
# Calculation Policy 2023-2024

# CALCULATION POLICY

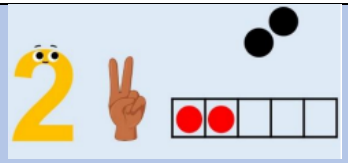
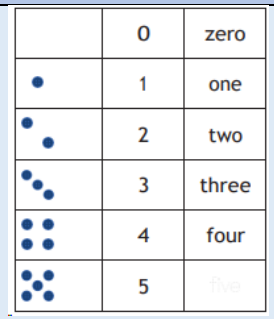
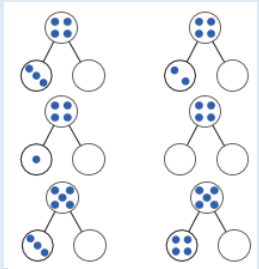
Over the years much has changed in the teaching and learning of maths. The calculation methods used by children today in many cases differ from those used by adults when they were at school. This can cause anxiety, with parents and carers unsure whether they should teach children particular methods.

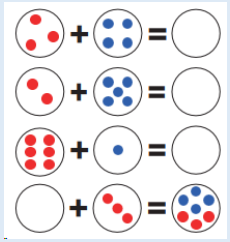
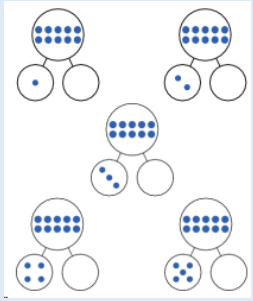
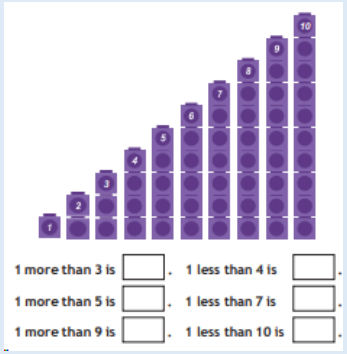
The purpose of this booklet is to provide guidance and information about the types of calculation methods that the children at St. Andrew's are being taught and are using from reception up to Year 2.

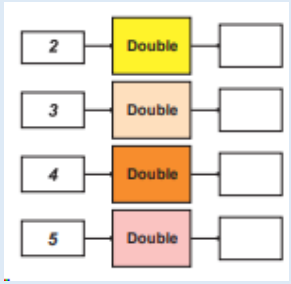
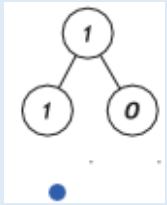
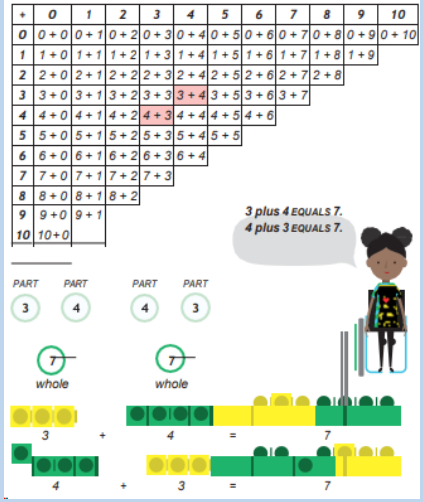
This policy lays out the expectations for both mental and written calculations for the 4 number operations and has been created to support the teaching of a mastery approach to mathematics. This is underpinned using models and images that support conceptual understanding and this policy promotes a range of representations to be used across the year groups. Mathematical understanding is developed through the use of representations that are first of all concrete (e.g. Dienes apparatus and place value counters), and then pictorial (e.g. bar models) to facilitate abstract working (e.g. standard written methods). This policy is a guide through an appropriate progression of representations and if at any point a pupil is struggling with the abstract, they should revert to familiar pictorial and/or concrete materials/representations as appropriate.

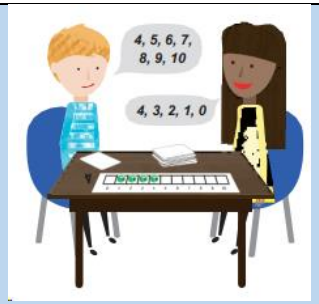
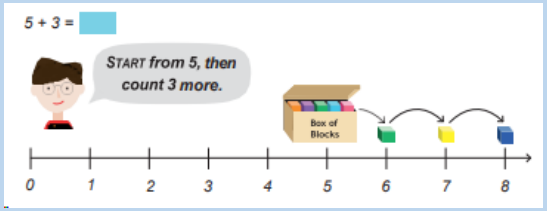
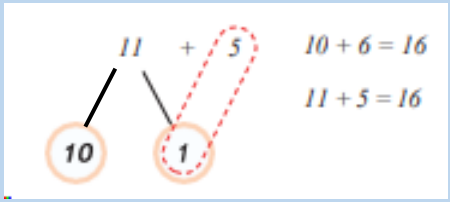
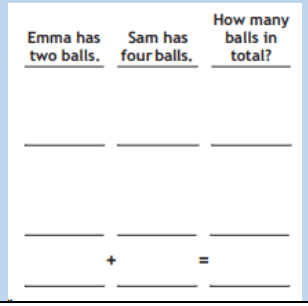
Although this policy sets out the main methods of mental and written calculations to be taught, it has been appended with a list of recommendations and effective practice teaching ideas aimed at informing and enhancing teaching across all the primary phases. Many of these ideas come from the NCETM's Calculation Guidance document (published October 2015) which is intended to sit alongside a school's calculation policy.

