

**BENTON DENE PRIMARY SCHOOL
MATHEMATICS**

PROGRESSION IN WRITTEN CALCULATIONS



**CALCULATION : ADDITION
(WRITTEN METHODS)
Reviewed: November 2016 - L Gallagher**

PROGRESSION THROUGH CALCULATIONS FOR ADDITION

MENTAL CALCULATIONS

(ongoing)

These are a **selection** of mental calculation strategies:

Mental recall of number bonds

$$6 + 4 = 10$$

$$25 + 75 = 100$$

$$\square + 3 = 10$$

$$19 + \square = 20$$

Use near doubles

$$6 + 7 = \text{double } 6 + 1 = 13$$

Addition using partitioning and recombining

$$34 + 45 = (30 + 40) + (4 + 5) = 79$$

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

$$86 + 57 = 143 \text{ (by counting on in tens and then in ones)}$$

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

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

$$24 + 19 = 24 + 20 - 1 = 43$$

$$458 + 71 = 458 + 70 + 1 = 529$$

Use the relationship between addition and subtraction

$$36 + 19 = 55$$

$$19 + 36 = 55$$

$$55 - 19 = 36$$

$$55 - 36 = 19$$

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

Problem Solving

Progression in problem solving:

Y1: one step problems involving + and - using concrete objects, pictorial representations and missing number calculations eg $7 = ? - 9$

Y2 and Y3: extension from Y1 to include measures in context and more complex + and -

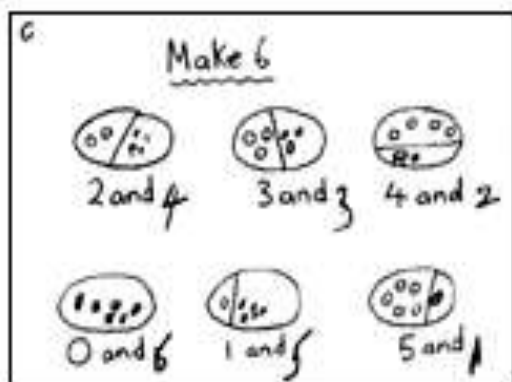
Y4: problems to include 2-step, in context, with decision making regarding which operations to use.

Y5 and Y6: extend Y4 to multi-step problems in context.

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE. CONTINUE TO USE PRACTICAL MATERIALS ALONGSIDE STANDARD WRITTEN METHODS. THESE ARE EXEMPLIFIED IN THE VISUAL CALCULATIONS POLICY.

YR and Y1

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.

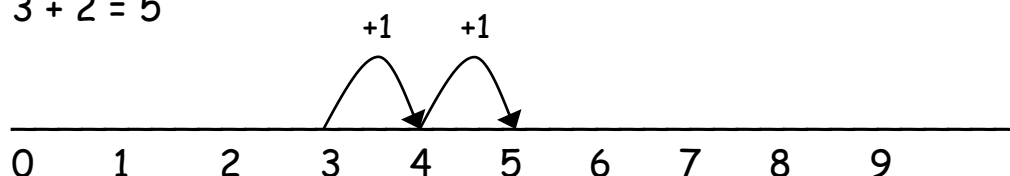


Children read, write and interpret mathematical statements involving + and = signs.

They represent number-bonds and related subtraction facts within 20.

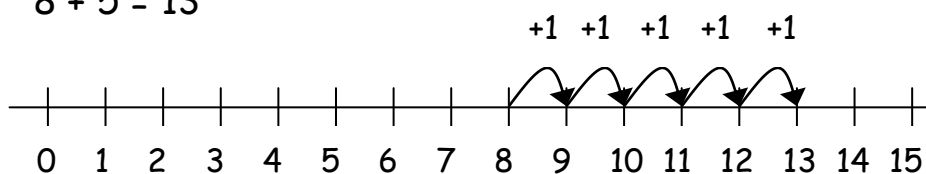
They use numberlines and practical resources, including songs and rhymes to support calculation and teachers *demonstrate* the use of the numberline.

$$3 + 2 = 5$$

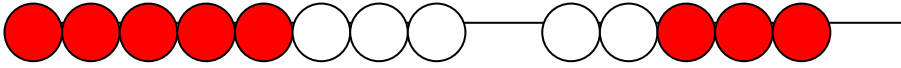


Children then begin to use numbered lines to support their own calculations using a numbered line to count on in ones, to add and subtract one and two digit numbers to 20, including zero.

$$8 + 5 = 13$$



Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.



Introduction of practical situations to illustrate the calculation are used, e.g. "There are three children and one more comes along. How many are there?"

Later, in Y1, when children are secure with place value of T U partitioning methods are introduced, e.g.

$$30 + 12$$

$$30 + 10 = 40$$

$$40 + 2 = 42.$$

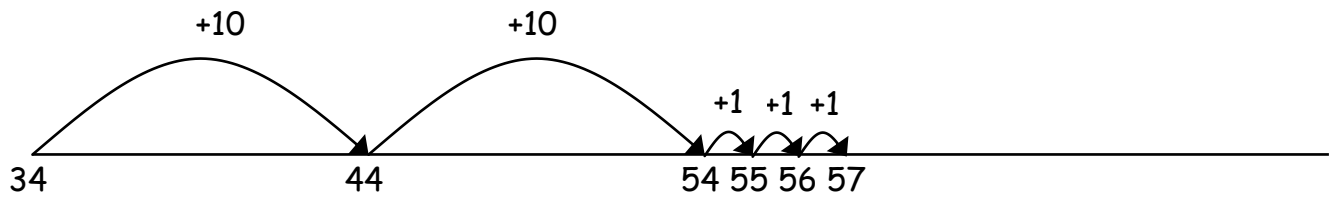
Y2

Children recall and use addition facts to 20, deriving related facts to 100.

