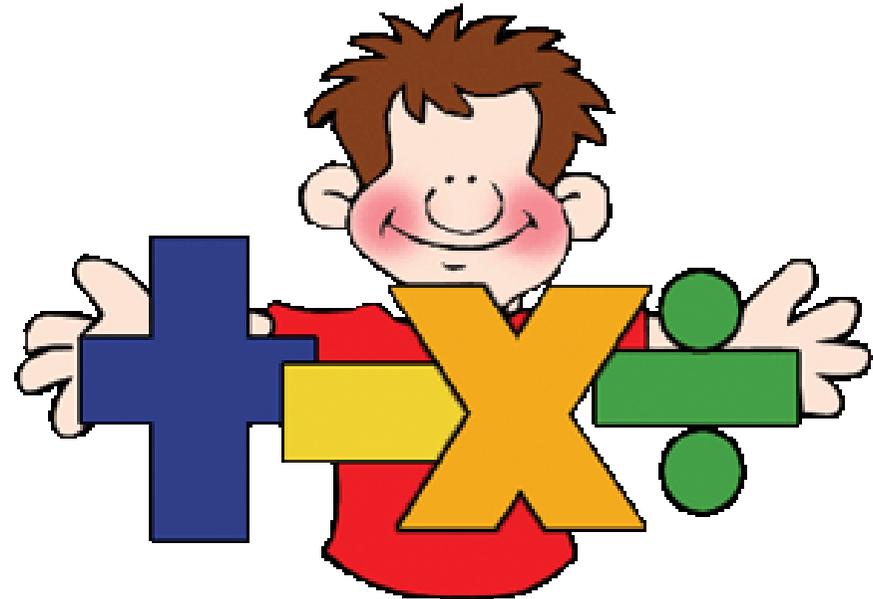




Goring-by-Sea C of E First School



Progression through calculation policy

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Goring C of E First School Calculations Policy

Goring First School has developed a consistent approach to the teaching of written calculations in order to establish continuity and progression throughout the school.

Although the focus of this policy is on written recording, it is important to recognise that the ability to calculate mentally lies at the heart of calculation.

This policy is divided into stages, which shows the development through children's learning within calculation and the progression through the methods they will use. It is important to note that children progress at *individual* rates within mathematics, therefore children will move naturally through the stages when they are able in line with their development.

Introduction

The Numeracy Framework provides a structured and systematic approach to the teaching of calculation. There is considerable emphasis on teaching mental calculation strategies and speaking and listening activities and we agree that this underpins our approach to teaching mathematics.

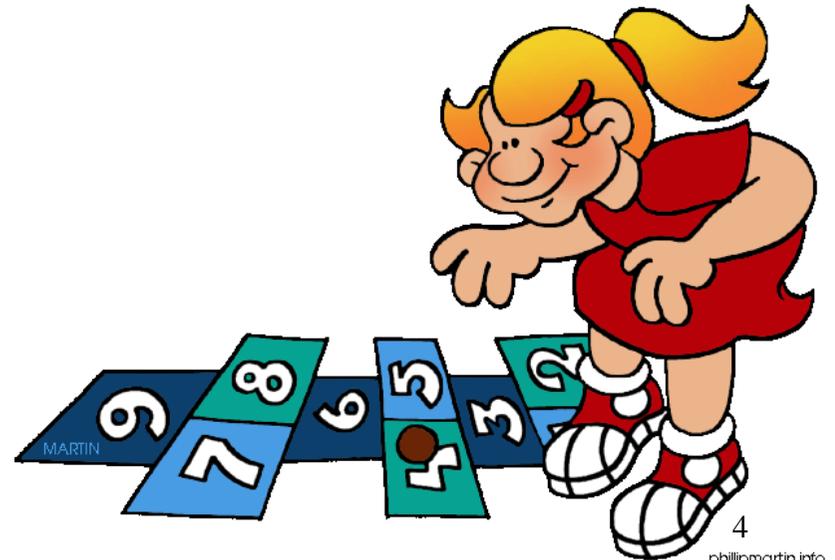
Up to the age of 9 (Year 4) informal written recording should take place regularly and is an important part of learning and understanding. **More formal written methods should follow only when the child is able to use a wide range of mental calculation strategies.** This will help communicate methods and solutions.

