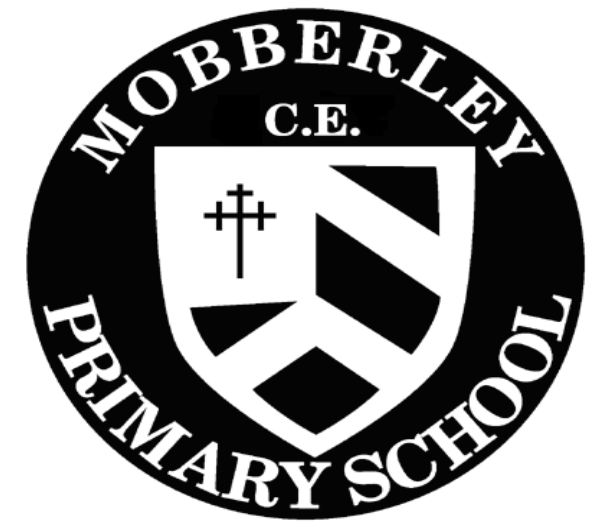


OPEN HEARTS • OPEN MINDS • OPEN DOORS

MATTHEW 7:7

***ASK AND IT WILL BE GIVEN TO YOU: SEEK AND YOU WILL FIND IT:
KNOCK AND THE DOOR WILL BE OPENED TO YOU***



Mobberley CE Primary School

Calculation Policy

Updated 5 September 2023

Mathematics Mastery

At the centre of the mastery approach to the teaching of mathematics is the belief that **all children have the potential to succeed**. They should have access to the same curriculum content and, rather than being extended with new learning, they should **deepen their conceptual understanding by tackling challenging and varied problems**. Similarly, with calculation strategies, children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations. This policy outlines the different calculation strategies that should be taught and used in Year 1 to Year 6 in line with the requirements of the 2014 Primary National Curriculum.

Background

The 2014 Primary National Curriculum for mathematics differs from its predecessor in many ways. Alongside the end of Key Stage year expectations, there are suggested goals for each year; there is also an emphasis on depth before breadth and a greater expectation of what children should achieve. In addition, there is a whole new assessment method, as the removal of levels gives schools greater freedom to develop and use their own systems. One of the key differences is the level of detail included, indicating what children should be learning and when. This is suggested content for each year group, but schools have been given autonomy to introduce content earlier or later, with the expectation that by the end of each key stage the required content has been covered. For example, in Year 2, it is suggested that children should be able to ‘add and subtract one-digit and two-digit numbers to 20, including zero’ and a few years later, in Year 5, they should be able to ‘add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction)’. In many ways, these specific objectives make it easier for teachers to plan a coherent approach to the development of pupils’ calculation skills. However, the expectation of using formal methods is rightly coupled with the explicit requirement for children to use concrete materials and create pictorial representations – a key component of the mastery approach.

Mathematical Language

The 2014 National Curriculum is explicit in articulating the importance of children using the correct mathematical language as a central part of their learning (*reasoning*). Indeed, in certain year groups, the non-statutory guidance highlights the requirement for children to extend their language around certain concepts. It is therefore essential that teaching using the strategies outlined in this policy is accompanied by the use of appropriate and precise mathematical vocabulary. New vocabulary should be introduced in a suitable context (for example, with relevant real objects, apparatus, pictures or diagrams) and explained carefully. High expectations of the mathematical language used are essential, with teachers only accepting what is correct. The school agreed list of terminology is located at Appendix A to this document.

The quality and variety of language that pupils hear and speak are key factors in developing their mathematical vocabulary and presenting a mathematical justification, argument or proof.

2014 Maths Programme of Study

How to use the policy

This mathematics policy is a guide for all staff at Mobberley CE Primary School and has been adapted from work by the NCETM. It is purposely set out as a progression of mathematical skills and not into year group phases to encourage a flexible approach to teaching and learning. It is expected that teachers will use their professional judgement as to when consolidation of existing skills is required or if to move onto the next concept. However, the **focus must always remain on breadth and depth rather than accelerating through concepts**. Children should not be extended with new learning before they are ready, they should deepen their conceptual understanding by tackling challenging and varied problems. All teachers have been given the scheme of work from the White Rose Maths Hub and are required to base their planning around their year group's modules and not to move onto a higher year group's work. These are affiliated to the workings of the 2014 Maths Programme of Study.

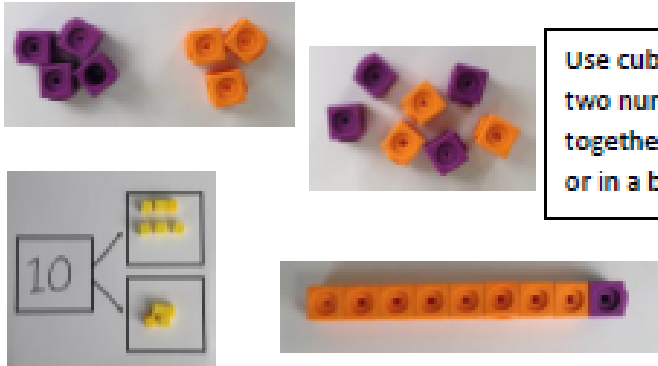
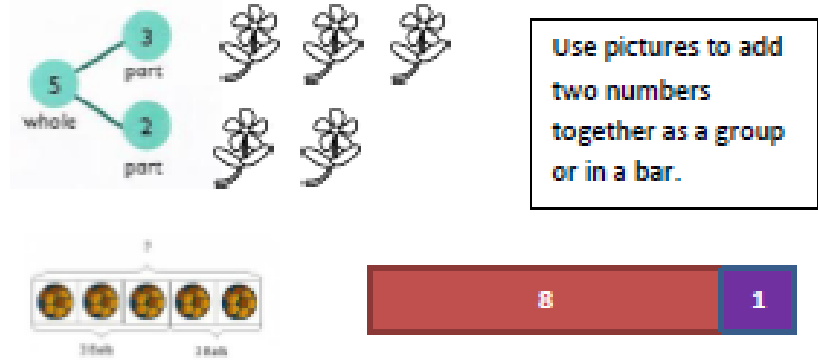
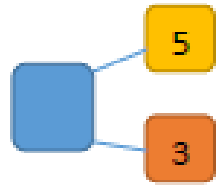


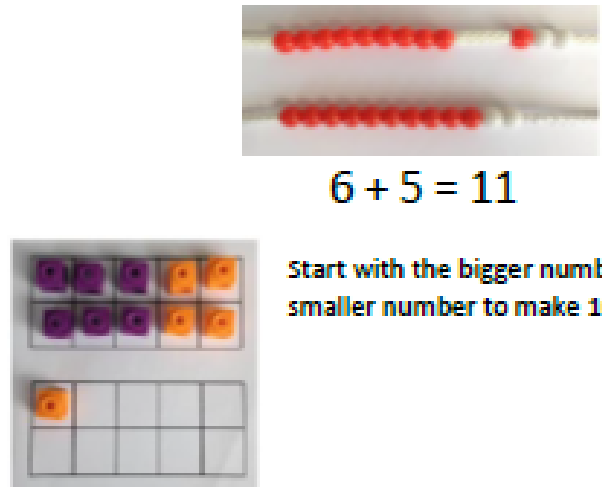
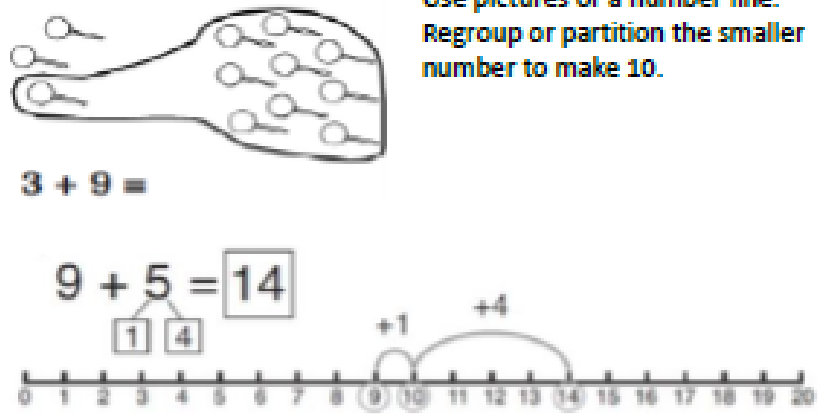

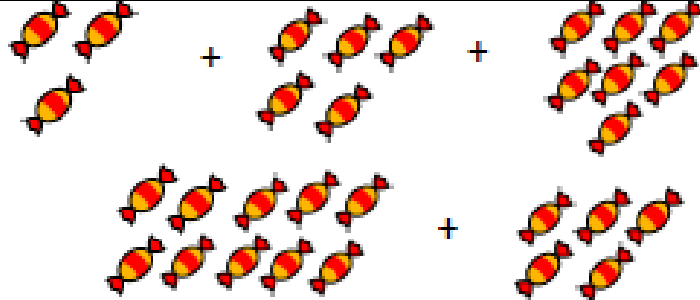
Teachers can use any teaching resources that they wish to use and the policy does not recommend one set of resources over another, rather that, a variety of resources are used. For each of the four rules of number, different strategies are laid out, together with examples of what concrete materials can be used and how, along with suggested pictorial representations. The principle of the concrete-pictorial-abstract (CPA) approach [Make it, Draw it, Write it] is for children to have a true understanding of a mathematical concept, they need to master all three phases within a year group's scheme of work.

