ul style="list-style-type: none"> • Scientific Skills • Organisation • Energy <p>We will also be practising how to</p> <ul style="list-style-type: none"> • Carry out practicals safely • Write descriptively to compare cells 	 <p>Educake - https://www.educake.co.uk/ BBC Bitesize – link here YouTube Cognito - https://www.youtube.com/watch?v=QCCp-Y_-7J0 https://www.youtube.com/watch?v=qHkUOIC8Nbo</p>

- Describe the difference between compounds and mixtures
- Describe the structure of an atom
- Calculate number of protons, neutrons and electrons
- Recall the history of the development of the atom

Keyword	Definition
Atom	The smallest unit of matter.
Element	A substance made up of only one type of atom.
Compound	Contains two or more different elements that are chemically bonded together.
Mixture	Contains two or more different substances that are not chemically joined together.
Proton	Positively charged particle in the atom.
Neutron	Neutral particle in the atom.
Electron	Negatively charged particle in the atom.
Subatomic particle	Particles that make up the atom.
Nucleus	The centre of the atom, containing protons and neutrons.
Periodic table	A table of elements which are organised into groups and periods.
Group	A column on periodic table (all elements in the same group have similar properties).
Period	A row on the periodic table.
Properties	Characteristics or features of something.

Atomic Structure

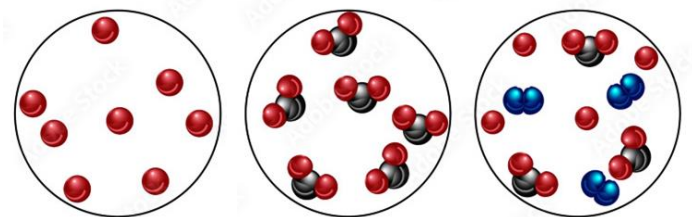


Overall, atoms have no charge (they are neutral). This is because they have the same number of protons (+1 charge) and electrons (-1 charge).

Particle	Relative Mass	Charge
proton	1	+1
neutron	1	0
electron	Very small	-1

Located in the nucleus: proton, neutron
 Located in the electron shells: electron

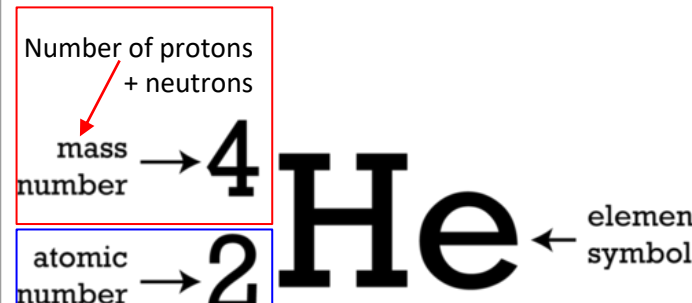
Substances



Element **Compound** **Mixture**

The properties of a compound are **different** to that of the elements that make it up. For example, iron (element) is magnetic but iron sulphide (compound) is not magnetic.

Number of Subatomic Particles



Number of protons + neutrons → mass number → 4

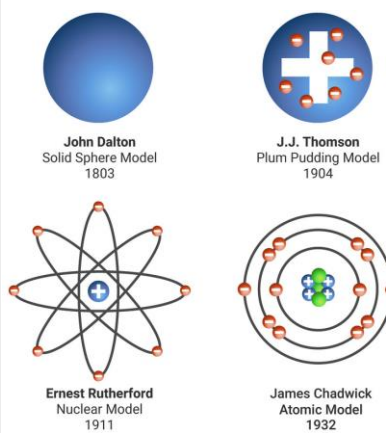
Number of protons → atomic number → 2

← element symbol

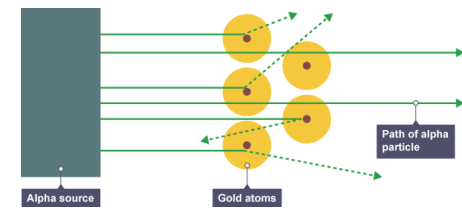
Worked example (sodium):

23	Na	Protons = 11
11		Neutrons = 23 - 11 = 12
		Electrons = 11

History of Atom



Rutherford's Gold foil experiment



Alpha source Gold atoms Path of alpha particle



- Describe the difference between compounds and mixtures
- Describe the structure of an atom
- Calculate number of protons, neutrons and electrons
- Recall the history of the development of the atom



Retrieval Practice

Questions	Answers
What is an element?	A substance made up of only one type of atom.
What is a compound?	Contains two or more different elements that are chemically bonded together.
What is the structure of an atom?	Protons and neutrons located in the nucleus, with electrons in electron shells.
What is the charge, mass and location of a proton?	Charge = +1, Mass = 1, Location = nucleus.
What is the charge, mass and location of a neutron?	Charge = 0, Mass = 1, Location = nucleus.
What is the charge, mass and location of an electron?	Charge = -1, Mass = very small, Location = shell
What does the mass number tell you?	Number of protons + neutrons an element has.
What does the atomic number tell you?	Number of protons an element has.
What is the overall charge of an atom?	An atom has no charge because it has an equal number of protons (+1) and electrons (-1).
How is the periodic table arranged?	In groups and periods (elements in the same group all have similar properties).
How does the reactivity of the group 1 elements change as you go down the group?	As you go down the group the elements get more reactive.
How does the reactivity of the group 7 elements change as you go down the group?	As you go down the group the elements get less reactive.
Why are the group 0 not reactive?	They have full outer shells.

Career Focus - Where could this take you?



I am a chemical engineer. My job is to changing the chemical, biochemical and physical state of a substance to turn it into something else, such as making plastic from oil. I need to understand how to alter raw materials into required products, while taking into consideration health and safety and cost issues. My main workplace is in a lab, office or processing plant develop raw materials into a range of useful products. A career in the field will see you creating petrochemicals, medicine and plastics.

Challenge Activities



1. Make flashcards for the definitions and retrieval practice questions.
2. Make a mind map for this topic. Remember to include keywords and the links between information.
3. Research how the periodic table was created? What scientists were involved?
4. Make a 3D model of an atom (showing the subatomic particles)
5. Find out more about chemical engineers and what they do. What qualifications would you need for this career? What is the average salary?
6. Research the history of the atomic model? What were the previous models? How do we know the atom looks the way we think it does?

Topic Links



This topic links to other science topics such as:

- Bonding
- States of matter
- Radiation
- Chemical reactions

Additional Resources



Educake - <https://www.educake.co.uk/>
 BBC Bitesize - <https://www.bbc.co.uk/bitesize/topics/zcckk2p>
 YouTube Cognito - <https://www.youtube.com/watch?v=fN8kH9Vvqo0>
<https://www.youtube.com/watch?v=jBDr0mHyc5M>



Humanities

Our students will:

- know and understand the history of these islands as a coherent, chronological narrative, from the earliest times to the present day: how people's lives have shaped this nation and how Britain has influenced and been influenced by the wider world
- understand historical concepts such as continuity and change, cause and consequence, similarity, difference and significance, and use them to make connections, draw contrasts, analyse trends, frame historically-valid questions and create their own structured accounts, including written narratives and analyses
- understand the methods of historical enquiry, including how evidence is used rigorously to make historical claims, and discern how and why contrasting arguments and interpretations of the past have been constructed
- develop contextual knowledge of the location of globally significant places – both terrestrial and marine – including their defining physical and human characteristics and how these provide a geographical context for understanding the actions of processes
- understand the processes that give rise to key physical and human geographical features of the world, how these are interdependent and how they bring about spatial variation and change over time

- The aims of the sequence of learning are to ensure that all students:
- Explain the global distribution of earthquakes and volcanic eruptions and their relationship to plate margins
 - Explain the physical processes at 3 plate margins

- Explain and contrast the primary and secondary effects of a hazard
- Evaluate the Immediate and long-term responses to a tectonic hazard

Keyword	Definition
Conservative Margin	Where two tectonic plates move past each other
Constructive Margin	Where two tectonic plates move apart.
Crust	The rigid shell that surrounds the mantle. Oceanic crust is thinner but denser than continental crust
Destructive Margin	Where a continental plate is subducted by an oceanic plate.
Distribution	The way something is spread out or arranged over a geographic area
Fold Mountains	Mountains formed from the folding of the Earth's crust
Immediate response	The reaction of people as the disaster happens and in the immediate aftermath.
Long-term responses	Later reactions that occur in the weeks, months and years after the event
Ocean Trench	Long, narrow depression on the seafloor where oceanic crust is forced under continental crust.
Primary effects	The initial impact of a natural event on people and property, caused directly by it.
Secondary effects	The after-effects that occur as indirect impacts of a natural event, sometimes on a longer timescale
Shield Volcano	A wide, low volcano that erupts basic, runny lava.
Subduction Zone	An area where oceanic crust travels under a continental plate at a destructive margin
Tectonic Plate	A section of the Earth's crust.

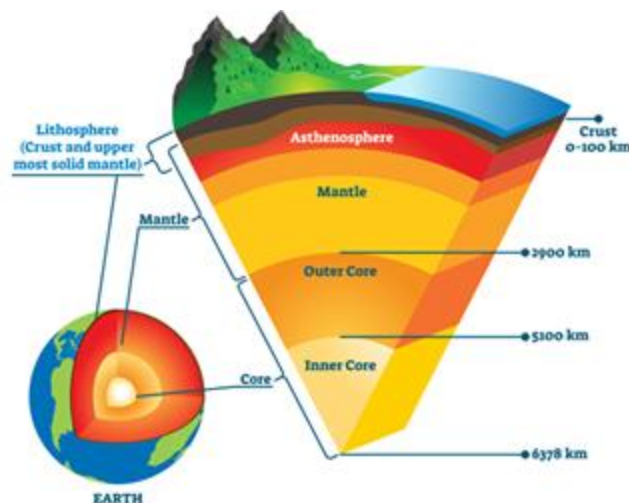
Key Concepts

The Distribution of Volcanoes and Earthquakes:

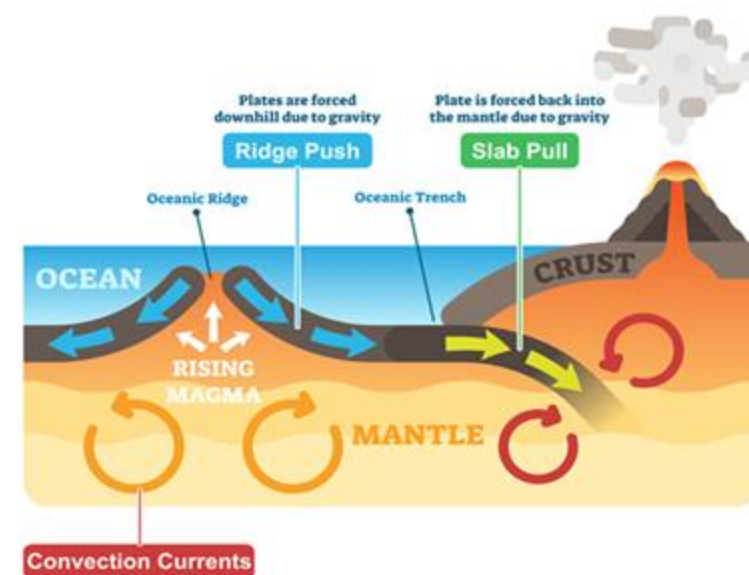
- The distribution is not random.
- Narrow bands along plate margins.
- Occur on both land and sea.
- Volcanoes are found at constructive and destructive plate margins.
- Earthquakes occur at all three boundaries



The Structure of the Earth:



How the plates move:



Key Concepts



Tectonic Plates:



Primary effects

Earthquakes:

- People injured and killed.
- Property, homes and buildings destroyed.
- Roads, railways, ports and bridges destroyed.

Volcanoes:

- People and livestock injured and killed due to pyroclastic and lava flows and ash.
- Farmland and property destroyed.
- Water supplies contaminated.

Secondary effects

Earthquakes:

- Fires can start due to broken gas pipes and damaged electricity cables.
- Lack of clean water and sanitation due to burst pipes leading to the spread of disease.

