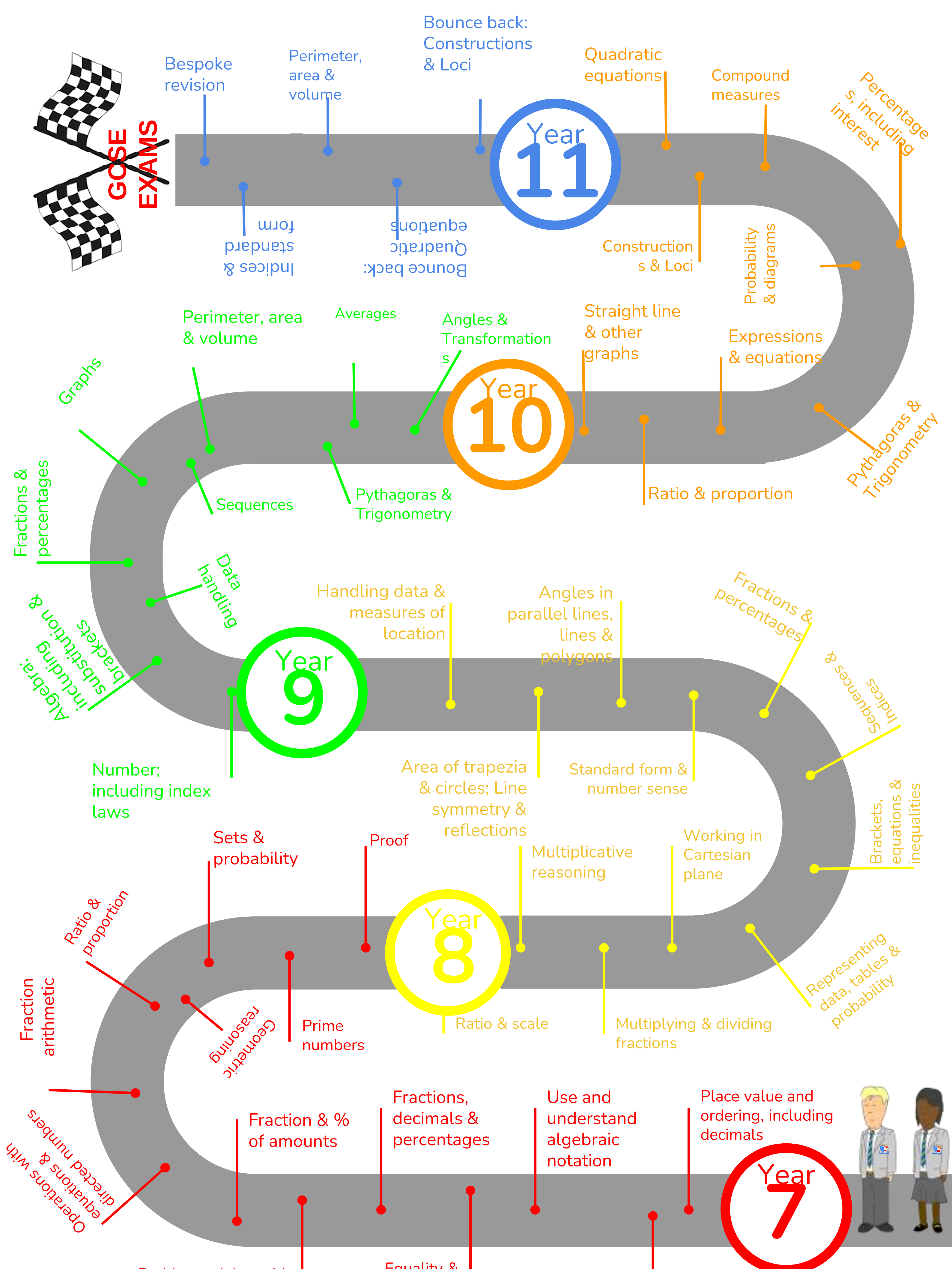
Year 11 Foundation Scheme of Learning

MODULE 2

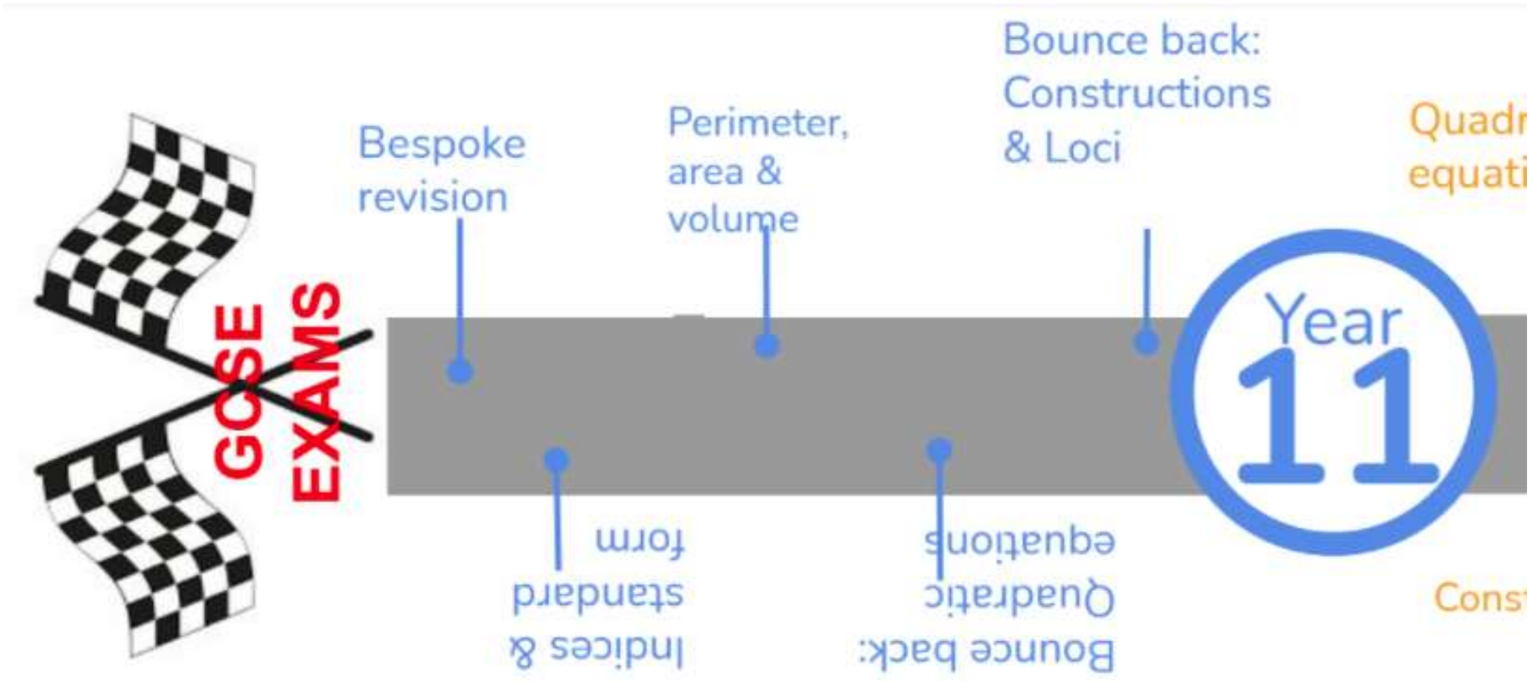
Caritas Christi Urget Nos

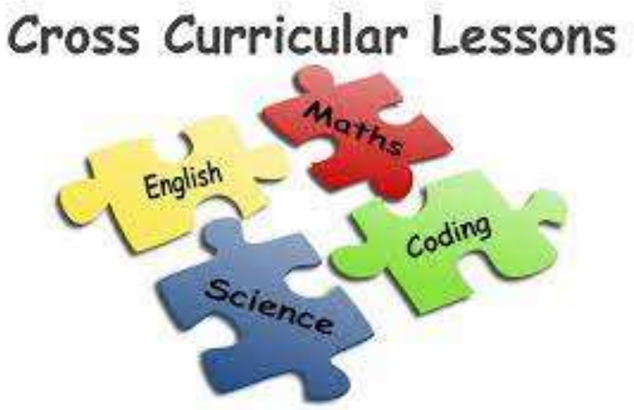
Bishop Chadwick
Catholic Education Trust



