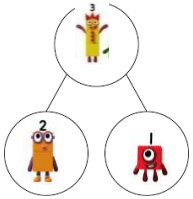
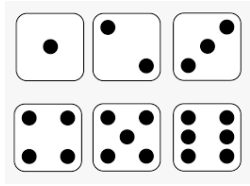
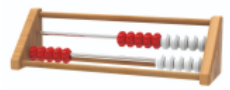
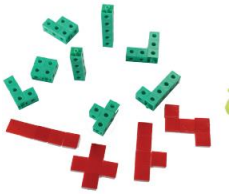
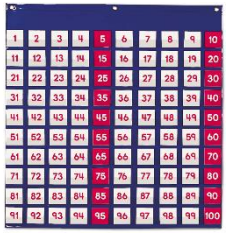
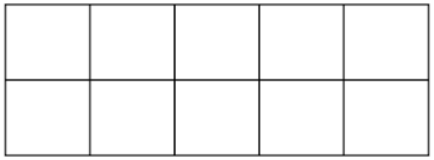
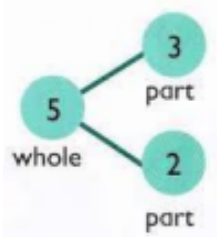
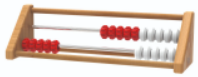
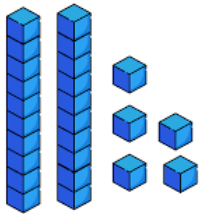
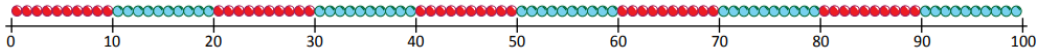
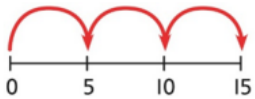
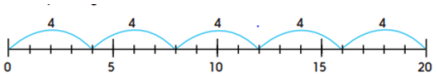
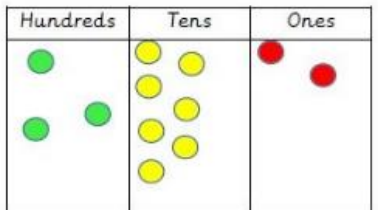
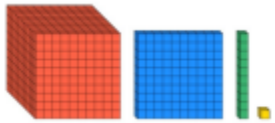
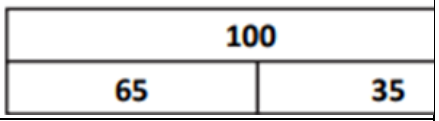
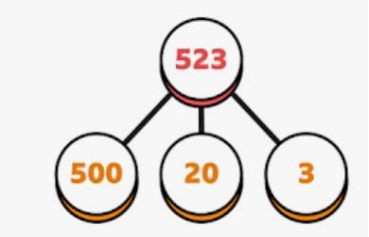
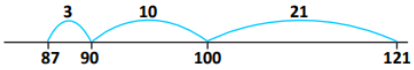
Progression in Calculation

