Progression in Calculations Policy

Newcomen Primary School

Reviewed September 2018

Written by

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Notes

- This is an agreed policy which should be implemented by all staff with immediate effect.
- Alterations may be made in the case of children with Special Educational Needs, Gifted and Talented, and at the discretion of the staff working within that year group.

Addition

Foundation Stage

- Emphasis on the use of appropriate mathematical vocabulary in all situations.
- Practical work, counting and use of variety of resources, such as fingers, counting bears, tally, scrap paper, markings as appropriate to level of the child.
- Teacher can model recording using + and = symbols where appropriate.
- Use number tracks from beginning, moving towards number lines when appropriate as part of the transition from Reception to Year 1.

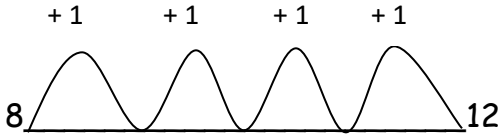
Early Learning Outcomes – Numbers

Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

Year 1

- Continue to develop points from Foundation Stage.
- Specifically teach children to write one digit in each square.
- Emphasis on the use of appropriate mathematical vocabulary in all situations.
- Begin partitioning when ready.
- Using number lines or tracks as appropriate to level of child's development, with aim towards majority of children using number lines by the end of Year 1.

Number lines 4 + 8 =



For this number line, the higher number is used as a starting point – this links with encouraging children to 'put the large number in your head and count on.' Method can be used for up to 30 if appropriate.

Year 2

- Emphasis on the use of appropriate mathematical vocabulary in all situations.
- Begin partitioning when ready.
- Partitioning with easy numbers, recording in varied informal ways.
- Partitioning (links with place value arrow cards)

13 + 14 =

13 ⟶ 10 + 3
14 ⟶ 10 + 4
20 + 7 = 27

53 + 26 =

53 ⟶ 50 + 3
26 ⟶ 20 + 6
70 + 9 = 79

54 + 27 =

54 ⟶ 50 + 4
27 ⟶ 20 + 7
70 + 11 = 81

104 + 110 =

104 ⟶ 100 + 0 + 4
110 ⟶ 100 + 10 + 0
200 + 10 + 4 = 214

- Adding three numbers together.

14 +17 + 9 =

14 ⟶ 10 + 4
17 ⟶ 10 + 7
9 ⟶ 0 + 9
20 + 20 = 40

Key Stage 2 – Number lines to be used for subtraction, not for addition.

Year 3

- Use of appropriate mathematical vocabulary in all situations, i.e. calculation not sum. Sum means to add.
- Children to write H, T, U at top of columns to reinforce place value.
- Compact (column) method to be taught.
- Children to be shown the formal columnar addition method for up to 3 digits, including carrying the digits over.

Carrying ones to tens

237 + 516 =

H	T	U
2	3	7
+5	~~1~~ 1	6
7	5	3

368 + 429 =

H	T	U
3	6	8
+ 4	~~1~~ 2	9
7	9	7

Carrying tens to hundreds

H	T	U
5	3	4
2	~~1~~ 2	8 +
7	6	2

Year 4

- Secure understanding of compact/columnar addition.
- Children to add up to 4 digits, including carrying.
- **Cross out the 'carried over' number once it has been added on.**

Th	H	T	U
4	7	3	6
~~1~~ 1	5	~~1~~ 2	5 +
6	2	6	1

Year 5

- Continue to use compact method.
- Add with more than 4 digits using the compact method.
- Carry the tens then repeat with hundreds until calculation is complete.

TTh	Th	H	T	U
	1	4	3	2	4
	1	12	9	13	7 +
2	7	2	6	1

- Include decimals.

H	T	U	.	Tth	Hth
4	7	5	.	6	4
2	1	3	.	12	8 +
6	8	8	.	9	2

- Adding three numbers.

		5	7	4	3
	1	2	5	6	1
		1	14	18	6 +
1	8	7	9	0

Year 6

- Continue to use compact method.
- Using more than 4 digits, including carrying and ensuring the carried numbers are crossed out.

