Southridge First School

Calculation Policy

Introduction

Rationale:

This policy contains the key pencil and paper procedures that will be taught at Southridge First School. It has been written to ensure consistency and progression throughout the school and reflects a whole school agreement.
Although the focus of the policy is on pencil and paper procedures it is important to recognise that the ability to calculate mentally lies at the heart of mathematics. The mental methods will be taught systematically throughout the school and pupils will be given regular opportunities to develop the necessary skills. In every written method there is an element of mental processing.

It is important that children do not abandon jottings and mental methods once pencil and paper procedures are introduced. Therefore children will always be encouraged to look at a calculation/problem and then decide which is the best method to choose – pictures, mental calculation (with or without jotting), or the written method.

Progression:

For each of the four operations, a progression of steps is given to show how a child will develop in their written calculation methods during their time at Southridge.

The policy also indicates where most children in a year group will start at the beginning of an academic year. However in each year group, there will be children at different places in their development, some children do jump steps, and may have progressed onto the next step, whilst others may need longer to consolidate methods and so in order to ensure a firm understanding, may still be working on the previous step.

Help!

If you have any questions about this document, or would like to talk about how you can best help your child with calculation, please do not hesitate to ask your child's class teacher or the Numeracy Co-ordinator (Mrs McIntosh).

Mental methods of calculation

Oral and mental work in mathematics is essential, particularly so in calculation. **Early practical, oral and mental work must lay the foundations by providing children with a good understanding of how the four operations build on efficient counting strategies and a secure knowledge of place value and number facts**. Later work must ensure that children recognise how the operations relate to one another and how the rules and laws of arithmetic are to be used and applied. Ongoing oral and mental work provides practice and consolidation of these ideas. It must give children the opportunity to apply what they have learned to particular cases, exemplifying how the rules and laws work, and to general cases where children make decisions and choices for themselves.

The ability to calculate mentally forms the basis of all methods of calculation and has to be maintained and refined. A good knowledge of numbers or a 'feel' for numbers is the product of structured practice and repetition. It requires an understanding of number patterns and relationships developed through directed enquiry, use of models and images and the application of acquired number knowledge and skills. Secure mental calculation requires the ability to:

- recall key number facts instantly – for example, rapidly recall and use addition and subtraction facts to 20 (Year 2), accurately add and subtract numbers mentally including: pairs of one- and 2-digit numbers; 3-digit numbers and ones; 3-digit numbers and tens; 3-digit numbers and hundreds;
  and multiplication facts up to 12 x 12 (Year 4);
- use taught strategies to work out the calculation – for example, recognise that addition can be done in any order and use this to add mentally a one-digit number or a multiple of 10 to a one-digit or two-digit number (Year 1)
- understand how the rules and laws of arithmetic are used and applied – for example, recognise and show that multiplication can be done in any order (commutative) and division cannot (Year 2), use the distributive law to derive facts, for example, 30 x 7 + 9 x 7= 39 x 7 (Year 5)

Written methods of calculation

The aim is that by the end of Key Stage 2, the great majority of children should be able to use an efficient written method for each operation with confidence and understanding. This guidance promotes the use of what are commonly known as 'standard' written methods – methods that are efficient and work for any calculations, including those that involve whole numbers or decimals. They are **compact** and consequently help children to keep track of their recorded steps. Being able to use these written methods gives children an efficient set of tools they can use when they are unable to carry out the calculation in their heads or do not have access to a calculator. We want children to know that they have such a reliable, written method to which they can turn when the need arises.

To support the development of written methods, the school will use base ten and Numicon materials to model

- partitioning of numbers into multiples of one, ten, hundred and thousand
- exchanging (ten ones exchange for one ten, ten tens exchange for one hundred, ten hundreds exchange for one thousand and vice versa)
- carrying in addition
- decomposition in subtraction
- partitioning and multiplication
- grouping in division
- recombining of amounts
- accurate setting out and placing of numbers according to their value

BASE TEN EXPLORATION EXPERIENCES

- Exploration of relationships (ten units match one ten etc.)
- Values of blocks
- Counting in ones, tens, hundreds
- Counting in tens then adding ones
- Counting in tens, adding ones then adding tens
- 'Collect and exchange' games
- 'Give away and exchange' games
- Making, matching and writing amounts
- Puzzles

NUMBER (+, -, x and ÷): Early Outcomes for Nursery:- (30-50 months and beyond)

30 - 50 Months	**13**	Uses some number names and number language spontaneously.
	14	Uses some number names accurately in play.
	15	Recites numbers in order to 10.
	16	Knows that numbers identify how many objects are in a set.
	17	Begin to represent numbers using fingers, marks on paper or pictures.
	18	Sometimes matches numeral and quantity correctly.
	19	Shows curiosity about numbers by offering comments or asking questions.
	20	Compares two groups of objects, saying when they have the same number.
	21	Shows an interest in number problems.
	22	Separates a group of three or four objects in different ways, beginning to recognise the total is still the same.
	23	Shows an interest in numerals in the environment.
	24	Shows an interest in representing numbers.
	25	Realises not only objects, but anything can be counted, including steps, claps or jumps.

NUMBER (+, -, x and ÷): Expectations for Reception: - At Southridge, many of our children are progressing beyond and exceeding the Early Learning Goals

40 - 60+ Months	**26**	Recognise some numerals of personal significance.
	27	Recognises numerals 1-5.
	28	Counts up to three objects by saying one number name for each item.
	29	Counts actions or objects which cannot be moved.
	30	Counts objects to 10, and begin to count beyond 10.
	31	Counts out up to 6 objects from a larger group.
	32	Selects the correct number to represent 1 to 5, then 1 – 10 objects.
	33	Counts an irregular arrangement of up to 10 objects.
	34	Estimates how many objects they can see and checks by counting them.
	35	Uses the language of 'more' and 'fewer' to compare two sets of objects.
	36	Finds the total number of items in two groups by counting all of them.
	37	Says the number that is one more than a given number.
	38	Finds one more object or one less from a group of up to five objects, then ten objects.
	39	In practical activities and discussion, begin to use the vocabulary involved in adding and subtracting.
	40	Records, using marks that they can interpret and explain.
	41	Begin to identify own mathematical problems based on their own interests and fascinations.
ELG	**42**	Children can count reliably with numbers from one to twenty, place them in order and say which number is one more or one less than a given number.
	43	Use quantities and objects, they add and subtract using two single-digit numbers and count on or back to find the answer.
	44	They solve problems, including doubling, halving and sharing.
Exceeding	**45**	Children estimate a number of objects and check quantities by counting up to 20.
	46	They solve practical problems that involve counting groups of 2, 5 or 10, or sharing into equal groups.

Reception Early Outcomes 40-60 months	Notes and Guidance
Number and place value Pupils should be taught to: • identify using objects and pictorial representations and use the vocabulary of: equal to; more than; less than (fewer); most; least • count from 0 to and across 100, forward and backwards, beginning with 0 or 1, and from any given number • count, read and write numbers to 20 in numerals, count in different multiples including ones, twos, fives and tens • given a number, identify one more and one less • recognise odd and even numbers • read and write numbers from 1 to 20 in numerals and words • distinguish between and use ordinal and cardinal numbers.	**Number and place value** Ensure pupils practise counting in ones, twos, fives and tens from different multiples to develop their recognition of patterns in the number system. Ensure pupils begin to recognise place value in numbers beyond 20 by reading, writing, counting and comparing numbers up to 100. Ensure pupils are taught when and how to use numbers for ordering (e.g. first, second, third), for counting (1, 2, 3) or to indicate a quantity (e.g. three apples, 2 centimetres). Exclude the terms "ordinal" and "cardinal".
Addition and subtraction Pupils should be taught to: • read, interpret and practise writing mathematical statements involving addition (+), subtraction (-) and equals (=) signs accurately • add and subtract 1-digit and 2-digit numbers to 20 (9 + 9, 18 - 9), including zero • add three 1-digit numbers practically • recall and use number bonds and related subtraction facts within 10 • solve simple word problems that involve addition and subtraction.	**Addition and subtraction** Ensure pupils practise reading and writing mathematical statements regularly so that they become fluent. Ensure pupils practise so that they memorise their number bonds to 20 in the four forms (e.g. 9 + 7 = 16; 7 + 9 = 16; 16 – 7 = 9; 16 – 9 = 7), and that they can record their answers. This will prepare them for Year 2 when they are taught how to add and subtract two 2-digit numbers.

Multiplication and division Pupils should be taught to: • recognise and write the multiplication symbol (x) and the division symbol (÷) in mathematical statements, calculating the answer with the teacher using concrete objects • Share objects into groups introduce ÷ symbol • Halve and double numbers to 10 – embed through games and practically. • Solve word problems involving simple multiplication and division, with teacher support.	**Multiplication and division** • Ensure pupils are introduced to the multiplication (x) and division (÷) symbols so that they can recognise and write them accurately. They should distinguish them from addition and subtraction. This prepares them for Year 2 when they are taught how to multiply and divide using two 1-digit numbers with concrete objects and then using numbers within the multiplication tables.

