HAREWOOD JUNIOR SCHOOL KEY SKILLS, KNOWLEDGE AND UNDERSTANDING
MATHS

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 have conceptual understanding and are able to recall and apply their knowledge rapidly and accurately to problems
- **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.

	Year 3	Year 4	Year 5	Year 6
	In addition to revision and application of previous skills, knowledge and concepts, Y3 children should be taught to:	**In addition to revision and application of previous skills, knowledge and concepts, Y4 children should be taught to:**	**In addition to revision and application of previous skills, knowledge and concepts, Y5 children should be taught to:**	**In addition to revision and application of previous skills, knowledge and concepts, Y6 children should be taught to:**
NUMBER	Count from 0 in multiples of 4, 8, 50 & 100	Order numbers up to 10,000	Read, write, order and compare numbers to at least 1000,000, including decimals	Read, write, order and compare numbers up to 10 000 000
	Find 10 or 100 more or less than a given number.	Round any number to the nearest 10,100, 1000 and decimals to the nearest whole number	Interpret negative numbers in context	Round any whole number to a required degree of accuracy
	Recognise the place value of each digit in a 3-digit number	Count forward and backwards in steps of 2-10, 25, 50, 100 and 1000 from any given number	Count forwards and backwards with positive and negative whole numbers	Use negative numbers in context
	Compare & order numbers up to 1000	Read write and order negative numbers including counting forwards and backwards	Round any number to the nearest 10,100,1000,10000 and 100000	
	Identify, represent and estimate numbers using different representations	Read Roman numerals up to 100 (in historic context)	Round decimals to the nearest whole number	
	Read and write numbers up to 1000 in digits and words		Read Roman numerals to 1000 (M) and recognise years written in Roman numerals	
CALCULATION	Add mentally a single digit number to a HTU	Add four digit numbers using column addition	Add and subtract whole numbers with more than four digits using formal written methods	Multiply numbers up to 4 digits including decimals (2 dp)by a two- digit whole number using the formal written method
	Add mentally a HTU number and a multiple of ten	Subtract four digit numbers using decomposition	Identify multiples and factors, including finding all factor pairs of a number and common factors of two numbers	Divide numbers up to 4 digits by a two-digit whole number using formal written method for long division
	Add mentally a 'near multiple of 10' to a two-digit number.	Multiply two and three digit numbers by one digit using formal written methods	Know or establish prime numbers up to 100 and use appropriate vocabulary	Interpret remainders as whole number remainders, fractions or by rounding, as appropriate for the context
	Add mentally a HTU number and hundreds	Recall quickly multiplication and division facts up to 12x12	Multiply numbers up to 4 digits by one or two digit number using formal written methods	Identify common factors, common multiples and prime numbers
	Subtract mentally a HTU number and ones	Divide a two digit number by 10 and 100 and identify the value of the digits in the answer	Divide numbers up to four digits by one digit using formal written methods and interpret remainders	Use knowledge of the order of operations to carry out calculations involving the four operations (BODMAS)
	Subtract mentally a HTU number and tens	Divide two and three digit numbers by one digit using formal short division	Multiply and divide whole numbers and those involving decimals by 10,100 and 1000	Solve multi-step problems involving addition, subtraction, multiplication and division
	Subtract in my head, a 'near multiple of 10' from a two digit number.	Find remainders after division	Recognise and use square numbers and cube numbers and notation for squared and cubed	
	Subtract mentally a HTU number and hundreds	Recognise and use factor pairs within 144	Solve multi-step word problems, including decimals, involving addition, subtraction, multiplication and division	
	Use columnar addition to add numbers up to three digits	Use all four operations to solve two-step word problems, involving negative numbers	Solve simple ratio problems using multiplication and division	
	Use columnar subtraction to subtract numbers up to three digits	Organise, review and check work using inverse operations		
	Estimate the answer to a calculation and use inverse operations to check answers			

	Solve addition and subtraction word problems, including missing number problems, using number facts, place value.			
	Recall and use multiplication and division facts for the 3, 4 & 8 multiplication tables			
	Use multiplication facts within the times tables to derive unknown multiplication and division statements			
	Use multiplication and division to solve word problems including missing number problems.			
	Multiply two digit by one digit numbers mentally			
	Multiply two digit by one digit numbers with formal written method			
	Solve problems involving multiplication and division			
	Solve problems involving multiplication and division using simple ratio			

FRACTIONS, DECIMALS & PERCENTAGES	Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing by 10	Recognise that fractions are equivalent	Identify, name and write equivalent fractions of a given fraction, including tenths and hundredths	Use common factors to simplify fractions
	Recognise, find and write fractions of a discrete set of objects	Find fractions of amounts	Convert fractions whose denominators are all multiples of the same number to compare and order	Use common multiples to express fractions in the same denomination
	Use fractions (unit fractions and non-unit fractions with small denominators) as numbers	Add and subtract two fractions with common denominators within one whole	Add and subtract fractions with the same denominator and multiples of the same number	Compare and order fractions
	Recognise and show, using diagrams, equivalent fractions with small denominators	Compare and order decimals up to 2 dp	Convert from one form to the other and write mathematical statements >1 as a mixed number	Add and subtract fractions with different denominators and mixed numbers
	Add and subtract fractions with the same denominator within one whole (eg ⅗ + ⅕ = ⅘)	Recognise decimal equivalents to 1/4 , ½, ¾, and any number of tenths and hundredths	Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams	Multiply simple pairs of proper fractions
	Compare and order fractions with the same denominator		Read and write decimal numbers as fractions	Divide proper fractions by whole numbers
			Recognise and use thousandths and relate them to tenths and hundredths and decimal equivalents	Calculate decimal fraction equivalents for a simple fraction
			Recognise the percent symbol (%) and understand that percent relates to number of parts per hundred	Multiply and divide numbers by 10, 100 and 1000 giving answers to three decimal places
			Write percentages as a fraction with denominator hundred, and as decimal fractions	Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts
			Solve problems which require knowing percentage and decimal equivalents of ½,1/4, 1/5, 2/5, 4/5 and those with a denominator of a multiple of 10 or 25	Solve problems involving ratio
				Solve problems involving calculation of percentages
				Solve problems involving similar shapes where the scale factor is known or can be found
				Solve problems involving fractions with different denominators
ALGEBRA	Solve missing number problems within standard calculations	Solve missing number problems within standard calculations	Solve missing number problems within standard calculations	Use linear formulae
			Use algebraic formulae for calculating the area of squares and rectangles	Generate and describe linear number sequences
				Express missing number problems algebraically
				Find pairs of numbers that satisfy an equation with two unknowns
				Enumerate all possibilities of combinations of two variables

