Birchwood Junior School

Whole-School Mathematics Knowledge Progression

Years 1 to 6

Year groups are shown in columns. Each row tracks a related strand of knowledge horizontally so the increase in conceptual demand can be seen from Year 1 to Year 6.

Place Value

Knowledge strand	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Counting / powers of 10	I know that numbers can be counted forwards and backwards and that each number has a position in the counting sequence.	I know that the position of a digit determines its value in a 2-digit number.	I know that 10 tens are equal to 1 hundred and that 100 is 10 times the size of 10.	I know that 10 hundreds are equal to 1 thousand and that 1,000 is 10 times the size of 100.	I know that powers of 10 can be used to represent numbers up to 1,000,000 and that each place is 10 times the value of the place immediately to its right.	I know the relationship between powers of 10 from hundredths to 10,000,000 and can use it to make numbers 10, 100 or 1,000 times the size or one tenth, one hundredth or one thousandth of the size.
Place-value structure	I know that 10 ones are equal to 1 ten and that 2-digit numbers are made up of tens and ones.	I know that the position of a digit determines its value in a 2-digit number.	I know that 10 tens are equal to 1 hundred and that 100 is 10 times the size of 10.	I know that 10 hundreds are equal to 1 thousand and that 1,000 is 10 times the size of 100.	I know that powers of 10 can be used to represent numbers up to 1,000,000 and that each place is 10 times the value of the place immediately to its right.	I know the relationship between powers of 10 from hundredths to 10,000,000 and can use it to make numbers 10, 100 or 1,000 times the size or one tenth, one hundredth or one thousandth of the size.
Compose and partition	I know that numbers can be represented and partitioned using tens and ones.	I know that 2-digit numbers can be partitioned into tens and ones in different ways while keeping the same value.	I know that 3-digit numbers are made up of hundreds, tens and ones and can be partitioned and recombined in different ways.	I know that the position of a digit determines its value in a 4-digit number and that numbers can be partitioned flexibly.	I know that numbers can be partitioned into hundred thousands, ten thousands, thousands, hundreds, tens and ones.	I know that the position of each digit determines its value in numbers to 10,000,000, including decimal fractions, and that numbers can be composed and decomposed flexibly.
Number-line position	I know that numbers can be positioned and compared on a number line using <, > and =.	I know that multiples of 10 have zero ones and that the previous and next multiples of 10 help locate numbers on a number line.	I know that number lines have equal intervals and can be used to position, estimate, compare and order numbers to 1,000.	I know that place value can be used to find 1, 10, 100 or 1,000 more or less and to compare and order numbers to 10,000.	I know that the position on a number line is determined by the end values and equal scaled intervals; number lines do not have to start at 0.	I know that place value can be used to compare, order and round integers and decimals and to reason about their position on number lines.

Knowledge strand	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Compare and order		I know that place value can be used to compare and order 2-digit numbers.	I know that adding or subtracting 1, 10 or 100 changes the corresponding place value and may cross a place-value boundary.	I know that rounding locates a number between consecutive multiples of 10, 100 or 1,000 and uses the midpoint to decide the nearest multiple.	I know that when comparing and ordering numbers to 1,000,000, I compare the greatest place value first and move right until the values are different.	I know that place value can be used to compare, order and round integers and decimals and to reason about their position on number lines.
Rounding				I know that rounding locates a number between consecutive multiples of 10, 100 or 1,000 and uses the midpoint to decide the nearest multiple.	I know that rounding helps to estimate and calculate and I can use previous and next multiples and the midpoint to round to 10, 100, 1,000, 10,000 and 100,000.	I know that place value can be used to compare, order and round integers and decimals and to reason about their position on number lines.
Negative numbers					I know that numbers less than zero are negative and numbers greater than zero are positive; zero is the boundary between them.	I know that positive and negative numbers are positioned either side of zero and can be used to calculate intervals across zero.
Roman numerals				I know that Roman numerals use combinations of I, V, X, L and C to represent numbers to 100.	I know that Roman numerals use I, V, X, L, C, D and M and that the position of a smaller symbol can indicate subtraction.	

