

Petersfield Infant School Mathematics Calculation Guide

Children begin to record in the context of play or practical activities and problems.

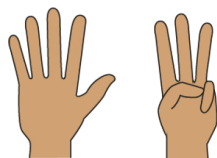
Children continue to explore mathematics practically while also developing more formal recording and representation.

Addition

Year R

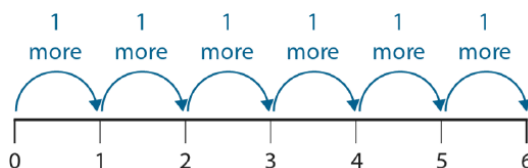
Children begin to relate addition to combining two groups of objects. Activities include:

- Counting with numbers from one to 20, placing them in order and saying which number is one more or one less than a given number
- Use stories, games and songs to begin using language for addition
- Begin to record in the context of play and practical activities
- Solve simple word problems using their fingers



- Use the language of one more when adding one to group
- Count forwards along a number line

1	2	3	4	5	6	7	8	9	10
one	two	three	four	five	six	seven	eight	nine	ten



Year 1

Mental Fluency

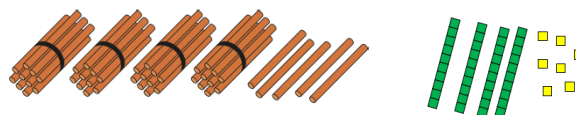
Children will develop fluency in the following addition facts:

- Count to 100 in 1s, beginning with 0 or 1, or from any given number
- Add two 1-digit numbers, spotting doubles or pairs to 10
- Add ten to any 1-digit number
- Represent and use number bonds within 10

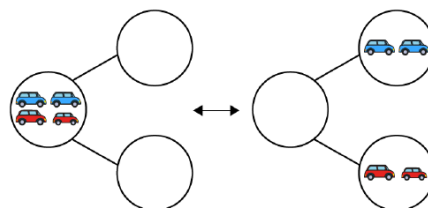
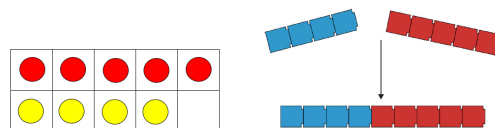
Calculation

Children are taught to:

- Understand and represent numbers to 100 as tens and ones



- Use objects to count and combine numbers, using the language of 'parts' and 'whole'. E.g. "Four is a part, five is a part, nine is the whole".

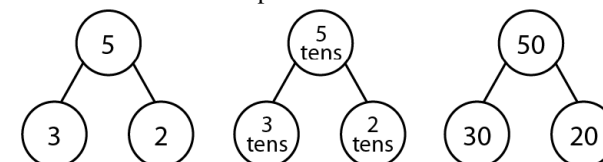


Year 2

Mental Fluency

Children will develop fluency in the following addition facts:

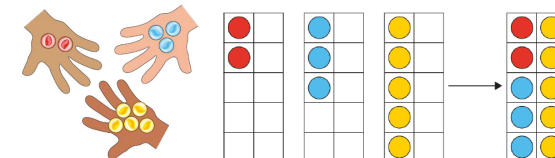
- Count on in steps of 2, 3, and 5 from 0, and in tens from any number, to and across 100
- Recall and use all addition facts to 20 fluently, and derive and use related facts up to 100



Calculation

Children will develop their use of the representations from Year 1, while being taught to:

- Add two or three 1-digit numbers



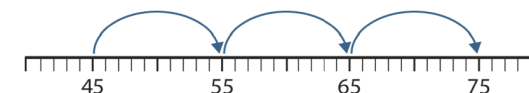
- Add a 1-digit number to any 2-digit number using number facts, including bridging multiples of 10

- Count on in 10s and 1s

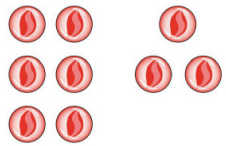


• 'Thirty-seven has one more one than thirty-six.'

