Sandy Hill Academy

Teaching and Learning Principles

Subject: Mathematics

Mission Statement:

'Aspiring to achieve, determined to succeed'

Vision:

The mathematics curriculum at Sandy Hill has been designed to ensure that children possess the skills and knowledge that will affect them positively in their lives. Concepts are taught in blocks and have been carefully sequenced to enable learners to make connections. At the heart of the curriculum, driven throughout each academic year, will be fundamental fluency/arithmetic skills.

We aim to:

- Ensure that every child possesses key fluency skills through deep practice, rigorous assessment and intervention
- Further develop concrete, pictorial and abstract understanding
- Instil confidence in every child to reason with precise mathematical vocabulary
- Provide all pupils opportunities to deepen their understanding through applying their skills to problem-solving activities and making real-life links
- Seek opportunities to be mathematical across the wider curriculum
- Celebrate mistakes in order to enhance resilience and self-motivation leading to greater well-being in every child

Mathematics Expectations (National Curriculum 2014):

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.

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects. The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

EYFS

Mathematics involves providing children with opportunities to develop and improve their skills in counting, understanding and using numbers, calculating simple addition and subtraction problems; and to describe shapes, spaces, and measure.

In the EYFS, Mathematics is broken down into two areas:

- Number
- Shape, Space and Measures

Number: children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

Shape, Space and Measures: children use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems. They recognise, create and describe patterns. They explore characteristics of everyday objects and shapes and use mathematical language to describe them.

(Statutory Framework for the Early Years, 2017)

EYFS Curriculum Design

In our Nursery and Reception classes, aspects of Mathematics are taught on a daily basis through: whole class/small group teaching, continuous provision areas and outdoor activities. Children have lots of opportunities to hear, discuss and explore mathematics- adults reflect upon learners' requirements, interests and the ways they learn best, to support effective planning and provision.

We use Tapestry, our online learning journal, to record and track children's progress and achievements in Mathematics against the Early Learning Goals. Children who need additional support are identified and interventions are put in to place when appropriate.

Children's progress within Mathematics is reported to parents through: settling in meetings, sharing learning journals and regular communication. In line with statutory requirements children are assessed against the Early Learning Goals for Mathematics at the end of the Reception year and this is reported to the LA and parents.

Area	*Early Learning Goal (2)*	*Exceeding (3)*
Numbers	Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.	Children estimate a number of objects and check quantities by counting up to 20. They solve practical problems that involve combining groups of 2, 5 or 10, or sharing into equal groups.
Shape, Space and Measures	Children use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems. They recognise, create and describe patterns. They explore characteristics of everyday objects and shapes and use mathematical language to describe them.	Children estimate, measure, weigh and compare and order objects and talk about properties, position and time.

KS1 and KS2 Curriculum Design

The mathematics curriculum at Sandy Hill has been designed to achieve the aims set out in this document and ensure as a school we realise our vision. Throughout each year (KS1 and KS2), key fluency skills will be revisited daily to ensure skills in each child are solidified. (See curriculum overview and curriculum maps for detail of these skills.)

The KS1 curriculum has been blocked to ensure elements follow on logically – for example covering multiplication and division first to enable this to be applied to the next unit (fractions). Despite the curriculum being blocked, some mathematical concepts (e.g. shape) are revisited to ensure that understanding is consolidated and built upon. Key fluency skills from the children's current and previous year are mapped out and revisited daily to ensure a solid foundation of number understanding is maintained and engrained in the children's long-term memory. Around the time of the KS1 SATs in Year 2, skills are revised. Following SATS, units/concepts are recapped to ensure this solid base of understanding before the children move seamlessly onto the KS2 programme of study.

The KS2 curriculum has been blocked to ensure elements follow on logically. Units are longer than in KS1 and less units will occur per half-term. Instead of revisiting units like in KS1, teachers will plan to build elements of previously taught learning into new concepts to allow children to continue to apply skills so they are remembered and built upon. Key fluency and arithmetic skills (which are mapped out) continue to be taught in each year group, building on prior knowledge.

