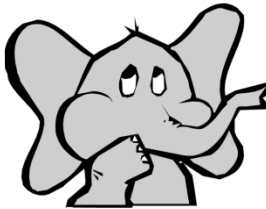
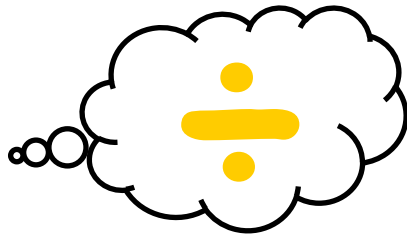
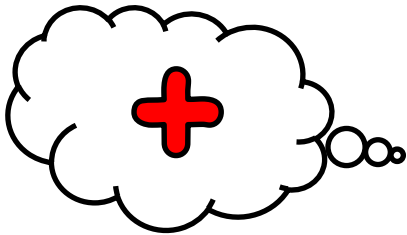
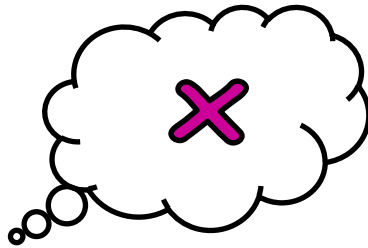
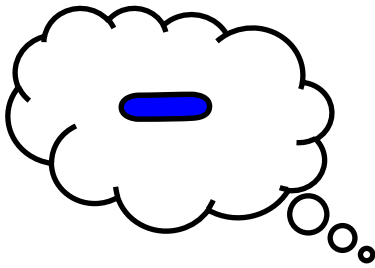


# Progression in Calculations



## Introduction

Written methods of calculations are based on mental strategies. Each of the four operations builds on mental skills which provide the foundation for jottings and informal written methods of recording. Skills need to be taught, practised and reviewed constantly. These skills lead on to more formal written methods of calculation.

Strategies for calculation need to be supported by familiar models and images to reinforce understanding. When teaching a new strategy it is important to start with numbers the child can easily manipulate so that they can understand the concept.

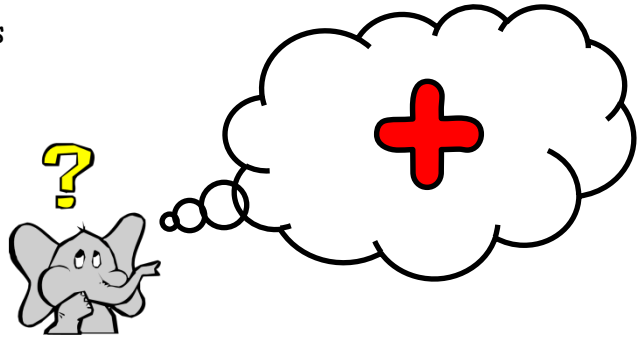
The transition between stages should not be hurried as not all children will be ready to move on to the next stage at the same time, therefore the progression in this document is outlined in stages. Previous stages may need to be revisited to consolidate understanding when introducing a new strategy.

A sound understanding of the number system is essential for children to carry out calculations efficiently and accurately.

## Progression in Teaching Addition

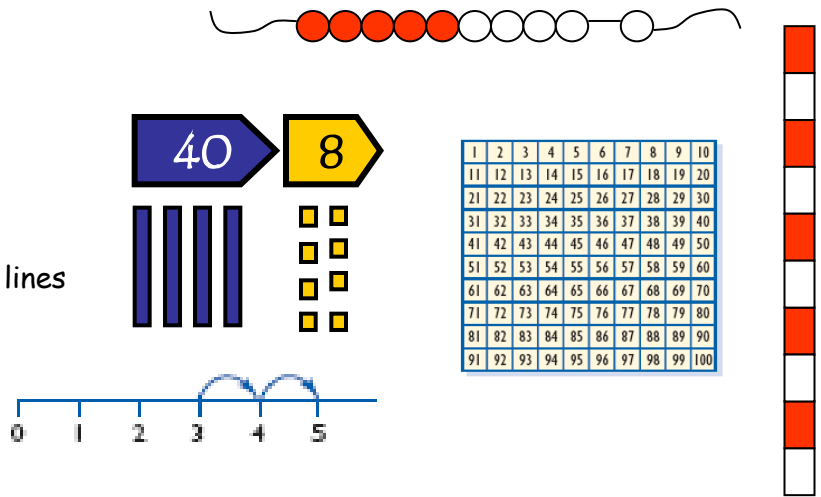
### Mental Skills

- Recognise the size and position of numbers
- Count on in ones and tens
- Know number bonds to 10 and 20
- Add multiples of 10 to any number
- Partition and recombine numbers
- Bridge through 10



