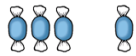
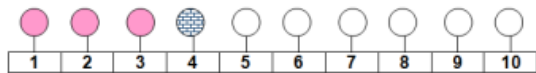


ADDITION

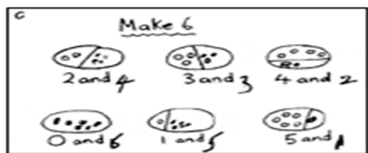
- Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They will record their workings through practical activities, e.g. I have 3 sweets, then I get one more:



- When pupils are ready to record numerals they may begin to record the above example as: 3 1 or just as 4 but not yet as 3+1, and certainly not as 3+1=4.
- Pupils will need lots of experience of practical addition, and an ability to respond to mathematical vocabulary practically. For instance, if you ask a child to show you 5 and 2 more, or 3 plus 1, or 1 add 4, they can use the teddies, counters or number tracks to do it, where counters can be placed in the circles without covering over the numerals.



- They can also develop ways of recording calculations using pictures, etc.

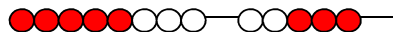


- From this it will be possible to develop an understanding of the + sign, which will enable pupils to begin to record in the form 2+4.
- Pupils then need to understand the concept of equality before using the = sign. This means they can see an example such as 7=6+1, or 5=5, as well as the more common arrangement 3+1=4, and know that it makes sense.
- Bead strings or bead bars can also be used to illustrate addition

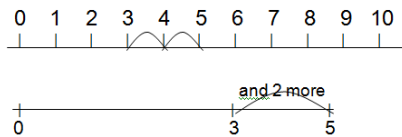


$$8+2=10$$

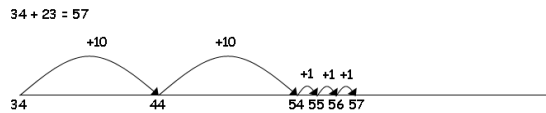
Including bridging through ten by counting on 2 then counting on 3.



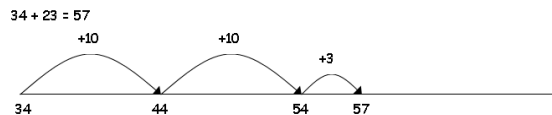
- Pupils will then start to use numbered number lines to record jumps, for example for 3+2



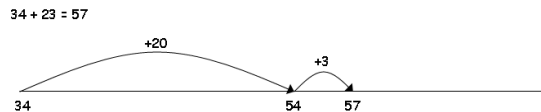
- Children will then begin to use 'empty number lines' themselves starting with the larger number and counting on
- First counting on in tens and ones



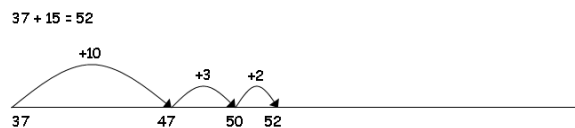
- Then helping children to become more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7)



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



- Bridging through ten can help children become more efficient



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

- When the children are confident with using a number line they begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

- Partitioning may be recorded as:

$$\begin{aligned} 36 + 45 &= (30 + 6) + (40 + 5) \\ &= 30 + 40 + 6 + 5 \\ &= 70 + 11 \\ &= 81 \end{aligned}$$

- These jottings for partitioning would be used with 2-digit and some simple 3-digit calculations
- Pupils will then start to record addition calculations vertically, adding numbers in columns, beginning with the units (ones) and then adding the tens, then the hundreds etc. The vocabulary used will always be whole number place value vocabulary, so 50 would be 50 and 4, never 5 tens and 4 ones or units.

- Expanded Method may be recorded as:

<table style="border-collapse: collapse;"> <tr><td>T</td><td>U</td></tr> <tr><td>6</td><td>7</td></tr> <tr><td>+</td><td>2 4</td></tr> <tr><td>1</td><td>1</td></tr> <tr><td>8</td><td>0</td></tr> <tr><td>9</td><td>1</td></tr> </table>	T	U	6	7	+	2 4	1	1	8	0	9	1	$(7 + 4)$ $(60 + 20)$	<table style="border-collapse: collapse;"> <tr><td>H</td><td>T</td><td>U</td></tr> <tr><td>2</td><td>6</td><td>7</td></tr> <tr><td>+</td><td>8</td><td>5</td></tr> <tr><td>1</td><td>4</td><td>0</td></tr> <tr><td>2</td><td>0</td><td>0</td></tr> <tr><td>3</td><td>5</td><td>2</td></tr> </table>	H	T	U	2	6	7	+	8	5	1	4	0	2	0	0	3	5	2
T	U																															
6	7																															
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+	8	5																														
1	4	0																														
2	0	0																														
3	5	2																														
	$(7 + 5)$ $(60 + 80)$ $(200 + 0)$																															

- Compact Method may be recorded as:

$\begin{array}{r} 625 \\ + 48 \\ \hline 673 \\ 1 \end{array}$	$\begin{array}{r} 783 \\ + 42 \\ \hline 825 \\ 1 \end{array}$	$\begin{array}{r} 367 \\ + 85 \\ \hline 452 \\ 11 \end{array}$
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- Pupils can then use either the expanded or compact method with larger numbers or decimals

