



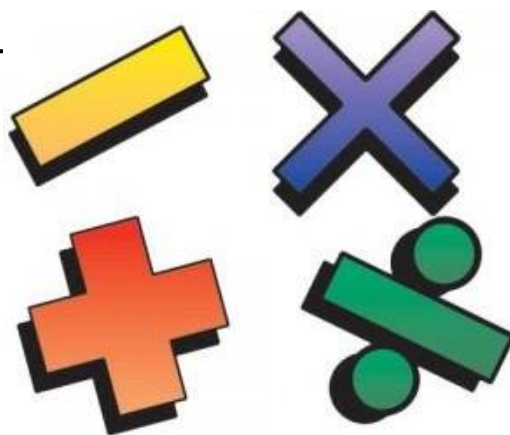
*Learning our
faith, loving*

*faith, living our
our faith*

St. Michael & St. Martin Catholic Primary
School

Calculation Policy

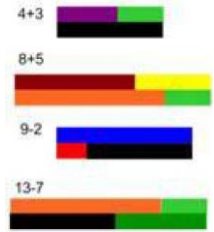
Year 1 - 6



St. Michael & St. Martin Catholic Primary School - Calculation Policy

Introduction and rationale:

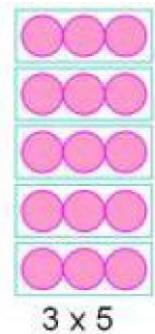
The St. Michael & St. Martin Catholic Primary School Calculation Policy has been written with the involvement of all staff to support the implementation of the new National Curriculum (2014). A document for each operation addresses what and how to teach stage by stage. The policy lays out expectations for written calculations. Alongside this, it coincides with the White Rose Scheme which has been implemented this year. This scheme looks at how ideas build on each other using concrete, pictorial and abstract methods throughout. It also builds on children's fluency with concepts and developing their reasoning and problem solving skills.



$$\begin{array}{r} 200 + 30 + 4 \quad 234 \\ 500 + 20 + 7 \quad \rightarrow + 527 \\ \hline 700 + 60 + 1 \quad 761 \\ 10 \quad 1 \end{array}$$

Representations

Key to successful implementation of a school calculation policy is consistent use of representations (model and images that support conceptual understanding of the mathematics) and this policy promotes a range of relevant representations, across the primary years. Mathematical understanding is developed through use of representations that are first of all concrete (e.g. Numicon, Dienes apparatus), and then pictorial (e.g. Array, place value counters) to then facilitate abstract working (e.g. Columnar addition, long multiplication). This policy guides teachers through an appropriate progression of representations, and if at any point a pupil is struggling they should revert to familiar pictorial and/or concrete materials/ representations as appropriate. Whilst a mathematically fluent child will be able to choose the most appropriate representation and procedure to carry out a calculation, whether written or mental, we should support pupils with carefully selected representations that underpin calculation methods (as detailed in this policy), and ensure there is consistency and development across the stages. The 'representations to support mental and written calculation' box on each page provides a range of models and images that underpin calculating in each stage. It is not an exhaustive collection, and applies to written calculation in most circumstances.



Progression in Calculation

The St. Michael & St. Martin Catholic School calculation policy promotes particular methods and procedures with particular representations alongside to support understanding of calculation, in order to meet requirements (use of columnar methods from Year 3 onwards for all four operations, including long multiplication and long division in Year 5/6). It is recommended that schools ensure consistency in both procedure and conceptual understanding to ensure fluency and confidence with written methods. This policy guides us in progression for each operation to ensure smooth transition. It is important that conceptual understanding, supported by the use of representations, is secure for procedures, and if at any point a pupil is struggling with a procedure, they should revert to concrete and/or pictorial resources and representations to solidify understanding.

Addition



| EYFS/Year 1 | Year 2 |
|---|---|
| Combining two parts to make a whole: part whole model. Starting at the bigger number and counting on- using cubes. Regrouping to make 10 using ten frame. | Adding three single digits. Use of base 10 to combine two numbers. |




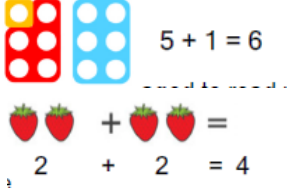
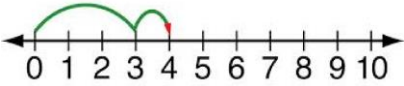
| Year 3 | Year 4 | Year 5 | Year 6 |
|--|--|--|--|
| Column method- regrouping. Using place value counters (up to 3 digits). | Column method- regrouping. (up to 4 digits) | Column method- regrouping. Use of place value counters for adding decimals. | Column method- regrouping. Abstract methods. Place value counters to be used for adding decimal numbers. |

Addition: EYFS

Focus: Find one more from a group of up to five objects, then ten objects Key skills for addition in

Key skills:

- Select the correct numeral to represent 1 to 5, then 1 to 10 objects.
- Count an irregular arrangement of up to ten objects.
- Estimate how many objects they can see and check by counting them.
- Use the language of 'more' and 'fewer' to compare two sets of objects.
- Find the total number of items in two groups by counting all of them.
- Say the number that is one more than a given number.
- In practical activities and discussion, begin to use the vocabulary involved in addition
- Record, using marks that they can interpret and explain.
- Begin to identify own mathematical problems based on own interests and fascinations

| | |
|---|---|
|  | Have an understanding of what "more" means and be able to say what is one more than a given number. |
|  | Children begin to combine groups of objects or pictures and use concrete apparatus. |
|  | Solve simple problems using fingers and introduce Numicon when appropriate. |
|  | Children make a record in pictures, words, Numicon shapes or symbols of addition activities already carried out. |
| <p>"Three add two equals 5" "Four plus 3 makes 7"</p> | Children are encouraged to read number sentences aloud in different ways. |
| | Construct number sentences verbally, or by using cards to go with practical activities. |
| <p style="text-align: center;">$3 + 1 = 4$</p>  | Number lines can be used alongside practical apparatus to solve addition calculations and word problems. Children "jump" along the number line to "count on". |

Key Vocabulary:

Games and songs can be a useful way to begin using the vocabulary involved in addition.
 add, more, plus, makes, total, altogether, score, double, one more, two more, ten more how many more to make...? how many more is ... than ...?

Addition: Stage 1


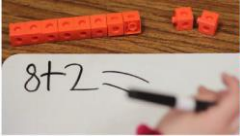
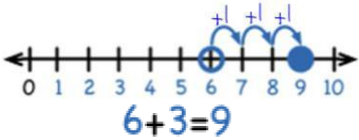
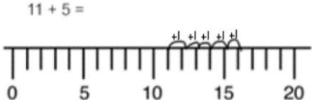
Focus: Adding with 1 digit and 2 digit numbers to 20, including 0.

In stage 1 the children will build on their knowledge of numbers to 20 from the Foundation Stage. They will begin by using simple strategies to add two group of objects together and move onto recording their number sentences orally and written.