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

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

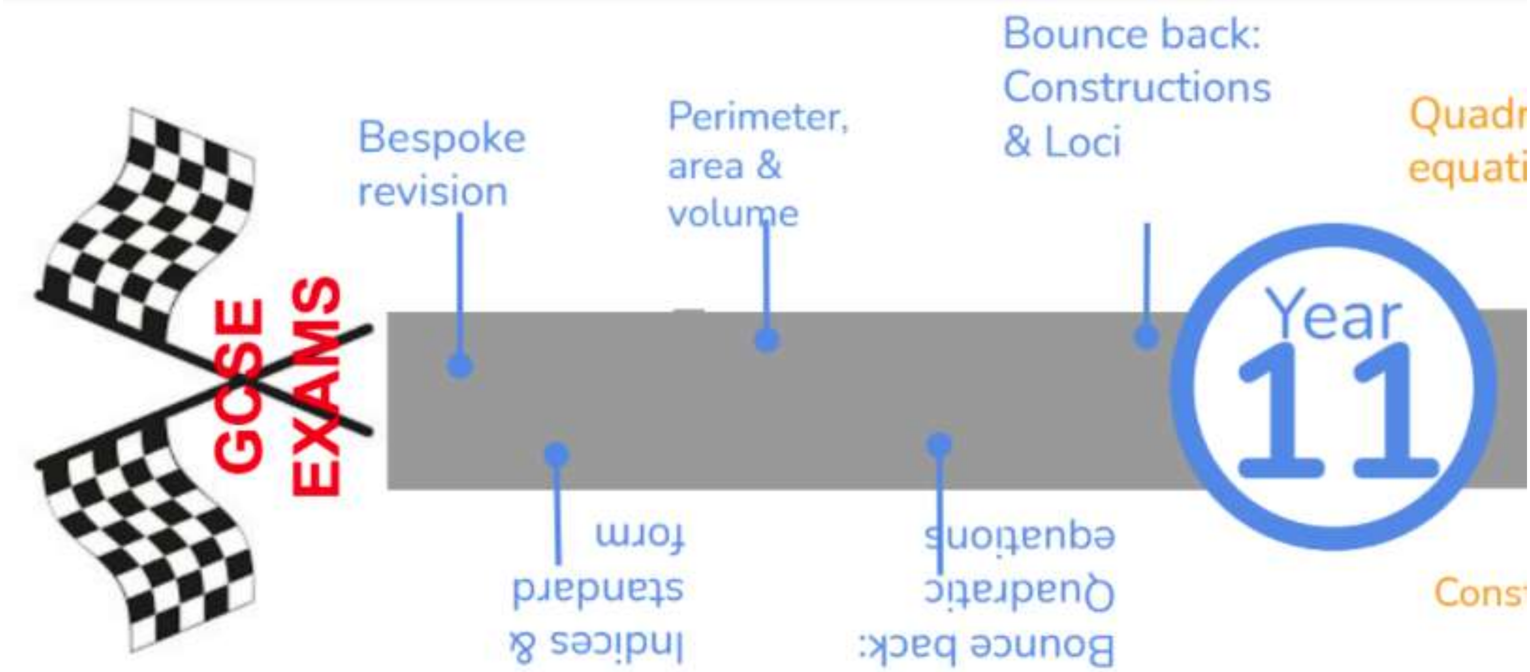




They will have also have specific lessons linked to other subjects and a diet of retrieval built into their lessons.

