LENT RISE SCHOOL

CALCULATION POLICY

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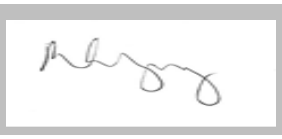
Abstract:

This policy sets out the methods the school uses to teach maths to ensure a consistent approach.

Approved by:	Mrs M Young Chair of Governors		05/05/2018
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Mathematical Vocabulary

As we know, it is often the vocabulary of mathematics that trips up children when problem solving. The only way to address this is to ensure a consistent approach to reinforcing the use of key vocabulary throughout all the units of work and through using and applying challenges.

Vocabulary needs to be:

- Explicitly taught
- Reinforced through children being expected to use it in their answers; and
- Reinforced through challenges and problems.

These tables outline the key vocabulary for each year group. Tables are cumulative, in other words teachers need to revisit and require children to use vocabulary which should have been learnt in earlier year groups.

EYFS vocabulary

Provision of good quality play is important, as in play children rehearse and refine maths skills and understanding. Play situations can also provide a context for using maths vocabulary that makes sense to a child and helps understanding. Many traditional songs, finger plays and rhymes contain themes that focus on maths vocabulary. Children with English as an additional language or those with language delay will benefit from pictures, models and pantomime to accompany the songs. Children need to be given time to fully explore the activities they are involved in and not be rushed to finish, nor should the focus to be on the finished product. Building a house with bricks takes time and provides a rich mathematical learning experience: discovering which shape bricks fit together, how to make a space in the wall to represent a window, figuring out how to overlap the bricks to make a corner and estimating whether there are enough bricks to complete the building. By comparison with building it, colouring in a picture of a house is much faster but the learning a much poorer experience.

An important experience is becoming familiar with and using mathematical vocabulary. Children's mathematical vocabulary is enhanced when the adults who are working alongside them:

- repeat key words in context during play activities;
- model using new words in commentary;
- encourage children to use new words through open-ended questioning;
- invite children to describe what they see, hear or think.

The following maths words should be used regularly in children's play so that they have a context in which to interpret them.

Comparing words

small and large, tall and short, fast and slow, heavy and light, hot and cold, high and low, near and far, young and old

It is helpful for children to see differences and a variety of properties in objects and situations. These must all be first-hand experiences such as comparing weight by handling objects and comparing height or speed through outdoor climbing or running activities.

Positional words

in, out, next to, behind, in front of, over, under, between, round, through

Children need a range of positional words if they are to explore shape and space meaningfully. Again these words need to be used during active learning using construction materials or playing hide and seek games.

Directional words

forward, backward, up, down, left, right, straight on

Any outdoor activity uses directional words especially if using wheeled vehicles or programmable toys.

Ordinal words

first, last, second, third, in front of, end, beginning, before, after

These words give children ways of describing order and sequence. Opportunities occur during activities that include lining up objects such as small cars, farm animals and counters.

Shape words

round, curved, wavy, straight, sloping, corners, pointed, sides, flat, circle, square, triangle

Children will gradually get to know names of shapes, but more importantly they need to know words that help them describe the shapes of things.

Calculating words

more, less, the same, many, lots, fewer, greater than, more than, less than

Children's first understanding of 'calculating' will be the vocabulary of more and less, and the language of increasing and diminishing quantities.

Time words

today, tomorrow, yesterday, morning, afternoon, night, the days of the week

Young children find time a difficult concept to understand and one that develops as the child matures. Initially, the words they use are mostly related to the here and now. Using a calendar to mark events and a group diary to record happenings will help children develop their sense of time. It is useful when talking about how many days to talk about how many 'sleeps' till your birthday.

New Maths vocabulary for Year 1							
Number and place value	Addition and subtraction	Multiplication and division	Measure	Geometry (position and direction)	Geometry (properties of shape)	Fractions	General/problem solving
Number Zero, one, two, three to twenty, and beyond None Count (on/up/to/from/ down) Before, after More, less, many, few, fewer, least, fewest, smallest, greater, lesser Equal to, the same as Odd, even	Number bonds, number line Add, more, plus, make, sum, total, altogether Inverse Double, near double Half, halve Equals, is the same as (including equals sign) Difference between How many more to make..?, how	Odd, even Count in twos, threes, fives Count in tens (forwards from/backwards from) How many times? Lots of, groups of Once, twice, three times, five times Multiple of, times, multiply, multiply by Repeated addition	Full, half full, empty Holds Container Weigh, weighs, balances Heavy, heavier, heaviest, light, lighter, lightest Scales Time Days of the week: Monday, Tuesday, etc. Seasons: spring, summer, autumn, winter Day, week, month, year, weekend Birthday, holiday Morning, afternoon, evening,	Position Over, under, underneath, above, below, top, bottom, side on, in, outside, inside around, in front, behind Front, back Before, after Beside, next to, Opposite Apart Between, middle, edge, centre Corner	Group, sort Cube, cuboid, pyramid, sphere, cone, cylinder, circle, triangle, square Shape Flat, curved, straight, round Hollow, solid Corner (point, pointed) Face, side, edge Make, build, draw	Whole Equal parts, four equal parts One half, two halves A quarter, two quarters	Listen, join in Say, think, imagine, remember Start from, start with, start at Look at, point to Put, place, fit Arrange, rearrange Change, change over Split, separate Carry on, continue, repeat, what comes next? Find, choose, collect, use, make, build

Pair Units, ones, tens Ten more/less Digit Numeral Figure(s) Compare (In) order/a different order Size Value Between, halfway between Above, below	many more is…than..?, how much more is..? Subtract, take away, minus How many fewer is…than..?, how much less is..?	Array, row, column Double, halve Share, share equally Group in pairs, threes, etc. Equal groups of Divide, divided by, left, left over	night, midnight Bedtime, dinnertime, playtime Today, yesterday, tomorrow Before, after Next, last Now, soon, early, late Quick, quicker, quickest, quickly , fast, faster, fastest, slow, slower, slowest, slowly Old, older, oldest, new, newer, newest Takes longer, takes less time Hour, o'clock, half past Clock, watch, hands How long ago?, how long will it be to…?, how long will it take to…?, how often? Always, never, often, sometimes, usually Once, twice First, second, third, etc. Estimate, close to, about	Direction Journey Left, right, up, down, forwards, backwards, sideways Across Close, far, near Along, through To, from, towards, away from Movement Slide, roll, turn, whole turn, half turn Stretch, bend			Tell me, describe, pick out, talk about, explain, show me Read, write, record, trace, copy, complete, finish, end Fill in, shade, colour, tick, cross, draw, draw a line between, join (up), ring, arrow Cost Count, work out, answer, check same number(s)/different number(s)/missing number(s) Number facts, number line, number track, number square, number cards Abacus, counters, cubes, blocks, rods, die, dice, dominoes, pegs, peg board Same way, different

			the				

			same as, just over, just under Too many, too few, not enough, enough Length, width, height, depth Long, longer, longest, short, shorter shortest, tall, taller, tallest, high, higher, highest Low, wide, narrow, deep, shallow, thick, thin Far, near, close Metre, ruler, metre stick Money, coin, penny, pence, pound, price, cost, buy, sell, spend, spent, pay, change, dear(er), costs more, costs less, cheaper, costs the same as How much?, how many? Total				way, best way, another way In order, in a different order Not all, every, each

New Maths vocabulary for Year 2						
Number and place value	Measure	Geometry (position and direction)	Geometry (properties of shape)	Fractions	Data/statistics	General/problem solving
Numbers to one hundred Hundreds Partition, recombine Hundred more/less	Quarter past/to m/km, g/kg, ml/l Temperature (degrees)	Rotation Clockwise, anticlockwise Straight line Ninety degree turn, right angle	Size Bigger, larger, smaller Symmetrical, line of symmetry Fold Match Mirror line, reflection Pattern, repeating pattern	Three quarters, one third, a third Equivalence, equivalent	Count, tally, sort Vote Graph, block graph, pictogram, Represent Group, set, list, table Label, title Most popular, most common, least popular, least common	Predict Describe the pattern, describe the rule Find, find all, find different Investigate

New Maths vocabulary for Year 3							
Number and place value	Addition and subtraction	Multiplication and division	Measure	Geometry (position and direction)	Geometry (properties of shape)	Fractions	Data/statistics
Numbers to one thousand	Column addition and subtraction	Product Multiples of four, eight, fifty and one hundred Scale up	Leap year Twelvehour/twenty-four- hour clock Roman numerals I to XIII	Greater/less than ninety degrees Orientation (same orientation, different orientation)	Horizontal, vertical, perpendicular and parallel lines	Numerator, denominator Unit fraction, nonunit fraction Compare and order Tenths	Chart, bar chart, frequency table, Carroll diagram, Venn diagram Axis, axes Diagram