Why do we need this policy?

- Consistency in methods taught throughout the school
- Progression from informal/practical methods of recording to written methods within each of the four operations
- An aid to parent's understanding in their child's stages of learning.

Recording in mathematics

Children need to be introduced to the processes of calculation through practical, oral and mental activities. As children begin to understand the underlying ideas behind calculations, they develop ways of recording to support their thinking and methods. Children learn how to use models and images, such as number lines, to support their mental and informal written methods of calculation. As children's mental methods are strengthened and refined, so too are their informal written methods. These methods become more efficient and succinct and lead to written methods that can be used more generally.



Early knowledge of number

It is important to note that children cannot progress through calculations without a clear understanding of early number and pattern. At the time children enter school, and throughout their schooling, they will need to be able to continuously access all the skills outlined below.

- **Understand the value of a number.**

We cannot stress enough the importance of children understanding the value of a number. Children need to be able to understand that 4 objects are the same amount, no matter the objects (e.g. eggs or pencils) and whichever formation they fall into. Without this knowledge children will not understand the skills required within calculations.

- **Count reliably up to 10 objects.**

Children need to be able to count objects accurately, touching them as they say the number. They need to understand that if you put the same amount of objects into a different array that the number will remain the same.

- **Say the number names in order.**

Children need to be able to understand the number names and relate these to a number, although they do not need to be introduced to numerals at this stage. They should recognise number order and count from 1 to 10. Regular number rhymes and games can help to support the development of early number.

- **Recognise differences in quantities.**

Children need to be able to see that one quantity is larger than another by sight, e.g. to see an array of 4 cubes and an array of 9 and say that 9 is bigger. If they cannot do this then they do not have a secure understanding of the value of a number.

Vocabulary

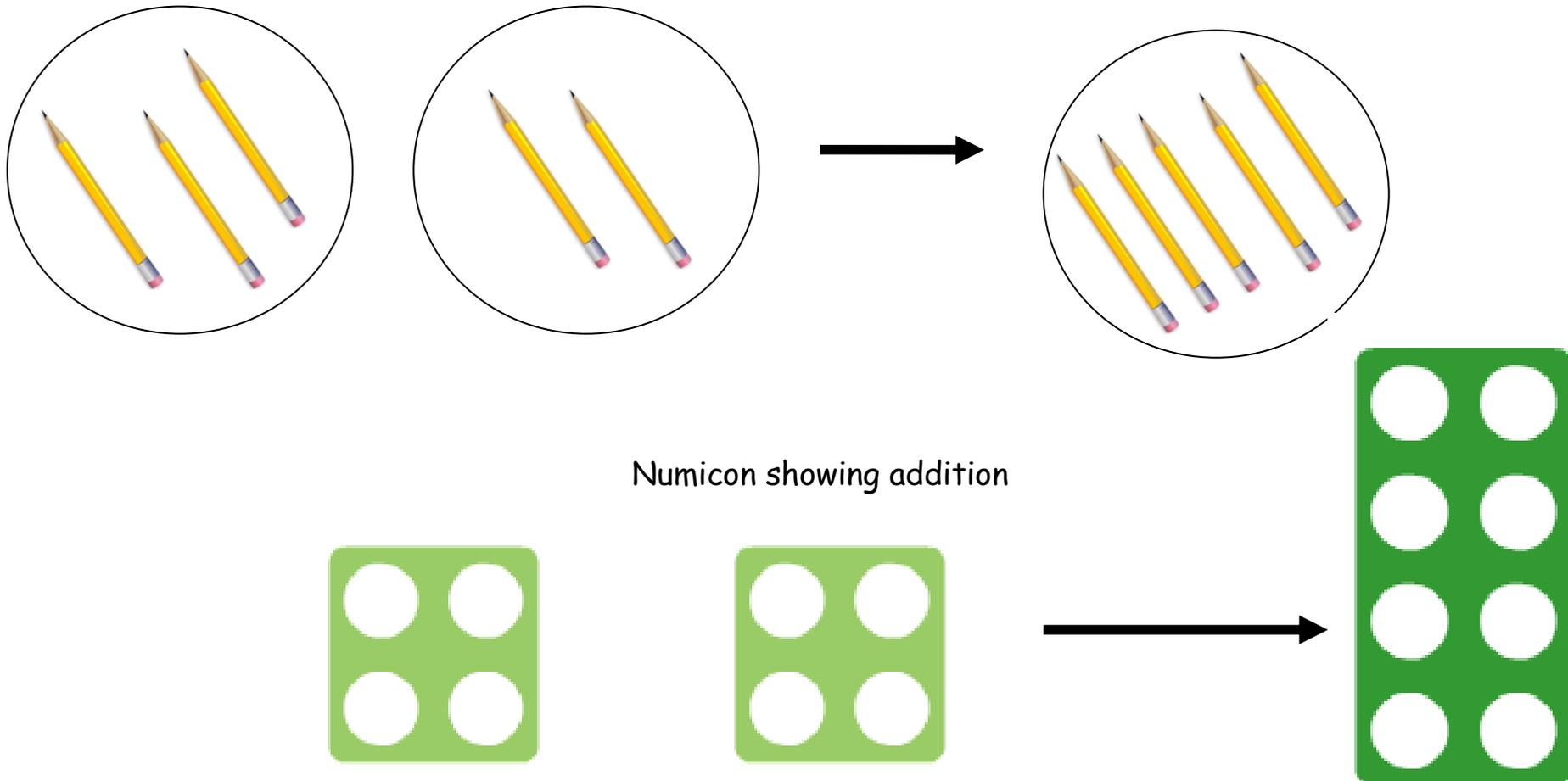
Addition	Subtraction	Multiplication	Division
add	subtract	multiplied by...	share
more than	take away	lots of...	group
plus	minus	groups of...	share equally
sum	decrease	times	divide by
total	difference	double	
and	fewer than	multiple	Other
increase	less than	product	equals

