Calculation Policy

Introduction

A calculation policy provides a structured and systematic approach to teaching number calculations. This policy is needed to ensure consistency and progression. This will also then help to inform parents about methods used at school. By upper Key Stage 2, children should be expressing preferences about their favoured methods. Children should be given alternative methods to use so that they can select the method that suits them best. However, too many methods can become confusing.

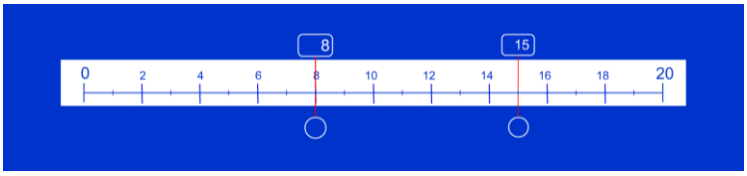
Things to Remember:

- Children need to know number and multiplication facts by heart to be successful mathematicians.
- Children should always estimate first to avoid careless errors.
- Important information in word problems should be highlighted to avoid organisational mistakes. Setting calculations out in an ordered and logical way is vitally important. This should be modelled by the teacher.
- Pay attention to mathematical language. For example, use the word calculation not 'sum' because sum is all about addition.
- Classrooms should have mathematical vocabulary displayed, referred to and utilised.
- Children should be encouraged to say, "does my answer look correct?" For example, has the adding calculation increased in size?
- Schemes and Year group guidelines are good foundations and ensure coverage. *However*, teachers must be flexible with these in order to meet the needs of their class. For example, if a child has managed a Year 4 objective easily, move them on to the next phase.
- The = sign needs to be used as a way of saying equal to. Children may think it indicates the place where the answer goes. So be flexible with the = symbol. 14 + 1 = 15 also 15 = 14 + 1
- Subtraction obviously involves counting backwards. So, children must experience daily counting of which some will be counting backwards.

Adding

Step 1

- Nursery Rhymes, action songs e.g. one potato, 5 currant buns, 5 little ducks and 10 fat sausages.
- Use of number lines and fingers to solve sums like 7 + 8 etc using counting on. Give more able longer number lines with more numbers on.

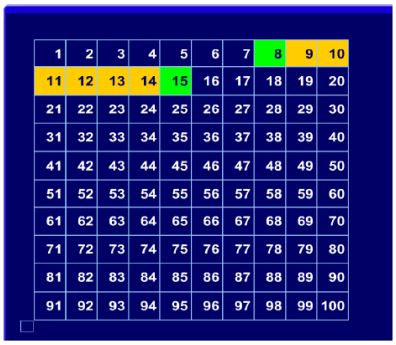


- Use concrete materials and pictures etc to add practically and in a context e.g. counting beads, counters, fingers and objects. Introduce + - = symbols.
- Use pictures e.g.

Add 5 more

Step 2

8 + 7 = 15



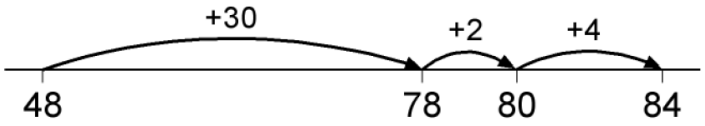
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- (In addition to above) use of adding 10 using number lines and 100 squares.
- Then once children are secure with this, children to add 10 and adjust. For example 25 + 9 – add 10 first and take one away.
- Use of number lines for 43 + 13. Add ten first to 'get it out of the way', then add the units.

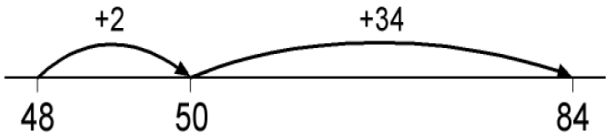
- For sums like 43 + 22 children can add two tens and then adjust. OR they can start partitioning.
- Partitioning involves adding biggest elements first. So add tens and then units and re configure answer.

Example 2 48 + 36=84

The number line helps to record the steps on the way to calculating the total.

