

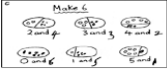



Calculation Policy

Barlby Primary School

We aim for children to learn how to use and apply the four operations (addition, subtraction, multiplication, and division) in abstract maths and real life maths problems. This should be taught through a progressive approach, challenging the children to use an array of strategies.

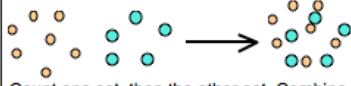
The following is guidance to the strategies that should be learnt by the pupil to ensure progress.

	Addition	Subtraction	Multiplication	Division
Rec	<p>Children's accuracy when counting is consolidated to ensure that they can count reliably with numbers from 1-20 and say which number is one more than a given number. Using quantities and objects, they add two single-digit numbers and count on to find the answer.</p> <p>They use practical resources and a range of different objects and contexts to support addition and teachers <i>demonstrate</i> the use of the number line.</p> <p>They develop ways of recording calculations using pictures, etc. and begin to record their calculations using number sentences.</p> 	<p>Children's accuracy when counting is consolidated to ensure that they can count reliably with numbers from 1-20 and say which number is one less than a given number. Using quantities and objects, they subtract two single-digit numbers and count back to find the answer.</p> <p>They use practical resources and a range of different objects and contexts to support addition and teachers <i>demonstrate</i> the use of the number line.</p> <p>They develop ways of recording calculations using pictures etc. and begin to record their calculations using number sentences.</p> 	<p>Children will solve practical problems which involve multiplication in the context of doubling.</p> <p>They use practical resources and a range of different objects to support their understanding.</p>	<p>Children will solve practical problems which involve multiplication in the context of halving and sharing (to make things fair).</p> <p>They use practical resources and a range of different objects to support their understanding.</p>

Y1

Combining two sets (aggregation)

Putting together – two or more amounts or numbers are put together to make a total
 $7 + 5 = 12$



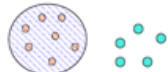
Count one set, then the other set. Combine the sets and count again. Starting at 1.
 Counting along the bead bar, count out the 2 sets, then draw them together, count again. Starting at 1.



Combining two sets (augmentation)

This stage is essential in starting children to calculate rather than counting
 Where one quantity is increased by some amount. Count on from the total of the first set, e.g. put 3 in your head and count on 2. Always start with the largest number.

Counters:



Start with 7, then count on 8, 9, 10, 11, 12

Bead strings:



Make a set of 7 and a set of 5. Then count on from 7.

Number tracks:



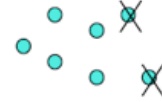
Start on 5 then count on 3 more

If able, children will use a 100 square to add tens and units. Find the largest number, add tens by jumping down and add units by jumping on.

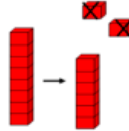
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Taking away (separation model)

Where one quantity is taken away from another to calculate what is left.
 $7 - 2 = 5$



Multilink towers - to physically take away objects.



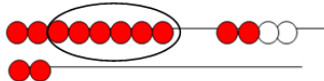
Finding the difference (comparison model)

Two quantities are compared to find the difference.
 $8 - 2 = 6$

Counters:



Bead strings:



Make a set of 8 and a set of 2. Then count the gap.

Number tracks:



Start with the smaller number and count the gap to the larger number.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

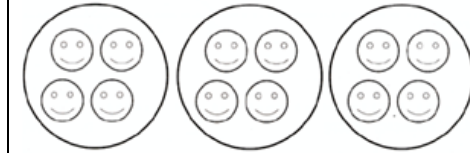
Children will experience equal groups of objects.

