



Booker Avenue Infant School Calculation Policy



'Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics and a sense of enjoyment and curiosity about the subject.' National Curriculum 2014

This policy has been designed to support the teaching and planning of Maths in our school. It only details the strategies, and teachers must plan opportunities for pupils to apply these; for example, when solving problems, or where opportunities emerge elsewhere in the curriculum. The examples and illustrations are not exhaustive but provide an overall picture of what the maths in our school should look like. This is not a scheme of work and must be used in conjunction with our school maths policy and curriculum documents.

In EYFS, pupils should be developing their concept of the number system through the use of concrete materials and pictorial representations. They should experience practical calculation opportunities using a wide variety of equipment, e.g. small world play, role play, counter, cubes etc. They develop ways of recording calculations using concrete resources and pictures, before written examples.

This policy sets out the progression of strategies and written methods which children will be taught as they develop in their understanding of the four operations. Strategies are set out in a Concrete, Pictorial, Abstract (CPA) approach, to develop children's deep understanding and mastery of mathematical concepts, and is relevant to both EYFS and Key Stage One.

- Concrete representation— a pupil is first introduced to an idea or skill by acting it out with real objects. This is a 'hands on' component using real objects and is a foundation for conceptual understanding.
- Pictorial representation – a pupil has sufficiently understood the 'hands on' experiences performed and can now relate them to representations, such as a diagram or picture of the problem.
- Abstract representation—a pupil is now capable of representing problems by using mathematical notation, for example $12 \times 2 = 24$.

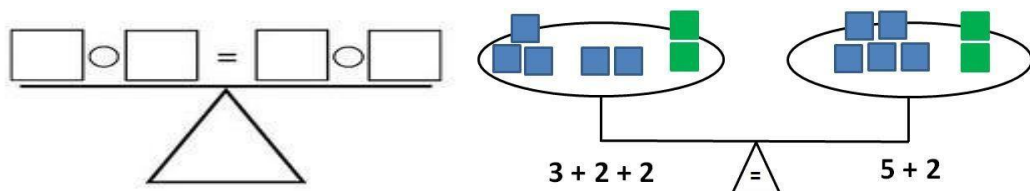
It is important that conceptual understanding, supported by the use of representation, is secure for all procedures. Reinforcement is achieved by going back and forth between these representations. It is also worth noting that if a child has moved on from the concrete to the pictorial, it does not mean that the concrete cannot be used alongside the pictorial. Or if a child is working in the abstract, 'proving' something or 'working out' could involve use of the concrete or pictorial. Similarly, although the strategies are taught in a progressive sequence, they are designed to equip children with a 'tool box' of skills and strategies

that they can apply to solve problems in a range of contexts. So as a new strategy is taught it does not necessarily supersede the previous, but builds on prior learning to enable children to have a variety of tools to select from. As children become increasingly independent, they will be able to and must be encouraged to select those strategies which are most efficient for the task.

Children should be moved through the strategies at a pace appropriate to their age related expectations as defined in the EYFS framework, and the National Curriculum. Effective teaching of the strategies relies on increasing levels of number sense, fluency and ability to reason mathematically. Children must be supported to gain depth of understanding within the strategy through the CPA approach and not learn strategies as a procedure.

Teaching Equality

It is important that when teaching the 4 operations that equality (=) is also taught appropriately. Misconceptions that = means that children must 'do something' and that it indicates that an answer is needed are common and must be addressed early on. Teachers should present children with number sentences and problems which place the = sign in different positions, different context and include missing box problems. For example, $?+4=7$; $7=3+?$; $<$, $>$, or $=$ $5+6$ $7+4$. In the concrete phase, scales provide a useful resource to demonstrate equality. Pictorial representations of equality can be used as shown below:



Importance of Vocabulary

At Booker Avenue Infant School, we value the importance of vocabulary and we understand that children will be unable to articulate their mathematical reasoning if they lack the mathematical vocabulary required to do so. It is therefore essential that teaching using the strategies outlined in this policy is accompanied by the use of appropriate mathematical vocabulary. New vocabulary should be introduced in a suitable context (for example, with relevant real objects, apparatus, pictures or diagrams) and explained carefully. High expectations of the mathematical language used are essential, with teachers modelling and only accepting what is correct.

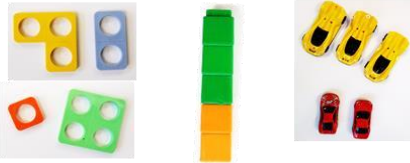
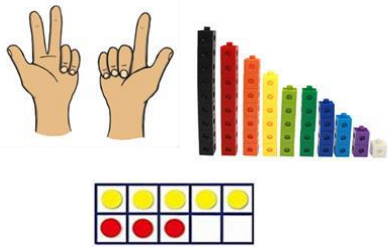
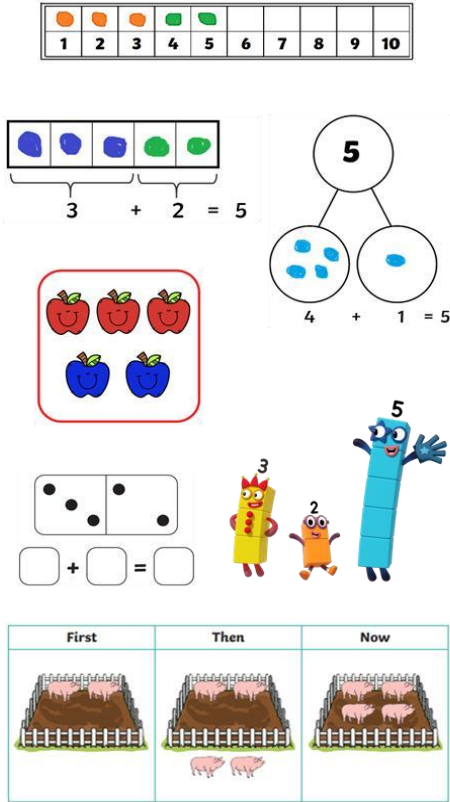

Aims




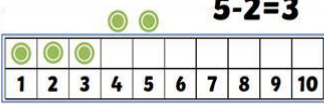




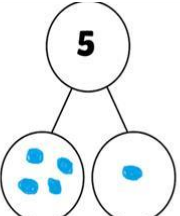


- To ensure consistency and progression in our approach to calculation and enable a smooth transition between year groups and phases.
- To ensure that children develop an efficient, reliable, formal written method of calculation for all operations.

- To ensure that children can use these methods accurately with confidence and understanding.
- To ensure pupils understand important concepts and make connections within mathematics.
- To ensure pupils show high levels of fluency in performing written and mental calculations.
- To ensure that pupils are ready for the next stage of learning and have been given strong foundations in mental methods, the use of practical equipment, allowed to explore jottings in a range of forms and then to move onto more formal recording using a strong knowledge of place value, number lines labelled or blank, partitioning before eventually using compact written methods.
- To ensure that pupils are competent in fluency, reasoning and problem solving and can make informed and appropriate choices about the methods they wish to use (mental or written) to solve mathematical problems efficiently and effectively.

EYFS

**Addition and
Subtraction**

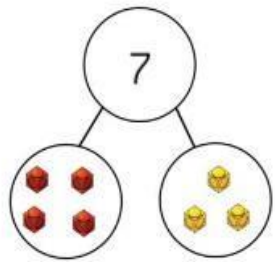
Question for Learning	Concrete	Pictorial	Abstract
<p>Addition How are numbers added?</p> <ul style="list-style-type: none"> Children are encouraged to gain a sense of the number system through the use of counting concrete objects. They combine objects in practical ways and find the total. They begin to use + and = to record number sentences. Children develop a mental picture of the number system through subitising to use for calculations. Children use first/then/now stories to work our word problems. They know that a group of things change in quantity when something is added. They say the number that is one more than a given number. 	 <p>Use specific Maths resources such as counters, cubes, Numicon, etc.</p>  <p>Use visual supports such as five/ten frames, part whole models and addition maths, with physical objects and resources that can be manipulated.</p>	 <p>5</p> $3 + 2 = 5$ $4 + 1 = 5$ <p>5</p> $3 + 2 = 5$ $4 + 1 = 5$ <p>5</p> <p>3</p> <p>2</p> <p>5</p> <p>3</p> <p>2</p> <p>5</p> <p>First Then Now</p>	 $3 + 2 = 5$ $4 + 1 = 5$ $5 + 0 = 5$ <p>*No expectation for children to be able to record a number sentence/addition calculation.</p>

Question for Learning	Concrete	Pictorial	Abstract
<p>Subtraction How are numbers subtracted?</p> <ul style="list-style-type: none"> Children know that a group of things change in quantity when something is taken away. They say the number that is one less than a given number up to 5 and then up to 10. In practical activities and discussion, they are beginning to use the vocabulary involved in subtraction. 	<p>Use toys and general classroom resources for children to physically manipulate, group/regroup</p>  <p> $5 - 3 = 2$</p> <p> $4 - 1 = 3$</p> <p> $5 - 2 = 3$</p>	<p> First there were 5 people on the bus. Then 2 people got off the bus. Now there are 3 people on the bus.</p> <p></p> <p> $- 2 = \bigcirc$</p> <p>A group of pictures for children to cross out or cover quantities to support subtraction.</p> <p> $5 - 2 = 3$</p> <p> $5 - 4 = 1$</p> <p></p> <p>Use visual supports such as five/ten frames, and part whole models with pictures.</p>	<p> $5 - 2 = 3$</p> <p>*No expectation for children to be able to record a number sentence/subtraction calculation.</p>