New Maths vocabulary for Year 4						
Number and place value	Multiplication and division	Measure	Geometry (position and direction)	Geometry (properties of shape)	Fractions and decimals	Data/statistics
Tenths, hundredths Decimal (places) Round (to nearest) Thousand more/less than Negative integers Count through zero Roman numerals (I to C)	Multiplication facts (up to 12x12) Division facts Inverse Derive	Convert	Coordinates Translation Quadrant x-axis, y-axis Perimeter and area	Quadrilaterals Triangles Right angle, acute and obtuse angles	Equivalent decimals and fractions	Continuous data Line graph

New Maths vocabulary for Year 5						
Number and place value	Addition and subtraction	Multiplication and division	Measure	Geometry (position and direction)	Geometry (properties of shape)	Fractions, decimals and percentages
Powers of 10	Efficient written method	Factor pairs Composite numbers, prime number, prime factors, square number, cubed number Formal written method	Volume Imperial units, metric units	Reflex angle Dimensions	Regular and irregular Polygons	Proper fractions, improper fractions, mixed numbers Percentage Half, quarter, fifth, two fifths, four fifths Ratio, proportion

New Maths vocabulary for Year 6							
Number and place value	Addition and subtraction	Multiplication and division	Geometry (position and direction)	Geometry (properties of shape)	Fractions, decimals and percentages	Algebra	Data/statistics
Numbers to ten million	Order of operations	Order of operations Common factors, common multiples	Four quadrants (for coordinates)	Vertically opposite (angles) Circumference, radius, diameter	Degree of accuracy Simplify	Linear number sequence Substitute Variables Symbol Known values	Mean Pie chart Construct

Progression in Calculations

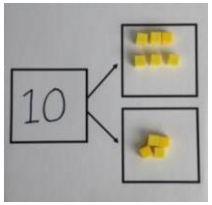
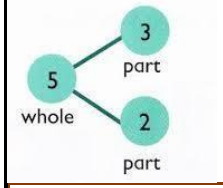
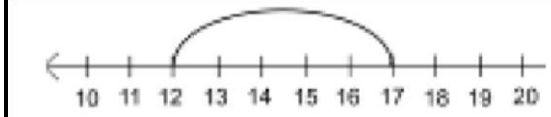
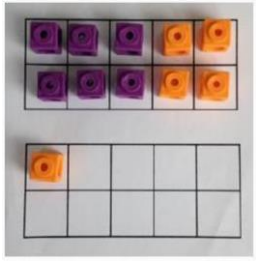
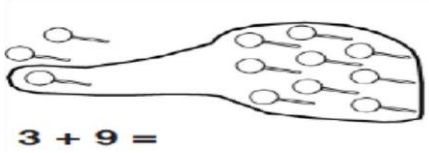
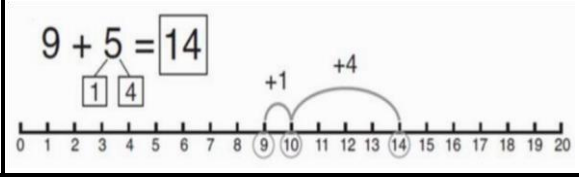
Addition

Nursery

Before addition can be introduced, children need to have a secure knowledge of number. In Nursery, children are introduced to the concept of counting, number order and number recognition through practical activities and games. This is taught through child initiated games such as hide and seek and I spy. Children also learn how to count 1-1 (pointing to each object as they count) and that anything can be counted, for example, claps, steps and jumps. This is reinforced by opportunities provided in the outdoor area for the children to count e.g. counting building blocks, twigs etc.

Reception

Before addition can be introduced, children in Reception build on concepts taught in Nursery by working through the number objectives in the 40 – 60 month band of Development Matters. Children need to have a secure knowledge of number in order to begin addition. Children are then introduced to the concept of addition through practical games and activities. Children act out addition sums to physically add two groups of objects together and use arm gestures to represent the signs + and =. This is reinforced by opportunities provided in the outdoor area for the children to use addition e.g. adding together groups of building blocks, twigs etc. Children build on their previous knowledge of 'more' by learning that adding two groups of objects together gives them a larger number (more objects). Adults model addition vocabulary supported by age appropriate definition. An example of this is "addition means we add two groups together / we put 2 lots of objects together. Equals means we find out how many we have got altogether. 3 add 2 equals 5! We have got 5 altogether". Adults support children in recording their addition sums in the written form on whiteboards and in their maths books.

Strategies	Concrete	Pictorial	Abstract
Combining 2 groups to make a whole Counting sets of objects, combining then recounting using a 1:1 correspondence.	  	  3+2=5 	4 + 3 = 7 I have 4 apples and I pick 3 more, how many have I got altogether?
Counting on Pupils should be taught to start at the biggest number and count on, using this as an opportunity to Introduce the commutativity of addition.	 		5 + 12 = 17 Reinforce starting from the largest number. 7 + 3 = 10 Encourage recall of known number facts to develop fluency in mental calculations. .
Regrouping to make 10 To move on from the previous strategy, rather than counting on, children use their number bond knowledge and bridge to 10 e.g. if 4 + 6 = 10, so 4 + 7 must equal 11.	 6+5=11 Start with the bigger number and use the smaller number to make 10.	 	7p+4p=11p I have 7p, how much more do I need to make 10p. How much more do I add on now? If you know 10=7+3, what else do you know?

Progression in Calculations

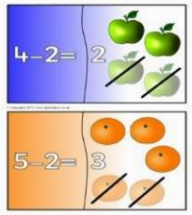
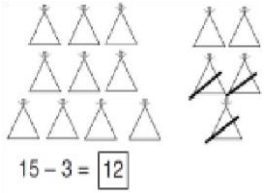
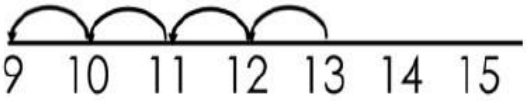
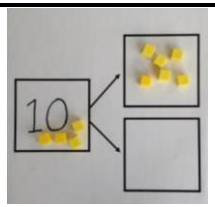
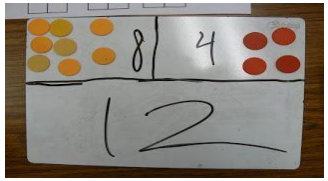
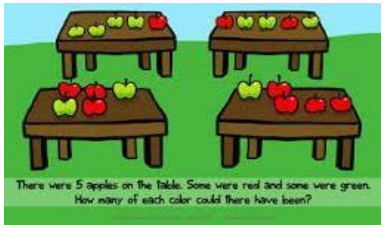
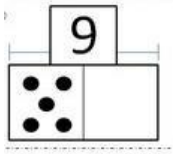
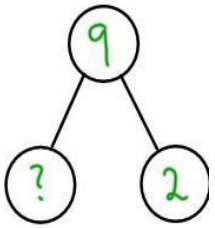
Subtraction

Nursery

Before subtraction can be introduced, children need to have a secure knowledge of number. In Nursery, children are introduced to the concept of counting backwards. This is taught through child initiated games indoors and outdoors such as acting out counting songs and running races (children shouting "5,4,3,2,1,0 - GO!").

Reception

Before subtraction can be introduced, children in Reception build on concepts taught in Nursery by working through the number objectives in the 40 – 60 month band of Development Matters. Children need to have a secure knowledge of number in order to begin subtraction. Children are then introduced to the concept of subtraction through practical games and activities. Children act out subtractions to physically subtract a number of objects from a group. Children use arm gestures to represent the signs - and =. This is reinforced by opportunities provided in the outdoor area for the children to count e.g. counting building blocks, twigs etc. Children build on their previous knowledge of 'less' by learning that subtracting means taking away a certain number of objects from a group (leaving them with less objects). Adults model subtraction vocabulary supported by age appropriate definition. An example of this is "subtraction means we take away objects from a group / we have 11 got less objects now. Equals means we find out how many we have got left. Wow! We have only got 3 left!" Adults support children in recording their subtractions in the written form on whiteboards and in their maths books.

