

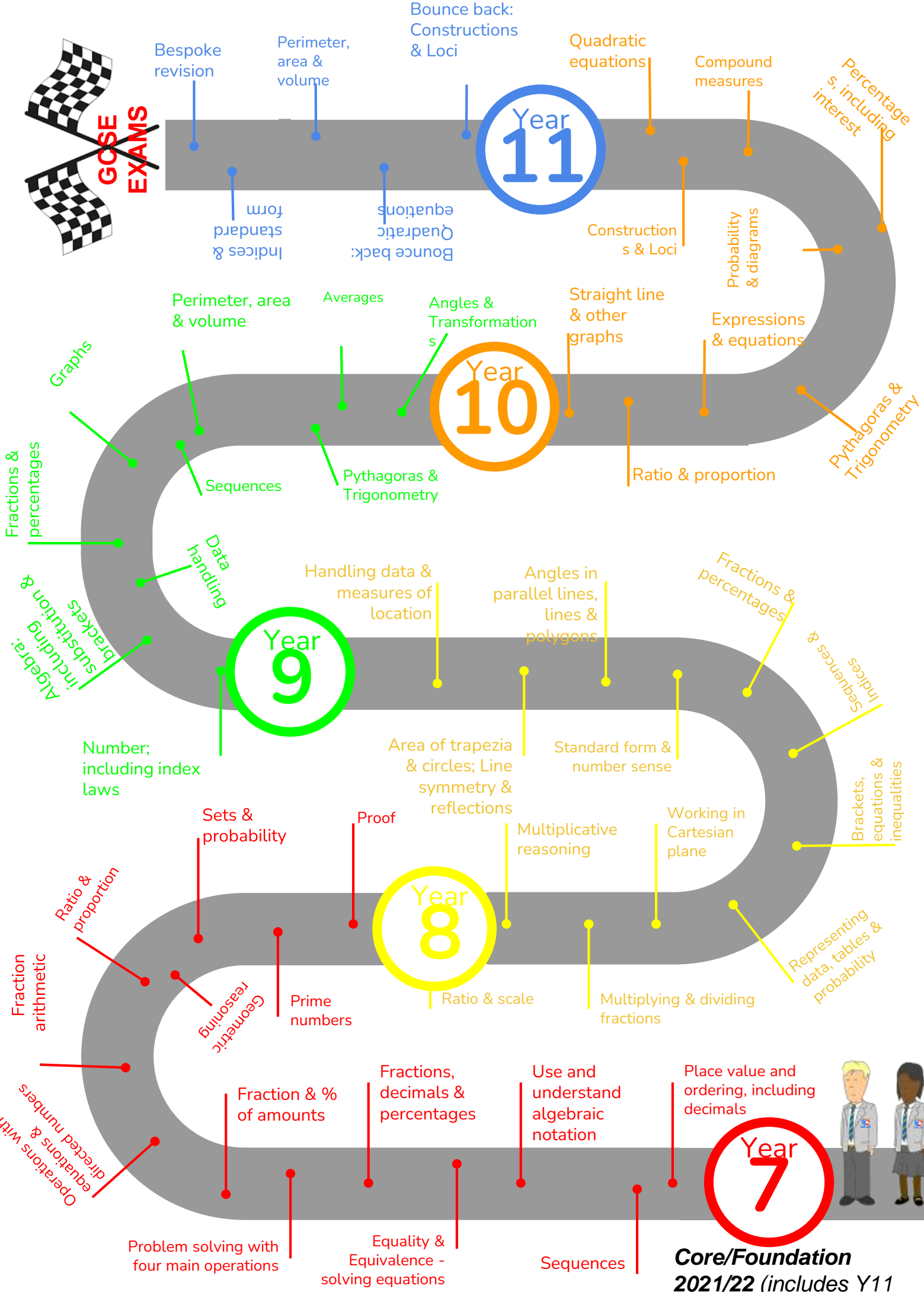


Year 11 Foundation Scheme of Learning

MODULE 2



Bishop Chadwick
Catholic Education Trust



GCSE EXAMS

Year 11

Year 10

Year 9

Year 8

Year 7



Core/Foundation 2021/22 (includes Y11 bounce back)

