

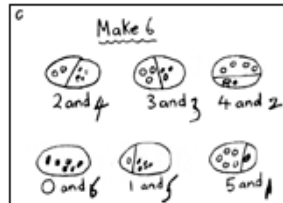
Teversham Church of England Primary School
Calculation Policy



Children should only move onto the next stage when they are confident and have a good understanding and can apply the method for themselves.

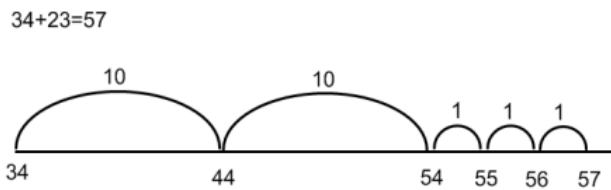
Stages in Addition

Stage 1: Use number lines and practical resources to support calculation. Children then begin to use numbered lines to support their own calculations using a numbered line to count on in ones.

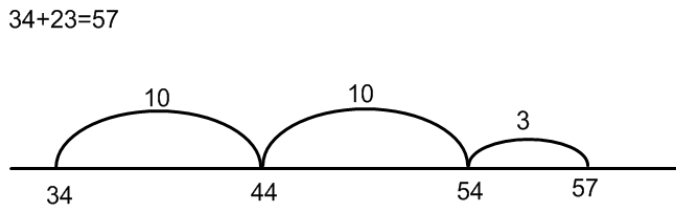


Stage 2: Children will begin to use 'empty number lines' themselves starting with the larger number and counting on.

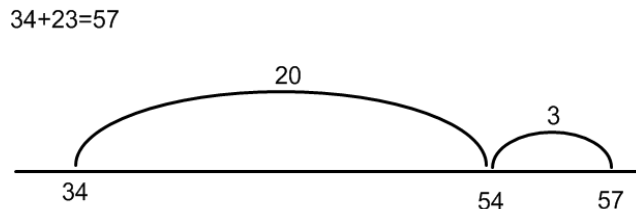
First counting on in tens and ones.



Then helping children to become more efficient by adding the units in one jump.

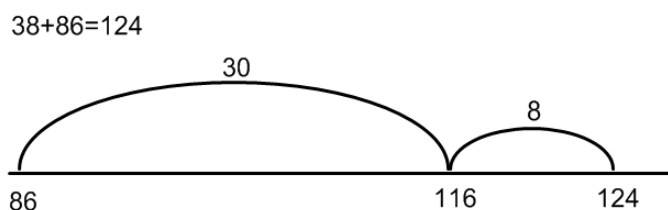


Followed by adding the tens in one jump and the units in one jump.



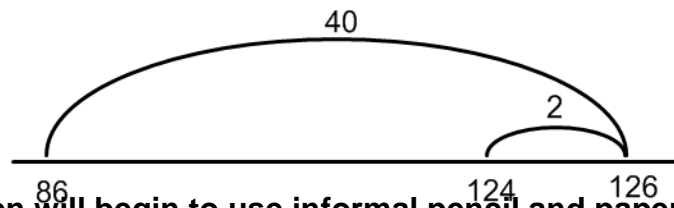
Stage 3: Children will continue to use empty number lines with increasingly large numbers, including compensation where appropriate.

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



Compensation:

$$38+86=124$$



Stage 4: Children will begin to use informal pencil and paper methods.

Leading to:

$$\begin{array}{r} 40 + 7 \\ 70 + 6 \\ \hline 110 + 13 = 123 \end{array}$$

$$\begin{array}{r} 47 \\ +76 \\ \hline 13 \quad (6+7) \\ 110 \quad (70+40) \\ \hline 123 \end{array}$$

Leading to:

$$\begin{array}{r} 267 \\ +85 \\ \hline 200 \\ 140 \\ \hline 85 \\ \hline 352 \end{array}$$

Stage 5: Children will then be confident enough with their maths to move onto standard written algorithms.

$$\begin{array}{r} 625 \\ + 48 \\ \hline 673 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 783 \\ + 42 \\ \hline 825 \\ \hline 1 \end{array}$$

$$\begin{array}{r} 367 \\ + 85 \\ \hline 452 \\ \hline 11 \end{array}$$

Children can extend the carrying method to number with any number of digits and decimals

$$\begin{array}{r} 7648 \\ + 1486 \\ \hline 9134 \\ \hline 111 \end{array}$$

$$\begin{array}{r} 6584 \\ + 5848 \\ \hline 12432 \\ \hline 111 \end{array}$$

$$\begin{array}{r} 42 \\ 6432 \\ 786 \\ 3 \\ \hline + 4681 \\ \hline 11944 \\ \hline 121 \end{array}$$

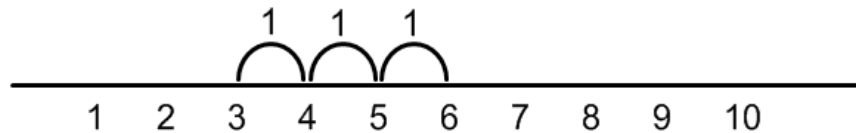
Stages in Subtraction

Stage 1: Children develop ways of recording calculations using pictures etc. They use numberlines and practical resources to support calculation.