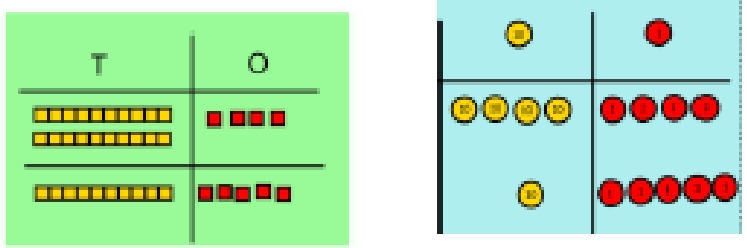
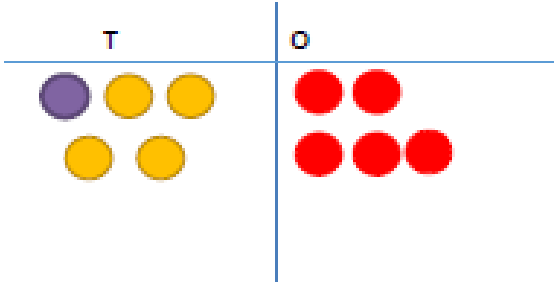
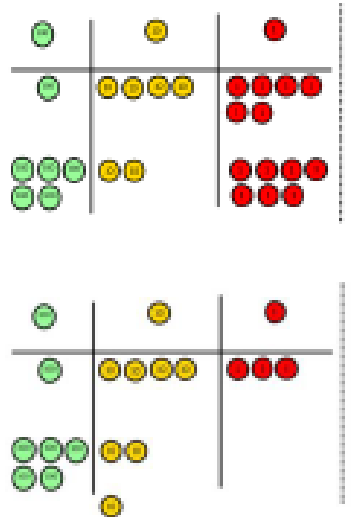
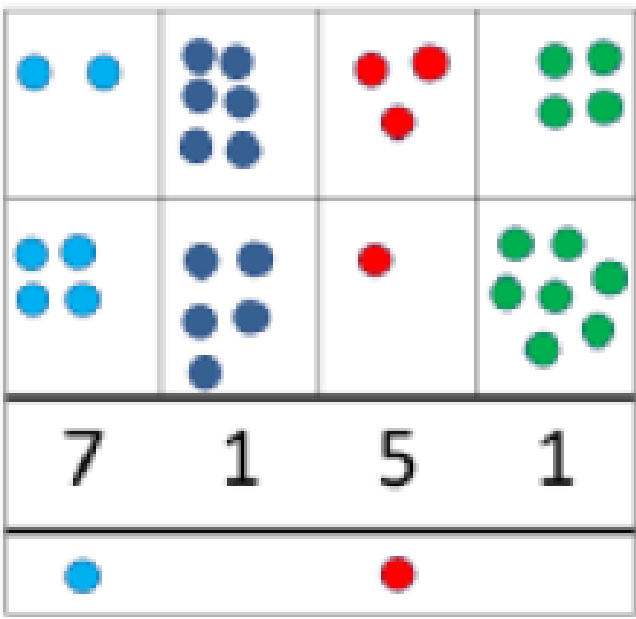
Content of the Policy

1. [Addition](#)
2. [Subtraction](#)
3. [Multiplication](#)
4. [Division](#)
5. [Mathematical Language and Question Prompts](#)

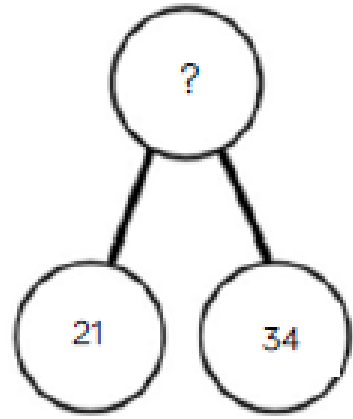
Calculation policy: Addition

Key language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'.

Objective and Strategies	Concrete	Pictorial	Abstract
<p>Combining two parts to make a whole: part- whole model</p>	 <p>Use cubes to add two numbers together as a group or in a bar.</p>	 <p>Use pictures to add two numbers together as a group or in a bar.</p>	 <p>Use the part-part whole diagram as shown above to move into the abstract.</p> <p>$4 + 3 = 7$</p> <p>$10 = 6 + 4$</p>
<p>Starting at the bigger number and counting on</p>	 <p>Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.</p>	<p>$12 + 5 = 17$</p>  <p>Start at the larger number on the number line and count on in ones or in one jump to find the answer.</p>	<p>$5 + 12 = 17$</p> <p>Place the larger number in your head and count on the smaller number to find your answer.</p>
<p>Regrouping to make 10.</p>	 <p>$6 + 5 = 11$</p> <p>Start with the bigger number and use the smaller number to make 10.</p>	 <p>Use pictures or a number line. Regroup or partition the smaller number to make 10.</p> <p>$3 + 9 =$</p> <p>$9 + 5 = 14$</p>	<p>$7 + 4 = 11$</p> <p>If I am at seven, how many more do I need to make 10. How many more do I add on now?</p>
<p>Adding three single digits</p>	<p>$4 + 7 + 6 = 17$</p> <p>Put 4 and 6 together to make 10. Add on 7.</p>  <p>Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.</p>	 <p>Add together three groups of objects. Draw a picture to recombine the groups to make 10.</p>	<p>$4 + 7 + 6 = 10 + 7$</p> <p>$= 17$</p> <p>Combine the two numbers that make 10 and then add on the remainder.</p>

<p>Column method- no regrouping</p>	<p style="text-align: center;">24 + 15 =</p> <p>Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.</p> 	<p>After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.</p> 	<p style="text-align: center;">Calculations</p> <p>$21 + 42 =$</p> $\begin{array}{r} 21 \\ + 42 \\ \hline \end{array}$
<p>Column method- regrouping</p>	<p>Make both numbers on a place value grid.</p>  <p>$146 + 527$</p> <p>Add up the units and exchange 10 ones for one 10.</p> <p>Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.</p> <p>This can also be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100.</p> <p>As children move on to decimals, money and decimal place value counters can be used to support learning.</p>	<p>Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.</p> 	<p>Start by partitioning the numbers before moving on to clearly show the exchange below the addition.</p> $\begin{array}{r} 20 + 5 \\ 40 + 8 \\ 60 + 13 = 73 \end{array}$ $\begin{array}{r} 536 \\ + 85 \\ \hline 621 \\ 11 \end{array}$ <p>As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.</p> $\begin{array}{r} 72.8 \\ + 54.6 \\ \hline 127.4 \\ 11 \end{array}$ $\begin{array}{r} \pounds 23.59 \\ + \pounds 7.55 \\ \hline \pounds 31.14 \\ 111 \end{array}$ $\begin{array}{r} 23.361 \\ 9.080 \\ 59.770 \\ + 1.300 \\ \hline 93.511 \\ 212 \end{array}$

Conceptual variation; different ways to ask children to solve $21 + 34$



Word problems:

In year 3, there are 21 children and in year 4, there are 34 children. How many children in total?

$21 + 34 = 55$. Prove it

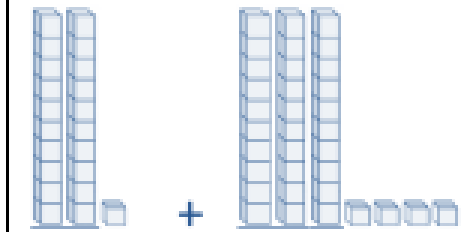
?	
21	34

$$\begin{array}{r} 21 \\ +34 \\ \hline \end{array}$$

$21 + 34 =$

 = $21 + 34$

Calculate the sum of twenty-one and thirty-four.

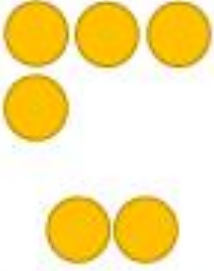
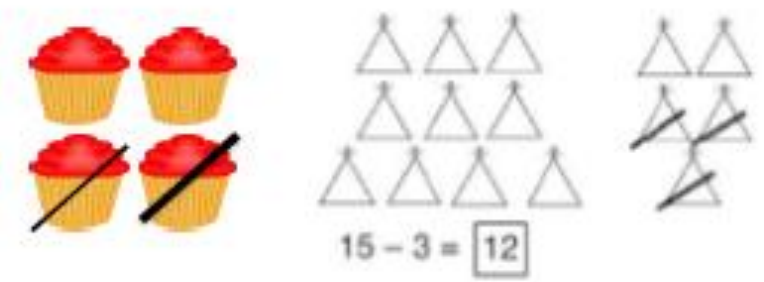