Bespoke revision

Perimeter, area & volume

Bounce back: Constructions & Loci

Quadratic equations

Compound measures

Percentages, including interest

Indices & standard form

Bounce back: Quadratic equations

Constructions & Loci

Probability & diagrams

Perimeter, area & volume

Averages

Angles & Transformations

Straight line & other graphs

Expressions & equations

Pythagoras & Trigonometry

Graphs

Fractions & percentages

Sequences

Pythagoras & Trigonometry

Ratio & proportion

Algebra: including substitution & brackets

Data handling

Handling data & measures of location

Angles in parallel lines, lines & polygons

Fractions & percentages

Year 9

Number; including index laws

Area of trapezia & circles; Line symmetry & reflections

Standard form & number sense

Indices, Sequences & Inequalities

Sets & probability

Proof

Multiplicative reasoning

Working in Cartesian plane

Brackets, equations & inequalities

Ratio & proportion

Fraction arithmetic

Geometric reasoning

Prime numbers

Year 8

Ratio & scale

Multiplying & dividing fractions

Representing data, tables & probability

Operations with directed numbers

Fraction & % of amounts

Fractions, decimals & percentages

Use and understand algebraic notation

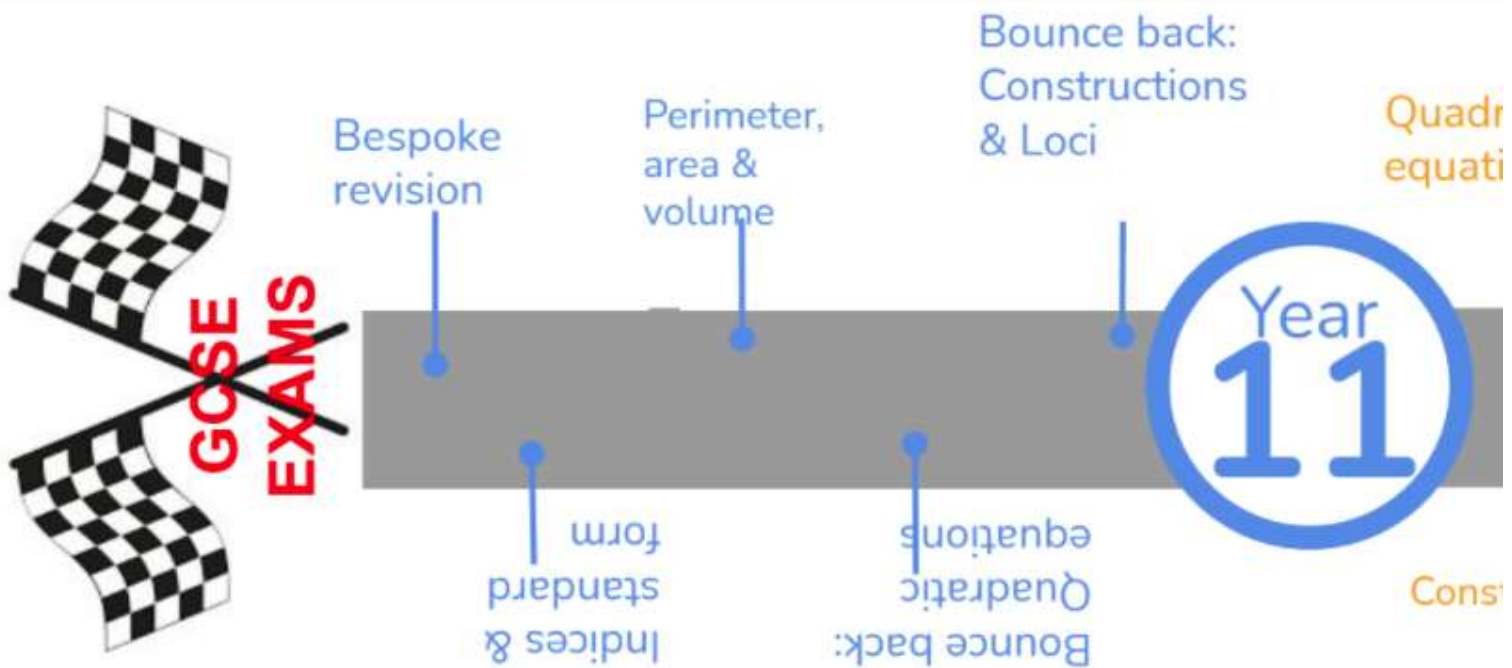
Place value and ordering, including decimals