Addition: Stage 1

At every stage practical equipment and images are imperative to providing a secure foundation for calculation. At stage 1, children are not expected to use numerals or operation signs unless they are able to associate them with a value or operation.

Practical understanding at stage 1

Count 2 sets of objects and say how many there are altogether.



Informal recording at stage 1

Children will choose how they represent their own mathematics and are encouraged to explain what it shows. A teacher or adult may model a number sentence but the children are not expected to record using numerals or operation signs unless they are able to associate them with a value or operation.



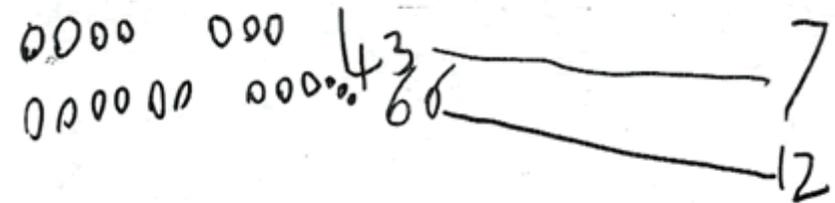
Stage 1: child representation of 3 and 3



Child representation of 6 and 7 is 13



Child representation of adding 4 and 9 to make 13.

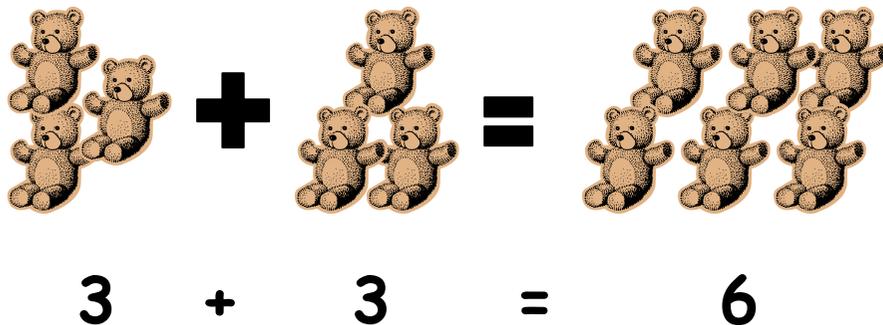
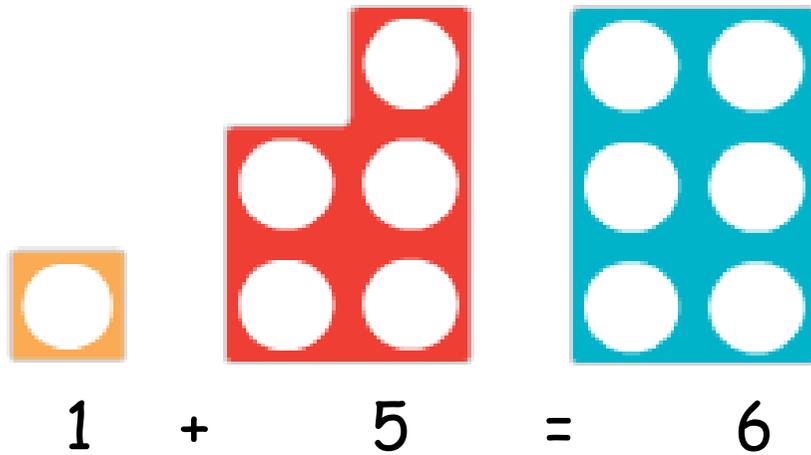


