Busill Jones Primary School Calculation Policy

This policy supports the White Rose Maths Schemes of Learning from Reception to Year 6. Each area of study progresses in line with the National Curriculum (2014) and the EYFS Early Adopter Framework (2020).

This calculation policy should be used to support children in developing a deep understanding of **number** and **calculation**, gaining **mastery** mathematics knowledge.
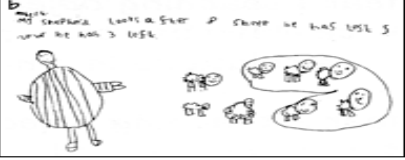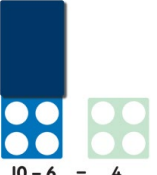
Concrete, Pictorial, Abstract (CPA) Approach

Children of all ages are first introduced to new mathematical learning by using real objects (concrete resources). They are offered a 'hands on' experience with manipulatives to support their fundamental knowledge as a foundation for their conceptual understanding. This is then followed by a pictorial representation which reflects the concrete manipulatives previously used. The children then make connections between the concrete resources and the pictorial representations. After sufficient foundation knowledge is gained, the pupils move onto an abstract representation using mathematical notations. To begin with, this concept is used parallel with the pictorial and concrete representations to secure the children's knowledge of all procedures.

These skills are reinforced through all representations being used throughout school, irrespective of the year group.

Reasoning and Problem Solving

Each lesson, children are exposed to reasoning and problem-solving questions to embed their understanding of the skills gained within the lesson. They use their learning in real-life contexts to solve complex and abstract problems, considering skills gained in previous areas of learning.

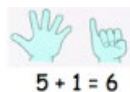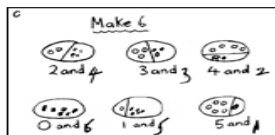| Children are encouraged to develop a mental picture of the calculation to support their understanding.			
Nursery / **Addition**	**Subtraction**	**Multiplication**	**Division**

Addition	**Subtraction**	**Multiplication**	**Division**
Progression of Calculation **O+O – combining objects** **1 more than a given number up to 5.** **O+O –counting on from a given number.** - **Subitise to 5** - **Automatically recall number bonds to 5** - **React to changes in an amount up to 3 items – adding items** - **Understand when two groups are the same** - **Solve real world mathematical problems up to 5** - **Be able to express how many there are in total through knowing that the last number counted is the total 'cardinal principle'.** - **Use key vocabulary when explaining reasoning 'I think this is larger because….' I think they have more because…'** Children develop ways of recording calculations using numicon bead strings, counters, pictures, marks etc. 5 + 1 = 6	**Progression of Calculation** **O-O (take –away)** **1 less than a given number up to 5** **O-O (comparison e.g. – 'how many more…'; 'how many less…')** - **React to changes in an amount up to 3 items – taking away items** - **Join in with songs and nursery rhymes involving hiding/returning – e.g. 5 little ducks** - **Solve real world mathematical problems up to 5** - **Use key vocabulary when explaining reasoning 'this person has fewer because…'** Children develop ways of recording calculations using numicon, pictures, words, fingers, counters etc. 10 – 6 = 4 Children use number lines, tracks and numicon shapes to find one less and to support with counting back. Teachers *demonstrate* the use of the number line.	**Progression of Calculation** **Experiment with numbers up to 10, looking at equal groups supported by the teacher.** Children will experience equal groups of objects using counting equipment, Numicon, Cuisenaire etc. Children use songs, games and real life contexts to count in repeated groups of the same size (2s, 10s). Children use number lines to begin counting in groups. 2 3 4 5 6 7 8 9 10 11 12	**Progression of Calculation** **Begin to share and understand the basic concept 'one for me, one for you'** Children will understand equal groups and share items out in play and problem solving. Explore sharing into equal groups and sets with counting equipment, Numicon, Cuisena

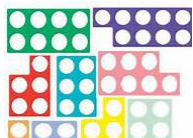|				
	Children experiment with combining different Numicon tiles together to find a total or match another piece.	Children use objects and numicon to help them compare objects and to say how many more or less.		
Key Vocabulary	*Add More And + Total Make Sum Lots Same Larger Smaller*	*Take Away Less Left Over Fewer Difference Between equal to/equals -*	*Same*	*Share*
Resources	Numicon Counting Equipment	Counting equipment	Sorting resources	Sorting resources

Children are encouraged to develop a mental picture of the calculation to support their understanding.				
Reception	**Addition**	**Subtraction**	**Multiplication**	**Division**
	Progression of Calculation **Understanding of the Cardinal Principle – the final number counted is the total.** **Subitise and then use counting to check (up to 10).** **O+O – combining objects** **1 more than a given number up to 20.** **O+O –counting on from a given number.** **Compare numbers using language such as 'more than' and 'greater than' and have a good understanding of 'one more than'.** **Understand the composition of numbers to 10.** Begin with numbers to 5 and understand the number bonds using a range of resources and physical objects, encouraging subitising. Move on to larger numbers as children develop a secure understanding. **Be able to recall number bonds to 10.** Use opportunities to encourage children to recall number bonds e.g. 'there are 3 children on the carpet and 3 children at the table. There are 6 children.' **Solve problems using concrete resources and pictorial images.**	**Progression of Calculation** **O-O (take –away)** **1 less than a given number up to 20.** **O-O (comparison e.g. – 'how many more…'; 'how many less…')** **Compare numbers using language such as 'less than' and 'fewer than' and have a good understanding of 'one less than'.** **Understanding of numbers to 10 and link this knowledge to subtraction.** Begin with numbers to 5 and understand the number bonds using a range of resources and physical objects, encouraging subitising. Move on to larger numbers as children develop a secure understanding. **Be able to recall number bonds to 10.** Use opportunities to encourage children to recall number bonds e.g. 'there were 5 children on the carpet but 2 have gone to play. There are now 3 children.'	**Progression of Calculation** **Counting in 2s and 10s** **Beginning to double single-digit numbers.** **Become exposed to language such as 'double' and 'half' and see this using concrete resources.** Children will experience equal groups of objects using counting equipment, Numicon, Cuisenaire etc. Children begin to record doubles.	**Progression of Calculation** **Creating equal groups of a set of objects.** **Sharing a set of objects** **Become exposed to language such as 'double' and 'half' and see this using concrete resources.** Children will understand equal groups and share items out in play and problem solving. Explore sharing into equal groups and sets with counting equipment, Numicon, Cuisenaire.

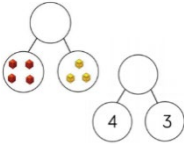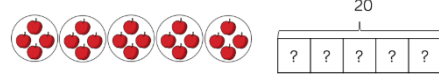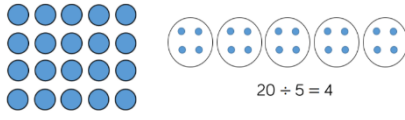|				
	Children develop ways of recording calculations using numicon, bead strings, counters, part whole models, marks etc. Children experiment with combining different Numicon tiles together to find a total or match another piece. Use tens frames to support addition of single digits by combining two groups.	**Use touch counting to understand the concept of subtraction, encouraging the children to physically take concrete resources away.** By touch counting and dragging in this way, it allows children to keep track of how many they are removing so they don't have to keep recounting. They will then touch count the amount that are left to find the answer. **Those who are ready** may record their own calculations. Children develop ways of recording calculations using numicon, pictures, words, fingers, counters, part whole models, ten frames etc. $8 - 4 = \_\_$ $10 - 6 = 4$ $5 - 1 = 4$ Children use number lines, tracks and numicon shapes to find one less and to support with counting back. Teachers *demonstrate* the use of the number line.	Children use songs, games and real life contexts to count in repeated groups of the same size (2s, 10s). Children use number squares, tracks to begin counting in groups	
Key Vocabulary	*Add More And +* *Total Make Sum Sequence*	*Take Away Less Left Over Fewer Difference Between equal to/equals*	*Double*	*Share* *Halving*
Resources	Numicon Counting Equipment Bead Strings Number lines	Bead Strings Counting equipment Number lines	Counters Number lines Double bugs Number squares	Halving mats

Children are encouraged to develop a mental picture of the calculation to support their understanding.

Year 1	Addition	Subtraction	Multiplication	Division
	Progression of Calculation **O+O counting on** **O+O crossing 10** **O+O crossing 10 using number facts to bridge** **TO + O within 20** **O + multiple of 10** **1 more than any give number to 100** - Confidently subitise numbers to 10 using knowledge from EYFS - Addition and subtraction to be taught alongside each other so that children can see the relationship between the two. - Derive additive facts to 10. E.g. "I know that 3 + 3 = 6 so 3 + 4 = 7" - Learn to recognise odd and even numbers using concrete resources. - Understand the equals sign as a 'balance'. - Combining two parts to make a whole: part whole model. - Joining two groups and then recounting all objects (number bonds within 10).	**Progression of Calculation** **O-O (take-away)** **O –O (comparison and difference)** - Any subtraction from 20 -Derive and use additive facts and make connections between these and subtraction problems. - Subtract multiples of 10 using the vocabulary 'one ten, two tens, three tens' alongside 10, 20, 30. - Addition and subtraction to be taught alongside each other so that children can see the relationship between the two. - Subtract using Base Ten/straws and understand regrouping one ten for ten ones. Begin with physical objects being taken away. 6 -3=3 Subtract by counting back, using a number line/bead string. Bead strings or bead bars can	**Progression of Calculation** - Doubling of numbers to 10 - Counting in 2s, 5s and 10s from 0 - When moving to pictorial/written calculations, language is vital. - Repeated addition as a method to solve multiplication problems - Learn to recognise 2p, 5p and 10p coins and apply their knowledge of multiples when using these. E.g. calculating how many coins to give to pay for an item.- Count in tens to add and subtract (see addition and subtraction). They will count in 2s and 10s and begin to count in 5s mentally, using a number line to count jumps, using Numicon, using sets of counters. They will work on practical problem solving activities involving equal sets or groups.	**Progression of Calulation** **Halving 0-20** **0-20 ÷O** - Working practically to share and group. - Children are not expected to divide and calculate formally. **Sharing** 20 There are 20 apples altogether. They are shared equally between 5 bags. How many apples are in each bag? 20 ÷ 5 = 4 **Grouping** Encourage children to use multiple knowledge and count in multiples. Link to repeated subtraction using a number line.

