



Written progression through subtraction

MENTAL CALCULATIONS

These are a selection of mental calculation strategies:

Mental recall of addition and subtraction facts

$$10 - 6 = 4 \qquad 17 - \square = 11$$

$$20 - 17 = 3 \qquad 10 - \square = 2$$

Find a small difference by counting up

$$82 - 79 = 3$$

Counting on or back in repeated steps of 1, 10, 100, 1000

$$86 - 52 = 34 \text{ (by counting back in tens and then in ones)}$$

$$460 - 300 = 160 \text{ (by counting back in hundreds)}$$

Subtract the nearest multiple of 10, 100 and 1000 and adjust

$$24 - 19 = 24 - 20 + 1 = 5$$

$$458 - 71 = 458 - 70 - 1 = 387$$

Use the relationship between addition and subtraction

$$36 + 19 = 55 \qquad 19 + 36 = 55$$

$$55 - 19 = 36 \qquad 55 - 36 = 19$$

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF OUR CHILDREN TO ACHIEVE.

Key representations to support conceptual understanding of addition and subtraction.

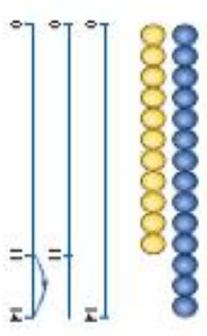
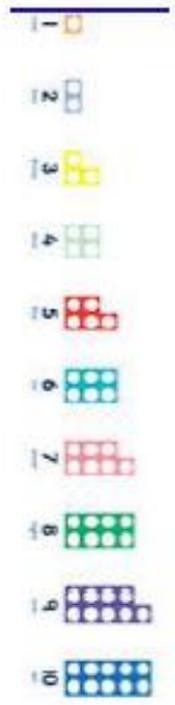
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

35...45,
55, 65

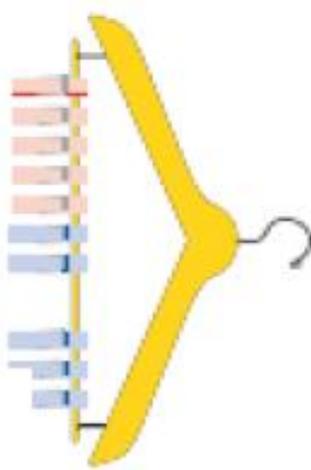
75...85,
55, 45

$6 + 10 = 16$
 $16 + 10 = 26$
 $26 + 10 = 36$
 $36 + 10 = 46$
 $36 + 20 = 56$

$96 - 10 = 86$
 $96 - 10 = 76$
 $76 - 10 = 66$
 etc.
 $76 - 20 = 46$



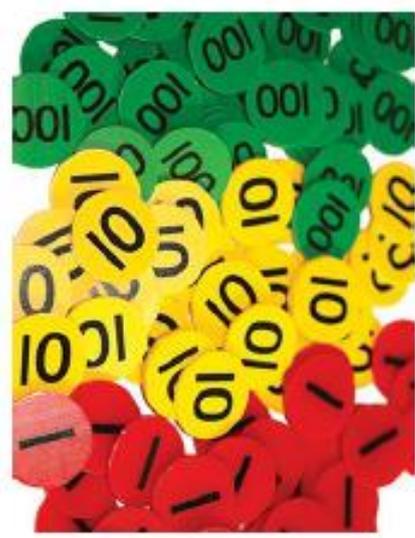
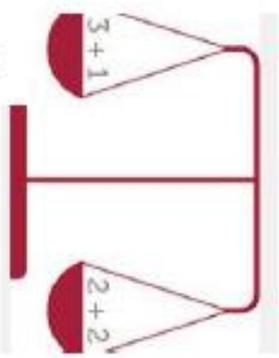
$10 = 7 + 3$
 The difference between 11 and 14 is 3:
 $14 - 11 = 3$
 $11 + \square = 14$



$8 + ? = 10$



$15 + 5 = 20$



PROGRESSION THROUGH CALCULATIONS FOR SUBTRACTION

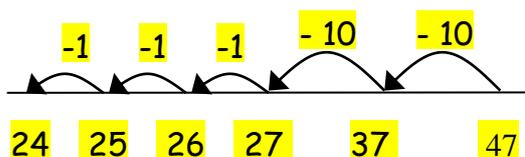
Stage 1: Number line

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

Counting back

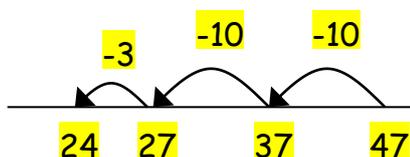
- ✓ First counting back in tens and ones.

$$47 - 23 = 24$$



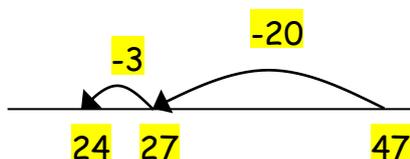
- ✓ Then helping children to become more efficient by subtracting the units in one jump (by using the known fact $7 - 3 = 4$).

$$47 - 23 = 24$$



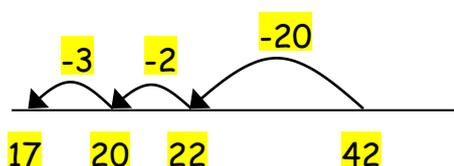
- ✓ Subtracting the tens in one jump and the units in one jump.

$$47 - 23 = 24$$



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

$$42 - 25 = 17$$

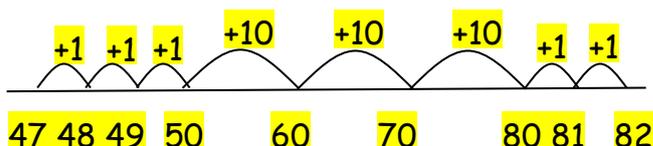


Counting on

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.

