PROGRESSION OF MATHEMATICAL VOCABULARY

This document sets out the key mathematical vocabulary for both Key Stage 1 and Key Stage 2 under the new National Curriculum. The purpose of the document is to identify the words and phrases that children need to understand and use if they are to make good progress in mathematics.

From the National Numeracy Strategy (1999) the following explains how children's failure to understand mathematical vocabulary may show itself:
Children do not respond to questions in lessons, they cannot do a task they are set and/or they do poorly in tests. Their lack of response may be because: they do not understand the spoken or written instructions, such as 'draw a line between…', 'ring…' or 'find two different ways to…' they are not familiar with the mathematical vocabulary, that is, words such as 'difference', 'subtract', 'divide' or 'product' they may be confused about mathematical terms, such as 'odd' or 'table', which have different meanings in everyday English they may be confused about other words, like 'area' or 'divide', which are used in everyday English and have similar, though more precise, meanings in mathematics There are, then, practical reasons why children need to acquire appropriate vocabulary so that they can participate in the activities, lessons and tests that are part of classroom life. There is, however, an even more important reason: mathematical language is crucial to children's development of thinking. If children don't have the vocabulary to talk about division, or perimeters, or numerical difference, they cannot make progress in understanding these areas of mathematical knowledge.

How do children develop their understanding of mathematical vocabulary?

Teachers often use informal, everyday language in mathematics lessons before or alongside technical mathematical vocabulary. Although this can help children to grasp the meaning of different words and phrases, you will find that a structured approach to the teaching and learning of vocabulary is essential if children are to move on and begin using the correct mathematical terminology as soon as possible. Some children may start school with a good understanding of mathematical words when used informally, either in English or their home language. Find out the extent of their mathematical vocabulary and the depth of their understanding, and build on this. You need to plan the introduction of new words in a suitable context, for example, with relevant real objects, mathematical apparatus, pictures and/or diagrams. Explain their meanings carefully and rehearse them several times. Referring to new words only once will do little to promote learning. Encourage their use in context in oral sessions, particularly through your questioning. You can help sort out any ambiguities or misconceptions your pupils may have through a range of open and closed questions. Use every opportunity to draw attention to new words or symbols with the whole class, in a group or when talking to individual pupils. The final stages are learning to read and write new mathematical vocabulary in a range of circumstances, ultimately spelling the relevant words correctly.

Regular, planned opportunities for development It is not just younger children who need regular, planned opportunities to develop their mathematical vocabulary. All children throughout Key Stages 1 and 2 need to experience a cycle of oral work, reading and writing as outlined below. oral work based on practical work so that they have visual images and tactile experience of what mathematical words mean in a variety of contexts other forms of oral work so that they have opportunities to: – listen to adults and other children using the words correctly – acquire confidence and fluency in speaking, using complete sentences that include the new words and phrases, sometimes in chorus with others and sometimes individually – describe, define and compare mathematical properties, positions, methods, patterns, relationships, rules – discuss ways of tackling a problem, collecting data, organising their work… – hypothesise or make predictions about possible results – present, explain and justify their methods, results, solutions or reasoning, to the whole class or to a group or partner – generalise, or describe examples that match a general statement reading aloud and silently, sometimes as a whole class and sometimes individually, for example, reading: – numbers, signs and symbols, expressions and equations in blackboard presentations – instructions and explanations in workbooks, textbooks, CD-ROMs… – texts with mathematical references in fiction and non-fiction books and books of rhymes during the literacy hour as well as mathematics lessons – labels and captions on classroom displays, in diagrams, graphs, charts and tables… – definitions in illustrated dictionaries, including dictionaries that they themselves have made, in order to discover synonyms, origins of words, words that start with the same group of letters (such as triangle, tricycle, triplet, trisect…) writing and recording in a variety of ways, progressing from words, phrases and short sentences to paragraphs and longer pieces of writing, for example: – writing prose in order to describe, compare, predict, interpret, explain, justify… – writing formulae, first using words, then symbols – sketching and labelling diagrams in order to clarify their meaning – drawing and labelling graphs, charts or tables, and interpreting and making predictions from the data in them, in mathematics and other subjects.

The Skill of Questioning
Children cannot learn the meanings of words in isolation. The use of questions is crucial in helping them to understand mathematical ideas and use mathematical terms correctly. It is important to ask questions in different ways so that children who do not understand the first time may pick up the meaning subsequently. Pupils for whom English is an additional language benefit and so will others who are not always familiar with the vocabulary and grammatical structures used in school. It is easy to use certain types of questions — those that ask the listener to recall and apply facts — more often than those that require a higher level of thinking. If you can use the full range of question types you will find that children begin to give more complex answers in which they explain their thinking.

