



How we teach calculations:

Calculation Policy for Mathematics

March 2014

Dear Parents & Guardians,

This booklet is designed to aid your understanding of the way your child will be taught to calculate, in order to help you support your child more effectively with calculations and at home.

It is important to bear in mind that if your child is working above age stage expectations, that they will be working at the level of year groups above their own, and likewise if your child is working below age stage expectations, they may be working at the level of year groups below their own.

This new policy is in line with the recently published **National Curriculum 2014**, and gives an outline of the methods your child will be learning to add, subtract, multiply and divide with.

Lastly, we welcome and encourage you to drop in and ask your child's class teacher if any questions arise about this, or there are any methods you are unsure about, so that we can work together to help your child succeed.

Maths Subject Leaders

Tower Learning Community

About our Calculation Policy

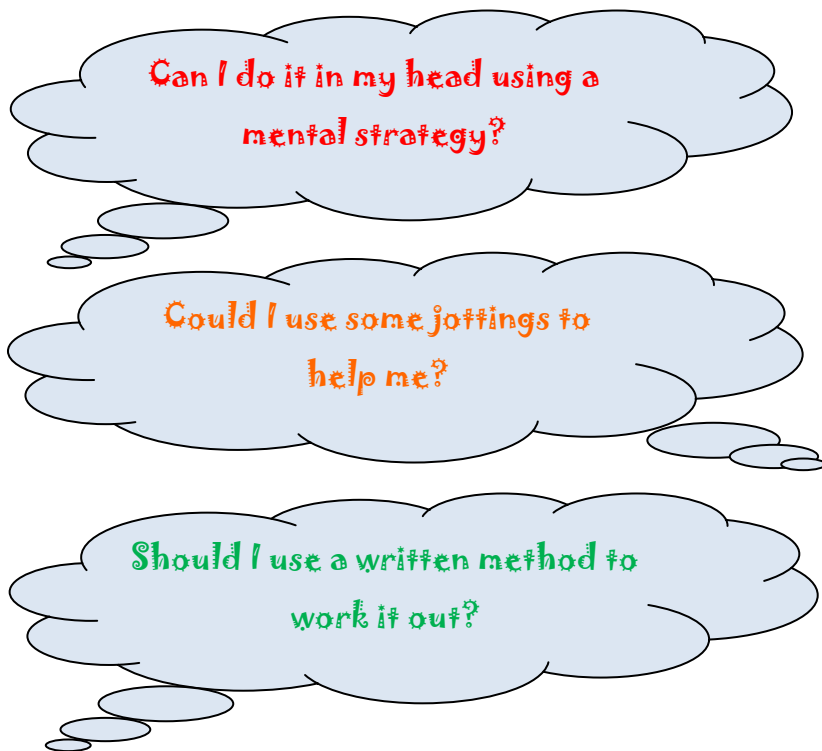
The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Please note that early learning in number and calculation in Foundation Stage follows the 'Development Matters' EYFS document, and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

Which stage is my child working at?

The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, **however pupils will be taught according to the level that they are currently working at**, being moved onto the next level as soon as they are ready, or working at a lower stage until they are secure enough to move on. This means a pupil currently achieving below the average level is likely to be working at the level of year groups below, and vice versa for pupils working at above average levels. Please feel welcome to come and ask your child's class teacher to clarify with you the stages / methods your child is working on if you are unsure.

How to start working out a calculation with children:

Children should be taught and encouraged to use the following processes in deciding what approach they will take to a calculation, to ensure they select the most appropriate method for the numbers involved:



Can I do it in my head using a mental strategy?

Could I use some jottings to help me?

Should I use a written method to work it out?

To work out a tricky calculation (KS2):

Approximate.

Calculate.

Check.

Addition

Year 1 Add with numbers up to 20

Use number tracks, practical methods and numbered number lines to add by counting on in ones, and using the addition (+) and equals (=) signs.

Encourage to start with the larger number and count on.

