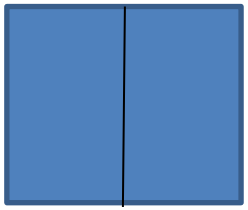
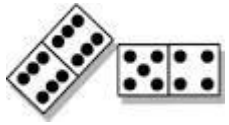
Progression in calculation Reception to Year 4
Multiplication and Division, including fractions

Reception	Representations	Recordings
Multiplication and Division • solve problems, including doubling halving and sharing	 Doubles- matching 2 Sharing food Sharing- making an equal number  Folding paper in half- not just in 2 Building a half/double number line 	Children need opportunities to ***mark make*** in a variety of contexts – e.g. recording how many each person has, making up party bags, writing their own labels for a double/half line... Discuss using the vocabulary of doubling, halving, sharing, equal or the same, left over. Provide a range of different sized papers and card, white boards, post-its, self-adhesive labels and clipboards etc. to encourage mark making. Ask questions like, 'Can you put something on paper to show me your ladybird spots…?'or 'Which Numicon tile is like this one?'- 'How many pegs would you need for both tiles?' Can you find all the double dominoes? Can you make some double dominoes? 

Key vocabulary: Multiplication – groups of, lots of, altogether, double
Key vocabulary: Division – share, share equally, one each, two each…, lots of, half, halve, left over

Year 1	Representations	Recordings
Multiplication and Division • solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher Fractions • recognise, find and name a half as 1 of 2 equal parts of an object, shape or quantity • recognise, find and name a quarter as 1 of 4 equal parts of an object, shape or quantity Geometry- position and movement • Describe position, direction and movement, including whole, half, quarter and three quarter turns	Practical apparatus- Double, half, share How many friends could I share this with? Numicon- oral counting in 3's etc Playdoh- making apples. Can you cut it in half Singing, acting, number rhymes	 Informal jottings to present answers. Discussion to consolidate learning of language of grouping and sharing. Link with step counting and the formation of arrays. Explain using symbols 2+2+2 or 2 three times 6 sweets shared between 3. Use numbers that won't share exactly- talk about remainders What arrays can we see? Can we match the real life arrays with Numicon tiles? How can we describe them? Explore links with fractions Can you make a half a ball of playdoh- How do I know? Link with measures or shapes. Can you have the biggest half? Explore real life quantities-Chocolate bar- association with shapes/numbers Folding paper to find half and half again Bottles of pop- how many cups? Share sign for fractions ½, ¼

Key vocabulary: Multiplication – groups of, lots of, times, array, altogether, multiply, count
Key vocabulary: Division – share, share equally, one each, two each…, group, groups of, lots of, array

Year 2	Representations	Recordings
Multiplication and Division • recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers • calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division (÷) and equals (=) signs • show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot • solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts Fractions • recognise, find, name and write fractions $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{4}$ and $\frac{3}{4}$ of a length, shape, set of objects or quantity • write simple fractions, for example $\frac{1}{2}$ of 6 = 3 and recognise the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$ Geometry- position and movement • use mathematical vocabulary to describe position, direction and movement…quarter, half and three quarter terms	Can you halve any number? What do you notice? Explore odd and even numbers with Numicon Remainders in context- how many cups in the bottle? Compare and describe Counting into multiplication and division using a counting stick Plavdoh fractions Plates- thirds of quantities, thirds of shapes? 	Use Numicon tiles to explain mathematical statements written 3x2= and explore how 2x3= gives the same answer but looks different. What would they look like when recorded on a number line. On a number line – show equal jumps 6÷3=, 2x3=, and make links Use ITP's to show links between objects and number lines and symbolic representations. Discuss remainders in context What is division? Why is it not commutative? 6÷2 gives a different answer to 6÷3, what do you notice? How would you work out ?÷3=4 Support learning mental strategies for multiplication facts using a counting stick, target boards, dice, matching cards, Number Fun songs for 2,4,5,10&3 Make links between division and fractions. Use a tape model to explore equivalence of ½ and 2/4 Explore finding ½ of 6 is 3 and to link with a number line. This is supported by Numicon, objects bead strings, number lines etc

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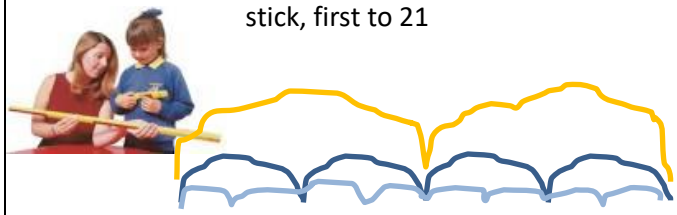
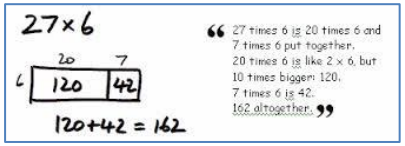
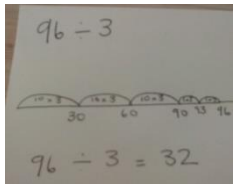
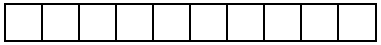
Key vocabulary: Division – share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over