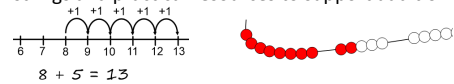Continue to use pictures and a range of resources to aid calculations.
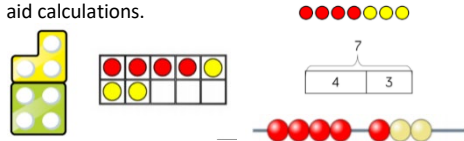
Children find a total to an addition by counting on from the first number, leading on to counting on from the larger number.

Begin to use known addition facts such as doubles or bonds to 10.

Children use numbered lines (to 10 and beyond), bead strings and practical resources to support addition.

$8 + 5 = 13$

Use Numicon tiles to calculate addition and solve problems e.g. all pairs that make 10. Begin to represent for bonds to 20. Use resources to support understanding of inverses.

Complete missing number problem such as
$3 + \square = 5$ using the part/whole model and resources. Understand what happens when zero is added to a number and embed using number lines and concrete resources.
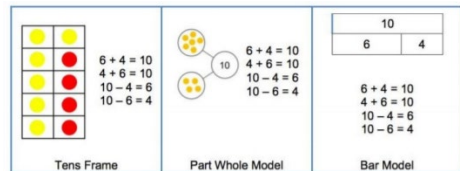
Use tens frames to embed understanding of bridging 10. E.g. $9 + 3 = 12$. Take one from the 3 and give it to the 9 to turn 9 into 10 so it is now $10 + 2 = 12$.

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be used to illustrate subtraction including bridging
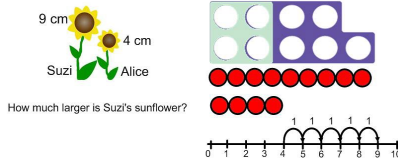
(13 – 5 = 4)

Use related subtraction facts to 20 and use known facts to support other facts e.g. $20 – 9$ by using fact $20 – 10$
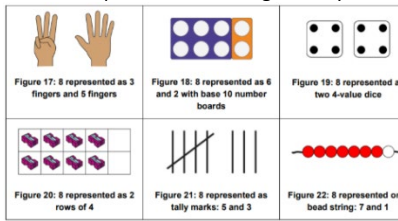
Subtraction to be calculated by crossing out pictures and introduction to bar models and tens frames.

Number lines and other resources should be used to show that subtraction can also mean finding the difference e.g. $9 - 4 =$ can also mean 'the difference between 4 and 9' and how many jumps they are apart.

How much larger is Suzi's sunflower?

Continue to use pictures, diagrams, and a range of resources to calculate and see numbers represented in a range of ways.
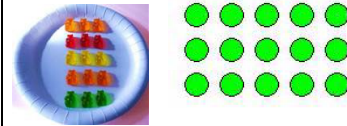
Understand what happens when zero is subtracted from a number.

Introduction to the part whole model to complete missing number problems e.g. $10 – 5 =$
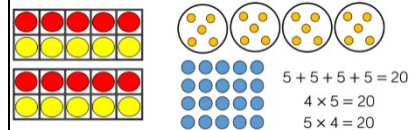
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10 x 8=80

Begin using an array to aid multiplication.

Use Numicon and other objects to aid multiplication and to support understanding of doubles.

Children begin to make connections between arrays, number patterns and

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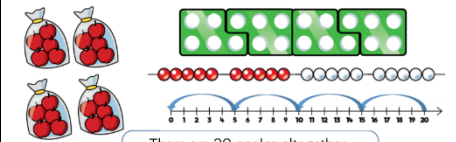$4 \times 5 = 20$
$5 \times 4 = 20$

counting in 2s, 5s and 10s.

Children begin to use a number line and hundred square to develop their understanding of multiplication as repeated addition and to record their multiplication of 2s, 5s and 10s. They should recognise that if numbers are grouped equally, it is more efficient to count in groups rather than ones.
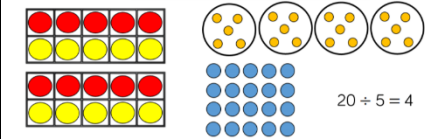
How many pencils are there?
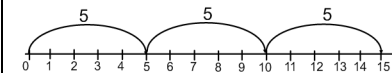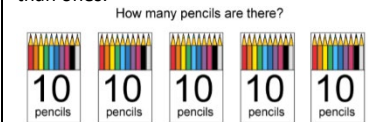
For assessment questions, see Mathematics Guidance sections: 1NPV and 1NF
https://assets.publishing.service.gov.uk/gov

Use fixed groups/resources (e.g. Numicon) to show relationship between multiplication and division

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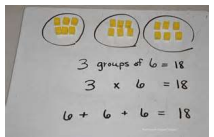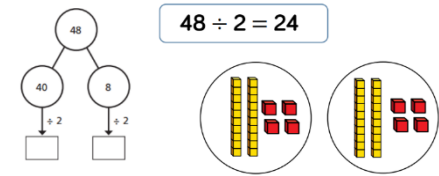
$20 \div 5 = 4$

Children to use informal recording when ready.

For assessment questions, see Mathematics Guidance sections: 1NPV and 1NF
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf

	Become familiar with the 100 square – quickly find where a number is located. Know that we move to the right and downwards when adding. Use to support adding multiples of 10. ***For assessment questions, see Mathematics Guidance sections: 1NPV, 1NF and 1AS*** https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	The position of the equals symbol should be varied so that children can recognise that calculations can be written in different ways. Become familiar with the 100 square – quickly find where a number is located. Know that we move upwards and left when subtracting. Reasoning should be done verbally. ***For assessment questions, see Mathematics Guidance sections: 1NPV, 1NF and 1AS*** https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	ernment/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	

Key Vocabulary	*Partition Equals/Same as* *Addition Number bonds* *More than Missing number* *Total/Sum*	*Subtraction* *Take Away Less Left Over* *Fewer Difference Between* *Equal to/Equals*	*Multiplication Groups of Equal* *Multiply Lots of* *Multiplied by Sets of* *Multiple Array*	*Half Grouping* *Halve Share* *Division Equal* *Dividing*
Resources	Numicon Hundred Square Bead Strings Straws Number lines Tens frame Counting equipment Double sided counters	Bead Strings Tens frame Number lines Straws Counting equipment Double sided counters Hundred Square Numicon	Tens frames Straws Arrays Double sided counters Numicon Bead strings Number lines	Tens frames Straws Arrays Double sided counters Numicon Bead strings Number lines

Children are encouraged to develop a mental picture of the calculation to support their understanding.

Year 2	**Addition**	**Subtraction**	**Multiplication**	**Division**
	Progression of Calculation **TO+O (not crossing 10)** **TO+T (not crossing 10)** **TO+O (bridging through 10)** **TO + 'teens number'** **TO+TO (not crossing tens)** **O+O+O** **- Understand addition as commutative.** **- Use the bar model to find missing digits.** **- Use the inverse to find missing numbers.** **- Confidence with a strategy to add/subtract, in particular when bridging ten.** **- Use additive facts to connect numbers e.g. 3 + 4 = 7 so 30 + 40 = 70, moving onto recognising 35 + 40 = 75** **- Recognise all coins and use this to add to an amount.**	**Progression of Calculation** **TO-O (not crossing 10s)** **TO-O (crossing 10s)** **TO-T** **TO-TO (counting back)** **TO-TO (counting on)** **- Recognise that subtraction is not commutative.** **- Recognise the inverse and use to check calculations using bar models.** Children use known facts e.g. 20 – 9 by using fact 20 – 10. **Counting back**	**Progression of Calculation** **O x 2, 5 and 10** **Doubles up to 20+20** **- Introduction to the X symbol and use when writing formal calculations.** **- Recall and reuse facts from times tables, recognising when to use these in problems.** **- Understand that multiplication is commutative.** **- Consider introducing counting in 3s towards the end of the year.** Express multiplication in a number of ways:	**Progression of Calculation** **Halving 0-40** **TO÷) (using jottings and equipment in context)** **TO÷2,5,10 (using known facts)** **TO÷2,5,10 (with remainders)** **- Recall and use division facts relating to known times tables.** **- Divide larger numbers by partitioning into tens and ones.** **- Multiplication and division taught alongside each other to show relationship.**

A bouncy ball costs 60p. Circle the coins which you could use to pay for it. Is there more than one answer?