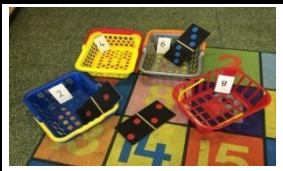
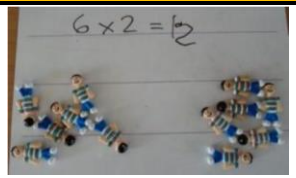
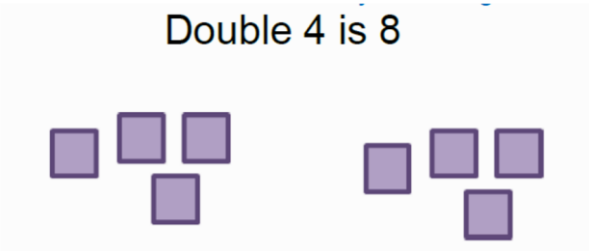
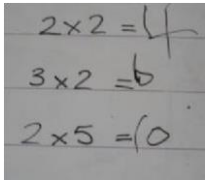
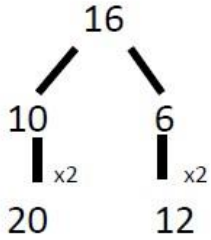
Strategies	Concrete	Pictorial	Abstract
Taking away ones Use physical objects to demonstrate how something can be taken away. Move on to crossing out drawn representations. This can be developed by representing a group of ten with a line and ones with dots.	  	   23 - 1 = 12	18 -3= 15 8 – 2 = 6 There are 15 cakes in the shop. One cake is eaten, how many are left.
Counting back As with the previous, this strategy is used for subtracting small numbers from larger numbers and provides a good foundation for the concept of subtraction	 Use counters or objects and move away from the group as they are counted.	 13-4=9	Put 17 in your head, count back 5. What number are you at? Use your fingers to help.
Part, part, whole model This model develops knowledge of the inverse relationship between addition and subtraction and is used to find the answer to missing number problems.	 If 10 is the whole and 6 is one of the parts. What is the other part? 	  Children should be taught the skills to approach problems in a systematic way.	 I made 9 buns for the cake sale and I only had 2 left at the end. How many did I sell? 

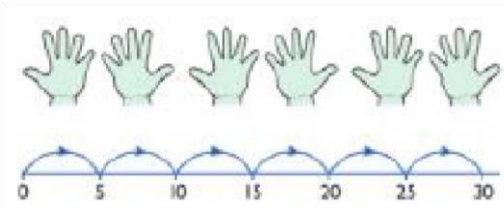
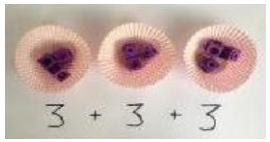
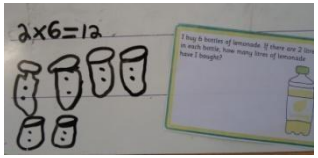
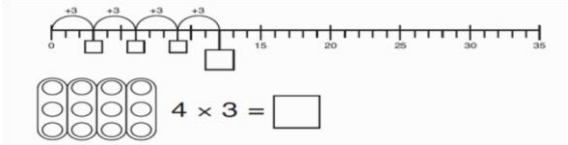
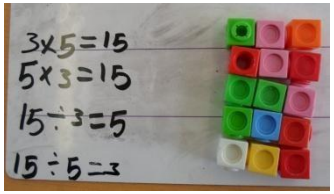
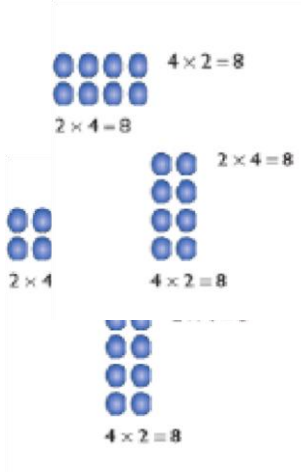
Progression in Calculations

Multiplication

Nursery and Reception

By the end of Reception, children are expected to understand the concept of doubling and to be able to double a number up to 10. Before doubling can be introduced, children need to have a secure knowledge of counting, number facts and addition in order to double. Children are then introduced to the concept of doubling through practical games and activities, including the use of the outdoor areas. Children act out 'doubling' by physically add two equal groups together to find out the 'doubles' answer.

Strategies	Concrete	Pictorial	Abstract
Doubling Pupils should be encouraged to develop fluent mental recall of doubles and relate to the 2 x table.	  		  If I can see 10 wheels, how many bikes are there?

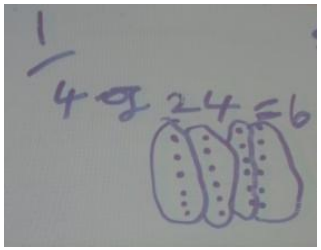
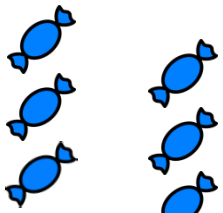
Counting in multiples Pupils can use their fingers as they are skip counting, to develop an understanding of 'groups of'. Children should become increasingly fluent as they practise.		Use a number line or pictures to continue support in counting in multiples. 	Count in multiples of a number aloud. Write sequences with multiples of numbers and work out missing numbers in sequences both forward and backward. If I count in 2's will I get to the number 58?
Repeated addition Pupils should apply skip counting to help find the totals of repeated additions.	 5+5+5=15  3+3+3=9	 Pupils begin to recognise the relationship between repeated addition and multiplication. 	Write addition or multiplication sentences to describe objects and pictures.  2+2+2+2+2=10 2x5=10
Arrays showing commutative multiplication Pupils should understand that an can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer.	 	Draw arrays in different rotations to find **commutative** multiplication sentences.  	3 children go to the park to hunt for plne cones. They find 5 each, how many do they find altogether? 5 children eat the same number of cakes at a party. 15 cakes are eaten in total, how many did they each eat? 5+5+5=15 3x5=15 3+3+3+3+3=15 5x3=15

Progression in Calculations

Division

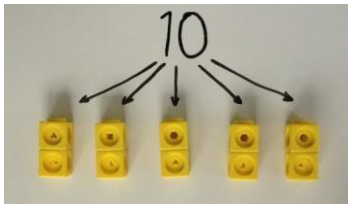
Nursery and Reception

By the end of Reception, children are expected to understand the concept of halving and sharing. Before this can be introduced, children need to have a secure knowledge of counting backwards, number facts and subtraction in order to halve and share. Children are then introduced to the concept of halving and sharing through practical games and activities. They act out 'halving and sharing' through activities such as sharing food for their Teddy Bear's Picnic, sharing resources equally to play a game. This is reinforced by opportunities provided in the outdoor area for the children to halve and share out objects such as building blocks, twigs etc.

Strategies	Concrete →	Pictorial →	Abstract
Sharing Here, division is shown as sharing. E.g. If we have 24 squares of chocolate and we share them between 3 people, each person will have 8 squares each.	 	  6÷2=3	Share 9 buns between three people. 9 ÷ 3 = 3 Can you make up your own 'sharing' story and record a matching equation?

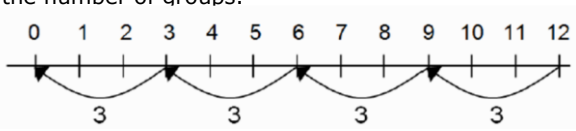
Division as grouping

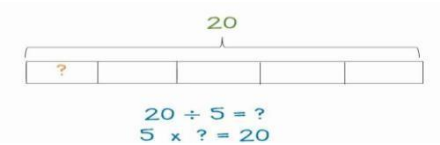
Here, division is shown as grouping. If we have ten cubes and put them into groups of two, there are 5 groups. This is a good opportunity to demonstrate and reinforce the inverse relationship with multiplication.



Divide quantities into equal groups.
Use cubes, counters, objects or place value counters to aid understanding.

Show jumps in groups. The number of jumps equals the number of groups.





Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.

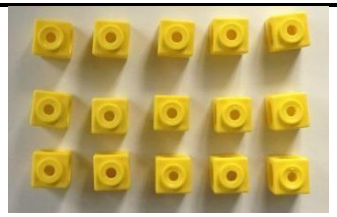
28 ÷ 7 = 4

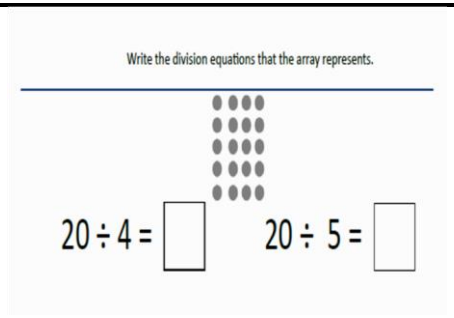
Divide 28 into 7 groups. How many are in each group?

Max is filling party bags with sweets. He has 20 sweets altogether and decides to put 5 in every bag. How many bags can he fill?

