Year 5

UPPER KEY STAGE 2

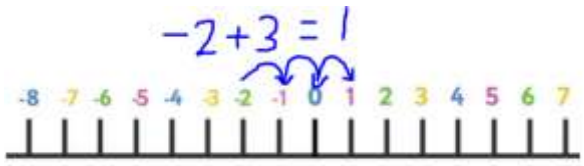
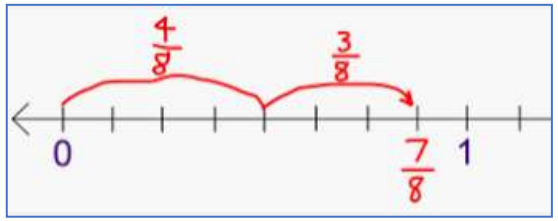
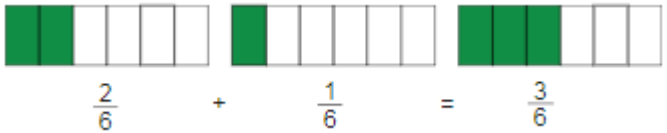
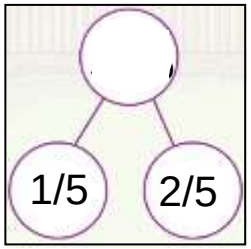
Children move on from dealing mainly with whole numbers to performing arithmetic operations with both decimals and fractions. By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages.

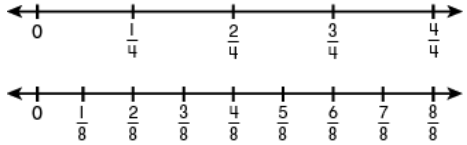
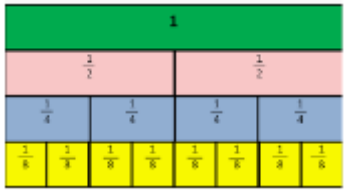
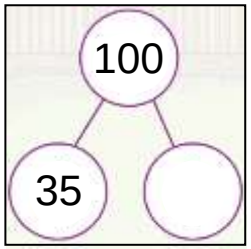
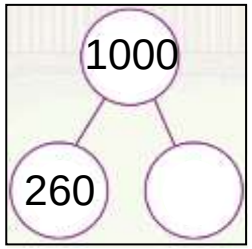
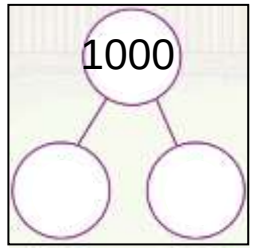
Addition and subtraction: Children will consolidate their use of written procedures in adding and subtracting whole numbers with up to 6 digits and also decimal numbers with up to 3 decimal places. Mental strategies for adding and subtracting increasingly large numbers will also be taught. These will draw upon children's robust understanding of place value and knowledge of number facts. Negative numbers will be added and subtracted.

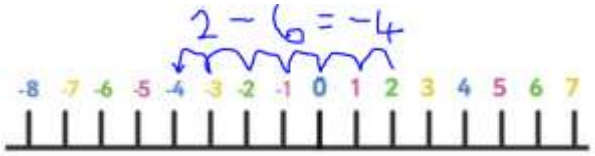
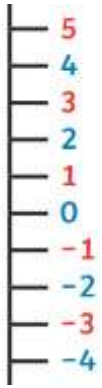
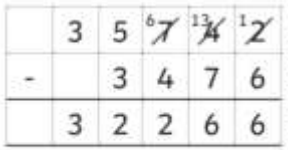
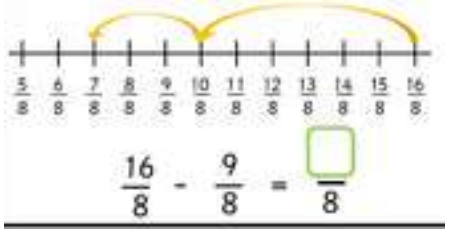
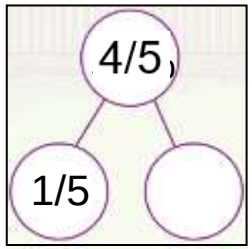
Multiplication and division: Efficient and flexible strategies for mental multiplication and division are taught and practised, so that children can perform appropriate calculations even when the numbers are large, such as 40 000 × 6 or 40 000 ÷ 8. In addition, it is in Years 5 and 6 that children extend their knowledge and confidence in using written algorithms for multiplication and division.

