Progression in calculation- Addition

Year Group objectives

Year 1

Counting and understanding number

Count reliably at least 20 objects, recognising that when rearranged the number of objects stays the same; estimate a number of objects that can be checked by counting

Compare and order numbers, using the related vocabulary; use the equals (=) sign

Read and write numerals from 0 to 20 then beyond; use knowledge of place value to position these numbers on a number track and number line

Say the number that is 1 more or less than any given number, and 10 more or less for multiples of 10

Knowing and using number facts

Derive and recall all pairs of numbers with a total of 10 and addition facts for totals to at least 5; work out the corresponding subtraction facts

Recall the doubles of all numbers to at least 10

Calculating

Relate addition to counting on; recognise that addition can be done in any order; use practical and informal written methods to support the addition of a one-digit number or a multiple of 10 to a one-digit or two-digit number

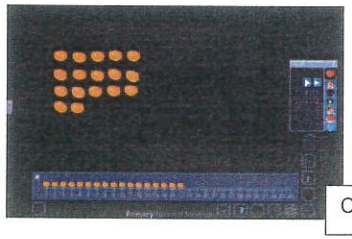
Understand subtraction as 'take away' and find a 'difference' by counting up; use practical and informal written methods to support the subtraction of a one-digit number from a one-digit or two-digit number and a multiple of 10 from a two-digit number

Use the vocabulary related to addition and subtraction and symbols to describe and record addition and subtraction number sentence

Models and Images

Continue with images from Foundation Stage as appropriate to the children. Children should have opportunities to use bead strings and number lines in a variety of contexts.

How many oranges do you think there are in this box?

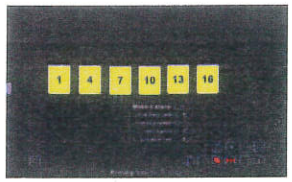


Counting ITP

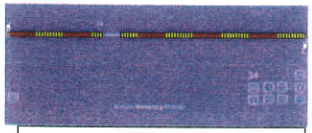
9 children want school dinners then 5 more children say they want dinner. How many dinners shall we order today?

Using bead string/dienes/Cuisenaire/counting camels

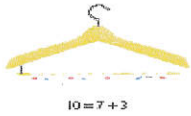
Number facts ITP



Twenty Cards ITP



Counting on and back ITP

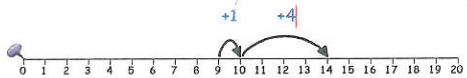


Use bead strings to 20, then 100

Ways in which children could record

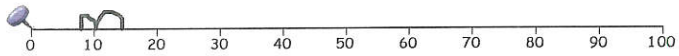
5 + 9 = 14

Put the larger number first

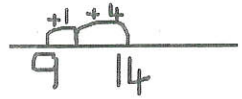


I have 9 and now I need 5

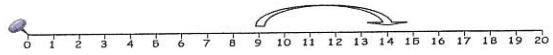
On a structured number line for more able



Begin to draw own empty number line

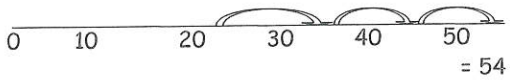


Adding 5 mentally or in one leap on the number line



24 + 30

Children can explain or model adding 30 to 24 mentally, using bead strings or number lines



Progression in calculation- Addition

Year Group objectives

Year 2

Counting and understanding number

Read and write two-digit and three-digit numbers in figures and words; describe and extend number sequences and recognise odd and even numbers

Count up to 100 objects by grouping them and counting in tens, fives or twos; explain what each digit in a two-digit number represents, including numbers where 0 is a place holder; partition two-digit numbers in different ways, including into multiples of 10 and 1

Order two-digit numbers and position them on a number line; use the greater than (>) and less than (<) signs

Estimate a number of objects; round two-digit numbers to the nearest 10

Knowing and using number facts

Derive and recall all addition and subtraction facts for each number to at least 10, all pairs with totals to 20 and all pairs of multiples of 10 with totals up to 100

Understand that halving is the inverse of doubling and derive and recall doubles of all *numbers to 20, and the corresponding halves*

Use knowledge of number facts and operations to estimate and check answers to calculations

Calculating

Add or subtract mentally a one-digit number or a multiple of 10 to or from any two-digit number; use practical and informal written methods to add and subtract two-digit numbers

Understand that subtraction is the inverse of addition and vice versa; use this to derive and record related addition and subtraction nu

Number facts ITP mber sentences

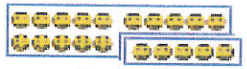
Use the symbols +, -, ×, ÷and =to record and interpret number sentences involving all four operations; calculate the value of an unknown in a number sentence (e.g. □÷2 =6, 30- □=24)

Models and images

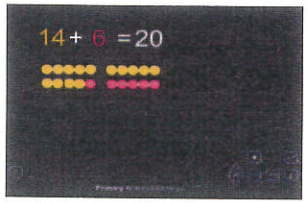
There are 23 boys and 12 girls in the class. How many children are there?

