Maths Policy

January 2024

Holy Family Catholic Primary School

Ratified by the Curriculum and Standards Committee:

Signed by the Governing Body: Chair of Standards and Curriculum

To be reviewed (annually):   September 2026

Intent

Our intent is to provide children with a mathematics curriculum that will allow them to become confident individuals through developing their mathematical skills to their full potential. We also aim to present maths as a challenging, exciting, creative and relevant subject in order to promote a positive and confident attitude. At Holy Family school we understand that our pupils come from a wide variety of backgrounds with different experiences and exposure to mathematical concepts. This means that they require robust and clear progression, in small steps, to become confident mathematicians. We want to enable our children to:

- remember key mathematical facts and understand how these relate to other facts.

- enjoy mathematics as a tool for problem solving and for its own sake.

- receive a broad and balanced Mathematical curriculum and a range of appropriate learning experiences.

- be able to reflect on their learning and how what they have experienced is linked to previous learning.

- leave Holy Family school 'Secondary ready', with secure foundations for future learning.

Implementation

We teach mathematics following the mastery approach. Mastering maths means pupils acquiring a deep, long-term, secure and adaptable understanding of the subject. The phrase 'teaching for mastery' describes the elements of classroom practice and school organisation that combine to give pupils the best chances of mastering the maths curriculum.

At Holy Family School, from our reception class to the end of year 6, we use the White Rose Maths schemes of learning as a basis to guide the children's journey to mathematical understanding. White Rose Maths is based on a mastery, small steps approach, that gradually builds up to develop a deep understanding of the subject and is fully aligned with the 2014 national curriculum for maths. Through using White Rose Maths, we help the children to develop their conceptual understanding of

mathematics by using concrete objects, pictorial representations and abstract thinking. Teachers use their expertise and knowledge to adapt and develop lessons and they may supplement the White Rose Maths scheme using resources from other sources.

Mathematics Curriculum

The Foundation Stage

We teach mathematics in our Foundation Stage through play and activities. We relate the mathematical aspects of the children's work to the objectives set out in the Early Years Foundation Stage Curriculum, which underpins the curriculum planning for children from birth to five. We assess and measure each child's progress against the EYFS Profile. The children will develop a deep understanding of the numbers to 10, the relationships between them and the patterns within those numbers. They will have frequent and varied opportunities to build and apply this understanding - such as using manipulatives, including small pebbles and tens frames for organising counting. The children will develop a secure base of knowledge and vocabulary from which mastery of mathematics is built. In addition, the curriculum will include rich opportunities for children to develop their spatial reasoning skills across all areas of mathematics including shape, space and measures. We give all the children ample opportunity to develop positive attitudes and interests in mathematics, look for patterns and relationships, spot connections, 'have a go', talk to adults and peers about what they notice and not be afraid to make mistakes.

Organisation

All children receive a daily maths lesson, although mathematical skills run through other areas of the curriculum.

- Each lesson focusses on one clear learning objective which all children are expected to master; challenge activities enable those children who grasp the objective rapidly to extend their learning by exploring it at greater depth.

- Lessons include elements of: fluency to practise skills; reasoning to deepen understanding; and problem solving to apply skills depending on the objective being taught and the understanding of the children.

- Teachers use the White Rose Mastery planning and resources to aid Maths teaching within school and to ensure full curriculum coverage including fluency, reasoning and problem solving opportunities are addressed within lessons. Other online resources are available via Purple Mash, TT Rock Stars

and Numbots which the children have access to both at home and in school.

- Whole class teaching is adopted. We believe that all children should have the same standard of teaching and to ensure this we aim not to group children based on their ability but also accept that at times this may be necessary.

- Talking about Maths is an important part of every lesson as this helps children to develop speaking, listening and reasoning skills. Maths vocabulary and sentence stems are explicitly introduced and recapped on to ensure understanding.

- Teachers use the White Rose Maths Flashback questions to revisit and revise topics previously covered. These might be used separately from the Maths lesson (as early morning work, for example) but are done several times a week.

- Teachers may use their professional discretion to vary the resources used in order to suit the needs of their children and keep lessons varied and engaging.

- Our KS1 and KS2 children use workbooks from the 'White Rose' series, which is based on the principles of how mathematics is taught in Singapore and aligned with the National Curriculum 2014, to support their planning and delivery of mathematics teaching.

Calculation policy

As a school we believe that all children, when introduced to a key new concept, should have the opportunity to build competency in this topic by using the CPA approach (Concrete, Pictorial, and Abstract).

Concrete – students should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

Pictorial – students should then build on this concrete approach by using pictorial representations. These representations can then be used to reason and solve problems.

Abstract – with the foundations firmly laid, students should be able to move to an abstract approach using numbers and key concepts with confidence.

The White Rose Maths Calculation Policies for Addition and Subtraction (appendix 1) and Multiplication and Division (appendix 2) are used to support progression across classes and to ensure that small steps of progress are made towards a deeper level of understanding.

Resources
The use of mathematics resources is integral to the CPA approach and thus planned into our learning and teaching. Resources such as number lines, numicon, multi-link cubes, dienes, hundred squares, shapes, etc. are located within individual classrooms. Resources within individual classes are accessible to all pupils who should be encouraged to be responsible for their use.

Display
We recognise the importance of a stimulating learning environment. Each classroom has a mathematical working wall with mathematical vocabulary, sentence stems and visual aids and interactive activities where appropriate.

Contribution of Maths to teaching in other curriculum areas
Mathematics is a tool for everyday life. It is a network of concepts and relationships and is used to analyse and communicate information and ideas in practical tasks and problems. By making links to other subjects at the initial planning stage we aim to provide real context in which to apply skills taught during the maths lessons.

Inclusion
Teaching maths for mastery offers all pupils access to the full maths curriculum. This inclusive approach, and its emphasis on promoting multiple methods of solving a problem, builds self-confidence and resilience in pupils. Though the whole class goes through the same content at the same pace, the questioning and scaffolding individual pupils receive in class as they work through problems may differ, with higher attaining children, or those pupils who grasp concepts quickly, challenged through more demanding problems which deepen their knowledge of the same content. While it is anticipated that the majority of pupils will move through the programmes of study at broadly the same pace, there may be some children who have Special Educational Needs in mathematics identified by staff. Children who are not sufficiently fluent may be given individual or small group support to meet their specific needs. Appropriate resources and materials will be used to support their learning. No child will be denied a full curriculum however and concepts will be revisited throughout the year to help with long term understanding.

Monitoring and Review
The monitoring of maths teaching and pupil progress is the shared responsibility of teachers, subject leader and the senior leadership team. The work of the subject leader includes supporting colleagues in the teaching of maths, keeping up to date with current developments as well as providing a strategic lead and direction for the subject. The school's governing body receive regular updates to inform them of the vision for driving forward teaching for mastery. We observe lessons, speak to children/staff, analyse books/marking and ultimately come together as a staff to critique what we are doing well and what we want to improve.

Assessment for Learning

Teachers will assess children's work in mathematics from three aspects (long-term, medium-term and short-term).

Short-term assessments are integral to every lesson. These daily assessments are closely matched to the teaching objectives and help teachers monitor how learning is progressing during the lesson. From these assessments teachers can adjust their daily plans. Written or verbal feedback is given to help guide children's progress. Children are given regular opportunities to self-assess and review their own work and they are encouraged to make judgments and reflect on their own learning.

There are three key assessment points throughout the year: Autumn term, Spring term and summer term. Children will complete written tests where they will complete arithmetic and reasoning tests. Teachers will use this and their day to day assessments to decide on the children's end of year outcome.

We make long-term assessments towards the end of the school year, and we use these to assess progress against school and national targets. We pass this information on to the next teacher at the end of the year, so that s/he can plan for the new school year. We make the long-term assessments with the help of end-of-year tests and teacher assessments. We use the national tests for children in Year 6, plus NFER assessments for children in both Key Stage 1 and 2.

Parental Involvement

Maths homework is set regularly by teachers. Children are given maths homework that helps them to practise key number fluency (i.e. times tables) and recap previous learning. Teachers meet parents and report to them verbally in the Autumn and Spring term. A full written report is provided for all parents towards the end of the Summer Term. Where applicable, parent workshops will be held to share strategies and expectations for children at all ages.

Impact

Our teaching of and curriculum for mathematics will lead to good progress over time across all key stages relative to each individual child's starting point. It is designed to prepare children for their future in and outside of education so they can become successful in whatever they pursue by leaving our school at least at the expected standard for their age. Our rich and broad mathematics curriculum aims to make the children enthusiastic about learning mathematics and gain an understanding of its importance in everyday life.

This policy will be reviewed at least every two years.

Approved by the Governors of the Curriculum and Standards Committee

Signed:

Date:

Year 1 - 6

Calculation Policy
Addition and Subtraction

#MathsEveryoneCan

White Rose Maths

Calculation Policy

Welcome to the White Rose Maths Calculation Policy.

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

At the start of each policy, there is an overview of the different models and images that can support the teaching of different concepts. These provide explanations of the benefits of using the models and show the links between different operations.

Each operation is then broken down into skills and each skill has a dedicated page showing the different models and images that could be used to effectively teach that concept.

There is an overview of skills linked to year groups to support consistency through out school. A glossary of terms is provided at the end of the calculation policy to support understanding of the key language used to teach the four operations.

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.

Bar Model (single)

Concrete

Discrete

7
4   3

7
?   3

Combination

7
4

Continuous

?
4   3

7
?   3

477
283   194

5.3
3.9   1.4
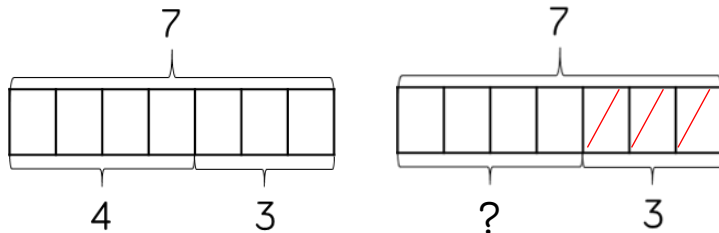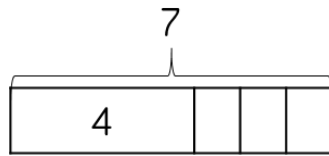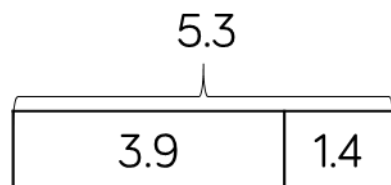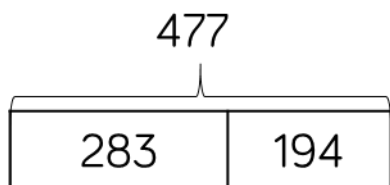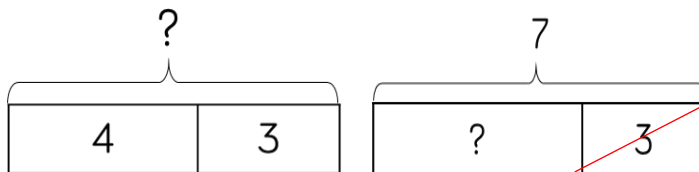
Benefits

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. Each box represents one whole.

The combination bar model can support children to calculate by counting on from the larger number. It is a good stepping stone towards the continuous bar model.

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

In KS2, children can use bar models to represent larger numbers, decimals and fractions.

Bar Model (multiple)

Discrete

$$7 + 3 = 10$$

$$7 - 3 = 4$$
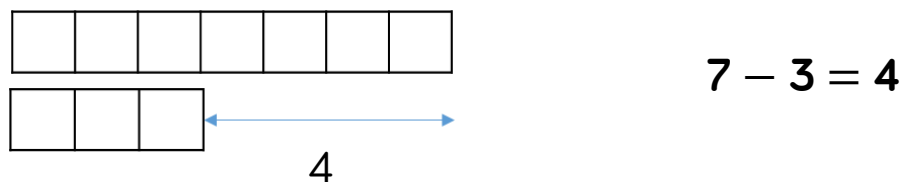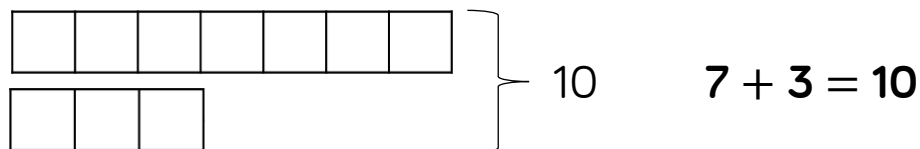
Continuous
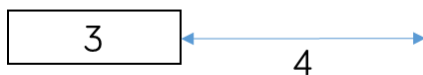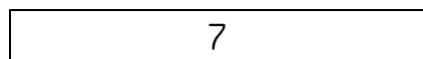
$$7 - 3 = 4$$
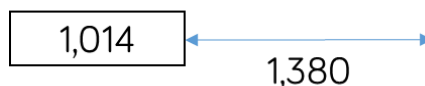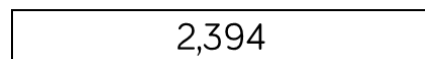
$$2{,}394 - 1{,}014 = 1{,}380$$

Benefits

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 positioned on the right hand side of the bars. 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.

Number Shapes
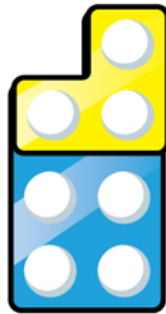
$$7 = 4 + 3 \qquad 7 = 3 + 4 \qquad 7 - 3 = 4$$
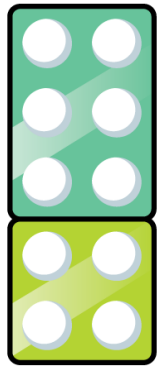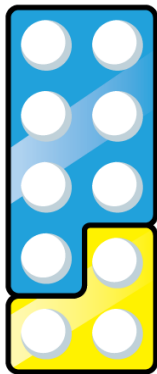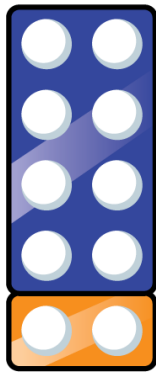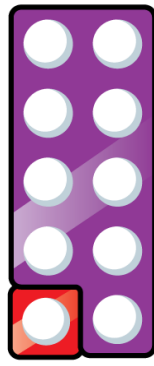
6+4 **7+3** **8+2** **9+1**

Benefits

Number shapes can be useful to 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 number shapes more often, they can start to subitise the total due to their familiarity with the shape of each number.

When subtracting numbers, children can 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 due to their familiarity 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
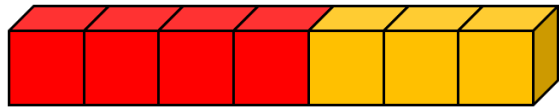
$$7 = 4 + 3$$
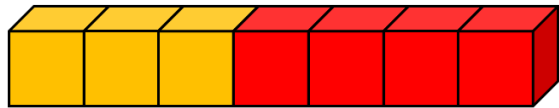
$$7 = 3 + 4$$
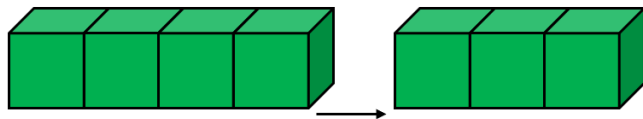
$$7 - 3 = 4$$
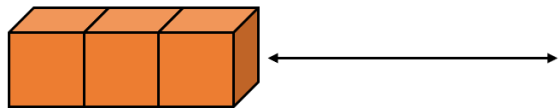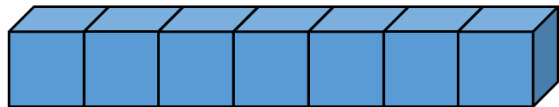
$$7 - 3 = 4$$

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)
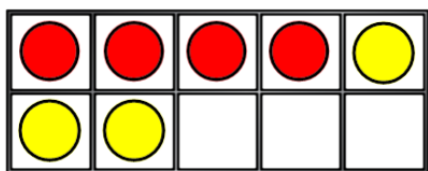
$$4 + 3 = 7$$
$$3 + 4 = 7$$
$$7 - 3 = 4$$
$$7 - 4 = 3$$

4 is a part.

