



Progression in Calculations (2022-2023)

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

National Curriculum in England 2014

Department for Education

This calculation policy is a guide for all staff at Bishop's Castle Primary School and forms part of the mathematics policy.

It is designed to be used alongside White Rose teaching resources plus NCETM Mastery materials.

All staff have access to White Rose resources which provides lessons and a host of ideas and activities to develop mastery in Mathematics. These resources are excellent ways to support the learning of mathematics and should be tailored to support the needs of the pupils. Staff are also encouraged to access the NCETM website for further ideas and guidance. In EYFS, Development Matters statements are referred to; to inform planning and progress towards meeting the Early Learning Goals.

All teachers have access to the schemes of work from the White Rose website. This scheme uses the Mastery approach. Where appropriate, staff are encouraged to base their planning around the units recommended in this scheme. However, it should be emphasised that all planning should take account of the requirements of the pupils in terms of where they are in their learning and how they can achieve successful outcomes. Teachers are responsible for making these judgements.

The White Rose Maths schemes of work provide sequential programmes of study that are underpinned by promoting fluency in number. They emphasise that all pupils must have a thorough grounding in the four basic rules of number before progressing on to the next level. This complete understanding gives pupils more confidence in dealing with number activities and in turn, leads to mastery of the four operations.

Whilst the calculation policy guidance document is separated into year group phases, these are intended to be used only as a guide and it is the teachers' professional judgement as to when the pupils move on to the next phase.



Progression in Calculations (2022-2023)

| | EYFS | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|--|--|--|---|---|---|--|---|
| A d d i t i o n | Saying which number is one more than a given number. Finding the total number of items in two groups by counting all of them. Finding the total by starting at the bigger number and counting on. Introduce the part part whole model. | Combining two parts to make a whole: part whole model. Starting at the bigger number and counting on. Regrouping to make 10. | Adding three single digits. Column method – no regrouping. | Column method – regrouping. (Up to 3 digits) | Column method – regrouping. (Up to 4 digits) | Column method – regrouping. (with more than 4 digits) Decimals – with the same amount of decimal places | Column method – regrouping. Decimals – with different amounts of decimal places |
| S u b t r a c t i o n | Taking away using objects or drawing and crossing out. Saying which number is one less than a given number. Subtracting two single digit numbers by counting back. Introduce the part part whole model. | Taking away ones Counting back Find the difference Part part whole model Make 10 | Counting back Finding the difference Part whole model Make 10 Column method – no regrouping | Column method – regrouping. (Up to 3 digits) | Column method – regrouping. (Up to 4 digits) | Column method – regrouping. (with more than 4 digits) Decimals – with the same amount of decimal places | Column method – regrouping. Decimals – with different amounts of decimal places |
| M u l t i p l i c a t i o n | Problem solving - doubling | Doubling Counting in multiples | Doubling Counting in multiples Repeated addition Arrays – showing commutative multiplication | Counting in multiples Repeated addition Arrays – showing commutative multiplication | Column multiplication (2 and 3 digit multiplied by 1 digit) | Column multiplication (up to 4 digit numbers multiplied by 1 or 2 digits) | Column multiplication (multi digit numbers multiplied by a 2 digit number). Including multiplying decimals |
| D i v i s i o n | Problem solving – halving and sharing. | Sharing objects into groups Division as grouping | Division as grouping Division within arrays | Division within arrays Division with a remainder Short Division (2 digits by 1 digit- concrete and pictorial) | Division within arrays Division with a remainder Short Division (up to 3 digits by 1 digit- concrete and pictorial) | Short Division (up to 4 digits by a 1 digit number interpret remainders appropriately for the context) | Short division Long division (up to 4 digits by a 2 digit number interpret remainders as whole numbers, fractions as required) |



Progression in Calculations (2022-2023)








Addition Vocabulary

| Year R | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|---|--|--|----------------------------------|-------------------------------|----------------------------|-----------------------------------|
| More One more More than Add Addition Equals Total Make Plus Part Whole Altogether And Number bonds | Number bonds Represents Sign Subitize Counting on Commutative Systematic Greater than | Column addition Column method Regroup Estimate Inverse | Regroup Increase Operation | Commutative Sum Integer | Equal to Is the same as | Annexing Vertical Algorithm |








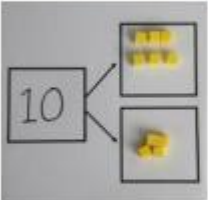

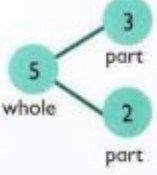
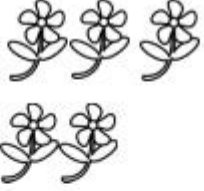
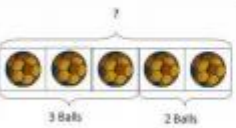



Progression in Calculations (2022-2023)

Addition progression

| Objectives and strategies | Concrete | Pictorial | Abstract |
|---|--|---|---|
| Saying which number is more than a given number |  <p>Use Numicon to add one more</p>  <p>Use cubes</p>  <p>Ten Frame</p> |  <p>Use pictures to add one more</p> | 4 and 1 makes <input type="text"/> $4 + 1 = \square$ |
| Finding a total number of items in two groups by counting all |  <p>Use Numicon</p>  <p>Use objects</p> |  <p>Use pictures to add 2 groups</p> | 3 and 4 makes <input type="text"/> $3 + 4 = \square$ |



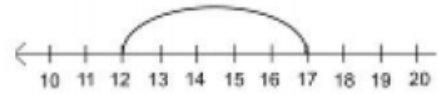

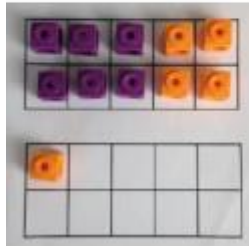
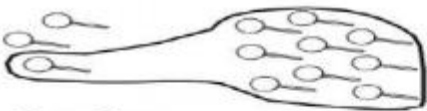
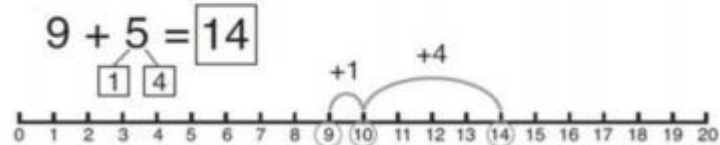


