

# Gawthorpe Community Academy

## How to teach Maths



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# Intent, Implementation and Impact

## **Intent:**

The intention of the maths curriculum at Gawthorpe Community Academy is that children are taught to become competent mathematicians; we strive to embed the skills and processes necessary to enable children to use and apply their Maths learning in a variety of contexts. We aim to develop children's enjoyment of maths and provide opportunities for children to build a conceptual understanding of maths before applying their knowledge to everyday problems and challenges. Our approach to the teaching of mathematics develops children's ability to work both independently and collaboratively as part of a team. Through mathematical talk, children will develop the ability to articulate and discuss their thinking. By the end of Key Stage Two, children will leave our academy prepared for the next step in their mathematical education.

## **Implementation:**

At Gawthorpe, we recognise that in order for pupils to progress to deeper and more complex problems, children need to be confident and fluent across each yearly objective. To ensure consistent coverage across the academy, we use Abacus textbooks to provide age-appropriate fluency tasks for our pupils: in turn, practising key skills and allowing children to become confident when working on key strategies, calculations or methods. To ensure our pupils acquire a deeper understanding in their mathematical learning journey, we supplement our fluency resources by using the White Rose Maths Hub to support the teaching of mathematics.

Within the Maths hub schemes of learning, each National Curriculum objective is broken down into fluency, reasoning and problem solving; our teachers use the learning challenges to teach for mastery - an approach to extend and deepen the understanding of pupils within each year group. Our teaching staff use this document in conjunction with a range of high quality resources such as NRich and NCETM to support, stretch and challenge all learners within the classroom. We use the Maths hub schemes, with a focus on developing fluency

# Overview of subject

Mathematics is a creative and highly interconnected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

## **Aims**

The national curriculum for mathematics aims to ensure that all pupils:

- 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

## **What makes a Mathematician?**

A definition of a Mathematician:

- Someone who can see patterns;
- Someone who shows deeper application;
- Someone who identifies and understands the interconnectivity of concepts and demonstrates this through the transfer of skills;
- Someone who is systematic and resilient and can extend their own learning.

## **Developing Mastery in Mathematics**

At the center of the mastery approach to the teaching of mathematics is the belief that all children have the potential to succeed with the correct level of challenge and support. At Gawthorpe Community Academy, we have to avoid shallow mastery and ensure that we help children to embed concepts so they

# Whole school overview

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
F2	Place value Addition and subtraction Shape Length	Place value Addition and subtraction Multiplication (counting in 2's) Time Money Shape	Place value Multiplication (counting in 2's, 5's, 10's) Addition and subtraction Division as sharing Shape Weight Length	Place value Multiplication (counting in 2's, 5's, 10's) Addition and subtraction Division as sharing Shape Weight Length	Place value Multiplication (counting in 2's, 5's, 10's) Addition and subtraction Division as sharing Shape Time Money	Place value Multiplication (counting in 2's, 5's, 10's) Addition and subtraction Division as sharing Shape Time Money
Year 1	Place value (10) Addition and subtraction (10)	Shape Place value (20)	Addition and subtraction (20) Place value (50)	Length and height Measurement: weight and volume	Multiplication and division (2, 5, 10) Fractions Position and direction	Place value (100) Money Time
Year 2	Place value Addition and subtraction	Measurement: Money Multiplication and division	Multiplication and division Statistics Geometry: shape	Fractions Measurement: length and height	Position and direction Problem solving and efficient methods Time	Mass, capacity and temperature Investigations
Year 3	Place value Addition and subtraction	Multiplication and division	Multiplication and division Money Statistics	Length and perimeter Fractions	Fractions Time	Shape Mass and capacity
Year 4	Place value Addition and subtraction	Length and perimeter Multiplication and division	Multiplication and division Area Fractions	Fractions Decimals	Decimals Money Time	Statistics Shape Position and direction
Year 5	Place value Addition and subtraction	Statistics Multiplication and division Perimeter and area	Multiplication and division Fractions	Fractions Decimals and percentages	Decimals Shape	Position and direction Converting units Volume
Year 6	Place value Four operations	Fractions Position and direction	Decimals Percentages Algebra Converting units	Revision	SATS	Problem solving Investigations

# Retention, memory and recall

Children have different types of memory, which effects how they recall and retain facts and skilled movements. Memory plays an important role in enabling a student to recall math facts accurately, quickly and with little effort while working through a problem.