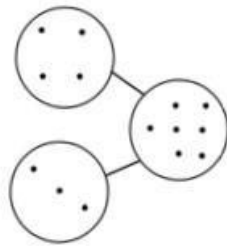
Key Stage One

Addition and Subtraction

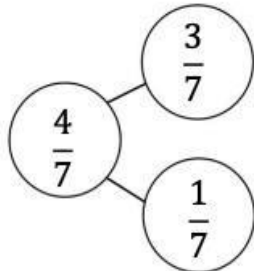
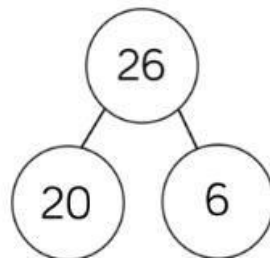
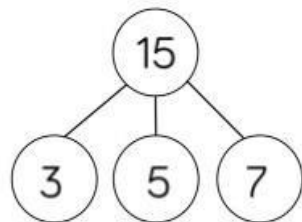
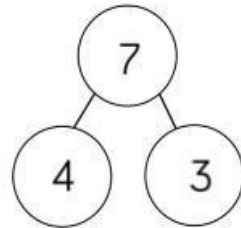
Part-Whole Model



$$7 = 4 + 3$$
$$7 = 3 + 4$$



$$7 - 3 = 4$$
$$7 - 4 = 3$$



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.

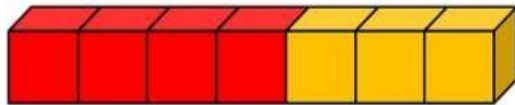
When the parts are complete and the whole is empty, children use aggregation to add the parts together to find the total.

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.

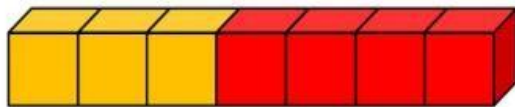
Part-whole models can be used to partition a number into two or more parts, or to help children to partition a number into tens and ones or other place value columns.

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

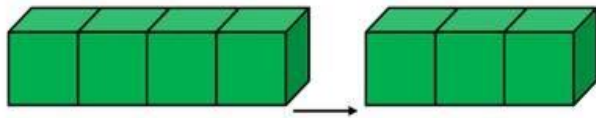
Cubes



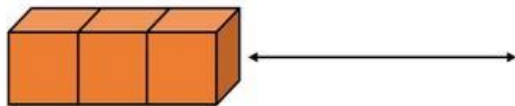
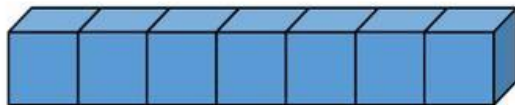
$$7 = 4 + 3$$



$$7 = 3 + 4$$



$$7 - 3 = 4$$



$$7 - 3 = 4$$

Benefits

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

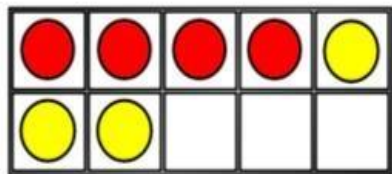
When adding numbers, children can see how the parts come together to make a whole. Children could use two different colours of cubes to represent the numbers before putting them together to create the whole.

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.

Ten Frames (within 10)



$$4 + 3 = 7$$

4 is a part.

$$3 + 4 = 7$$

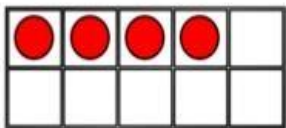
3 is a part.

$$7 - 3 = 4$$

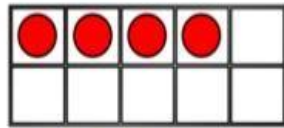
7 is the whole.

$$7 - 4 = 3$$

First

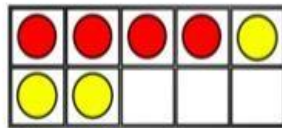


Then

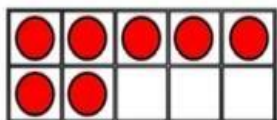


$$4 + 3 = 7$$

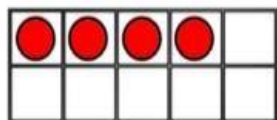
Now



First

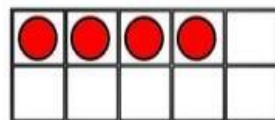


Then



$$7 - 3 = 4$$

Now



Benefits

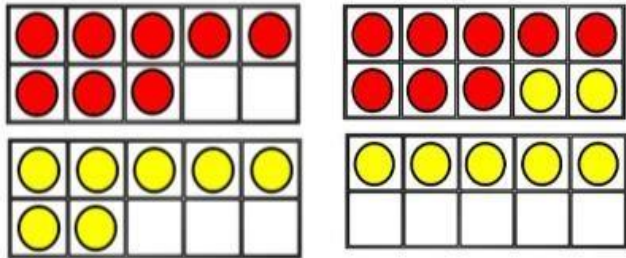
When adding and subtracting within 10, the ten frame can support children to understand the different structures of addition and subtraction.

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.

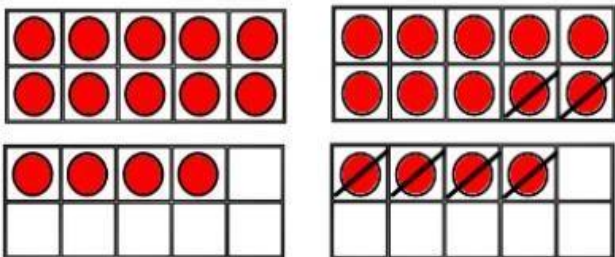
Children can also use ten frames to look at augmentation (increasing a number) and take-away (decreasing a number). This can be introduced through a first, then, now structure which shows the change in the number in the 'then' stage. This can be put into a story structure to help children understand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

Ten Frames (within 20)



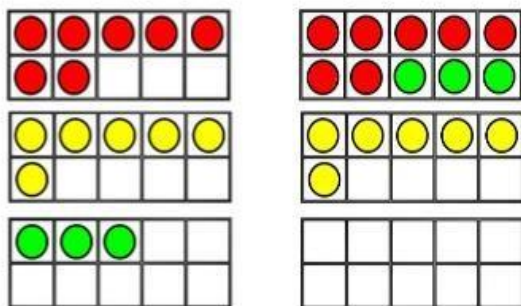
$$8 + 7 = 15$$

Diagram showing 8 and 7 being added to equal 15. A bracket groups 8 and 2, with a line pointing to 10. Another bracket groups 5 and 10, with a line pointing to 15.



$$14 - 6 = 8$$

Diagram showing 14 minus 6 equals 8. A bracket groups 14 and 4, with a line pointing to 10. Another bracket groups 2 and 10, with a line pointing to 12.



$$7 + 6 + 3 = 16$$

Diagram showing 7, 6, and 3 being added to equal 16. A bracket groups 7 and 3, with a line pointing to 10. Another bracket groups 6 and 10, with a line pointing to 16.

Benefits

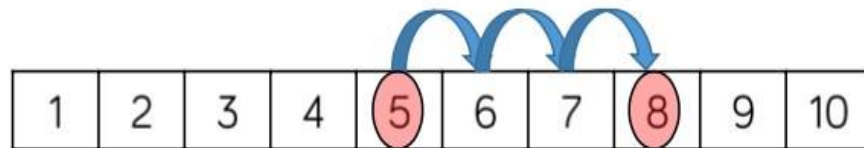
When adding two single digits, children can make each number on separate ten frames before moving part of one number to make 10 on one of the ten frames. This supports children to see how they have partitioned one of the numbers to make 10, and makes links to effective mental methods of addition.

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.

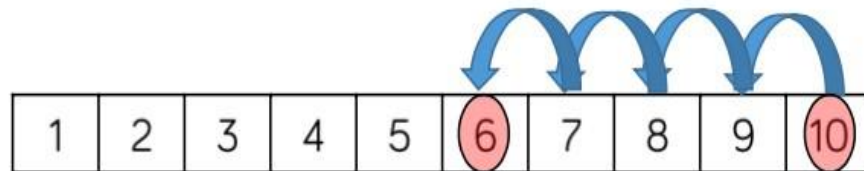
When adding three single-digit numbers, children can make each number on 3 separate 10 frames before considering which order to add the numbers in. They may be able to find a number bond to 10 which makes the calculation easier. Once again, the ten frames support the link to effective mental methods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

Number Tracks

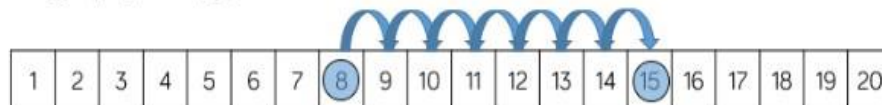
$$5 + 3 = 8$$



$$10 - 4 = 6$$



$$8 + 7 = 15$$



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.