Volcanoes:

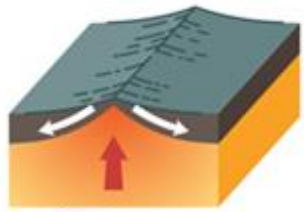
- Lahars occur due to the mixing of ash with rain/glacial melt water which can lead to deaths and damage to property.
- Tourism increases with those interested in volcanoes.
- Ash breaks down, providing nutrients to farmland.



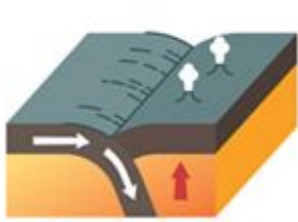
Key Concepts

Types of plate margin:

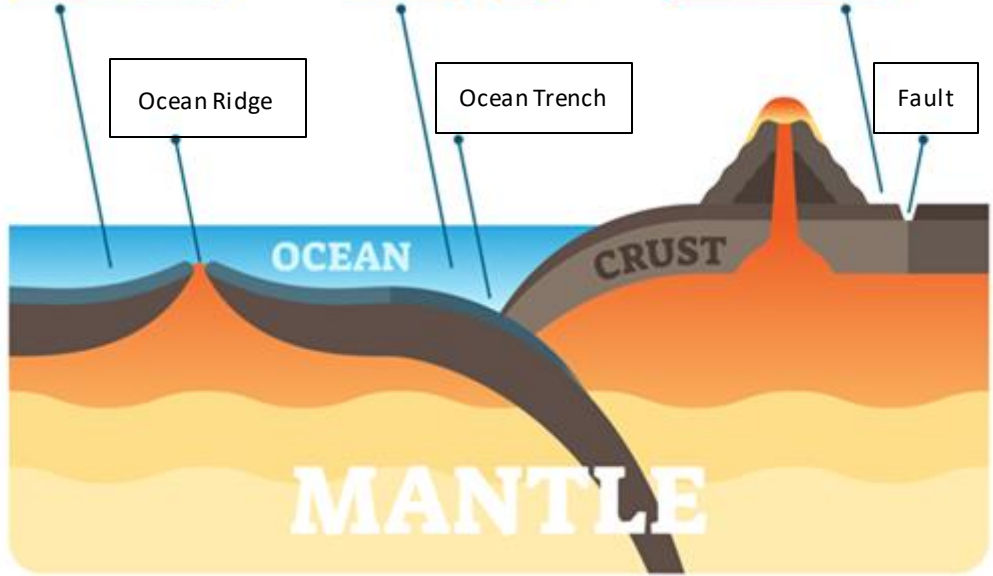
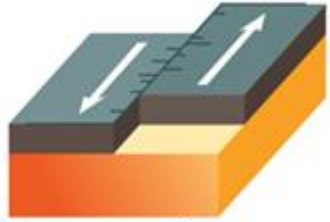
Constructive Margin



Destructive Margin



Conservative Margin



Ocean Ridge

Ocean Trench

Fault

Destructive Margin

- Crust: oceanic and continental
- Landforms: fold mountains, ocean trench and composite volcanoes
- Hazards: earthquakes and volcanoes

Constructive Margin

- Crust: oceanic & oceanic/continental & continental
- Landforms: ocean ridge/rift valley, shield volcanoes
- Hazards: earthquakes and volcanoes

Conservative Margin

- Crust: both
- Landforms: faults
- Hazards: earthquakes

Immediate Responses:


Immediate responses to tectonic hazards include:

- Issuing warnings
- Rescue teams searching for survivors
- Providing treatment to injured people
- Food, drink and shelter provided
- Bodies recovered
- Fires extinguished

Long-Term Responses:

Long term responses to tectonic hazards include:

- Rebuilding and repairing properties
- Rebuilding and repairing transport infrastructure
- Improving building regulations
- Restoring utilities such as water, electric and gas
- Resettling local people
- Developing opportunities for the economy to recover
- Installing monitoring equipment

Retrieval Practice 	
Questions	Answers
Where are volcanoes and earthquakes located?	Narrow bands along plate margins and on both land and sea
What process in the mantle moves the crust?	Convection currents
Name 2 continental plates	Eurasian Plate and African Plate
Name 2 oceanic plates	Pacific Plate and Nazca Plate
What happens at a destructive plate boundary?	Oceanic and continental crust collide and the denser oceanic crust subducts creating volcanoes and earthquakes on the surface
Give 2 primary effects of an earthquake	People injured and killed. Property, homes and buildings destroyed.
Give 2 reasons why people might live near volcanoes	Tourism increases with those interested in volcanoes. Ash breaks down, providing nutrients to farmland.
Give 2 immediate responses to a tectonic hazard	Rescue teams searching for survivors and providing treatment to injured people
Give 2 long-term responses to a tectonic hazard	Rebuilding and repairing properties and improving building regulations

Career Focus - Where could this take you?



Volcanologists are scientists who use a variety of sophisticated equipment to measure and analyse volcanic activity, lava, rock, ashes and gases as well as earthquakes caused by eruptions. They try to predict eruptions and minimise adverse effects on people and their environment.

Challenge Activities

- Design and create a jigsaw for the plates of the earth
- Create a public safety poster booklet which provides advice on how people should prepare and act in a natural disaster
- Produce a presentation including a series of diagrams and information which explain what happens at the 3 main plate boundaries
- Create a model of an erupting volcano Research a recent volcanic eruption and write a news report on the causes, the effects and how people tried to reduce the impacts

Topic Links

This topic links to

- Science
- Weather Hazards - in Year 10 Geography

Additional Resources

To further practise and develop your knowledge see: BBC Bitesize



The aims of the sequence of learning are to ensure that all students:

- Explore how the Nazis treated minority groups in Germany.
- Explain why life in Nazi Germany could be seen as positive and negative between the years 1933 to 1939?

- Analyse the causes of World War Two and the consequences of Hitler's actions.
- Evaluate the key events and battles of World War Two and their significance.

Keyword	Definition
Causes	The reason an event happened.
Dictator	A political leader who has total control and power over a country.
Communism	Communism is a type of government. In a Communist system, individual people do not own land, factories, or machinery. Instead, the government or the whole community owns these things. Everyone is supposed to share the wealth that they create.
Lebensraum	Living Space - the land Nazis believed was required in order to grow and flourish.
Appeasement	When Britain and France gave Hitler what he wanted (<i>appeased him</i>) to try to avoid war.
Anschluss	German word for 'Union' – Hitler declared an Anschluss between Germany and Austria in 1938.
Blitzkrieg	German attack on enemy targets, means 'lightning war'.
Evacuation	Taking people away from danger.
Persecution	To treat someone cruelly or unfairly especially because of race or religious or political beliefs.
Anti-Semitism	Hostility towards Jews or discrimination against them as a group.
Aryan	Northern Europeans, including Germans, who Hitler believed were the 'Master Race'.
Ghettos	Areas of towns (usually run-down) sectioned off to separate Jews within the community.
Kristallnacht	Night of Broken Glass: attacks on Jews & Jewish property that intensified persecution of Jews in Germany.
Synagogues	Jewish places of worship.

Key Concepts



Causes of WWII: C. Timeline of Hitler's Actions:

1933: Hitler becomes Chancellor of Germany and builds up Germany's armed forces which breaks one of the terms of the Treaty of Versailles.

1936: German soldiers occupy the Rhineland where they were not supposed to go. Other countries, including Britain, did not stop this as the land belonged to Germany. This is the start of **Appeasement** by Britain and France.

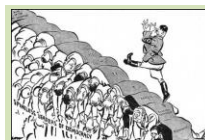
1938: Hitler took over Austria, again breaking the Treaty. Britain protested but did nothing.

1938: Hitler threatened war with Czechoslovakia if they did not return the Sudetenland to Germany. 3 million Germans lived there. Britain and France agreed that Germany should be allowed to take the Sudetenland but made Hitler promise not to invade any other countries.

1939: Hitler broke his promise by taking over the rest of Czechoslovakia. He then started to threaten Poland. Poland was determined to fight Hitler...

1st September 1939: Germany invaded Poland, using 'Blitzkrieg' strategy. Britain and France (Poland's allies) gave notice to Germany to remove their troops from Poland. When they did not, Britain and France declared war on **3rd September 1939.**

This was the start of World War 2!

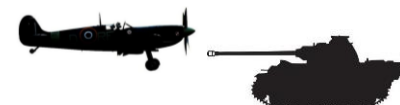


Other Causes of WWII:

Treaty of Versailles: By the 1930's many people believed that Germany had been treated too harshly in the Treaty including Britain. Germany had lost land to create new countries like Poland and Czechoslovakia and Hitler promised to overturn the Treaty of Versailles and reunite all German speaking people in a greater Germany.

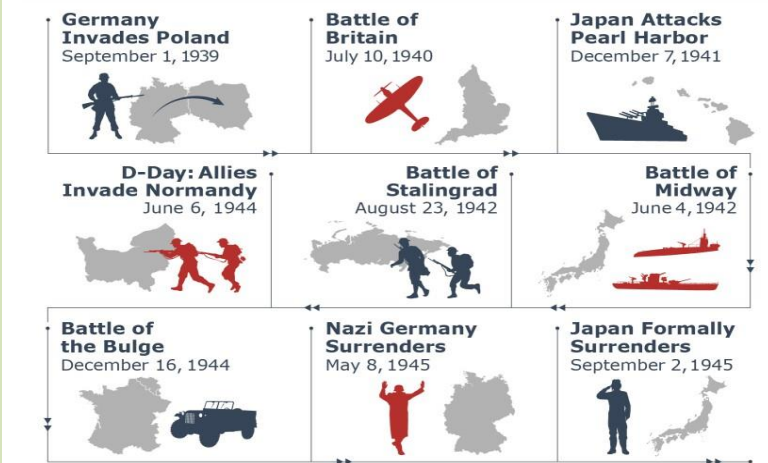
Appeasement: The policy of appeasement aimed to prevent another war and is linked particularly with the British Prime Minister Neville Chamberlain. Many believe he made a mistake by trusting Hitler. Britain and France could have stopped Germany. Opportunities, such as the Rhineland, were missed and Chamberlain even negotiated with Hitler in Munich to give him the Sudetenland. This prompted the Nazi Soviet Pact.

The Nazi Soviet Pact: Stalin felt alienated by the Munich Agreement and this encouraged him to sign the pact even though he and Hitler hated each other. It was a truce to agree to share Poland. This would help Hitler avoid a war on two fronts and give him back up from the USSR. This made him more confident about invading Poland even though Britain and France had promised to protect them.



WWII TIMELINE

Major Turning Points



What was the most important turning point of World War II?
A turning point is a significant moment when events alter in a way that has an impact both in the short and long term. There are many key moments in WWII that had an impact on the outcome of the war.

Turning Point: Was the evacuation of Dunkirk seen as a triumph or disaster?
Large numbers of British, French and Belgian troops were surrounded by German soldiers in the French town Dunkirk but 338226 were saved by a fleet of British navy ships and 800 small boats. These soldiers made up of much of Britain's army went on to fight throughout the war. It gave the British public hope.

Turning Point: How important was the Battle of Britain?
The Royal Air Force (RAF) successfully defended against attacks by Nazi Germany's air force: Luftwaffe. It has been described as the first military campaign fought entirely by air forces. Hitler changed his tactics when it was clear the RAF could not be defeated, and he cancelled the invasion of Britain. The RAF went on to bomb targets in Germany.

- Explore how the Nazis treated minority groups in Germany.
- Explain why life in Nazi Germany could be seen as positive and negative between the years 1933 to 1939?

- Analyse the causes of World War Two and the consequences of Hitler's actions.
- Evaluate the key events and battles of World War Two and their significance.



Key Concepts

The Holocaust: What is it? The mass murder of Jews under the German Nazi regime during the period 1939 - 1945. More than 6 million European Jews, as well as members of other persecuted groups, were murdered at concentration camps such as Auschwitz. Holocaust means destruction or slaughter on a mass scale, especially by fire. Many Jews use the term 'Shoah' which comes from the Hebrew meaning catastrophe.

A History of Anti-Semitism

The Nazis did not invent hatred of Jews or anti-Semitism.

Jews were persecuted in the Middle Ages for religious reasons. In 1190, 150 Jews were massacred in York and all Jews were expelled in 1290.