NUMBER (+, -, x and ÷): Expectations for Year 1

Year 1 Programme of Study	Notes and Guidance
Number and place value Pupils should be taught to: • identify using objects and pictorial representations and use the vocabulary of: equal to; more than; less than (fewer); most; least • count from 0 to and across 100, forward and backwards, beginning with 0 or 1, and from any given number • count, read and write numbers to 100 in numerals, count in different multiples including ones, twos, fives and tens • given a number, identify one more and one less • recognise odd and even numbers • read and write numbers from 1 to 20 in numerals and words • distinguish between and use ordinal and cardinal numbers.	**Number and place value** Ensure pupils practise counting in ones, twos, fives and tens from different multiples to develop their recognition of patterns in the number system. Ensure pupils begin to recognise place value in numbers beyond 20 by reading, writing, counting and comparing numbers up to 100. Ensure pupils are taught when and how to use numbers for ordering (e.g. first, second, third), for counting (1, 2, 3) or to indicate a quantity (e.g. three apples, 2 centimetres). Exclude the terms "ordinal" and "cardinal".
Addition and subtraction Pupils should be taught to: • read, interpret and practise writing mathematical statements involving addition (+), subtraction (-) and equals (=) signs accurately • add and subtract 1-digit and 2-digit numbers to 20 (9 + 9, 18 - 9), including zero • add three 1-digit numbers • recall and use number bonds and related subtraction facts within 20 • solve simple one-step word problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as	**Addition and subtraction** Ensure pupils practise reading and writing mathematical statements regularly so that they become fluent. Ensure pupils practise so that they memorise their number bonds to 20 in the four forms (e.g. 9 + 7 = 16; 7 + 9 = 16; 16 – 7 = 9; 16 – 9 = 7), and that they can record their answers. This will prepare them for Year 2 when they are taught how to add and subtract two 2-digit numbers.

7= x – 9.	
Multiplication and division Pupils should be taught to: • recognise and write the multiplication symbol (x) and the division symbol (÷) in mathematical statements, calculating the answer with the teacher using concrete objects • solve word problems involving simple multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher .	**Multiplication and division** • Ensure pupils are introduced to the multiplication (x) and division (÷) symbols so that they can recognise and write them accurately. They should distinguish them from addition and subtraction. This prepares them for Year 2 when they are taught how to multiply and divide using two 1-digit numbers with concrete objects and then using numbers within the multiplication tables.

NUMBER (+, -, x and ÷): Expectations for Year 2

Year 2 Programme of Study	Notes and Guidance
Number and place value Pupils should be taught to: • read and write numbers to at least 100 in numerals and in words • recognise the place value of each digit in a 2-digit number (tens, ones) • count in steps of 2, 3, 5 and 10, count in tens from any number, and give 10 more or less than a given number to 100 • compare and order numbers from 0 up to 100; use <, > and = signs • arrange, read and write numbers in increasing and decreasing order • Identify, represent and estimate numbers using different representations, including the number line. • solve word problems using place value and number facts with increasing precision.	**Number and place value** Ensure pupils practise counting, reading, writing and comparing numbers to at least 100 to develop mental fluency, extend their concept of place value and solve related word problems. They should be introduced to counting in multiples of 3 to support their understanding of a third. Ensure pupils continue to compare and order increasingly large numbers. They should also practise related vocabulary while using <, > and =. Pupils should be introduced to larger numbers as they become more confident with numbers up to 100 to further develop their recognition of patterns within the number system. Ensure pupils are fluent and apply their knowledge of larger numbers to discuss and solve problems that emphasise the value of each digit in 2-digit numbers. For example, they should read 46 as 'forty and six' and solve addition and subtraction mentally such as, 36 – 6 = 30 and 50 + 6 = 56.
Addition and subtraction Pupils should be taught to: • rapidly recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 • add and subtract numbers with up to two 2-digits including using column addition without carrying and column subtraction without borrowing • add and subtract numbers mentally including: o - a 2-digit number and ones o - a 2-digit number and tens o - two 2-digit numbers o - adding 3 one-digit	**Addition and subtraction** Ensure pupils practise addition and subtraction of number bonds to 20 so that they become fluent in recalling them. This includes using related facts to perform calculations (e.g. using 3 + 7 = 10, 10 - 7 = 3 and 10 – 3 = 7 to calculate 30 + 70 = 100, 100 - 70 = 30 and 100 – 30 = 70). Ensure pupils practise column addition and subtraction to write numbers with precision to calculate answers. This also reinforces the concept of place value. Horizontal written methods should progress rapidly to more efficient column methods to help prepare pupils in Year 3 when they are taught column addition with carrying and subtraction with borrowing. Ensure pupils practise mental addition and subtraction of two numbers of up to 2-digits, with

numbers • use subtraction in 'take away' and 'find the difference' problems • recognise and show that addition can be done in any order (commutative) and subtraction cannot • recognise and use addition and subtraction as inverse operations including to check calculations • solve word problems with addition and subtraction of numbers with up to 2-digits	answers not exceeding 100. They should know how to check calculations, including by adding to check subtraction and adding numbers in a different order to check addition; for example 5 + 2 + 1 = 1 + 5 + 2 = 1 + 2 + 5. Ensure pupils regularly practise how to interpret word problems to ensure addition and subtraction is firmly understood.
Multiplication and division Pupils should be taught to: • recall multiplication and division facts for the 2, 5 and 10 multiplication tables including recognising odd and even numbers • use the multiplication (x), division (÷) and equals (=) signs to read and write mathematical statements • write and calculate mathematical statements for multiplication and division within the multiplication tables • recognise and use the inverse relationship between multiplication and division to check calculations • ensure pupils can recognise and show that multiplication can be done in any order (commutative) and division cannot • solve word problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts.	**Multiplication and division** Ensure pupils are taught multiplication and division through sharing out quantities; finding simple fractions of objects, numbers and quantities; doubling numbers and quantities; and find related halves. This also links to recognition of division as sharing and grouping. Pupils are introduced to the multiplication tables in Year 2. Ensure pupils practise 2, 5 and 10 multiplication tables up to x12 so they are fluent in recalling them. This includes using related division facts to perform written and mental calculations.

NUMBER (+, -, x and ÷): Expectations for Year 3

Year 3 Programme of Study	Notes and Guidance
Number and place value Pupils should be taught to: • read and write numbers to at least 1000 in numerals and in words • recognise the place value of each digit in a 3-digit number (hundreds, tens, ones) • compare and order numbers up to 1000 • count in multiples of 2, 3, 4, 5, 8, 10, 50 and 100 from 0; give 10 or 100 more or less than a given number • identify, represent and estimate numbers using different representations. • Solve number problems	**Number and place value** Ensure pupils continue to practise counting in units, tens and hundreds, so that they become fluent in the order and place value of numbers to 1000.
Addition and subtraction Pupils should be taught to: • add and subtract numbers with up to 3 digits, including using columnar addition and subtraction • estimate the answer to a calculation and use inverse operations to check answers. • accurately add and subtract numbers mentally including: pairs of one- and 2-digit numbers; 3-digit numbers and ones; 3-digit numbers and tens; 3-digit numbers and hundreds • solve word problems including missing number problems, using number facts, place value, and more complex addition and subtraction.	**Addition and subtraction** Ensure pupils continue to practise the use of column addition and subtraction with increasingly large numbers, using carrying for addition and borrowing for subtraction. For mental calculations with 2-digit numbers, answers should exceed 100.

Multiplication and division Pupils should be taught to: • recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables • write and calculate mathematical statements for multiplication and division within the multiplication tables; and for 2-digit numbers x 1-digit numbers, using mental and written methods • solve word problems involving the four operations, including missing number problems.	**Multiplication and division** Ensure pupils continue to practise regularly the mental recall of multiplication tables when they are calculating mathematical statements until they are confident to use them. Ensure pupils develop efficient mental methods. For example, pupils should use commutativity (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240) and multiplication and division facts (e.g. using 3 x 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3 to calculate 30 x 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3). Ensure pupils develop reliable written methods for multiplication and division, starting with calculations with 2-digit by 1-digit numbers and progressing to formal written methods. This helps prepare pupils for long multiplication from Year 4 and short and long division in Years 5 and 6.

NUMBER (+, -, x and ÷): Expectations for Year 4

Year 4 Programme of Study	Notes and Guidance
Number and place value Pupils should be taught to: • read and write numbers to at least 10,000 • recognise the place value of each digit in a 4-digit number (thousands, hundreds, tens, and ones) • order and compare numbers up to 10,000 • count in multiples of 2, 3, 4, 5, 6, 7, 8, 9, 10, 25, 50, 100 and 1000 from any given number, and 10, 100,1000 more or less than a given number • round any number to the nearest 10 ,100 or 1000 • read and write negative numbers; order, count forwards and backwards with positive and negative whole numbers through zero • read Roman numerals to 100 (I-C) and know that over time, the number system changed to include the concept of zero and place value • solve word problems that involve negative and increasingly large positive numbers.	**Number and place value** Ensure pupils continue to practise counting regularly so that they become fluent in the order and place value of numbers beyond 1000 and include regular practice counting in tens and hundreds. Ensure pupils read and write 4-digit numbers accurately, including the use of zero as a place holder. Ensure pupils are applying their mathematics, including completing number sequences and finding the difference. Roman numerals should be put in their historical context so pupils understand that there were different ways to write whole number and that Hindu-Arabic numerals introduced the important concept of zero and place value.
Addition and subtraction Pupils should be taught to: • add and subtract numbers using formal written methods with up to 4 digits • accurately add and subtract numbers mentally including two 2-digit numbers • estimate, within a range, the	**Addition and subtraction** Ensure pupils continue practising formal written methods and mental methods with increasingly large numbers, and include the terms 'sum' and 'difference'. For mental calculations, include increasingly large numbers, for example, 12,462 - 2,400 = 10,062 or 12,462 + 600 = 13,062.

answer to a calculation and use inverse operations to check answers. • Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.	Ensure pupils say and write the numbers correctly and with precision, so that they are clear about place value and confident when working with mental calculations. This will prepare them for Year 5, when pupils are taught to calculate the sum and difference of two decimal numbers (up to 2 decimal places).
Multiplication and division Pupils should be taught to: • recall multiplication and division facts for multiplication tables up to 12 x 12 • mentally perform multiplication and division calculations quickly and accurately, including multiplying by 0 and 1 and dividing by 1; multiplying together 3 numbers • multiply or divide 2-digit and 3-digit numbers by a 1-digit number using formal written methods; interpret remainders appropriately as integers • recognise and use factor pairs and commutativity within 144 • solve word problems involving the four operations.	**Multiplication and division** Ensure pupils continue to practise recalling and using multiplication tables and related division facts on a regular basis until they are confident using them mentally. Ensure pupils continue to practise mental methods and extend this to 3-digit numbers to derive facts, for example 300 x 2 = 600 into 600 ÷ 3 = 200. Pupils should also use the distributive law to derive facts, for example, 30 x 7 + 9 x 7= 39 x 7.