In Year 11 Module 2 your child will study:

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

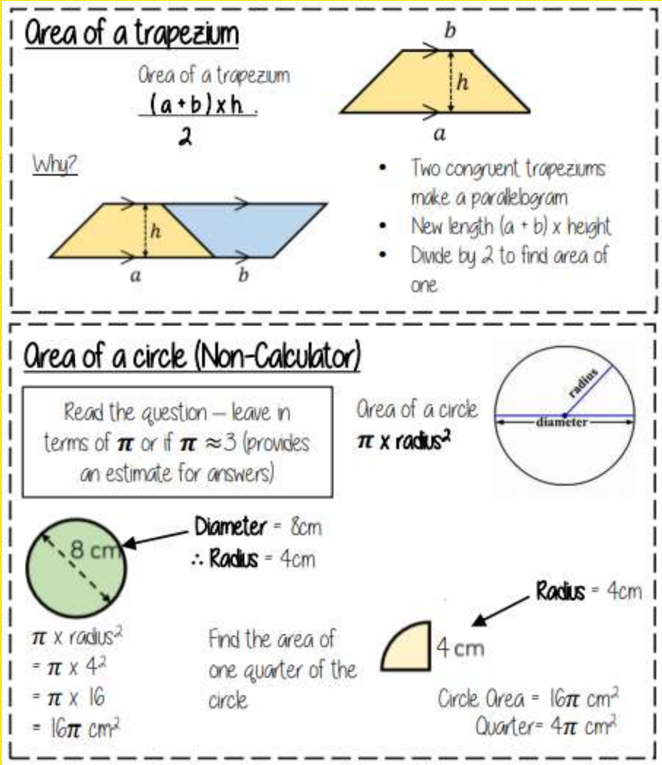


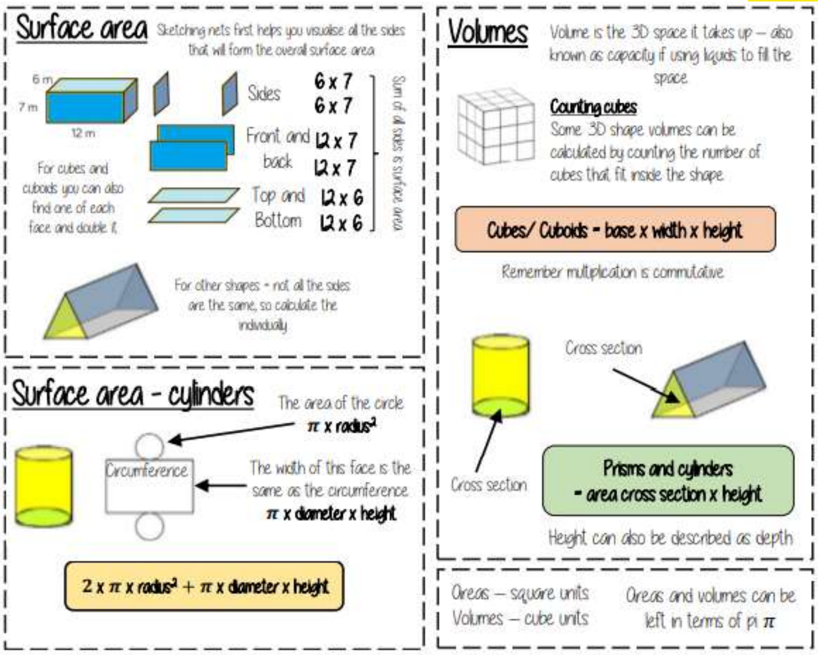
The Year 11 scheme of learning includes elements of our ‘bounce back’ scheme, which takes into account the periods of lockdown.