In many European countries, Jews were blamed for spreading the Black Death and were banned from owning land. In towns they were usually confined to certain areas—ghettos and subject to restrictions, such as curfews.

Martin Luther, who started the Protestant Reformation, called for Jewish synagogues to be destroyed.

In the 1800s, millions of Jews fled the Russian Empire because of pogroms (organised massacre) against them. Immigrants often ended up in Britain or the USA.

The Ghettos:

Ghettos were usually in the most run-down area of a city and were used to segregate the Jews. By mid-1941, nearly all Jews in occupied Poland had been forced into these overcrowded districts.

In the Warsaw ghetto, by far the largest, 490,000 Jews and a few hundred Roma and Sinti (Gypsies) struggled to survive. In larger centres, ghettos were shut in by walls, fences or barbed wire. No one could leave or enter without a special permit.

Jews received little food and the ghettos were overcrowded. Diseases such as typhus and tuberculosis were rife. It is estimated that 500,000 Jews died in the ghettos of disease and starvation. Many also perished in nearby slave labour camps, where conditions were even worse.



Nazi Persecution of the Jews:

Hitler's dislike of the Jews was based on many things including his experiences in Vienna as a youth, but mainly the economy. He blamed them for making Germany weak and for the defeat of World War One.

1933: From 1st April the Nazi Party began an official Boycott of all Jewish shops, businesses, doctors and lawyers. The SA were used to paint Jewish stars or the word 'Jude' (Jew) outside Jewish businesses and they stood outside holding banners to discourage people from going inside.

Jews were also banned from government jobs and Jewish civil servants and teachers were sacked.

1935: The Nuremberg Laws were passed and stated only those of German blood could be German citizens. Jews became German 'subjects', not citizens and marriage between Jews and Aryans was banned. Placards saying 'Jews not wanted here' were displayed in resorts, public buildings, restaurants and cafes.

9th November 1938: Kristallnacht (*Night of Broken Glass*) - gangs smashed and burned Jewish homes, businesses & synagogues all over Germany and attacked Jews. Many Jews were killed and 20,000 arrested and sent to concentration camps.

1939-41: Millions of Jews living in Poland & the USSR came under Nazi control. Many were shot or kept in Ghettos.

1942: Leading Nazis agreed upon a 'Final Solution' at the Wannsee Conference to the "Jewish problem". Death camps would be used to eradicate Jews from Europe.

Concentration Camps:

The Nazis had been using concentration camps since 1933 as extended prisons or work camps, often for political opponents, but thousands of Jews were taken to camps like Dachau following Kristallnacht.

Germany's invasions of Poland & The Soviet Union meant that there were now millions more Jews under Nazi control. Initially, groups of SS troops – 'Einsatzgruppen', murdered Jews by shooting.

Following the decision at the Wannsee Conference in 1942 to eradicate all Jews, death camps were built. The death camps used gas chambers to murder Jews and others on an industrial scale.

When Jews arrived from all over Europe, 'selection' happened. Women with young children, the Elderly and the unfit were sent straight to the gas chambers. The Jews were told they were being taken to 'showers' but the 'showers' were in fact gas chambers which used a chemical called Zyklon-B. Usually, people 14 years of age and upwards were sent to the camp if they were fit and healthy. They would receive showers to clean them up. The showers were either really hot or extremely cold. They would then be given a uniform, tattooed with a number and have their hair shaved.

Sometimes, horrifying medical experiments were carried out on camp inmates, for example, by Dr Mengele at Auschwitz who was fascinated in studying twins.

All of the Jews' personal belongings: gold, silver, spectacles, clothes, even hair was kept to be re-used. Even in work camps, deaths through beatings, lack of food and disease were common. It is widely accepted that as many as 6 million Jews were murdered during the Holocaust.


Other groups, such as Russian prisoners, homosexuals, communists, gypsies and the mentally and physically disabled were also victims of the Nazi regime.

As the map shows, most death camps were in Poland rather than Germany, and Poles made up half of the victims. Jews from nearly all European countries were victims during World War Two.

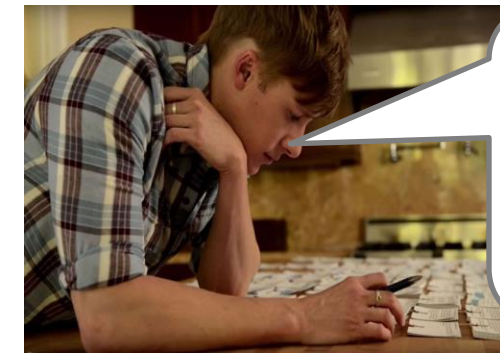


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- Explain why life in Nazi Germany could be seen as positive and negative between the years 1933 to 1939?

- Analyse the causes of World War Two and the consequences of Hitler's actions.
- Evaluate the key events and battles of World War Two and their significance.

Retrieval Practice 	
Questions	Answers
Tell me three minority groups persecuted by the Nazis:	Jewish, disabled and homosexuals
What date was Kristallnacht and what happened?	8th November 1938 when gangs smashed and burned Jewish homes, businesses & synagogues all over Germany and attacked Jews. Many Jews were killed and 20,000 arrested and sent to concentration camps.
Who was Anne Frank and why is she significant when studying the Holocaust?	Anne Frank was a German girl and Jewish victim of the Holocaust who is famous for keeping a diary of her experiences. Anne and her family went into hiding for two years to avoid Nazi persecution
Explain two causes of World War Two (short or long term):	Treaty of Versailles – Many believed Germany was too harshly punished Appeasement- Many believe Chamberlain made a mistake by trusting Hitler. Britain and France could have stopped Germany.
What was the Nazi Soviet pact? Explain with examples.	A pact between Hitler and Stalin. It was a truce to agree to share Poland. This would help Hitler avoid a war on two fronts and give him back up from the USSR.
Why did Britain and France eventually declare war on Germany?	When Germany invaded Poland
Was Dunkirk a triumph or disaster? Explain your answer.	A disaster as large numbers of French, British and Belgium troops died. A success as 338,226 troops were saved
What happened at the Battle of Britain and why was it a turning point of WWII?	The Royal Air Force (RAF) successfully defended Britain against attacks by Nazi Germany's air force the Luftwaffe. Britain could now bomb targets in Germany
What consequences did Germany face after the Battle of Stalingrad?	It was the first failure of the war to be publicly acknowledged by Hitler and put Hitler and the Axis powers on the defensive, boosting Russian confidence.
Why did Germany surrender? Tell me one reason.	Soviet forces neared Adolf Hitler's command bunker in central Berlin. On April 30, 1945, Hitler committed suicide. Within days, Berlin fell to the Soviets.

Career Focus - Where could this take you?



I am a Screenwriter: My job is to write and develop screenplays for film or TV drama. I do this either based on an original idea, by adapting an existing story into a screenplay or by joining an existing project (if on TV). I will also use events that have happened in History and dramatise it while including historical facts. I have to make sure I have researched the area I want to focus on and plan my ideas, plots and characters.

Challenge Activities

1. Write a newspaper article about one of the key battles in World War Two. You need to research the battles and decide which one you want to write about- ensure you know enough to make a comparison to at least one other battle.
2. Write a script to use in a movie or play about one of the key battles of World War Two or about the Holocaust. Many movies have been produced which use historical fiction (incorporating some historical facts with a fictional storyline).
3. Produce a timeline which can be used as a display piece of key events in World War Two. This should include dates, key individuals, the event (what happened) and pictures to match.

Topic Links Additional Resources

This topic links to other humanities topics such as:

- From Democracy to Dictatorship
- The end of World War Two
- Britain's Homefront
- Judaism

To further practise and develop your knowledge see:

<https://www.familysearch.org/en/blog/world-war-2-facts>

<https://www.youtube.com/watch?app=desktop&v=8a8fqGpHjSk>

<https://www.britannica.com/study/world-war-ii-major-events-battles>

<https://www.bbc.co.uk/bitesize/topics/zk94jxs/articles/z6vff82>



The aims of the sequence of learning are to ensure that all students:

- Explain Tikkun Olam as a way of healing the world and how this is linked to Rosh Hashanah & Yom Kippur.
- Explore the importance of Tzedakah & Chesed & their differences

Analyse the importance of the Land to Jews & beliefs about a Jewish State.

- Show understanding about antisemitism, exploring & reflecting on the causes & impact for Jews & others.
- Explore the impact of the Holocaust (Shoah) on Jewish people

Keyword	Definition
Tikkun Olam	Hebrew wordings meaning 'repairing the world.'
Rosh Hashanah	Rosh Hashanah commemorates the creation of the world and marks the beginning of the Days of Awe, a 10-day period of reflection and repentance.
Yom Kippur	Means the Day of Atonement. This is known as the holiest day of the Jewish year. Leading up to and on that day, Jews traditionally ask for forgiveness for any wrongdoings from God and from fellow human beings.
Tzedakah	This is a Hebrew word meaning charity. Meaning justice as well. This defines to doing the right things by helping people or those that in need.
Atonement	To reflect on oneself and asking God for forgiveness for any sins.
Chesed	This means kindness or loving-kindness. This means giving oneself fully with love and kindness.
Antisemitism	This means hatred toward Jewish people.
Covenant	The word covenant means agreement, such as a contract between two people. Jews see their relationship with God as a covenant, or an agreement.

Key Concepts



Tikkun Olam: In Jewish teachings, this can be referred as 'healing the world' which means that any activity that helps to make the world a better place or brings a good change in society, towards a happy and peaceful place. This also means that originally the world was created good, its creator (God) purposely left room for us as humans to improve his work.

Rosh Hashanah

Rosh Hashanah is a special festival which celebrates Jewish New Year.

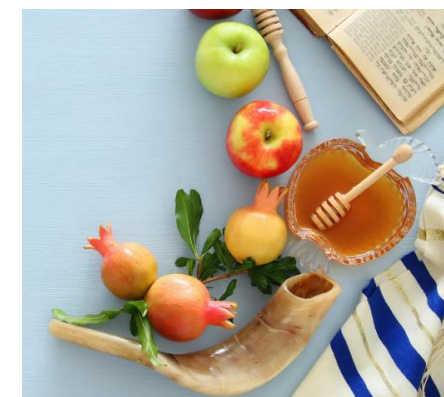
It literally means 'head of the year'. **What does it symbolise?**

Rosh Hashanah is a celebration of the creation of the world and marks making a fresh start.

It is a time for people to reflect on the past year and to ask for forgiveness for anything wrong they feel they have done.

They can also think about their priorities in life and what it important to them.

The festival also marks a time of judgment, when Jewish people believe that God balances a person's good acts over the last year with their bad acts and decides what the coming 12 months will be like for them.



Yom Kippur

This is a most important Jewish holiday, where Jews repent (ask for forgiveness for their sins). This starts with Rosh Hashanah and lasts for 10 days. Jews mark the day of Yom Kippur by fasting for 25 hours. They also wear white and they don't wear make-up, perfume, or leather shoes. The most important part of Yom Kippur is the time spent in the synagogue. Even Jews who do not go to the synagogue very much will go on Yom Kippur. The day is spent in continuous prayer.

TZEDAKAH – Charity

Helping the poor and the needy is a duty in Judaism. It must be performed regardless of one's financial standing, and so is mandatory even for those of limited financial means.

CHESED - Mercy

It a Hebrew word that means 'kindness or love between people', specifically of the devotional piety of people towards God as well as of love or mercy of God towards humanity.



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- Explore the impact of the Holocaust (Shoah) on Jewish people



Key Concepts

Promised Land

Covenant with Abraham



Abraham leaves his home to go to Canaan, the Promised Land. God asks him to be an example to others



Sarah gives birth to a son, Isaac



God names Abraham the father of many nations. God promises Abraham and Sarah a son. The covenant is sealed with Abraham's circumcision



God tests Abraham's faith ten times - in the final test, God asks Abraham to sacrifice his son



At the last moment, God sends an angel to stop Abraham's hand; God sees that Isaac has the faith to continue in his father's footsteps

Much of Jewish history is connected with the struggle of Israel and their identity as a people. The Torah describes this early history from the Creation and contains key events such as the Exodus (the escape from slavery in Egypt under the leadership of Moses), the building of a portable sanctuary in the desert, and the Tanakh tells of the establishment of the Temple in Jerusalem. The Temple was destroyed in 586 BCE, and the Jews were exiled to Babylonia. Re-settlement and the rebuilding of the Temple commenced about 70 years later. In 70 CE the Romans destroyed the second Temple, and over many centuries the Jews were dispersed throughout the world. Since 1948, the foundation of the State of Israel has provided a beacon of hope for a people who were nearly destroyed by the Nazis in Hitler's Germany. The Holocaust and the systematic murder of 6,000,000 Jewish men, women and children is a permanent reminder of the evils of racism.