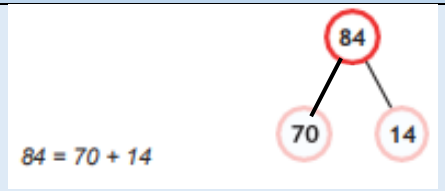
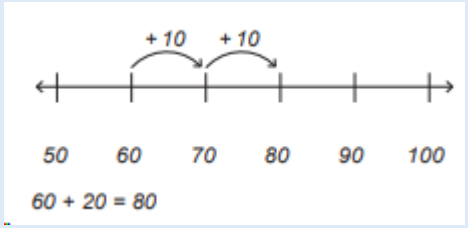
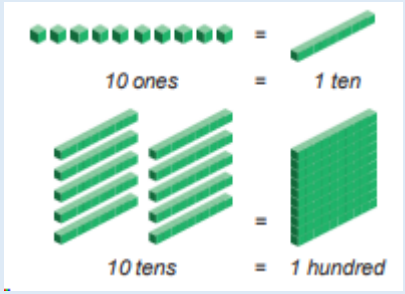
# Addition

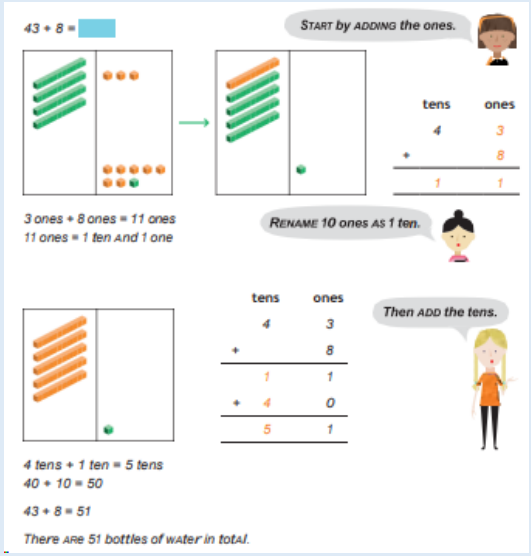
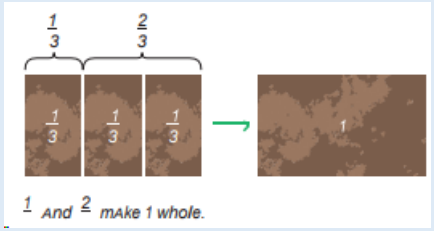
| Year Group | Strand/Topic | Representation | Key Idea |
|---|---|---|---|
| Reception | Perceptual Subitising |  | A key development underpinning the ability to subitise. Perceptual subitising is when pupils can recognise the quantity of items in groups up to 5 without counting each item. |
| | Composition |  | This is a mathematical structure that underpins all addition situations. Numbers can be understood in a practical /roleplay exploration and through pictorial stories. “How many birds are sitting on the fence?” How many birds are in the tree?<br>How many birds altogether?<br>What if 1 bird flew on the fence, how many birds can you see? |
| Reception | Perceptual Subitising |  | A key development underpinning the ability to add is subitising. Perceptual subitising is when pupils can recognise the quantity of items in groups up to 5 without counting each item. |
| | Part – Part – Whole |  | This is a mathematical structure that underpins all addition situations. Numbers can be understood in terms of their parts; understanding that the parts are part of a larger collection. |

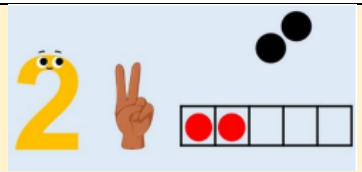
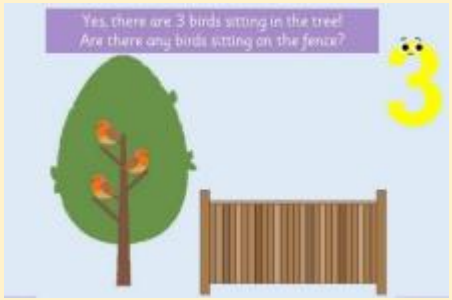
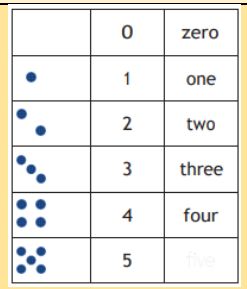
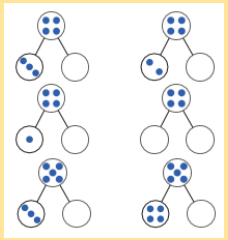
| | | | |
|---|---|---|---|
| | Conceptual Subitising |  | Pupils are able to recognise a quantity by combining groups that have not needed to be counted. Pupils may see 5 items as 3 items and 2 items. |
| | Composition of 5 |  | Pupils are able to demonstrate all possible whole number compositions of 5, including recognising and showing 5 on a five frame and using a number bond diagram. |
| | Composition of 10 |  | Pupils are able to demonstrate all possible whole number compositions of 10, including recognising and showing 10 on a ten frame and using a number bond diagram. |
| | Adding 1, 1 More |  | Pupils relate adding 1 to 1 more than the starting number. |