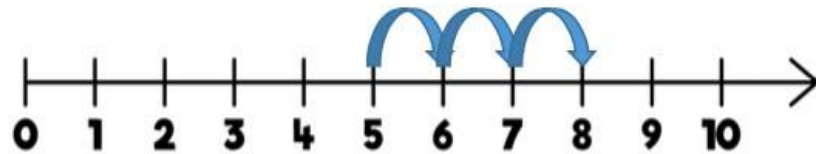
When subtracting, children count back to find their answer. They start at the minuend and then take away the subtrahend to find the difference between the numbers.

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

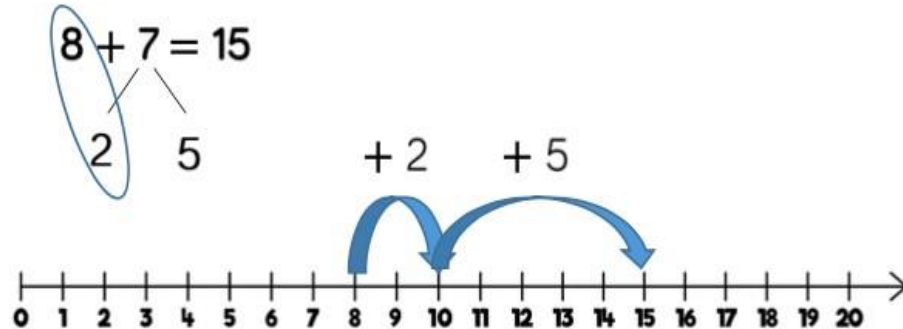
Playing board games can help children to become familiar with the idea of counting on using a number track before they move on to number lines.

Number Lines (labelled)

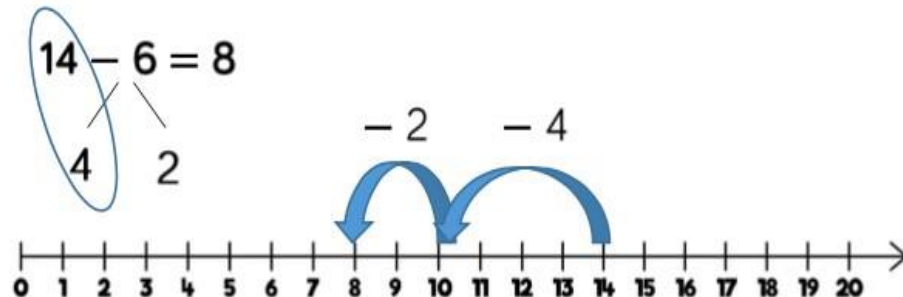
$$5 + 3 = 8$$



$$8 + 7 = 15$$



$$14 - 6 = 8$$



Benefits

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

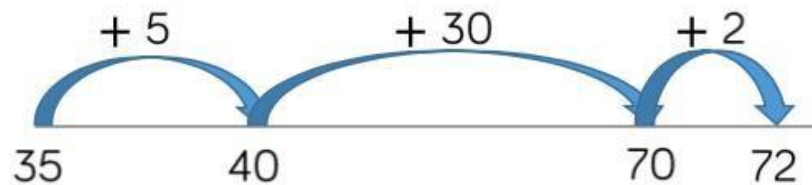
Children can start by counting on or back in ones, up or down the number line. This skill links directly to the use of the number track.

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.

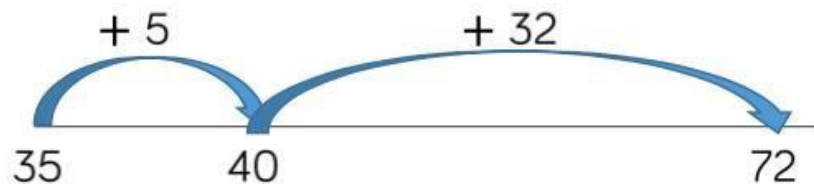
Children can subtract numbers by firstly jumping to the nearest 10. Again, this can be supported by ten frames so children can see how they partition the smaller number into the two separate jumps.

Number Lines (blank)

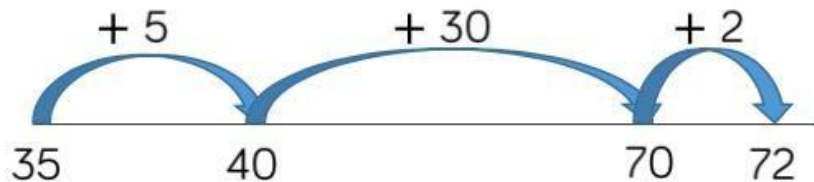
$$35 + 37 = 72$$



$$35 + 37 = 72$$



$$72 - 35 = 37$$



Benefits

Blank number lines provide children with a structure to add and subtract numbers in smaller parts.

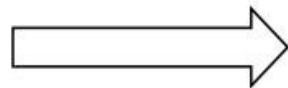
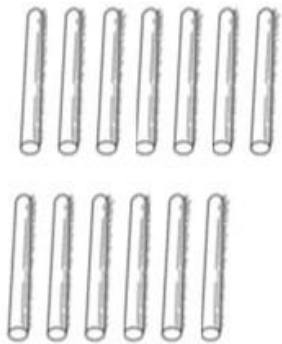
Developing from labelled number lines, children can add by jumping to the nearest 10 and then adding the rest of the number either as a whole or by adding the tens and ones separately.

Children may also count back on a number line to subtract, again by jumping to the nearest 10 and then subtracting the rest of the number.

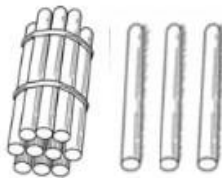
Blank number lines can also be used effectively to help children subtract by finding the difference between numbers. This can be done by starting with the smaller number and then counting on to the larger number. They then add up the parts they have counted on to find the difference between the numbers.

Straws

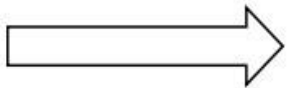
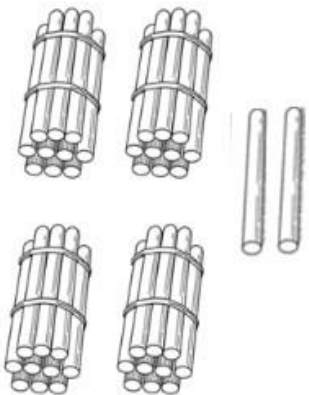
$$7 + 6 = 13$$



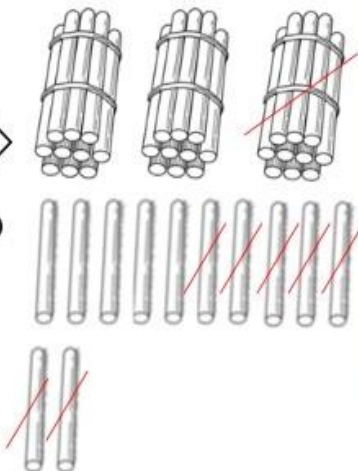
bundle together
groups of 10



$$42 - 17 = 25$$



unbundle group
of 10 straws



Benefits

Straws are an effective way to support children in their understanding of exchange when adding and subtracting 2-digit numbers.

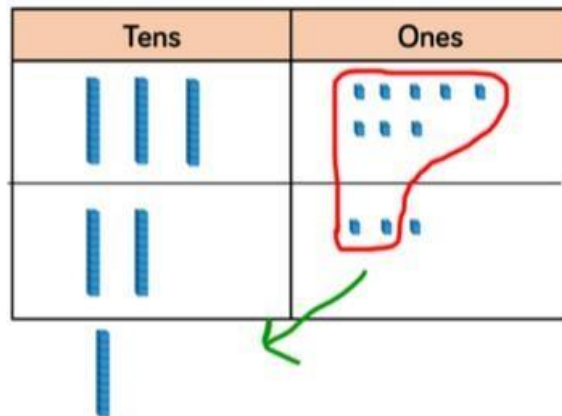
Children can be introduced to the idea of bundling groups of ten when adding smaller numbers and when representing 2-digit numbers. Use elastic bands or other ties to make bundles of ten straws.

When adding numbers, children bundle a group of 10 straws to represent the exchange from 10 ones to 1 ten. They then add the individual straws (ones) and bundles of straws (tens) to find the total.

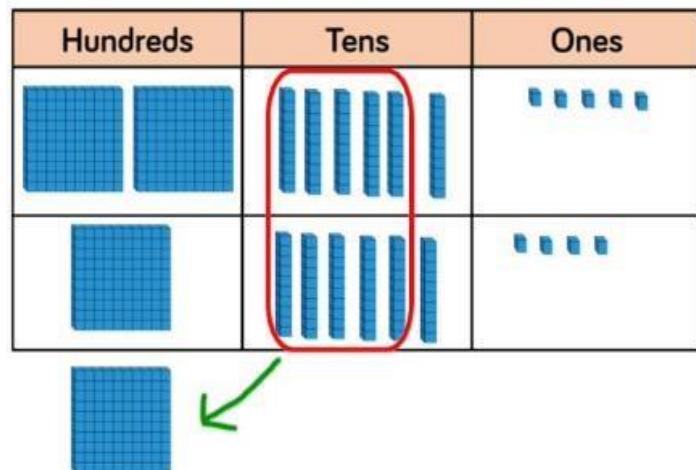
When subtracting numbers, children unbundle a group of 10 straws to represent the exchange from 1 ten to 10 ones.

