

Addition

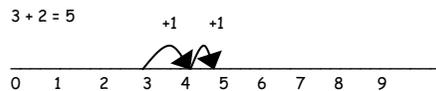
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.



Bead strings or bead bars can be used to illustrate addition



They use numberlines and practical resources to support calculation and teachers *demonstrate* the use of the numberline.



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



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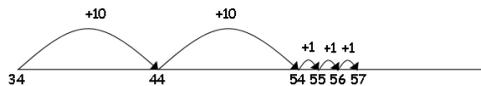
Begin to **partition and recombine** (mentally) by breaking units of 6, 7, 8 or 9 into '5 and a bit'.

$$\begin{aligned} 5 + 8 &= 5 \text{ plus } (5 \text{ and } 3) \\ &= 5 + 5 + 3 \\ &= 10 + 3 \\ &= 13 \end{aligned}$$

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

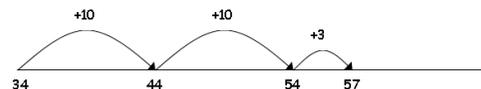
✓ First counting on in tens and ones.

$$34 + 23 = 57$$



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

$$34 + 23 = 57$$



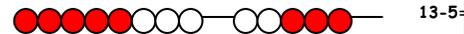
Subtraction

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.



They use numberlines and practical resources to support calculation. Teachers *demonstrate* the use of the numberline

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



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

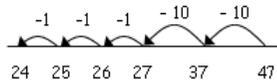
The numberline should also be used to show that $6 - 3$ means the 'difference between 6 and 3' or 'the difference between 3 and 6' and how many jumps they are apart.

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

Counting back:

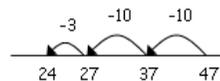
✓ First counting back in tens and ones.

$$47 - 23 = 24$$



✓ 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.

Multiplication

Children will experience equal groups of objects. They will count in 2s and 10s and later in 5s.

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

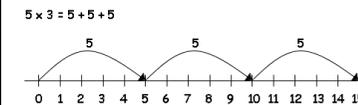


Children will develop their understanding of multiplication and use jottings to support calculation:

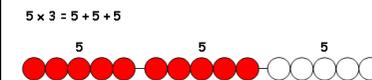
✓ **Repeated addition**

3 times 5 is $5 + 5 + 5 = 15$ or 3 lots of 5 or 5×3

Repeated addition can be shown easily on a number line:

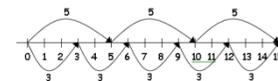


and on a bead bar:



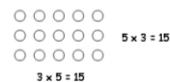
✓ **Commutativity**

Children should know that 3×5 has the same answer as 5×3 . 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.



✓ **Scaling**

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

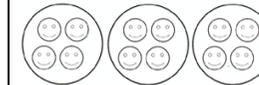


✓ **Partitioning**

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

Division

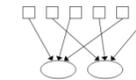
Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.



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

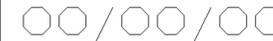
✓ **Sharing equally**

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



✓ **Grouping or repeated subtraction**

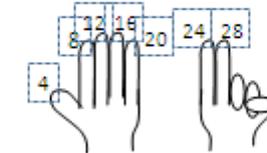
There are 6 sweets, how many people can have 2 sweets each?



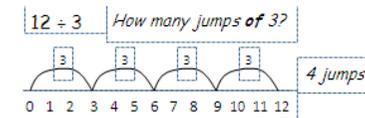
Ensure that the emphasis remains on grouping and sharing.

Children use known multiplication facts to count in groups.

$$28 \div 4 = 7$$



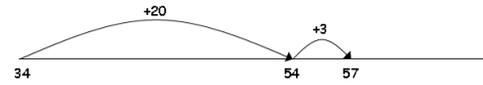
Children will use number lines to count forward jumps dividing by units up to the tenth multiple.