3 is a part.

7 is the whole.

First

Then

Now

$$4 + 3 = 7$$

First

Then

Now

$$7 - 3 = 4$$
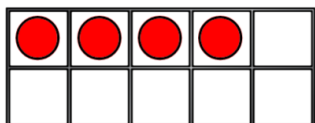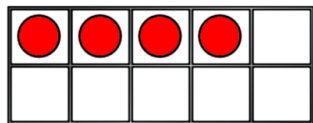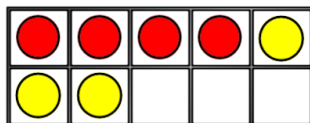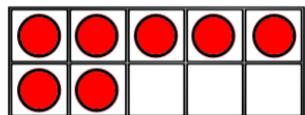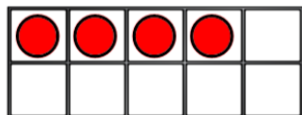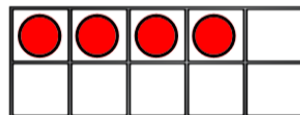
Benefits

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)
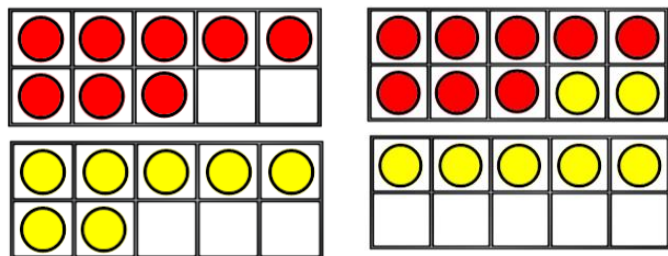
$8 + 7 = 15$

2   5

$14 - 6 = 8$

4   2

$7 + 6 + 3 = 16$

10
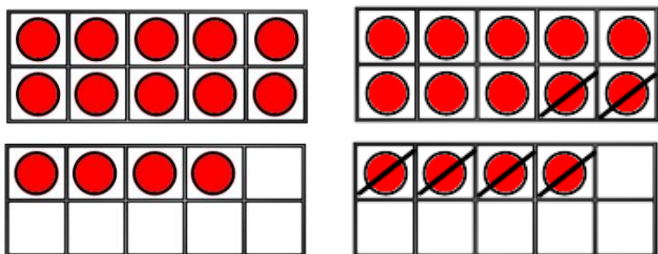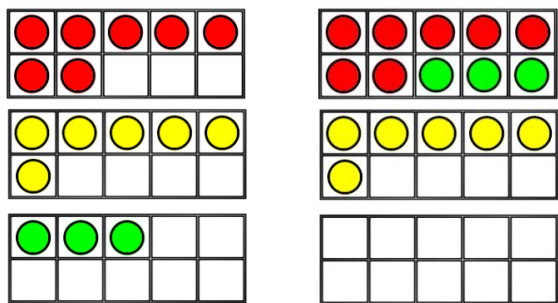
Benefits

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.

Bead Strings
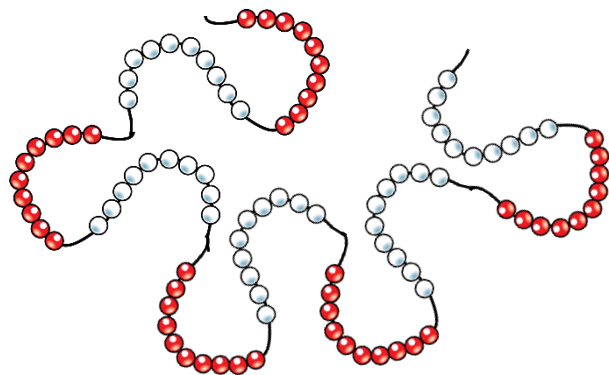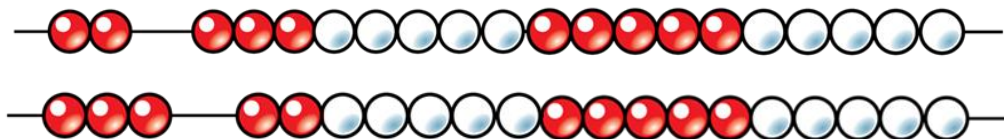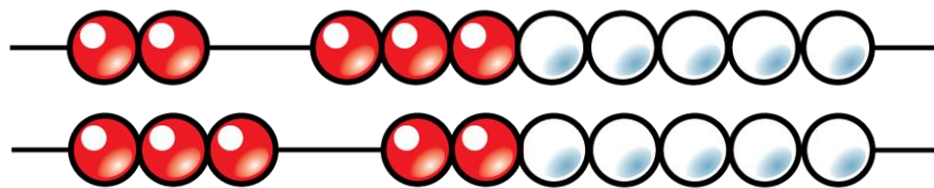
Benefits

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 up to 10.
They can help children to systematically find all the number bonds to 10 by moving one 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 can apply their knowledge of number bonds to 10 and see the links to number bonds to 20.

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

5 + 3 = 8
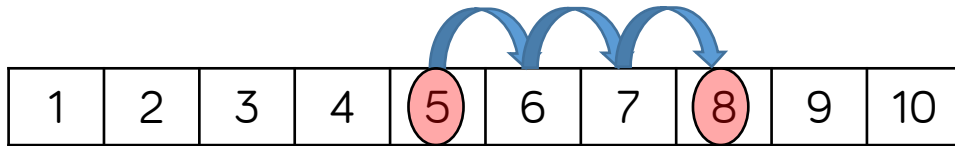
1	2	3	4	5	6	7	8	9	10

10 − 4 = 6

1	2	3	4	5	6	7	8	9	10

8 + 7 = 15

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
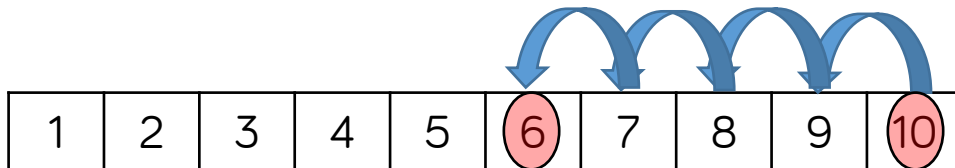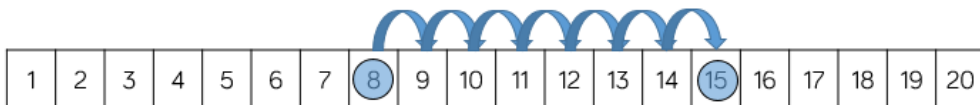
Benefits

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)

$5 + 3 = 8$

$8 + 7 = 15$

2   5

$+ 2$ $+ 5$

$14 - 6 = 8$

4   2

$- 2$ $- 4$
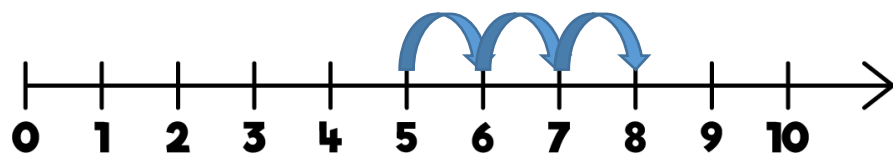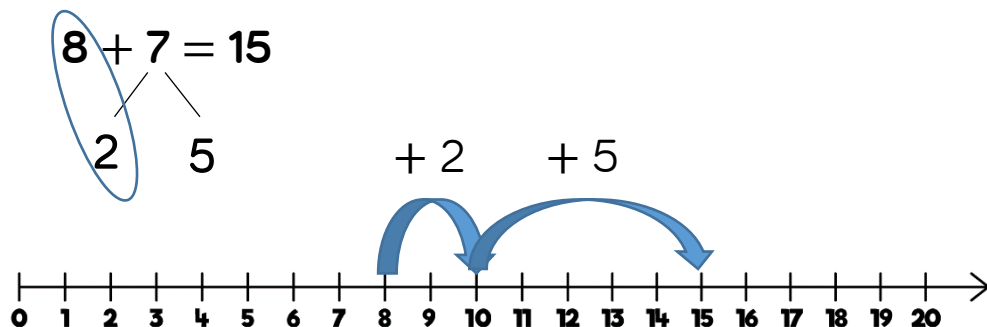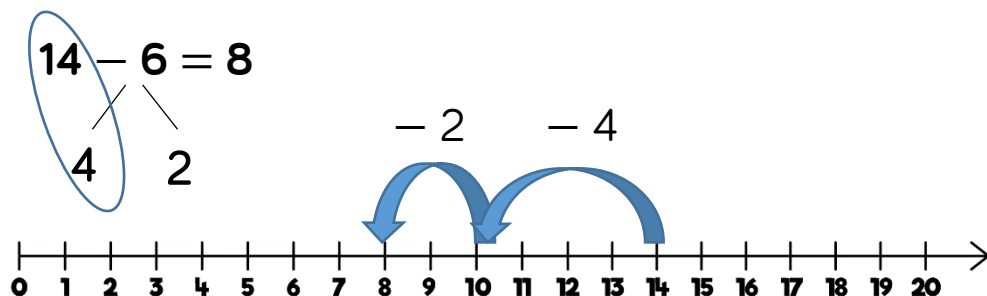
Benefits

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

+ 5   + 30   + 2

35   40   70   72

35 + 37 = 72

+ 5   + 32

35   40   72

72 − 35 = 37

+ 5   + 30   + 2

35   40   70   72
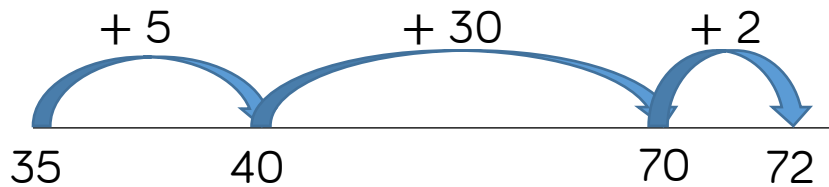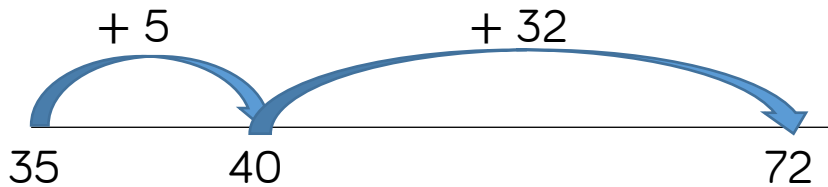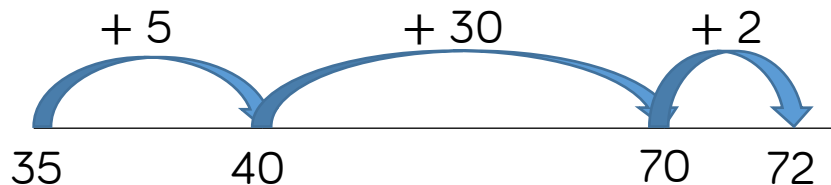
Benefits

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

$7 + 6 = 13$
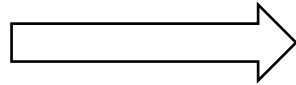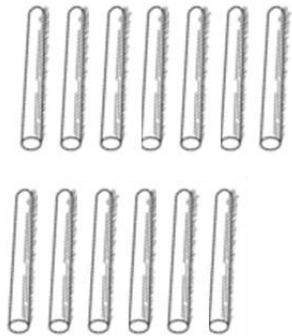
bundle together groups of 10
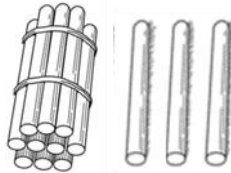
$42 - 17 = 25$
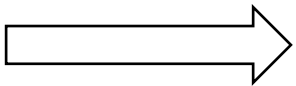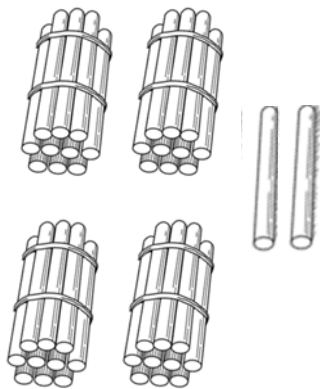
unbundle group of 10 straws
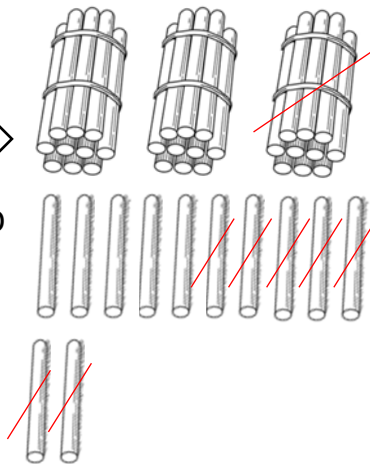
Benefits

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)
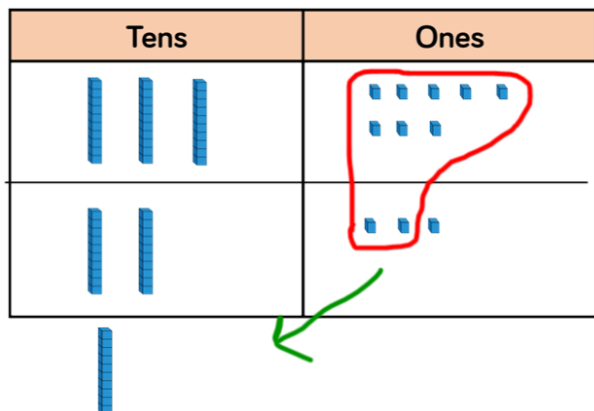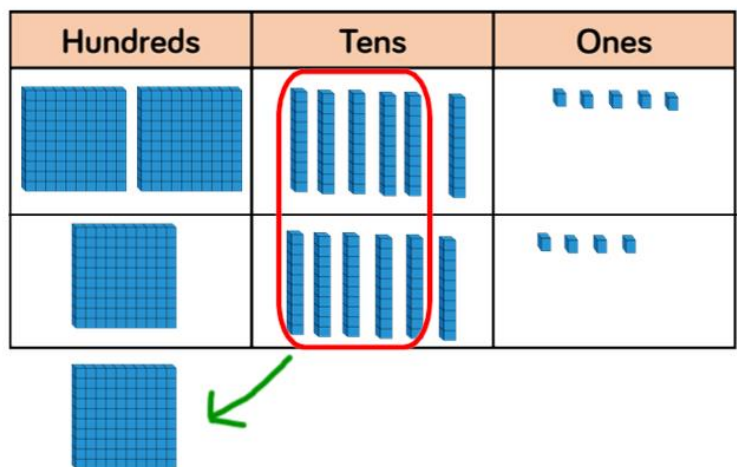
$$38$$
$$+\ 23$$
$$\overline{61}$$
$$1$$
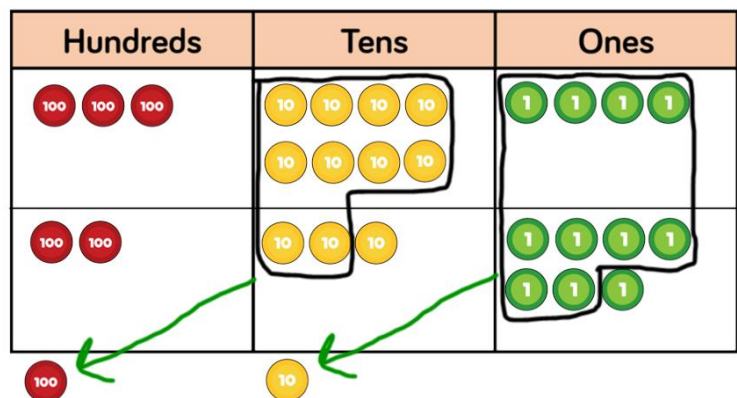

$$265$$
$$+\ 164$$
$$\overline{429}$$
$$1$$

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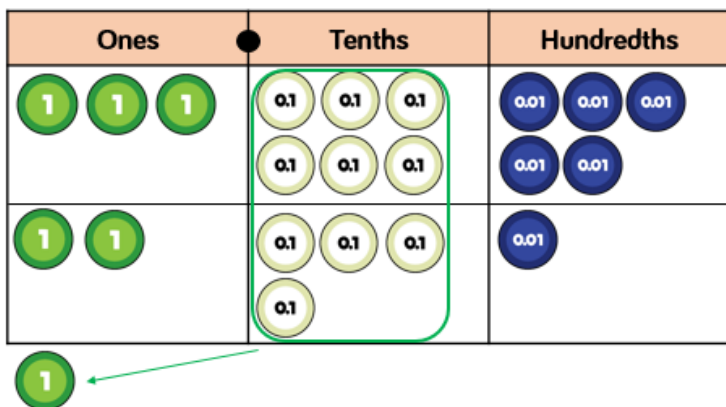
Children should first add without an exchange before moving on to addition with exchange.. The representation becomes less efficient with larger numbers due to the size of Base 10. In this case, place value counters may be the better model to use.

