Southbourne Junior School
Calculation Policy

This progression in calculation policy has been adopted from the White Rose Maths Hub Calculation Policies. It is a working document and will be revised and amended as necessary.

The document is broken down into addition and subtraction, and multiplication and division.

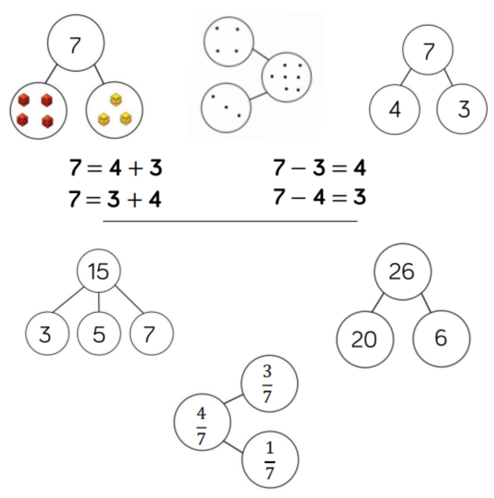
At the start of the policy, there is an overview of the different models and images that we use to support the teaching of different concepts. For each model, an explanation is given providing the benefits of using the model and the links between different operations.

Each operation is then broken down into skills showing the different models that we use to effectively teach the concept. This guidance supports staff to embed metacognitive processes in their planning and teaching- SDP long term priority 2021-2024.

A glossary of terms is provided at the end of the policy to support understanding of the key language used to teach the four operations.

Addition & Subtraction

Part-Whole Model



Supports children's understanding of aggregation and partitioning.

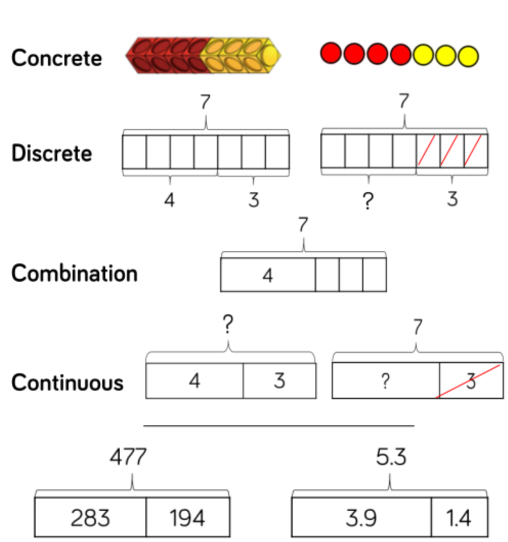
When the parts are complete and the whole is empty, children use aggregation to add the parts together to find the total.

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.

Children also apply their understanding of the part-whole model to add and subtract fractions, decimals and percentages.

Bar Model (single)



The single bar model is another type of a part-whole model that can support children in representing calculations to help them unpick the structure. Cubes and counters can be used in a line as a concrete representation of the bar model.

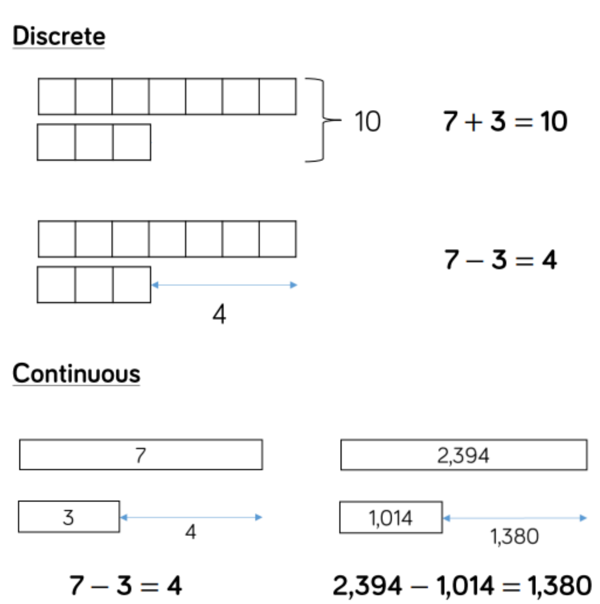
Discrete bar models are a good starting point with smaller numbers where each box represents one whole.

The combination bar model can support children to calculate by counting on from the larger number.

Continuous bar models are useful for a range of values. Each rectangle represents a number. The question mark indicates the value to be found.

Children use bar models to represent larger numbers, decimals and fractions.

Bar Model (multiple)



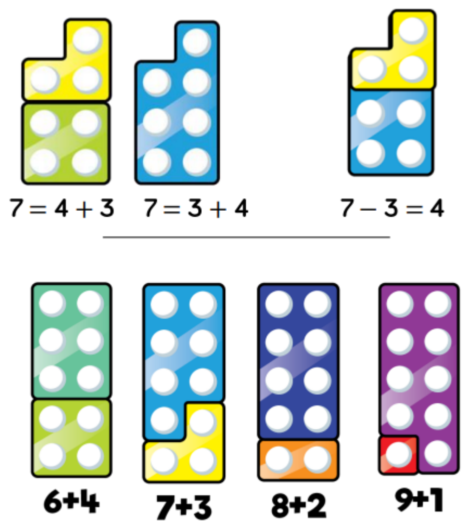
The multiple bar model is a good way to compare quantities whilst still unpicking the structure.

Two or more bars can be drawn, with a bracket labelling the whole. Smaller numbers can be represented with a discrete bar model whilst continuous bar models are more effective for larger numbers.

Multiple bar models can also be used to represent the difference in subtraction. An arrow can be used to model the difference.

When working with smaller numbers, children can use cubes and a discrete model to find the difference. This supports children to see how counting on can help when finding the difference.

Numicon Number Shapes



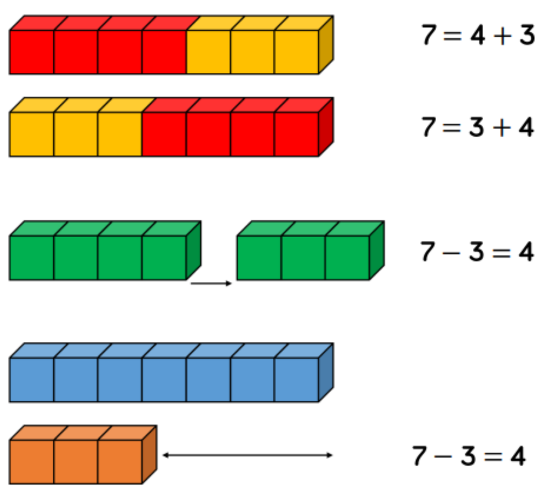
Numicon shapes support children to subitise numbers as well as explore aggregation, partitioning and number bonds.

When adding numbers, children can see how the parts come together making a whole. As children use the shapes more often, they can start to subitise the total due to their familiarity with the shape of each number.

When subtracting, children start with the whole and then place one of the parts on top of the whole to see what part is missing. Again, children will start to be able to subitise the part that is missing as they become more familiar with the shapes.

Children can also work systematically to find number bonds. As they increase one number by 1, they can see that the other number decreases by 1 to find all the possible number bonds for a number.

Cubes

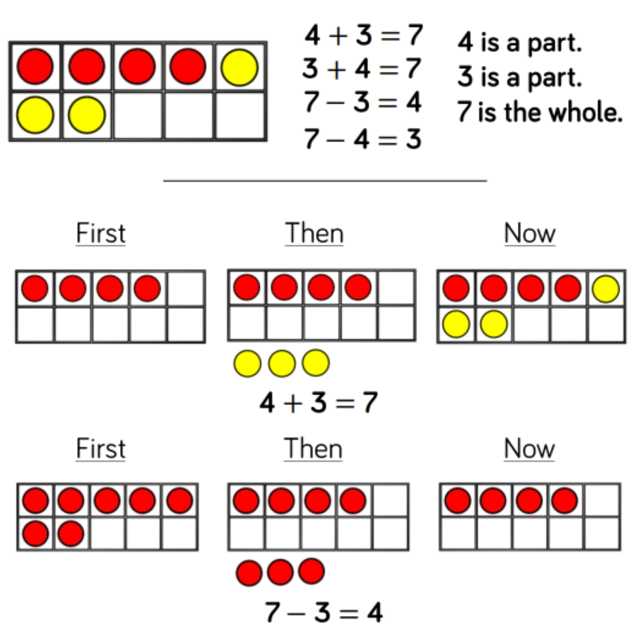


Cubes can be used to support children with the addition and subtraction of one-digit numbers.

When adding, children can see how the parts come together to make a whole. Two different colours of cubes can be used to represent the numbers before putting them together to create the whole. When subtracting, children can start with the whole and then remove the number of cubes that they are subtracting. This model of subtraction is reduction, or take away.

Cubes can also be used to look at subtraction as difference. Both numbers are made 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)



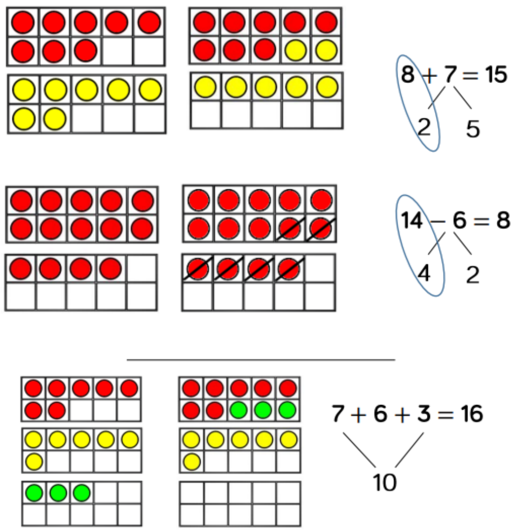
The ten frame can support children to understand the different structures of addition and subtraction (within ten).

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

Aggregation- a form of addition where parts are combined together to make a whole.
Partitioning- 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.
Ten frames can also be used to look at augmentation (increasing a number) and take-away (decreasing). 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.

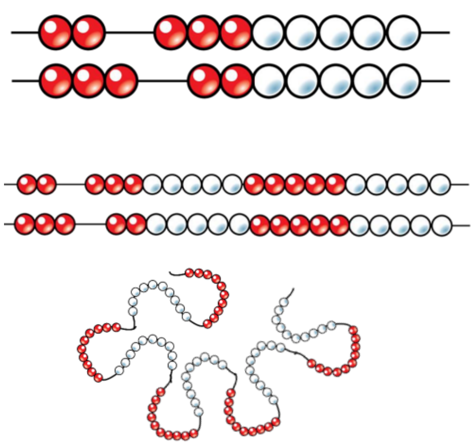
Ten Frames (within 20)



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 methods of addition.

When subtracting a one-digit number from a two-digit number, firstly make the larger number of 2 ten frames. Remove the smaller number, thinking carefully about how the number has been partitioned 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.

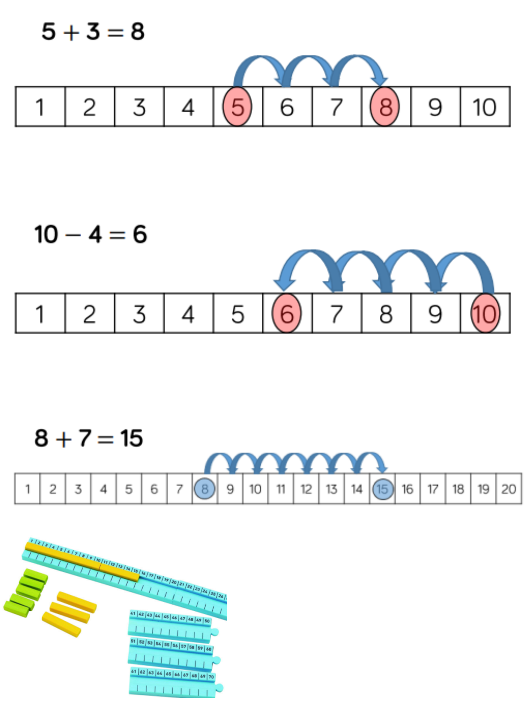
Bead Strings



Different sizes of bead strings can support children at different stages of addition and subtraction.