Count up from 47 to 82 in jumps of 10 and jumps of 1.

$$82 - 47$$



Help children to become more efficient with counting on by:

- ✓ Subtracting the units in one jump;
- ✓ Subtracting the tens in one jump and the units in one jump;
- ✓ Bridging through ten.

Stage 2: Develop written methods - partitioning

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

Partitioning and decomposition

This process should be demonstrated using arrow cards to show the partitioning and base 10 materials to show the decomposition of the number.

NOTE: When solving the calculation $89 - 57$, children should know that 57 **DOES NOT EXIST AS AN AMOUNT**, it is what you are subtracting from the other number.

Therefore, when using base 10 materials, children would need to count out only the 89.

Partitioning method

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

Initially, the children will be taught using examples that do not need the children to exchange.

From this the children will begin to exchange (not borrow!)

Stage 3: Developing Decomposition method - Partitioning.

Partitioning and Decomposition, leading to column subtraction

Partitioning the numbers into tens and ones and writing one under the other mirrors the column method, where ones are placed under ones and tens under tens. This does not link directly to mental methods of counting back or up but parallels the partitioning method for addition. It also relies on secure mental skills.

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

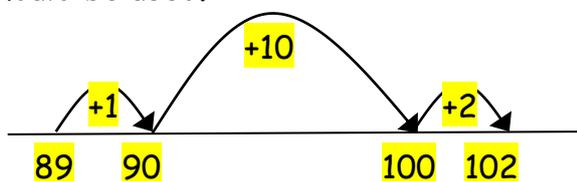
$$\begin{array}{r} 70 + 1 \\ - 40 + 6 \\ \hline \end{array}$$

$$\begin{array}{r} 60 & 1 \\ \cancel{70} + 1 \\ - 40 + 6 \\ \hline 20 + 5 & 25 \end{array}$$

Children should know that units line up under units, tens under tens, and so on.

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

$$102 - 89 = 13$$



Example $74 - 27$

$$\begin{array}{r} 70 + 4 \\ - 20 + 7 \\ \hline \end{array}$$

$$\begin{array}{r} 60 & 14 \\ \cancel{70} + 4 \\ - 20 + 7 \\ \hline 40 + 7 \end{array}$$

Example $741 - 367$

$$\begin{array}{r} 700 + 40 + 1 \\ - 300 + 60 + 7 \\ \hline \end{array}$$

$$\begin{array}{r} 600 & 130 & 11 \\ \cancel{700} + 40 + 1 \\ - 300 + 60 + 7 \\ \hline 300 + 70 + 4 \end{array}$$

The amount of time that should be spent teaching and practising the expanded method will depend on how secure the children are in their recall of number facts and with partitioning.

The partitioning method leads children to the more concise method (Column Subtraction) so that they understand its structure and efficiency.

Step 1

$$\begin{array}{r} 707 \\ - 286 \\ \hline \end{array} = \begin{array}{r} 700 + 00 + 7 \\ - 200 + 80 + 6 \\ \hline \end{array}$$

$$\begin{array}{r} 600 & 100 \\ \cancel{700} + 00 + 7 \\ - 200 + 80 + 6 \\ \hline 400 + 20 + 1 = 421 \end{array}$$

Children should:

- ✓ be able to subtract numbers with different numbers of digits;
- ✓ using this method, children should also begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds;
- ✓ know that decimal points should line up under each other.

Stage 4: Column Subtraction

$$\begin{array}{r} 610 \\ 707 \\ - 286 \\ \hline 421 \end{array}$$

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

NB: If your children have reached the concise stage they will then continue this method through into year 6. They will not go back to using the expanded methods.

Children should:

- ✓ be able to subtract numbers with different numbers of digits;
- ✓ begin to find the difference between two decimal fractions with up to three digits and the same number of decimal places;
- ✓ know that decimal points should line up under each other.

Stage 5: Decimal column subtraction

During year 6, children will use a range of calculation methods, mental and written. Selection will depend upon the numbers involved. These will need to be used and applied across the mathematics curriculum.

Decomposition with decimals

$$\begin{array}{r} 5131 \\ 64.67 \\ - 26.84 \\ \hline 37.83 \end{array}$$

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

Children should not be made to go onto the next stage if:

- 1) **They are not ready.**
- 2) **They are not confident.**

Children should be encouraged to approximate their answers before calculating.

Children should be encouraged to check their answers after the calculation using an appropriate strategy.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

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.*