Problem solving with four main operations

Equality & Equivalence - solving equations

Sequences

This is what your child will be taught as part of the GCSE foundation course in Year 11 in their MATHS lessons.



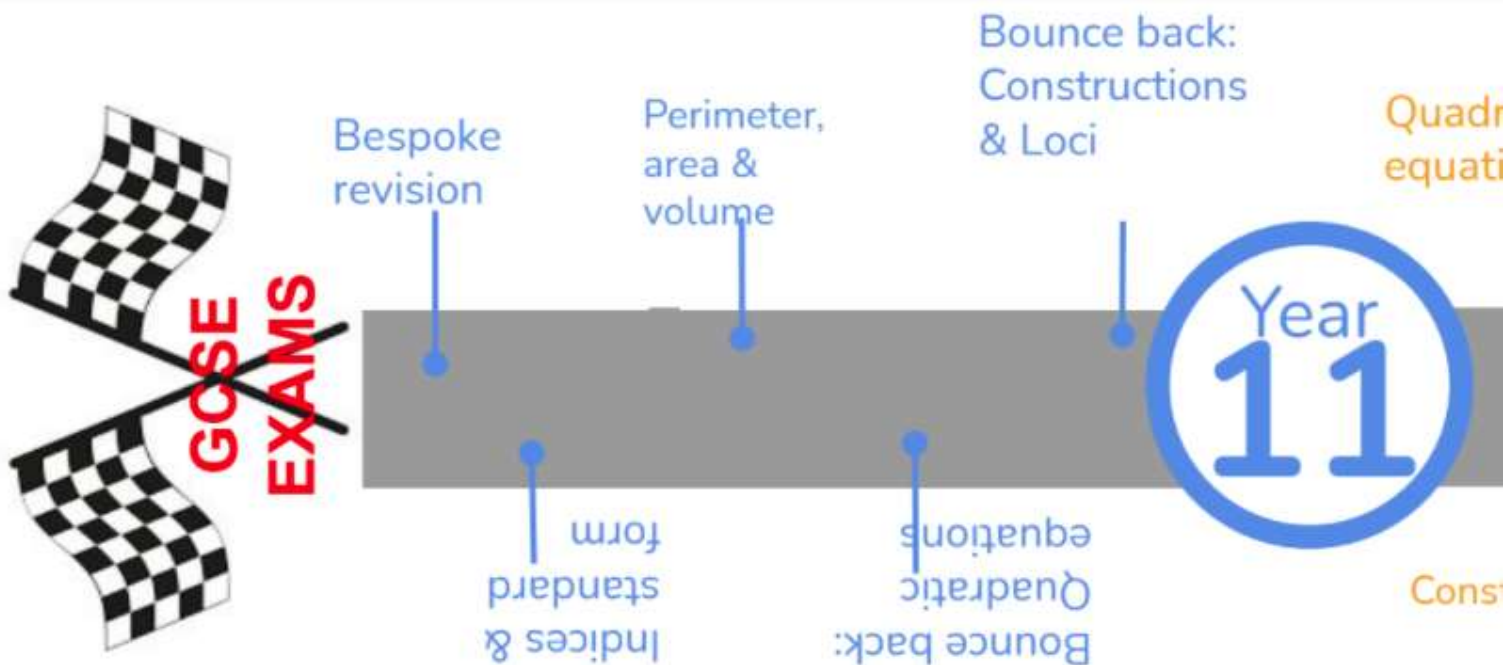
Cross Curricular Lessons



They will also have specific lessons linked to other subjects and a diet of retrieval built into their lessons.