Progression in Calculations (2022-2023)

| | | | |
|---|---|--|--|
| <p>Finding the total number of items in two groups by counting on</p> |  Use Numicon to count on  Use blocks  Rekenrek |  <p>Counting on using pictures</p> | <p>$5 + 3 = \square$</p> <p>Move into abstract (holding larger numbers in head)</p> |
| <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>$4 + 3 = 7$</p> <p>$10 = 6 + 4$</p>  <p>Use the part-part whole diagram as shown above to move into the abstract.</p> |



Progression in Calculations (2022-2023)

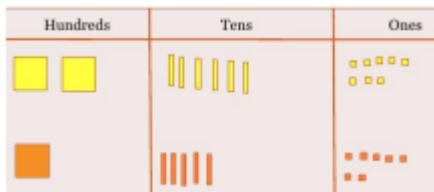
| | | | |
|--|--|--|---|
| <p>Starting at the bigger number and counting on</p> |  <p>Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.</p>  Rekenrek | $12 + 5 = 17$  <p>Start at the larger number on the number line and count on in ones or in one jump to find the answer.</p> | $5 + 12 = 17$ <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> |  $6 + 5 = 11$  <p>Start with the bigger number and use the smaller number to make 10.</p> |  $3 + 9 =$ <p>Use pictures or a number line. Regroup or partition the smaller number to make 10.</p> $9 + 5 = 14$  | $7 + 4 = 11$ <p>If I am at seven, how many more do I need to make 10. How many more do I add on now?</p> |



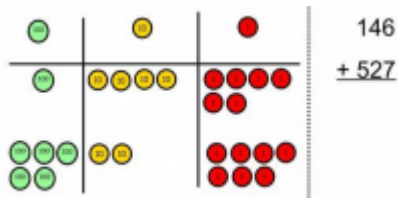
Progression in Calculations (2022-2023)

Column method with regrouping

This process is to be done with the base 10 equipment to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100. Add, re-group 10 ones for a ten and 10 tens for a hundred.

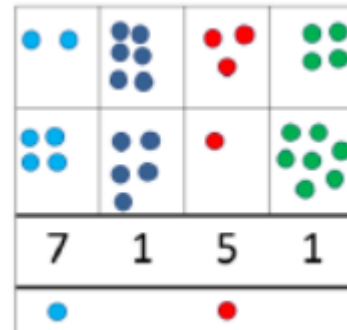
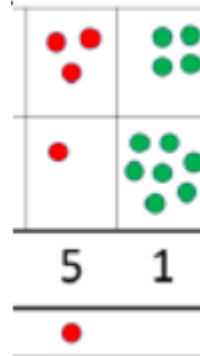


Progressing to place value counters. Make both numbers on a place value grid.



Add up the ones and re-group 10 ones for one 10.

Children draw a pictorial representation of the place value frame and counters to further support their learning and understanding re-grouping the ten underneath the equals line.



Start by partitioning the numbers before moving on to formal written methods clearly show the re-grouping.

$$25 + 48 =$$

$$\begin{array}{r} 20 + 5 \\ 40 + 8 \\ \hline 60 + 13 = 73 \end{array}$$

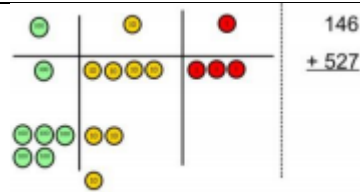
Add the ones first, then the tens, then the hundreds.

$$\begin{array}{r} \text{HT O} \\ 536 \\ + 85 \\ \hline 621 \\ 11 \end{array}$$

As the children move on, introduce decimals with the same number of decimal places and different places. Money can be used here.



Progression in Calculations (2022-2023)



Add up the rest of the columns, re-grouping the 10 counters from one column for the next place value column until every column has been added.

As children move on to decimals, money and decimals place value counters can be used to support learning.



$$\begin{array}{r}
 72.8 \\
 + 54.6 \\
 \hline
 127.4 \\
 \hline
 11
 \end{array}$$

$$\begin{array}{r}
 81,059 \\
 3,668 \\
 15,301 \\
 + 20,551 \\
 \hline
 120,579
 \end{array}$$

Insert zeros for place holders.

$$\begin{array}{r}
 23.361 \\
 9.080 \\
 59.770 \\
 + 1.300 \\
 \hline
 93.511 \\
 \hline
 212
 \end{array}$$



Progression in Calculations (2022-2023)







Subtraction Vocabulary

| Year R | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|--|--|---|---------------------|--------|--------|---------------|
| Fewer Subtraction Take away Less Count Back First, Then, Now How many left Minus | Difference Find the difference Difference between Smaller Less than Subitise Part Whole Partition Related facts | Column method Column subtraction Exchange Regroup Count on to find the difference | Regroup Exchange | | | Decomposition |




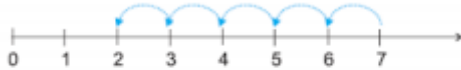


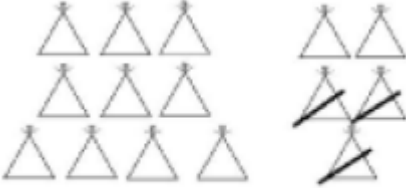
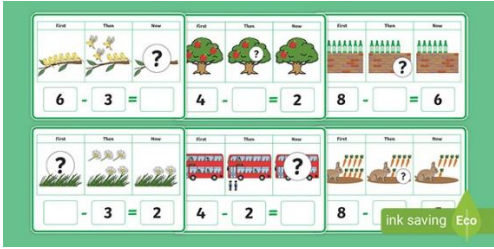
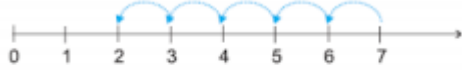
Progression in Calculations (2022-2023)