Division within arrays

Use arrays of concrete manipulatives and images of familiar objects to find division equations. Begin to use dot arrays to develop a more abstract concept of division.





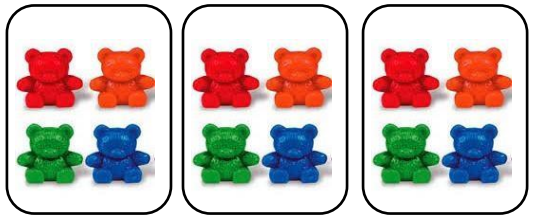
Children can draw lines to divide their array

Find the inverse of multiplication and division sentences by creating four linking number sentences.

7 x 4 = 28
4 x 7 = 28
28 ÷ 7 = 4
28 ÷ 4 = 7

Division with a remainder

This strategy provides an opportunity to reinforce prior learning of odd and even and 'multiples' when exploring how numbers can and cannot be divided into different whole numbers.



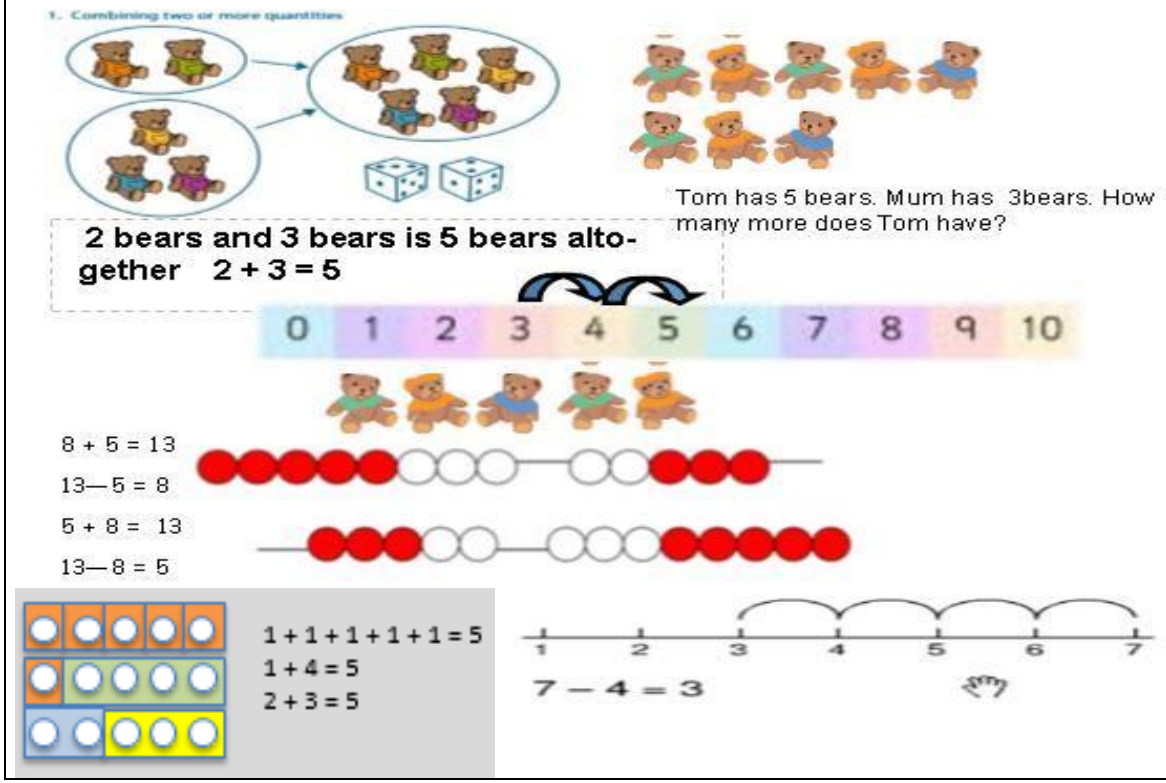
14 ÷ 3 =
Divide objects between groups and see how many are left over.

Complete written divisions and show the remainder using r.

Year 1	
Objectives	Recall of Facts
read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs **represent** and **use** number bonds and related subtraction facts within 20 add and subtract one-digit and two-digit numbers to 20, including zero	■ = ■ + ■ If we know 4 + 5 =9 We also know: 5 +4 = 9 9 – 5 = 4 9 – 4 = 5 14 + 5 = 19 19 – 14 = 5 etc. Work with all numbers up to 20.

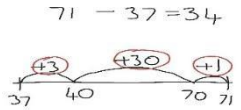
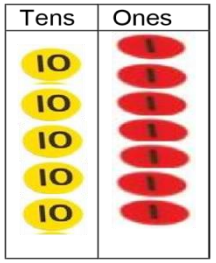
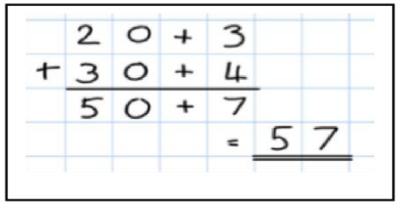
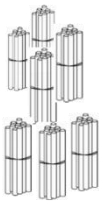
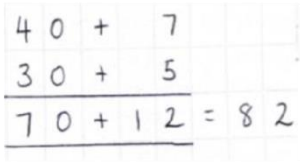
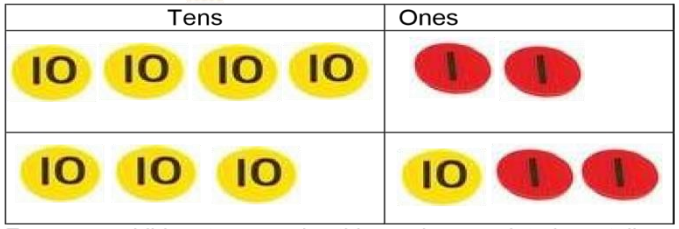
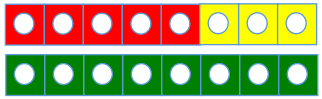
Mental Jottings with representations

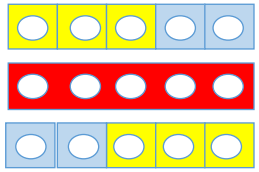
Immerse children in practical opportunities to develop understanding of addition and subtraction. Link practical representations on a number track on a beadstring to recording on a number line. Use carrbars© to show addition and subtraction sums. By the end of Year 1 children should be able to recall and use facts within and to 20.

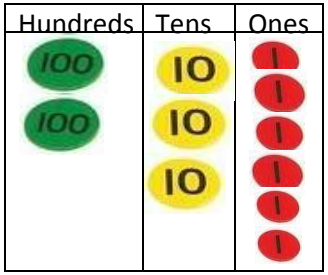
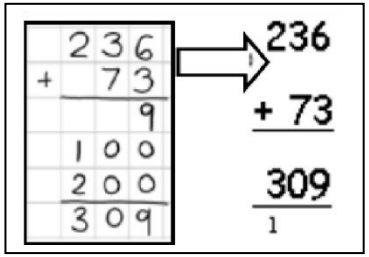
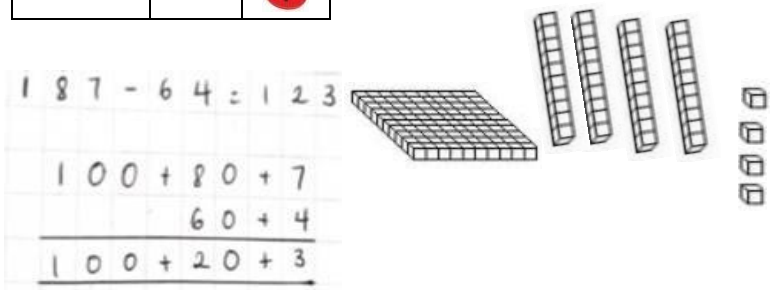
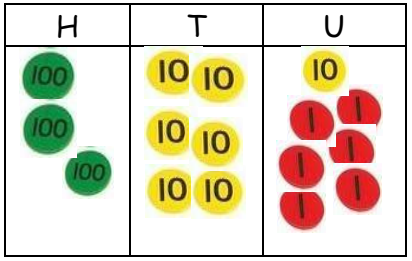
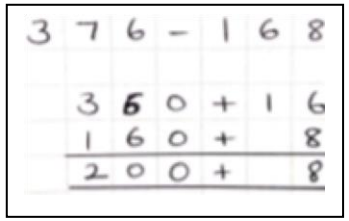


Children need to be secure with Using and Applying these skills in unfamiliar contexts before moving into the Year 2 objectives.

