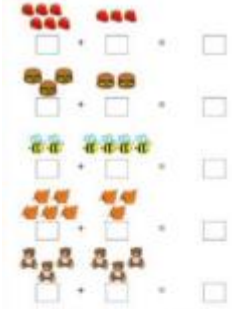
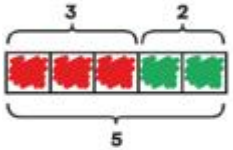
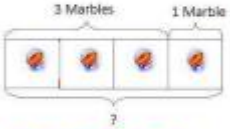
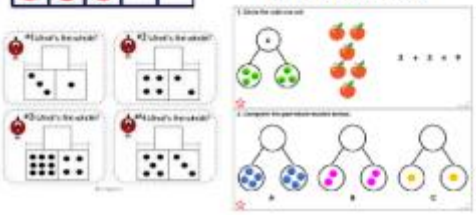
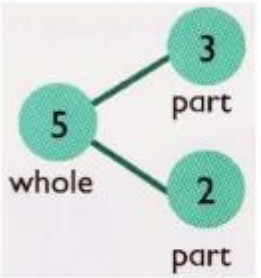
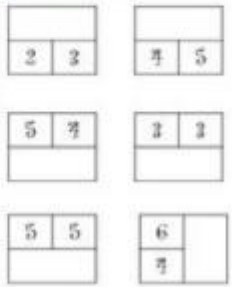
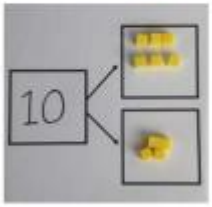
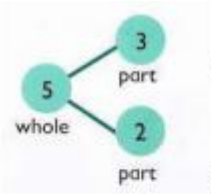
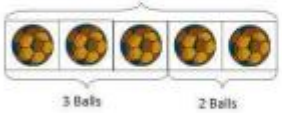
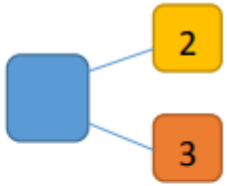
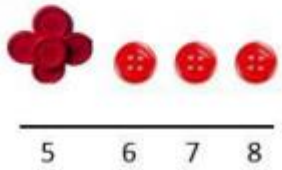
# Framwellgate Moor Primary School

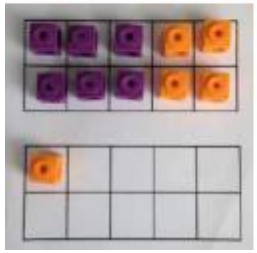
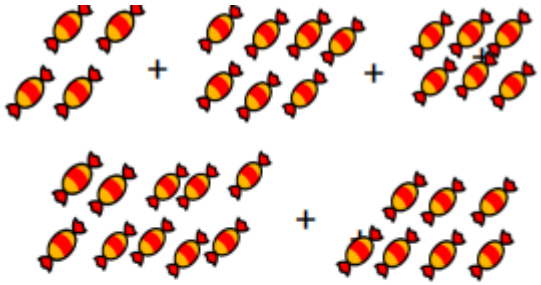
## Calculation Policy 2023

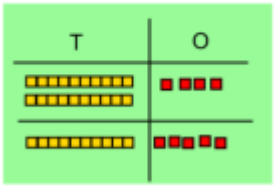
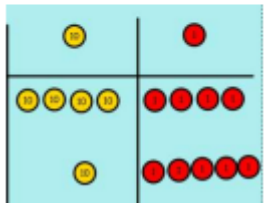
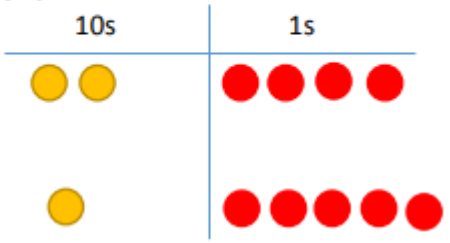
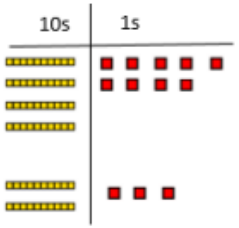
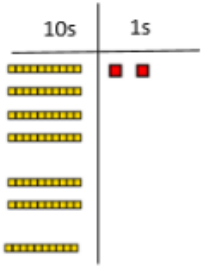
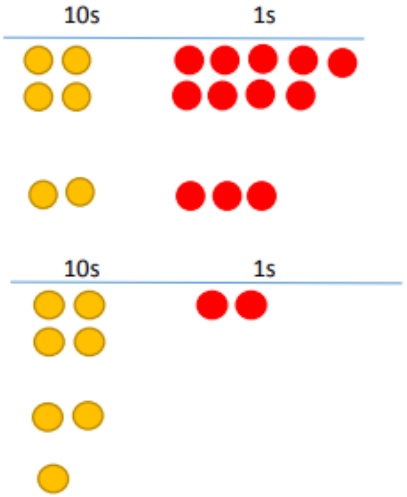
**This policy has been largely adapted from the Whiterose Maths Calculation Policy with further material added. It is a working document and will be revisited and amended as necessary.**

