

**St. Paul's Primary**

**Maths Workshop**

**Addition and Subtraction**

## Addition Terms

An **addend** is a number that is being added to another number.

The **sum** is the answer to an addition problem.

$$\begin{array}{ccccccc} 4 & + & 7 & = & 11 \\ \text{addend} & & \text{addend} & & \text{sum} \end{array}$$

The 4 and the 7 are both addends because they are each being added to one another. The sum is 11 because it is the answer to the problem. Another word for sum is **total**.

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## Subtraction Terms

The **minuend** is the first number in a subtraction sentence.

The **subtrahend** is the number taken away from the minuend.

The **difference** is the answer to a subtraction problem.

$$\begin{array}{ccccccc} 8 & - & 2 & = & 6 \\ \text{minuend} & & \text{subtrahend} & & \text{difference} \end{array}$$

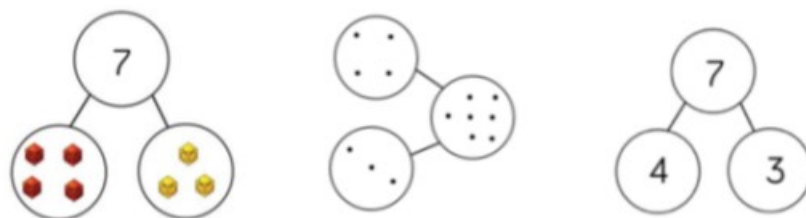
Aggregation— combining two or more quantities

Augmentation—increasing a number.

Subitise— looking at a set of objects and knowing how many are there without counting. For example : we don't count the dots on a dice.

Commutative—when you get the same answer no matter the order. Addition and multiplication are commutative.  $4 + 2$  is the same as  $2 + 4$  ;  $4 \times 2$  is the same as  $2 \times 4$

# Part-Whole Model

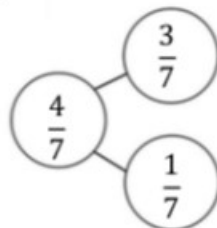
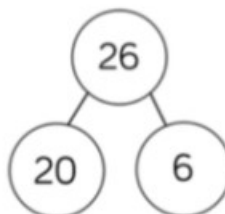
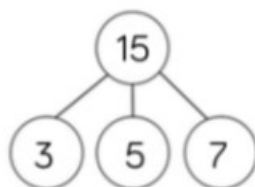


$$7 = 4 + 3$$

$$7 = 3 + 4$$

$$7 - 3 = 4$$

$$7 - 4 = 3$$



## Benefits

This part-whole model supports children in their understanding of aggregation and partitioning. Due to its shape, it can be referred to as a cherry part-whole model.

When the parts are complete and the whole is empty, children use aggregation to add the parts together to find the total.

When the whole is complete and at least one of the parts is empty, children use partitioning (a form of subtraction) to find the missing part.

Part-whole models can be used to partition a number into two or more parts, or to help children to partition a number into tens and ones or other place value columns.

In KS2, children can apply their understanding of the part-whole model to add and subtract fractions, decimals and percentages.

# Cubes



$$7 = 4 + 3$$



$$7 = 3 + 4$$



$$7 - 3 = 4$$



$$7 - 3 = 4$$

## Benefits

Cubes can be useful to support children with the addition and subtraction of one-digit numbers.

When adding numbers, children can see how the parts come together to make a whole. Children could use two different colours of cubes to represent the numbers before putting them together to create the whole.

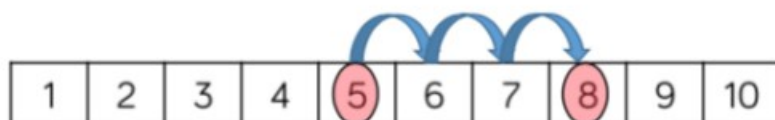
When subtracting numbers, children can start with the whole and then remove the number of cubes that they are subtracting in order to find the answer. This model of subtraction is reduction, or take away.

Cubes can also be useful to look at subtraction as difference. Here, both numbers are made and then lined up to find the difference between the numbers.

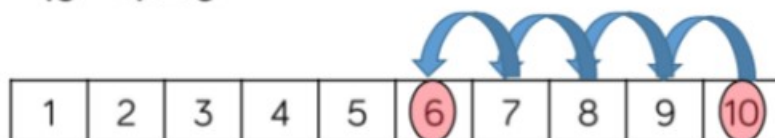
Cubes are useful when working with smaller numbers but are less efficient with larger numbers as they are difficult to subitise and children may miscount them.

# Number Tracks

$$5 + 3 = 8$$



$$10 - 4 = 6$$



$$8 + 7 = 15$$



## Benefits

Number tracks are useful to support children in their understanding of augmentation and reduction.

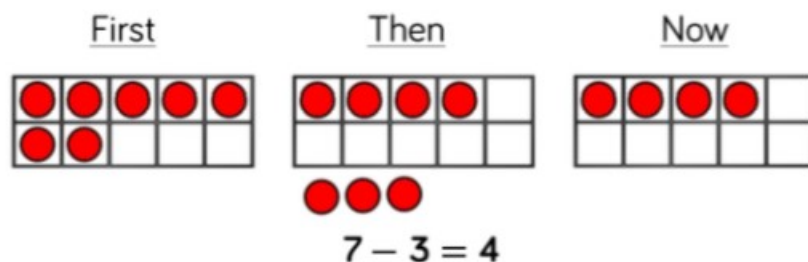
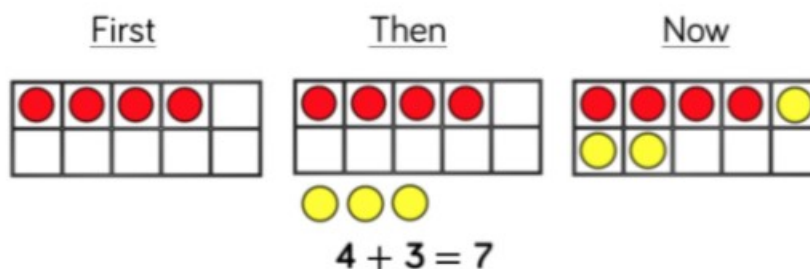
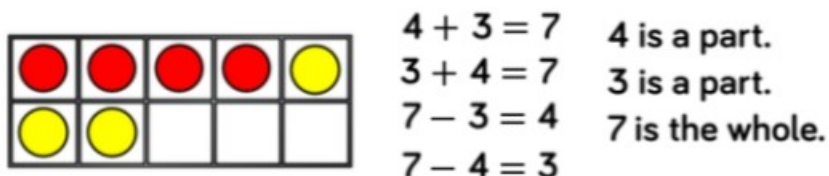
When adding, children count on to find the total of the numbers. On a number track, children can place a counter on the starting number and then count on to find the total.

When subtracting, children count back to find their answer. They start at the minuend and then take away the subtrahend to find the difference between the numbers.

Number tracks can work well alongside ten frames and bead strings which can also model counting on or counting back.

Playing board games can help children to become familiar with the idea of counting on using a number track before they move on to number lines.

# Ten Frames (within 10)



## Benefits

When adding and subtracting within 10, the ten frame can support children to understand the different structures of addition and subtraction.

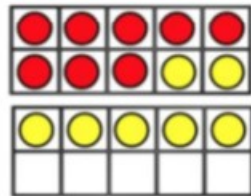
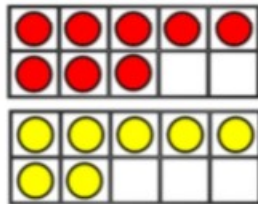
Using the language of parts and wholes represented by objects on the ten frame introduces children to aggregation and partitioning.

Aggregation is a form of addition where parts are combined together to make a whole. Partitioning is a form of subtraction where the whole is split into parts. Using these structures, the ten frame can enable children to find all the number bonds for a number.

Children can also use ten frames to look at augmentation (increasing a number) and take-away (decreasing a number). This can be introduced through a first, then, now structure which shows the change in the number in the 'then' stage. This can be put into a story structure to help children understand the change e.g. First, there were 7 cars. Then, 3 cars left. Now, there are 4 cars.

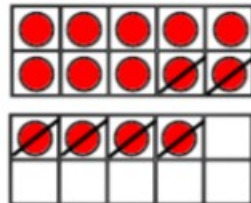
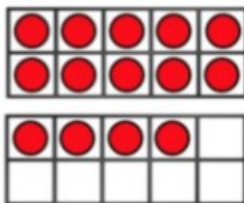


# Ten Frames (within 20)



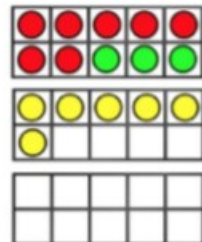
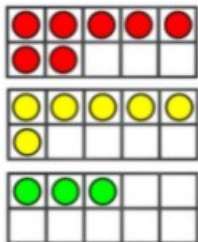
$$8 + 7 = 15$$

Diagram showing 8 partitioned into 2 and 5, with lines connecting to the 7 in the equation above.



$$14 - 6 = 8$$

Diagram showing 14 partitioned into 4 and 10, with lines connecting to the 6 in the equation above.



$$7 + 6 + 3 = 16$$

Diagram showing 7, 6, and 3 partitioned into 10 and 6, with lines connecting to the numbers in the equation above.

## Benefits

When adding two single digits, children can make each number on separate ten frames before moving part of one number to make 10 on one of the ten frames. This supports children to see how they have partitioned one of the numbers to make 10, and makes links to effective mental methods of addition.

When subtracting a one-digit number from a two-digit number, firstly make the larger number on 2 ten frames. Remove the smaller number, thinking carefully about how you have partitioned the number to make 10, this supports mental methods of subtraction.

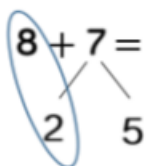
When adding three single-digit numbers, children can make each number on 3 separate 10 frames before considering which order to add the numbers in. They may be able to find a number bond to 10 which makes the calculation easier. Once again, the ten frames support the link to effective mental methods of addition as well as the importance of commutativity.

# Number Lines (labelled)

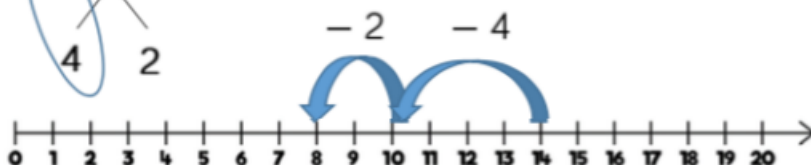
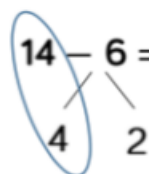
$$5 + 3 = 8$$



$$8 + 7 = 15$$



$$14 - 6 = 8$$



## Benefits

Labelled number lines support children in their understanding of addition and subtraction as augmentation and reduction.

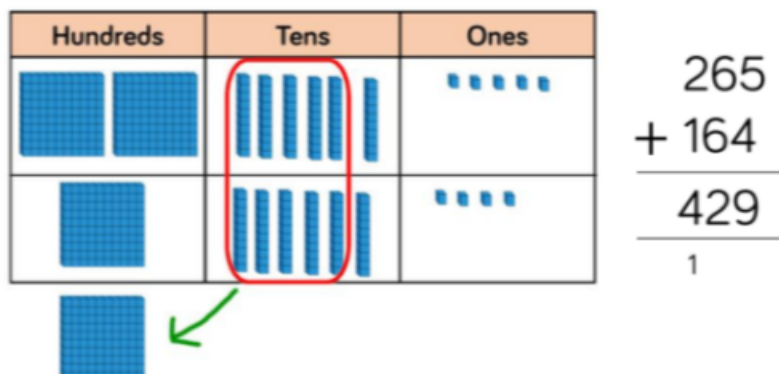
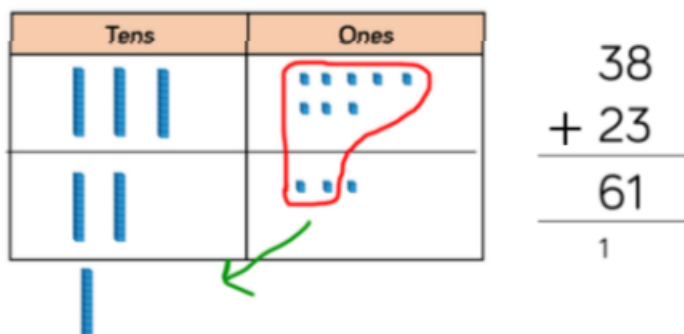
Children can start by counting on or back in ones, up or down the number line. This skill links directly to the use of the number track.

Progressing further, children can add numbers by jumping to the nearest 10 and then jumping to the total. This links to the making 10 method which can also be supported by ten frames. The smaller number is partitioned to support children to make a number bond to 10 and to then add on the remaining part.

Children can subtract numbers by firstly jumping to the nearest 10. Again, this can be supported by ten frames so children can see how they partition the smaller number into the two separate jumps.



# Base 10/Dienes (addition)



## Benefits

Using Base 10 or Dienes is an effective way to support children's understanding of column addition. It is important that children write out their calculations alongside using or drawing Base 10 so they can see the clear links between the written method and the model.

Children should first add without an exchange before moving on to addition with exchange. The representation becomes less efficient with larger numbers due to the size of Base 10. In this case, place value counters may be the better model to use.

When adding, always start with the smallest place value column. Here are some questions to support children.

How many ones are there altogether?

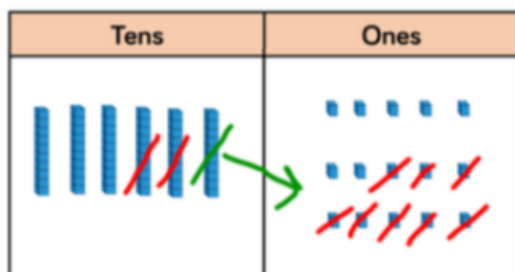
Can we make an exchange? (Yes or No)

How many do we exchange? (10 ones for 1 ten, show exchanged 10 in tens column by writing 1 in column)

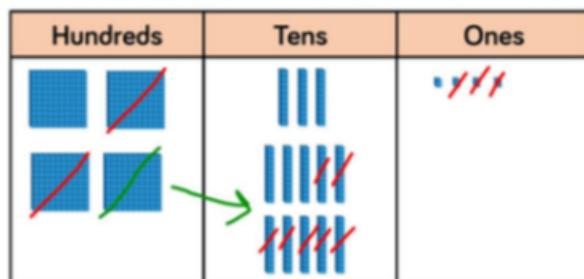
How many ones do we have left? (Write in ones column)

Repeat for each column.