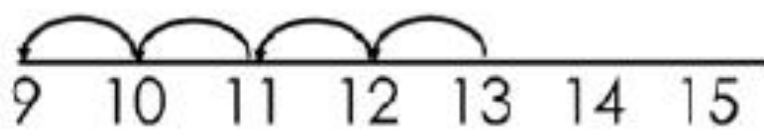
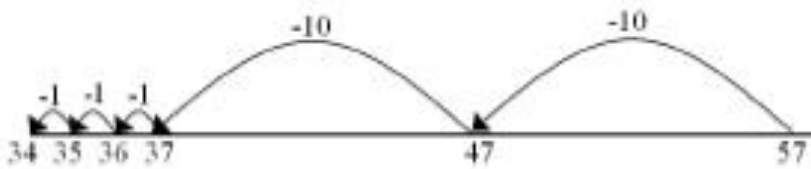
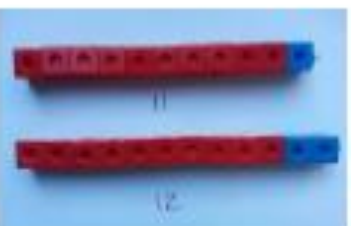
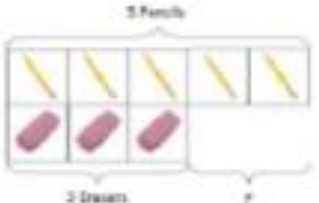
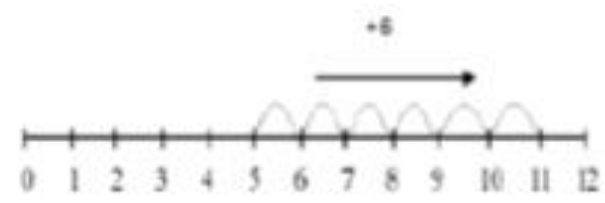
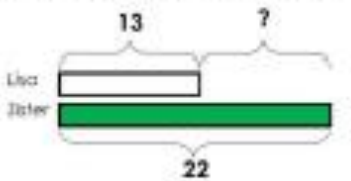


Missing digit problems:

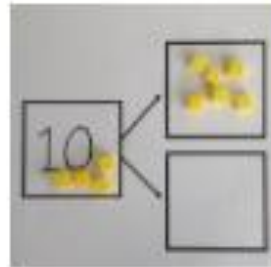
10s	1s
10 10	1
10 10 10	?
?	5

Calculation policy: Subtraction

Key language: take away, less than, the difference, subtract, minus, fewer, decrease.

Objective and Strategies	Concrete	Pictorial	Abstract
Taking away ones	<p>Use physical objects, counters, cubes etc to show how objects can be taken away.</p>  <p>$6 - 2 = 4$</p>	<p>Cross out drawn objects to show what has been taken away.</p>  <p>$15 - 3 = 12$</p>	<p>$18 - 3 = 15$</p> <p>$8 - 2 = 6$</p>
Counting back	<p>Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.</p> <p>$13 - 4$</p>  <p>Use counters and move them away from the group as you take them away counting backwards as you go.</p> 	<p>Count back on a number line or number track</p>  <p>Start at the bigger number and count back the smaller number showing the jumps on the number line.</p>  <p>This can progress all the way to counting back using two 2 digit numbers.</p>	<p>Put 13 in your head, count back 4. What number are you at? Use your fingers to help.</p>
Find the difference	<p>Compare amounts and objects to find the difference.</p>  <p>Use cubes to build towers or make bars to find the difference</p>  <p>Use basic bar models with items to find the difference.</p>	 <p>Count on to find the difference.</p> <p>Comparison Bar Models</p> <p>Draw bars to find the difference between 2 numbers.</p> <p>Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.</p> 	<p>Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.</p>

Part Part Whole Model

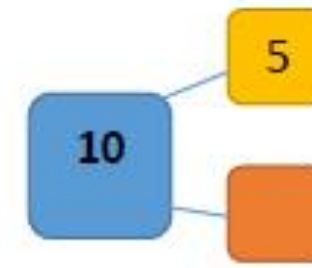
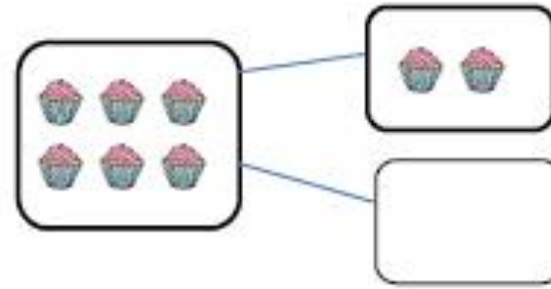


Link to addition- use the part whole model to help explain the inverse between addition and subtraction.

If 10 is the whole and 6 is one of the parts. What is the other part?

$$10 - 6 =$$

Use a pictorial representation of objects to show the part part whole model.



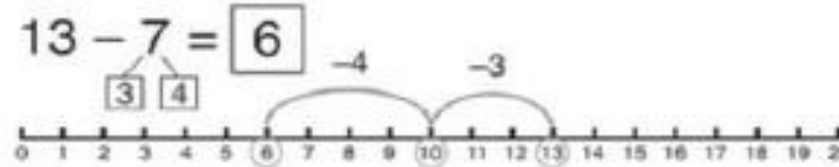
Move to using numbers within the part whole model.

Make 10



Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.

$$14 - 9 =$$



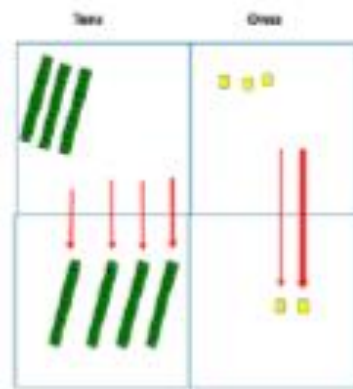
Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.

$$16 - 8 =$$

How many do we take off to reach the next 10?

How many do we have left to take off?

Column method without regrouping

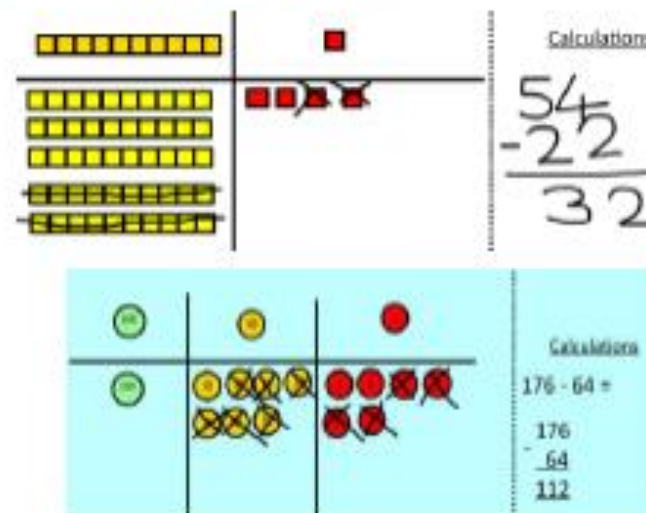


Use Base 10 to make the bigger number then take the smaller number away.



Show how you partition numbers to subtract. Again make the larger number first.

Draw the Base 10 or place value counters alongside the written calculation to help to show working.



$$\begin{array}{r} 47 - 24 = 23 \\ - \quad 20 + 7 \\ \quad \quad 20 + 3 \end{array}$$

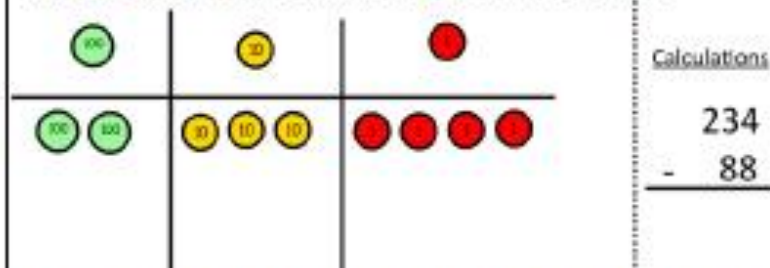
This will lead to a clear written column subtraction.

$$\begin{array}{r} 32 \\ - 12 \\ \hline 20 \end{array}$$

Column method with regrouping

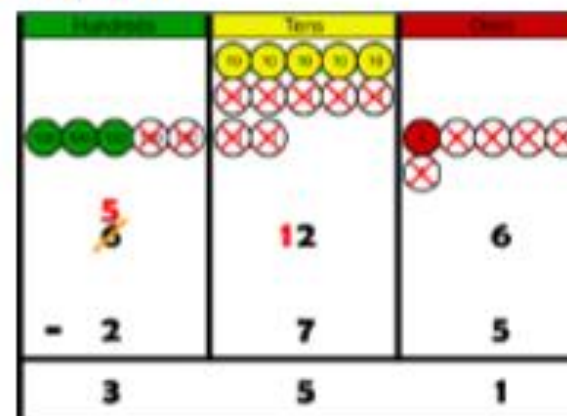
Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.

Make the larger number with the place value counters



Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.

Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.



Children can start their formal written method by partitioning the number into clear place value columns.

Calculations

$$\begin{array}{r} 234 \\ - 88 \\ \hline \end{array}$$

Now I can subtract my ones.

Calculations

$$\begin{array}{r} 234 \\ - 88 \\ \hline \end{array}$$

Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.

