Skills & Knowledge progression: Mathematics

National Curriculum – Aims and purpose	School aims - skills, attitudes and knowledge that we would like all children to develop on their journey through the school
Purpose of study Mathematics is a creative and highly inter-connected 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 nonroutine 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.	Mathematics is a key subject that covers a huge range of topics and skills. As well as practicing mental and written methods for adding, subtracting, multiplying and dividing, we learn about many other areas of mathematics such as money, measures, time, shape, statistics and co-ordinates etc. At Stapleford Primary School we have chosen to use the White Rose Maths Scheme of work. This excellent resource was chosen because it provides: - a well planned and thorough journey through mathematics for teachers to follow - excellent learning resources - a high level challenge for the children. - comprehensive remote learning resources - quality mixed aged planning <u>Maths Mastery</u> The delivery of our mathematics lessons follows the Maths Mastery approach. According to most dictionary definitions, to master something is to be able to do it very well. The term 'maths mastery' has been defined as: "…mastering maths means acquiring a deep, long-term, secure and adaptable understanding of the subject. At any one point in a pupil's journey through school, achieving mastery is taken to mean acquiring a solid enough understanding of the maths that's been taught to enable him/her to move on to more advanced material." NCETM website 17 October 2018. What can you expect to see in maths mastery lessons? In delivering maths lessons to achieve mastery, you can typically expect to see the following in maths mastery lessons: • Small steps • Teaching whole class together • Ping pong teaching and learning • Carefully chosen representations, questions and tasks • CPA (Concrete, Pictorial, Abstract representations) • Opportunities for pupils to think, reason and problem solve • Articulating using correct maths vocabulary and speaking in full sentences • Secure number facts and fluency Every week pupils are supported, in school, to learn their times tables using the Golden 100. This provides a very clear record of the progress the children have made which motivates them to keep practising. Maths homework is set every week and teachers are always available to discuss homework errors with their pupils.

Milestones:
At Stapleford Primary School children are taught in mixed age classes e.g. Years 1 & 2 together etc. Our curriculum sets out progression in the form of three 'Milestones'. The children work towards each Milestone for two years. During the first year pupils attain an understanding of the skills set out in the Milestone and during the second year they develop an advanced or deeper understanding. Each Milestone contains a range of descriptors which provide details of the skills to be covered. Over a two-year period, students become more and more familiar with these details by exploring them in a breadth of contexts. This helps pupils to "know more" and "remember more."

Links to learning in EYFS:	**Links to other subjects / curriculum areas:**	**Experiences every child should have:**
Mathematics can be linked to most subjects. Opportunities for maths in the EYFS can include: - role play shop - painting/counting dots on ladybird paintings - creating repeating patterns in art or with construction kit - singing counting songs - learning to write numbers - finding and counting acorns etc.	Mathematics can be linked to most subjects. Opportunities for maths in the curriculum can include: - recording and analysing results of science investigations - hearing and counting the pulse/beat in music - recording scores and times in PE - learning about foreign currency in French - coding in computing - solving worded problems etc.	Every pupil should be provided with the opportunity to: - learn to work with and handle real money - learn from mistakes in a safe and encouraging environment (Growth Mindset – "I can't do it……YET!") - create and solve mathematical investigations - design their own board games - enjoy maths lessons outdoors - use and apply mathematical knowledge to draw scientific conclusions - program and control computers/devices etc.

Skills Progression: Mathematics

Threshold Concept		**Years 1 & 2** Milestone 1	**Years 3 & 4** Milestone 2	**Years 5 & 6** Milestone 3
Know and use numbers This concept involves understanding the number system and how they are used in a wide variety of mathematical ways.	Counting	• Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number. • Count, read and write numbers to 100 in numerals. • Given a number, identify one more and one less. • Count in steps of 2, 3, 5 and 10 from 0 or 1 and in tens from any number, forward and backward.	• Count in multiples of 2 to 9, 25, 50, 100 and 1000. • Find 1000 more or less than a given number. • Count backwards through zero to include negative numbers.	• Read numbers up to 10 000 000. • Use negative numbers in context and calculate intervals across zero.