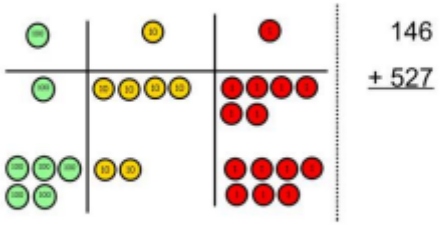
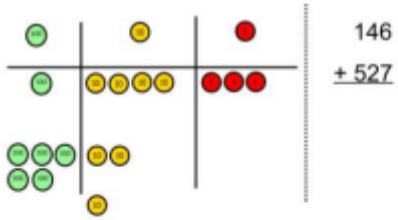
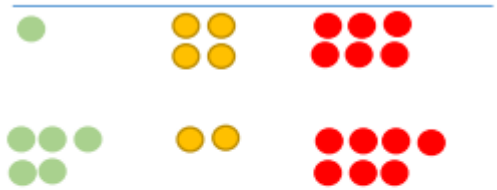
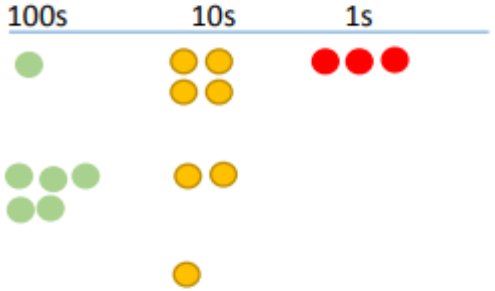
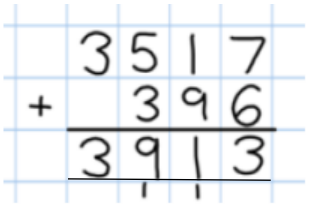
# Calculation Guidance: Addition

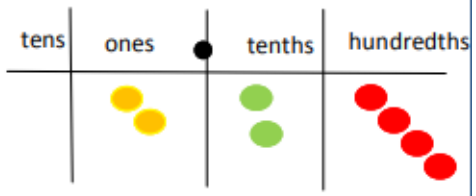
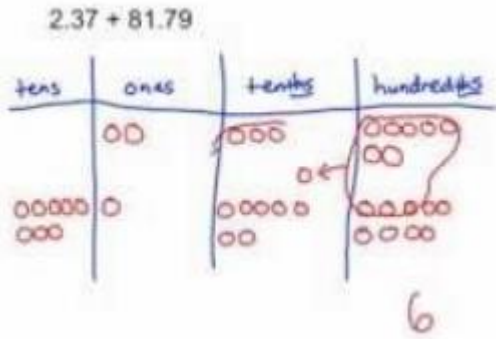
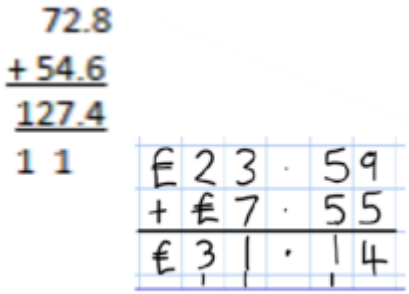
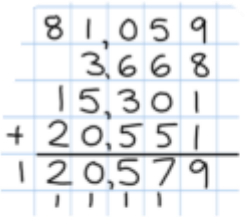
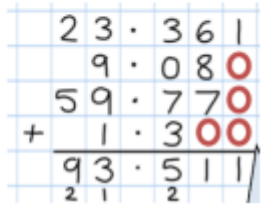
| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| EYFS | Knows that a group of things change in quantity when something is added.<br><br>Find the total number of items in two groups by counting all of them.<br><br>Finds one more from a group of up to five objects, then ten objects.<br><br>In practical activities and discussions, beginning to use the vocabulary involved in adding.<br><br>Using quantities and objects, they add two single digit numbers and count on to find the answer.<br><br>Solve problems including doubling. | <br>Use toys and general classroom resources for children to physically manipulate, group/regroup.<br><br> <br>Use specific maths resources such as counters, snap cubes, Numicon etc.<br><br> <br> <br>Use visual supports such as ten frames, part part whole and addition mats, with the physical objects and resources that can be manipulated. |  <br> <br>Two groups of pictures so children are able to count the total.<br><br>  <br>Bar model using visuals, pictures/icons or colours.<br><br>  <br>Use visual supports such as ten frames, part part whole and addition mats with pictures/icons.<br><br>  | A focus on symbols and numbers to form a calculation.<br><br>$5+2=7$<br><br>  <br><br>  <br>No expectation for children to be able to record a number sentence/addition calculation. |

| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| YEAR 1 | Number bonds of 5,6,7,8,9 and 10 | <br>  <br>Use cubes to add two numbers together as a group or in a bar.<br> |  <br><br>  <br><br>Use pictures to add two numbers together as a group or in a bar.<br> <br> | 2 + 3 = 5<br>3 + 2 = 5<br>5 = 3 + 2<br>5 = 2 + 3<br>  <br><br>Use the part-part-whole diagram as shown above to move into the abstract. |
| | Counting | <br>Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.<br>  <br> | Use a number line to count on in ones.<br> <br> | 5 + 3 = 8 |

