



KEY STAGE 1

Children develop the core ideas that underpin all calculation. They begin by connecting calculation with counting on and counting back, but they should learn that understanding wholes and parts will enable them to calculate efficiently and accurately, and with greater flexibility. They learn how to use an understanding of 10s and 1s to develop their calculation strategies, especially in addition and subtraction.

Key language: whole, part, ones, ten, tens, number bond, add, addition, plus, total, altogether, subtract, subtraction, find the difference, take away, minus, less, more, group, share, equal, equals, is equal to, groups, equal groups, times, multiply, multiplied by, divide, share, shared equally, times-table

Addition and subtraction: Children first learn to connect addition and subtraction with counting, but they soon develop two very important skills: an understanding of parts and wholes, and an understanding of unitising 10s, to develop efficient and effective calculation strategies based on known number bonds and an increasing awareness of place value. Addition and subtraction are taught in a way that is interlinked to highlight the link between the two operations. A key idea is that children will select methods and approaches based on their number sense. For example, in Year 1, when faced with $15 - 3$ and $15 - 13$, they will adapt their ways of approaching the calculation appropriately. The teaching should always emphasise the importance of mathematical thinking to ensure accuracy and flexibility of approach, and the importance of using known number facts to harness their recall of bonds within 20 to support both addition and subtraction methods.

In Year 2, they will start to see calculations presented in a column format, although this is not expected to be formalised until KS2. We show the column method in Year 2 as an option; teachers may not wish to include it until Year 3.

Multiplication and division: Children develop an awareness of equal groups and link this with counting in equal steps, starting with 2s, 5s and 10s. In Year 2, they learn to connect the language of equal groups with the mathematical symbols for multiplication and division.

They learn how multiplication and division can be related to repeated addition and repeated subtraction to find the answer to the calculation. In this key stage, it is vital that children explore and experience a variety of strong images and manipulative representations of equal groups, including concrete experiences as well as abstract calculations.

Children begin to recall some key multiplication facts, including doubles, and an understanding of the 2, 5 and 10 times-tables and how they are related to counting.

Fractions: In Year 1, children encounter halves and quarters, and link this with their understanding of sharing. They experience key spatial representations of these fractions, and learn to recognise examples and non-examples, based on their awareness of equal parts of a whole. In Year 2, they develop an awareness of unit fractions and experience non-unit fractions, and they learn to write them and read them in the common format of numerator and denominator.

The following pages show the *Power Maths/HVPA* progression in calculation (addition, subtraction, multiplication and division) and how this works in line with the National Curriculum. The consistent use of the CPA (concrete, pictorial, abstract) approach across our curriculum helps children develop mastery across all the operations in an efficient and reliable way. This policy shows how these methods develop children's confidence in their understanding of both written and mental methods.

The **CONCRETE** stage introduces real objects that children can use to 'do' the maths – any familiar object that a child can manipulate and move to help bring the maths to life. It is important to appreciate, however, that children must always understand the link between models and the objects they represent. Although they can be used at any time, good concrete models are an essential first step in understanding.

PICTORIAL representations of objects to let children 'see' what particular maths problems look like. It helps them make connections between the concrete and pictorial representations and the abstract maths concept. Children can also create or view a pictorial representation together, enabling discussion and comparisons.

Our ultimate goal is for children to understand **ABSTRACT** mathematical concepts, signs and notation and, of course, some children will reach this stage far more quickly than others. To work with abstract concepts, a child needs to be comfortable with the meaning of, and relationships between, concrete, pictorial and abstract models and representations. The C-P-A approach is not linear, and children may need different types of models at different times. However, when a child demonstrates with concrete models and pictorial representations that they have grasped a concept, we can be confident that they are ready to explore or model it with abstract signs such as numbers and notation.

What are Non-examples?

Even with  as examples, a learner does not have enough information to know what is not a triangle. Selected non-examples like

, help focus attention on details that might otherwise be missed. The "three sides" must be straight, not curved; there can be no extra frills or bows or hanging-over bits of line (line segments must intersect only at their endpoints); the "points" can't be "cut off" (the shape is bounded by only three segments); the figure must be closed (all endpoints must be joined).