The Tanakh repeatedly refers to God's offer of a Promised Land for Abraham and his descendants. God promised Abraham and his wife Sarah many descendants, who would make you into nations and who would be kings with whom God would keep an eternal covenant (Genesis 17:6–7) throughout future generations. Today, many Jews believe that the land now known as Israel belongs to Jews in fulfilment of God's covenant with Abraham to give the Jewish people a Promised Land. This has often led to conflict both within and outside the religion. In 1948, in the face of opposition from Arab countries in the Middle East, the State of Israel was created. Since then, there have been many disputes, and even wars, over the land. The Tanakh repeatedly refers to God's offer of a Promised Land for Abraham and his descendants.



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Key Concepts

Different views about the importance of the Promised Land

For some Jews, their relationship with the modern State of Israel is an essential part of their religious identity and key to their understanding of Judaism.

For some Jews, a connection to Israel is part of their cultural and personal identity.

A very small minority of Jews do not see the land of Israel as important in their understanding of what it means to be Jewish. These Jews tend to spend less time practising their faith.

There are some Jews who feel that there should not have been an attempt to set up the State of Israel before the coming of the Messiah because the Jews' exile from the land was a punishment from God.

The importance of Jerusalem and the land of Israel for Judaism

Within Judaism, **Israel is the Holy Land**. It is the land where the faith began – and **Jerusalem is the Holy City**. For Jews, Jerusalem is at the core of their faith and their world. According to Jewish tradition, all of creation began in Jerusalem. Other key events are believed to have happened in this important city, including:

- **Abraham** showed he was prepared to sacrifice his son, Isaac, at Mount Moriah. It was also here that Jacob (Abraham's grandson) dreamed of a ladder that went up to Heaven.
- **King David** captured Jerusalem around 3,000 years ago and made it the capital of the ancient Jewish people.
- **King Solomon** built the **first temple** in Jerusalem. The **Ark of the Covenant** is believed to have been kept in the most sacred part of the temple, the **Holy of Holies**, the place where it was believed God Himself was present.

Anti-Semitism is a certain perception of Jews, which may be expressed as hatred toward Jews. Rhetorical and physical manifestations of antisemitism are directed toward Jewish or non-Jewish individuals and/or their property, toward Jewish community institutions and religious facilities.

Origin – How did antisemitism start?

Jewish people have been discriminated against for more than 2,000 years. Often it has been because of their religious beliefs. In ancient times some people worshipped many gods. They did not trust the Jewish people because the Jews did not follow the same gods. The Jewish people worship only one God.

Later, the new religion of Christianity developed from the religion of Judaism. The new religion was based on the teachings of Jesus Christ. He and his followers were Jewish, but the two religions became separate because of different beliefs. The Christians thought that Jesus was a saviour sent by God. The Jewish people did not believe that. At the time, the Roman Empire controlled the land where both religions began. The Romans destroyed the Jewish Temple in Jerusalem and forced the Jews to leave. Eventually, the Roman rulers accepted Christianity. The empire controlled many lands, so the religion of Christianity spread. The Roman leaders were powerful. They tried to turn Christians against the Jewish people. People treated the Jews poorly. Anti-Jewish laws in ancient Rome separated the Jews and limited their freedoms. Jewish people moved to many parts of Europe, but in some places they were forced to live in areas called ghettos. They were forced to leave other areas altogether. People made up myths about Jewish people so others would not trust them.

Anti-Semitism in the Russian Empire

When they were forced out of parts of western Europe, many Jews moved to Poland and Russia. Toward the end of the 1800s, however, they were mistreated there as well. The Russian Empire wrote laws to take away land from the Jews. Jewish people had to move to a different part of Russia, away from others. Many Jewish people could no longer work. Mobs of people attacked the Jews. These violent attacks were called pogroms.

Anti-Semitism in Modern Europe

In the 1800s people in Europe began to think of Jewish people as a separate race. Racism toward Jews helped a political party in Germany come to power in 1933. The Nazi Party was led by Adolf Hitler. The party spread hateful misinformation about Jewish people. They ordered boycotts of Jewish-owned businesses. They said that the Aryan race was superior. The Aryans were white people from northern Europe. The Nazis wanted to get rid of all Jewish people. They collected Jewish people from throughout Europe. They forced the Jews into concentration camps to work as slaves. Many Jews were killed right away. This time is called the Holocaust. Nazi Germany and those who helped the Nazis killed about 6 million Jews.

The Nazis were defeated in World War II, which ended in 1945. Many places in the world did not express anti-Semitism any more. Jewish people became part of the culture. But in some places, anti-Jewish acts still happened.

Anti-Semitism Today

Today many people believe that anti-Semitism is wrong. Unfortunately, anti-Semitic acts still happen. For example, people paint anti-Jewish symbols on buildings and Jewish graves. Others spread misinformation. They say Jewish people have too much control of the media, the economy, and the government. Some people even say that the Holocaust never happened.




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Retrieval Practice 	
Questions	Answers
What does Tikkun Olam mean?	Tikkun Olam means repairing the world in Hebrew.
How can Jews apply Tikkun Olam in their everyday life?	Jews can apply Tikkun Olam to their everyday lives by performing good deeds. By connecting (praying) to God and observing religious obligations.
Why do Jews celebrate Yom Kippur?	It is on Yom Kippur that God decides each person's fate, so Jews are encouraged to make amends and ask for forgiveness for sins committed during the past year.
What does Rosh Hashanah symbolise?	Rosh Hashanah means New Year, which symbolises the creation of the world.
Where were some of the Jewish people forced to live?	Some Jews were forced by the Nazis to live in Ghettos.
Who built the first temple in Jerusalem?	The first temple in Jerusalem was built by King Solomon.
Which son was Abraham prepared to sacrifice?	Abraham was prepared to sacrifice his son Isaac.

Career Focus - Where could this take you?



I am a Historical researcher. I study past events, people, policies and documents to gain an in-dept understanding of their significance and impact on modern and future societies. Examining primary and secondary sources is an essential part of a historical researcher, as well as knowing and understanding peoples' beliefs and views.

Challenge Activities

- Explain the significance of the covenant between God and Abraham?
- Make a list of how you can help someone wholeheartedly.
- Explain in your own words, the history of Judaism that led to antisemitic attacks.
- Research how the holocaust has affected many Jews in the world today.
- Create a detailed leaflet on Rosh Hashanah, explaining the importance of this holy festival.

Don't forget!
Point
Explain
Evidence (Quote)

Topic Links Additional Resources

This topic links to other RE topics such as

- Judaism

This topic links with other subjects such as:

- History

We will also be practising how to


- Argue a point and practise our Voice 21
- Participate in debates
- Write PEE sentences/how to answer exam questions

To further practise and develop your knowledge see:

<https://www.bbc.co.uk/newsround/29363650>

<https://www.bbc.co.uk/bitesize/topics/znwhfg8/articles/z4vvhjv>

<https://www.bbc.co.uk/bitesize/guides/zf3yb82/revision/6>



Our students will:

- understand and respond to spoken and written language from a variety of authentic sources
- speak with increasing confidence, fluency and spontaneity, finding ways of communicating what they want to say, including through discussion and asking questions, and continually improving the accuracy of their pronunciation and intonation
- can write at varying length, for different purposes and audiences, using the variety of grammatical structures that they have learnt
- discover and develop an appreciation of a range of writing in the language studied.

- Learn how to be able to say what they do to earn money.
- Recognise different careers in French.
- Learn how to talk about their career choices.
- Learn how to talk about their plans for the future.
- Learn how to say how they helped at home recently.



Keyword	Definition
Qu'est-ce qu'on peut faire pour gagner de l'argent?	What can you do to earn money?
On peut + infinitive	You can.....
Qu'est-ce que tu fais?	What do you do?
Je travaille	I work
Je gagne	I earn
Qu'est-ce que tu veux faire comme métier?	What do you want to do as a job?
Je veux être.....	<i>I want to be.....</i>
Qu'est-ce que tu vas faire à l'avenir?	What are you going to do in the future?
Je vais + infinitive	I'm going to
Ce sera + opinion.	That will be.....
Qu'est-ce que tu as fait hier?	What did you do yesterday?
J'ai préparé les repas.	I prepared the meals.
Je n'ai pas aidé à la maison.	I didn't help at home.
C'était comment ?	What was it like?
C'était ...	It was

Key Concepts	
Qu'est-ce qu'on peut faire pour gagner de l'argent?	
Pour gagner de l'argent, on peut ... aider à la maison. aider les voisins. trouver un petit boulot. faire du baby-sitting.	<i>(In order) to earn money, you can ... help at home. help the neighbours. find a part-time job. do babysitting.</i>
Qu'est-ce que tu fais?	
Je lave la voiture. Je garde mon petit frère. Je garde ma petite sœur. Je range ma chambre. Je travaille dans un café. Je travaille à la boulangerie. Je fais la cuisine. Je gagne 8 euros par semaine / par mois.	<i>I wash the car. I look after my little brother. I look after my little sister. I tidy my room. I work in a café. I work at the bakery. I do the cooking. I earn 8 euros a week / a month.</i>
Qu'est-ce que tu veux faire comme métier?	
Je veux être ... scientifique. pilote. ingénieur/ingénieure. danseur/danseuse. acteur/actrice. dessinateur/dessinatrice. infirmier/infirmière. policier/policière. mécanicien/mécanicienne.	<i>I want to be a(n) ... scientist. pilot. engineer. dancer. actor/actress. designer. nurse. police officer. mechanic.</i>

Phonics and Vocabulary		
 Qu – qu'est-ce que		
quatre 4	musique 	équipe 
Qu'est-ce que tu vas faire à l'avenir?		
Je vais habiter ... à l'étranger.	Je vais acheter ... une grande maison. une Ferrari rouge.	Je vais être ... célèbre. heureux/heureuse.
<i>I am going to live ... abroad.</i>	<i>I am going to buy ... a big house. a red Ferrari.</i>	<i>I am going to be ... famous. happy.</i>
Je vais avoir ... cinq enfants.	Je vais aller ... à New York. en Chine.	Je vais faire du travail bénévole.
<i>I am going to have ... five children.</i>	<i>I am going to go ... to New York. to China.</i>	<i>I am going to do voluntary work.</i>
à l'avenir	dans dix ans	dans vingt-cinq ans
<i>in the future</i>	<i>in 10 years</i>	<i>in 25 years</i>
Ce sera ...	cool / fantastique.	It will be ... cool / fantastic.



- Learn how to be able to say what they do to earn money.
- Recognise different careers in French.
- Learn how to talk about their career choices.

- Learn how to talk about their plans for the future.
- Learn how to say how they helped at home recently.

Retrieval Practice



Questions	Answers
<u>Qu'est-ce qu'on</u> peut faire pour gagner de l'argent?	Pour gagner de l'argent on peut trouver un petit boulot ou aider à la maison.
<u>Qu'est-ce que</u> tu fais?	Personnellement je lave la voiture et je garde mon petit frère tous les week-ends. À mon avis c'est ennuyeux.
Tu gagnes combien d'argent?	Je gagne dix livres par heure. C'est bien payé.
<u>Qu'est-ce que</u> tu veux faire comme métier?	Je ne sais pas exactement. Je veux être acteur mais c'est difficile. Aussi je veux être pilote.
<u>Qu'est-ce que</u> tu vas faire à l'avenir?	Dans dix ans je vais habiter à New York. Je vais acheter une grande maison. Dans vingt ans je vais avoir deux enfants.
Ce sera comment?	Je crois que ce sera formidable.
<u>Qu'est-ce que</u> tu as fait hier?	Hier matin je suis resté(e) à la maison mais je n'ai pas regardé la télé. L'après-midi je suis allé au supermarché.
<u>C'était comment?</u>	À mon avis c'était assez ennuyeux.