Calculations

$$\begin{array}{r} 234 \\ - 88 \\ \hline \end{array}$$

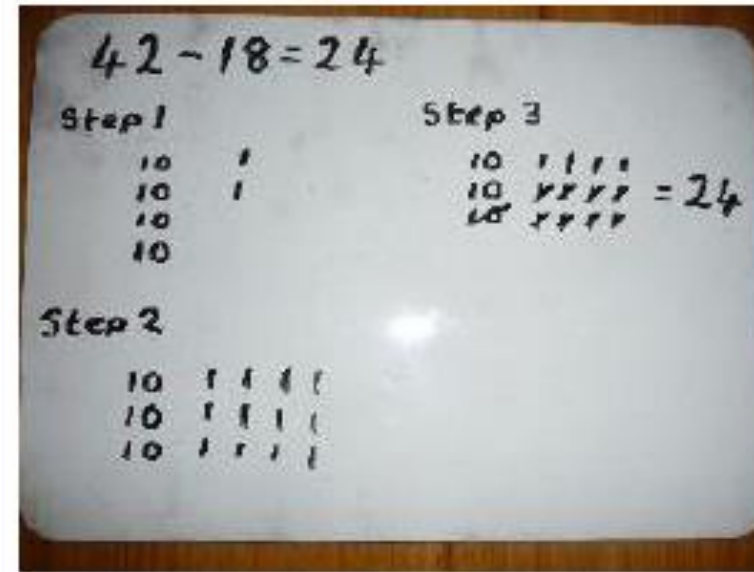
Now I can take away eight tens and complete my subtraction

Calculations

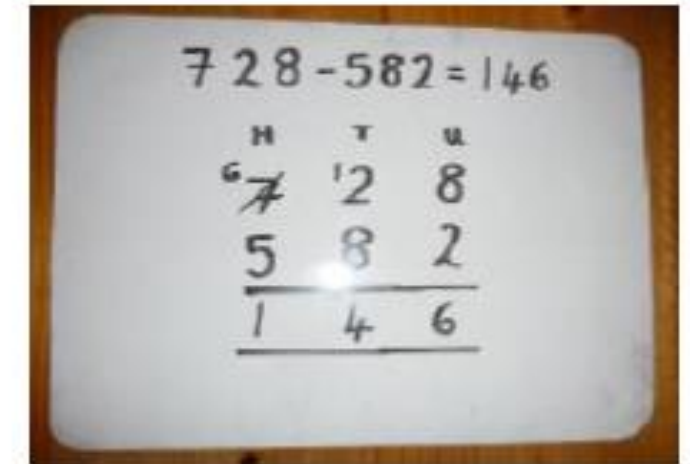
$$\begin{array}{r} 234 \\ - 88 \\ \hline 146 \end{array}$$

Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.

When confident, children can find their own way to record the exchange/regrouping.



Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.

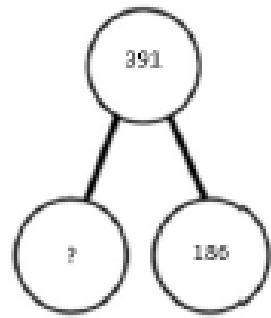


Moving forward the children use a more compact method.

This will lead to an understanding of subtracting any number including decimals.

$$\begin{array}{r} 5 \quad 12 \quad 1 \\ 2 \quad \cancel{6} \quad \cancel{3} \quad . \quad 0 \\ - \quad 2 \quad 6 \quad . \quad 5 \\ \hline 2 \quad 3 \quad 6 \quad . \quad 5 \end{array}$$

Conceptual variation; different ways to ask children to solve $391 - 186$



391	
186	?

Raj spent £391, Timmy spent £186.
How much more did Raj spend?

Calculate the difference between 391 and 186.

$$\square = 391 - 186$$

$$\begin{array}{r} 391 \\ -186 \\ \hline \end{array}$$



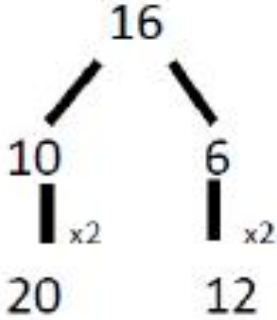
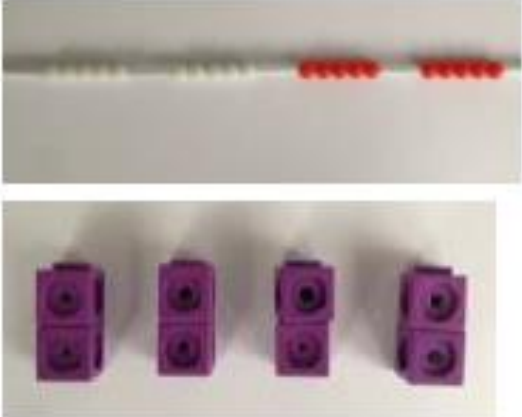
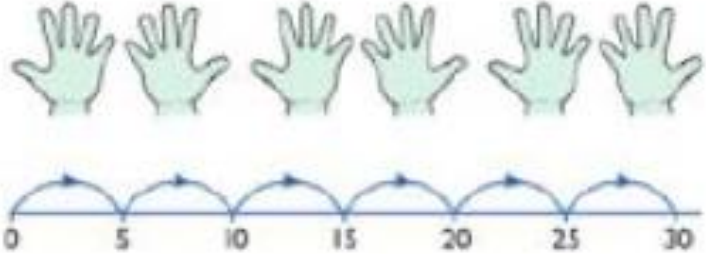




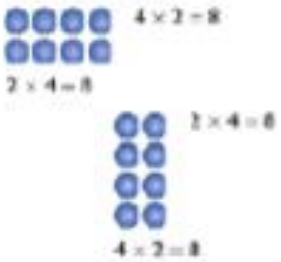
What is 186 less than 391?

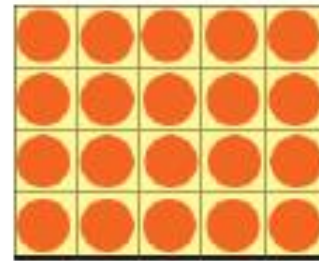
Missing digit calculations

$$\begin{array}{r} 39\square \\ -\square\square 6 \\ \hline \square 0 5 \end{array}$$

Calculation policy: Multiplication

Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Objective and Strategies	Concrete	Pictorial	Abstract
Doubling	<p>Use practical activities to show how to double a number.</p> 	<p>Draw pictures to show how to double a number.</p> <p>Double 4 is 8</p> 	<p>Partition a number and then double each part before recombining it back together.</p> 
Counting in multiples	 <p>Count in multiples supported by concrete objects in equal groups.</p>	 <p>Use a number line or pictures to continue support in counting in multiples.</p>	<p>Count in multiples of a number aloud.</p> <p>Write sequences with multiples of numbers.</p> <p>2, 4, 6, 8, 10</p> <p>5, 10, 15, 20, 25, 30</p>
Repeated addition	 <p>Use different objects to add equal groups.</p>	<p>There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?</p> 	<p>Write addition sentences to describe objects and pictures.</p>  <p>$2 + 2 + 2 + 2 + 2 = 10$</p>
Arrays- showing commutative multiplication	<p>Create arrays using counters/ cubes to show multiplication sentences.</p> 	<p>Draw arrays in different rotations to find commutative multiplication sentences.</p> 	<p>Use an array to write multiplication sentences and reinforce repeated addition.</p>



Link arrays to area of rectangles.



$$5 + 5 + 5 = 15$$

$$3 + 3 + 3 + 3 + 3 = 15$$

$$5 \times 3 = 15$$

$$3 \times 5 = 15$$

Show the link with arrays to first introduce the grid method.

x	10	3
4		

4 rows of 10
4 rows of 3

Move on to using Base 10 to move towards a more compact method.

x	T	U
4		

4 rows of 13

Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.

	100	10	1
4			

Calculations
 4×126

Fill each row with 126.

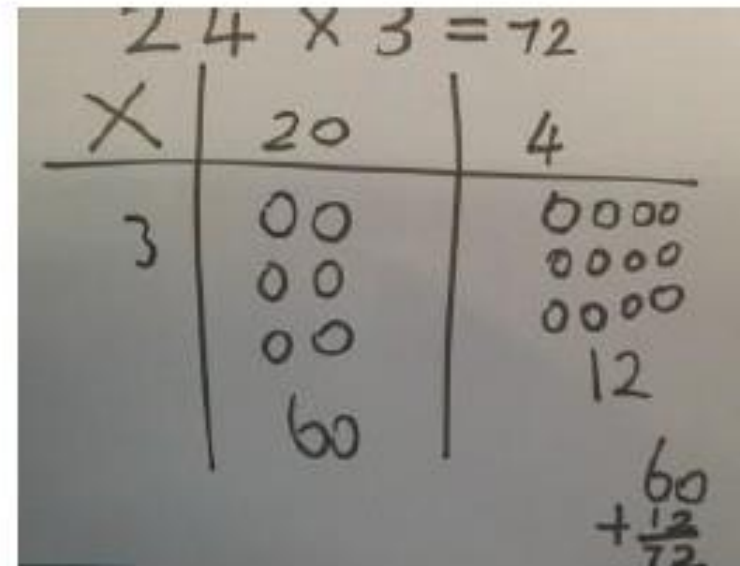
	100	10	1
4	100	20	6
	100	20	6
	100	20	6

Calculations
 4×126

Add up each column, starting with the ones making any exchanges needed.

Children can represent the work they have done with place value counters in a way that they understand.

They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.



Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

x	30	5
7	210	35

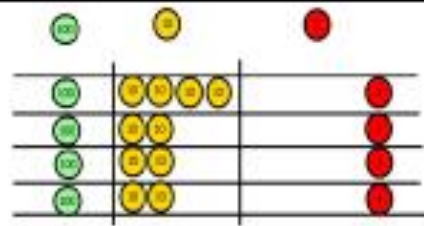
$$210 + 35 = 245$$

Moving forward, multiply by a 2 digit number showing the different rows within the grid method.