Counting on e.g. 13 + 5 =
Children use visual resources to begin to draw their own empty number lines to support

calculation.
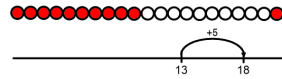
Partitioning
Children use known addition facts such as doubles or bonds to 20 to add more quickly or derive new facts up to 100. E.g. Use knowledge that 4 + 3=7 to know 40 + 30=70
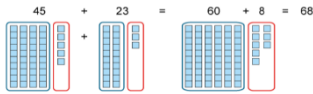
Children use knowledge of place value to partition two digit numbers. Progression begins with adding tens then ones, progressing to 2 digit add tens add ones.

$$40 + 20 + 5 + 3 = 60 + 8 = 68$$
$$40 + 5 + 20 + 3 = 60 + 8 = 68$$
$$45 + 23 = 60 + 8 = 68$$

Children to think flexible

$$45 \quad + \quad 23 \quad = \quad 60 \quad + \quad 8 \quad = \quad 68$$

about numbers and partition in different ways
e.g. 23 = 20+3 and 23 = 10 + 13
Use partitioning knowledge to support calculation using number lines and hundred squares.
Children to become more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7).
Children to be supported in understanding that bridging through ten can lead to more efficient calculation. E.g.

$$37 + 15 = 52$$
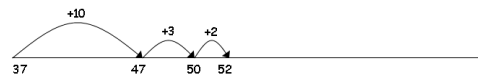
Children use visual resources to begin to draw their own empty number lines to support calculation**s.**
Children first counting back in tens and ones.

47 – 23 = 24
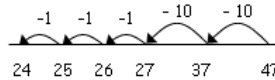
Children then become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4).
Children move to subtracting the tens in one jump and the units in one jump.
Use a variety of methods when subtracting through ten.
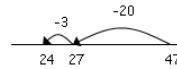
Use a range of resources and representations to make links and recognise numbers shown in a variety of ways.

Repeated addition
5 times 3 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x3
Although children must understand that multiplication is commutative, it must be taught that:
The 'start' number (the operand) will be the group size; the 'change' number (multiplicand) will be the number of times the group is repeatedly added.
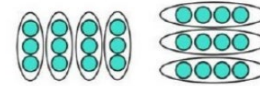
$12 = 3 \times 4 \qquad 12 = 4 \times 3$

Repeated addition can be shown easily on a number line and empty number line:

$5 \times 3 = 5 + 5 + 5$
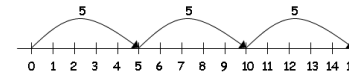
and on a bead bar:

$5 \times 3 = 5 + 5 + 5$
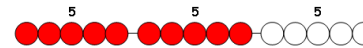
Links should also be made to money.

And to 5 minute intervals on a clock face.
e.g. 3 lots of 5 minutes = 15 minutes.
Arrays
Children should be able to model a multiplication calculation using an array. This knowledge will support with the understanding of commutativity and the development of the grid method. **Links can be made from all of these resources to division as the inverse of multiplication.**

Sharing equally without remainders
6 sweets shared between 2 people, how many do they each get?
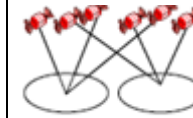
Grouping
There are 6 sweets, how many people can have 2 sweets each?

The grouping image of division is the basis of 'chunking' and should therefore be developed further.
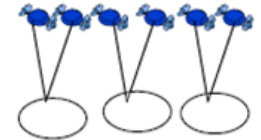
Repeated subtraction using a number line or bead bar
12 ÷ 3 = 4

The bead bar will help children with interpreting division calculations such as 10 ÷ 5 as 'how many 5s make 10?'

Using symbols to stand for unknown numbers to complete equations using inverse operations

£ ÷ 2 = 4   20 ÷ r = 4   £ ÷ r = 4

Relate division to fractions e.g. 40 ÷ 2 = 20
20 is half of 40. Use half and double alongside one another.

For assessment questions, see Mathematics Guidance sections: 2MD
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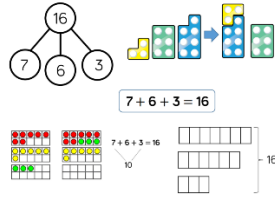|				
	Children continue to use visual resources to support bridging through ten such as bead strings and Numicon. Children to use knowledge of number facts to efficiently add 3 one digit numbers e.g. 7 + 6 + 3 =. Children should look for number bonds to 10 or double to solve easily. This will improve knowledge of commutativity. $7 + 6 + 3 = 16$ Continue to deepen knowledge of links to subtraction and to solve missing number problems. ***For assessment questions, see Mathematics Guidance sections: 2NPV, 2NF and 2AS*** https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	$+2 \quad +30 \quad +5$ $65 - 28 = 37$ Children should be able to solve problems with missing addends and $15 - 9$ $5 \quad 4$ $15 - 5 = 10$ $10 - 4 = 6$ so $15 - 9 = 6$ $15 - 9$ $10 \quad 5$ $10 - 9 = 1$ $1 + 5 = 6$ so $15 - 9 = 6$ recognise when to use the inverse to solve. Continue to deepen knowledge of links to addition and to solve missing number problems. ***For assessment questions, see Mathematics Guidance sections: 2NPV, 2NF and 2AS*** https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	Use a range of equipment such as Numicon to show alternative calculations. $5 \times 3 = 15$ $3 \times 5 = 15$ Recall or derive multiplication facts for the 2, 5, 10 times tables. ***For assessment questions, see Mathematics Guidance sections: 2NPV, 2NF and 2MD*** https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	ent_data/file/897806/Maths_guidance_KS_1_and_2.pdf
Key Vocabulary	*Partition Equals/Same as* *Addition Number bonds* *More than Missing number* *Total/Sum Inverse* *Commutative Calculate* *Strategy Addend*	*Subtraction Less* *Take Away Left Over* *Fewer Difference Between* *Equal to/Equals Addend* *How many more*	*Row* *Column* *Multiplication Table* *Times* *Repeated addition*	*Divided by* *Divided into* *Equal groups of*
Resources	Numicon Base 10 Bead Strings Arrow cards Number lines Hundred Square Counting equipment	Bead Strings Hundred Square Numberlines Counting equipment Cuisenaire	Cuisenaire Clocks Numicon Arrays Bead Strings	Bead Strings Arrays
Children are encouraged to develop a mental picture of the calculation to support their understanding.				

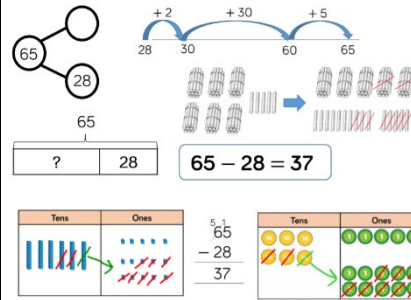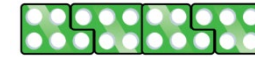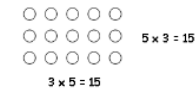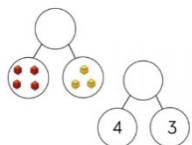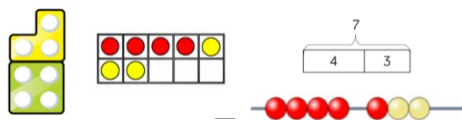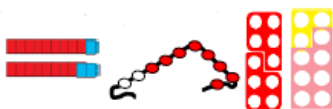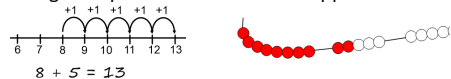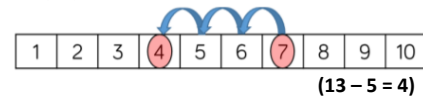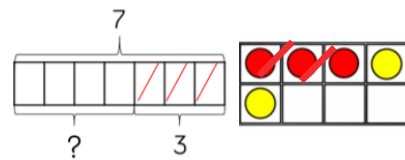| Year 1	Addition	Subtraction	Multiplication	Division
	Progression of Calculation **O+O counting on** **O+O crossing 10** **O+O crossing 10 using number facts to bridge** **TO + O within 20** **O + multiple of 10** **1 more than any give number to 100** - Confidently subitise numbers to 10 using knowledge from EYFS - Addition and subtraction to be taught alongside each other so that children can see the relationship between the two. - Derive additive facts to 10. E.g. "I know that 3 + 3 = 6 so 3 + 4 = 7" - Learn to recognise odd and even numbers using concrete resources. - Understand the equals sign as a 'balance'. - Combining two parts to make a whole: part whole model. - Joining two groups and then recounting all objects (number bonds within 10). Continue to use pictures and a range of resources to aid calculations. Children find a total to an addition by counting on from the first number, leading on to counting on from the larger number. Begin to use known addition facts such as doubles or bonds to 10. Children use numbered lines (to 10 and beyond), bead strings and practical resources to support addition. $8 + 5 = 13$ Use Numicon tiles to calculate addition and solve problems e.g. all pairs that make 10. Begin to represent	**Progression of Calculation** **O-O (take-away)** **O –O (comparison and difference)** - Any subtraction from 20 -Derive and use additive facts and make connections between these and subtraction problems. - Subtract multiples of 10 using the vocabulary 'one ten, two tens, three tens' alongside 10, 20, 30. - Addition and subtraction to be taught alongside each other so that children can see the relationship between the two. - Subtract using Base Ten/straws and understand regrouping one ten for ten ones. Begin with physical objects being taken away. 6 -3=3 Subtract by counting back, using a number line/bead string. Bead strings or bead bars can be used to illustrate subtraction including bridging **(13 – 5 = 4)** Use related subtraction facts to 20 and use known facts to support other facts e.g. 20 – 9 by using fact 20 – 10 Subtraction to be calculated by crossing out pictures and introduction to bar models and tens frames. Number lines and other resources should be used to show that subtraction can also mean finding the difference e.g. 9- 4 = can also mean 'the difference between 4 and 9' and how many jumps they are apart.	**Progression of Calculation** - Doubling of numbers to 10 - Counting in 2s, 5s and 10s from 0 - When moving to pictorial/written calculations, language is vital. - Repeated addition as a method to solve multiplication problems - Learn to recognise 2p, 5p and 10p coins and apply their knowledge of multiples when using these. E.g. calculating how many coins to give to pay for an item.- Count in tens to add and subtract (see addition and subtraction). They will count in 2s and 10s and begin to count in 5s mentally, using a number line to count jumps, using Numicon, using sets of counters. They will work on practical problem solving activities involving equal sets or groups. **10 x 8=80** Begin using an array to aid multiplication. Use Numicon and other objects to aid multiplication and to support understanding of doubles. Children begin to make connections between arrays, number patterns and $5 + 5 + 5 + 5 = 20$ $4 \times 5 = 20$ $5 \times 4 = 20$ counting in 2s, 5s and 10s.	**Progression of Calulation** **Halving 0-20** **0-20 ÷O** - Working practically to share and group. - Children are not expected to divide and calculate formally. **Sharing** 20 There are 20 apples altogether. They are shared equally between 5 bags. How many apples are in each bag? $20 \div 5 = 4$ **Grouping** Encourage children to use multiple knowledge and count in multiples. Link to repeated subtraction using a number line. Use fixed groups/resources (e.g. Numicon) to show relationship between multiplication and division There are 20 apples altogether. They are put in bags of 5. How many bags are there? $20 \div 5 = 4$ Children to use informal recording when ready. *For assessment questions, see Mathematics Guidance sections: 1NPV and 1NF* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf
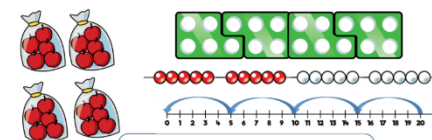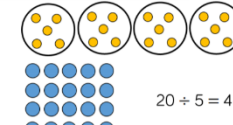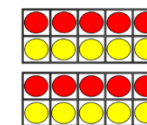
for bonds to 20. Use resources to support understanding of inverses.