Year 3	Representations	Recordings- Examples
Multiplication and Division • recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables • write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods • solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects Fractions • count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10 • recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators • recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators • recognise and show, using diagrams, equivalent fractions with small denominators • add and subtract fractions with the same denominator within one whole [for example, $\frac{5}{7}+\frac{1}{7}=\frac{6}{7}$] • compare and order unit fractions, and fractions with the same denominators • solve problems that involve all of the above	Olympic maths, Hot seating-timing, beat your own scores, Primary Games- ICT, Dice Games, Multiplication Grid- division facts, Shoot out, counting stick, first to 21  2x8 is the same as 4x4 and 8x2 20x8 the same as 40x4 and 80x2   Fractions  	**Record as** **3x1** Match to visual pictures and **3x2** vocabulary to support learning. **3x3** Match with division facts how **3x4** many 3's in …? Encourage children to ' just know' in problem solving Make links with 2,4,8 tables- explore number lines to 'see' the connections and Numicon tile towers Scaling problems- compare and talk 2 straws ten times bigger is 20 straws 2x10 is 2x1- 10 times bigger or (2x1) x10- illustrate in bundles of straws. Grouping on a number line & with remainders- use counting up eg 13÷3 96÷3 Illustrate on a number line then… $3\overline{)96}$ *Short division without remainders if ready* ***n objects connected to m objects would be 'Granny's Tea Cup problem' nrich*** Use the tape model to develop understanding of fractions, including a fraction wall and reinforce links with division. Use objects on the tape for equivalence, adding, subtracting

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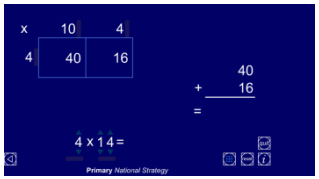
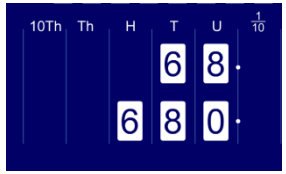
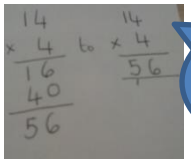
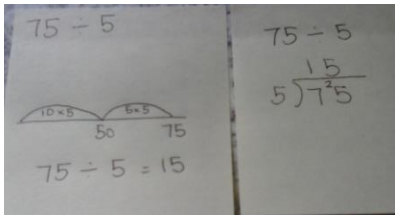
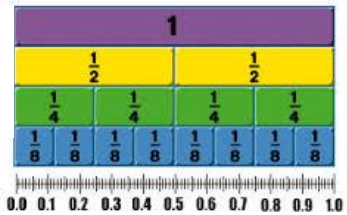
Key vocabulary: Division – share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, 'carry', remainder, multiple

Year 4	Representations	Recordings
Multiplication and division • recall multiplication and division facts for multiplication tables up to 12 x 12 • use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1: dividing by 1: multiplying together 3 numbers • recognise and use factor pairs and commutativity in mental calculations • multiply two-digit and three-digit numbers by a one-digit number using formal written layout • solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects Fractions • recognise and show, using diagrams, families of common equivalent fractions • count up and down in hundredths; recognise that hundredths arise when dividing an object by 100 and dividing tenths by 10 • 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 • add and subtract fractions with the same denominator • recognise and write decimal equivalents of any number of tenths or hundreds • recognise and write decimal equivalents to $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}$ • 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 • round decimals with 1 decimal place to the nearest whole number • compare numbers with the same number of decimal places up to 2 decimal places • solve simple measure and money problems involving fractions and decimals to 2 decimal places	Multiplication grid ITP's Number dial and Grid method   14x4 becomes  Or double and double again  75÷5 can be shown on a number line and developed into short division – remainders within Children need to be secure at this level to move onto dividing 3 digit numbers by 1 digit number Fraction number line 	Commutativity-Make full use of the distributive law or the associative law to solve multiplication problems E.g I can't remember my 7 times table 6x7 can become… 3x7 +3x7 or 3x2x7- associative need to know factors 6x2+6x5- distributive as shown with an array Reinforcing associative/distributive law for more efficient methods at times eg 164÷4 is half and half again or 160÷4 and 4÷4 ***Mental Methods Matters Most*** Use Multiplication Grid ITP to demonstrate two digit by one digit number Use Moving digits ITP to show the effect of x,÷ 10,100 14x4 using a grid method can be moved to a short method *Ensure children have a good grasp of known facts, place value and estimation skills* 123X5- short multiplication Division needs to be taught alongside as the inverse of multiplication, scaling up and division, scaling down. Use of multiplication and division facts essential (i.e.1/4 of 36 – how many 4s are there in 36?) Make the link between % and 100ths.

