**Ysgol Trelawnyd V.A. School**

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**Written calculations in the Foundation Phase**

Outlined below are the methods we use for the four operations, they are used alongside the mental calculation strategies which are mentioned as appropriate throughout the document. It is designed to ensure that there is progression as a child moves through the Foundation Phase and also to provide the flexibility that allows children to develop at their own pace.

Review: March 2023

Signed by governors:

Date:

**Progression through calculations for addition**

**Nursery and Reception**

Much of the learning is through practical and oral activities. Children learn to say numbers by rote counting and through songs and rhymes, they learn the associated symbols for each number in a variety of ways, they learn to count objects or pictures accurately assigning numbers to objects as they touch each one. They learn the mathematical symbols for add + and equals = and they use these to write a number sentence. They use number lines to support calculation when adding two amounts to find ‘how many altogether’ and to support counting forwards and backwards.

3 + 2 = 5

+1

+1

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0 1 2 3 4 5 6 7 8 9

They use stories and situations to help understand and make number sentences such as the duck pond.



 2 + 2 = 4

Numicon is used to represent numbers, compare and order numbers and help them to understand the size of a number. They learn the concept of 1 more in practical activities with objects. Later, they learn to count in steps of 2 and 10 and understand what we mean by odd and even numbers. They begin to learn number bonds using practical equipment and in problem solving and pattern seeking.

**Year 1 and 2**

**groundwork:** counting sets of objects, seeing different numbers of objects in different arrangements, comparison language to describe and compare numbers – fewer, more, less, greater etc., number bonds – using equipment to investigate and learn all possible sets of bonds up to 10

Numbers within 10 are added by ‘counting on’ and using knowledge of number bonds within the part – whole concept:

Pictures represent objects and sums are written horizontally from left to right but the methods used are becoming more complex and knowledge of number bonds essential. For example 8 + 6 uses pictures to regroup and bridge through 10.

 8 6

 10 4

Adding by regrouping into tens and ones: if we have a teens number that can be regrouped, we then add the units and the tens and then put them back together:

e.g. 16 + 3 >>> regroup 16 into 10 and 6

3

6

 then add the ones 6 + 3 = 9

 then put tens and ones together 10 + 9 = 19

9

Equipment such as Dienes with cubes or straws is used to support addition of higher numbers. A place value chart is used to separate the components. Simple addition is taught by counting on with or without a number line and writing the sum horizontally:

e.g. 24 + 3 =

|  |  |  |  |
| --- | --- | --- | --- |
| 24 | 25 | 26 | 27 |

or

using a place value chart, with Dienes equipment and writing the sum vertically:

 Tens Ones

 2 4

 + 3

|  |  |
| --- | --- |
| Tens | Ones |
|  24 |  |
|  3 |  |

**Addition when units go over 10:**

Sums are written vertically and a place value chart with Dienes equipment is used to help with concepts of adding tens and ones. Ones are added first and when they go over 10 the number is regrouped into a 10 and some ones. A 1 is written in the tens column. Then add the tens. Answers are written in columns below the sum.

Tens Ones

 2 8

 + 6

 3 4

1

|  |  |
| --- | --- |
| Tens | Ones |
|  20 | 8 |
|   | 6 |

Addition then progresses to a 2 digit number TO added to a tens number i.e. a multiple of 10 that has no units. Sums are written vertically and a place value chart is used to help with concepts of what we are adding. Ones are added first then the tens. Answers are written in columns below the sum.

 Tens Ones

 3 5

 + 4 0

 7 5

|  |  |
| --- | --- |
| Tens | Ones |
|  30 | 5 |
|  40 |  |

Addition then progresses to a 2 digit number added to another 2 digit number TO + TO with no regrouping. Sums are written vertically and a place value chart with Dienes equipment is used to help with concepts of adding tens and ones. Ones are added first, then the tens. Answers are written in columns below the sum.

Tens Ones

 3 5

 + 4 3

 7 8

|  |  |
| --- | --- |
| Tens | Ones |
|  30 | 5 |
|  40 | 3 |

Addition then progresses to adding a 2 digit number to another 2 digit number where the ones go over 10. Sums are written vertically and a place value chart with Dienes equipment is used to help with concepts of adding tens and ones. Ones are added first and when they go over 10 the number is regrouped into a 10 and some ones. A 1 is written in the tens column. Then the tens are added. Answers are written in columns below the sum.

Tens Ones

 6 6

+ 1 7

 8 3

 1

|  |  |
| --- | --- |
| Tens | Ones |
|  60 | 6 |
|  10 | 7 |

**Addition within 1000**

Sums are written vertically and each column must line up carefully. Children add the ones first, then the tens, then the hundreds. Methods are taught starting with simple addition and no regrouping, then regrouping of the ones, then with regrouping of the tens, then with regrouping of tens and ones and then regrouping of hundreds, tens and ones and so on until all possibilities have been practiced. Children are also given word problems and encouraged to set out sums vertically as they’ve been taught.