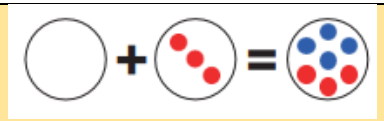
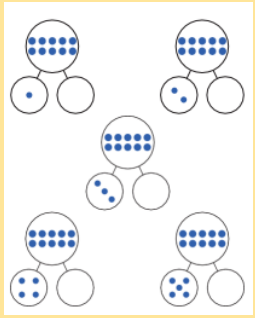
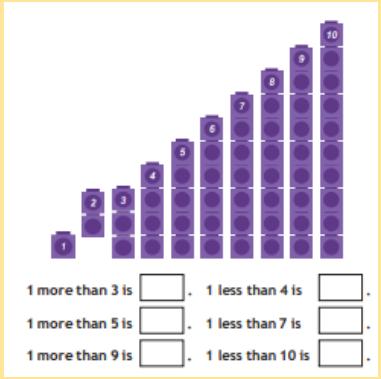
| | | | |
|---|---|---|---|
| | Doubles<br><br><br><br><br><br>Adding zero |  <br><br>  | Pupils understand doubles up to 5 + 5. This forms the basis of generalising about near doubles. Pupils should also develop an awareness that the sum of any whole number that is doubled will be an even number.<br><br>Pupils understand zero can be added to any number but the number will remain unchanged. |
| Year 1 | Part – Part – Whole |  | Pupils develop automatic recall of number bonds to 10. This can be shown using a ten frame, a NUMBER bond diagram and written as an equation. This understanding can be related to adding tens, hundreds and so on when used with a sound understanding of place value. |

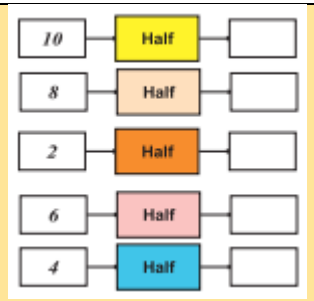
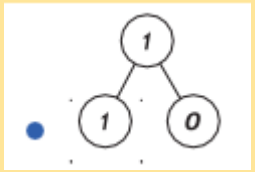
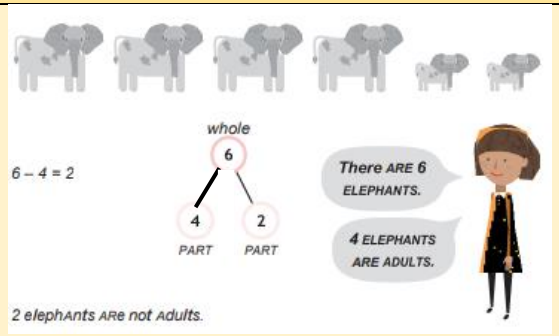
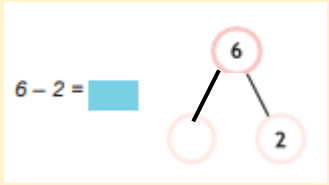
| | | | |
|---|---|---|---|
| | Using a Number Track |   | Pupils are first introduced to a linear number system through the number track. This is a precursor to the number line. Pupils may benefit from placing items on the number track as they count and add, before moving on to use the more abstract number line. |
| | Counting on Using a Number Line |  | Pupils move from a number track to a number line, starting from zero and having marked increments of 1. The use of the number line is further developed when counting starts from a given number, relying on pupils' ability to locate and count on from a given number. |
| | Adding by Making 10 |  | Pupils use their part–whole understanding to rename a number into its component parts in order to make 10 within an equation. Pupils also look for combinations of numbers that make 10 in addition examples that have 3 numbers with a sum greater than 10. |
| | Addition Word Problems |  | Pupils apply their knowledge of addition within the context of word problems. The problems may involve different situations, contexts or strategies. |