In Year 11 Module 2 your child will study:

- Perimeter, Area and Volume
- Simultaneous Equations
- Indices and Standard Form
- Similarity, Congruence and Vectors



The Year 11 scheme of learning includes elements of our 'bounce back' scheme, which takes into account the periods of lockdown.



Perimeter, Area and Volume



Topics covered in this unit include:

- Area and perimeter of triangles, compound shapes, circles
- Volume of prisms, cylinders, cones, spheres
- Surface area of cylinders, cones and spheres

Area of a trapezium

Area of a trapezium $\frac{(a+b) \times h}{2}$

Why?

- Two congruent trapeziums make a parallelogram
- New length (a + b) x height
- Divide by 2 to find area of one

Area of a circle (Non-Calculator)

Read the question – leave in terms of π or if $\pi \approx 3$ (provides an estimate for answers)

Area of a circle $\pi \times \text{radius}^2$

Diameter = 8cm
 \therefore Radius = 4cm

Find the area of one quarter of the circle

Circle Area = $16\pi \text{ cm}^2$
Quarter = $4\pi \text{ cm}^2$

$\pi \times \text{radius}^2$
= $\pi \times 4^2$
= $\pi \times 16$
= $16\pi \text{ cm}^2$

Surface area Sketching nets first helps you visualise all the sides that will form the overall surface area

Sides 6×7
 6×7

Front and back 12×7
 12×7

Top and Bottom 12×6
 12×6

Sum of all sides = surface area

For other shapes - not all the sides are the same, so calculate the individually

Volumes Volume is the 3D space it takes up – also known as capacity if using liquids to fill the space

Counting cubes Some 3D shape volumes can be calculated by counting the number of cubes that fit inside the shape.

Cubes/ Cuboids = base x width x height

Remember multiplication is commutative

Prisms and cylinders = area cross section x height

Height can also be described as depth

Areas – square units
Volumes – cube units

Areas and volumes can be left in terms of pi π

Surface area - cylinders

The area of the circle $\pi \times \text{radius}^2$

The width of this face is the same as the circumference $\pi \times \text{diameter} \times \text{height}$

$2 \times \pi \times \text{radius}^2 + \pi \times \text{diameter} \times \text{height}$

Keywords

Congruent: The same

Area: Space inside a 2D object

Perimeter: Length around the outside of a 2D object

Pi (π): The ratio of a circle's circumference to its diameter.

Perpendicular: At an angle of 90° to a given surface

Formula: A mathematical relationship/ rule given in symbols Eg $b \times h = \text{area of rectangle/ square}$

Infinity (∞): A number without a given ending (too great to count to the end of the number) – never ends

Sector: A part of the circle enclosed by two radii and an arc

In the algebra unit your child will study:

- Different methods to solve simultaneous equations including substitution and elimination
- How to recognise when to use a particular method



Is (x, y) a solution? x and y represent values that can be substituted into an equation

Does the coordinate (1,8) lie on the line $y=3x+5$?

This coordinate represents $x=1$ and $y=8$

$$y = 3x + 5$$

$$8 = 3(1) + 5$$

As the substitution makes the equation correct the coordinate (1,8) IS on the line $y=3x+5$

Is (2,7) on the same line?

$$7 \neq 3(2) + 5$$

No 7 does NOT equal 6+5

Solve by subtraction

$$\begin{array}{r} 3x + 2y = 18 \\ - (x + 2y = 10) \\ \hline 2x = 8 \\ \div 2 \quad \div 2 \\ \hline x = 4 \end{array}$$

$$\begin{array}{r} x + 2y = 10 \\ (4) + 2y = 10 \\ -4 \quad -4 \\ \hline 2y = 6 \\ \div 2 \quad \div 2 \\ \hline y = 3 \end{array}$$

$x = 4$
 $y = 3$

Simultaneous Equations

Solve by addition

$$\begin{array}{r} 3x + 2y = 16 \\ + 6x - 2y = 2 \\ \hline 9x = 18 \\ \div 9 \quad \div 9 \\ \hline x = 2 \end{array}$$

$$\begin{array}{r} 3x + 2y = 16 \\ 3(2) + 2(y) = 16 \\ 6 + 2y = 16 \\ -6 \quad -6 \\ \hline 2y = 10 \\ \div 2 \quad \div 2 \\ \hline y = 5 \end{array}$$