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)
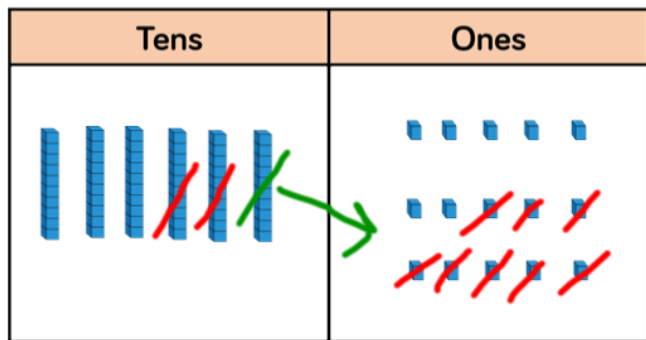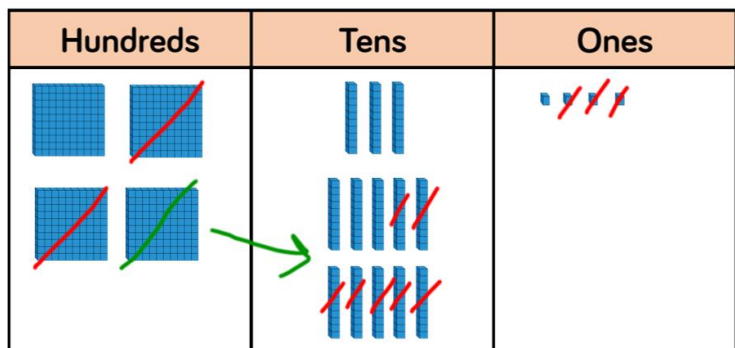
Tens | Ones

$$\overset{5}{\cancel{6}}\overset{1}{5}$$
$$-\ 28$$
$$\overline{37}$$

Hundreds | Tens | Ones

$$\overset{3}{\cancel{4}}\overset{1}{3}5$$
$$-\ 273$$
$$\overline{162}$$

Benefits

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

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

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

Place Value Counters (addition)
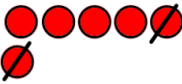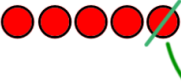
Hundreds	Tens	Ones
100 100 100	10 10 10 10 / 10 10 10 10	1 1 1 1
100 100	10 10 10	1 1 1 1 / 1 1 1
100	10	

384
+ 237
621
  1 1

Ones	•	Tenths	Hundredths
1 1 1		0.1 0.1 0.1 / 0.1 0.1 0.1	0.01 0.01 0.01 / 0.01 0.01
1 1		0.1 0.1 0.1 / 0.1	0.01
1			

3.65
+ 2.41
6.06
  1

Benefits

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

Children should first add without an exchange before moving on to addition with exchange. Different place value counters can be used to represent larger numbers or decimals. If you don't have place value counters, use normal counters on a place value grid to enable children to experience the exchange between columns.
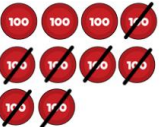
When adding money, children can also use coins to support their understanding. It is important that children consider how the coins link to the written calculation especially when adding decimal amounts.

Place Value Counters (Subtraction)

Hundreds	Tens	Ones

$$6\overset{4}{\cancel{5}}\overset{1}{2}$$
$$-\ 207$$
$$\overline{\ \ 445}$$

Thousands	Hundreds	Tens	Ones

$$\overset{3}{\cancel{4}}\overset{1}{3}57$$
$$-\ 2735$$
$$\overline{\ \ 1622}$$

Benefits

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

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

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

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
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
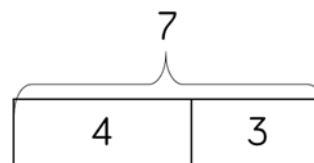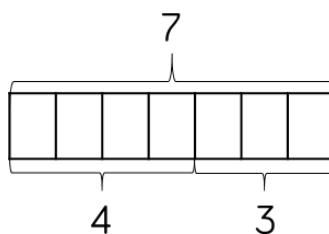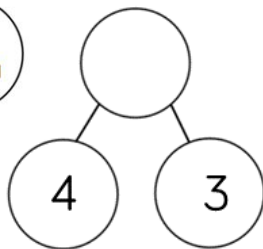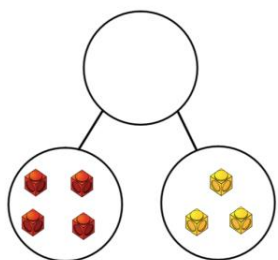
$$4 + 3 = 7$$
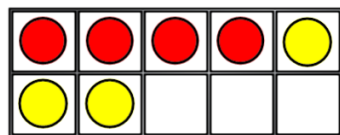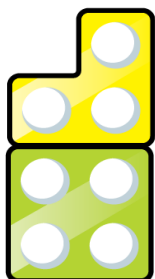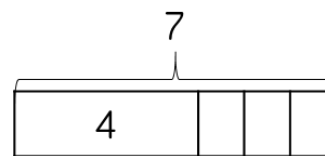
When adding numbers to 10, children can explore both aggregation and augmentation.

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.
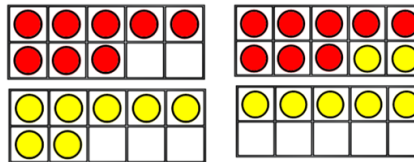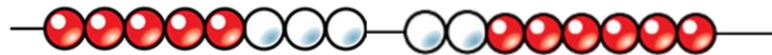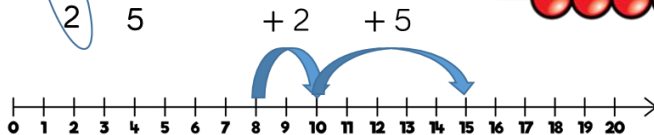
Skill: Add 1 and 2-digit numbers to 20	Year: 1/2

7

8

15

8	7

$$8 + 7 = 15$$

8 + 7 = 15

2   5

+ 2   + 5

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
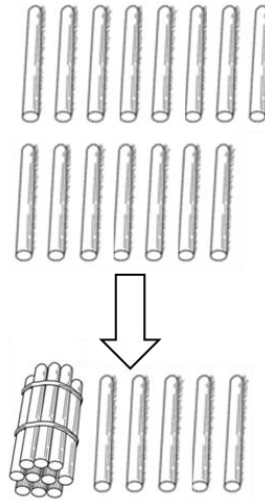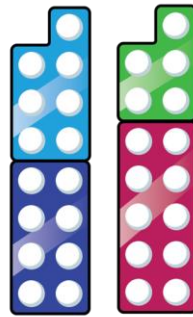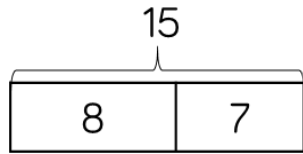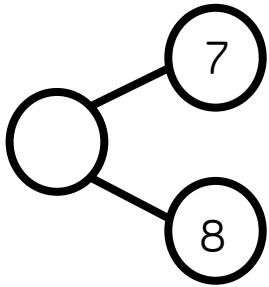
8 + 7 = 15

2   5

When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. In Year 1, this is only done just by counting on. From Year 2, use different manipulatives can be used to represent this exchange alongside number lines to support children in understanding how to partition their jumps.

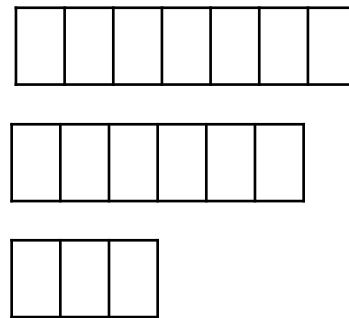| Skill: Add three 1-digit numbers	Year: 2
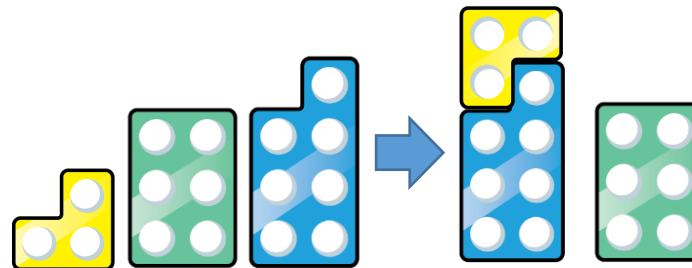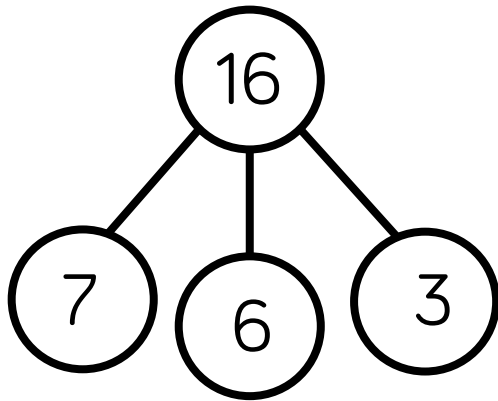
$$7 + 6 + 3 = 16$$
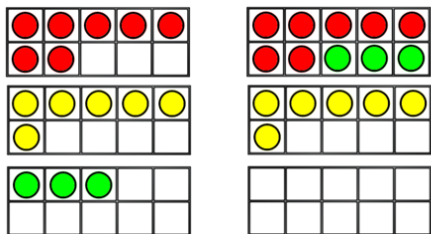
$7 + 6 + 3 = 16$

10

16

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.

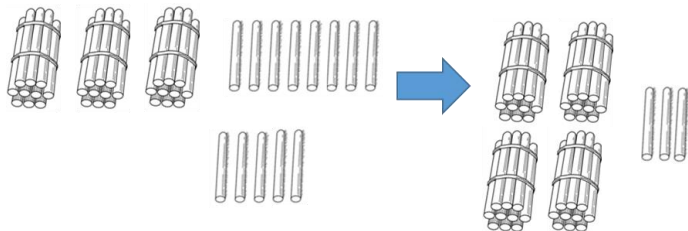This supports children in their understanding of commutativity.

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
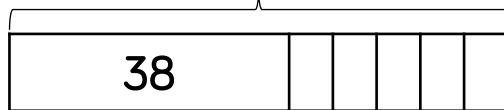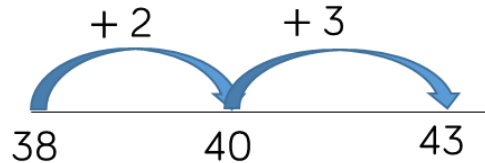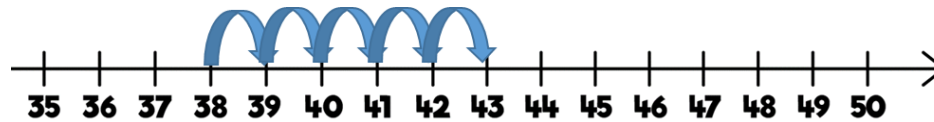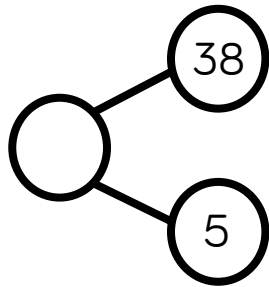
38

5

?

38

38 + 5 = 43

+2   +3

38   40   43

35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

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 $38 + 5 = 43$.

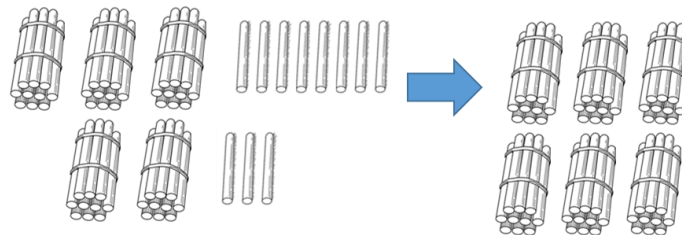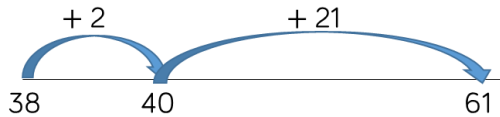Hundred squares and straws can support children to find the number bond to 10.

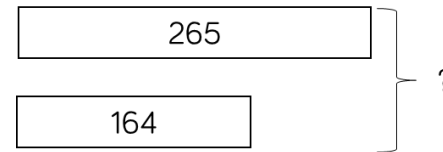| Skill: Add two 2-digit numbers to 100	Year: 2/3

38

23

?

| 38 | 23 |

+2   + 21

38   40   61

38 + 23 = 61

Tens	Ones

38
+ 23

61
1
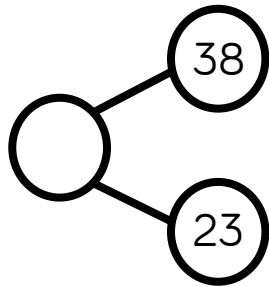
| Tens	Ones
10 10 10	1 1 1 1 1 1 1 1
10 10	1 1 1
10	

Children can use a blank number line and other representations to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient. From Year 3, 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.
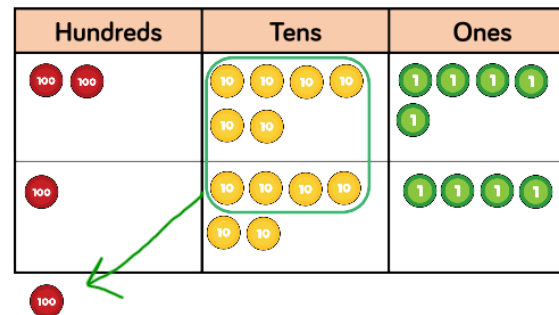
Skill: Add numbers with up to 3 digits	Year: 3
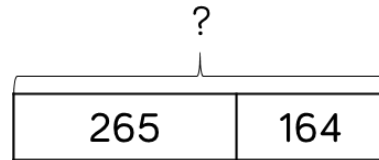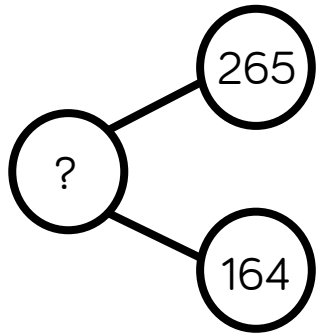
265

?