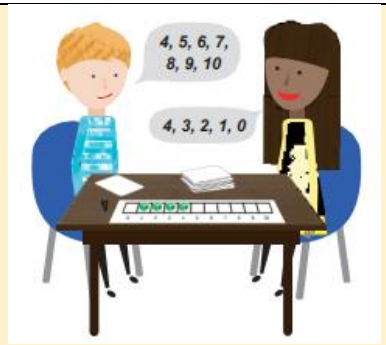
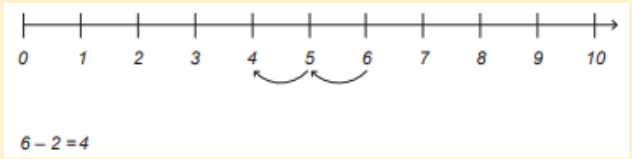
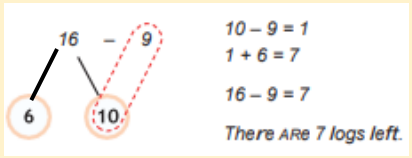
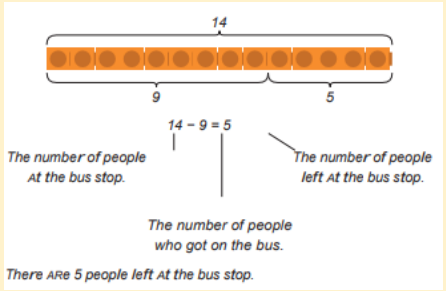
| | | | |
|---|---|---|---|
| Year 2 | Part – Part – Whole |  | This is a mathematical structure that underpins all addition situations. Numbers can be understood in terms of their parts; understanding that the parts are part of a larger collection. Pupils develop an understanding of the parts and the whole within an equation. |
| | Counting on using a Number Line |  | The use of the number line is further developed when counting starts from a given number, relying on pupils' ability to locate and count from a given number, including starting from a 2-digit number. Initially a 1-digit number is added to a 2-digit number, then this progresses to a number line shown with intervals of 10 when adding 2-digit numbers that do not have any ones. |
| | Base 10 Blocks |  | The use of base 10 blocks provides a representation of the place value, primarily of 2-digit numbers. This representation is related to the formal written method but also encourages pupils to use their understanding of adding the same noun to add 2-digit numbers. For example, 20 + 30 can be understood as 2 tens + 3 tens. The sum of these numbers is 50 or 5 tens. An understanding of place value will support addition as well as subtraction, multiplication and division. |

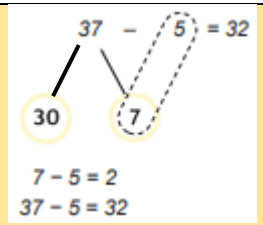
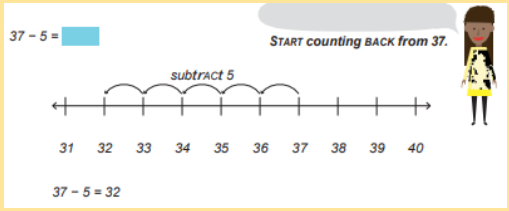
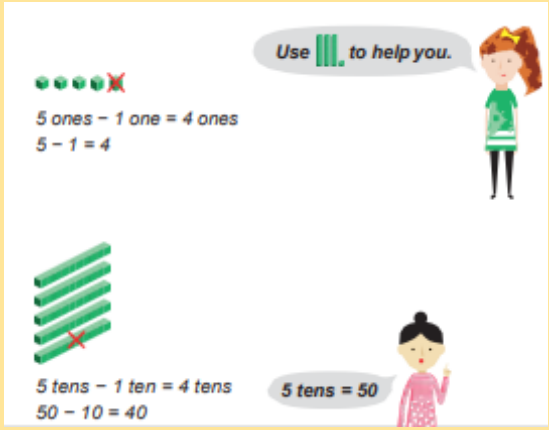
| | | | |
|---|---|---|---|
| | Formal Written Method |  | This is a procedural method that relies on a pupil's conceptual understanding of addition. This begins without renaming and progresses to the renaming of 10 ones into 1 ten. Pupils understand that at this stage, they start with the addition of the ones before they add the tens. This method is supported with base 10 block representation. The formal written method is always accompanied by a written equation to ensure that the relationship between the representations is made. |
| | Adding Fractions |  | Pupils use their understanding of adding the same noun when adding fractions through a written sentence. Fractions with the same denominator are added using a '[ ] and [ ] make [ ]' structure. |

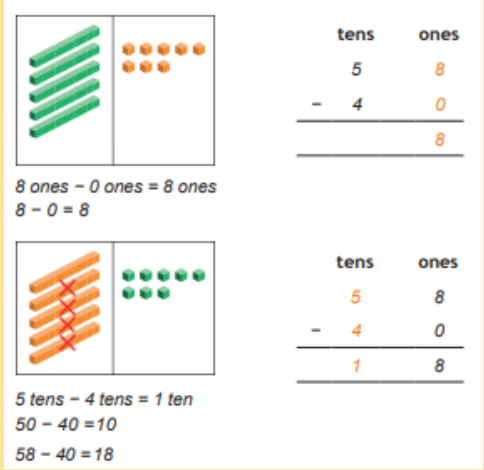
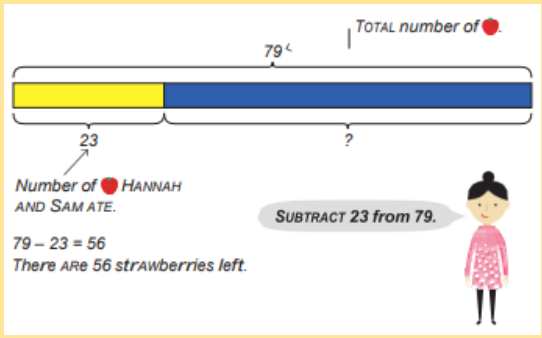
| Subtraction | | | |
|---|---|---|---|
| **Year Group** | **Strand/Topic** | **Representation** | **Key Idea** |
| Reception | Perceptual Subitising |  | A key development underpinning the ability to subitise. Perceptual subitising is when pupils can recognise the quantity of items in groups up to 5 without counting each item. |
| | Composition |  | This is a mathematical structure that underpins all subtraction situations. numbers can be understood in a practical /roleplay exploration and through pictorial stories.<br>"How many birds are sitting on the fence?"<br>If one bird flew out of the tree and onto the fence, how many birds can you see in the tree? |
| Reception | Perceptual Subitising |  | A key development underpinning the ability to subtract is subitising. Perceptual subitising is when pupils can recognise the quantity of items in groups up to 5 without counting each item. |
| | Part-Part-Whole |  | This is a mathematical structure that underpins subtraction situations. Numbers can be understood in terms of their parts; understanding that the parts are part of a larger collection. |
| | Conceptual Subitising | | |