More than two numbers to be added

35 + 62 + 24 =

TU
35
62
+ 24
121
1

237 + 148 + 516 =

HTU
237
148
+ 516
901
12

More than 4 digits to be added and carried

TTh	Th	H	T	U	
2	5	3	6	6	
1	7	8	5	7	+
4	3	2	2	3	

Subtraction

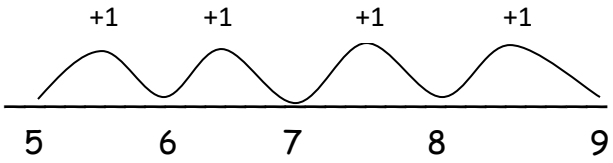
Foundation Stage

- Emphasis on the use of appropriate mathematical vocabulary in all situations.
- Practical work, counting and use of variety of resources, such as fingers, counting bears, tally, scrap paper, markings as appropriate to level of the child.
- Singing number songs such as Ten Green Bottles and number rhymes.
- Teacher can model recording using - and = symbols where appropriate.
- Use number tracks from beginning, moving towards number lines when appropriate as part of the transition from Reception to Year 1.
- Early Learning Outcomes – Numbers
  Children count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

Year 1

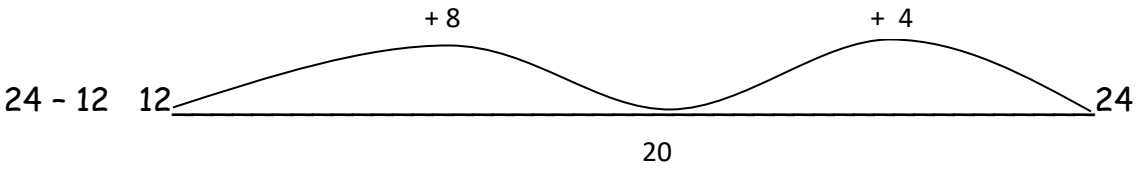
- Emphasis on the use of appropriate practical apparatus/situations to develop understanding of 'the difference between two numbers' and 'take away.' Children to have access to apparatus and display of vocabulary at all times.
- Use a number line to count on, as a visual method of finding the difference.
- Subtraction by counting on.
- Using number lines or tracks as appropriate to level of child's development, with aim towards majority of children using number lines by the end of Year 1.
- Use method to solve problems.
- Children should be able to subtract one-digit and two-digit numbers to 20, including zero, represent and use number bonds and related subtraction facts within 20, solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = □ - 9.

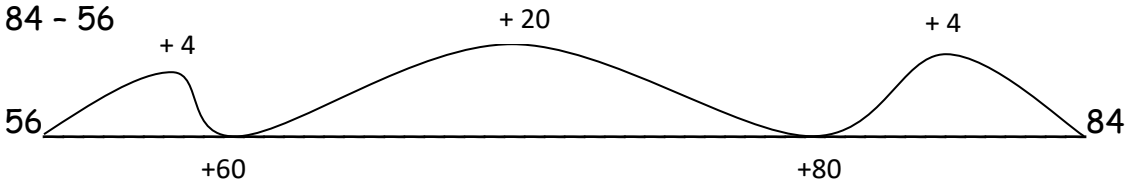
  i.e. 9 – 5 = 4



Year 2

- Continue to develop understanding using practical apparatus.
- No counting back.
- Subtraction by counting on using a number line.
- Even in subtraction and counting on, empty number line must still move from left to right.





= 4 + 20 + 4 = a difference of 28

Year 3

- Teach the column method to subtract up to 3 digits, including the use of decomposition.
- Exchange method to be used to solve subtraction calculations. Numbers to be crossed out and decreased, then carried over to the next column.
- Children must be able to make links between vertical, horizontal and word calculations, i.e. 436 – 217 as calculation, then as column subtraction:

H	T	U
4	$^{2}\cancel{3}$	$^{1}6$
2	1	7 –
2	1	9

Year 4

- Extend the column method to subtract up to 4 digits, including the use of decomposition.