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





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 x h = 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

Simultaneous Equations

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

$y = 3x + 5$

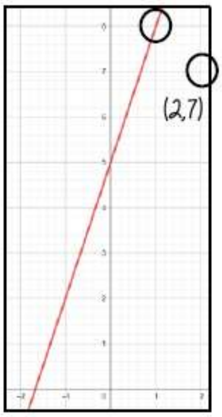
$8 = 3(1) + 5$

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

$3x + 2y = 18$

$- \quad x + 2y = 10$

$2x = 8$

$\div 2 \quad \div 2$

$x = 4$

$x + 2y = 10$

$(4) + 2y = 10$

$-4 \quad -4$

$2y = 6$

$\div 2 \quad \div 2$

$y = 3$

$x = 4$

$y = 3$

= 18
= 10
= 18
= 10
= 8
= 4
= 3

Solve by addition

Addition makes zero pairs

$3x + 2y = 16$

$+ \; 6x - 2y = 2$

$9x = 18$

$\div 9 \quad \div 9$

$x = 2$

$3x + 2y = 16$

$3(2) + 2(y) = 16$

$6 + 2y = 16$

$-6 \quad -6$

$2y = 10$

$y = 5$

= 16
= 2
= 18
= 2
= 5

Solve by adjusting one

$h + j = 12$

$2h + 2j = 29$

No equivalent values

12
29

$2h + 2j = 24$

$2h + 2j = 29$

24
29

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

Solve by adjusting both

$2x + 3y = 39$

$5x - 2y = -7$

= 39
= −7

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

$4x + 6y = 78$

$15x - 6y = -21$

= 78
= −21

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

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Addition/ Subtraction laws for indices

$3^5 \times 3^2$ → 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

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

$3^5 \div 3^2$ → 3^3

$\frac{3 \times 3 \times 3 \times 3 \times 3}{3 \times 3}$ → $\frac{3^3}{3^0}$ → $\frac{3^3}{1}$

Subtraction law for indices

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

Positive powers of 10

1 billion – 1 000 000 000

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

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

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

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

$A \times 10^n$

Any number between 1 and less than 10 → A

Any integer → n

Example

3.2×10^4

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

= 32000

Non-example

0.8×10^4

$5.3 \times 10^{0.7}$

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

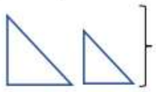
Negative: A value below zero

Similarity, Congruence and Vectors

Topics covered in this unit include:

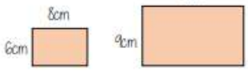
- Congruent triangles
- Similarity and scale factors
- Arithmetic with vectors

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



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

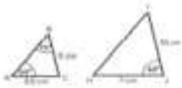
Compare sides: 6 : 9 = **2 : 3**, 8 : 12 = **2 : 3**

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 OC=MM BC=LM triangles OBC and MLM are **congruent**



Because all angles are the same, but all sides are enlarged by 2 OBC and HIJ 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)

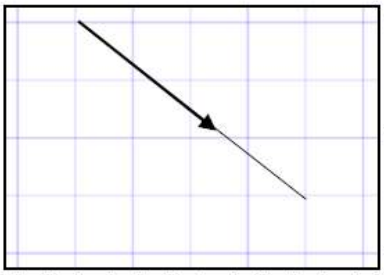
Right angle-hypotenuse-side
The triangles both have a right angle, the hypotenuse and one side are the same

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 ↗

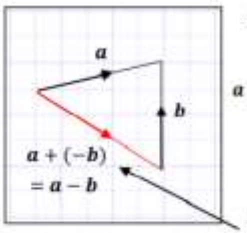
$\begin{pmatrix} 4 \\ -3 \end{pmatrix}$ →



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

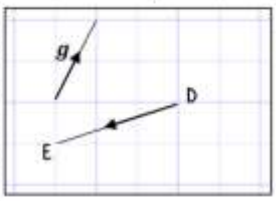


$\boldsymbol{a} = \begin{pmatrix} 5 \\ 1 \end{pmatrix}$ $\boldsymbol{b} = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$

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

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

Understand and represent vectors



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

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

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

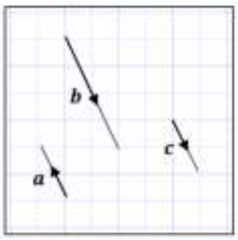
Vectors can also be written in bold lower case so $\boldsymbol{g}$ represents the vector $\boldsymbol{g} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$