Expanded Method:

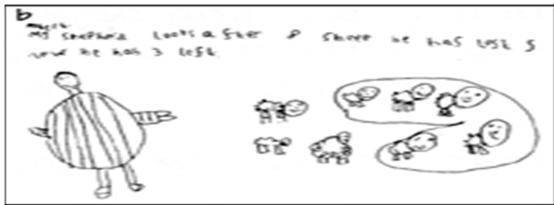
<table style="border-collapse: collapse;"> <tr><td>u</td><td>.</td><td>1/10</td><td>1/100</td></tr> <tr><td>1</td><td>.</td><td>2</td><td>3</td></tr> <tr><td>+</td><td>3</td><td>.</td><td>4 8</td></tr> <tr><td>.</td><td>.</td><td>1</td><td>1</td></tr> <tr><td>.</td><td>.</td><td>6</td><td>0</td></tr> <tr><td>4</td><td>.</td><td>0</td><td>0</td></tr> <tr><td>4</td><td>.</td><td>7</td><td>1</td></tr> </table>	u	.	1/10	1/100	1	.	2	3	+	3	.	4 8	.	.	1	1	.	.	6	0	4	.	0	0	4	.	7	1
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1	.	2	3																									
+	3	.	4 8																									
.	.	1	1																									
.	.	6	0																									
4	.	0	0																									
4	.	7	1																									

Compact Method:

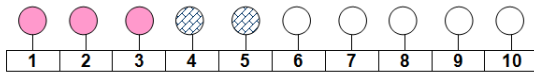
<table style="border-collapse: collapse;"> <tr><td>u</td><td>.</td><td>1/10</td><td>1/100</td></tr> <tr><td>3</td><td>.</td><td>9</td><td>3</td></tr> <tr><td>+</td><td>2</td><td>.</td><td>3 9</td></tr> <tr><td>6</td><td>.</td><td>3</td><td>2</td></tr> <tr><td>1</td><td>.</td><td>1</td><td></td></tr> </table>	u	.	1/10	1/100	3	.	9	3	+	2	.	3 9	6	.	3	2	1	.	1	
u	.	1/10	1/100																	
3	.	9	3																	
+	2	.	3 9																	
6	.	3	2																	
1	.	1																		

SUBTRACTION

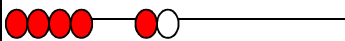
- ✓ As with addition, subtraction is initially recorded as drawing the result of a practical activity
- ✓ Pupils will need lots of experience of practical subtraction, and an ability to respond to mathematical vocabulary practically. For instance, if you ask a child to show you 4 subtract 1, or 4 minus 1, or take 1 from 4, they can use the teddies, counters or number tracks to do it



- ✓ Initially number tracks will be used to subtract small numbers such as $5 - 2$, where counters can be placed in the circles without covering over the numerals and then removed accordingly.



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



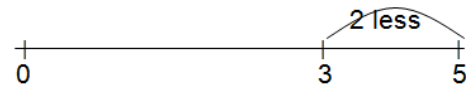
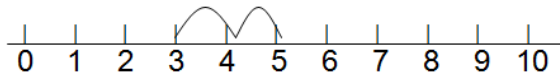
$$6-2=4$$

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



$$13-5=8$$

- ✓ Children then begin to use numbered lines to support their own calculations - using a numbered line to count back in ones.
- ✓ The number line should also be used to show that subtraction means the 'difference between 5 and 3' or 'the difference between 3 and 5' and how many jumps they are apart.

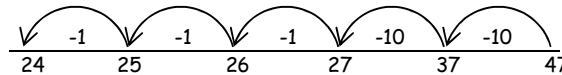


- ✓ Children will then begin to use empty number lines to support calculations.

Counting back:

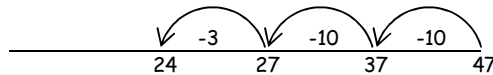
- ✓ First counting back in tens and ones.

$$47-23 = 24$$



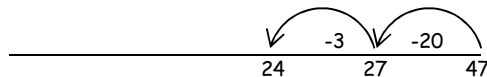
- ✓ Then children become more efficient by subtracting the units in one jump (by using the known fact $7 - 3 = 4$).

$$47-23 = 24$$



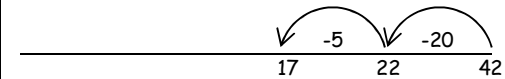
- ✓ Then subtracting the tens in one jump and the units in one jump

$$47-23 = 24$$



- ✓ Bridging through ten can help children become more efficient.

$$42-25 = 17$$



- ✓ Children will be introduced to column method through partitioned/expanded column subtraction for taking away 3 digits or more. Example shows 2 digits.

$$274 - 153 =$$

$$\begin{array}{r} 200 + 70 + 4 \\ - 100 + 50 + 3 \\ \hline 100 + 20 + 1 = 121 \end{array}$$

- ✓ Children will use partitioned/expanded column subtraction for bridging through tens and hundreds.

$$\begin{array}{r} 2754 - 1562 = 1192 \\ \hline 2000 + 700 + 50 + 4 \\ - 1000 + 500 + 60 + 2 \\ \hline 1000 + 100 + 90 + 2 \end{array}$$

- ✓ Children will be aware of compact column subtraction as the next step.

$$\begin{array}{r} 2754 \\ - 1562 \\ \hline 1192 \end{array}$$

MULTIPLICATION

- ✓ 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.