Complete missing number problem such as
3 + ☐ = 5 using the part/whole model and resources.
Understand what happens when zero is added to a
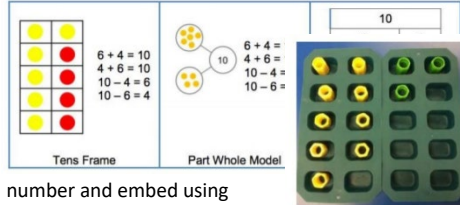
number and embed using number lines and concrete resources.

Use tens frames to embed understanding of bridging 10. E.g. 9 + 3 = 12. Take one from the 3 and give it to the 9 to turn 9 into 10 so it is now 10 + 2 = 12.

Become familiar with the 100 square – quickly find where a number is located. Know that we move to the right and downwards when adding. Use to support adding multiples of 10.

For assessment questions, see Mathematics Guidance sections: 1NPV, 1NF and 1AS
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Continue to use pictures, diagrams, and a range of resources to calculate and see numbers represented in a range of ways.
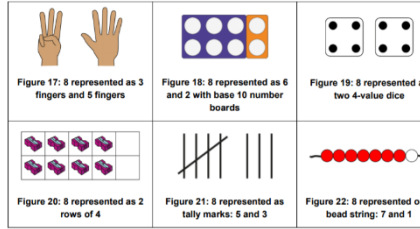
Understand what happens when zero is subtracted from a number.

Introduction to the part whole model to complete missing number problems
e.g. 10 – 5 =
The position of the equals symbol should be varied so that children can recognise that calculations can be written in different ways.

Become familiar with the 100 square – quickly find where a number is located. Know that we move upwards and left when subtracting.

Reasoning should be done verbally.
For assessment questions, see Mathematics Guidance sections: 1NPV, 1NF and 1AS
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Children begin to use a number line and hundred square to develop their understanding of multiplication as repeated addition and to record their multiplication of 2s, 5s and 10s. They should recognise that if numbers are grouped equally, it is more efficient to count in groups rather than ones.

For assessment questions, see Mathematics Guidance sections: 1NPV and 1NF
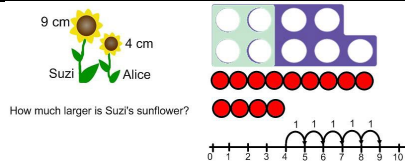https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf

Key Vocabulary	Partition Equals/Same as Addition Number bonds More than Missing number Total/Sum	Subtraction Take Away Less Left Over Fewer Difference Between Equal to/Equals	Multiplication Groups of Equal Multiply Lots of Multiplied by Sets of Multiple Array	Half Grouping Halve Share Division Equal Dividing
Resources	Numicon Hundred Square Bead Strings Straws Number lines Tens frame Counting equipment Double sided counters	Bead Strings Tens frame Number lines Straws Counting equipment Double sided counters	Tens frames Straws Arrays Double sided counters Numicon Bead strings Number lines	Tens frames Straws Arrays Double sided counters Numicon Bead strings Number lines

		Hundred Square	Numicon		

Children are encouraged to develop a mental picture of the calculation to support their understanding.

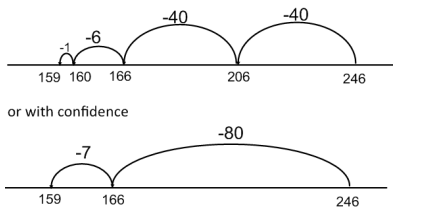| Year 3	Addition	Subtraction	Multiplication	Division

	Progression in Calculation
	TO+TO (bridging through 10s, not crossing 100)
	TO+TO
	HTO+TO
	HTO+HTO
	- Know and use complements to 100, especially when calculating money problems and finding change.
	- Recognise the inverse and use to check calculations
	
	Know place value to 3 digits.
	
	`8 5 4 = 800 > 50 > 4`
	
	Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.
	
	Children will count on from the largest number irrespective of the order of the calculation and partition the 2nd number only. E.g.
	38 + 86 = 124
	
	`+30` `+4` `+4`
	`86    116 120 124`
	
	Compensation
	Children will continue to use empty number lines with increasingly large numbers, including compensation where appropriate.
	49 + 73 = 122
	
	`+50` `-1`
	`73           122 123`
	
	Expanded methods of addition.
	Adding the least significant digits first. Diennes/base 10 materials must be used to support understanding of columnar methods of addition. – Up to 3 digit columnar addition.
		Progression of Calculation
		Empty Number Line
		HTO-TO (crossing100s)
		HTO-HTO
		Expanded Column Method
		HTO-HTO
		Stage 1 : no exchange
		Stage 2: Exchange T to O
		Stage 3: Exchange H to T
		- Recognise the inverse and use to check calculations
		
		Children will continue to use empty number lines with increasingly large numbers.
		E.g. 246-87=
		
		`-1 -6    -40      -40`
		`159 160 166     206        246`
		
		or with confidence
		
		`-7        -80`
		`159    166            246`
		
		Partitioning and decomposition
		• Partitioning – demonstrated using arrow cards
		`6 5`
		`- 2 3`
		`4 2`
		• Decomposition – Diennes/base 10 materials must be used to support understanding of columnar methods of subtraction. Up to 3 digit columnar subtraction.
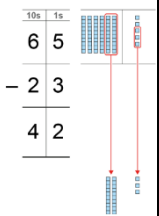		
		NOTE - When solving the calculation 89 – 57, children should know that 57 **DOES NOT EXIST AS AN AMOUNT** it is what you are subtracting from the other number. Therefore, when using base 10 materials, children would need to count out only the 89.
			Progression of Calculation
			Ox (2,3,4,5,8,10)
			(1-20) x (2,3,4,5,8,10) – beyond 20 when confident.
			Multiply 1 or 2 digit numbers by 10 and 100.
			- Understand the commutative property of multiplication
			
			Children will continue to use:
			Repeated Addition
			4 times 6 is 6 + 6 + 6 + 6 = 24 or 4 lots of 6 or 6 x 4
			
			The 'start' number (the operand) will be the group size; the 'change' number (*multiplicand*) will be the number of times the group is repeatedly added.
			
			Children should continue to use number lines or bead bars to support their understanding of repeated addition
			
			`6   6   6   6`
			`0   6   12   18   24`
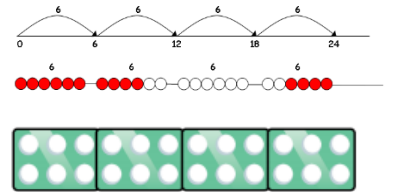			
			Scaling
			Children must be given opportunities to answer problem-solving questions related to the 'Scaling' model of multiplication.
			