164
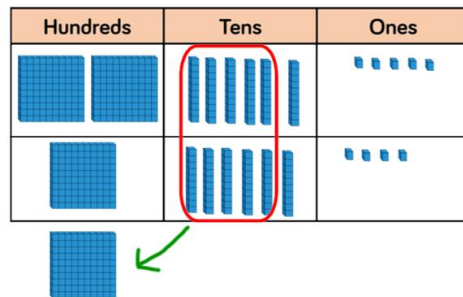
?

265 | 164

265

164

?

$$265 + 164 = 429$$

Hundreds	Tens	Ones

265
+ 164

429
  1

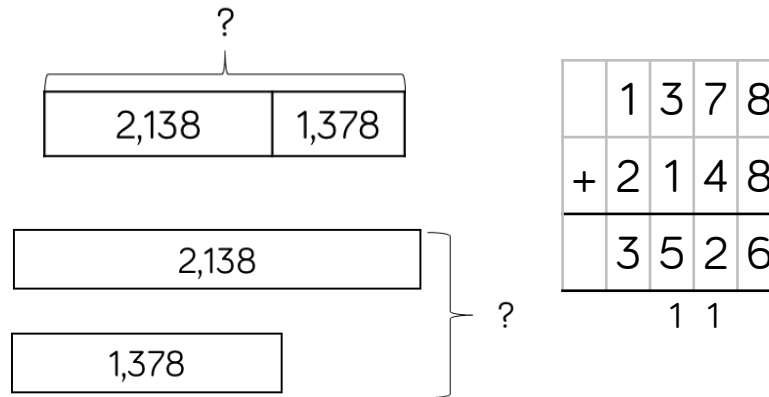| Hundreds	Tens	Ones

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.

Plain counters on a place value grid can also be used to support learning.

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

1,378

2,148

?

?

2,138	1,378

2,138

1,378

?

	1	3	7	8
+	2	1	4	8
	3	5	2	6

1 1

$$1{,}378 + 2{,}148 = 3{,}526$$

Thousands	Hundreds	Tens	Ones

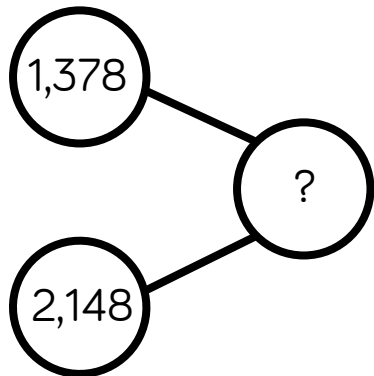| Thousands	Hundreds	Tens	Ones

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.
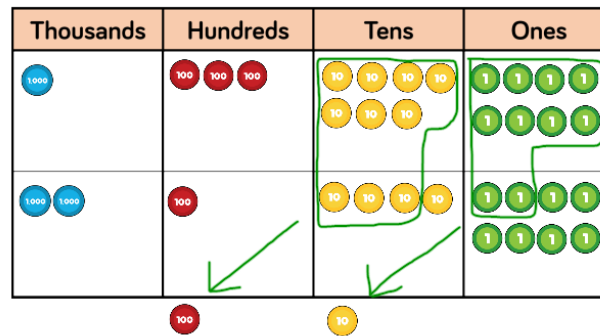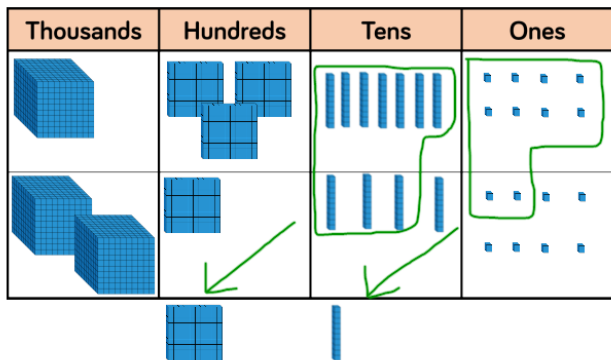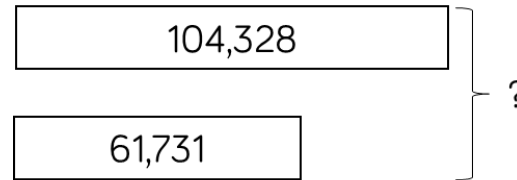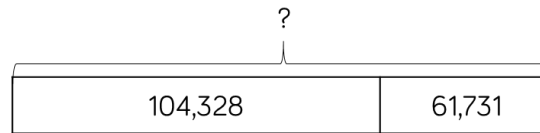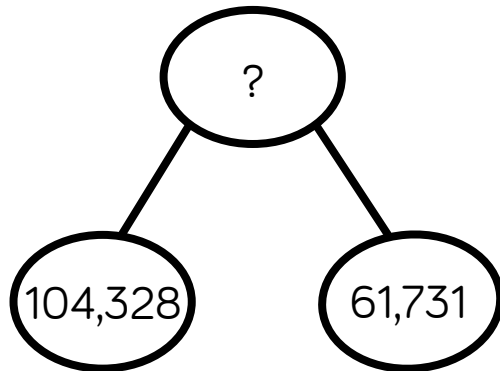
Plain counters on a place value grid can also be used to support learning.

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

?

104,328   61,731

?

104,328	61,731

104,328

61,731

?

104,328 + 61,731 = 166,059

HTh	TTh	Th	H	T	O

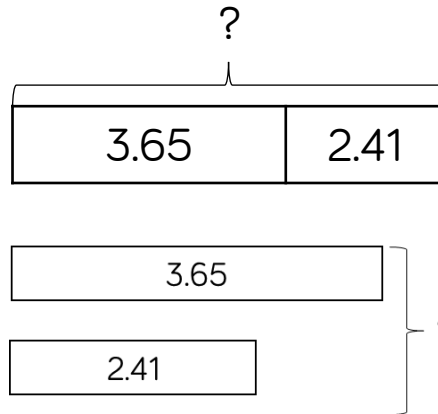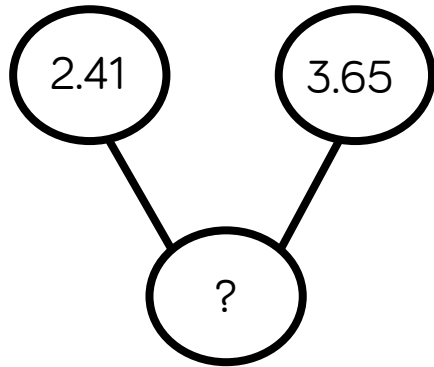|	1	0	4	3	2	8
+	6	1	7	3	1
	1	6	6	0	5	9
				1	

Place value counters or plain counters on a place value grid are the most effective concrete 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.
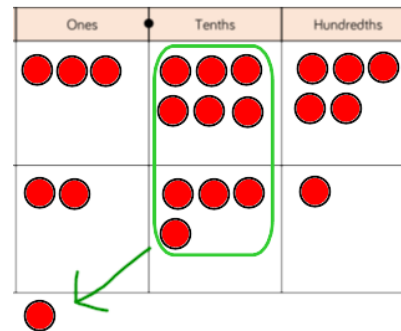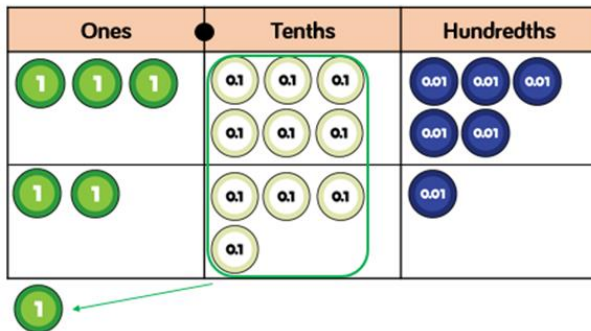
Skill: Add with up to 3 decimal places	Year: 5

2.41   3.65

?

?

3.65 | 2.41

3.65

2.41

?

$$3.65 + 2.41 = 6.06$$

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

Ones	Tenths	Hundredths
1 1 1	0.1 0.1 0.1 0.1 0.1 0.1	0.01 0.01 0.01 0.01 0.01
1 1	0.1 0.1 0.1 0.1	0.01
1		

Ones	Tenths	Hundredths
● ● ●	● ● ● ● ● ●	● ● ● ● ●
● ●	● ● ● ●	●
●		

Place value counters and plain 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 decimal places. This includes putting this into context when adding money and other measures.

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

| Skill	Year	Representations and models	
Subtract with up to 3-digits	3	Part-whole model Bar model	Base 10 Place value counters Column subtraction
Subtract with up to 4-digits	4	Part-whole model Bar model	Base 10 Place value counters Column subtraction
Subtract with more than 4 digits	5	Part-whole model Bar model	Place value counters Column subtraction
Subtract with up to 3 decimal places	5	Part-whole model Bar model	Place value counters Column subtraction

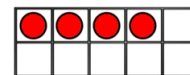| Skill: Subtract 1-digit numbers within 10	Year: 1

$$7 - 3 = 4$$

First   Then   Now

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
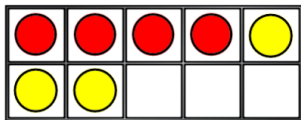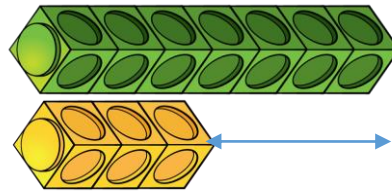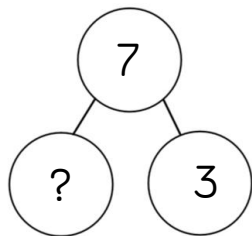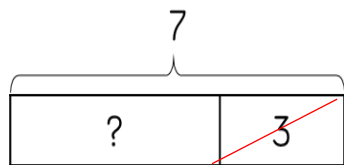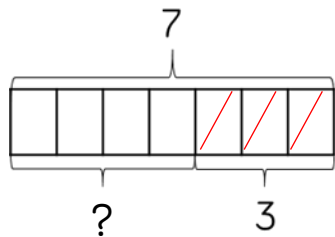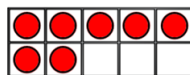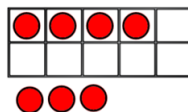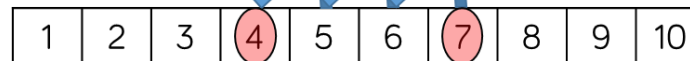
Part-whole models, bar models, ten frames and number shapes support partitioning.

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
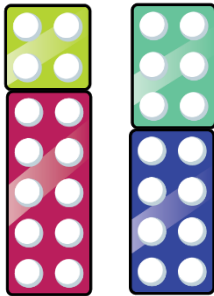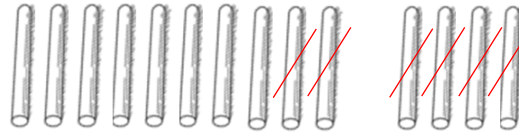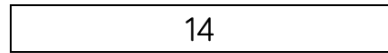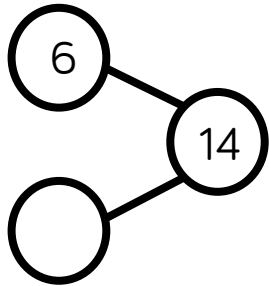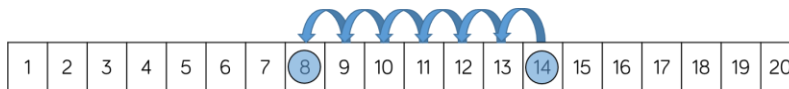
6

14

14

6

8

$$14 - 6 = 8$$

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

14 − 6 = 8

4   2

− 2   − 4

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
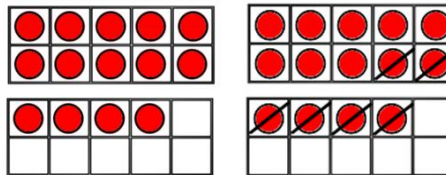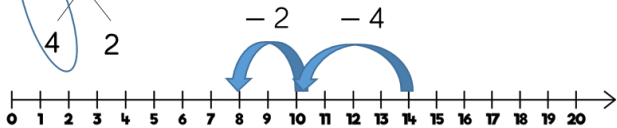
14 − 6 = 8

4   2

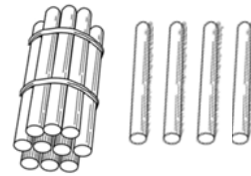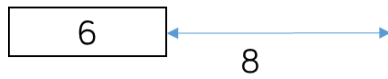In Year 1, subtracting one-digit numbers that cross 10, is done by counting back, using objects, number tracks and number lines. From Year 2, children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.

Skill: Subtract 1 and 2-digit numbers to 100	Year: 2/3

$$+2 \quad +30 \quad +5$$

$$28 \quad 30 \quad 60 \quad 65$$

65

28

65

?	28

$$65 - 28 = 37$$

Tens	Ones
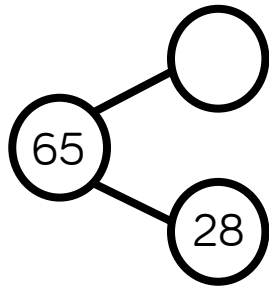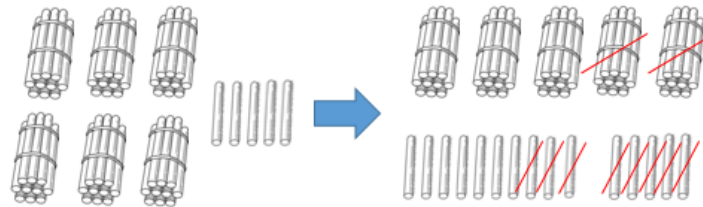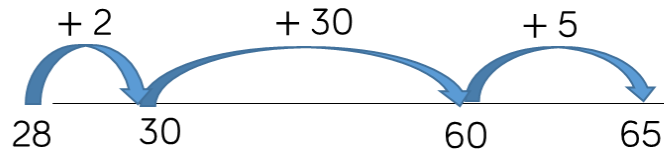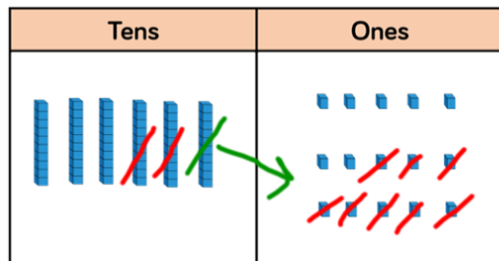
$$\begin{array}{r} \overset{5\;\;1}{6\,5} \\ -\;2\,8 \\ \hline 3\,7 \end{array}$$

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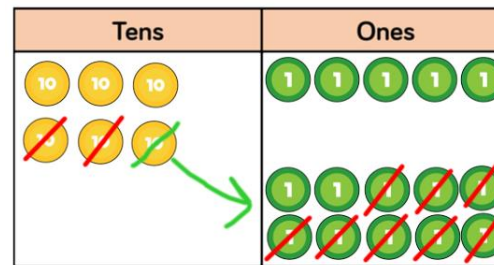
Children can also use a blank number line to count back to find the difference. Encourage them to jump to multiples of 10 to become more efficient.

From Year 3, 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.