*Child representation of:
4 and 3 is 7
6 and 6 is 12*

Addition: Stage 2

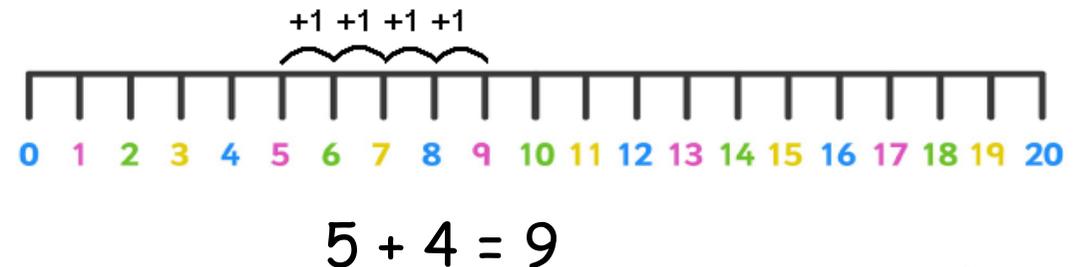
Practical equipment and images are still incredibly important at this stage and children are now beginning to use signs and numerals to record their number sentences. As their knowledge of number value grows, children will also begin to use number-lines and number squares to support their understanding of calculation and numerical value.

Practical understanding at stage 2



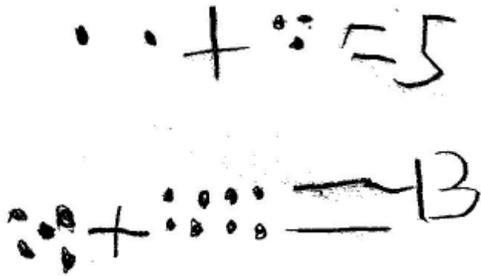
1 - 100 number square

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

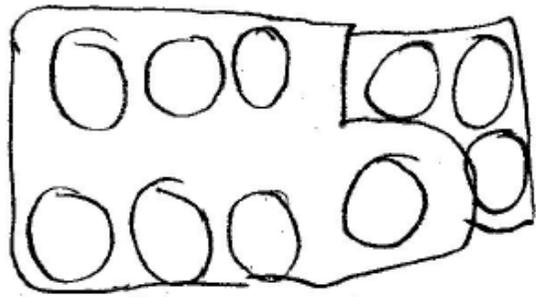


Informal recording at stage 2

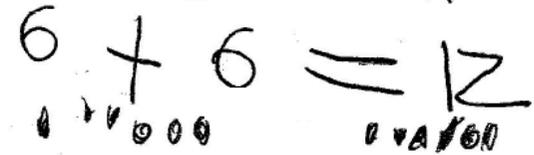
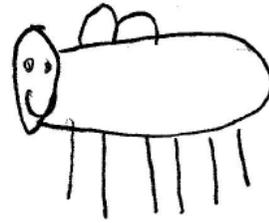
Children will begin to draw to support their understanding of calculation and represent this in their own way. They will begin to use signs and numerals to show number sentences and they may begin to group numbers when drawing to make it easier to record.