			E.g. Find a ribbon that is 4 times as long as the blue ribbon.
			`5 cm` `20 cm`
			
			Arrays
				Progression of Calculation
				TO ÷ (2,3,4,5,8,10) – answers between 0 and 10.
				TO ÷ (2,3,4,5,8,10) – answers between 1 and 10 with remainders.-
				- Divide 100 into 2, 4, 5 or 10 equal parts by practising counting multiples of 10, 20, 25 or 50.
				
				Use of both methods:
				• **Grouping**
				• **Sharing**
				
				Children will continue to use:
				Repeated Subtraction
				Counters
				
				Using a number line
				Children will use an empty number line to support their calculation.
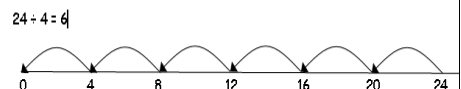				
				24 ÷ 4 = 6
				`0   4   8   12   16   20   24`
				Children should be allowed to move forwards or backwards on the number line depending on familiarity with times tables.
				
				Remainders
				Children should move onto calculations involving remainders, jumping forwards or backwards on the number line. E.g. 13 ÷ 4 =
				13 ÷ 4 = 3 r 1
				`4   4   4`
				`0 1   5   9   13`
				13 ÷ 4 = 3 Remainder 1
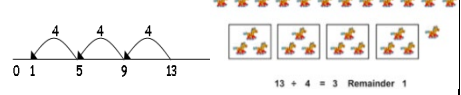				
				Arrays
				Arrays and known facts can be used to support children in answering missing number calculations.
				E.g. 24 ÷ £ = 6

$$20 + 5$$
$$40 + 8$$
$$60 + 13 = 73$$

Estimation
Children must begin to make sensible estimates of their answers.

When children are confident with adding two addends, they should move on to more than two, using their known facts to support adding in an efficient order e.g. doubles and number bonds.

make 10 4 1 6
2 2 3 make 10
+ 1 8 4

1 5
5 7 double
+ 2 7

Children to move onto formal column methods if place value is secure.
TO + TO

HTO + TO

HTO + HTO

Hundreds	Tens	Ones

$$384 + 237$$
$$621$$
1 1

Bar Model

477
283	194

600
200	400
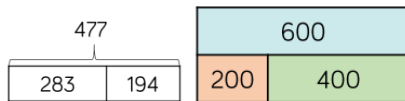
Ensure a range of methods are used to aid children when problem solving.

Complementary Addition
Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on

+10
+1   +2
0   89 90   100 102

using a number line should be used.
Children begin to exchange.

Children to move onto formal column methods if place value is secure.

Hundreds	Tens	Ones

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

Children must begin to make sensible estimates of their answers.

Bar Model

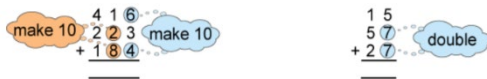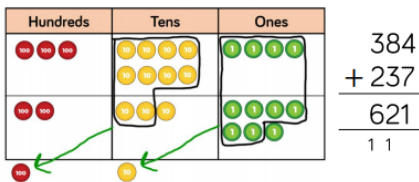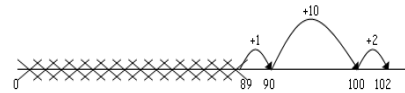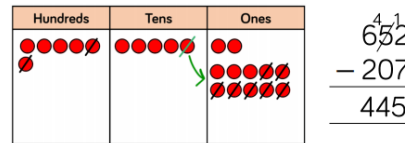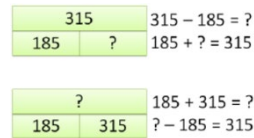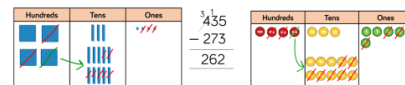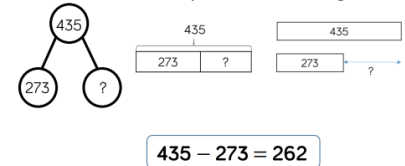| 315 | | $315 - 185 = ?$ |
| 185 | ? | $185 + ? = 315$ |

| ? | | $185 + 315 = ?$ |
| 185 | 315 | $? - 185 = 315$ |

Ensure a range of methods are used to aid children when problem solving.

435
273   ?

435
273 ?

435
273

$$435 - 273 = 262$$

| Hundreds | Tens | Ones |
$$\overset{3}{\cancel{4}}\overset{1}{3}5$$
$$- 273$$
$$262$$

| Hundreds | Tens | Ones |

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.

$9 \times 4 = 36$
$9 \times 4 = 36$
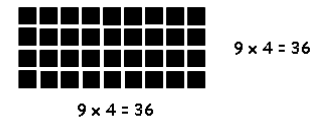
Arrays can also be used to support the associative law of multiplication. E.g.

4×7 + 4×7 = 8×7
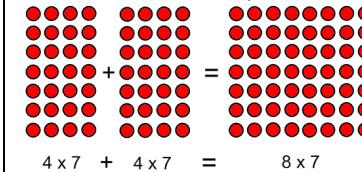
Missing Number Problems
Children to use symbols to stand for unknown numbers to complete equations using inverse operations
£ x 5 = 20   3 x ſ = 18
£ x š = 32

Partitioning
$38 \times 5 = (30 \times 5) + (8 \times 5)$
$= 150 + 40$
$= 190$

Children must begin to make sensible estimates of their answer.

Children will know 3, 4, 8 multiplication facts. They will use doubling and resources to see the links between the 2, 4, and 8 multiplication tables.
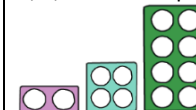
Bar Model
E.g. 4 children go to the cinema. They each pay £15. Ho much do they spend altogether?

| ? | | | |
| 15 | 15 | 15 | 15 |

---

6   6
?   4

6
6
12
18
24
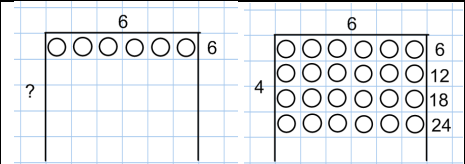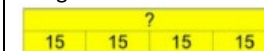
Children should be encouraged to make sensible estimates of their answers.

Missing Number Problems
Children will use symbols to stand for unknown numbers to complete equations using inverse operations

$26 \div 2 = £$ $24 \div r = 12$
$£ \div 10 = 8$

Place Value Grid

Bar Model
E.g. 4 children bought a present for £28. They shared the costs equally. How much did each child pay?

28
Cost of the present

?   £28 ÷ 4 = £7
whole   number of   one part
parts

Partitioning

52
40   12
÷ 4   ÷ 4
10   3
$10 + 3 = 13$

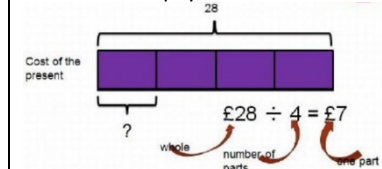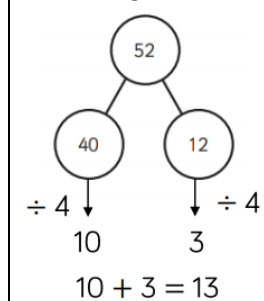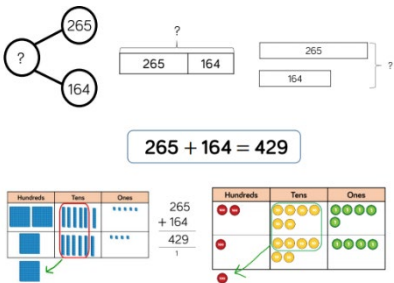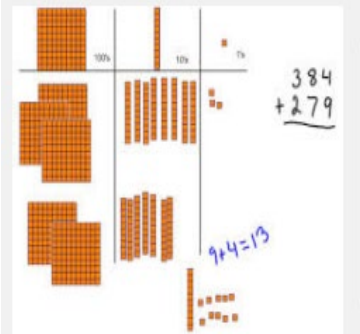|			
	  For assessment questions, see Mathematics Guidance sections: 3NPV, 3NF and 3AS https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	*For assessment questions, see Mathematics Guidance sections: 3NPV, 3NF and 3AS* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	*For assessment questions, see Mathematics Guidance sections: 3NPV, 3NF and 3MD* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	*For assessment questions, see Mathematics Guidance sections: 3NPV, 3NF and 3MD* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf
Key Vocabulary	All previous words *Increase* – get larger *Addend* – a number to be added to another *Augmentation* – increase 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 *Exchange* – change a number for another of an equal value. *Partitioning* – split a number into parts. *Subitise* – instantly recognise the number of objects in a small group. *Sum* – the result of an addition *Total* – the aggregate or the sum found by addition. *Ones/Tenths/Hundreds Boundary* – The boundary to the next PV column – knowing when to exchange. *Inverse* – the opposite in effect.	All previous words *Decrease* – get smaller *Difference* – the numerical difference between two numbers found by comparing each quantity *Exchange* – change a number or expression for another of equal value *Minuend* – a quantity or number from which another is subtracted *Partitioning* – splitting a number into parts *Reduction* – subtraction as take away *Subtrahend* – a number subtracted from another *Inverse* – the opposite in effect.	All previous words *Factorise* – finding what to multiply to get an expression. *Array* – an ordered collection of resources in rows and columns. *Commutative* – numbers that can be multiplied in any order. *Exchange* – change a number for another of an equal value. *Factor* – a number that multiplies with another to make a product. *Multiplicand* – a number to be multiplied by another. *Partitioning* – splitting a number into parts. *Product* – the result of multiplying one number by another. *Scaling* – enlarging or reducing a number by a given amount. *Inverse* – the opposite in effect.	All previous words *Dividend* – the number that is divided. *Divisor* – the number by which another is divided *Factor* – a number that multiplies to make another product. *Quotient* – the result of a division *Remainder* – the amount left over when the divisor is not a factor of the dividend. *Scaling* – enlarging or reducing a number by a given amount. *Inverse* – the opposite in effect.
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Bead Strings Number Tracks/Number Lines/Empty number line Place value counters/Place value grid/Place Value Sliders Double sided counters Bar Models Tens frame (scaling known facts)	Bead Strings Number Tracks/Number Lines/Empty number line Place value counters/Place value grid/Place Value Sliders Double sided counters Bar Models Tens frame (scaling known facts)	Place Value Counters/ Place value grid/Place Value Calculation Mat Place Value Sliders Bar Models	Number Tracks/Number Lines Place Value Counters/ Place value grid/Place Value Calculation Mat Place Value Sliders Bar Models