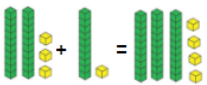
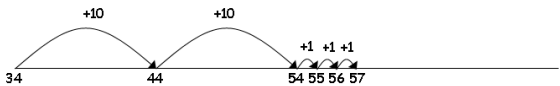
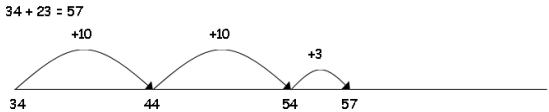
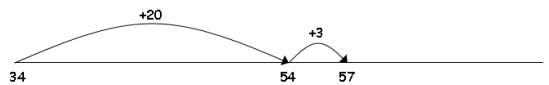


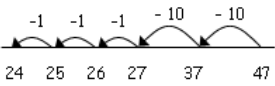
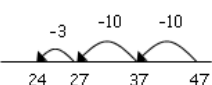
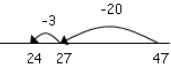
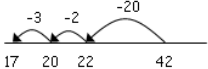
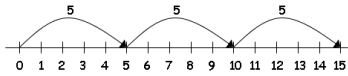
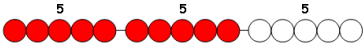
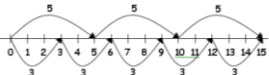

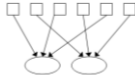

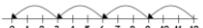

They will count in 2s and 10s and begin to count in 5s.

They will work on practical problem solving activities involving equal sets or groups.



Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.

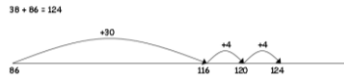


	Addition	Subtraction	Multiplication	Division
Y2	<p>Children will use a 100 square to add tens and units. Find the largest number, add tens by jumping down and add units by jumping on.</p> <p>Children can use Dienes to add two-digit numbers, by adding the tens and then the ones.</p> <p>$23 + 11 = 34$</p>  <p>Children will begin to use 'empty number lines' themselves starting with the larger number and counting on.</p> <p>✓ First counting on in tens and ones.</p> <p>$34 + 23 = 57$</p>  <p>✓ Then helping children to become more efficient by adding the units in one jump (by using the known fact $4 + 3 = 7$).</p> <p>$34 + 23 = 57$</p>  <p>✓ Followed by adding the tens in one jump and the units in one jump.</p> <p>$34 + 23 = 57$</p>  <p>✓ Bridging through ten can help children become more efficient.</p> <p>$37 + 15 = 52$</p> 	<p>Children will use a 100 square to subtract tens and units. Find the largest number, subtract tens by jumping up and subtract units by jumping back.</p> <p>Children can use Dienes to subtract a number from a two-digit number, by taking away the tens and then the ones.</p> <p>$34 - 12 = 22$</p>  <p>Children will begin to use empty number lines to support calculations.</p> <p>Counting back:</p> <p>✓ First counting back in tens and ones.</p> <p>$47 - 23 = 24$</p>  <p>✓ Then helping children to become more efficient by subtracting the units in one jump (by using the known fact $7 - 3 = 4$).</p> <p>$47 - 23 = 24$</p>  <p>✓ Subtracting the tens in one jump and the units in one jump.</p> <p>$47 - 23 = 24$</p>  <p>✓ Bridging through ten can help children become more efficient.</p> <p>$42 - 25 = 17$</p>  <p>Counting on: 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'.</p>	<p>Children will develop their understanding of multiplication and use jottings to support calculation:</p> <p>✓ Repeated addition 3 times 5 is $5 + 5 + 5 = 15$ or 3 lots of 5 or 5×3</p> <p>Repeated addition can be shown easily on a number line:</p> <p>$5 \times 3 = 5 + 5 + 5$</p>  <p>and on a bead bar:</p> <p>$5 \times 3 = 5 + 5 + 5$</p>  <p>✓ Skip counting in 2s, 3s, 5s, 10s</p> <p>✓ Commutativity Children should know that 3×5 has the same answer as 5×3. This can also be shown on the number line.</p>  <p>✓ Arrays Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.</p> 	<p>Children will develop their understanding of division and use jottings to support calculation</p> <p>✓ Sharing equally 6 sweets shared between 2 people, how many do they each get?</p>  <p>✓ Grouping or repeated subtraction There are 6 sweets, how many people can have 2 sweets each?</p>  <p>✓ Repeated subtraction using a number line or bead bar $12 \div 3 = 4$</p>   <p><small>The bead bar will help children with interpreting division calculations such as $10 \div 5$ as 'how many 5s make 10?'</small></p> <p>✓ Skip counting in 2s, 3s, 5s, 10s</p> <p>✓ Using symbols to stand for unknown numbers to complete equations using inverse operations</p> <p>$\square \div 2 = 4$ $20 \div \triangle = 4$ $\square \div \triangle = 4$</p>

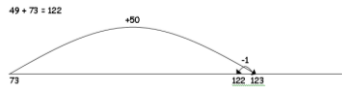
Y3

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.