Through short-term memory, information is first registered into the mind. The details of math facts within a contextualised problem must be registered and processed quickly. Active working memory plays an important role, since students must rapidly recall facts while holding in mind the operations and steps of the larger problem. Finally, efficient organisation of math facts in long term memory aids the student's quick and easy access of those facts contained in the problem.

## **How we develop and improve students' recall of math facts:**

- We teach a progressive Maths curriculum, revisiting and building on skills each year.
- We apply skills and facts to real life contextual problems, encouraging children to apply their skills in various contexts
- We teach strategies for developing accuracy with math facts and then build speed in recall.
- We provide students with alternative techniques for working through facts that are not consistently recalled.
- We incorporate multi-sensory activities into the teaching and memorizing of math facts, i.e. have students write it, say or sing it, show it, do it, etc.
- We use group rehearsal. For example, "Repeat each fact as I give it to you before writing it down."
- We use multiple methods (e.g., flashcards, rhyming, rapping) to help students "over-learn" critical fact pairs. Have students work in teams, drilling each other on facts.
- We use visual prompts on working walls and resources on tables to prompt children with methods and key information.

# Key skills

## **Key Stage One**

Teaching throughout Key Stage One ensures that children in our academy are confident to manipulate numbers up to 100. The Key Stage One curriculum provides opportunities for children to develop their competency in place value and the four operations. A high focus is placed on concrete, pictorial and mental strategies to equip children with a readiness for more abstract concepts to be introduced in Key Stage Two. Teachers model correct mathematical vocabulary and children are expected to use this vocabulary to articulate their ideas.

## **Key Stage Two**

Teaching throughout Key Stage Two builds on the solid foundations of the previous key stage. Children are introduced to formal calculation methods in Year Three and these are developed and built on each year in line with age related expectations. The frequent opportunities to reason and problem solve in real life contexts, provided by teachers, develops their conceptual understanding and prepares them for the statutory end of key stage assessments.

# Progression

Ad-

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Counting in ones, 1:1 correspondence starting from difference numbers – up to 20.	Count to, read and write numbers across 100.	Use partitioning and add <u>2</u> digit number.	Partition using columns for addition – involve crossing 10 then 100.	Formal column method of addition (4 digit numbers).	Introduce adding decimal in a column.	Add negative integers.
Adding 2 groups together by counting and counting on.	Number bonds 10, 20 & 100.	Apply written methods as well as concrete objects.	Extend to 4 digit numbers when secure.	Involve 2 step problems.	Read, write & compare numbers to at least 1,000,000.	Consolidating & applying knowledge to solve problems.
	Add 1 & 2 digit numbers to 20 including 0.	Adding 3 digit numbers using partitioning.	Extend children who are ready to formal column method.	Adding 3 lots of four digit numbers.	<u>Interpret negative numbers in context, calculate, interpret, answer, etc</u>	
	Solve <u>one step</u> problems that involve addition using concrete objects and mentally.	Understanding of commutative law in relation to addition.	Counting in multiples of 4, 8, 50 & 100. (6, 7, 9, 25 & 1000 extension)	Doubling & halving 2, 3 & 4 digit number (odd numbers).	Solve number problems & practical problems.	
	Doubling & halving simple numbers.	Use inverse to check missing number problems.	Compare & order number to 1000 (and beyond).			
	Missing & number problems.	Doubling & halving including multiples of 12.	Solve number and practical problems involving these ideas.			
	Use language of equal to, more than.	Extend mental <u>maths</u> strategies to include number bonds.				
	Given a <u>number</u> , identify 1 more or 1 less.					
	Partition 2 digit numbers into tens and units.					
	Add simple 2 digit numbers together					

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Physically taking away using numbers up to 20.	Subtract by finding the difference on a number line.	Subtract by finding the difference on a number line.	Subtract by finding the difference on a number line.	Subtract using formal column method.	Subtract using formal column method.	Subtract using formal column method.
Using number lines with physical objects.	Numbers should extend as children become more confident. This then needs applying to problems both written and practical.	Begin to do larger jumps of 10 or 2.	Use a number line to make bigger jumps. Mixture of numbers counting onto the next whole 10, 100.	Application to number challenges using inverse to check.	Decimals (as money)	Decimals (as money)
	Missing number sentences.	Extension work to involve 3 digit numbers.	Extend children who are ready to formal column method.		Application to number challenges using inverse to check.	Application to number challenges using inverse to check.
	Application to number challenges using inverse to check.	Application to number challenges using inverse to check.	Doubling / halving 2, 3 and 4 digit number.			
			Application to number challenges using inverse to check.			