Th	H	T	U
4	6	$^{3}\cancel{4}$	$^{1}7$
1	1	2	8 –
3	5	1	9

Year 5

- Subtract with more than 4 digits using column subtraction and decomposition.

Th	H	T	U
5	6	$^{3}\cancel{4}$	$^{1}7$
3	1	2	8 -
2	5	1	9

- Subtraction involving decimals.

H	T	U	.	Tth	Hth
4	7	1	.	8$\cancel{7}$	$^{1}3$
1	2	0	.	2	9 -
3	5	1	.	5	4

Year 6

- Continue to develop an efficient method of subtraction for both larger and smaller numbers that can be applied generally.
- Teach the count on method; 7000 – 5890 =
- Continue to use column method, including zeroes.

TTh	Th	H	T	U
5	$^{6}\cancel{7}$	$^{2}\cancel{3}$	$^{3}\cancel{4}$	$^{1}\cancel{2}$
3	2	5	3	5 -
2	4	8	0	7

Multiplication

Foundation Stage and Year 1

- Emphasis on the use of appropriate mathematical vocabulary in all situations.
- Practical work, grouping objects and use of variety of resources within areas of learning.
- No recording using symbols.

- Solve practical problems that involve combining groups of 2, 5 or 10 – if appropriate to ability.
- Refer to as 'lots of.'
- Doubling (FS – simple doubling of objects such as food and numbers to 5. Y1 – doubling with numbers to 10 then 20).
- Repeated addition in Year 1.

Year 2

- Continue with repeated addition.
- Describing an array.

4 x 2 = 8

☺☺☺☺

☺☺☺☺ 2 x 4 = 8

- Introduce the multiplication symbol, linking to array.
- When confident, introduce linking the arrays with partitioning.

15 x 2 =

Use partitioning 10 x 2 = 20

5 x 2 = 10

14 x 2 =

10 x 2 = 20

4 x 2 = 8+

28

Year 3

- Teach the column method with basic numbers, using the 2, 3, 4, 5, 6 and 10 times tables, TU x U

T	U
3	6
x	6
2	1 6

Year 4

NATIONAL EXPECTATIONS – CHILDREN MUST LEARN TABLES TO 12 X 12 – NOT BEYOND – BY THE END OF YEAR 4

- Consolidate the column method, moving from TU x U to HTU x U.

Year 5

- Continue to use column method, using TU x TU, ThHTU x U and HTU x TU.
- When multiplying TU x TU, ensure the children multiply the **units** first!
- Ensure children cross out the tens, etc. when added.

```
  Th H T U
   4 7 6 3
X  4 3   1 6
-----------
  2 8 5 7 8
```

```
  T U
  4 7
X 1 8
-----
  3 7 6
1 4 7 0
-------
  8 4 6
```

```
    H T U
    5 7 1
x   4 1 6
---------
  3 4 2 6
1 5 7 1 0
---------
  9 1 3 6
```

Year 6

- As Year 5, consolidate and extend range of numbers.

  HTU x TU

  TU x TU

  ThHTU x TU

  TU x U.t

Division

All children find division the most difficult calculation, so spend more time on this topic and practice skills to consolidate learning!

Foundation Stage

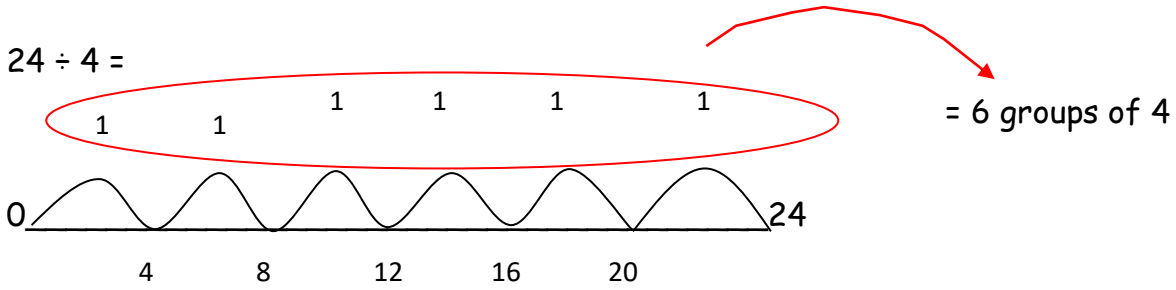
- Emphasis on the use of appropriate mathematical vocabulary in all situations.
- Practical and real life contexts, grouping objects and use of variety of resources within areas of learning.