Subtraction Progression

| Objectives and strategies | Concrete | Pictorial | Abstract |
|---|--|---|---|
| Subtraction as take away |  <p>Physically taking away</p>  <p>Tractor pull</p>  <p>Ten Frame</p> |  <p>Crossing out</p> | 4 take away 2 makes <input type="text"/> $4 - 2 =$ <input type="text"/> |
| Saying which number is one less than a given number |  <p>Physically removing one item "Yum"</p> |  <p>Crossing out one</p> | 4 take away 1 makes <input type="text"/> 1 less than 4 is <input type="text"/> 1 fewer than 4 is <input type="text"/> |



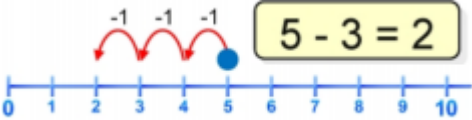
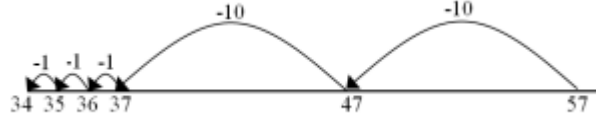
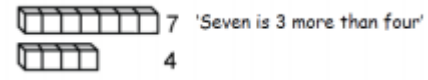

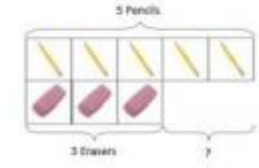
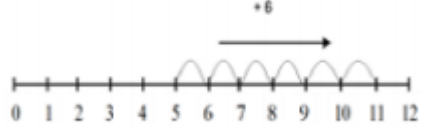
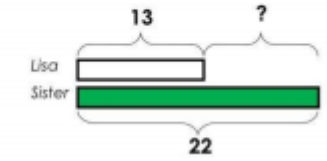


Progression in Calculations (2022-2023)

| | | | |
|--|---|---|---|
| <p>Subtracting two single digit numbers by counting back</p> |  <p>Physical number line</p> |  <p>Counting back on number line</p> | <p>$9 - 4 = \square$</p> <p>Put larger number in head and count back</p> |
| <p>Taking away ones</p> | <p>Use physical objects, counters, cubes etc to show how objects can be taken away.</p> <p>$6 - 4 = 2$</p>   <p>Ten Frame</p> | <p>Cross out drawn objects to show what has been taken away.</p>  <p>$15 - 3 = \square$</p>   <p>Counting back on number line</p> | <p>$7 - 4 = 3$</p> <p>$6 = 8 - 2$</p> <p>$18 - 3 = 15$</p> |

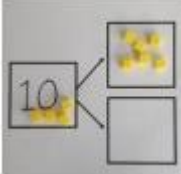
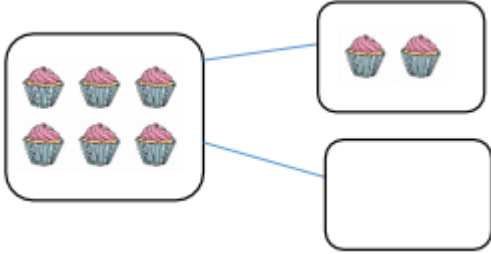


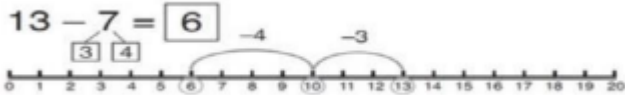


Progression in Calculations (2022-2023)

| | | | |
|-----------------------------------|---|--|--|
| <p>Counting back</p> | <p>Move objects away from the group, counting backwards.</p>  <p>Make the larger number in your subtraction. Move the beads along the bead string as you count backwards in ones.</p>  | <p>Count back in ones using a number line.</p>  <p>$5 - 3 = 2$</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?</p> |
| <p>Find the difference</p> | <p>Compare amounts and objects to find the difference.</p>  <p>'Seven is 3 more than four'</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 using a number line 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 sweets. Her sister has 15 sweets. Find the difference between the number of sweets.</p> <p>Ben has 12 marbles, and his brother has 5. How many more marbles does Ben have than his brother?</p> |

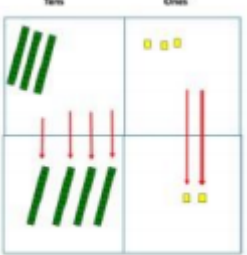

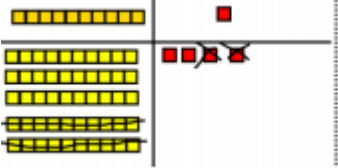
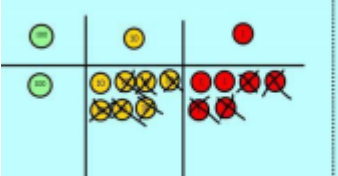
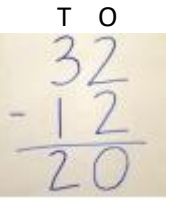
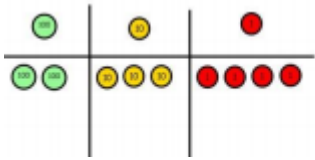
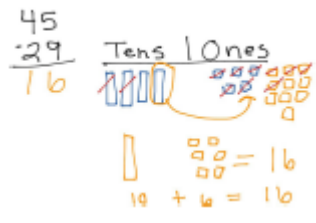


Progression in Calculations (2022-2023)

| | | | |
|--|--|--|--|
| <p>Part Whole Model</p> | <p>Link to addition – use the part whole model to help explain the inverse between addition and subtraction.</p>  <p>If 10 is the whole and 6 is one of the parts. What is the other part?</p> <p>$10 - 6 =$</p> | <p>Use a pictorial representation of objects to show the part whole model.</p>  | <p>Move to using numbers within the part whole model.</p>  |
| <p>Make 10</p> | <p>$14 - 5$</p> <p>Make 14 on the ten frame. We will partition the 5. Take away the 4 first to make 10 and then take away 1 more so you have taken away 5.</p>  | <p>Use a number line.</p> <p>$13 - 7 =$ Start at 13. Partition the 7 into a 3 and a 4 so can take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether.</p>  | <p>$16 - 8 =$</p> <p>Partition the 8.</p> <p>How many do we take off to reach the next 10?</p> <p>How many do we have left to take off?</p> |
| <p>Column method without regrouping</p> | <p>Use the base 10 equipment to make the bigger number then take the smaller number away.</p> | <p>Draw the Base 10 or place value counters alongside the written calculation to support understanding.</p> | <p>Intermediate step of partitioning.</p> |