These non-examples were selected to be "near-misses," very close to the image people have of triangles. When children give verbal descriptions of triangles, they often mention "three lines" or "three corners," but omit the details that eliminate even fairly distant misses, like,  , which may sometimes be useful non-examples to help children improve their verbal descriptions.

Year 1

Year 1
Addition

Concrete



Pictorial



Abstract

Counting and adding more

Children add one more person or object to a group to find one more.

Counting and adding more

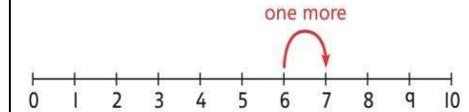
Children add one more cube or counter to a group to represent one more.



One more than 4 is 5.

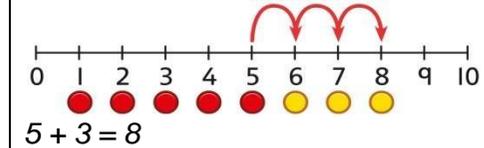
Counting and adding more

Use a number line to understand how to link counting on with finding one more.



One more than 6 is 7.
7 is one more than 6.

Learn to link counting on with adding more than one.



Understanding part-part-whole relationship

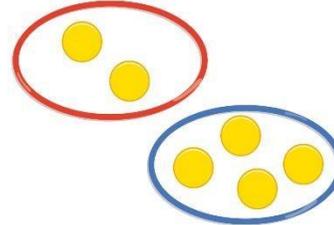
Sort people and objects into parts and understand the relationship with the whole.



The parts are 2 and 4. The whole is 6.

Understanding part-part-whole relationship

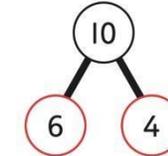
Children draw to represent the parts and understand the relationship with the whole.



The parts are 1 and 5. The whole is 6.

Understanding part-part-whole relationship

Use a part-whole model to represent the numbers.

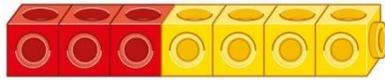


$$6 + 4 = 10$$

$$6 + 4 = 10$$

Knowing and finding number bonds within 10

Break apart a group and put back together to find and form number bonds.



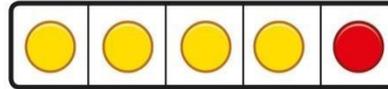
$$3 + 4 = 7$$



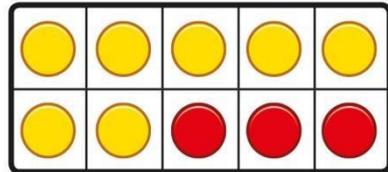
$$6 = 2 + 4$$

Knowing and finding number bonds within 10

Use five and ten frames to represent key number bonds.



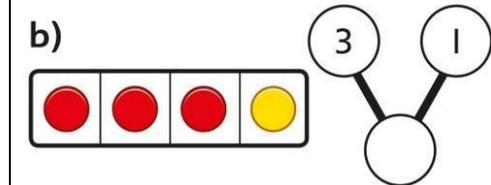
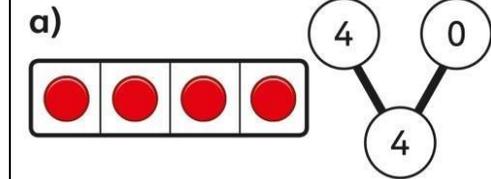
$$5 = 4 + 1$$



$$10 = 7 + 3$$

Knowing and finding number bonds within 10

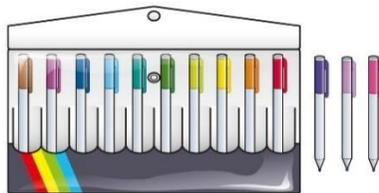
Use a part-whole model alongside other representations to find number bonds. Make sure to include examples where one of the parts is zero.



$$4 + 0 = 4$$
$$3 + 1 = 4$$

Understanding teen numbers as a complete 10 and some more

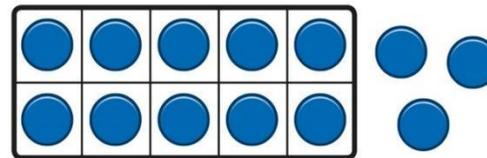
Complete a group of 10 objects and count more.



13 is 10 and 3 more.

Understanding teen numbers as a complete 10 and some more

Use a ten frame to support understanding of a complete 10 for teen numbers.