Straws provide a good stepping stone to adding and subtracting with Base 10/Dienes.

Base 10/Dienes (addition)



$$\begin{array}{r} 38 \\ + 23 \\ \hline 61 \\ 1 \end{array}$$



$$\begin{array}{r} 265 \\ + 164 \\ \hline 429 \\ 1 \end{array}$$

Benefits

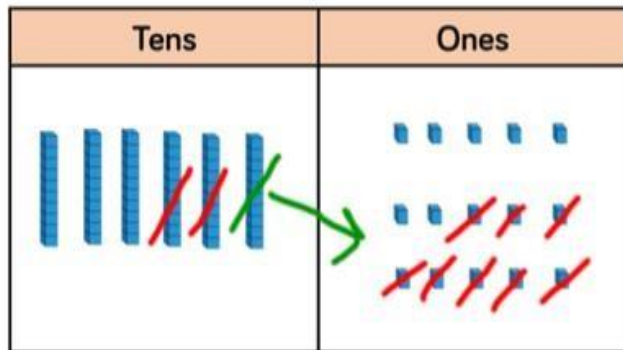
Using Base 10 or Dienes is an effective way to support children's understanding of column addition. It is important that children write out their calculations alongside using or drawing Base 10 so they can see the clear links between the written method and the model.

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)



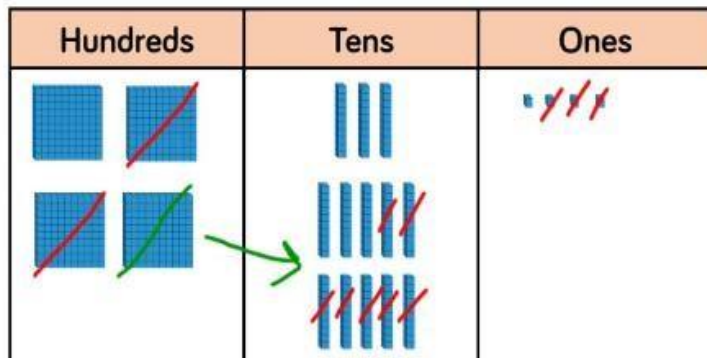
$$\begin{array}{r}
 \overset{5}{\cancel{6}}\overset{1}{5} \\
 - 28 \\
 \hline
 37
 \end{array}$$

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.



$$\begin{array}{r}
 \overset{3}{\cancel{4}}\overset{1}{3}\overset{1}{5} \\
 - 273 \\
 \hline
 262
 \end{array}$$

Key Stage One

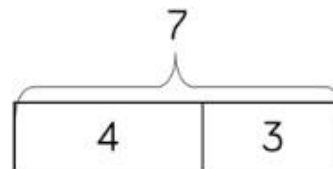
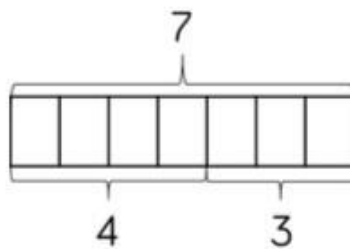
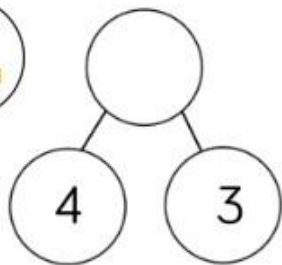
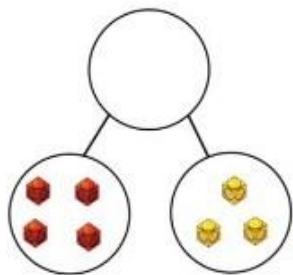
Addition

Skill	Year	Representations and models	
Add two 1-digit numbers to 10	1	Part-whole model Bar model Number shapes	Ten frames (within 10) Bead strings (10) Number tracks
Add 1 and 2-digit numbers to 20	1	Part-whole model Bar model Number shapes Ten frames (within 20)	Bead strings (20) Number tracks Number lines (labelled) Straws
Add three 1-digit numbers	2	Part-whole model Bar model	Ten frames (within 20) Number shapes
Add 1 and 2-digit numbers to 100	2	Part-whole model Bar model Number lines (labelled)	Number lines (blank) Straws Hundred square

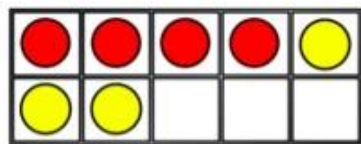
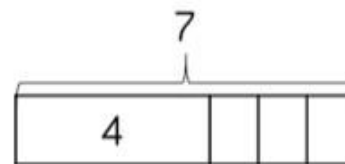
Skill	Year	Representations and models
Add two 2-digit numbers	2	Part-whole model Bar model Number lines (blank) Straws Base 10 Place value counters Column addition
Add with up to 3-digits	3	Part-whole model Bar model Base 10 Place value counters Column addition
Add with up to 4-digits	4	Part-whole model Bar model Base 10 Place value counters Column addition
Add with more than 4 digits	5	Part-whole model Bar model Place value counters Column addition
Add with up to 3 decimal places	5	Part-whole model Bar model Place value counters Column addition

Skill: Add 1-digit numbers within 10

Year: 1



$$4 + 3 = 7$$



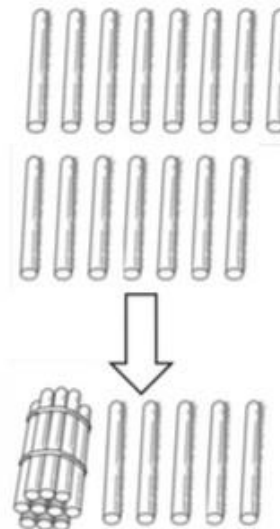
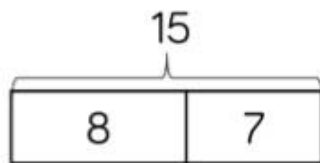
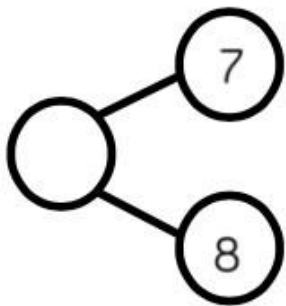
When adding numbers to 10, children can explore both aggregation and augmentation.

The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation.

The combination bar model, ten frame, bead string and number track all support augmentation.

Skill: Add 1 and 2-digit numbers to 20

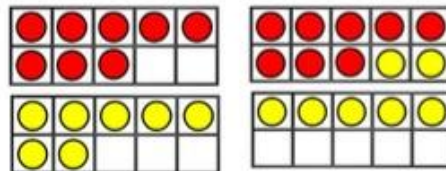
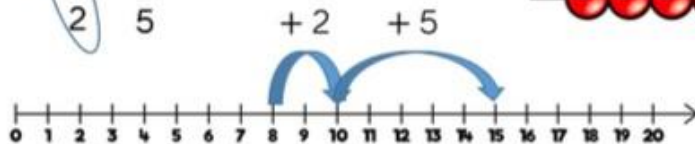
Year: 1/2



$$8 + 7 = 15$$

$$8 + 7 = 15$$

2 5



$$8 + 7 = 15$$

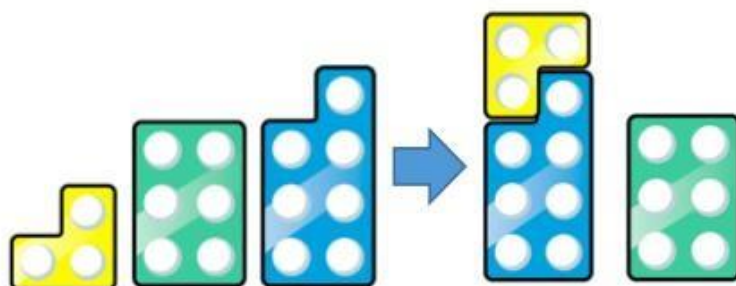
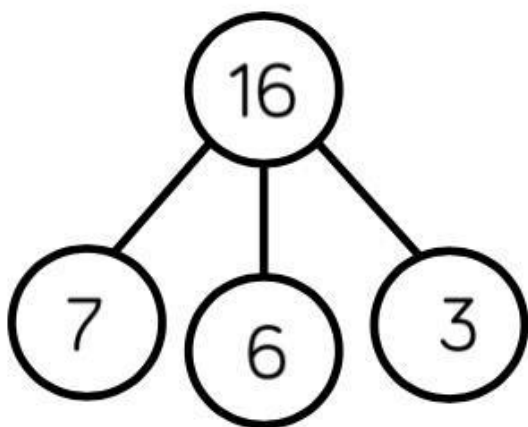
2 5

When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.

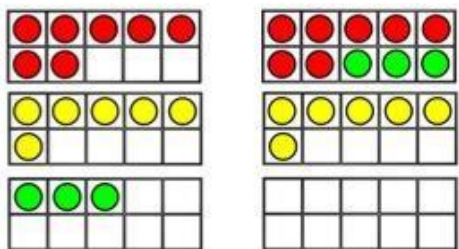
Different manipulatives can be used to represent this exchange. Use concrete resources alongside number lines to support children in understanding how to partition their jumps.