Children are encouraged to develop a mental picture of the calculation to support their understanding.			
Year 4	**Addition**	**Subtraction**	**Multiplication**	**Division**

Addition

Progression of Calculation
HTO+HTO (Crossing 100)
£O.t h + £O. t h
£TO.t h + £TO. t h
- Scaling number facts by 100 and using known additive facts to solve calculations.

Children may continue to use the number line to count on and support mental calculations.

Expanded Method to Compact Method
Children will use various place value resources to support the development of conceptual understanding of a formal written method.
Children now learn to carry below the line using resources to support understanding.

$$
\begin{array}{r} 625 \\ + 48 \\ \hline 673 \\ {\scriptstyle 1} \end{array}
\qquad
\begin{array}{r} 783 \\ + 42 \\ \hline 825 \\ {\scriptstyle 1} \end{array}
\qquad
\begin{array}{r} 367 \\ + 85 \\ \hline 452 \\ {\scriptstyle 11} \end{array}
$$

Progression of resources as children's grasp of place value develops.
Beginning with Straws
Progressing to Diennes/Base 10

Subtraction

Progression of Calculation
HTO – TO; HTO-HTO
Stage 4 : Exchange of T to O and H to T
Stage 5 £O.t t - £O.t h and Handling of zero place holders E.g.

$$
\begin{array}{r} 470 \\ -142 \\ \hline \end{array}
\qquad
\begin{array}{r} 700 \\ -485 \\ \hline \end{array}
$$

Children may continue to use the number line to model understanding and to support mental calculations.

Expanded Method to decomposition

$$
\begin{array}{r} 754 \quad = \\ - \quad 86 \\ \hline \end{array}
$$

Step 1   700 + 50 + 4
         -        80 + 6

Step 2   700 + 40 + 14   (adjust from T to U)
         -        80 + 6

Step 3   600 + 140 + 14   (adjust from H to T)
         -        80 + 6
         ─────────────────────
          600 + 60 + 8 = 668

This would be recorded by the children as

$$
\begin{array}{r} \overset{600}{\cancel{700}} + \overset{140}{\cancel{50}} + \overset{14}{\cancel{4}} \\ - \quad 80 + 6 \\ \hline 600 + 60 + 8 = 668 \end{array}
$$

Decomposition

Multiplication

Progression of Calculation
O x TO
O x HTO
Multiplication of numbers by 10,100 and 1000.
Knowledge of all multiplication facts up to 12x12.
- Secure understanding of the commutative property of multiplication.
Multiply 2-digit numbers by 1-digit numbers
Multiply 3-digit numbers by 1-digit numbers

$245 \times 4 = 980$

Grid method
TO x O
(Short multiplication – multiplication by a single digit)
23 x 8
Children will approximate first
23 x 8 is approximately 25 x 8 = 200
Children will then use the Grid method to solve

Division

Progression of Calculation
TO ÷ O = answers 0 – 10
TO ÷ O = answers greater than 10.
As above including remainders.
- Divide 1000 into 2, 4, 5 or 10 equal parts by practising counting multiples of 100, 200, 250 or 500.
Divide 2-digits by 1-digit (grouping)

$52 \div 4 = 13$

Divide 3-digits by 1-digit (sharing)

$844 \div 4 = 122$

$844 \div 4 = 122$

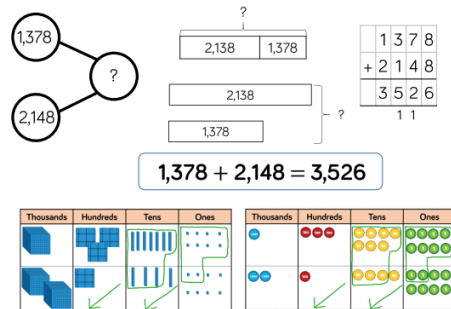**Empty Number Line – Repeated Subtraction**

Finally using Place Value Counters which make it necessary for children to understand 'a one to many' representation of value.

$$25$$
$$+47$$
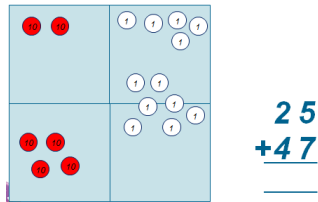
Revert back to expanded method for children who develop misconceptions.

Ensure a range of methods are used to aid children when problem solving.

$$1\,378 + 2\,148 = 3\,526$$

Bar Model
On one day Peter ran 6,860 metres. The next day, Peter ran 5,470 metres. How far does he run altogether?

As in addition, a progression of resources should be used to support the development of concept and understanding alongside a written method.
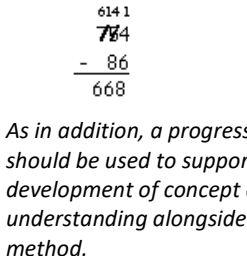
When completing three digit money calculations children will know that decimal points should line up under each other.

= £4.57

Ensure a range of methods are used to aid children when problem solving.

$$4,357 - 2,735 = 1,622$$
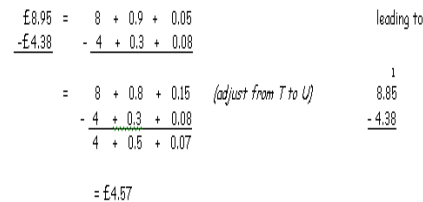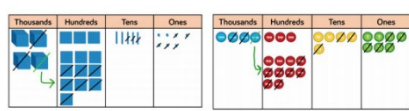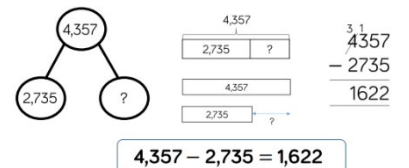
Bar Model
There are 3,160 counters in a bag. 1,226 are red counters and the red are blue. How many are blue counters?
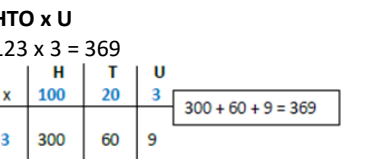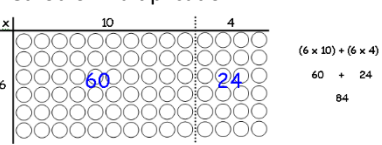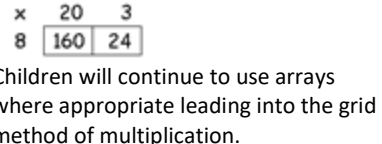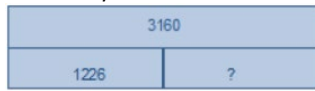
3160	
1226	?

Children will continue to use arrays where appropriate leading into the grid method of multiplication.

HTO x U
123 x 3 = 369

Use of resources, arrays and the grid method to support the links between division and multiplication.

Arrays
Use of arrays to support understanding of the laws of multiplication.

Expanded column method with
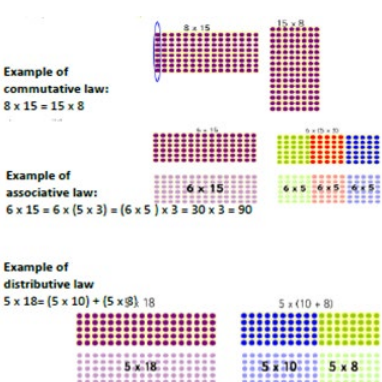
representations

Children must understand the distributive law of multiplication and represent this in mixed operation calculations (as above).

Bar Model

Children will develop their use of repeated subtraction to be able to subtract multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar.

