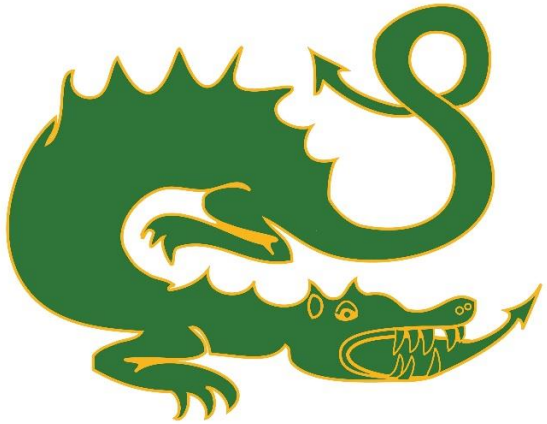
# Leechpool Primary School Calculation Policy

Next Review: December 2024



**Leechpool Primary School**

**Leechpool Lane**

**Horsham**

**West Sussex**

**RH13 6AG**

**"Tell me and I forget. Teach me and I remember. Involve me and I learn." – Benjamin Franklin**

This policy is a framework of expectations for how children should be taught to develop their understanding of the 4 operations at Leechpool. It has been developed to support a teaching for mastery approach. Solid mathematical understanding in every child at Leechpool is underpinned by each child's journey through the concrete➔pictorial➔abstract (written methods). This policy is a guide through the appropriate progression of written calculation and if at any time a child is struggling with the abstract a child should revert to the pictorial or concrete to aid their solving of problems, where appropriate. It is vital that children are using a strategy that is appropriate to their **stage of learning**. As a result this may result in them using a strategy that is found in a different age group.

**Foundations**- Five Principles of Number

| Principle | Success criteria | Context |
|---|---|---|
| Stable order principle | Can say some number names when asked to count. | Counting objects as they are put out on a table for art, role play, games.... Counting children in a group. Counting around a group up to a target number. |
| | Can join in with saying number names in order. | |
| | Can say number names in order to 10 starting with 0. | |
| | Can say number names in order to 20 starting with 0. | |
| One to one principle | Can point to objects as a number name is being said. | Moving counting objects from a pot into a tub as they are counted. Holding objects in hand and placing them down on the table one by one saying the number each time. Counting beads along a bead string. |
| | Can move objects as the number names are being said one at a time. | |
| | Can point to each object (or move it) only once as it is being counted. | |
| Cardinal principle | Can respond to "how many?" by saying number names in order and knowing last number said is how many. | Using pointing or moving strategy count sets of counters, pencils, paperclip, leaves, bean bags… |
| | Can repeat how many are in the set without having to recount it. | |
| Order irrelevance principle | Can say how many are in a set despite having the set rearranged between requests. | Practise making and moving sets of objects without adding or taking any away. Make patterns and pictures using counted sets. Make sets using objects of mixed varying sizes. |
| Abstraction principle | Can count a series of claps, coin drops (to 10/20). | Practise saying number names in order to a signal such as a clap, wave, nod… Count actions as well as objects, count words on a page, words spoken, foot tapped… Play "my turn your turn" for showing a target number. |
| | Can count a series of own actions, e.g. jumps, clap? | |

Place value should only be taught once the five principles of number are secure.

## Vocabulary

Children should be introduced to the correct mathematical language at the earliest opportunity. The following language can be used within calculations.

**Addend**- a number which is added to another

**Sum/Total**- the total amount resulting from the addition of two or more numbers, amounts, or items.

**Minuend**- a quantity or number from which another is to be subtracted.

**Subtrahend**- a quantity or number to be subtracted from another.

**Difference**- the result of subtracting one number from another.

**Multiplicand**- a quantity which is to be multiplied by another.

**Multiplier**- a quantity by which a given number is to be multiplied.

**Product**- the result of multiplying.

**Dividend**- a number to be divided by another number.

**Divisor**- a number by which another number is to be divided.

**Quotient**- a result obtained by dividing one quantity by another.

Addend + addend = sum or total

Minuend – subtrahend = difference

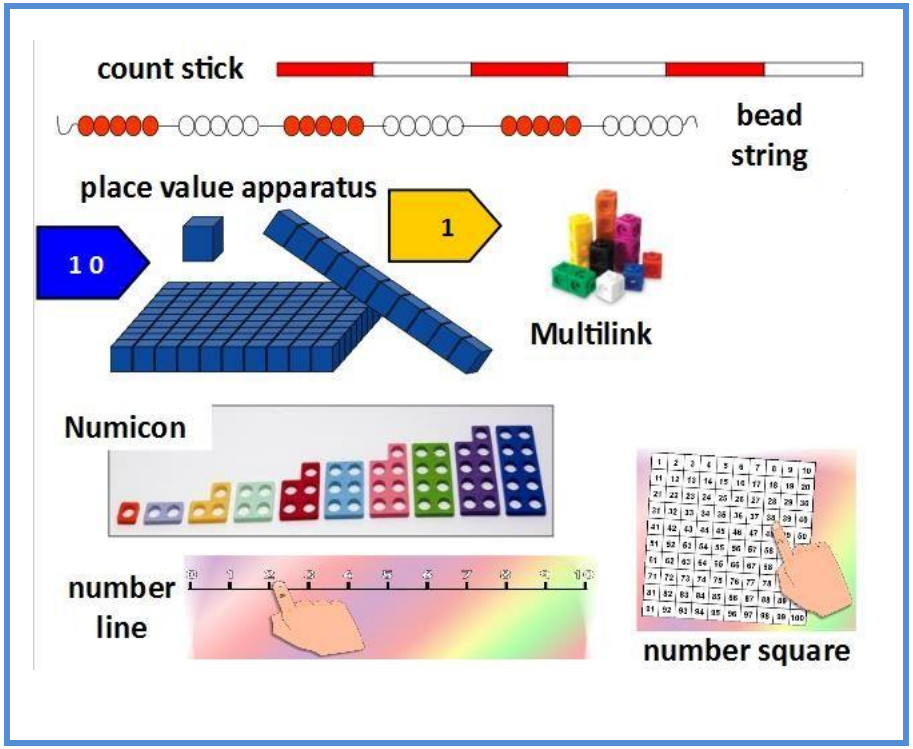
Multiplicand x multiplier = product

Dividend ÷ divisor = quotient

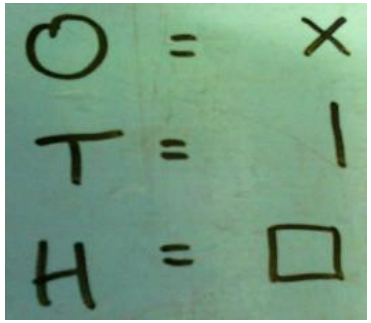
Subject specific language can be found at the end of each calculation section. ***Posters for all four operations can be found in appendix 1.***

## Resources

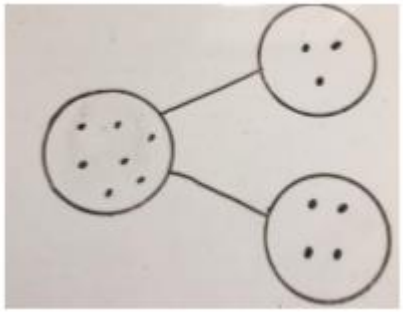
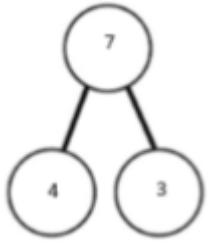
A range of resources may be used however the following should be available to all children.




**Pictorial jottings- The** following representations should be used for pictorial representations by teachers and by children when working in their books.



# Written Methods for Addition

| YEAR GROUP & RELEVANT OBJECTIVES | STRATEGY | CONCRETE | PICTORIAL | ABSTRACT / WRITTEN |
|---|---|---|---|---|
| Y1: Add one-digit numbers to 20 including 0<br>Y1: Add two-digit numbers to 20<br><br>Y2: Add numbers using concrete objects and pictorial representations, including adding three one-digit numbers | Aggregation – combining two parts to make a whole | 3+4=<br>  <br>Possible resources: cubes, numicon, teddies, etc. |  <br>  <br>Part-whole model where the numbers are represented by dots | 4 + 3 = 7<br>  |