Career Focus - Where could this take you?



I am a news reporter. I work all over Europe and even worldwide. It helps me that I can speak another language, because I can communicate with people who live in the country I am reporting from.

Challenge Activities



- 1) Research some careers where Languages are important. Make a fact file.
- 2) Create a day of Cinderella's diary. Include at least 6 things that she did to help at home and her opinion about the chores.
- 3) Complete the activities on Language nut,

Topic Links



This topic links to:

- Sports and leisure.
- All about me.

Additional Resources



To further practise and develop your knowledge see:

- Language nut
- Active learn.



Computing

Our students will:

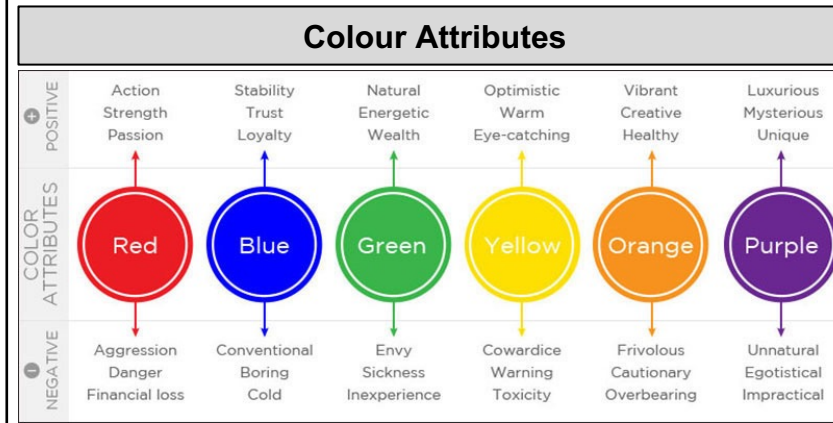
- can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation
- can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems
- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems
- are responsible, competent, confident and creative users of information and communication technology

- The aims of the sequence of learning are to ensure that all students:
- Evaluate on the planning and design process for the creation of a user interface
 - Evaluate on the development process for the creation of a user interface

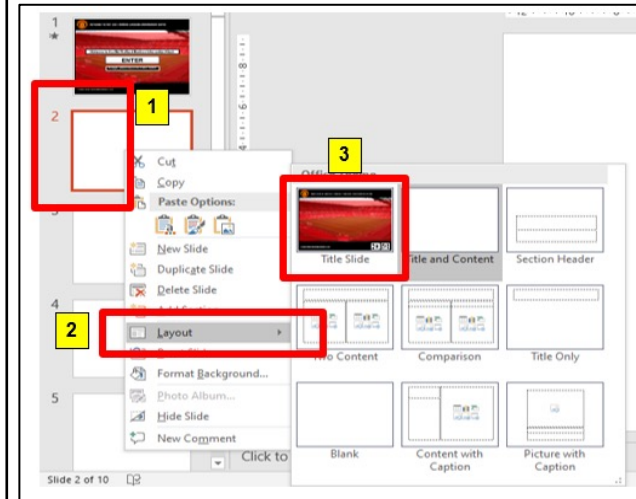
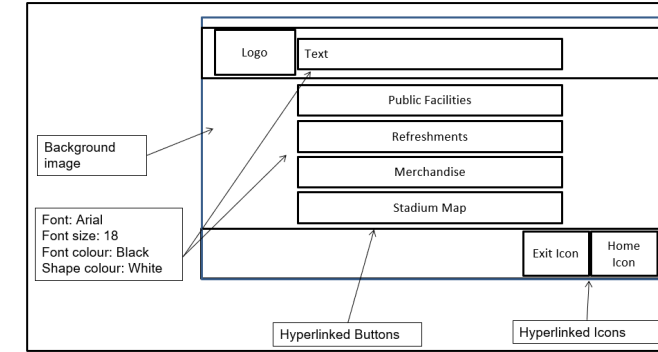
- Evaluate on the testing process for the creation of a user interface
- Describe the definitions of some key words related to the unit

Keyword	Definition
User Interface (UI)	The method in which a person controls and interacts with a software application or hardware device
Mock-up	A realistic representation or a visual draft of the design of a digital product e.g. app, website...
Mood board	A 'collage' of design ideas, colours or other inspirations used to show the thinking towards a design task
Storyboard	A graphical representation of the main sequence of steps/screens that users will use on an interface
Project Requirements	The features, functions, and tasks that need to be completed for a project to be deemed successful
House Style	A company's preferred manner of presentation and layout of written or digital material
Master Slide	A feature in Microsoft PowerPoint that helps you create a template design that can be applied across the whole document.
Hyperlink	An object (word, shape or image) that you can click on to jump to a new section within the current document or to a brand new document
Professional Design	A design that aims to replicate the design quality or style of something that has been created by a professional

Key Concepts

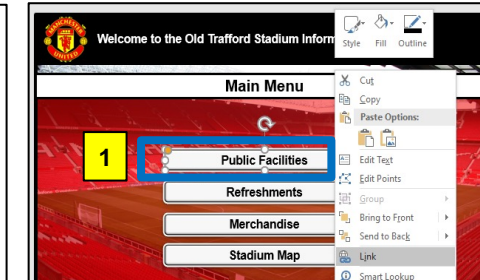


Example Storyboard



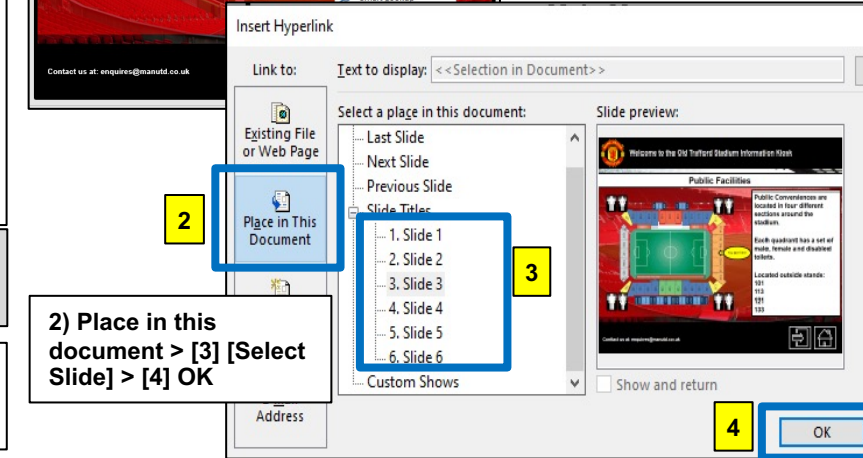
Applying the Master Slide to the document

- 1) Right click on a new slide
- 2) Select the 'Layout' option
- 3) Select the Master Slide template



How to create Hyperlinks

- 1) Right click on button > Link



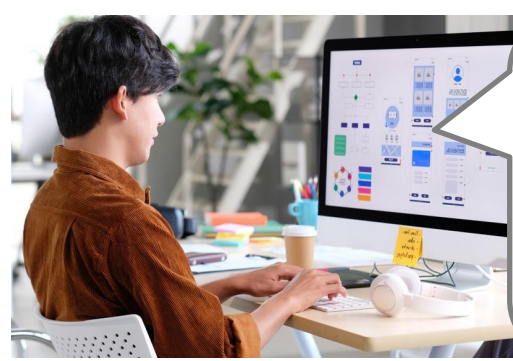
- 2) Place in this document > [3] [Select Slide] > [4] OK



Retrieval Practice

Questions	Answers
What is a 'User Interface' and what is the purpose of it?	A user interface, also called a "UI", is the method in which a person controls and interacts with a software application or hardware device. The UI acts as the layer between the software and the computer hardware – most software will be unusable without a UI.
Why is it important to carefully consider the use of a colour when designing a user interface?	Colour can speak, as powerful as language. It is the visual appearance, which largely depends on colour, that always leaves you the very first impression.
Which details do you need to include on a 'Storyboard' design?	A storyboard must include the following: Details such as font name, font size, font colour, shape colour, logo position, text box position and positioning of other objects.
What are you able to do using the 'Slide Master' tool in MS PowerPoint?	In MS PowerPoint, a Slide Master is a feature that allows you to create master templates (or master slides). One template design can be applied to slides within the document – this reduces interface development time and allows the designer to develop a clear house style.
Which features and tools in MS PowerPoint are useful when developing a user interface?	Some useful features and tools are: <ul style="list-style-type: none"> • Slide Master – to create template designs • Hyperlinks – to create a navigation bar and other interactive buttons • Drawing tools e.g. Shape -Fill, -Outline, -Effects... • Arrange tool – for layering of objects (sent to front and send to back) • Text boxes – add content on each slide • Insert Online Pictures tool – to insert images from the web
Explain what a 'Hyperlink' allows you to do and how you could it on your user interface?	A hyperlink is an object (word, shape or image) that you can click on to jump to a new section within the current document or to a brand new document. They allow users to click their way from page to page.
What is the purpose of testing a digital product or interface?	There are many benefits to testing a digital product or interface: <ul style="list-style-type: none"> • Refines the whole product before release • It reduces development and maintenance costs • Provides better usability and enhanced functionality • Reduces the number of 'bugs' or errors • Creates a positive impression of you/ your company

Career Focus - Where could this take you?

In my role as a **User experience (UX) designer** I create accessible, aesthetically appealing and meaningful physical and digital products that people find enjoyable to use. It is about understanding users' emotions and feelings to make sure they continue to come back to the product.

Challenge Activities



1. Create a professionally designed and formatted questionnaire or survey to gather feedback for the user interface. Include questions that clearly check if you have met the requirements of the project. Use the feedback to make improvements to your user interface.
2. Create a tutorial video or document to explain how to create an interactive user interface using MS PowerPoint. Make sure it includes a step-by-step breakdown of each task.
3. Do some research on the internet to find out which other pieces of software can be used to create a user interface. Create a table which compares the features, tools and functionality of each piece of software and then decide which software you think is the most appropriate to use to create a most professional looking user interface.

Topic Links



This topic links to:
Computing Curriculum:

- Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
- Create and re-purpose digital artefacts for a given audience, with attention to trustworthiness and usability
- Art and design (creative design, colour schemes etc..)
- English (appropriate language for a target audience)

Additional Resources



To further practise and develop your knowledge see:

- Colour scheme designer: <https://paletton.com/>
- Master Slide Tutorial: <youtu.be/bDk7z0mYmeE>
- Hyperlinks Tutorial <youtu.be/bYkUuaA63vc>



Our students will:

- produce creative work, exploring their ideas and recording their experiences
- become proficient in drawing, painting, sculpture and other art, craft and design techniques
- evaluate and analyse creative works using the language of art, craft and design
- know about great artists, craft makers and designers, and understand the historical and cultural development of their art forms.

- develop competence to excel in a broad range of physical activities
- are physically active for sustained periods of time
- engage in competitive sports and activities
- lead healthy, active lives.

- The aims of the sequence of learning are to ensure that all students:
- Describe the difference between graffiti and street art
 - Create your own stencil and printmaking materials

- Explain how street art is inspired by social/contextual and current affairs

Keyword	Definition
Graffiti	writing or drawings scribbled, scratched, or sprayed illicitly on a wall or other surface in a public place.
Vandalism	action involving deliberate destruction of or damage to public or private property.
Stencil	a thin sheet of card, plastic, or metal with a pattern or letters cut out of it, used to produce the cut design on the surface below by the application of ink or paint through the holes.
Mural	a painting or other work of art executed directly on a wall.
Satire	the use of humour, irony, exaggeration, or ridicule to expose and criticize people's stupidity or vices, particularly in the context of contemporary politics and other topical issues.
Typography	the style and appearance of printed matter.

Key Concepts



Scan the QR code to watch the video a brief history on graffiti, is graffiti art or vandalism.

What are your thoughts? Is Graffiti Art or is it vandalism?



SCAN ME



Scan the QR code to watch a video on the Street Artist Ben Eine.




SCAN ME



SCAN ME

Scan the QR code on the left to take you to some examples of local street art.