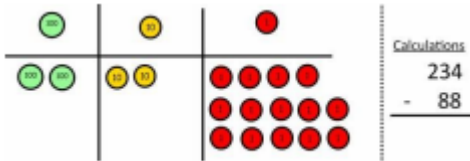
Progression in Calculations (2022-2023)

| |  <p>Show how you partition numbers to subtract. Again make the larger number first.</p>  |  <p>Calculations</p> $\begin{array}{r} 54 \\ - 22 \\ \hline 32 \end{array}$  <p>Calculations</p> $\begin{array}{r} 176 \\ - 64 \\ \hline 112 \end{array}$ | $47 - 24 = 23$ $\begin{array}{r} 40 + 7 \\ - 20 + 4 \\ \hline 20 + 3 \end{array}$ <p>This will lead to a clear written column subtraction.</p>  | | | | | | | | | | | | | | | | | | |
|--------------------------------------|---|---|---|---|---|---|-----|-----|---|------|----|---|-------|--|--|-----|----|---|-------|--|--|
| <p>Column method with regrouping</p> | <p>Use Base 10 to start with before moving onto place value counters. Start with one regrouping before moving onto subtractions with 2 regroupings then onto 3.</p> <p>Make the larger number with the place value counters</p>  <p>Calculations</p> $\begin{array}{r} 234 \\ - 88 \\ \hline \end{array}$ <p>Start with the ones, can I take 8 from 4? I need to regroup one of my tens for 10</p> | <p>Children draw the Base 10 equipment, or the place value counters to</p>  | <p>Children can start their formal written method by partitioning the number into clear place value columns.</p> $836 - 254 = 582$ <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>H</th> <th>T</th> <th>O</th> </tr> </thead> <tbody> <tr> <td>800</td> <td>130</td> <td>6</td> </tr> <tr> <td>-200</td> <td>50</td> <td>4</td> </tr> <tr> <td colspan="3">-----</td> </tr> <tr> <td>500</td> <td>80</td> <td>2</td> </tr> <tr> <td colspan="3">-----</td> </tr> </tbody> </table> | H | T | O | 800 | 130 | 6 | -200 | 50 | 4 | ----- | | | 500 | 80 | 2 | ----- | | |
| H | T | O | | | | | | | | | | | | | | | | | | | |
| 800 | 130 | 6 | | | | | | | | | | | | | | | | | | | |
| -200 | 50 | 4 | | | | | | | | | | | | | | | | | | | |
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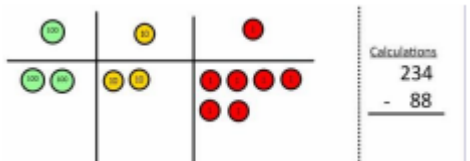


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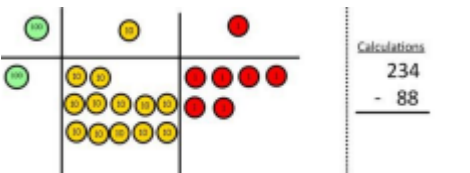
ones.



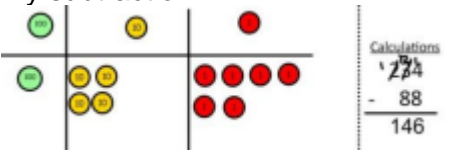
Now I can subtract my ones.



Now look at the tens, can I take away 8 tens? I need to regroup 1 hundred for 10 tens.



Now I can take away 8 tens and complete my subtraction.



Show how the concrete method links to the written method alongside your workings. Cross out the numbers when regrouping and show where and how we write the new amount.

The children then progress to formal written methods.

$$\begin{array}{r}
 728 - 582 \\
 \text{H T O} \\
 \begin{array}{r}
 6 \cancel{7} 1 2 8 \\
 - 5 8 2 \\
 \hline
 1 4 6
 \end{array}
 \end{array}$$

This will lead to subtracting any number

$$\begin{array}{r}
 \overset{6}{2} \cancel{7} 5 4 \\
 - 1 5 6 2 \\
 \hline
 1 1 9 2
 \end{array}$$

including decimals

Use zeros for place holders.

$$\begin{array}{r}
 \begin{array}{r}
 \overset{5}{2} \overset{12}{\cancel{6}} \overset{1}{\cancel{3}} . 0 \\
 - 2 6 . 5 \\
 \hline
 2 3 6 . 5
 \end{array} \\
 \begin{array}{r}
 \cancel{7} \cancel{8} \overset{10}{6} 9 9 \\
 - 8 9 9 4 9 \\
 \hline
 6 0 7 5 0
 \end{array} \\
 \begin{array}{r}
 \cancel{7} \cancel{8} \overset{15}{5} . \cancel{4} \overset{1}{1} 9 \text{ kg} \\
 - 3 6 . 0 8 0 \text{ kg} \\
 \hline
 6 9 . 3 3 9 \text{ kg}
 \end{array}
 \end{array}$$



Progression in Calculations (2022-2023)





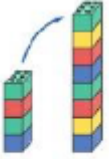

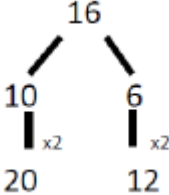
Multiplication Vocabulary

| Year R | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|--------------------------------|--|--|--------------------------|---------|---|-----------------------------|
| Double Equal groups Same | Repeated Addition Groups of Array Fact families Related facts Subitize | Times Multiple Lots of Multiplied by Inverse | Column multiplication | Product | Factor Common multiples Prime numbers Square numbers Composite numbers Cube numbers Scaling | BIDMAS Powers Indices |