778 + 119 = 7 7 8

 + 1 1 9

 8 9 7

 1

**Progression through calculations for subtraction**

**Nursery and Reception**

Much of the learning is through practical and oral activities, they learn to take away objects to find out how many are left. They learn the mathematical symbols for take away - and equals = and they use these to write number sentences. They practice counting backwards and use number lines to support them. The number line can be used to find out “what is 6 take away 3?”

6 – 3 = 3

-1

-1

-1

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0 1 2 3 4 5 6 7 8 9 10

 It is also used to show that the jumps between two numbers is the difference between these numbers.

0 1 2 3 4 5 6 7 8 9 10

Numicon equipment is used to represent numbers and we can show the difference between two numbers by overlaying 1 numicon piece over the other and counting the holes not covered. We also use stories and songs and simple problem solving situations to understand subtraction.



 3 – 1 = 2



**Year 1 and 2**

Subtract by taking away – crossing out pictures and counting what’s left. Writing as a subtraction sentence

e.g. 9 – 6 = 3

cubes can be used to show the parts and whole when taking away:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |

6 – 2 = 4

language such as less than is used to discuss the subtraction:

 “what is 2 less than 6?”

subtract by counting on – count on from the smaller number and stop when you get to the larger number

e.g. 9 – 6 = ?

count on from 6 **7, 8, 9** it was 3 steps

subtract by counting back – count back from the greater number by the amount you are taking away

e.g. 9 – 2 = ?

count back 2 steps from 9 **8, 7** the answer is 7

pictures and equipment are used as this is being taught to help children visualise the concepts.

Subtract using number bonds – number bonds help children to subtract if they start to notice in a subtraction story that the starting number is the whole and the number being taken away is one part so the remaining amount is the other part. Pictures and stories are used and sums are written horizontally. The idea of part- whole is also reinforced with diagrams showing the number bond:

 e.g. 9 – 4 = 5

Work is also done on families of number sentences using pictures and equipment to show the relationship between addition and subtraction facts with the same problem.

**Subtraction within 20:**

Examples start by subtracting a single digit number from a 2 digit number. The single digit is smaller than the ones number of the 2 digit number. The 2 digit number is regrouped into a ten and some ones. The ones are then subtracted and the number is recombined to get the answer. Subtraction sums are written out horizontally.

e.g. 17 – 3 regroup as 17 = 10 + 7

subtract 3 from 7 7 – 3 = 4

10 + 4 = 14

17 – 3 = 14

pictures, equipment and stories are used throughout to help children visualise concepts.

Examples get harder when the single digit number is larger than the ones part of the 2 digit number. Here the single digit is taken away from the ten and then the answer to that is added to the remaining ones. Subtraction sums are written horizontally.

e.g. 12 – 7 regroup as 12 = 10 + 2

we cannot subtract 7 from 2 . We subtract 7 from 10.

10 – 7 = 3

add the 3 to the ones part of the 2 digit number to get the answer.

3 + 2 = 5

There are lots of word problems and stories to allow children to practice.

**Subtraction within 40:**

Examples start by subtracting a single digit from a 2 digit number and counting back with or without a number line. Then a place value chart and Dienes equipment is used as with addition to help pupils visualise the concepts. Sums are written vertically in columns. Ones are subtracted first, then tens. The answer is written in columns below the sum.

e.g. 27 – 4 = ? count back from 27

or place value chart and write sum out vertically

Tens Ones

 2 7

* 4

 2 3

|  |  |
| --- | --- |
| Tens | Ones |
|  20 | 7 |

Cross out or take 3 cubes away

Examples then progress to taking multiples of ten away.

e.g. 40 – 20

children are taught to count back in 10s

or

use a place value chart and write the sum vertically as shown

Tens Ones

1. 0

- 2 0

 2 0

|  |  |
| --- | --- |
| Tens | Ones |
|  40 |  |

Cross out or take 2 tens away

Harder subtraction involves taking a 1 digit number away from a 2 digit number and it is larger than the ones part of the 2 digit number.

e.g. 32 – 9 =

One of the tens is regrouped to become 10 ones and they are placed in the ones part of the place value chart. The sum is written vertically and the regrouping is shown by crossing out a ten and adding it to the ones number in that column – see below:

Tens Ones

 2 1

 3 2

- 9

 3

|  |  |
| --- | --- |
| Tens | Ones |
|  30 | 2 |

|  |  |
| --- | --- |
| Tens | Ones |
|  30 | 12 |

Cross out or take 9 ones away

Subtracting a 2 digit number from a multiple of ten:

Sums are written vertically and a place value chart and Deines equipment is used to support the calculation.