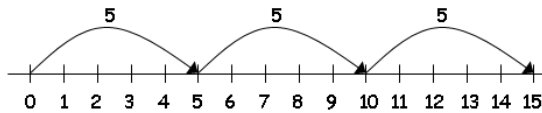
- ✓ Children will develop their understanding of multiplication and use jottings to support calculation:

Repeated addition

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

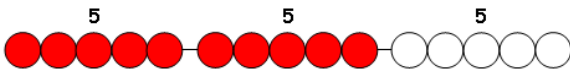
- ✓ Repeated addition can be shown easily on a number line:

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



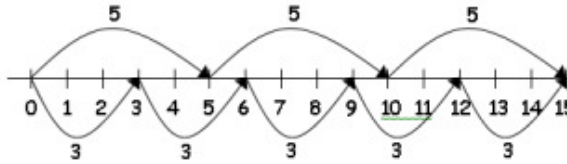
- ✓ and on a bead bar:

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



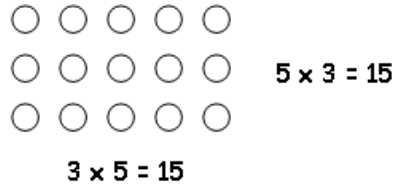
Commutativity

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



Arrays

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



Grid Method

$$8 \times 23 =$$

X	10	10	3	
8	80	80	24	=184

leading to

X	20	3	
8	160	24	=184

- ✓ The grid method can then be used for 2-digit by 2-digit multiplication.

$$66 \times 34 =$$

X	60	6	
30	1800	180	
4	240	24	
	= 2040	= 204	= 2244

Or

X	60	6	
30	1800	180	= 1980
4	240	24	= 264
			= 2244

- ✓ This is extended to larger numbers and decimals.

$$73.5 \times 17$$

X	70	3	0.5
10	700	30	5
7	490	21	3.5
	= 1190	= 51	= 8.5

$$\begin{array}{r}
 1190.0 \\
 + \quad 51.5 \\
 \hline
 1249.5 \\
 \hline
 1
 \end{array}$$

D I V I S I O N

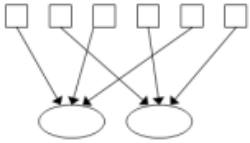
- ✓ Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.



- ✓ 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?



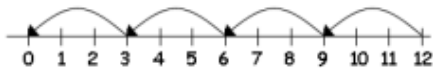
✓ **Grouping**

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



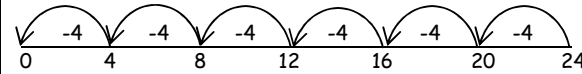
- ✓ **Repeated subtraction** using a given number line or bead bar

$$12 \div 3 = 4$$



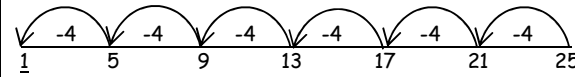
- ✓ Progressing onto children drawing a blank number line for the repeated subtraction method in their books.

$$24 \div 4 = 6$$



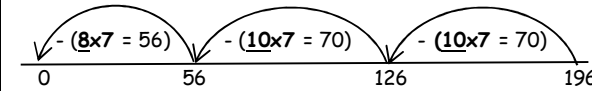
- ✓ Children should also move onto calculations involving remainders.

$$25 \div 4 = 6 \text{ r}1$$



- ✓ Number lines can also be used for more complex calculations, where the pupil is working with multiples of the divisor.

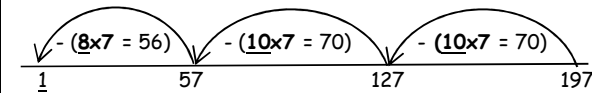
$$196 \div 7 =$$



$$\text{so } 196 \div 7 = 28 \quad (10 + 10 + 8)$$

- ✓ And even with remainders.

$$197 \div 7 =$$



$$\text{so } 197 \div 7 = 28 \text{ r}1 \quad (10 + 10 + 8) \text{ r}1$$

- ✓ Children will be introduced to the short division method for dividing up to 4 digit numbers by a single digit

$$\begin{array}{r} 18 \\ 4 \overline{)72} \end{array} \quad \begin{array}{r} 218 \\ 4 \overline{)872} \end{array} \quad \begin{array}{r} 037 \\ 5 \overline{)185} \end{array}$$

- ✓ This method can also be used for those with remainders.

$$\begin{array}{r} 037 \text{ r}4 \\ 5 \overline{)189} \end{array}$$

- ✓ Children then use long division to divide at least 4 digit numbers by up to two digits.

$$\begin{array}{r} 136 \text{ r}15 \\ 18 \overline{)2246} \end{array} \quad 136 \frac{5}{8} = 136 \frac{5}{8}$$