Bead strings to 10 are very effective at helping children to investigate number bonds to 10. They can systematically find all the number bonds to 10 by moving ine bead at a time to see the different numbers they have partitioned the 10 beads into e.g. 2+8=10, move one bead, 3+7=10.Bead strings to 20 work in a similar way but they also group the beads in fives. Children apply their knowledge of number bonds to 10 and see the links to numbers bonds to 10. Bead strings to 100 are grouped in tens and can support children in number bonds to 100 as well as helping when adding by making ten. Bead strings can show a link to adding to the next 10 on number lines which supports a mental method of addition.

Number Tracks & Number Rod Tracks



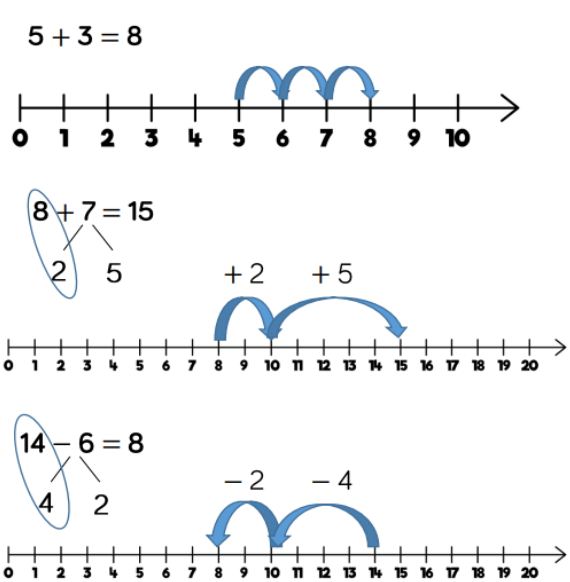
Number tracks are useful to support children in their understanding of augmentation and reduction.

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 and number rod tracks (used with cuisenaire rods) can work well alongside ten frames and bead strings which can also model counting on or back. Playing board games can also help with this concept.

Number Lines (labelled)



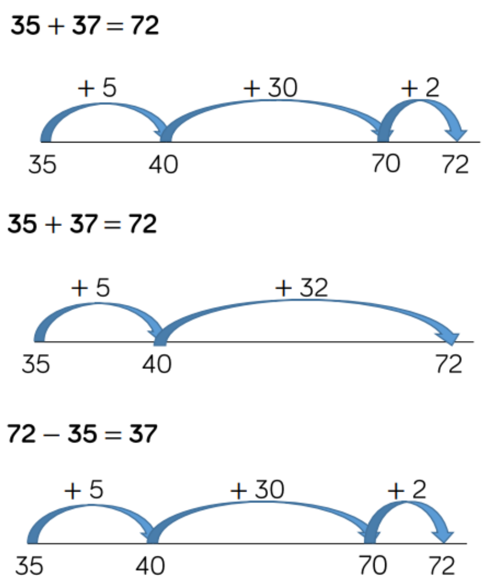
Labelled number lines support children in their understanding of addition and subtraction as augmentation and reduction.

Children can start by counting on or back in ones, up or down the number lines- 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 bonds 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 two separate jumps.

Number Lines (blank)



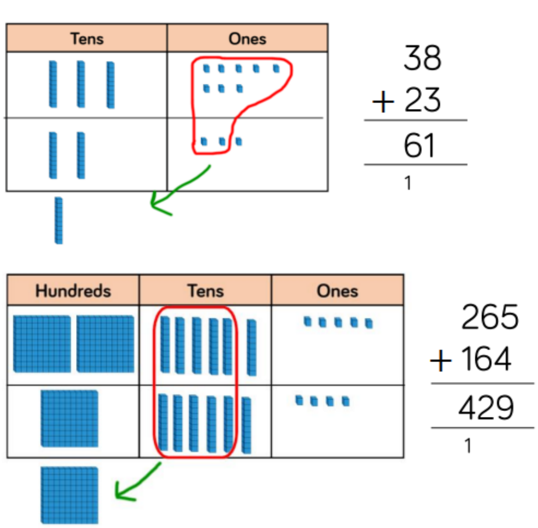
Blank number lines provide children with a structure to add and subtract numbers in smaller parts.

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 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.

Base 10/Dienes (addition)

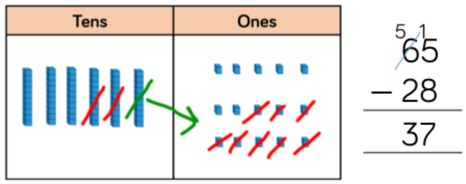


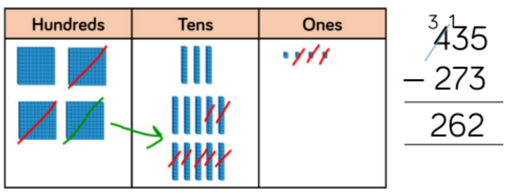
Using Base 10/Dienes supports children's understanding of column addition. It is important that children write out their calculations alongside using or drawing Base 10 so they can see the clear links between the written method and the model.

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

Children are taught to always start with the smallest place value column. Questions to support children:
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)

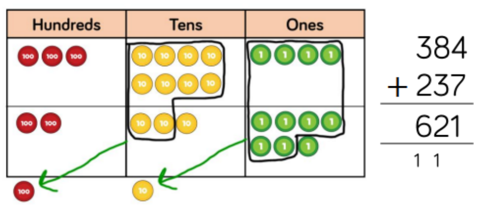


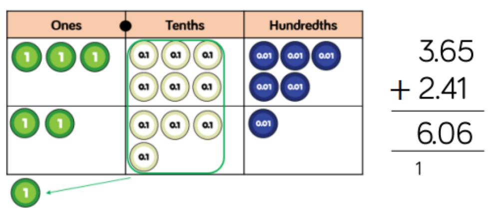


Using Base 10/Dienes supports children’s understanding of column subtraction. Again, children must write out their calculations alongside using or drawing Base 10 so they can see the clear links.

Children first subtract without exchange before moving onto exchanging. When building the model, children should just make the minuend using Base 10, they then subtract the subtrahend. Highlight this difference with 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

Place Value Counters (addition)



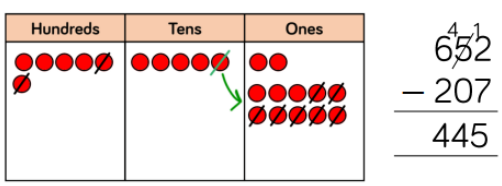


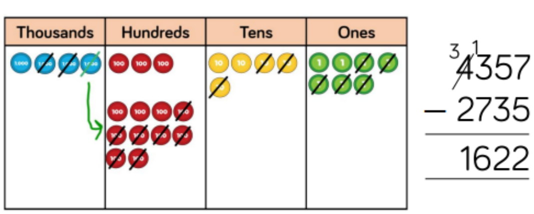
Using place value counters is an effective way to support children’s understanding of column addition. As with Base 10, it is important that children write out their calculations alongside using or drawing the counters so they can see the clear links between the written method and the model.

Children would first add without an exchange before moving onto addition with exchange. Different place value counters can be used to represent larger numbers or decimals.

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)



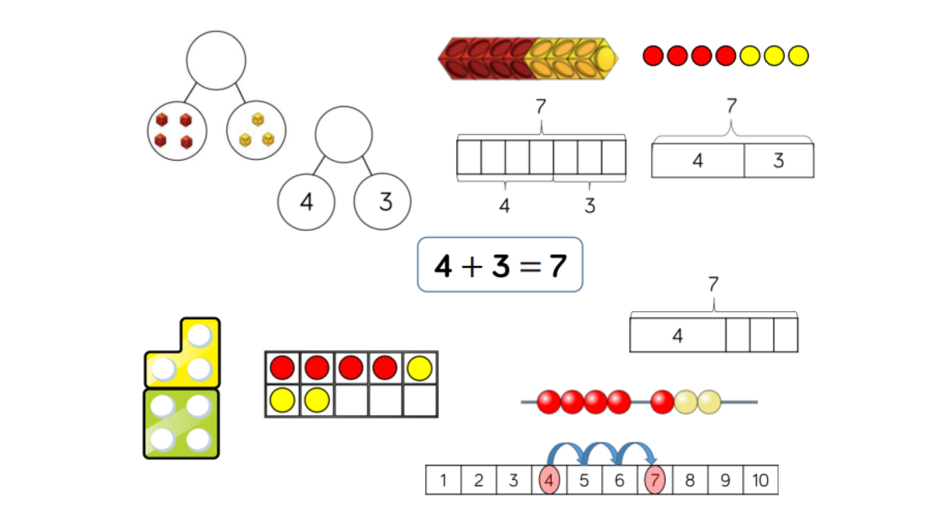
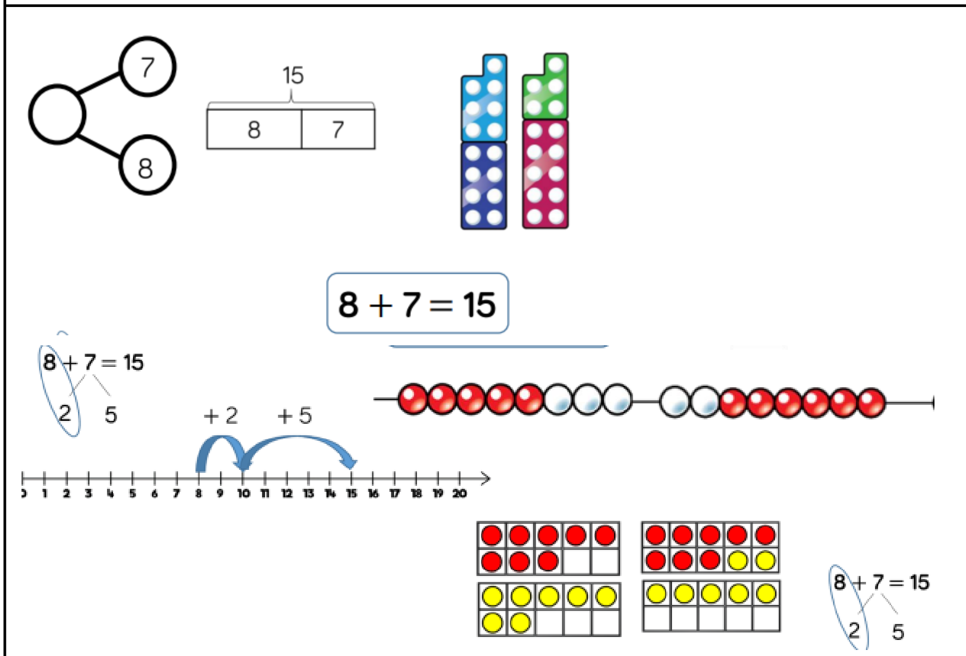
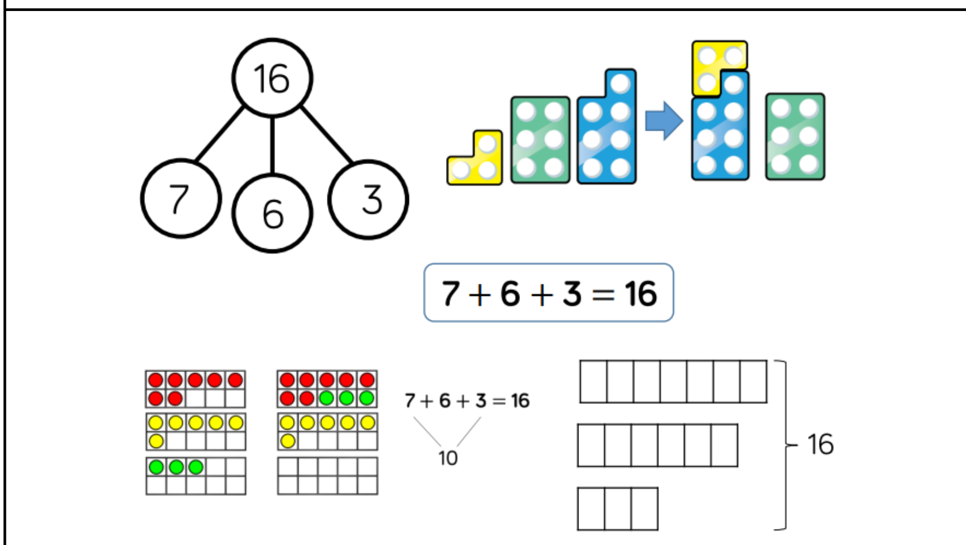


Using place value counters is an effective way to support children’s understanding of column subtraction. As with Base 10, it is important that children write out their calculations alongside using or drawing the counters so they can see the clear links between the written method and the model.