NUMBER (+, -, x and ÷): Expectations for Year 5

Year 5 Programme of Study	**Notes and Guidance**
Number, place value, approximation and estimation Pupils should be taught to: • read, write, order and compare numbers at least to 1,000,000 and determine the value of each digit • count forwards or backwards in steps of 100, 1000 or 10,000 for any given number up to 1,000,000 • round any number up to 1,000,000 to the nearest 10, 100, 1000, 10,000 and 100,000 • estimate the answers to calculations involving addition, subtraction, multiplication and division • 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.	**Number, place value, approximation and estimation** Ensure pupils continue to practise reading and saying regularly the place value of each digit in up to six digit numbers, including decimals.
Addition and subtraction Pupils should be taught to: • add and subtract whole numbers with up to 5 digits, including using formal written methods • add and subtract numbers mentally with increasingly large numbers. • Use rounding to check answers to calculations and determine, in the context of problem, levels of accuracy • Solve addition and subtraction	**Addition and subtraction** Ensure pupils continue practising formal written methods with increasingly large numbers so they are fluent and precise. This will aid the introduction of adding and subtracting with decimals in this year. Ensure pupils continue to practise fast responses for mental calculations with increasingly large numbers, for example: 12,462 – 2,300 = 10,162.

multi-step problems in contexts, deciding which operations and methods to use and why.	
Multiplication and division Pupils should be taught to: • identify multiples including common multiples, and factors including common factors (finding all factor pairs of a number and common factors of 2 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 the prime numbers up to 19 • multiply numbers up to 4-digits by a 1 or 2-digit number using a formal written method, including long multiplication • accurately multiply and divide numbers mentally drawing upon known facts • divide numbers up to 4 digits by a 1-digit number and 10 and interpret remainders appropriately using short division • multiply and divide numbers by 10, 100 and 1000 • recognise and use square numbers, cubed numbers and square roots and the notation for square and square root • solve word problems involving addition and subtraction, multiplication and division.	**Multiplication and division** Ensure pupils extend their use of written methods for multiplication to practise long multiplication. Also, ensure pupils continue to practise and apply all the multiplication tables and related division facts as often as possible to ensure they are committed to memory and can be used confidently to make larger calculations. Ensure pupils record answers for non-integer division in different ways, including: with remainders, fractions, decimals or with rounding, for example: 98 ÷ 4 = 24 r 2 = 24$\frac{1}{2}$ = 24.5 = 25. [

NUMBER (+, -, x and ÷): Expectations for Year 6

Year 6 Programme of Study	Notes and Guidance
Number, place value and rounding **Pupils should be taught to:** • read, write, order and compare numbers up to 10 million and determine the value of each digit • round any number to a required degree of accuracy • use negative numbers in context, and calculate intervals across zero	**Number, place value and rounding** Ensure pupils regularly practise saying, reading and writing numbers accurately. (Binary numerals could be introduced so pupils are familiar with the concept of place value using a different base)
Addition, subtraction, multiplication and division Pupils should be taught to: • add and subtract negative integers • multiply numbers with at least 4-digits by 2-digits of whole number using long multiplication • divide numbers up to 4-digits by a 2-digit whole number using long division, and interpret remainders as whole number remainders, fractions, decimals or by rounding • perform mental calculations, including with mixed operations and large numbers • use estimation to check answers to calculations and determine in the context of a problem whether an answer should be rounded, or written as a fraction or a decimal • identify common factors, common multiples and prime numbers	**Addition, subtraction, multiplication and division** Ensure pupils continue to practise calculating addition, subtraction, multiplication and division using formal written methods. Extend application of written methods to larger numbers. Ensure pupils continue to practise fast responses for mental calculations with increasingly large numbers and more complex calculations. Ensure pupils continue to use all the multiplication tables to calculate mathematical statements to maintain fluency. Include rounding answers to a specified degree of accuracy. For the order of operations include the use of brackets, for example: 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9.

• carry out combined operations involving the four operations accurately and state the order of operations • solve word problems involving addition, subtraction, multiplication and division, deciding which operations and methods to use and why.	

PROGRESSION THROUGH CALCULATIONS FOR ADDITION

MENTAL CALCULATIONS

These are a **selection** of mental calculation strategies:-

Mental recall of number bonds

6 + 4 = 10 □ + 3 = 10

25 + 75 = 100 19 + □ = 20

Use near doubles

6 + 7 = double 6 + 1 = 13

Addition using partitioning and recombining

34 + 45 = (30 + 40) + (4 + 5) = 79

Counting on or back in repeated steps of 1, 10, 100, 1000

86 + 57 = 143 (by counting on in tens and then in ones)

460 - 300 = 160 (by counting back in hundreds)

Add the nearest multiple of 10, 100 and 1000 and adjust

24 + 19 = 24 + 20 – 1 = 43

458 + 71 = 458 + 70 + 1 = 529

Use the relationship between addition and subtraction

36 + 19 = 55 19 + 36 = 55

55 – 19 = 36 55 – 36 = 19

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE.

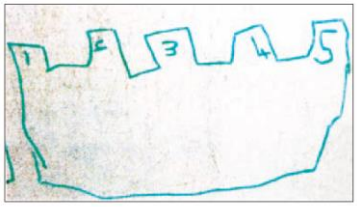
RECEPTION
EXEMPLIFICATIONS ELG 11- NUMBERS 2014

'B' proudly showed a spider she had made.

"Oh no! It's got 7 legs now. One must have fallen off. I'm going to glue another leg so that it's got 8 again."

Observation: Whilst playing with the rocket ship Christopher confidently said "10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0 blast off."

Observation: When playing in the shop Christopher was able to use his shopping list to add 2 amounts. He said "the beans are 5 pence and the bananas are 3 pence, altogether that is 8 pence."



After looking at one more and one less when counting. Hakima drew this fantastic castle on the whiteboard with five turrets. She wrote the numbers 1-5, placing one number in each turret in order.

There is a whole school football tournament to celebrate the World Cup. Each team needs 5 players. On getting ready to start, it is noticed that England have 6 players, while one child playing for Japan is away.

Child A says "I know! If you take one from the England team and put them in the Japan team it will be fair and we will all have 5 players."

Notes

Here is Hattie's leg! She counted how many stripes there were on her tights! Hattie counted 8 stripes and she told me that if she showed one more, then there would be 9 stripes.

Next steps

If you covered up one stripe, then there would be one less. How many is that Hattie?

C put two wheels on one side of his lorry. Now double it. He put two on the other side. "That's four"

Observation of: Josh

Area of Learning: PSED PD CL L (M) UW EAD

Social setting: Child initiated Adults/ Peers

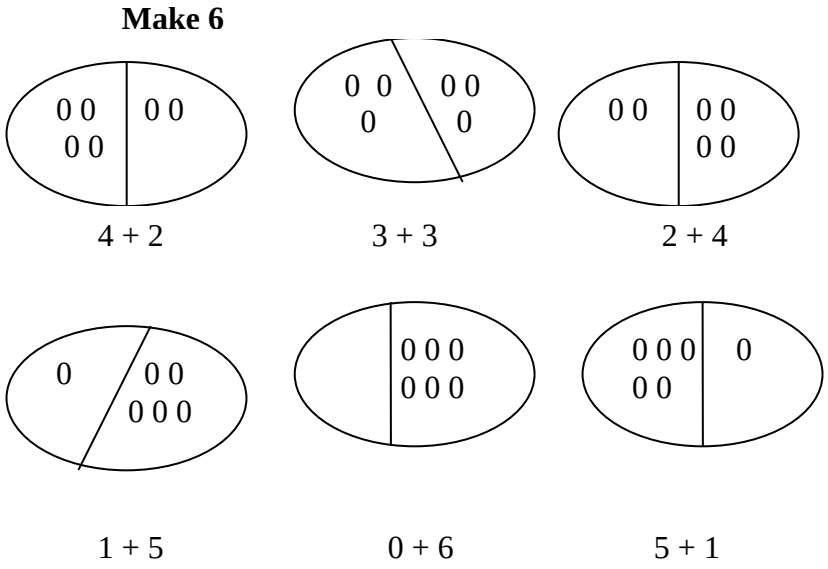
Context: Playdough and toy owls had been left out following an adult led activity the previous day Photo/ Work

Josh rolled out four playdough worms. Then said "one for you, one for you, one for you, one for you. Two each, that's fair!" He then repeated the same process for six playdough worms. Giving the owls three each.

Mia shared 10 frogs equally between 2 lilypads. "half of 10 is 5, 5 on that pad and 5 on this one, that's fair."

Y1

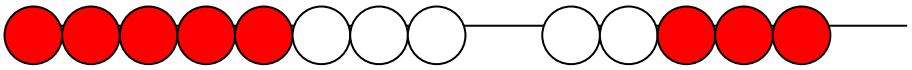
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.