Year 1

- Halving and doubling.
- Use of pictorial representations to show groups of.
- Introduce the concept of the division sign ÷
- Begin recording using symbols.
- Solve problems that involve sharing and grouping into equal groups.

Year 2

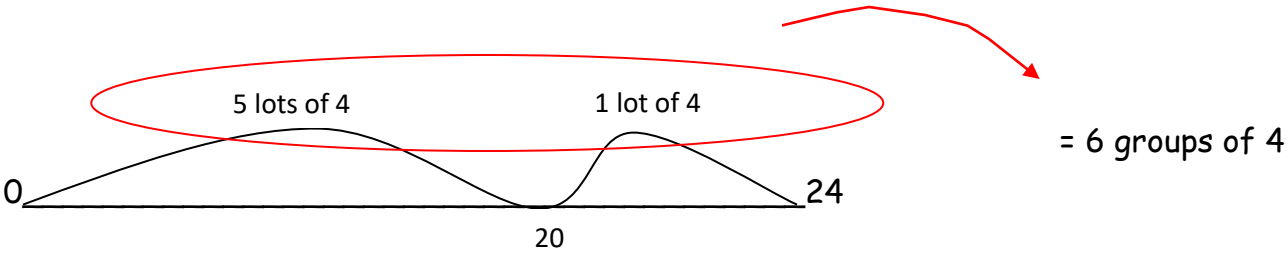
- Sharing equally, e.g. share 8 sweets between 2 people. How many do they get each?
- Grouping: How many 2's are there in 8? Here are 8 shoes, how many pairs is that?
- Practical work.
- Arrays to show groups of equal numbers.
- Use arrays to show the inverse method.
- Use of vocabulary of grouping and sharing.
- Grouping and sharing of larger numbers – only those within tables being learned by the children. Be challenging.
- Introduce the use of number lines to count on in groups. Children start at zero and 'jump up' in groups of the divisor towards the dividend ('big number').



Year 3

- Continue with number lines, using a greater range of multiplication tables and begin to use larger numbers.

Develop these number lines to use larger jumps. (in tens etc) Then move onto:



- Begin to apply number line work to an empty number line, finding remainders.
- Use informal pencil and paper methods to develop into more efficient written methods.
- No partitioning.
- Divide by 10's to make the number ten times smaller, e.g. 4 / 10 = 0.4

Year 4

- Teach the formal method of short division.
- TU÷U, HTU÷U

$$\begin{array}{r} 21 \\ 4\overline{)84} \end{array} \qquad \begin{array}{r} 32 \\ 3\overline{)96} \end{array} \qquad \begin{array}{r} 141 \\ 4\overline{)5^{1}64} \end{array}$$

Year 5

- Continue to develop efficient methods using larger numbers, comparing all methods covered so far to compare efficiency.
- Ensure children understand the process of checking their solutions by using the inverse operation.
- ThTHU ÷ U, HTU ÷ U with remainders, TU ÷ TU with remainders.

$$\begin{array}{r} 1\ 2\ 1\ 0 \\ 6\overline{)\,7\ {}^{1}2\ 6\ 0} \end{array} \qquad \begin{array}{r} 1\ 2\ 5\ 1\ r\ 1 \\ 7\overline{)\,8\ {}^{1}7\ {}^{3}5\ 8} \end{array}$$

Year 6

- Consolidate year 5 division with extended work on ThHTU ÷ TU.