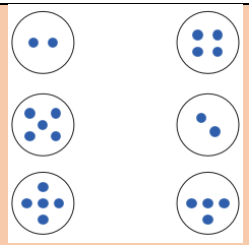
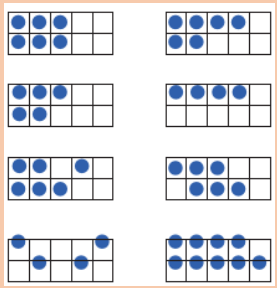
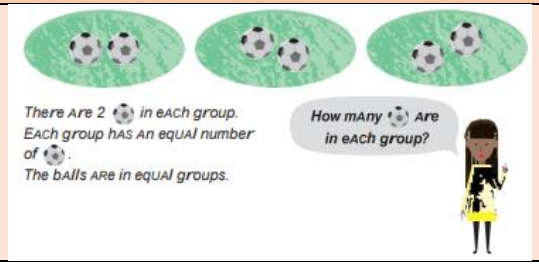
| | | | |
|---|---|---|---|
| | Composition of 5 |  | Pupils are able to recognise different quantities by combining within a group without counting them. Pupils can combine these quantities to find the whole amount. This skill is used when subtracting small amounts. |
| | |  | Pupils are able to demonstrate all possible whole number compositions of 5, including recognising and showing 5 on a five frame and using a number bond diagram. |
| | Composition of 10 |  | Pupils are able to demonstrate all possible whole number compositions of 10, including recognising and showing 10 on a ten frame and using a number bond diagram. |
| | Subtracting 1, 1 Less |  | Pupils relate subtracting 1 to one less than the starting number. |
| | Doubles | | By knowing doubles, pupils can find half of a quantity that remains after half the quantity is subtracted. |

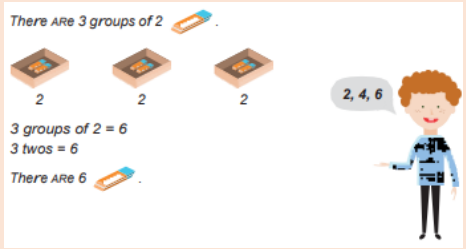
| | | | |
|---|---|---|---|
| | Subtracting Zero |  <br>  | Pupils understand zero can be subtracted from any number, but the number will remain unchanged. |
| Year 1 | Part-Part-Whole |  | This is a mathematical structure that underpins subtraction situations. Numbers can be understood in terms of their parts; understanding that the parts are part of a larger collection. Pupils develop an understanding of the parts and the whole within an equation. |
| | Number Bonds to 10 |  | Pupils develop automatic recall of number bonds to 10. This can be shown using a ten frame, a number bond diagram and written as an equation. This understanding can be related to subtracting tens, hundreds and so on when used with a sound understanding of place value. |
| | Using a Number Track | | Pupils are first introduced to a linear number system through the number |

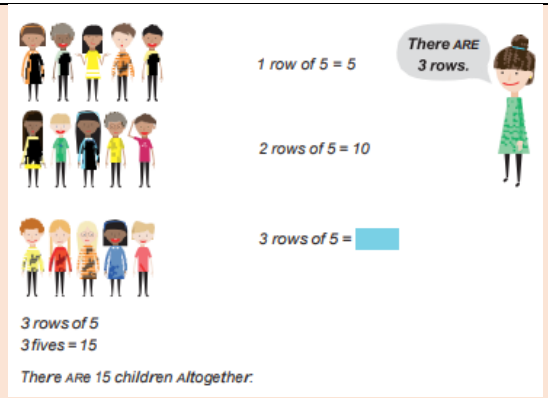
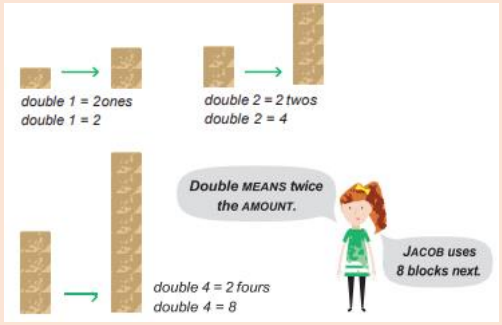
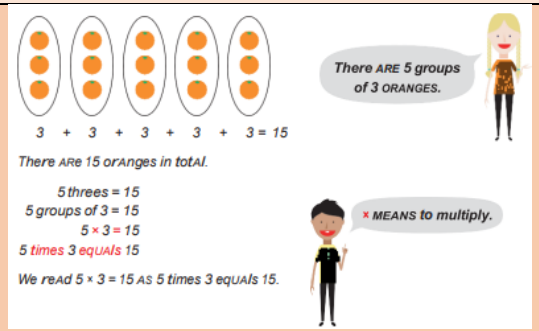
| | | | |
|---|---|---|---|
| | Counting Back Using a Number Line |  <br>  | track. This is a precursor to the number line. Pupils may benefit from placing items on the number track as they count and subtract before moving on to use the more abstract number line.<br><br>Pupils move from a number track to a number line, starting from zero and having marked increments of 1. The use of the number line is further developed when counting back starts from a given number, relying on pupils' ability to locate and count back from a given number. |
| | Subtracting from 10 |  | Pupils use their part–whole understanding to rename a number into its component parts in order to subtract from 10 within an equation. |
| | Subtracting Word Problems |  | Pupils develop an understanding of situations and problems that require subtraction. |