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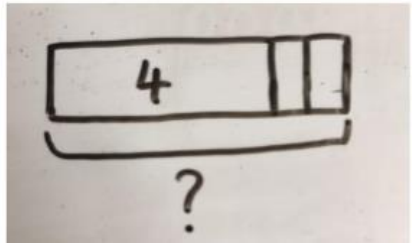
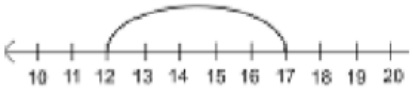
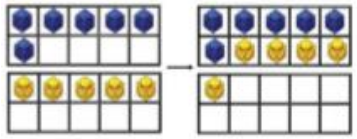
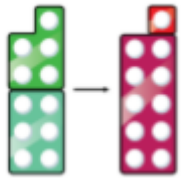
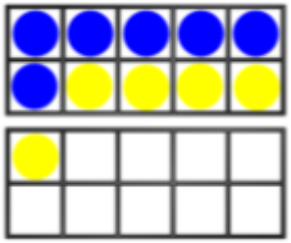
|---|---|---|---|---|
| Y1: Add one-digit numbers to 20 including 0<br>Y1: Add two-digit numbers to 20<br><br>Y2: Add numbers using concrete objects and pictorial representations, including adding three one-digit numbers | Augmentation – increasing a quantity by an amount (starting with the largest number and counting on) |  <br><br>  <br>Possible resources: bead string, number lines with cubes or numicon |  <br><br>Bar model which encourages children to count on, rather than count all<br><br>  <br><br>Counting on using a number line, beginning at the largest number and counting on in ones or in one jump | 4 + 2 = 6<br>  <br><br>The abstract number line. |
| Y1: Add one-digit numbers to 20 including 0<br>Y1: Add two-digit numbers to 20<br><br>Y2: Add numbers using concrete objects and pictorial representations, including adding three one-digit numbers | Regrouping – i.e. to make 10 |  <br>  <br>Possible resources: ten frames and cubes, numicon |  <br>Children draw their own ten frames and dots | Children develop an understanding of equality and look for links between numbers.<br>6 + [ ] = 11<br><br>6 + 5 = 5 + [ ]<br><br>6 + 5 = [ ] + 4<br><br>11 = [ ] + 6 |

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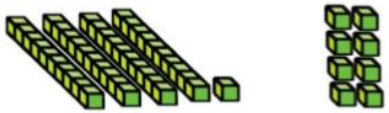
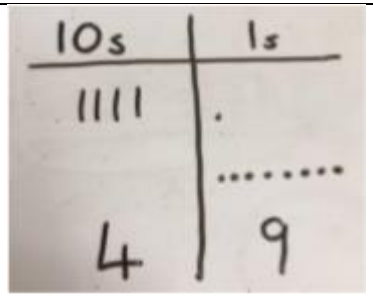
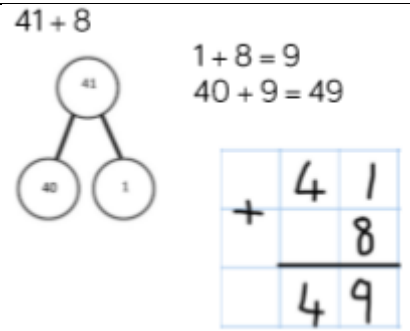
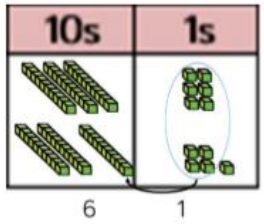
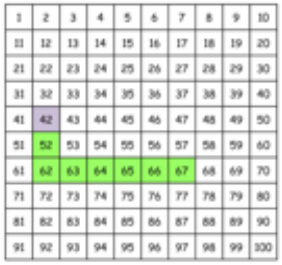
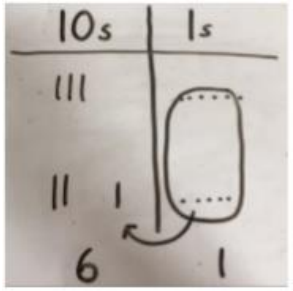
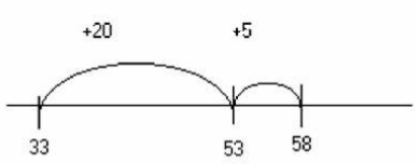
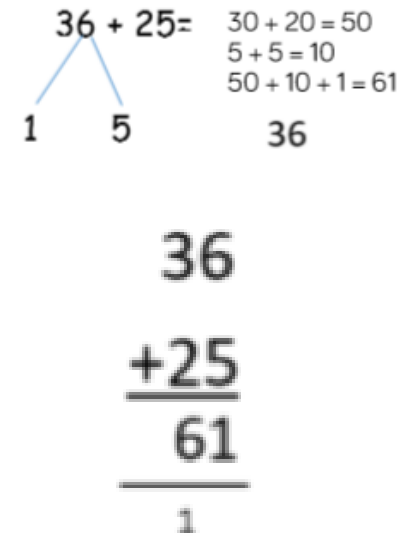
|---|---|---|---|---|
| Y2: Add numbers using concrete objects and pictorial representations, including a two-digit number and ones | TO + O – developing understanding of place value and partitioning<br>Step 1: without exchange<br>Step 2: with exchange |  <br>Possible resources: base 10 |  <br>Children draw a place value grid and represent tens with lines and ones with xs |  |
| Y2: Add numbers using concrete objects and pictorial representations, including a two-digit number and tens<br><br>Y2: Add numbers using concrete objects and pictorial representations, including two two-digit numbers | TO + TO – continue to develop understanding of place value and partitioning<br>Step 1: without exchange<br>Step 2: with exchange |  <br>  <br>(Adding on a hundred square, children should move down to add tens and along to add ones)<br><br>Possible resources: place value grid, base 10, hundred square |  <br>Children draw a place value grid and represent tens with lines and ones with xs, showing exchange with circles and arrows<br><br>  <br>Using an empty number line, counting in jumps of tens and ones | Looking for ways to make 10.<br>  |

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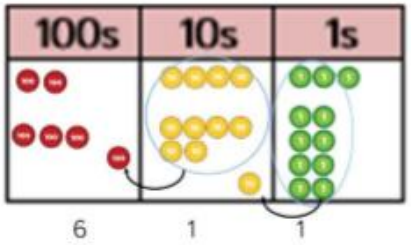
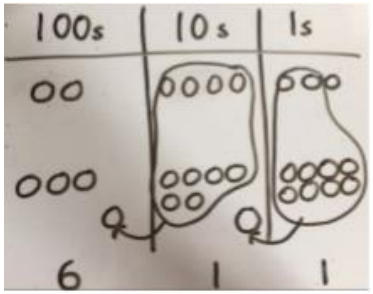
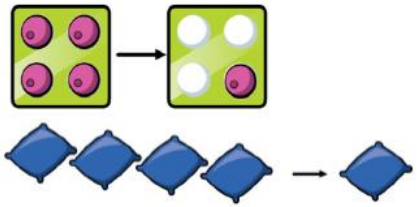
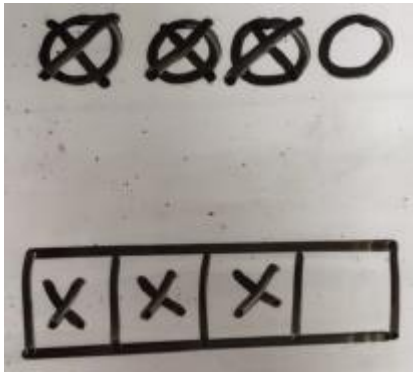
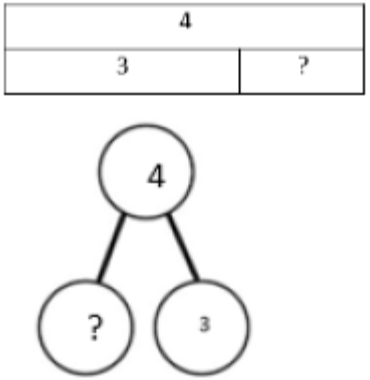
|---|---|---|---|---|
| Y3: Add numbers with up to three digits, using formal written methods of columnar addition<br><br>Y4: Add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate<br><br>Y5: Add whole numbers with more than 4 digits, including using formal written methods (columnar addition) | HTO + TO or<br>HTO + HTO<br>(with multiple exchanges)<br><br>Any number of digits + any number of digits,<br>(with multiple exchanges)<br><br>Adding decimals<br><br>Adding more than 2 numbers |  <br>Possible resources: place value grid, base 10, place value counters |  <br>Children draw a place value grid and represent tens with lines and ones with dots, showing exchange with circles and arrows | 243<br>+368<br>611<br>1 1 |

**Key vocabulary for addition:**

sum, total, parts and wholes, plus, add, altogether, more, 'is equal to', 'is the same as, addend

# Written Methods for Subtraction

| YEAR GROUP & RELEVANT OBJECTIVES | STRATEGY | CONCRETE | PICTORIAL | ABSTRACT / WRITTEN |
|---|---|---|---|---|
| Y1: Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7= □ - 9.<br><br>Y2: 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. | **Partitioning**<br>Taking away and removing objects from original set | 4 – 3 = 1<br>  <br>Possible resources: numicon, bean bags, cubes, tens frame | Children draw resources and cross out<br>  | 4 – 3 =<br>_ = 4 – 3<br>  |