Children will also be encouraged to write matching number sentences 2+4, 3+3, 4+2 etc…..

Children in Reception and Year 1 use Numicon which is a quality teaching approach designed to give children the understanding of number ideas and number relationships that are essential for success in maths. They use a series of structured patterns - Numicon shapes - to represent numbers, as part of a progressive teaching programme.

Bead strings or bead bars can be used to illustrate addition such as 8 add 5 more.

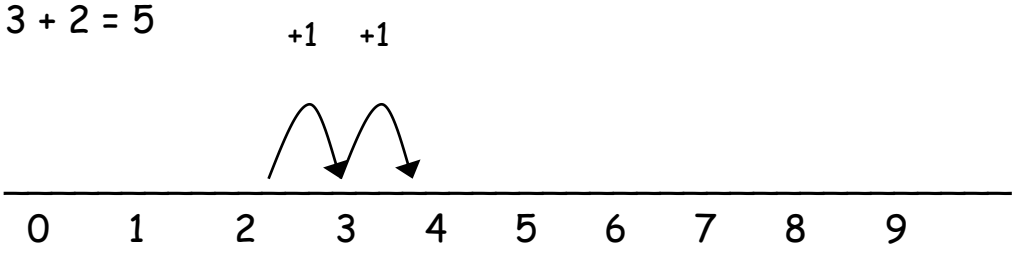


In reception, children are provided with number lines to 20 so that they can physically move small objects such as teddy bears along them.

Year 1

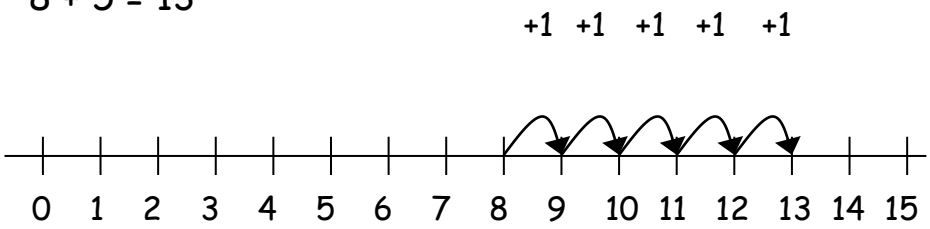
They then progress to use number lines and practical resources to support calculation and teachers *demonstrate* the use of the number line. Blank number lines are also used which encourage the children to write out their own numbers.

3 + 2 = 5



Children then begin to use numbered lines to support their own calculations. Also often used by the teacher as a demonstration method. **Children record the number sentence in their books**

8 + 5 = 13

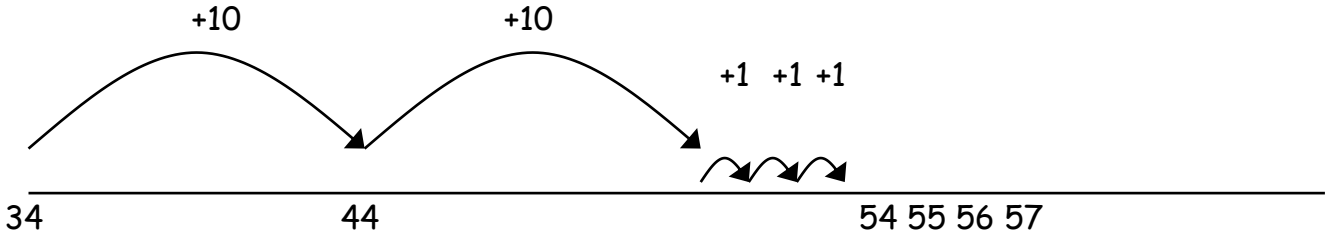


Y2

Children will begin to use 'empty number lines' themselves starting with the larger number and counting on.

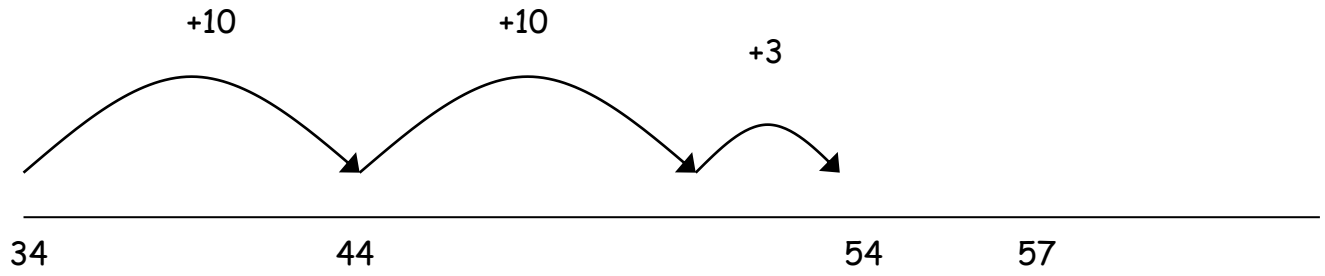
- ✓ First counting on in tens and ones.

34 + 23 = 57



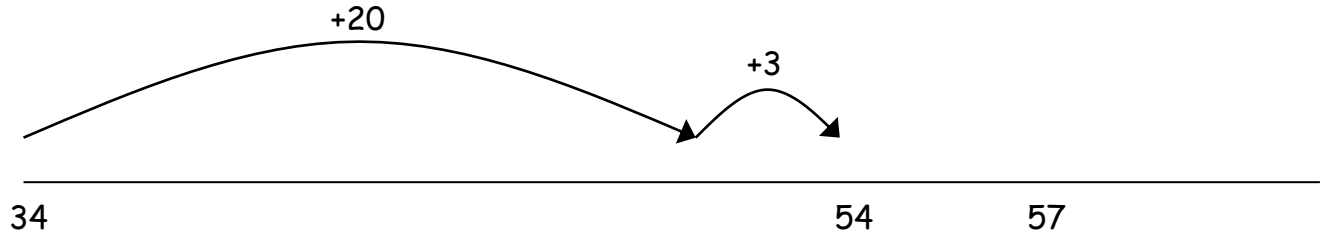
✓ Then helping children to become more efficient by adding the units in one jump. (using the known fact 4 + 3 = 7).

34 + 23 = 57



✓ Followed by adding the tens in one jump and the units in one jump.

34 + 23 = 57



✓ Using base 10 to bridge through ten can help children become more efficient.

37 + 15 = 52

More able children in Year 2 should be able to move onto the standard written method without carrying.

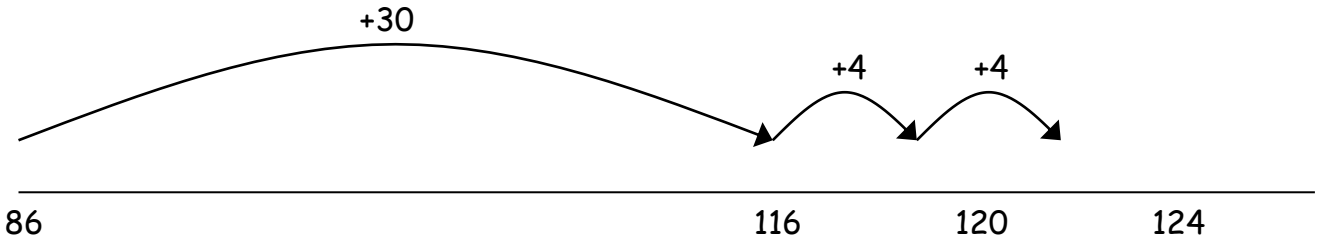
$$\begin{array}{r} 34 \\ +23 \\ \hline 57 \end{array}$$

Y3

Children will continue to use empty number lines with increasingly large numbers, including compensation where appropriate.

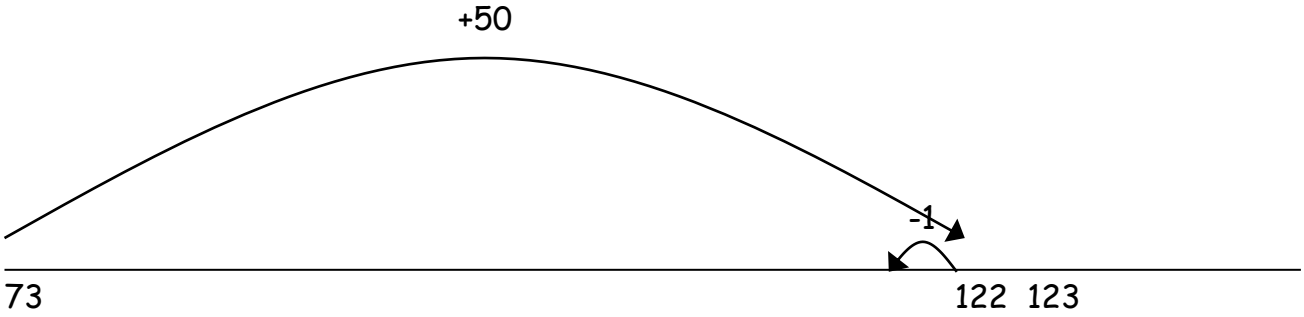
✓ Count on from the largest number irrespective of the order of the calculation.