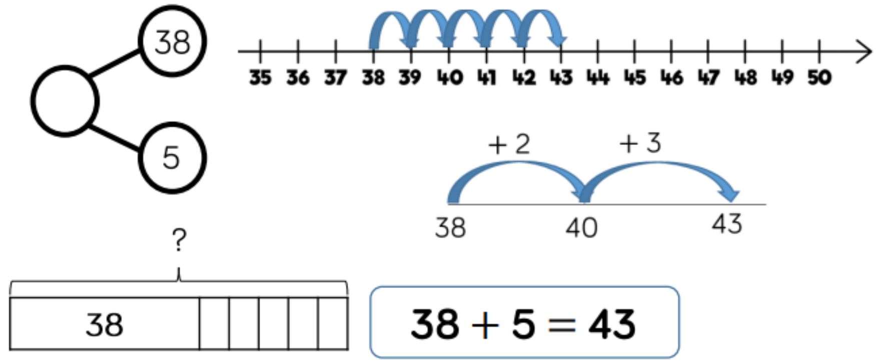
Children would first subtract without an exchange before moving onto subtraction with exchange.

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.

Addition

Skill: Add 1-digit numbers within 10	Year: 1
	When adding numbers to 10, children can explore both aggregation and augmentation. The part-whole model, discrete and continuous bar model, Numison 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 10	**Year: 1/2**
	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**
	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 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**



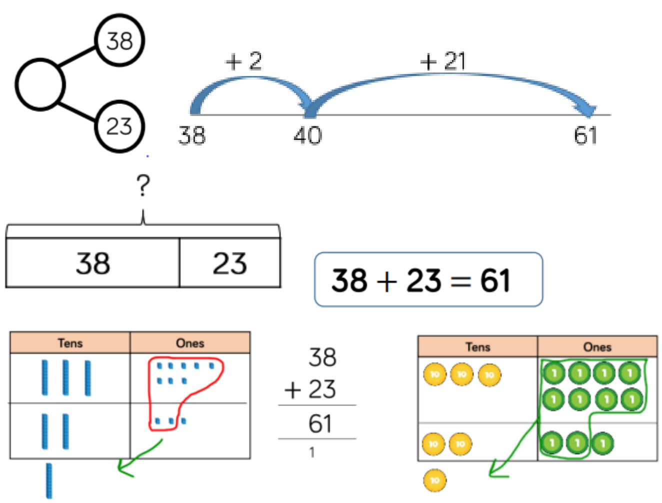
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

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 can support children to find the number bond to 10.

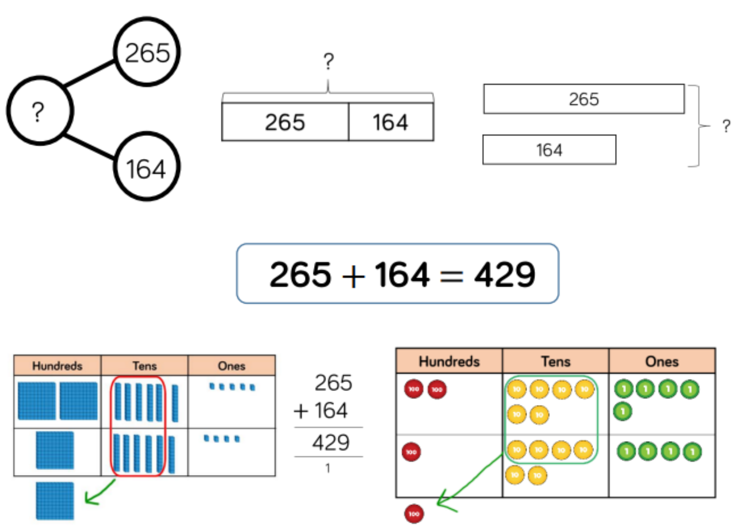
Skill: Add two 2-digit numbers to 100	**Year: 2/3**



At this stage, encourage children to use the formal column method when calculating alongside base 10 or place value counters.

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.

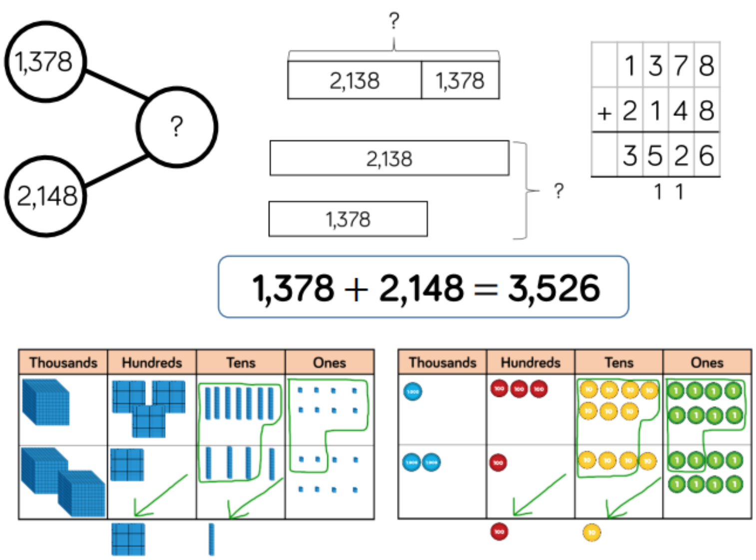
Skill: Add numbers with up to 3 digits	**Year: 3**



Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

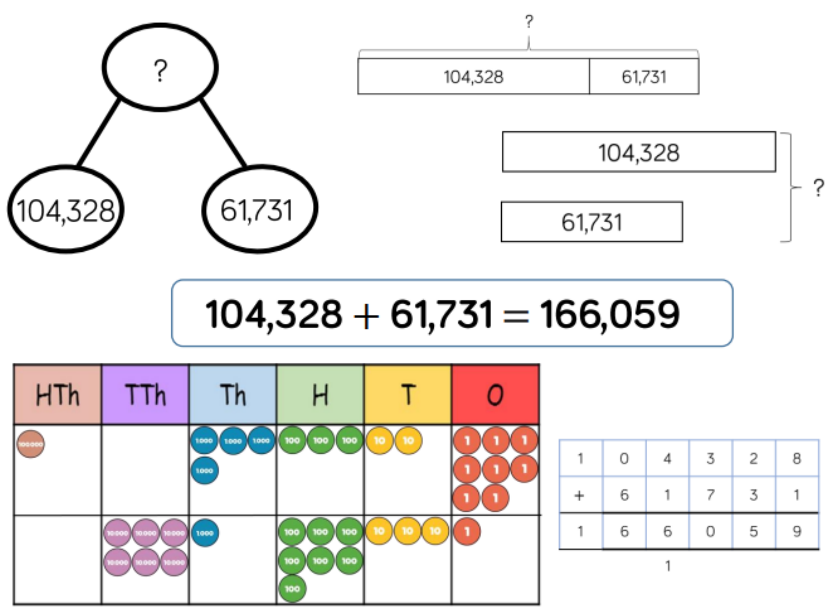
Skill: Add numbers with up to 4 digits	Year: 4



Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

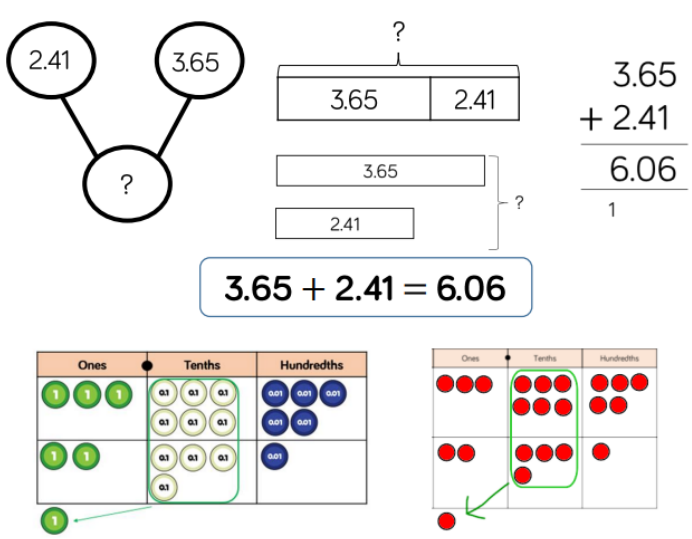
Skill: Add numbers with more than 4 digits	Year: 5/6



Place value counters on a place value grid are the most effective resources when adding numbers with more than 4 digits.

At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.

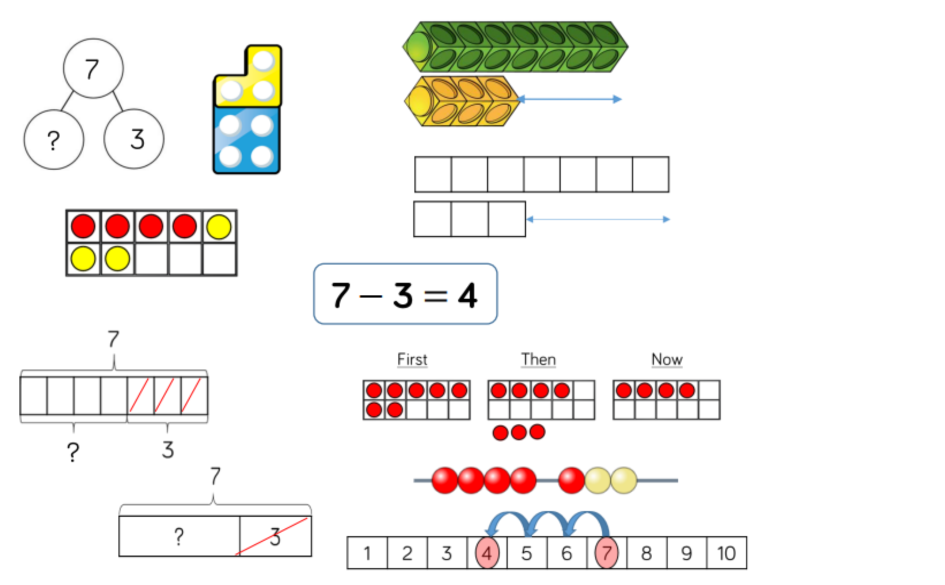
Skill: Add with up to 3 decimal places	Year: 5