Children then move onto using the number line with numbers.

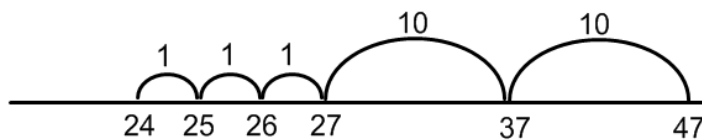
$$6-3=3$$



Stage 2 Children will begin to use empty number lines to support calculations.

First counting back in tens and ones:

$$47-23=24$$

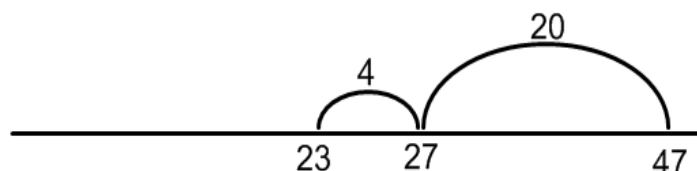


Children should then begin to subtract the units in one jump and the tens in one jump (similar to addition).

Counting on:

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

$$47-23=24$$

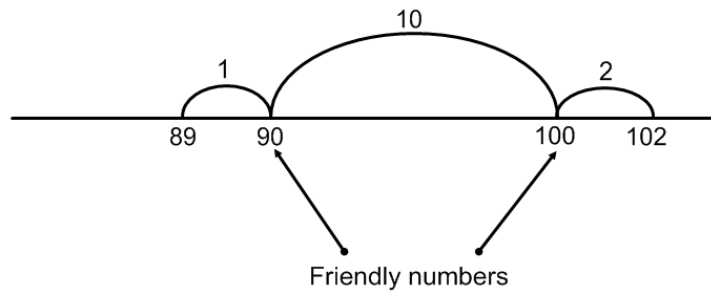


Stage 3: Children will continue to use empty number lines with increasingly large numbers.

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

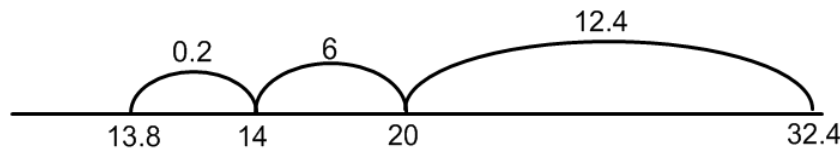
Where the numbers in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used. These should be referred to as 'friendly numbers'.

$$102 - 89 = 13$$



The above methods can be applied to larger numbers, using complements to 100 for friendly numbers and extended to subtracting decimals:

$$32.4 - 13.8 = 18.6$$



Stage 4: children move on to subtracting using a more formal, expanded column method. The partitioning and adjusting method can be demonstrated if required.

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

$$\text{Step 1} \quad \begin{array}{r} 700 + 50 + 4 \\ - \quad \quad 80 + 6 \\ \hline \end{array}$$

$$\text{Step 2} \quad \begin{array}{r} 700 + 40 + 14 \\ - \quad \quad 80 + 6 \\ \hline \end{array} \quad (\text{adjust from T to U})$$

$$\text{Step 3} \quad \begin{array}{r} 600 + 140 + 14 \\ - \quad \quad 80 + 6 \\ \hline 600 + 60 + 8 = 668 \end{array} \quad (\text{adjust from H to T})$$

Can be extended to more compact method to demonstrate decomposition:

$$\begin{array}{r} 60 \\ \cancel{70} + 11 \\ - 40 + 6 \\ \hline 20 + 5 = 25 \end{array}$$

Stage 5: Children will be confident enough with their maths to move onto standard written algorithms, including decomposition:

$$\begin{array}{r} 516 \\ \cancel{5} \cancel{1} 8 \\ - 2589 \\ \hline 3089 \end{array}$$

Stages in multiplication

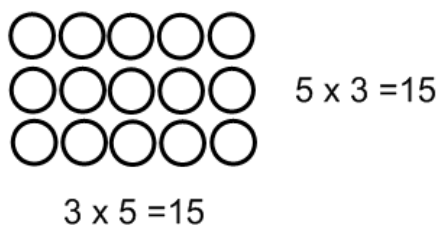
Stage 1: Children will experience equal groups of objects and will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.