Addition makes zero pairs

Solve by adjusting one

$$\begin{array}{r} h + j = 12 \\ 2h + 2j = 29 \end{array}$$

No equivalent values

$$\begin{array}{r} 2h + 2j = 24 \\ 2h + 2j = 29 \end{array}$$

By proportionally adjusting one of the equations – now solve the simultaneous equations choosing an addition or subtraction method

Solve by adjusting both

$$\begin{array}{r} 2x + 3y = 39 \\ 5x - 2y = -7 \end{array}$$

Use LCM to make equivalent x OR y values
Because of the negative values using zero pairs and y values is chosen choice

$$\begin{array}{r} 4x + 6y = 78 \\ 15x - 6y = -21 \end{array}$$

Now solve by addition

Addition makes zero pairs

Keywords

- Solution:** a value we can put in place of a variable that makes the equation true
- Variable:** a symbol for a number we don't know yet
- Equation:** an equation says that two things are equal – it will have an equals sign =
- Substitute:** replace a variable with a numerical value
- LCM:** lowest common multiple (the first time the times table of two or more numbers match)
- Eliminate:** to remove
- Expression:** a maths sentence with a minimum of two numbers and at least one math operation (no equals sign)
- Coordinate:** a set of values that show an exact position
- Intersection:** the point two lines cross or meet

In the algebra unit your child will study:

- Index laws
- Converting between standard and normal form
- Calculate with standard form



Addition/ Subtraction laws for indices

$$3^5 \times 3^2 \longrightarrow 3^7$$

$$= (3 \times 3 \times 3 \times 3 \times 3) \times (3 \times 3)$$

The base number is all the same so the terms can be simplified

Addition law for indices

$$a^m \times a^n = a^{m+n}$$

$$3^5 \div 3^2 \longrightarrow 3^3$$

$$\frac{3 \times 3 \times 3 \times \cancel{3} \times \cancel{3}}{\cancel{3} \times \cancel{3}} \longrightarrow \frac{3^3}{3^0} \longrightarrow \frac{3^3}{1} = 3^3$$

Subtraction law for indices

$$a^m \div a^n = a^{m-n}$$

Positive powers of 10

1 billion = 1 000 000 000

$$10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 10^9$$

$$\text{Addition rule for indices } 10^a \times 10^b = 10^{a+b}$$

$$\text{Subtraction rule for indices } 10^a \div 10^b = 10^{a-b}$$

Indices and Standard Form

Numbers between 0 and 1

$$0.054 = 5.4 \times 10^{-2}$$

| | | | | |
|--------|---|----------------|-----------------|------------------|
| 1 | • | $\frac{1}{10}$ | $\frac{1}{100}$ | $\frac{1}{1000}$ |
| 10^0 | • | 10^{-1} | 10^{-2} | 10^{-3} |
| 0 | • | 0 | 5 | 4 |

A negative power does not mean a negative answer – it means a number closer to 0

Standard form with numbers > 1

Any number between 1 and less than 10

$$A \times 10^n$$

← Any integer

Example

$$3.2 \times 10^4$$

$$= 3.2 \times 10 \times 10 \times 10 \times 10$$

$$= 32000$$

Non-example

$$\textcircled{0.8} \times 10^4$$

$$5.3 \times 10^{\textcircled{07}}$$

Keywords

Standard (index) Form: A system of writing very big or very small numbers

Commutative: an operation is commutative if changing the order does not change the result

Base: The number that gets multiplied by a power

Power: The exponent – or the number that tells you how many times to use the number in multiplication

Exponent: The power – or the number that tells you how many times to use the number in multiplication

Indices: The power or the exponent

Negative: A value below zero

Similarity, Congruence and Vectors



Topics covered in this unit include:

- Congruent triangles
- Similarity and scale factors
- Arithmetic with vectors

Identify similar shapes

Angles in similar shapes do not change
e.g. if a triangle gets bigger the angles can not go above 180°

Similar shapes

8cm 6cm 9cm 12cm

Scale Factor
Both sides on the bigger shape are 1.5 times bigger

Compare sides $\frac{6}{8} = \frac{9}{12}$ $\frac{8}{12} = \frac{9}{12}$
 $\frac{2}{3} = \frac{2}{3}$

Both sets of sides are in the same ratio

Congruence and Similarity

Congruent shapes are identical – all corresponding sides and angles are the same size

Because all the angles are the same and $\overline{GB} = \overline{PL}$ $\overline{BC} = \overline{LM}$ triangles GBC and PLM are **congruent**

Because all angles are the same, and all sides are enlarged by 2 GBC and PLM are **similar**

Conditions for congruent triangles

Triangles are congruent if they satisfy any of the following conditions

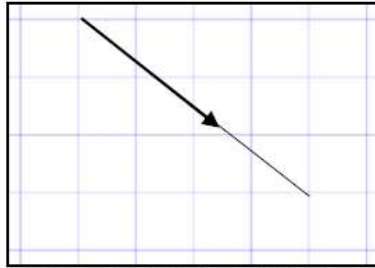
- Side-side-side**: All three sides on the triangle are the same size.
- Angle-side-angle**: Two angles and the side connecting them are equal in two triangles.
- Side-angle-side**: Two sides and the angle in-between them are equal in two triangles (It will also mean the third side is the same size on both shapes).
- Right angle-hypotenuse-side**: The triangles both have a right angle, the hypotenuse and one side are the same.

Understand and represent vectors

Column vectors have been seen in translations to describe the movement of one image onto another

Movement along the x-axis →
Movement along the y-axis →

$$\begin{pmatrix} 4 \\ -3 \end{pmatrix}$$



Vectors show both direction and magnitude

The arrow is pointing in the direction from starting point to end point of the vector.

The direction is important to correctly write the vector

The magnitude is the length of the vector (This is calculated using Pythagoras theorem and forming a right-angled triangle with auxiliary lines)

The magnitude stays the same even if the direction changes

Addition and subtraction of vectors

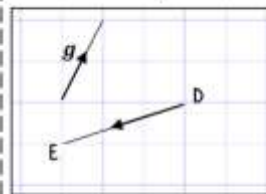
$a = \begin{pmatrix} 5 \\ 1 \end{pmatrix}$ $b = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$

$a + (-b) = \begin{pmatrix} 5 + -0 \\ 1 + -4 \end{pmatrix} = \begin{pmatrix} 5 \\ -4 \end{pmatrix}$

$a + (-b) = a - b$

The resultant is $a - b$ because the vector is in the opposite direction to b which needs a scalar of -1

Understand and represent vectors



Vector notation \overline{DE} is another way to represent the vector joining the point D to the point E

$$\overline{DE} = \begin{pmatrix} -3 \\ -1 \end{pmatrix}$$

The arrow also indicates the direction from point D to point E

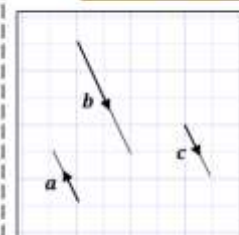
Vectors can also be written in bold lower case so \mathbf{g} represents the vector $\mathbf{g} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$

Keywords

- Direction: the line our course something is going
- Magnitude: the magnitude of a vector is its length
- Scalar: a single number used to represent the multiplier when working with vectors
- Column vector: a matrix of one column describing the movement from a point
- Resultant: the vector that is the sum of two or more other vectors
- Parallel: straight lines that never meet

Vectors multiplied by a scalar

Parallel vectors are scalar multiples of each other



$$\mathbf{b} = 2 \times \mathbf{c} = 2\mathbf{c}$$

Multiply \mathbf{c} by 2 this becomes \mathbf{b} . The two lines are parallel

$$\mathbf{a} = -1 \times \mathbf{c} = -\mathbf{c}$$

The vectors \mathbf{a} and \mathbf{c} are also parallel (A negative scalar causes the vector to reverse direction)

$$\mathbf{b} = -2 \times \mathbf{a} = -2\mathbf{a}$$

$$\mathbf{a} = \begin{pmatrix} -1 \\ 2 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} 2 \\ -4 \end{pmatrix} \quad \mathbf{c} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$$

We recommend pupils have a Casio scientific calculator.