## Base 10/Dienes (subtraction)



$$\begin{array}{r} 5 \phantom{0} \overset{1}{\cancel{6}}5 \\ - 28 \\ \hline 37 \end{array}$$



$$\begin{array}{r} 3 \phantom{0} \overset{1}{\cancel{4}}35 \\ - 273 \\ \hline 262 \end{array}$$

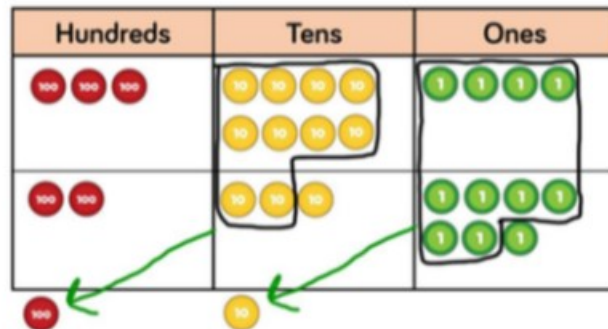
### Benefits

Using Base 10 or Dienes is an effective way to support children's understanding of column subtraction. It is important that children write out their calculations alongside using or drawing Base 10 so they can see the clear links between the written method and the model.

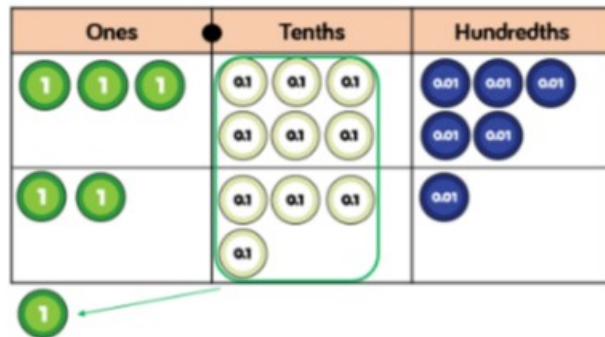
Children should first subtract without an exchange before moving on to subtraction with exchange. When building the model, children should just make the minuend using Base 10, they then subtract the subtrahend. Highlight this difference to addition to avoid errors by making both numbers. Children start with the smallest place value column. When there are not enough ones/tens/hundreds to subtract in a column, children need to move to the column to the left and exchange e.g. exchange 1 ten for 10 ones. They can then subtract efficiently.

This model is efficient with up to 4-digit numbers. Place value counters are more efficient with larger numbers and decimals.

# Place Value Counters (addition)



$$\begin{array}{r} 384 \\ + 237 \\ \hline 621 \\ 1 \quad 1 \end{array}$$



$$\begin{array}{r} 3.65 \\ + 2.41 \\ \hline 6.06 \\ 1 \end{array}$$

## Benefits

Using place value counters is an effective way to support children's understanding of column addition. It is important that children write out their calculations alongside using or drawing counters so they can see the clear links between the written method and the model.









Children should first add without an exchange before moving on to addition with exchange. Different place value counters can be used to represent larger numbers or decimals. If you don't have place value counters, use normal counters on a place value grid to enable children to experience the exchange between columns.

When adding money, children can also use coins to support their understanding. It is important that children consider how the coins link to the written calculation especially when adding decimal amounts.

# Place Value Counters (Subtraction)

Hundreds	Tens	Ones
		
		

$$\begin{array}{r} 652 \\ - 207 \\ \hline 445 \end{array}$$

Thousands	Hundreds	Tens	Ones
			
			

$$\begin{array}{r} 4357 \\ - 2735 \\ \hline 1622 \end{array}$$

## Benefits

Using place value counters is an effective way to support children's understanding of column subtraction. It is important that children write out their calculations alongside using or drawing counters so they can see the clear links between the written method and the model.

Children should first subtract without an exchange before moving on to subtraction with exchange. If you don't have place value counters, use normal counters on a place value grid to enable children to experience the exchange between columns.

When building the model, children should just make the minuend using counters, they then subtract the subtrahend. Children start with the smallest place value column. When there are not enough ones/tens/hundreds to subtract in a column, children need to move to the column to the left and exchange e.g. exchange 1 ten for 10 ones. They can then subtract efficiently.





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