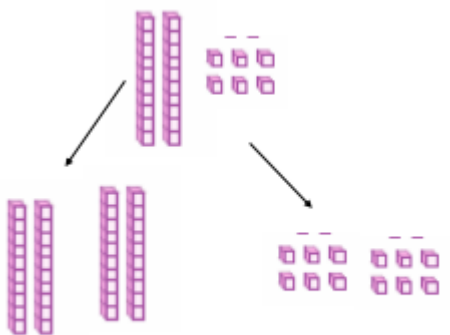
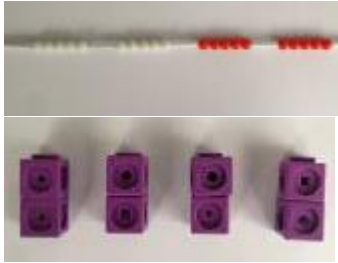
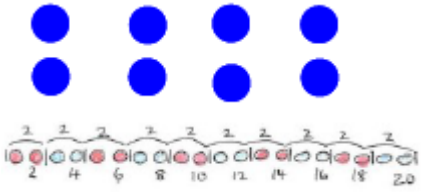
Progression in Calculations (2022-2023)

Multiplication Progression

| Objectives and strategies | Concrete | Pictorial | Abstract |
|-----------------------------------|--|--|---|
| <p>Problem solving - doubling</p> |  <p>I have 3 pears. Can you double the number of pears?</p>  |  <p>Can you double the numicon shape?</p>  | <p>What is double 3?</p> <p>Double 3 is <input type="text"/></p> |
| <p>Doubling</p> | <p>Use practical activities to show how to double a number.</p>  <p>double 4 is 8 $4 \times 2 = 8$</p> <p>Model doubling using the Base ten equipment:</p> <p>Double 26 =</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>  |




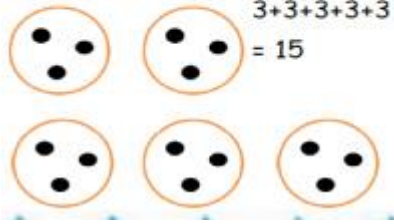
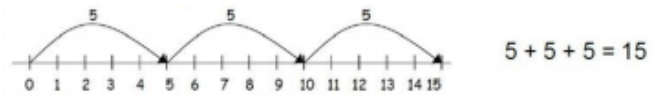



Progression in Calculations (2022-2023)

| | | | |
|------------------------------|--|--|---|
| |  <p>$40 + 12 = 52$</p> | | |
| <p>Counting in multiples</p> | <p>Count in multiples supported by concrete objects in equal groups</p>  | <p>Children make representations to show 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> |



Progression in Calculations (2022-2023)

| | | | |
|---|--|--|--|
| <p>Repeated addition</p> | <p>Use different objects to add equal groups</p>    | <p>Use pictorial including number lines to solve problem</p> <p>There are 3 sweets in one bag. How many sweets are in 5 bags altogether?</p>   | <p>Write addition asentences to describe objects and pictures.</p>  |
| <p>Counting in multiples from 0 (repeated addition)</p> | <p>Count the groups as children skip count. Use bar models.</p> | <p>Number lines, counting sticks and bar models should be used to show representation of counting in multiples.</p> | <p>Count in multiples of a number aloud. Write sequences with multiples of numbers.</p> |

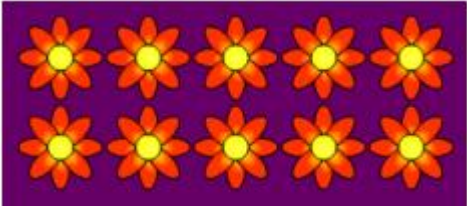


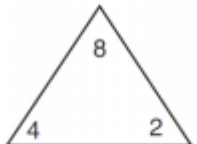


Progression in Calculations (2022-2023)

| | | | |
|--|---|---|---|
| | <p>$5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40$</p> <p>?</p> | <p>?</p> | <p>0, 2, 4, 6, 8, 10 0, 3, 6, 9, 12, 15 0, 5, 10, 15, 20, 25, 30</p> <p>$4 \times 3 = \square$</p> |
| <p>Arrays showing commutative multiplication</p> | <p>Create arrays using counters/cubes to show multiplication sentences</p> <p>And find answers to 2 lots of 5, 3 lots of 2 etc.</p> | <p>Draw arrays in different rotations to find commutative multiplication sentences</p> <p>$4 \times 2 = 8$</p> <p>$2 \times 4 = 8$</p> <p>$2 \times 4 = 8$</p> <p>$4 \times 2 = 8$</p> <p>Link arrays to areas of rectangles.</p> | <p>Use an array to write multiplication sentences and reinforce repeated addition.</p> <p>$5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$</p> |



Progression in Calculations (2022-2023)

| | | | |
|---|---|--|--|
| |  <p>Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer.</p>  | | |
| <p>Using the inverse.</p> <p>This should be taught alongside division so pupils learn how they work alongside each other.</p> |  | <p>Fact Family</p>  $\begin{array}{l} \square \times \square = \square \\ \square \times \square = \square \\ \square \div \square = \square \\ \square \div \square = \square \end{array}$ | <p>Show all 8 related fact family sentences.</p> $\begin{array}{l} 2 \times 4 = 8 \\ 4 \times 2 = 8 \\ 8 \div 2 = 4 \\ 8 \div 4 = 2 \\ 8 = 2 \times 4 \\ 8 = 4 \times 2 \\ 2 = 8 \div 4 \\ 4 = 8 \div 2 \end{array}$ |



Progression in Calculations (2022-2023)

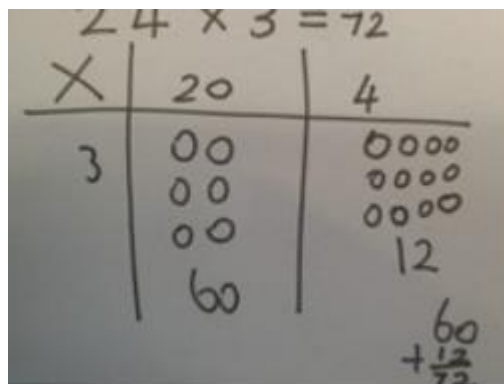
Partitioning

Use base ten to move towards a more compact method.

$$4 \times 13 =$$

| x | T | O |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking:



Children use partitioning and use the multiplication facts that they know to help them by making numbers 10 x smaller to multiply then make them 10 x bigger in the answer.