The Casio calculator featured is the one we use when demonstrating in lessons.



On our school website there is a calculation policy showing the methods we use for common operations.

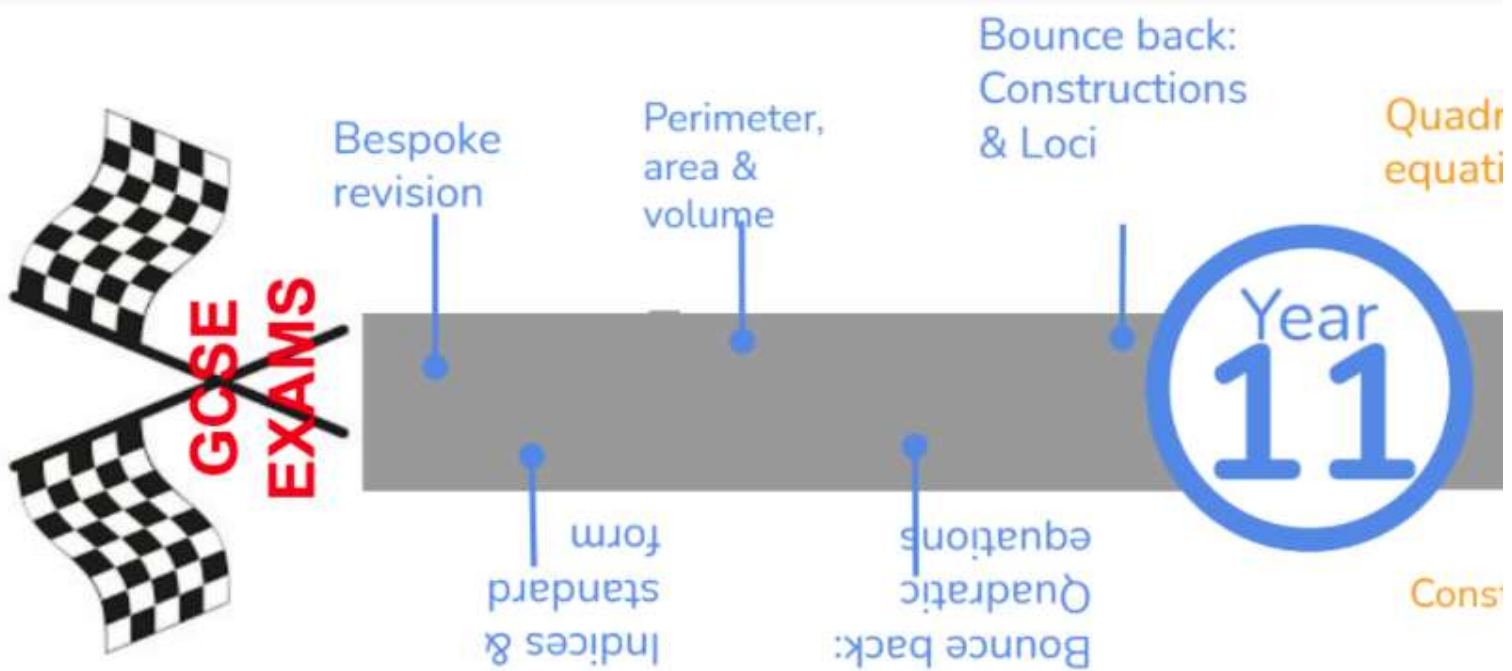
**It can be found at:
Our School > Policies**



St Joseph's Catholic Academy

Calculation Policy

Moving into Module 3



The Year 11 scheme of learning includes bespoke revision in order to prepare our students for their external examinations.

Module 2 ends our delivery of new content.

Module 3 concentrates on revision centred around the needs of your child.

