Fen Rivers Mathematics Curriculum Y1-9 Overview

Structure

- The Fen Rivers (FR) KS1-3 mathematics curriculum is based on the Statutory 2014 National Curriculum (NC) (DfE).

- Each NC objective is ragged as either green, amber or red. The objectives ragged as green are the essential learning components that all children must be taught. These objectives provide the foundations for children to gain a secure understanding of mathematics and will allow them to progress to their next stage of learning. Amber and red objectives may also be covered, but are not essential.

- The FR curriculum has also mapped the DfE/NCETM Non-Statutory Mathematics Guidance Ready to Progress (RtP) statements (2020) for Years 1-6 (there are no RtP statements for KS3 currently). These statements are all ragged as green.

Guidance

- As teachers use the document, they are encouraged to add in notes to support the teaching of each objective, in the Teaching guidance section.

- In addition, the following resources should be used when planning:

  NRICH website and tasks: https://nrich.maths.org
  ECMG Spatial Reasoning Trajectory: https://earlymaths.org
  ATM The Power of Pattern book: https://www.atm.org.uk/shop/All-Books/The-Power-of-Pattern---Patterning-in-the-Early-Years/ACT133
  NNS framework for Y1-6 and Y7-9: http://www.satspapers.org/Resources/maths%20resources/oldstrategy/introduction.pdf
  NCETM PD materials (Spines 1-3): https://www.ncetm.org.uk/teaching-for-mastery/mastery-materials/
  MathsBeat Oxford University Press Teacher Guides: https://global.oup.com/education/content/primary/series/mathsbeat/?region=uk

Right of a mathematician

At Fen Rivers we have adopted Cath Gripton's The Rights of a Mathematician: https://blogs.nottingham.ac.uk/primaryeducationnetwork/2020/02/14/the-rights-of-the-mathematician/

1. The right to enjoy mathematics
2. The right to have interests and preferences
3. The right to make jottings, drawings and working out
4. The right to use our own methods and approaches
5. The right to use manipulatives and resources
6. The right to reason, to talk about maths and be listened to
7. The right to make mistakes
8. The right to estimate, to guess and to conjecture
9. The right to ponder and take time
10. The right to be playful

Assessment

The following assessments provide age-related assessments for all children:

- All RtP statements have an assessment task which children should complete
- Pattern baseline and pattern PITA should continue termly
- NCETM Y7 checkpoint tests
- Y6 National tests

Fen Rivers Year 4 Curriculum

Number – Number and place value

Aims of number and place value:

Children reason about how the position (place) of a digit in a numeral determines its value (worth). They solve problems involving estimating, counting and recording quantities, including translating word problems into pictorial representations. They develop fluency in counting multiples and reason about how this is linked to adding.

Key ideas in number and place value:

- The number tagged to the last object in a collection tells us the total quantity. It does not matter in which order we count the objects.
- When counting on, on a number track we count from the next square, not the one you are on. When counting on, on a number line, we count the jumps being made, not the marks on the line.
- Children will need plenty of experience of putting numerals on number tracks and number lines to understand that each counting number has a unique position on the line.
- Children need to be exposed to the idea that partitioning a number can be done in a variety of ways (e.g. 45 can be partitioned into 40 and 5, 30 and 15 or 10 and 32, and so on).
- Children appreciate that in a 2-digit number the tens digit is the ‘big picture’ and the ones digit is the ‘fine detail’.
- Children need to become familiar with two meanings of zero. First that zero is the answer when you count a group with no objects, and also that it can be used a place holder.
- Children need plenty of experience of estimating quantities before counting them to check, which helps to develop their number sense.

- Developing understanding of place value is based in practical experiences, not just labelling and manipulating symbols. Children need lots of experience of enumerating (establishing the total in) large collections by making groups of ten and then counting in tens (and other numbers).