Finally, the curriculum follows a similar pattern in each year group (where possible). This enables continuity and progression for learners, CPD for staff and pedagogical and professional discussion. This reflection around different mathematical concepts leads to continually improving the mathematical experience for learners.

Planning

As a school we use a range of resources to support effective planning of Mathematics. We use curriculum overviews and curriculum maps to ensure comprehensive coverage of the curriculum.

Within planning, learning objectives are matched to the National Curriculum. Marking ladders are used within lessons to enable learners to progress within a Mathematical concept. Associated vocabulary is also included on marking ladders to support learners in reasoning with precision.

A typical lesson within KS1 and KS2 at Sandy Hill would look like this:

Warm Up	Whole Class Teaching	Independent Activities	GDS All
Learners prepare their minds for mathematics with a burst of fluency These warm ups can be in the form of many things e.g.: a quiz, game, repetitive exercise, open-ended question or skill recap A challenge question is provided for children to deepen their understanding. Sometimes, this is an active-warm up where learners complete, 5, 10 or 15 minute physical activities (30:30) alongside their practising of fluency skills e.g. squat you know, hoop games.	Learning objective is shared by the teacher with learners. Vocabulary is shared and opportunities to address knowledge gaps given. I do, we do, you do – metacognition modelling is provided for the children Children are given opportunity to reason about the learning they have just acquired. Challenge questions are provided for children to deepen their understanding throughout whole class teaching	Children practise their skills they have just acquired. Fluency activities can be varied conceptually (images used) or procedurally (e.g. missing numbers) however sometimes it may be appropriate to solidify understanding in one way before further variation Challenges move forward coherently in small steps, allowing children to link their understanding. Reasoning and problem solving activities can be built into any stage of the independent activity. Mistakes are celebrated.	All children are given opportunity to apply their mathematical understanding to a question/activity or situation that requires deeper application of that concept. This can be done through whole class discussion, small group, paired work or independently.

Skills Progression:

At Sandy Hill, we use the objectives from the National Curriculum to ensure good coverage and challenge for all. We carefully track the objectives to ensure that new learning builds on prior knowledge and consolidates understanding showing sound progression across the depth and breadth of the subject. We have created our own curriculum maps that incorporate the new non-statutory guidance for teaching mathematics. Alongside this, teachers use our calculation policy to ensure progression in calculations.

Within lessons and topics, we ensure sufficient time is given to recall prior learning so that children are able to see and develop links within their learning. One objective may last for a series of lessons whilst the children deepen and consolidate their understanding.