Before moving onto addition children need to be able to:

Form numbers 0 – 20 (then to 50)

Say numbers in order (at least to 100)

| | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|--|--|--|---|---|---|---|---|--|---|---|---|---|---|---|
|  | <p>Children begin to add units together using physical objects e.g. Maths makes sense cups, counters, Numicon shapes.</p> <p>They count each object to find how many altogether.</p> <p>Teacher models the language e.g. '3 cups add 6 cups equals 9 cups altogether'.</p> <p>They begin to record by drawing pictures/marks.</p> | | | | | | | | | | | | | | | | | | | | | |
|  | <p>The teacher models what the adding of two groups looks like in a number sentence.</p> <p>The children begin to copy these number sentences onto whiteboards whilst still using objects to add.</p> | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; text-align: center;"> <tr><td>2</td><td>+</td><td>3</td><td>=</td><td>5</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td>6</td><td>+</td><td>2</td><td>=</td><td>8</td></tr> </table> | 2 | + | 3 | = | 5 | | | | | | 6 | + | 2 | = | 8 | <p>The children become more independent and start to write number sentences into their maths books (squared maths paper) ensuring one digit in each box.</p> | | | | | | |
| 2 | + | 3 | = | 5 | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| 6 | + | 2 | = | 8 | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; text-align: center;"> <tr><td>6</td><td>+</td><td>5</td><td>=</td><td>1</td><td>1</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td>9</td><td>+</td><td>4</td><td>=</td><td>1</td><td>3</td></tr> </table> | 6 | + | 5 | = | 1 | 1 | | | | | | | 9 | + | 4 | = | 1 | 3 | <p>Children begin to add numbers that bridge 10 using the same strategies.</p> <p>Introduce language of tens and units. Continue to use objects e.g. Numicon.</p> | | | |
| 6 | + | 5 | = | 1 | 1 | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| 9 | + | 4 | = | 1 | 3 | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; text-align: center;"> <tr><td>1</td><td>0</td><td>+</td><td>6</td><td>=</td><td>1</td><td>6</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td>1</td><td>2</td><td>+</td><td>3</td><td>=</td><td>1</td><td>5</td></tr> </table> | 1 | 0 | + | 6 | = | 1 | 6 | | | | | | | | 1 | 2 | + | 3 | = | 1 | 5 | <p>Children start to add a 1 digit number to a 2 digit number within 20.</p> <p>Objects are still used to help the addition process.</p> <p>Begin to bridge 20.</p> |
| 1 | 0 | + | 6 | = | 1 | 6 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | + | 3 | = | 1 | 5 | | | | | | | | | | | | | | | | |
|  | <p>Children are shown how to add using a number line. They record their findings orally to begin with before moving on to drawing the jumps themselves.</p> <p>Note: Each jump is one unit.</p> | | | | | | | | | | | | | | | | | | | | | |
|  | <p>Partial number lines are then used as a transition to open number lines.</p> | | | | | | | | | | | | | | | | | | | | | |

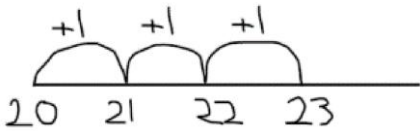
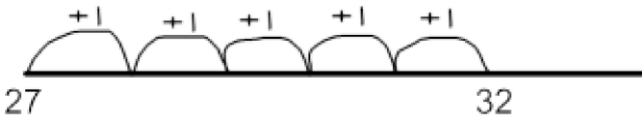
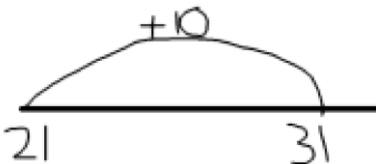
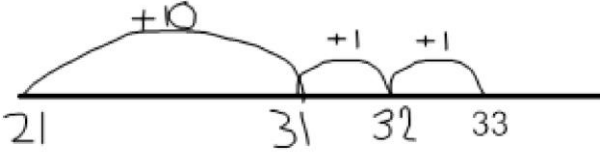
Key Vocabulary:

Add, more, plus, make, altogether, equals, most, count on, number line, tens, units, addition, number sentence

Addition: Stage 2

Focus: Adding two 2 digit numbers.

In stage 2 children will move onto using an open number line to add 1 and 2 digit numbers. They will learn how to partition 2 digit numbers.

| | |
|--|---|
| $20 + 3 =$  | <p>The children will move onto adding using an open number line to add a 1 digit number to a rounded 2 digit number e.g. $20 + 7 =$</p> |
| $27 + 5 = 32$  | <p>When using this method securely, children move on to bridge 10 whilst still adding units e.g. $27 + 5 =$</p> |
| $21 + 10 = 31$  | <p>Once the children can confidently add a 1 digit number to a 2 digit number they can move on to adding two 2 digit numbers. To make it simpler for them they should start by adding rounded tens e.g. $21 + 10$ Extend by adding multiple tens e.g. $21 + 20$</p> |
| $\begin{array}{c} 23 \\ / \quad \backslash \\ 20 + 3 \end{array}$ | <p>Children will build on their number knowledge by partitioning 2 digit numbers into tens and units so they are ready for the next step.</p> <p>The children must be confident in their understanding of place value before moving on.</p> |
| $21 + 12 = 33$  | <p>Adding two 2 digit numbers using an open number line using their prior knowledge of adding tens and units. The children only need to partition the smaller number to add.</p> |
| $48 + 16 = 64 \text{ (bridging the 10)}$ | <p>When the children have secured this skill they can begin to add numbers that bridge through the next ten (use 100 squares etc to help with number knowledge).</p> |

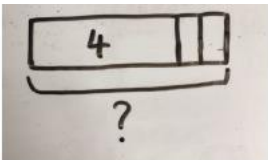
Key Vocabulary

Add, more, plus, and, make, altogether, total, equal to, equals, the same as, most, count on, number line, number sentence, tens, units, partition, addition, *hundreds*.

Addition: Stage 3

Focus: Adding with numbers up to 3 digits.

In stage 3 we will move to the traditional column method and to support this, children will first apply their partitioning skills to the partitioning column method.

| | |
|--|---|
| $246 + 132 = 378$ $200 + 40 + 6$ $100 + 30 + 2$ $300 + 70 + 8 = 378$ | <p>Introduce the partitioning column method with numbers that do not bridge so children become confident with the method itself.</p> <p>Please Note: Start by adding the units first.</p> |
| $337 + 188 = 525$ $300 + 30 + 7$ $100 + 80 + 8$ $400 + 110 + 15 = 525$ | <p>Once confident, children can start using the partitioning column method to solve problems that bridge the tens and hundreds boundaries.</p> |
| $\begin{array}{r} 343 \\ + 116 \\ \hline 400 \\ 50 \\ + 9 \\ \hline 459 \end{array}$ | <p>Children can use the expanded column method for addition.</p> |
| $116 + 343 = 459$ $\begin{array}{r} 343 \\ + 116 \\ \hline 459 \end{array}$ | <p>Now children are ready to move on to the traditional column methods. Introduce this initially with numbers that do not bridge any boundaries. It is important children remember that it is three hundred add one hundred, NOT 3 + 1!</p> |
| $245 + 84 = 329$ $\begin{array}{r} 245 \\ + 84 \\ \hline 329 \\ 1 \end{array}$ | <p>Once the method is secure children are now ready to be introduced to 'carrying' which happens when bridging in the column method. Make sure children add the units first and 'carry' numbers under the bottom line.</p> |
|  | <p>Bar Model – children should be taught to count on using the bar model rather than counting all.</p> |

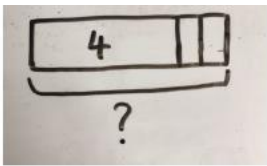
Key Vocabulary

Add, more, plus, and, make, altogether, total, equal to, equals, the same as, double, most, count on, number line, sum, tens, units, partition, addition, column, tens boundary, *hundreds boundary*, increase, vertical, carry, expanded, compact

Addition: Stage 4

Focus: Adding with numbers up to 4 digits.

In stage 4 children will consolidate their use of the traditional column method and will be able to use it confidently to add numbers up to 4 digits. This could include carrying units, tens and hundreds.