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Year 1	Year 2	Year 3	Year 4	Year 5 & Year 6
Solve simple <u>one step</u> problems involving 'group of' concrete and pictorial objects.	2, 5, 10 times table and understand it as repeated addition.	Children should know all times tables by end of year.	Consolidate all times tables.	Consolidate all times tables.
	Learn these tables, extend to 3, 4 when confident.	Multiplication using grid method, 2 digit x 1 digit. Extend to larger numbers to challenge higher ability.	Introduce multiplication in formal method.	Multiply multi digit numbers up to 4 digit whole numbers using formal method.
	Solve problems using materials, array & repeated addition.	Application to number challenges. Real life situations & problems.	2 & 3 digit x 1 & digit. Extend to 4 addition in columns.	Multiply decimal numbers by 10, 100 and 1000.
	Calculate simple number sentences using table they know – begin to use grid method with higher ability.		Application to number challenges. Real life situations & problems.	Identify multiples, factors, common factors and prime numbers.
	Understand cumulative law with x link to +.			<u>Recognise</u> squared and cubed numbers.
	Application to number challenges. Real life situations & problems.			Application to number challenges. Real life situations & problems.



# Progression

Di-

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Solve simple <u>one step</u> problems involving division using concrete / pictorial objects.	Share between physically into groups, <u>then</u> put onto a number line.	Divide using formal method starting at 0.	Use place value to recall multiplication and division facts for all tables.	Use place value to recall multiplication and division facts for all tables.	Use place value to recall multiplication and division facts for all tables.
Using sharing to understand the concept.	Larger numbers.	Calculate with small remainders when confident.	Divide mentally using known facts.	Divide mentally using known facts.	Divide mentally using known facts.
Application into number challenges, use invers of known x tables to check answers.	Simple remainders.	Larger number.	Use times tables to divide by 2 & 3 digit number.	Use times tables to divide 4 digit by 2 & 3 digit numbers.	Use times tables to divide 4 digit by 2 & 3 digit numbers.
	To understand the inverse to prove it.	Apply to fractions.		Give remainders as a fraction / decimal.	Use knowledge of BODMAS to carry out calculations.
	Application into number challenges, use invers of known times tables to check answers.	Application into number challenges, use invers of times tables to check answers.			Give remainders as a fraction / decimal.

vision.

## Timestables

Gawthorpe Community Academy believe that when children are proficient in times tables it enables them to calculate more efficiently.

Expectations within each year group:

### Year 1

Children to be able to count in 2 and 10's. Extension in 5's.

### Year 2

# Assessment

Maths	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	Teacher assessment in all year groups.	Maths hub tests 3, 4, 5 Y2&6 – SATs Teacher assessment Y1	Maths hub tests 3, 4, 5  Y2&6 – SATs Teacher assessment Y1	Test base tests 3, 4, 5  Y2& 6 – SATs materials Teacher assessment	Y2 & Y6 SATs	Summative Test base tests 3, 4, 5  Y1 Teacher assessment and Salford

Parents will be informed of pupils' progress and attainment during parents evenings; this is an opportunity to share targets and celebrate attainment with parents. Additional parents evenings to be organised in years 2 and 6 prior to the SATs.

## **Testbase:**

Individual logins to be set by class teachers. Mathematics assessment materials to be ordered through Testbase in Autumn term for the year. Weekly arithmetic practice to be sourced from Testbase.

## **Key Instant Recall Facts:**

To be sent home at the start of each half term; speak to parents about these at open classroom and parents evenings.

# British values

At Gawthorpe Community Academy, all pupils are encouraged to achieve their maximum potential through Maths lessons and learn the importance of Maths in all aspects of life and recognise how integral mathematics is to an independent future.

## Tolerance

The mathematics curriculum promotes the British values of tolerance and resilience on a daily basis through problem solving and understanding of complex concepts, encouraging pupils to persevere and try different methods to arrive at a correct solution. All learners within the classroom are encouraged to believe they are able to achieve and are aware of the importance of learning from their mistakes. This fosters confidence and builds self-esteem, it encourages pupils to take risks and become lifelong learners whilst using their mathematical skills in all aspects of life.