	Representing	• Identify, represent and estimate numbers using different representations, including the number line. • Read and write numbers initially from 1 to 20 and then to at least 100 in numerals and in words.	• Identify, represent and estimate numbers using different representations. • Read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value.	• Write numbers up to 10 000 000 • Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.
	Comparing	• Use the language of: equal to, more than, less than (fewer), most and least. • Compare and order numbers from 0 up to 100; use <, > and = signs.	• Order and compare numbers beyond 1000.	• Order and compare numbers up to 10 000 000.
	Place value	• Recognise the place value of each digit in a two-digit number (tens, ones).	• Recognise the place value of each digit in a four-digit number. (thousands, hundreds, tens, and ones) • Round any number to the nearest 10, 100 or 1000.	• Round any whole number to a required degree of accuracy. • Determine the value of each digit in any number.
	Solving problems	• Use place value and number facts to solve problems.	• Solve number and practical problems with increasingly large positive numbers.	• Solve number and practical problems.
Add and subtract This concept involves understanding both the concepts and processes of addition and subtraction.	Complexity	• Solve one-step problems with addition and subtraction: • Using concrete objects and pictorial representations including those involving numbers, quantities and measures. • Using the addition (+), subtraction (-) and equals (=) signs. • Applying their increasing knowledge of mental and written methods.	• Solve two-step addition and subtraction problems in contexts, deciding which operations and methods to use and why.	• Solve multi-step addition and subtraction problems in contexts, deciding which operations and methods to use and why.

	Methods	• Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: • One-digit and two-digit numbers to 20, including zero. • A two-digit number and ones. • A two-digit number and tens. • Two two-digit numbers. • Adding three one-digit numbers. • Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot.	• Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate. • Add and subtract numbers mentally, including: • A three-digit number and ones. • A three-digit number and tens. • A three-digit number and hundreds.	• Add and subtract whole numbers with more than 4 digits, including using formal written methods. (columnar addition and subtraction) • Add and subtract numbers mentally with increasingly large numbers.
	Checking	• Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.	• Estimate and use inverse operations to check answers to a calculation.	• Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.
	Using number facts	• Represent and use number bonds and related subtraction facts within 20. • Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100.	• Solve problems, including missing number problems, using number facts, place value and more complex addition and subtraction.	• Add and subtract negative integers.
Multiply and divide This concept involves understanding both the concepts and processes of multiplication and division.	Complexity	• Solve one-step (two-step at greater depth) problems involving multiplication and division.	• Solve problems involving multiplying and dividing, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems (such as n objects are connected to m objects).	• Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign. • Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

				• Use knowledge of the order of operations to carry out calculations involving the four operations.
	Methods	• Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division (÷) and equals (=) signs. • Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot. • Solve problems involving multiplication and division using mental methods.	• Multiply two-digit and three-digit numbers by a one-digit number using formal written layout. • Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers. • Recognise and use factor pairs and commutativity in mental calculations.	• Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication. • Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. • Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context. • Perform mental calculations, including with mixed operations and large numbers.
	Checking	• Use known multiplication facts to check the accuracy of calculations.	• Recognise and use the inverse relationship between multiplication and division and use this to check calculations and solve missing number problems.	• Estimate and use inverse operations and rounding to check answers to a calculation.
	Using multiplication and division facts	• Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables. • Recognise odd and even numbers. • Use multiplication and division facts to solve problems.	• Recall multiplication and division facts for multiplication tables up to 12 × 12.	• Identify common factors, common multiples and prime numbers. • Establish whether a number up to 100 is prime and recall prime numbers up to 19. • Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000. • Recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3).

				• Solve problems involving multiplication and division including using knowledge of factors and multiples, squares and cubes.
Fractions This concept involves understanding the concept of part and whole and ways of calculating using it.	<u>Recognising fractions</u>	• Recognise, find and name a half as one of two equal parts of an object, shape or quantity. • Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity. • Recognise, find, name and write fractions 1/2, 1/4, 2/4 and 3/4 of a length, shape, set of objects or quantity.	• Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators. • Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators. • Round decimals with one decimal place to the nearest whole number. • Compare numbers with the same number of decimal places up to two decimal places. • Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10. • Count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten. • Compare and order unit fractions and fractions with the same denominators.	• Compare and order fractions whose denominators are all multiples of the same number. • Compare and order fractions, including fractions > 1. • Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number. • Round decimals with two decimal places to the nearest whole number and to one decimal place. • Read, write, order and compare numbers with up to three decimal places. • Identify the value of each digit in numbers given to three decimal places. • Solve problems involving number up to three decimal places. • Recognise the percent symbol (%) and understand that percent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal.
	<u>Equivalence</u>	• Recognise the equivalence of 2/4 and 1/2.	• Recognise and show, using diagrams, families of common equivalent fractions. • Recognise and write decimal equivalents of any number of tenths or hundredths.	• Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths. • Read and write decimal numbers as fractions.