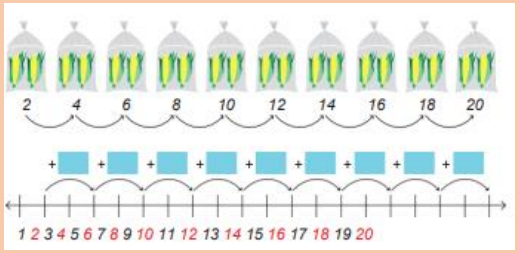
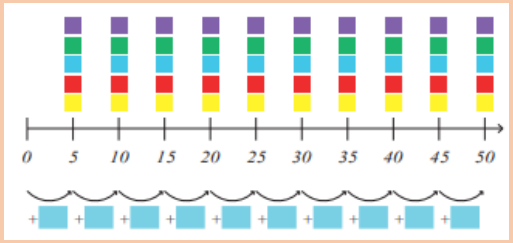
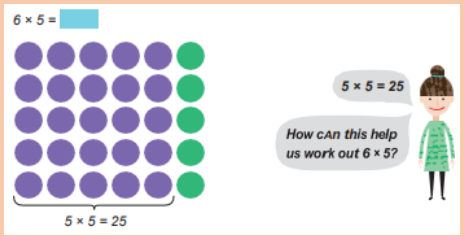
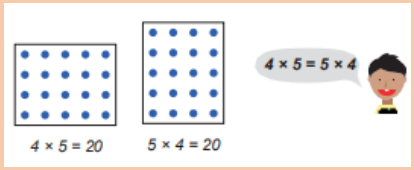
| | | | |
|---|---|---|---|
| Year 2 | Part-Part-Whole |  | This is a mathematical structure that underpins subtraction situations. Numbers can be understood in term of their parts; understanding that the parts are part of a larger collection. Pupils develop an understanding of the parts and the whole within an equation. |
| | Counting Back Using a Number Line |  | The use of the number line is further developed when counting back starts from a given number, relying on pupils' ability to locate and count back from a given number, including starting from a 2-digit number. Initially a 1-digit number is subtracted from a 2-digit number, then this progresses to a number line shown with intervals of 10 when subtracting 2-digit numbers that do not have any ones. |
| | Base 10 Blocks |  | The use of base 10 blocks provides a representation of the place value primarily of 2-digit numbers. This representation is related to the formal written method but also encourages pupils to use their understanding of subtracting the same noun to subtract 2-digit numbers. For example, 50 – 30 can |

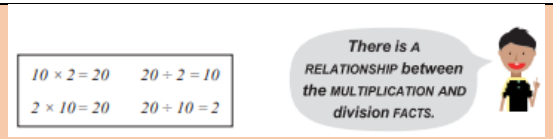
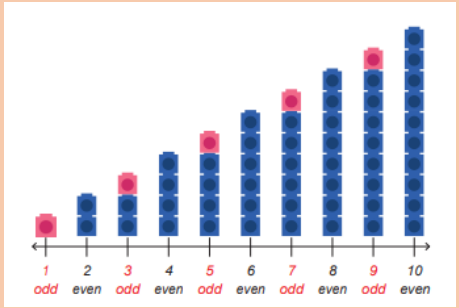
| | | | |
|---|---|---|---|
| | Formal Written Method<br><br>Subtraction Word Problems |  <br>  | be understood as 5 tens – 3 tens. The difference between the numbers is 20 or 2 tens. An understanding of place value will support subtraction as well as addition, multiplication and division.<br><br>This is a procedural method that relies on a pupil's conceptual understanding of subtraction. Initially, this begins without renaming and progresses to the renaming of 1 ten into 10 ones. Pupils understand that at this stage, they start with the subtraction of the ones before they subtract the tens. This method is supported with base 10 block representation. The formal written method is always accompanied by a written equation to ensure that the relationship between the representations are made.<br><br>Pupils develop an understanding of situations and problems that require subtraction. |

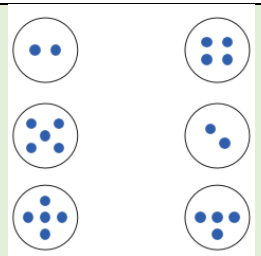
| Multiplication | | | |
|---|---|---|---|
| **Year Group** | **Strand/Topic** | **Representation** | **Key Idea** |
| Reception | Equal Groups |  | Pupils learn to recognise groups that are equal in quantity, initially using like items and then progressing to different items. Pupils understand that equal groups can be represented by concrete items, diagrams and written numbers. Pupils need to be secure in the abstraction principle of counting the quantity of items, regardless of the properties or characteristics of the items, in order to recognise equal groups in a range of situations. |
| | Addition |  | Addition and equal groups are concepts that underpin multiplication. During Reception, pupils make equal groups and use equal groups when doubling numbers. |
| Year 1 | Equal Groups |  | Pupils learn to recognise groups that are equal in quantity, initially using like items and then progressing to different items. Pupils understand that equal groups can be represented by concrete items, |