Skill: Add three 1-digit numbers

Year: 2

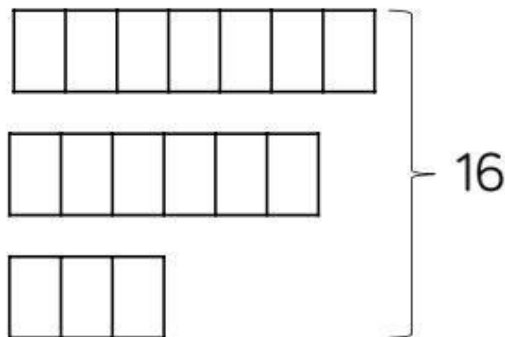


$$7 + 6 + 3 = 16$$



$$7 + 6 + 3 = 16$$

10



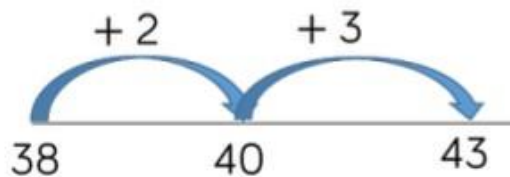
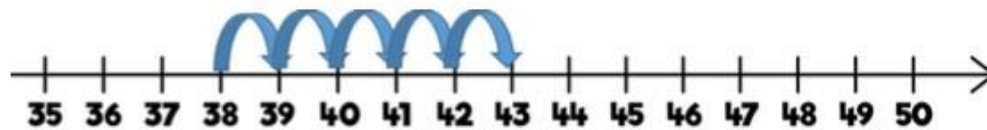
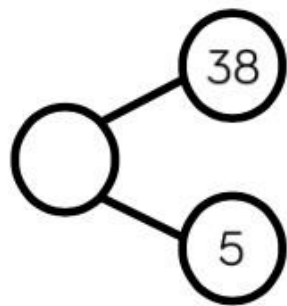
When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently.

This supports children in their understanding of commutativity.

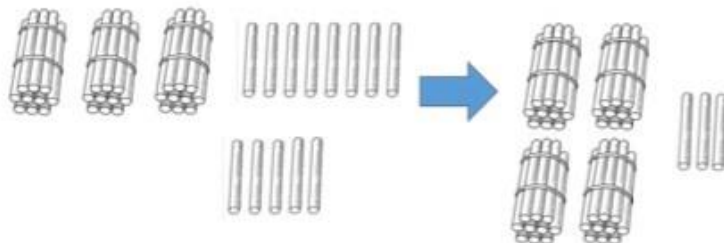
Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.

Skill: Add 1-digit and 2-digit numbers to 100

Year: 2/3



$$38 + 5 = 43$$



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

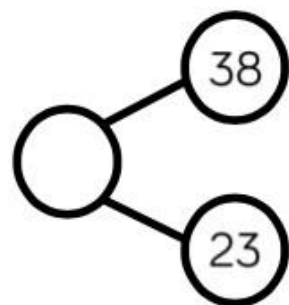
When adding single digits to a two-digit number, children should be encouraged to count on from the larger number.

They should also apply their knowledge of number bonds to add more efficiently e.g. $8 + 5 = 13$ so $38 + 5 = 43$.

Hundred squares and straws can support children to find the number bond to 10.

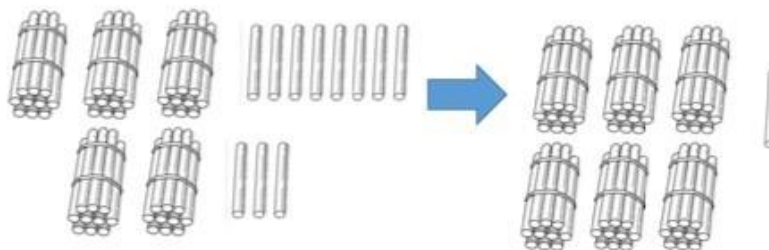
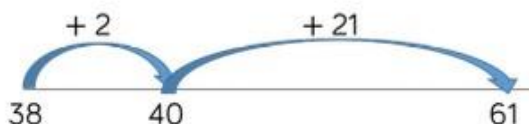
Skill: Add two 2-digit numbers to 100

Year: 2/3



?

38	23
----	----



$$38 + 23 = 61$$

Tens	Ones
	■ ■ ■ ■ ■ ■ ■ ■
	■ ■ ■

$$\begin{array}{r} 38 \\ + 23 \\ \hline 61 \\ 1 \end{array}$$

Tens	Ones
● ● ●	● ● ● ● ● ● ● ●
● ●	● ● ●

At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

Children can also use a blank number line to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient.

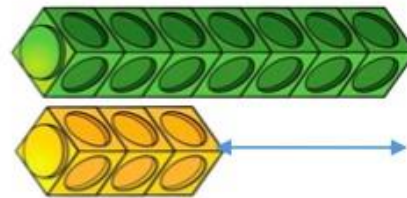
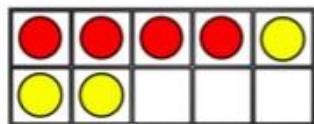
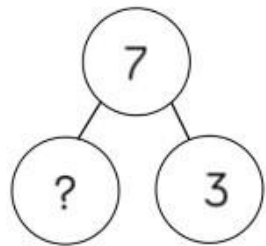
Key Stage One

Subtraction

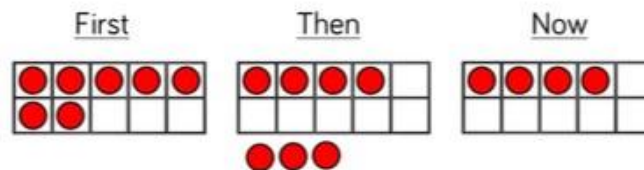
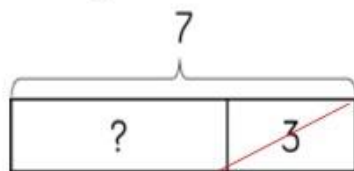
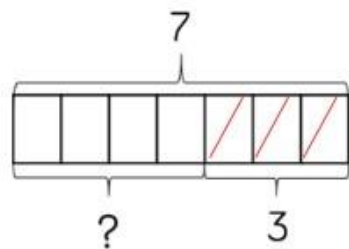
Skill	Year	Representations and models	
Subtract two 1-digit numbers to 10	1	Part-whole model Bar model Number shapes	Ten frames (within 10) Bead strings (10) Number tracks
Subtract 1 and 2-digit numbers to 20	1	Part-whole model Bar model Number shapes Ten frames (within 20)	Bead string (20) Number tracks Number lines (labelled) Straws
Subtract 1 and 2-digit numbers to 100	2	Part-whole model Bar model Number lines (labelled)	Number lines (blank) Straws Hundred square
Subtract two 2-digit numbers	2	Part-whole model Bar model Number lines (blank) Straws	Base 10 Place value counters Column addition

Skill: Subtract 1-digit numbers within 10

Year: 1



$$7 - 3 = 4$$



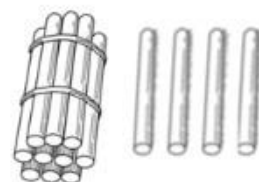
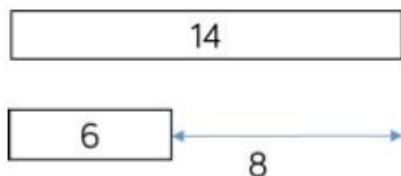
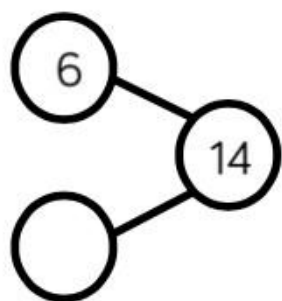
Part-whole models, bar models, ten frames and number shapes support partitioning.

Ten frames, number tracks, single bar models and bead strings support reduction.

Cubes and bar models with two bars can support finding the difference.

Skill: Subtract 1 and 2-digit numbers to 20

Year: 1/2

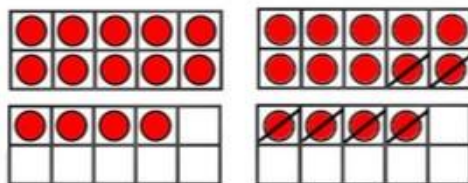
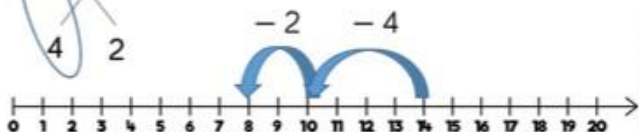


$$14 - 6 = 8$$



$$14 - 6 = 8$$

A diagram showing the number 14 with a bracket around it. A line goes from the top of the bracket down to the number 6, and another line goes from the bottom of the bracket down to the number 8.



$$14 - 6 = 8$$

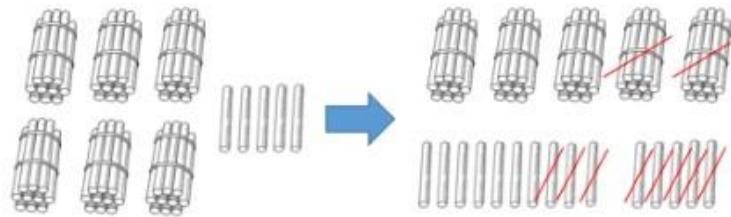
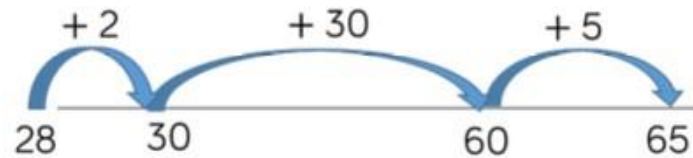
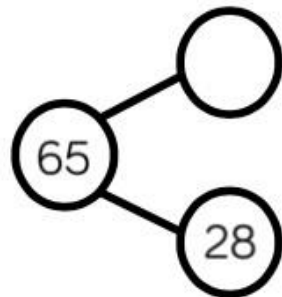
A diagram showing the number 14 with a bracket around it. A line goes from the top of the bracket down to the number 6, and another line goes from the bottom of the bracket down to the number 8.