Aims and key ideas inspired from MathsBeat Teacher Handbooks (OUP, 2019)

Number – Number and place value

NC/RtP	Statement	Teaching guidance
NC	Count in multiples of 6, 7, 9, 25 and 1000	
NC	Find 1000 more or less than a given number	
NC	Count backwards through zero to include negative numbers	
NC	Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens and ones)	
NC	Order and compare numbers beyond 1000	
NC	Identify, represent and estimate numbers using different representations	
NC	Round any number to the nearest 10, 100 or 1000	
NC	Solve number and practical problems that involve all of the above and with increasingly large positive numbers	
NC	Read Roman numerals to 100 (I to C) and know that over time, the number system changed to include the concept of zero and place value	
RtP 4NPV-1	Know that 10 hundreds are equivalent to 1 thousand, and that 1000 is 10 times the size of 100; apply this to identify and work out how many 100s there are in other four-digit numbers of 100	RtP p. 12
RtP 4NPV-2	Recognise the place value of each digit in four-digit numbers, and compose and decompose four-digit numbers using non-standard and standard partitioning	RtP p. 15
RtP 4NPV-3	Reason about the location of any four-digit number in the linear number system, including identifying the previous and next multiple of 1000 and 100, and rounding to the nearest of each	RtP p. 16
RtP 4NPV-4	Divide 1000 into 2, 4, 5, 10 equal parts, and read scales/number lines marked with multiples of 1000 and 2, 4, 5, 10 equal parts	RtP p. 21

RtP 4NF-3	Apply place value knowledge to known additive and multiplicative number facts (scaling facts by 100)	RtP p. 32

Fen Rivers Year 4 Curriculum

Number – addition and subtraction

Aims of addition and subtraction:

Children solve, practically, different problem types – for example, change, collection and comparison. They solve problems of increasing complexity, particularly ones where the unknown in a problem is not always in an obvious place. They reason about how such problems involve part-whole relationships. They develop fluency in knowing number bonds.

Key ideas in addition and subtraction:

- There are three core experiences underpinning all addition and subtraction problems: change increase or decrease, collection and comparison. Children need to learn how to identify each type of problem.
- Children develop a more secure understanding of addition and subtraction by working on both concepts together and talking about part-whole relationships and describing the relationship between addition and subtraction.
- Making explicit the part-whole relationship in a problem helps children reason about different ways to do the calculation.
- Children need to relate numbers to each other to become confident with number bonds.
- Becoming fluent in number bonds builds on using strategies, for example, partitioning, bridging and using near doubles.

Aims and key ideas inspired from MathsBeat Teacher Handbooks (OUP, 2019)

Number – addition and subtraction

NC/RtP	Statement	Teaching guidance
NC	Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate *	
NC	Estimate and use inverse operations to check answers to a calculation	
NC	Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why	

** please refer to the Fen River's calculation policy*

Fen Rivers Year 4 Curriculum

Number – multiplication and division

Aims of multiplication and division:

Children solve, practically, multiplication problems involving the core idea of creating equal groups. They solve, practically, division problems that involve grouping or equal sharing. They reason, in practical and visual situations, about multiplication being commutative, but division not being commutative. By finding the total number in terms of arrays, they begin to become fluent in counting in multiples (unitising).

Key ideas in multiplication and division:

- A big step from addition to multiplication is the idea of unitising; moving from using one to represent a single object to one representing one group.
- Multiplication problems are either simple rate problems (e.g. there are five plates on a table, and three biscuits on each plate. The word 'each' in a problem flags that is it a simple rate) or scaling problem (e.g. a baby eel is 3cm long and its mother is 5 times as long. How long is the mother?).
- Solving division problems involves either equal sharing or equal grouping. Each type of problem involves different actions and children need plenty of experience with each.
- Exploring arrays and talking about different ways to describe them and find the total provides an informal introduction to the idea that multiplication is commutative.
- The convention that children work with is that (e.g.) 4 x 5 is 4 multiplied by 5, or 5 groups of 4.

Aims and key ideas inspired from MathsBeat Teacher Handbooks (OUP, 2019)

Number – multiplication and division

NC/RtP	Statement	Teaching guidance
NC	Recall multiplication and division facts for multiplication tables up to 12 x 12	
NC	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	
NC	Recognise and use factor pairs and commutativity in mental calculations	
NC	Multiply two-digit and three-digit numbers by a one-digit number using formal written layout*	
NC	Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit number by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m terms	
RtP 4NF-1	Recall multiplication and division facts up to 12 x 12 and recognise products in multiplication and tables as multiples of the corresponding number	RtP p. 26
RtP 4NF-2	Solve division problems, with two-digit dividends and one-digit divisors, that involve remainders, and interpret remainders approximately according to the context	RtP p. 29
RtP 4MD-1	Multiply and divide whole numbers by 10 and 100 (keeping to whole number quotients); understand this as equivalent to making a number 10 or 100 times the size	RtP p. 36
RtP 4MD-2	Manipulate multiplication and division equations, and understand and apply the commutative property of multiplication	RtP p. 39
RtP 4MD-3	Understand and apply the distributive property of multiplication	RtP p. 44

** please refer to the Fen River's calculation policy*

Fen Rivers Year 4 Curriculum

Number – fractions

Aims of fractions:

Children develop their fluency when sharing in practical and concrete contexts. They begin by solve problems practically, with individual objects, countable groups and continuous quantities, and then abstract numbers and quantities (e.g. time). They continue to solve problems using a given fraction of a whole to find another fraction of the same whole and compare to fractional parts when wholes are equal and unequal. They reason about the similarities of the outcomes each time, despite the differences in the methods used. This leads to the introduction of formal language and fraction notation.