Examples: $8 + 3 = \square$ $15 + 4 = \square$ $5 + 3 + 1 = \square$ $\square + \square = 6$



Key vocabulary: *add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line*

Key number skills needed at Y1:

Read and write numbers to 100 in numerals, incl. 1–20 in words.
Recall bonds to 10 and 20, and addition facts within 20.
Count to and across 100.
Count in multiples of 1, 2, 5 and 10.

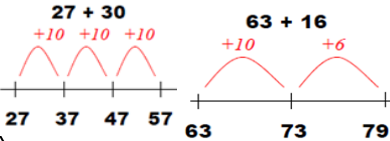


Year 2 Add with 2-digit numbers

Add 2 digit numbers and tens:

Add pairs of 2-digit numbers (add tens then units, starting with largest number):

Lead to expanded column method, only introducing examples that cross tens boundary when ready.



$$\begin{array}{r} 20 + 3 \\ + 30 + 4 \\ \hline 50 + 7 \\ \hline = 57 \end{array}$$

Key vocabulary: As before, & *sum, tens, ones, partition, addition, column, tens boundary*

Key number skills needed at Y2:

Add a 2-digit number and ones (e.g. $27 + 6$)
Add a 2-digit number and tens (e.g. $23 + 40$)
Add pairs of 2-digit numbers (e.g. $35 + 47$)
Add three one-digit numbers (e.g. $5 + 9 + 7$)
Show that adding can be done in any order.
Recall bonds to 20 and bonds of tens to 100 ($30 + 70$ etc.)
Understand the place value of 2-digit numbers (tens and units)
Compare and order numbers to 100 using $<$ $>$ and $=$ signs.
Read and write numbers to at least 100 in numerals and words.

Year 3 Add with numbers up to 3-digits

Expanded column method, adding units first.

$6 + 3 \rightarrow$
 $30 + 70 \rightarrow$
 $200 + 0 \rightarrow$

$$\begin{array}{r} 236 \\ + 73 \\ \hline 9 \\ 100 \\ 200 \\ \hline 309 \end{array}$$

Progressing to the compact column method, using 'carrying'.

$$\begin{array}{r} 236 \\ + 73 \\ \hline 309 \\ 1 \end{array}$$

Key vocabulary: As before, & *hundreds boundary, increase, vertical, 'carry', expanded, compact*

Key number skills needed at Y3:

Read and write numbers to 1000 in numerals and words.
Add 2-digit numbers mentally, incl. those exceeding 100.
Add a three-digit number and ones mentally ($175 + 8$)
Add a three-digit number and tens mentally ($249 + 50$)
Add a three-digit number and hundreds mentally ($381 + 400$)
Estimate answers to calculations, using inverse to check answers.
Recognise place value of digits in 3-digit numbers (hundreds, tens, units)

Year 4 Add numbers with up to 4 digits

Using the compact column method, adding units first, and 'carrying' numbers underneath the calculation. Pupils should also add money and measures.

e.g. $3517 + 396 = 3913$

$$\begin{array}{r} 3517 \\ + 396 \\ \hline 3913 \end{array}$$

Key vocabulary: As before & *thousands, hundreds, digits, inverse*

Key number skills needed at Y4:

Select most appropriate method: mental, jottings or written and explain why.
Recognise the place value of each digit in a four-digit number.
Round any number to the nearest 10, 100 or 1000.
Estimate and use inverse operations to check answers.
Find 1000 more or less than a given number.

Year 5 Add numbers with more than 4 digits

including money, measures and decimals with different numbers of decimal places.

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

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

$$\begin{array}{r} 19.01 \\ + 3.65 \\ \hline 22.66 \end{array}$$

Key vocabulary: As before & *decimal places, decimal point, tenths, hundredths, thousandths*

Key number skills needed at Y5:

Add numbers mentally with increasingly large numbers
Use rounding to check answers and accuracy.
Read, write, order and compare numbers to at least 1 million and determine the value of each digit.
Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000.