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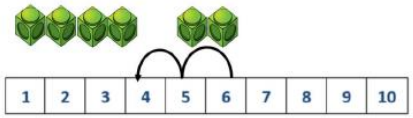
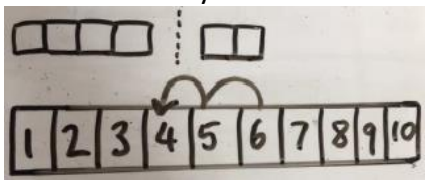
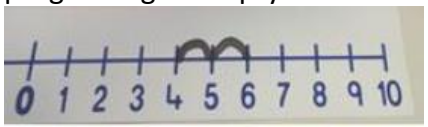
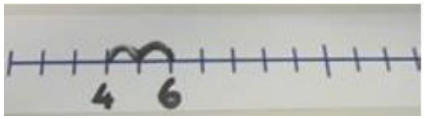
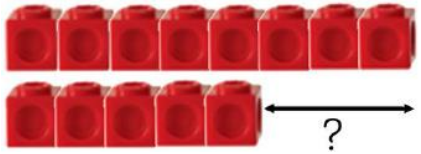
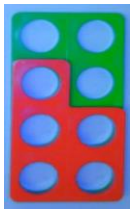
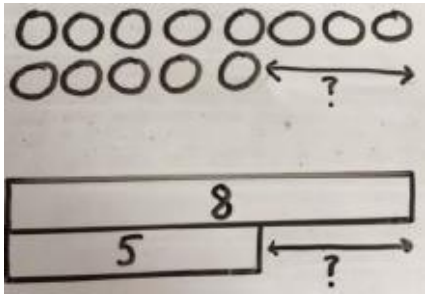
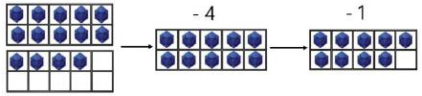
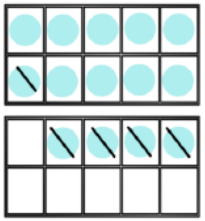
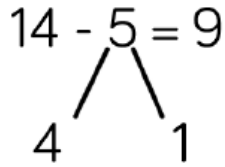
|---|---|---|---|---|
| Y1: Subtract one digit and two- digit numbers<br><br>Y2: Add and subtract numbers using concrete objects, pictorial representations and mentally | **Reduction**<br>Start at and count back | 6 – 2 = 4<br>  <br><br>Possible resources: cubes or number tracks | Draw what they see<br>  <br> | Children represent on a numberline or track, progressing to empty line<br>  <br><br>  <br> |
| Y1: Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7= □ - 9.<br><br>Y2: Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 | **Comparison**<br>Finding the difference between two numbers | 8 – 5 = 3<br>  <br><br>  <br>Possible resources: cubes, base 10, numicon | Children draw the cubes or objects, bar model can also be used to show what they need to calculate<br>  <br> | Find the difference between 8 and 5.<br><br>8 – 5, the difference is □<br><br>Children to explore why<br>9 - 6 = 8 – 5 = 7 – 4 have the same difference. |
| Y1: Represent and use number bonds and related subtraction facts within 20<br><br>Y2: Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 | **Making 10** (bridging 10) | 14 – 5 = 9<br>  <br><br>Possible resources: number tracks, number lines, 10s frame, numicon | Children represent 10s frame pictorially. Children should be encouraged to explain what they have done<br>  | Children demonstrate partitioning of subtrahend<br>  <br><br>14 – 4 = 10<br>10 – 1 = 9 |

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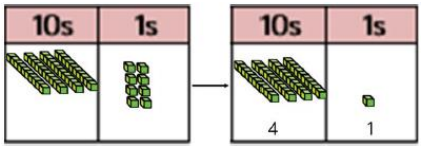
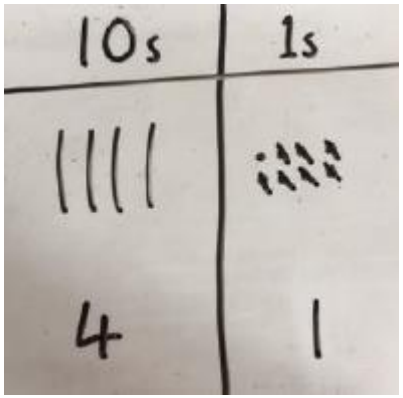
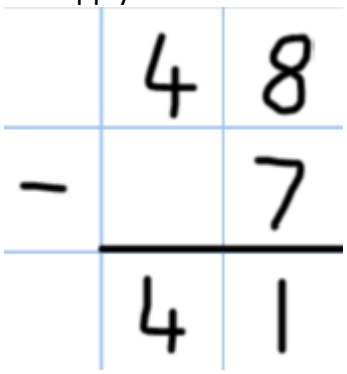
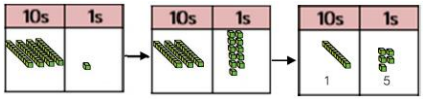
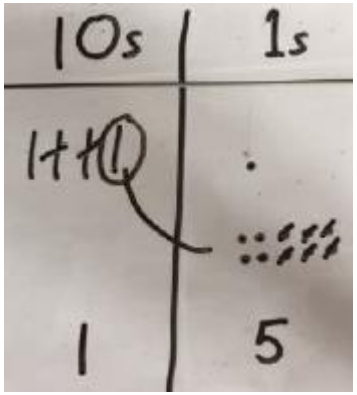
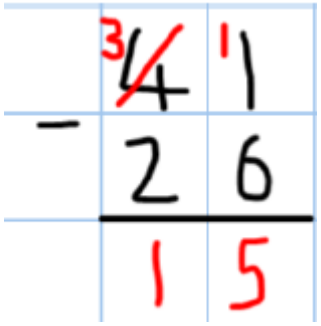
|---|---|---|---|---|
| Y1: Subtract one digit and two- digit numbers<br><br>Y2: Add and **subtract** numbers using concrete objects, pictorial representations and mentally<br><br>Y3: add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction | **Column method**<br>T U | 48 – 7 = 41<br>  <br><br>Possible resources: base 10, PV counters | Children represent base 10 with I and x<br>  <br> | Children use column method and apply number facts to 10<br>  <br> |
| Y3: add and **subtract** numbers with up to three digits, using formal written methods of columnar addition and subtraction<br><br>Y4: add and **subtract** numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate<br><br>Y5: add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) | **Column method**<br>(with exchanging, decomposition)<br>T U | 41 – 26 = 15<br>  <br><br>Using base 10 with exchange | Children draw with I and x, remembering to show exchange<br>  <br> | Formal column method to be used (CHILDREN MUST SHOW UNDERSTANDING OF DECOMPOSTION AND THAT THEY still have 41 as 41 = 30 + 11)<br>  <br> |

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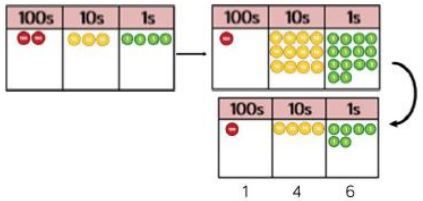
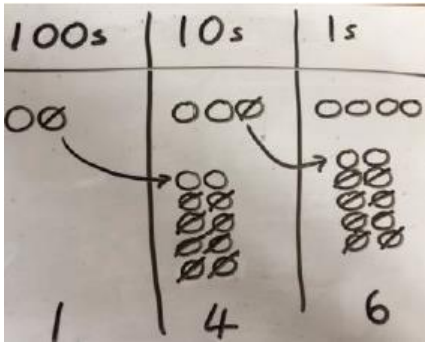
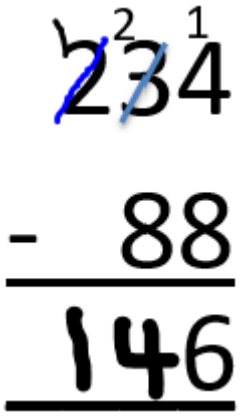
| Y3: add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction<br><br>Y4: add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate<br><br>Y5: add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) | **Column method**<br>(with PV counters)<br>HTU | 234 – 88 = 146<br>  <br><br>Using place value counters | Children to draw place value counters, showing what has been exchanged<br>  <br> | Formal column method to be used (CHILDREN MUST SHOW UNDERSTANDING OF DECOMPOSTION)<br>  <br> |

**Key vocabulary for subtraction:**

take away, less than, the difference, subtract, minus, fewer, decrease, subtrahend, minuend

# Mental Expectations for Addition and Subtraction

| By the end of the year | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| **-children are able to derive and recall** | • number pairs with a total of 10, e.g. 3 + 7, or what to add to a single-digit number to make 10, e.g. 3 + □ = 10<br>• addition facts for totals to at least 5, e.g. 2 + 3, 4 + 3<br>• addition doubles for all numbers to at least 10, e.g. 8 + 8 | • addition and subtraction facts for all numbers up to at least 10, e.g. 3 + 4, 8 – 5<br>• number pairs with totals to 20<br>• all pairs of multiples of 10 with totals up to 100, e.g. 30 + 70, or 60 + □ = 100<br>• what must be added to any two-digit number to make the next multiple of 10, e.g. 52 + □ = 60<br>• addition doubles for all numbers to 20, e.g. 17 + 17 and multiples of 10 to 50, e.g. 40 + 40 | • addition and subtraction facts for all numbers to 20, e.g. 9 + 8, 17 – 9, drawing on knowledge of inverse operations<br>• sums and differences of multiples of 10, e.g. 50 + 80, 120 – 90<br>• pairs of two-digit numbers with a total of 100, e.g. 32 + 68, or 32 + □ = 100<br>• addition doubles for multiples of 10 to 100, e.g. 90 + 90 | • sums and differences of pairs of multiples of 10, 100 or 1000<br>• addition doubles of numbers 1 to 100, e.g. 38 + 38, and the corresponding halves<br>• what must be added to any three-digit number to make the next multiple of 100, e.g. 521 + □ = 600<br>• pairs of fractions that total 1 | • sums and differences of decimals, e.g. 6.5 + 2.7, 7.8 – 1.3<br>• doubles and halves of decimals, e.g. half of 5.6, double 3.4<br>• what must be added to any four-digit number to make the next multiple of 1000, e.g. 4087 + □ = 5000<br>• what must be added to a decimal with units and tenths to make the next whole number, e.g. 7.2 + □ = 8 | • addition and subtraction facts for multiples of 10 to 1000 and decimal numbers with one decimal place, e.g. 650 + □ = 930, □ – 1.4 = 2.5<br>• what must be added to a decimal with units, tenths and hundredths to make the next whole number, e.g. 7.26 + □ = 8 |