Contextual example or Curriculum map

Sandy Hill Academy

Subject Progression

Mathematics – Year 6

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Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Addition/Subtraction BIDMAS Multiplication/Division Multiply/Divide Fractions Multiplying decimals ***Recognise the place value of each digit in numbers up to 10 million, including decimal fractions, and compose and decompose numbers up to 10 million using standard and nonstandard partitioning.*** ***Reason about the location of any number up to 10 million, including decimal fractions, in the linear number system, and round numbers, as appropriate, including in contexts.*** ***Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000)*** 12x12 Tables Add/Subtract mentally (Y5) Mixed numbers to improper fractions Multiplying decimals	Percentages Add/Take Fractions Continuation of previously learned skills ***Recognise when fractions can be simplified, and use common factors to simplify fractions*** ***Express fractions in a common denomination and use this to compare fractions that are similar in value.*** ***Compare fractions with different denominators, including fractions greater than 1, using reasoning, and choose between reasoning and common denomination as a comparison strategy*** ***Understand that 2 numbers can be related additively or multiplicatively, and quantify additive and multiplicative relationships (multiplicative relationships restricted to multiplication by a whole number).*** 12x12 Tables Add/Subtract mentally (Y5) Mixed numbers to improper fractions Multiplying decimals Square and Cubed numbers Prime Numbers Factors	Continuation of previously learned skills ***Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000)*** ***Recognise when fractions can be simplified, and use common factors to simplify fractions*** ***Express fractions in a common denomination and use this to compare fractions that are similar in value.*** ***Compare fractions with different denominators, including fractions greater than 1, using reasoning, and choose between reasoning and common denomination as a comparison strategy*** ***Understand that 2 numbers can be related additively or multiplicatively, and quantify additive and multiplicative relationships (multiplicative relationships restricted to multiplication by a whole number).*** 12x12 Tables Multiplying decimals Add/Subtract mentally (Y5) Square and Cubed numbers Prime Numbers Factors	Continuation of previously learned skills ***Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000)*** ***Recognise when fractions can be simplified, and use common factors to simplify fractions*** ***Express fractions in a common denomination and use this to compare fractions that are similar in value.*** ***Compare fractions with different denominators, including fractions greater than 1, using reasoning, and choose between reasoning and common denomination as a comparison strategy*** 12x12 Tables Multiplying decimals Add/Subtract mentally (Y5) Square and Cubed numbers Prime Numbers Factors	Continuation of previously learned skills ***Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000)*** ***Recognise when fractions can be simplified, and use common factors to simplify fractions*** ***Express fractions in a common denomination and use this to compare fractions that are similar in value.*** ***Compare fractions with different denominators, including fractions greater than 1, using reasoning, and choose between reasoning and common denomination as a comparison strategy*** 12x12 Tables Multiplying decimals Add/Subtract mentally (Y5)	Continuation of previously learned skills ***Full range of RTPC – including Y7*** 12x12 Tables Multiplying decimals Add/Subtract mentally (Y5)

Place Value (2 weeks) ***Recognise the place value of each digit in numbers up to 10 million, including decimal fractions, and compose and decompose numbers up to 10 million using standard and nonstandard partitioning.*** ***Reason about the location of any number up to 10 million, including decimal fractions, in the linear number system, and round numbers, as appropriate, including in contexts.*** ***Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000)*** To round any whole number to a required degree of accuracy To use negative numbers in context, and calculate intervals across 0 **Addition. Subtraction, Multiplication and Division (5 weeks)** To solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why To identify common factors, common multiples and prime numbers ***Understand that 2 numbers can be related additively or multiplicatively, and quantify***	**Fractions (4 weeks)** ***Recognise when fractions can be simplified, and use common factors to simplify fractions*** ***Express fractions in a common denomination and use this to compare fractions that are similar in value.*** ***Compare fractions with different denominators, including fractions greater than 1, using reasoning, and choose between reasoning and common denomination as a comparison strategy*** To add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions To multiply simple pairs of proper fractions, writing the answer in its simplest form To divide proper fractions by whole numbers **Decimals and Percentages (2 weeks)** To associate a fraction with division and calculate decimal fraction equivalents for a simple fraction. To recall and use equivalences between simple fractions, decimals and percentages, including in different contexts. To multiply one-digit numbers with up to 2 decimal places by whole numbers	**Decimals and Percentages (2 week)** To associate a fraction with division and calculate decimal fraction equivalents for a simple fraction. To recall and use equivalences between simple fractions, decimals and percentages, including in different contexts. To multiply one-digit numbers with up to 2 decimal places by whole numbers To use written division methods in cases where the answer has up to 2 decimal places To solve problems involving the calculation of percentages and the use of percentages for comparison **Converting Measures (1 week)** To use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3 decimal places To convert between miles and kilometres (5 miles = 8Km or 1 mile = 1.6 km) To calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units.	**Perimeter, Area and Volume (3 weeks)** To recognise that shapes with the same areas can have different perimeters and vice versa To recognise when it is possible to use formulae for area and volume of shapes. **Ratio and Proportion (2 weeks)** ***Solve problems involving ratio relationships*** To solve problems involving similar shapes where the scale factor is known or can be found To solve problems involving unequal sharing and grouping using knowledge of fractions and multiples. **Statistics (1 week)** To interpret and construct pie charts and line graphs and use these to solve problems To calculate and interpret the mean as an average	**Algebra (2 weeks)** To use simple formulae To express missing number problems algebraically To generate and describe linear number sequences ***Solve problems with 2 unknow*** To enumerate possibilities of combinations of 2 variables. **Revision of units (4 weeks)**