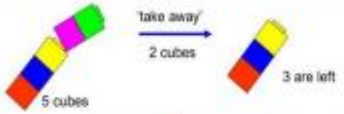
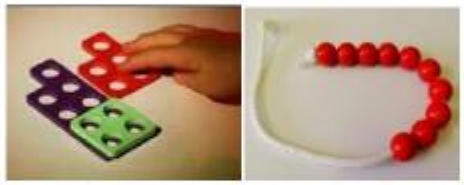
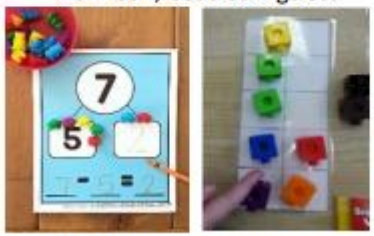
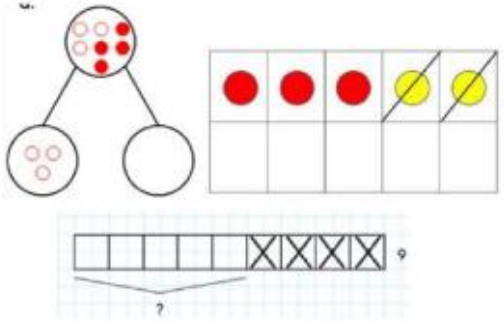
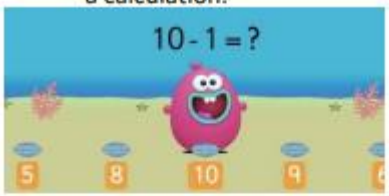
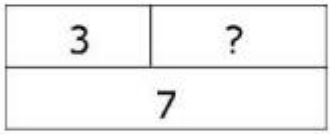
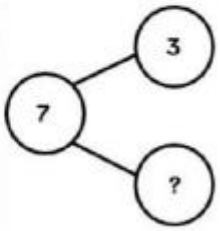
| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| Year 1 | Regrouping to make 10 | <br>  <br>6 + 5 = 11<br>Start with the bigger number and use the smaller number to make 10. | <br>6 + 5 = 11<br>4 1<br>6 + 4 =10<br>10 + 1 = 11 | 6 + 5 = 11 |
| Year 2 | Adding 3 single digit numbers | 4 + 7 + 6= 17<br>Put 4 and 6 together to make 10. Add on 7.<br> <br>Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit. |  <br>Add together three groups of objects. Draw a picture to recombine the groups to make 10. | 4 + 7 + 6 = 10 + 7<br>10<br>= 17<br>Combine the two numbers that make 10 and then add on the remainder. |

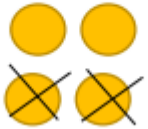
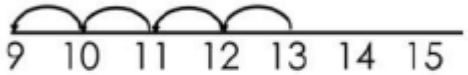
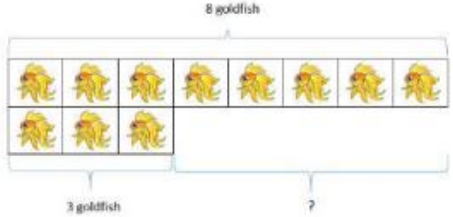
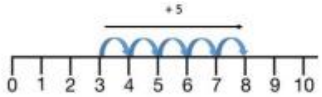
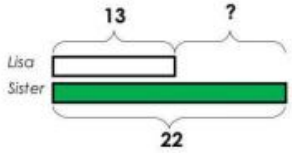
| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| Year 2 | Column method without regrouping | Add together the ones first, then add the tens. Use the Base 10 blocks first before moving onto place value counters.<br>24 + 15 =<br>  <br><br>44 + 15 =<br>  | After physically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.<br>  <br> | 24 + 15 = 39<br><br>24<br>+ 15<br>39 |
| | Column method with regrouping | Make both numbers on a place value grid.<br>  <br><br>Add up the units and exchange 10 ones for 1 ten.<br>  <br> | Using place value counters, children can draw the counters to help them to solve additions.<br>  <br> | 40 + 9<br>20 + 3<br>60 + 12 = 72 |