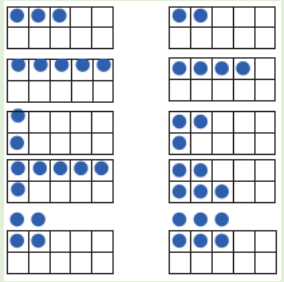
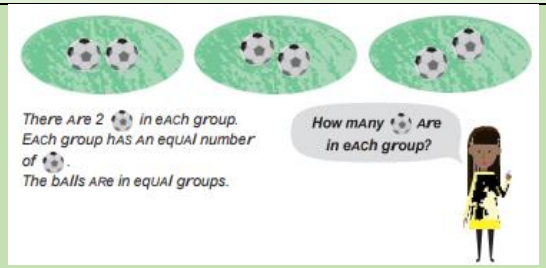
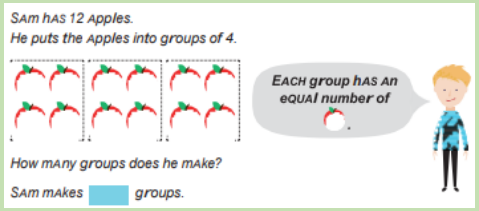
| | | | |
|---|---|---|---|
| | Repeated Addition |  | diagrams and written numbers. Pupils need to be secure in the abstraction principle of counting the quantity of items, regardless of the properties or characteristics of the items, in order to recognise equal groups in a range of situations.<br><br>Initially, multiplication is shown as the addition of equal groups. The key idea of adding like nouns still applies in multiplication. A group of 3 bananas and 3 apples does not result in 6 bananas or 6 apples. In order to add, the nouns must be the same, in this case 6 pieces of fruit. This is also true of multiplication: 2 groups of 3 pieces of fruit makes 6 pieces of fruit. |
| | Counting in 2s, 5s and 10s |  | Pupils start to count in multiples of 2 and multiples of 10, then progress to counting in multiples of 2, 5 and 10 supported by discrete, countable representations. |
| | Arrays | | Multiplication is represented by arrays, beginning with making equal rows and further developing the language associated with arrays. For example: ‘There are 3 rows of 5. There are 15 altogether.’ |

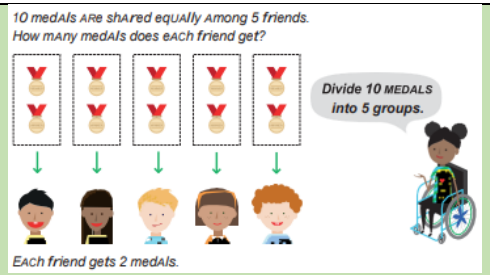
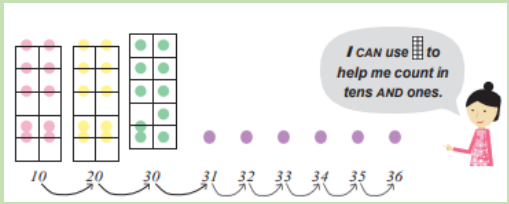
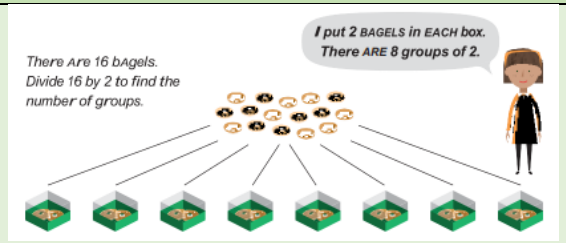
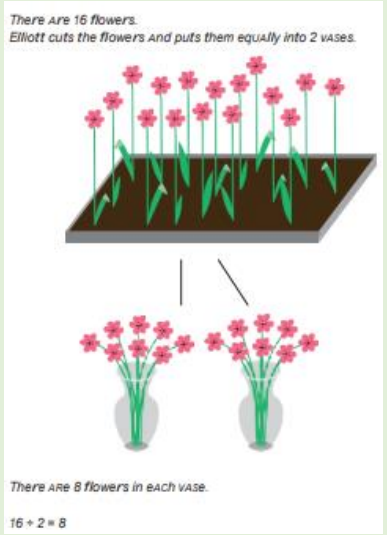
| | | | | |
|---|---|---|---|---|
| | Doubles |  <br>  | The diagrams used to support learning how to double numbers, not only show equal groups of 2 being added each time, but also show the pattern scaling up and each 'tower' being twice the height of the tower just before it. Pupils can develop the language associated with multiplication by describing the growing block pattern. This also provides the basis for understanding halving, in which the representation scales down. |
| Year 2 | Equal Groups |  | Pupils learn to recognise groups that are equal in quantity, initially using like items and then progressing to different items. Pupils understand that equal groups can be represented by concrete items, diagrams and written numbers. In Year 2, the progression to multiplication from repeated addition is shown as 3 + 3 + 3 + 3 + 3 being equal to 5 groups of 3 and 5 |