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



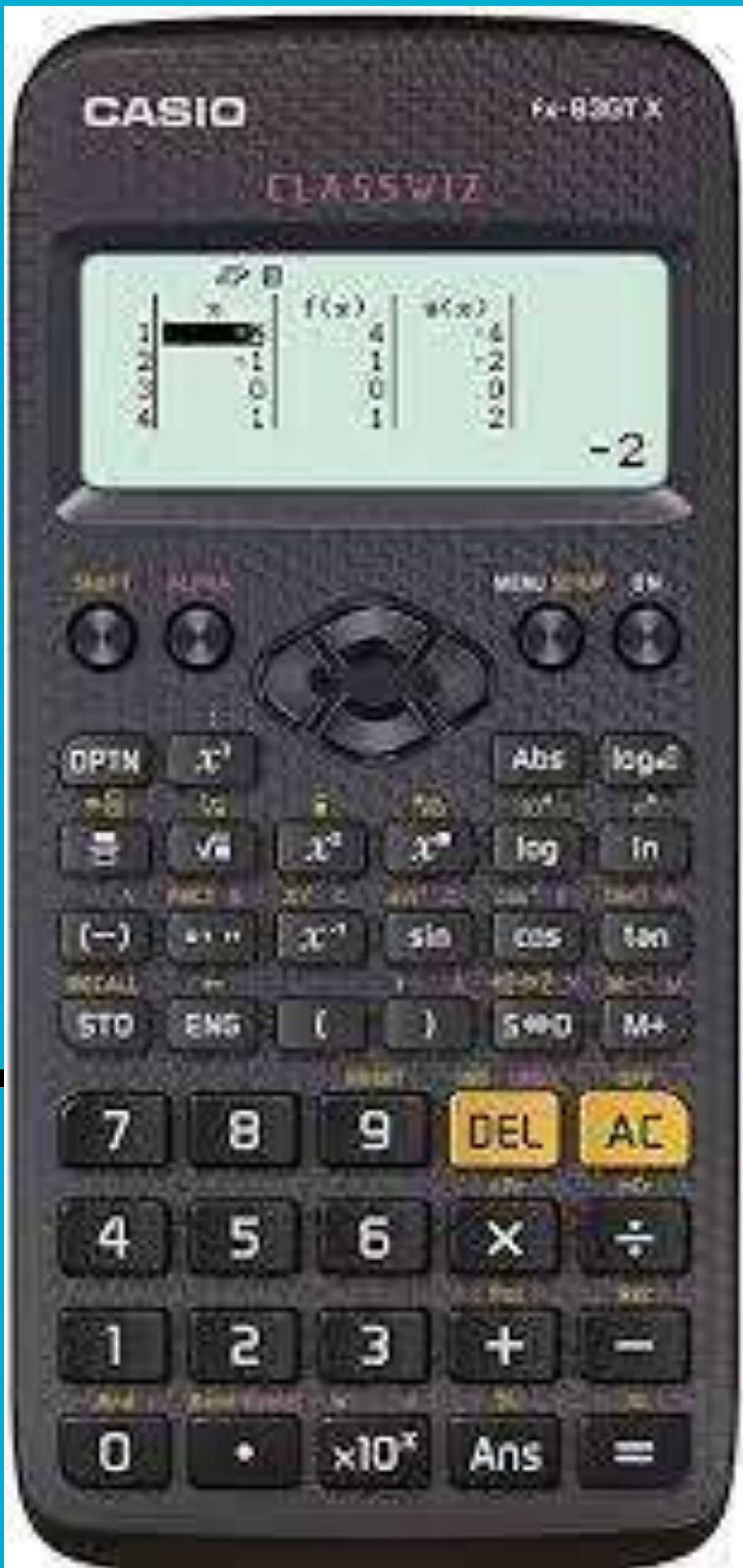
$\boldsymbol{b} = 2 \times \boldsymbol{c} = 2\boldsymbol{c}$
Multiply $\boldsymbol{c}$ by 2 this becomes $\boldsymbol{b}$. The two lines are parallel