- Describe the difference between graffiti and street art
- Create your own stencil and printmaking materials
- Explain how street art is inspired by social/contextual and current affairs

Retrieval Practice 	
Questions	Answers
What is street art/graffiti?	Street art is related to graffiti art in that it is created in public locations and is usually unsanctioned, but it covers a wider range of media and is more connected with graphic design
What is a stencil?	This is a form of street art creation whereby a design is cut into paper or cardboard, then spray painted onto the canvas (wall)
What is a mural?	A mural is an enormous piece of street art, and may be created by a single artist or a group. It may show a single large scene, or depict a series of either standalone or connected images to tell a story.
What is mono printing?	The monoprint is a form of printmaking where the image can only be made once.
What is satire?	Humour that is used to make fun of and often show the weaknesses of someone or something.
What is typography?	This is the art of arranging letters and text in a way that makes the font style legible, clear, and visually appealing to the reader.

Career Focus - Where could this take you?



I am a **set designer** and I work in creating large pieces of art work for sets of television programmes, movies or theatre productions. My work is similar to street art in my use of stencils and large wall canvases.

Challenge Activities

1. Look through the examples of Street Art you will find in Leeds and explain what pieces you like/dislike and why you have made these choices. Comment on things like colour, pattern and the style of the work.
2. Working in the style of Ben Eine design a mural that could go somewhere in the Academy. Remember the key characteristics of Ben Eine's work when designing your mural.

Topic Links

This topic links to:

- English – arguing for or against a statement, e.g. whether street art is or is not graffiti
- History – culture and social circumstances that would influence street art

Additional Resources

To further practise and develop your knowledge see:



SCAN ME



SCAN ME



SCAN ME



The aims of the sequence of learning are to ensure that all students:

- Replicate a set phrase of movement.
- Select and apply a formation to my performance
- Recognise and describe dance elements

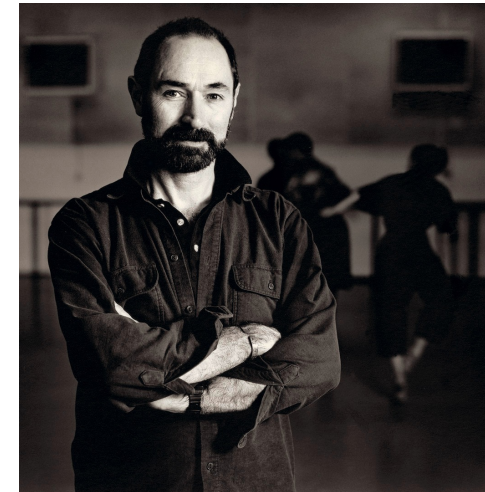
- Develop a duet/group using spatial content to communicate a choreographic intention
- Perform sequences with control, accuracy and fluency.
- Apply choreographic devices to enhance choreographed routines
- Perform basic and more complex lifts.

Keyword	Definition
Swansong	The last act you do before retirement or death
Human Rights	Equality, Individuality, Freedom of speech
Amnesty International	An organisation that look after human rights
Prisoner of conscience	Prisoned for your social or political beliefs
Physical setting	Scenery, Props, lighting
Theme	An idea that reoccurs
Choreography	The art of making dances
Costume	A set of clothes in a style typical of a particular country or historical period
Prop	a portable object other than furniture or costumes used on the set of a play or film
Stimulus	an interesting and exciting quality.

Key Concepts

FACT FILE - CHRISTOPHER BRUCE (Choreographer)

- Bruce was born in Leicester in 1945.
- He trained at the Ballet Rambert School, which he later choreographed for.
- He then became choreographer for English National Ballet, then Houston Ballet.
 - Bruce is now Artistic Director of Rambert.
- Bruce prefers an audience to keep an open mind about his works, often avoiding programme notes and specific statements. However, he does recognize that his pieces are concerned with ideas rather than being abstract pieces of dance, there is usually strong imagery.
 - Some of his works have an autobiographical element
- Several of Bruce's works express his political, social and ecological awareness.
- His dances generally develop from a stimulus such as music, painting or literature, but he selects themes which can be conveyed through dance.
- Bruce chooses a wide range of music, from popular songs, world music, classical, contemporary, to specially commissioned scores in close collaboration with the composers. The dance often responds closely to the music
- Bruce uses a blend of dance techniques, notably ballet and contemporary. His own contemporary training was in Martha Graham technique and strong use of the back and a low centre of gravity are important elements in his choreography.



FACT FILE - SWANSONG

First premiered - **1987**
 Company - **Ballet Rambert**
 choreographer - **Christopher Bruce**
 lighting designer - **David Mohr**
 Musical director - **Philip Chambon**
 Costume designer - **Christopher Bruce**
 Set Designer - **Christopher Bruce**
 Dancers - **Trio**
 Set - **Black Box**
 Lighting - **beam of light symbolizing a window or freedom.**
 Costume guard - **Khaki trousers and shirt, Black jazz shoes**
 Costume prisoner - **Faded red T shirt and blue jeans**
 Props - **Chair, Cap, Canes, Cigarette**
 Stimulus - **The work of Amnesty International, saying goodbye, The experiences of Victor Jara a Chilean poet and the novel A MAN by Oriana Fallaci.**
 Themes - **Human Rights, Prisoner of Conscience.**
 Dance Styles - **Contemporary, Physical Contact, Ballet, Jazz, Tap, Folk, Ballroom and Vaudeville.**
 Choreographic style - **Episodic, Dramatic, Thematic.**



The aims of the sequence of learning are to ensure that all students:

- Replicate a set phrase of movement.
- Select and apply a formation to my performance
- Recognise and describe dance elements

- Develop a duet/group using spatial content to communicate a choreographic intention
- Perform sequences with control, accuracy and fluency.
- Apply choreographic devices to enhance choreographed routines
- Perform basic and more complex lifts.



Retrieval Practice

Questions	Answers
What dance techniques does Bruce use?	Bruce uses a blend of dance techniques, notably ballet and contemporary. His own contemporary training was in Martha Graham technique and strong use of the back and a low centre of gravity are important elements in his choreography
What are some of the stimuli from Swansong?	The work of Amnesty International, saying goodbye, The experiences of Victor Jara a Chilean poet and the novel A MAN by Oriana Fallaci.
What is vaudeville style?	a type of entertainment popular chiefly in the US in the early 20th century, featuring a mixture of speciality acts such as burlesque comedy and song and dance
What is contemporary dance?	Contemporary dance is a style of expressive dance that combines elements of several dance genres including modern, jazz, lyrical and classical ballet. Contemporary dancers strive to connect the mind and the body through fluid dance movements. The term "contemporary" is somewhat misleading: it describes a genre that developed during the mid-20th century and is still very popular today.

Career Focus - Where could this take you?



As a **Costume Designer** I use my creative skills to make new and exciting costumes and outfits. It is important that I understand the themes of the piece I am creating for and can communicate them through my designs.

Challenge Activities



[Swansong worksheet](#)

[Interview with christopher Bruce - the creation of swansong](#)

[Swansong clip](#)

Topic Links




- This topic links to:
- Drama Performance skills
 - PE - Physical skills
 - English - Understanding terminology and verbs.
 - Maths - Problem solving.

Additional Resources



To further practise and develop you knowledge see:

- <https://www.scottishballet.co.uk/profile/christopher-bruce>
- <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKewjc6cLpoO75AhW4SkEAHdcAATIQtWJ6BAgLEAI&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3D038BdfaaVV&usq=AOvVaw2-2GFIU4Hgo9nbivk-7fB8>

Retrieval Practice 	
Questions	Answers
Action	What you do, Based the six basic actions Travel , Turn, Gesture, stillness , Jump , Transfer of weight.
Spatial awareness	Formation , Level , Direction, Size, Pathway
Dynamics	How you move, Soft , Sharp , Fast , Slow.
Relationship	With who or what – Dancer to dancer, Dancer to audience, Dancer to prop.
Motif	A short sequence that can be repeated or developed.
Motif Development	Develop a motif using the elements involving space, relationship and action.

Career Focus - Where could this take you?



I am an **artistic director** and it is my role to lead and organise the performers in my show. I need to be able to communicate effectively so that everyone understands their roles and the overall vision. I need to collaborate with experts in many different areas to create a cohesive performance.

Challenge Activities

[choreography - Janelle Gineshra](#)

[_Director Luke Davis](#)


[_Andrew winghart - choreography](#)

Topic Links

This topic links to:
Drama Performance skills
PE - Physical skills
English - Understanding terminology and verbs.
Maths - Problem solving

Additional Resources

To further practise and develop your knowledge see:
[Interview cast and creative team - some like it hip hop](#)

Keyword 	Definition
Choreographic Devise	Tools to help develop a motif
Stimulus	Initial idea or starting point
Motif	A short sequence that can be developed
Devising	A group response to a stimulus
Transition	Linking movements
Theme	An idea that reoccurs
Spatial Awareness	Formation, Level, Pathway and Direction.

Key Concepts

STRUCTURING DEVICES and FORM - including binary, ternary, rondo, narrative, episodic, beginning/middle/end, unity, logical sequence, transitions

Structures of Dance

Binary – A B – The first section contrasts the second section but both have a common nature.

Ternary – ABA' – The first section contrasts the second section but the third is very similar to the first as it is developed through the use of devices.

Rondo - ABACAD... - Like a verse and a chorus, the A section is very similar (but uses different devices to differentiate it) but the other sections are different.

Episodic – ABCDE... - each section is different from each other but they all have some elements in common

- Binary:




- Ternary:



- Rondo:



Year 9 Scripting, Staging, Directing & Performing

Keyword 	
Accents	Articulation
Blocking	Centre Stage
Character	Cold Reading
Duologue	Ensemble
Exposition	Genre
Gesture	Interpretation
Performance	Projection
Role	Situation
Setting	Staging



Key Concepts

Thinking Questions

- How am I showing my character?
- What is my body language?
- How is it different to my normal?
- What is my character feeling?
- Do my facial expressions match this?
- What is my posture like?
- How do I walk? What is my gait like?
- How do I react to the other characters?
- How close do I stand next to others?

Techniques:

Status (Looking at who is important in a scene and how to show their importance)

Tension (Creating a feeling of unease)

Pitch (How high or low you speak to give effect and show character)

Pace (How quickly or slowly you speak to show character and give effect)

Volume (How loudly or quietly you speak to give effect and show character)

THE SCRIPT

You will be looking at a set script. You will bring a scene to life, using the performance skills learned and developed over the year so far and create a interesting and engaging performance.

PAGE TO STAGE

You will create a piece of documentary theatre.. We will be looking at vocal skills, physicalizing a script, and setting a scene

A good scripted performance

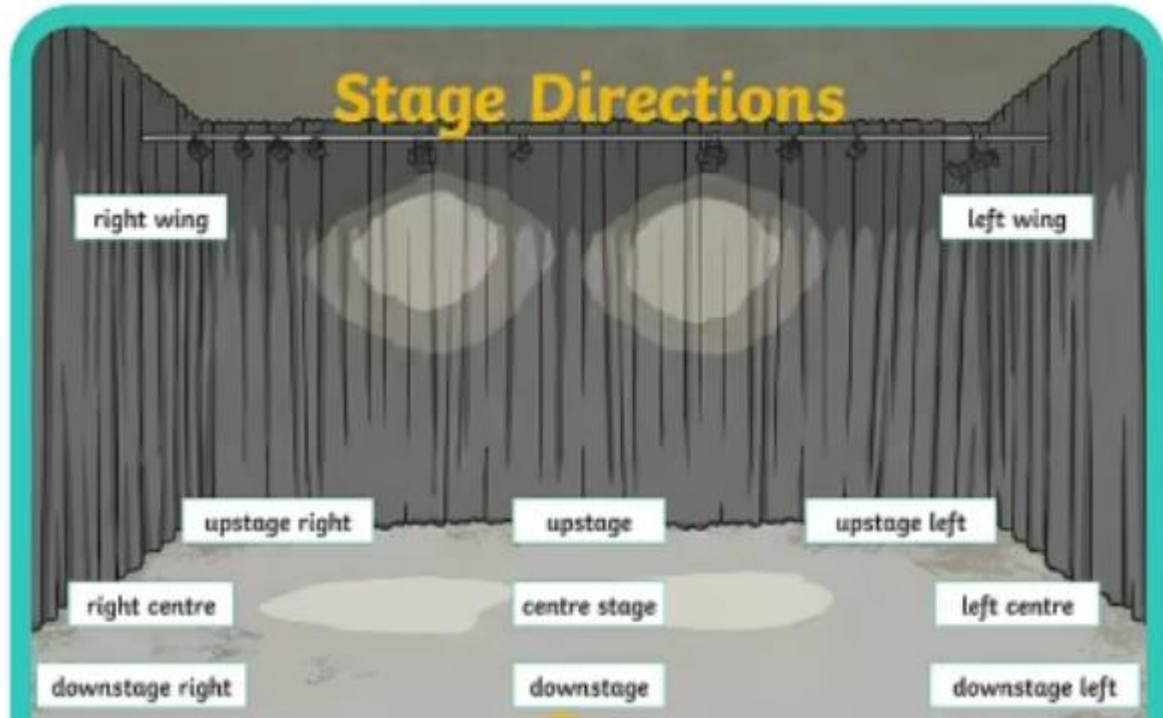
Will demonstrate the character and the scene as the director intended and create a clear meaning or message for the audience. It will be interesting to watch and focus on the performance not just the words.

