

Beechwood Primary School



Calculation Policy

Date of Creation: 1st March 2018

Review Date: March 2019

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*This replaces all previous copies of the **Calculation Policy***

Addition

Vocabulary

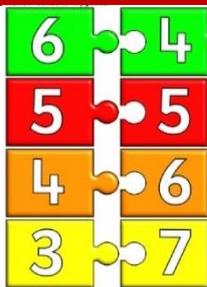
add and plus more than addition total
count on increase join bigger together more

Step 1

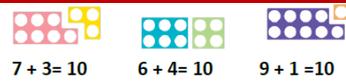


Developing mental methods

Mental addition and fluency is developed through frequent practise of strategies taught, including addition facts to 20 and related facts to 100, and addition of 1 and 2-digit numbers (including three 1-digit numbers).



Developing knowledge and understanding of number bonds to 10

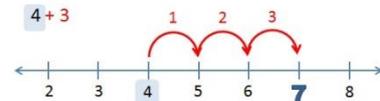


$7 + 3 = 10$

$6 + 4 = 10$

$9 + 1 = 10$

Addition using a number line



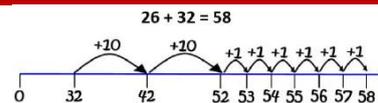
Step 2



Developing mental methods

Children should have regular practise of mental addition, including multiple numbers. Explore how children visualise numbers in their heads, and encourage them to use a variety of methods for manipulating numbers. They should be able to add 3 1-digit numbers mentally and any pair of 2-digit numbers mentally, using a strategy of their choice.

Addition using a blank number line (putting biggest number first)



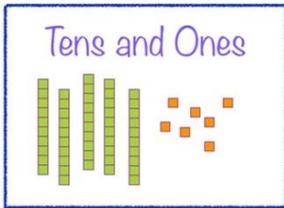
Dienes' Apparatus



$13 + 12 = 25$

Counting on in jumps of ten and one using a hundred square





Adding by partitioning, keeping the first number whole

$$26 + 32$$

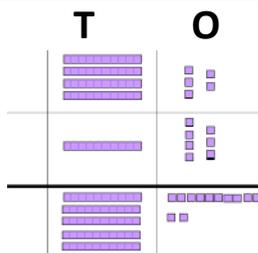
$$26 + 30 + 2$$

$$26 + 30 = 56 \text{ (add the tens)}$$

$$56 + 2 = 58 \text{ (add the ones)}$$

Children to be shown through practical resources the commutative law. Number can be added in any order and still give the same answer.

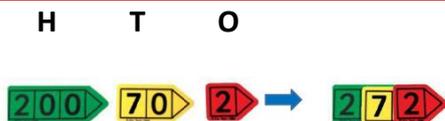
Step 3 & 4



Begin to use expanded written methods

$$\begin{array}{r} \text{T} \quad \text{O} \\ 40 \quad 5 \\ + 10 \quad 7 \\ \hline 50 + 12 \quad 62 \end{array}$$

Introduce practically with dienes.



Progress to expanded written methods involving hundreds

$$\begin{array}{r} \text{H} \quad \text{T} \quad \text{O} \\ 145 + 127 \\ 100 \quad 40 \quad 5 \\ + 100 \quad 20 \quad 7 \\ \hline 200 + 60 + 12 \quad 272 \end{array}$$

Reinforce understanding with use of arrow cards.

Addition using the compact written method involving carrying, adding the ones first

$$\begin{array}{r} \text{H} \quad \text{T} \quad \text{O} \\ 264 + 148 \\ \quad \quad 2 \quad 64 \\ + \quad 1 \quad 48 \\ \hline \quad \quad 4 \quad 12 \\ \hline \quad \quad 1 \quad 1 \end{array}$$

Step 5 & 6

Addition using the compact written method progressing to thousands

$$\begin{array}{r} \text{H} \quad \text{T} \quad \text{O} \\ 3364 + 247 \\ \quad \quad 3 \quad 3 \quad 64 \\ + \quad \quad 2 \quad 47 \\ \hline \quad \quad 3 \quad 6 \quad 11 \\ \hline \quad \quad 1 \quad 1 \end{array}$$

Addition involving decimals using compact written methods

$$\begin{array}{r} 3.56 + 2.47 \\ \quad \quad 3 \quad . \quad 5 \quad 6 \\ + \quad \quad 2 \quad . \quad 4 \quad 7 \\ \hline \quad \quad 6 \quad . \quad 0 \quad 3 \\ \hline \quad \quad 1 \quad 1 \end{array}$$

Use landmarked number lines to support children at the beginning.