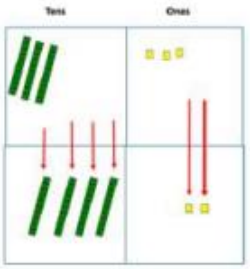
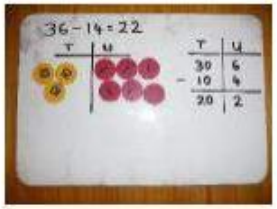
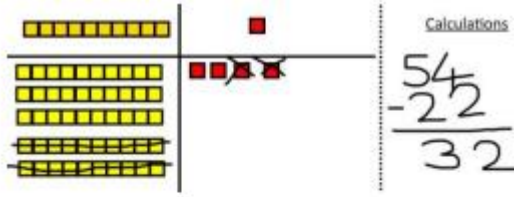
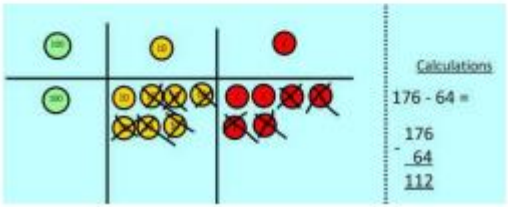
| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| Year 3/4 | Column method with regrouping | Make both numbers on a place value grid.<br>  <br>146<br>+ 527<br>Add up the units and exchange 10 ones for 1 ten.<br>  <br>146<br>+ 527<br>As children move on to decimals, money and decimal place value counters can be used to support learning.<br><br>**NB** By Year 4 children will progress on to adding four digit numbers. | 100s 10s 1s<br>  <br>100s 10s 1s<br>  <br>Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.<br><br>**NB** Addition of money needs to have £ and p added separately. | 100 + 40 + 6<br>500 + 20 + 7<br>600 + 70 + 3 = 673<br><br>As the children progress, they will move from the expanded to the compacted method.<br><br>146<br>+ 527<br>673<br>1<br><br>As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.<br>  <br>Continue from previous work to carry hundreds as well as tens.<br><br>Relate to money and measures.<br><br>Language: Can we exchange? Yes- then we place our ten/hundred here (under the line). |

| | | | | |
|---|---|---|---|---|
| Year 5/6 | Column method with regrouping | Consolidate understanding using numbers with more than 4 digits and extend by adding numbers with up to 3 decimal places.<br><br>As year 4<br>  <br><br>Introduce decimal place value counters and model exchange for addition. |  <br> |  <br> |
| Year 6 | Add several numbers of increasing complexity including adding money, measure and decimals with different numbers of decimal points. | As Y5 | As Y5 |  <br><br>Insert zeros for place holders.<br>  <br> |

# Calculation Guidance: Subtraction

| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| EYFS | Knows that a group of things change in quantity when something is taken away.<br><br>Find one less from a group of five objects.<br><br>In practical activities and discussion, beginning to use the vocabulary involved in subtracting.<br><br>Using quantities and objects, they subtract two single digit numbers and count back to find the answer. | <br>Use toys and general classroom resources for children to physically manipulate, group/regroup.<br>  <br>  <br>Use specific maths resources such as snap cubes, Numicon, bead strings etc.<br>  <br>Use visual supports such as ten frames, part part whole and subtraction mats, with the physical objects and resources that can be manipulated. | <br> <br>6 - 4 =<br> <br>3 - 1 =<br> <br>5 - 3 =<br> <br>7 - 2 =<br>A group of pictures for children to cross out or cover quantities to support subtraction.<br>  <br>Use visual supports such as ten frames, part part whole and bar model with pictures/icons. | A focus on symbols and numbers to form a calculation.<br>  <br>10 - 6 = 4<br>  <br>7 - 3 = ?<br>  <br>* No expectation for children to be able to record a number sentence/addition calculation. |

| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| Year 1 | Take away ones | Use physical objects, counters, cubes etc. to show how objects can be taken away.<br>4 – 2 = 2<br> | Cross out drawn objects to show what has been taken away.<br>4 – 2 = 2<br>  | 4 – 2 = 2 |
| | Counting back | Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.<br> <br>13 – 4 = 9 | Count back on a number line or number track<br>  <br>Start at the bigger number and count back the smaller number, showing the jumps on the number line. | Put 13 in your head, count back 4. What number are you at?<br>Use your fingers to help. |
| | Find the difference | Compare amounts and objects to find the difference.<br>  <br>Use cubes to build towers or make bars to find the difference. Use basic bar models with items to find the difference. |  <br>Count on to find the difference.<br>*Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.*<br>  <br>Draw bars to find the difference between 2 numbers. | Hannah has 8 goldfish.<br>Helen has 3 goldfish.<br>Find the difference between the number of goldfish the girls have. |