Bar Model - children should be taught to count on using the bar model rather than counting all.

$$\begin{array}{r} 4267 + 1584 = 5851 \\ 4267 \\ + 1584 \\ \hline 5851 \\ 11 \end{array}$$

Children should already be familiar with the column method from year 3 but it is very important to go over the method again ensuring children understand why they start with the units, have to carry a number etc.

Please Note:

- 1) The units must be added first!
- 2) 'Carry' numbers underneath the bottom line!
- 3) Reinforce the place value! It is not 6 add 8, it is 6 tens add 8 tens!

Key Vocabulary

Add, more, plus, and, make, altogether, total, equal to, equals, the same as, double, most, count on, number line, sum, tens, units, partition, addition, column, tens boundary, hundreds boundary, increase, vertical, carry, expanded, compact, *thousands*, *hundreds*, *digits*, *inverse*.

Addition: Stage 5

Focus: Adding with more than 4 digits.

In stage 5 children will now use the column method to add decimal numbers in the context of money and measures. It is important that children have place value skills beyond 4 digits here and fully understand what a decimal number represents.

$$\begin{array}{r} \text{£ } 23.59 \\ + \text{£ } 7.55 \\ \hline \text{£ } 31.14 \end{array}$$

The decimal point needs to be lined up just like all of the other place value columns and must be remembered in the answer column. It is important children understand why this is and get into this habit very quickly.

$$\begin{array}{r} 23481 \\ + \quad 1362 \\ \hline 24843 \end{array}$$

Children should be working with numbers greater than 4 digits including numbers in the ten thousands and hundred thousands.

$$\begin{array}{r} 19.01 \\ \quad 3.65 \\ + 0.70 \\ \hline 23.36 \end{array}$$

Children need to start using the column method to add more than two values, still considering place value very carefully.

Please Note:

- 1) It is important that children say 6 tenths add 7 tenths so they understand that they are adding part of a number not a whole number.
- 2) Empty places should be filled with a zero to show the value of that place.

Key Vocabulary

Add, more, plus, and, make, altogether, total, equal to, equals, the same as, double, most, count on, number line, sum, tens, units, partition, addition, column, tens boundary, hundreds boundary, increase,

vertical, carry, expanded, compact, thousands, hundreds, digits, inverse, *decimal place, decimal point, tenths, hundredths, thousandths.*

Addition: Stage 6

Focus: Adding several numbers with an increasing level of complexity.

In stage 6 children need to use all the previous adding skills developed to add several numbers with a variety of different decimal places. Many of these problems will be in the context of money or measures.

$$\begin{array}{r} 23.361 \\ 9.080 \\ 59.770 \\ + 1.300 \\ \hline 93.511 \\ \begin{array}{l} 2 \quad 1 \quad 2 \end{array} \end{array}$$

Children need to use their knowledge of the decimal point to line up their amounts correctly in the column. Zeroes should be added to support place value, showing that there is no value to add.

$$\begin{array}{r} 81,059 \\ 3,668 \\ 15,301 \\ + 20,551 \\ \hline 120,579 \\ \begin{array}{l} 1 \quad 1 \quad 1 \quad 1 \end{array} \end{array}$$

Children should also continue to add multiple integers with 4 digits or more.

Key Vocabulary

Add, more, plus, and, make, altogether, total, equal to, equals, the same as, double, most, count on, number line, sum, tens, units, partition, addition, column, tens boundary, hundreds boundary, increase, vertical, carry, expanded, compact, thousands, hundreds, digits, inverse, decimal place, decimal point, tenths, hundredths, thousandths

Subtraction

| EYFS/Year 1 | Year 2 |
|-----------------------------|---------------------|
| Taking away ones | Counting back |
| Counting back | Find the difference |
| Find the difference | Part whole model |
| Part whole model | Make 10 |
| Make 10 using the ten frame | Use of base 10 |





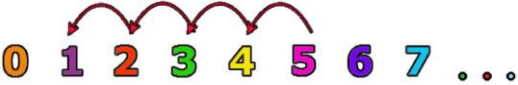
| Year 3 | Year 4 | Year 5 | Year 6 |
|---|--|--|---|
| Column method with regrouping. (up to 3 digits using place value counters) | Column method with regrouping. (up to 4 digits) | Column method with regrouping. Abstract for whole numbers. Start with place value counters for decimals- with the same amount of decimal places. | Column method with regrouping. Abstract methods. Place value counters for decimals- with different amounts of decimal places. |

Subtraction: EYFS

Focus: Find one less from a group of up to five objects, then ten objects.

Key skills:

- Select the correct numeral to represent 1 to 5, then 1 to 10 objects.
- Count an irregular arrangement of up to ten objects
- Estimate how many objects they can see and check by counting them.
- Use the language of 'more' and 'fewer' to compare two sets of objects.
- Say the number that is one less than a given number.
- In practical activities and discussion, begin to use the vocabulary involved in subtraction
- Record, using marks that they can interpret and explain.
- Begin to identify own mathematical problems based on own interests and fascinations

| | |
|---|--|
| | <p>Have an understanding of what “less” means and be able to say what is one less than a given number.</p> |
|  | <p>Children begin to use objects, pictures and concrete apparatus to relate subtraction to taking away and counting how many objects are left.</p> |
|  | <p>Solve simple problems using fingers and introduce Numicon where appropriate.</p> |
|  | <p>Children make a record in pictures, words, Numicon shapes or symbols of subtraction activities already carried out.</p> |
| <p>“Five subtract one leaves four” “Six take away 3 equals 3”</p> | <p>Children are encouraged to read number sentences aloud in different ways.</p> |
|  | <p>Construct number sentences verbally, or by using cards to go with practical activities.</p> |
|  | <p>Number lines can be used alongside practical apparatus to solve subtraction “jump” back to “count” down the number line.</p> |

Key Vocabulary:

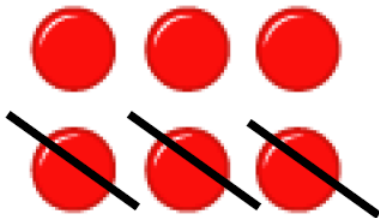
Games and songs can be a useful way to begin using the vocabulary involved in subtraction:

take, take away, leave, subtract, minus, equals, number sentence, count back, one less, two less, ten less
how many are left / left over? how many have gone? how many fewer is ... than ...

Subtraction: Stage 1

Focus: Subtracting with 1 digit and 2 digit numbers to 20, including 0.

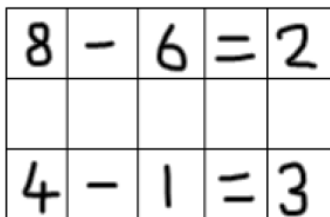
In stage 1 the children will build on their knowledge of numbers to 20 from the Foundation Stage. They will begin by using simple strategies to subtract from a group of objects and move onto recording their number sentences orally and written.



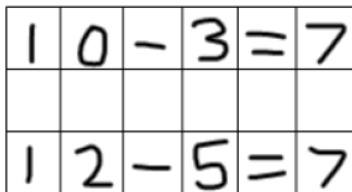
Children begin to subtract units from a large group using physical objects e.g. Maths makes sense cups, counters, Numicon shapes. They count each object to find how many left. Teacher models the language e.g. '6 cups take away 3 cups equals 3 cups'. They begin to record by drawing pictures/marks.