Skill: Subtract numbers with up to 3 digits	Year: 3
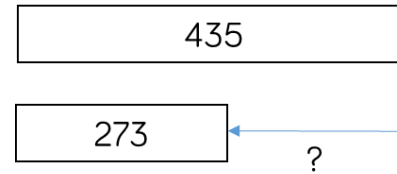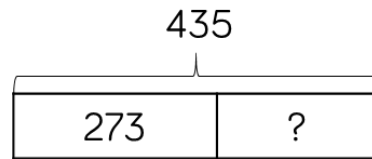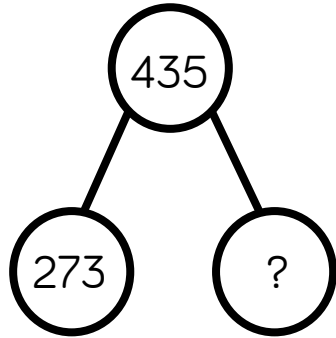
435

273   ?
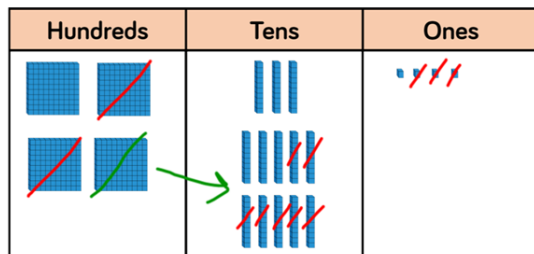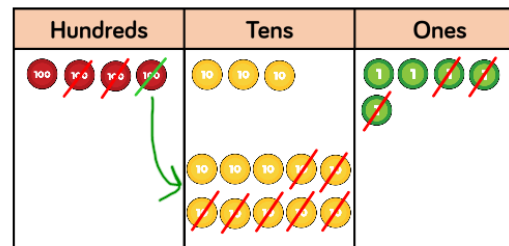
435

| 273 | ? |

435

| 273 | ← ? → |

$$435 - 273 = 162$$

Hundreds	Tens	Ones

$$^3\cancel{4}^1\cancel{3}5$$
$$- 273$$
$$\overline{162}$$

Hundreds	Tens	Ones

Base 10 and place value counters are the most effective manipulative 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 column method.

Plain counters on a place value grid can also be used to support learning.

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

4,357

2,735   ?

4,357

2,735   ?

$$3\ 1$$
$$\cancel{4}\cancel{3}57$$
$$-\ 2735$$
$$\overline{\ \ 1622}$$
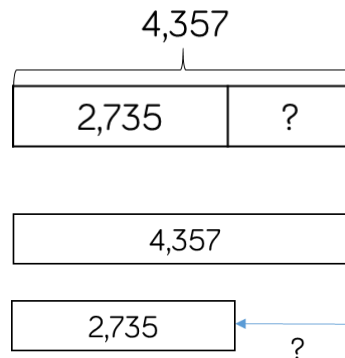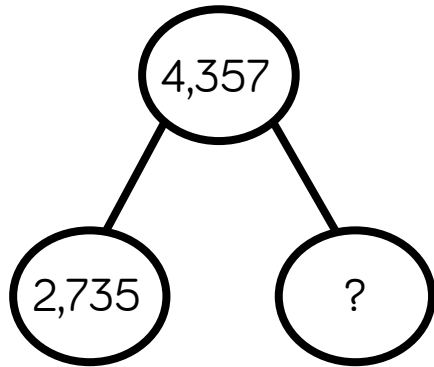
$$4,357 - 2,735 = 1,622$$

Thousands	Hundreds	Tens	Ones

Thousands	Hundreds	Tens	Ones

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 column method.

Plain counters on a place value grid can also be used to support learning.

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

294,382

182,501 ?

294,382

| 182,501 | ? |
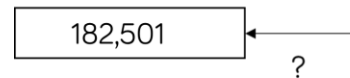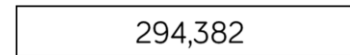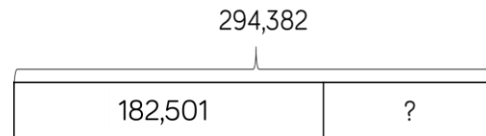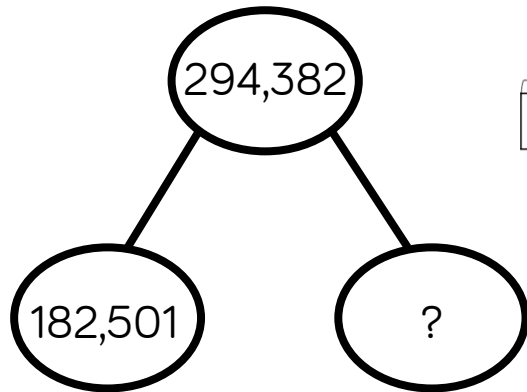
294,382

182,501 ?

$$294{,}382 - 182{,}501 = 111{,}881$$

HTh	TTh	Th	H	T	O

			2	9	$^3\!\!\!/$	$^1 3$	8	2
−			1	8	2	5	0	1
			1	1	1	8	8	1

Place value counters or plain 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 column method to subtract larger numbers efficiently.

Skill: Subtract with up to 3 decimal places	Year: 5/6

2.7   ?

5.43

5.43

2.7	?

5.43

2.7

?
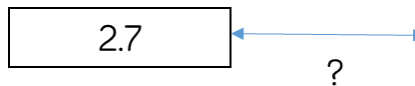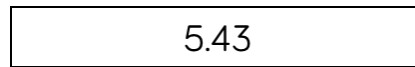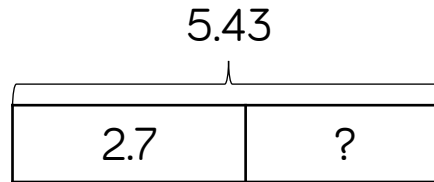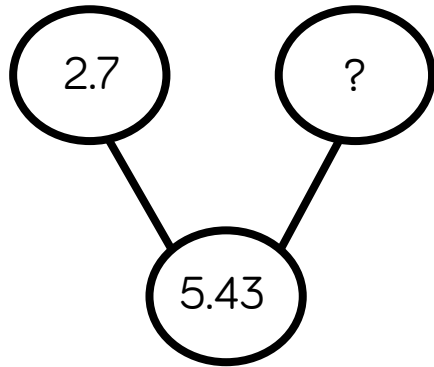
$$\begin{array}{r} {}^{4}{}^{1} \\ \cancel{5}.43 \\ -\ 2.7 \\ \hline 2.73 \end{array}$$

$$5.43 - 2.7 = 2.73$$
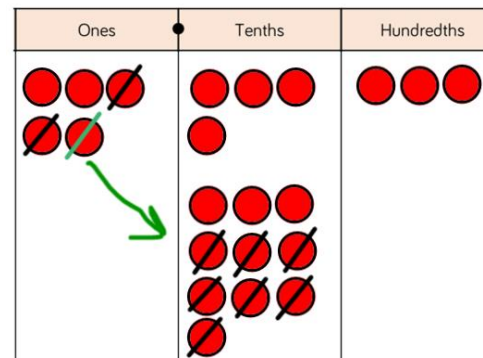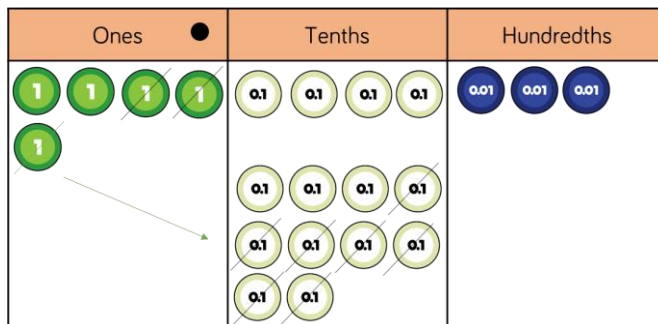
Ones ●	Tenths	Hundredths
1 1 1 1 / 1	0.1 0.1 0.1 0.1 / 0.1 0.1 0.1 0.1 / 0.1 0.1 0.1 0.1 / 0.1 0.1	0.01 0.01 0.01

Ones ●	Tenths	Hundredths

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

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

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.

Year 1 - 6

Calculation Policy
Multiplication and Division

#MathsEveryoneCan

White Rose Maths

Calculation Policy

Welcome to the White Rose Maths Calculation Policy.

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

At the start of each policy, there is an overview of the different models and images that can support the teaching of different concepts. These provide explanations of the benefits of using the models and show the links between different operations.

Each operation is then broken down into skills and each skill has a dedicated page showing the different models and images that could be used to effectively teach that concept.

There is an overview of skills linked to year groups to support consistency through out school. A glossary of terms is provided at the end of the calculation policy to support understanding of the key language used to teach the four operations.

Bar Model

$5 \times 5 = 25$

$3 \times 7 = 21$

$7 \times 3 = 21$

$21 \div 7 = 3$

Boys | 3 | 3 | 3 | 3 | 3

Girls | 3

Benefits

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 the 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 boys than girls. How many boys are there?
The multiple bar model provides an opportunity to compare the groups.

Number Shapes

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

$5 \times 4 = 20$
$4 \times 5 = 20$
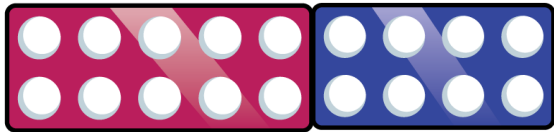
$18 \div 3 = 6$
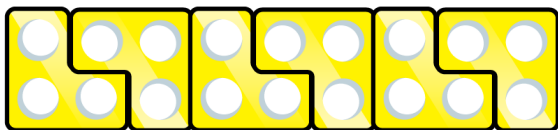
Benefits

Number shapes support children's understanding of multiplication as repeated addition.

Children can build multiplications in a row using the number shapes. When using odd numbers, encourage children to interlock the shapes so there are no gaps in the row. They can then use the tens number shapes along with other necessary shapes over the top of the row to check the total. Using the number shapes in multiplication can support children in discovering patterns of multiplication e.g. odd × odd = even, odd × even = odd, even × even = even.

When dividing, number shapes support children's understanding of division as grouping. Children make the number they are dividing and then place the number shape 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.

Bead Strings

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

$15 \div 3 = 5$

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

$15 \div 5 = 3$

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

$20 \div 4 = 5$

Benefits

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, 16, 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
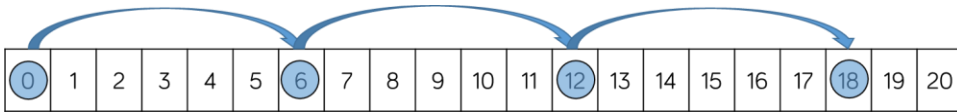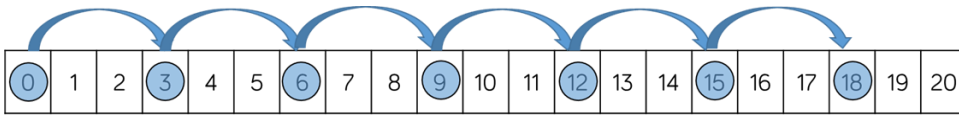
$$6 \times 3 = 18$$
$$3 \times 6 = 18$$
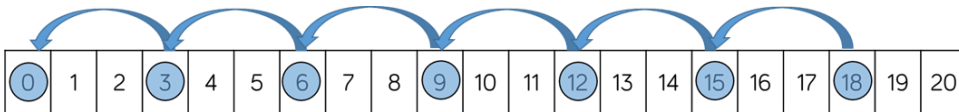
$$18 \div 3 = 6$$

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)
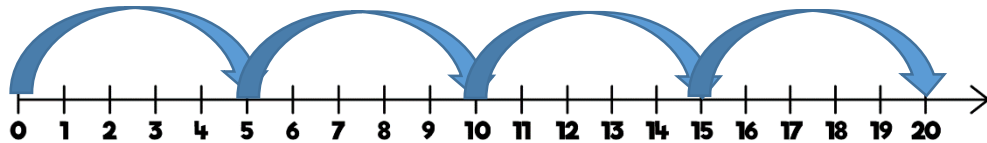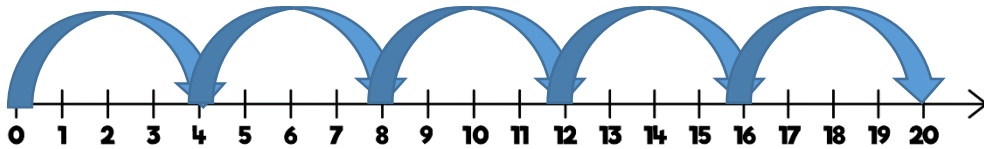
$$4 \times 5 = 20$$
$$5 \times 4 = 20$$
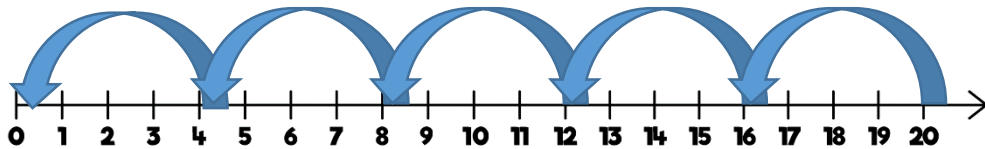
$$20 \div 4 = 5$$

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.

Number Lines (blank)

× 4

0   3   6   9   12
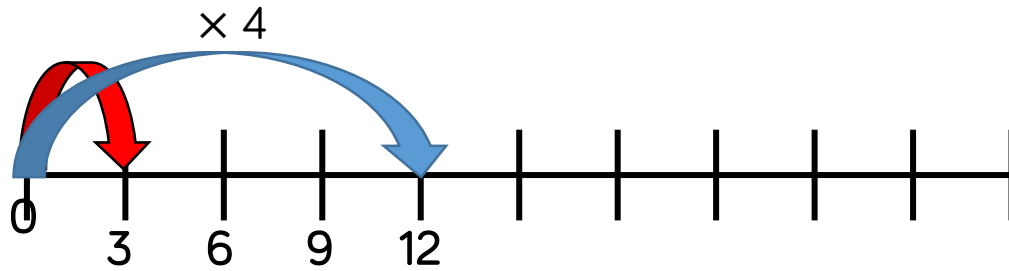
A red car travels 3 miles.
A blue car 4 times further.
How far does the blue car travel?

× 4

0   3   12
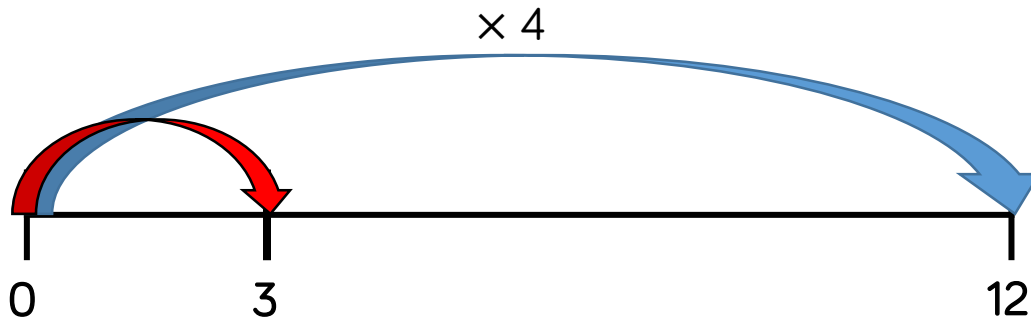
A blue car travels 12 miles.
A red car 4 times less.
How far does the red car travel?