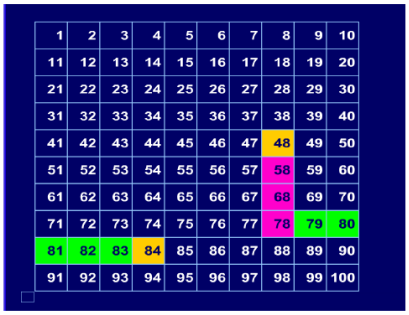


OR



OR use a hundred square

Example 4 48 + 36=84



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61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
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Step 3

- Secure the use of partitioning of numbers into hundreds, tens and units so that they can then be used to add.

  Example

47 + 76

40 + 70 = 110

7 + 6 =13

110 + 13 = 123

which is then recorded in a shorter form below

47 + 76 = 110 + 13 = 123

Step 4

- Move onto column addition for a quicker and more efficient method.
- If children become confused, they can use the method that suits them. Choice is important.

In this method, recording is reduced further. Carry digits are recorded below the line, using the words 'carry ten' or 'carry one hundred', not 'carry one'.

Example 8

$$\begin{array}{r} 47 \\ +\ 76 \\ \hline 123 \\ \hline 1\ 1 \end{array}$$

Step 5

- Use of column addition to add decimals. It is important to emphasise place value. This can include naming columns e.g.

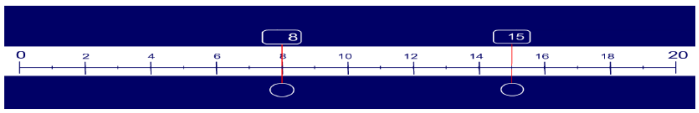
Th	H	T	U	.	t	h
4	5	6	7	.	4	5

Subtraction

Step 1

- Counting songs and rhymes to teach vocabulary of less etc.
- No formal written methods
- Use of equipment to physically take objects away.
- Practical activities using fingers and pictures.
- Introduce symbols - =
- Counting back on number lines from the largest number.

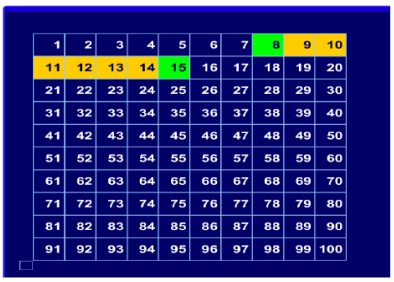
Example 1 15 – 7 = 8



Step 2

- Subtracting using the 100 square

Example 3 15-7=8



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81	82	83	84	85	86	87	88	89	90
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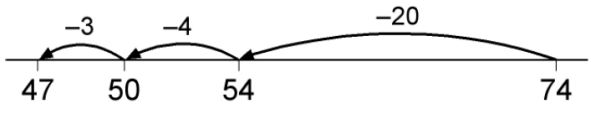
- Subtracting tens first using 100 squares or number lines.
- Then subtracting 10 and adjusting for taking 9 and 11

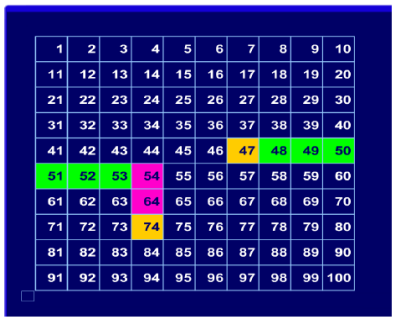
- Same as above but introducing finding the difference by counting on.
- Then subtracting tens and units using a number line – see below.

Example 2 74 – 27 = 47



The steps backwards may be recorded in any order.

OR – count back using a 100 square.



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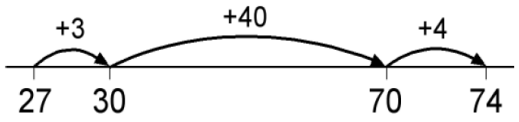
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

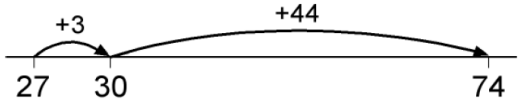
Step 3

- Finding the difference by counting on from the smallest number. However, this must be set within the taking away context. Number lines to be used here.
- If appropriate with more able, children can be shown portioning method. 78 – 43. 78 take away 4 tens (use equipment) and then subtract the units.

Example 5 74 – 27=47



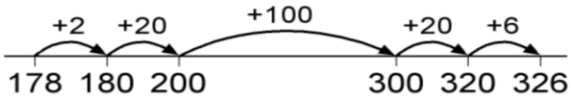
Others will need less jumps, especially when they become confident with the method.