- ✓ Compensation



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

Using expanded column method. When confident begin to exchange. Children to use Dienes to support understanding.

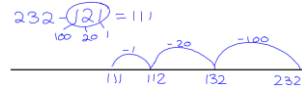
$$21 + 22 = 43$$

$$\begin{array}{r} \text{T O} \\ 20 \ 1 \\ \underline{20 \ 2} + \\ 40 + 3 = 43 \end{array}$$

$$127 + 124 = 251$$

$$\begin{array}{r} \text{H T O} \\ + 100 \ 20 \ 7 \\ \underline{100 \ 20 \ 4} \\ 200 + 50 + 1 = 251 \\ 10 \end{array}$$

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



Children will begin to use informal pencil and paper methods (jottings).

- ✓ **Partitioning and decomposition**

- Partitioning – demonstrated using arrow cards
- Decomposition - base 10 materials

NOTE When solving the calculation $89 - 57$, children should know that 57 **does NOT EXIST AS AN AMOUNT** it is what you are subtracting from the other number. Therefore, when using base 10 materials, children would need to count out only the 89.

Using expanded column method. When confident begin to exchange

$$36 - 22 = 14$$

$$\begin{array}{r} \text{T O} \\ 30 \ 6 \\ \underline{- 20 \ 2} \\ 10 + 4 = 14 \end{array}$$

$$41 - 22 = 19$$

$$\begin{array}{r} \text{T O} \\ 40 \ 11 \\ \underline{- 20 \ 2} \\ 10 + 9 = 19 \end{array}$$

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

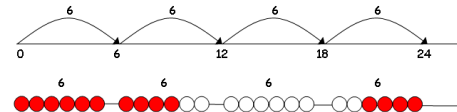
$$102 - 89 = 13$$



Children will continue to use:

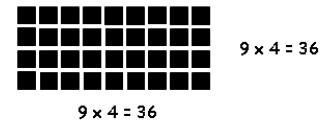
- ✓ **Repeated addition**
4 times 6 is $6 + 6 + 6 + 6 = 24$ or 4 lots of 6 or 6×4

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



- ✓ **Arrays**

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



- ✓ **Scaling**

e.g. Find a ribbon that is 4 times as long as the blue ribbon

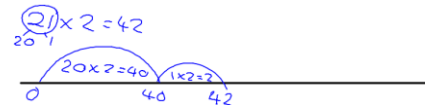


- ✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

$$\square \times 5 = 20 \qquad 3 \times \triangle = 18$$

$$\square \times \bigcirc = 32$$

- ✓ **Partitioning**



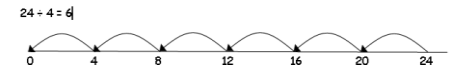
$$\begin{aligned} 38 \times 5 &= (30 \times 5) + (8 \times 5) \\ &= 150 + 40 \\ &= 190 \end{aligned}$$

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.



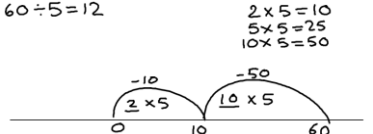
Children should also move onto calculations involving remainders.

$$13 \div 4 = 3 \text{ r } 1$$



Chunking on a number line method

$$60 \div 5 = 12$$



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

$$26 \div 2 = \square$$

$$24 \div \triangle = 12$$

$$\square \div 10 = 8$$

Y4

✓ Carry below the line.

$$\begin{array}{r} 625 \\ + 48 \\ \hline 673 \\ 1 \end{array} \qquad \begin{array}{r} 783 \\ + 42 \\ \hline 825 \\ 1 \end{array} \qquad \begin{array}{r} 367 \\ + 85 \\ \hline 452 \\ 11 \end{array}$$

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.