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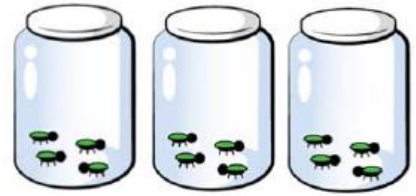
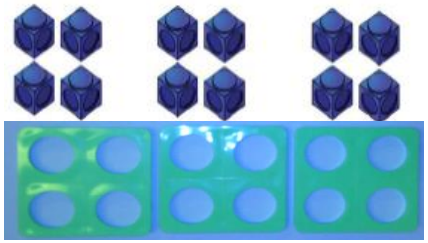
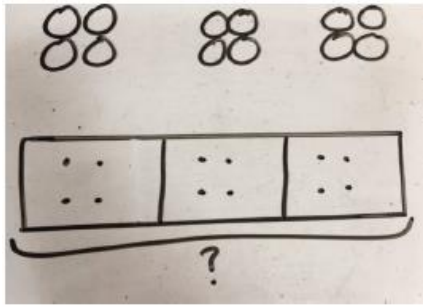
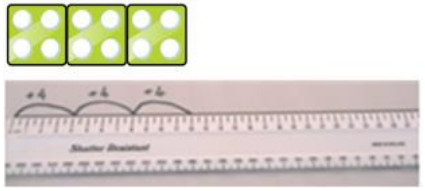
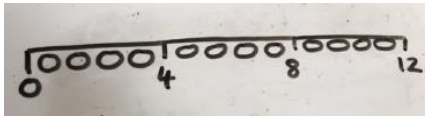
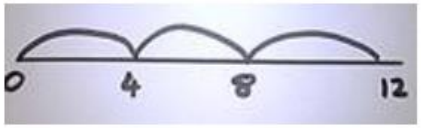
|---|---|---|---|---|---|---|
| **-working mentally (with jottings where necessary)** | • add or subtract a pair of single-digit numbers,<br>• e.g. 4 + 5, 8 – 3<br>• add or subtract a single-digit number to or from a teens number, e.g. 13 + 5, 17 – 3<br>• add or subtract a single-digit to or from 10, and add a multiple of 10 to a single-digit number, e.g. 10 + 7, 7 + 30<br>• add near doubles, e.g. 6 + 7 | • add or subtract a pair of single-digit numbers, including crossing 10, e.g. 5 + 8, 12 – 7<br>• add any single-digit number to or from a multiple of 10, e.g. 60 + 5<br>• subtract any single-digit number from a multiple of 10, e.g. 80 – 7<br>• add or subtract a single-digit number to or from a two-digit number, including crossing the tens boundary, e.g. 23 + 5, 57 – 3, then 28 + 5, 52 – 7<br>• add or subtract a multiple of 10 to or from any two-digit number, e.g. 27 + 60, 72 – 50 add 9, 19, 29, … or 11, 21, 31, …<br>• add near doubles, e.g. 13 + 14, 39 + 40 | • add and subtract groups of small numbers, e.g. 5 – 3 + 2<br>• add or subtract a two-digit number to or from a multiple of 10, e.g. 50 + 38, 90 – 27<br>• add and subtract two-digit numbers e.g. 34 + 65, 68 – 35<br>• add near doubles, e.g. 18 + 16, 60 + 70 | • add or subtract any pair of two-digit numbers, including crossing the tens and 100 boundary, e.g. 47 + 58, 91 – 35<br>• add or subtract a near multiple of 10, e.g. 56 + 29, 86 – 38<br>• add near doubles of two-digit numbers, e.g. 38 + 37<br>• add or subtract two-digit or three-digit multiples of 10, e.g. 120 – 40, 140 + 150, 370 – 180 | • add or subtract a pair of two-digit numbers or three-digit multiples of 10, e.g. 38 + 86, 620 – 380, 350+ 360<br>• add or subtract a near multiple of 10 or 100 to any two-digit or three-digit number, e.g. 235 + 198<br>• find the difference between near multiples of 100, e.g. 607 – 588, or of 1000, e.g. 6070 – 4087<br>• add or subtract any pairs of decimal fractions each with units and tenths, e.g. 5.7 + 2.5, 6.3 – 4.8 | • count on or back in hundreds, tens, ones and tenths<br>• partition: add hundreds, tens or ones separately, then recombine<br>• subtract by counting up from the smaller to the larger number<br>• add or subtract a multiple of 10 or 100 and adjust<br>• partition: double and adjust<br>• use knowledge of place value and related calculations, e.g. 6.3 – 4.8 using 63 – 48<br>• partition: count on or back in minutes and hours, bridging through 60 (analogue and digital times) |

| | | | | | | |
|---|---|---|---|---|---|---|
| **-understand when to be able to apply** | • reorder numbers when adding, e.g. put the larger number first<br>• count on or back in ones, twos or tens<br>• partition small numbers, e.g. 8 + 3 = 8 + 2 + 1<br>• partition and combine tens and ones<br>• partition: double and adjust, e.g. 5 + 6 = 5 + 5 + 1 | • reorder numbers when adding<br>• partition: bridge through 10 and multiples of 10 when adding and subtracting<br>• partition and combine multiples of tens and ones<br>• use knowledge of pairs making 10<br>• partition: count on in tens and ones to find the total<br>• partition: count on or back in tens and ones to find the difference<br>• partition: add a multiple of 10 and adjust by 1<br>• partition: double and adjust | • reorder numbers when adding<br>• identify pairs totalling 10 or multiples of 10<br>• partition: add tens and ones separately, then recombine<br>• partition: count on in tens and ones to find the total<br>• partition: count on or back in tens and ones to find the difference<br>• partition: add or subtract 10 or 20 and adjust<br>• partition: double and adjust<br>• partition: count on or back in minutes and hours, bridging through 60 (analogue times) | • count on or back in hundreds, tens and ones<br>• partition: add tens and ones separately, then recombine<br>• partition: subtract tens and then ones, e.g. subtracting 27 by subtracting 20 then 7<br>• subtract by counting up from the smaller to the larger number<br>• partition: add or subtract a multiple of 10 and adjust,<br>• e.g. 56 + 29 = 56 + 30 – 1, or 86 – 38 = 86 – 40 + 2<br>• partition: double and adjust<br>• use knowledge of place value and related calculations, e.g. work out 140 + 150 = 290 using 14 + 15 = 29<br>• partition: count on or back in minutes and hours, bridging through 60 (analogue and digital times) | • add or subtract pairs of decimals with units, tenths or hundredths, e.g. 0.7 + 3.38<br>• find doubles of decimals each with units and tenths, e.g. 1.6 + 1.6<br>• add near doubles of decimals, e.g. 2.5 + 2.6<br>• add or subtract a decimal with units and tenths, that is nearly a whole number,<br>• e.g. 4.3 + 2.9, 6.5 – 3.8 | • count on or back in hundreds, tens, ones, tenths and hundredths<br>• use knowledge of place value and related calculations, e.g. 680 + 430, 6.8 + 4.3, 0.68 + 0.43 can all be worked out using the related calculation 68 + 43<br>• use knowledge of place value and of doubles of two-digit whole numbers<br>• partition: double and adjust<br>• partition: add or subtract a whole number and adjust, e.g. 4.3 + 2.9 = 4.3 + 3 – 0.1, 6.5 – 3.8 = 6.5 – 4 + 0.2<br>• partition: count on or back in minutes and hours, bridging through 60 (analogue and digital times, 12-hour and 24-hour clock) |

# Written Methods for Multiplication

| YEAR GROUP & RELEVANT OBJECTIVES | STRATEGY | CONCRETE | PICTORIAL | ABSTRACT / WRITTEN |
|---|---|---|---|---|
| Y1: Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.<br><br>Y2: Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs. | **Repeated addition** | 3 x 4<br>4+4+4<br>Ther are 3 equal groups with 4 in each group.<br>  <br>  | Children represent physical resources in a bar model<br>  | 3 x 4= 12<br>4+4+4= 12 |
| Y1: Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and | **Repeated addition on a number line** | 3 x 4<br>  | Pictorial representation alongside number line<br>  | Abstract showing jumps of 4<br>3 x 4= 12<br>  |