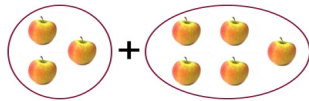
$$45 + 30$$



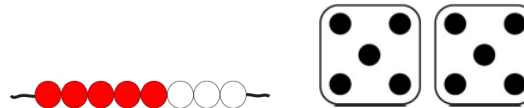
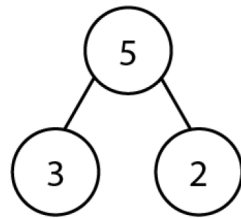
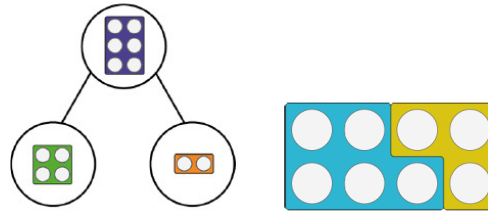
- Practically combine two groups of objects



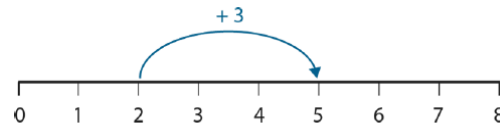
- Make a record in pictures, words or symbols of practical addition



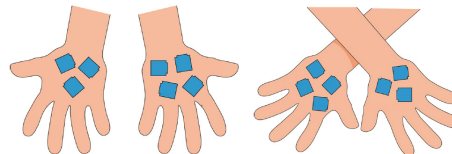
- Construct number sentences to go with practical activities



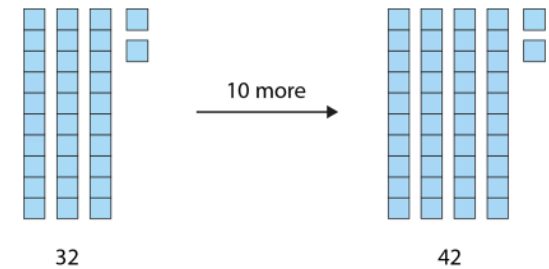
- Add by counting on, first in 1s then progressing to steps of different numbers



- Understand that addition can be done in any order and that it is more efficient to put the larger number first



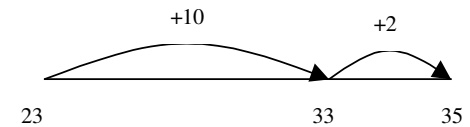
- Know that when counting in tens, the 'ones' digit stays the same, and understand why this is true



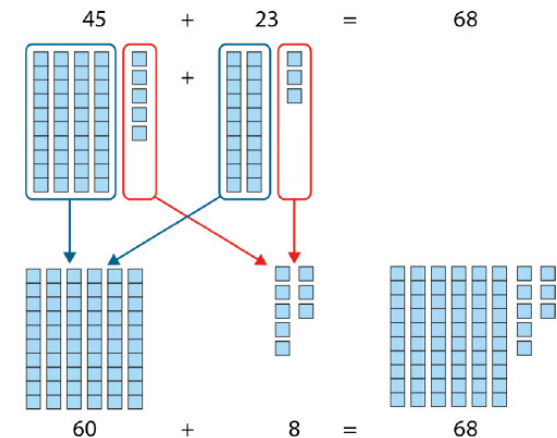
'We had three tens and two ones. Ten more gives us four tens and two ones.'

- Begin to draw their own number lines for calculations

$$\begin{aligned} 23 + 12 &= 23 + 10 + 2 \\ &= 33 + 2 \\ &= 35 \end{aligned}$$



- Add 2-digit numbers by partitioning and re-combining into 10s and 1s

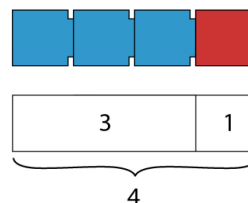
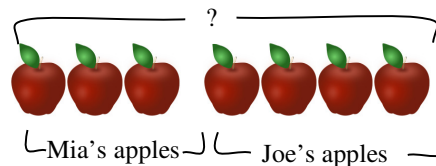