Year 6 Add several numbers of increasing complexity

Add 'zeros' where needed to show the place value of decimals.

$$\begin{array}{r} 23.361 \\ 9.080 \\ 59.770 \\ + 1.300 \\ \hline 93.511 \end{array}$$

$$\begin{array}{r} 81059 \\ 3668 \\ 15301 \\ + 20551 \\ \hline 120579 \end{array}$$

Key vocabulary: As before.

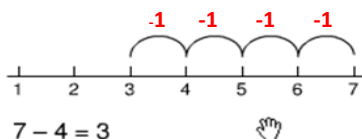
Key number skills needed at Y6:

Perform mental calculations, including with mixed operations and large numbers.
Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.
Read, write, order and compare numbers up to 10 million and determine the value of each digit.
Round any whole number to a required degree of accuracy.

Subtraction

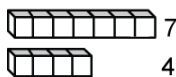
Year 1 Subtract from numbers up to 20

Count back in ones on a numbered number line to take away:



Begin to write number sentences with - and = signs.

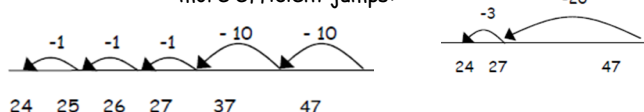
Find the 'difference between' - including 'how many more' and 'how many less' is introduced practically by counting on.



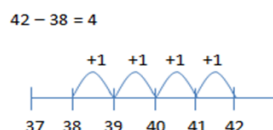
Year 2 Subtract with 2-digit numbers

Subtract by counting back, gradually using more efficient jumps:

$$47 - 23 = 24$$



Use counting on as a mental strategy for subtraction where numbers are close together e.g. 42-38:



Year 3 Subtract with 2 and 3-digit numbers

Partitioned column subtraction method.

$$89 - 35$$

$$72 - 47$$

$$\begin{array}{r} 80 + 9 \\ - 30 + 5 \\ \hline 50 + 4 \end{array}$$

$$\begin{array}{r} 60 + 12 \\ - 40 + 7 \\ \hline 20 + 5 \end{array}$$

$$\begin{array}{r} 238 - 146 = 92 \\ \begin{array}{r} 100 \\ 200 \\ - 100 + 30 + 8 \\ \hline 0 + 90 + 2 \end{array} \end{array}$$

Money: partition as £1 + 30 + 5 etc.

Year 4 Subtract with up to 4-digit numbers

Partitioned column subtraction method with 'exchanging'.

$$\begin{array}{r} 2754 - 1562 = 1192 \\ \begin{array}{r} 600 \\ 2000 + 700 + 50 + 4 \\ - 1000 + 500 + 60 + 2 \\ \hline 1000 + 100 + 90 + 2 \end{array} \end{array}$$

Year 5 Subtract with at least 4-digit numbers

and money, measures, decimals.

$$\begin{array}{r} 7768.0 \\ - 372.5 \\ \hline 6796.5 \end{array}$$

$$\begin{array}{r} 28105.6 \\ - 2128 \\ \hline 28928 \end{array}$$

Year 6 Subtract with increasingly large and more complex numbers and decimal values

$$\begin{array}{r} 15.699 \\ - 8.994 \\ \hline 6.705 \end{array}$$

$$\begin{array}{r} 15.699 \text{ kg} \\ - 36.08 \text{ kg} \\ \hline 69.339 \text{ kg} \end{array}$$

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, difference between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is...?

Note: children will begin by taking away from a group of pictures or apparatus, e.g. bead string, objects, cubes.

Key number skills needed at Y1:

Given any number, say one more or one less.

Count to and over 100, forward and back, from any number.

Represent and use subtraction facts to 20 and within 20.

Subtract with one-digit and two-digit numbers to 20, including 0.