On a bead string

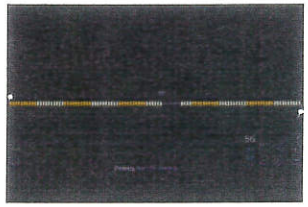
23 +10 +2 = 35



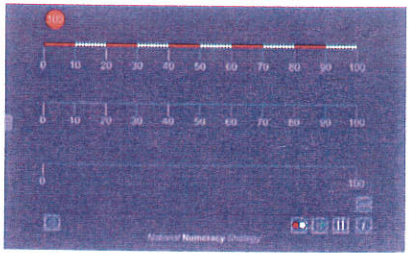
Building on known number facts - I know 5 and 5 make 10 so 15 and 5 make 20



Number Facts ITP



Counting on and back ITP
56 + 30



Ordering numbers ITP

Also use Number lines, Cuisenaire, Dienes, Numicon when appropriate

Ways in which children could record

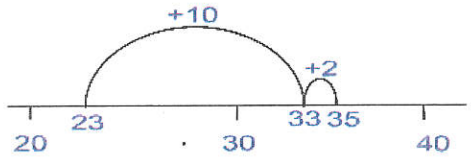
Keep the largest number whole and partition smaller number

12 + 23 = 35

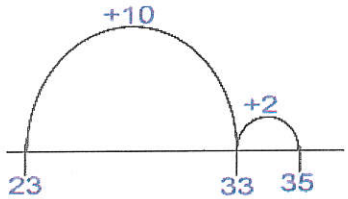
partitioning one number and explaining thinking

23 + 10 + 2 = 33 + 2 = 35

using a structured number line



using an empty number line



15p each bar
How much for all four bars?

Explain working mentally **or** use a structured number line **or** an empty number line **or** show jottings to work out what they spent on two items.

Progression in calculation- Addition

Year Group objectives

Year 3

Counting and understanding number

Read, write and order whole numbers to at least 1000 and position them on a number line; count on from and back to zero in single-digit steps or multiples of 10

Partition three-digit numbers into multiples of 100, 10 and 1 in different ways

Round two-digit or three-digit numbers to the nearest 10 or 100 and give estimates for their sums and differences

Knowing and using number facts

Derive and recall all addition and subtraction facts for each number to 20, sums and differences of multiples of 10 and number pairs that total 100

Use knowledge of number operations and corresponding inverses, including doubling and halving to estimate and check calculations

Calculating

Add or subtract mentally combinations of one-digit and two-digit numbers

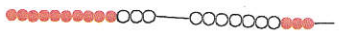
Develop and use written methods to record, support or explain addition and subtraction of two-digit and three-digit numbers

Models and images

Continue to use 100 bead strings to support children using known facts.

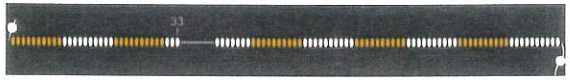
3 + 7 = 10 3 + 10 = 13

13 + 7 = 20 13 + 10 = 23



30 + 70 = 100

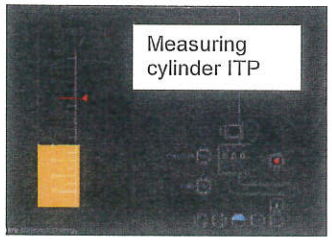
33 + 67 = 100



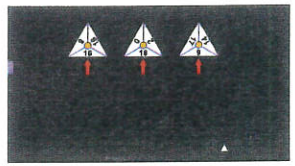
Encourage children to add mentally by using real life contexts and money.
How much would a Freddo bar and a chocolate bar cost altogether? What if we bought two of each?

24p 15p

also Measuring Scales and Counting On and Back ITPs



Measuring cylinder ITP



Number Spinners ITP

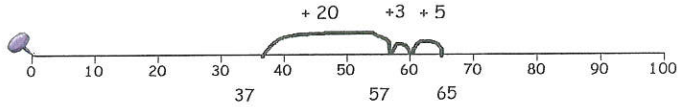
Ways in which children could record

Keep the largest number whole and partition smaller number

37 + 28 = 65

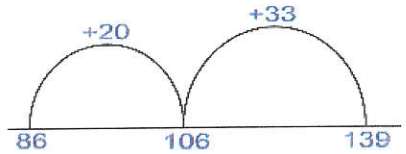
On a structured number line

37 + 20 + 3 + 5 = 65

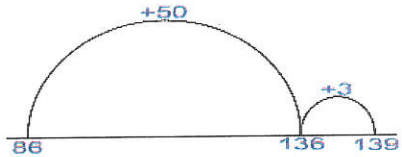


Bridging through 100

53 + 86 = 139

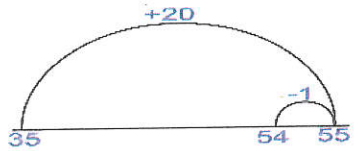


or



Using known number facts

35 + 19 = 54



By now children should be encouraged to choose their own methods of calculating using the empty number line – methods that reflect their thinking