 Tens Ones

 4 1

 5 0

 - 3 5

|  |  |
| --- | --- |
| Tens | Ones |
|  |  |
|  50 |  |

One of the tens is regrouped as 10 ones and moved into the ones, the 5 is crossed out in the sum and replaced by 4, there is now a ten in the ones column.

|  |  |
| --- | --- |
| Tens | Ones |
|  40 | 10 |

5 of the ones are removed and 3 of the tens to leave 1 ten and 5 ones. This method is then extended to a 2 digit subtracted from a 2 digit with regrouping as shown above.

**Subtraction within 1000**

Sums are written horizontally and vertically. In a vertical sum, each column must line up carefully. Children subtract the ones first, then the tens, then the hundreds. Methods are taught starting with simple subtraction and no regrouping, then regrouping of the tens and ones, then with regrouping of the hundreds and tens, then regrouping of hundreds, tens and ones and so on until all possibilities have been practiced. Children are also given word problems and encouraged to set out sums vertically as they’ve been taught.

 1 13 1

241 – 173 = 2 4 1

 - 1 7 3

 6 8

**Progression through calculations for multiplication**

**Nursery and Reception**

Children will experience equal groups of objects and will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups. They also learn to recognise, make and describe patterns in their play activities.

 

**Year 1 and 2**

**Oral and mental work:**

Children learn to count in 2’s, 5’s and 10’s and are encouraged to identify other patterns in numbers. Extend to counting in 3’s and 4’s.

Sums are written that repeatedly add the same number and they shorten this to a general statement.

2 + 2 + 2 + 2 = …………….. 4 twos =

They then begin to write equivalent addition and multiplication sentences.

3 + 3 + 3 = 9

3 x 3 = 9

Repeated addition can be shown easily on a number line:

5 x 3 = 5 + 5 + 5

5

5

5

 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

 on a bead bar and with Numicon:

5 x 3 = 5 + 5 + 5

5

5

5

Practical tasks are done where children can build an array showing a multiplication fact and also it’s commutativity.

 4 x 2 = 8

 2 x 4 = 8

Commutativity can also be shown on a number line.

3 x 5 has the same answer as 5 x 3

5

5

5

 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

3

3

3

3

3

Pictures of groups of objects are used to write multiplication sentences.

 3 + 3 = 6

 2 x 3 = 6

Children use skip counting for multiplying by 2, 3, 4, 5 and 10 and they write the sums horizontally. 3 x 4 = 9 x 4 = etc.

Children also use dot paper to help them calculate multiples of numbers.

 2 x 4 = 8

Children multiply by ten using skip counting and dot paper. They also see how it is linked to multiplying by 1.

**Using models**

Models of multiplication problems enable children to see how to calculate from a word problem.

Ruby has 3 baskets of fruit.

There are 5 fruits in each basket.

How many fruits does she have altogether?

 5

 ?

3 x 5 = 15

**Progression through calculations for Division**

**Nursery and Reception**

Children will understand equal groups and share items out in play and problem solving. For example with a tea set ‘are there enough plates?’ or pizza sharing ‘how many can have a piece?’ They will count in 2s and 10s and later in 5s.



**Year 1 and 2**

**Oral and mental work:**

Counting in multiples of 2, 5 and 10 and later extend to 3’s and 4’s. Children do practical tasks involving sharing out objects into equal groups and recording results.

**Written methods:**

Pictures of objects need to be shared out equally and children fill in the missing numbers in a division story to show they understand how to share out equally. They also put things into groups so that they have the same number in each group. The pictures show objects arranged in ways that encourage children to see patterns that they can easily associate with equal groups.



  There are 2 cakes, how many people

 can have 2 cakes each?



Later they are introduced to the division sign and use a story to make a division sentence.

Divide 12 cakes into groups of 4



12 ÷ 3 =

Children are also shown repeated subtraction using a number line

12 ÷ 3 = 4

 0 1 2 3 4 5 6 7 8 9 10 11 12

 3 3 3 3

The bead bar will help children with interpreting division calculations such as 10 ÷ 5 as ‘how many 5s make 10?’

**Symbols are used to stand for unknown numbers to complete equations using inverse operations**

**÷ = Signs and missing numbers with appropriate sized numbers**

□ ÷ 2 = 4 20 ÷ △ = 4 □ ÷ △ = 4

**Using models**

Models of division problems enable children to see how to calculate from a word problem.

David has 12 teddy bears.

He divides the teddies equally between 4 children

How many teddies does each child have?

 ?

 12

12 ÷ 4 =