			• Recognise and write decimal equivalents to 1/4, 1/2, 3/4.	• Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents. • Use common factors to simplify fractions; use common multiples to express fractions in the same denomination. • Associate a fraction with division and calculate decimal fraction equivalents. • Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.
	<u>Solving problems</u>	• Write simple fractions for example, 1/2 of 6 = 3.	• Add and subtract fractions with the same denominator within one whole. • Solve problems involving increasingly harder fractions. • Calculate quantities and fractions to divide quantities (including non-unit fractions where the answer is a whole number). • Add and subtract fractions with the same denominator. • Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths. • Solve simple measure and money problems involving fractions and decimals to two decimal places.	• Add and subtract fractions with the same denominator and denominators that are multiples of the same number. • Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions. • Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams. • Multiply simple pairs of proper fractions, writing the answer in its simplest form. • Solve problems which require knowing percentage and decimal equivalents of, 1/2, 1/4, 1/5, 2/5, 4/5 and those fractions with a denominator of a multiple of 10 or 25. • Divide proper fractions by whole numbers. • Multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places.

				Ratio and proportion • Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts. • Solve problems involving the calculation of percentages and the use of percentages for comparison. • Solve problems involving similar shapes where the scale factor is known or can be found. • Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.
Understand the properties of shapes This concept involves recognising the names and properties of geometric shapes and angles.		• Recognise and name common 2D and 3D shapes. • Identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line. • Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces. • Identify 2-D shapes on the surface of 3-D shapes. • Compare and sort common 2-D and 3-D shapes and everyday objects.	• Draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them. • Recognise angles as a property of shape or a description of a turn. • Identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle. • Identify horizontal and vertical lines and pairs of perpendicular and parallel lines. • Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes. • Identify acute and obtuse angles and compare and order angles up to two right angles by size.	• Identify 3-D shapes, including cubes and other cuboids, from 2-D representations. • Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles. • Draw given angles, and measure them in degrees (°). • Identify: • Angles at a point and one whole turn (total 360°). • Angles at a point on a straight line and a turn (total 180°). • Other multiples of 90°. • Use the properties of rectangles to deduce related facts and find missing lengths and angles. • Distinguish between regular and irregular polygons based on

			• Identify lines of symmetry in 2-D shapes presented in different orientations. • Complete a simple symmetric figure with respect to a specific line of symmetry.	reasoning about equal sides and angles. • Draw 2-D shapes using given dimensions and angles. • Recognise, describe and build simple 3-D shapes, including making nets. • Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons. • Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius. • Recognise angles where they meet at a point, are on a straight line, or are vertically opposite and find missing angles.
Describe position, direction and movement This concept involves recognising various types of mathematical movements.		• Describe position, direction and movement, including whole, half, quarter and three-quarter turns. • Order and arrange combinations of mathematical objects in patterns and sequences. • Use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise).	• Recognise angles as a property of shape and as an amount of rotation. • Identify right angles, recognise that 2 right angles make a half turn and 4 make a whole turn. • Identify angles that are greater than a right angle. • Describe positions on a 2-D grid as coordinates in the first quadrant. • Describe movements between positions as translations of a given unit to the left/right and up/down. • Plot specified points and draw sides to complete a given polygon.	• Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed. • Describe positions on the full coordinate grid. (all four quadrants) • Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.