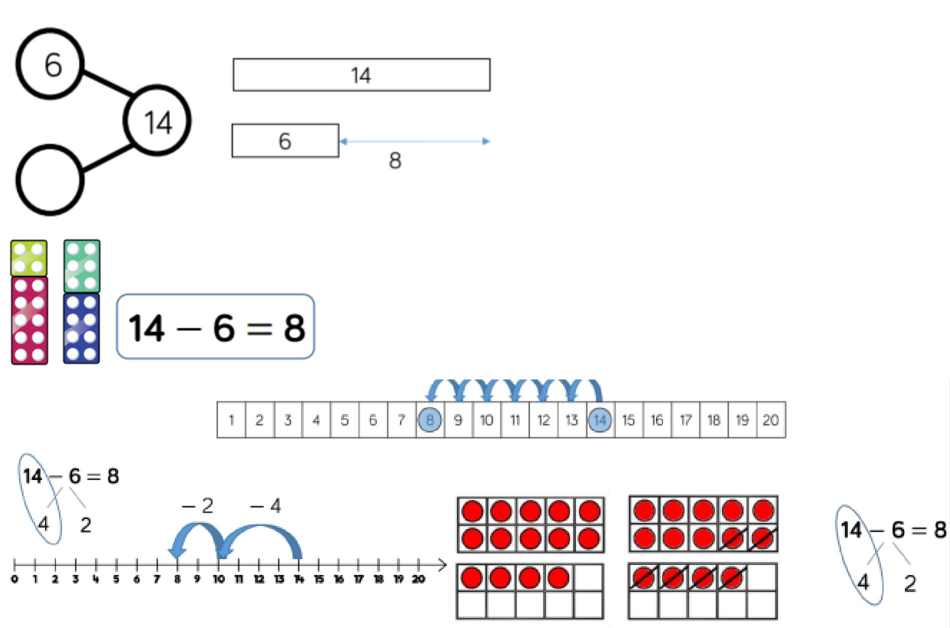
Place value counters on a place value grid are the most effective manipulatives when adding decimals with 1,2 and then 3 decimal places.

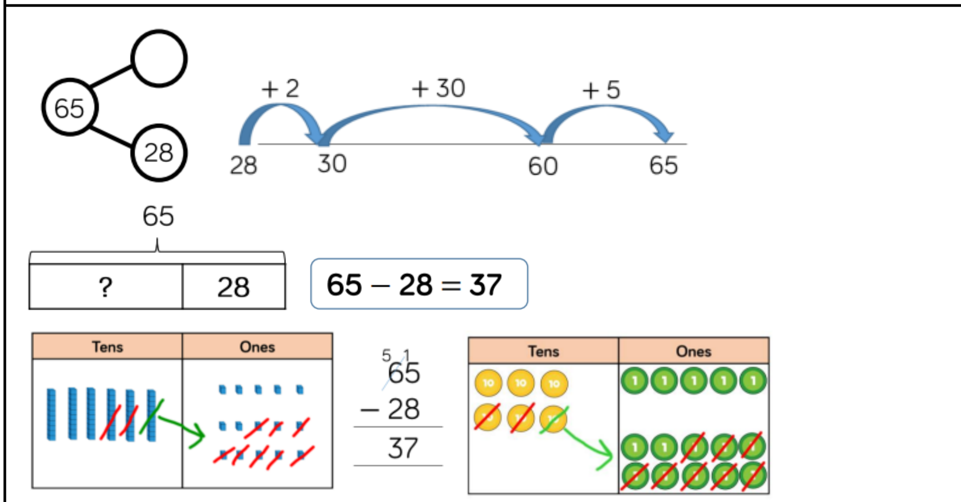
Ensure children have experience of adding decimals with a variety of decimals places. This includes putting this into context when adding money and other measures.

Subtraction

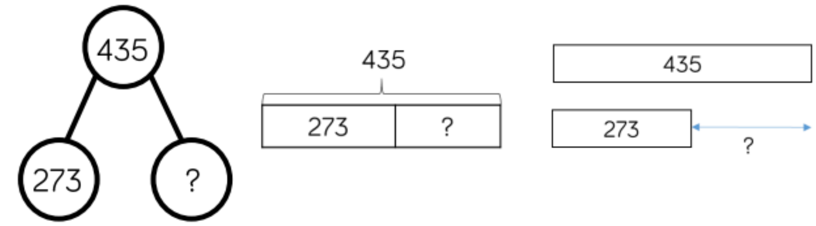
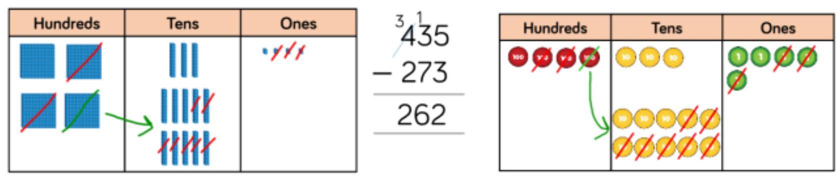
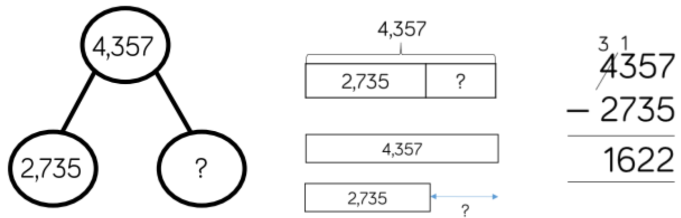
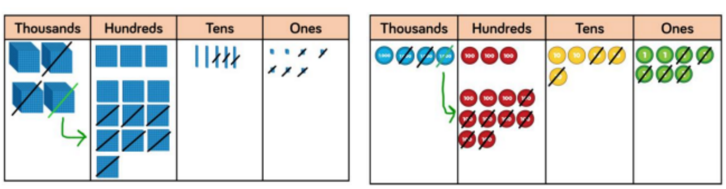
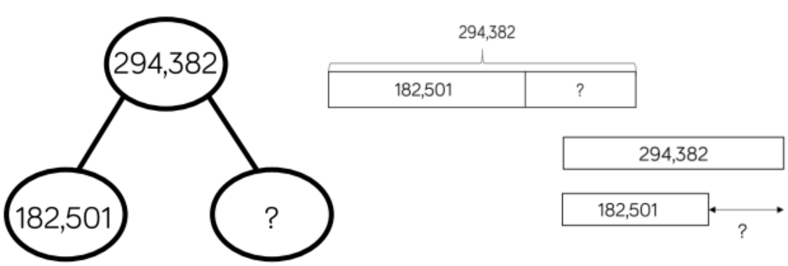
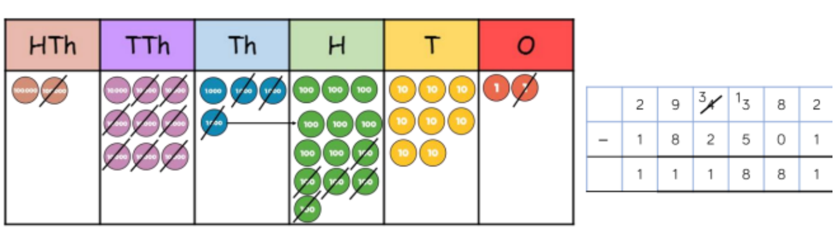
<table>
<tr><th>Skill: Subtract 1-digit numbers within 10</th><th>Year: 1</th></tr>
<tr><td>
</td><td>Part-whole models, bar models, ten frames and Numicon shapes support partitioning.

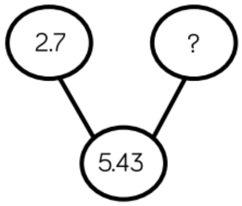
Ten frames, number tracks, single bar models and bead strings support reduction.

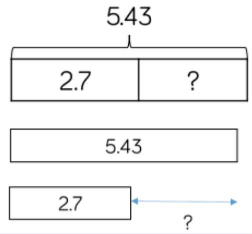
Cubes and bar models with two bars can support finding the difference.</td></tr>
<tr><th>Skill: Subtract 1 and 2-digit numbers to 20</th><th>Year: 1/2</th></tr>
<tr><td>
</td><td>When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.

Children should be encouraged to find the number bonds to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are useful for this.</td></tr>
<tr><th>Skill: Subtract 1 and 2-digit numbers to 100</th><th>Year: 2</th></tr>
<tr><td>
</td><td>At this stage, encourage children to use the formal column method when calculating alongside base 10 or place value counters.

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

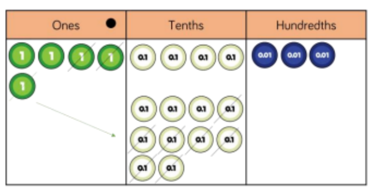
Skill: Subtract numbers with up to 3 digits	Year: 3
 **435 – 273 = 262** 	Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 3 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written method.
Skill: Subtract numbers with up to 4 digits	**Year: 4**
 **4,357 – 2,735 = 1,622** 	Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written method.
Skill: Subtract numbers with more than 4 digits	**Year: 5/6**
 **294,382 – 182,501 = 111,881** 	Place value counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using the column method to subtract larger numbers efficiently.

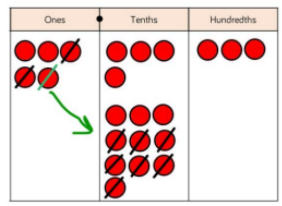
<table>
<tr><th>Skill: Subtract with up to 3 decimal places</th><th>Year: 5</th></tr>
<tr><td>




$\begin{array}{r} \overset{4}{\cancel{5}}.\overset{1}{4}3 \\ -\ 2.7 \\ \hline 2.73 \\ \hline \end{array}$

$5.43 - 2.7 = 2.73$

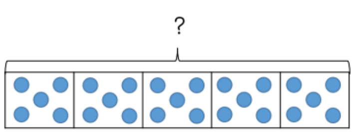




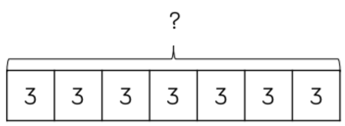
</td><td>
Place value counters on a place value grid are the most effective concrete resource when subtracting decimals with 1,2 and then 3 decimal places.

Ensure children have experience of subtracting with a variety of decimal places. This includes putting this into context when subtracting money and other measures.
</td></tr>
</table>

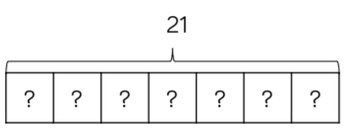
Multiplication & Division

<table>
<tr><th colspan="2">Bar Model</th></tr>
<tr><td>


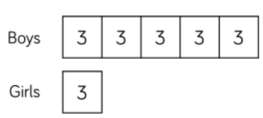
$5 \times 5 = 25$



$3 \times 7 = 21$
$7 \times 3 = 21$



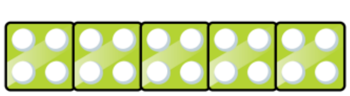
$21 \div 7 = 3$



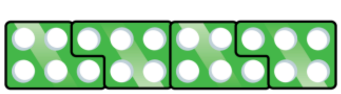
</td><td>
Children can use the single bar model to represent multiplication as repeated addition. They could use counters, cubes or dots within the bar model to support calculation before moving on to placing digits into the bar model to represent multiplication.

Division can be represented by showing the total of the bar model and then dividing the bar model into equal groups.

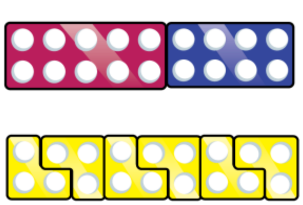
It is important when solving word problems that the bar model represents the problem.

Sometimes children may look at scaling problems. In this case, more than one bar model is useful to represent this type of problem e.g. There are 3 girls in a group. There are 5 times more mores than girls. How many boys are there?
The multiple bar model provides an opportunity to compare the groups.
</td></tr>
<tr><th colspan="2">Numicon Number Shapes</th></tr>
<tr><td>


$5 \times 4 = 20$
$4 \times 5 = 20$



$5 \times 4 = 20$
$4 \times 5 = 20$



$18 \div 3 = 6$
</td><td>
Numicon shapes support children’s understanding of multiplication as repeated addition.