	10	8
10	100	80
3	30	24

x	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

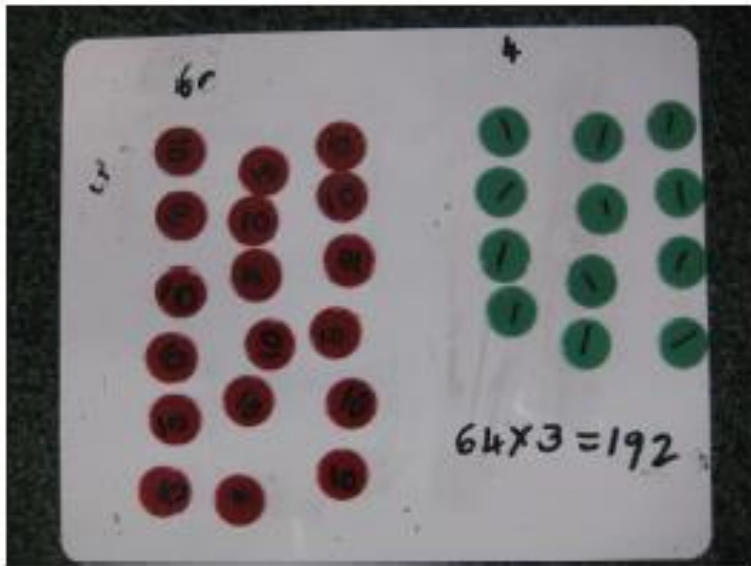
Grid Method



Then you have your answer.

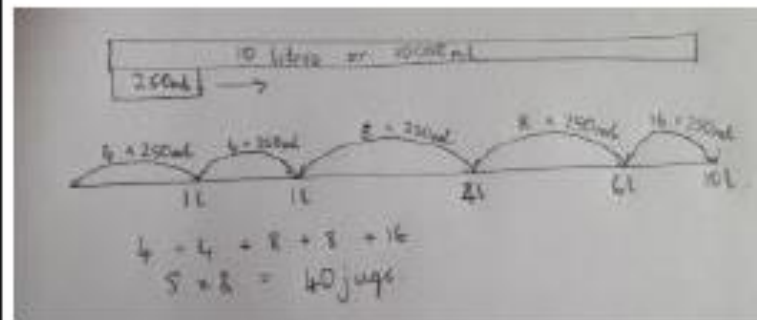
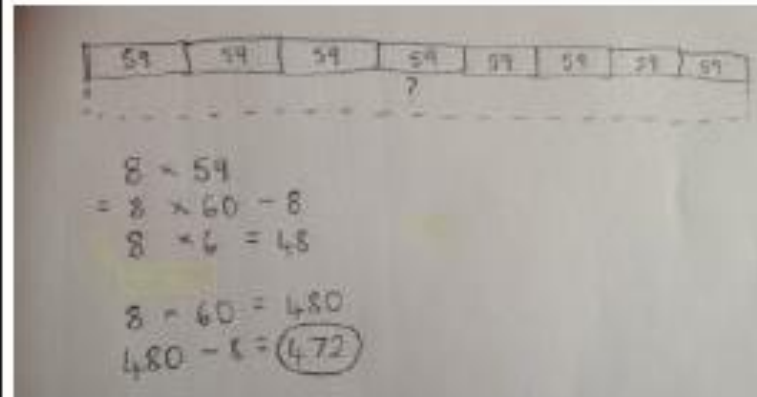


Children can continue to be supported by place value counters at the stage of multiplication.



It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.

Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.



Start with long multiplication, reminding the children about lining up their numbers clearly in columns.

If it helps, children can write out what they are solving next to their answer.

$$\begin{array}{r}
 32 \\
 \times 24 \\
 \hline
 128 \quad (4 \times 2) \\
 640 \quad (4 \times 30) \\
 \hline
 768
 \end{array}$$

$$\begin{array}{r}
 74 \\
 \times 63 \\
 \hline
 12 \\
 210 \\
 240 \\
 + 4200 \\
 \hline
 4662
 \end{array}$$

This moves to the more compact method.

$$\begin{array}{r}
 2342 \\
 \times 18 \\
 \hline
 13420 \\
 10736 \\
 \hline
 24156
 \end{array}$$

Column multiplication

Conceptual variation; different ways to ask children to solve 6×23

23	23	23	23	23	23
----	----	----	----	----	----

?

Mai had to swim 23 lengths, 6 times a week.

How many lengths did she swim in one week?

With the counters, prove that $6 \times 23 = 138$

Find the product of 6 and 23

$$6 \times 23 =$$

$$\square = 6 \times 23$$

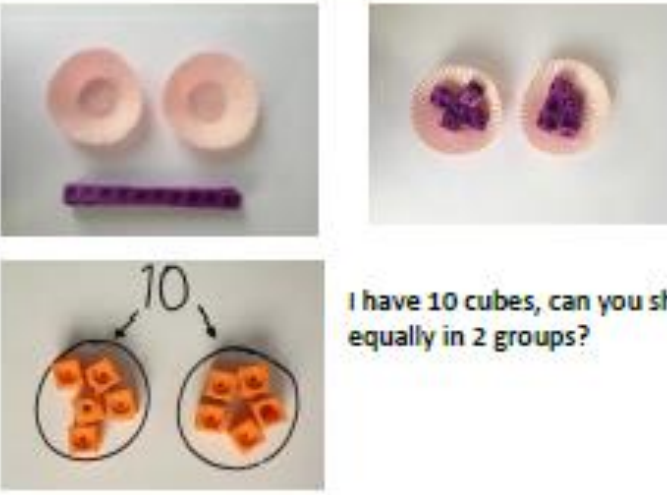

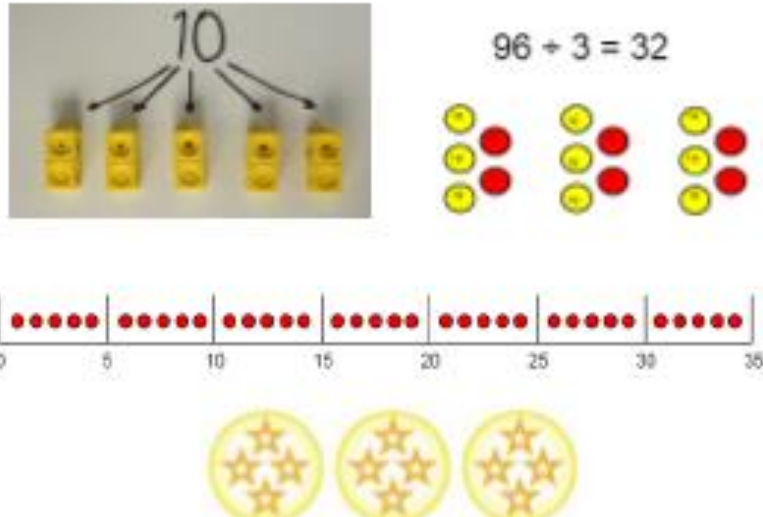
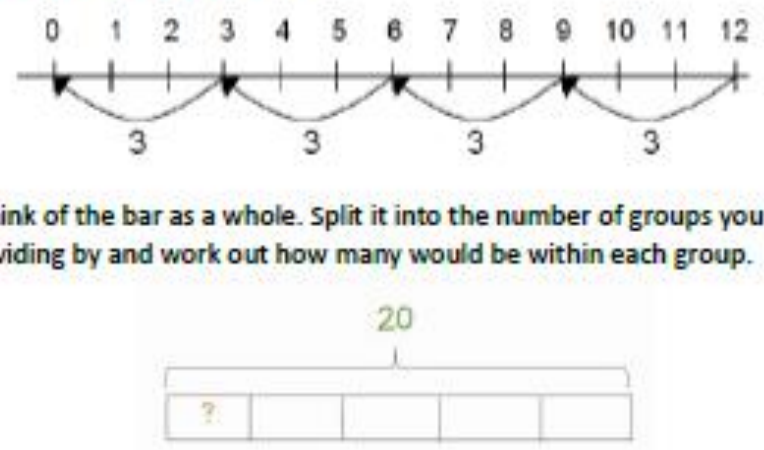

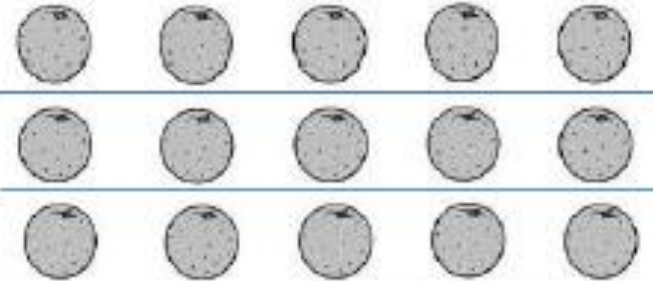
$$\begin{array}{r} 6 \quad 23 \\ \times \quad 23 \\ \hline \end{array} \quad \begin{array}{r} 23 \\ \times 6 \\ \hline \end{array}$$

What is the calculation?
What is the product?