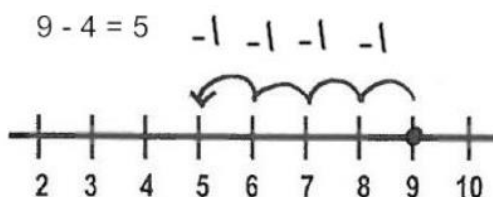
The teacher models what the subtraction looks like in a number sentence. The children begin to copy these number sentences onto whiteboards whilst still using objects to help them subtract.



The children become more independent and start to write number sentences into their maths books (squared maths paper) ensuring one digit in each box.

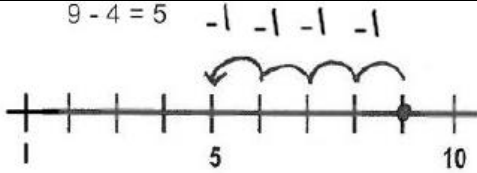


Children begin to subtract numbers that bridge 10 using the same strategies. A 1-digit number is subtracted from a 2 digit number. Introduce language of tens and units. Continue to use objects e.g. Numicon.



Children are now shown how to subtract using a number line. They record their findings orally to begin with before moving on to drawing the jumps themselves.

$9 - 4 = 5$



Partial number lines are then used as a transition to open number lines.

Key Vocabulary

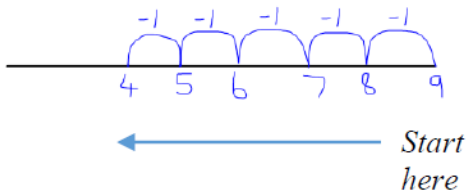
Take away, less, minus, subtract, how many more, how many fewer/less than, most, least, how many left, partition, tens, units, *digit*

Subtraction: Stage 2

Focus: Subtracting with two 2 digit numbers.

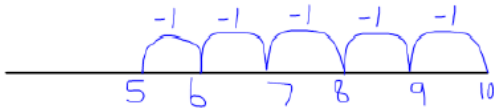
Children will begin to count back using a blank number line to subtract. They will use these methods both written and mentally.

$9 - 5 = 4$

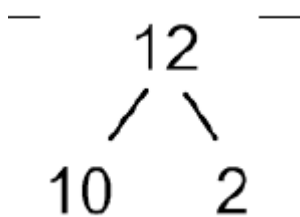


Once the children are confident using a tracked number line, they will be shown how to use a blank number line. They will start by subtracting units in (backward) jumps of one.

$10 - 5 = 5$

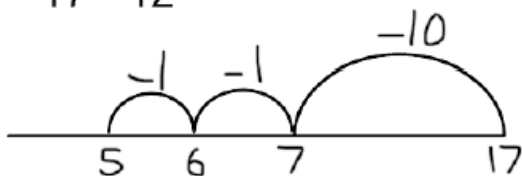


Children now bridge 10 when subtracting units from a two digit number under 20.



Partitioning is taught (or recapped) so that children can start to subtract two 2 digit numbers.

$17 - 12 =$

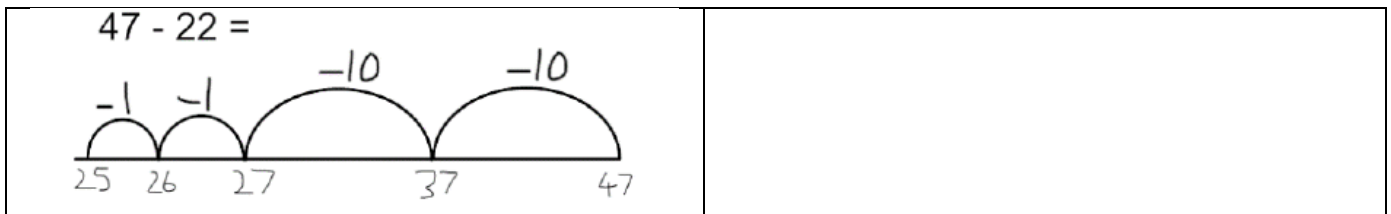


Children are now ready to subtract tens and units on an open number line.

Note: Jump large tens and small units. Biggest number goes at the end of the number line. Only the smaller number needs to be partitioned.

Continue to increase difficulty by subtracting larger numbers with multiple tens.

Note: Work with numbers up to 100



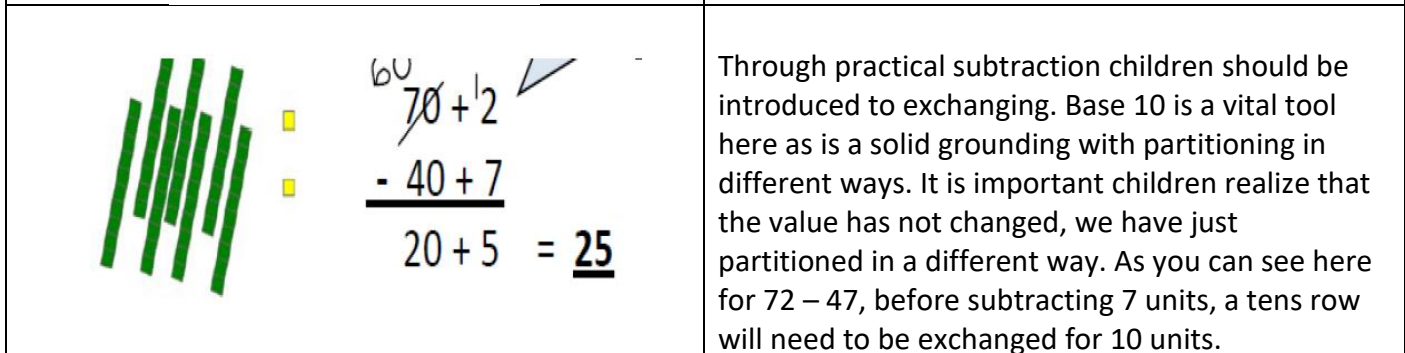
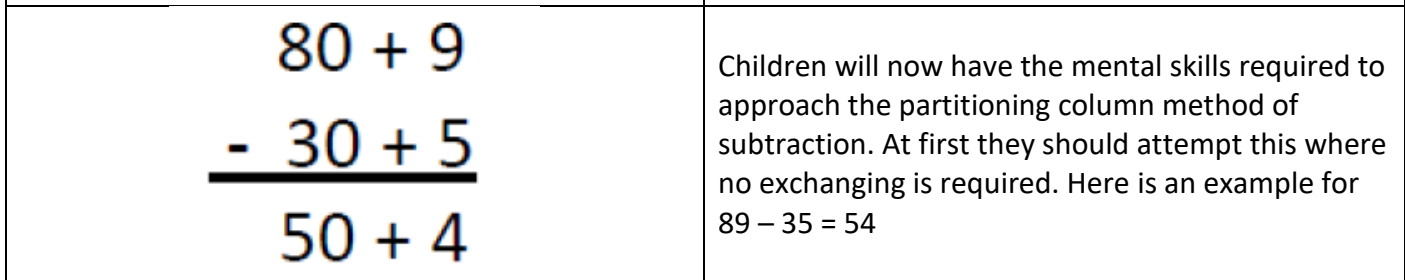
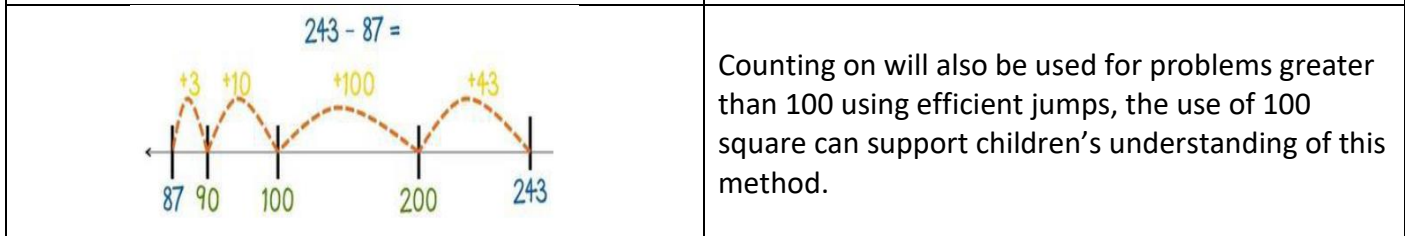
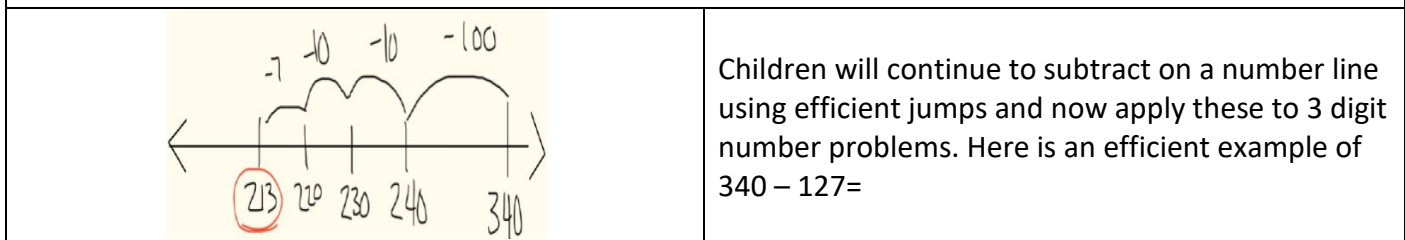
Key Vocabulary