Stage 2: Children will develop their understanding of multiplication and use jottings to support calculation:

Arrays:

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

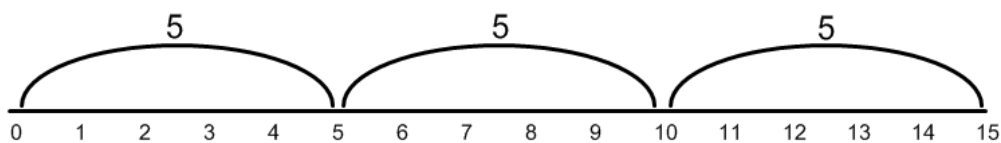


Repeated addition:

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:

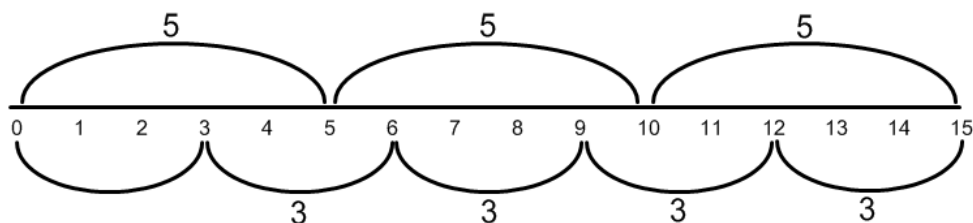
$$5 \times 3 = 5 + 5 + 5$$



Commutativity:

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

$$5 \times 3 = 3 \times 5$$

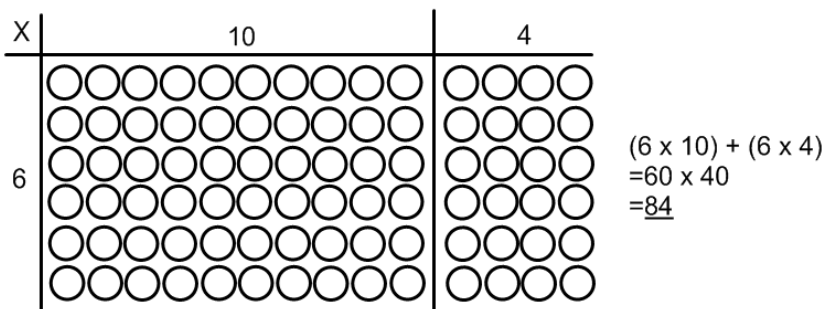


Stage 3: Children will also develop an understanding of:

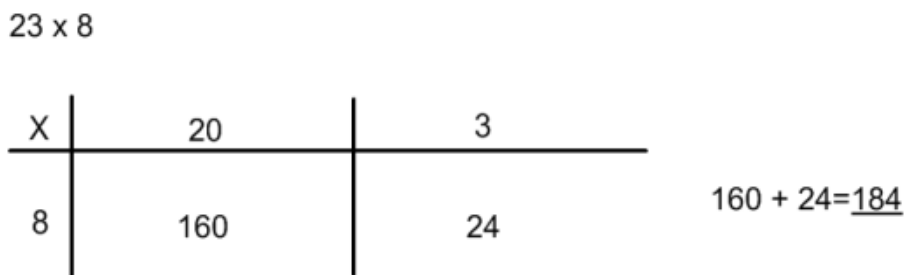
Partitioning:

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

Stage 4: Children will continue to use arrays where appropriate leading into the grid method of multiplication



Grid method: TU x U



Grid method extended to HTU x U, TU x TU and also U. X U (e.g. 4.3 x 7)

then..

Grid method extended to ThHTU x U, ThHTU x TU and also decimals to 2 decimal places (e.g. 4.38 x 7)

Stage 5: Expanded method

$$\begin{array}{r}
 168 \times 4 = \quad 168 \\
 \times \quad 4 \\
 \hline
 32 \quad (4 \times 8) \\
 240 \quad (4 \times 60) \\
 400 \quad (4 \times 100) \\
 \hline
 672
 \end{array}$$

Stage 6: Shortened method

$$\begin{array}{r}
 168 \times 4 = \quad 168 \\
 \times \quad 4 \\
 \hline
 672 \\
 23 \\
 \hline
 \hline
 \end{array}$$