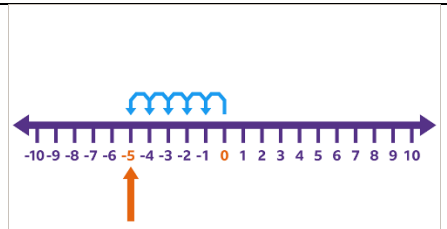
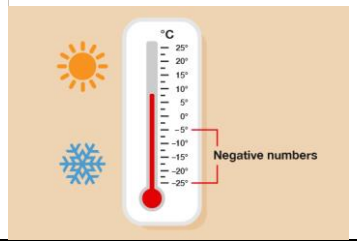
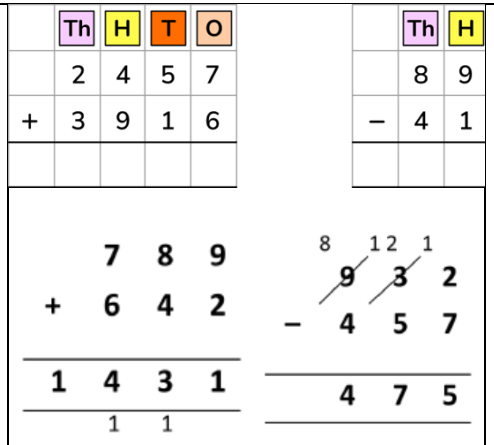
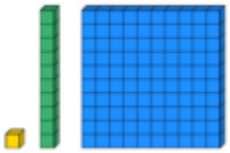
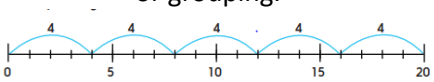
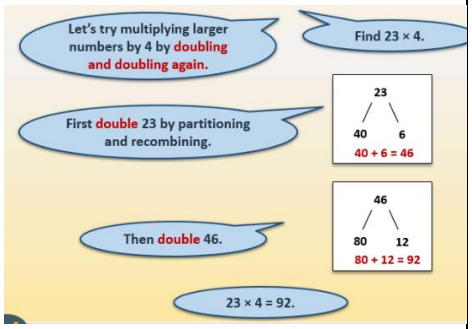
Phase	Key Learning Intentions (National Curriculum/EYFS Framework)	How to support the learning	Key Vocabulary
EYFS	● Children should be able to count confidently, develop a deep understanding of the numbers to 10, the relationships between them and the patterns within those numbers. ● In addition, it is important that the curriculum includes rich opportunities for children to develop their spatial reasoning skills across all areas of mathematics including shape, space and measures. ● ELG: Number Children at the expected level of development will: ● Have a deep understanding of number to 10, including the composition of each number ● Subitise (recognise quantities without counting) up to 5 ● Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts.	 **One-to-one correspondence** – match one number name to each item to be counted **Cardinality** – the last number in the count is the total size of the group **Stable order** - say the number names in the correct order  **Part- part-whole model** Conservation of number – a number can be partitioned but the whole (total) remains the same.  **Hungarian number frame** subitise different arrangements, both unstructured and structured, including using the Hungarian number frame  Explore the structure of the numbers 6 and 7 as '5 and a bit' and connect this to finger patterns and the Hungarian number frame  Develop conceptual subitising skills including when using a **rekenrek**  **Number bonds** within 5 and then 10 2 4 6 8 10 **Odd and Even** - Even Tops and the Odd Blocks to match Numicon concrete manipulatives. 	Subitise Counting to 10 Comparing sets of objects Equal/ unequal Matching Whole Parts Partitioning/ combining Doubles/ halves One more than One less than Pairs Addition Subtraction Number bonds to 5 Missing numbers Greater than, less than Finding the difference Longer, shorter Full, empty, nearly full, nearly empty, Match, sort, compare Measure, patterns Circle, triangle, square, rectangle, quadrilateral, sides, straight, corners, 2D 3D, mass, capacity, length, height, time, sharing, grouping **Stem Sentences** **Songs:**

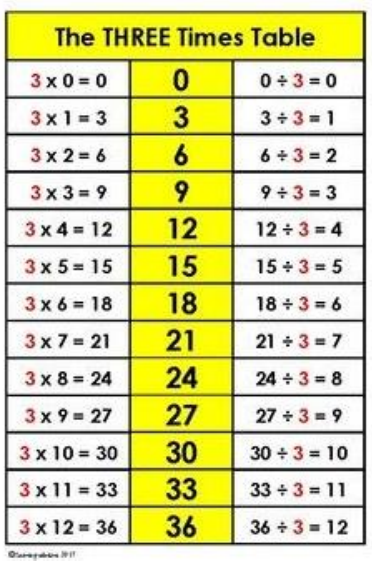
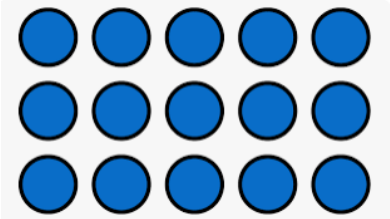
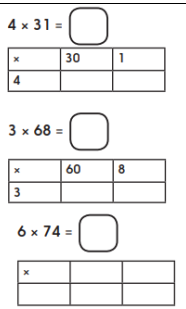
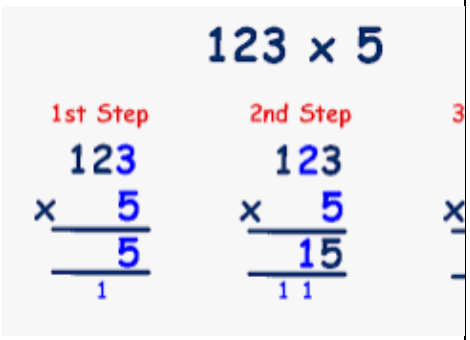
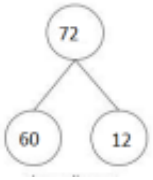
		Explore numbers that make up a number Two-ness of 2 Three-ness of 3 Four-ness of 4 Five-ness of 5  Number recognition: models and images commonly used in class.   Children are exposed to numbers to 100 in the class environment.	  **Ten Frame-** composition and comparison of numbers to 10, subitising numbers to 10 exploring equivalent ways to represent numbers to 10. Comparison of numbers 1 to 5 using the language of 'greater than' and 'less than' Blockzilla 	'one and one is two' 'two is one and one' '… is one more than…' '… is one les than…' '…comes before…' '… comes after….' '… is a part of me and … is a part of me and the whole of me is…' 'if the whole is…, then .. is a part and … is a part' 'five is made of… and …' ' I see… without counting' 'one ten is the same as ten ones' 'ten ones is the same as one ten' '… take away 1 is…' '… add 1 is…' '… is even because it is made of two's' '…is odd because it has one on top '…is greater than…' '…is less than…' 'the difference between.. and … is …'
KS1 Addition and Subtraction (including Place Value)	**Year 1** ● Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number ● Count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens ● Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs	 **whole** 10 5 | 5 **part** **part** Part whole models and Bar models are used to support addition and subtraction, finding missing parts and place value using numerals to support concrete and pictorial concepts.	Addend + Addend=Sum Minuend - subtrahend = difference More/ less, fewer/larger/ smaller, many, few Tens, ones Equal to