additive and multiplicative relationships (multiplicative relationships restricted to multiplication by a whole number). To multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication To divide numbers up to 4 digits by	To use written division methods in cases where the answer has up to 2 decimal places To solve problems involving the calculation of percentages and the use of percentages for comparison	To calculate the area of parallelograms and triangles **Shape (3 weeks)** To recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.		

The top section is dedicated to fluency. Areas in blue are mental elements of number to be driven, green indicate written areas of calculation. Areas in bold and italics are key indicators as stated in the RTPC non-statutory guidance document (July 2020). The below section is the key progression of teaching. Key areas of learning indicated in yellow with subsequent objectives.

Teaching and Learning Expectations:

- Mathematics will be taught five times a week: as a session each day or two sessions within a mathematics morning/afternoon
- When a mathematics morning is employed, an element of English will be given some time to ensure skills are continually driven and vice versa should an English morning take place.
- All children are able to access Mathematics
- All children have access to appropriate manipulatives and pictorial images
- Opportunities for children to develop fluency, reasoning and problem-solving skills within each lesson
- Teachers to use skills curriculum maps to ensure comprehensive and effective coverage
- All lessons will have four set slides for whole class teaching as a minimum: fluency, learning objective with vocabulary, metacognition modelling and reasoning.
- Class blogs and social media to include examples of Mathematics

Working Walls/Displays:

All classes to display current Mathematics learning on working wall. They must include: key vocabulary, WAGOLL (What a good one looks like), children's work, reasoning sentence starters

- Corridor display (main building) showcasing effective mathematics across the school
- Hall display with leader-board for times tables rock stars and actions for times tables
- Connected mathematics learning display – new build, encouraging learners to link between concepts of mathematics
- In classrooms, numbers/number lines are present in the classroom to support learners
- In classrooms, fixed display posters of new/hard to remember learning (see below) which remain throughout a term/for the year. E.g. parallel and perpendicular may be there all year to help pupils retain this knowledge

Fixed Displays:

Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Maths books Number of the Day Number-line to 20 2D Shapes Subitising Birthday Balloons	Maths books Number of the Day Number-line to 30 2D and 3D Shapes Subitising Birthday Balloons	Numbers to 100 caterpillars Numbers to 20 representations Number formation Daily number Sunflowers vocabulary Twinkl reasoning stems X Tables 2,5,10 2D and 3D Shape Names	Numbers to 100 (10s frames) Place Value to 100 X Tables 2,3,4,5,10 Daily Number Sunflowers vocabulary Twinkl reasoning stems Written and mental strategies Vertices, faces and edges/sides 2D and 3D Shape Names	Roman Numeral Date X Tables to 12x12 Place Value to 1,000 with 2 DP 2D and 3D shape properties 2D and 3D Shape Names Counting in 50s/100s to 1000 Clock Times 24Hr to nearest minute Parallel, perpendicular, vertical, horizontal, diagonal Equivalent fractions (small denominators) Right angles and right angles in turn KS2 Reasoning Stems	Roman Numeral Date X Tables to 12x12 Place Value to 10,000 with 2 DP 2D and 3D shape properties 2D and 3D Shape Names Negative numbers past 0 Counting ins 25s, 50s, 100s Clock Times 24Hr to nearest minute Parallel, perpendicular, vertical, horizontal, diagonal Obtuse/Acute /reflex angles Fraction and decimal equivalence for quarter, half and three quarters Lines of symmetry KS2 Reasoning Stems	Roman Numeral Date X Tables to 12x12 Place Value to 1,000,000 2D and 3D shape properties FDP Equivalents Counting in 250s, 500s, 1000s Clock Times 24Hr to nearest minute Area and perimeter of rectangles/ Perimeter of rectilinear shapes Obtuse/Acute /reflex angles Square/cube number sequences Prime Numbers (Factor bugs) Regular and Irregular Polygons KS2 Reasoning Stems	Roman Numeral Date Place Value to 10,000,000 with 3DP FDP Equivalents Formulas for areas/perimeter Volume – how to calculate Measures conversions Missing angles Square/cube number sequences Prime Numbers (Factor bugs) KS2 Reasoning Stems
Not discretely on maths board. Could be anywhere within environment.							