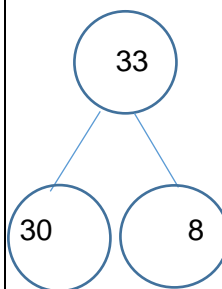
$$33 \times 8 =$$

$$30 \times 8 = 240$$

$$3 \times 8 = 24$$

$$240 + 24 = 264$$

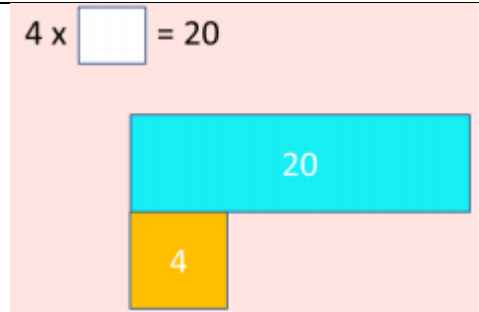
Draw part whole models



Bar models are used to explore missing numbers



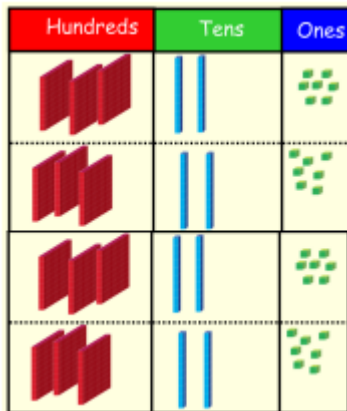
Progression in Calculations (2022-2023)



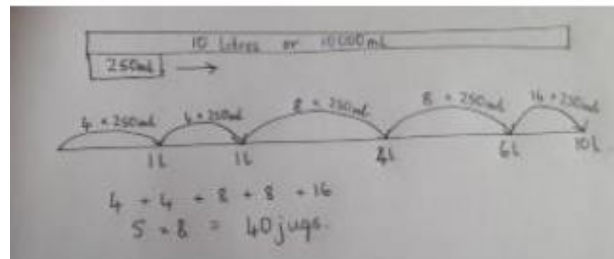
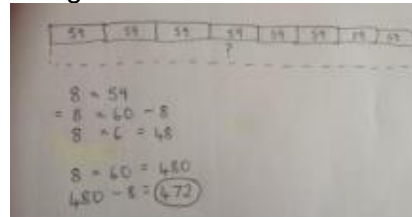
Column multiplication

Children continue to be supported by base ten equipment. This is initially done where there is no regrouping ie $321 \times 2 =$

Progressing to re-grouping always multiply the ones column first. The corresponding long multiplication is modelled alongside.



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




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

Initially, Children to write out what they are solving next to their answer to help them understand the process.

$$\begin{array}{r}
 32 \\
 \times 24 \\
 \hline
 8 \quad (4 \times 2) \\
 120 \quad (4 \times 30) \\
 40 \quad (20 \times 2) \\
 600 \quad (20 \times 30) \\
 \hline
 768
 \end{array}$$

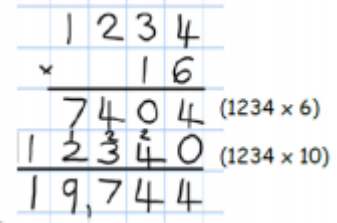
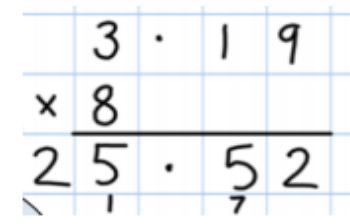


Progression in Calculations (2022-2023)

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|---|-------|--|--|---|---|---|---|--|--|---|-------|--|--|--|--|---|---|---|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|---|--|---|---|---|--|--|-------|--|--|--|---|---|--|--|---|--|--|---|---|---|--|--|-------|--|--|---|---|---|
| | | | $\begin{array}{r} 327 \\ \times 4 \\ \hline 28 \\ 80 \\ 1200 \\ \hline 1308 \end{array}$  <table border="1" data-bbox="1657 654 1881 829"><tr><td></td><td>3</td><td>2</td><td>7</td></tr><tr><td>x</td><td></td><td></td><td>4</td></tr><tr><td colspan="4"><hr/></td></tr><tr><td></td><td>1</td><td>3</td><td>0</td></tr><tr><td></td><td></td><td>8</td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table> <p data-bbox="1904 638 2060 750">This may lead to a compact method.</p> <table border="1" data-bbox="1657 877 1881 1149"><tr><td></td><td></td><td>1</td><td>8</td></tr><tr><td></td><td>x</td><td>1</td><td>3</td></tr><tr><td></td><td></td><td colspan="2"><hr/></td></tr><tr><td></td><td></td><td>5</td><td>4</td></tr><tr><td></td><td></td><td>2</td><td></td></tr><tr><td></td><td>1</td><td>8</td><td>0</td></tr><tr><td></td><td></td><td colspan="2"><hr/></td></tr><tr><td></td><td>2</td><td>3</td><td>4</td></tr></table> | | 3 | 2 | 7 | x | | | 4 | <hr/> | | | | | 1 | 3 | 0 | | | 8 | | | | | | | | | | | | | | | | 1 | 8 | | x | 1 | 3 | | | <hr/> | | | | 5 | 4 | | | 2 | | | 1 | 8 | 0 | | | <hr/> | | | 2 | 3 | 4 |
| | 3 | 2 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| x | | | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | 1 | 3 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | | 1 | 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | x | 1 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | | 5 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 8 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | 2 | 3 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