100s	10s	1s
		

Calculation policy: Division

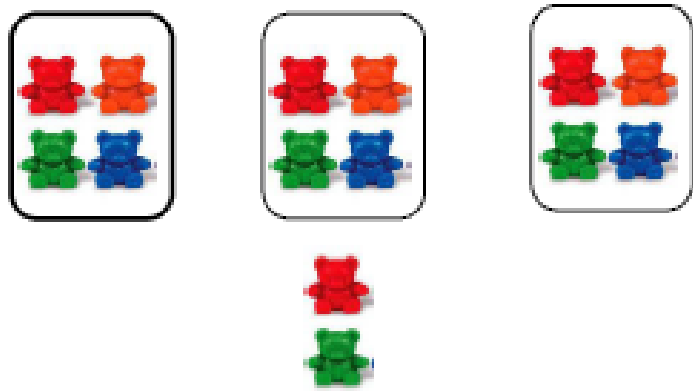
Key language: share, group, divide, divided by, half.

Objective and Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	 <p>I have 10 cubes, can you share them equally in 2 groups?</p>	<p>Children use pictures or shapes to share quantities.</p>  <div style="border: 1px solid black; padding: 5px; display: inline-block;"> $8 \div 2 = 4$ </div>	<p>Share 9 buns between three people.</p> $9 \div 3 = 3$
Division as grouping	<p>Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.</p>  $96 \div 3 = 32$	<p>Use a number line to show jumps in groups. The number of jumps equals the number of groups.</p>  <p>Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.</p> $20 \div 5 = ?$ $5 \times ? = 20$	<p>Divide 28 into 7 groups. How many are in each group?</p> $28 \div 7 = 4$
Division within arrays	<p>Link division to multiplication by creating an array and thinking about the number sentences that can be created.</p>  <p>E.g. $15 \div 3 = 5$ $5 \times 3 = 15$ $15 \div 5 = 3$ $3 \times 5 = 15$</p>	 <p>Draw an array and use lines to split the array into groups to make multiplication and division sentences.</p>	<p>Find the inverse of multiplication and division sentences by creating four linking number sentences.</p> $7 \times 4 = 28$ $4 \times 7 = 28$ $28 \div 7 = 4$ $28 \div 4 = 7$

Division with a remainder

$$14 \div 3 =$$

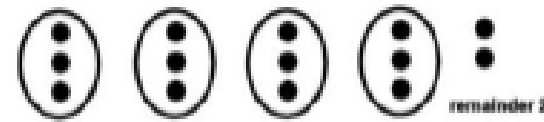
Divide objects between groups and see how much is left over



Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.



Draw dots and group them to divide an amount and clearly show a remainder.



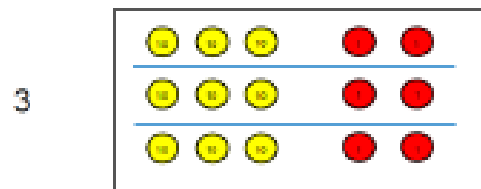
Complete written divisions and show the remainder using r.

$$29 \div 8 = 3 \text{ REMAINDER } 5$$

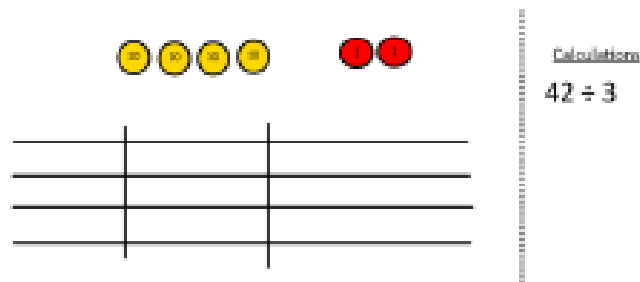
↑ ↑ ↑ ↑
 dividend divisor quotient remainder

Tens Units

3 2

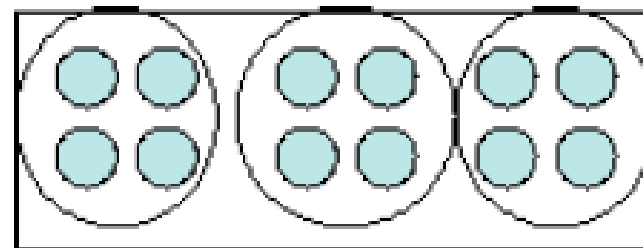


Use place value counters to divide using the bus stop method alongside



Calculation
42 ÷ 3

Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.



Encourage them to move towards counting in multiples to divide more efficiently.

Begin with divisions that divide equally with no remainder.

$$\begin{array}{r} 218 \\ 4 \overline{) 872} \end{array}$$

Move onto divisions with a remainder.

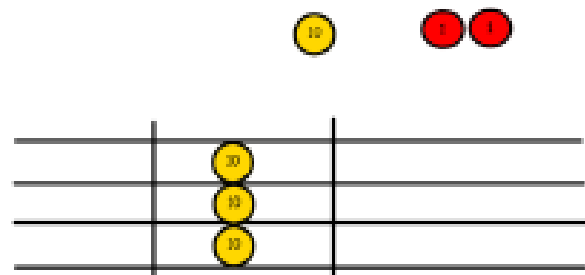
$$\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \end{array}$$

Finally move into decimal places to divide the total accurately.

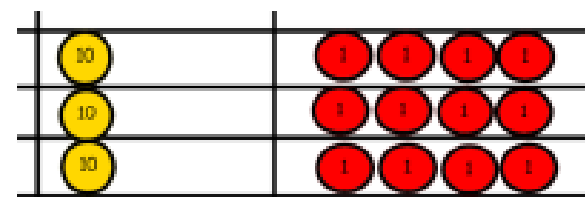
$$\begin{array}{r} 14.6 \\ 35 \overline{) 511.0} \end{array}$$

Short division

Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.



We exchange this ten for ten ones and then share the ones equally among the groups.



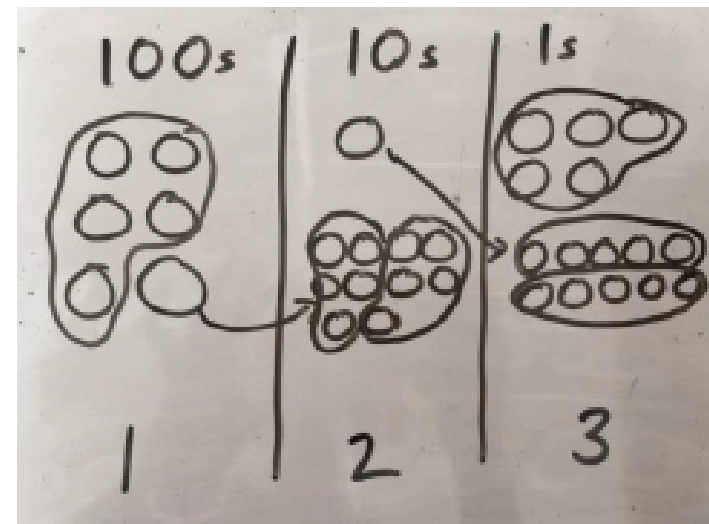
We look how much in 1 group so the answer is 14.

Short division using place value counters to group.
 $615 \div 5$

100s	10s	1s
1	2	3

1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?

Represent the place value counters pictorially.



Children to the calculation using the short division scaffold.

$$5 \overline{) 615} \begin{matrix} 123 \\ \underline{615} \\ 0 \end{matrix}$$

Long division using place value counters
 $2544 \div 12$

1000s	100s	10s	1s

We can't group 2 thousands into groups of 12 so will exchange them.

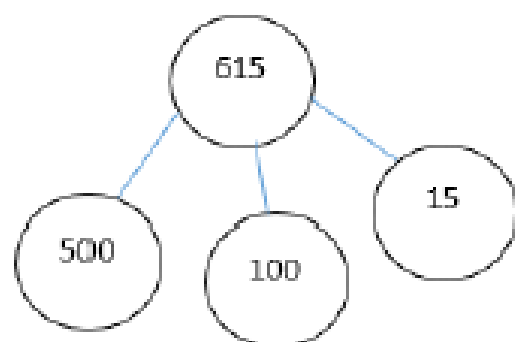
1000s	100s	10s	1s

We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

$$12 \overline{) 2544} \begin{matrix} 212 \\ \underline{24} \\ 1 \end{matrix}$$

Conceptual variation; different ways to ask children to solve $615 \div 5$

Using the part whole model below, how can you divide 615 by 5 without using short division?



I have £615 and share it equally between 5 bank accounts. How much will be in each account?

615 pupils need to be put into 5 groups. How many will be in each group?

$$5 \overline{)615}$$

$$615 \div 5 =$$

$$\square = 615 \div 5$$

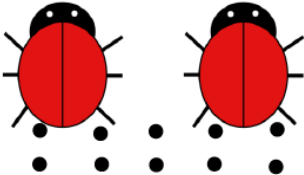
What is the calculation?
What is the answer?