Addition with negative numbers

$$-15 + 6 = -9$$

Resources

Multi-link, Numicon, Dienes, pegs, landmarked, number line, hundred, square

Subtraction

Vocabulary

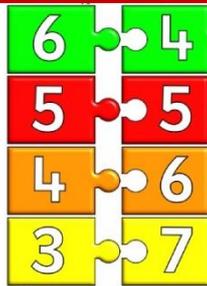
subtract subtraction take away take less less than minus
reduce fewer count back how many left difference

Step 1

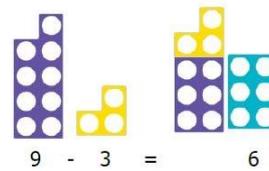


Developing mental methods

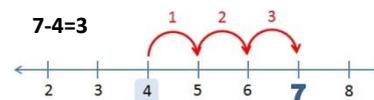
Children should apply their increasing knowledge of mental methods, subtract mentally, recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100



Developing knowledge and understanding of number bonds to 10 to solve simple subtraction sums.

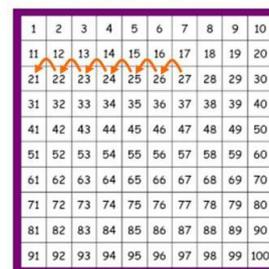


Counting back in jumps of one using a number line.



Counting back in jumps of one using a hundred square

$$27 - 6$$



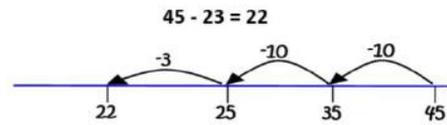
Step 2

Counting back in jumps of ten and one using a hundred square

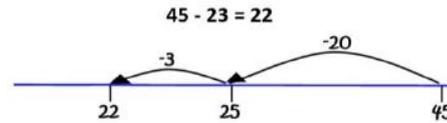
$$58 - 26$$



Counting back on a number line.



Children progress to adding groups of 10.



Step 3 & 4



Developing mental methods

Children should have regular practise of mental subtractions. Explore how children visualise numbers in their heads, and encourage them to use a variety of methods for manipulating the numbers.

Mental methods include partitioning and compensating: e.g. $31 - 17$ as $31 - 10 - 7$



Subtraction using expanded written methods in a vertical layout

$$66 - 54$$

$$\begin{array}{r} \text{T} \quad \text{O} \\ 60 \quad 6 \\ - 50 \quad 4 \\ \hline 10+2 \quad \rightarrow \quad 12 \end{array}$$

Introduce practically using dienes.

Subtraction using expanded written method using exchange

$$\begin{array}{r} \text{T} \quad \text{O} \quad \text{T} \quad \text{O} \\ 80 \quad 1 \rightarrow 70 \quad 11 \\ - 50 \quad 7 \\ \hline 20+4 \rightarrow 24 \end{array} \quad \begin{array}{r} \text{T} \quad \text{O} \\ 70 \quad 80 \quad 11 \\ - 50 \quad 7 \\ \hline 20+4 \rightarrow 24 \end{array}$$

Subtraction using compact written method

$$\begin{array}{r} 81 - 57 \\ \text{T} \quad \text{O} \\ 7 \quad 8 \quad 11 \\ - 5 \quad 7 \\ \hline 2 \quad 4 \end{array}$$

Step 5 & 6

Subtraction using compact written method exchanging across columns

$$\begin{array}{r} 403 - 127 = \\ \text{H} \quad \text{T} \quad \text{O} \\ 3 \quad 4 \quad 0 \quad 3 \\ - 1 \quad 2 \quad 7 \\ \hline 2 \quad 7 \quad 6 \end{array}$$

Subtraction
of decimal
numbers to 2
decimal
places using
compact
written
method

$$\pounds 2.31 - \pounds 1.53$$

$$\begin{array}{r} \cancel{\pounds 2}^1 \cdot \cancel{3}^2 \cancel{1}^1 \\ \underline{\pounds 1.53} \\ \underline{\pounds 0.78} \end{array}$$