Stage 7: Long multiplication

Long multiplication

24 x 16 becomes

$$\begin{array}{r}
 \quad \quad 2 \\
 \quad 24 \\
 \times 16 \\
 \hline
 240 \\
 144 \\
 \hline
 384
 \end{array}$$

Answer: 384

Stages in Division

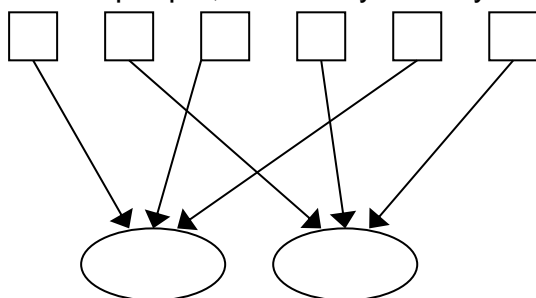
Stage 1: Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.



Stage 2: Children will develop their understanding of division and use jottings to support calculation

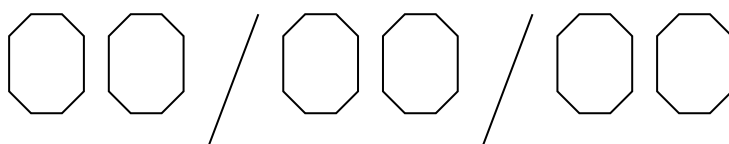
Sharing:

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



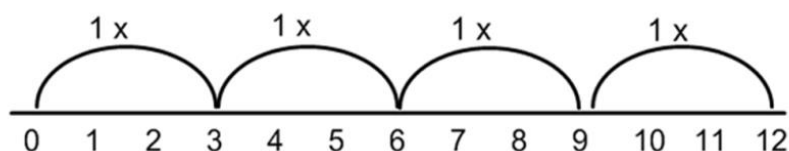
Grouping or repeated subtraction/addition:

There are 6 sweets. How many people can have 2 sweets each?



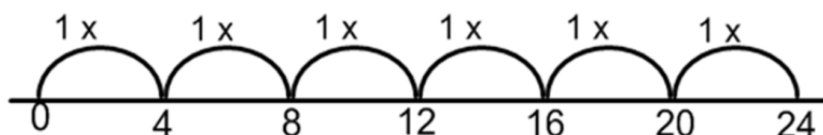
Repeated subtraction or addition using a number line:

$$12 \div 3 = 4$$



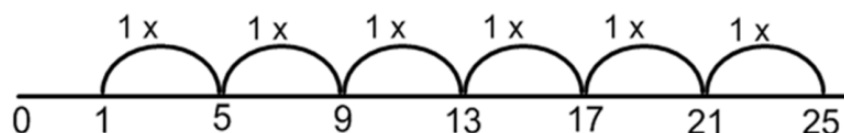
Stage 3: Repeated subtraction or addition using an empty number line

$$24 \div 4 = 6$$



Children should also move onto calculations involving remainders:

$$25 \div 4 = 6r1$$



Stage 4: Children will develop their use of repeated subtraction/addition to be able to add or subtract multiples of the divisor (CHUNKING)



Chunking

$$\begin{array}{r}
 72 \div 3 = \quad 72 \\
 \underline{-30} \quad (10x) \\
 42 \\
 \underline{-30} \quad (10x) \\
 12 \\
 \underline{-12} \quad (4x) \\
 0
 \end{array}$$

Total = 24

$$\begin{array}{r}
 196 \div 6 = \quad 196 \\
 \underline{-180} \quad (30x) \\
 16 \\
 \underline{-12} \quad (2x) \\
 4
 \end{array}$$

Total = 32 r 4

Stage 5: Children will continue to use written methods to solve short division $TU \div U$ and $HTU \div U$. Children can start to add or subtract larger multiples of the divisor as appropriate (eg 100 x)

Short division

$98 \div 7$ becomes

$$\begin{array}{r}
 14 \\
 7 \overline{) 98} \\
 \underline{7} \\
 28 \\
 \underline{28} \\
 0
 \end{array}$$

Answer:

$432 \div 5$ becomes

$$\begin{array}{r}
 86 \text{ r } 2 \\
 5 \overline{) 432} \\
 \underline{40} \\
 32 \\
 \underline{30} \\
 2
 \end{array}$$

Answer: 86 remainder 2

$432 \div 15$ becomes

Stage 6: Long division:

$$\begin{array}{r}
 28 \\
 15 \overline{) 432} \\
 \underline{30} \\
 132 \\
 \underline{150} \\
 120 \\
 \underline{120} \\
 0
 \end{array}$$

15×20

15×8

$$\frac{12}{15} = \frac{4}{5}$$

Answer: $28 \frac{4}{5}$