100s	10s	1s

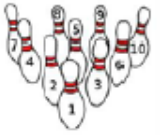
Maths Language / question prompts for the four operations

Maths Language / question prompts for the four operations

Language in EYFS

<p><u>Addition/Subtraction</u></p> <p>One more, one less</p> <p>Add, more, and</p> <p>Altogether, count all of them,</p> <p>count on</p> <p>Take-away, subtract</p> <p>Count what is left, count back</p> <p>Make, equals, total,</p> <p>Is the same as</p>	<p><u>Multiplication/Division</u></p> <p>Double, half, share</p> <p>How many each? equal groups</p> <p>Lots of, groups of</p> <p>Repeated addition</p>
<p><u>Reasoning Question examples</u></p> <p>$3 + 2 = 5$</p> <p>$3 + 2 = 6$</p> <p>Why can't both of these number sentences be correct?</p>	<p><u>Problem Solving Examples</u></p> <p>How many different ways can you put the spots on the ladybirds?</p>  The image shows two red ladybirds with black spots on their backs. The ladybird on the left has two spots, and the ladybird on the right has three spots. There are also five individual black dots arranged in a row below the ladybirds, representing spots that can be placed on them.

Maths Language/ question prompts for the four operations – Language in Year 1

<p style="text-align: center;"><u>Addition/Subtraction</u></p> <p style="text-align: center;">Addition</p> <p style="text-align: center;">+ add, more, plus, count on</p> <p style="text-align: center;">Make, total</p> <p style="text-align: center;">Altogether</p> <p style="text-align: center;">Double, near double</p> <p style="text-align: center;">One more, two more, ten more</p> <p style="text-align: center;">More than</p> <p style="text-align: center;">How many more to make...?</p> <p style="text-align: center;">How much more is...?</p> <p style="text-align: center;">How many altogether?</p> <p style="text-align: center;">Subtraction</p> <p style="text-align: center;">- Subtract, take away, minus, count back</p> <p style="text-align: center;">Leave</p> <p style="text-align: center;">How many are left (over)?</p> <p style="text-align: center;">One less, two more, ten more</p> <p style="text-align: center;">Less than</p> <p style="text-align: center;">How many fewer is... than...?</p> <p style="text-align: center;">Difference between</p> <p style="text-align: center;">Half, halve</p> <p style="text-align: center;">Equals</p> <p style="text-align: center;">= equals, equal to, is the same as</p>	<p style="text-align: center;"><u>Multiplication/Division</u></p> <p style="text-align: center;">Multiplication</p> <p style="text-align: center;">Multiples, lots of, groups of</p> <p style="text-align: center;">Multiplication</p> <p style="text-align: center;">Arrays</p> <p style="text-align: center;">Repeated addition</p> <p style="text-align: center;">Double</p> <p style="text-align: center;">Division</p> <p style="text-align: center;">Halve, share, share equally</p> <p style="text-align: center;">How many in each...?</p> <p style="text-align: center;">One each, two each, five each</p> <p style="text-align: center;">Equal groups</p>
<p style="text-align: center;"><u>Reasoning Question examples</u></p> <p>What do you notice?</p> <p>$20 - 12 = 8$</p> <p>$20 - 8 = 12$</p>	<p style="text-align: center;"><u>Problem Solving Examples</u></p> <ul style="list-style-type: none"> Tom is bowling, which pins must he knock down to score 7? How many ways can you do it? 

Can you make up some other number sentences like these using three numbers?

What number goes in the missing box?

$$9 + \underline{\quad} = 10$$

$$10 - \underline{\quad} = 9$$

Can you prove this using your fingers?

Danielle says, "I know 50 is in the ten times table so I know it is also in the five times table." Is she correct? Explain why.

Here is an array.



Mandy says, "I can find four facts from this." Do you agree? Convince me!

Amrit is counting in twos. She says the number 11. Explain the mistake she has made.

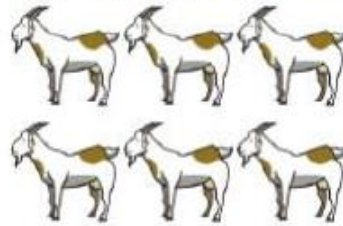
- A rabbit is hopping to a carrot. It starts on 5 and finishes on 40. The rabbit only hops on squares 5 more than the last number it landed on. Can you find a path for the rabbit to get to the carrot?



15	20	25	30	35
10	15	20	35	40
5	10	25	30	35



6 goats have twins. How many goats are born?



I have 10p to spend. Which two items could I buy? List of all the different items I could buy together.



Maths Language/ question prompts for the four operations

Language in Year 2

<u>Addition/Subtraction</u>	<u>Multiplication/Division</u>									
<p>Add, addition, more, plus Make, sum, total Altogether Double, near double, Ten more, one hundred more How many more to make? How many more isthan...? How much more is....? Subtract, subtraction, take away, minus How many are left? Ten less, one hundred less How many fewer is than....? How much less is...? Difference between Half/halve Equals, sign, is the same as</p>	<p>Lots of, group of Times, multiply, multiplied by Multiply of Times Repeated addition, repeated subtraction Array Row, column Double, halve Share, share equally Equal groups of Divide, divided by, divided into Left, left over</p>									
<u>Reasoning Question examples</u>	<u>Problem Solving Examples</u>									
<p>Continue the pattern: $90 = 100 - 10$ $80 = 100 - 20$ Can you make up a similar pattern starting with the numbers 75, 25 and 100?</p> <p>Missing numbers: $81 + \underline{\quad} = 100$ $100 - \underline{\quad} = 89$</p> <p>Problem Solving Examples Jenny has ten 10ps. How many</p>	<p>Jenny has ten 10ps. How many ways can she add them together to make £1? E.G. $20p + 80p$</p> <p>Can you find the missing number so each row and column adds up to 100?</p> <table border="1" data-bbox="855 1809 1177 1973"> <tbody> <tr> <td>20</td> <td></td> <td>50</td> </tr> <tr> <td>30</td> <td>40</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	20		50	30	40				
20		50								
30	40									

ways can she add them together to make £1?
E.G. 20p + 80p

Can you find the missing number so each row and column adds up to 100?
Explain how you can use number bonds to 10 to find the missing numbers above.

Sam says 'If I know $9 + 1 = 10$, I also know what I add to 90 to make 100.' Is he right? Prove it

Multiplication & Division

Which has more? Four bags of sweets with 5 in each or 3 bags of sweets with 10 in each? Explain your reasoning.

What numbers could go in the boxes?
 $20 = \square \times \square$

Prove it.

Use the numbers 1, 2 and 3. In pairs, one child chooses a number. The other child has to choose another number to add to the first number. The aim is to be the person who reaches 20 first. You must try to make sure your partner doesn't reach 20.

Multiplication & Division

- Use the number cards to make multiplication and division sentences.
How many numbers up to 20 can you make?



- Use the pictures below to think of multiplication and division sentences using \times , \div and $=$




Maths Language/ question prompts for the four operations

Language in Year 3

<u>Addition/Subtraction</u>	<u>Multiplication/Division</u>
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<p>Add, addition, more, plus Make, sum, total, altogether Double, near double Ten more, hundred more How many more to make? How many more is ...than...? How much more is? Subtract, subtraction, take (away), minus Leave, how many are left/leftover? Ten less, hundred less How many fewer is ... than...? How many less? Difference between Half/halve, quarter, two quarters, three quarters, third Equals, sign, is the same as</p>	<p>Lots of, groups of Times, multiply, multiple of, multiplication, multiplied by, product Once, twice, three times.....ten times Times as big/long/wide Repeated addition, repeated subtraction, array Row, column Double, halve Share, share equally One each, two each, three each.....</p>
<p style="text-align: center;"><u>Reasoning Question examples</u></p> <ul style="list-style-type: none"> Find the missing numbers in the addition $ \begin{array}{r} \square \ 4 \\ + 2 \ \square \\ \hline 6 \ 2 \end{array} $ <p style="text-align: center;"><u>Multiplication & Division</u></p> <p>Start this rhythm, clap, clap, click, clap, clap, click. Carry on the rhythm, what will you be doing on the 15th beat? How do you know? What will you be doing on the 20th beat? Explain and prove your</p>	<p style="text-align: center;"><u>Problem Solving Examples</u></p> <p style="text-align: center;">201 = $\square\square + \square\square + \square\square$</p> <p>Can this be done more than one way? Convince me.</p> <p>The answer to the addition is 201.</p>

<ul style="list-style-type: none"> Which of the problems below can be solved using $8 \div 2$? <p>-There are 2 bags of sweets with 8 sweets in each. How many altogether?</p> <p>-A rollercoaster carriage holds 2 people, how many carriages are needed for 8 people?</p> <p>-I have 8 crayons and share them out so people have 2 crayons each. How many people did I share them between?</p> <p>-I have 8 buns and I give two to my brother. How many do I have left?</p> <p>Explain your reasoning.</p>	<p>All the digits used are either 1 or 9.</p> <p>Fill in the boxes.</p> <p>Multiplication & Division</p> <p>Can you sort the cards below so that they would follow round in a loop? The number at the top is the answer, then follow the instruction at the bottom to get the next answer.</p>  <p>A group of aliens live on Planet Xert. Tinions have three legs, Quinions have four legs. The group has 22 legs altogether. How many Tinions and Quinions might there be? Is there more than one solution?</p>
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Maths Language/ question prompts for the four operations

Language in Year 4

<u>Addition/Subtraction</u>	<u>Multiplication/Division</u>
Add, addition, more, plus Make, sum, total, altogether Double, near double Ten more, hundred more How many more to make?	Lots of, groups of Times, multiply, multiple of, multiplication, multiplied by, product Once, twice, three times.....ten times