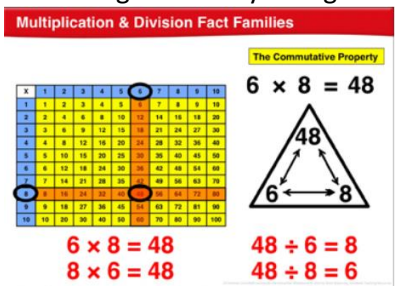
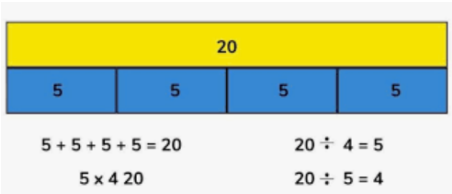
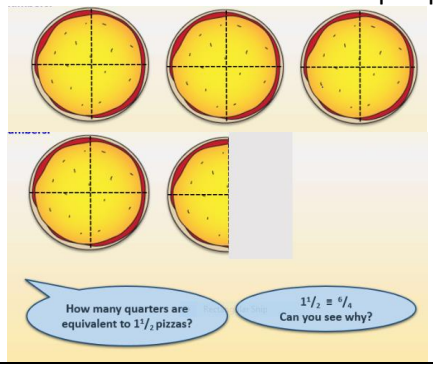
	● Represent and use number bonds and related subtraction facts within 20 ● Add and subtract one-digit and two-digit numbers to 20, including zero ● Solve one-step problems that involve addition and subtraction, using concrete objects, pictorial representations and simple missing number problems Year 2 ● Count in steps of 2, 3, and 5 from 0, and in tens from any number, forward and backward ● Recognise the place value of each digit in a two-digit number (tens, ones) ● Identify, represent and estimate numbers using different representations, including the number line ● Compare and order numbers from 0 up to 100; use and = signs Read and write numbers to at least 100 in numerals and in words Use place value and number facts to solve problems ● Solve problems with addition and subtraction ● Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 ● Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and ones, a two-digit number and tens, two two-digit numbers, adding three one-digit numbers	Rekenreks are used to represent and use number bonds and to add and subtract to and within 10 and 20.  Hundred squares are used to support cardinality and ordinality. Counting in twos, fives and tens. Counting, reading, writing, ordering and comparing numbers to 100.   Base 10 is used to support place value understanding and the addition and subtraction of 2 two-digit numbers, a two-digit number and ones and a two-digit number and tens. Representation of Base 10 will be used pictorally (I I .. = 22) and into the abstract (numerals – 22)  Number lines will be used to support understanding of ordinality, 1 more and 1 less, finding the difference and subtracting bridging 10. Formal written methods of calculations will be recorded as number sentences: 20 + 7 = 27 27 = 20 + 7 27 – 20 = 7 27 – 7 = 20 20 + ? = 27 27 - ? = 20	Compare Value **Stem Sentences:** ___ is made from ___ and ___ Double ____ is ____ ___ needs ___ to make ___ ___ is equal to ___ and ___ _____ can be made from double _____ and 1 more

	● Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems		
KS1 Multiplication and Division	**Year 1** ● 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. ● Recognise, find and name a half as one of two equal parts of an object, shape or quantity Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity Year 2 ● 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 (×), division (÷) and equals (=) signs ● Show that multiplication of two numbers can be done in any order (commutative) and division of one number by	 Concrete resources are used to show equal and unequal groups. Children also pictorially represent equal and unequal groups.  Arrays and Numicon are used to develop the x sign and commutative law, support multiplicative and additive relationships and to develop unitising in twos, fives and tens.  Number lines used to support repeated addition. Formal written methods of calculations will be recorded as number sentences: 6 X 2 = 12 12 ÷ 2 = 6 6 X ? = 12 12 ÷ ? = 6	Repeated Addition Factor x factor = Product/multiple Quotient (answer in a division calculation) Array, row, column Divide, divided by Lots of, groups of, multiply, multiplied by, times, repeated addition Double, halve Equal, unequal Odd, even Commutative Equal groups of **Stem sentence** Multiplication is … Arrays can help me with…

	another cannot solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.			
LKS2 Addition and Subtraction (including Place Value)	**Year 3** ● Count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number ● Recognise the place value of each digit in a three-digit number (hundreds, tens, ones) ● Compare and order numbers up to 1000 ● Identify, represent and estimate numbers using different representations ● Read and write numbers up to 1000 in numerals and in words solve number problems and practical problems involving these ideas ● Pupils should be taught to: add and subtract numbers mentally, including: a three-digit number and ones, a three-digit number and tens, a three-digit number and hundreds ● Add and subtract numbers with up to three digits, using formal written methods of column addition and subtraction ● Estimate the answer to a calculation and use inverse operations to check answers ● Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. Year 4 ● Count in multiples of 6, 7, 9, 25 and 1000 ● Find 1000 more or less than a given number ● Count backwards through zero to include negative numbers Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) ● Order and compare numbers beyond 1000 ● Identify, represent and estimate numbers using different representations ● Round any number to the nearest 10, 100 or 1000 ● Solve number and practical problems that involve all of the above and with increasingly large positive numbers ● Read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value. ● Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where	**Support Strategies**  Count in steps along a number line. Place value grids with base 10, counters and numerals.   Base 10 supports and extends place value understanding and knowledge of 1 ten = 10 ones, ten 10's = 100 <u>Using number facts</u> Number bonds to 100 e.g. 35 = 65, 46 + 54, 73 +27 etc Negative numbers on numberlines in a variety of forms.	**Formal Written Methods** Use of bar models to provide visual representations of calculations.   Partitioning numbers using part-whole model and place value <u>Counting up</u> Find a difference between two numbers by counting up from the smaller to the larger e.g. 121 - 87  <u>Formal Column Method (including the use of exchanging)</u>	Addend + addend = sum Minuend - subtrahend = Difference Add More Plus Sum Total Altogether Subtract Minus Less fewer Take-away Difference between **Stem Sentences:** Addition can be done in any order. Start with the largest number first. When working on the column method, start with the ones column.

	appropriate Estimate and use inverse operations to check answers to a calculation ● Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.	 		
LKS2 Multiplication and Division	**Year 3** ● 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 ● 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. Year 4 ● Recall multiplication and division facts for multiplication tables up to 12 × 12 ● 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 ● 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 one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.	**Support strategies**  Base 10 supports and extends place value understanding and knowledge of: 1 ten = 10 ones, 10 tens = 1 hundred Counting in steps using number lines or grouping.  Doubling and halving Using number facts, including the inverse.	**Formal written methods** Partitioning numbers to multiply and divide 2- and 3-digit numbers by 1 digit numbers.  Build on partitioning to develop multiplication grid, to multiply 3 digit by 1 digit numbers.	Repeated addition, Times, Multiply, lots of, double Multiple Partition Group, sharing, half, share equally, equal groups, Dividend Divisor Quotient Remainder Factor x factor = Product/multiple **Stem Sentences:** Multiplication can be done in any order. When dividing, always have the greatest number first.

		 Rote learning Times tables Songs Arrays  3 x 5 = 15 5 x 3 = 15 15 ÷ 5 = 3 15 ÷ 5 = 3	 Use a column method to multiply 3-digit numbers by 1 digit numbers.  <u>Partitioning into smaller divisible units.</u> 	

		Noticing fact family triangles  Bar models  		
LKS2 Fractions and Decimals	**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** **Compare and order unit fractions, and fractions with the same denominators** **Add and subtract fractions with the same denominator within one whole (e.g 5/7 +1/7 = 6/7) Solve problems that involve all of the above** **Count up and down in hundredths; recognise that hundredths arise when dividing an object by 100 and dividing tenths by 10** **Recognise and show , using diagrams, families of common equivalent fractions** **Add and subtract fractions with the same denominator**	**Methods** Base 10 and place value counters.  Use real life objects and shapes to as pictorial and concrete images to visualise fractions. Visualise that fractions are equal parts of a whole.  	Half of an odd number always ends in a ½ A numerator is ‘never under’. The denominator is at the bottom.