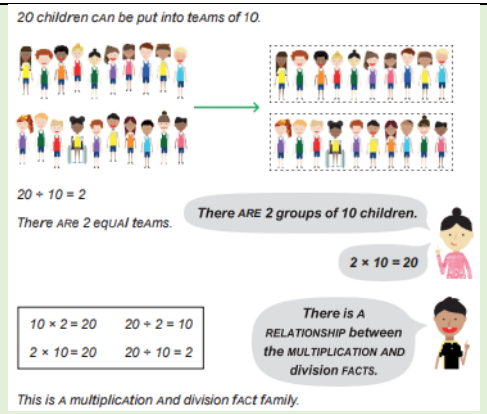
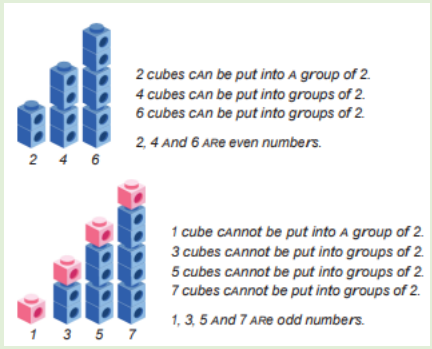
| | | | |
|---|---|---|---|
| | | | groups of 3 being equal to 5 × 3. Pupils read 5 × 3 as 5 groups of 3. |
| | Counting in 2s, 5s and 10s |  | When a pupil knows that the size of a group is 2, 5 or 10 and the group size remains consistent, they can count in multiples of 2, 5 and 10 to find the product. Counting in multiples is supported by representation on a number line. |
| | Number Line |  | Counting in multiples is shown on a number line. The increasingly abstract nature of the number line is shown as intervals change from 1 to 2, 5 and 10. |
| | Associated Facts |  | As pupils become more fluent and their understanding of their times tables increases, they are expected to use this knowledge to calculate associated facts. A pupil should be able to relate 10 x 5 to 9 × 5, knowing that the latter expression is 1 group of 5 less. So, 9 × 5 = 50 – 5. |
| | Commutativity |  | Pupils learn that the order of the factors in an equation does not affect the product. This is supported pictorially through the use of arrays. |
| | Fact Families | | Pupils relate multiplication and division and see the connection |

| | | | |
|---|---|---|---|
| | Odd and Even Numbers |  <br>  | between them when completing fact families. Pupils develop an understanding that factor × factor = product and product ÷ factor = factor. Once the understanding of this is secure, pupils can relate this to both multiplication and division situations.<br><br>Pupils develop an understanding that even numbers can be put into groups of 2 exactly but when odd numbers are grouped in twos, there is always 1 remaining. |

| Division | | | |
|---|---|---|---|
| **Year Group** | **Strand/Topic** | **Representation** | **Key Idea** |
| Reception | Equal Groups |  | Pupils learn to recognise groups that are equal in quantity, initially using like items and then progressing to different items. Pupils understand that equal groups can be represented by concrete items, diagrams and written numbers. Pupils need to be secure in the abstraction principle of counting the quantity of items regardless of the items' properties or characteristics, |

| | | | |
|---|---|---|---|
| | Subtraction |  | in order to recognise equal groups in a range of situations.<br><br>Subtraction and equal groups are concepts that underpin division. During Reception, pupils make equal groups and use equal groups when doubling numbers. While they are doubling numbers, they will see that the whole amount can be partitioned into 2 equal groups. |
| Year 1 | Equal Groups |  | Pupils learn to recognise groups that are equal in quantity, initially using like items and then progressing to different items. Pupils understand that equal groups can be represented by concrete items, diagrams and written numbers. Pupils need to be secure in the abstraction principle of counting the quantity of items regardless of the items' properties or characteristics, in order to recognise equal groups in a range of situations. |
| | Grouping |  | Pupils initially use grouping for division. They put items into equal groups to find the number of equal groups that can be made from a set amount. |
| | Sharing | | Pupils move from division through grouping to division through sharing. They share a set amount of items |

| | | | |
|---|---|---|---|
| | Counting in 2s, 5s and 10s |  <br>  | equally between a number of groups. The number of groups is known and pupils find the number of items in each group.<br><br>Pupils start to count in multiples of 2 and multiples of 10, then progress to counting in multiples of 2, 5 and 10 supported by discrete, countable representations. |
| Year 2 | Grouping |  | Pupils initially use grouping for division. They put items into equal groups to find the number of equal groups that can be made from a set amount. |
| | Sharing |  | Pupils move from division through grouping to division through sharing. They share a set amount of items equally between a number of groups. The number of groups is known and pupils find the number of items in each group. |

| | | | | |
|---|---|---|---|---|
| | Division by 2, 5 and 10 |  | | Pupils start to make the connection between division and multiplication. They see amounts as equal groups and relate this to multiplication. |
| | Odd and Even Numbers |  | | Pupils develop an understanding that even numbers can be put into groups of 2 exactly. Numbers that can be put into groups of 2 and have 1 remaining are described as odd numbers. |