Addition and Subtraction

Knowledge strand	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Structures and language	I know that addition combines parts to make a whole and subtraction can describe taking away or finding the difference.	I know that known number facts can be used to derive related addition and subtraction facts.	I know that number bonds within 10 can be used to derive related facts to 100.	I know that formal column addition and subtraction align digits of the same place value.	I know that numbers added together are addends and their total is the sum. Column addition is a written method used to find the sum, and exchanges are made when a column total is greater than 9.	I know that the structures of addition and subtraction remain the same for larger integers and decimals and that digits must be aligned by place value.
Inverse relationships	I know that addition and subtraction facts are related and can be represented using part-whole models and number lines.	I know that addition and subtraction are inverse operations and can be used to check calculations.	I know that addition and subtraction are inverse operations and estimation can be used to check whether an answer is reasonable.	I know that efficient mental methods, estimation and inverse operations can be chosen to solve and check calculations.	I know that addition and subtraction are inverse operations and the inverse can check calculations or find missing parts.	I know that estimation, inverse operations and number sense can be combined to check the accuracy and reasonableness of answers.
Known facts and estimation	I know number bonds within 10 and can use them to reason about bonds within 20.	I know that known number facts can be used to derive related addition and subtraction facts.	I know that number bonds within 10 can be used to derive related facts to 100.	I know that efficient mental methods, estimation and inverse operations can be chosen to solve and check calculations.	I know that rounding can estimate a sum or difference and help me check whether a calculation is reasonable.	I know that estimation, inverse operations and number sense can be combined to check the accuracy and reasonableness of answers.
Place-value calculation		I know that adding or subtracting ones changes the ones value and adding or subtracting tens changes the tens value.	I know that adding or subtracting ones, tens or hundreds changes the corresponding place value.	I know that formal column addition and subtraction align digits of the same place value.	I know that numbers added together are addends and their total is the sum. Column addition is a written method used to find the sum, and exchanges are made when a column total is greater than 9.	I know that the structures of addition and subtraction remain the same for larger integers and decimals and that digits must be aligned by place value.
Exchange		I know that 10 ones are equivalent to 1 ten and can be exchanged when crossing a tens boundary.	I know that 10 ones are equal to 1 ten and 10 tens are equal to 1 hundred, so exchanges can be made when crossing boundaries.	I know that an exchange is made when a place-value column has too much or not enough value.	I know that the minuend is the number being subtracted from, the subtrahend is the number being taken away and the answer is the difference. Column subtraction may require exchanges, including across zero placeholders.	I know that the structures of addition and subtraction remain the same for larger integers and decimals and that digits must be aligned by place value.

Knowledge strand	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Formal written methods			I know that column addition and subtraction align digits with the same place value and exchanges may be needed.	I know that an exchange is made when a place-value column has too much or not enough value.	I know that the minuend is the number being subtracted from, the subtrahend is the number being taken away and the answer is the difference. Column subtraction may require exchanges, including across zero placeholders.	I know that the structures of addition and subtraction remain the same for larger integers and decimals and that digits must be aligned by place value.
Checking and reasonableness			I know that addition and subtraction are inverse operations and estimation can be used to check whether an answer is reasonable.	I know that efficient mental methods, estimation and inverse operations can be chosen to solve and check calculations.	I know that rounding can estimate a sum or difference and help me check whether a calculation is reasonable.	I know that estimation, inverse operations and number sense can be combined to check the accuracy and reasonableness of answers.
Problem solving				I know that bar models can represent one-step and multi-step addition and subtraction problems.	I know that bar models can represent multi-step problems and help identify whether addition, subtraction or both are required.	I know that multi-step problems can require different operations and that the order and relationship of these operations must be identified before calculating.

Perimeter

Knowledge strand	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Length foundations	I know that length describes how long an object or side is and that lengths can be compared directly.	I know that length can be measured using standard units such as centimetres and metres.	I know that perimeter is the distance around the outside of a 2D shape.	I know that the perimeter of rectilinear shapes is found by adding the lengths around the boundary.	I know that perimeter is the distance around a 2D shape and is calculated by adding the lengths of all its sides.	I know that perimeter is a linear measure and remains distinct from area, which measures surface.
Boundary / perimeter		I know that the lengths of several sides can be added to find a total distance.	I know that perimeter can be found by measuring and adding all the side lengths of a shape.	I know that the perimeter of rectilinear shapes is found by adding the lengths around the boundary.	I know that perimeter is the distance around a 2D shape and is calculated by adding the lengths of all its sides.	I know that perimeter is a linear measure and remains distinct from area, which measures surface.
Calculate perimeter			I know that side lengths must use the same unit before they are added.	I know that properties of rectangles, including equal opposite sides, can be used to calculate missing lengths and perimeter.	I know that a rectangle has two pairs of equal sides, so known lengths can be used to calculate its perimeter efficiently.	I know that known properties and algebraic relationships between side lengths can be used to determine missing lengths and solve perimeter problems.
Units and conversion				I know that properties of rectangles, including equal opposite sides, can be used to calculate missing lengths and perimeter.	I know that a rectilinear shape can be split into rectangles and that equal opposite sides can help calculate missing lengths.	I know that unit conversion may be required before combining lengths in perimeter calculations.
Rectangle / missing lengths					I know that all sides must be converted to the same unit before perimeter is calculated.	I know that unit conversion may be required before combining lengths in perimeter calculations.
Rectilinear and polygon reasoning					I know that a polygon is a closed 2D shape with straight sides and its perimeter is the sum of its side lengths.	I know that known properties and algebraic relationships between side lengths can be used to determine missing lengths and solve perimeter problems.