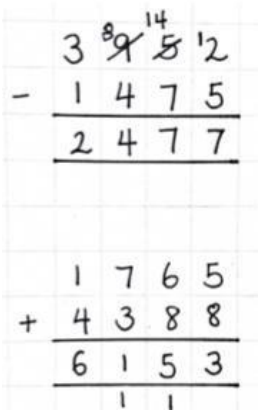
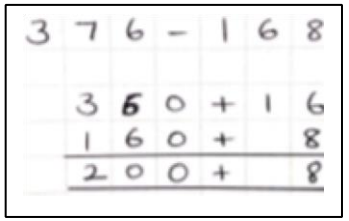
Year 2

Objectives:	Mental Recall/Jottings:	Written Methods with representations
Show that addition of two numbers can be done in any order and subtraction cannot. 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 presentations and mentally including: 2 digit number and ones 2 digit number and tens Two 2 digit numbers Add three 1 digit numbers Solve problems with addition and subtraction: · using concrete objects and pictorial representations, including those involving numbers, quantities and measures · applying their increasing knowledge of mental and written methods	**Using known facts** If I know: 2+3 = 5 I also know: 3+2 = 5 20 + 30 = 50 30 + 20 = 50 50—30 = 20 50—20 = 30 **Partitioning** 23 + 34 = 46—25 = **Bonds to 10** 2 + 7 + 8 = 8 + 2 + 7 **Bridge through 10** 26 + 7 = 26 + 4 + 3 26 + 4 = 30 30 + 3 = 33 **Counting on/back in 10s** 26 + 20 = 67 – 20 = **Rounding and Adjusting** + 9—9 +11—11  **Finding the difference between two numbers. 71 – 37:** **Partitioning numbers in different ways in preparation for subtracting using decomposition:** 90 + 2 80 + 12 (I have subtracted a ten and added it onto the ones) Continue to record mental jottings as outlined in Year 2 with increasingly larger numbers. Use suitable resources as required (See models and images page). Children that have not achieved the age related expectations for Year 2 should not move onto formal written methods	Recording addition and subtraction in columns supports place value and prepares for formal written methods.       

	until they are secure with mental recall/jottings.	Encourage children to recognise this can be completed mentally: 42 -15 → 40 + 2 10 + 5 → 30+12 10 + 5 20 + 7 → 42 – 15 = 27 
Year 3		
Objectives:	**Mental Recall/Jottings:**	**Written Methods with representations**
Add and subtract numbers	**Bridging to 10**	Pupils use their understanding of place value and

mentally A 3 digit number and 1s A 3 digit number and 10s A 3 digit number and 100s Add and subtract numbers with up to 3 digits using formal written methods of columnar addition and subtraction. **Estimate** **Calculate** **Check**	425 + 8 = 425 + 5 + 3 = 430 + 3 = 433 **Rounding and Adjusting** 425 + 90 = 425 + 100 = 525 - 10 = 515 146 – 9 = 146 – 10 + 1 = 136 + 1 = 137 146 – 50 = 146 – 40 – 10 = 106 – 10 = 96 **Counting forwards or backwards in 100s** 636 – 500 = 136	partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to three digits to become fluent.    376 – 168 = Using my knowledge of partitioning in different ways. 376 = 360 +16  

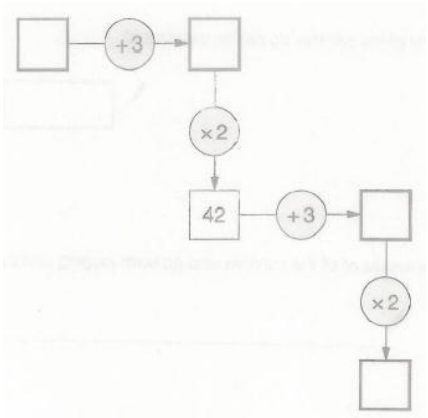
Year 4		
Objectives:	**Mental Recall/Jottings:**	**Written Methods with representations**

Continue to secure and extend mental methods from previous year groups. To select whether a calculation can be done mentally, with a jotting or using a formal written method. Add and subtract numbers with up to 4 digits using formal written methods of column addition and subtraction where appropriate.	Develop confidence at calculating mentally with larger numbers. Using the full range of strategies: · **Counting in 1s/10s** · **Bridging through multiples of 10** · **Partitioning** · **Rounding and Adjusting** · **Reordering** · **Near Doubles** · **Bridging through 60 when calculating with time.** **(SEE PREVIOUS YEAR GROUPS)** **Can I do it mentally?** **Should I use a jotting?** **Should I use a written method?**	Add and subtract numbers up to four digits.   Revert to expanded methods if the children experience any difficulty. (YEAR 3) Use the written method with decimals in the context of money £ 32.50 + £ 21.75 = £54.25 £32.50 + £21.75 £54.25 1 £ 42.50 - £ 13.35 = £ 29.15 £ 3 4 1 2 . 4 5 1 0 - £ 1 3 . 3 5 £ 2 9 . 1 5 Using number to ensure children understand the process before quickly moving into numbers that do require a written method.

Year 5

Objectives:	Mental Recall/Jottings:	Written Methods with representations
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.	12 462 – 2300 Use knowledge of place value to calculate mentally with increasingly larger numbers. Employ a range of special strategies to develop confidence in calculating mentally. E.g. **2364 + 1999 =** 2364 + 2000 = 4364 4364—1 = 4363 **13484 + 2400 =** 13000 + 2000 = 15000 484 + 400 = 884 15000 + 884 = 15884 4 = 2001—1997  1997 2000 2001 13486—5000 13486—3000 = 10486 10486—2000 = 8486	**Estimate:** 800 + 640 = 1440 900 – 500 = 400 900 – 500 = 400 789 + 642 becomes 7 8 9 + 6 4 2 1 4 3 1 1 1 Answer: 1431 874 – 523 becomes 8 7 4 – 5 2 3 3 5 1 Answer: 351 932 – 457 becomes 8 12 1 9 3 2 – 4 5 7 4 7 5 Answer: 475 932 – 457 becomes 1 1 9 3 2 – 4 5 7 5 6 4 7 5 Answer: 475 **Check:** **Is your estimate close to the answer you have calculated?** 25.356 + 346.28 becomes: Estimate: 9.076 – 3.142 becomes: Estimate: 25 + 350 = 375 9 – 3 = 6 25.356 $^{8}9.^{1}076$ +346.28 3. 142 371.636 5. 934 1 1

Year 6

Objectives	Mental Recall/Jottings	Written Methods with representations
Perform mental calculations, including with mixed operations and large numbers Use their knowledge of the order of operations to carry out calculations involving the four operations Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why	**Ensure children use a wide range of mental strategies when calculating including decimals and increasingly larger numbers.** **What is 2 minus 0.005?** **What is 5.7 added to 8.3?**  **57 + ☐ = 125** **911 – 47 = ☐** **149 + 137 + 158 = ☐** **(☐ + ☐) x ☐ = 10**	12 462 + 8456 Estimate: 21 000 = 12 500 + 8 500 12 462 + 8 456 20 918 1 1 3906 = 12 462 – 8556 Estimate: 4000 = 12 500 – 8 500 1112 145612 - 8 5 5 6 3 9 0 6 Add and subtract numbers with a different number of decimal places. 12.4 – 3.56 = Estimate: 12 – 4 = 8 (my answer should be between 8 and 9) 1 12. 13 4 10 - 3. 5 6 8. 8 4