Using dots and signs to represent addition



Example of grouping a number using Numicon to represent $7 + 3$



Using pictures and symbols to represent addition

Addition: Stage 3

At stage 3 children will be continuously accessing practical equipment and using visual drawings to support their calculations. They will begin to know number facts off by heart and be developing a repertoire of strategies to support their mental calculations.

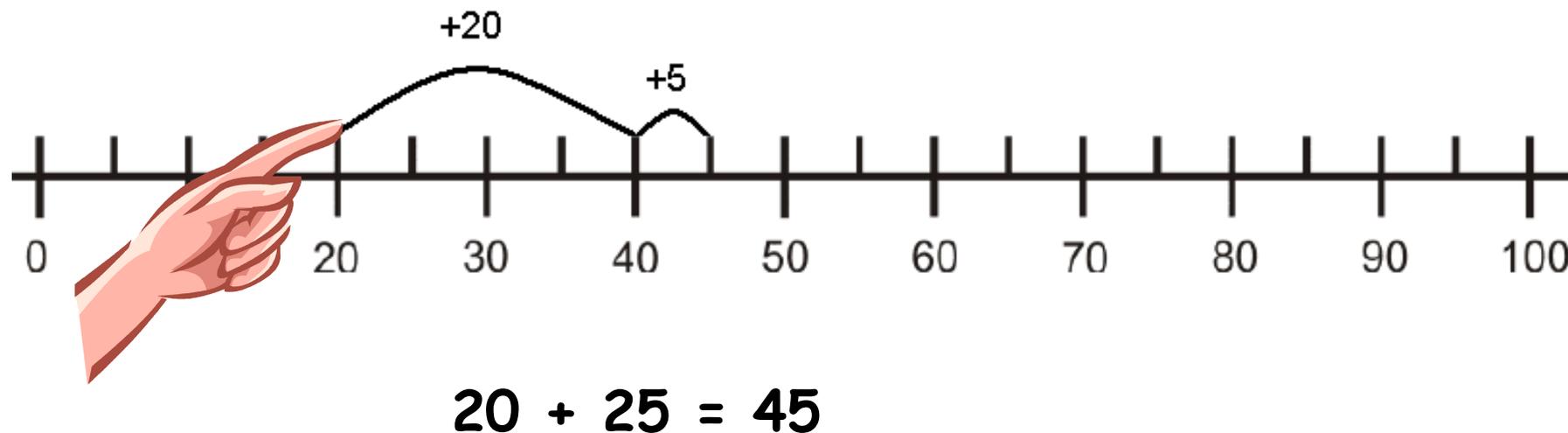
It is hoped by stage 3 that children are becoming more confident with their mental calculations. Children therefore need to be able to access the following before moving towards other stages of calculations.

- Recognition and recall of number pairs to 10 and 20.
- Knowledge of place value (tens and units).
- Understanding of number values from 0-100.
- Visualise a number or mathematical image in their heads.

Practical understanding at stage 3

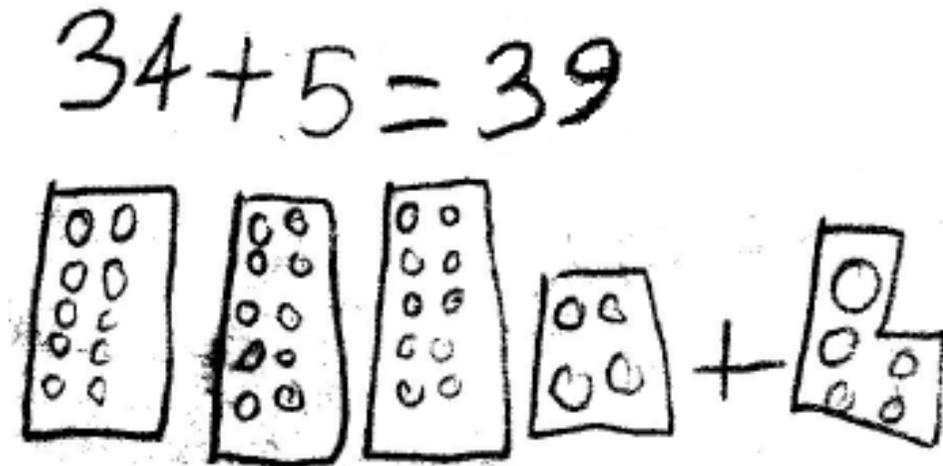
Children will continue to access practical equipment as above in stages 1 and 2. Please note that it is important children have this support at *all times* throughout their mathematical development and working practically should be encouraged when needed.