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

Recognise and write decimals equivalents of any number of tenths or hundredths

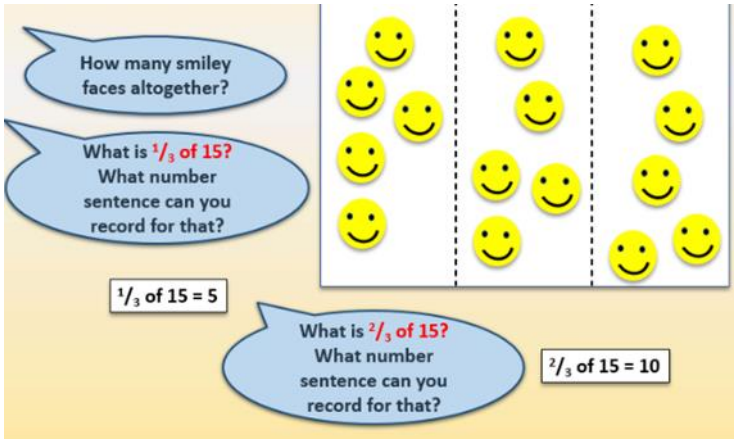
Recognise and write decimal equivalents to ¼, ½, ¾

Round decimals with one decimal place to the nearest whole number

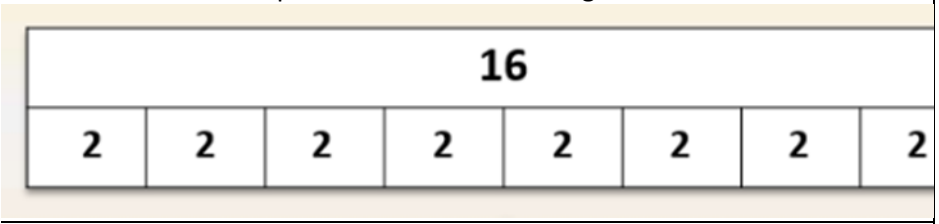
Compare numbers with the same number of decimal places up to 2 decimal places

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

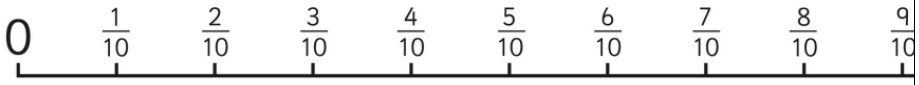
Use concrete and pictorial representations to calculate fractions of numbers e.g. 1/3 of 15 is 5.



Formal representation of this through bar models.



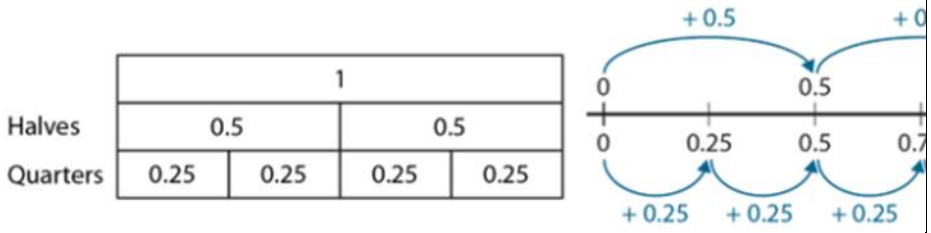
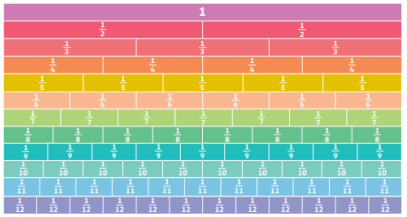
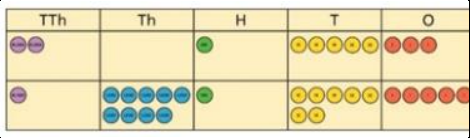
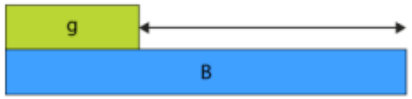
Fraction number lines to count, compare and order fractions. A tool to support adding and subtracting fractions with the same denominator.



Formal written method to calculate addition and subtraction of fractions.

$$\frac{1}{7} + \frac{4}{7} = \frac{5}{7}$$

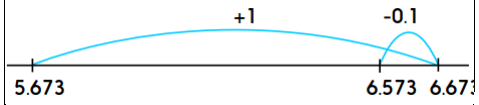
$$\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$$