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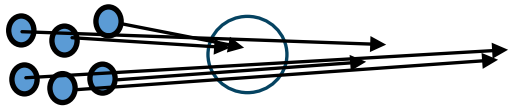
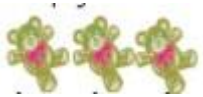
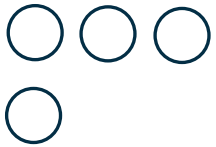
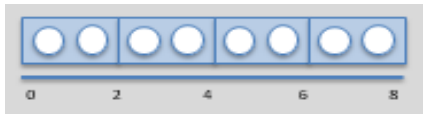
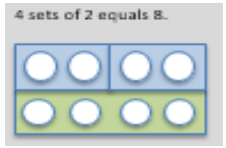
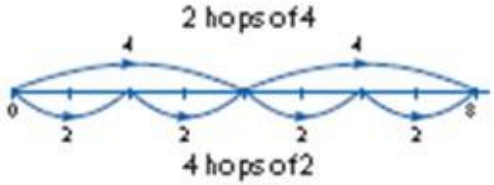
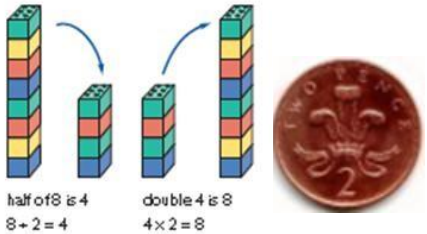
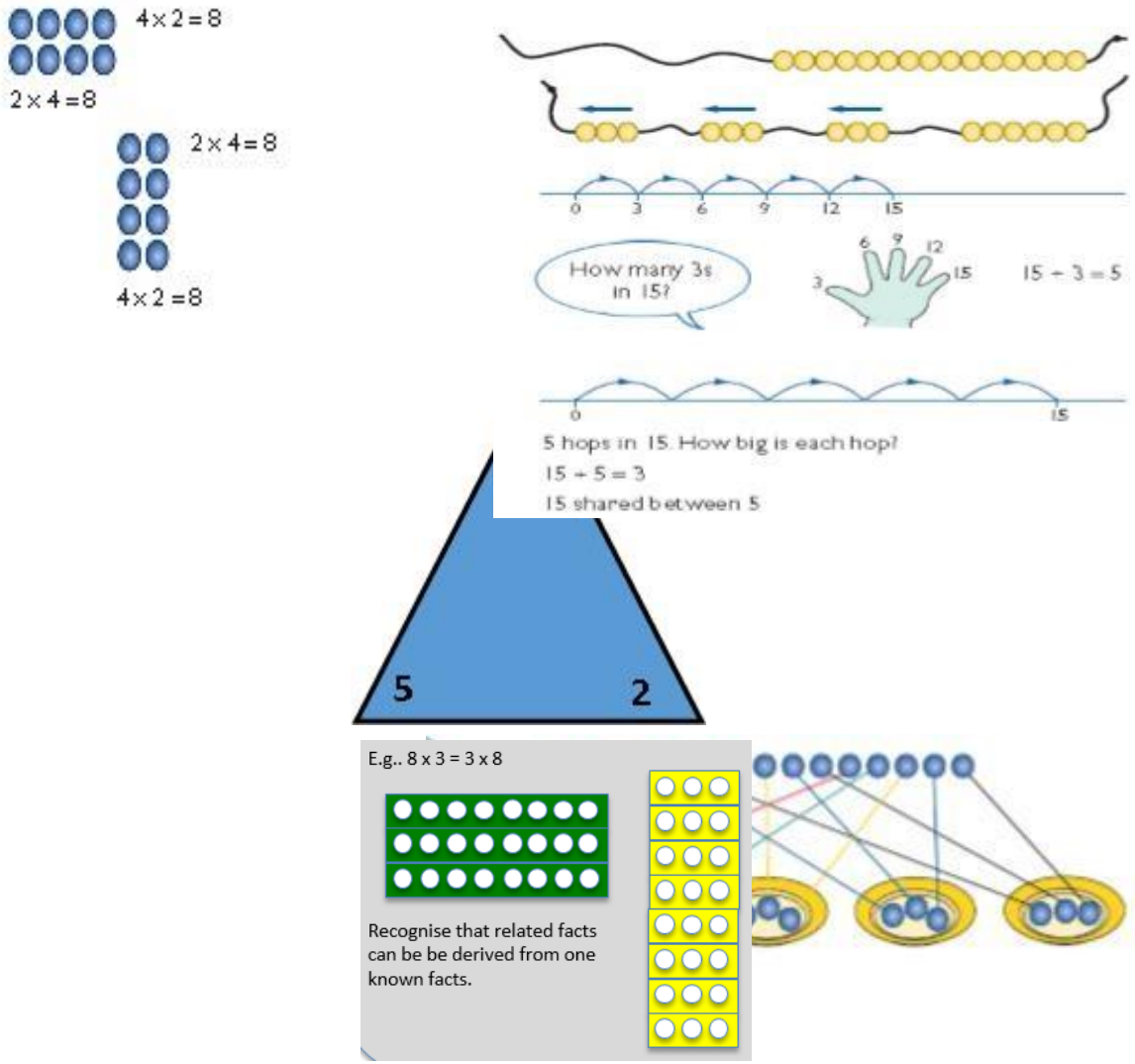
DEVELOPING UNDERSTANDING OF MULTIPLICATION AND DIVISION

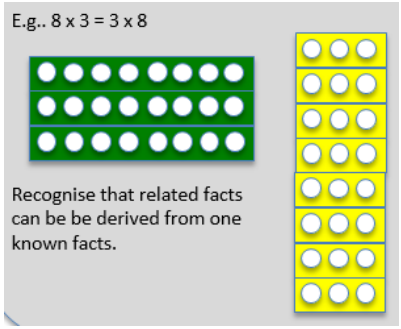
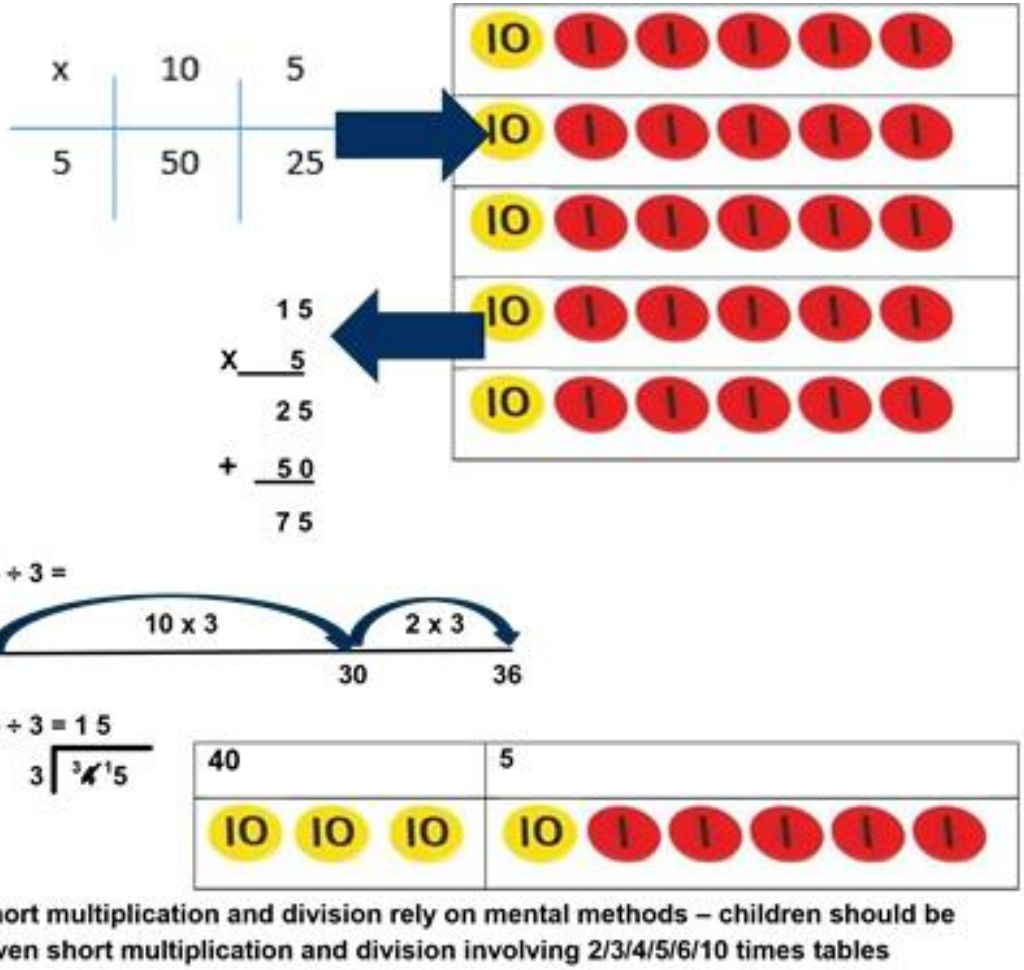
Year 1		
Objectives	**Mental Recall/Jottings**	**Written Methods with representations**

Count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens Double numbers to 20	Use of visual models to support counting in 2, 5, 10 Ensure children begin to see the patterns of counting in 2, 5, 10. Double/halve numbers up to: 10 + 10 = 10 x 2 20 – 10 = 20 ÷ 2 Children do not need to record number sentences using the symbols. Develop the vocabulary by encouraging children to explain what they are doing.	Grouping and sharing    **Arrays**  How many legs will 3 teddies have?       