Children will continue to use number squares and number lines to support their addition. They will make *practical* jumps using their knowledge of tens and units and learn strategies to use these successfully.



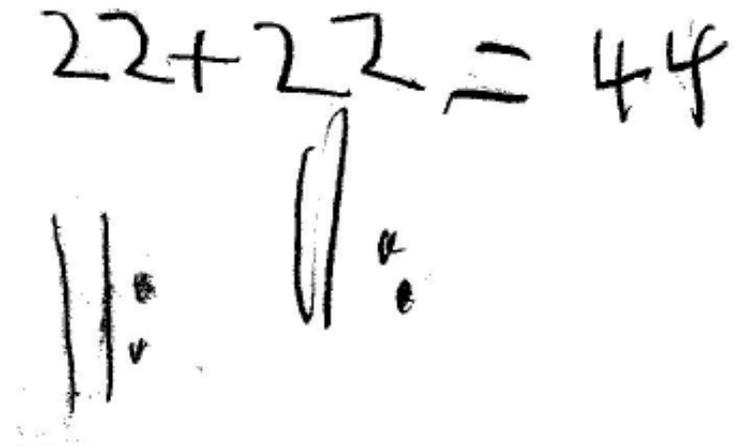
Informal recording at stage 3

Children will continue to draw their own representations for number calculation sentences but now these will begin to understand the importance of grouping tens to ensure accuracy. At school, children will be encouraged to begin to draw Numicon shapes to support their addition, alongside the use of numerals and signs.



Numicon demonstrating the use of grouping and partitioning into tens to support addition.

Using partitioning to represent addition with tens and units.



Addition: Stage 4

At stage 4, children will be encouraged to use a formal written method to show their calculations. They will need to be secure in their understanding of partitioning to be able to do this.

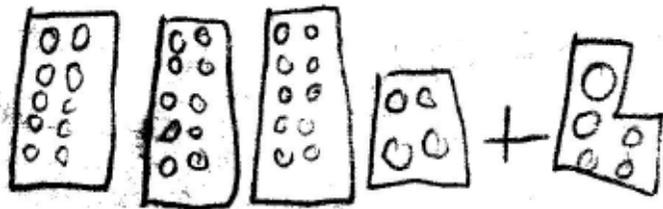
Practical understanding at stage 4

Children will continue to access practical equipment as above in stages 1, 2 and 3. Please note that it is important children have this support at *all times* throughout their development of mathematics and working practically should be encouraged when needed.

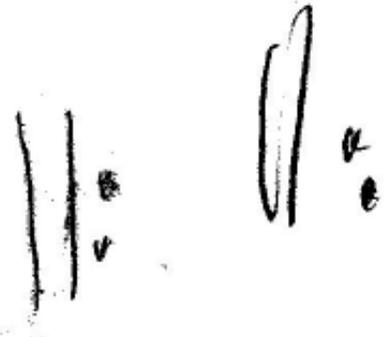
Informal recording at stage 4

Children will continue to record maths in methods they deem appropriate, but will begin to be introduced to more formal methods of calculation.

$$34 + 5 = 39$$



$$22 + 22 = 44$$



Formal recording at stage 4

To build on from the foundation of Numicon and to encourage partitioning in mental skills, we have selected 2 methods in which the children will learn addition strategies.