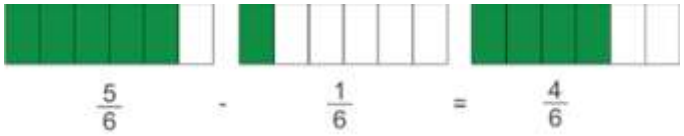
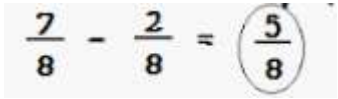
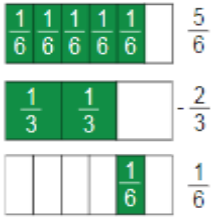
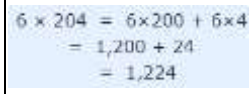
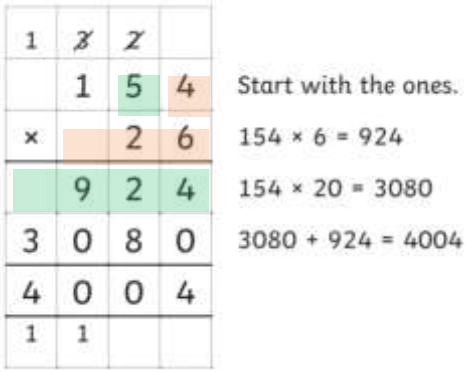
Fractions, decimals and percentages: Fractions and decimals are also added, subtracted, divided and multiplied, within the bounds of children's understanding of these more complicated numbers. Children will also calculate percentages and ratios.

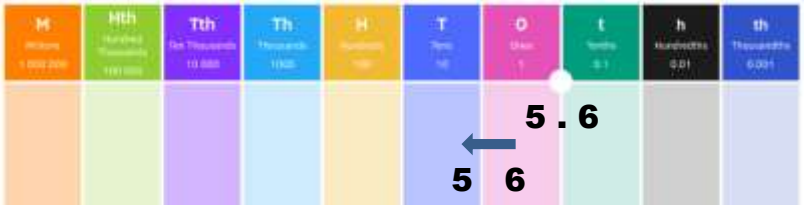
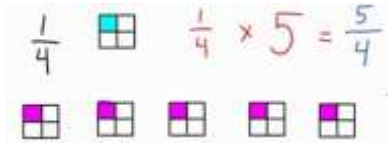
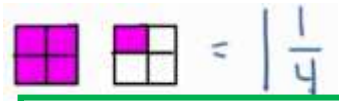
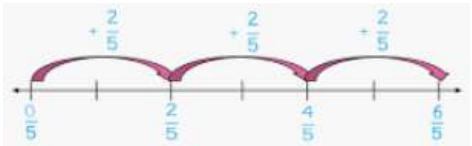
	National Curriculum Objectives	Mental Calculation	Written Calculation- including concrete, pictorial and abstract methods
Y5 +	**<u>Add whole numbers with more than 4 digits, including using formal written methods</u>** **<u>Add numbers mentally with increasingly large numbers</u>**	Simple mental addition to ensure no errors with column addition. Use of place value to find 10, 100, 1,000, 10,000, 100,000 or	**<u>Column method for addition including regrouping.</u>** Children will be working with place value of numbers up to 1,000,000 in year 5 and will continue to build upon the column addition skills they have worked on in Y4 by calculating with numbers with more than 4 digits. Starting with the ones, add each column in turn. Regroup tens, hundreds, thousands, ten thousands as required. N.B. Children are encouraged to put their regrouped digit wherever they feel suits them best. They are shown different ways and are allowed to choose **<u>Children will also use this method to add numbers that have up to 3 decimal places</u>** N.B. Children are given problems which involve adding numbers with differing place value and involving whole numbers added to numbers with decimal places. We teach children to use place holders to help them to line their digits up with the correct place value.