Subtraction
using
negative
numbers

$$-12 - 4 = -16$$

Multiplication

Vocabulary

times multiply
multiplication

lots of repeated
addition

array groups of
product

Step 1



Developing
mental
methods

Recall and use multiplication facts for the 2, 5 and 10 multiplication tables and begin to solve related problems mentally

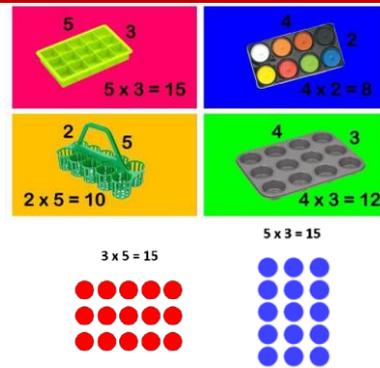
Repeated
addition using
practical
resources
only.

e.g. 3×5 using Numcion



Children begin by using practical resources for arrays and then move on to representing array in their books

Arrays



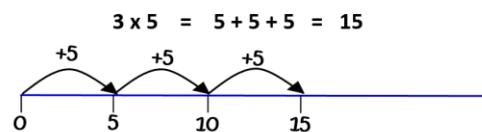
Step 2



Developing
mental
methods

Recall and use multiplication facts for the 2x, 3x, 4x, 5x and 10x multiplication tables and begin to solve related problems mentally

Multiplication
by repeated
addition



Children begin
to record
written
calculations

$3 \times 5 = 15$
 $6 \times 2 = 12$
 $7 \times 4 = 28$

Children to be shown through practical resources the commutative law. Numbers can be multiplied in any order and still give the same answer.

Step 3 & 4



Developing mental methods

Know by heart multiplication facts for 2x, 3x, 4x, 5x, 6x, 7x, 8x, 9x, 10x, 11x and 12x tables and related division facts.

Grid Method

Multiplying a 2-digit number by a 1-digit number:

x	20	3	
4	80	12	$80 + 12 = 92$

It is important that children know that when multiplying by ten it is not just a matter of adding a zero! The digits move left, and a place holder (0) may have to be inserted.

Grid Method

Multiplying a 2-digit number by a 1-digit number:

x	20	3	
8	160	24	$160 + 24 = 184$

Multiplying a 3-digit number by a 1-digit number:

x	100	20	3	
6	600	120	18	$= 738$

Multiplying two 2-digit numbers:

x	20	3	
40	800	120	→ 920
2	40	6	→ 46
			<u>966</u>

Step 5 & 6

Expanded Column Method

Multiplying a 2-digit number by a 1-digit number:

$$\begin{array}{r}
 23 \\
 \times 7 \\
 \hline
 21 \quad (3 \times 7) \\
 \underline{140} \quad (20 \times 7) \\
 161
 \end{array}$$

Expanded
Column
Method

Multiplying a 3-digit number by a 1-digit number:

$$\begin{array}{r} 246 \\ \times 7 \\ \hline 42 \\ 280 \\ \underline{1400} \\ 1722 \end{array} \quad \begin{array}{l} (6 \times 7) \\ (40 \times 7) \\ (200 \times 7) \end{array}$$

Contracted
(Compact)
Column
Method

Multiplying a 2-digit number by a 1-digit number:

$$\begin{array}{r} 23 \\ \times 7 \\ \hline 161 \\ 2 \end{array}$$

Contracted
Column
Method

Multiplying a 3 or 4-digit number by a 1-digit number:

$$\begin{array}{r} 246 \\ \times 7 \\ \hline 1722 \\ 34 \end{array}$$

Resources

Everyday items e.g. straws, counters, sorting bears

Multi-link

Numicon

Dienes

landmarked number line

hundred square

Division

Vocabulary

divide division share group sort left over
 how many lots of repeated subtraction split remainder

Step 1



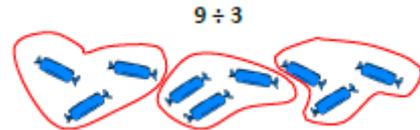
Developing mental methods

● recall and use division facts for the 2, 5 and 10 multiplication tables and begin to solve related problems mentally