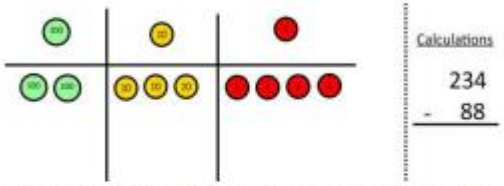
| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| Year 2 | Column method without regrouping | 75 – 42 = 33<br>  <br><br>Use Base 10 to make the bigger number then take the smaller number away.<br><br>Show how you partition numbers to subtract.<br><br>Again make the larger number first.<br>  <br> |  <br><br>Draw the Base 10 or place value counters alongside the written calculation to help to show working.<br><br>  <br> | 47 – 24 = 23<br>40 + 7<br>– 20 + 4<br>20 + 3<br><br>This will lead to a clear written column subtraction.<br><br> <br> |

# Year 3 onwards

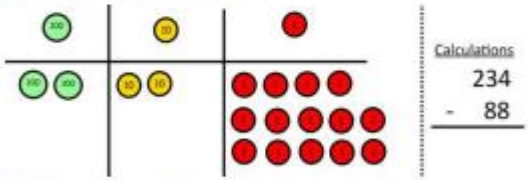
## Column method with regrouping

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

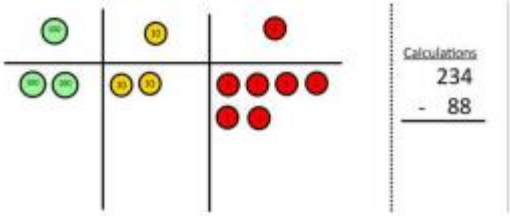
Make the larger number with the place value counters

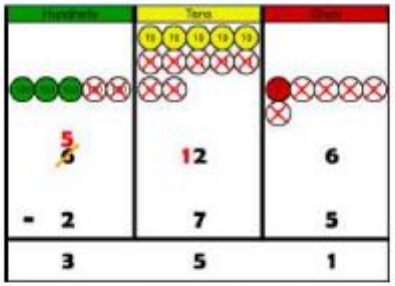



Start with the ones, can I take away 8 from 4 easily? I need to exchange 1 of my tens for 10 ones.




Now I can subtract my ones.

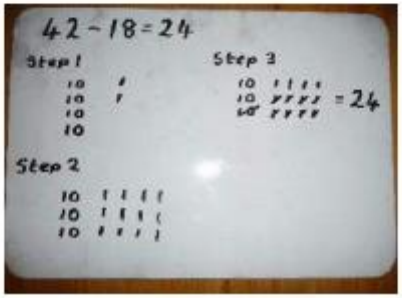


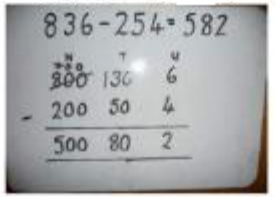




Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.

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.

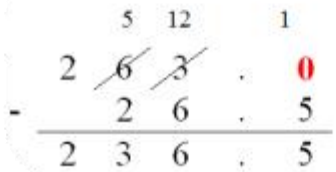


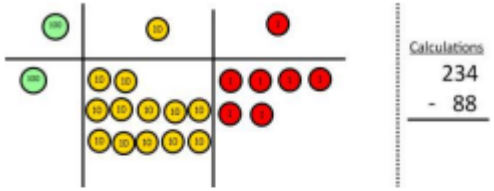
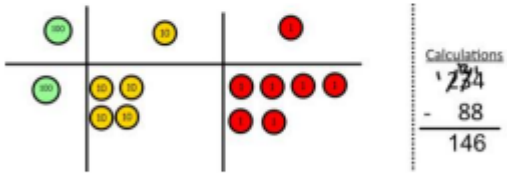




Children can start their formal written method by partitioning the number into clear place value columns.

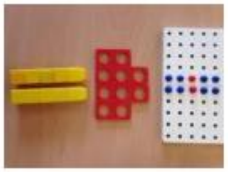
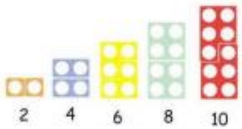
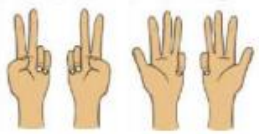
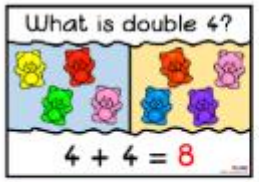
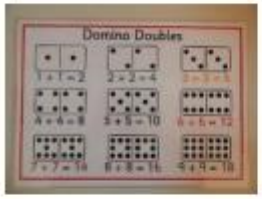
Moving forward the children use a more compact method.