Equal to, take away, less, minus, subtract, difference between, how many more, how many fewer/less than, most, least, count back, how many left, count on, partition, tens,

Subtraction: Stage 3

Focus: Subtracting with 2 and 3 digit numbers.

Children will consolidate their knowledge of counting back and counting on using a blank number line to subtract. They will use these methods both written and mentally. Once children become fully confident they will be ready to move on to the partitioning column method of subtraction.



$$238 - 146 = 92$$

$$\begin{array}{r} 100 \\ 200 + 30 + 8 \\ - 100 + 40 + 6 \\ \hline 0 + 90 + 2 \end{array}$$

Children who are secure with the concept of 'exchanging' should now be able to use the partitioning column method to subtract any 2

Key Vocabulary


Equal to, take, take away, less, minus, subtract, leaves, distance between, difference between, how many more, how many fewer/less than, most, least, count back, how many left, how much less is_?, count on, strategy, partition, tens, units, *exchange, decrease, hundreds, value, digit*

Subtraction: Stage 4

Focus: Subtracting with numbers up to 4 digits.

Children will consolidate their knowledge of the partitioning column method for subtraction with 4 digit numbers including those where exchanging is required. Once they are secure with this they will move on to the compact (traditional) method of column subtraction.

$$2754 - 1562 = 1192$$

$$\begin{array}{r} 600 \\ 2000 + 700 + 50 + 4 \\ - 1000 + 500 + 60 + 2 \\ \hline 1000 + 100 + 90 + 2 \end{array}$$


Children will consolidate their learning of the partitioning column method of subtraction and exchanging by solving calculations with more complex numbers. Place value counters will come in handy here when building children's confidence. Money can also be partitioned for subtraction e.g. £1 + 30 + 5 - £1 + 10 + 2 =

$$\begin{array}{r} 2754 \\ - 1562 \\ \hline 1192 \end{array}$$

Once confident children are ready to move on to the compact method of subtraction. Encourage children to complete a calculation in the partitioning column methods and then model compact method. See if children can see how they are linked and discuss which is simpler. Although this is seen as the 'easiest' method it does not mean that it is necessarily the best method and they need to carefully select the best method for the problem they are solving.

Key Vocabulary

Equal to, take, take away, less, minus, subtract, leaves, distance between, difference between, how many more, how many fewer/less than, most, least, count back, how many left, how much less is_?, count on, strategy, partition, tens, units, exchange, decrease, hundreds, value, digit, *inverse*.

Subtraction: Stage 5

Focus: Subtracting with numbers beyond 4 digits including decimals.

Children in stage 5 will continue to use the compact column method of subtraction to solve problems including those where exchanging is required. They will subtract larger integers and begin to subtract decimal amounts.

$$\begin{array}{r} \overset{2}{\cancel{3}} \overset{10}{\cancel{1}} \overset{0}{\cancel{0}} \overset{8}{\cancel{8}} \overset{6}{\cancel{6}} \\ - \quad \quad 2 \quad 1 \quad 2 \quad 8 \\ \hline 2 \quad 8, \quad 9 \quad 2 \quad 8 \end{array}$$

Children will come across problems where exchanging will need to take place several times to complete the problem.

$$\begin{array}{r} \overset{6}{\cancel{7}} \overset{10}{\cancel{1}} \overset{6}{\cancel{6}} \overset{8}{\cancel{8}} \cdot \overset{0}{\cancel{0}} \\ - \quad \quad 3 \quad 7 \quad 2 \cdot 5 \\ \hline 6 \quad 7 \quad 9 \quad 6 \cdot 5 \end{array}$$

Once confident with large integers, children will now be ready to move onto decimal numbers including lots in the context of measures and money. Just like addition, it is important that the children line up the decimal point and understand why they are doing this.

Please Note:

Where there is a space in a column it is important that children add a zero so they understand the value and know what to subtract in that column.

Key Vocabulary

Equal to, take, take away, less, minus, subtract, leaves, distance between, difference between, how many more, how many fewer/less than, most, least, count back, how many left, how much less is_?,

count on, strategy, partition, tens, units, exchange, decrease, hundreds, value, digit, inverse, *tenths*, *hundredths*, *decimal place*, *decimal*.

Subtraction: Stage 6

Focus: Subtracting with increasingly complex numbers including decimals.

In stage 6, children need to use mental methods and the compact column method of subtraction to solve an increasingly complex range of calculation including those with integers, those with decimals and those with mixed numbers.

$$\begin{array}{r} \overset{0}{\cancel{1}}\overset{00}{\cancel{5}}\overset{00}{\cancel{0}},699 \\ - 89,949 \\ \hline 60,750 \end{array}$$

Children will use the compact method to solve problems involving integers up to 6 digits and beyond and solve problems where they will need to use 'exchanging' several times.

$$\begin{array}{r} \overset{1}{\cancel{1}}\overset{00}{\cancel{0}}\overset{00}{\cancel{1}}5 \cdot \overset{00}{\cancel{3}}\overset{00}{\cancel{4}}\overset{00}{\cancel{1}}9 \\ - 36 \cdot 080 \\ \hline 69 \cdot 339 \end{array}$$

They will also solve problems in context involving increasingly large decimals. They will need to continue using their knowledge of decimal points to line up their numbers and place zeroes in any empty places so they fully understand the value of that column.

Key Vocabulary

Equal to, take, take away, less, minus, subtract, leaves, distance between, difference between, how many more, how many fewer/less than, most, least, count back, how many left, how much less is_?, count on, strategy, partition, tens, units, exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal place, decimal.

Multiplication



EYFS/Year 1

Year 2

Recognising and making equal groups.