Benefits

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)

	Hundreds	Tens	Ones

$$\begin{array}{r} 24 \\ \times \ \ 3 \\ \hline 72 \\ \hline 1 \end{array}$$
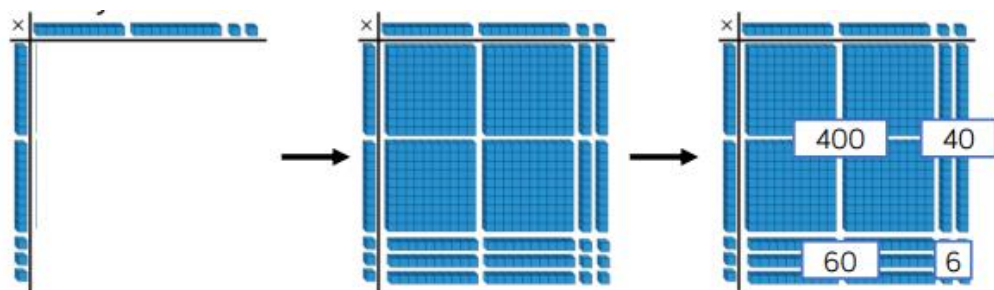
400 — 40
60 — 6

Benefits

Using Base 10 or Dienes 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 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.

Base 10 also supports the area model of multiplication well. Children use the equipment to build the number in a rectangular shape which they then find the area of by calculating the total value of the pieces This area model can be linked to the grid method or the formal column method of multiplying 2-digits by 2-digits.

Base 10/Dienes (division)
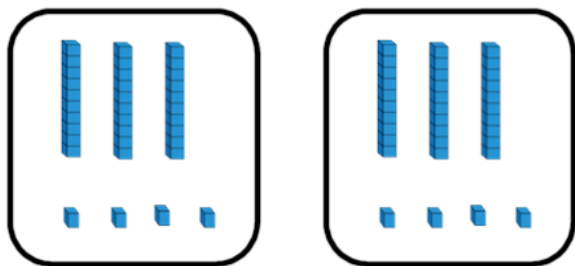
$68 \div 2 = 34$
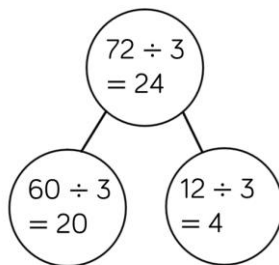
$72 \div 3 = 24$

Tens	Ones

Benefits

Using Base 10 or Dienes is an effective way to support children's understanding of division.

When numbers become larger, it can be an effective way to move children from representing numbers as ones towards representing them as tens and ones in order to divide. Children can then 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)
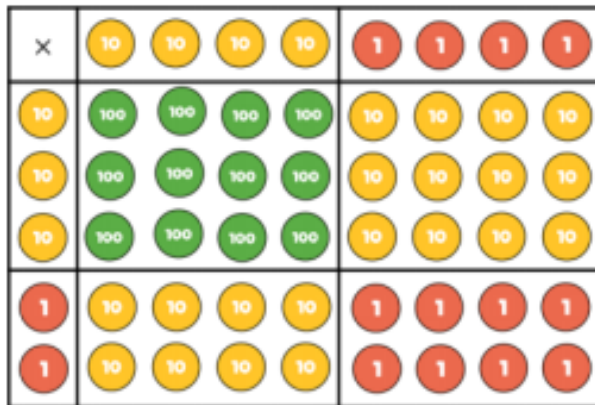
$$34$$
$$\times \ \ 5$$
$$\overline{170}$$
$$1 \ \ 2$$

$$44$$
$$\times \ 32$$
$$\overline{8}$$
$$80$$
$$120$$
$$+ \ 1200$$
$$\overline{1408}$$
$$1$$

Benefits

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 amounts of groups becomes higher, Base 10 / Dienes becomes 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 well. Children can see how to multiply 2-digit numbers by 2-digit numbers.

Place Value Counters (division)

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

10

96 ÷ 4 = 24

80 ÷ 4 = 20

16 ÷ 4 = 4
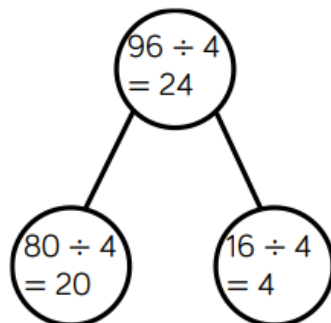
Thousands	Hundreds	Tens	Ones
1000 1000	100 100	10 10	1 1
1000 1000	100 100	10 10	1 1
	100 100	10 10	1 1
	100 100	10 10	1 1
		10	1 1
			1 1

$$\begin{array}{r} 1223 \\ 4\overline{)489{}^{1}2} \end{array}$$

Benefits

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 dividing 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	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	Year	Representations and models	
Recall and use multiplication and division facts for the 3-times table	3	Hundred square Number shapes Counters	Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 4-times table	3	Hundred square Number shapes Counters	Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 8-times table	3	Hundred square Number shapes	Bead strings Number tracks Everyday objects
Recall and use multiplication and division facts for the 6-times table	4	Hundred square Number shapes	Bead strings Number tracks Everyday objects

| Skill	Year	Representations and models	
Recall and use multiplication and division facts for the 7-times table	4	Hundred square Number shapes	Bead strings Number lines
Recall and use multiplication and division facts for the 9-times table	4	Hundred square Number shapes	Bead strings Number lines
Recall and use multiplication and division facts for the 11-times table	4	Hundred square Base 10	Place value counters Number lines
Recall and use multiplication and division facts for the 12-times table	4	Hundred square Base 10	Place value counters Number lines

Skill: 2 times table	Year: 2
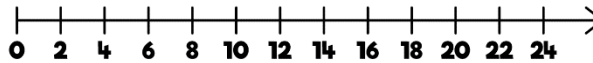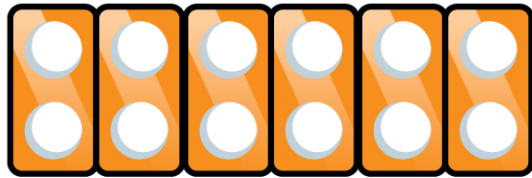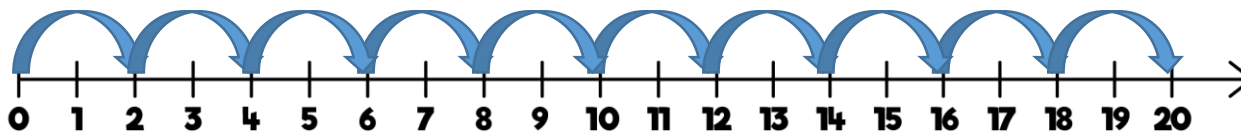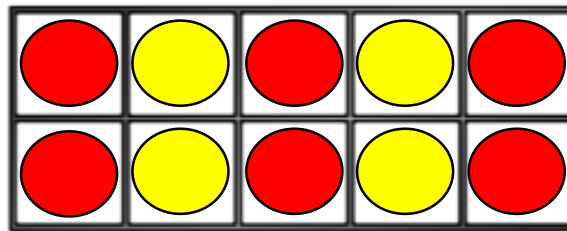
Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square.

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.
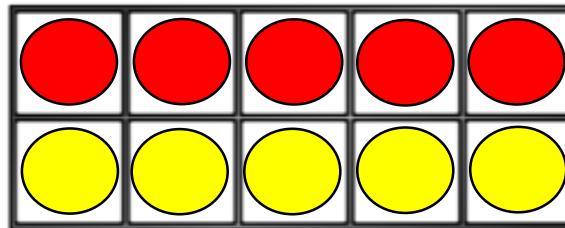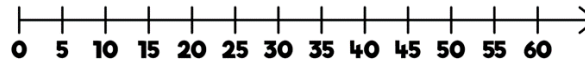
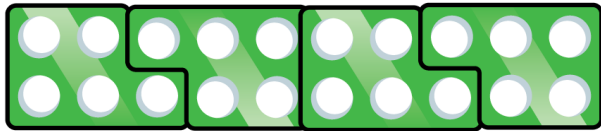| Skill: 5 times table	Year: 2
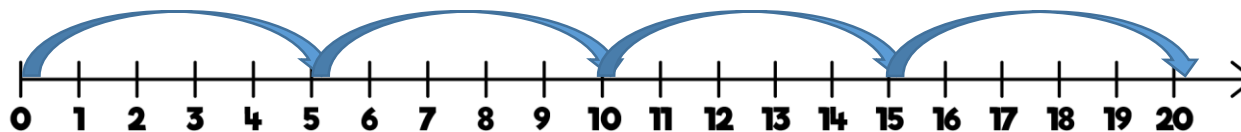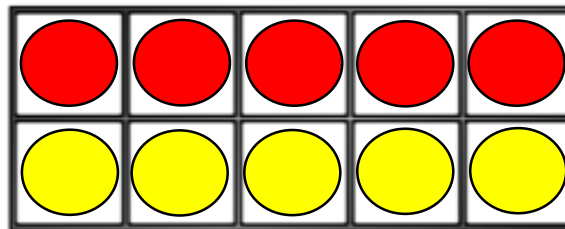
Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square.

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
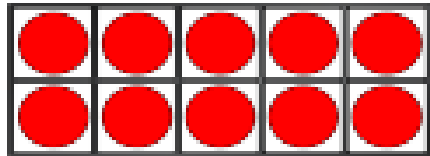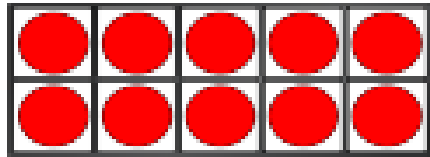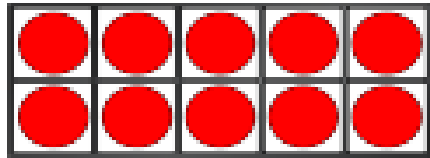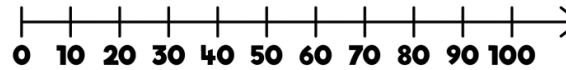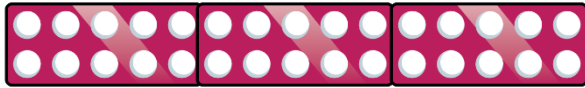
Number line: 0 10 20 30 40 50 60 70 80 90 100

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.

Skill: 3 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

3   6   9   12
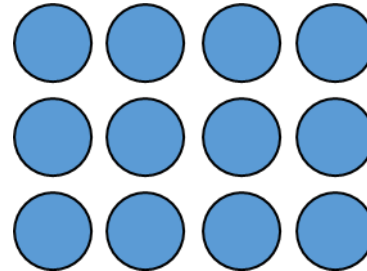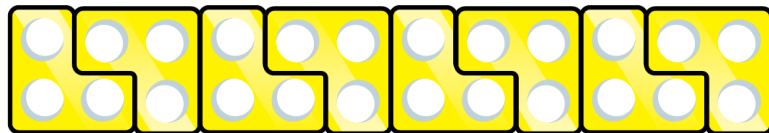
0 3 6 9 12 15 18 21 24 27 30 33 36

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

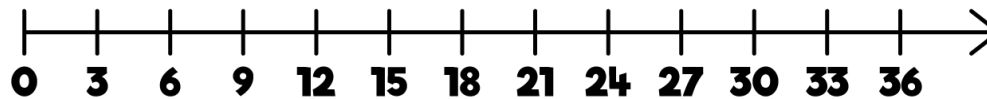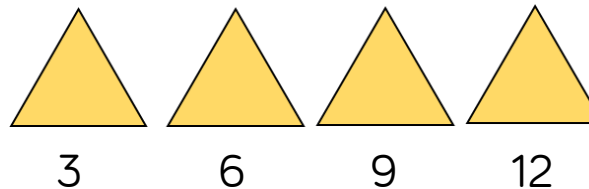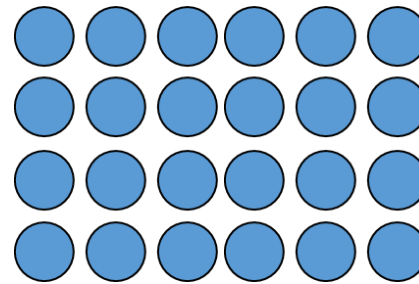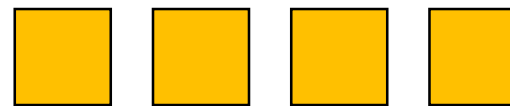Look for patterns in the three times table, using concrete manipulatives to support. Notice the odd, even, odd, even pattern using number shapes to support. Highlight the pattern in the ones using a hundred square.

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
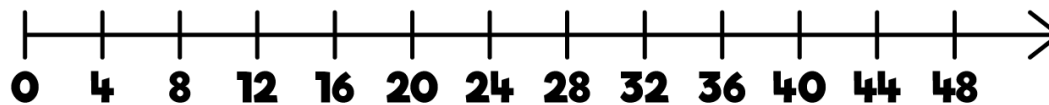
4   8   12   16

0   4   8   12   16   20   24   28   32   36   40   44   48

Encourage daily counting in multiples, supported by a number line or a hundred square. Look for patterns in the four times table, using 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 number shapes to support.

Skill: 8 times table								Year: 3	

Skill: 8 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
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

8   16   24   32

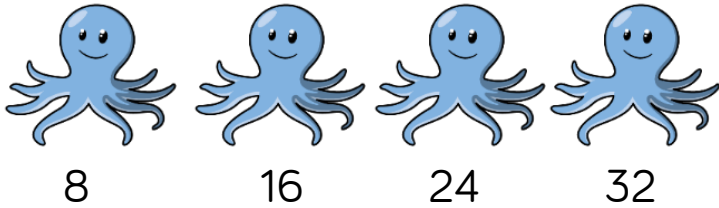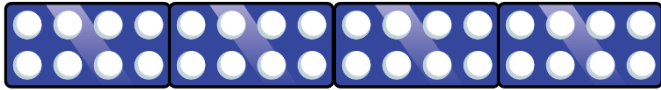| 8	16	24	32	40
48	56	64	72	80

0   8   16   24   32   40   48   56   64   72   80   88   96

Encourage daily counting in multiples, supported by a number line or a hundred square. Look for patterns in the eight times table, using 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 number shapes to support.
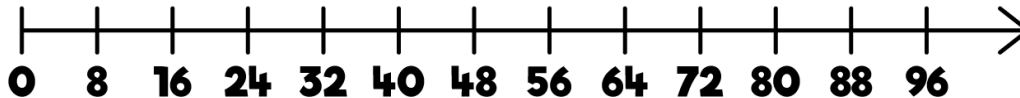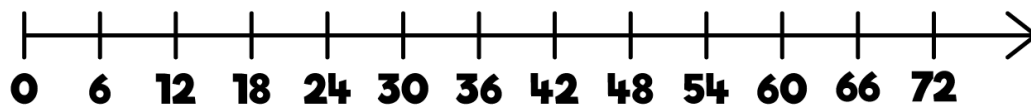
Skill: 6 times table	Year: 4

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

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

0 6 12 18 24 30 36 42 48 54 60 66 72

Encourage daily counting in multiples, supported by a number line or a 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 number shapes to support.
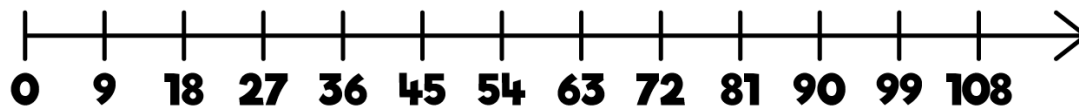
Skill: 9 times table	Year: 4

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

9	18	27	36	45
54	63	72	81	90

0 9 18 27 36 45 54 63 72 81 90 99 108

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 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.
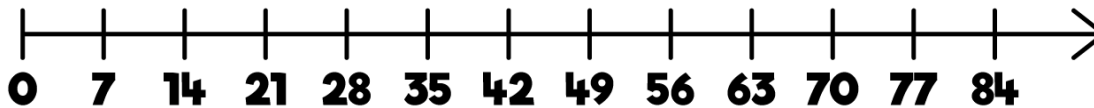
Skill: 7 times table	Year: 4

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

0 7 14 21 28 35 42 49 56 63 70 77 84

Encourage daily counting in multiples both forwards and backwards, supported by a number line or a 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 number 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

0   11   22   33   44   55   66   77   88   99   110   121   132
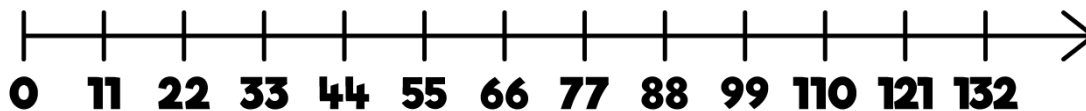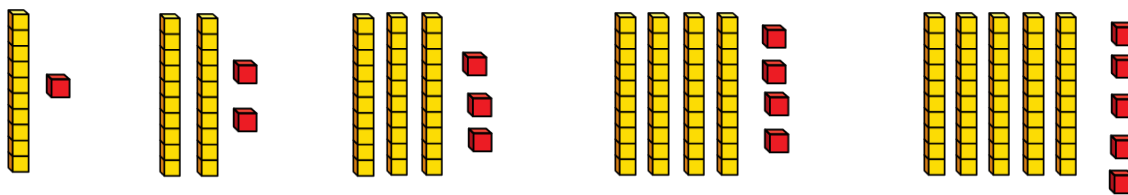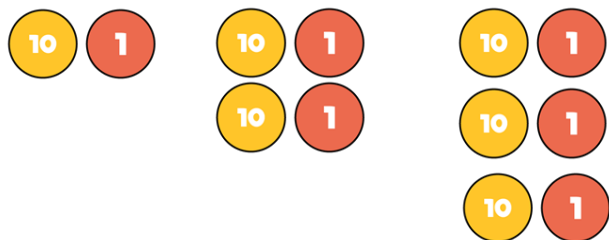
Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square.