Multiplication and Division

Knowledge strand	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Equal groups	I know that equal groups can be counted in 2s, 5s and 10s.	I know that multiplication represents equal groups and can be represented using repeated addition and arrays.	I know that arrays represent equal rows and columns and show the relationship between multiplication and division.	I know and can use multiplication and division facts for all tables to 12 x 12.	I know that multiplying or dividing by 10, 100 or 1,000 changes each digit value by the corresponding power of 10.	I know that multiplication and division structures can be applied to larger integers and decimals using place-value relationships and powers of 10.
Division and inverse	I know that doubling creates two equal groups and halving shares a whole into two equal parts.	I know that division can represent sharing equally or grouping into equal groups.	I know that multiplication and division are inverse operations and belong to the same fact families.	I know that factor pairs multiply to make a product and that multiplication is commutative.	I know that the numbers multiplied are factors and the answer is the product; multiplication is commutative.	I know that multiplication and division are inverse operations and can be used to check solutions and solve multi-step problems.
Commutativity		I know that multiplication is commutative but division is not.	I know that multiplication and division are inverse operations and belong to the same fact families.	I know that factor pairs multiply to make a product and that multiplication is commutative.	I know that formal multiplication partitions factors by place value and combines partial products.	I know that multiplication and division are inverse operations and can be used to check solutions and solve multi-step problems.
Times-table fluency		I know and can use multiplication and division facts for the 2, 5 and 10 times tables.	I know and can use multiplication and division facts for the 3, 4 and 8 times tables, building from known 2, 5 and 10 facts.	I know and can use multiplication and division facts for all tables to 12 x 12.	I know that multiplying or dividing by 10, 100 or 1,000 changes each digit value by the corresponding power of 10.	I know that multiplication and division structures can be applied to larger integers and decimals using place-value relationships and powers of 10.
Scaling by powers of 10			I know that multiplication facts can be scaled using place value to calculate with multiples of 10.	I know that multiplying or dividing by 10 and 100 changes the value of each digit according to place value.	I know that known multiplication facts can be scaled using place value to calculate with multiples of 10, 100 and 1,000.	I know that multiplication and division structures can be applied to larger integers and decimals using place-value relationships and powers of 10.
Formal multiplication				I know that formal multiplication can use partitioning and place value to multiply 2-digit and 3-digit numbers by a 1-digit number.	I know that formal multiplication partitions factors by place value and combines partial products.	I know that formal multiplication and division methods use place value, partitioning and known facts to calculate efficiently with larger numbers.

Knowledge strand	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Division and remainders				I know that division can be represented by partitioning into place-value parts and may leave a remainder.	I know that short division partitions the dividend by place value and may result in a remainder.	I know that formal multiplication and division methods use place value, partitioning and known facts to calculate efficiently with larger numbers.
Multiples					I know that a multiple is the product of a number and an integer and that a common multiple is shared by two or more numbers.	I know that factors, multiples, primes, squares and cubes can be used to reason about divisibility and common relationships between numbers.
Factors					I know that factors come in pairs and a common factor is shared by two or more numbers.	I know that factors, multiples, primes, squares and cubes can be used to reason about divisibility and common relationships between numbers.
Squares / cubes / primes					I know that square numbers are products of equal factors, cube numbers multiply an integer by itself twice, and prime numbers have exactly two factors.	I know that factors, multiples, primes, squares and cubes can be used to reason about divisibility and common relationships between numbers.
Formal methods					I know that in division, the dividend is divided by the divisor to find the quotient and that division is not commutative.	I know that formal multiplication and division methods use place value, partitioning and known facts to calculate efficiently with larger numbers.

Area

Knowledge strand	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Surface / space inside	I know that shapes cover space and can be compared informally by how much surface they cover.	I know that equal-size squares can be used to cover and compare the space inside shapes.	I know that area describes the amount of space inside a 2D shape and can be explored by counting equal squares.	I know that area measures the space inside a 2D shape and is measured in square units.	I know that area is the space inside a two-dimensional shape and the area of a rectangle can be found by multiplying its base by its height.	I know that area is measured in square units and that formulae generalise the multiplicative relationship between dimensions and area.
Square units				I know that the area of rectangles can be found by counting equal squares and by using multiplication.	I know that area is measured in squared units because it describes how many unit squares cover a surface.	I know that area is measured in square units and that formulae generalise the multiplicative relationship between dimensions and area.
Rectangle area				I know that the area of rectangles can be found by counting equal squares and by using multiplication.	I know that area is the space inside a two-dimensional shape and the area of a rectangle can be found by multiplying its base by its height.	I know that area is measured in square units and that formulae generalise the multiplicative relationship between dimensions and area.
Unit conversion					I know that if the base and height use different units, they must be converted to the same unit before calculating area.	I know that unit conversion for area must account for square units, not just linear conversion.
Compound area					I know that a rectilinear compound shape can be partitioned into rectangles; the area of each rectangle can be calculated and added to find the total.	I know that compound shapes can be decomposed into simpler shapes, their areas calculated and then combined.