Classroom Resources:

Classroom resources are available for all learners to access. Children are taught how to use them and are guided towards what resources might be useful; children can also select and choose independently during lessons. Resources link with our school calculation policy.

Below is a list of what resources are permanently found in classrooms to support learners' understanding.

EYFS (Resources to be added as taught) – Maths resource area/resources chosen for purpose

Various objects to count

Cubes

Numicon

Dice

Tens Frames

Number Fans

Balance Scales

Number tiles

Part-Part-Whole

Cuisenaire Rods – not stored in classroom

KS1 Classroom Resources – Available for independent use at desks for learners

Base 10 (Diennes)

Place Value Counters – Up to 100

Cubes

Numicon

Dice

Tens Frames

Cuisenaire Rods – not stored in classroom

KS2 Classroom Resources – Available for independent access at resource area

Base 10 – including 1000s

Place Value Counters – Up to 1,000,000

Cubes

Dice

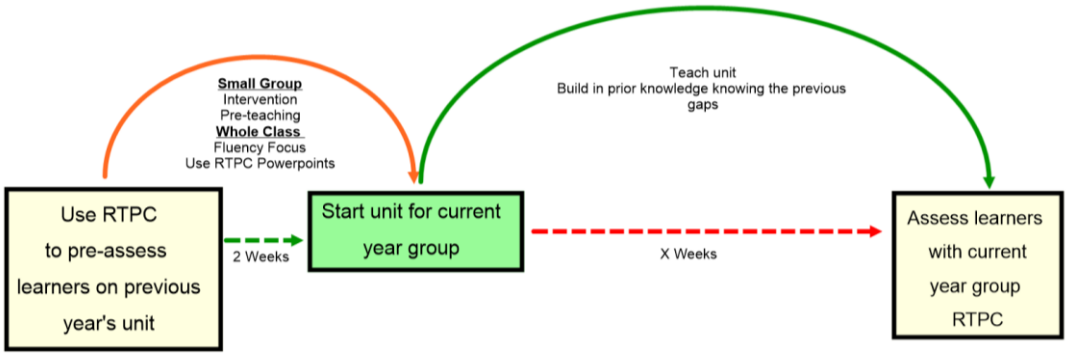
Cuisenaire Rods – not stored in classroom

Monitoring/Assessment:

- Key Stage 1 to assess children with Ready to Progress Criteria (RTPC) this format (ongoing) – at the beginning of the unit with the previous year's criteria. Gaps will be addressed during the unit and then the children will be assessed on their current year groups criteria.

Date	Area of Mathematics	Specific Area Of Mathematics	Children Requiring Intervention	Impact after Intervention and Unit Taught	Further Action?
e.g. 14.10.20	**Multiplication and Division**	**Long Multiplication**	***Jonathan Gordon Samantha***	***All children demonstrated solid understanding following the intervention. All children accessed and achieved end of unit assessment.***	***Work with Gordon a few more times in class when multiplying – just to ensure retention.***

- Key Stage 2 to assess with this same format however they will place intervention pre-unit (see below.) KS1 do not complete the pre-unit work to avoid confusion with current area of study.



- Summative assessment: PUMA tests, Twinkl tests, end of unit assessments to identify children who are WTS, EXS and GDS
- Formative assessment techniques within lessons
- Pupil Conferencing
- Learning Walk/Lesson Observations
- Work scrutiny and book looks.
- Progress review meetings