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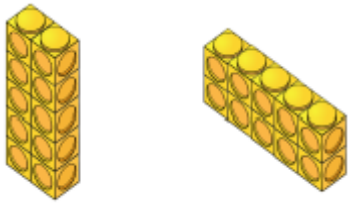
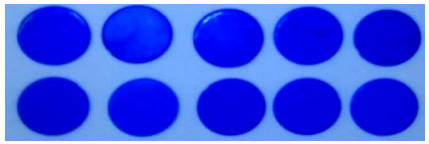
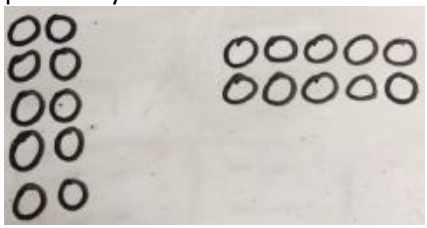
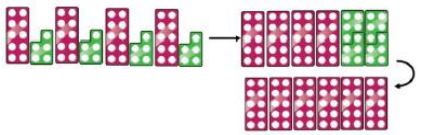
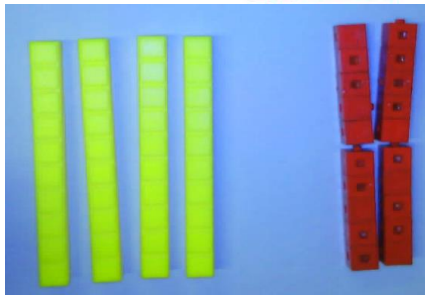
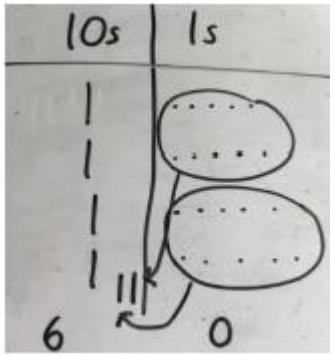
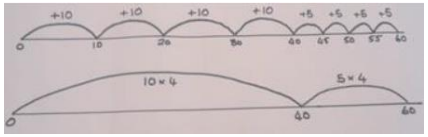
| arrays with the support of the teacher.<br><br>Y2: Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts. | | | | |
| Y1: Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.<br><br>Y2: Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot. | **Commutative Law**<br><br>Key vocab: columns and rows (it is important to spend time ensuring children know what each one is)<br><br>Column=  <br>Rows=  | 2 x 5 = 5 x 2<br>  <br>2 lots of 5 5 lots of 2<br>  <br>Counters and Unifix can be used | Children represent arrays pictorially<br>  | Children are able to write a range of calculations based upon an array<br>Eg.<br>10 = 2 x 5<br>5 x 2 = 10<br>2 + 2 + 2 + 2 + 2 = 10<br>10 = 5 + 5 |

| | | | | |
|---|---|---|---|---|
| Y3: 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<br><br>Y4: solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects. | **Partition to multiply** | 4 x 15<br>  <br>  <br>numicon or base10 | Children represent pictorially<br>  | Children work out using jottings<br>4 x 15<br>10 5<br><br>10 x 4 = 40<br>5 x 4 = 20<br>40 + 20 = 60<br>Jottings can also be represented on a numberline<br>  |

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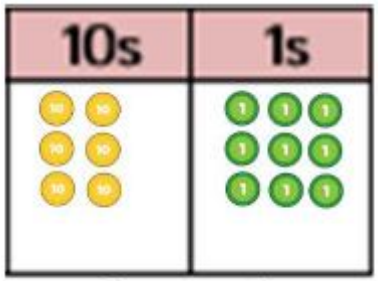
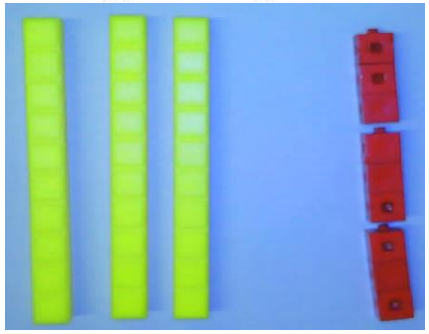
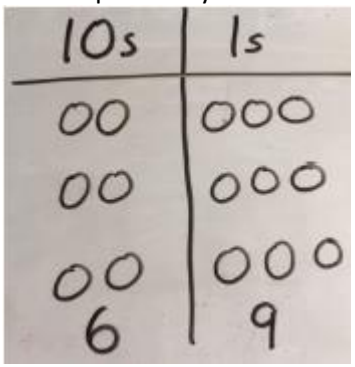
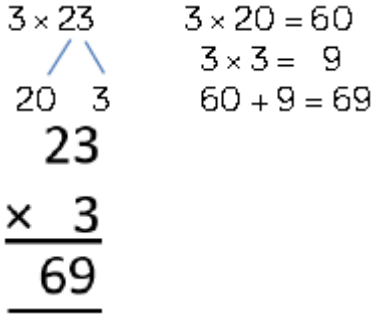
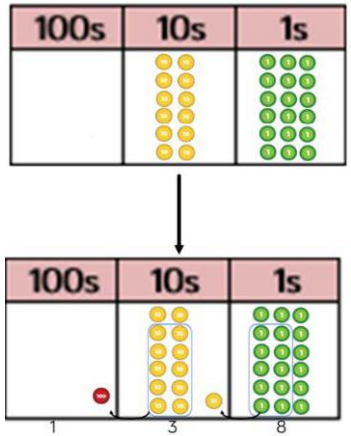
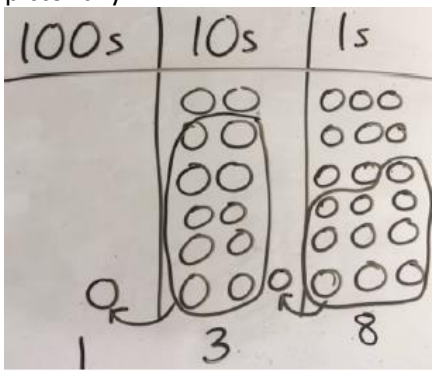
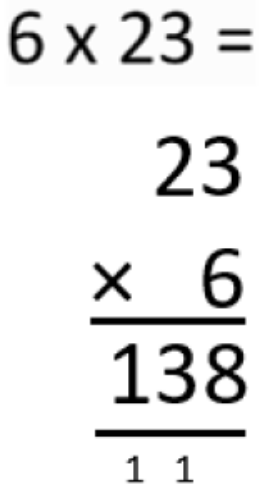
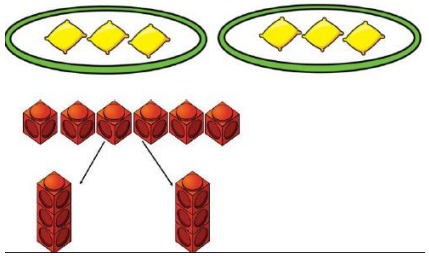
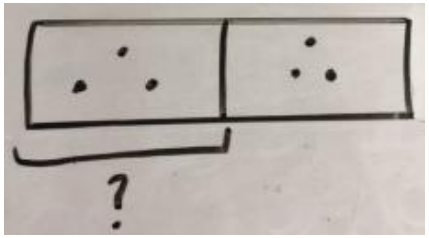
|---|---|---|---|---|
| Y4: multiply two-digit and three-digit numbers by a one-digit number using formal written layout<br><br>Y5: multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers<br><br>Y6: multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication | **Formal column method** | Shown using place value counters<br>3 x 23<br>  <br><br>  <br>Base10 can also be used | Children represent counters or base10 pictorially<br>  <br> | Children record partitioning before moving onto formal method<br>  <br> |
| Y4: multiply two-digit and three-digit numbers by a one-digit number using formal written layout<br>Y5: 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<br>Y6: multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication | **Formal column method**<br>(exchanging across place value columns) | 6 x 23<br>  <br><br>Place value counters | Children represent exchanging pictorially<br>  <br> | Formal written method<br>  <br> |

## Key vocabulary for multiplication:

double, times, multiplied by, the product of, groups of, lots of, equal groups

# Written Methods for Division

| YEAR GROUP & RELEVANT OBJECTIVES | STRATEGY | CONCRETE | PICTORIAL | ABSTRACT / WRITTEN |
|---|---|---|---|---|
| Y1: Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.<br><br>Y2: Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts. | **Equal Sharing** | 6 ÷ 2<br>  <br>Counters, bean bags, unifix | Children to represent pictorially using the bar model<br>  | 6 ÷ 2 = 3<br>3 \| 3<br>Children to be encouraged to make link with 2 times tables |