		Bar models and number lines to show parts of a whole  Fraction wall to support understanding of equivalent fractions. Fractions Wall  Fraction notation / Decimal notation / Name 1/10 — 0.1 — one-tenth 1/100 — 0.01 — one-hundredth		
UKS2 Addition and Subtraction (including Place Value)	**Year 5** ● Read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit ● Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 ● Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero ● Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000 ● Solve number problems and practical problems that involve all of the above. ●Read Roman numerals to 1000 (M) and recognise years written in Roman numerals ● Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) Add and subtract numbers mentally with increasingly large numbers Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy ● Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.	**Support strategies**  **Additive – comparative**  **Additive or multiplicative**	**Formal written methods** 3 4 5 2 3 + 3 2 9 1 3 7 8 1 4 1 3 1 3 4 3 - 2 3 7 1 0 6	Addend + addend = sum (5 + 4 = 9) Minuend - subtrahend = difference (10 – 3 = 7) Additive Multiplicative Difference **Stem Sentences:**

Year 6

- Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit
- Round any whole number to a required degree of accuracy
- Use negative numbers in context, and calculate intervals across zero
- Solve number and practical problems that involve all of the above.
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why
- Solve problems involving addition, subtraction, multiplication and division
- Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

Add near multiples of 1, e.g. 6.345 + 0.999 or 5.673 + 0.9.



Partitioning, e.g. 2.4 + 5.8 as 2 + 5 and 0.4 + 0.8 and combine the totals: 7 + 1.2 = 8.2.

Partitioning, e.g. 9.54 + 3.25 as 9 + 3 and 0.5 + 0.2 and 0.04 + 0.05 to get 12.79.

10s	1s	·	0.1s ⅒s	0.01s ⅒₀s
	9	·	5	4
	3	·	2	5
1	2	·	7	9

Adding fractions with unlike denominators,

e.g. ¾ + ⅓ = 1 1/12 or 2 ¼ + 1 ⅓ = 3 7/12

¾ + ⅓

= 9/12 + 4/12

= 13/12

= 1 1/12

Subtracting fractions with unlike denomi

e.g. 1¼ - ⅔

= 5/4 - ⅔

= 15/12 - 8/12

= 7/12

UKS2 Multiplication and Division

Year 5

- 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

Year 6

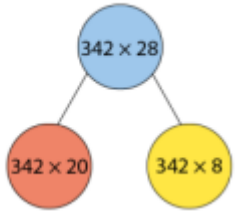
- Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
- Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context
- Perform mental calculations, including with mixed operations and large numbers identify common factors, common multiples and prime numbers
- Use their knowledge of the order of operations to carry out calculations involving the four operations

Support strategies

Multiplication using decimal places.

£23.67
x 3
£71.01
1 2 2

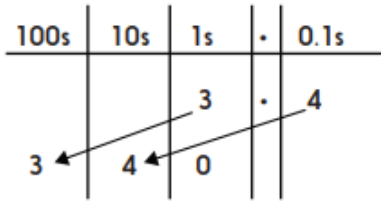
Part–part–whole model:



Grid method for multiplication, using partitioning.

x	300	40	5	
20	6000	800	100	6900
6	1800	240	30	2070
				8970

Place value grids to show that the decimal place doesn't move, the number moves across the grid.



Use partitioning to multiply 2, 3 or 4 digit numbers by 1 digit numbers:

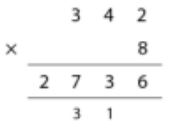
e.g: 34 x 7 =

30 x 7 = 210

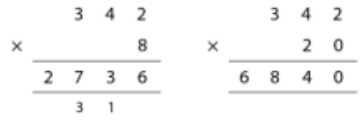
4 x 7 = 28

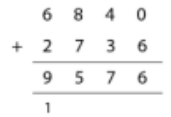
Formal written methods

Short multiplication of 2, 3 and 4 digits by 1 digits.



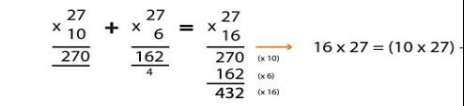
Short multiplication of 2, 3 and 4 digits, combining partial products.





Long multiplication of 2, 3, 4 digits by 2 digits (multiplying tens first):

16 x 27 = ?



Long multiplication of 2, 3, 4 digits by 2 digits (multiplying ones first, explaining it's cumulative):

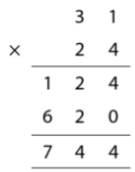
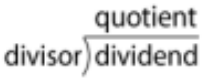
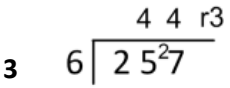
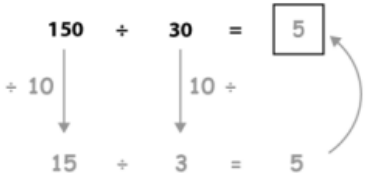
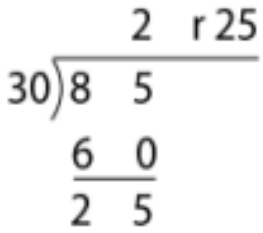
Factor x factor = product / multiple

Dividend
Divisor
Divisible
Quotient
Remainder
Prime numbers
Prime factors
Composite numbers
Multiples
Factors
Common factors
Remainders
Rounding
Squared number
Cubed number
Integer
Scaling

Stem Sentences:

A prime number is only divisible by itself and 1.