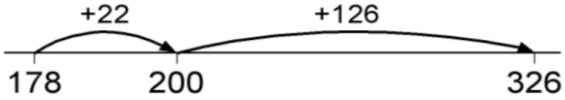
Then progress to

For 3 digit numbers:

Example 6 326 – 178=148

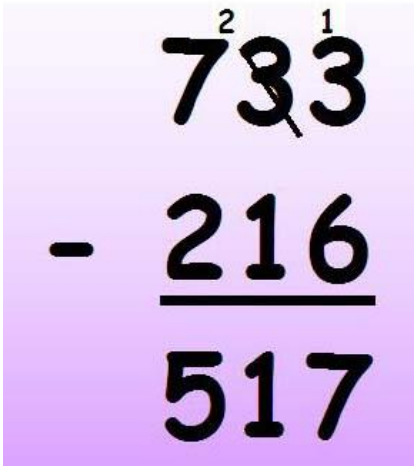


leading to:



Step 4

- Start column subtraction.
- Teachers to reinforce a mix of column subtraction and counting on. Children should be taught to use both methods depending on the type of calculation/problem.
- In a column subtraction calculation, if the bottom number is larger than the top we teach the children to exchange and not borrow. We talk about the number being the same but that we have moved a ten for example.



Multiplication

Step 1

- Counting in 10's, 2's and then 5's
- Begin to recognise patterns and multiples

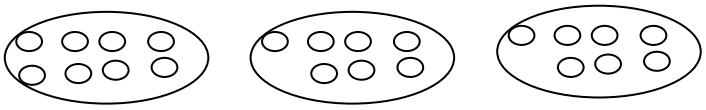
Step 2

- Introduce times table symbol x
- Use vocabulary such as groups, lots of, sets of
- Multiplication sums for 2's, 5's and 10's times tables e.g. 5 x 10 =

Step 3

- Multiplication word problems using jottings and additions e.g.

3 x 8 =
8 + 8 + 8 =



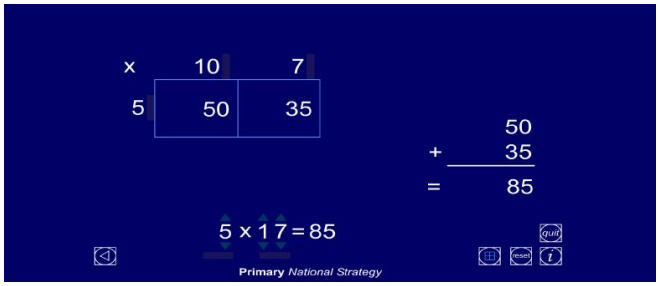
Step 5

- Multiplication using TU x U

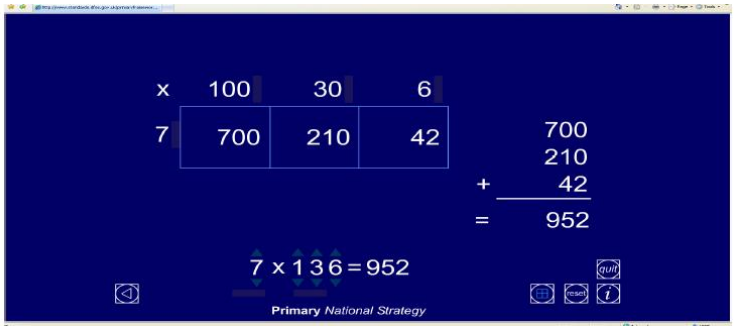
35 x 3 =
5 x 3 =
30 x 3 =
90 + 10 + 5 = 105

Step 6

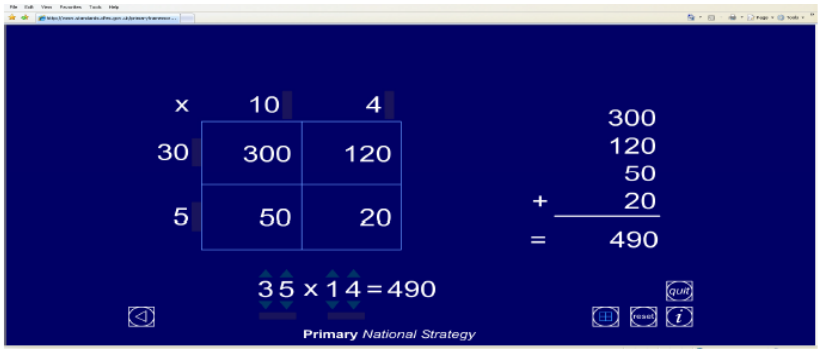
- Multiplication using the grid method. Children need to start by partitioning the numbers into tens and units e.g. TU x U