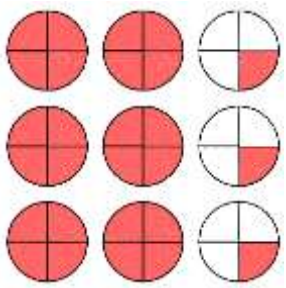
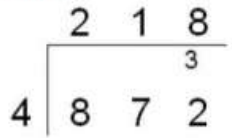
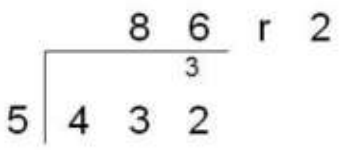
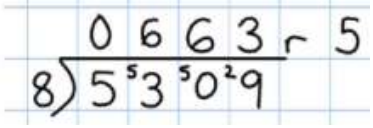
	Add fractions with the same denominator and denominators that are multiples of the same number	1,000,000 more. **Negative numbers** Find 12 more than -8. Children to use a number line to start with and then use counting through 0 to support with this type of calculation e.g. -8 to 0 = 8. 0 + 4 = 4. **Number bonds** Have a focus on quick and accurate recall of number bonds to 100 (in tens and ones) and to 1000 (in hundreds and tens) and be able to apply these to larger numbers e.g. 51+49=100 so 510 +490 =1000 and therefore 5100 + 4900 = 10,000 etc.	 **Adding fractions with the same denominator** Children are taught using a range of different models. They are taught to count in fractions and use number lines to add fractions of the same denominator.  They are also taught addition of fractions using the bar model.   These pictorial representations demonstrate that when adding fractions of the same denominator, only the numerators are added and the denominator stays the same. The children can then use a more abstract method as shown. $\frac{2}{9} + \frac{5}{9} = \frac{7}{9}$

			<u>Adding Fractions with denominators that are multiples of the same number</u>. Children are taught to use their knowledge of equivalent fractions to convert the fractions to the same denominator before adding them. For example, 4/8 + ¼ First they would convert 4/8 to 2/4 at first using pictorial representations (bar model, number line, fraction wall etc) and then the more abstract way of multiplying the numerator and denominator by the same number.    Then they would add the numerators together 2/4 + ¼ = ¾
Y5 –	**<u>Subtract numbers mentally with increasingly large numbers</u>**	**<u>Number bonds</u>** Have a focus on quick and accurate recall of number bonds to 100 (in tens and ones) and to 1000 (in hundreds and tens) and be able to apply these to larger numbers e.g. 100 – 49 = 51 so 1,000 – 490 = 510 and therefore 10,000 – 4900 = 5,100 etc. **<u>Compensating and bridging</u>** Children are taught to use rounding to support with the mental calculation of subtracting larger numbers e.g. 4,000 – 1998. Children are to round to the nearest ten, hundred, thousand,	   Part whole models can be used to help children see the relationship between number bonds

	Subtract whole numbers with more than 4 digits, including using formal written methods **Subtract fractions with the same denominator and denominators that are multiples of the same number**	ten thousand, hundred thousand dependent on the calculation. 4,000 – 1998 would be 4,000 – 2,000 and then the two would need to be added back on. **Negative numbers** Find 12 less than 8. Children to use a number line to start with and then use counting through 0 to support with this type of calculation e.g. 8 – 8 = 0 and 0 – 4 leftover = -4	  **Column method for subtraction including exchanging.** Children will be working with numbers up to 1,000,000 in year 5 and will continue to build upon the column subtraction skills they have worked on in Y4 by calculating with numbers with more than 4 digits.  Starting with the ones, subtract each column in turn. Exchange tens, hundreds, thousands and/or ten thousands as required. **Subtracting fractions with the same denominator.** Children are taught using a range of different models. They are taught to count in fractions and use number lines to add fractions of the same denominator.   They are also taught subtraction of fractions using the bar model and also represent it using part-whole models.