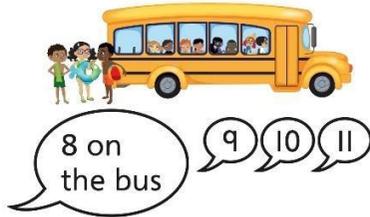
13 is 10 and 3 more.

Understanding teen numbers as a complete 10 and some more.

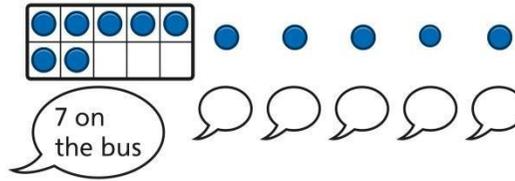
1 ten and 3 ones equal 13.
 $10 + 3 = 13$

Adding by counting on

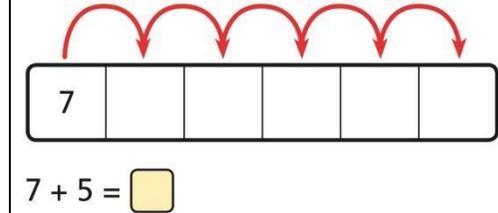
Children use knowledge of counting to 20 to find a total by counting on using people or objects.

**Adding by counting on**

Children use counters to support and represent their counting on strategy.

**Adding by counting on**

Children use number lines or number tracks to support their counting on strategy.

**Adding the 1s**

Children use bead strings to recognise how to add the 1s to find the total efficiently.

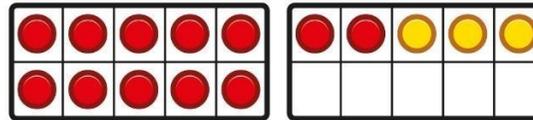


$$2 + 3 = 5$$

$$12 + 3 = 15$$

Adding the 1s

Children represent calculations using ten frames to add a teen and 1s.



$$2 + 3 = 5$$

$$12 + 3 = 15$$

Adding the 1s

Children recognise that a teen is made from a 10 and some 1s and use their knowledge of addition within 10 to work efficiently.

$$3 + 5 = 8$$

$$\text{So, } 13 + 5 = 18$$

Bridging the 10 using number bonds

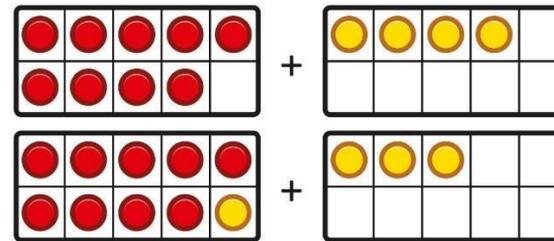
Children use a bead string to complete a 10 and understand how this relates to the addition.



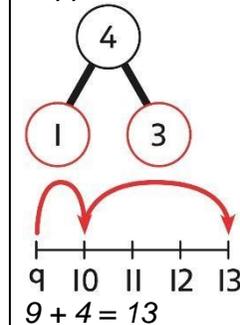
7 add 3 makes 10.
So, 7 add 5 is 10 and 2 more.

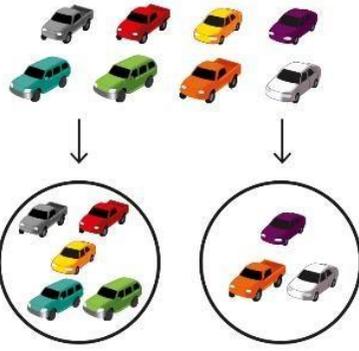
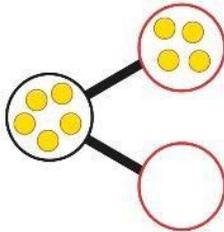
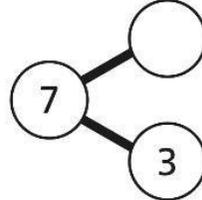
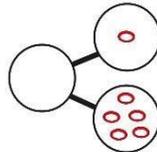
Bridging the 10 using number bonds

Children use counters to complete a ten frame and understand how they can add using knowledge of number bonds to 10.



Bridging the 10 using number bonds Use a part-whole model and a number line to support the calculation.



Year 1 Subtraction	Concrete →	Pictorial →	Abstract
	<p>Counting back and taking away Children arrange objects and remove to find how many are left.</p>  <p>1 less than 6 is 5. 6 subtract 1 is 5.</p>	<p>Counting back and taking away Children draw and cross out or use counters to represent objects from a problem.</p>   <p>$9 - \square = \square$ There are <input type="text"/> children left.</p>	<p>Counting back and taking away Children count back to take away and use a number line or number track to support the method.</p>  <p>$9 - 3 = 6$</p>
	<p>Finding a missing part, given a whole and a part Children separate a whole into parts and understand how one part can be found by subtraction.</p>  <p>$8 - 5 = ?$</p>	<p>Finding a missing part, given a whole and a part Children represent a whole and a part and understand how to find the missing part by subtraction.</p>  <p>$5 - 4 = \square$</p>	<p>Finding a missing part, given a whole and a part Children use a part-whole model to support the subtraction to find a missing part.</p>  <p>$7 - 3 = ?$</p> <p>Children develop an understanding of the relationship between addition and subtraction facts in a part-whole model.</p>  <p> <input type="text"/> - <input type="text"/> = <input type="text"/> <input type="text"/> - <input type="text"/> = <input type="text"/> <input type="text"/> + <input type="text"/> = <input type="text"/> <input type="text"/> + <input type="text"/> = <input type="text"/> </p>

Finding the difference

Arrange two groups so that the difference between the groups can be worked out.



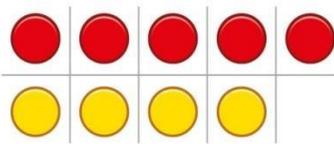
8 is 2 more than 6.

6 is 2 less than 8.

The difference between 8 and 6 is 2.

Finding the difference

Represent objects using sketches or counters to support finding the difference.

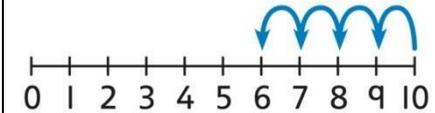


$$5 - 4 = 1$$

The difference between 5 and 4 is 1.

Finding the difference

Children understand 'find the difference' as subtraction.



$$10 - 4 = 6$$

The difference between 10 and 6 is 4.

Subtraction within 20

Understand when and how to subtract 1s efficiently.

Use a bead string to subtract 1s efficiently.

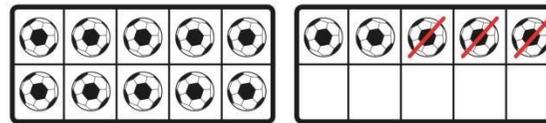


$$5 - 3 = 2$$

$$15 - 3 = 12$$

Subtraction within 20

Understand when and how to subtract 1s efficiently.



$$5 - 3 = 2$$

$$15 - 3 = 12$$

Subtraction within 20

Understand how to use knowledge of bonds within 10 to subtract efficiently.

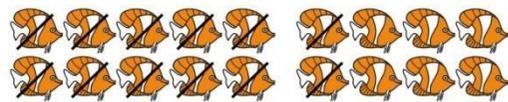
$$5 - 3 = 2$$

$$15 - 3 = 12$$

Subtracting 10s and 1s

For example: $18 - 12$

Subtract 12 by first subtracting the 10, then the remaining 2.

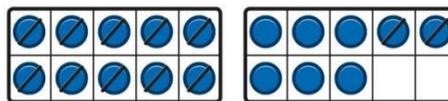


First subtract the 10, then take away 2.

Subtracting 10s and 1s

For example: $18 - 12$

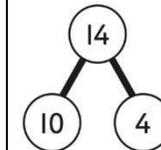
Use ten frames to represent the efficient method of subtracting 12.



First subtract the 10, then subtract 2.

Subtracting 10s and 1s

Use a part-whole model to support the calculation.



$$19 - 14$$

$$19 - 10 = 9$$

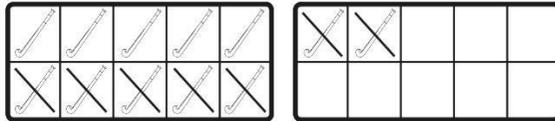
$$9 - 4 = 5$$

$$\text{So, } 19 - 14 = 5$$

Subtraction bridging 10 using number bonds

For example: $12 - 7$

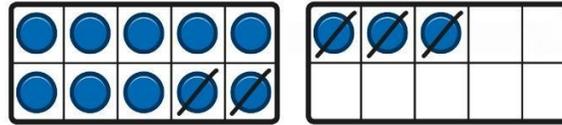
Arrange objects into a 10 and some 1s, then decide on how to split the 7 into parts.