Progression in calculation- Addition

Year Group objectives

Year 4

Counting and understanding number

Recognise and continue number sequences formed by counting on or back in steps of constant size

Partition, round and order four-digit whole numbers; use positive and negative numbers in context and position them on a number line; state inequalities using the symbols <and >(e.g. -3 >-5, -1 <+1)

Use decimal notation for tenths and hundredths and partition decimals; relate the notation to money and measurement; position one-place and two-place decimals on a number line

Knowing and using number facts

Use knowledge of addition and subtraction facts and place value to derive sums and differences of pairs of multiples of 10, 100 or 1000

Identify the doubles of two-digit numbers; use these to calculate doubles of multiples of 10 and 100 and derive the corresponding halves

Use knowledge of rounding, number operations and inverses to estimate and check calculations

Calculating

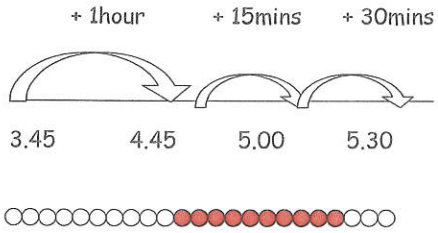
Add or subtract mentally pairs of two-digit whole numbers (e.g. 47+ 58, 91 -35)
Refine and use efficient written methods to add and subtract two-and three-digit whole numbers and £ p

Use a calculator to carry out one and two step calculations involving all 4 operations, recognise negative numbers on the display, correct mistaken entries and interpret display correctly in the context of money

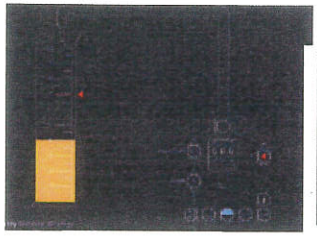
Models and images

Model calculation in context

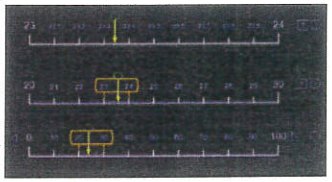
A T.V. programme starts at 3.45pm and lasts for 1hr 45 minutes. What time did it end?



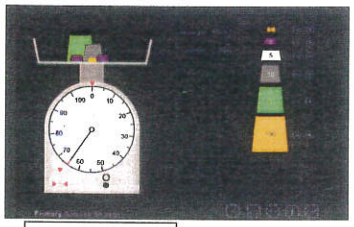
Use bead strings to support decimal understanding



Measuring Cylinder ITP



Decimal Number Line ITP

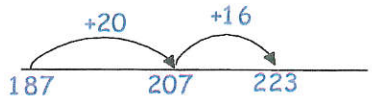


Scales ITP

Ways in which children could record

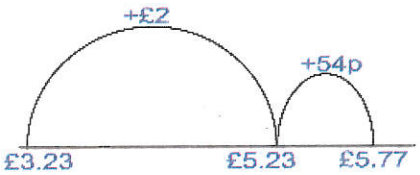
Keep the largest number whole and partition smaller number

187 + 36 = 223



Money and decimals

£3.23 + £2.54



Using a written method when ready for 2, 3 digit numbers and for decimals

```
  366
+ 458
-----
   14
  110
  700
-----
  824
```

Children should be taught to *look at the numbers* in calculations to determine the best method to use to solve them

Progression in calculation- Addition

Year Group objectives

Year 5

Counting and understanding number

Count from any given number in whole-number and decimal steps, extending beyond zero when counting backwards; relate the numbers to their position on a number line

Explain what each digit represents in whole numbers and decimals with up to two places, and partition, round and order these numbers

Knowing and using number facts

Use knowledge of place value and addition and subtraction of two-digit numbers to derive sums and differences and doubles and halves of decimals (e.g. 6.5 ±2.7, half of 5.6, double 0.34)

Use knowledge of rounding, place value, number facts and inverse operations to estimate and check calculations

Calculating

Extend mental methods for whole number calculations, for example to subtract one near multiple of 1000 from another (eg. 6070-4097)

Use efficient written methods to add and subtract whole numbers and decimals with up to two places