38 + 86 = 124



✓ Compensation

49 + 73 = 122



Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

Option 1 – adding the least significant digits first in preparation for 'carrying'

```
  67
+ 24
  11  (7 + 4)
  80  (60 + 20)
  91
```

```
  67
+ 85
  12  ( 7  +  5)
 140  (60 + 80)
+200
 352
```

By the end of Y3:-

(If children can understand this standard method, they should by-pass the expanded method shown above)

From this, children will begin to carry below the line.

```
  625        783        367
+  48      +  42      +  85
 673        825        452
  1          1          1 1
```

Using similar methods, children will:

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds;*
- ✓ *know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p.*

Y4

Children should extend the carrying method to numbers with at least four digits (or beyond).

```
  587        3587
+ 475      +  675
 1062       4262
  1 1        1 1 1
```

Using similar methods, children will:

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more decimal fractions with up to three digits and the same number of decimal places;*
- ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 3.2 m – 280 cm.*

Y5/6

Children should extend the carrying method to number with any number of digits.

7648	6584	42
+ 1486	+ 5848	6432
9134	12432	786
1 1 1	1 1 1	3
		+ 4681
		11944
		1 2 1

Using similar methods, children will

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more decimal fractions with up to four digits and either one or two decimal places;*
- ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 401.2 + 26.85 + 0.71.*

+ - + - + - + - + - + - +

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

A) They are not ready.
B) They are not confident.

Children should be encouraged to approximate their answers before calculating.

Children should be encouraged to check their answers after calculation using an appropriate strategy.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

PROGRESSION THROUGH CALCULATIONS FOR SUBTRACTION

MENTAL CALCULATIONS

These are a **selection** of mental calculation strategies:-

Mental recall of addition and subtraction facts

10 – 6 = 4 17 - □ = 11

20 - 17 = 3 10 - □ = 2

Find a small difference by counting up

82 – 79 = 3

Counting on or back in repeated steps of 1, 10, 100, 1000

86 - 52 = 34 (by counting back in tens and then in ones)

460 - 300 = 160 (by counting back in hundreds)

Subtract the nearest multiple of 10, 100 and 1000 and adjust

24 - 19 = 24 - 20 + 1 = 5

458 - 71 = 458 - 70 - 1 = 387

Use the relationship between addition and subtraction

36 + 19 = 55 19 + 36 = 55

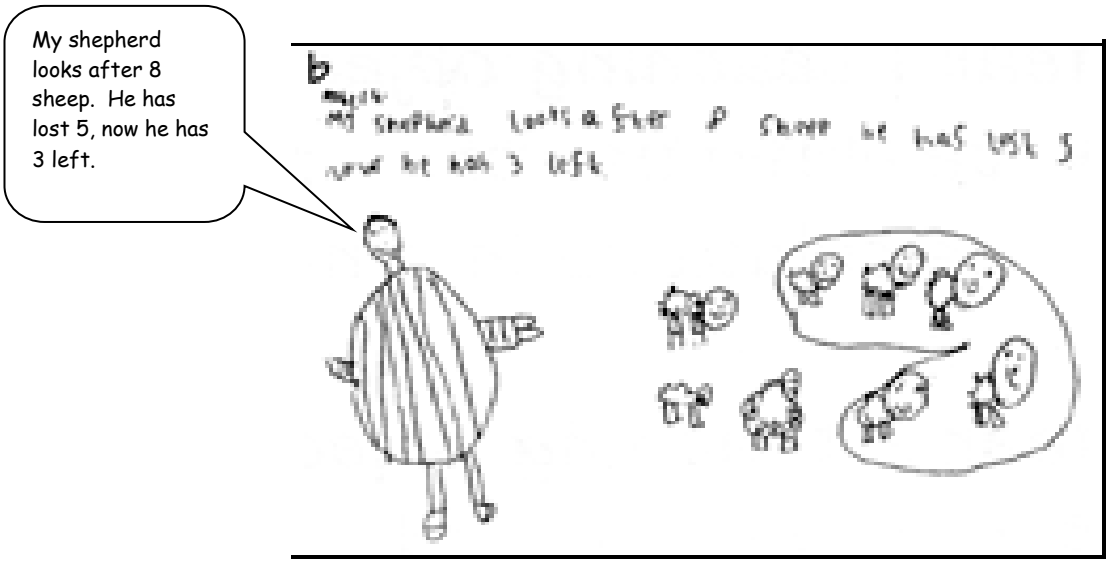
55 – 19 = 36 55 – 36 = 19

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE.

YR and Y1

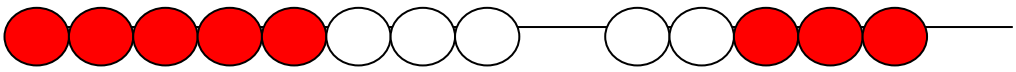
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures etc.



Reception children would then record this as 8 -5 = 3

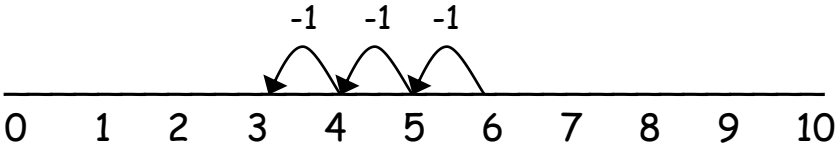
Bead strings or bead bars can be used to illustrate subtraction.

13 – 5 = 8

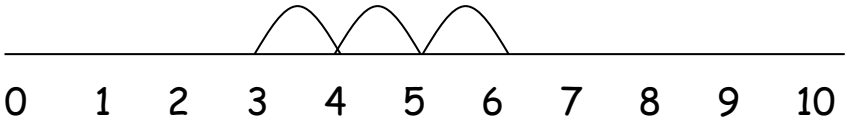


They use number lines and practical resources to support calculation. **Teachers *demonstrate*** the use of the number line. **(In reception children would be shown jumps back without the -1 written above, they would use practical equipment and record the number sentence)**

Children will record:- 6 - 3 = 3



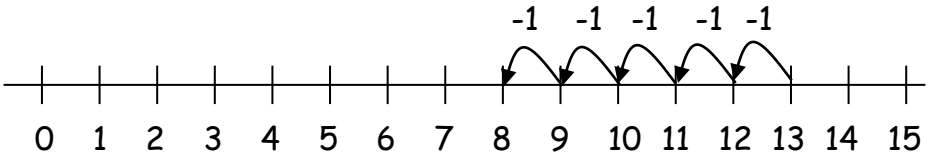
The number line should also be used to show that 6 - 3 means the 'difference between 6 and 3' or 'the difference between 3 and 6' and how many jumps they are apart.



In reception children will find difference by also using Numicon blocks and graphs.

Children then begin to use numbered lines to support their own calculations - using a **numbered** line to count back in ones.

13 – 5 = 8



Bead strings or bead bars can be used to illustrate subtraction including bridging through ten by counting back 3 then counting back 2.

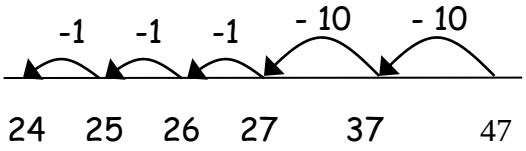
Y2

Children will begin to use empty number lines to support calculations.

Counting back

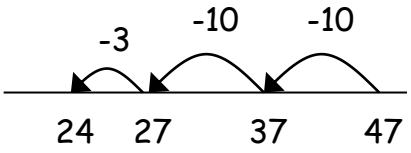
- ✓ First counting back in tens and ones.

47 – 23 = 24



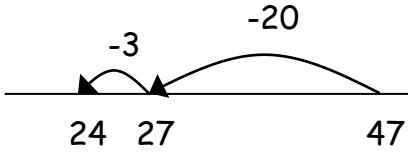
- ✓ Then helping children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4).

47 – 23 = 24



- ✓ Subtracting the tens in one jump and the units in one jump.

47 – 23 = 24



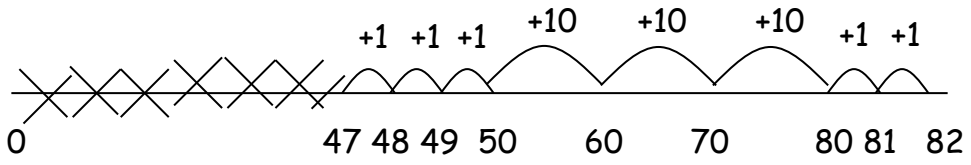
Counting on

If the numbers involved in the calculation are close together or near to multiples of 10, 100 etc, it can be more efficient to count on.

Count up from 47 to 82 in jumps of 10 and jumps of 1.

The number line should still show 0 so children can cross out the section from 0 to the smallest number. They then associate this method with 'taking away'.

82 - 47



Help children to become more efficient with counting on by:

- ✓ Subtracting the units in one jump;
- ✓ Subtracting the tens in one jump and the units in one jump;
- ✓ Bridging through ten.

Y3

Children will continue to use empty number lines with increasingly large numbers.

Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

Partitioning and decomposition

This process should be demonstrated using arrow cards to show the partitioning. *Initially, the children will be taught using examples that do not need the children to exchange. Once confident,* children should then progress to use practical base 10 materials to exchange.

From this the children will begin to exchange.

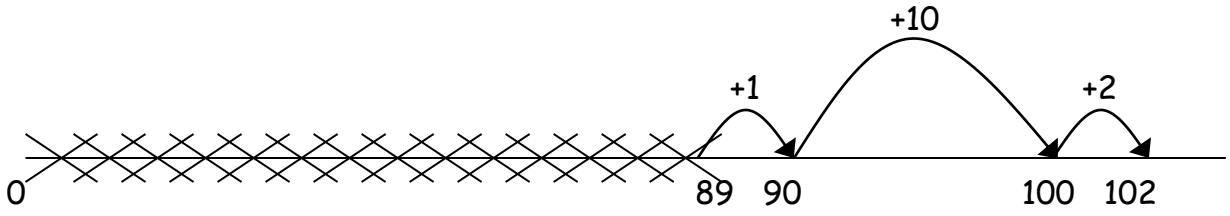
Using base 10, this would be recorded by the children as

$$\begin{array}{rrcl} & {\scriptstyle 60} & & \\ & \cancel{70} & + & {}^{1}1 \\ - & 40 & + & 6 \\ \hline & 20 & + & 5 \quad = 25 \end{array}$$

Children should know that units line up under units, tens under tens, and so on.