Children can build multiplications in a row using the shapes. When using odd numbers, encourage children to interlock the shapes over the top of the row to check the total. Using the shapes in multiplication can support children in discovering patterns of multiplication e.g. odd x odd = even, odd x even= odd, even x even = even.

When dividing, shapes support children’s understanding of division as grouping. Children make the number they are dividing by over the top of the number to find how many groups of the number there are altogether e.g. There are 6 groups of 3 in 18.
</td></tr>
</table>

Bead Strings

$5 \times 3 = 15$
$3 \times 5 = 15$

$15 \div 3 = 5$

$5 \times 3 = 15$
$3 \times 5 = 15$

$15 \div 5 = 3$

$4 \times 5 = 20$
$5 \times 4 = 20$

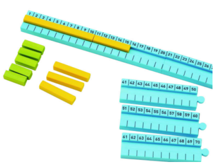
$20 \div 4 = 5$

Bead strings to 100 can support children in their understanding of multiplication as repeated addition. Children can build the multiplication using the beads. The colour of beads supports children in seeing how many groups of 10 they have, to calculate the total more efficiently.

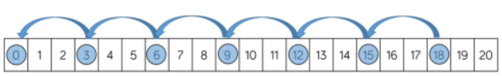
Encourage children to count in multiples as they build the number e.g. 4,8,12, 6, 20. Children can also use the bead string to count forwards and backwards in multiples, moving the beads as they count.

When dividing, children build the number they are dividing and then group the beads into the number they are dividing by e.g. 20 divided by 4- Make 20 and then group the beads into groups of four. Count how many groups you have made to find the answer.

Number Tracks & Number Rod Tracks



$6 \times 3 = 18$
$3 \times 6 = 18$



$18 \div 3 = 6$

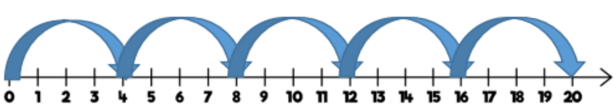
Number tracks and Number Rod tracks (used with cuisenaire rods) are useful to support children to count in multiples, forwards and backwards. Moving counters or cubes along the number track can support children to keep track of their counting.

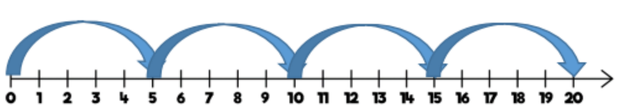
When multiplying, children place their counter on 0 to start and then count on to find the product of the numbers.

When dividing, children place their counter on the number they are dividing and they 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.

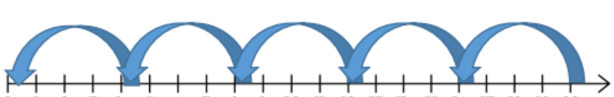
Number tracks can be useful with smaller multiples but when reaching larger numbers they become less efficient.

Number Lines (labelled)





$4 \times 5 = 20$
$5 \times 4 = 20$



$20 \div 4 = 5$

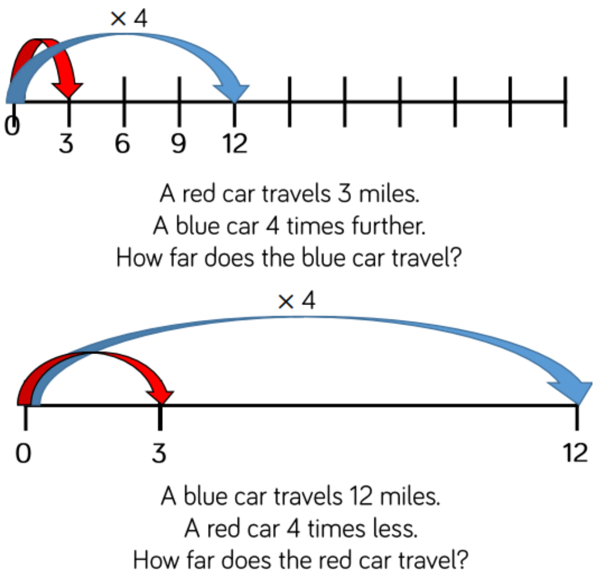
Labelled number lines are useful to support children to count in multiples, forwards, backwards as well as calculating single-digit multiplications.

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 then 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 are useful with smaller multiples, however they become inefficient as numbers become larger dur to the required size of the number line.

Number Lines (blank)

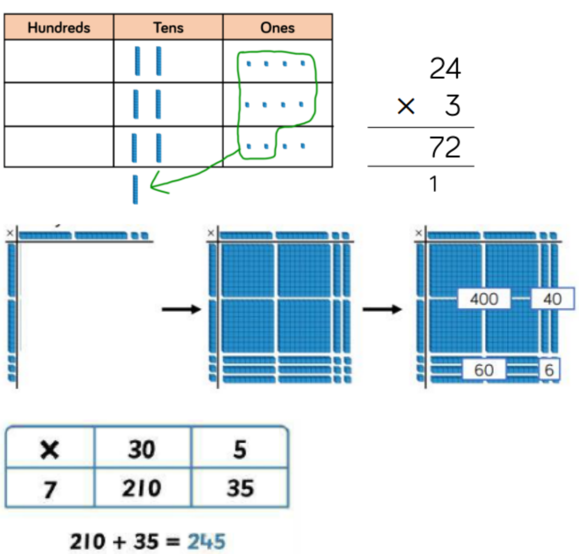


Children can use blank number lines to represent scaling as multiplication or division.

Blank number lines with intervals can support children to represent scaling accurately. Children can label intervals with multiples to calculate scaling problems.

Blank number lines without intervals can also be used for children to represent scaling.

Base 10/Dienes (multiplication)

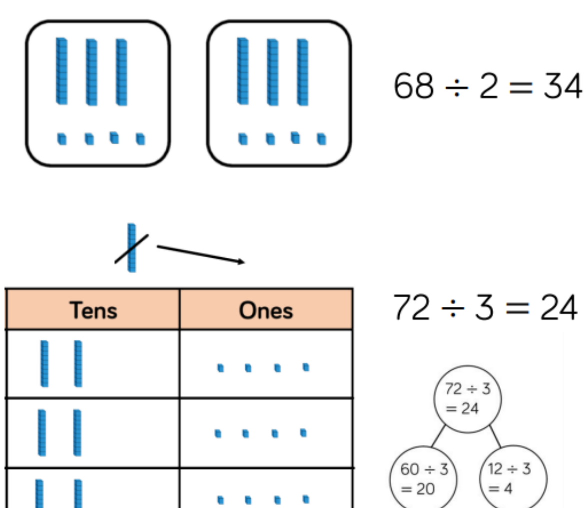


Using base 10/Dienes is an effective way to support children's understanding of column multiplication. It is important that children write out their calculations alongside the equipment so they can see how the concrete and written representations match.

As numbers become larger in multiplication or the amounts of groups becomes higher, Base 10/Dienes becomes less efficient due to the amount of equipment and number of exchanges needed.

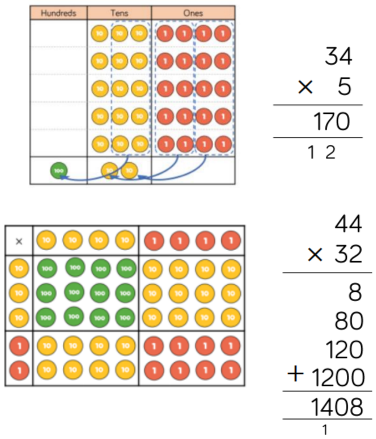
The area model (linked to the grid method). Children use the equipment to build the number in a rectangular shapes which they then find the area of by calculating the total value of the pieces.

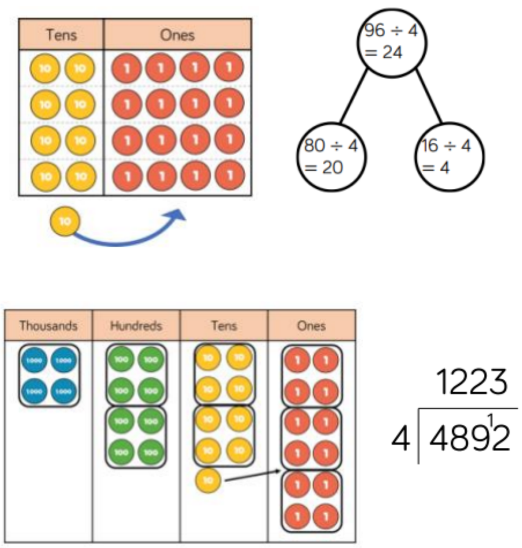
Base 10/Dienes (division)



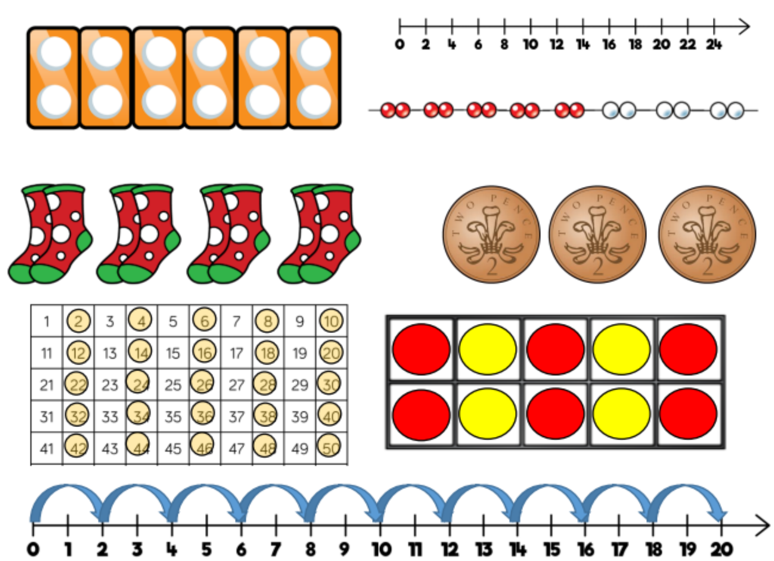
When numbers become larger, children move on from representing numbers as ones towards representing them as tens and ones in order to divide. Children can share the Base 10/Dienes between different groups e.g.by drawing circles or by rows on a place value grid.

When they are sharing, children start with the larger place value and work from left to right. If there are any left in a column, they exchange e.g. one ten for ten ones. When recording, encourage children to use the part-whole model so they can consider how the number has been partitioned in order to divide. This will support them with mental methods.

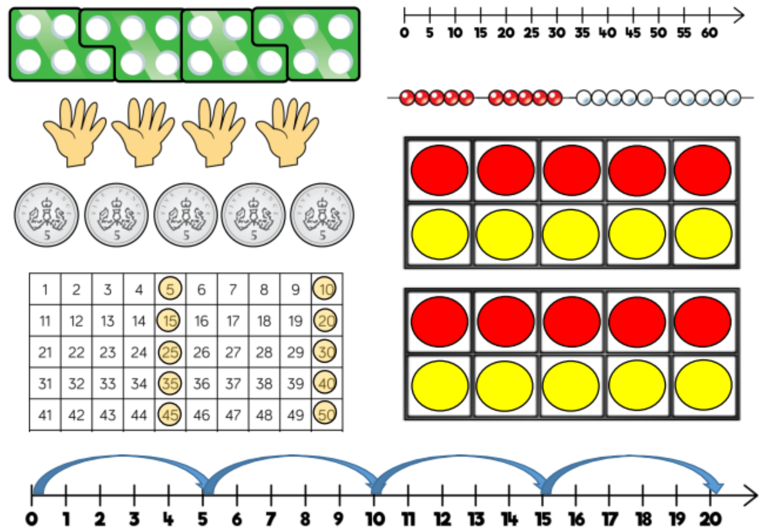
Place Value Counters (multiplication)	
	Using place value counters is an effective way to support children's understanding of column multiplication. It is important that children write out their calculation alongside the equipment so they can see how the concrete and written match. As numbers become larger in multiplication or the amount of groups becomes higher, Base 10/Dienes become less efficient due to the amount of equipment and number of exchanges needed. The counters should be used to support the understanding of the written method rather than support the arithmetic. Place value counters also support the area model of multiplication. Children can see how to multiply 2-digit numbers by 2-digit.