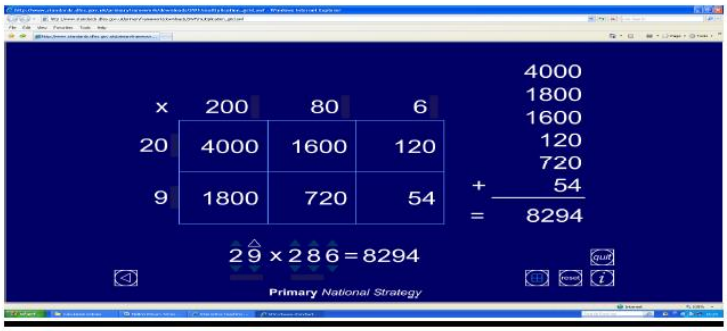
Then three digit x one digit. HTU x U



Then TU x TU



Then HTU X TU



Times tables to be practised daily with corresponding division facts.

Step 7

- Multiplying decimals using the grid method. Relate palce value to multiplication e.g.
  0.2 x 4 = 2 x 4 = 8 0.2 x 4 = 0.8
  Then

	2	0.5
3	6	1.5
0.5	1	0.25

6
1
1.5
+ 0.25
8.75

Pupils can see the place value more clearly with this method.

Step 8

- Use formal methods for long multiplication e.g.

123 x 5

1st Step

```
 123
x  5
 ---
   5
 ---
   1
```

2nd Step

```
 123
x  5
 ---
  15
 ---
 1 1
```

3rd Step

```
 123
x  5
 ---
 615
 ---
 1 1
```

Division

Division is a tricky concept and needs to be underpinned with secure counting skills. Children are to understand division as grouping/sharing and it must be done with equipment.

Step 1

- Practical examples of sharing such as sharing counters, sweets etc.
- Halving numbers and sharing between 2.

Step 2

- Halving and quatering. Sharing in 2's.
- Begin to use jottings e.g. 8 ÷ 2 = 4

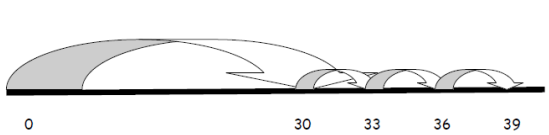
To introduce division it should be practical, using equipment to demonstrate.
Children are to understand division as grouping which is repeated subtraction.

1)

Step 3

Securing and enforcing the number line using times tables. Also, showing that x and divide are the inverses of each other.
Use multiplication questions when solving division problems e.g.
10 ÷ 2 = How many 2's are in 10?
Count in 2's on your fingers. How many did you count to get to 10?

5) 39 ÷ 3 = 13 (How many groups of 3 – in larger groups)



Step 4

- Division with remainders using multiplication facts e.g. 26 ÷ 5 =

5 x 5 = 25
26 – 25 = 1
26 ÷ 5 = 5 r 1

Step 5

- Introduce the 'wonky table' method. How many 8's in 9? = 1 with 1 left. How many 8's in 12? = 1 r 4

2. $8\overline{)92}$ 3. $3\overline{)46}$

Step 6

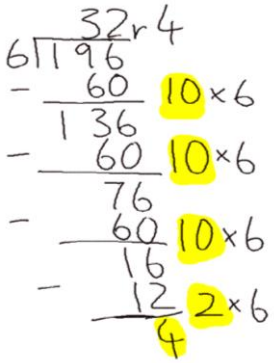
- Start of chunking and continuation of short division.

Calculation Policy

6) Chunking 81 ÷ 3 =

3	8 1	
	6 0	(**20** x3)
	2 1	
	2 1	(**7** x 3)
	0	

Answer = 27



Step 7

- Selecting preferred methods depending on the sum. Certain questions are suited to chunking whereas others favour short division. The calculation below suits the chunking method.