72 ÷ 5

Moving onto:
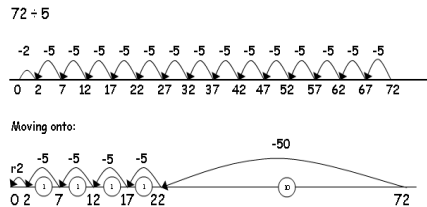
Then onto the vertical method:
Short Division TO ÷ U
E.g. 72 ÷ 3 =
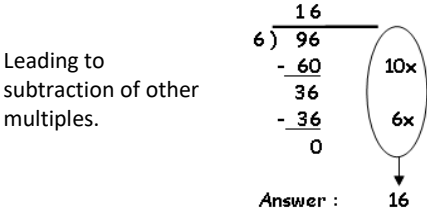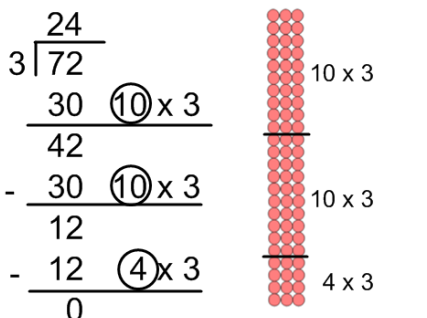
Leading to subtraction of other multiples.

Leading to Short Division HTO ÷ O (as above)
Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2. Children need to consider how to express their quotient and round up or down accordingly. They should make sensible decisions about rounding up or down after division.

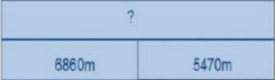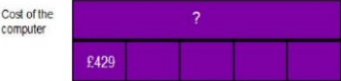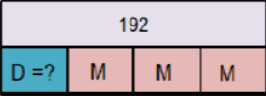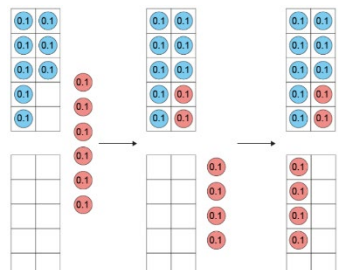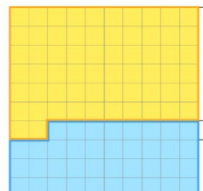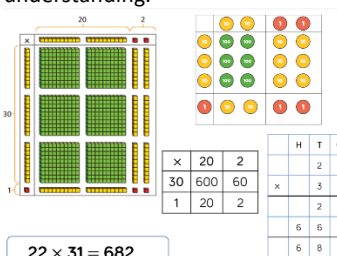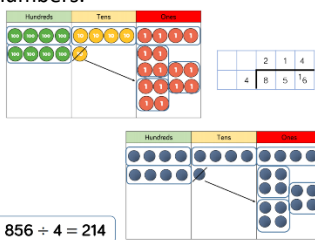|				
	For assessment questions, see Mathematics Guidance sections: 4NPV, 4NF and 4AS https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	*For assessment questions, see Mathematics Guidance sections: 4NPV, 4NF and 4AS* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	E.g. A computer cost 5 times as much as a television. The television cost £429. How much does the computer cost? *For assessment questions, see Mathematics Guidance sections: 4NPV, 4NF and 4MD* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf	Use of resources, arrays and the grid method to support the links between division and multiplication. **Bar Model** E.g. Dale and Mary collect marbles. They have 192 marbles. Mary has three times as many marbles as Dale. How many marbles does Dale have? *For assessment questions, see Mathematics Guidance sections: 4NPV, 4NF and 4MD* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf
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colspan				
Children are encouraged to develop a mental picture of the calculation to support their understanding.				
Year 5	**Addition**	**Subtraction**	**Multiplication**	**Division**
	Progression of Calculation **- Addition of numbers beyond 1000s** **- Addition of numbers with up to three decimal places.** **- Addition of numbers with up to 4 digits and decimals with various missing place-holders.** **- Using a bar model to find missing amounts and to support problem solving.** **- Scale known additive facts, both within 10 and bridging 10 when adding/subtracting decimals.** E.g. 0.5 + 0.4 = 0.9 or 0.8 + 0.6 = 1.4 **Also use this knowledge with complements to 100 - scale to complements to 1.**	**Progression of Calculation** **- Subtract at least 4 digit numbers and up to 3 decimal places.** **- Larger numbers involving decimals including money and measures.** **- Use bar models to support subtraction.** **- Scale known additive facts, both within 10 and bridging 10 when adding/subtracting decimals.** E.g. 0.9 - 0.5 = 0.4 and 1.5 – 0.6 = 0.9 **Also use this knowledge with complements to 100 - scale to complements to 1.** E.g. 100 – 65 = 35 so 1 – 0.65 = 0.35 100 grids may also be used to show complements to 1. **Empty Number Lines and Decimals**	**Progression of Calculation** **- ThHTO x O** **- HTO x O** **- TO x TO** **- Use a bar model to support problem solving in multiplication.** **- Multiply by 10, 100 and 1000 and understand how this affects a number's place value.** **Area Model** Area will continue to support understanding of short and long multiplication, using concrete and pictorial resources to support understanding. $22 \times 31 = 682$	**Progression of Calculation** **- TO÷O** **- HTO÷O=TO** **- HTO÷O=HTO** **- THTO÷ O =** **- Using a bar model to support problem solving in division** **-Divide by 10, 100 and 1000 and understand how this affects a number's place value.** **Grouping to support Short Division** Children will use concrete and pictorial resources to support grouping when using short division with progressively larger numbers. $856 \div 4 = 214$

Column 1:

E.g. 73 + 27 = 100 so 0.73 + 0.27 = 1

Children to continue to demonstrate understanding of mental methods. Children to recognise when to use a mental or a written method.

Formal Compact Method
Method to be extended to numbers with at least four digits and decimals (including missing place holders).

$$
\begin{array}{r}
H\ T\ U\ .\ t\ h \\
2\ 5\ 7\ .\ 8\ 0 \\
+\ 4\ 9\ 2\ .\ 5\ 5 \\
\hline
7\ 5\ 0\ .\ 3\ 5 \\
1\ \ \ \ 1\ \ \ \ 1
\end{array}
$$

Children to include zero place-holders to aid understanding of place value.

Resources to be used to support understanding of the compact method where necessary e.g. Base Ten, place value counters, empty number line etc.
Children will use a range of representations to support additions, including when solving problems, for example:

104,328 + 61,731 = 166,059

For assessment questions, see Mathematics Guidance sections: 5NPV and 5NF
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf

Column 2:

Children will apply this method to subtract decimals including bridging through tenths and ones when scaling known facts cannot be used.
E.g. 0.5-0.31 = 0.19
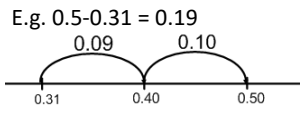
Formal Compact Method
Children should be able to use the formal compact method when subtracting fractions, using both concrete and pictorial resources to support them when they are less confident (see below).

294,382 − 182,501 = 111,881

For assessment questions, see Mathematics Guidance sections: 5NPV and 5NF
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf

Column 3:

If children are struggling with their times tables knowledge, offer a multiplication grid so that they can focus on the method.

Expanded Column Method
Children will transfer their understanding to the expanded column method – starting with least significant

$$
\begin{array}{r}
56 \\
\times\ 27 \\
\hline
42\quad (7 \times 6) \\
350\quad (7 \times 50) \\
120\quad (20 \times 6) \\
+\ 1000\quad (20 \times 50) \\
\hline
1512
\end{array}
$$

Children complete units part of the calculation first.
Steps in brackets may support understanding of the method

digit first.
If children are confident in this method they may begin to us the formal written method, making connections between this method and the area model.

1,826 × 3 = 5,478

For assessment questions, see Mathematics Guidance sections: 5NPV and 5MD

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf

Column 4:

Short Formal Method
When confident, children should be encouraged to move away from concrete and pictorial representations and use the abstract to calculate.

$$
\begin{array}{r}
H\ T\ U \\
6\ \overline{)7\ 9\ 2}
\end{array}
$$

100 (6s) R 100

$$
\begin{array}{r}
H\ T\ U \\
1 \\
6\ \overline{)7\ 9\ 2}
\end{array}
$$

30 (6s) R 10

$$
\begin{array}{r}
H\ T\ U \\
1\ 3\ 2 \\
6\ \overline{)7\ ^1 9\ ^1 2}
\end{array}
$$

Division with remainders
Children should begin to understand how to express remainders as whole number remainders, rounded numbers, fractions and decimals and consider how to select the most appropriate way to express the remainder in the context of the question.

$$
8\ \overline{)5\ ^5 3\ ^5 0\ ^2 9}\quad = 0\ 6\ 6\ 3\ r\ 5
$$

Bar Model to support understanding of problem solving:
Frank has 4920 apples. He needs to put them into baskets of 40. How many baskets does he need?