- Understand the concept of equality before using the = sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as the 'answer'. E.g. $2 = 1+1$ and $1+1 = 2$
- Find the missing numbers in a number sentence. The missing number needs to be placed in all possible places
 $3 + 4 = \square$ $\square = 3 + 4$
 $3 + \square = 7$ $7 = \square + 4$
- Use knowledge of addition facts to support calculation



$$10 = 4 + 6$$

- Solve one-step word problems using concrete objects and pictorial representation, e.g.
Peter had 12 apples. He bought 8 more at the greengrocers. How many apples did Peter have altogether?
- Begin to use bar models to represent addition



$$\begin{array}{r} 45 \\ 40 \quad 5 \end{array} + \begin{array}{r} 23 \\ 20 \quad 3 \end{array}$$

'First I partition the forty-five into forty and five, and the twenty-three into twenty and three.'

$$40 + 20 = 60$$

'Forty plus twenty is equal to sixty...'

$$5 + 3 = 8$$

'...five plus three is equal to eight...'

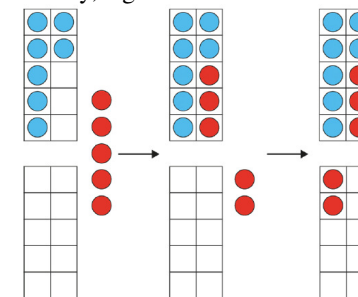
$$60 + 8 = 68$$

'...and sixty plus eight is equal to sixty-eight.'

- Represent 2-digit numbers with drawings to help with partitioning

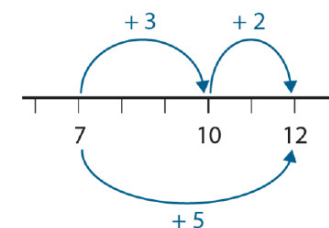


- Understand bridging through a multiple of 10 where necessary, e.g. $7 + 5$

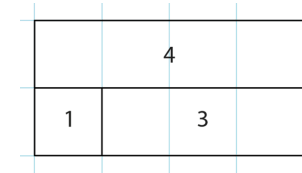


$$7 + 3 = 10$$

$$10 + 2 = 12$$



- Solve one and two- step addition word problems, e.g.
The Smith family left school and drove 12 miles to the library. They left the library and drove 14 miles home. How many miles did the Smith family drive?
- Use bar models to represent addition, using numbers in place of concrete or 1:1 pictorial representation.



- Solve more complex missing number problems

$$2 + 4 + 3 = \square + 3 = \square$$

$$2 + 4 + 3 = \square + 4 = \square$$

Subtraction

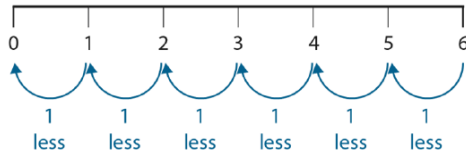
Year R

Activities include:

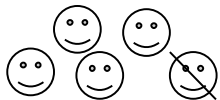
- Counting rhymes involving counting back
- Removing objects from a group
'I have 5 apples and I take 1 away how many are left?'
- Use the language of 1 less by taking 1 from a group, e.g. a tower of cubes
- Use stories and role play to encourage the language of subtraction, e.g. 4 people were on the bus, 1 got off, how many were left?



- Use numbered floor tiles and number tracks to identify one less



- Draw a picture representation of a subtraction sentence



5 take away 1 leaves 4

Year 1

Mental Fluency

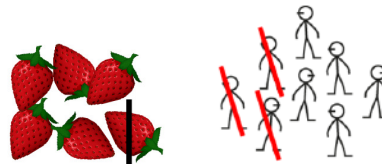
Children will develop fluency in the following subtraction facts:

- Count back from 100, or from any given number, in 1s
- Subtract one 1-digit number from another
- Count back in 10s from any given 2-digit number
- Subtract 10 from any 2-digit number within 20
- Represent and use subtraction facts within 20

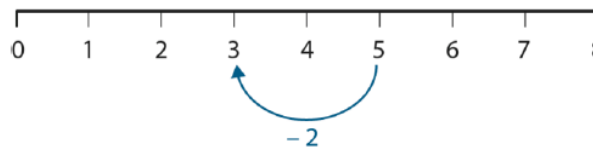
Calculation

As subtraction is the inverse (opposite) of addition, children learn these calculations alongside each other, using many of the same representations. For example, children are taught to:

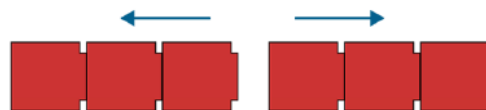
- Begin to recognise that subtraction is the inverse of addition
- Subtract numbers within 20 using concrete objects and pictorial representations



- Subtract by counting back from the first number



- Use objects to partition numbers, including into tens and ones





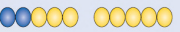

'Taking apart'

Year 2

Mental Fluency

Children will develop fluency in the following subtraction facts:

- Count back in steps of 2, 3, and 5 from 0, and in tens from any number
- Know that subtraction is the inverse of addition and use known number facts to calculate mentally

		$20 = 12 + 8$	$8 + 12 = 20$
		$20 - 8 = 12$	$20 - 12 = 8$
$(10 + 2 + 8 = 10 + 10 = 20)$			

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

Calculation

As subtraction is the inverse (opposite) of addition, children learn these calculations alongside each other, using many of the same representations. For example, children are taught to:

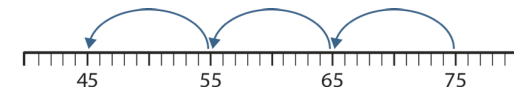
- Count back in 10s and 1s



32 22

'We had three tens and two ones. Ten less gives us two tens and two ones.'

$75 - 30$



- 'Seventy-five, sixty-five, fifty-five, forty-five.'
 - 'Seventy-five minus thirty is equal to forty-five.'
- $75 - 30 = 45$

- Solve missing number problems

$$7 = \square - 9 \quad 15 - 9 = \square$$

$$20 - \square = 9 \quad \square - \square = 11$$

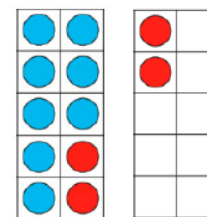
- Begin to record subtraction number sentences using $-$ and $=$

- Understand subtraction as finding the difference

- Begin to subtract to solve simple one-step word problems e.g.

Peter bought 5 apples. He gave 2 to his friends. How many did he have left?

- Understand bridging through a multiple of 10 where necessary, e.g. $12 - 4$



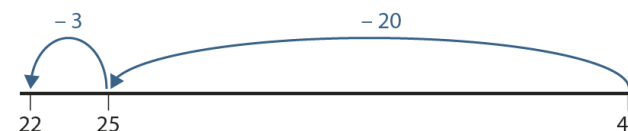
$$12 - 2 = 10$$

$$10 - 2 = 8$$

so

$$12 - 4 = 8$$

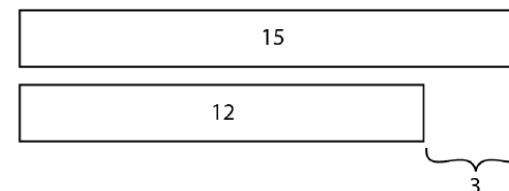
- Subtract a 1-digit number from any 2-digit number using number facts, e.g. $53 - 5$
- Subtract 2-digit numbers by counting back in tens and then back in ones, e.g. $45 - 23$



- Solve more complex missing number problems

$$75 - 34 = 75 - \square - 4$$

- Use bar models to represent subtraction, using numbers in place of concrete or 1:1 pictorial representation.

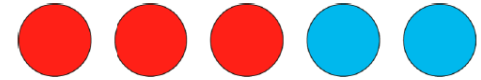


- Solve one and two-step subtraction word problems e.g.

Peter had 20 stamps. He used 5 on Christmas cards and 4 on birthday cards. How many stamps did he have left?