Progression in Calculations (2022-2023)

| | | | |
|--|--|--|--|
| | | |  <p>Multiplying decimals up to 2 decimal places by a single digit:</p> <p>Remind children that the single digit belongs to the ones column. Line up the decimal points in the question and the answer.</p>  |
|--|--|--|--|

Division Vocabulary



| Year R | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
|---------------|------------------------|------------------------|---------------------------|----------------|-----------------------|---------------|
| Share Half | Groups Equal groups | Left over Remainder | Shared equally between | Short division | Divisibility rules | Long division |



Progression in Calculations (2022-2023)


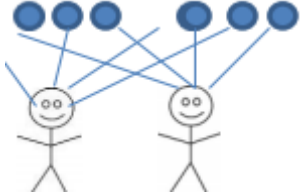

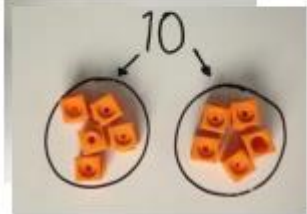

| | | | | | | |
|---------------|---|-----------------------|--------------------------------------|--|--|--|
| Equal Same | Unequal groups Less Division Divide Subitise | Divide by Division | Divisible by Can be divided by | | | Remainders as decimals Remainders as fractions Divisor Dividend Quotient Annexing Ratio Scaling |
|---------------|---|-----------------------|--------------------------------------|--|--|--|

Division progression

| Objectives and strategies | Concrete | Pictorial | Abstract |
|---------------------------|--|---|--|
| Problem solving - halving |  <p>I have 4 pencils. I give half of these pencils to a friend.</p> |  <p>Cross off half of the holes on the Numicon. How many holes are left?</p> | <p>Half of 8 is <input type="text"/></p> <p>What is half of 8?</p> |



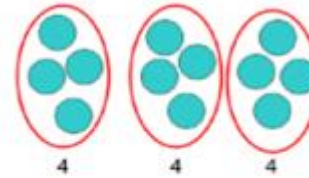
Progression in Calculations (2022-2023)

| | | | |
|-----------------------------|---|---|---|
| | Can you cut the cake/pizza in half? | | |
| Problem solving - sharing |  <p>Share these 6 pears between 3 children in the class.</p> | Show how these marbles can be shared between two children  | What is 8 shared between 2? Ben has eight marbles and he wants to share them equally with his friend, Sam. How many marbles to they get each? |
| Sharing objects into groups | I have 10 cubes. Can you share them equally into 2 groups?   | Children use pictures or shapes to share quantities.  $8 \div 2 = 4$ | Share 9 sweets between 3 children $9 \div 3 = 3$ |



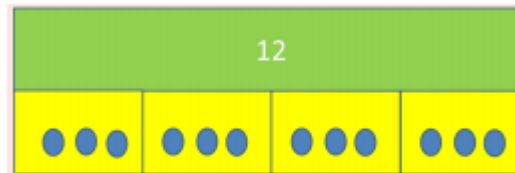
Progression in Calculations (2022-2023)

Sharing:



12 shared between 3 is 4

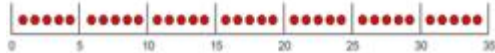
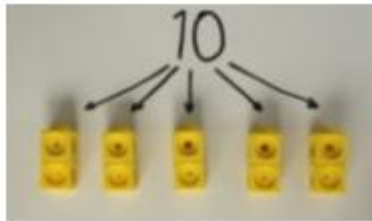
Children use bar modelling to show and support understanding.



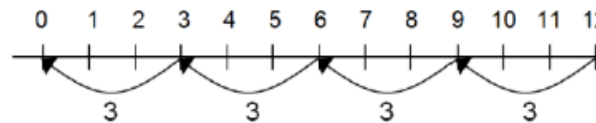
$$12 \div 4 = 3$$

Division as grouping

Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.



Use a number line to show jumps in groups. The number of jumps equals the number of groups.






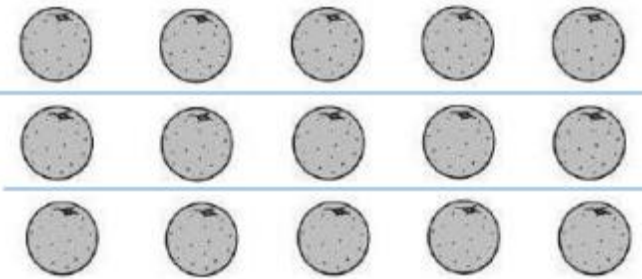
Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.

$$28 \div 7 = 4$$

Divide 28 into 7 groups. How many are in each group?



Progression in Calculations (2022-2023)

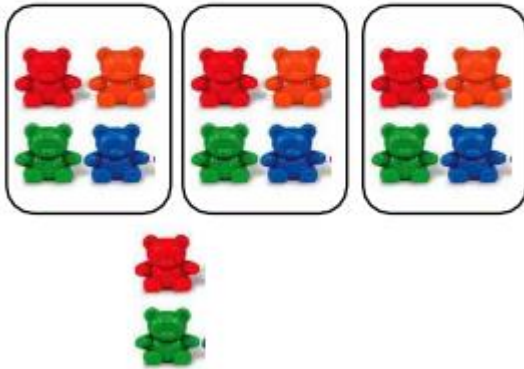
| | | | |
|------------------------------|---|--|---|
| | <p>Use the Base Ten equipment or place value counters:</p> <p>24 divided into groups of 6 = 4</p> <p>$96 \div 3 = 32$</p>  | <p>20</p>  <p>$20 \div 5 = ?$ $5 \times ? = 20$</p> | |
| <p>Division with arrays.</p> | <p>Link division to multiplication by creating an array and thinking about the number sentences that can be created.</p>  <p>Eg $15 \div 3 = 5$ $5 \times 3 = 15$ $15 \div 5 = 3$ $3 \times 5 = 15$</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 family number sentences.</p> <p>$7 \times 4 = 28$ $4 \times 7 = 28$ $28 \div 7 = 4$ $28 \div 4 = 7$</p> |



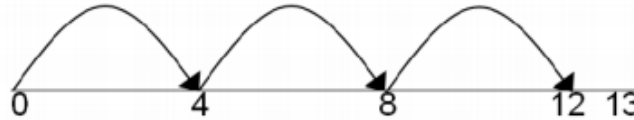
Progression in Calculations (2022-2023)

Division with a remainder

$14 \div 3 =$
Divide objects between groups and see how much is left over



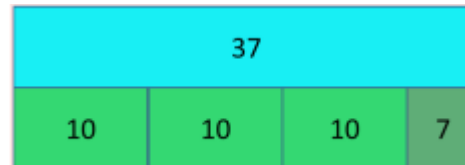
Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.