### Models and Images

- Place value apparatus
- Place value cards
- Number tracks
- Numbered number lines
- Marked but unnumbered number lines
- Empty number lines
- Hundred square
- Counting stick
- Bead string
- Models and Images charts
- ITPs - Number Facts, Ordering Numbers, Number Grid, Counting on and back in ones and tens



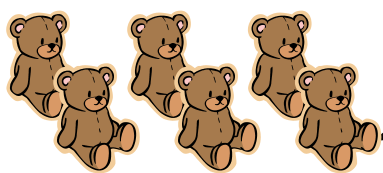
### Key Vocabulary

- add
- addition
- plus
- and
- count on
- more
- sum
- total
- altogether
- increase

add addition and  
make count on  
sum plus total  
more  
altogether increase

Recognise numbers 0 to 10

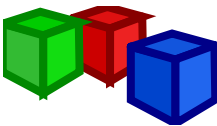
0 1 2 3 4 5 6 7 8 9 10



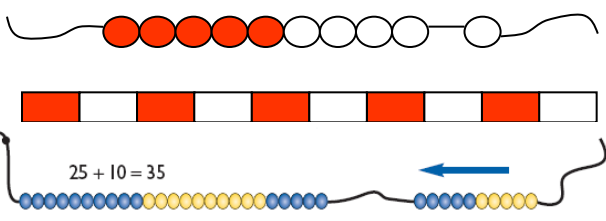
1, 2, 3, 4, 5, 6  
... there are 6 teddies

Count reliably up to 10 everyday objects

Find one more than a number



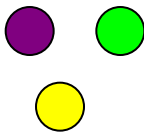
One more than three is four



|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
| 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 |

Count in ones and tens

Begin to relate addition to combining two groups of objects



and  makes 5

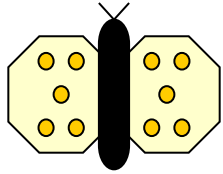
$3 + 2 = 5$



Count along a number line to add numbers together

Begin to use the + and = signs to record mental calculations in a number sentence

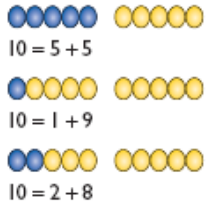
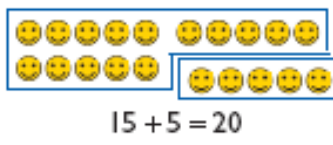
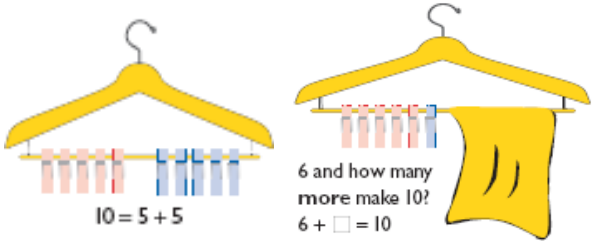
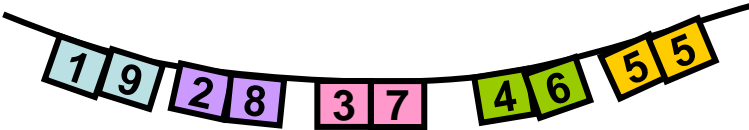
$6 + 4 = 10$