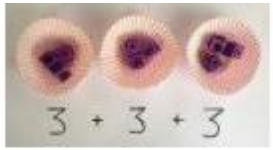
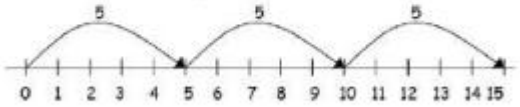
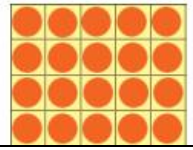
This will lead to an understanding of subtracting any number including decimals.



| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| Year 3 onwards | Column method with regrouping | Now look at the tens, can I take away 8 tens easily? I need to exchange 1 hundred for 10 tens.<br>  <br><br>Now I can take away 8 tens and complete my subtraction.<br>  <br><br>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. | | |

# Calculation Guidance: Multiplication

| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| EYFS | **Solving problems including doubling** |    Counting and other maths resources for children to make 2 equal groups.  Physical and real life examples that encourage children to see concept of doubling as adding two equal groups. |   Pictures and icons that encourage children to see concept of doubling as adding two equal groups. | 1+1= 7+7= 2+2= 8+8= 3+3= 9+9= 4+4= 10+10= 5+5= 11+11= 6+6= 12+12= Addition calculations to model adding two equal groups. |

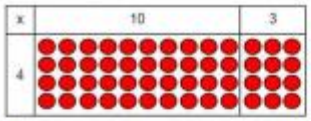
| | | | | |
|---|---|---|---|---|
| Year 1/2 | Repeated addition |  <br> <br> <br>Use different objects to add equal groups. | There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?<br> <br>2 + 2 + 2 = 6<br>  <br>5 + 5 + 5 = 15 | Write addition sentences to describe objects and pictures.<br> <br>2 + 2 + 2 = 6 |
| | Arrays-showing commutative multiplication | Create arrays using counters/cubes to show multiplication sentences.<br> <br> | Draw arrays in different rotations to find **commutative** multiplication sentences.<br> <br>4 × 2 = 8<br>2 × 4 = 8<br> <br>2 × 4 = 8<br>4 × 2 = 8<br>Link arrays to area of rectangles.<br>  | Use an array to write multiplication sentences and reinforce repeated addition.<br> <br>5 + 5 + 5 = 15<br>3 + 3 + 3 + 3 + 3 = 15<br>5 x 3 = 15<br>3 x 5 = 15 |

Year 3/4

Grid method

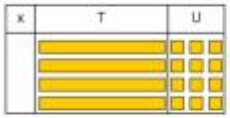
## Concrete

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



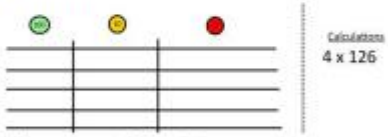

4 rows of 10
4 rows of 3

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

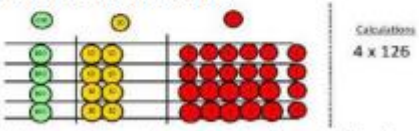



4 rows of 13

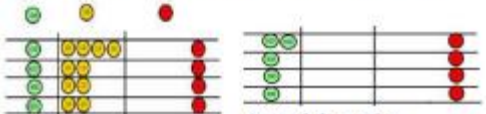
Move on to place value counters to show how we are finding groups of a number.We are multiplying by 4 so we need 4 rows.




Fill each row with 126.




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

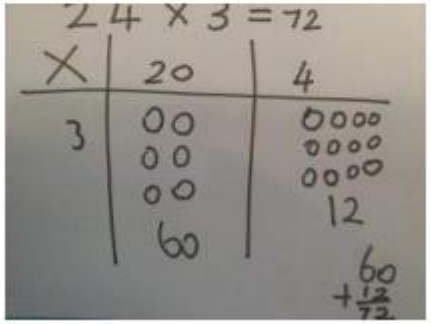


4 × 126 = 504

## Pictorial

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.