Children then begin to use 'chunks' to move into dividing beyond the tenth multiple and work with calculations which

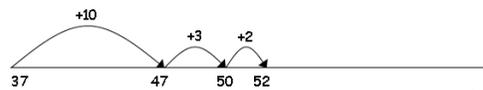
✓ Followed by adding the tens in one jump and the units in one jump.

$$34 + 23 = 57$$



✓ Bridging through ten can help children become more efficient.

$$37 + 15 = 52$$



Moving on to partitioning
67+24=91

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

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

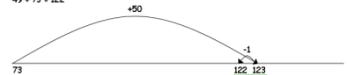
✓ Count on from the largest number irrespective of the order of the calculation.

$$38 + 86 = 124$$



✓ Compensation

$$49 + 73 = 122$$



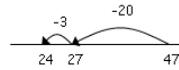
Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

Adding the least significant digits first

$$\begin{array}{r} 67 \\ + 24 \\ \hline 11 \quad (7 + 4) \\ 80 \quad (60 + 20) \\ \hline 91 \end{array} \qquad \begin{array}{r} 267 \\ + 85 \\ \hline 12 \quad (7 + 5) \\ 140 \quad (60 + 80) \\ \hline 200 \\ \hline 352 \end{array}$$

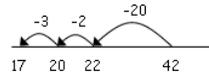
✓ Carry below the line.

$$47 - 23 = 24$$



✓ Bridging through ten can help children become more efficient.

$$42 - 25 = 17$$



Counting on using a number line.

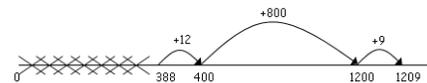
The number line should still show 0 so children can cross out the section from 0 to the smallest number. They then associate this method with 'taking away'.

Children will continue to use empty number lines with increasingly large numbers, particularly where numbers are close together.

$$102 - 89 = 13$$



$$1209 - 388 = 821$$



✓ Partitioning and decomposition

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

$$\begin{array}{r} 89 \\ - 57 \\ \hline 32 \end{array} = \begin{array}{r} 80 + 9 \\ - 50 + 7 \\ \hline 30 + 2 = 32 \end{array}$$

✓ Begin to exchange.

$$\begin{array}{r} 71 \\ - 46 \\ \hline \end{array}$$

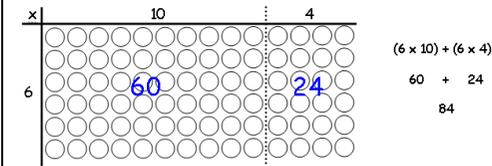
$$\begin{array}{r} \text{Step 1} \quad 70 + 1 \\ - 40 + 6 \\ \hline \text{Step 2} \quad 60 + 11 \\ - 40 + 6 \\ \hline 20 + 5 = 25 \end{array}$$

This would be recorded by the children as

$$\begin{array}{r} 70 + 1 \\ - 40 + 6 \\ \hline 20 + 5 = 25 \end{array}$$

Partitioning and decomposition

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 x 8 is approximately 25 x 8 = 200

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

HTU x U

(Short multiplication - multiplication by a single digit)

$$346 \times 9$$

Children will approximate first
346 x 9 is approximately 350 x 10 = 3500

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

Partitioning method

$$\begin{array}{r} 24 \\ \underline{8x} \\ 8 \times 4 \quad 24 \\ 8 \times 20 \quad 160 \\ \hline 184 \end{array}$$

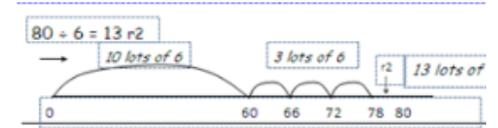
TU x TU

(Long multiplication - multiplication by more than a single digit)

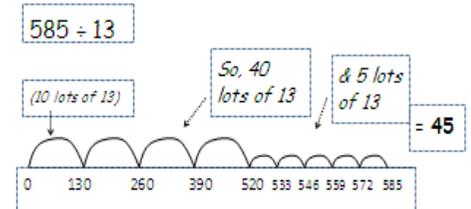
$$72 \times 38$$

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

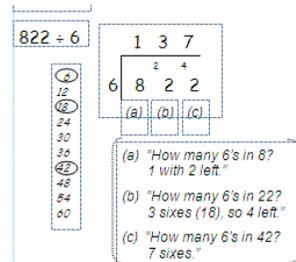
give ride to remainders



Children then move into using this method to divide by TU - Note this method may be used on children who are confident may move straight onto shorter written methods, first for divide by units then for dividing by tens and units.