			 These pictorial representations demonstrate that when subtracting fractions of the same denominator, only the numerators are subtracted and the denominator stays the same. The children can then use a more abstract method as shown.  **Subtracting Fractions with denominators that are multiples of the same number** Children are taught to use their knowledge of equivalent fractions to convert the fractions to the same denominator before subtracting them.  For this they would first recognise that 2/3 is equivalent to 4/6 and then subtract 4/6 from 5/6. Children will use pictorial representations to support them with calculations. E.g. number lines, bar models and fraction walls.
Y5 ×	**Multiply numbers mentally drawing upon known facts**	Children will be taught to build upon their rapid recall of 1-12 x multiplication facts, and multiplication facts for multiples of 10 and 100 to calculate an increasing range of multiplication questions mentally. E.g. if they know 3x4 they can work out 30x4, 0.3x4 etc. Multiply a 2 or 3 digit number by a single digit by partitioning– e.g. 26 x 3 = 20 x 3 + 6 x 3 	**Long Multiplication method** Children have been introduced to the formal written method of short multiplication for 2 or 3 digit numbers multiplied by one digit in year 4. This will be recapped prior to extending to long multiplication (see Yr 4 policy).  Start with the ones. 154 × 6 = 924 154 × 20 = 3080 3080 + 924 = 4004 N.B. Children are encouraged to use different colour pens for each line of working out if they struggle. See diagram for example of how colour can be used to show which digit the lines of working out relate to.

	Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit number		**Multiplication by 10, 100 and 1000**  N.B. We continue to reiterate here that children **cannot** simply add a zero. When we work with numbers with decimal places, this becomes really apparent as the place value doesn't change, e.g. 5.6 is the same value as 5.60. The example in the table demonstrates the correct working for multiplying 5.6 by 10. Children are provided with a laminated version of this grid to practise moving the digits when multiplying by 10, 100 and 1000. The majority of children will move on to drawing their own grid on their whiteboard in their book to support their calculations and then to complete the calculations mentally.
	Multiply whole numbers and those involving decimals by 10, 100 and 1000		x10 Move 1 place to the left for x100 Move 2 places to the left for x1000 Move 3 places to the left for
	Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams		**Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams**    Children are provided with visual representation to show how to multiply fractions. They are also taught how to convert an answer from an improper fraction to a mixed number as shown above. Number lines are used to show the repeated addition method for multiplying fractions.

			Multiply mixed numbers by whole numbers  Children are provided with visual representation to show how to multiply mixed numbers by whole numbers. They calculate using images to begin with. They are taught the following more abstract steps. 1. Convert the mixed number into an improper fraction. 2. Multiply the numerator by the whole number. 3. Convert the answer back into a mixed number by dividing the numerator by the denominator. The remainder is represented as a fraction. 2 ¼ x 3 = 4/4 + 4/4 + ¼ x 3 = 9/4 x 3 9/4 x 3 = 27/4 27 divided by 4 = 6 r3 6 3/4
Y5 **÷**	**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**	Children will be taught to build upon their rapid recall of 1-12 x division facts, and dividing and multiplying by 10 and 100 to calculate an increasing range of division questions mentally. E.g. if they know 12 divided by 3 =4 they can work out 12 divided by 0.3= 40	**Divide numbers up to 4 digits by a one-digit number using the formal written method of short division** 'Bus Stop Division' has been introduced in year 4 with 3 digit dividends and a single digit divisor with no remainders. This will be the first step in year 5. They will then move on to 3 digit dividends with single digit divisor with remainders. Finally, they will work with 4 digit dividends. Begin with divisions that divide equally with no remainder.  Move onto divisions with a remainder.   **Interpreting remainders** Children will be taught how to interpret remainders from division questions and whether they should round to the next whole number or not. They will be taught to read questions carefully, underlining key words/phrases e.g. full boxes, how many do they need, how many … can be bought?

	Divide whole numbers and those involving decimals by 10, 100 and 1000		**Division by 10, 100 and 1000**  N.B. We continue to reiterate here that children **cannot** simply remove zeros. Many of the numbers the children work with aren't multiples of 10 or 100 so they need to have the concept of the digits moving on the place value grid. Move 1 place to the right for ÷10 Move 2 places to the right for ÷100 Move 3 places to the right for ÷1000 Children are provided with a laminated version of this grid to practise moving the digits when dividing by 10, 100 and 1000. The majority of children will move on to drawing their own grid on their whiteboard in their book to support their calculations and then to complete the calculations mentally.