## Abstract

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

| × | 30 | 5 |
|---|---|---|
| 7 | 210 | 35 |

**210 + 35 = 245**

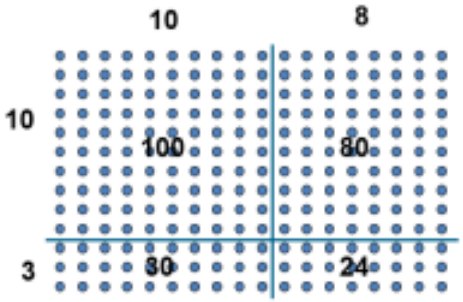
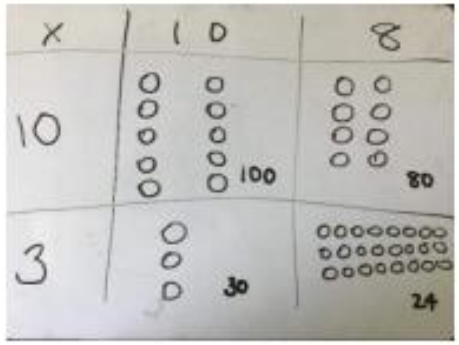
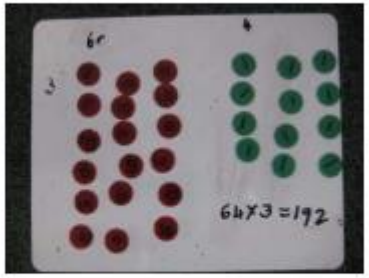
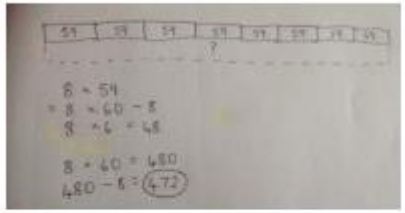
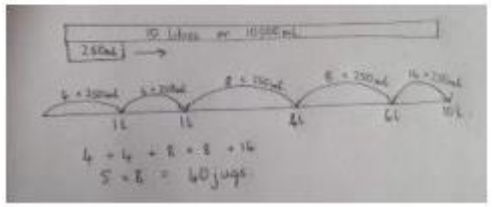
Moving forward, multiply by a 2 digit number showing the different rows within the grid method.

| | 10 | 8 |
|---|---|---|
| 10 | 100 | 80 |
| 3 | 30 | 24 |

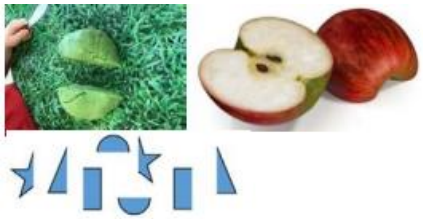
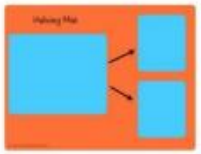
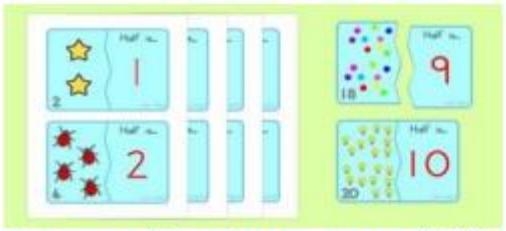
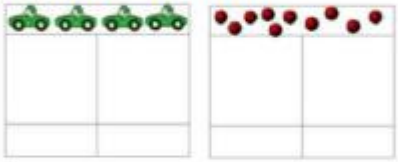
| X | 1000 | 300 | 40 | 2 |
|---|---|---|---|---|
| 10 | 10000 | 3000 | 400 | 20 |
| 8 | 8000 | 2400 | 320 | 16 |

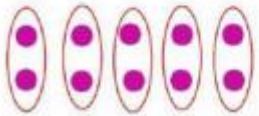
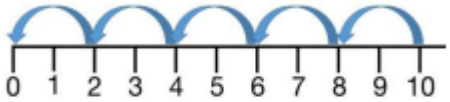
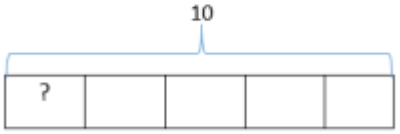
Short multiplication:

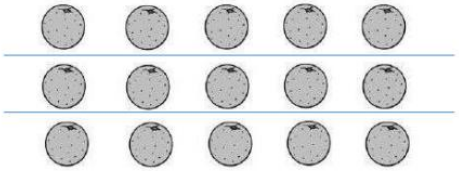
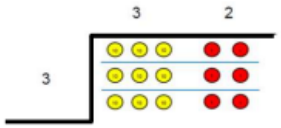
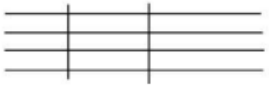
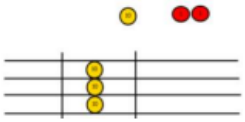
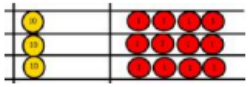
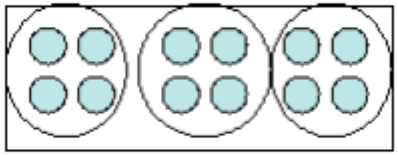
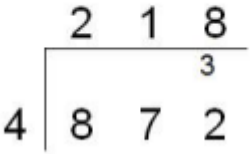
**37**
**X 5**
____