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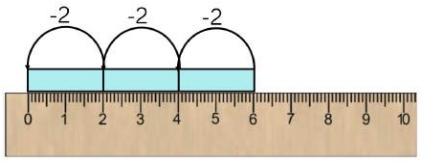
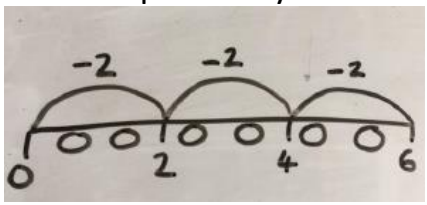
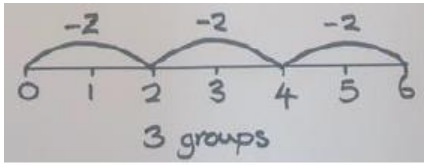
|---|---|---|---|---|
| Y1: Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.<br><br>Y2: Calculate mathematical statements for multiplication and **division** within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs. | **Inverse of multiplication** (repeated subtraction) | Base10 above a ruler<br>6 ÷ 2<br>  <br><br>  <br>3 groups of 2 | Children to represent pictorially<br>  <br> | Children represent the equal groups on a number line<br>  <br> |

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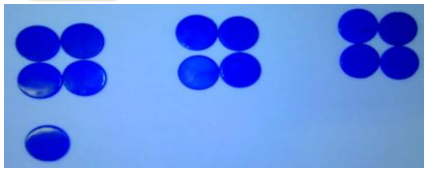
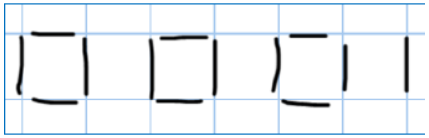
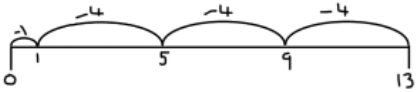
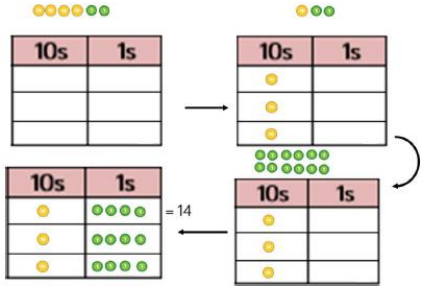
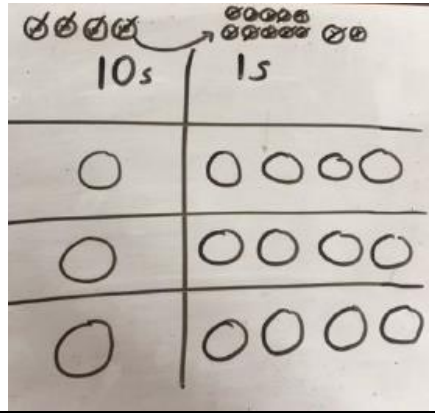
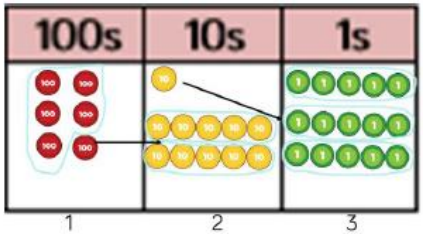
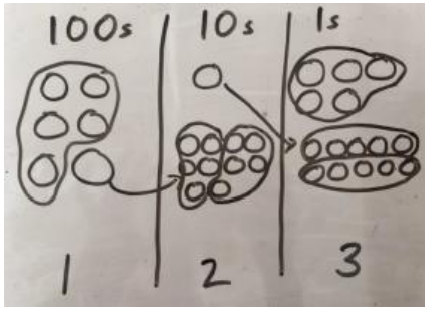
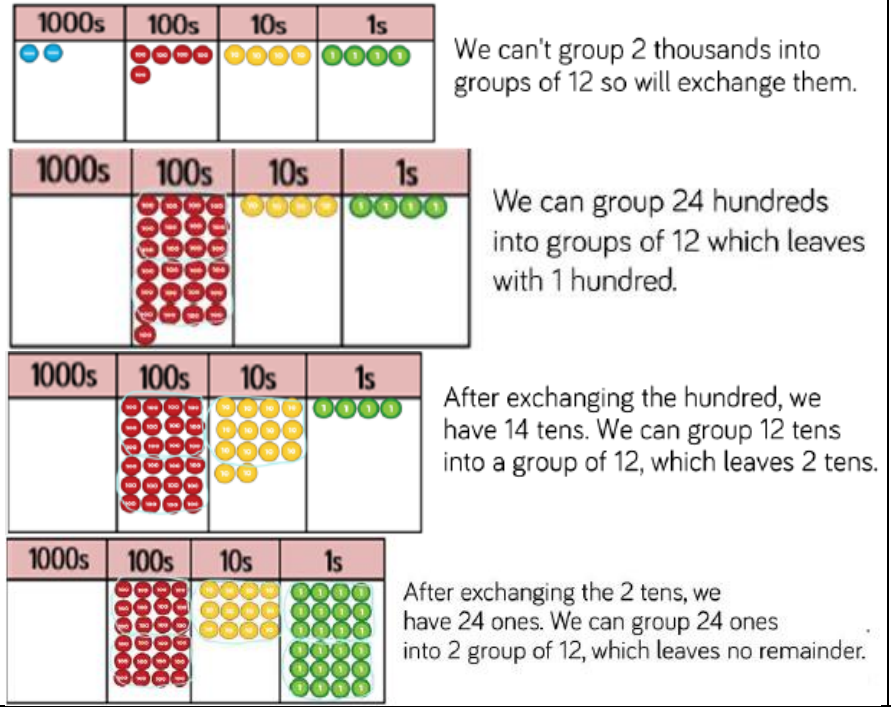
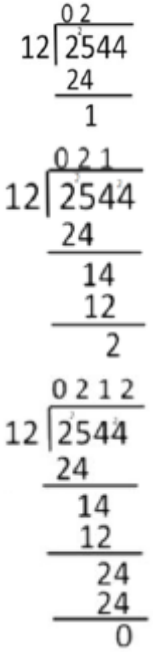
|---|---|---|---|---|
| Y3: write and calculate mathematical statements for multiplication and **division** using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods<br><br>Y4: use place value, known and derived facts to multiply and **divide** mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers<br>Y5: 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** | **Grouping**<br>(with remainders) | Lollipop sticks can be used to make whole shapes (eg dividing by 4 would be squares, 3 would be triangles)<br>13 ÷ 4 =<br>  <br>  <br>There are 3 whole squares with 1 left over. | Children represent lollipop sticks pictorially with lines<br>  <br>There are 3 whole squares with 1 left over. | 13 ÷ 4 = 3 remainder 1<br>Encourage children to use their times tables facts.<br><br>'3 groups of 4 with 1 left over'<br>  |

| | | | | |
|---|---|---|---|---|
| Y4: 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 | **Sharing**<br>*With place value counters* | 42 ÷ 3 = 14<br>  | Children draw place value counters<br>  | Children write process of calculations they have carried out<br>42 ÷ 3<br>42 = 30 + 12<br>30 ÷ 3 = 10<br>12 ÷ 3 = 4<br>10 + 4 = 14 |
| Y5: 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<br><br>Y6: 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** (grouping)<br>*Using place value counters to group* | 615 ÷ 5<br>  <br>1. Make 615 with place value counters<br>2. How many groups of 5 hundreds can you make with 6 hundreds counters?<br>3. Exchange 1 hundred for 10 tens<br>4. How many groups of 5 tens can you make with 11 ten counters?<br>5. Exchange 1 ten for 10 ones<br>6. How many groups of 5 ones can you make with 15 ones? | Children represent counters pictorially<br>  | Children do calculation using the short division scaffold.<br>123<br>5 ⟌ 6¹1¹5 |

| | | | |
|---|---|---|---|
| Y5: 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<br><br>Y6: 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 | **Long division** (grouping)<br>*Using place value counters* | 2544 ÷ 12<br>(children can represent pictorally, however this can become very messy due to the number of exhanges. It is often easier to move straight to the abstract on this occasion)<br>  <br> | 2544 ÷ 12<br>  <br> |