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

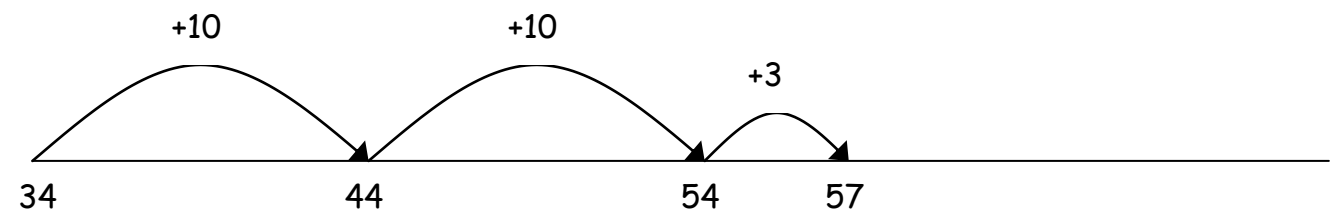
- ✓ First counting on in tens and ones.

$$34 + 23 = 57$$



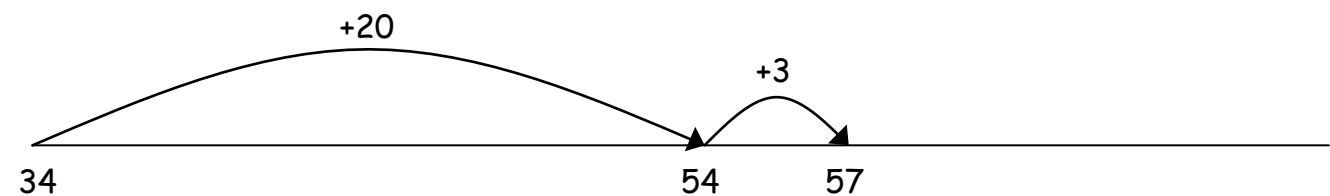
- ✓ Then helping children to become more efficient by adding the units in one jump (by using the known fact $4 + 3 = 7$).

$$34 + 23 = 57$$



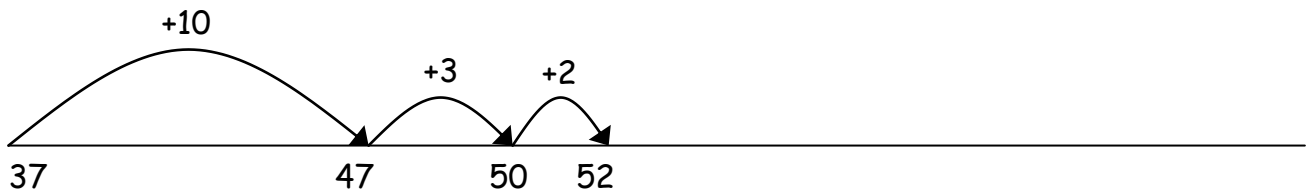
- ✓ Followed by adding the tens in one jump and the units in one jump.

$$34 + 23 = 57$$



✓ Bridging through ten can help children become more efficient.

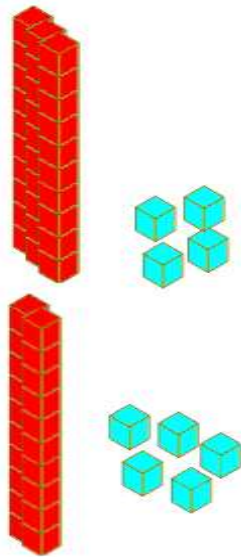
$$37 + 15 = 52$$



Y2 introduces the column method of addition of T U to consolidate place value.

$$\begin{array}{r} 34 \\ + 25 \\ \hline 59 \end{array}$$

This addition using concrete materials is demonstrated practically with Diene's materials.



By using these materials this can be extended to cross the tens boundary. They will add 2 digit numbers and ones, 2 digit numbers and tens, two 2 digit numbers and 3 one digit numbers. Y2 introduces the commutative law of addition.

Y3

Children will continue to use the column method for addition extending to 3 digit numbers. Place value is continually reinforced with the use of practical materials, e.g. Diene's.

Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies, to add 3 digit numbers and ones, 3 digit numbers and tens, 3 digit numbers and hundreds.

Y4

From this, children will begin to carry below the line using the standard method..

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

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

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

Using similar methods, children will:

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds;*
- ✓ *know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p.*

Pupils will add numbers with up to four digits.

Y5

Children should extend the carrying method to numbers with at least four digits.

$$\begin{array}{r} 587 \\ + 475 \\ \hline 1062 \\ 11 \end{array}$$

$$\begin{array}{r} 3587 \\ + 675 \\ \hline 4262 \\ 111 \end{array}$$

Using similar methods, children will:

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more decimal fractions with up to three digits and the same number of decimal places;*
- ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 3.2 m - 280 cm.*

Y6

Children should extend the columnar method to numbers with any number of digits.

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

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

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

Using similar methods, children will

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more decimal fractions with up to four digits and either one or two decimal places;*
- ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. $401.2 + 26.85 + 0.71$.*

+ - + - + - + - + - + - +

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Place value must be secure at each stage in order to understand the method.

Practical materials should be used with all ages and abilities **ALONGSIDE** written methods (VAK learning).

Children should be encouraged to approximate their answers before calculating. Children should be encouraged to check their answers after calculation using an appropriate strategy.

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