Arrays- showing commutative multiplication

Doubling

Counting in multiples
Use cubes, Numicon and other objects in the classroom

Column multiplication

Abstract methods
multi-digit up to 4 digits by a 2 digit number)

Arrays

$2d \times 1d$ using base 10

Year 3

Year 4

Year 5

Year 6

digits)

Multiplication: EYFS

Focus: Find the total number of items in two groups by counting all of them.

Key skills:

- Select the correct numeral to represent 1 to 5, then 1 to 10 objects.
- Count an irregular arrangement of up to ten objects.
- Estimate how many objects they can see and check by counting them.
- Record, using marks that they can interpret and explain.
- Begin to identify own mathematical problems based on own interests and fascinations.

The link between addition and multiplication can be introduced through doubling and reinforced through repeated addition of the same number.



How many groups of 2 are there? 3 groups of 2 = 6

Children begin with mostly pictorial representations.

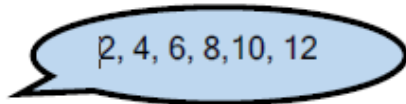


How many wheels are there altogether?



How much money do I have?

Real life contexts and use of practical equipment to count in repeated groups of the same size.



Count in twos, fives and tens, both aloud and with objects, such as Numicon or other concrete apparatus.

“Five groups of two makes ten”

“Three lots of two makes six”

Children are encouraged to read number sentences aloud in different ways

“How many fingers on two hands?”



“How many sides on three triangles?”



“How many legs on four ducks?”



Children are given multiplication problems set in a real life context and are encouraged to visualise the problem.

Key Vocabulary:

lots of, groups of, times, repeated addition, double, combine, twos, fives, tens

Multiplication: Stage 1

Focus: Solving one step multiplication problems.

In stage 1, children will begin to learn how to multiply. They will work on simple multiplication problems using tangible objects and pictorial recording.

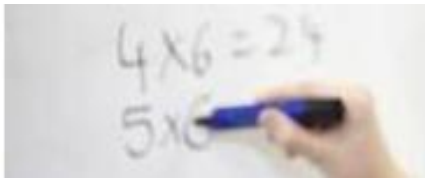
Before moving on to multiplication, children need to be able to:

- Have a secure understanding of addition and subtraction
- Begin to count in multiples of 2, 5, 10

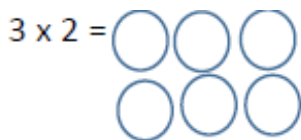


The teacher gives verbal instructions showing children how to 'multiply' the same amount of objects e.g. I give out 3 sweets and I do the same thing 4 times'.

The children record pictorially.



The written multiplication sentence will be modelled by the teacher and the children will start to copy onto whiteboards/into their books.



*Group size x
number of groups
= product.*

Children record each number sentence by drawing the array e.g. put '3 cups on the maths table, do it two times'

$$3 \times 2 = 6$$

Once children have shown a basic understanding of multiplication they will start to record in numbers, not pictorially anymore. They write each number sentence onto squared paper (maths books).

Note: Objects to aid working out are available at all times until children begin to use mental recall strategies.

Key Vocabulary



Times, lots of times, array, altogether, multiply, count, *tens*, *units*,

Multiplication: Stage 2

Focus: Solve problems involving multiplication.

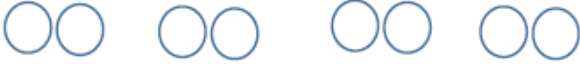
In stage 2 children will move on from basic multiplication arrays and will be taught different strategies including repeated addition and mental methods.

Throughout the year children should be working on learning their 2, 5 and 10x tables in a range of different ways.

$3 \times 2 =$  $2 \times 3 =$ 
Group size x number of groups = product.

Children will be shown that multiplication of two numbers can be done in any order (commutative) and will use arrays to represent this.

Physical objects/drawings used to aid working out.


 $2+2+2+2=8$
 $2 \times 4 = 8$

Repeated addition will be taught as another strategy to multiplication.

Physical objects/drawings used to aid working out.

$3 \times 2 =$



Repeated addition moves on to using an open number line.

Group size x number of groups = product.

e.g. $9 \times 4 =$
 $7 \times 6 =$
 $8 \times 9 =$ } (draw array/use open number line)

Children continue to master these strategies until they can confidently multiply a 1 digit number with a 1 digit number.

Key Vocabulary

Groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, tens, units, value.

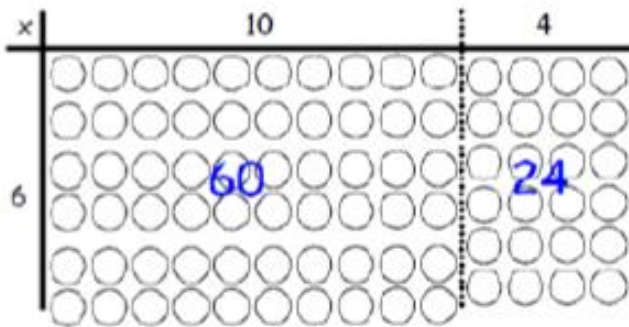
Multiplication: Stage 3

Focus: Multiplying 2 digit numbers by 1 digit numbers.

In stage 3 children will move on from arrays and start using the grid method of multiplication. It is essential that before children move onto the grid method they are completely confident with all previous methods and have a solid grounding with mental methods and partitioning.

Before moving on to grid multiplication, children need to be able to:

- Partition numbers into tens and units
- Multiply single digits by multiples of 10 ($3 \times 30 = 90$)
- Quickly recall multiplication facts for the 2, 3, 4, 5, 6 and 10 x tables
- Use any previous method to work out unknown multiplication facts, quickly and accurately.



| | | |
|----------|------------|-----------|
| x | 30 | 5 |
| 7 | 210 | 35 |

$$210 + 35 = 245$$

The grid method should be introduced using an arrays model such as the one to the left for 14×6 . Children need to use their partitioning skills to partition the two digit number and then use their existing knowledge of arrays to come to an answer with minimal support.

Multiplication grid method requires good organization but also a solid understanding of partitioning and multiplication facts, as you can see in the example to the left for 35×7 . The children need to remember that once they have multiplied the partitioned parts of the number, they then need to add the two

Key Vocabulary

Groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times, *partition*, *grid method*, *multiple*, *product*, *tens*, *units*, *value*.

Multiplication: Stage 4

Focus: Multiplying 2 and 3 digit numbers by 1 digit numbers.

In stage 4 children need to use the grid method confidently to solve problems where a 2 or 3 digit number is multiplied by a one digit number. They need to move on to the use of short multiplication to solve 3 digit number multiplied by 1 digit problems.

| | | | |
|---|------|----|----|
| x | 600 | 10 | 3 |
| 5 | 3000 | 50 | 15 |

Add up 3000, 50 and 15 to make 3065.

$$613 \times 5 = 3065$$

The grid method is extended in year 4 so children will now multiply 3 digit numbers by 1 digit numbers. When adding the 3 answers up to create a total, column addition could be used to ensure accuracy, especially where bridging will be needed.

$$\begin{array}{r} 463 \\ \times 8 \\ \hline 3704 \\ \hline 52 \end{array}$$

The compact 'short multiplication' method is tricky and needs to be approached carefully. At first children should solve a problem using grid method and then observe the teacher solve a problem using short multiplication and make comparisons. How are they similar? Children need to go through it very slowly and carefully, unpicking each step until they are fully confident.

It is at this stage that approximation and estimation should become a regular part of classroom practice. Children should approximate an answer before using a method so they know if their answer is accurate or not.