Key vocabulary: As before, & difference, count on, strategy, partition, tens, units

Key number skills needed at Y2:

Recognise the place value of each digit in a two-digit number.

Recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100

Subtract using concrete objects, pictorial representations, 100 squares and mentally, including: a two-digit number and ones, a two-digit number and tens, and two two-digit numbers.

Show that subtraction cannot be done in any order.

Recognise and use inverse relationship between addition and subtraction, to check calculations and missing number problems.

Key vocabulary: As before, & exchange, decrease, hundreds, value, digit

Key number skills needed at Y3:

Subtract mentally: A 3-digit number and ones;

a 3-digit number and tens;

a 3-digit number and hundreds.

Estimate answers and use inverse operations to check.

Solve problems, including missing number problems.

Find 10 or 100 more or less than a given number.

Recognise the place value of each digit in a 3-digit number.

Key vocabulary: As before, & inverse

Key number skills needed at Y4:

Subtract by counting on where numbers are close together or are near to multiples of 10, 100 etc. (87-79, 202-197)

Estimate and use inverse operations to check answers.

Solve addition and subtraction 2-step problems in contexts, choosing which operations and methods to use and why.

Find 1000 more or less than a given number.

Count backwards through zero to include negative numbers.

Recognise the place value of each digit in a four-digit number.

Round any number to the nearest 10, 100 or 1000.

Key vocabulary: As before, & tenths, hundredths, decimal point, decimal

Key number skills needed at Y5:

Subtract numbers mentally with increasingly large numbers.

Use rounding and estimation to check answers to calculations.

Solve addition and subtraction multi-step problems in context, deciding which operations and best methods to use and why.

Read, write, order and compare numbers to at least 1 million and determine the value of each digit.

Count forwards or backwards in steps of 10, 100, 1000, 10,000...

Interpret negative numbers in context, counting forwards and backwards with positive and negative integers through 0.

Key vocabulary: As before.

Key number skills needed at Y6:

Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.

Read, write, order and compare numbers up to 10 million and determine the value of each digit.

Round any whole number to a required degree of accuracy.

Use negative numbers in context, calculating intervals across zero.

Multiplication

Year 1 Multiply with concrete objects, arrays and pictorial representations.

How many legs will 3 teddies have?

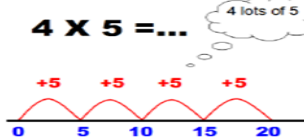
$$2 + 2 + 2 = 6$$

There are 3 sweets in one bag.
How many sweets are in 5 bags altogether?

$$3 + 3 + 3 + 3 + 3 = 15$$

Year 2 Multiply using arrays and repeated addition.

$$4 \times 5 = \dots$$



$$4 \times 5 = 20$$



$$5 \times 3 = 15$$

$$3 \times 5 = 15$$

$$5 \times 3 = 3 + 3 + 3 + 3 + 3 = 15$$

Year 3 Multiply 2-digits by a single digit number (Grid method)

Eg. $23 \times 8 = 184$

Continue to use repeated addition on number lines as above (where needed) to reinforce how to calculate multiplication facts.

X	20	3
8	160	24

$$160 + 24 = 184$$

Year 4 Multiply 2 and 3-digits by a single digit (Grid method)

Eg. $136 \times 5 = 680$

X	100	30	6
5	500	150	30

$$\begin{array}{r} 500 \\ 150 \\ + 30 \\ \hline 680 \end{array}$$

$$500 + 150 + 30 = 680$$

Year 5 Multiply up to 4-digits by 1 or 2 digits.

Short multiplication:
Start with the units.

$$\begin{array}{r} 327 \\ \times 4 \\ \hline 1308 \end{array}$$

Long multiplication
for multiplying by
2-digit numbers:

$$\begin{array}{r} 1234 \\ \times 16 \\ \hline 7404 \rightarrow (1234 \times 6) \\ 12340 \rightarrow (1234 \times 10) \\ \hline 19744 \end{array}$$

Put a 0 in units first when multiplying tens

Year 6 As Y5, and multiply decimals with up to 2d.p by a single digit.

$$\begin{array}{r} 3.19 \\ \times 8 \\ \hline 25.52 \end{array}$$

Key vocab: groups of, lots of, times, array, altogether, multiply, total, count up in...