Types of Question

Recalling facts

What is 3 add 7? How many days are there in a week? How many centimetres are there in a metre? Is 31 a prime number?

Applying facts

Tell me two numbers that have a difference of 12. What unit would you choose to measure the width of the table? What are the factors of 42?

Hypothesising or predicting

Estimate the number of marbles in this jar. If we did our survey again on Friday, how likely is it that our graph would be the same?
Roughly, what is 51 times 47? How many rectangles in the next diagram? And the next?

Designing and comparing procedures

How might we count this pile of sticks? How could you subtract 37 from 82? How could we test a number to see if it is divisible by 6? How could we find the 20th triangular number? Are there other ways of doing it?

Interpreting results

So what does that tell us about numbers that end in 5 or 0? What does the graph tell us about the most common shoe size? So what can we say about the sum of the angles in a triangle?

Applying reasoning

The seven coins in my purse total 23p. What could they be? In how many different ways can four children sit at a round table? Why is the sum of two odd numbers always even?

The tables below can be used to check pupils' understanding of new vocabulary introduced in Years 1-6. The lists are a guide to what pupils should know but they are not exhaustive.

It is good practice to display key vocabulary when it is being taught and needs to be promoted and reinforced through mathematical talk in lessons.

Mathematical Vocabulary for EYFS

Number and Place Value	**Addition and Subtraction**	**Multiplication and division**	**Measure**	**Geometry** (Position and Direction)	**Geometry** (Properties of Shape)	**Fractions**	**Problem Solving and Reasoning**
number, zero 1-20 count on/back lots, more, few, fewer, compare, sort, order, before, after, less, many, most, the same as, ones, pair	add, more, altogether, takeaway, number line, one more, one less, equals, equal to, double, half, how many? make, total	times, counting in ones, twos, fives, tens, lots of, groups of, once, twice, five times sharing, share, set, group, left, left over	days of the week, week, month, year, weekend, birthday, holiday, morning, afternoon, evening, night, midnight, bedtime, dinnertime, playtime, today, yesterday, tomorrow, before, after, next, last, now, soon, early, late, quick, fast, slow, old, new, watch, clock, always, never, first, size, weight, capacity, time, money long, longer, longest, short, shorter, shortest, heavy, light, empty, full, tall, small, large, thick, thin, low, deep, ruler, far, near, holds, container, weigh, weighs coin, pound, pence, cost, money, penny, buy, sell, pay, price, how many?	position, distance, after, before, in, on, inside, under, on top of, behind, next to, above, below, top, bottom, side, outside, around, underneath, in front, front, back, before, middle, up, down, forwards, backwards, across, close, far, along, to, from, slide, roll, turn, stretch, bend, move.	shape, group, sort, round, flat, straight, make, build, draw. square, circle, triangle, cube, cuboid, sphere	double half whole	listen, join in, say, think, imagine, remember, start from, start with, start at, look at, point to, put, place, fit, change, split, carry on, what comes next? find, choose, collect, use, make, build, tell me, pick out, talk about, explain, show me read, write, finish, copy, colour, tick, cross, draw, draw a line between, join (up), ring, arrow, cost, count, work out, answer, fill in, check, in order, every, each.