Use a calculator to solve problems including those involving decimals and interpret the display correctly in the context of measurement

Models and images

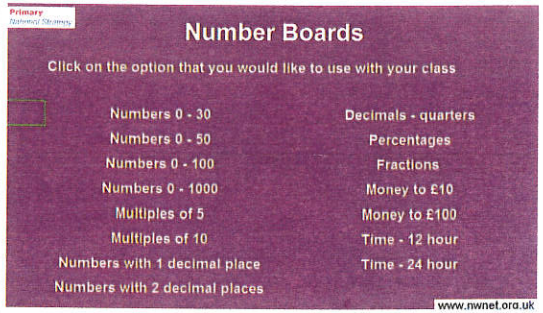
It is important that children do not feel that the compact method of recording a calculation is 'better' than using mental strategies, jottings or using a calculator. Children need to look at a calculation and decide what the most efficient and reliable approach is.

Teachers should not spend too long teaching this method, if children can understand it and identify when to use it fairly quickly then it will be useful to them.

If children struggle, continuing to use number lines and jottings will be more efficient and reliable.

79	67.4	63.4	62.8	21.8
80	43.8	19.1	47	40.5
13	33.9	85.6	51.7	72.8
30.2	96	2.3	63.6	21.9
11.9	28.1	13.4	26.4	47.1

Number Boards Spreadsheet

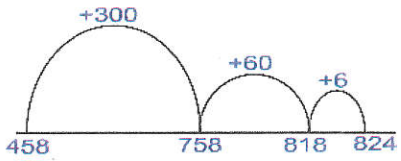


The Number Boards help sheet shows range of boards available

Ways in which children could record

366 + 458

Empty number line

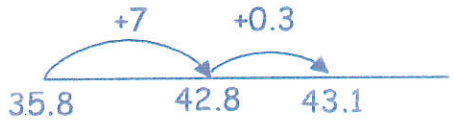


Compact written method

$$\begin{array}{r} 366 \\ +\,458 \\ \hline 824 \\ \hline 11 \end{array}$$

Adding decimals, keep the largest number whole and partition and add the smaller number

35.8 + 7.3 = 35.8 + 7 + 0.3



Progression in calculation- Addition

Year Group objectives

Year 6

Counting and understanding number

Find the difference between a positive and a negative integer, or two negative integers, in context

Use decimal notation for tenths, hundredths and thousandths; partition, round and order decimals with up to three places, and position them on the number line

Use approximations, inverse operations to estimate and check results

Calculating

Calculate mentally with integers and decimals: U.t ±U.t,

Use efficient written methods to add and subtract integers and decimals,

Use a calculator to solve problems involving multi step calculations

Models and images to support

It is important that children do not feel that the compact method of recording a calculation is 'better' than using mental strategies, jottings or using a calculator. Children need to look at a calculation and decide what the most efficient and reliable approach is.

Teachers should not spend too long teaching this method, if children can understand it and identify when to use it fairly quickly then it will be useful to them.

If children struggle, continuing to use number lines and jottings will be more efficient and reliable.

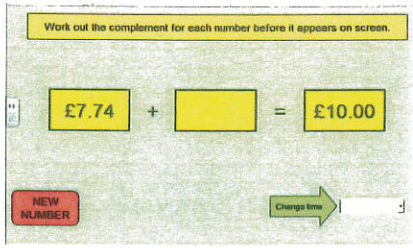
Look at the numbers in the calculation. What's the best strategy to use?

Can you make a sensible estimate of the answer?

Can you do all or part of it in your head?

Will you need a calculator?

See previous year groups and the *National Strategies* website for appropriate supportive ITPs and Spreadsheets



Complements Spreadsheet on the 'complements to £10' tab.

Ways in which children could record

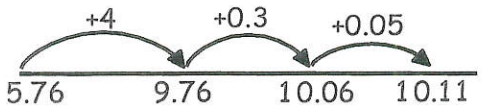
Written method

124.9 + 117.25

$$\begin{array}{r} 124.9 \\ 117.25 \\ \hline 242.15 \\ \hline 11 \end{array}$$

Keep the largest number whole and partition the smaller number

5.76 + 4.35 = 10.11



Working out additions in real contexts choosing appropriate methods

Here is the cost of pizzas.

PIZZAS		
	Small	Medium
Ham	£4.20	£5.50
Salami	£4.40	£5.75
Mushroom	£4.50	£6.00
Cheese	£3.80	£4.95
Tuna	£4.25	£5.40
Extra tomato	50p	
Extra cheese	60p	

Jill orders one small cheese pizza with extra tomato.

What is the total cost?

Ben buys one small pizza and one medium pizza. They cost him £10. Which two could they be?