For assessment questions, see Mathematics Guidance sections: 5NPV and 5MD
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf

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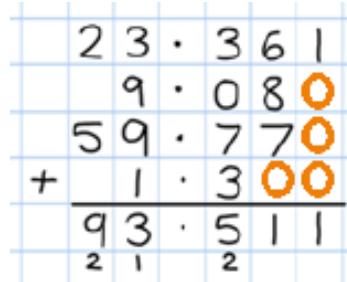| **Key Vocabulary**	*Increase* – get larger *Addend* – a number to be added to another	*Decrease* – get smaller	*Factorise* – finding what to multiply to get an expression.	*Dividend* – the number that is divided. *Divisor* – the number by which another is divided

|	Addition	Subtraction	Multiplication	Division
	Augmentation – increase 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 *Exchange* – change a number for another of an equal value. *Partitioning* – split a number into parts. *Subitise* – instantly recognise the number of objects in a small group. *Sum* – the result of an addition *Total* – the aggregate or the sum found by addition. *Ones/Tenths Boundary* – The boundary to the next PV column – knowing when to exchange.	*Difference* – the numerical difference between two numbers found by comparing each quantity *Exchange* – change a number or expression for another of equal value *Minuend* – a quantity or number from which another is subtracted *Partitioning* – splitting a number into parts *Reduction* – subtraction as take away *Subtrahend* – a number subtracted from another	*Prime Factor* – the factors of a number that are prime numbers. *Array* – an ordered collection of resources in rows and columns. *Commutative* – numbers can be multiplied in any order. *Exchange* – change a number for another of an equal value. *Factor* – a number that multiplies with another to make a product. *Multiplicand* – a number to be multiplied by another. *Partitioning* – splitting a number into parts. *Product* – the result of multiplying one number by another. *Scaling* – enlarging or reducing a number by a given amount.	*Factor* – a number that multiplies to make another product. *Quotient* – the result of a division *Remainder* – the amount left over when the divisor is not a factor of the dividend. *Scaling* – enlarging or reducing a number by a given amount.
Resources	Double sided counters Place value counters Base Ten Calculation Mat Empty Number Line Arrow Cards Place value grid Place Value Sliders Bar Models Tens frame (scaling known facts)	Double sided counters Place value counters Base Ten Calculation Mat Empty Number Line Arrow Cards Place value grid Place Value Sliders Bar Models	Place Value Counters Calculation Mat Empty Number Line Arrays Place Value Sliders Bar Models	Place Value Counters Calculation Mat Empty Number Line Place Value Sliders Bar Models

Children are encouraged to develop a mental picture of the calculation to support their understanding.				
Year 6	**Addition**	**Subtraction**	**Multiplication**	**Division**
	Progression in Calculation - **Addition of numbers with any number of digits.** - **Addition of two or more numbers with up to 3 decimal places (including problems involving money).** - **Addition of two or more numbers with at least 4 digits of various sizes and varied decimal places. (E.g. 401.2 + 26.85 + 13 =)** - **Using the bar model to support addition and problem solve.** - **Use a given additive calculation to derive or complete a related calculation, using arithmetic and place value knowledge and inverse operations.** Children will continue to develop procedural fluency of the column method. Children to use	**Progression in Calculation** **Refine Year 5** **Subtracting with increasingly more complex numbers with up to 3 decimal places (including problems involving money).** **Using the bar model to support subtraction.** **Difference between two negative integers.** **Difference between positive and negative integers.** Solve problems relating to subtraction of any single place value part from a number:	**Progression of Calculation** **TH H T O x O** **H T O x T O** **O x O. t h** **Multiply by up to 2 decimal places.** **Understand the relationship between powers of 10 and apply this.** **Use bar models to support multiplication.** **Use a given multiplicative calculation to derive or complete a related calculation, using arithmetic and place value knowledge and inverse operations.** Children may continue to use the area model as necessary to maintain understanding of place value when multiplying larger numbers and	**Progression of Calculation** **THTO ÷O (with decimal and fraction remainders, depending on context)** **HTO ÷ TO** **THTO ÷TO** **O.t ÷O** **TO.t ÷O** **All methods below will be viewed as formal methods.** Children should understand how to express remainders as whole number remainders, rounded numbers, fractions and decimals and select the most appropriate way to express the remainder in the context of the question.

zero as a place holder as necessary to support calculations.

```
  2 3 · 3 6 1
      9 · 0 8 0
  5 9 · 7 7 0
+     1 · 3 0 0
─────────────
  9 3 · 5 1 1
  2 1     2
```

Children will use a range of representations to support additions, including when solving problems, for example:

$104,328 + 61,731 = 166,059$

HTh	TTh	Th	H	T	O
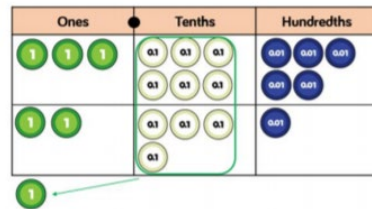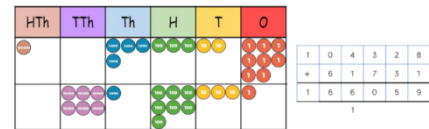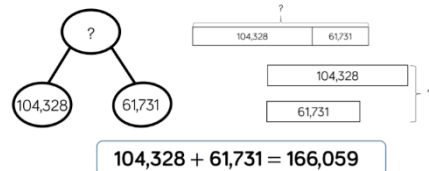
$$381,920 - 900 = \boxed{}$$

$$381,920 - \boxed{} = 380,920$$

Empty Number Line for Negative Numbers

An empty number line will be used to show differences between negative numbers and positive and negative numbers.

E.g. What is the difference between 40 and -35?

$$35 + 40 = 75$$

Children will use a range of representations to support subtraction, including when solving problems. For

$$5.43 - 2.7 = 2.73$$

For assessment questions, see Mathematics Guidance sections: 6NPV and 6AS/MD
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf

example:
For assessment questions, see Mathematics Guidance sections: 6NPV and 6AS/MD
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf

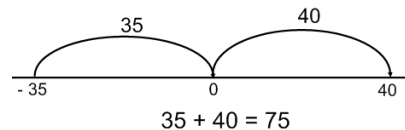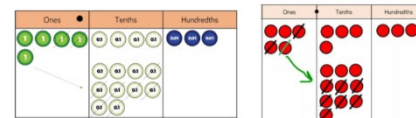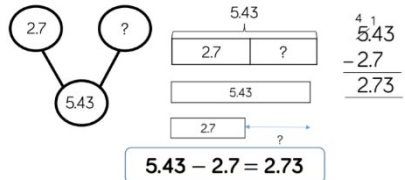understanding the process of finding partial products.
Move understanding to column method as soon as secure.

FORMAL METHOD - Long Multiplication
Children to move to a more traditional compact method of long multiplication if they are confident in their understanding of the expanded method

```
      4 5
   ×  2 3
   ───────
    9 0 0
    1 3 5
   ───────
  1 0 3 5
```

Children will use a range of representations to support subtraction, including when solving problems. For example:

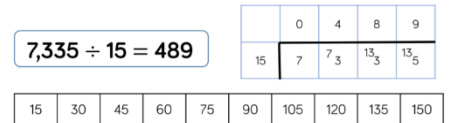| ×	200	30	4
30	6,000	900	120
2	400	60	8

$234 \times 32 = 7,488$
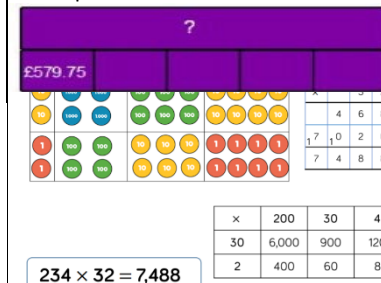
For assessment questions, see Mathematics Guidance sections: 6NPV and 6AS/MD
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf

Chunking

```
         22
  36 │ 792
     -720    20 x 36
      72
     - 72    2 x 36
     ───
       0
```

Short Formal Method

$7,335 \div 15 = 489$

15	30	45	60	75	90	105	120	135	150

Chunking with Decimals

```
        12.5
   7 │ 87.5
      70.0    10 x 7
      17.5
      14.0    2 x 7
       3.5
       3.5    0.5 x 7
       ───
         0
```

Answer: 12.5

Using a bar model to support division:

Paul and David hire a car together at a cost of £297.50. Paul pays 6 times more than David. How much does David pay?

For assessment questions, see Mathematics Guidance sections: 6NPV and 6AS/MD
https://assets.publishing.service.gov.uk/gov

				ernment/uploads/system/uploads/attachment_data/file/897806/Maths_guidance_KS_1_and_2.pdf
Key Vocabulary	*Increase* – get larger *Addend* – a number to be added to another *Augmentation* – increase 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 *Exchange* – change a number for another of an equal value. *Partitioning* – split a number into parts. *Subitise* – instantly recognise the number of objects in a small group. *Sum* – the result of an addition *Total* – the aggregate or the sum found by addition. *Ones/Tenths Boundary* – The boundary to the next PV column – knowing when to exchange.	*Decrease* – get smaller *Difference* – the numerical difference between two numbers found by comparing each quantity *Exchange* – change a number or expression for another of equal value *Minuend* – a quantity or number from which another is subtracted *Partitioning* – splitting a number into parts *Reduction* – subtraction as take away *Subtrahend* – a number subtracted from another	*Factorise* – finding what to multiply to get an expression. *Prime Factor* – the factors of a number that are prime numbers. *Array* – an ordered collection of resources in rows and columns. *Commutative* – numbers can be multiplied in any order. *Exchange* – change a number for another of an equal value. *Factor* – a number that multiplies with another to make a product. *Multiplicand* – a number to be multiplied by another. *Partitioning* – splitting a number into parts. *Product* – the result of multiplying one number by another. *Scaling* – enlarging or reducing a number by a given amount.	*Dividend* – the number that is divided. *Divisor* – the number by which another is divided *Factor* – a number that multiplies to make another product. *Quotient* – the result of a division *Remainder* – the amount left over when the divisor is not a factor of the dividend. *Scaling* – enlarging or reducing a number by a given amount.
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