Key skills for multiplication at Y1:

Count in 2s, 5s and 10s.

Solve 1-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Make connections between arrays, number patterns, and counting in twos, fives and tens.

Begin to understand doubling using concrete objects and pictorial representations.

Key vocabulary: As before, & multiplied by, column, row, repeated addition, commutative, sets of, equal groups, times as big as, once, twice, three times etc.

Key skills for multiplication at Y2:

Count in steps of 2, 3 and 5 from 0, and in 10s from any number.

Recall and use multiplication facts from the 2, 5 and 10 multiplication tables, incl. recognising odds and evens.

Write and calculate number statements using the $\times$ and $=$ signs.

Show that multiplication can be done in any order (commutative).

Solve a range of problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication facts.

Key vocabulary: As before, & partition, grid method, multiple, product, tens, units, value

Key skills for multiplication at Y3:

Recall and use multiplication facts for the 2, 3, 4, 5, 8 and 10 multiplication tables, and multiply multiples of ten.

Write and calculate number statements using the multiplication tables they know, incl. 2-digit $\times$ single-digit, drawing upon mental methods, and progressing to reliable written methods.

Solve multiplication problems, including missing number problems.

Develop mental strategies using commutativity (e.g. $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$)

Key vocabulary: As before, & square, factor, integer, decimal, short / long multiplication, 'carry'

Key skills for multiplication at Y4:

Count in multiples of 6, 7, 9, 25 and 1000

Recall multiplication facts for multiplication tables up to 12×12 .

Recognise place value of digits in up to 4-digit numbers

Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or multiply 3 numbers.

Use commutativity and other strategies in mental calculations

$3 \times 6 = 6 \times 3$, $2 \times 6 \times 5 = 10 \times 6$, $39 \times 7 = 30 \times 7 + 9 \times 7$.

Key vocabulary: As before, & cubed, integer, square, factor, integer, decimal, short/long multiplication, 'carry'

Key skills for multiplication at Y5:

Identify multiples and factors, using knowledge of multiplication tables to 12×12 .

Solve problems where larger numbers are decomposed into their factors.

Multiply and divide integers and decimals by 10, 100, 1000.

Recognise and use square and cube numbers and their notation.

Key vocabulary: As before, & tenths, hundredths

Key skills for multiplication at Y6:

Multiply multi-digit numbers, up to 4-digit $\times$ 2-digit using long multiplication.

Perform mental calculations with mixed operations and large numbers.

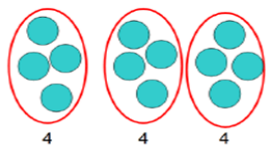
Estimate answers using round and approximation and determine levels of accuracy.

Round any integer to a required degree of accuracy.

Division

Year 1 Group and share small quantities

Using objects, diagrams and pictorial representations to solve problems about both grouping and sharing.



12 shared between 3 is 4

How many groups of 4 can be made with 12 stars? = 3



Key vocabulary: *share, share equally, one each, two each..., group, groups of, lots of, array*

Key number skills needed at Y1:

Solve one-step problems, calculating answers using concrete objects, pictorial representations, arrays with support. Through grouping and sharing small quantities, begin to understand division, and find simple fractions of objects, numbers / quantities. Make connections between arrays, number patterns, and counting in 2s, 5s and 10s.