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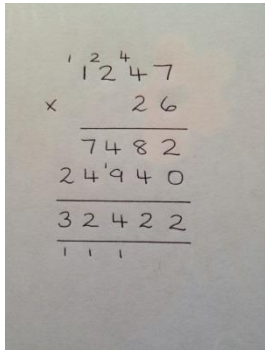
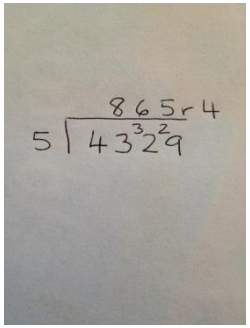
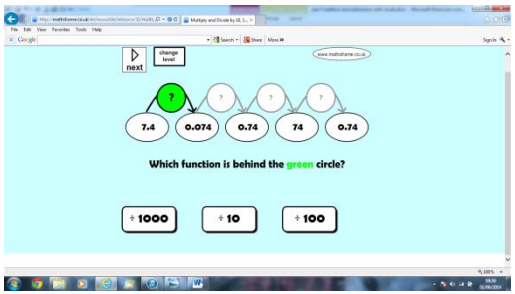
Year 5	Representations	Recordings
Multiplication and Division • identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers • Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers • Establish whether a number up to 100 is prime and recall prime numbers up to 19 • Multiply numbers up to 4 digits by a one- or two- digit number using a formal written method, including long multiplication for two-digit numbers • Multiply and divide numbers mentally drawing upon known facts • Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context • Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 • Recognise and use square numbers and cube numbers, and the notation for squared (²) and cubed (³) • Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes • Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign • Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates	   	2n + 10 = 36 2n -= 36 – 10 2n = 26 n = 13 Expressing results in different ways according to the context: 98 ÷ 4 = $^{98}/_{4}$ = 24 r 2 = 24 ½ = 24.5 ≈ 25 Equivalence statements: 4 x 35 = 2 x 2 x 35 3 x 270 = 3 x 3 x 9 x 10 = 9^2 x 10 Explain the equals sign, including in missing number problems: 13 + 24 = 12 + 25 33 = 5 x □ find two square numbers that total 45 Place the digits 0 to 9 to make this calculation correct: □□□□ – □□ □ = □□□.

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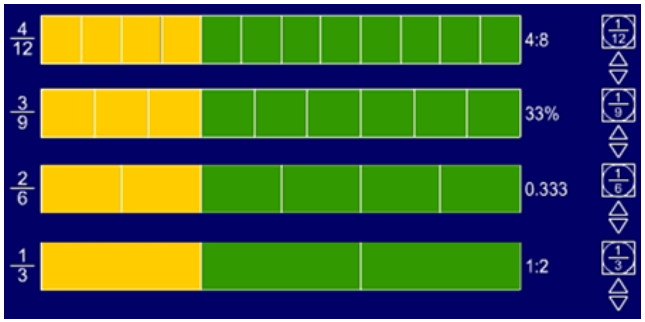
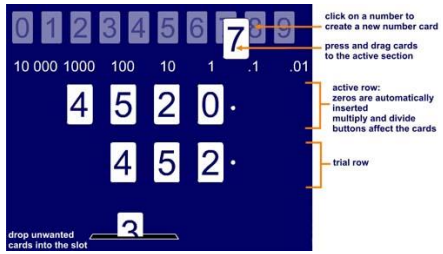
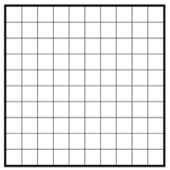
Fractions

- Compare and order fractions whose denominators are all multiples of the same number
- Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths
- Recognise mixed numbers and improper fractions and convert from one form to the other
- Add and subtract fractions with the same denominator and denominators that are multiples of the same number
- Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams
- Read and write decimal numbers as fractions
- Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents
- Round decimals with two decimal places to the nearest whole number and to one decimal place
- Read, write, order and compare numbers with up to three decimal places
- Recognise the per cent symbol (%) and understand that per cent relates to "number of parts per hundred", and write percentages as a fraction with denominator 100, and as a decimal
- Solve problems which require knowing percentage and decimal equivalents of ½, ¼, $^{1}/_{5}$, $^{2}/_{5}$, $^{4}/_{5}$ and those fractions with a denominator of a multiple of 10 or 25







$$\begin{array}{r} 72.8 \\ +\ 54.6 \\ \hline 127.4 \\ 1 \end{array}$$

Children should be able to circle the two fractions that have the same value, or choose which one is the odd one out and justify their decision.
$^{6}/_{10}$, $^{3}/_{5}$, $^{18}/_{20}$, $^{9}/_{15}$

Put the correct symbol, < or >, in each box.

3.03 ☐ 3.3
0.37 ☐ 0.327
Order these numbers: 0.27 0.207 0.027 2.07 2.7

Which is a better mark in a test: 61% , or 30 out of 50? How do you know?

Learners will encounter fractions, decimals and percentages in:

Measurement – when calculating measures for recipes, calculating journey times and fuel consumption

Money – working out the result of sales offers, tips/gratuities on bills, comparing prices

Statistics – interpreting and evaluating data e.g. 19% of the world's population lives in China

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