✓ Partitioning and decomposition

$$\begin{array}{r} 754 \\ - 86 \\ \hline \end{array}$$

Step 1 $700 + 50 + 4$
 $- \quad \quad 80 + 6$

Step 2 $700 + 40 + 14$ (adjust from T to U)
 $- \quad \quad 80 + 6$

Step 3 $600 + 140 + 14$ (adjust from H to T)
 $- \quad \quad 80 + 6 = 668$

This would be recorded by the children as

$$\begin{array}{r} 600 + 140 + 14 \\ - \quad \quad 80 + 6 \\ \hline 600 + 60 + 8 = 668 \end{array}$$

✓ Decomposition

$$\begin{array}{r} 6141 \\ 784 \\ - 86 \\ \hline 668 \end{array}$$

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.

$$\begin{array}{r} \text{£}8.95 \\ - \text{£}4.38 \\ \hline \end{array} = 8 + 0.9 + 0.05 - 4 - 0.3 + 0.08$$

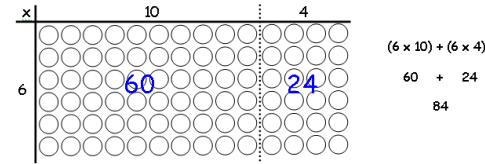
leading to

$$\begin{array}{r} 8.85 \\ - 4.38 \\ \hline \end{array} = 8 + 0.8 + 0.15 - 4 - 0.3 + 0.08$$

(adjust from T to U)

$$\begin{array}{r} 8.85 \\ - 4.38 \\ \hline \end{array} = \text{£}4.47$$

Children will continue to use arrays where appropriate leading into the grid method of multiplication.



✓ Grid method

TU x U

(Short multiplication – multiplication by a single digit)

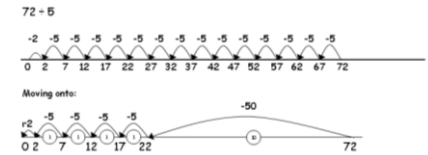
$$23 \times 8$$

Children will approximate first

$$23 \times 8 \text{ is approximately } 25 \times 8 = 200$$

$$\begin{array}{r} \times 20 \quad 3 \\ 8 \quad \boxed{160} \quad \boxed{24} \\ \hline 160 \\ + 24 \\ \hline 184 \end{array}$$

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.



Then onto the vertical method:

Short division TU ÷ U

$$72 \div 3$$

$$\begin{array}{r} 3 \overline{) 72} \\ - 30 \\ \hline 42 \\ - 30 \\ \hline 12 \\ - 9 \\ \hline 3 \\ - 3 \\ \hline 0 \end{array}$$

Answer: 24

Leading to subtraction of other multiples.

$$96 \div 6$$

$$\begin{array}{r} 16 \\ 6 \overline{) 96} \\ - 60 \\ \hline 36 \\ - 36 \\ \hline 0 \end{array}$$

Answer: 16

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.

Y5

Children should extend the carrying method to numbers with at least four digits.

$$\begin{array}{r} 587 \\ + 475 \\ \hline 1062 \\ \text{1 1} \end{array} \qquad \begin{array}{r} 3587 \\ + 675 \\ \hline 4262 \\ \text{1 1 1} \end{array}$$

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. $3.2\text{ m} - 280\text{ cm}$.

Decomposition

$$\begin{array}{r} 614\text{ 1} \\ 784 \\ - 286 \\ \hline 468 \end{array}$$

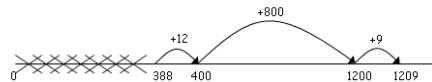
Children should:

- ✓ 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

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

$$1209 - 388 = 821$$



Grid method
HTU x U

(Short multiplication – multiplication by a single digit)
 346×9
Children will approximate first
 346×9 is approximately $350 \times 10 = 3500$

$$\begin{array}{r} \times \quad 300 \quad 40 \quad 6 \\ 9 \quad \boxed{2700} \quad \boxed{360} \quad \boxed{54} \\ \hline 2700 \\ + 360 \\ + 54 \\ \hline 3114 \\ \text{1 1} \end{array}$$

TU x TU

(Long multiplication – multiplication by more than a single digit)
 72×38
Children will approximate first
 72×38 is approximately $70 \times 40 = 2800$

$$\begin{array}{r} \times \quad 70 \quad 2 \\ 30 \quad \boxed{2100} \quad \boxed{60} \\ 8 \quad \boxed{560} \quad \boxed{16} \\ \hline 2100 \\ + 560 \\ + 60 \\ + 16 \\ \hline 2736 \\ \text{1 1} \end{array}$$