## Mutual respect

Pupils work together in all areas of the maths curriculum to support each other and build mutual respect for one another. Pupils are exposed to their peers' methods of solving problems and pupils are encouraged to provide their peers with feedback. Teamwork through peer assessment, feedback and group work underpins the schemes of learning in mathematics. All pupils have the right to a safe and secure learning environment and teachers and pupils have the right to be treated with respect.

## Democracy

Through student voice, pupils are able to articulate their views on the mathe-

# SMSC

In Maths lessons pupils are encouraged to delve deeply into their understanding of Mathematics and how it relates to the world around them. Our Maths teaching actively encourages risk taking which enables pupils to explore and try new ideas without the fear of failure. This is fundamental to building pupils' self-esteem within Mathematics.

## Spiritual

Developing deep thinking and questioning the way in which the world works promotes the spiritual growth of our pupils.

We are sensitive to pupils' individual needs and backgrounds and experience. Encourage pupils to regularly use their imagination and creativity when solving deeper contextual problems. Pupils are encouraged to reflect upon their learning and outcomes and discuss their progress with peers.

## Moral

We value listening to others views and opinions on problem solving.

Teachers regularly provide pupils with feedback and opportunities to further their learning; this ensures pupils are aware of their next steps to develop their own learning.

We promote discussion about mathematical understanding and challenge assumptions, supporting pupils to question information and data that they are presented with.

## Social

We encourage collaborative learning in the classroom - in the form of listening and learning from each other and paired discussion / talking partners.

We help pupils develop their mathematical voice and powers of logic, reasoning and explanation by offering explanations to each other.

Pupils are encouraged to provide their peers with feedback. Teamwork through peer assessment, feedback and group work underpins the schemes of learning

# Protected characteristics

The Equality Act covers the same groups that were **protected** by existing equality legislation - age, disability, gender reassignment, race, religion or belief, sex, sexual orientation, marriage and civil partnership and pregnancy and maternity. These are now called ` **protected characteristics**.

The Act uses the term “**protected characteristics**” to refer to aspects of a person’s identity. Treating a person less favourably be-

Gender reassignment	Pregnancy / Maternity	Race	Religion / Belief	Sexual Orientation	Gender
Use of statistics can be a very valuable way to show that claims and assertions should be critically analysed before being accepted.	Compare pregnancy term length in different animals. Create a chart and line graph.	Maths in different cultures  How are other countries developing the way they use maths	Percentages of other religions in the local area and within the world—pie charts	Alan Turing - mathematician and code breaker during WW2	<u>Careers week:</u>  Just 13 per cent of science, technology, engineering and maths (STEM) workers are women

cause they have one or more of these characteristics would be unlawful.

# How to help at home

Below you will find useful links for games and interactive activities to enjoy at home.

## **Websites:**

[www.mathletics.co.uk](http://www.mathletics.co.uk)

<https://www.topmarks.co.uk/maths-games/5-7-years/counting>

<https://www.mathplayground.com/games.html>

<http://www.ictgames.com/resources.html>

<https://play.ttrockstars.com/auth/school/student>

<https://www.mathsisfun.com/>

<https://www.theschoolrun.com/>

## **Apps:**

Number Board

Kids Academy 123 Tracing Numbers

Number Lines

Maths Sumo

Operation Math

Eggs on legs

# Glossary

**Mastery** - the expectation that all pupils will gain a deep understanding of the maths they are learning.

**Fluency** - knowing key mathematical facts and methods and recalling these efficiently

**Reasoning** - the skill that enables a student to make use of all other mathematical skills; students recognize that mathematics makes sense and can be understood

**Problem solving** - the ability to engage with real problems; discovering and making sense of mathematics.

**Addition** - the process of calculating the total of two or more numbers or amounts.

**Subtraction** - the process or skill of taking one number or amount away from another.

**Multiplication** - repeated addition e.g.  $5 \times 3 = 5 + 5 + 5 = 15$

**Division** - is splitting into equal parts or groups. It is the result of "fair sharing" .

**Place value** - the numerical value that a digit has by virtue of its position in a number.

**Pictorial representations** - related types of symbols or pictures are used to represent a specific number of objects

**Concrete representations** - something that exists physically in the