Key ideas in fractions:

- With fractions we must make equal parts. Sharing fairly might mean something different to children in real life.
- Parts need to be equivalent but they can appear different and/or be made up of smaller, separate parts.
- Children need to consider regularly both non-examples of fractions where the resulting parts are not equal, and also where the parts are exact but not obvious.
- Experiencing fractions in a concrete way prepares children for thinking about 'fractions of' as an abstract operation on numbers and the number line.

Aims and key ideas inspired from MathsBeat Teacher Handbooks (OUP, 2019)

Number – fractions

NC/RtP	Statement	Teaching guidance
NC	Recognise and show, using diagrams, families of common equivalent fractions	
NC	Count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten	
NC	Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number	
NC	Add and subtract fractions with the same denominator	
NC	Recognise and write decimal equivalents of any number of tenths or hundredths	
NC	Recognise and write decimal equivalents to ¼, ½, ¾	
NC	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	
NC	Round decimals with one decimal place to the nearest whole number	
NC	Compare numbers with the same number of decimal places up to two decimal places	
NC	Solve simple measure and money problems involving fractions and decimals to two decimal places	
RtP 4F-1	Reason about the location of mixed numbers un the linear number system	RtP p. 48
RtP 4F-2	Convert mixed numbers to improper fractions and vice versa	RtP p. 51
RtP 4F-3	Add and subtract improper and mixed fractions with the same denominator, including bridging whole numbers	RtP p. 54

Fen Rivers Year 4 Curriculum

Measurement

Aims of measurement:

Children measure to solve problems comparing quantities that cannot be counted. They begin to develop fluency comparing lengths, masses and volumes using classrooms units (e.g. cubes and paper clips) and then start to do so using standard metric units. They become fluent with using conventional measuring devices, units and scales. They become familiar with coins and develop their knowledge of standard coins and notes and use this when reasoning about transactions, and then calculating and paying change. They fluently tell the time on both analogue and digital clocks and use this skill when solving problems.

Key ideas in measurement:

- Equivalence underpins measuring (e.g. how many cubes are equivalent to the length of the book?).
- Measuring is necessary when the quantities being compared are not physically close or adjacent, or they are being measured at different times.
- Estimating prior to measuring develops children's familiarity with the size of the standard units.
- Equivalence in money is not physical; one coin can be equivalent to several larger coins.
- Learning to tell the time does not develop children's sense of the passage and duration of time.
- Reading a scale is the same as reading a number line.
- Measuring naturally leads to using fractional language (e.g. half full, one third of my pocket money, quarter past 5).

Aims and key ideas inspired from MathsBeat Teacher Handbooks (OUP, 2019)

Measurement

NC/RtP	Statement	Teaching guidance
NC	Convert between different units of measure [for example, kilometre to metre; hour to minute]	
NC	Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres	
NC	Find the area of rectilinear shapes by counting squares	
NC	Estimate, compare and calculate different measures, including money in pounds and pence	
NC	Read, write and convert time between analogue and digital 12- and 24- hour clocks	
NC	Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days	

Fen Rivers Year 4 Curriculum

Geometry – properties and shapes

Aims of properties of shape:

Children develop fluency in recognising and naming 3D and 2D shapes. They become fluent using formal mathematical vocabulary, as they describe and reason about sorting shapes into categories. In doing so, they describe similarities and differences between properties of shapes, such as the number of edges and vertices shapes have, and the number and nature of the faces of 3D shapes. They solve problems that develop their understanding of line symmetry and construct symmetrical and non-symmetrical whole shapes from given parts.

