Holly Park School
Calculation Policy
Addition and Subtraction

EYFS - Number

A secure understanding of early number concepts and counting are vital for children to be able to calculate confidently later on. Early number concepts are surprisingly complicated! Children need to understand that a number (eg 5) has lots of different meanings including:

- A written symbol (5)
- An arbitrary label (the number 5 bus)
- A number in a logical sequence (5 in an oral count, on a number line, on a front door)
- Someone's age (something you can be)
- Five ones
- A 'five' (something you can treat as an object and do things to)

Numbers are fundamentally different from letters in this way and it is not obvious to children that they can mean all these different things.
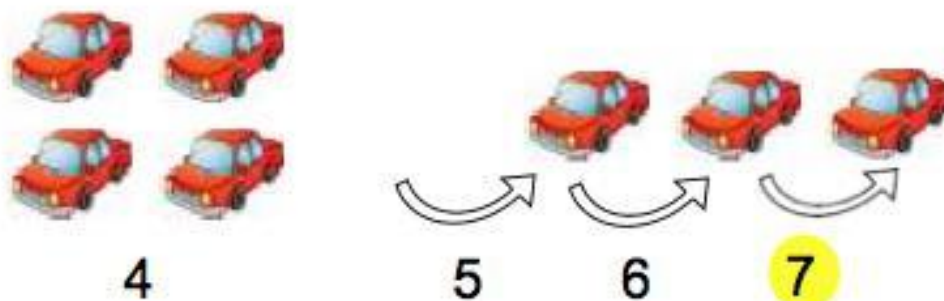
Counting
Counting means more than just reciting the number names in order. Children do need to do this, but they also need to connect these number names to groups of objects as well as to written symbols. Children need lots of practical experiences in different play contexts, counting objects and saying number names in sequence. For children to be secure in counting they need to ultimately have a 'bi-directional breakable chain'.

This means that they can count from any given number to any other, forwards or backwards. This lays the foundations for addition and subtraction by counting on and back in ones and steps of other sizes. Children also need this very secure sense of the number sequence for later more complex mental/informal calculations using empty number lines.

Using counting on to add:

Ten in the bed:
'Ten in the bed' is a great way for children to link counting backwards with taking away one each time. This can be modelled with toys.

Subitising
Even before school, many children can identify small numbers of objects without having to count them – three biscuits on a plate, four wheels on a car, the regular pattern of 6 on a dice, domino or playing card.
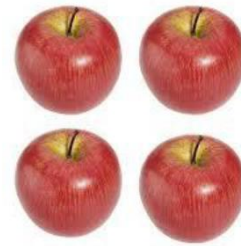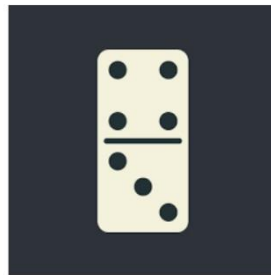
This skill – knowing how many without counting – is called subitising and it is essential. Children need to be able to subitise to have strong mental images of number. There are two types of subitising – perceptual and conceptual. Perceptual subitising means knowing how many without counting – ie seeing that there are 6 dots in the dice pattern. Conceptual subitiisng means seeing that within this pattern there is a 3 and a 3. In this way, children build on those initial mental images of the 6 to find the number bonds for 6. Understanding that there are smaller numbers inside bigger ones is a key part of children's mathematical development.

Language
In the Foundation Stage the focus is on secure oral and object counting, recognising numbers and developing mental representations. Much of their experience of this will be through concrete, movable objects and through songs, rhymes, games and play. Children will develop number concepts through role play, small world play, sensory play and physical activity. At the same time they will begin to use some of the language of early number and calculation. The language of comparison is particularly important as it is quite subtle. The shift from 'how many' to 'how many more' (more than) can pass unnoticed by a child, particularly a child with EAL. However, comparison is the basis of a whole structure of subtraction later on.

I have two more animals than you. You have two fewer animals than me.

Resources
As well as using all kinds of play resources, toys and objects to count, we also use structured resources to strengthen children's understanding of early calculation principles.

Numicon

The Numicon shapes are 'pictures of numbers'. It is important that we do not just use the shapes by themselves but also give children the opportunity to connect the 'picture of 5' that is the Numicon 5 with five ones. They can use the pegs and count them onto the shape and make the shape with pegs on the peg board. The Numicon staircase can lead children to see the connections between numbers – eg that each number is one more than the number before. They can compare Numicon numbers directly by putting them on top of each other as well as side by side.

Numberblocks

Numberblocks is a BBC television series aimed at introducing children to early number. The animation and engaging storylines are used to gently introduce concepts of number to support early mathematical understanding. The NCETM has created materials that are designed to be used by teachers and Early Years Educators in conjunction with the Numberblocks episodes. They highlight and develop the key mathematical ideas that are embedded in the programmes. Each set of materials supports the development of key mathematical concepts, mathematical language and offers ideas on how to create enabling environments so that young children can engage in meaningful exploration.

Recording
Children are encouraged to develop their own meaningful ways of representing and recording numbers. They will cycle between concrete, pictorial and abstract representations to clarify and deepen their thinking.
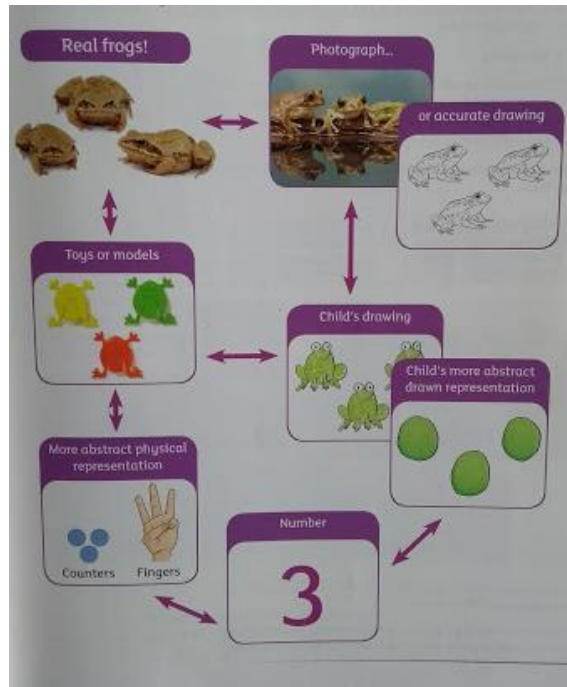
# Year 1 - Addition and Subtraction

Children are expected to:

Represent and use number bonds and related subtraction facts within 20. Once a basic number sense has developed for the numbers up to ten (see the Foundation Stage section of the calculation policy), children must establish a **strong sense of 'ten'**. Children will become familiar with the '**tenness'** of ten using a variety of practical resources:

Numicon:

10=   7   +   3   4   +   6

20=   11   +   9
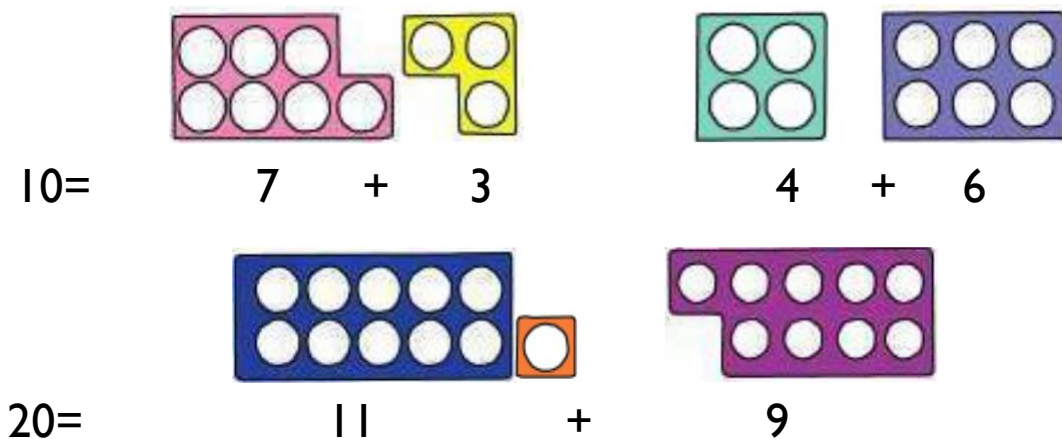
Once children are secure with bonds for ten, the link between bonds for 10 and those for 20 needs to be made clear, and Numicon is a good way to do this

Children should also be made familiar with the **related subtraction facts**:

1 + 9 = 10
11 + 9 = 20
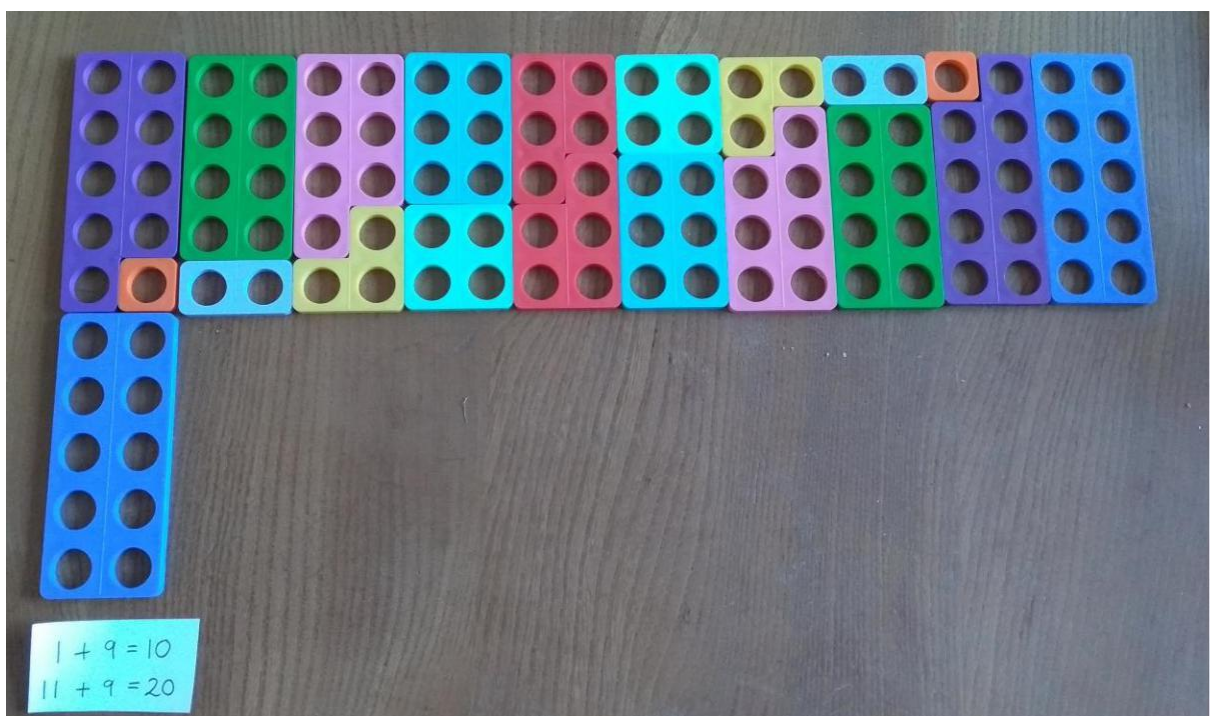
Ten-Frames (or Tens-Frames):

A ten-frame, like the one below, is a great tool for embedding an understanding of ten. By placing counters in different arrangements on the frame, children can begin to generate **various mental images** of the number ten, as well as how other numbers relate to it.
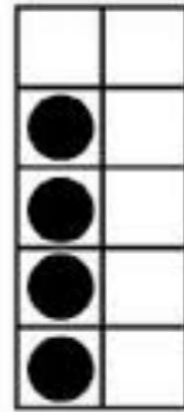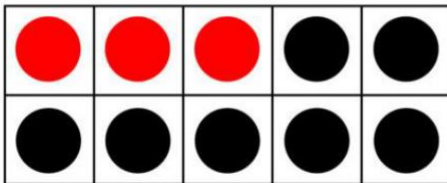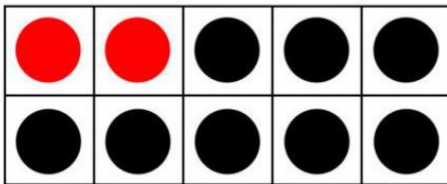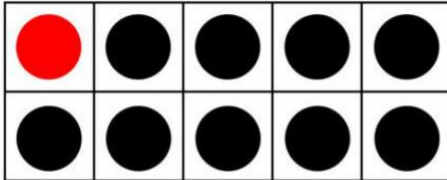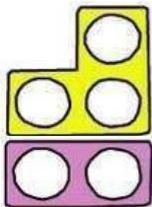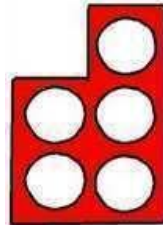
A knowledge of **number bonds** is not just about knowing how to make the numbers 10 and 20. Children should also start to investigate ways to make other numbers less than 20. Several resources can aid this learning:

Numicon:

What numicon pieces will help us make the number 5?

3+2=5
5-3=2
5-2=3
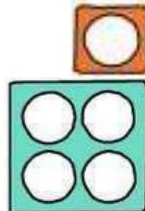
4+1=5
5-1=4
5-4=1
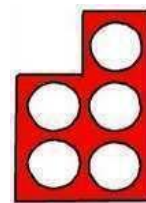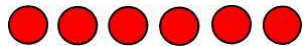
5+0=5
5-0=5

The **concrete** or **pictorial representations** of number facts should always be linked to the **abstract** (i.e. the number sentence it relates to). Children should represent these number facts in as many different ways as possible including through play (eg small world play) and through their own recording and pictures.

Double-sided counters:
Red-Yellow counters can be used to help children find out about different ways of making the same number. They may also start to spot patterns.
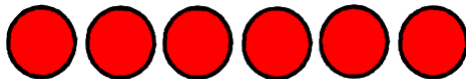
6+0=6
5+1=6
4+2=6
3+3=6
2+4=6
1+5=6
0+6=6

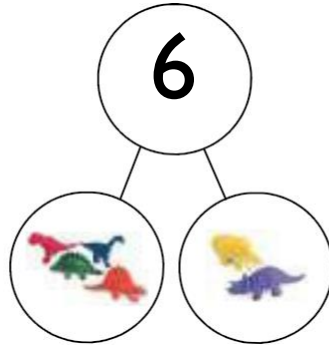Can you use these to help you write some **take away** number sentences?

The 'Part Part Whole' model allows children to visualise the concept that numbers are made up of **2 or more parts** (i.e. other numbers). Initially children make these with concrete resources.
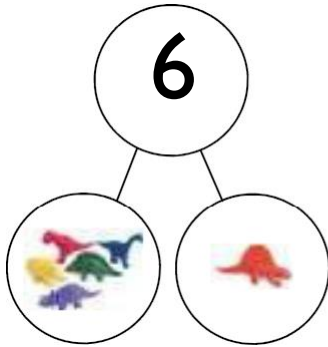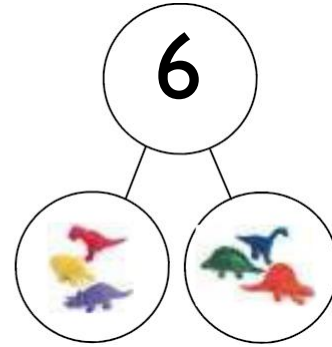
5+1=6
6-1=5
6-5=1

4+2=6
6-2=4
6-4=2

3+3=6
6-3=3

Ten-frames
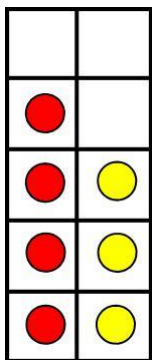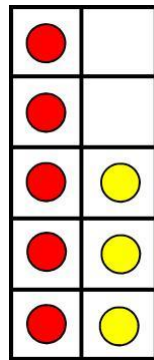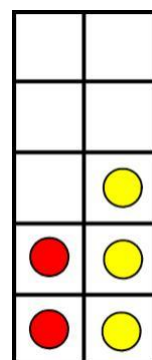Ten-frames (and Numicon resources) can naturally lead the eye to **addition concepts**:
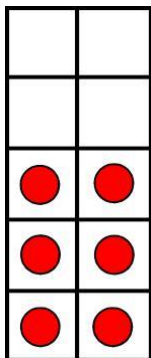
4+3=7
7-3=4
7-4=3

5+3=8
8-3=5
8-5=3

2+3=5
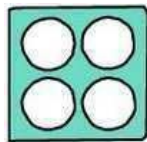5-2=3
5-3=2

They can also help the children visualise **addition doubles**:

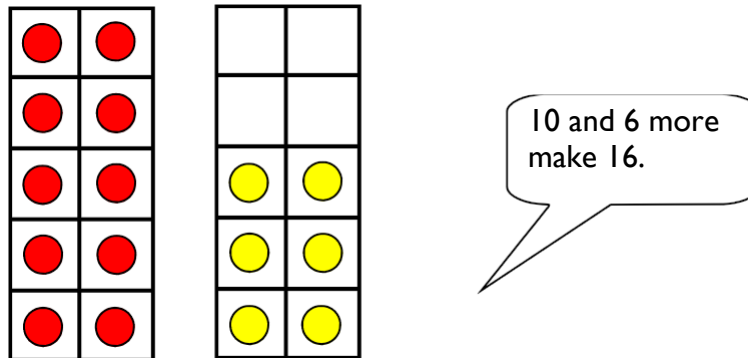3+3=6   2+2=4

4+4=8

Furthermore, Numicon and ten-frame resources can provide the first step into understanding **2-digit numbers**. By using two ten-frames simultaneously, children can start to see **the value of each digit** in a **'teen' number**.

10 and 6 more make 16.

10 and 2 make 12.

We also use straws bundled into tens and single straws (ones) in Year 1 to help children really understand the link between ten ones and a ten. With the straws, they can see the ten ones inside the ten and count them if they need to. They can make their own bundles. Children use these to partition numbers into tens and ones. We use 'ones' rather than 'units' throughout the school as numbers beside ones can also be units (unitized).
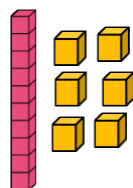
Through all of the above, children should start to recognise the **relationship** between **addition** and **subtraction** facts. This relationship needs to be made explicit – eg using Numicon or part-part-whole diagrams, children can see that if 3 and 7 come together to make 10, then 10 take away 3 will leave 7.

Add and subtract any one-digit or two-digit number up to (and including) 20. We have already seen how children can start to understand addition as combining groups. To help them work out the total of two numbers, children may initially count them up. Once again, concrete, movable objects will support this process. Children will move from stating the sentence '5 and 1 more is 6' orally, read and/or write this in words and finally use the abstract symbol for addition.

Eventually, as children become more competent, they will be able to hold the **biggest number** in their head and then **count on** - perhaps using their fingers - from there. Using two sets of dice, one with digits and another with dots, is a great way to encourage children to practice this skill.

I'm going to put 6 in my head and then count on 5, using the dots to help.

They will also begin to use a number line **to add or subtract numbers.**

6+2=8

9-4=5
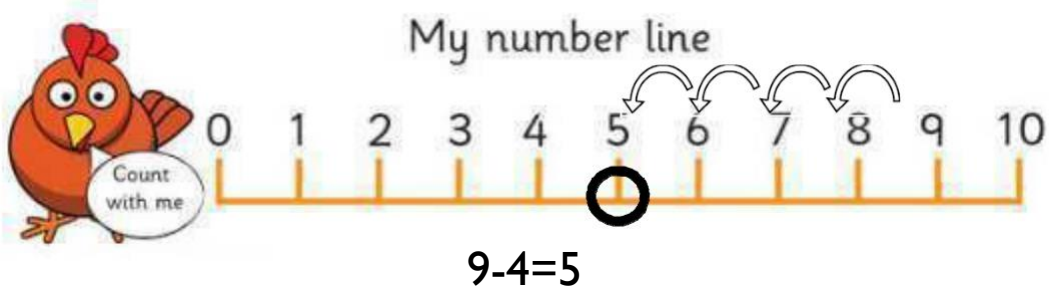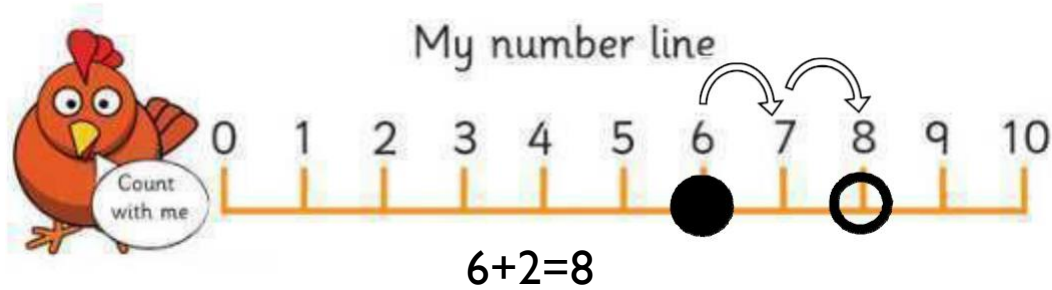
Through these processes, children should start to understand that **addition** makes numbers **bigger** whilst **subtraction** makes numbers **smaller**. They need experience of the different structures of addition (augmentation and aggregation) and of the different structures of subtraction (mainly partitioning and comparison). We need to be aware of a common confusion in how to represent these two operations. When we represent addition we put out both addends and find the total either by counting all (first) or counting on (later). If we follow this procedure with subtraction and 'take away' the subtrahend (second number) we are left with the minuend (first number) and have actually not subtracted anything! Children need to be clear that the subtrahend has to be taken away **from** the minuend.

They should also recognise that they can add numbers **in any order** and still get the **same answer**.

T**en-frames** will help the children visualise what is happening when they add two numbers that bridge through 10.

For example, with the calculation $7 + 5 = ?$ children will begin to identify the opportunity to make 10 first, and then add the remainder.

Children should begin to understand **subtraction** as both **taking away** and **finding the difference** between.

A simple **bar model** can help them get to grips with the latter:
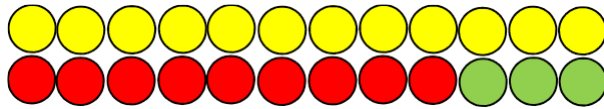
The difference between 12 and 9 is 3.

or $12 - 9 = 3$

This model is introduced using concrete objects first (including cards with pictures), which the children can move, before progressing to pictorial representations.

**Understand that the equals sign (=) is a sign of equivalence.**
Many children develop the misconception that the **answer** to a calculation is on the right hand side of the equals sign. Scales can be used to help children explore the idea that **both sides** of a calculation must **balance**:

$5=$ $3+$ 2 $2=$ $6-$ $?$
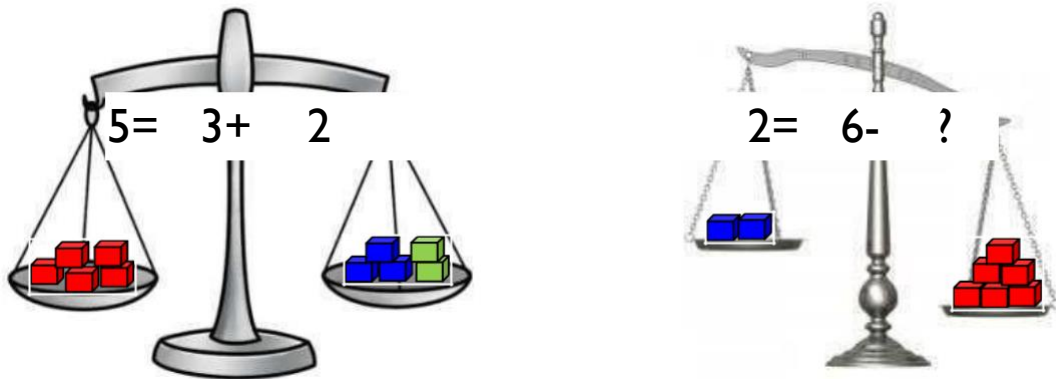
It is important that the children experience the **equals sign** (=) in **different positions**. By writing calculations either side of the equals sign (e.g. $2+4=5+1$), the children will not just interpret it as meaning 'the answer'

Through all this, the children should start to see that **addition** and **subtraction** are **related operations**.

For example: $7 + 3 = 10$ is related to $7 = 10 - 3$.
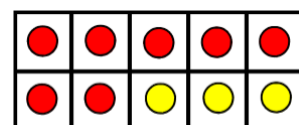
This understanding can be supported with a tens frame:

Solve missing number problems.

Children must be able to complete missing number problems, where the 'missing number' can be placed in all possible positions:

For example: $7 + \boxed{} = 9$

$\boxed{} - 3 = 11$

$\boxed{} = 8 + 5$

Vocabulary

Addition, add, forwards, put together, more than, total, altogether, distance between, difference between, equals = same as, pattern, odd, even, digit, counting on, subtraction, subtract, take away, minus, less than, most, least.

Year 2 - Addition and Subtraction

Children are expected to:
Recall addition and subtraction number facts to 20 fluently.
In Year 1, a great deal of emphasis is placed on generating different mental images and internal representations of number, with a view to build up a bank of facts about them. In order to achieve this, a wide variety of concrete and pictorial resources (please see the Year 1 calculation policy for more details) are used to support the children's investigations.

The expectation at the end of Year 2 is that most children should now be able to recall these number facts to 20 **from memory**. In Year 2 we still use concrete resources to help children build these images.
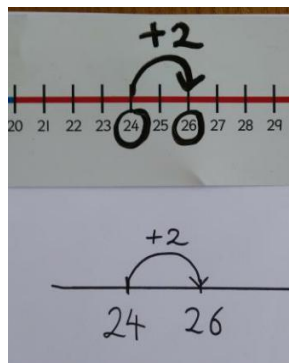
Adding a single digit number to a multiple of 10:
Children must be able to do this quickly and efficiently mentally before moving on.

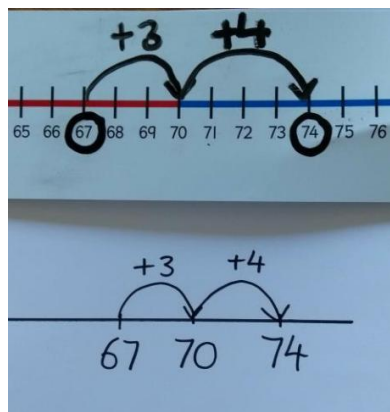**Adding a single digit number to a two digit number:**

Begin with calculations that don't bridge 10. Children can use a number line or empty number line, but the use of an empty number line should be encouraged.

24+2=?

Then move children onto calculations that bridge 10:
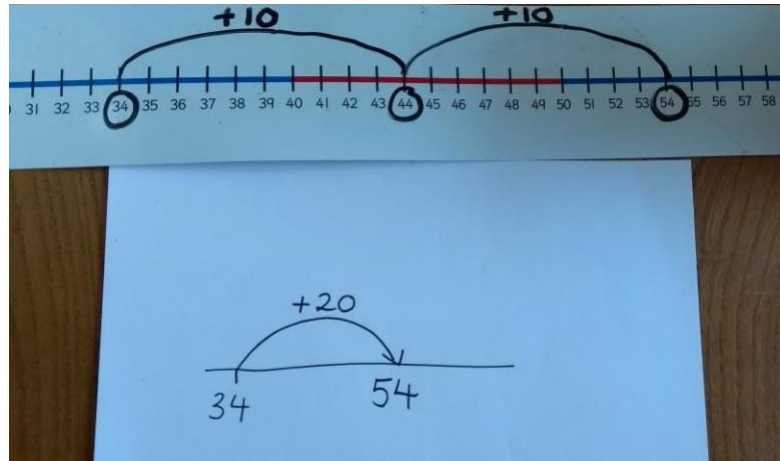
67+7=?

The child uses their knowledge of number bonds to 10 to know that adding 3 to 7 will get you to

the next 10. They will also use a subtraction/ partitioning fact to know that 7 – 3 = 4.
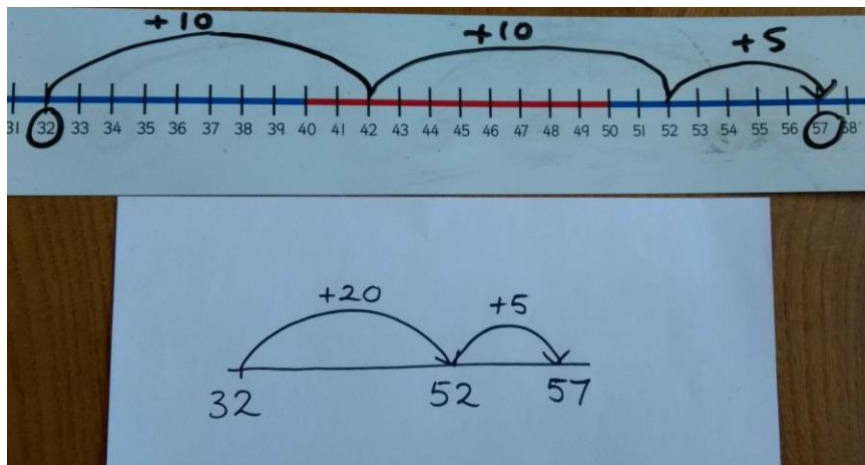
Adding a two digit number and a multiple of 10:

At first children should be encouraged to count up in 10s and then move onto counting up in larger multiples of 10.
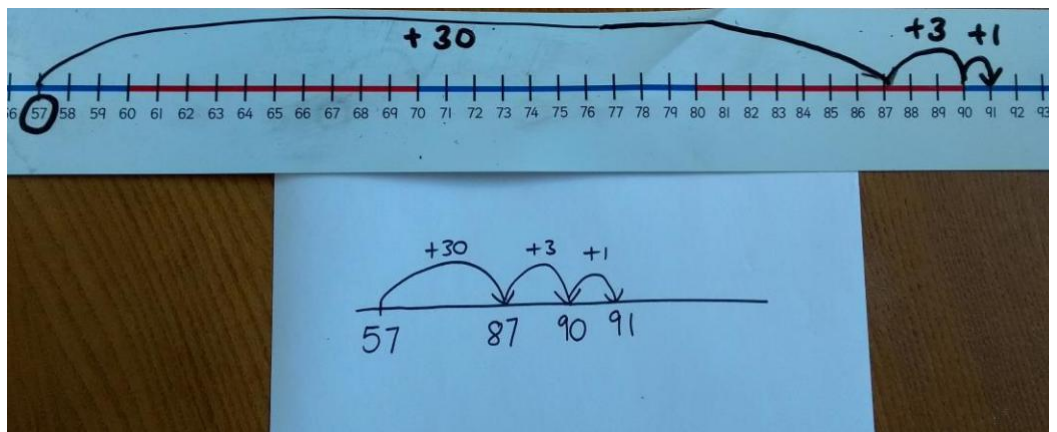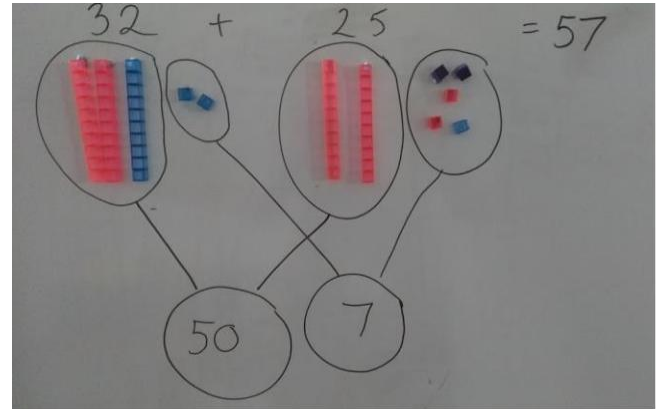
34 +20=?

32+25=?

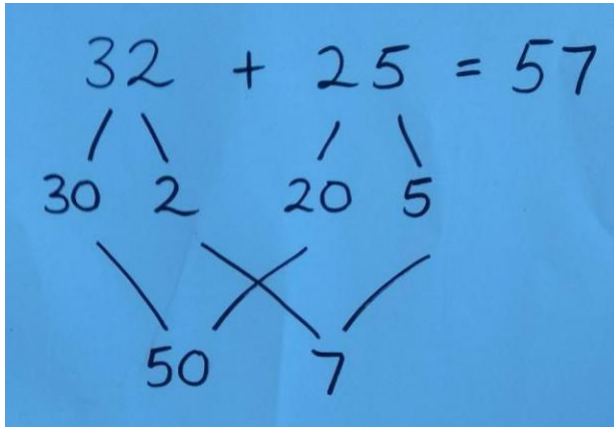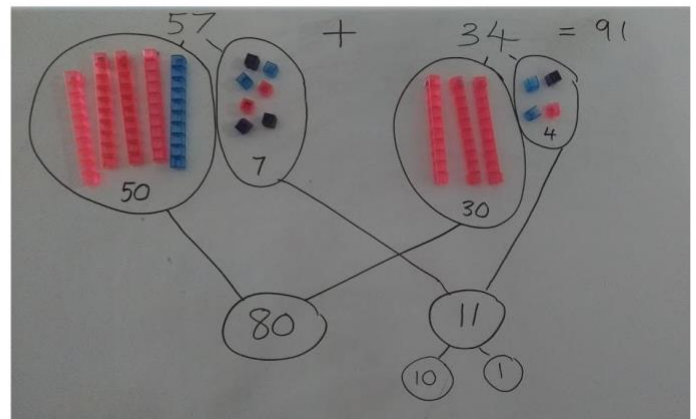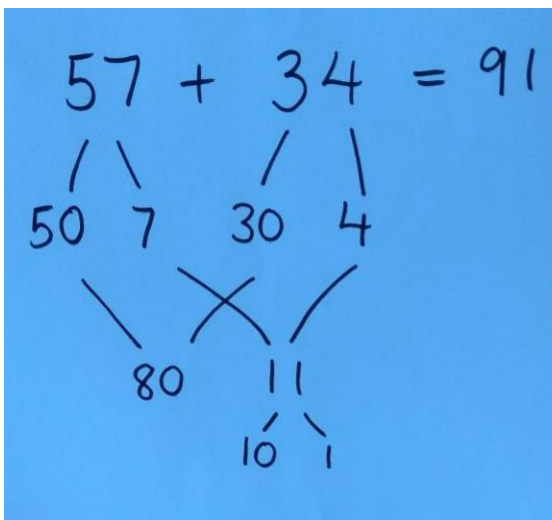57+34=?

Alongside the use of empty number lines, we use a partitioning written method, which can be supported by Dienes. This should be linked to part, part whole models.

Partitioning without having to bridge 10:

Partitioning with having to bridge 10:

Subtraction
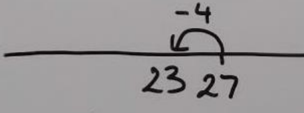
Children will record their workings informally to start with. They can draw Dienes simply with sticks and dots. Again, number lines and empty number lines can be used and these are particularly useful with subtraction. This can often be clearer to children than using the same partitioning strategy that works so well with addition.

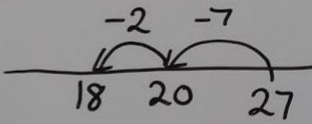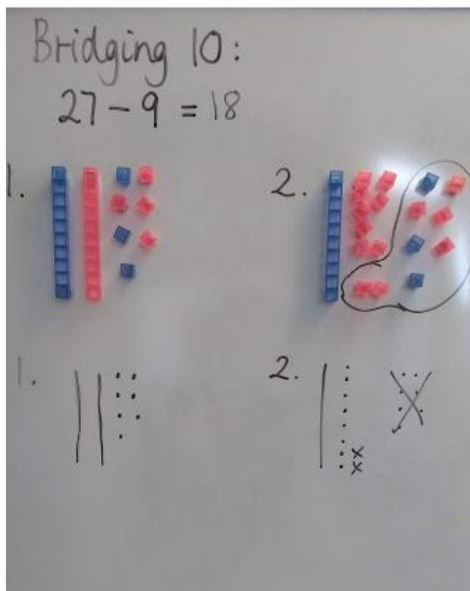### Subtracting a single digit number from a two digit number:
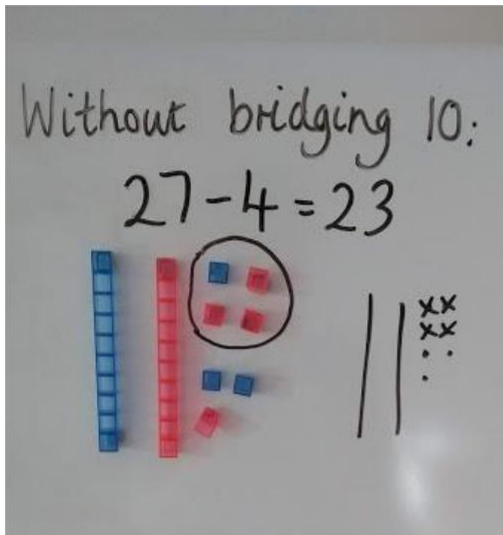
Subtracting a two digit number from a two digit number:
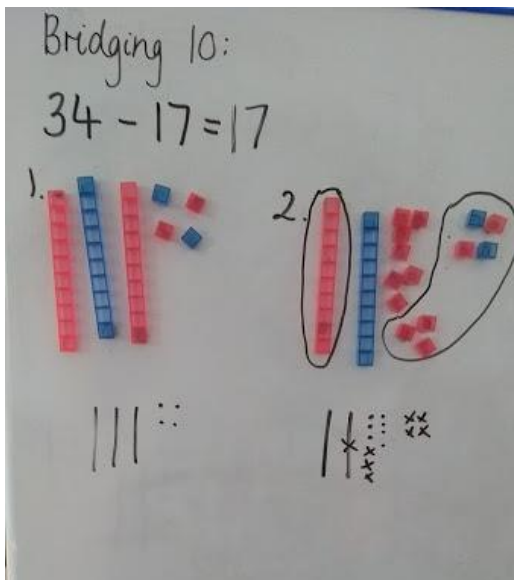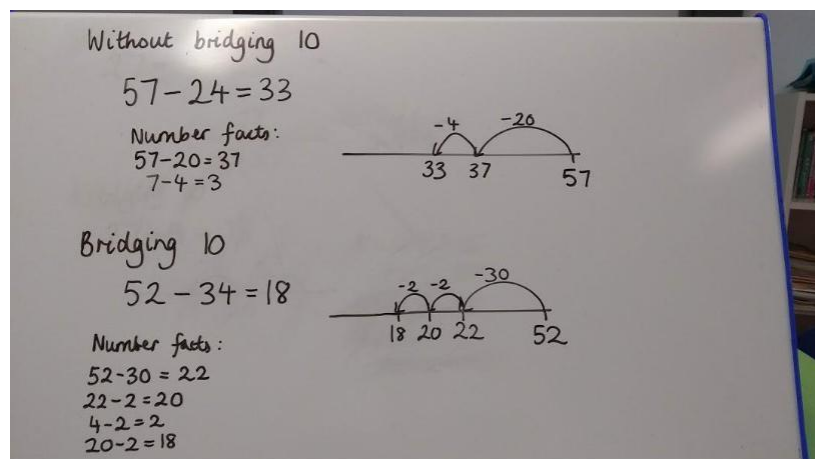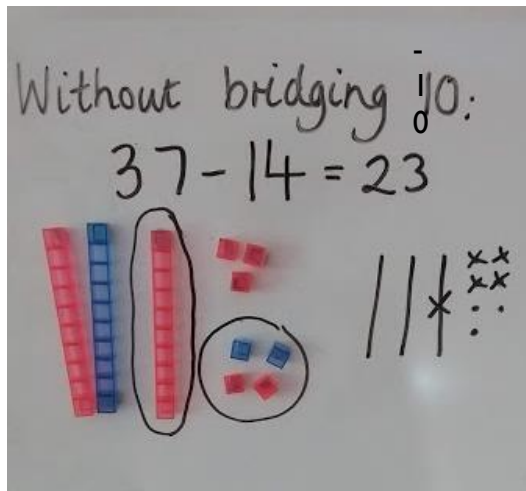
Comparison Structure:
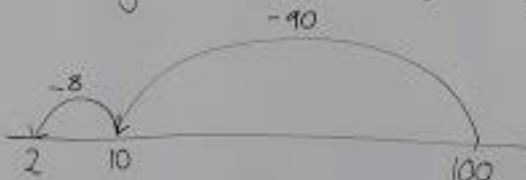
Subtraction is complex because it has two fundamentally different structures one of which is partitioning or taking away as seen above, the other of which is comparison. Children need to experience solving comparison word problems and use the following language:

Find the difference between 10 and 17.
How many more than 10 is 17?
How many fewer/less than 17 is 10?

Once children are secure with comparison and can represent this on an empty number line, they can use this strategy to solve any subtraction problem. They can begin to see that it is easier to calculate some subtractions this way, eg 100 – 98 is much easier to represent and calculate by finding the difference between the two numbers than by taking 98 away from 100. The **difference between** two numbers can be calculated by counting up from the smaller **number** to the **bigger one**.

All the way through these calculations children are expected to use their knowledge of number facts, rather than to count.

Vocabulary
+, add, addition, more, plus, make, sum, total, altogether, how many more to make.? how many more is. than.? how much more is.? =, equals, sign, is the same as, tens, units, partition, multiple of 10, tens boundary, more than, one more, two more. ten more. one hundred more, -, subtraction, subtract, take away, difference, difference between, minus, less than, one less, two less. ten less. one hundred less

Year 3 - Addition and Subtraction

Children should be taught to:
Add and subtract mentally:
- a 3-digit number and ones
- a 3-digit number and tens
- a 3-digit number and hundreds

To grasp these, children must be able to **partition** a 3-digit number into **hundreds**, **tens** and **ones**. Children will continue to develop the informal methods used for addition and subtraction in Year 2, particularly addition by partitioning and recombining, and subtraction on an empty number line.

Dienes resources and **place value counters** can support children with this. In Year 3 we use both.

Bar modelling is important for children to understand part part whole relationships, inverse relationships and to choose which operation to use to solve a problem.
Children need to start by using bar models to represent simple one step problems and then move into using a bar model to represent more complex two step problems.

53+34=87

34+53=87

87	
53	34

87–34=53

87–53=34

Add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction.
Using Dienes when first modelling the column method of addition is very useful for children to see that they are essentially doing exactly the same thing they have been doing with the informal partitioning method, but in the reverse order, ie adding the ones first.

We put Dienes onto a place value board in exactly the same way we did In Year 2 when introducing addition of two digit numbers by partitioning.

Adding two two digit numbers without bridging 10.
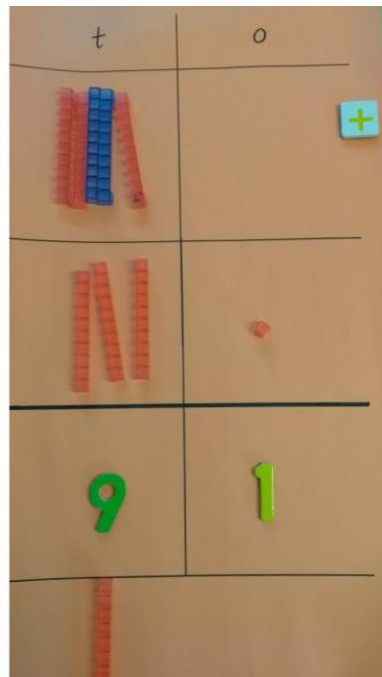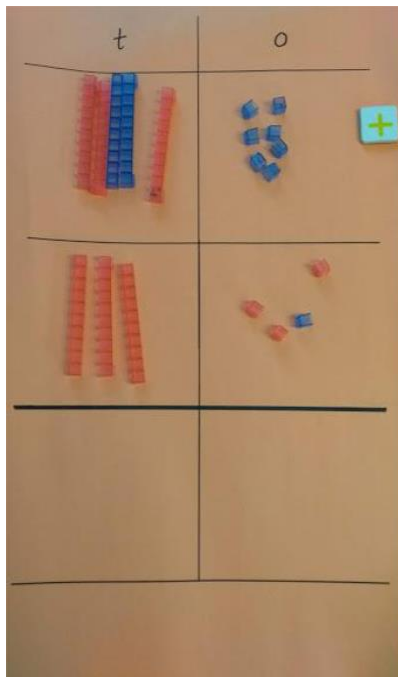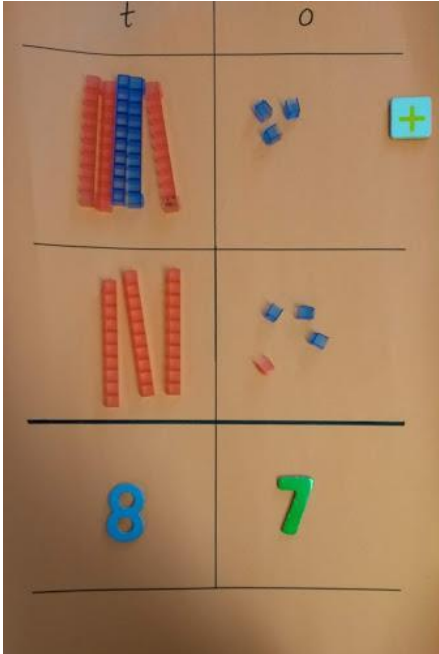
Adding two two digit numbers with bridging 10.
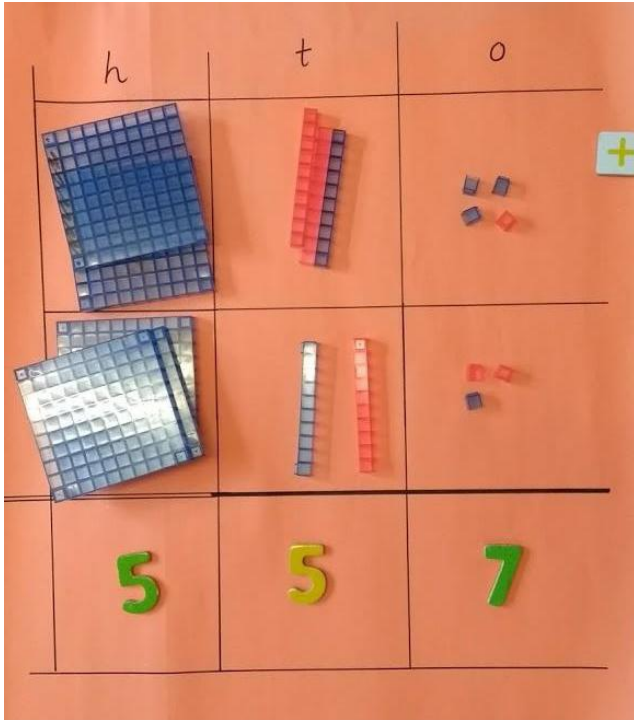
Adding two three digit numbers without bridging 10 or 100.
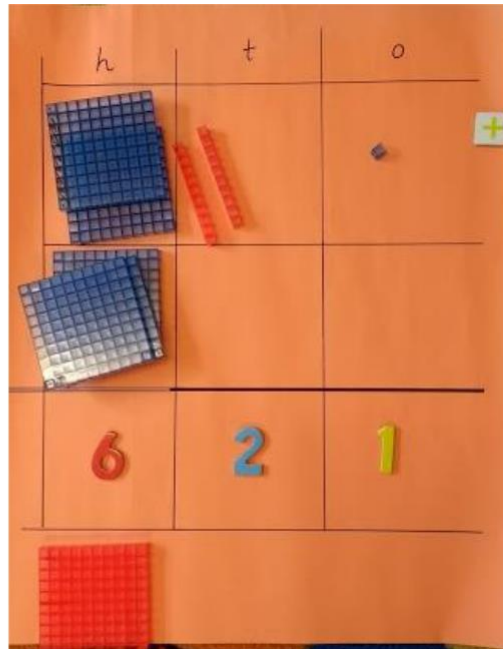
Adding two three digit numbers bridging 100.

Subtraction

Subtracting a two digit number from a two digit number without needing to exchange.
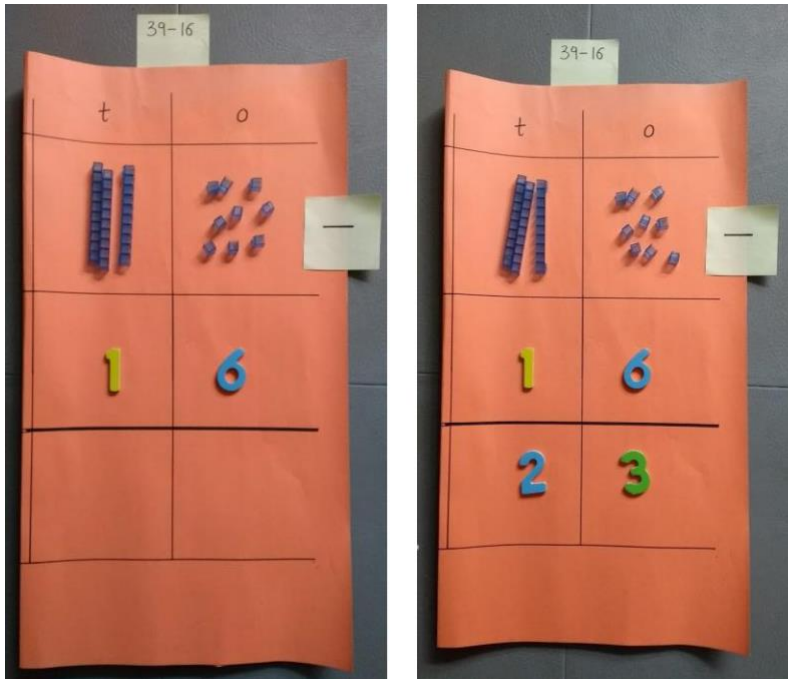
Subtracting a two digit number from a two digit number with exchanging.

Vocabulary
Hundreds, tens, ones, estimate, partition, recombine, difference, decrease, near multiple of 10 and 100, inverse, rounding, column subtraction, exchange. See also Y1 and Y2 vocabulary.

Year 4 - Addition and Subtraction

Children are expected to:

Add and subtract numbers up to 4 digits using the formal written methods of columnar addition and subtraction.

Children should continue to consolidate the **compact columnar addition** method.
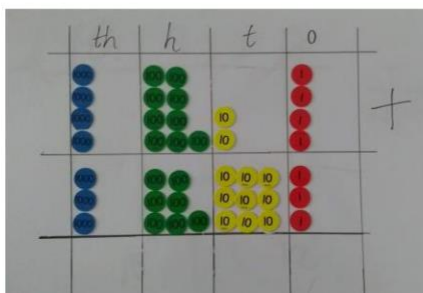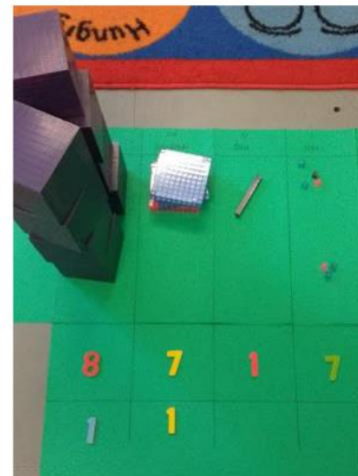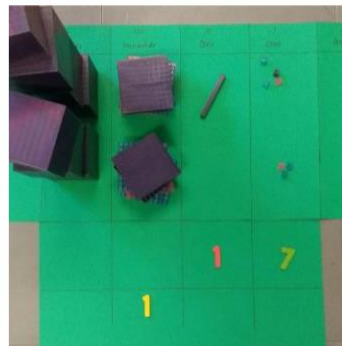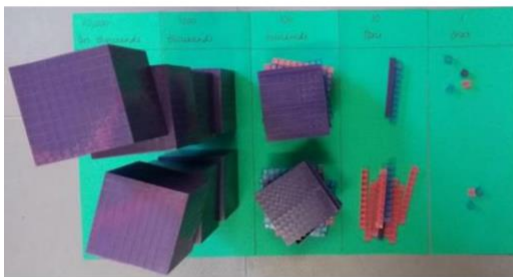
We continue to use place value counters in Year 4 and still use Dienes to be able to represent calculations like this. Children can 'dig deeper' into understanding column methods through activities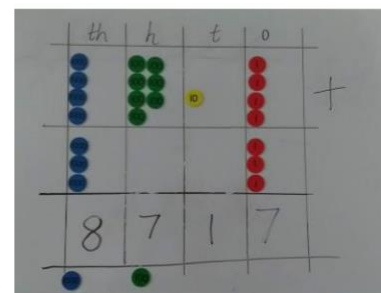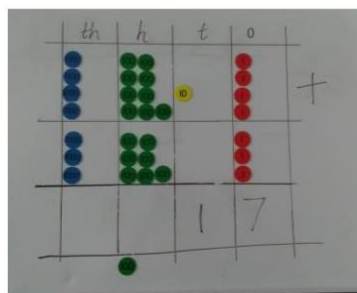 like Nrich's 'Dicey Operations' and reasoning about missing digits in calculations. This helps them to move their understanding from procedural to conceptual. They can use concrete resources to model and explain their understanding to others.

Children should also be able to add numbers with up to **2 decimal places** (at this stage, both numbers should have the **same number of decimal places**): It is very helpful if children can also use concrete resources to represent tenths and hundredths – this can be done by making 'Dienes' tenths and hundredths with cardboard [pic] as well as using decimal place value counters (0.1 and 0.01)

$$
\begin{array}{r}
3\ 9.8 \\
+\ 2\ 7.4 \\
\hline
6\ 7.2 \\
{}_{\cdot 1}
\end{array}
$$

Children should continue to consolidate the **columnar subtraction** method using 4-digit numbers. Alongside this children continue to use mental methods of addition and subtraction by partitioning and representing calculations with part part whole diagrams (cherry and bar):
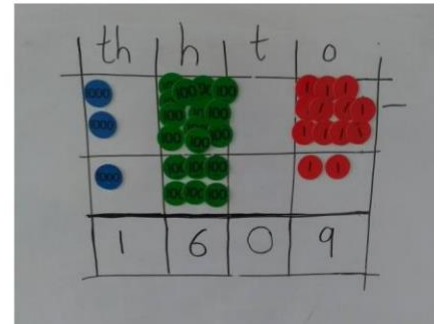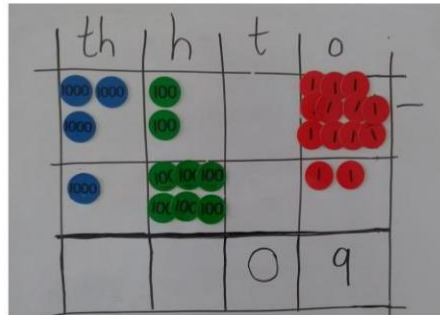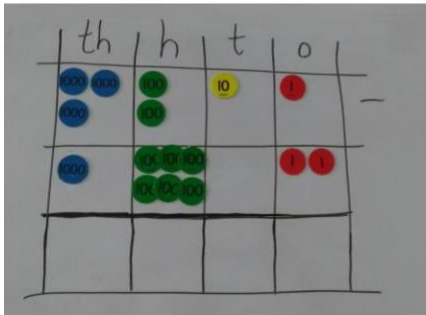
Vocabulary

add, addition, sum, more, plus, increase, total, altogether, double, near double, how many more to make..?, how much more?, ones boundary, tens boundary, hundreds boundary, thousands boundary, tenths boundary, hundredths boundary, inverse, how many more/fewer? Equals sign, is the same as.

Year 5 - Addition and Subtraction

Children are expected to:

Add and subtract whole numbers with more than 4 digits.
Children should continue to consolidate their understanding of the **columnar addition and subtraction** methods using numbers with more than 4 digits.

 Please see the Year 4 images for examples of representations using Dienes and place value counters.

They should be able to use the same method to add decimal numbers and to add more than two numbers.

Children should still have access to concrete resources such as place value counters to represent ten thousands, tenths and hundredths. As in Y4, 'Dienes' tenths and hundredths can be made from cardboard and ten thousands can be made by stacking ten thousand cubes together. Children can use these to help them see the quantities involved and also to explain and model their thinking to others. As in Y4, children 'dig deeper' into understanding column methods through activities like Nrich's 'Dicey Operations' and through exploring missing numbers in calculations. Nrich has several such activities as do the old BEAM Maths of the Month resources.
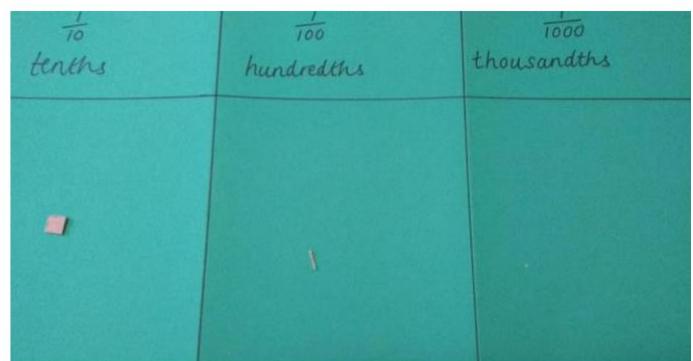
Add and subtract numbers mentally with increasingly large numbers. Children should be encouraged to use a variety of different mental maths strategies in order to solve some calculations involving large whole numbers and decimals using informal and mental methods. Children need to have lots of opportunities to make their own decisions about appropriate strategies for a calculation and should be able to explain why they chose one strategy over another. This may include adjusting numbers to make them easier to work with. Eg for 20,451 + 1,992 It is much easier to add 8 to the second number, treat it as 2000 and then subtract 8 from the total than it is to mentally add the number as given. Calculations may also be re-ordered to make them easier to deal with. Eg:

$$2.8 + 3.6 - 0.8 \text{ becomes } 2.8 - 0.8 + 3.6 = 2.0 + 3.6 = 5.6$$

They should be able to count on and back in tenths and hundredths. They could use a number line and/or informal jottings to help them. They can also use a hundredths square from 0.01 to 1.

0·01	0·02	0·03	0·04	0·05	0·06	0·07	0·08	0·09	0·1
0·11	0·12	0·13	0·14	0·15	0·16	0·17	0·18	0·19	0·2
0·21	0·22	0·23	0·24	0·25	0·26	0·27	0·28	0·29	0·3
0·31	0·32	0·33	0·34	0·35	0·36	0·37	0·38	0·39	0·4
0·41	0·42	0·43	0·44	0·45	0·46	0·47	0·48	0·49	0·5
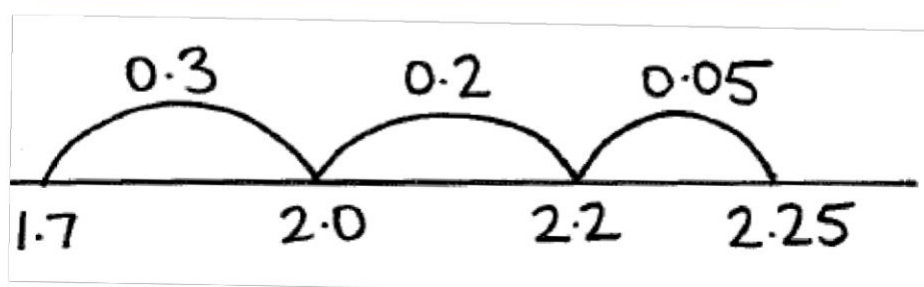
$$1.7 + 0.55 = 2.25$$

Throughout Y5 children are expected to continue to represent addition and subtraction calculations with the same bar models and cherry diagrams they have been using in earlier years.

Vocabulary
Tens of thousands, hundreds of thousands & millions.
Also see previous years.

Year 6 - Addition and Subtraction

Children in Year 6 should continue to develop their mental and written calculation methods for addition and subtraction. They should progress to larger numbers and continue calculating with decimals, including those with different numbers of decimal places.

Please see the Year 5 (or earlier) calculation policy for more information about the mental and written strategies for addition and subtraction they should use.

In Y6 children still access concrete resources such as place value counters and Dienes to represent and explain their thinking. As for Y4 and 5, Dienes can be made to represent ten thousands (stacking ten 'thousand cubes' together in a stick), tenths (cardboard squares, each a tenth of a one), hundredths (tenth of a tenth, ie a tiny cardboard stick) and even thousandths (a very tiny little cardboard square; a tenth of a hundredth!). Children can visualize or even make a 'hundred thousand' Dienes square by putting together ten 'ten thousand' sticks!

Children are expected to represent calculations with bar modelling. This is particularly useful for children to decide which calculation to do when faced with complex multi-step worded problems. Thinking about the whole and the parts and representing a problem with one or more bar models can bring clarity and make the mathematics within the problem visible.

Vocabulary
Tens of millions.
Also see previous years.

Document Control
This policy will be reviewed biannually. Responsibility is delegated to the Governors Teaching & learning Committee.
Revision History

Version	Revision Date	Revised By	Revision
1.0	Summer 2023	Ann Pelham & Maths Lead & staff	Policy written
1.1	Spring 2024	T&L committee	Amended, Adopted & ratified

Signed by

	Name	Signature	Date
Headteacher	Ann Pelham	*Pelham*	

Chair of Governors	Clare Hegarty		

Distribution

Date for next review
Spring 2026