Partitioning to add

For this method children will be encouraged to use Numicon where necessary to support their understanding of place value. They will partition each number into tens and units before adding up the total amount. When children are able, they will progress to using this method to include hundreds.

$$33 + 29 = 62$$

T: $30 + 20 = 50$
U: $3 + 9 = 12$
 $50 + 12 = 62$

$$25 + 21 = 46$$
$$20 + 20 = 40$$
$$5 + 1 = 6 \quad + 40$$

$$254 + 123 = 377$$

$$H: 200 + 100 = 300$$

$$T: 50 + 20 = 70$$

$$U: 4 + 3 = 7$$

$$300 + 70 + 7 = 377$$

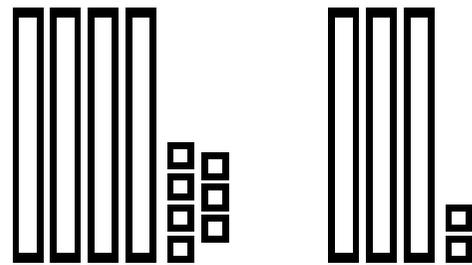
H - hundreds

T - tens

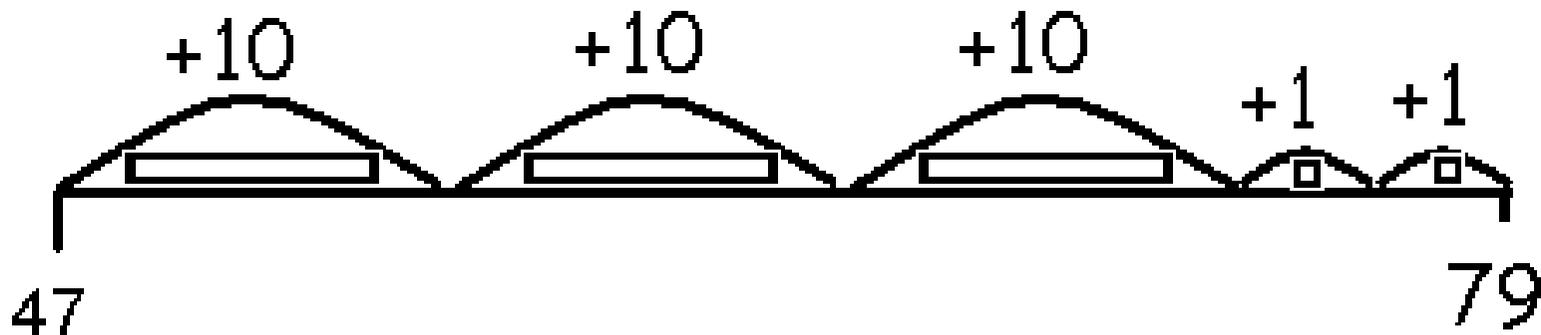
U - units

Partition using a number-line to add

For this method children are encouraged to use Dienes to support their understanding using an open number-line. Children will lay the tens rods down and jump over them to visually represent a jump of ten and similarly with units. They will then record this in their books as a written method.



$$47 + 32 =$$



Addition: Stage 5

Practical understanding at stage 5

Children will continue to access practical equipment as above. Children will have this support at *all times* throughout their mathematics development and working practically should be encouraged when needed.

Informal recording at stage 5

Informal recording is much less common at this stage as children should have a secure understanding of methods taught at stage 4.

Formal recording at stage 5

To build on from stage 4 the children will continue to access their knowledge of partitioning to help support their calculations. However, once this is clear, children will be taught 'shorter' methods to find answers.

$$\begin{array}{r} \text{HTU} \\ 377 \\ + 221 \\ \hline 598 \end{array}$$

$$\begin{array}{r} \text{HTU} \\ 451 \\ + 336 \\ \hline 787 \end{array}$$

Column method addition

For this method children will first be taught how to add without 'carrying' a number. They will learn to add the units first and then the tens and hundreds.

Addition: Stage 6

Practical understanding at stage 6

Children will continue to access practical equipment as above. Children will have this support at *all times* throughout their mathematics development and working practically should be encouraged when needed.

Informal recording at stage 6

Informal recording will not be used at this stage unless children are asked to show their calculations in their own way. This is because children should now have a secure understanding of methods taught at stages 4 and 5.

Formal recording at stage 6

Children will continue to use column method as taught in stage 5, but be introduced to 'carrying' a number below the line.

$$\begin{array}{r} 423 \\ + 368 \\ \hline 791 \\ \hline 1 \end{array}$$

Column method addition (continued)

Beginning with the units digit, children will add the digits together. If the number goes over the next boundary, e.g. becomes 11, they will learn to put the unit as 1 and then carry an 'extra' ten into the next column. They will then ensure they add this ten to the digits in the tens column.