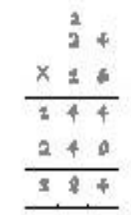
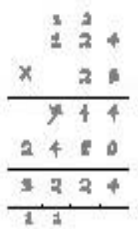
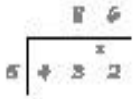
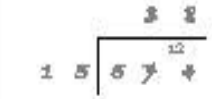
Year 2

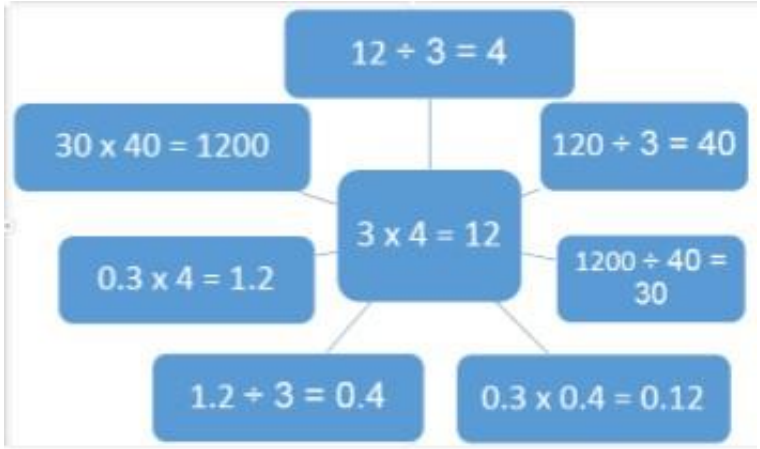
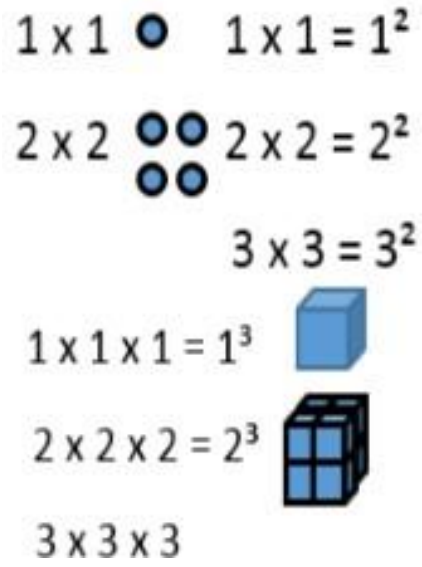
Objectives	Mental Recall/Jottings	Written Methods with representations
Count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward (copied from Number and Place Value) Recall and use multiplication and division facts for the 2, 4, 5, 10 and 11 multiplication tables, including recognising odd and even numbers Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot Written calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals(=) signs	2 x 5 = 10 5 x 2 = 10 10 ÷ 2 = 5 10 ÷ 5 = 2 Use knowledge of doubling: 2 x 10 = 20 10 x 2 = 20 20 ÷ 2 = 10 20 ÷ 10 = 2	

Year 3

Objectives	Mental Recall/Jottings	Written Methods with representations
Count from 0 in multiples of 4, 8, 50 and 100 Recall and use multiplication and division facts for the 3, 4, 6, 9, and 11 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.	If the children know 2/4/5/ 10 / 11 facts they need to now learn: 3 x 3 6 x 6 6 x 9 6 x 3 7 x 6 7 x 9 7 x 3 8 x 6 12 x 9 8 x 3 9 x 6 9 x 3 12 x 6 12 x 3 With corresponding division facts. Recall facts along with counting in steps sizes  8 x 3 = 3 x 8 24 ÷ 3 = 8 24 ÷ 8 = 3 To make 6 fairy cakes you need… How much will you need for 12?	 **Short multiplication and division rely on mental methods – children should be given short multiplication and division involving 2/3/4/5/6/10 times tables** Children should be working on the written methods as quickly as possible **(only use the grid method for children really struggling to grasp multiplication)**

Year 4

Objectives:	Mental Recall/Jottings:	Written Methods with representations
Count in multiples of 6, 7, 9, 25 and 1 000 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	If the children know multiplication and division facts for: 2/5/10/3/4/8/ they now need to learn. 7 x 7 8 x 8 12 x 12 8 x 7 9 x 8 9 x 7 11 x 8 11 x 7 12 x 8 12 x 7 Explore what happens when we divide by 1 and 0. To solve 24 x 3 Use knowledge of factor pairs. 8 x 3 x 3 6 x 4 x 3 In measuring and scaling contexts, (for example, four times as high, eight times as long etc.) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).	**These are the methods from the appendix of the National Curriculum. Year 4 should be using** Long multiplication 24 × 16 becomes  Answer: 384 24 × 32 becomes  Answer: 768 124 × 26 becomes  Answer: 3 224 Short division 432 ÷ 5 becomes  Answer: 86 remainder 2 574 ÷ 15 becomes  Answer: 38 $^{4}/_{15}$ 511 ÷ 35 becomes  Answer: 14.6
Year 5		

Objectives:	**Mental Recall/Jottings:**
Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 Multiply and divide numbers mentally drawing upon known facts Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 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 (nonprime) numbers Establish whether a number up to 100 is prime and recall prime numbers up to 19 recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)	Multiplying and dividing whole numbers and decimals by 10, 100 and 1000. **Thousands** | **Hundreds** | **Tens** | **Ones** | **/10 (tenths)** | **/100 (Hundredths)** | | | | | |  

Year 5 continued

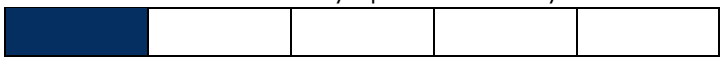
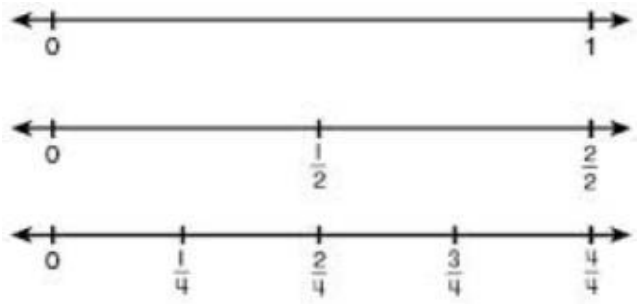
Objectives	Written Methods	
Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context Introduce long division to teach dividing numbers up to 4 digits by a two-digit number	2307 x 8 = Estimate: 2000 x 8 = 16000 Calculate: (Short multiplication) 2 3 0 7 X 8 18 4 5 6 2 5 1431 x 23 = Estimate: 1431 x 20 = 28620 1 Calculate: (Long multiplication) 1 4 3 1 X 2 3 4 2 9 3 (1431 x 3) 2 8 6 2 0 (1431 x 20) 3 2 9 1 3 1 1 Examples with decimals: 4.65 x 9 =	432 ÷ 5 = Estimate: 400 ÷ 5 = 80 Calculate (short division) 432 ÷ 5 becomes 8 6 r 2 5 | 4 3 2 3 Answer: 86 remainder 2 Estimate: 450 ÷ 15 = 30 Calculate: (Long division) 432 ÷ 15 becomes 2 8 r 12 1 5 | 4 3 2 3 0 0 1 3 2 1 2 0 1 2 Examples with decimals: 37.2 ÷ 8 =

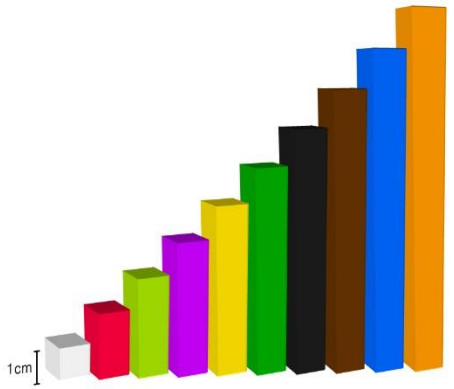
Ensure children are able to express remainders either as remainder, fraction or decimal. For example remainder 12 or 12/15 (4/5) or 0.8)

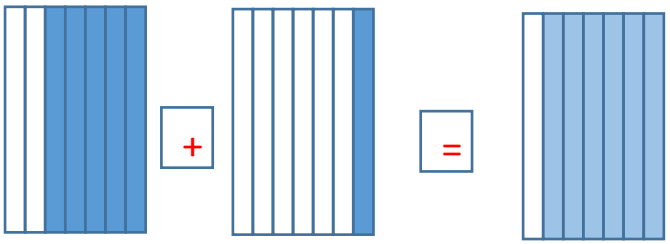
Year 6	
Objectives	**Mental Methods**
Perform mental calculations, including with mixed operations and large numbers Identify common factors, common multiples and prime numbers Use their knowledge of the order of operations to carry out calculations involving the four operations	They undertake mental calculations with increasingly large numbers and more complex calculations. Pupils continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency. Pupils round answers to a specified degree of accuracy, for example, to the nearest 10, 20, 50 etc., but not to a specified number of significant figures. Pupils explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9. Common factors can be related to finding equivalent fractions. Calculate 900 ÷ (45 × 4). A bag of four oranges costs thirty seven pence. How much do twelve oranges cost?