253×9 is approximately $250 \times 10 = 2500$

Key Vocabulary

Groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times, partition, grid method, multiple, product, tens, units, value, *inverse*.

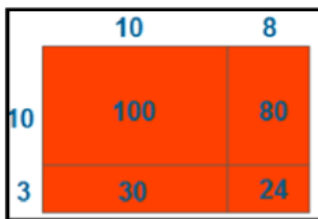
Multiplication: Stage 5

Focus: Multiplying up to 4 digits by 1 or 2 digits.

In stage 5 children will continue to use short multiplication to solve increasingly richer problems that involve multiplying by 1 digit. They will then move on to long multiplication for problems that involve multiplying by 2 digits. Approximation will play an important part-with children making approximations before using long multiplication to help check their answer is correct

$$\begin{array}{r}
 3652 \\
 \times \quad 8 \\
 \hline
 29216
 \end{array}$$

Children will use short multiplication in a range of increasingly challenging problems. Solving using the grid method and then comparing to the short multiplication method will help cement the children's understanding of the short multiplication method.



$$\begin{array}{r}
 8 \\
 \times 13 \\
 \hline
 54 \\
 180 \\
 \hline
 234
 \end{array}$$

When multiplying by more than 1 digit, children need to use long multiplication. Like with short multiplication, they will solve the problem using the grid method first and then make comparisons until their understanding is secure. In the example below the top row shows 18×3 and the bottom shows 18×10 . The final row shows the total of both calculations.

$$\begin{array}{r}
 1234 \\
 \times \quad 16 \\
 \hline
 7404 \\
 12340 \\
 \hline
 19744
 \end{array}$$

Once long multiplication methods are secure, children are ready to move on to more challenging problems which require greater levels of mental calculation.

The problem to the right shows 1234×6 on the top line, 1234×10 on the bottom line and the total of both calculations on the final row.

Key Vocabulary

Groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times, partition, grid method,

multiple, product, tens, units, value, inverse, *square, factor, integer, decimal, short/long multiplication, carry.*

Multiplication: Stage 6

Focus: Consolidating short and long multiplication, multiplying decimals by 1 digit.

In stage 6 children will consolidate all they know about short and long multiplication before they go to Secondary school. They will also learn the new skill of using short multiplication to multiply decimal numbers to 2 decimal places.

A handwritten multiplication problem on a grid background. The first number is 3.19 and the second number is 8. The result is 25.52. The decimal point in the result is aligned with the decimal point in the first number. The grid lines are light blue.

When multiplying decimals it is important to remember that the digit you are multiplying by needs to be lined up with the ones digits. As with all decimal work, the decimal points must be lined up and the children need to have a clear understanding why that is.

Key Vocabulary

Groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times, partition, grid method, multiple, product, tens, units, value, inverse, *square, factor, integer, decimal, short/long multiplication, carry.*

Division



| EYFS/Year 1 | Year 2 |
|---|--|
| <p>Sharing objects into groups</p> <p>Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups?</p> <p>Use cubes and draw round 3 cubes at a time.</p> | <p>Division as grouping</p> <p>Division within arrays- linking to multiplication</p> <p>Repeated subtraction</p> |

Year 3

Year 4

Year 5

Year 6

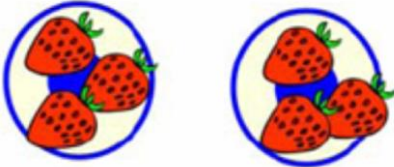



| | | | |
|--|--|--|---|
| <p>Division with a remainder-using lollipop sticks, times tables facts and repeated subtraction.</p> <p>2d divided by 1d using base 10 or place value counters</p> | <p>Division with a remainder</p> <p>Short division (up to 3 digits by 1 digit- concrete and pictorial)</p> | <p>Short division</p> <p>(up to 4 digits by a 1 digit number including remainders)</p> | <p>Short division</p> <p>Long division with place value counters (up to 4 digits by a 2 digit number)</p> <p>Children should exchange into the tenths and hundredths column too</p> |
|--|--|--|---|


Division: EYFS


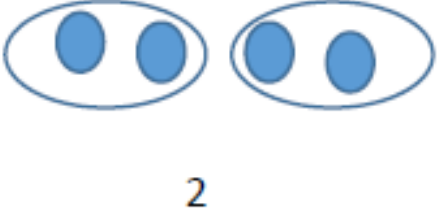
Focus: Record, using marks that they can interpret and explain

Key skills:

- Select the correct numeral to represent 1 to 5, then 1 to 10 objects.
- Count an irregular arrangement of up to ten objects.
- Estimate how many objects they can see and check by counting them.
- Record, using marks that they can interpret and explain.
- Begin to identify own mathematical problems based on own interests and fascinations.

| | |
|--|--|
|  | <p>Division can be introduced through halving or sharing an equal amount into 2 groups.</p> |
| <p>Grouping Model Mum has 6 socks. She grouped them into pairs. How many pairs did she make?</p>  <p>Sharing Model I have 10 sweets. I want to share them with my friend. How many will we have each?</p>  | <p>Children begin with mostly pictorial representations linked to real life contexts.</p> <p>Children need to see and hear representations of division as both grouping and sharing.</p> |
| <p>by drawing pictures in groups or by arranging concrete apparatus into groups</p> | <p>Children have a go at recording the calculation that has been carried out.</p> |
| | <p>Children are encouraged to read number sentences aloud in different ways</p> |
| <p>12 shared equally by 3 is 4</p>  | <p>Children are given multiplication problems set in a real life context and are encouraged to visualise the problem.</p> |
| <p style="text-align: center;"><u>Key Vocabulary:</u></p> <p>halve, share, share equally, one each, two each, three each, group in pairs / threes / tens, equal groups of, in equal parts, left, left over</p> | |

| | |
|--|---|
| <p>Division: Stage 1</p> | |
| <p><u>Focus:</u> Solve one step division problems.</p> <p>Children in stage 1 will begin to learn how to divide. They will work on simple division problems using tangible objects and pictorial recording.</p> | |
|  | <p>The children will start by sharing objects between set groups e.g. 12 sweets shared between 3 children. They will discuss how to share equally so no group has more or less.</p> |

| | |
|---|---|
|  | <p>The written division sentence will be modelled by the teacher and the children will start to copy onto whiteboards/into their books.</p> |
| <p>$4 \div 2 =$</p>  | <p>Children will begin to use arrays to work out division sentences by drawing rings around each 'group'.</p> |
| <p style="text-align: center;"><u>Key Vocabulary</u></p> <p>Share, share equally, groups of, lots of, array, divide, divided by.</p> | |

Division: Stage 2

Focus: Solve problems involving division.

Children in stage 2 will continue to work on basic division strategies and will learn that division is not commutative.

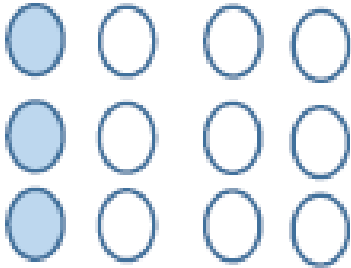
$$12 \div 3 = 4$$



Children will consolidate their understanding of division as sharing using objects and visual representations.