$\boldsymbol{a} = -1 \times \boldsymbol{c} = -\boldsymbol{c}$
The vectors $\boldsymbol{a}$ and $\boldsymbol{c}$ are also parallel. A negative scalar causes the vector to reverse direction

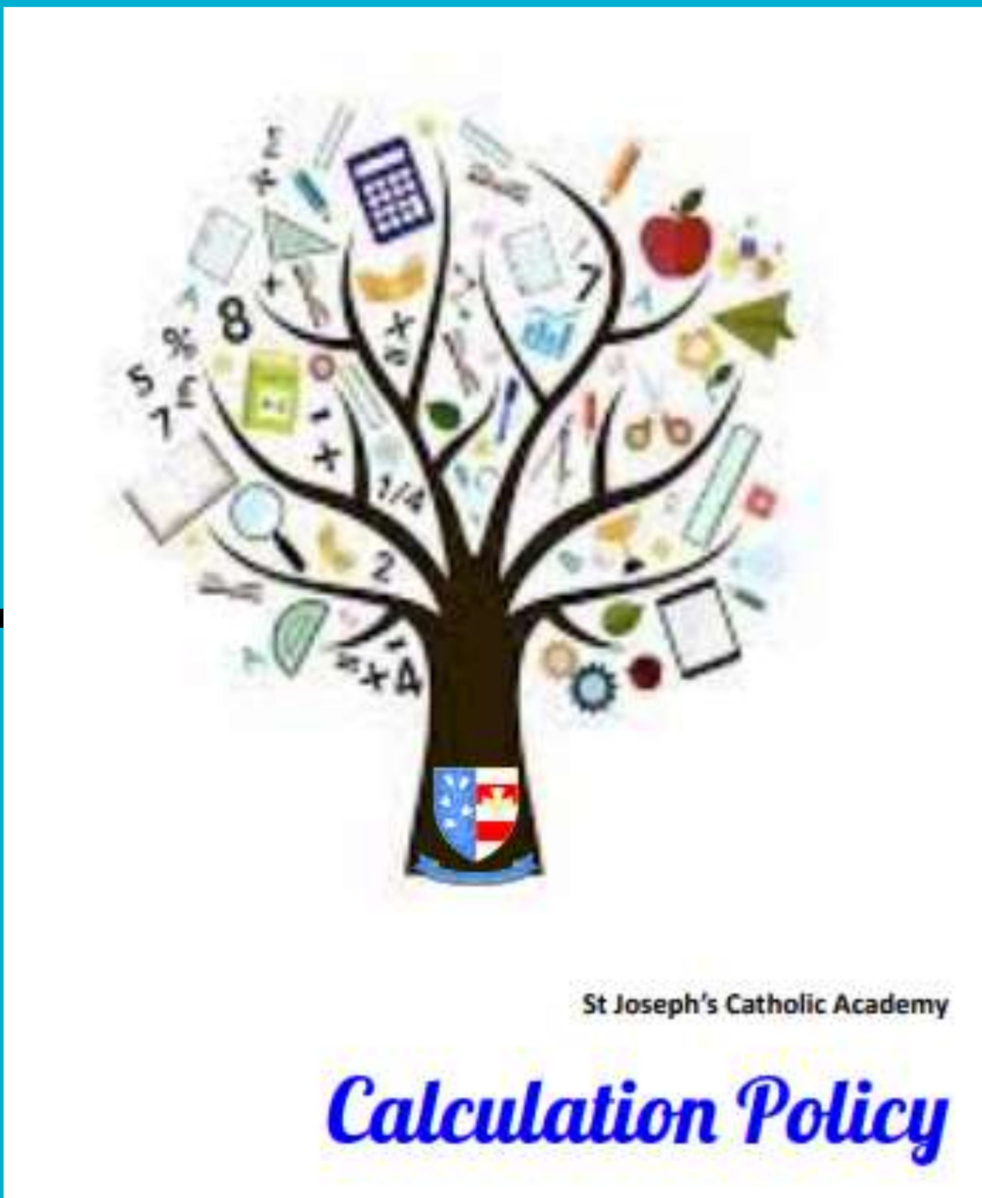
$\boldsymbol{b} = -2 \times \boldsymbol{a} = -2\boldsymbol{a}$