- Understand subtraction as partitioning, reduction and difference, e.g. $5 - 3$ can be seen as:

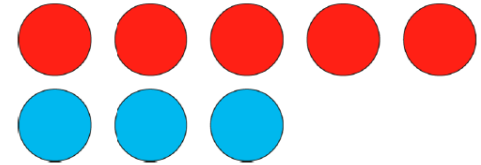
Partitioning:



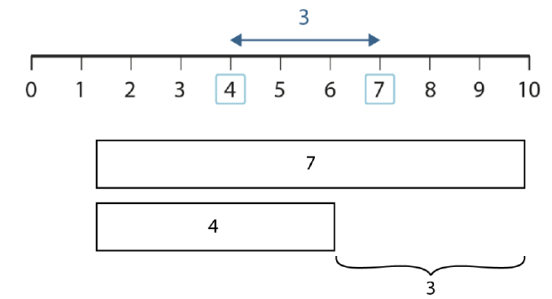
Reduction:



Difference:



- Find the difference between two numbers



Multiplication

Year R

Children begin to count in groups of 2s, 5s and 10s using objects, recite counting, songs and rhymes. Activities include:

- Counting in groups of the same size in games and practical activities



- Using a variety of practical resources to support counting such as Numicon, bead strings, counters, socks, shoes

Year 1

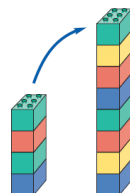
Mental Fluency

- Count in multiples of 2s, 5s and 10s
- Double numbers to 10

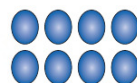
Calculation

Children are taught to:

- Begin to say what three 5s are by counting in 5s, or what four 2s are by counting in 2s, etc.
- Understand multiplication is related to doubling and combining groups of the same size



- Group objects in 2s, 5s and 10s using concrete objects, pictorial representation and arrays



- Begin to understand multiplication as repeated addition

$$5 + 5 + 5 + 5 = 20$$



- Solve simple one-step word problems involving multiplication e.g.
4 children had 2 pencils each. How many pencils did they have altogether?

Year 2

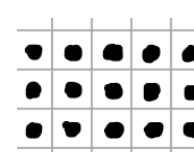
Mental Fluency

- Count in 2s, 5s and 10s, forward and back
- Begin to count forward and back in 3s
- Recall and use multiplication facts for the $\times 2$, $\times 5$ and $\times 10$ tables, describing these as 'groups of' or 'lots of' e.g. 5 lots of 2, 6 lots of 2, 7 lots of 2
- Double numbers to 20

Calculation

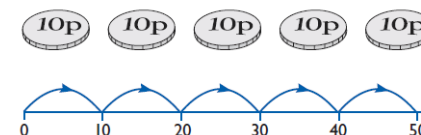
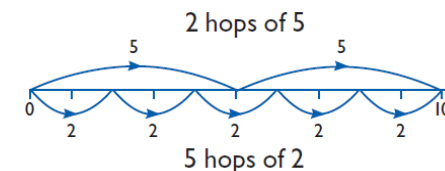
Children will develop their use of the representations from Year 1, while being taught to:

- Write number sentences using the \times and $=$ signs
- Use repeated addition number sentences to calculate multiplication
 $3 \times 5 = 5 + 5 + 5$
- Solve problems involving multiplication, using materials, arrays, repeated addition, mental methods and multiplication facts




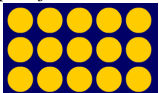
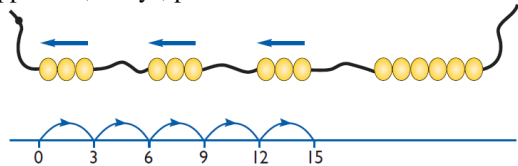
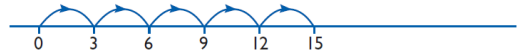
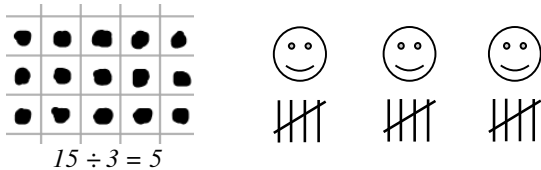
$$2 \times 5 = 10$$