Mathematical Vocabulary for Year 1

Number and Place Value	**Addition and Subtraction**	**Multiplication and division**	**Measure**	**Geometry** (Position and Direction)	**Geometry** (Properties of Shape)	**Fractions**	**Problem Solving and Reasoning**
number zero, one, two, three to twenty, and beyond none count (on/up/to/from/down) before, after more, less, many, few, fewer, least, fewest, smallest, greater, lesser equal to, the same as odd, even pair units, ones, tens ten more/less digit numeral figure(s) compare (in) order/a different	number bonds, number line add, more, plus, make, sum, total, altogether inverse double, near double half, halve equals, is the same as (including equals sign) difference between how many more to make..?, how many more is…than..?, how much more is..? subtract, take away, minus how many fewer is…than..?, how much less is..?	odd, even count in twos, threes, fives count in tens (forwards from/backwards from) how many times? lots of, groups of once, twice, three times, five times multiple of, times, multiply, multiply by repeated addition array, row, column double, halve share, share equally group in pairs, threes, etc. equal groups of divide, divided by, left, left over	full, half full, empty holds, container weigh, weighs, balances heavy, heavier, heaviest, light, lighter, lightest scales time days of the week: Monday,Tuesday, etc. seasons: spring, summer, autumn, winter day, week, month, year, weekend birthday, holiday morning, afternoon, evening, night, midnight bedtime, dinnertime, playtime today, yesterday, tomorrow before, after next, last now, soon, early, late quick, quicker, quickest, quickly , fast, faster, fastest, slow, slower, slowest, slowly old, older, oldest, new, newer, newest takes longer, takes less time hour, o'clock, half past clock, watch, hands always, never, often, sometimes, usually once, twice first, second, third...	position over, under, underneath, above, below, top, bottom, side on, in, outside, inside around, in front, behind front, back before, after beside, next to, opposite apart between, middle, edge, centre corner direction journey left, right, up, down, forwards, backwards, sideways across	group, sort cube, cuboid, pyramid, sphere, cone, cylinder, circle, triangle, square shape flat, curved, straight, round hollow, solid corner (point, pointed) face, side, edge make, build, draw	whole equal parts, four equal parts one half, two halves a quarter, two quarters	listen, join in say, think, imagine, remember start from, start with, start at look at, point to put, place, fit arrange, rearrange change, change over split, separate carry on, continue, repeat, what comes next? find, choose, collect, use, make, build tell me, describe, pick out, talk about, explain, show me read, write, record, trace, copy, complete, finish, end cost count, work out, answer, check same number(s)/different

order size value between, halfway between above, below			estimate, close to, about the same as, just over, just under length, width, height, depth long, longer, longest, short, shorter shortest, tall, taller, tallest, high, higher, highest wide, narrow, deep, shallow, thick, thin far, near, close metre, ruler, metre stick money, coin, penny, pence, pound, price, cost, buy, sell, spend, spent, pay, change, costs more, costs less, cheaper, costs the same as how much? how many? total	close, far, near along, through to, from, towards, away from movement slide, roll, turn, whole turn, half turn stretch, bend			number(s)/missing number(s) number facts, number line, number track, number square, number cards abacus, counters, cubes, blocks, rods, die, dice, dominoes, pegs, peg board same way, different way, best way, another way in order, in a different order not all, every, each

Mathematical Vocabulary for Year 2

Number and Place Value	**Measure**	**Geometry (Position and Direction)**	**Geometry (Properties of Shape)**	**Fractions**	**Data / Statistics**	**Problem Solving and Reasoning**
numbers to one hundred hundreds partition, recombine hundred more/less	quarter past quarter to metres /kilometres grams / kilograms, millilitres /litres temperature (degrees)	rotation clockwise, anticlockwise straight line ninety degree turn, right angle	size bigger, larger, smaller symmetrical, line of symmetry fold match mirror line, reflection	three quarters, one third, a third equivalence, equivalent	count, tally, sort vote graph, block graph, pictogram, represent group, set, list, table label, title	predict describe the pattern, describe the rule find, find all, find different investigate

			pattern, repeating pattern		most popular, most common, least popular, least common	

Mathematical Vocabulary for Year 3

Number and Place Value	Addition and Subtraction	Multiplication and Division	Measure	Geometry (Position and Direction)	Geometry (Properties of Shape)	Fractions	Data / Statistics
numbers to one thousand	formal written methods column addition column subtraction	product multiples of four, eight, fifty and one hundred scale up	leap year twelve-hour clock twenty-four hour clock roman numerals i to xii	greater / less than ninety degrees orientation same orientation different orientation	horizontal vertical perpendicular lines parallel lines	numerator denominator unit fraction non unit fraction compare and order tenths	chart, bar chart, frequency table Carroll diagram Venn diagram axis axes diagram

Mathematical Vocabulary for Year 4

Number and Place Value	Multiplication and Division	Measure	Geometry (Position and Direction)	Geometry (Properties of Shape)	Fractions and Decimals	Data / Statistics
tenths, hundredths decimal (places) round (to nearest) thousand more/less than negative integers count through zero Roman numerals to	multiplication facts (up to 12x12) division facts inverse derive quotient divisor dividend	convert analogue and digital 12- and 24- hour clocks convert from hours to minutes; minutes to seconds; years to months; weeks to days area of rectilinear shapes	coordinates translation left/right up/down quadrant x-axis, y-axis perimeter and area	quadrilaterals triangles right angle acute and obtuse angles degrees symmetric	families of common equivalent decimals and fractions numbers with up to 2 decimal places (tenths, hundredths)	continuous data line graph