Children then move onto the shorter formal method for dividing by a unit.



This method can then be transferred for dividing by TU

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

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.

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

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

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.

Step 1 $754 = 700 + 50 + 4$
 $- 286 \quad - 200 + 80 + 6$

Step 2 $700 + 40 + 14$ (adjust from T to U)
 $- 200 + 80 + 6$

Step 3 $600 + 140 + 14$ (adjust from H to T)
 $- 200 + 80 + 6$
 $400 + 60 + 8 = 468$

This would be recorded by the children as

$$\begin{array}{r} 600 + 140 + 14 \\ 700 + 50 + 4 \\ - 200 + 80 + 6 \\ \hline 400 + 60 + 8 = 468 \end{array}$$

Decomposition

$$\begin{array}{r} 6141 \\ 784 \\ - 286 \\ \hline 468 \end{array} \quad \begin{array}{r} 5131 \\ 6467 \\ - 2684 \\ \hline 3783 \end{array}$$

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.

$$\begin{array}{r} \times 702 \\ 30 \quad 2100 \quad 60 \\ 8 \quad 560 \quad 16 \\ \hline 2100 \\ + 560 \\ + 60 \\ + 16 \\ \hline 2736 \end{array}$$

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 $5 \times 3 = 15$

HTU x TU

(Long multiplication - multiplication by more than a single digit)

372×24
 Children will approximate first
 372×24 is approximately $400 \times 25 = 10000$

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

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 $5 \times 3 = 15$

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

Moving into standard written method

$$\begin{array}{r} 234 \\ \underline{\quad 3} \\ 702 \\ 1 \quad 1 \end{array}$$

And then standard written method for HTU by TU

$$\begin{array}{r} 521 \times \\ \underline{\quad 22} \\ 1042 \\ 10420 \\ \hline 11462 \end{array}$$

+ by TU

$$585 \div 13$$

$$\begin{array}{r} 13 \overline{) 585} \\ \underline{26} \\ 32 \\ \underline{26} \\ 65 \\ \underline{65} \\ 0 \end{array} \quad \begin{array}{r} 0 \quad 4 \quad 5 \\ 13 \overline{) 585} \\ \underline{52} \\ 65 \\ \underline{65} \\ 0 \end{array}$$

This can also be used for division giving rise to remainders / decimals and for dividing decimal numbers.

$$986 \div 8$$

$$\begin{array}{r} 8 \overline{) 986} \\ \underline{72} \\ 26 \\ \underline{24} \\ 26 \\ \underline{24} \\ 2 \end{array} \quad \begin{array}{r} 1 \quad 2 \quad 3 \quad 2 \quad 5 \\ 8 \overline{) 986.00} \\ \underline{72} \\ 26 \\ \underline{24} \\ 26 \\ \underline{24} \\ 2 \end{array}$$

Place decimal point and zeros & continue process

$$76.5 \div 6$$

$$\begin{array}{r} 6 \overline{) 76.5} \\ \underline{6} \\ 16 \\ \underline{12} \\ 45 \\ \underline{42} \\ 35 \\ \underline{30} \\ 5 \end{array} \quad \begin{array}{r} 1 \quad 2 \quad 7 \quad 5 \\ 6 \overline{) 76.50} \\ \underline{6} \\ 16 \\ \underline{12} \\ 45 \\ \underline{42} \\ 35 \\ \underline{30} \\ 5 \end{array}$$