When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.

Children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.

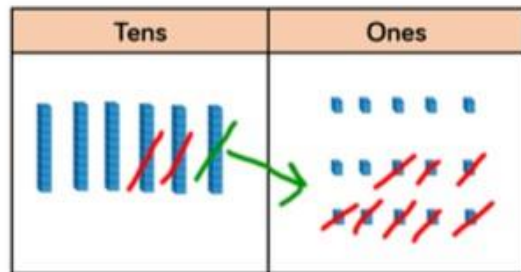
Skill: Subtract 1 and 2-digit numbers to 100

Year: 2

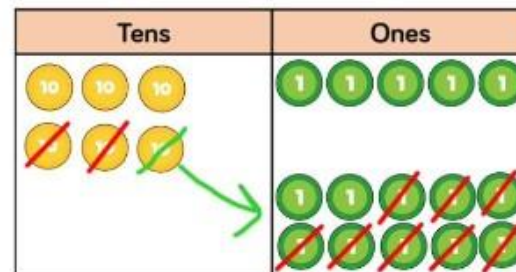


65	
?	28

$$65 - 28 = 37$$



$$\begin{array}{r} 5 \ 1 \\ 65 \\ - 28 \\ \hline 37 \end{array}$$



At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

Children can also use a blank number line to count on to find the difference. Encourage them to jump to multiples of 10 to become more efficient.

Glossary

Addend - A number to be added to another.

Aggregation - combining two or more quantities or measures to find a total.

Augmentation - increasing a quantity or measure by another quantity.

Commutative - numbers can be added in any order.

Complement - in addition, a number and its complement make a total e.g. 300 is the complement to 700 to make 1,000

Difference - the numerical difference between two numbers is found by comparing the quantity in each group.

Exchange - Change a number or expression for another of an equal value.

Minuend - A quantity or number from which another is subtracted.

Partitioning - Splitting a number into its component parts.

Reduction - Subtraction as take away.

Subitise - Instantly recognise the number of objects in a small group without needing to count.



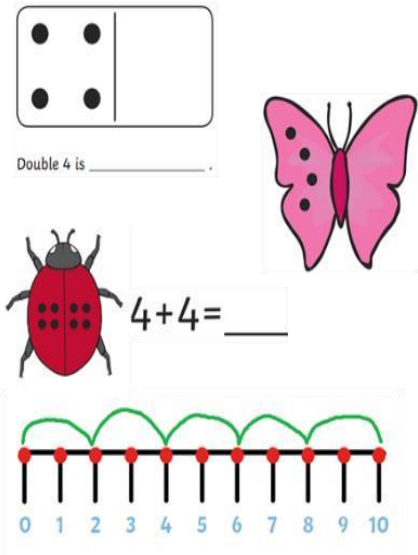
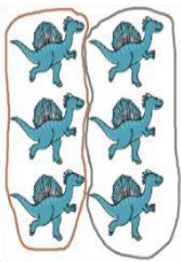
Subtrahend - A number to be subtracted from another.

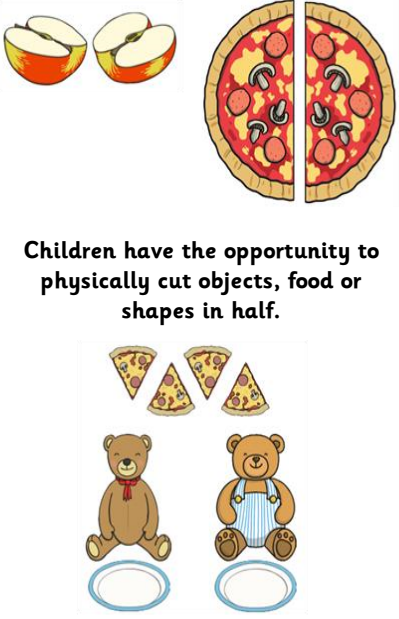
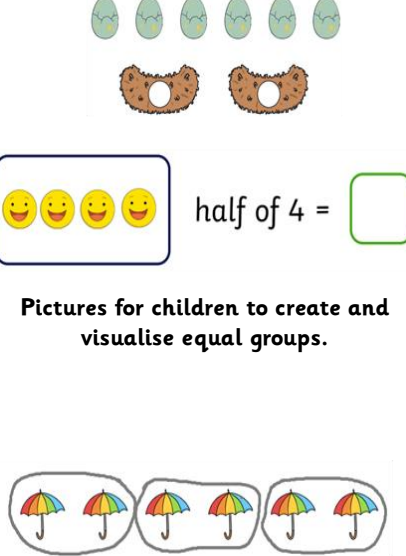
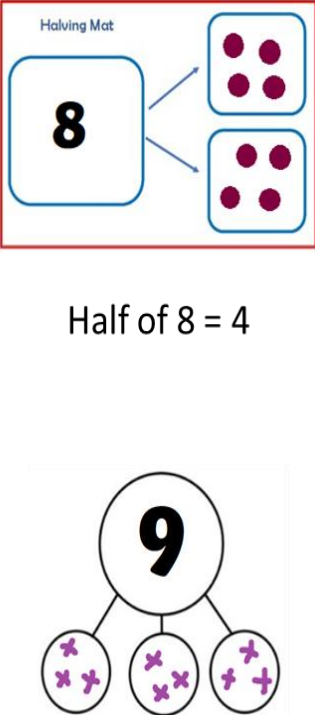
Sum - The result of an addition.

Total - The aggregate or the sum found by addition.

EYFS

**Multiplication and
Division**

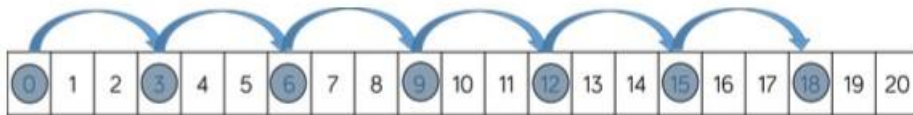
Question for Learning	Concrete	Pictorial	Abstract
<p><u>Multiplication</u> How are numbers multiplied?</p> <ul style="list-style-type: none"> • Doubling a number created two groups of the same number. • Creating multiple groups of the same quantity and counting them together. 	 <p>Practical fun activities to visualise doubling using mirrors and paint.</p>  <p>Physical and real life examples that encourage children to see concept of doubling as adding two equal groups.</p>	 <p>Double 4 is _____.</p> <p>Double 4 is 8.</p> <p>4 + 4 = _____</p> <p>Counting in 2s</p>  <p>2 groups of 3 is 6</p>	<p>Double 2 = 4</p> <p>Double 4 = 8</p> <p>$3 + 3 = 6$</p> <p>$4 + 4 = 8$</p> <p>$5 + 5 = 10$</p>

Question for Learning	Concrete	Pictorial	Abstract
<p>Division How are numbers divided?</p> <ul style="list-style-type: none"> Halving a whole. Share a quantity of objects into equal groups and count how many in each group. 	 <p>Children have the opportunity to physically cut objects, food or shapes in half.</p> <p>Counting and other Maths resources for children to share into two equal groups.</p> <p>Use visual supports such as halving mats and part whole models, with the physical objects and resources that can be manipulated.</p>	 <p>half of 4 = <input type="text"/></p> <p>Pictures for children to create and visualise equal groups.</p> <p>Pictures and icons that encourage children to see concept of halving in relation to subitising, addition and subtraction knowledge, i.e. knowing 4 is made of 2 groups of 2, so half of 4 is 2.</p>	 <p>Half of 8 = 4</p>

Key Stage One

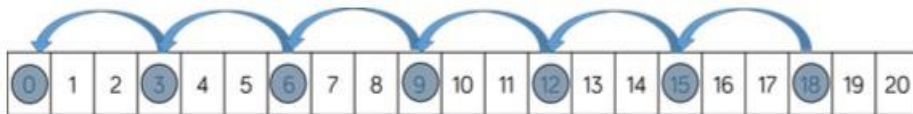
Multiplication and Division

Number Tracks



$$6 \times 3 = 18$$

$$3 \times 6 = 18$$



$$18 \div 3 = 6$$

Benefits

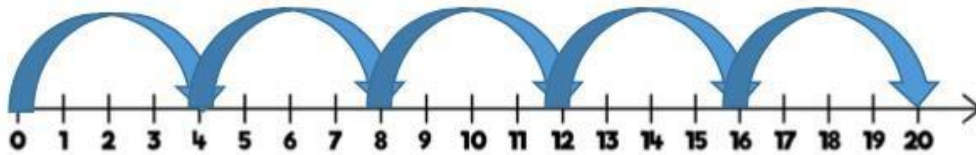
Number tracks are useful to support children to count in multiples, forwards and backwards. Moving counters or cubes along the number track can support children to keep track of their counting. Translucent counters help children to see the number they have landed on whilst counting.