100 = C	integer scaling					

Mathematical Vocabulary for Year 5

Number and Place Value	Addition and Subtraction	Multiplication and Division	Measure	Geometry (Position and Direction)	Geometry (Properties of Shape)	Fraction, Decimals and Percentages
powers of 10 numbers to 1,000,000 Roman numerals to 1000 = M	efficient written methods	factor pairs composite numbers, prime number, prime factors, square number, cubed number formal written methods	volume imperial units (such as inches, pounds and pints) convert between different metric units (kilometre, metre; centimetre and metre; gram and kilogram; litre and millilitre)	reflex angle dimensions	regular and irregular polygons degrees whole turn = 360°	proper fractions, improper fractions, mixed numbers percentage half, quarter, fifth, two fifths, four fifths ratio, proportion

Mathematical Vocabulary for Year 6

Number and Place Value	Addition and Subtraction	Multiplication and Division	Geometry (Position and Direction)	Geometry (Properties of Shape)	Fractions, Decimals and Percentages	Algebra	Data / Statistics
numbers to ten million	order of operations	order of operations common factors common multiples interpret remainders common factors common multiples prime numbers	four quadrants in relation to coordinates translate shapes	vertically opposite angles circumference radius diameter	degree of accuracy simplify simplest form same denomination place value in numbers given to 3 decimal places	formulae linear number sequence substitute variables symbol	mean average pie chart construct

					(tenths, hundredths, thousandths)	known values	

Mathematical Vocabulary for Year 7

Number and Place Value	CALCULATIONS	Shape, space and measures	Fractions, Decimals and Percentages	Algebra	Data / Statistics
approximate, approximately approximately equal to (≈) between compare decimal number decimal place digit equals (=) greater than (>), less than (	add, addition amount brackets calculate, calculation calculator: clear, display, enter, key, memory, change (money) commutative complements (in 10, 100) currency difference discount divide, division double, halve estimate exact, exactly exchange rate factor increase, decrease inverse multiply, multiplication nearly operation order of operations partition product quotient remainder rough, roughly sale price sign subtract, subtraction sum total	Shape, space and measures Geometrical reasoning: lines, angles and shapes adjacent (side) angle: acute, obtuse, right, reflex angles at a point angles on a straight line base (of plane shape or solid) base angles centre circle concave, convex degree (°) diagonal diagram edge (of solid) equal (sides, angles) face horizonal, vertical identical (shapes) intersect, intersection line, line segment opposite (sides, angles) parallel perpendicular plane point polygon: pentagon, hexagon, octagon quadrilateral: arrowhead, delta, kite, parallelogram, rectangle, rhombus, square, trapezium regular, irregular shape side (of 2-D shape) solid (3-D) shape: cube, cuboid, cylinder, hemisphere, prism, pyramid, square-based pyramid, sphere, tetrahedron three-dimensional (3-D) triangle: equilateral, isosceles, scalene, right-angled two-dimensional (2-D) vertex, vertices vertically opposite angles Transformations axis of symmetry centre of rotation congruent line of symmetry line symmetry mirror line object, image order of rotation symmetry reflect, reflection reflection symmetry rotate, rotation rotation symmetry symmetrical transformation translate, translation Coordinates axis, axes coordinates direction grid intersecting, intersection origin position quadrant row, column x-axis, y-axis x-coordinate, y-coordinate Construction and loci construct draw measure net perpendicular protractor (angle measurer) ruler set square sketch	Integers, powers and roots classify common factor consecutive divisible, divisibility divisor factor factorise highest common factor (HCF) integer lowest common multiple (LCM) multiple negative (e.g. –6) plus, minus positive (e.g. +6) prime prime factor property sign square number, squared square root triangular number Fractions, decimals, percentages, ratio and proportion cancel, cancellation convert decimal fraction equivalent, equivalence fraction lowest terms mixed number numerator, denominator percentage (%) proper/improper fraction proportion ratio, including notation 3 : 2 simplest form	Algebra Equations, formulae and identities algebra brackets commutative equals (=) equation expression evaluate prove simplify, simplest form solution (of an equation) solve (an equation) squared substitute symbol term therefore (∴) unknown value variable verify	Sequences, functions and graphs axis, axes consecutive continue coordinate pair coordinate point coordinates equation (of a graph) finite, infinite function function machine generate graph increase, decrease input, output mapping nth term origin predict relationship, rule sequence straight-line graph term x-axis, y-axis x-coordinate, y-coordinate