Assessment

You will take part in several peer and self assessment tasks over the project, as well as your teacher assessment. receiving feedback from your teacher.

Your assessment for this Topic will be based on a performance of a set script that the teacher will give you and an evaluation of your performance.

Year 9 Scripting, Staging, Directing & Performing



Career Focus - Where could this take you?



I am a stage director. I have to have excellent communication skills as my job includes managing time and organising people and space. attending production meetings with set designers. organising rehearsals. communicating and liaising with all parties involved, including actors, the creative team, the production team and producers.

Challenge Activities



TASK 1

Look at the list of **Drama practitioners** below.

You need to **pick ONE** of these people to **research**.

You will be researching a lot of information about them. So make sure it is someone you find interesting!

Chris Pratt – Actor (Easy)

Jennifer Lawrence – Actor (Easy)

Konstantin Stanislavski – Came up with the style of drama we see today on telly and normally on stage (Medium)

Bertolt Brecht – Came up with a very different way to perform plays on the stage (Hard)

TASK 2

You need to research key things about them and then write down all the information you found in a fun and engaging way. This could be a poster, a blog post, a fact file, a facebook style page, a vlog, anything you like as long as it has the information.

You need to research –

Who they are

What they do

Their career

Their life

The work they have done or things they took part in

Any books they wrote or work they created

You also need to write about *why* you chose that person to research. Please do NOT write, because it was an easy one, or because it was the only one I knew. I would like to see things like – inspiring, different, fun personality, good role model, interesting, etc.

Topic Links



Music
English
Maths
Science
Art
Dance
Music

Additional Resources



If you want to do more and extend yourself in Drama...Explore the Arts as a participant

Watch to learn more about performing and staging Macbeth

<https://youtu.be/vumgtbMObAA>











- The aims of the sequence of learning are to ensure that all students:
- Describe common cuisines from different regions of the world
- Discuss the environmental impact of how we use food

- Explain different types of heating
- Evaluate dishes using the five taste sensations







Keyword	Definition
Environment	The air, water and land where people and animals live
Sustainability	Looking after our environment by using less energy, reducing the consumption of water, avoiding waste and recycling as much as possible
Carbon footprint	A measure of the impact your lifestyle has on the environment (including your food choices)
Landfill	Sites where waste is collected and left to decompose
Composting	Left over food is collected and piled in the garden to decompose into useable compost (meat, fish and dairy products cannot be composted)
Reuse	Using items again after their initial use; using leftover food to make another dish
Recycle	Taking package and other used items and forming them into something new to be used again
Staple food	Crops that are grown in particular parts of the world due to their climate and conditions (wheat in Europe, rice in Asia, maize in South America)
Cuisine	A style of cooking from a particular country or region of the world. Different cuisine has different ingredients, styles and preparation/cooking techniques)
Convection	when heat travels through air or water. E.g. in an oven or a pan of boiling water
Conduction	when heat travels by direct contact through solid materials such as food or metal
Radiation	when heat rays travel towards food, e.g. grilling, toasting, microwaving

Key Concepts

Skills and Processes Used In Year 9

	Spicy wedges (Mexican), Knife skills. Stir frying. Protein denaturation (chicken). Checking for readiness (no pink left inside chicken). Working with <u>high risk</u> foods (chicken).		Churros (Mexican) Weighing & measuring deep frying. Creating a sweet dough, piping control, temperature
	Chilli Con Carne (Mexican), Knife Skills. High risk foods (raw meat). Protein denaturation. Simmering a reduction sauce.		Tortilla (Mexican), Weighing & measuring Flavouring using spices. Using flour dough (must be kept damp during rise). Dry frying
	Mexican Bean Salad (Mexican), Knife skills. Combining different textures, ingredients.		Spicy Mexican wraps (British), Knife skills, peeling, Frying, protein denaturation chicken). Checking for readiness, working with <u>high risk</u> foods (chicken). Frying.
	Mexican Salsa and sour cream dip (Mexican) Taste testing spices, blending, knife skills to create Julian vegetables		Taste testing (Mexican). Understanding 5 taste sensations, recording findings. Using knowledge gained to add balance to dishes

Foods and Cuisines from Around The World

	UK Roast dinner. Fish & Chips. Bakewell Tart.		Japan Sushi. Ramen. Udon noodles. Jasmine Rice.
	Italy Pizza, Pasta, Lasagne, Risotto, Gelato.		China Spring Rolls. Stir fry. Sweet & Sour. Chow Mein.
	Mexico Chilli Con Carne, Burritos, Tacos, Salsa, Guacamole		India Samosas, Curries, Tandoori Chicken, Nan Breads

5 ways to reduce your carbon FOOTPRINT

- 1 only buy what you need**
20-50% of everything we buy ends up in landfill
- 2 eat less meat and dairy**
70% of the world's footprint is from animal products
- 3 eat less processed food**
the more processed a food is, the bigger its footprint
- 4 buy local and in season**
these foods have travelled less and stored less
- 5 grow your own food**
the ultimate in local, seasonal, unprocessed food








- The aims of the sequence of learning are to ensure that all students:
- Describe common cuisines from different regions of the world
 - Discuss the environmental impact of how we use food

- Explain different types of heating
- Evaluate dishes using the five taste sensations




Retrieval Practice

Questions	Answers
What are common features of Mexican cooking?	<p>Mexican food uses a variety of herbs and spices including chillies both fresh and dried as well as paprika. Garlic is also a common spice used along with cumin and the herb oregano.</p> <p>Chipotle is another spice used in Mexican cooking. Maize is the main ingredient of the pancake called the tortilla. This can be served in many ways; When it is fried crisp and golden on both sides it is called a tostada.</p> <p>Tacos are tortillas curled into a shell shape and fired. Tortillas which are rolled up with onion and cheese then covered in sauce are called enchiladas.</p>

What are the three heat transfer methods?	<p>Convection</p> <p>Conduction</p> <p>Radiation</p>   
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Career Focus - Where could this take you?



I am a **Dietician** and am an expert in food and nutrition. I work with individual or population groups to study nutritional requirement and devise eating plans and recipes.



Challenge Activities

Read the sections on the varying dietary habits of the different religious groups. Plan a meal or dish for each group that doesn't use any of the prohibited ingredients.

For an extra challenge try to use authentic cuisines in your meal.

Topic Links	Additional Resources
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This topic links to:

- RE – studying the different eating habits and dietary requirements of persons from different religious or cultural groups

To further practise and develop you knowledge see:

- <https://www.chefspencil.com/most-popular-mexican-foods/>
- <https://www.bbc.co.uk/bitesize/guides/zjnsrd/revision/1>

Islam



Prohibited animal flesh: pork.

The Koran outlines the foods which can be eaten (halal) and those forbidden (haram). Beef, lamb and chicken can only be eaten if the animal has been slaughtered by the halal method. This means that the animal must be killed by slitting its throat. The animal will then have all the blood drained from its body. The method of slaughter in the UK is carried out following strict animal welfare guides, the same as for non halal meat.

Muslims will only eat meat slaughtered by Muslims, Christians or Jews.

Haram are foods which are forbidden. Examples include pork, blood, alcohol and meat sacrificed to idols.

During the month of Ramadan, Muslims need to refrain from eating, drinking and smoking from sunrise to sunset. Ramadan is the ninth month of the Islamic calendar.

Eid

- Eid-ul-Fitr – day celebrating end of Ramadan.
- Eid ul-Adha – day that celebrates the end of the Hajj.

Eid can be celebrated with special foods shared with friends and family, such as Eid sweets.



Hinduism



Prohibited animal flesh: all, except lamb, chicken and fish.

Strict Hindus are vegetarian. The cow is held in high regard and a symbol of abundance, therefore Hindus do not eat beef.

Some Hindus may also avoid certain foods, such as domestic fowl, salted pork, milk, ghee, onions, garlic, eggs and coconut.

It is particularly important to check food products like bread, biscuits, cheese and jam to ensure that the forbidden ingredients are not present.

Some devout Hindus observe fasting on special occasions, or on certain days of the week or month, as a mark of respect to personal Gods or as part of their penance.

The religious festival **Diwali** marks the end of the Hindu year and the start of a new. Special Diwali sweets are eaten.



Seventh-day Adventist Church



The Seventh-day Adventist Church is a Protestant Christian denomination. (A religious denomination is a subgroup within a religion that operates under a common name, tradition, and identity).

Many Adventists are ovo-lacto vegetarians, which means they do not consume animal flesh of any kind, but will consume dairy and egg products.

Some Adventists avoid food and drinks which contain caffeine, therefore they do not consume tea and coffee. They also avoid alcohol.



Judaism



Prohibited animal flesh: pork and non-kosher beef, lamb and chicken.

The Torah (the law of God as revealed to Moses and recorded in the first five books of the Hebrew scriptures) outlines which foods are allowed for Jews to eat. Permissible foods are called Kosher and forbidden foods are called Trefa.

Kosher animals have a completely split hoof and chew cud, e.g. cows, goat and sheep. Horses and pigs are not Kosher animals.

Kosher fish must have fins and scales, therefore shellfish and eels are excluded. All plant foods are Kosher, unless damaged by rot or insects.

Kosher meat is prepared by using a single knife to cut open the throat to kill the animal, with all the blood drained. The meat should be soaked in water and salted to remove the last traces of blood.

The method of slaughter in the UK is carried out following strict animal welfare guides, the same as for non kosher meat.

Meat and dairy foods must not be prepared or eaten together.

Jews should not prepare food on the Sabbath, which begins at sundown on Friday and ends at sundown on Saturday.

There are other periods of fasting in the Jewish calendar, e.g. Feast of Pesach (Passover).



Sikhism



Prohibited animal flesh: pork, beef, halal and kosher.

Sikhs do not eat halal or kosher meat because they are not meant to take part in religious rituals apart from the Sikh Rehat Maryada (Code of Conduct). They should also refrain from food and drinks which may harm their body, e.g. alcohol.

Some older Sikhs may fast during full moon or specific holidays, but most are discouraged from fasting and going on pilgrimages.

Sikhs believe in sharing food. Every gurdwara (place of worship) has a langar (common kitchen). The congregation eats together here after the service.

Sikhs also celebrate the festival **Diwali**.



Buddhism



Prohibited animal flesh: all.

Buddhists believe they should not be responsible for the death of any other living organism. Therefore, most, but not all, Buddhists follow a strict vegetarian, if not vegan diet.

They also avoid the consumption of alcohol.

Wesak is a festival celebrating the birth, enlightenment and death of Siddhartha (who some people believe to be Buddha). Foods such as eight treasure rice can be eaten on Wesak (Chinese rice pudding).



Christianity

The general beliefs in Christianity are that there is **no restriction** on kinds of animals that can be eaten, however some Christians may choose to follow a vegetarian or vegan diet. Some Christian denominations follow a meat free diet but only during the holy period of lent.

Christian views on alcohol are varied however, alcohol consumption is found frequently throughout the bible and its stories.

There are a number of occasions in the Church year where special food may be eaten. This includes:

Christmas – a day celebrating the birth of Jesus;

Easter – celebrates Jesus' resurrection from the dead; Simnel cake is often eaten during the Easter period. The cake is topped with eleven marzipan balls to represent the eleven disciples of Jesus Christ (excluding Judas).