Place Value Counters (division)	
	Using place value counters is an effective way to support children's understanding of division. When working with smaller numbers, children can use place value counters to share between groups. They start by sharing the larger place value column and work from left to right. If there are any counters left over once they have been shared, they exchange the counter e.g. exchange one ten for ten ones. This method can be linked to the part-whole model to support children to show their thinking. Place value counters also support children's understanding of short division by grouping the counters rather than sharing them. Children work from left to right through the place value columns and group the counters in the number they are devising by. If there are any counters left over after they have been grouped, they exchange the counter e.g. exchange one hundred for ten tens.

Times Tables

Skill: 2 times table	Year: 2
	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or hundred square. Look for patterns in the two times table, using concrete manipulatives to support. Notice how all the numbers are even and this is a pattern in the ones. Use different models to develop fluency.

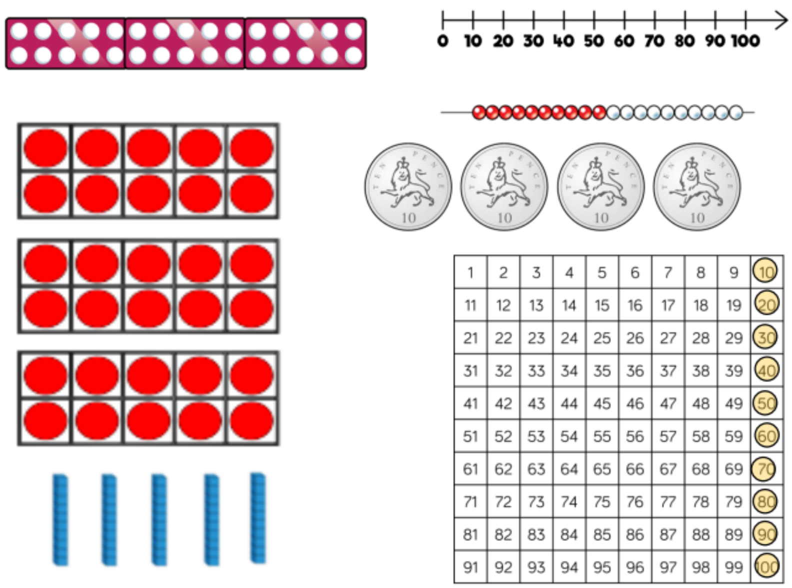
Skill: 5 times table	Year: 2



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

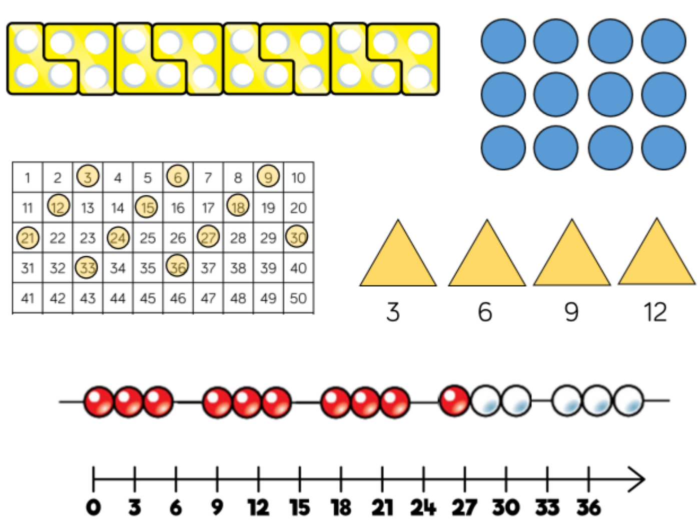
Skill: 10 times table	Year: 2



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

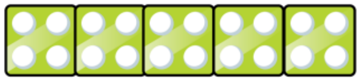
Skill: 3 times table	Year: 3



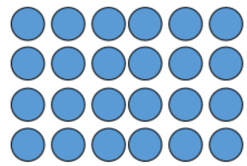
Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or hundred square.

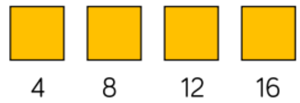
Look for patterns in the three times table, using concrete manipulatives to support. Notice the odd, even, odd, even pattern using number shapes to support. Highlight the pattern in the ones using a hundred square.

Skill: 4 times table	**Year: 3**

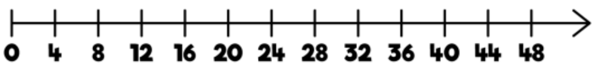


1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50





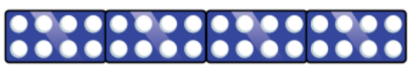
4	8	12	16	20
24	28	32	36	40
44	48	52	56	60

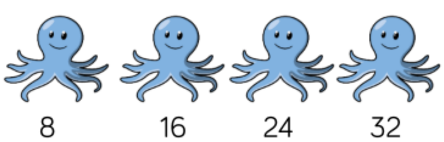


Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or hundred square.

Look for patterns in the three times table, using concrete manipulatives to support. Make links to the 2 times table, seeing how each multiple is double the twos. Notice the pattern in the ones within each group of five multiples. Highlight that all the multiples are even using Numicon shapes to support.

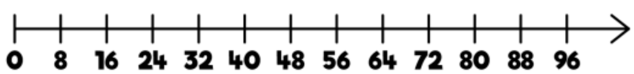
Skill: 8 times table	**Year: 3**





8	16	24	32	40
48	56	64	72	80

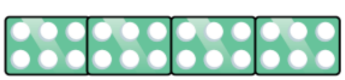
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

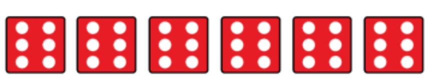


Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or hundred square.

Look for patterns in the eight times table, using concrete manipulatives to support. Make links to the 4 times table, seeing how each multiple is double the fours. Notice the pattern in the ones within each group of five multiples. Highlight that all the multiples are even using Numicon shapes to support.

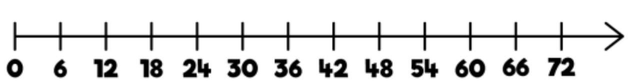
Skill: 6 times table	**Year: 4**





6	12	18	24	30
36	42	48	54	60
66	72	78	84	90

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



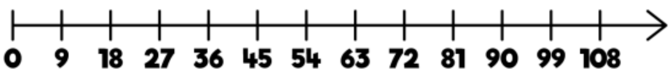
Encourage daily counting in multiples, supported by a number line or hundred square.

Look for patterns in the six times table, using manipulatives to support. Make links to the 3 times table, seeing how each multiple is double the threes. Notice the pattern in the ones within each group of five multiples. Highlight that all the multiples are even using Numicon shapes to support.

Skill: 9 times table	Year: 4

9	18	27	36	45
54	63	72	81	90

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



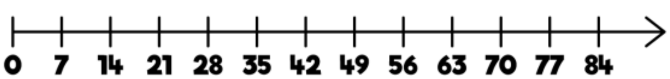
Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or hundred square.

Look for patterns in the nine times table, using concrete manipulatives to support. Notice the pattern in the tens and ones using the hundred square to support as well as noting the odd, even pattern within the multiples.

Skill: 7 times table	Year: 4

7	14	21	28	35
42	49	56	63	70

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



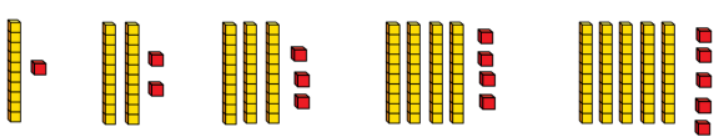
Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or hundred square.

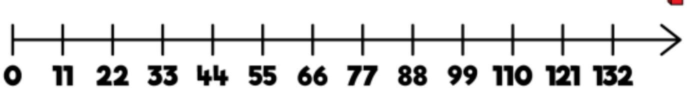
The seven times table can be trickier to learn due to the lack of obvious pattern in the numbers, however they already know several facts due to commutativity. Children can still see the odd, even pattern in the multiples using Numicon shapes to support.

Skill: 11 times table	Year: 4

11	22	33	44	55	66
77	88	99	110	121	132

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

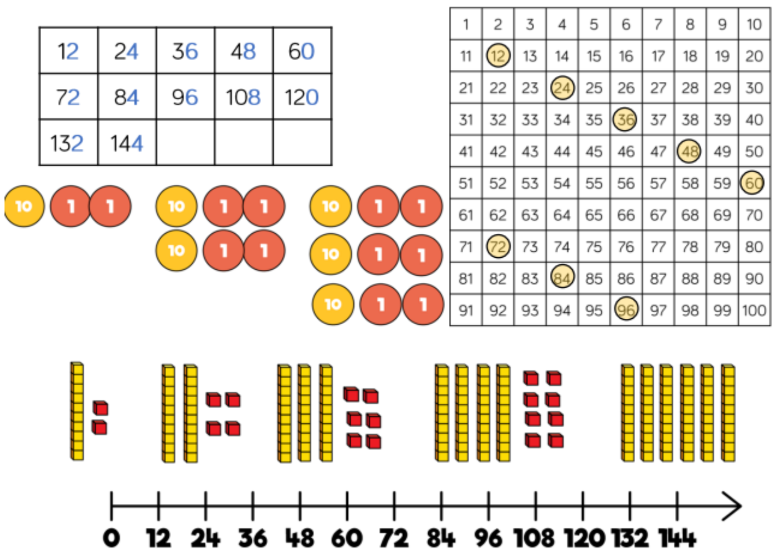




Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or hundred square.

Look for patterns in the eleven times table, using concrete manipulatives to support. Notice the pattern in the tens and ones using the hundred square to support. Also consider the pattern after crossing 100.

Skill: 12 times table	Year: 4

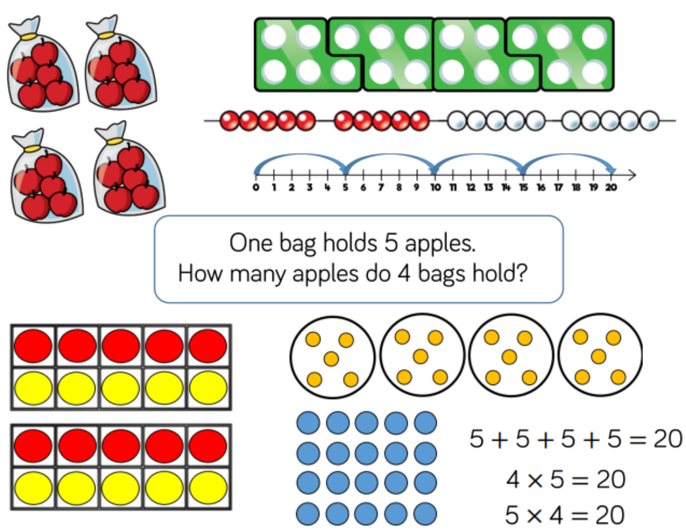


Encourage daily counting in multiples, supported by a number line or hundred square.

Look for patterns in the 12 times table, using manipulatives to support. Make links to the 6 times table, seeing how each multiple is double the sixes. Notice the pattern in the ones within each group of five multiples. The hundred square can support in highlighting this pattern.