The decimal point never moves, the number moves across the place value grid.

		35 x 7 = 238 **Use partitioning to multiply decimals by 1 digit numbers:** **e.g: 4.5 x 9 =** 4 x 9 = 36 0.5 x 9 = 4.5 4.5 x 9 = 40.5 **Use times-tables facts up to 12 x 12** 4 x 6 = 24 40 x 6 = 240 40 x 60 = 2,400 **Multiple** 4 x 9 = 36 **Factor** 4 x 9 = 36	 **Short division of 3 and 4 digit numbers by 1 digit numbers.**   **Long division of 3 and 4 digit numbers by 2 digit numbers.**  Scaling initially used to introduce  long division. Progress onto long division. 	Multiplication is cumulative. It can be done either way.

UKS2 Fractions and Decimals

Year 5:

Use common factors to simplify fractions; use common multiples to express fractions in the same denomination

Compare and order fractions, including fractions >1

Add and subtract fractions with different denominations and mixed numbers, using the concept of equivalent fractions.

Multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g ¼ x1/2 = ⅛)

Divide proper fractions by whole numbers (e.g ⅓ divided by 2 = ⅙)

Identify the value of each digit in numbers given to 3 decimal places.

Multiply and divide numbers by 10, 100 and 1000 giving answers up to 3 decimal places.

Multiply one-digit numbers with up to 2 decimal places by whole numbers.

Use written division methods in cases where the answer has up to 2 decimal places.

Solve problems which require answers to be rounded to specified degrees of accuracy.

Year 6:

Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths

Recognise mixed numbers and improper fractions and convert one form to the other and write mathematical statements > 1 as a mixed number (e.g ⅖ +⅘ = 6/5 = 1 ⅕)

Compare and order fractions whose denominators are all multiples of the same number

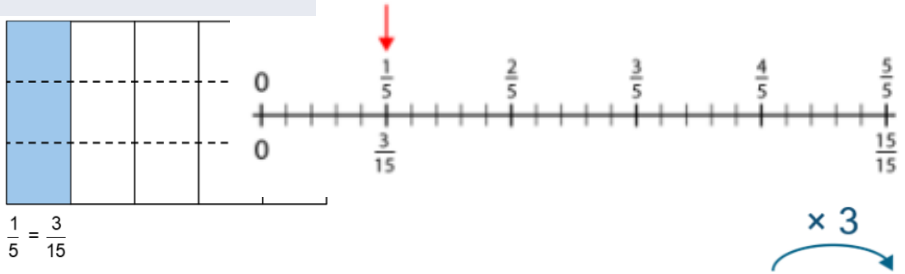
Add and subtract fractions with the same denominator and denominators that are multiples of the same number

Methods

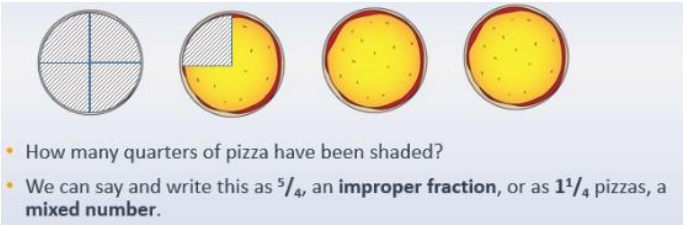
Finding equivalent fractions, using common multiples, and using them for addition and subtraction:

$^3/_4 - {}^2/_3$

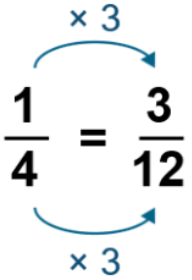
$^9/_{12} - {}^8/_{12}$



Writing fractions as improper fractions and mixed numbers:

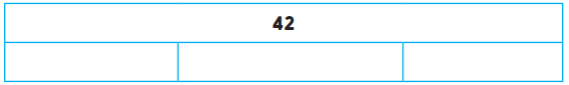


- How many quarters of pizza have been shaded?
- We can say and write this as $^5/_4$, an **improper fraction**, or as $1^1/_4$ pizzas, a **mixed number**.



Representing fractions of a number through bar models:

1. $\frac{1}{3}$ of 42 2. $\frac{2}{3}$ of 42



Comparing fractions and decimals.

