**Declarative Knowledge**

**Factual “I know that”**

**Early years**: Numbers and number bonds to 10; concepts and vocabulary for talking about maths and mathematical patterns (size, weight, capacity, quantity, position, distance, time).

**KS1:**

Concepts, representations and associated vocabulary:

* Simple fractions.
* Basic arithmetic: the numbering system and its symbols, place value, conventions for expressions and equations, counting, addition, subtraction, equal sharing, doubling, balancing simple arithmetic equations, classifying numbers (odd, even, teens), inverse operations, estimation, numerical patterns.
* Basic measurement: length; capacity; time; position; relative size, position, direction, motion, quantity.
* Currency and coinage.
* Basic geometry: 2D and 3D shapes, geometric patterns.
* Categorical data.
* Maths facts; all number bonds within and between 20; key number bnds within and between 100, all multiplication facts for the 2, 5, 10 multiplication tables, key “fraction facts” such as “half of 6 is 3”, key “time facts” such as the number of minutes in an hour.

**Lower KS2:**

Concepts, representations and associated vocabulary:

* Arithmetic: enhanced knowledge of the code for number (to 1000s) including patterns and associated rules for addition and subtraction of numbers, decimal numbers, place value, negative numbers, associative and distributed laws.
* Maths facts: all multiplication facts for the 3, 4, 6, 7, 8, 9, 11, 12 multiplications tables, decimal equivalents of key fractions.
* Equivalent fractions.
* Formulae: units of measurement conversion rules, formulae for perimeter and area.
* Roman numeral system and associated historical facts.
* Geometry facts: rights angles, acute and obtuse angles, right angles in whole and half terms, symmetry, triangle and quadrilateral classifications: horizontal, perpendicular, parallel and perpendicular lines.
* Links between words/phrases in word problems and their corresponding operations in mathematics (e.g. “spending” is associated with “subtraction from an amount”).
* The rules for multiplying and dividing by 10, 100 and 1000.
* First quadrant grid coordinate principles.

**Upper KS2:**

Concepts, representations and associated vocabulary:

* Enhanced knowledge of the code for number: up to and within 1 000 000, multiples, factors, decimals, prime number facts to 100, composite numbers, indexation for square and cubed numbers.
* Properties of linear sequences.
* Conversion facts metric to imperial measurements and vice versa.
* Key circle, quadrilateral and triangle facts and formulae (e.g. angles on a straight line sum to 180 degrees).
* Rules and principles governing order of operations.

**Procedural Knowledge**

**A series of steps that must be followed to solve mathematical problems**

**“I know how”**

**Early years:** Accurate counting, single digit addition and subtraction, halving, doubling and sharing.

**KS1:**

Efficient and accurate methods:

* Counting up and down in 1s, 2s, 5s, 10s, and 1/2s; addition; subtraction, equal sharing, division and multiplication.
* Reading, writing of the digits/symbols, vocabulary and phrases required for working with simple fractions, arithmetic expressions and equations.
* Measuring length, capacity, time and monitory value.
* Presentation and layout of calculations.
* Using a ruler.
* Spotting and making geometric and numerical patterns.
* Construction and interpretation of categorical data: pictograms, charts, tables..

**Lower KS2:**

Efficient and accurate methods:

* Counting up and down in multiples of 3, 4, 6, 7, 8, 9, 11, 12, 25, 50, 100, 1000, in tenths, in ones through to negative numbers.
* Column addition and subtraction.
* Mental addition and subtraction using patterns and rules of number.
* Short division and multiplication.
* Mental multiplication using derived facts.
* Fractions: finding unit and non unit fractions of amounts, common equivalents, addition, subtraction, and comparison of fractions with the same denominator.
* Measure, compare, add, subtract: lengths, mass, capacity (all units of measurement).
* Read, write and compare roman numerals.
* Draw 2D and 3D shapes.
* Interpret and present data.
* Estimation and rounding.
* First quadrant grid construction, plotting and translation of points.

**Upper KS2:**

Efficient and accurate methods:

* Scaling, coordinate geometry in all four quadrants.
* Division with remainders as fractions, decimals and where rounding is needed.
* Fractions: conversion mixed to improper and vice versa, add, subtract and multiply.
* Finding percentages of amounts.
* Converting units of measurement.
* Measurement of length, angles, area, perimeter, volume.
* Use of order of operations.
* Convert between fractions, decimals, and percentages.
* Linear algebra, basic trigonometry.
* Long multiplication and division.

**Conditional Knowledge**

**Strategies which can be used to reason & solve problems**

**“I know when”**

**Early years**:

Use combinations of number facts, shape facts, pattern facts, methods of counting, addition and subtraction to:

* Play games.
* Sing songs.
* Answer questions.
* Talk about everyday objects.
* Solve problems using objects within continuous provision.

**KS1**:

Use combinations of taught and rehearsed facts and methods to:

* Complete written exercises.
* Solve missing number problems.
* Solve simple word problems involving arithmetic, money, time and fractions.
* Solve data and measurement problems.

**Lower KS2:**

Use combinations of taught and rehearsed facts and methods to:

* Complete written exercises.
* Solve missing number, length problems.
* Solve word problems involving arithmetic, fractions, data handling, shape, length, mass and capacity

**Upper KS2:**

Use combinations of taught and rehearsed facts and methods to:

* Complete written exercises.
* Find missing quantities, lengths, angles.
* Solve one/and two-step word problems involving all the operations.
* Abstract and solve linear equations from word problems.