Where the numbers involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

102 – 89 = 13



By the end of Y3:-

Children should be ready for the compact method of decomposition of Tens and units.

$$\begin{array}{r} {\scriptstyle 2\ 1} \\ \cancel{3}6 \\ \underline{-18} \\ \underline{1\ 8} \end{array}$$

Year 4

Children should be confident at compact decomposition and be able to subtract larger numbers

```
  6 14 1
   7 5 4
 -   8 6
   6 6 8
```

Children should:

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *using this method, children should also begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds;*
- ✓ *know that decimal points should line up under each other.*

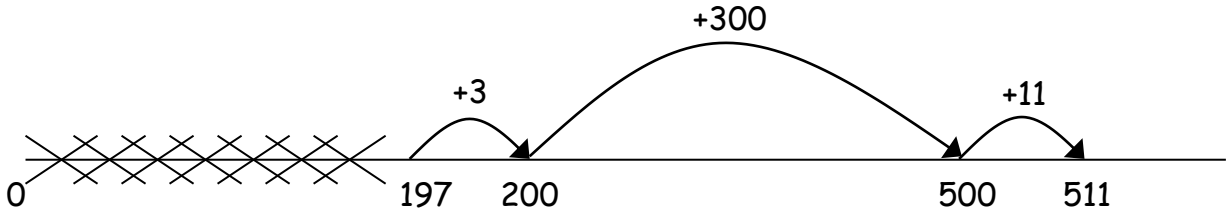
For example

```
    8 1
   8.9 5
 - 4.3 8
   4.5 7
```

NB. If children have reached the concise stage, they will then continue this method through into years 5 and 6. They will not go back to using the expanded methods.

Where the numbers involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

511 – 197 = 314



Y5

Decomposition should be secure, if not, revert to expanded method demonstrated at the end of Year 3.

```
  614 1
   7 ⅛4
 - 286
   468
```

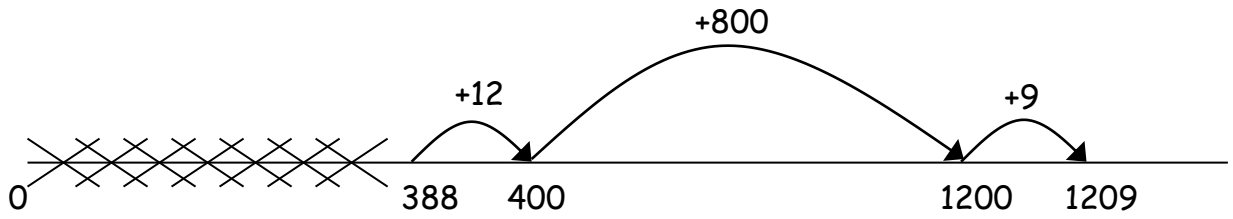
Children should:

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *begin to find the difference between two decimal fractions with up to three digits and the same number of decimal places;*
- ✓ *know that decimal points should line up under each other.*

NB. If children have reached the concise stage, they will then continue this method through into year 6. They will not go back to using the expanded methods.

Where the numbers involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

1209 – 388 = 821



Y6

Continue to confidently use decomposition with increasingly larger numbers.

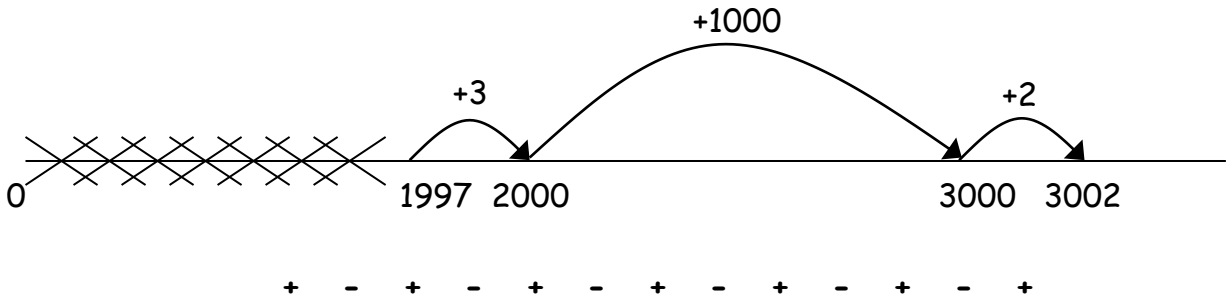
$$\begin{array}{r} {\scriptstyle 5\ 13\ 1} \\ 6\not{4}67 \\ -\ 2684 \\ \hline 3783 \end{array}$$

Children should:

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *be able to subtract two or more decimal fractions with up to three digits and either one or two decimal places;*
- ✓ *know that decimal points should line up under each other.*

Where the numbers involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

3002 – 1997 = 1005



By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

A) They are not ready.
B) They are not confident.

Children should be encouraged to approximate their answers before calculating.
Children should be encouraged to check their answers after calculation using an appropriate strategy.
Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

PROGRESSION THROUGH CALCULATIONS FOR MULTIPLICATION

MENTAL CALCULATIONS

These are a **selection** of mental calculation strategies:-

Doubling and halving
Applying the knowledge of doubles and halves to known facts.
e.g. 8 x 4 is double 4 x 4

Using multiplication facts

Tables should be taught everyday from Y2 onwards, either as part of the mental oral starter or other times as appropriate within the day.

Year 2 2 times table
5 times table
10 times table
3 times table

Year 3 2 times table
3 times table
4 times table
5 times table
6 times table
8 times table
10 times table

Year 4 Derive and recall all multiplication facts up to 12 x 12
Years 5 & 6 Confidently derive and recall quickly all multiplication facts up to 12 x 12.

It is particularly important that division facts are taught alongside multiplication facts.

Using and applying division facts
Children should be able to utilise their times tables knowledge to derive other facts.
e.g. If I know 3 x 7 = 21, what else do I know?
30 x 7 = 210, 300 x 7 = 2100, 3000 x 7 = 21 000, 0.3 x 7 = 2.1 etc

Use closely related facts already known
13 x 11 = (13 x 10) + (13 x 1)
= 130 + 13
= 143

Multiplying by 10 or 100
Knowing that the effect of multiplying by 10, is a shift in the digits one place to the left.
Knowing that the effect of multiplying by 100, is a shift in the digits two places to the left.

Partitioning
23 x 4 = (20 x 4) + (3 x 4)
= 80 + 12
= 102

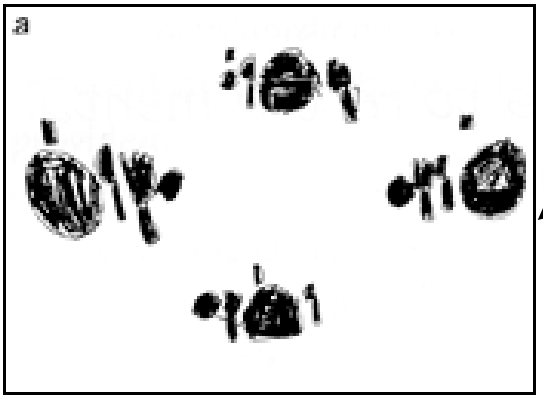
Use of factors
8 x 12 = 8 x 4 x 3

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE.

YR and Y1

Children will experience equal groups of objects and will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.



Children will group items in role play eg setting the table for Goldilocks and the Three Bears.

In reception there will be lots of practical work through stories which involve sharing and doubling.
They are taught to use the vocabulary – 'double' rather than 'times'.

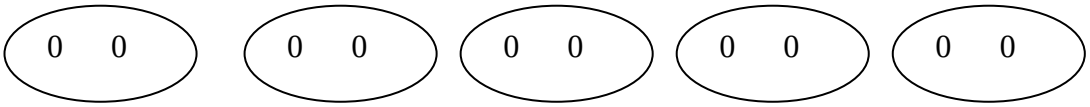
Year 1

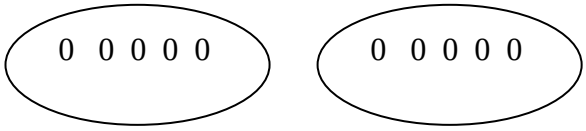
Children will begin to write simple calculations as repeated addition

- ✓ **Repeated addition**

2x5 is 2+2+2+2+2= 10
or 5x2 is 5+5 = 10

Use of arrays to demonstrate working out:-





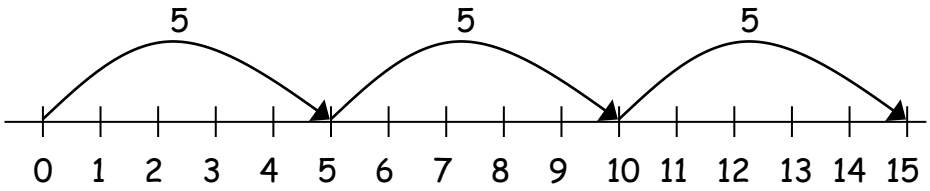
Children will continue to develop their understanding of multiplication and use jottings to support calculation:

- ✓ **Repeated addition**

5 times 3 is 5 + 5 + 5 = 15 or 3 lots of 5 or 3 x 5

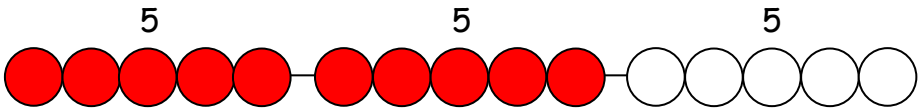
Repeated addition can be shown easily on a number line:

5 x 3 = 5 + 5 + 5



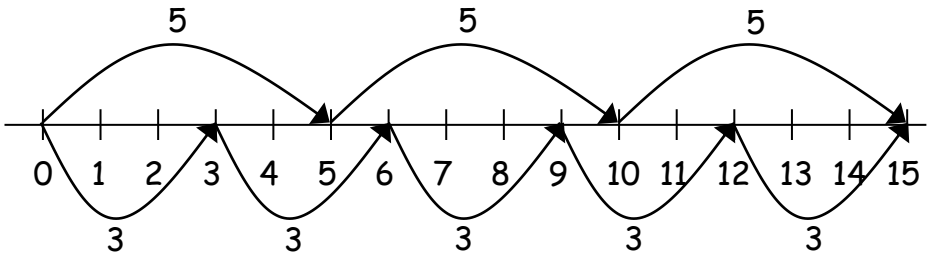
and on a bead bar:

5 x 3 = 5 + 5 + 5



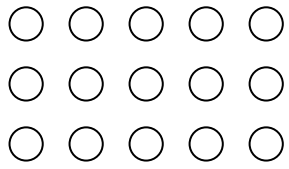
✓ **Commutativity**

Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.



✓ **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



5 x 3 = 15

3 x 5 = 15

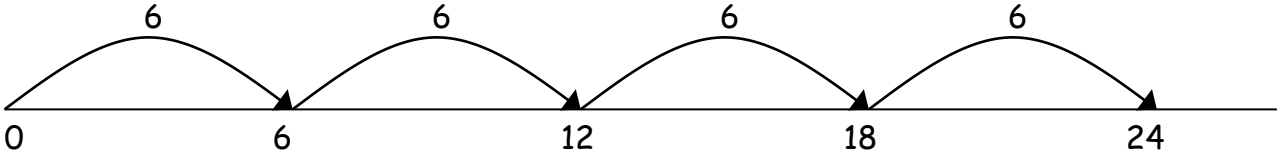
Y3

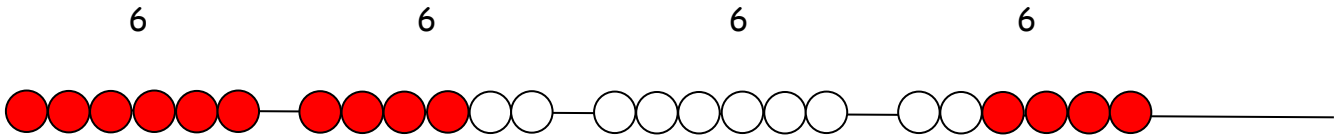
Children will continue to use:

✓ **Repeated addition**

6 times 4 is 6 + 6 + 6 + 6 = 24 or 4 lots of 6 or 6 x 4

Children should use number lines or bead bars to support their understanding.





✓ **Arrays**

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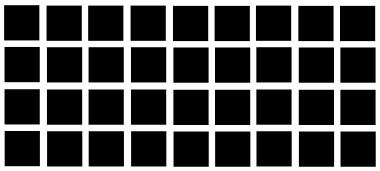


4 x 9 = 36

9 x 4 = 36

Children will also develop an understanding of

✓ **Scaling**

e.g. Find a ribbon that is 4 times as long as the small one:-

5 cm

20 cm

✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

□ x 5 = 20 3 x △ = 18 □ x 4 = 32

✓ **Partitioning**

38 x 5 = (30 x 5) + (8 x 5)

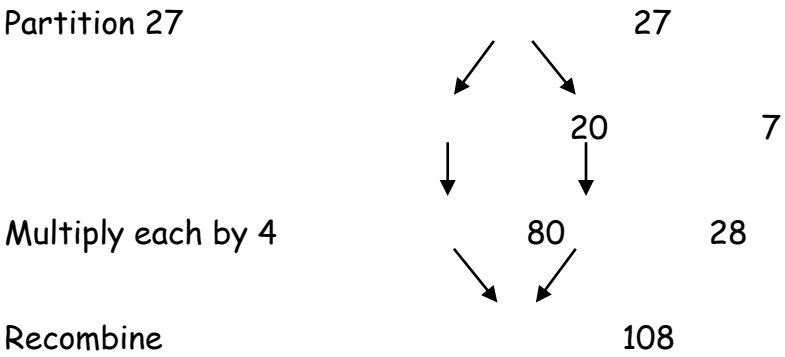
= 150 + 40
= 190

✓ **Expanded Method**

```
  36
X  5
  30
+150
 180
```

Diamond Method

TU x U Partitioning method (e.g. 27 x 4)



(You can use the same method for HTU x U)

The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and one efficient written method of calculation for multiplication and division which they know they can rely on when mental methods are not appropriate. These notes show the stages in building up to using an efficient written method for multiplication and division of whole numbers **for the vast majority of children** by the end of Year 4.

To multiply and divide successfully, children need to be able to:

- recall multiplication tables quickly and accurately alongside their corresponding division facts
- understand from an early stage that multiplication is repeated addition and to see this illustrated in diagrams and written in numbers
- understand from an early stage that division is repeated subtraction and to see this illustrated in diagrams and written in numbers
- multiply and divide numbers by 10 and 100 as well

- have a clear understanding of partitioning numbers and estimating answers
- multiply multiples of 10 and 100
- understand that sharing and the grouping are both ways of solving division problems
- deal with remainders accurately and in context

Note: It is important that children's mental methods of calculation are practised and secured alongside their learning and use of efficient written methods for multiplication and division.

Multiplication methods

TU x U Partitioning method (e.g. 27 x 4)

Partition 27 → 27 → 20 and 7

Multiply each by 4 → 80 and 28

Recombine → 108

(You can use the same method for HTU x U)

TU x U Grid method (e.g. 47 x 8)

Begin by partitioning the number with the greatest number of digits down the left hand side.

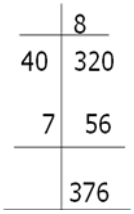
	8
40	320
7	56
	376

(Use the same method for HTU x U.)

Formal method (Y4)
TU x U (e.g. 47 x 8)

Model the calculation methods side by side so that children can see the links.

(You can use base 10 materials to show the 47)



47
x 8
56
320
376

47
x 8
376
5

(Only if necessary)

Y4/5/6

(Some more able children will be able to use the grid method to multiply decimals as shown in Year 6 section)

Grid method
TU x TU
(Long multiplication – multiplication by more than a single digit)

72 x 38

Children will approximate first
72 x 38 is approximately 70 x 40 = 2800

x	70	2
30	2100	60
8	560	16

2100
+ 560
+ 60

$$\begin{array}{r} +\quad 16 \\ \hline 2736 \\ \hline {\scriptstyle 1} \end{array}$$

HTU x TU
(Long multiplication – multiplication by more than a single digit)

372 x 24

Children will approximate first
372 x 24 is approximately 400 x 25 = 10000

x	300	70	2
20	6000	1400	40
4	1200	280	8

$$\begin{array}{r} 6000 \\ +\ 1400 \\ +\ 1200 \\ +\ 280 \\ +\ 40 \\ +\ 8 \\ \hline 8928 \\ \hline {\scriptstyle 1} \end{array}$$

Using similar methods, they will be able to multiply decimals with up to two decimal places by a single digit number and then two digit numbers, approximating first.

e.g. 4.9 x 3

Children will approximate first
4.9 x 3 is approximately 5 x 3 = 15

x	3
4	12
0.9	+ 2.7
	14.7

4.92 x 3

Children will approximate first
4.92 x 3 is approximately 5 x 3 = 15

x	3
4	12
0.9	+ 2.7
0.02	+ 0.06
	14.76

+ - + - + - + - + - + - +

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

A) They are not ready.
B) They are not confident.

Children should be encouraged to approximate their answers before calculating.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

PROGRESSION THROUGH CALCULATIONS FOR DIVISION

MENTAL CALCULATIONS

These are a **selection** of mental calculation strategies:

Doubling and halving
Knowing that halving is dividing by 2

Deriving and recalling division facts

Tables and their division facts should be taught everyday from Y2 onwards, either as part of the mental oral starter or other times as appropriate within the day.

Year 2
- 2 times table
- 5 times table
- 10 times table
- 3 times table

Year 3
- 2 times table
- 3 times table
- 4 times table
- 5 times table
- 6 times table
- 8 times table
- 10 times table

Year 4 Derive and recall division facts for all tables up to 12 x 12

Year 5 & 6 Confidently derive and recall quickly division facts for all tables up to 12 x 12

Using and applying division facts
Children should be able to utilise their times tables knowledge to derive other facts.
e.g. If I know 3 x 7 = 21, what else do I know?
21 ÷ 3= 7, 21 ÷ 7 = 3 etc

Dividing by 10 or 100
Knowing that the effect of dividing by 10, is a shift in the digits one place to the right.
Knowing that the effect of dividing by 100, is a shift in the digits two places to the right.