7 is 2 and 5, so I take away the 2 and then the 5.

Subtraction bridging 10 using number bonds

Represent the use of bonds using ten frames.

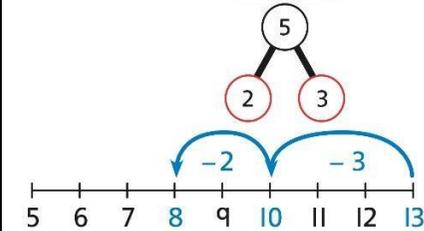


For $13 - 5$, I take away 3 to make 10, then take away 2 to make 8.

Subtraction bridging 10 using number bonds

Use a number line and a part-whole model to support the method.

$13 - 5$



Year 1 Multiplication

Concrete



Pictorial



Abstract

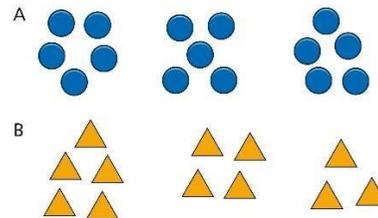
Recognising and making equal groups

Children arrange objects in equal and unequal groups and understand how to recognise whether they are equal.



Recognising and making equal groups

Children draw and represent equal and unequal groups.



Describe equal groups using words

Three equal groups of 4.
Four equal groups of 3.

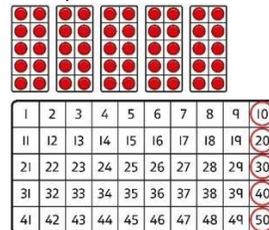
Finding the total of equal groups by counting in 2s, 5s and 10s



There are 5 pens in each pack ...
5...10...15...20...25...30...35...40...

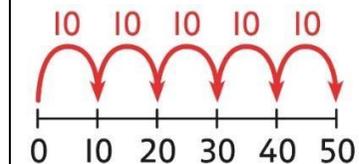
Finding the total of equal groups by counting in 2s, 5s and 10s

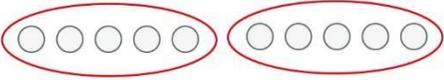
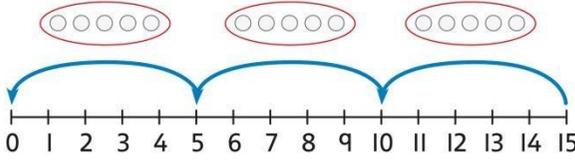
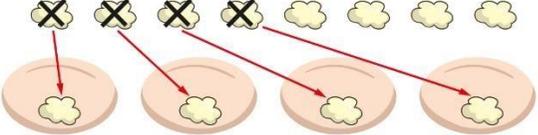
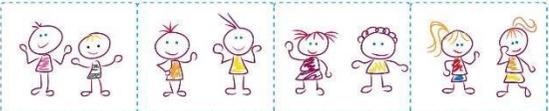
100 squares and ten frames support counting in 2s, 5s and 10s.



Finding the total of equal groups by counting in 2s, 5s and 10s

Use a number line to support repeated addition through counting in 2s, 5s and 10s.



Year 1 Division	Concrete →	Pictorial →	Abstract
	<p>Grouping Learn to make equal groups from a whole and find how many equal groups of a certain size can be made.</p> <p>Sort a whole set people and objects into equal groups.</p>  <p><i>There are 10 children altogether. There are 2 in each group. There are 5 groups.</i></p>	<p>Grouping Represent a whole and work out how many equal groups.</p>  <p><i>There are 10 in total. There are 5 in each group. There are 2 groups.</i></p>	<p>Grouping Children may relate this to counting back in steps of 2, 5 or 10.</p> 
	<p>Sharing Share a set of objects into equal parts and work out how many are in each part.</p> 	<p>Sharing Sketch or draw to represent sharing into equal parts. This may be related to fractions.</p> 	<p>Sharing <i>10 shared into 2 equal groups gives 5 in each group.</i></p>