**Key vocabulary for division:**

share, group, divide by, half

# Mental Expectations for Multiplication and Division

| By the end of the year | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| **-children are able to derive and recall** | • doubles of all numbers to 10, e.g. double 6<br>• odd and even numbers to 20 | • doubles of all numbers to 20, e.g. double 13, and corresponding halves<br>• doubles of multiples of 10 to 50, e.g. double 40, and corresponding halves<br>• multiplication facts for the 2, 5 and 10 times-tables, and corresponding division fm,acts<br>• odd and even numbers to 100 | • multiplication facts for the 2, 3, 4, 5, 6 and 10 times-tables, and corresponding division facts<br>• doubles of multiples of 10 to 100, e.g. double 90, and corresponding halves | • multiplication facts to 10 × 10 and the corresponding division facts<br>• doubles of numbers 1 to 100, e.g. double 58, and corresponding halves<br>• doubles of multiples of 10 and 100 and corresponding halves<br>• fraction and decimal equivalents of one-half, quarters, tenths and hundredths, e.g. 310 is 0.3 and 3100 is 0.03<br>• factor pairs for known multiplication facts | • squares to 10 × 10<br>• division facts corresponding to tables up to 10 × 10, and the related unit fractions, e.g. 7 × 9 = 63 so one-ninth of 63 is 7 and one-seventh of 63 is 9<br>• percentage equivalents of one-half, one-quarter, three-quarters, tenths and hundredths<br>• factor pairs to 100 | • squares to 12 × 12<br>• squares of the corresponding multiples of 10<br>• prime numbers less than 100<br>• equivalent fractions, decimals and percentages for hundredths, e.g. 35% is equivalent to 0.35 or 35/100 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **-working mentally (with jottings where necessary)** | • count on from and back to zero in ones, twos, fives or tens | • double any multiple of 5 up to 50, e.g. double 35<br>• halve any multiple of 10 up to 100, e.g. halve 90<br>• find half of even numbers to 40<br>• find the total number of objects when they are organised into groups of 2, 5 or 10 | • double any multiple of 5 up to 100, e.g. double 35<br>• halve any multiple of 10 up to 200, e.g. halve 170<br>• multiply one-digit or two-digit numbers by 10 or 100, e.g. 7 × 100, 46 × 10, 54 x 100<br>• find unit fractions of numbers and quantities involving halves, thirds, quarters, fifths and tenths | • double any two-digit number, e.g. double 39<br>• double any multiple of 10 or 100, e.g. double 340, double 800, and halve the corresponding multiples of 10 and 100<br>• halve any even number to 200<br>• find unit fractions and simple non-unit fractions of numbers and quantities, e.g. 38 of 24<br>• multiply and divide numbers to 1000 by 10 and then 100 (whole-number answers), e.g. 325 × 10, 42 × 100, 120 ÷ 10, 600 ÷ 100, 850 ÷ 10<br>• multiply a multiple of 10 to 100 by a single-digit number, e.g. 40 × 3<br>• multiply numbers to 20 by a single-digit, e.g. 17 × 3<br>• identify the remainder when dividing by 2, 5 or 10<br>• give the factor pair associated with a multiplication fact, e.g. identify that if 2 | • multiply and divide two-digit numbers by 4 or 8, e.g. 26 × 4, 96 ÷ 8<br>• multiply two-digit numbers by 5 or 20, e.g. 320 × 5, 14 × 20<br>• multiply by 25 or 50, e.g. 48 × 25, 32 × 50<br>• double three-digit multiples of 10 to 500, e.g. 380 × 2, and find the corresponding halves, e.g. 760 ÷ 2<br>• find the remainder after dividing a two-digit number by a single-digit number, e.g. 27 ÷ 4 = 6 R 3<br>• multiply and divide whole numbers and decimals by 10, 100 or 1000, e.g. 4.3 × 10, 0.75 × 100, 25 ÷ 10, 673 ÷ 100, 74 ÷ 100<br>• multiply pairs of multiples of 10, e.g. 60 × 30, and a multiple of 100 by a single digit number, e.g. 900 × 8<br>• divide a multiple of 10 by a single-digit number (whole number answers) e.g. 80 ÷ 4, 270 ÷ 3<br>• find fractions of whole numbers or quantities, e.g. | • multiply pairs of two-digit and single-digit numbers, e.g. 28 × 3<br>• divide a two-digit number by a single-digit number, e.g. 68 ÷ 4<br>• divide by 25 or 50, e.g. 480 ÷ 25, 3200 ÷ 50<br>• double decimals with units and tenths, e.g. double 7.6, and find the corresponding halves, e.g. half of 15.2<br>• multiply pairs of multiples of 10 and 100, e.g. 50 × 30, 600 × 20<br>• divide multiples of 100 by a multiple of 10 or 100 (whole number answers), e.g. 600 ÷ 20, 800 ÷ 400, 2100 ÷ 300<br>• multiply and divide two-digit decimals such as 0.8 × 7, 4.8 ÷ 6<br>• find 10% or multiples of 10%, of whole numbers and quantities, e.g. 30% of 50 ml, 40% of £30, 70% of 200 g<br>• simplify fractions by cancelling<br>• scale up and down using known facts, |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | x 3 = 6 then 6 has the factor pair 2 and 3 | • 23 of 27, 45 of 70 kg<br>• find 50%, 25% or 10% of whole numbers or quantities, e.g. 25% of 20 kg, 10% of £80<br>• find factor pairs for numbers to 100, e.g. 30 has the factor pairs 1 × 30, 2 × 15, 3 × 10 and 5 × 6 | e.g. given that three oranges cost 24p, find the cost of four oranges<br>• identify numbers with odd and even numbers of factors and no factor pairs other than 1 and themselves |
| **-understand when to be able to apply** | • use patterns of last digits, e.g. 0 and 5 when counting in fives | • partition: double the tens and ones separately, then recombine<br>• use knowledge that halving is the inverse of doubling and that doubling is equivalent to multiplying by two<br>• use knowledge of multiplication facts from the 2, 5 and 10 times-tables, e.g. recognise that there are 15 objects altogether because there are three groups of five | • partition: when doubling, double the tens and ones separately, then recombine<br>• partition: when halving, halve the tens and ones separately, then recombine<br>• use knowledge that halving and doubling are inverse operations<br>• recognise that finding a unit fraction is equivalent to dividing by the denominator and use knowledge of division facts<br>• recognise that when multiplying by 10 or 100 the digits move one or two places to the left and zero is used as a place holder | • partition: double or halve the tens and ones separately, then recombine<br>• use understanding that when a number is multiplied or divided by 10 or 100, its digits move one or two places to the left or the right and zero is used as a place holder<br>• use knowledge of multiplication facts and place value, e.g. 7 x 8 = 56 to find 70 x 8, 7 x 80<br>• use partitioning and the distributive law to multiply, e.g.<br>➢ 13 × 4 =<br>➢ (10 + 3) × 4=<br>➢ (10 × 4) + (3 × 4)=<br>➢ 40 + 12 = 52 | • multiply or divide by 4 or 8 by repeated doubling or halving<br>• form an equivalent calculation, e.g. to multiply by 5, multiply by 10, then halve; to multiply by 20, double, then multiply by 10<br>• use knowledge of doubles/halves and understanding of place value, e.g. when multiplying by 50 multiply by 100 and divide by 2<br>• use knowledge of division facts, e.g. when carrying out a division to find a remainder<br>• use understanding that when a number is multiplied or divided by 10 or 100, its digits move one or two places to the left or the right relative to the decimal point, | • partition: use partitioning and the distributive law to divide tens and ones separately, e.g.<br>➢ 92 ÷ 4 =<br>➢ (80 + 12) ÷ 4 =<br>➢ 20 + 3 = 23<br>• form an equivalent calculation, e.g. to divide by 25, divide by 100, then multiply by 4; to divide by 50, divide by 100, then double<br>• use knowledge of the equivalence between fractions and percentages and the relationship between fractions and division<br>• recognise how to scale up or down using multiplication and division, e.g.<br>➢ if three oranges cost 24p:<br>➢ one orange costs 24 ÷ 3 = 8p |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | and zero is used as a place holder<br>• use knowledge of multiplication and division facts and understanding of place value, e.g. when calculating with multiples of 10<br>• use knowledge of equivalence between fractions and percentages, e.g. to find 50%, 25% and 10%<br>• use knowledge of multiplication and division facts to find factor pairs | ➢ four oranges cost 8 × 4 = 32p<br>• Use knowledge of multiplication and division facts to identify factor pairs and numbers with only two factors |

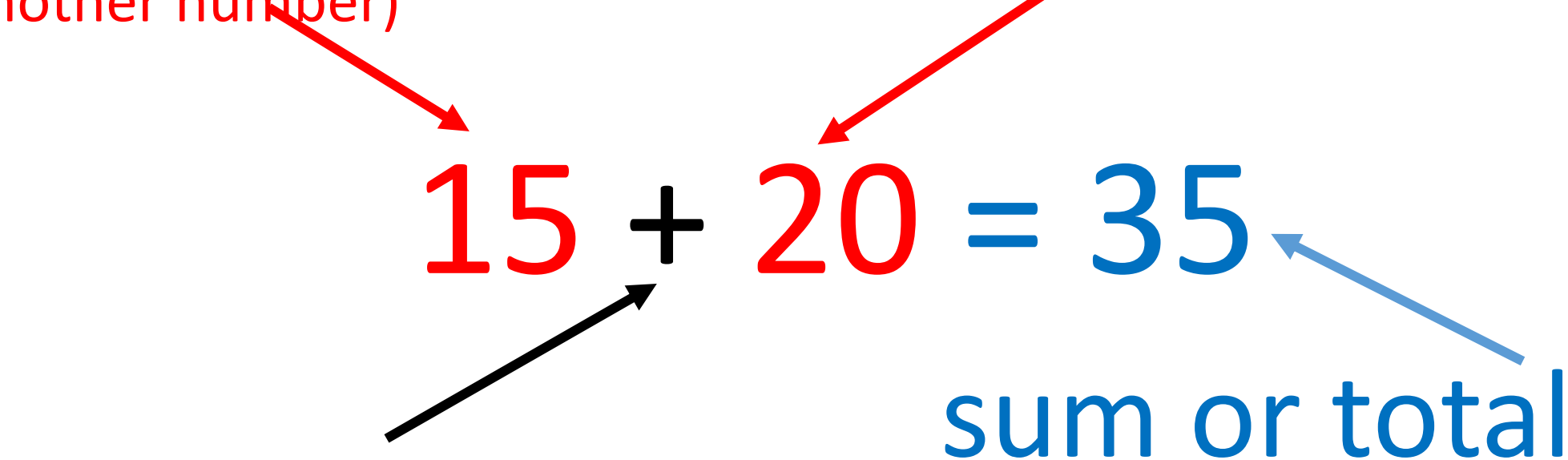
**Appendix 1**

# Addition

addend

(A number which is added to another number)