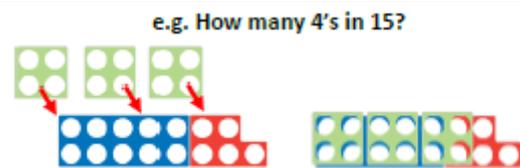
Sharing



Grouping



Division using practical resources



Step 2



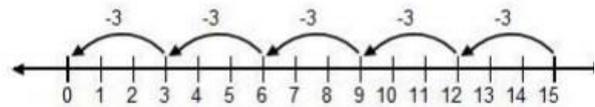
Developing mental methods

● recall and use division facts for the 2, 3, 4, 5 and 10 multiplication tables and begin to solve related problems mentally

Repeated Subtraction

Repeated Subtraction

$15 \div 3 = 5$ is the number of times you can subtract 3 from 15 before you get to 0.



$$15 - 3 - 3 - 3 - 3 - 3 = 0$$

$$15 \div 3 = 5$$

Children begin to record written calculations

$$15 \div 5 = 3$$

$$12 \div 6 = 2$$

$$28 \div 7 = 4$$

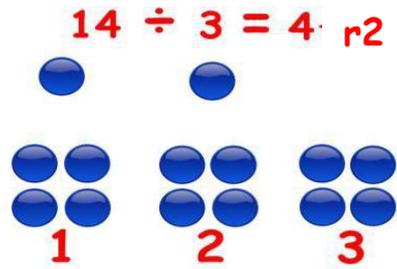
Step 3 & 4



Developing mental methods

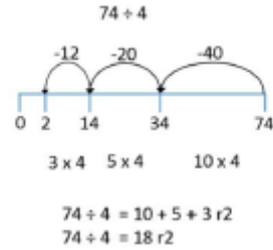
Recall and use division facts for 2x, 3x, 4x, 5x, 6x, 7x, 8x, 9x, 10x, 11x and 12x tables solve related problems mentally.

Sharing
representing
remainders



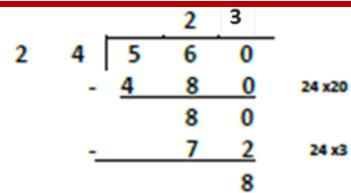
Repeated
subtraction of
chunks

Using a number line to take off chunks



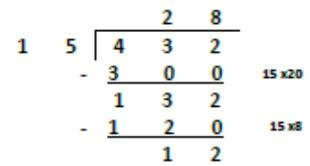
Step 5 & 6

Long division $560 \div 24 =$



$560 \div 24 = 23 \cdot r8$

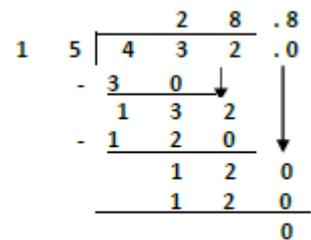
Long division $432 \div 15 =$
showing
answer as a
fraction



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

$432 \div 15 = 28 \frac{4}{5}$

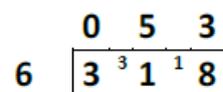
Long division $432 \div 15 =$
showing
answer as a
decimal



$432 \div 15 = 28.8$

Compact short
division

$318 \div 6$



$318 \div 3 = 53$

Compact short
division
showing
answers with a
remainder

$$560 \div 24$$
$$24 \overline{) 5 \overset{5}{5} 6 \overset{8}{8} 0} \begin{array}{l} 0 \ 2 \ 3 \\ \text{r}8 \end{array}$$

$$318 \div 3 = 53$$

Compact short
division
showing
answer as a
decimal

$$560 \div 24$$
$$24 \overline{) 5 \overset{5}{5} 6 \overset{8}{8} 0 \overset{8}{.} 0 \overset{8}{8} 0} \begin{array}{l} 0 \ 2 \ 3 \ . \ 3 \ 3 \end{array}$$

$$318 \div 3 = 53$$

Compact short
division of
decimal
numbers

$$15.4 \div 4$$
$$4 \overline{) 1 \overset{1}{1} 5 \overset{3}{.} 4 \overset{2}{2} 0} \begin{array}{l} 3 \ . \ 8 \ 5 \end{array}$$

Division
involving
negative
numbers

$$-40 \div 8 = -5$$

$$-40 \div -8 = 5$$

Resources

Everyday items e.g. straws, counters, sorting bears

Multi-link

Numicon

Dienes

landmarked number line

fraction cards