When multiplying, children place their counter on 0 to start and then count on to find the product of the numbers.

When dividing, children place their counter on the number they are dividing and the count back in jumps of the number they are dividing by until they reach 0. Children record how many jumps they have made to find the answer to the division.

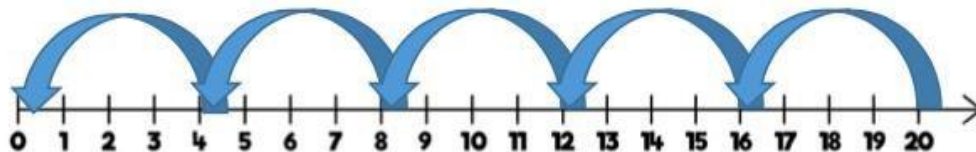
Number tracks can be useful with smaller multiples but when reaching larger numbers they can become less efficient.

Number Lines (labelled)



$$4 \times 5 = 20$$

$$5 \times 4 = 20$$



$$20 \div 4 = 5$$

Benefits

Labelled number lines are useful to support children to count in multiples, forwards and backwards as well as calculating single-digit multiplications.

When multiplying, children start at 0 and then count on to find the product of the numbers.

When dividing, start at the number they are dividing and the count back in jumps of the number they are dividing by until they reach 0.

Children record how many jumps they have made to find the answer to the division.

Labelled number lines can be useful with smaller multiples, however they become inefficient as numbers become larger due to the required size of the number line.

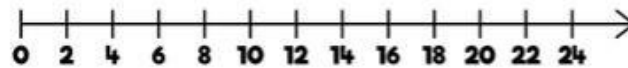
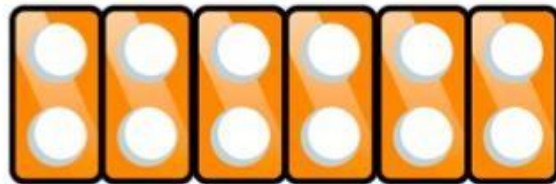
Key Stage One

Times Tables

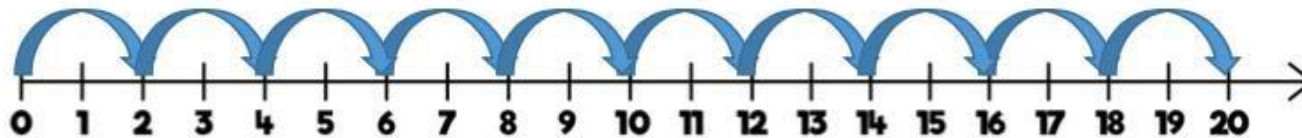
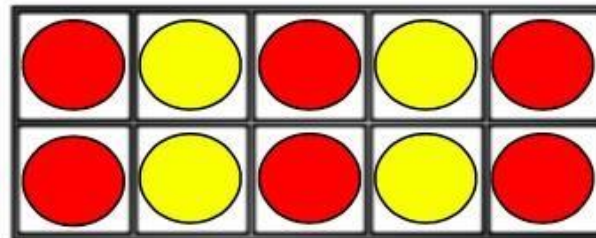
Skill	Year	Representations and models	
Recall and use multiplication and division facts for the 2-times table	2	Bar model Number shapes Counters Money	Ten frames Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 5-times table	2	Bar model Number shapes Counters Money	Ten frames Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 10-times table	2	Hundred square Number shapes Counters Money	Ten frames Bead strings Number lines Base 10

Skill: 2 times table

Year: 2



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50



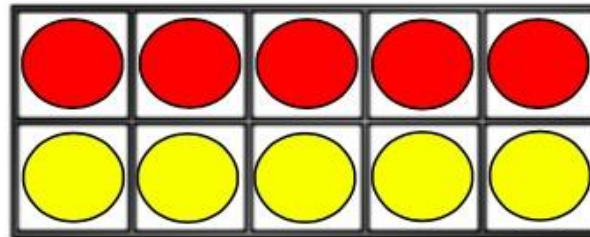
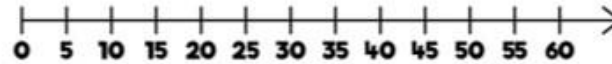
Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square.

Look for patterns in the two times table, using concrete manipulatives to support. Notice how all the numbers are even and there is a pattern in the ones.

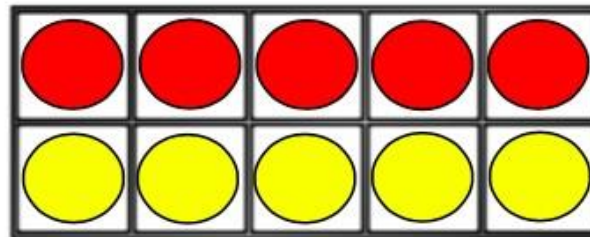
Use different models to develop fluency.

Skill: 5 times table

Year: 2



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

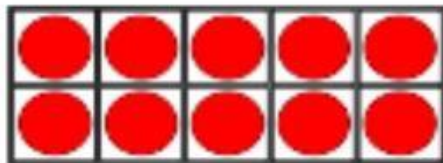
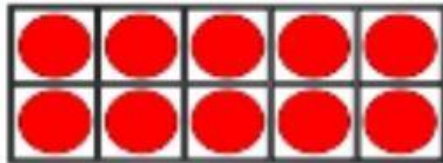


Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square.

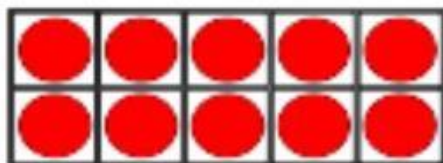
Look for patterns in the five times table, using concrete manipulatives to support. Notice the pattern in the ones as well as highlighting the odd, even, odd, even pattern.

Skill: 10 times table

Year: 2



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square.

Look for patterns in the ten times table, using concrete manipulatives to support. Notice the pattern in the digits- the ones are always 0, and the tens increase by 1 ten each time.

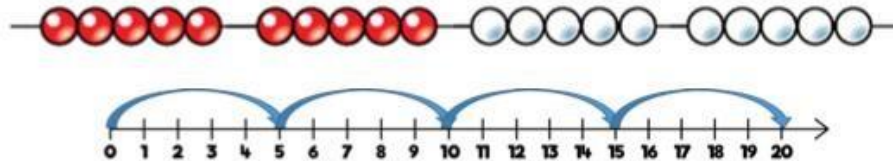
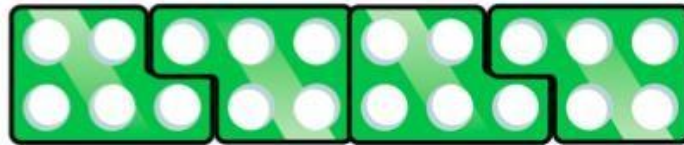
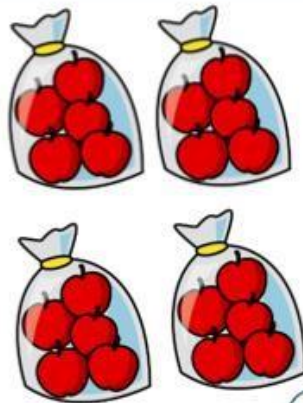
Key Stage One

Multiplication

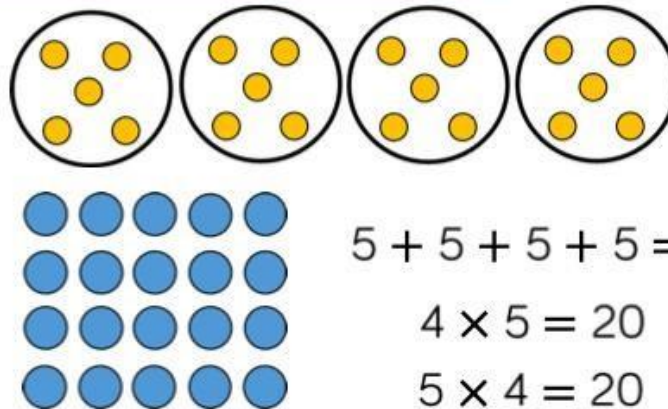
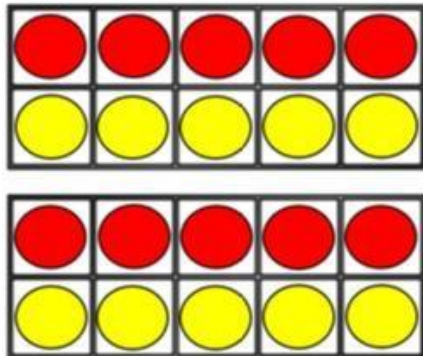
Skill	Year	Representations and models	
Solve one-step problems with multiplication	1/2	Bar model Number shapes Counters	Ten frames Bead strings Number lines
Multiply 2-digit by 1-digit numbers	3/4	Place value counters Base 10	Short written method Expanded written method
Multiply 3-digit by 1-digit numbers	4	Place value counters Base 10	Short written method
Multiply 4-digit by 1-digit numbers	5	Place value counters	Short written method

Skill: Solve 1-step problems using multiplication

Year: 1/2



One bag holds 5 apples.
How many apples do 4 bags hold?