Using similar methods, they will be able to multiply decimals with one decimal place by a single digit number, approximating first. They should know that the decimal points line up under each other.

e.g. 4.9×3
Children will approximate first
 4.9×3 is approximately $5 \times 3 = 15$

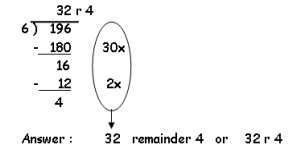
$$\begin{array}{r} \times \quad 4 \quad 0.9 \\ 3 \quad \boxed{12} \quad \boxed{2.7} \\ \hline 12 \\ + 2.7 \\ \hline 14.7 \end{array}$$

Children will continue to use written methods to solve short division $TU \div U$.

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

Short division HTU \div U

$$196 \div 6$$



Any remainders should be shown as integers, i.e. 14 remainder 2 or $14\text{ r }2$.

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.

Y6

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

$$\begin{array}{r} 7648 \\ + 1486 \\ \hline 9134 \\ \small{111} \end{array} \qquad \begin{array}{r} 6584 \\ + 5848 \\ \hline 12432 \\ \small{111} \end{array} \qquad \begin{array}{r} 42 \\ 6432 \\ 786 \\ 3 \\ + 4681 \\ \hline 11944 \\ \small{121} \end{array}$$

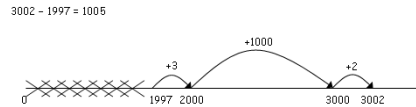
- Using similar methods, children will
- ✓ add several numbers with different numbers of digits;
 - ✓ begin to add two or more decimal fractions with up to four digits and either one or two decimal places;
 - ✓ know that decimal points should line up under each other, particularly when adding or subtracting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

Decomposition

$$\begin{array}{r} 3131 \\ 4467 \\ - 2684 \\ \hline 3783 \end{array}$$

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



ThHTU x U

(Short multiplication – multiplication by a single digit)
 4346×8
 Children will approximate first
 4346×8 is approximately $4346 \times 10 = 43460$

$$\begin{array}{r} \times \quad 4000 \quad 300 \quad 40 \quad 6 \\ 8 \quad \boxed{32000} \quad \boxed{2400} \quad \boxed{320} \quad \boxed{48} \\ \hline 32000 \\ + 2400 \\ + 320 \\ + 48 \\ \hline 34768 \end{array}$$

HTU x TU

(Long multiplication – multiplication by more than a single digit)
 372×24
 Children will approximate first
 372×24 is approximately $400 \times 25 = 10000$

$$\begin{array}{r} \times \quad 300 \quad 70 \quad 2 \\ 20 \quad \boxed{6000} \quad \boxed{1400} \quad \boxed{40} \\ 4 \quad \boxed{1200} \quad \boxed{280} \quad \boxed{8} \\ \hline 6000 \\ + 1400 \\ + 1200 \\ + 280 \\ + 40 \\ + 8 \\ \hline 8928 \end{array}$$

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. They should know that the decimal points line up under each other.

For example:
 4.92×3
 Children will approximate first
 4.92×3 is approximately $5 \times 3 = 15$

$$\begin{array}{r} \times \quad 4 \quad 0.9 \quad 0.02 \\ 3 \quad \boxed{12} \quad \boxed{2.7} \quad \boxed{0.06} \\ \hline 12 \\ + 0.7 \\ + 0.06 \\ \hline 12.76 \end{array}$$

Use short multiplication method when confident to exchange.

$$\begin{array}{r} 1121 \\ 432 \\ \times 57 \\ \hline 3024 \\ + 21600 \\ \hline 24624 \end{array}$$

Children will continue to use written methods to solve short division $TU \div U$ and $HTU \div U$.

Long division HTU ÷ TU

972 ÷ 36

Any remainders should be shown as fractions, i.e. if the children were dividing 32 by 10, the answer should be shown as $3 \frac{2}{10}$ which could then be written as $3 \frac{1}{5}$ in its 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