addend

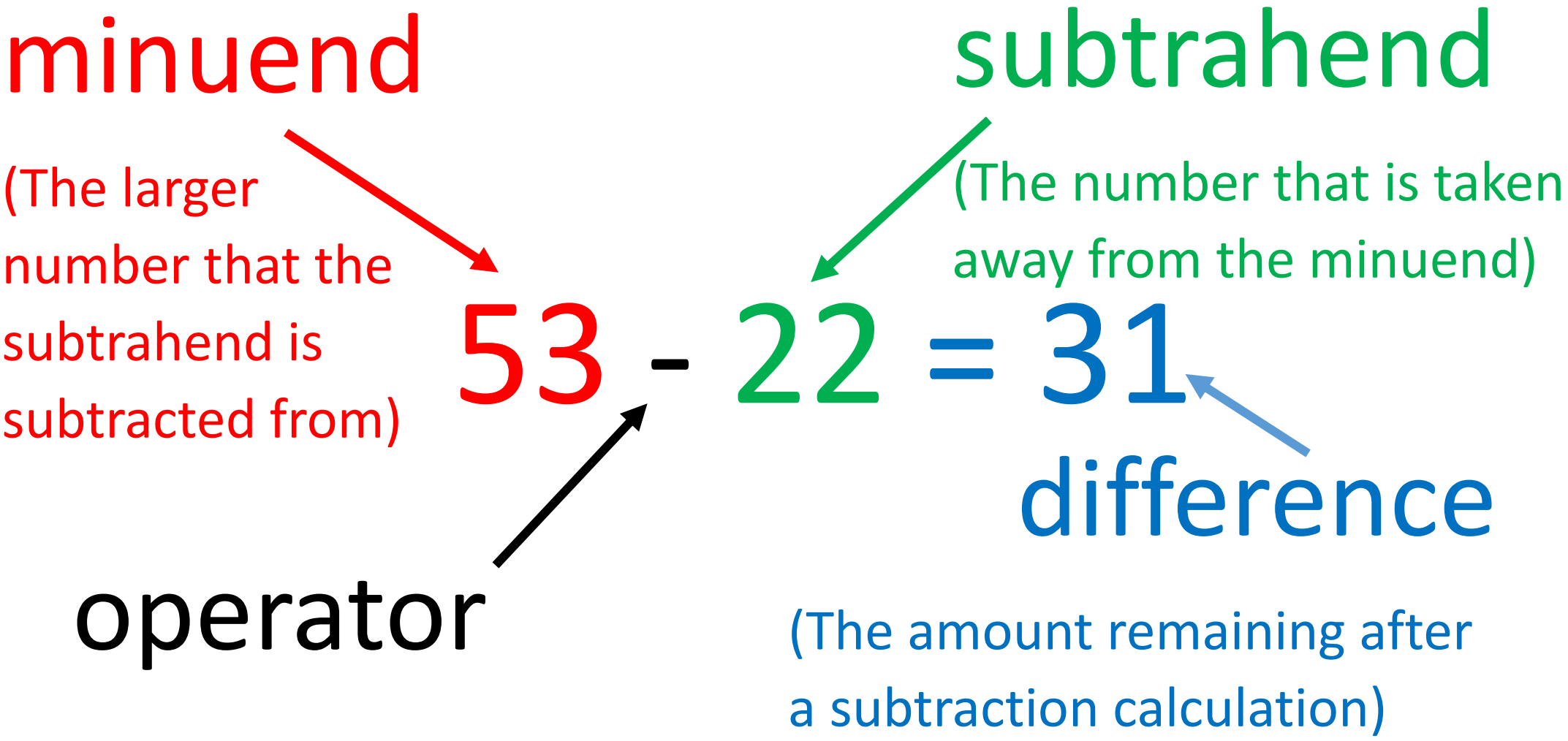



operator

sum or total

(The whole amount)

# Subtraction



# Multiplication

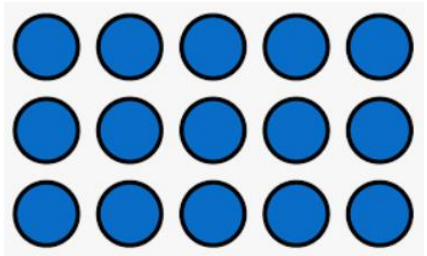
factor

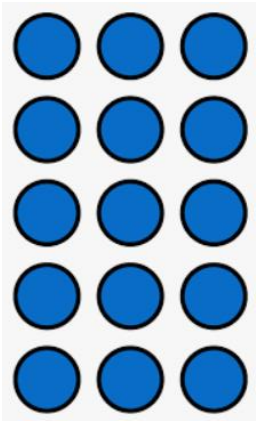
factor

3 x 5 = 15

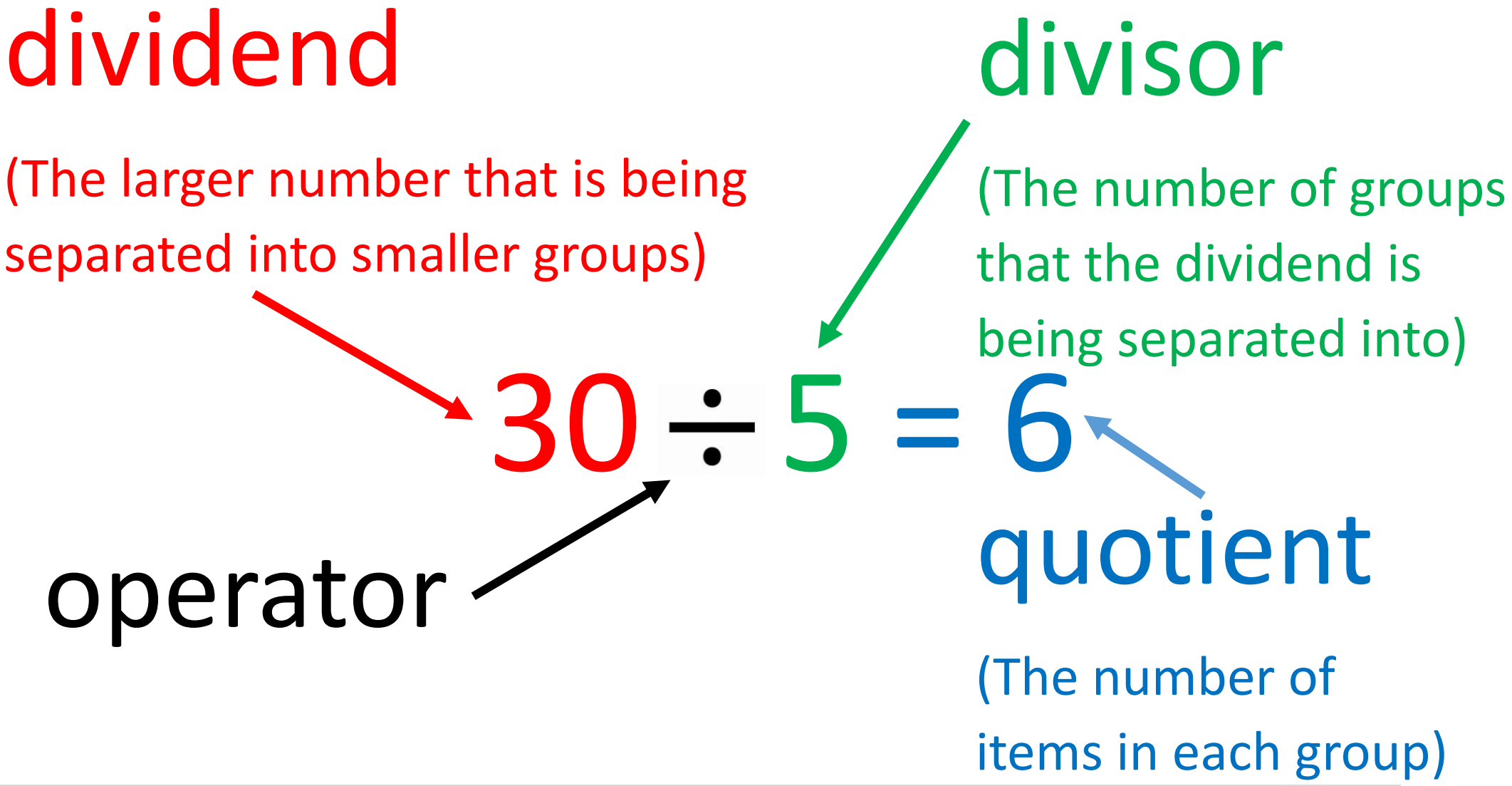
operator

product





# Division


dividend
(The larger number that is being separated into smaller groups)
divisor
(The number of groups that the dividend is being separated into)
30 ÷ 5 = 6
operator
quotient
(The number of items in each group)