Use measures This concept involves becoming familiar with a range of measures, devices used for measuring and calculations.		• Compare, describe and solve practical problems for: •lengths and heights •mass/weight •capacity and volume •time. • Measure and begin to record: •lengths and heights •mass/weight •capacity and volume •time (hours, minutes, seconds). • Recognise and know the value of different denominations of coins and notes. • Sequence events in chronological order using language. • Recognise and use language relating to dates, including days of the week, weeks, months and years. • Tell the time to the hour and half past the hour and draw the hands on a clock face to show these times. • Use standard units to estimate and measure length/height (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels. • Compare and order lengths, mass, volume/capacity and record the results using >, < and =.	• Measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml). • Measure the perimeter of simple 2-D shapes. • Add and subtract amounts of money to give change. (£ and p) • Tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks. • Estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use appropriate vocabulary. • Know the number of seconds in a minute and the number of days in each month, year and leap year. • Compare durations of events. • Convert between different units of measure. (for example, kilometre to metre; hour to minute) • Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres. • Find the area of rectilinear shapes by counting squares. • Estimate, compare and calculate different measures, including money in pounds and pence. • Read, write and convert time between analogue and digital 12- and 24-hour clocks.	• Convert between different units of metric measure. • Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints. • Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres. • Calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm2) and square metres (m2) and estimate the area of irregular shapes. • Estimate volume and capacity. • Solve problems involving converting between units of time. • Use all four operations to solve problems involving measure (for example, length, mass, volume, money) using decimal notation, including scaling. • Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate. • 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 up to three decimal places. • Convert between miles and kilometres.

		• Recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value. • Find different combinations of coins that equal the same amounts of money. • Solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change. • Compare and sequence intervals of time. • Tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times. • Know the number of minutes in an hour and the number of hours in a day.	• Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.	• Recognise that shapes with the same areas can have different perimeters and vice versa. • Recognise when it is possible to use formulae for area and volume of shapes. • Calculate the area of parallelograms and triangles. • Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm3) and cubic metres (m3), and extending to other units.
Use statistics This concept involves interpreting, manipulating and presenting data in various ways.		• Interpret and construct simple pictograms, tally charts, block diagrams and simple tables. • Ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity. • Ask and answer questions about totalling and comparing categorical data.	• Interpret and present data using bar charts, pictograms and tables. • Solve one-step and two-step questions (for example, 'How many more?' and 'How many fewer?') using information presented in scaled bar charts, pictograms and tables. • Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs. • Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.	• Solve comparison, sum and difference problems using information presented in a line graph. • Complete, read and interpret information in tables, including timetables. • Interpret and construct pie charts and line graphs and use these to solve problems. • Calculate and interpret the mean as an average.

Use algebra This concept involves recognising mathematical properties and relationships using symbolic representations.		• Solve addition and subtraction problems involving missing numbers.	• Solve addition and subtraction, multiplication and division problems that involve missing numbers.	• Use simple formulae. • Generate and describe linear number sequences. • Express missing number problems algebraically. • Find pairs of numbers that satisfy an equation with two unknowns. • Enumerate possibilities of combinations of two variables.

Mathematics: Curriculum covered at Stapleford Primary School

KS1 (Class 3 – Year 1 & 2)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number: Place Value Y1 – Numbers to 20 Y2 – Numbers to 100			Number: Addition and Subtraction Year 1- Numbers within 20 (including recognising money) Year 2- Numbers within 100 (including money)						Number: Year 1: Place Value to 50 and Multiplication Year 2: Multiplication		
Spring	Number: Year 1: Division & consolidation Year 2: Division			Year 1: Place Value to 100 Year 2: Statistics		Measurement: Length and Height	Geometry: Year 1: Shape and Consolidation Year 2: Properties of Shape			Number: Year 1: Fractions and Consolidation Year 2: Fractions		Consolidation
Summer	Geometry: Position and Direction		Measurement: Time		Problem solving and efficient methods		Measurement: Year 1: Weight and Volume Year 2: Mass, Capacity and Temperature			Consolidation and Investigations		

Lower KS2 (Class 2 – Year 3 & 4)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number: Place Value				Number: Addition and Subtraction				Number: Multiplication and Division			
Spring	Number: Multiplication and Division		Measurement: Length, Perimeter and Area		Number: Fractions				Y3: Measurement: Mass and Capacity Y4: Number: Decimals			Consolidation
Summer	Number: Decimals (including Money)			Measurement: Time		Statistics		Geometry: Properties of Shape (including Y4 Position and Direction)				Consolidation

Upper KS2 (Class 1 – Years 5 & 6)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number: Place Value		Number: Four Operations					Number: Fractions				
Spring	Y5: Number: Fractions Y6: Number: Ratio		Number: Decimals and Percentages			Y5: Number: Decimals Y6: Number: Algebra		Measurement: Converting Units	Measurement: Perimeter, Area and Volume		Statistics	
Summer	Geometry: Properties of Shape		Geometry: Position and Direction	Y6: SATS		Investigations and Consolidation						