<p>How many more is ...than...? How much more is? Subtract, subtraction, take (away), minus Leave, how many are left/leftover? Ten less, hundred less How many fewer is ... than...? How many less? Difference between Half/halve, quarter, two quarters, three quarters, third Equals, sign, is the same as Increase, decrease, inverse</p>	<p>Times as big/long/wide Repeated addition, repeated subtraction, array Row, column Double, halve Share, share equally One each, two each, three each Divisible by</p>															
<p><u>Reasoning Question examples</u></p> <p>Identify the missing number in this bar model. It is not drawn to scale.</p> <table border="1" data-bbox="274 981 593 1070"> <tr> <td colspan="3">1000</td> </tr> <tr> <td></td> <td>353</td> <td>354</td> </tr> </table> <p>Fill in the missing digits.</p> <p>1 <input type="text"/> 3 + 6 <input type="text"/> = 200 1 <input type="text"/> 5 <input type="text"/> + 300 = 1557 5 <input type="text"/> 28 - 44 <input type="text"/> = 4788 <input type="text"/> <input type="text"/> <input type="text"/> 0 - 2468 = 5092</p> <p>Place one of these symbols in the circle to make the number sentence correct: >, < or =</p> <table border="1" data-bbox="258 1574 544 1798"> <tr> <td>8 × 50</td> <td><input type="radio"/></td> <td>50 × 8</td> </tr> <tr> <td>8 × 50</td> <td><input type="radio"/></td> <td>80 × 5</td> </tr> <tr> <td>300 × 3</td> <td><input type="radio"/></td> <td>5 × 200</td> </tr> </table> <p>Justify your answers</p>	1000				353	354	8 × 50	<input type="radio"/>	50 × 8	8 × 50	<input type="radio"/>	80 × 5	300 × 3	<input type="radio"/>	5 × 200	<p><u>Problem Solving Examples</u></p> <p>I am thinking of a number. It is greater than 1500 but smaller than 2000. The digits add up to 13. The difference between the largest and smallest digit is 5. What could the number be?</p> <p>A chocolate factory usually produce 1568 caramel bars on a Saturday but on a Sunday production decreases and they make 325 fewer bars. How many bars are produced at the weekend in total?</p> <p>All of the digits below are either a 3 or a 9. Can you work out each digit?</p> <p>7338=???? + ????</p> <p>Miss Wood orders some new whiteboard pens for Year 5 and 6. There are 160 children in Year 5 and 6. If she orders 6 boxes of 27 pens, will she have enough?</p>
1000																
	353	354														
8 × 50	<input type="radio"/>	50 × 8														
8 × 50	<input type="radio"/>	80 × 5														
300 × 3	<input type="radio"/>	5 × 200														

There are mistakes in the following calculations. Explain the mistake and then make a correction to find the correct answer.

$$\begin{array}{r} 2451 \\ +562 \\ \hline 8071 \end{array} \qquad \begin{array}{r} 782 \\ -435 \\ \hline 353 \end{array}$$

Penny says a two digit number multiplied by a one digit number will always give a two digit answer. Is she correct? Justify your answer.

In a box there are red and yellow cubes. For every 5 red cubes there are 3 yellow cubes.

Hannah says ' If I have more than 10 red cubes, I will definitely have more than 10 yellow cubes.'
Do you agree?

Show your calculation.

An ice cream sundae is made from one scoop of ice cream, one topping and one sauce.

How many different ice cream sundaes can be created from 5 different flavours of ice cream, 3 different toppings and 4 different sauces?

What could the numbers in the multiplication be? Every digit is different.

$$??? \times 3 = ????$$

Maths Language/ question prompts for the four operations

Language in Year 5

<u>Addition/Subtraction</u>	<u>Multiplication/Division</u>
<p>Add, addition, more, plus Make, sum, total, altogether Double, near double Ten more, hundred more How many more to make? How many more is ...than...? How much more is? Subtract, subtraction, take (away), minus Leave, how many are left/leftover? Ten less, hundred less How many fewer is ... than...? How many less? Difference between Half/halve, quarter, two quarters, three quarters, third Equals, sign, is the same as Increase, decrease, inverse Ascend, descend</p>	<p>Lots of, groups of Times, multiply, multiple of, multiplication, multiplied by, product Once, twice, three times.....ten times Times as big/long/wide Repeated addition, repeated subtraction, array Row, column Double, halve Share, share equally One each, two each, three each Divisible by Cubed Squared Quotient To the power of Square Root Factor Multiple</p>
<p><u>Reasoning Question examples</u></p> <p>Spot the mistake and make the correction:</p> $\begin{array}{r} 527 \\ \times 42 \\ \hline 10540 \\ 2018 \\ \hline 12648 \end{array}$ <p>6 x 7 = 42</p>	<p><u>Problem Solving Examples</u></p> <p>Find the missing numbers in these calculations:</p> $\begin{array}{r} 34\Box1\Box \\ - \Box482 \\ \hline 292\Box4 \end{array}$ $\begin{array}{r} 6\Box02\Box \\ + 5\Box51 \\ \hline \Box9180 \end{array}$

<p>How can you use this fact to solve the following calculations?</p> <p>$4200 \div 70 =$ $0.6 \times 0.7 =$</p> <p>A five digit number and a four digit number have a difference of 4365. Give me three possible pairs of numbers.</p> <p>What number goes in the box? $323 \times \underline{\quad} 1 = 13243$ Prove it.</p> <p>Andrew says that the answer to 166 divided by 4 can be written as '46 remainder 2' or as '46.5'. Do you agree? Explain your Reasoning</p> <p>Tom says '<i>Factors come in pairs, so all numbers have an even number of factors.</i>' Do you agree? Explain your reasoning.</p>	<p>David has £35700 in his bank. He divides the amount by 100 and takes that much money out of the bank. Using the money he has taken out he spends £268 on furniture for his new house. How much money does David have left from the money he took out? Show your working.</p> <p>I am thinking of a number. When it is divided by 9, the remainder is 3. When it is divided by 2, the remainder is 1. When it is divided by 5, the remainder is 4. What is my number?</p> <p>My answer is 5398, what's the question? - Create 3 addition calculations. - Create 3 subtraction questions. - Did you use a strategy? Explain it.</p> <p>Clare's age is a multiple of 7 and 3 less than a multiple of 8. How old is Clare?</p>
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Maths Language/ question prompts for the four operations

Language in Year 6

<u>Addition/Subtraction</u>	<u>Multiplication/Division</u>
<p>Add, addition, more, plus Make, sum, total, altogether Double, near double Ten more, hundred more How many more to make? How many more is ...than...? How much more is? Subtract, subtraction, take (away), minus Leave, how many are left/leftover? Ten less, hundred less How many fewer is ... than...? How many less? Difference between Half/halve, quarter, two quarters, three quarters, third Equals, sign, is the same as Increase, decrease, inverse Ascend, descend</p>	<p>Lots of, groups of Times, multiply, multiple of, multiplication, multiplied by, product Once, twice, three times.....ten times Times as big/long/wide Repeated addition, repeated subtraction, array Row, column Double, halve Share, share equally One each, two each, three each Divisible by Cubed Squared Divisor Dividend Quotient To the power of Square Root Factor Multiple</p>
<u>Reasoning Question examples</u>	<u>Problem Solving Examples</u>
<p>Abdul says “If I add any two 4 digit numbers together is will make a 5 digit number.” Do you agree? Explain why.</p>	<p>Javid has six white mice, three males and three females. Each of the three couples has 7 female baby mice. The each of these females has 8 babies. One night Javid’s little sister Aisha leaves the mice cage open</p>

and 47 escape. How many mice does Javid have left?

What is the closest you can get to any given number e.g. 256 using only multiplication and a list of numbers given e.g. 10, 7, 6, 2, 25, 4?

How do you know this is the closest? What strategy did you use?

Using the number 4236, how many numbers up to 20 does it divide by without a remainder? Is there a pattern? What can you say about these numbers?

Peter paid £21 for 5 presents. For A and B he paid a total of £6.

For B and C he paid a total of £10.

For C and D he paid a total of £7.

For D and E he paid a total of £9.

How much did Peter pay for each present?

Nancy is double her sister's age. They are both older

	than 20 and younger than 50. They are both multiples of 7. How old are they?
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Reasoning Question starters and activities

Reasoning question starters and activities can be applied in all objectives of the maths curriculum. Below are some helpful examples that can be used with children.

Teachers will also use information from the NCETM progression maps and White Rose planning to support the use of these with appropriate examples.

Spot the mistake / Which is correct?

True or false?

What comes next?

Do, then explain

Make up an example / Write more statements / Create a question /

Another and another

Possible answers / Other possibilities

What do you notice?

Continue the pattern

Missing numbers / Missing symbols / Missing information/Connected calculations

Working backwards / Use the inverse / Undoing /

Unpicking

Hard and easy questions

What else do you know? / Use a fact

Fact families

Convince me / Prove it / Generalising e.g. Ted thinks that any number ending in a 4 is in the four times table. Do you agree? Explain your thinking

Make an estimate / Size of an answer – How did you make that estimate?

Always, sometimes, never

Making links / Application

Can you find?

What's the same, what's different?

Odd one out

Complete the pattern / Continue the pattern

Ordering

Testing conditions – e.g. asking for a number/answer that fits a range of criteria e.g. a number is 3 digits and is a multiple of 3 and 5. What could I be?

The answer is...

Visualise