$5 + 5 = 10$

Know doubles of numbers

Know by heart all pairs of numbers with a total of 10 and 20



**1** + **2** = **3**



**2** + **1** = **3**



2 + 5 = 7

2 count on 5

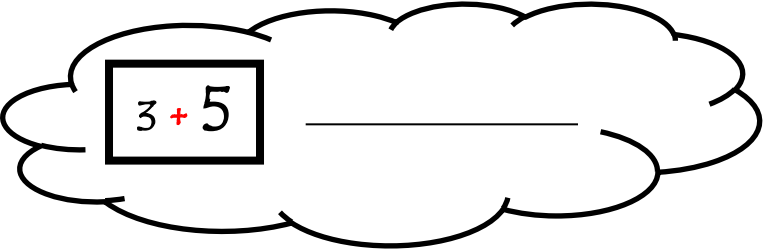
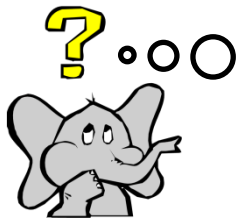


5 + 2 = 7

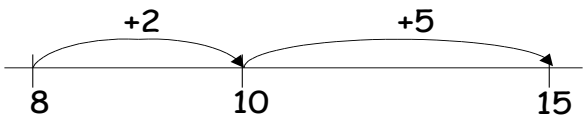
5 count on 2

Know that addition can be done in any order

Put the biggest number first and count on

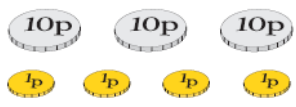
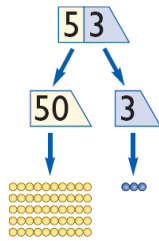


**8 + 7 = 15**



Add two single-digit numbers that bridge 10

Begin to partition numbers in order to add

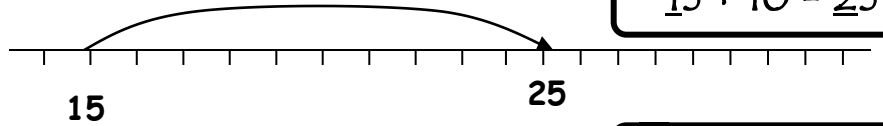


30p + 4p = 34p

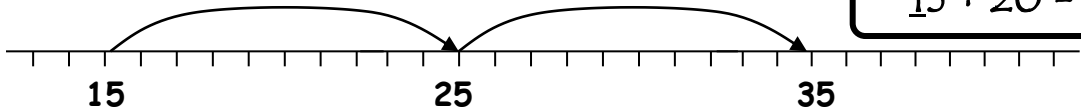
Know which digit changes when adding 1s or 10s to any number



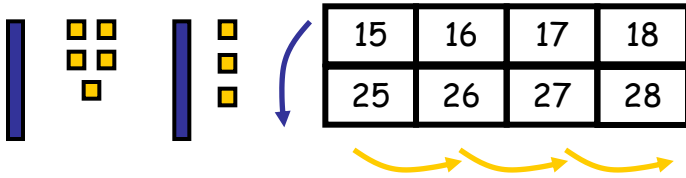
$$15 + 1 = 16$$



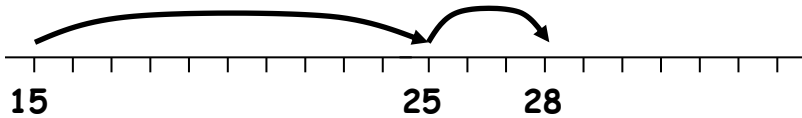
$$15 + 10 = 25$$



$$15 + 20 = 35$$



Adding two two-digit numbers (without bridging)  
Counting in tens and ones  
Partitioning and recombining



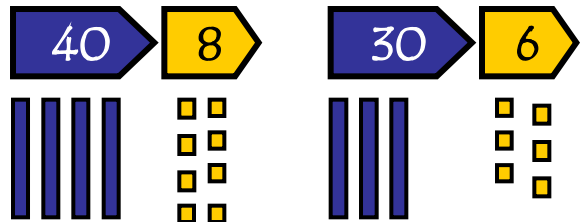
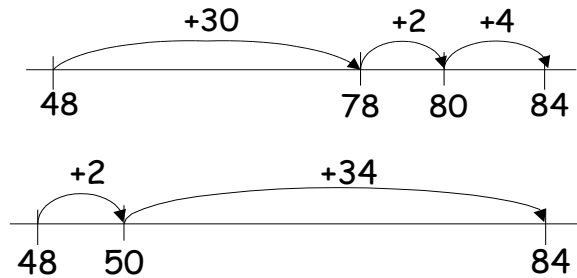
$$15 + 13 = 28$$