Use of factors

378 ÷ 21 378 ÷ 3 = 126
Then; 126 ÷ 7 = 18

Therefore 378 ÷ 21 = 18

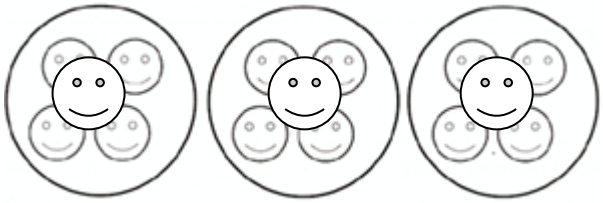
Use related facts
Given that 1.4 x 1.1 = 1.54
What is 1.54 ÷ 1.4, or 1.54 ÷ 1.1?

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE.

YR and Y1

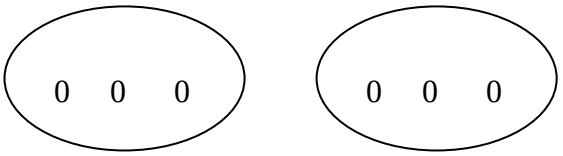
Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s. Reception children will be taught to count 2,4,6,etc…
5,10,15,20 etc…..



They will be taught to solve problems involving doubling, halving and sharing (simple fractions) in context eg half a pizza, half a cake etc……

Year 1

6 sweets shared between 2 people, how many do they each get? 6 ÷ 2 = 3

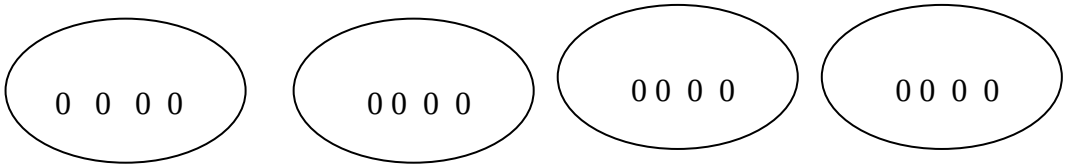


Y2

Children will develop their understanding of division and use jottings to support calculation

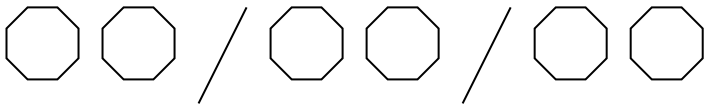
- ✓ **Sharing equally**

16 sweets shared between 4 people, how many do they each get? 16 ÷ 4 = 4



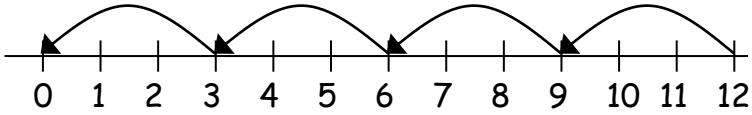
✓ **Grouping or repeated subtraction**

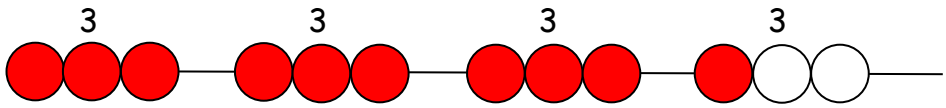
There are 6 sweets, how many people can have 2 sweets each?



✓ **Repeated subtraction using a number line or bead bar**

12 ÷ 3 = 4





The bead bar will help children with interpreting division calculations such as 10 ÷ 5 as 'how many 5s make 10?'

✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

□ ÷ 2 = 4 20 ÷ △ = 4 □ ÷ △ = 4

Y3

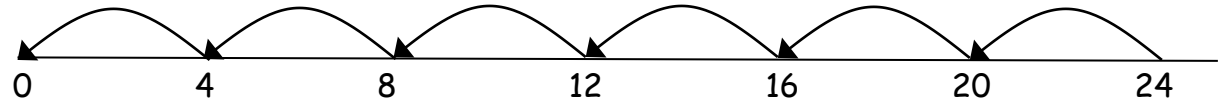
Ensure that the emphasis in Y3 is on grouping rather than sharing.

Children will continue to use:

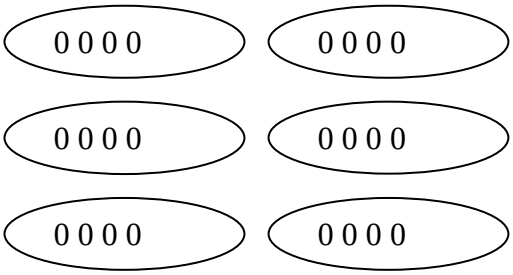
- ✓ **Repeated subtraction using a number line**

Children will use an empty number line to support their calculation.

24 ÷ 4 = 6

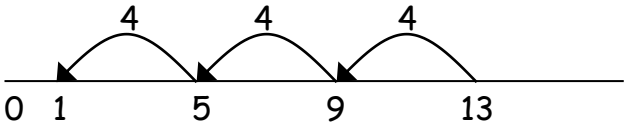


OR:-



Children should also move onto calculations involving remainders.

13 ÷ 4 = 3 r 1

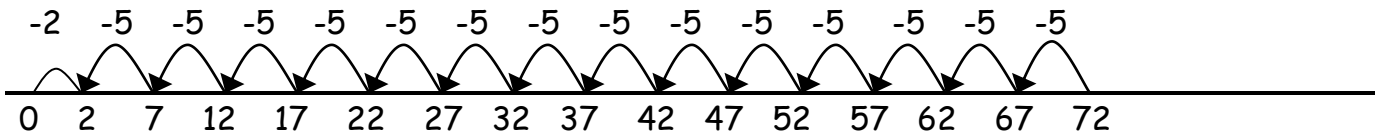


- ✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

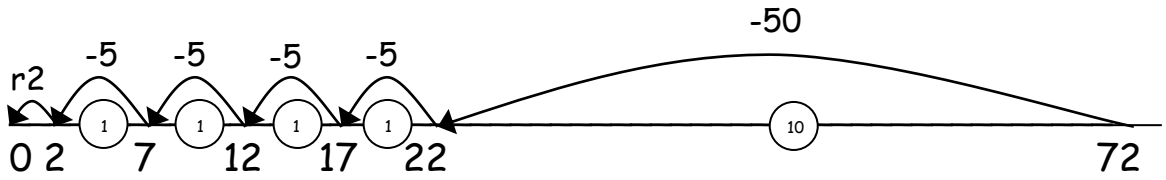
26 ÷ 2 = □ 24 ÷ △ = 12 □ ÷ 10 = 8

Children will develop their use of repeated subtraction to be able to subtract multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar.

72 ÷ 5



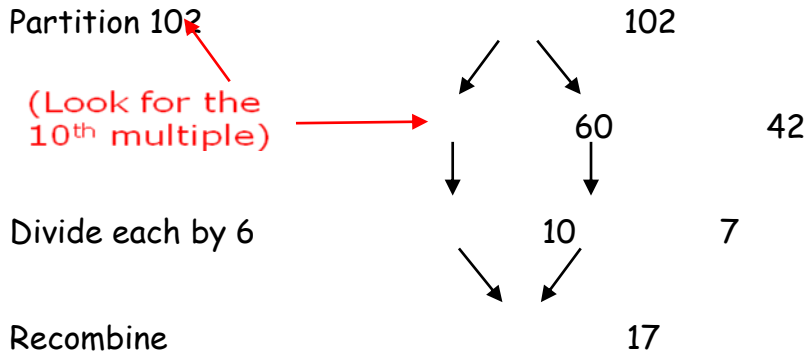
Moving onto:



Year 4

Division methods

TU ÷ U and HTU ÷ U: Partitioning method (e.g. 102 ÷ 6)



By year 4, children should consolidate the methods taught in year 3 and be ready to move onto the standard vertical method:

Short division TU ÷ U

72 ÷ 3

$$\begin{array}{r} 24 \\ 3\overline{)\,7_{1}2} \end{array}$$

96 ÷ 6

$$\begin{array}{r} 16 \\ 6\overline{)\,9_{3}6} \end{array}$$

Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to be able to decide what to do after division and round up or down accordingly.
They should make sensible decisions about rounding up or down after division. For example 62 ÷ 8 is 7 remainder 6, but whether the answer should be rounded up to 8 or rounded down to 7 depends on the context.

e.g. I have 62p. Sweets are 8p each. How many can I buy?
Answer: 7 (the remaining 6p is not enough to buy another sweet)

Apples are packed into boxes of 8. There are 62 apples. How many boxes are needed?
Answer: 8 (the remaining 6 apples still need to be placed into a box)

Y5

Children will continue to use written methods to solve short division TU ÷ U.

Children can start to subtract larger multiples of the divisor, e.g. 30x

Short division HTU ÷ U

196 ÷ 6

```
      32 r 4
   ------
6 ) 1916
```

Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to be able to decide what to do after division and round up or down accordingly.

They should make sensible decisions about rounding up or down after division. For example 240 ÷ 52 is 4 remainder 32, but whether the answer should be rounded up to 5 or rounded down to 4 depends on the context.

Y6

Children will continue to use written methods to solve short division TU ÷ U and HTU ÷ U.

Long division HTU ÷ TU

972 ÷ 36

```
      27
   ------
36 ) 972
    -72
     252
```

Any remainders should be shown as fractions, i.e. if the children were dividing 32 by 10, the answer should be shown as $3\ ^{2}/_{10,}$ which could then be written as $3\ ^{1}/_{5}$ in it's lowest terms.

Extend to decimals with up to two decimal places. Children should know that decimal points line up under each other.

87.5 ÷ 7

```
    12.5
7 ) 87.5
  - 84
    3.5
```

+ - + - + - + - + - + - +

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

A) They are not ready.
B) They are not confident.

Children should be encouraged to approximate their answers before calculating.

Children should be encouraged to check their answers after calculation using an appropriate strategy.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.