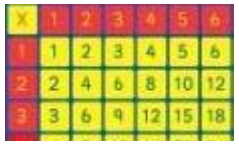
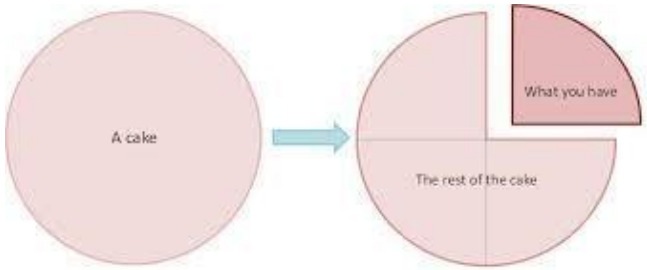
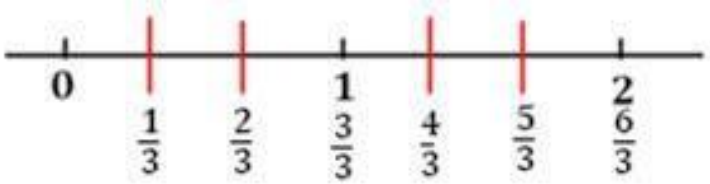
Year 6 Continued

Objective	Written Methods
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 4digits by a two-digit whole number using the formal written method of short division where appropriate for the context 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	**Short division** 98 ÷ 7 becomes $\begin{array}{r} 1\ 4 \\ 7\overline{)\ 9\ 8} \\ \ \ \ {\scriptstyle 2} \end{array}$ Answer: 14 432 ÷ 5 becomes $\begin{array}{r} 8\ 6\ \text{r}\,2 \\ 5\overline{)\ 4\ 3\ 2} \\ \ \ \ \ \ {\scriptstyle 3} \end{array}$ Answer: 86 remainder 2 496 ÷ 11 becomes $\begin{array}{r} 4\ 5\ \text{r}\,1 \\ 1\ 1\overline{)\ 4\ 9\ 6} \\ \ \ \ \ \ {\scriptstyle 5} \end{array}$ Answer: $45\frac{1}{11}$ **Long division** 432 ÷ 15 becomes $\begin{array}{r} 2\ 8\ \text{r}\,12 \\ 1\ 5\overline{)\ 4\ 3\ 2} \\ \ \ \ 3\ 0\ 0 \\ \hline \ \ \ 1\ 3\ 2 \\ \ \ \ 1\ 2\ 0 \\ \hline \ \ \ \ \ 1\ 2 \end{array}$ 432 ÷ 15 becomes $\begin{array}{r} 2\ 8 \\ 1\ 5\overline{)\ 4\ 3\ 2} \\ \ \ \ 3\ 0\ 0 \quad 15\times20 \\ \hline \ \ \ 1\ 3\ 2 \\ \ \ \ 1\ 2\ 0 \quad 15\times8 \\ \hline \ \ \ \ \ 1\ 2 \end{array}$ $\frac{\cancel{12}}{\cancel{15}} = \frac{4}{5}$ 432 ÷ 15 becomes $\begin{array}{r} 2\ 8\cdot 8 \\ 1\ 5\overline{)\ 4\ 3\ 2\cdot 0} \\ \ \ \ 3\ 0\ \downarrow \\ \hline \ \ \ 1\ 3\ 2 \\ \ \ \ 1\ 2\ 0 \\ \hline \ \ \ \ \ 1\ 2\ 0 \\ \ \ \ \ \ 1\ 2\ 0 \\ \hline \ \ \ \ \ \ \ \ 0 \end{array}$

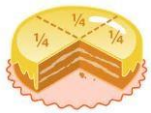
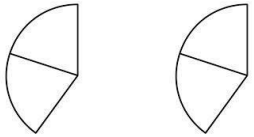
DEVELOPING UNDERSTANDING OF FRACTIONS/DECIMALS AND PERCENTAGES			
Year	Objectives	Examples	Models and Images
1	• Recognise, find and name a half as one of two equal parts of an object, shape or quantity • Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity	Children use their knowledge of fractions of shape to find fractions of quantities. Children should be give practical apparatus to find halves and quarters of quantities within 20. Record work pictorially.	
2	• 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 $\frac{1}{2}$.	Children use their knowledge of unit and non-unit fractions of shapes to find fractions of quantities. They relate this to find fractions of a length e.g. 2/4 of 1m = Children need to relate finding a quarter to halving and halving again. *Pupils should count in fractions up to 10, starting from any number and using the1/2 and 2/4 equivalence on the number line (Non Statutory Guidance)*	If I can see ¼ how many quarters can you see?  If I can see 2/3 how many thirds can you see?   
3	• count up and down in tenths;	Encourage children to count up	

	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	and down in tenths. 1 ÷ 10 = 1/10 2 ÷ 10 = 2/10 3 ÷ 10 = 3/10 Continue the pattern. What do you notice? What's the same? What's different? Children can use fractions as an operator E.g. 1/4 of 12 = 12 ÷ 4 = 3 Children can relate fractions to the division of integers 1 ÷ 4 = $\frac{1}{4}$ 4 x $\frac{1}{4}$ = 1 3 ÷ 4 = $\frac{3}{4}$ $\frac{3}{4}$ x 4 = 3 (12/4 or $\frac{3}{4}$ + $\frac{3}{4}$ + $\frac{3}{4}$ + $\frac{3}{4}$) Children need to relate and reason about why their diagrams are equivalent to a half – make connections between the numerator and the denominator E.g. $\frac{1}{2}$ = 4/ 8 The numerator will be half of the denominator. Children should be encouraged to make the connection between their	1÷ 10 = 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/10 1/ 0 2 ÷ 10 = 2/10 2/10 2/10 2/10 2/10 2/10 2/10 2/10 2/10 2/10 2/ 0 2 0 3 6 9 12 3 3 3 3 0 ¼ ½ ¾ 4/4 Use Cuisenaire rods to develop vocabulary of equivalence. 

	• add and subtract fractions with the same denominator within one whole • compare and order unit fractions, and fractions with the same denominators	multiplication tables and equivalents E.g. 1/3 = 3/9 because 3 x 3 = 9. $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$ Children need to use practical resources/visual representations to support the comparison of fractions E.g. 1/3 > $\frac{1}{4}$ Children should also be taught how to order fractions on a number line	 

DEVELOPING UNDERSTANDING OF FRACTIONS/DECIMALS AND PERCENTAGES			
Year	**Objectives**	**Examples**	**Models and Images**
4	• 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 one hundred and dividing tenths by tenths • 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 hundredths recognise and 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	1 ÷ 100 = 1/100 2 ÷ 100 = 2/100 3/7 of 56 = 24 3/10 of 120 = 36 $\frac{1}{4}$ = 12 $\frac{3}{4}$ = ___ 3/10 + 4/10 = 7/10 9/100 – 7/100 = 2/100 Children can record on a number line equivalents between 1/10 and 0.1 Count on and back in tenths as decimals and relate to counting on/back in 10ths (fractions).	  Count back in 1 and 1/10 from 101.  

	digits in the answer as ones, tenths and hundredths • round decimals with one decimal place to the nearest whole number • compare numbers with the same number of decimal places up to two decimal places • solve simple measures and money problems involving fractions and decimal to two decimal places	25 ÷ 10 = 2.5 2 ones and 5 tenths 25 ÷ 100 = 0.25 0 ones, 2 tenths and 5 hundredths or 25 hundredths	

DEVELOPING UNDERSTANDING OF FRACTIONS/DECIMALS AND PERCENTAGES			
Year	**Objectives**	**Examples**	**Models and Images**
5	• 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.	**$\frac{3}{4} - \frac{1}{4} =$** **1/10 + 2/5 =** **2/5 x 2 =**	 I eat 1 more piece of this cake. What fraction would be left? 
6	• Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions. • Multiply simple pairs of proper fractions, writing the answer in its simplest form • Divide proper fractions by whole numbers	**$\frac{1}{4} \times \frac{1}{2} =$** **1/3 ÷ 2/1 = 1/6**