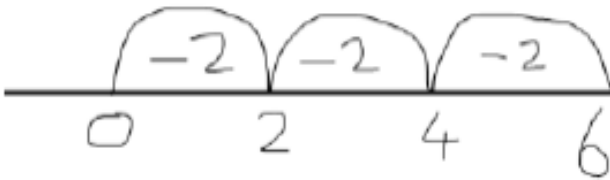
They will then move on to division as grouping using objects such as bead strings.

$$12 \div 3 = 4$$



Children will move on to recording by drawing arrays. For the example on the left they will start by drawing 3 rows and then keep adding one to each row until they get to 12. The number of columns gives them the answer.

$$6 \div 2 = 3$$



When the children are confident at using arrays to group for division, they will move onto using open number lines to do repeated subtraction.

Note: Do not work with numbers that have remainders at this stage.

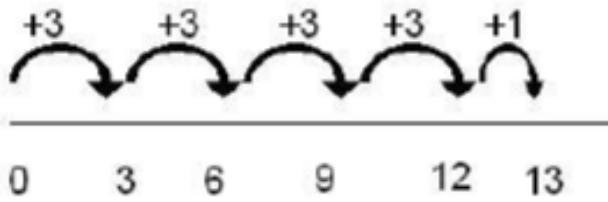
Key Vocabulary

Share, share equally, one each, two each..., group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line.

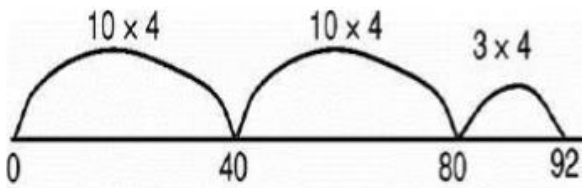
Division: Stage 3

Focus: Dividing 2 digit numbers by 1 digit numbers moving from number line methods to short division.

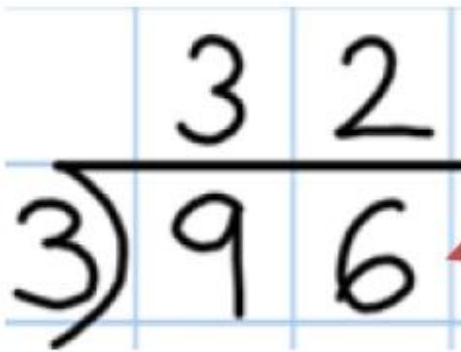
Children in stage 3 will continue to use a number line to solve division problems and will begin to jump more than one step at a time in the style of 'chunking'. Once confident they will move on to short division without any remainders.



Children will begin to use the grouping number line method to solve problems with remainders. They will start on zero and write the dividend at the end of their number line. They will jump in steps of the divisor until they get as close to the end as possible. Whatever is left over is the remainder. Using cubes or arrays alongside the number line will consolidate understanding.



Once confident children will begin to solve problems on a grouping number line involving bigger numbers. To solve this effectively they will need to subtract chunks of the divisor. As you can see in the image for $92 \div 4$, a step of 10 groups of 4 has been jumped, followed by another step of 10 jumps, and finally followed by a step of 3 jumps of 4. This means that in total 4 was jumped 23 times making 23 the answer.



Once children are confident with number line methods then they should start work on short division. First of all arrays should be used to show a division calculation, the same calculation should then be shown in the short multiplication method. Place value should be regularly discussed so children realize that they are partitioning the dividend and dividing the units then the tens by the divisor.

Please Note:

Initially children will start with simple problems where each digit is a multiple of the divisor.

Key Vocabulary

Share, share equally, one each, two each, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, *inverse*, *short division*, *carry*, *remainder*, *multiple*.

Division: Stage 4

Focus: Consolidating and extending use of short division.

Children in stage 4 will continue to use short division to solve division problems. They will begin to work on remainders, including problems where there are remainders in the first numbers but not in the final answer.

$$\begin{array}{r}
 12 \div 3 \qquad 12 \\
 \text{Subtract 3: } \begin{array}{r} -3 \\ 12-3=9 \end{array} \quad (1 \times 3) \\
 \text{Subtract 3: } \begin{array}{r} -3 \\ 9-3=6 \end{array} \quad (1 \times 3) \\
 \text{Subtract 3: } \begin{array}{r} -3 \\ 6-3=3 \end{array} \quad (1 \times 3) \\
 \text{Subtract 3: } \begin{array}{r} -3 \\ 3-3=0 \end{array} \quad (1 \times 3) \\
 \hline
 \end{array}$$

We then count up all the times we subtracted 3, which in this example is 4 times. We reached an answer of 0, so there is no remainder and the answer to $12 \div 3$ is 4.

Chunking method - Children should be taught to use chunking method as a means of dividing where they take 'chunks' of the number away. They use the times tables they are fluent in until they reach the final answer.

$$\begin{array}{r}
 12 \\
 8 \overline{) 96} \\
 \hline
 \end{array}$$

Once confident with the method of short division, they will move on to problems where the first digit of the dividend is not a multiple of the divisor and therefore a remainder will need to be carried. Children may need to use other equipment to calculate the division and multiplication facts required.

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

Children who can use short multiplication problems with remainders (but not those in the final answer) are now ready to work on 3 digit problems. Again, there should be remainders in the calculation but never in the final answer.

$$\begin{array}{r}
 035 \\
 5 \overline{) 175} \\
 \hline
 \end{array}$$

Once children are confident at dividing with 3 digits, they need to attempt problems where the answer in the first column (hundreds column) is a zero. They may wish to record the hundred initially as this will help them remember its place and the numbers value.

Key Vocabulary

Share, share equally, one each, two each..., group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, carry, remainder, multiple, *divisible by*, *factor*.

Division: Stage 5

Focus: Extending use of short multiplication to 4 digits and remainders.

Children in stage 5 will use short division to solve problems up to 4 digits long. For the first time they will use short division to solve problems that have a remainder in the final answer.

$$\begin{array}{r} 0663 \text{ r } 5 \\ 8 \overline{) 5309} \end{array}$$

In year 5 children will begin to solve division problems where a number up to 4 digits is divided by a single digit number including answers with remainders. These division problems need to be contextual so the children learn how to express the remainder- as a number, a fraction, a decimals, rounded up or rounded down.

Key Vocabulary

Share, share equally, one each, two each..., group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, carry, remainder, multiple, divisible by, factor, *quotient, prime number, prime factors, composite number (non-prime)*.

Division: Stage 6

Focus: Using short division to divide 4 digit numbers and express remainders as decimals and long division for dividing 2 digit numbers.

In stage 6, children will use short division to divide decimal numbers by single digit numbers. The final step of division will be long division which will be used to divide numbers by 2 digits. The focus in year 6 is not so much the method of short division but how the remainders are expressed- children need to express remainders as decimals and fractions- depending on the context of the question.

$$\begin{array}{r} 8 \overline{) 6497.000} \\ \underline{8} \\ 8 \\ \underline{8} \\ 8 \\ \underline{8} \\ 0 \\ \underline{0} \\ 0 \\ \underline{0} \\ 0 \\ \underline{0} \\ 0 \end{array}$$

The remainder in this answer would have been 1 but it has been expressed as a decimal. To do this, children need to insert a decimal point next to the units and carry the remainder over the decimal point. Zeroes are inserted to the right of the decimal point to show that there was no value.

$$\begin{array}{r} 291 \\ 45 \overline{) 13095} \\ \underline{90} \\ 409 \\ \underline{405} \\ 45 \\ \underline{45} \\ 0 \end{array}$$

To divide by 2 digit numbers, the children will use the method of long division. Any remainders would need to be expressed in a way that matched the context of the problem.

Key Vocabulary

Share, share equally, one each, two each..., group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, carry, remainder, multiple, divisible by, factor, quotient, prime number, prime factors, composite number (non-prime), *common factor*.