Multiplication

Skill: Solve 1-step problems using multiplication	Year: 1/2

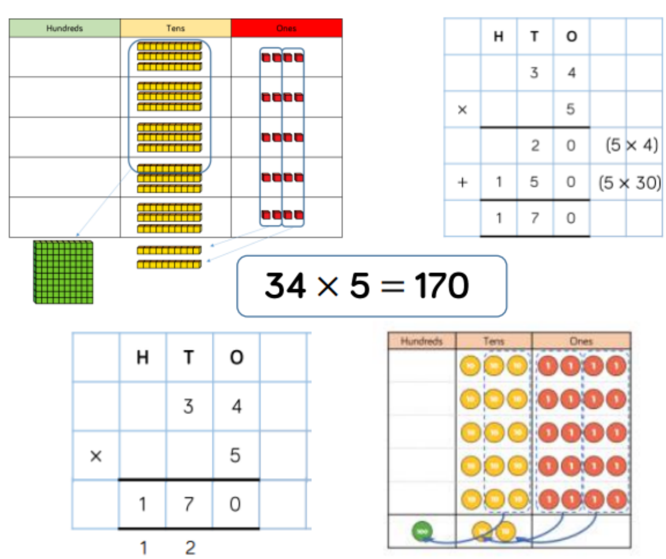


Children represent multiplication as repeated addition in many different ways.

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.

Skill: Multiply 2-digit numbers by 1-digit numbers	Year: 3/4

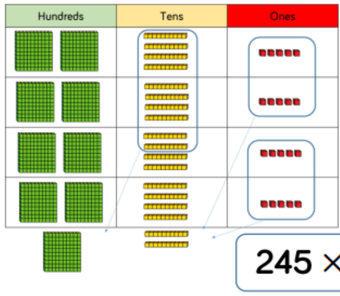


Teachers may decide to first look at the expanded column method before moving on to the short multiplication method.

The place value counters are used to support understanding of the method rather than supporting the multiplication, as children should use times table knowledge.

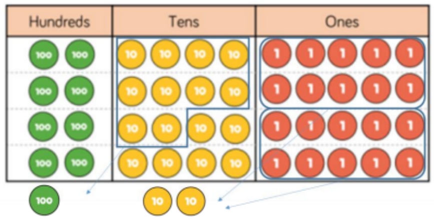
Skill: Multiply 3-digit numbers by 1-digit numbers

Year: 3/4



	H	T	O
	2	4	5
×			4
	9	8	0
	1	2	

$245 \times 4 = 980$

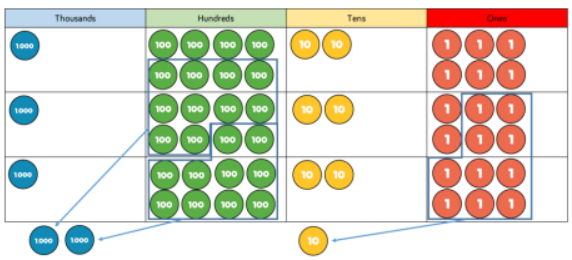


When moving to 3-digit by 1-digit multiplication, children are encouraged to move towards the short, formal written method.

Base 10 and place value counters continue to support understanding of the written method. The number of exchanges needed in the questions are limited in order to move children away from resources when multiplying larger numbers.

Skill: Multiply 4-digit numbers by 1-digit numbers

Year: 5



$1{,}826 \times 3 = 5{,}478$

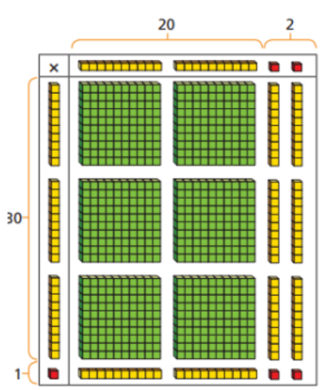
	Th	H	T	O
	1	8	2	6
×				3
	5	4	7	8
	2		1	

When multiplying 4-digit numbers, place value counters are the best manipulative to support children in their understanding of the formal written method.

If children are multiplying larger numbers and struggling with their times tables, teachers encourage the use of multiplication grids so children can focus on the use of the written method.

Skill: Multiply 2-digit numbers by 2-digit numbers

Year: 5



×	20	2
30	600	60
1	20	2

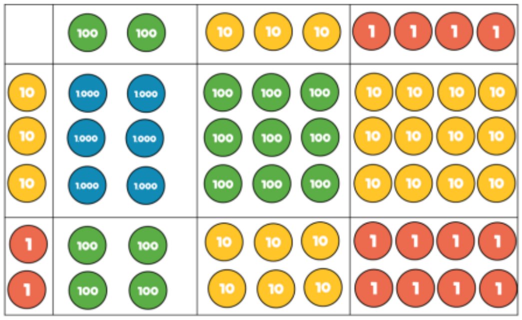
	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

$22 \times 31 = 682$

When multiplying a multi-digit number by 2-digits, teachers may use the area model to help children understand the size of the numbers they are using. This links to finding the area of a rectangle by finding the space covered by the Base 10.

The grid method matches the area model as an initial written method before moving on to the formal written method.

Skill: Multiply 3-digit numbers by 2-digit numbers	Year: 5
	Children can continue to use the area model when multiplying 3-digits by 2 digits. Place value counters become more efficient to use but Bse 10 can be used to highlight the size of numbers. Children are encouraged to move towards the formal written method, seeing the links with the grid method.



Th	H	T	O
	2	3	4
×		3	2
	4	6	8
$_{1}7$	$_{1}0$	2	0
7	4	8	8

×	200	30	4
30	6,000	900	120
2	400	60	8

$234 \times 32 = 7{,}488$

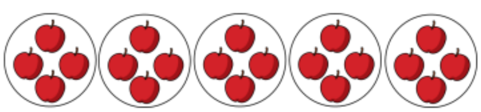
Skill: Multiply 4-digit numbers by 2-digit numbers	Year: 5/6
	Children move to multiplying 4-digits by 2-digits when they are confident in the written method. If they are still struggling with times tables, multiplication grids are provided to support when they are focusing on the use of the method.

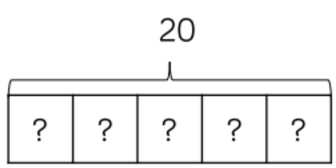
TTh	Th	H	T	O
	2	7	3	9
×			2	8
2_{2}	1_{5}	9_{3}	1_{7}	2
5_{1}	4	7_{1}	8	0
7	6	6	9	2
		1		

$2{,}739 \times 28 = 76{,}692$

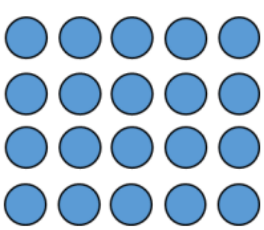
Division

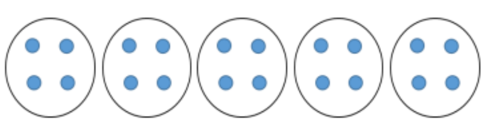
Skill: Solve 1-step problems using multiplication (sharing)	Year: 1/2
	Children solve problems by sharing amounts into equal groups. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally. In Year 2, children are introduced to the division symbol.





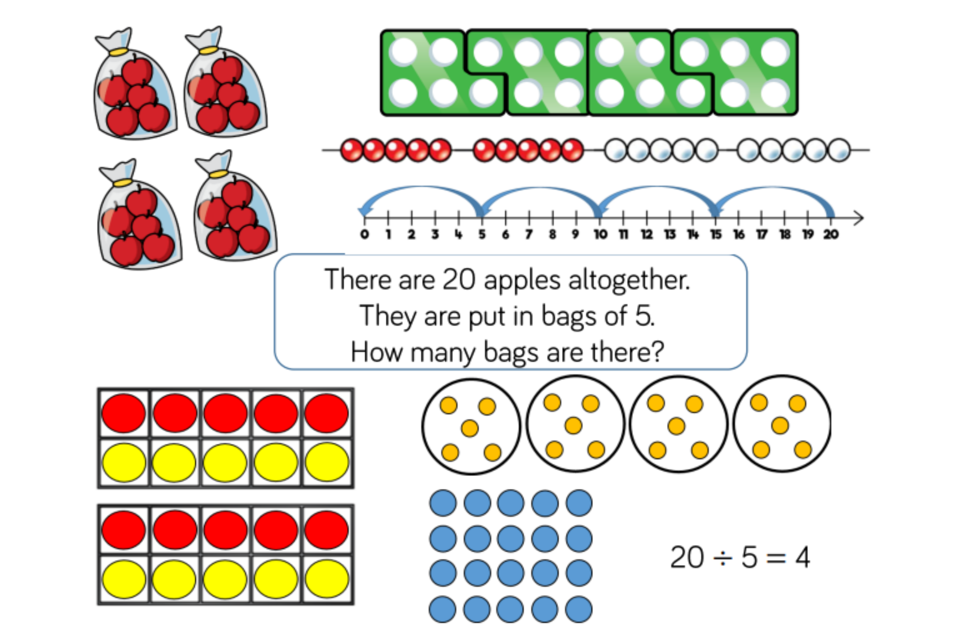
There are 20 apples altogether.
They are shared equally between 5 bags.
How many apples are in each bag?





$20 \div 5 = 4$

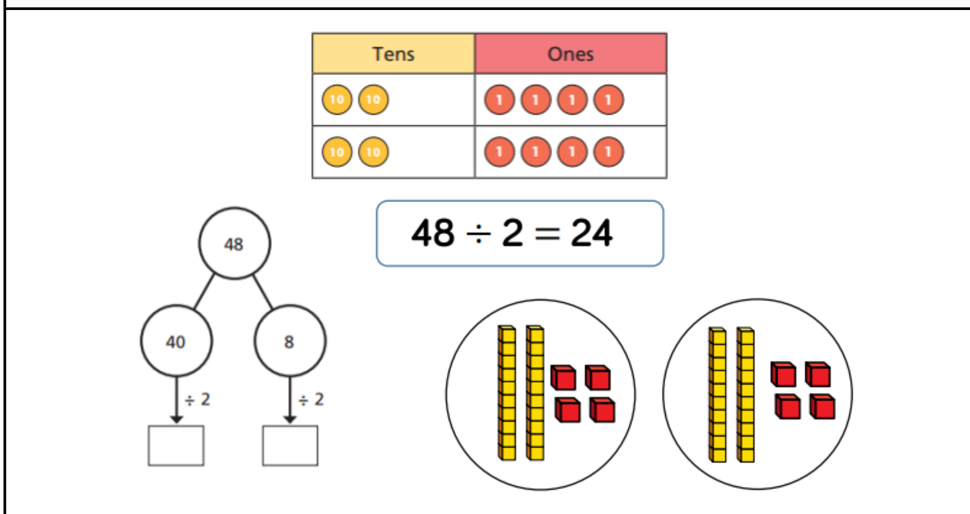
Skill: Solve 1-step problems using division (grouping)	Year: 1/2



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 show the link between multiplication and division.