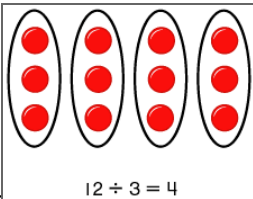
Key vocabulary: As before, & *divide, divided by, divided into, division, grouping, number line, left, left over*

Key number skills needed at Y2:

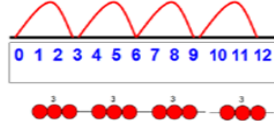
*Count in 2s, 3s and 5s from 0.
*Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, recognising odds and evens.
*Calculate statements for multiplication and division within the multiplication tables, writing them using $\times$, $\div$ and $=$ signs.
*Show that division cannot be done in any order.
*Solve problems in context using materials, arrays, repeated addition, mental methods, multiplication and division facts.

Year 2 Group and share, using the $\div$ sign

Use objects, arrays, diagrams and pictorial representations, and repeated addition on a number line.



$12 \div 3 = 4$



$12 \div 3 = 4$

Key vocabulary: As before & *inverse, short division, 'carry', remainder, multiple*

Key number skills needed at Y3:

*Recall and use multiplication / division facts for 2, 3, 4, 5, 8, 10 multiplication tables (through doubling, connect the 2, 4 and 8s).
*Write and calculate number statements for multiplication and division using multiplication tables that they know, including for 2-digit numbers times 1-digit numbers.
*Solve problems, in contexts, and including missing number problems, involving multiplication and division.
*Develop efficient mental methods, e.g. using multiplication and division facts (e.g. using $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 \times 6 = 12$) to derive related facts ($30 \times 2 = 60$, so $60 \div 3 = 20$ and $20 \times 3 = 60$).

Year 3 Divide 2-digit numbers by a single digit (no remainders in the final answer)

SHORT DIVISION:

1)
$$\begin{array}{r} 32 \\ 3 \overline{)96} \end{array}$$

Remainders carried within the calculation once confident with the method:

2)
$$\begin{array}{r} 18 \\ 4 \overline{)72} \end{array}$$

Year 4 Divide up to 3-digit numbers by a single digit (without remainders) **SHORT DIVISION:**

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

$$\begin{array}{r} 037 \\ 5 \overline{)185} \end{array}$$

Key vocabulary: As before & *divisible by, factor*

Key number skills needed at Y4:

*Recall all multiplication and division facts up to 12×12 .
*Use place value, known and derived facts to multiply and divide mentally, incl. multiplying and dividing by 10 and 100 and
*Use short division with exact answers.
*Extend mental methods to 3-digit numbers, deriving facts, for example $200 \times 3 = 600$ so $600 \div 3 = 200$
*Solve 2-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.

Year 5 Divide up to 4 digits by a single digit, including those with remainder answers.

SHORT DIVISION:

$$\begin{array}{r} 0663r5 \\ 8 \overline{)5359} \end{array}$$

Key vocabulary: As before & *quotient, prime number, prime factors, composite number (non-prime)*

Key number skills needed at Y5:

*Recall multiplication / division facts for all numbers up to 12×12 .
*Identify multiples and factors of any number.
*Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.
*Work out if numbers to 100 are prime, recalling primes to 19.
*Use multiplication and division as inverses.
*Express remainder answers as fractions, decimals or rounded numbers, as appropriate to the context of the problem.

Year 6 Divide at least 4-digit numbers by 1 or 2 digits (incl. decimal numbers / quantities)

Short division:

Long division:

$$\begin{array}{r} 0812.125 \\ 8 \overline{)6497.000} \end{array}$$

$$\begin{array}{r} 27 \\ 36 \overline{)972} \\ -720 \\ \hline 252 \\ -180 \\ \hline 72 \\ -72 \\ \hline 0 \end{array}$$

Long division is used for dividing by a 2-digit number:

Key vocabulary: As before, & *common factor*

Key number skills needed at Y6:

*Use multiplication and division facts for all numbers to 12×12 for more complex calculations.
*Identify common factors, common multiples and prime numbers
*Solve problems which require answers to be rounded to specified degrees of accuracy, and remainders to be expressed as rounded numbers, fractions or decimals.
*Use estimation to check answers to calculations.