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

$$4 \times 5 = 20$$

$$5 \times 4 = 20$$

Children represent multiplication as repeated addition in many different ways.

In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally.

In Year 2, children are introduced to the multiplication symbol.

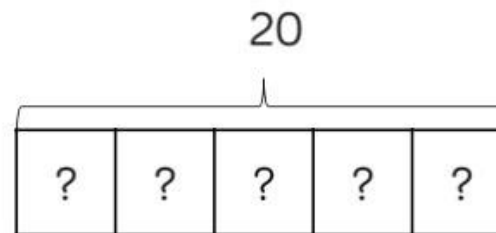
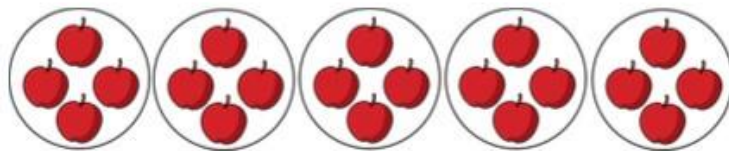
Key Stage One

Division

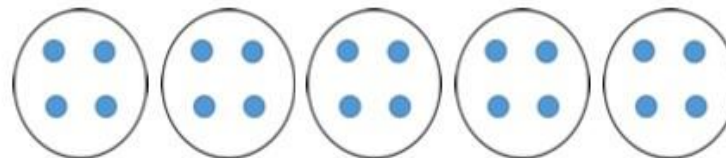
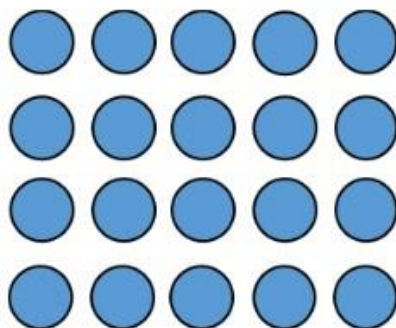
Skill	Year	Representations and models	
Solve one-step problems with division (sharing)	1/2	Bar model Real life objects	Arrays Counters
Solve one-step problems with division (grouping)	1/2	Real life objects Number shapes Bead strings Ten frames	Number lines Arrays Counters
Divide 2-digits by 1-digit (no exchange sharing)	3	Straws Base 10 Bar model	Place value counters Part-whole model
Divide 2-digits by 1-digit (sharing with exchange)	3	Straws Base 10 Bar model	Place value counters Part-whole model

Skill: Solve 1-step problems using multiplication (sharing)

Year: 1/2



There are 20 apples altogether.
They are shared equally between 5 bags.
How many apples are in each bag?



$$20 \div 5 = 4$$

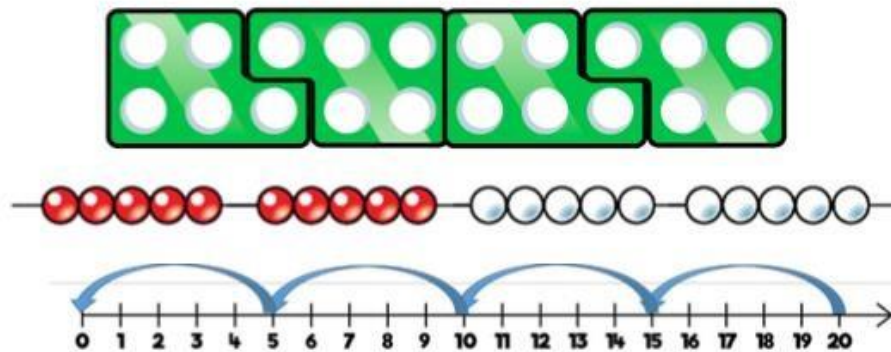
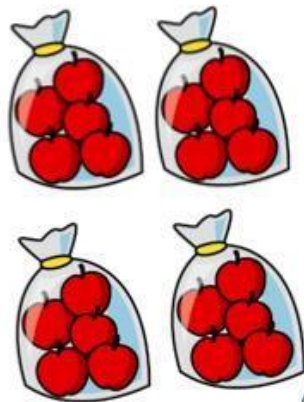
Children solve problems by sharing amounts into equal groups.

In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally.

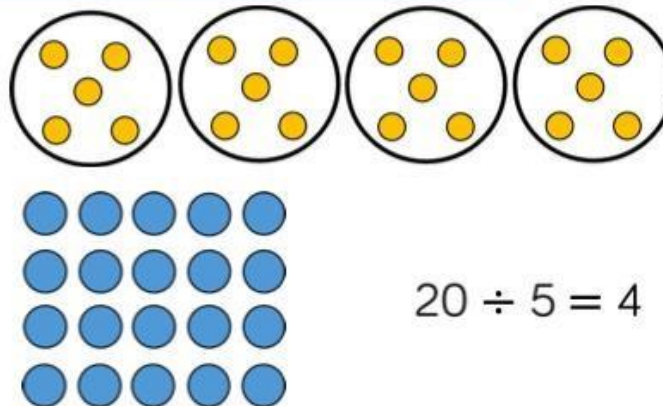
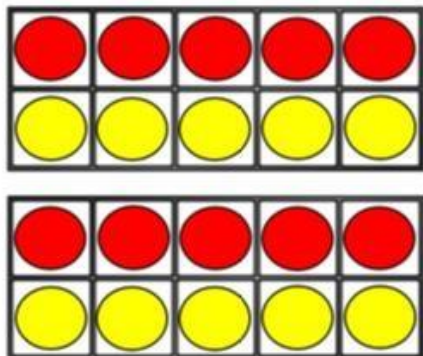
In Year 2, children are introduced to the division symbol.

Skill: Solve 1-step problems using division (grouping)

Year: 1/2



There are 20 apples altogether.
They are put in bags of 5.
How many bags are there?



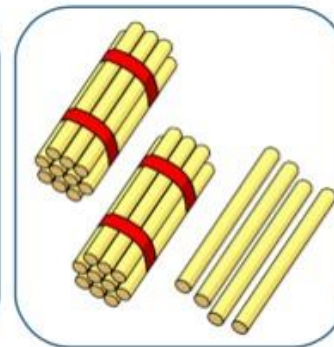
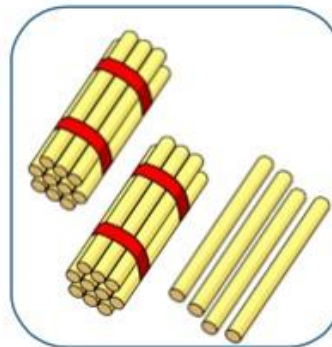
$$20 \div 5 = 4$$

Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.

Skill: Divide 2-digits by 1-digit (sharing with no exchange)

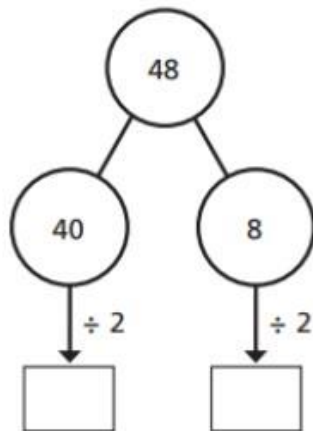
Year: 1/2

Tens	Ones
10 10	1 1 1 1
10 10	1 1 1 1

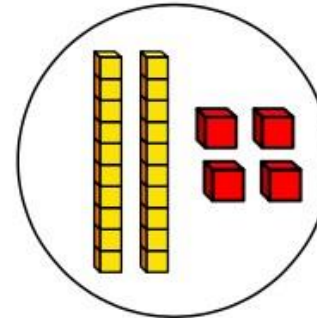
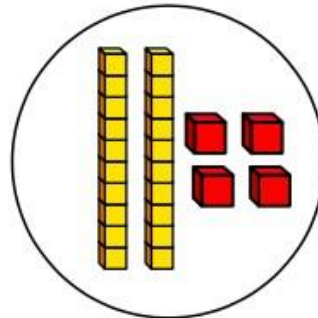


When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones.

Straws, Base 10 and place value counters can all be used to share numbers into equal groups.



$$48 \div 2 = 24$$



Part-whole models can provide children with a clear written method that matches the concrete representation.

Glossary

Array – An ordered collection of counters, cubes or other item in rows and columns.

Commutative – Numbers can be multiplied in any order.

Dividend – In division, the number that is divided.

Divisor – In division, the number by which another is divided.

Exchange – Change a number or expression for another of an equal value.

Factor – A number that multiplies with another to make a product.

Multiplicand – In multiplication, a number to be multiplied by another.

Partitioning – Splitting a number into its component parts.

Product – The result of multiplying one number by another.

Quotient – The result of a division

Remainder – The amount left over after a division when the divisor is not a factor of the dividend.

Scaling – Enlarging or reducing a number by a given amount, called the scale factor