Mixed number

Proper fraction

Improper fraction

Unit fraction

Non- unit fraction

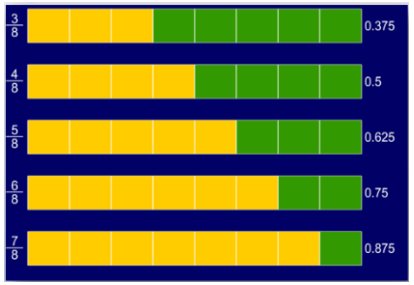
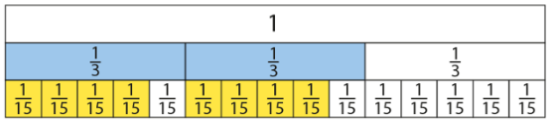
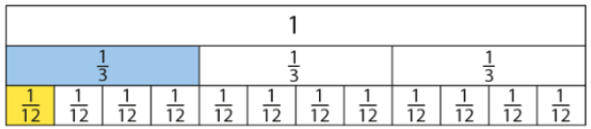
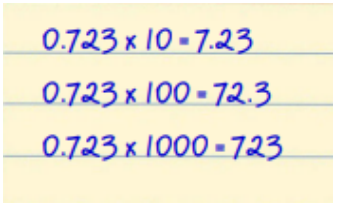
Denominator

Numerator

Thousandth

Hundredth

Tenth

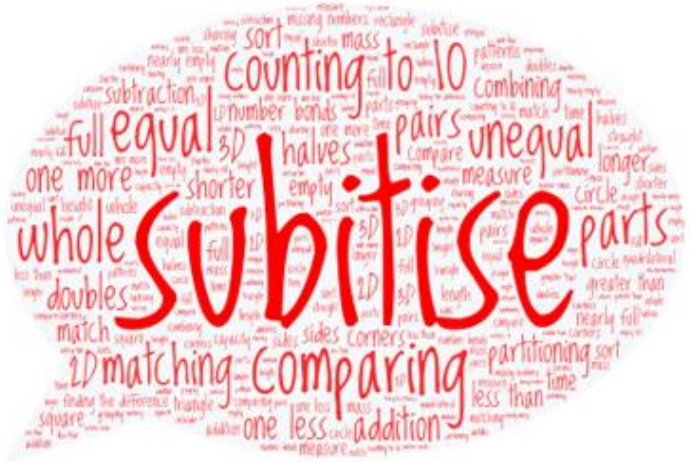
	Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams Read and write decimal numbers as fractions (e.g 0.71 = 71/100) Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalent Round decimals with 2 decimal places to the nearest whole number and to 1 decimal place Read, write, order and compare numbers with up to 3 decimal places Solve problems involving number up to 3 decimal places	 **Multiplying fractions by a whole number:** $\frac{4}{5} \times \frac{2}{3} = \frac{8}{15}$ $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$  **Dividing fractions by a whole number:** $\frac{1}{3} \div 4 = \frac{1}{12}$ $\frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$  **Multiply and divide decimals by 10, 100, 1000:** 	

		Multiply decimals by whole numbers: $685 \times 0.2 = \frac{2}{10}$ of 685 $\frac{1}{10}$ of 685 = 68.5 $\begin{array}{r} 6\ 8\ .\ 5 \\ \times \quad\quad 2 \\ \hline 1\ 3\ 7\ .\ 0 \\ \hline \quad 1\ \ 1 \end{array}$	**Multiply fractions by whole numbers:** $685 \times \frac{1}{5}$ $5\overline{)\,6\,{}^{1}8\,{}^{3}5}$ $\quad 1\ 3\ 7$	

Maths

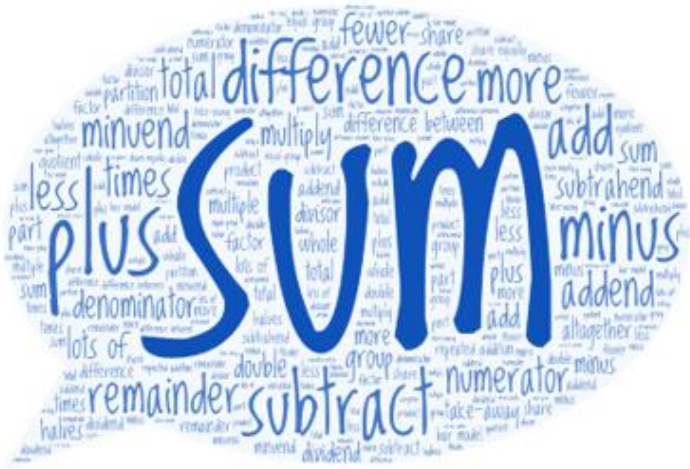
Maths Progression Vocabulary Word Clouds

EYFS



KS1

LKS2



UKS2