$$5 \times 2 = 10$$



- Explore the fact that multiplication, like addition, can be done in any order

Division

Year R	Year 1	Year 2
<p>Children begin to experience division as sharing objects into equal groups. Activities include:</p> <ul style="list-style-type: none"> Sharing out milk bottles and fruit at snack time Sharing practically in role play, e.g. sharing biscuits in the home corner Sharing objects into two groups (halving) 	<p><u>Mental Fluency</u></p> <ul style="list-style-type: none"> Count in multiples of 2s, 5s and 10s Halve even numbers to 10 <p><u>Calculation</u></p> <p>As division is the inverse (opposite) of multiplication, children learn these calculations alongside each other, using many of the same representations. For example, children are taught to:</p> <ul style="list-style-type: none"> Group and share small quantities into 'equal groups', understanding the relationship between division and multiplication Share using concrete apparatus  <ul style="list-style-type: none"> Apply their counting skills to develop some understanding of grouping Use arrays as a pictorial representation for division <p>'There are 5 groups of 3' 'There are 3 groups of 5'</p>  <ul style="list-style-type: none"> Find a half and a quarter of objects, shapes and numbers Solve simple one-step word problems involving division e.g. <i>There are 10 cakes and 5 children. How many cakes can they each have? Make sure it is fair!</i> 	<p><u>Mental Fluency</u></p> <ul style="list-style-type: none"> Count in 2s, 5s and 10s, forward and back Begin to count forward and back in 3s Relate division facts to known multiplication facts, e.g. $3 \times 5 = 15$ so $15 \div 5 = 3$ Halve even numbers to 20 <p><u>Calculation</u></p> <p>As division is the inverse (opposite) of multiplication, children learn these calculations alongside each other, using many of the same representations. For example, children are taught to:</p> <ul style="list-style-type: none"> Understand division as both 'grouping into' and 'sharing between' and represent using practical apparatus, arrays, pictures and number lines    <p>$15 \div 3 = 5$</p> <ul style="list-style-type: none"> Progress to grouping numbers into equal sets with a remainder Write number sentences using the \div and $=$ signs Use the multiplication and division facts to work out missing numbers, e.g. $15 \div ? = 5$ Relate fractions to division and find $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{3}{4}$ of objects, shapes and numbers

Addition Facts to 20

Children will develop understanding and rapid recall of the following addition facts and their related subtraction facts.
These facts are vital in developing fluency in calculation.

Adding 1

Bonds to 10

Adding 10

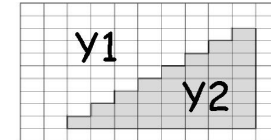
Bridging 10

Adding 2

Adding 0

Doubles

Near doubles



+	0	1	2	3	4	5	6	7	8	9	10
0	0 + 0	0 + 1	0 + 2	0 + 3	0 + 4	0 + 5	0 + 6	0 + 7	0 + 8	0 + 9	0 + 10
1	1 + 0	1 + 1	1 + 2	1 + 3	1 + 4	1 + 5	1 + 6	1 + 7	1 + 8	1 + 9	1 + 10
2	2 + 0	2 + 1	2 + 2	2 + 3	2 + 4	2 + 5	2 + 6	2 + 7	2 + 8	2 + 9	2 + 10
3	3 + 0	3 + 1	3 + 2	3 + 3	3 + 4	3 + 5	3 + 6	3 + 7	3 + 8	3 + 9	3 + 10
4	4 + 0	4 + 1	4 + 2	4 + 3	4 + 4	4 + 5	4 + 6	4 + 7	4 + 8	4 + 9	4 + 10
5	5 + 0	5 + 1	5 + 2	5 + 3	5 + 4	5 + 5	5 + 6	5 + 7	5 + 8	5 + 9	5 + 10
6	6 + 0	6 + 1	6 + 2	6 + 3	6 + 4	6 + 5	6 + 6	6 + 7	6 + 8	6 + 9	6 + 10
7	7 + 0	7 + 1	7 + 2	7 + 3	7 + 4	7 + 5	7 + 6	7 + 7	7 + 8	7 + 9	7 + 10
8	8 + 0	8 + 1	8 + 2	8 + 3	8 + 4	8 + 5	8 + 6	8 + 7	8 + 8	8 + 9	8 + 10
9	9 + 0	9 + 1	9 + 2	9 + 3	9 + 4	9 + 5	9 + 6	9 + 7	9 + 8	9 + 9	9 + 10
10	10 + 0	10 + 1	10 + 2	10 + 3	10 + 4	10 + 5	10 + 6	10 + 7	10 + 8	10 + 9	10 + 10