Look for patterns in the 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

12	24	36	48	60
72	84	96	108	120
132	144			

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

0   12   24   36   48   60   72   84   96   108   120   132   144
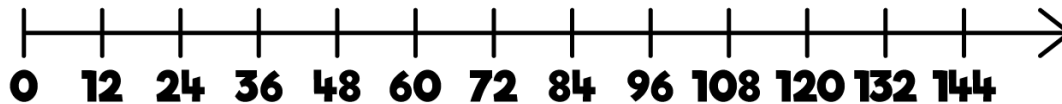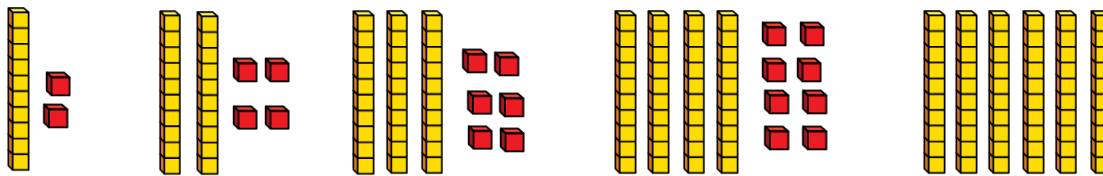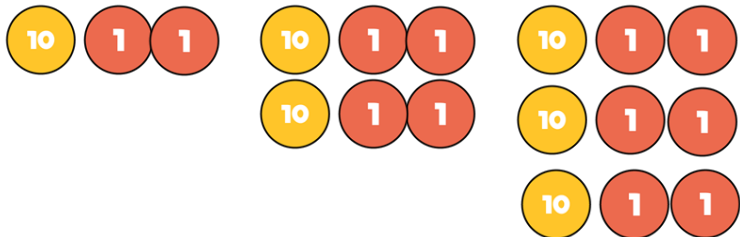
Encourage daily counting in multiples, supported by a number line or a hundred square. Look for patterns in the 12 times table, using manipulatives to support. Make links to the 6 times table, seeing how each multiple is double the sixes. Notice the pattern in the ones within each group of five multiples. The hundred square can support in highlighting this pattern.

Multiplication

Skill	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	Expanded written method Short 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	Year	Representations and models		
Multiply 2-digit by 2-digit numbers	5	Place value counters Base 10		Short written method Grid method
Multiply 2-digit by 3-digit numbers	5	Place value counters		Short written method Grid method
Multiply 2-digit by 4-digit numbers	5/6	Formal written method		

Skill: Solve 1-step problems using multiplication	Year: 1/2
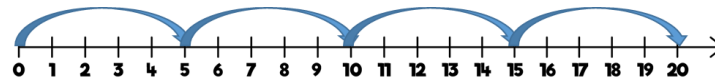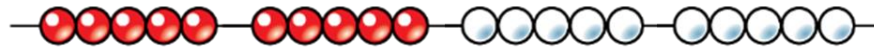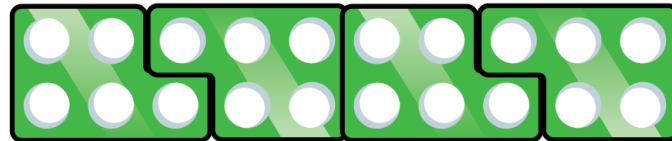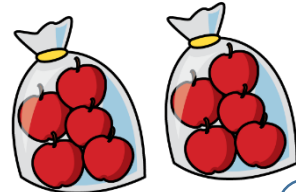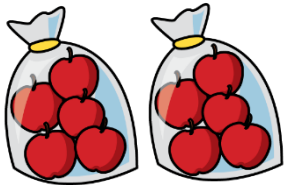
One bag holds 5 apples.
How many apples do 4 bags hold?
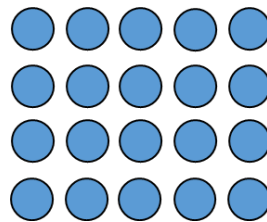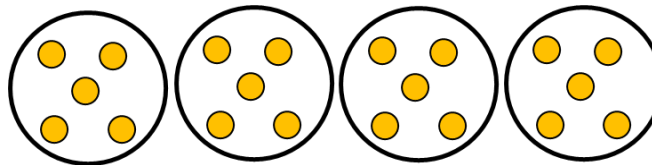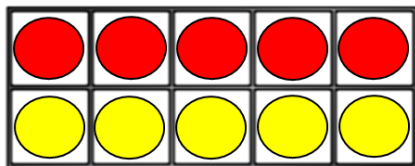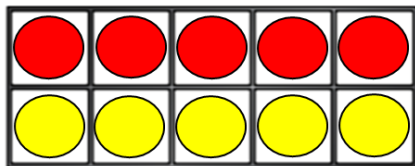
$5 + 5 + 5 + 5 = 20$

$4 \times 5 = 20$

$5 \times 4 = 20$

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.

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

$$34 \times 5 = 170$$

	H	T	O		
		3	4		
×			5		
		2	0		(5 × 4)
+		1	5	0	(5 × 30)
		1	7	0	
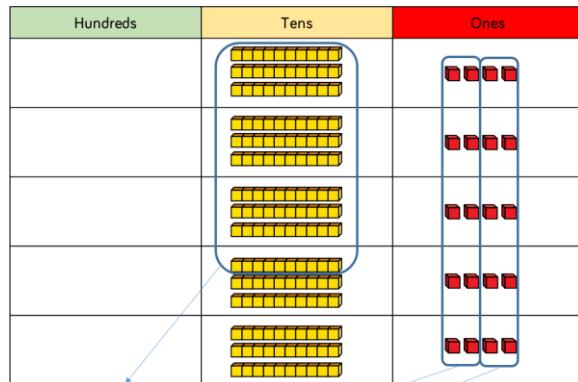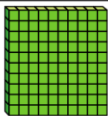
	H	T	O
		3	4
×			5
	1	7	0
	1	2	
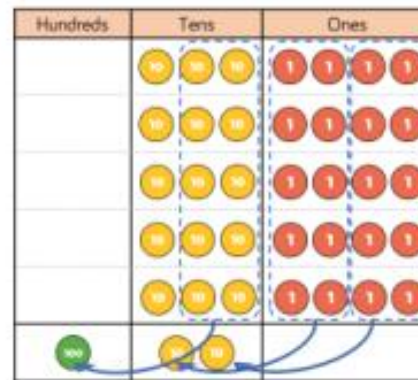
Informal methods and the expanded method are used in Year 3 before moving on to the short multiplication method in Year 4.

Place value counters should be used to support the 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: 4

$$245 \times 4 = 980$$

	H	T	O
	2	4	5
×			4
	9	8	0
	1	2	
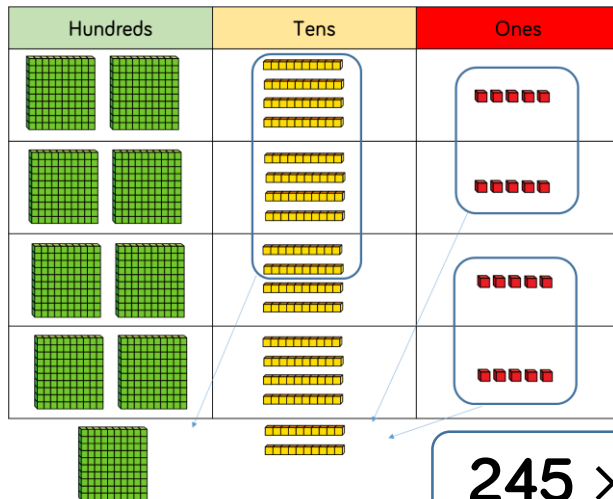
When moving to 3-digit by 1-digit multiplication, encourage children to move towards the short, formal written method.

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

Skill: Multiply 4-digit numbers by 1-digit numbers	Year: 5
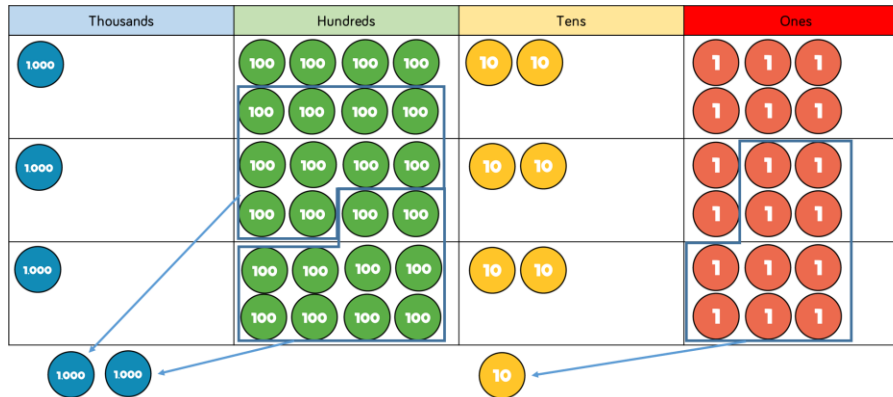
$$1,826 \times 3 = 5,478$$

	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 use to support children in their understanding of the formal written method.

If children are multiplying larger numbers and struggling with their times tables, 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
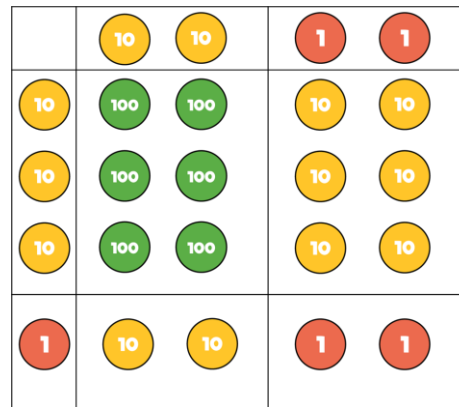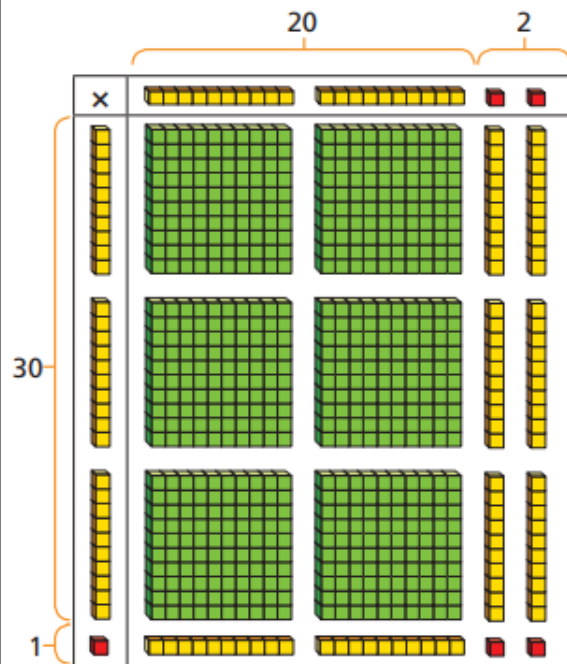
×	20	2
30	600	60
1	20	2

	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, 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 multiplication 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 Base 10 can be used to highlight the size of numbers.

Children should now move towards the formal written method, seeing the links with the grid method.
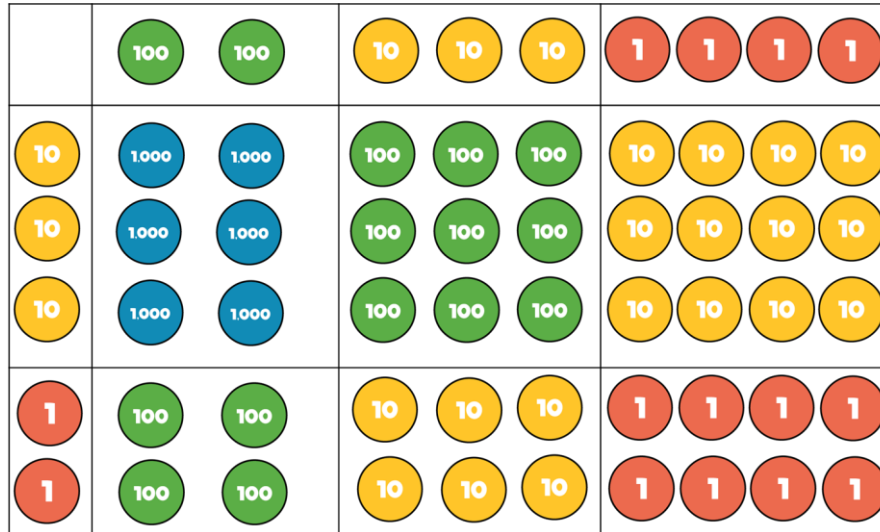
Th	H	T	O
	2	3	4
×		3	2
	4	6	8
1 7	1 0	2	0
7	4	8	8

×	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

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

(carried 1 below)

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

When multiplying 4-digits by 2-digits, children should be confident in using the formal written method.

If they are still struggling with times tables, provide multiplication grids to support when they are focusing on the use of the method.

Consider where exchanged digits are placed and make sure this is consistent.