Adding two two-digit numbers (bridging through tens boundary)

Using a number line

OR

Using place value cards and Dienes to partition numbers and recombine



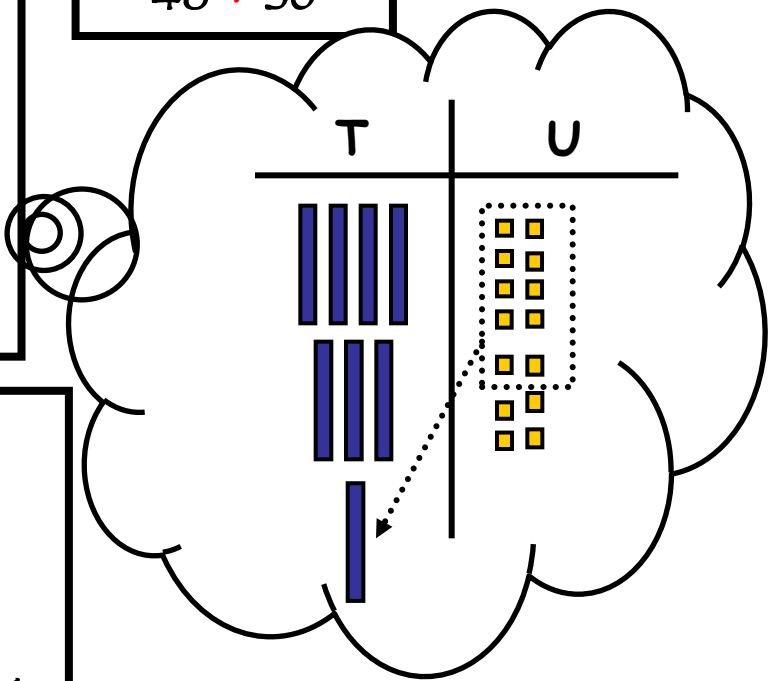
$$48 + 36 = 84$$

$$\begin{array}{r}
 40 + 30 + 8 + 6 \\
 \hline
 40 + 30 = 70 \\
 8 + 6 = 14 \\
 70 + 14 = 84
 \end{array}$$

### Expanded column addition

It is important that the children have a good understanding of place value and partitioning using concrete resources and visual images to support calculations. The expanded method enables children to see what happens to numbers in the standard written method of compact column addition.

$$48 + 36$$



T U

$$40 + 8$$

$$30 + 6$$

$$\begin{array}{r} 10 \\ \hline \end{array} \quad \text{exchanging}$$

$$\begin{array}{r} 80 + 4 \\ \hline \end{array} \quad \text{answer}$$

If it was  $78 + 36$ .....

We use an **exchanging row** to show that because  $8 \text{ units} + 6 \text{ units} = 14 \text{ units}$ , we must 'exchange' 10 of them for a ten stick.

We use the word '**exchanging**' instead of '**carrying**'.

H T U

$$70 + 8$$

$$30 + 6$$

We need to **exchange** 10 ten sticks for one hundred because  $70 + 30 + 10 = 110$

$$\begin{array}{r} 100 \quad 10 \\ \hline \end{array} \quad \text{exchanging}$$

$$\begin{array}{r} 100 + 10 + 4 \\ \hline \end{array} \quad \text{answer}$$

T U

$$4 \quad 8$$

$$3 \quad 6$$

$$\begin{array}{r} 1 \\ \hline \end{array} \quad e$$

$$\begin{array}{r} 8 \quad 4 \\ \hline \end{array} \quad a$$

### Compact column addition

When children are confident with the previous stages they can record with single digits and remove the exchanging row altogether.

T U

$$4 \quad 8$$

$$3 \quad 6$$

$$\begin{array}{r} 1 \\ \hline 8 \quad 4 \\ \hline \end{array}$$

H T U

$$7 \quad 8$$

$$3 \quad 6$$

$$\begin{array}{r} 1 \\ \hline 1 \quad 1 \quad 4 \\ \hline \end{array}$$