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

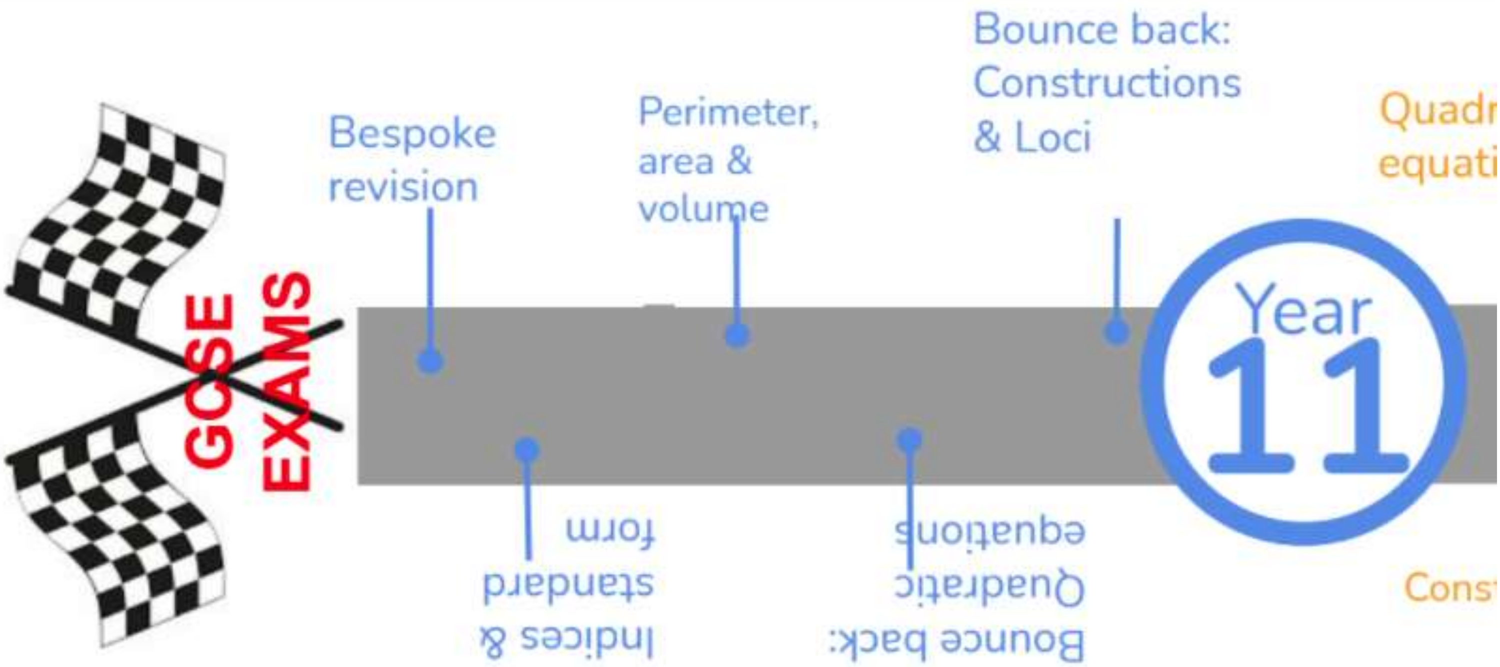
We recommend pupils have a Casio scientific calculator.
The Casio calculator featured is the one we use when demonstrating in lessons.



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



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.