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	Year	Representations and models	
Divide 2-digits by 1-digit (sharing with remainders)	3/4	Straws Base 10 Bar model	Place value counters Part-whole model
Divide 2-digits by 1-digit (grouping)	4/5	Place value counters Counters	Place value grid Written short division
Divide 3-digits by 1-digit (sharing with exchange)	4	Base 10 Bar model	Place value counters Part-whole model
Divide 3-digits by 1-digit (grouping)	4/5	Place value counters Counters	Place value grid Written short division

Skill	Year	Representations and models	
Divide 4-digits by 1-digit (grouping)	5	Place value counters Counters	Place value grid Written short division
Divide multi-digits by 2-digits (short division)	6	Written short division	List of multiples
Divide multi-digits by 2-digits (long division)	6	Written long division	List of multiples

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

20

? ? ? ? ?
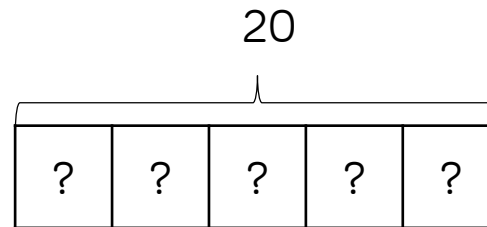
There are 20 apples altogether.
They are shared equally between 5 bags.
How many apples are in each bag?
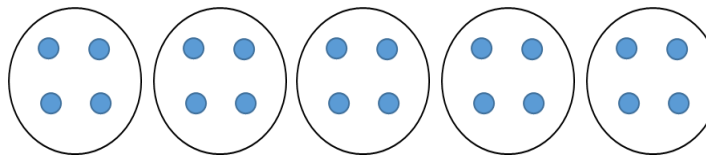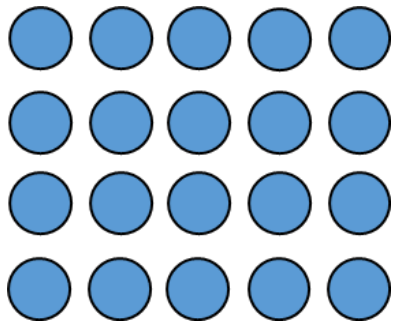
$20 \div 5 = 4$

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
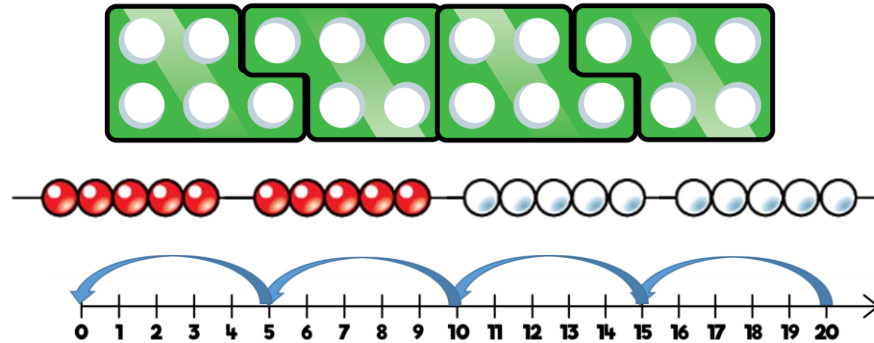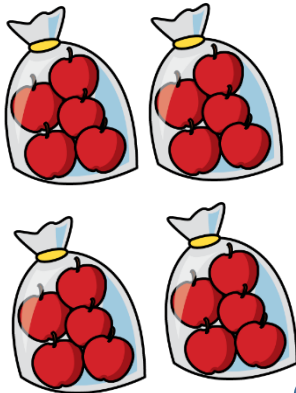
There are 20 apples altogether.
They are put in bags of 5.
How many bags are there?
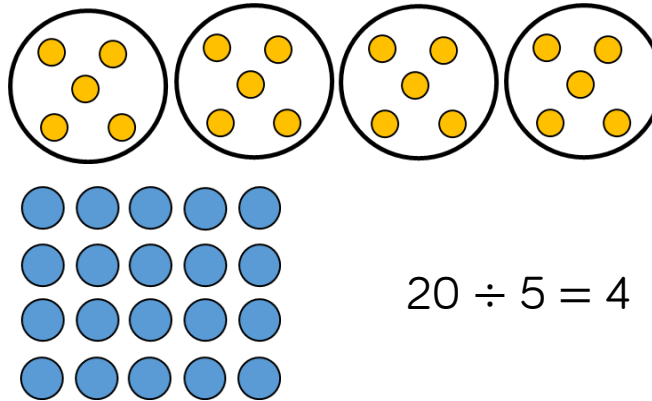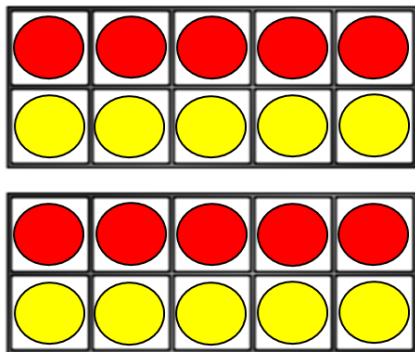
$20 \div 5 = 4$

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: 3

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

$$48 \div 2 = 24$$

48
40 8
÷ 2 ÷ 2
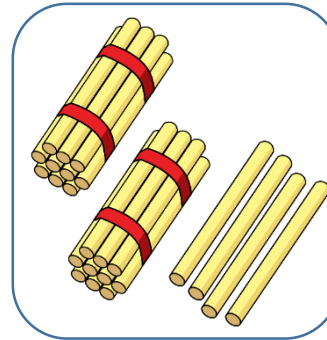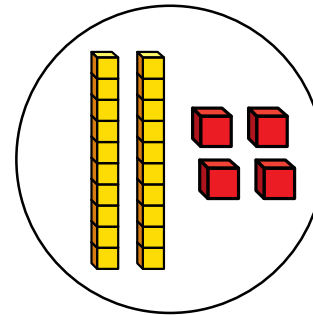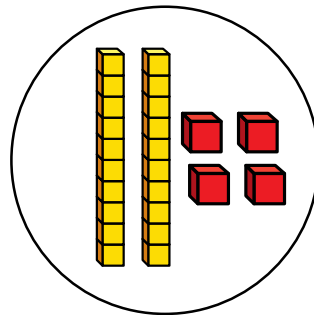
When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones.

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

Part-whole models can 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

Tens	Ones

52

?	?	?	?

$$52 \div 4 = 13$$

52

40   12

÷ 4   ÷ 4

10   3

10 + 3 = 13
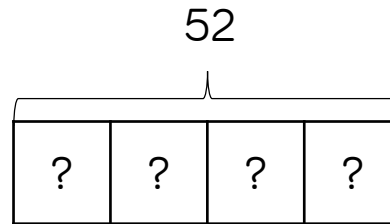
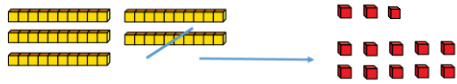| Tens	Ones
10	1 1 1
10	1 1 1
10	1 1 1
10	1 1 1
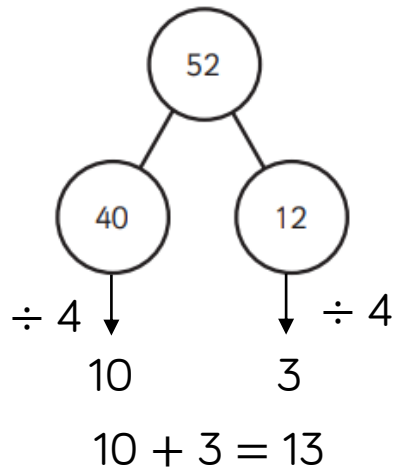
When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones. Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows.
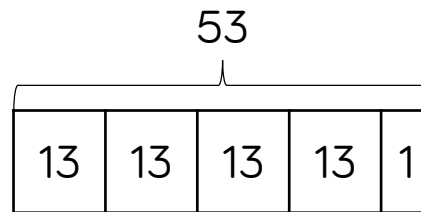
Flexible partitioning in a part-whole model supports this method.

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

53 ÷ 4 = 13 r1

When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones. Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made.
Flexible partitioning in a part-whole model supports this method.
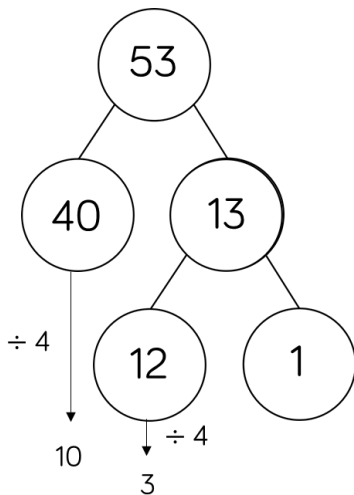
Skill: Divide 2-digits by 1-digit (grouping)	Year: 5

Tens	Ones

10 10
10 10
10

1 1
1 1
1 1
1 1
1 1
1 1

$$52 \div 4 = 13$$

		1	3	
	4	5	^{1}2	

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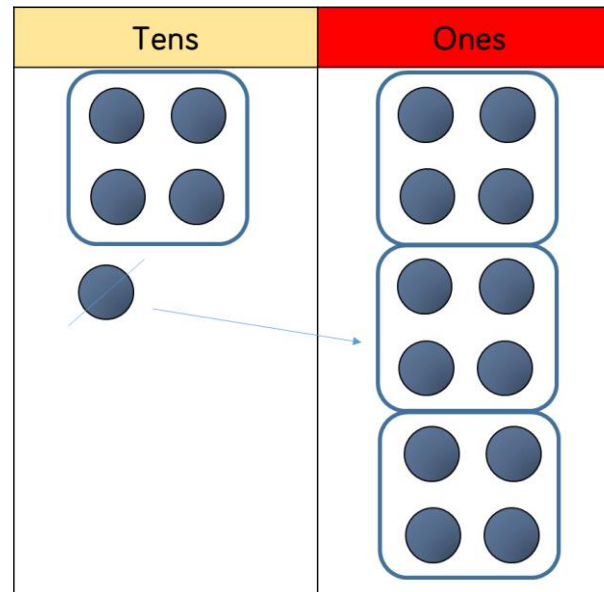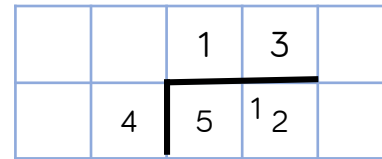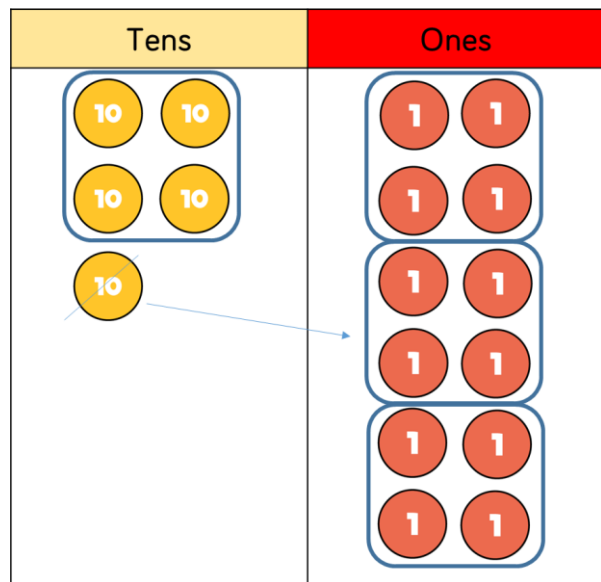
When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor.

Language is important here. Children should consider '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.

$$844 \div 4 = 211$$

844

H	T	O
100 100	10	1
100 100	10	1
100 100	10	1
100 100	10	1

844
800   40   4
÷ 4   ÷ 4   ÷ 4

$$856 \div 4 = 214$$

856
800   40   16
÷ 4   ÷ 4   ÷ 4
200   10   4

Hundreds	Tens	Ones
100 100	10	1 1 1 1
100 100	10	1 1 1 1
100 100	10	1 1 1 1
100 100	10	1 1 1 1
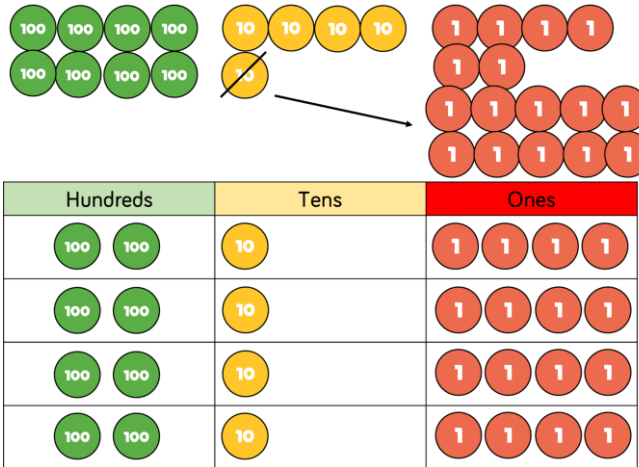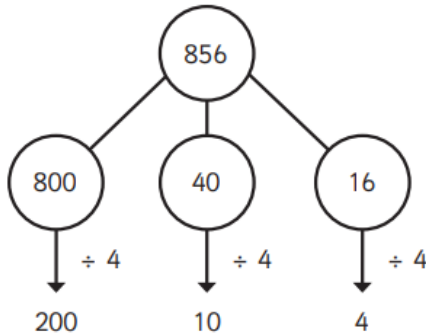
Children can continue to use place value counters to share 3-digit numbers into equal groups. Children should start with the equipment outside the place value grid before sharing the hundreds, tens and ones equally between the rows. This method can also help to highlight remainders. Flexible partitioning in a part-whole model supports this method.

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

Hundreds	Tens	Ones
100 100 100 100	10 10 10 10	1 1 1 1
100 100 100 100	10	...
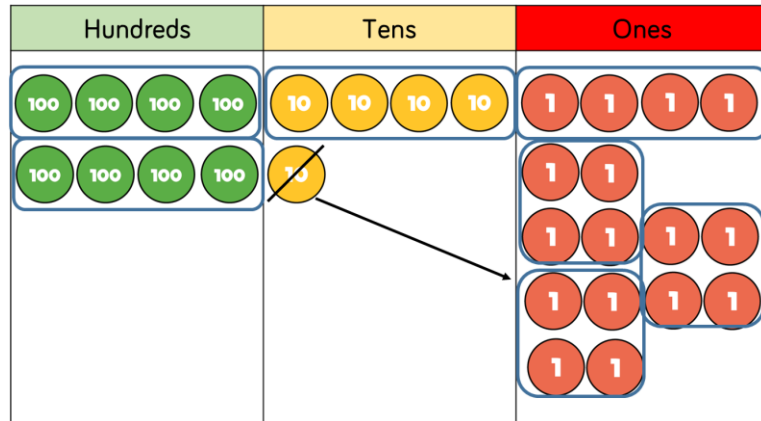
		2	1	4
4	8	5	$^{1}6$
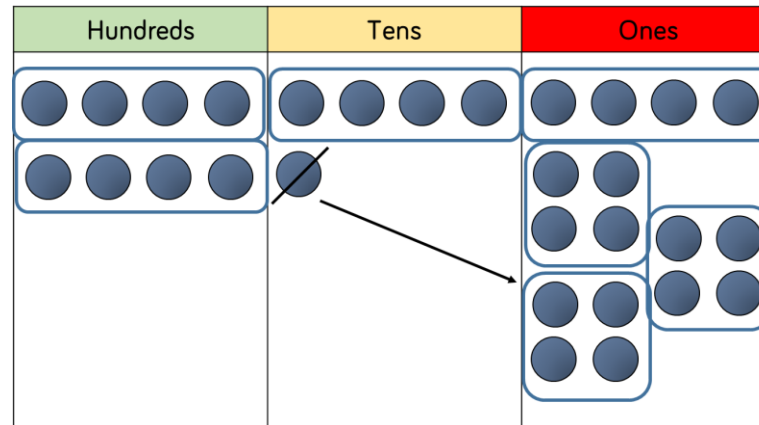
$$856 \div 4 = 214$$

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 or plain 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 |

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 or plain 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 should be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.

		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 up to 4-digits 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 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

$$432 \div 12 = 36$$

12 × 1 = 12
12 × 2 = 24
12 × 3 = 36 (×30)
12 × 4 = 48
12 × 5 = 60
12 × 6 = 72 (×6)
12 × 7 = 84
12 × 8 = 96
12 × 7 = 108
12 × 10 = 120

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

1 × 15 = 15
2 × 15 = 30
3 × 15 = 45
4 × 15 = 60
5 × 15 = 75
10 × 15 = 150

(×400)
(×80)
(×9)

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 |

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 answer questions where the quotient needs to be rounded according to the context.

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