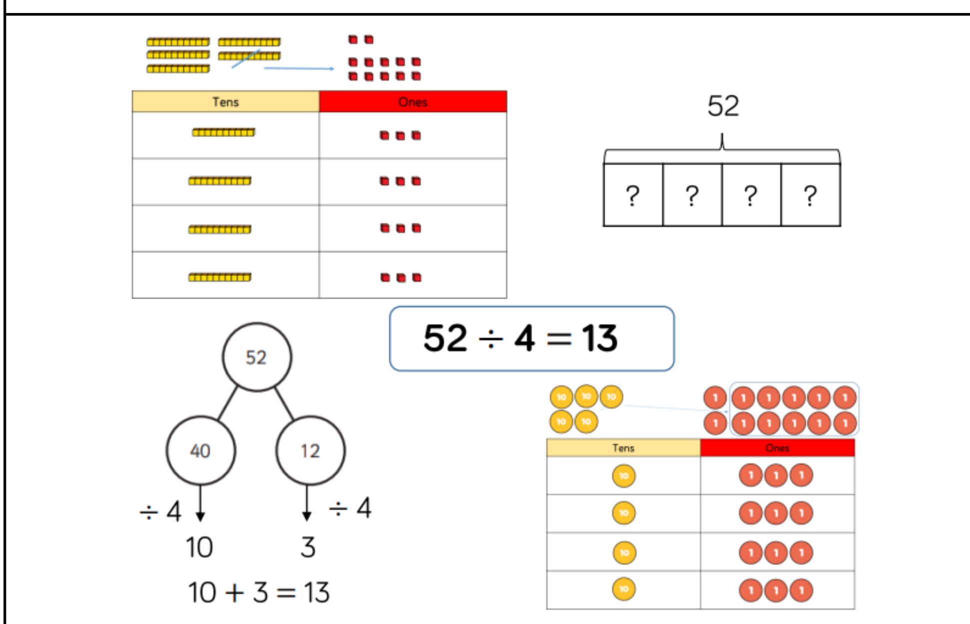
Skill: Divide 2-digits by 1-digit (sharing with no exchange)	Year: 1/2



When dividing larger numbers, children use Base 10 and place value counters that allow them to partition into tens and ones to share numbers into equal groups.

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

Skill: Divide 2-digits by 1-digit (sharing with exchange)	Year: 3/4

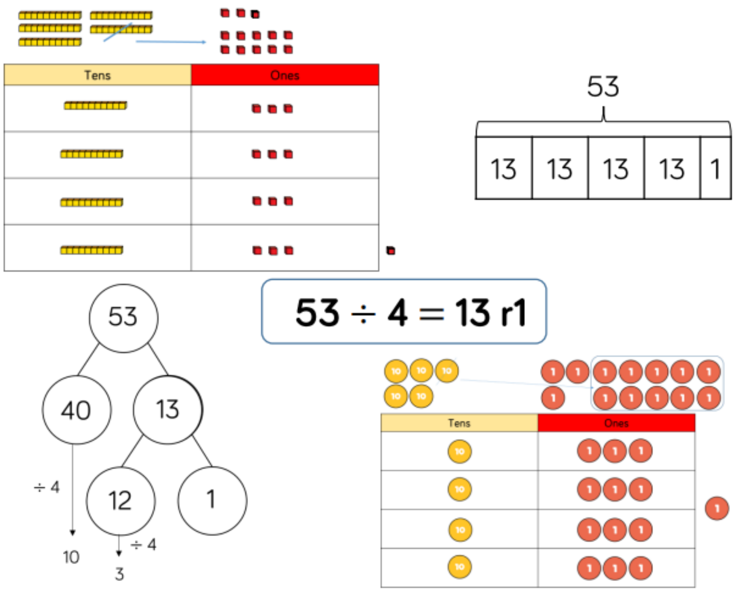


When dividing numbers involving an exchange, children use Base 10 and place value counters to exchange one ten for ten ones.

Children start with the equipment outside the place value grid before sharing then tens and ones equally between the rows.

Flexible partitioning in a part-whole model supports this method.

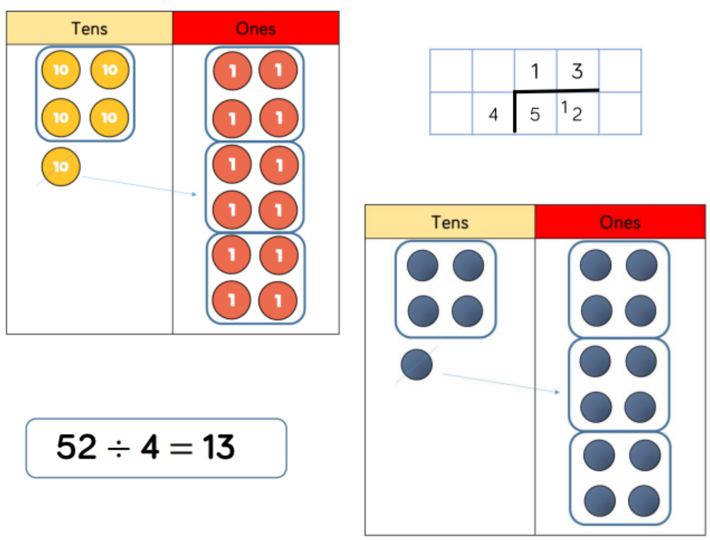
Skill: Divide 2-digits by 1-digit (sharing with remainders)	Year: 3/4



When dividing numbers with remainders, children use Base 10 and place value counters to exchange one ten for ten ones. Starting with the equipment outside the place value grid highlights the remainders, as they will be left outside the grid once the equal groups have been made.

Flexible partitioning in a part-whole model again supports this method.

Skill: Divide 2-digits by 1-digit (grouping)	Year: 4/5

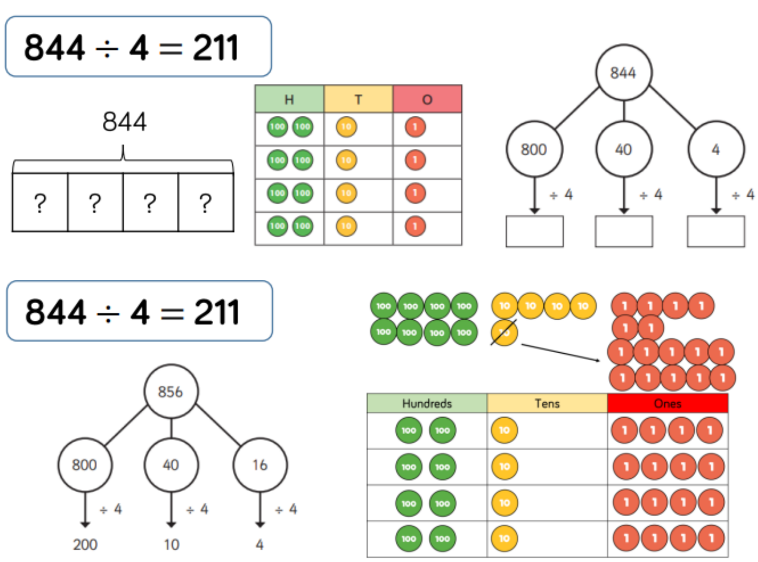


When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor.

Teachers are explicit with language: ‘How many groups of 4 tens can we make?’ and ‘How many groups of 4 ones can we make?’

Remainders can also be seen as they are left ungrouped.

Skill: Divide 3-digits by 1-digit (sharing)	Year:4

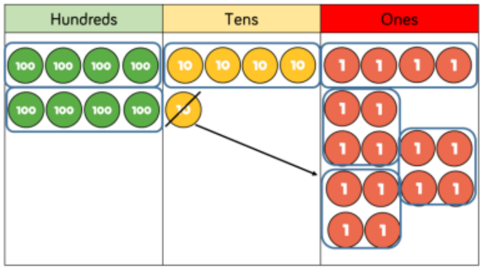


Children can continue to use place value counters to share 3-digit numbers into equal groups.

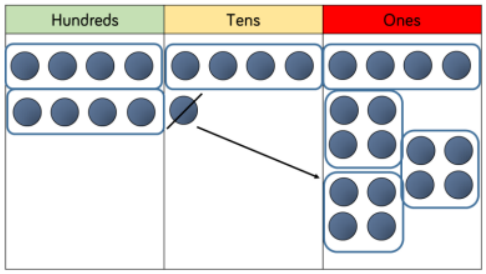
Children start with the equipment outside the place value grid before sharing the hundreds, tens and ones equally between the rows. This method also helps to highlight remainders.

Flexible partitioning in a part-whole model supports this method.

Skill: Divide 3-digits by 1 digit (grouping)	Year: 5



		2	1	4
	4	8	5	$^{1}6$

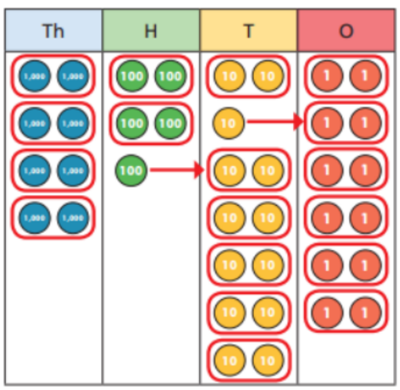


$856 \div 4 = 214$

Children can continue to use grouping to support their understanding of short division when dividing a 3-digit number by a 1-digit number.

Place value counters can be used on a place value grid to support this understanding. Children can also draw their own counters and group them through a more pictorial method.

Skill: Divide 4-digits by 1 digit (grouping)	Year: 5



	4	2	6	6
2	8	5	$^{1}3$	$^{1}2$

$8{,}532 \div 2 = 4{,}266$

Place value counters can be used on a place value grid to support children to divide 4-digits by 1-digit. Children can also draw their own counters and group them through a more pictorial method.

Children are encouraged to move away from concrete and pictorial when dividing numbers with multiple exchanges.

Skill: Divide multi digits by 2-digits (short division)	Year: 6

		0	3	6
	12	4	$^{4}3$	$^{7}2$

$432 \div 12 = 36$

$7{,}335 \div 15 = 489$

	0	4	8	9
15	7	$^{7}3$	$^{13}3$	$^{13}5$

15	30	45	60	75	90	105	120	135	150

When children begin to divide by 2-digits, written methods become the most accurate as concrete and pictorial representations become less effective.

Children can write out multiples to support their calculations with larger remainders.

Children also solve problems with remainders where the quotient can be rounded as appropriate.

Skill: Divide multi-digits by 2-digits (long division)	Year: 6

		0	3	6	
1	2	4	3	2	
	–	3	6	0	(×30)
			7	2	
	–		7	2	(×6)
				0	

$12 \times 1 = 12$
$12 \times 2 = 24$
$12 \times 3 = 36$
$12 \times 4 = 48$
$12 \times 5 = 60$
$12 \times 6 = 72$
$12 \times 7 = 84$
$12 \times 8 = 96$
$12 \times 7 = 108$
$12 \times 10 = 120$

$432 \div 12 = 36$

$7{,}335 \div 15 = 489$

	0	4	8	9	
15	7	3	3	5	
–	6	0	0	0	(×400
	1	3	3	5	
–	1	2	0	0	(×80)
		1	3	5	
–		1	3	5	(×9)
				0	

$1 \times 15 = 15$
$2 \times 15 = 30$
$3 \times 15 = 45$
$4 \times 15 = 60$
$5 \times 15 = 75$
$10 \times 15 = 150$

Children can also divide by 2-digit numbers using long division.

Children can write out multiples to support their calculations with larger remainders.

Children will also solve problems with remainders where the quotient can be rounded as appropriate.

Skill: Divide multi digits by 2-digits (long division)	Year: 6

$372 \div 15 = 24\ r12$

			2	4	r	1	2
1	5	3	7	2			
	–	3	0	0			
			7	2			
	–		6	0			
			1	2			

$1 \times 15 = 15$
$2 \times 15 = 30$
$3 \times 15 = 45$
$4 \times 15 = 60$
$5 \times 15 = 75$
$10 \times 15 = 150$

			2	4	$\frac{4}{5}$
1	5	3	7	2	
	–	3	0	0	
			7	2	
	–		6	0	
			1	2	

$372 \div 15 = 24\frac{4}{5}$

When a remainder is left at the end of a calculation, children can either leave it as a remainder or convert it to a fraction. This will depend on the context of the question.

Children can also be asked questions where the quotient needs to be rounded according to the context.

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.

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