MEASURE	Measure, compare, add and subtract: lengths (m/cm/mm);	Know the relationships between metric units of length. Eg: 1km = 1000m and 1m = 100cm 1cm =10mm	Convert between different units of measure (eg km and m, m and cm, cm and mm, kg and g, litre and ml)	Use read, write and convert between standard units of measurement
	Measure, compare, add and subtract: mass (kg/g);	Know the relationships between metric units of mass. Eg: 1000g = 1kg and 500g = ½ kg	Understand and use equivalence between metric and imperial units, such as inches, pounds and pints	Solve problems involving the calculation and conversion of units
	Measure, compare, add and subtract: volume/capacity (l/ml)	Know the relationships between metric units of capacity. Eg: 1 litre = 1000ml and ½ l = 500ml	Measure and calculate the perimeter of composite rectilinear shapes(cm and m)	Convert between miles and kilometers
	Measure the perimeter of simple 2D shapes	Know the relationship between 1 hour = 60 minutes 1minute=60seconds 1 year = 12 months, 1 week = 7 days	Calculate and compare the area of squares and rectangles	Recognise that shapes with the same area can have different perimeters and vice versa
	Add amounts of money, using both £ and p in practical contexts (not necessarily decimals)	Read and convert between analogue and digital time (12 and 24 hour)	Estimate volume and capacity	
	Subtract amounts of money to give change, using both £ and p in practical contexts	Estimate, compare and calculate different measures including money	Solve problems involving converting between units of time	
	Tell and write the time from an analogue 12-hour clock and from digital, and match equivalent times		Use all four operations to solving problems including decimals	
	Tell and write the time from an analogue clock using Roman numerals from I to XII,			
	Tell and write the time using 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 vocabulary such as o'clock, am/pm, morning, afternoon, noon & midnight			
	Know the number of seconds in a minute and the number of days in each month, year and leap year			
	Compare durations of events [eg to calculate the time taken by particular events or tasks]			
SHAPE & SPACE	Identify, make and describe the properties of 2D shapes, including the number of sides and can identify 2D shapes on the surface of 3D shapes	Classify 2D shapes according to their properties, specifically triangles, quadrilaterals	Identify 3D shapes from pictures including cubes and cuboids	Calculate, estimate and compare volumes of cubes and cuboids using standard units
	Identify, make and describe the properties of 3D shapes in different orientations, including the number of edges, vertices and faces	Recognise 2D shapes in different orientations and their lines of symmetry	Estimate and compare acute, obtuse and reflex angles	Draw 2D shapes using given dimensions and angles
	Identify right angles	Reflect simple 2D shapes in a vertical or horizontal mirror line	Draw given angles	Recognise, describe and build simple 3D shapes including nets
	Recognise that two right-angles make a half-turn, three makes three-quarters turn, four a complete turn	Identify acute and obtuse angles and compare the size of different angles	Measure given angles in degrees	Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius

	Recognise whether angles are greater than or less than a right angle	Plot and describe co-ordinates in the first quadrant including completing a reflection in a given line of symmetry	Identify ¼, ½, ¾, whole turns as multiples of 90°	Compare and classify geometric shapes based on their properties
	Identify horizontal and vertical lines	Describe the translation of a shape left/right or up/down	Know angles on a straight line = 180°	Find unknown angles in any triangle, quadrilaterals, regular polygons, or at a point on a straight line, or vertically opposite
	Recognise pairs of perpendicular and parallel lines	Measure and calculate the perimeter of a rectilinear shape	Know angles at a point = 360°	Plot shapes or points in all four quadrants and give missing co-ordinates
		Find the area of squares and rectangles including compound shapes	Use properties of a rectangle to deduce related facts and find missing lengths and angles	Translate shapes, give new positions and describe movement (eg x+1, y+2)
			Distinguish between regular and regular polygons based on reasoning about equal sides and angles	Reflect shapes in axis, giving new position
			Reflect and translate shapes in the first quadrant	
DATA	Interpret and present data using pictograms and tables	Read, interpret and solve problems using information in bar graphs, including reading scales on the axes	Interpret and answer questions using information presented in line graphs	Interpret and construct pie charts and use these to solve problems
	Interpret and present data using bar charts		Complete, read and interpret information in tables, including timetables	Plot and interpret line graphs
	Solve one-step and two-step questions eg 'How many more?' and 'How many fewer?', using information presented in pictograms and tables			Calculate and interpret the mean, median and mode as an average
	Solve one-step and two-step questions [eg 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts			