

# Progression in Calculation Addition and Subtraction

## How to use this document

This document is designed to give ideas about how to use concrete apparatus and images to support children's conceptual understanding.

So often children are able to follow calculation processes and get the answer right in many cases without fully understanding how and why the method works. This document is designed to support teachers to do that so that children are able to reason effectively and apply maths that they have learnt to other methods and new concepts as they have that deep understanding required at Mastery. Not all National Curriculum objectives are listed but just some to give a flavour of how the images and apparatus can be used to develop children's conceptual understanding of different mathematical ideas. Teachers should read previous year groups to ensure children have consolidated these ideas before moving on. For some year groups the same images and concrete resources will be used but maybe with larger numbers and with a greater level of reasoning so they have therefore not been repeated.

For more guidance use the Resource Tool <https://www.ncetm.org.uk/resources/41211> on the NCETM website where exemplification material and activity ideas can be found using the following tabs of EXEMPLIFICATION and ACTIVITIES. The SUBJECT KNOWLEDGE Audit tool will also help to give an insight to the expectations under each NC objective. There is also a tab for VIDEOS under each domain where you can see teacher using concrete resources to develop childrens' conceptual understanding and reasoning.

## The EYFS Framework

Mathematics involves providing children with opportunities to develop and improve their skills in **counting, understanding and using numbers**, calculating **simple addition and subtraction problems**; and to describe shapes, spaces, and measures

### **Early Learning Goals**

Mathematics Numbers: children **count reliably with numbers from 1 to 20**, **place them in order** and say which number is **one more or one less** than a given number. Using **quantities and objects**, they **add and subtract two single-digit numbers** and **count on or back** to find the answer. They solve problems, including doubling, halving and sharing.

Shape, space and measures: children use everyday language to talk about size, weight, capacity, position, distance, time and money to compare quantities and objects and to solve problems. They recognise, create and describe patterns. They explore characteristics of everyday objects and shapes and use **mathematical language** to describe them.

Additional Guidance can be found in Development Matters:

<https://www.early-education.org.uk/development-matters>

# Early Maths Foundation Stage to early KS1

ELG: Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

## Counting

- Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number.

### Oral counting

Oral counting in 1s forwards and backwards to 10 then 20 **starting at zero. 0,1,2,3 etc**

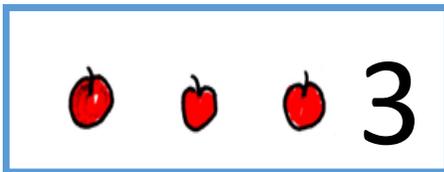
Progress to **starting at any number** and counting in 1s. 5, 6, 7 (important if children are able to count on later.

Oral counting- Saying **teen and ty** numbers correctly.  
e.g. 13- thirteen, 30- thirty.

40-60 months  
Selects the correct numeral to represent 1 to 5, then 1 to 10 objects.

### Object counting

**Counting all- 1:1 principle (1:1 correspondence)**



**One, two, three**

**Counting objects up to 10 then 20.**

Children need to understand that number labels (words) match objects as they count them.

## Place Value and Number System

- Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer



### Subitising

Children should start to recognise small amounts without counting, especially when presented with familiar arrangements e.g. numicon and dice.

### Number conservation

Children should have opportunities to explore groups of objects and note that when some are moved there is still the same quantity there (unless any are removed or added).

How many counters?



How many now?



## The learning environment

### A number rich environment

#### Multi-representation of numbers to 20

Activities to promote multi-representation through play/exploration.



In your writing area– have you got prompts to encourage children to write their numbers and mark make in maths?

40-60 months

- Counts up to three or four objects by saying one number name for each item.
- Counts actions or objects which cannot be moved.
- Counts objects to 10, and beginning to count beyond 10.
- Counts an irregular arrangement of up to ten objects.
- Counts out up to six objects from a larger group.
- Counts an irregular arrangement of up to ten objects.

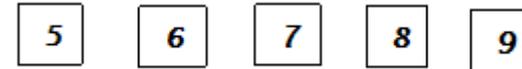
Children need opportunities to make links with number labels (figures),

object counting and ordering numbers.

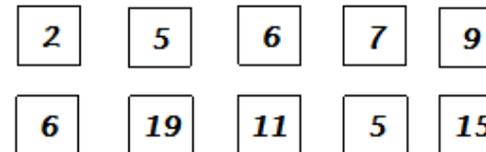
## Place Value and Number System

#### Ordering numbers

Ordering a set of consecutive numbers e.g.



Ordering a set of random numbers e.g.



#### Using comparative language to describe group size

Which group has more/fewer?

Which has most/least?



40-60 months

Uses the language of 'more' and 'fewer' to compare two sets of objects.

There are fewer apples/less apples than oranges.

There are more oranges than apples.

There are most oranges.

## Addition

### Aggregation— combining groups

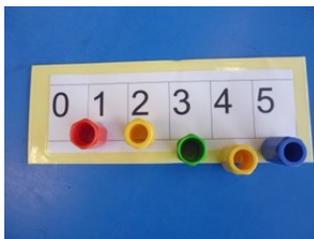
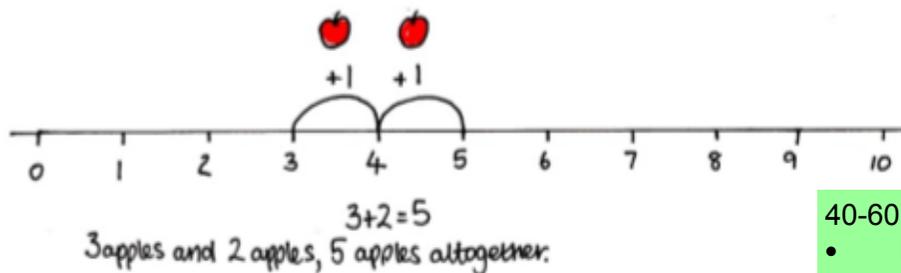
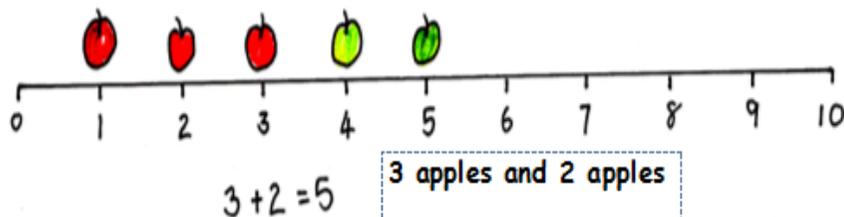
Counting all, 1, 2, 3, 4, 5 There are 5 apples



### Structured Number Lines

Counting on from first number 2, 3, 4, 5 There are 5 apples

Counting on from the greatest number. 3, 4, 5

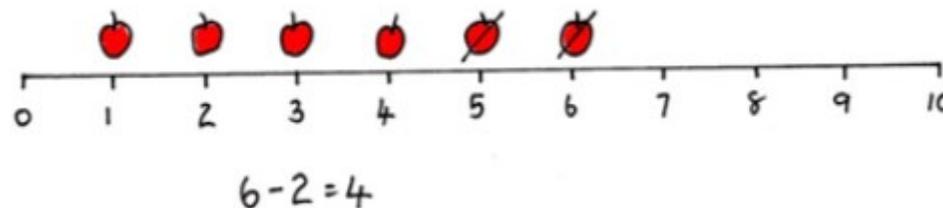


## Subtraction

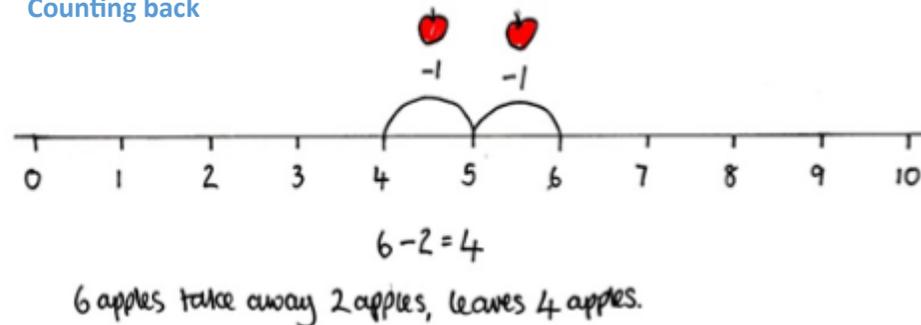
### Taking away— removing objects from a group

I have 6 apples. I eat 2 apples. How many are left?

Count out 6, take away 2, count how many are left?



### Counting back



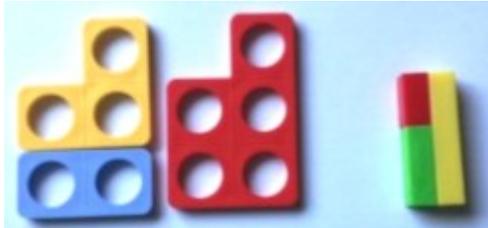
40-60 months

- Finds one more or one less from a group of up to five objects, then ten objects.
- In practical activities and discussion, beginning to use the vocabulary involved in adding and subtracting.
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## Exploring relationships (inverse)

### Bar Modelling

#### Part, part, whole models



The whole is 5.

3 is a part, 2 is a part of the whole.

If you remove 1 part, the other is left. E.g.  $5 - 3 = 2$  or  $5 - 2 = 3$

If you put the parts together, you get the whole.

$3 + 2 = 5$     $2 + 3 = 5$  These are commutative .



40– 60 months

- In practical activities and discussion, beginning to use the vocabulary involved in adding and subtracting.

*What is the same? What is different?*

*Mary had 7 letters in her bag and she posted 3.  
How many did she have left?*

$$7 - 3 = ?$$

*Mary had 7 letters in her bag and after she  
posted some, she had 4 left. How many did she  
post?*

$$7 - ? = 4$$

*Mary had some letters and after post-  
ing 3, she had 4 left. How many did  
she start with?*

$$? - 3 = 4$$

**Act out problems in  
different ways**

Year 1

- Read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs
- Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as  $7 = ? - 9$

## Key Stage 1

The principal focus of mathematics teaching in key stage 1 is to ensure that pupils **develop confidence and mental fluency** with **whole numbers, counting and place value**. This should involve working with **numerals, words and the four operations**, including with **practical resources [for example, concrete objects and measuring tools]**.

At this stage, pupils should develop their ability to recognise, describe, draw, compare and sort different shapes and use the related vocabulary. Teaching should also involve using a range of measures to **describe and compare different quantities such as length, mass, capacity/volume, time and money**.

By the end of year 2, pupils should **know the number bonds to 20 and be precise in using and understanding place value**. An emphasis on **practice** at this early stage will aid **fluency**.

Pupils should read and spell mathematical vocabulary, at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

# Key stage 1

## Counting

Concentrate on the tricky areas e.g. bridging through 100.

97, 98, 99, 100, 101, 102

Remember to count backwards as frequently as you count on!

Year 1

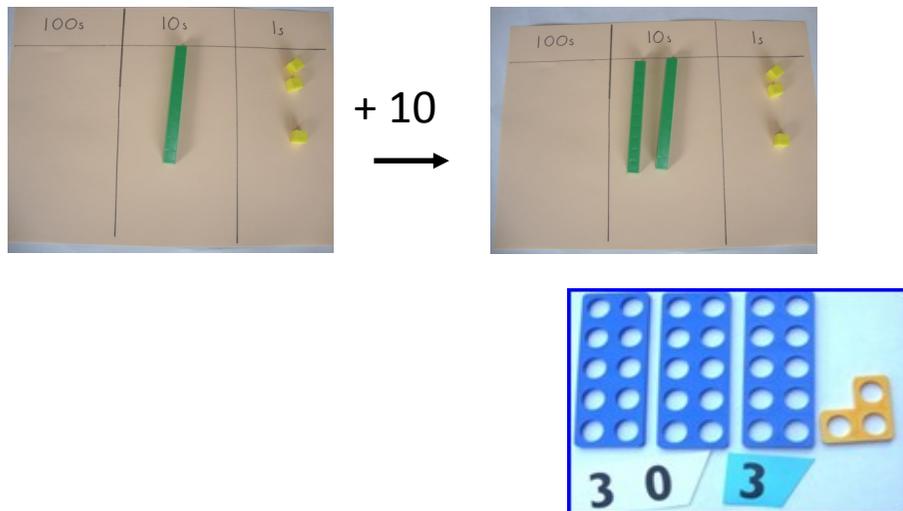
Count to and across 100, forwards and backwards, beginning with 0 or 1 or from any given number.  
Count, read and write numbers to 100 in numerals.  
Given a number, identify one more, one less.

Year 2

Count in tens from any number (forwards and backwards)

What has changed? Stayed the same?

13, 23, 33



## Place Value and Number System



### Ordering numbers

Which numbers are covered?

Give me a number between... and... .

How do you know?

Order consecutive to 100. Use number line to support.

Year 1

- Read and write numerals from 1 to 20 in numerals and words.
- Identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least

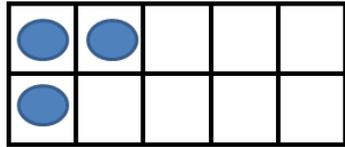
### Number formation

Stencils, dot to dot, tracing, writing in sand, making numbers from modelling dough, using different pens.

Year 1

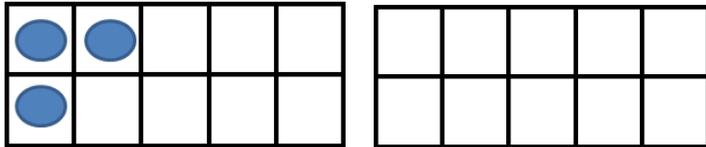
Count read and write numbers to 100 in numerals.

## Addition



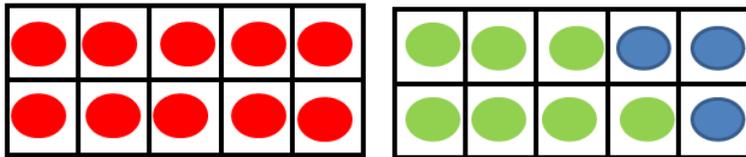
$$\boxed{3} + \boxed{\phantom{00}} = 10$$

How many to make 10? What about 20?



Partitioning numbers in different ways

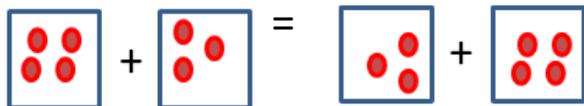
$$20 = \boxed{10} + \boxed{7} + \boxed{\phantom{00}}$$



Lucy has 20 marbles in her bag. 10 were red, 7 were green and the rest were blue. How many

Commutativity

$$4 + 3 = 3 + 4$$



## Subtraction

Year 2

- derive and use related facts up to 100.

$$36 + \boxed{\phantom{00}} = 100$$

										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				

Year 2

- Solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures; apply their increasing knowledge of mental and written methods.

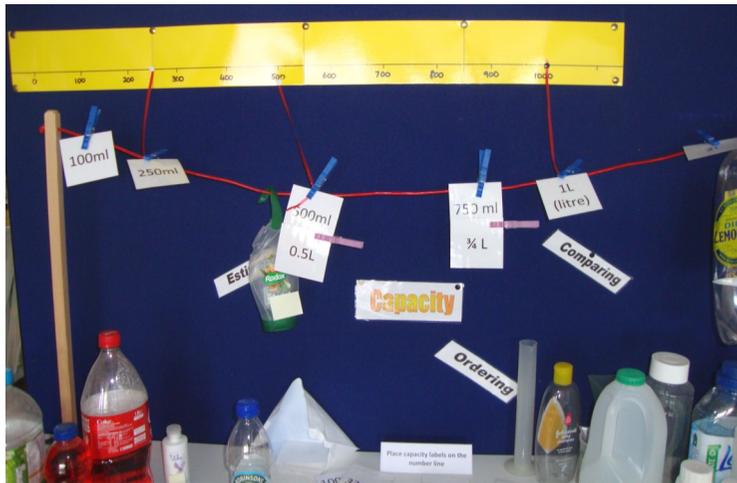
Year 1

- Solve one step problems that involve addition and subtraction, using concrete objects, pictorial representations, and missing number problems.

Jo poured 4 cups of juice from the jug. How many cups were left in the jug?

Children need to use number lines in different orientations e.g. a vertical number line supports work with capacity and Statistics

## The learning environment



A number rich environment



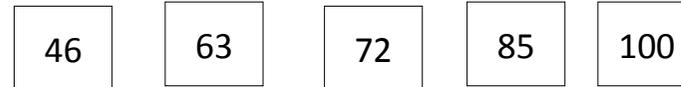
Display numbers in words, numerals and using Multi-representation.

Make link to other areas e.g. measures and money.

## Place Value and Number System

### Ordering numbers

Order consecutive and random numbers to 100.



Year 2

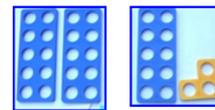
Compare and order numbers from 0 up to 100; use the < > and = signs.

### Concept of place value tens and ones

Year 2

Recognise the place value of each digit in a 2 digit number (tens and ones)

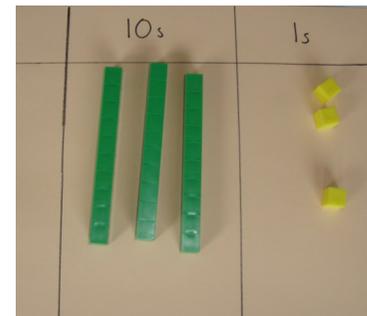
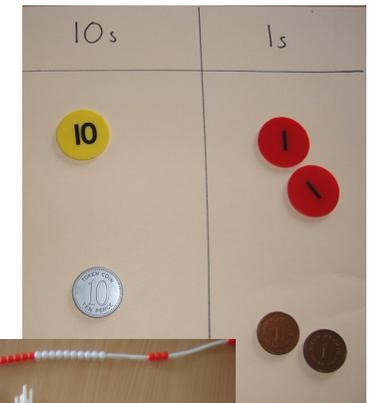
33 can be partitioned in different ways



$$33 = 30 + 3$$

$$33 = 20 + 13$$

20      10 + 3



## Addition

### Using known facts

Secure bonds to ten

Bonds to 20

Bonds for any number to ten

Then use these for bonds within 20

### Year 1

- Represent and use number bonds and related subtraction facts within 20
- Add and subtract one-digit and two-digit numbers to 20, including zero
- Read and write mathematical statements involving addition and subtraction and equals signs.

If I know  $2 + 3 = 5$ ,

How could this help you with  $2 + 4$ ?

What is the same? What is different?

Show me

### Variation

Vary the way in which you present the practice. Use images and practical apparatus combined with symbols.

$$\square + \square = 5$$

$$\square + \square = 5$$

How many ways can you make

$$\square + \square = 5$$

Continue the pattern. What is the same? What is different?

What other ways can you arrange your counters to make your calculation equal 5?

$$5 = \begin{array}{|c|} \hline \bullet \bullet \\ \hline \end{array} + \begin{array}{|c|} \hline \bullet \bullet \\ \hline \end{array}$$

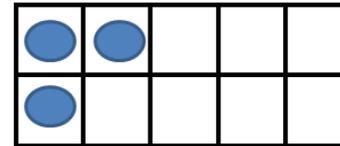
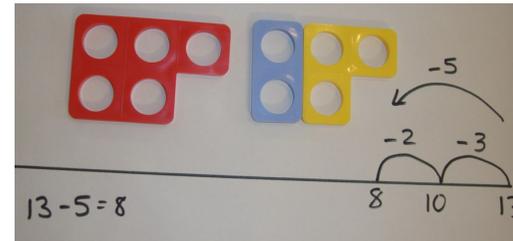
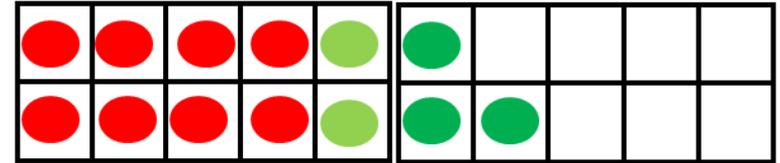
### Year 2

- Recall and use addition and subtraction facts to 20 fluently and derive and use related facts up to 100.

## Subtraction

### Using known facts

$$13 - 5 = 13 - 3 - 2$$



$$\square - \square = 3$$

$$20 = \square - \square$$

What subtraction facts to 20 can you show using a range of apparatus?

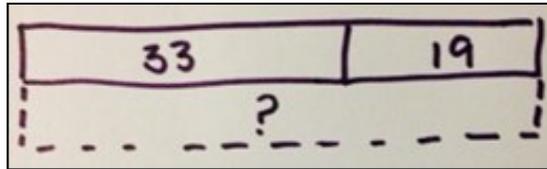
Record as a number sentence.

dogs	<del>    </del>	7
Cats	<del>    </del> <del>    </del> <del>    </del>	19
Rabbits	<del>    </del> <del>    </del>	12
Snake		1
Hamster		3
birds		2

## Addition

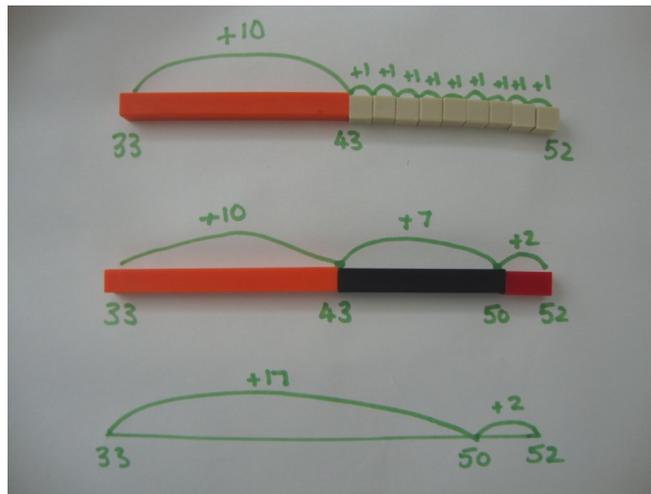
Unstructured number lines

Jottings to support mental methods e.g. number line and bar model



There are 33 children in the playground, 19 more come out to play. How many children are now in the playground?

$$33 + 19 = ?$$



$$33 + 19$$

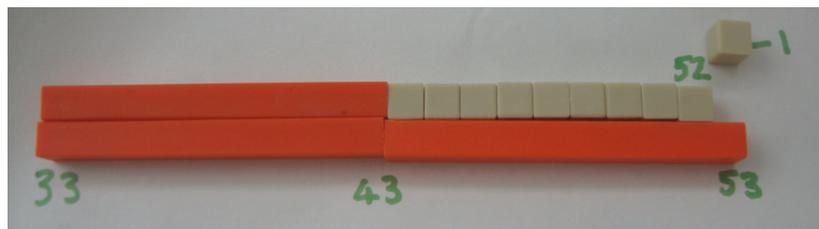
$$33 + 10 + 7 + 2$$

$$33 + 17 + 2$$

Encourage use of number bonds

$$33 + 20 - 1$$

Round and adjust— adding near tens



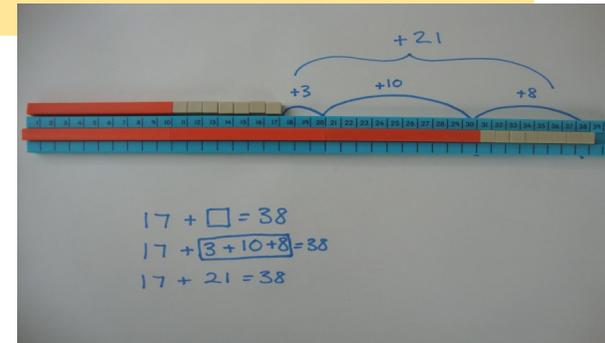
## Subtraction

Finding the difference and counting up to subtract (see also exploring relationships)

Year 2

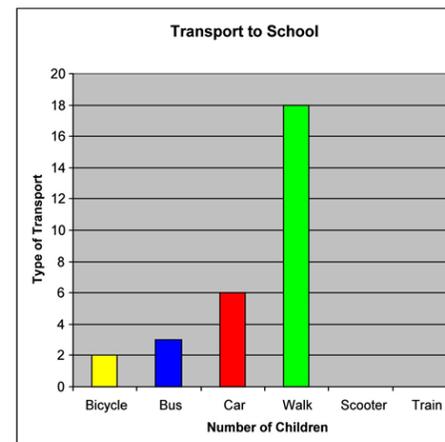
• **NON STATUTORY**

*Pupils extend their understanding of the language of addition and subtraction to include sum and difference.*



I have 36 DVDs, my friend has 17. How many **more** DVDs do I have than my friend?

$$36 = 17 + ? \text{ or } 17 + ? = 36$$



How many more children walked to school than travelled by car?

Use a variety of contexts for children to practice their addition and subtraction skills.

## Addition

Jottings to support mental methods e.g. using place value - partitioning

Once children can count on/back in tens it is easier if they just partition one number as quickly as possible. This prevent issues with subtraction where partitioning both numbers does not work with bridging.

### Progression

**36 + 40 (adding only tens to any number)**

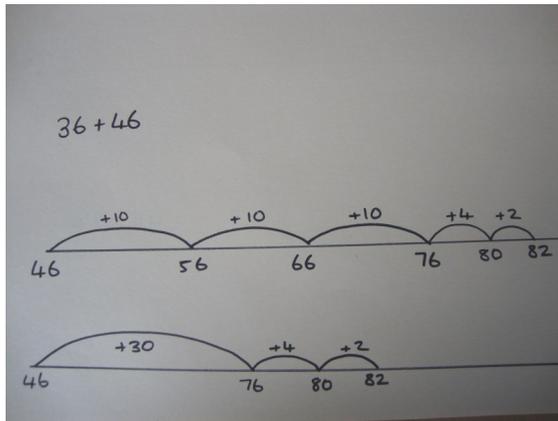
**36 + 43 (adding tens and ones with no bridging)**

**36 + 46 (adding tens and ones with bridging)**

36 + 46

36 + 40 (36, 46, 56, 66, 76) add tens

76 + 6 or 76 + 4 + 2 (using number bond knowledge)



## Subtraction

Jottings to support mental methods e.g. using place value - partitioning

**56 - 20 (subtracting only tens to any number)**

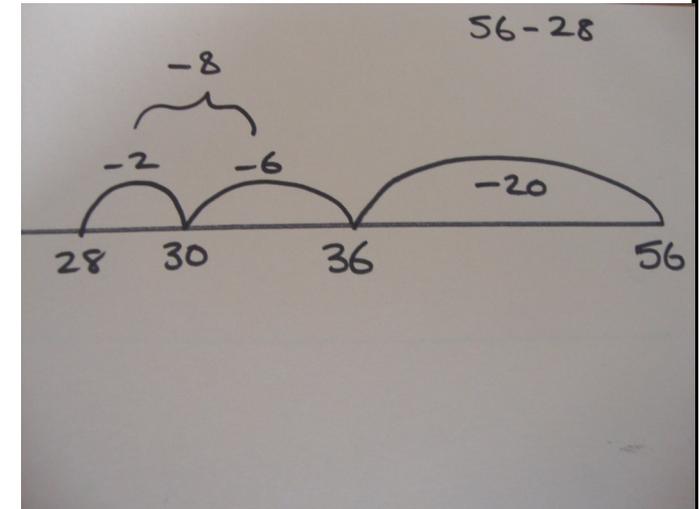
**56 - 23 (subtracting tens and ones with no bridging)**

**56 + 28 (subtracting tens and ones with bridging)**

56 - 28

56, 46, 36 (-20)

36—8 or 36—6—2



Year 2

Add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

- A 2 digit number and ones
- A 2 digit numbers and tens
- Two 2 digit numbers.
- Adding 3 one digit numbers.