Key ideas in properties of shape:

- Children should explore 3D shapes first because 3D shapes actually exist in their world, whereas 2D shapes are an abstraction. Even models of 2D shapes will always have some depth, and so in reality they are examples of 3D shapes.
- The orientation of a shape does not change the type of shape that it is.
- Non-examples help children use language with increased precision: knowing what it is not sharpens knowledge of what it is.
- Children should reason about shapes and their properties in general. Shapes are a context which support children's developing use of rule-making and generalisation (e.g. all pentagons have 5 edges and 5 vertices).
- Asking children to find, create and draw shapes is worthwhile because it is more challenging than recognising and describing shapes that are presented to them.
- Shapes also have important non-numerical properties (e.g. a cone, a sphere and a cylinder all roll, but they each do so in a different way).

Aims and key ideas inspired from MathsBeat Teacher Handbooks (OUP, 2019)

Geometry – properties and shapes

NC/RtP	Statement	Teaching guidance
NC	Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes	
NC	Identify acute and obtuse angles and compare and order angles up to two right angles by size	
NC	Identify lines of symmetry in 2D shapes presented in different orientations	
NC	Complete a simple symmetric figure with respect to a specific line of symmetry	
RtG 4G-1	Draw polygons, specified by coordinates in the first quadrant, and translate within the first quadrant	RtP p. 58
RtG 4G-2	Identify regular polygons, including equilateral triangles and squares, as those in which the side-lengths are equal and angles are equal. Find the perimeter of regular and irregular polygons	RtP p. 63
RtG 4G-3	Identify line symmetry in 2D shapes presented in different orientations. Reflect shapes in a line of symmetry and complete a symmetric figure or pattern with respect to a specified line of symmetry	RtP p. 67

Fen Rivers Year 4 Curriculum

Geometry – position and direction

Aims of position and direction:

Children develop fluency with the language conventionally used when describing position, direction and movement. They use this language to give their reasoning when solving problems about position and direction and apply it as they explore patterns. They solve problems about direction in practical contexts, such as navigating a partner through an obstacle course.

Key ideas in position and direction:

- Children need to act out the language of position, direction and movement to develop their spatial awareness and reasoning.
- Shared language and agreed conventions enable one person to describe the position, direction and movement of objects to another person, even when the objects are not visible to that person.
- Sometimes knowing the comparative position of one object tells us the position of another (e.g. if the bird is above the tree and below the aeroplane we know the aeroplane must be above the tree) but sometimes it does not (e.g. the car can be outside the shop and the dog can be outside the car, but the dog might not be outside the shop).
- Different children will see different patterns in the same sequence. Patterns can be classified by their structure (e.g. red, blue, AB). Identifying the underlying pattern of a sequence helps children predict the sections that come before or after the visible portion and justify their reasoning.
- Children should make connections with fractions (e.g. quarter and half turns) and measurement (clockwise and anti-clockwise turns).

Aims and key ideas inspired from MathsBeat Teacher Handbooks (OUP, 2019)

Geometry – position and direction

NC/RtP	Statement	Teaching guidance
NC	Describe position on a 2D grid as coordinates in the first quadrant	
NC	Describe movements between positions as translations of a given unit to the left/right and up/down	
NC	Plot specified points and draw sides to complete a given polygon	

Fen Rivers Year 4 Curriculum

Statistics

Aims of statistics:

Children solve problems that require them to gather information from and about people, such as finding out what sandwiches to make for a class picnic through a survey of each child's filling. They reason about, and draw inferences from, the data they collect. They become fluent with making predictions and posing hypotheses; carrying our surveys; displaying relevant data using tally charts, data tables, pictograms, block diagrams and so on; interpreting the representations and drawing conclusions that relate to the original problem. These conclusions might be qualitative (e.g. lots more children chose cheese than jam), or multiplicative (e.g. twice as many children chose cheese as jam).

Key ideas in statistics:

- Children can sometimes forget the source of the data (e.g. forgetting that each cube in a block graph records and actual response, and hence making conclusions about the numbers of blocks not the numbers of people).

- All the information in a data visual conveys meaning including the title, key and labels.

- The data that are gathered can restrict the scope of the conclusions that can be drawn from them. Survey questions and data collection methods need to be carefully designed so that justifiable conclusions can be drawn.

Aims and key ideas inspired from MathsBeat Teacher Handbooks (OUP, 2019)

Statistics

NC/RtP	Statement	Teaching guidance
NC	Interpret and present discrete and continuous date using appropriate graphical methods, including bar charts and time graphs	
NC	Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs	

Fen Rivers Year 4 Curriculum

Summary

- 58 statements in total (NC and RtP)
- 41 green (71%)
- 16 Amber (27%)
- 1 red (2%)