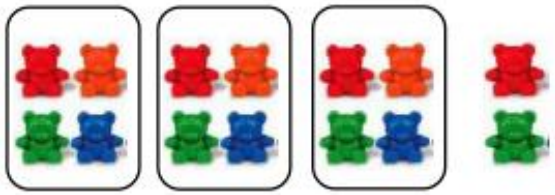
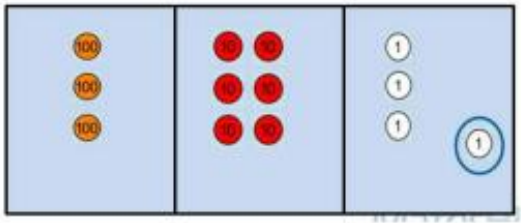
| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| Year 3/4 | Expanded method | Show the link with arrays to first introduce the expanded method.<br>  |  | Start with long multiplication, reminding the children about lining up their numbers clearly in columns.<br>18<br>x 13<br>24 (3 x 8)<br>30 (3 x 10))<br>80 (10 x 8)<br>100 (10 x 10)<br>234 |
| Year 5/6 | Compact method | Children can continue to be supported by place value counters at the stage of multiplication.<br>  <br>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.<br>  <br>  | Start with long multiplication, reminding the children about lining up their numbers clearly in columns.<br>If it helps, children can write out what they are solving next to their answer.<br>74 x 63<br>12<br>210<br>240<br>+ 4200<br>4662<br>This moves to the more compact method.<br>1342 x 18<br>13420<br>10736<br>24156 |

# Calculation Guidance: Division

| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| EYFS | Solving problems including halving and sharing.<br><br>Halving a whole, halving a quantity of objects.<br><br>Sharing a quantity of objects. |  <br>Children have the opportunity to physically cut objects, food or shapes in half.<br><br> <br>  <br>Use visual supports such as halving mats and part part whole with the physical objects and resources that can be manipulated<br> <br> <br>Counting and other maths resources for children to explore sharing between 3 or more<br><br>Counting and other maths resources for children to share into two equal groups. |  <br>Pictures and icons that encourage children to see concept of halving in relation to subitising, addition and subtraction knowledge. i.e. Knowing 4 is made of 2 groups of 2, so half of 4 is 2.<br><br>  <br>Bar model with pictures or icons to support understanding of finding 2 equal parts of a number, to further understand how two halves make a whole.<br><br> <br>Pictures for children to create and visualise 3 or more | |

| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| Year 1/2 | Sharing | I have 8 cubes, can you share them equally between two people? | Children use pictures or shapes to share quantities.<br> <br>8 ÷ 2 = 4 | Share 8 buns between two people.<br>8 ÷ 2 = 4<br> |
| | Grouping | Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.<br> <br>  | Use a number line to show jumps in groups. The number of jumps equals the number of groups.<br>  <br>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.<br>  <br>10 ÷ 5 = ?<br>5 x ? = 10 | 10 ÷ 5 = 2<br><br>Divide 10 into 5 groups. How many are in each group? |

| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| Year 3/4 | Division with arrays | Link division to multiplication by creating an array and thinking about the number sentences that can be created.<br> <br>Eg 15 ÷ 3 = 5 5 x 3 = 15<br>15 ÷ 5 = 3 3 x 5 = 15 |  <br>Draw an array and use lines to split the array into groups to make multiplication and division sentences. | Find the inverse of multiplication and division sentences by creating four linking number sentences.<br><br>5 x 3 = 15<br>3 x 5 = 15<br>15 ÷ 5 = 3<br>15 ÷ 3 = 5 |
| | Short division | Use place value counters to divide using the short division method alongside.<br>96 ÷ 3<br>  <br>42 ÷ 3<br>Start with the biggest place value. We are<br>  <br>sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.<br>We exchange this ten for 10 ones and then share the<br>  <br>ones equally among the groups.<br>We look at how many are in each group.<br>  | Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.<br>  <br>Encourage them to move towards counting in multiples to divide more efficiently. | Begin with divisions that divide equally with no remainder.<br>  |

| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| Year 5/6 | Division with remainders | 14 ÷ 3 =<br>Divide objects between groups and see how much is left over<br>  | Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.<br> <br><br>Draw dots and group them to divide an amount and clearly show a remainder.<br> <br> | Complete written divisions and show the remainder using r.<br> <br> |
| | Short division with remainder | 364 ÷ 3 =<br>1 2 1 rem 1<br>3 \| 3 6 4<br>  | | Move onto divisions with a remainder. Once children understand remainders, begin to express as a fraction or decimal according to the context.<br>8 6 r 2<br>3<br>5 \| 4 3 2<br>1 8 6 1/5<br>5 \| 9 4 3 1<br>1 4 . 6<br>16 21<br>3 5 \| 5 1 1 . 0 |

| | Objective | Concrete | Pictorial | Abstract |
|---|---|---|---|---|
| Year 6 | Long Division | | | Children will use long division to divide numbers with up to 4 digits by 2 digit numbers.<br><br>015<br>32 ⟌ 487<br>-0<br>48<br>-32<br>167<br>-160<br>7<br><br>17 r 19<br>31 ⟌ 546<br>31↓<br>236<br>217<br>19 |