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



Use bar models to show division with remainders.



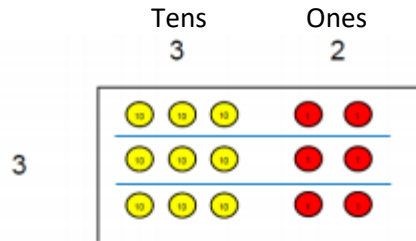
Complete written divisions and show the remainder using r.

$$\begin{array}{ccccccc} 29 \div 8 = 3 \text{ REMAINDER } 5 \\ \uparrow \quad \uparrow \quad \uparrow \quad \quad \uparrow \\ \text{dividend} \quad \text{divisor} \quad \text{quotient} \quad \quad \text{remainder} \end{array}$$

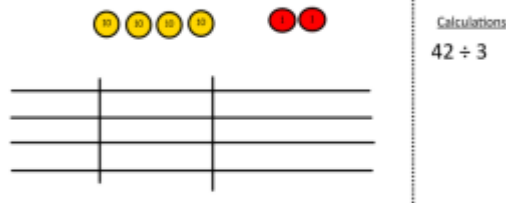


Progression in Calculations (2022-2023)

Short division

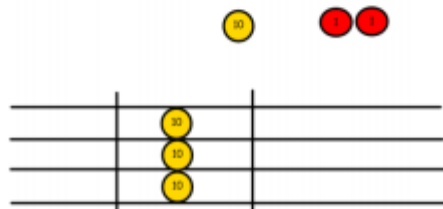


Use place value counters to divide using the bus stop method alongside



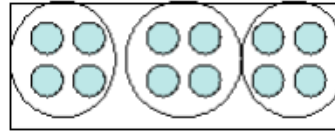
$42 \div 3 =$

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

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.

$$\begin{array}{r} 218 \\ 3 \overline{) 872} \end{array}$$

Move onto divisions with a remainder.

$$\begin{array}{r} 86 \text{ r } 2 \\ 3 \overline{) 432} \end{array}$$

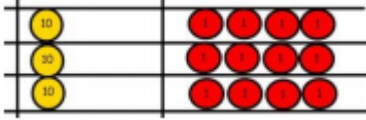
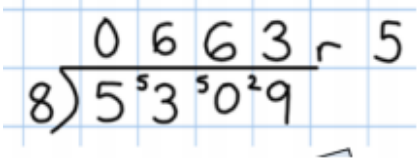

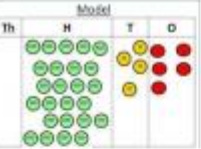
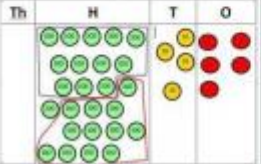
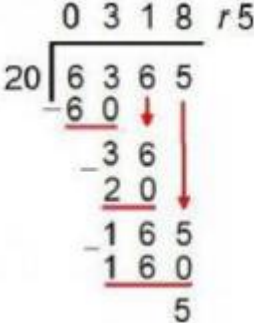
Move onto divisions with remainders expressed as fractions.

Finally move into decimal places to divide the total accurately for appropriate contexts.

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

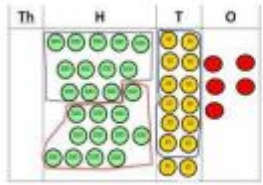


Progression in Calculations (2022-2023)

| | | | |
|----------------------|---|---|---|
| |  <p>We look how much is in 1 group so the answer is 14.</p> | |  |
| <p>Long Division</p> | <p>$2544 \div 12$ How many groups of 12 thousands do we have? None</p> <p>Regroup 2 thousands for 20 hundreds.</p>   <p>How many groups of 12 are in 25 hundreds? 2 groups. Circle them. We have grouped 24 hundreds so can take them off and we are left with one.</p>  <p>Regroup the 1 hundred for 10 tens so now we have 14 tens. How many groups of 12 are there in 14? 1 remainder 2.</p> | <p>Instead of using physical counters, students can draw the counters and circle the groups on a whiteboard or in their books.</p> <p>Use this method to explain what is happening and as soon as they have understood what move on to the abstract method as this can be a time consuming process.</p> |  |

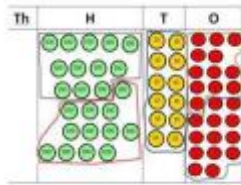


Progression in Calculations (2022-2023)



$$\begin{array}{r}
 021 \\
 12 \overline{) 2544} \\
 \underline{24} \\
 14 \\
 \underline{12} \\
 2
 \end{array}$$

Regroup the 2 tens for 20 ones so now we have 24 ones. How many groups of 12 are in 24? 2



$$\begin{array}{r}
 0212 \\
 12 \overline{) 2544} \\
 \underline{24} \\
 14 \\
 \underline{12} \\
 24 \\
 \underline{24} \\
 0
 \end{array}$$

Express remainders as fractions

Express remainders as decimals

432 ÷ 15 becomes

$$\begin{array}{r}
 28.8 \\
 15 \overline{) 432.0} \\
 \underline{30} \quad \downarrow \\
 132 \\
 \underline{120} \quad \downarrow \\
 120 \\
 \underline{120} \\
 0
 \end{array}$$

Answer: 28.8