Shrove Tuesday – Shrove Tuesday is the Tuesday prior to Lent, where Christians remember the time Jesus fasted in the desert. They often give up certain food during this period. Shrove Tuesday was traditionally the last chance to use up the foods Christians would not be eating during Lent (e.g. eggs, fats).



Rastafari Movement

Prohibited animal flesh: all.

Most Rastafarians are vegetarians or vegans.

Foods approved for Rastafarians are called Ital, which should be natural or pure, without the addition of artificial colours, flavourings or preservatives.

Rastafarians avoid alcohol and some also avoid tea, coffee and other caffeinated drinks because these are considered to confuse the soul.



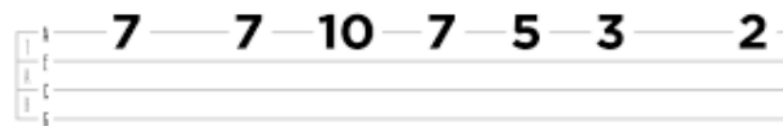
- The aims of the sequence of learning are to ensure that all students:
- develop knowledge of the skills required to perform in a band
 - Build confidence to perform for an audience

Keyword	Definition
Riff	A short, repeated, 'catchy' phrase in popular music, typically used as an introduction or refrain in a song. Often played on a guitar or some other lead instrument.
Hook	A short riff, passage, or phrase, that is used in popular music to make a song appealing, memorable and "catchy".
Structure	The order of the different sections in a song.
Composition	A song or piece of music.
Ensemble	A group of musicians (most often used in classical music).
Band	A group of musicians (most often used in pop music)
Rehearsal	A set time a band get together to practise and learn their songs.
Performance	When a musician or group of musicians play music, usually in front of an audience.
Tab	A form of music notation for guitar and bass.

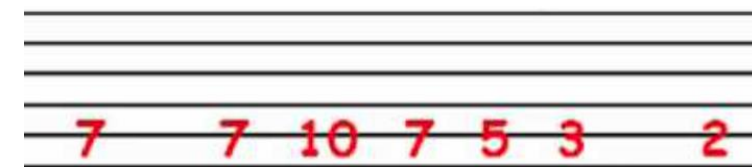
Key Concepts

'Seven Nation Army' Tabs

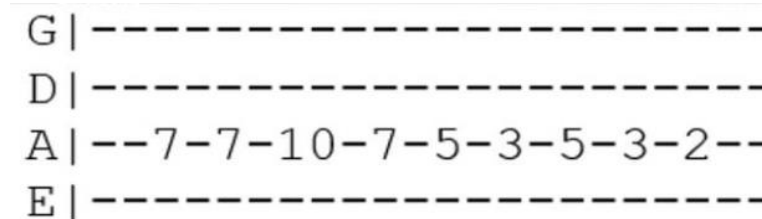
Ukulele



Guitar



Bass




A rock band:



An acoustic band:



- develop knowledge of the skills required to perform in a band
- Build confidence to perform for an audience

Retrieval Practice 	
Questions	Answers
What is a genre?	A genre is a type, style or category of music, e.g. rock, metal, jazz.
What is an ostinato?	An ostinato is a short, repeating pattern.
What does duration mean?	Duration is the length of time that a note is held.
What is the difference between a rhythm and a pulse?	A rhythm is a pattern of notes with <i>different</i> durations. A pulse is a sequence of notes with the <i>same</i> duration.
What is a scale?	A scale is a pattern of notes ascending and decreasing in pitch. They can be played on any pitched instrument.
What is a chord?	A chord is more than one note played at the same time.
In music, what does song structure mean?	Song structure is all the parts of a song (for example, the verses and choruses) and how they are arranged.

Career Focus - Where could this take you?



Being in a band will really strengthen your time management. Getting to rehearsals, gigs and studio sessions on time is vital in our band. While we don't always get along, we have to overcome these difficulties and learn to work well with others. Through the years we have developed our creative thinking skills by coming up with ideas and writing over 150 songs!

Challenge Activities

1. Create your own guitar or piano riff using a scale (eg. Pentatonic, Minor).
2. Here is a compilation of riffs played using the pentatonic scale. See how many you can play on an instrument:
https://www.youtube.com/watch?v=9teYiPih-X8&ab_channel=MartyMusic
3. Become a multi-instrumentalist: Can you play 'Seven Nation Army' on three different instruments?

Topic Links

- This topic links to:
- Drama – General skills (voice projection, stage presence, costumes)
 - Voice 21 Oracy skills (through performance)
 - English literature – Lyrics, poetry and creative writing

Additional Resources

To further practise and develop your knowledge see:
BBC Bitesize:
<https://www.bbc.co.uk/bitesize/guides/z6ch8xs/revisio n/4>

Billboard list of the 25 catchiest hooks ever:
<https://www.billboard.com/music/music-news/greatest-catchiest-pop-hooks-ever-6731053/>

Year 9 Net and Wall Games

The aims of the sequence of learning are to ensure that all students:

- Can identify at least five core skills required for net and wall games
- Demonstrate core skills in a game situation
- Demonstrate core skills in a practice situation
- Lead a small group of peers in a skill practice session

Keyword	Definition
Racket	A piece of equipment with a handle, frame and head. This is used to hit the shuttle or ball over the net
Shuttle	A cone shaped object with a cork base. This is hit over the net with the racket.
Net	Rectangular net placed across the court. It divides the court in two.
Court	The playing surface area marked out with lines
Table	The playing surface used to play table tennis
Serve	A shot that is selected to start a game in net and wall activities
Forehand shot	Shot taken with the palm of your hand facing the direction of the stroke
Backhand shot	Shot taken with back of your hand facing the direction of the stroke across your body
Let	The shuttle or ball hits the top of the net and lands in the service box. The serve is retaken for fair play
Drop shot	The shuttle or ball is hit gently so it falls just over the net
Spin	Applying rotation on the ball so it moves faster in the air and rebounds on the table
Clear shot	A defensive shot where the shuttle is placed to the back of the court

Key Concepts You should already know:- The aim of net and wall games


You will be assessed on:- Understanding - Technique in isolation - Technique in game - Leadership - Attitude to learning

Table Tennis

Ready Position

Players should always be in the ready position before receiving the ball.

- Knees bent
- Feet shoulder width apart
- Feet shoulder width apart
- Racket should be level with the table and in front of body



Backhand push

- Ready position
- Controlled backswing so your elbow bends inwards towards chest (making an L shape)
- Forward movement comes from the elbow making contact underneath the ball
- Finish by extending your arm in the follow through (changing from an L shape to a I shape)

Forehand Drive

- Ready position
- Controlled backswing, with striking arm opening up extending outwards
- Positive forward movement, arm moves forward and weight transfers from right to left foot
- Strike the ball on top of the bounce
- Follow through the shot, moving upwards and finishes in line with your nose

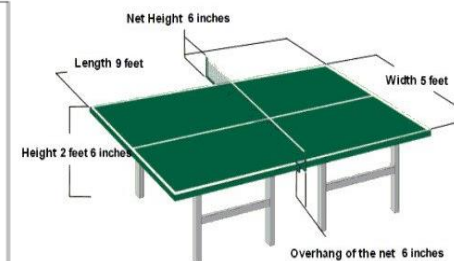
Backhand serve

- Ready position
- The ball rests in the palm of the resting hand
- Arm moves back towards chest
- Toss the ball up (at least 15cm)
- Forward movement comes from the elbow making contact down on the ball so it bounces on your half of the table first
- Head should be over the ball when making contact
- Follow through by returning to the ready position

9 feet (2.74m) long,
5 feet (1.525m) wide and
2 feet 6 inches (76cm) high

... and the net is

6 feet (1.83m) long and
6 inches (15.25 cm) high.



Badminton

The aim of badminton is to hit the shuttle with your racket so that it passes over the net and lands inside your opponent's half of the court. Whenever you do this, you have won a rally; win enough rallies, and you win the match.

Your opponent has the same goal. He will try to reach the shuttle and send it back into your half of the court. You can also win rallies from your opponent's mistakes: if he hits the shuttle into or under the net, or out of court, then you win the rally.

Scoring

A point is scored when you successfully hit the shuttlecock over the net and land it in your opponent's court before they hit it. A point can also be gained when your opponent hits the shuttlecock into either the net or outside the parameters

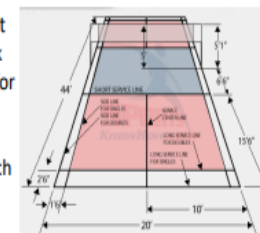
To win a game you must reach 21 points before your opponent. If you do so then you will have won that set. If the scores are tied at 20-20 then it comes down to whichever player manages to get two clear points ahead. If the points are still tied at 29-29 then the next point will decide the winner of the set. Winning the overall game will require you to win 2 out of the 3 sets played.

The Court

The overall dimensions of a badminton court is 20 feet by 44 feet. The lines along these measurements mark the side-lines for doubles play and long service lines for singles play.

The net line marks the middle of the court where the net is placed, creating a 22 feet by 20 feet area on each side of the net.

The badminton net measures 5 feet tall in the centre.



- Can identify at least five core skills required for net and wall games
- Demonstrate core skills in a practice situation
- Demonstrate core skills in a game situation
- Lead a small group of peers in a skill practice session



Retrieval Practice

Questions	Answers
What are some of the core skills needed for attacking in badminton and why are they important?	<ol style="list-style-type: none"> 1. Smash shot is a core skill. The aim is to hit the shuttle as hard as possible to the oppositions side of the court floor, so they are unable to return the shot due to the velocity (speed and direction) placed on the shuttle. 2. The long serve is a core skill for attacking in badminton. The aim is to send the opponent to the back of the court, so they find it more difficult to return the shuttle back to you. If the shuttle is returned, it shall usually be a high return giving (you) the attacker time to react by selecting the smash shot in order to win the next point.
What are some of the core skills needed for defending in badminton and why are they important?	<ol style="list-style-type: none"> 1. The overhead clear shot is used in a rally situation so that you force your opponent to move to the back of the court. This then allows you time to get prepared into a better court position and to apply attacking tactics to win the next point. 2. The drop shot is a gentle forehand or backhand shot that applies little force to the shuttle, so it drops just over the net. This is usually a defensive shot as it slows down the speed of the rally. It does however have an advantage of attacking if your opponent is at the back of the court. The shot can force your opponent to move and make an error.
What are some of the core skills needed for attacking in table tennis and why are they important?	<ol style="list-style-type: none"> 1. Top spin forehand drive shot is a fast open palm shot facing the direction of the stroke. By placing top spin on the ball, the balls rotation means it travels faster through the air and recoils off the table meaning that the opponent will find it hard to react to return the shot successfully. This means you are more likely to win the point in a game. 2. Back spin forehand or backhand shot is skill that is designed to slow down the speed of a rally in table tennis. It forces the ball to gently land just over the net and stop dead. This means the opponent has to move quickly forward from the back of the table to the front of the table.
What are some of the core skills needed for defending in badminton and why are they important?	<ol style="list-style-type: none"> 1. Backhand push shot and the forehand push shot are two skills designed to slow down the speed of a rally in a game. This gives the person more time to react to the next shot so they can have time to think about where they want to place the ball when they are in a better attacking position so they can then try to win the next point.

Career Focus - Where could this take you?



I am a sports sales executive. I have a degree in Sports Science Technology. A sports sales executive is a sales professional who specialises in sports sales. My responsibilities include persuading people to buy our products, negotiating sales prices, presenting to clients and meeting sales targets.

Challenge Activities



Design a skill card:

This can be used in a PE lesson to help a student to assess their current ability level. The skill card should have basic key instructions and diagrams that you have learnt from badminton or table tennis.

Create a rules of the game poster:

This can be used by all students in their PE lessons for badminton or table tennis when their role is umpiring a game so that all games can be played fairly, following RITA values.

Topic Links



- This topic links to:
- Science – The role of the cardiovascular system; the physics of sports
 - English – understanding and defining key terminology
 - Mathematics – problem solving, recording figures and analysing performance and score keeping
 - Voice 21 – coaching peers and explaining rules by officiating

Additional Resources



To further practise and develop your knowledge see:
<https://www.badmintonengland.co.uk/>
<https://www.tabletennisengland.co.uk/>

Username and Passwords
