



Progression in Calculations



**A Guide for
Parents**

Spring 2017

Mathematics
at
Stower Provost School

Primary schools have calculation policies so that they can give children a consistent and smooth progression in learning calculations from year to year. There are many similarities between each school's approach but there can also be variations. This leaflet is to give you an overview of our approach and methods .

The new 2014 National Curriculum has increased expectations and put an even stronger focus on number and calculation. By the end of their time at primary school, there is a greater expectation that children will be using more formal, 'traditional' written methods.

However, it is still vital that children have a real understanding of numbers and calculations so they are able to apply their knowledge and skills to problem solving and are not just learning to calculate 'by rote' when carrying out written methods.

We encourage children to consider the following in deciding what approach they will take to a calculation, to ensure they select the most appropriate method for the numbers involved and do not just start a long written method without thinking first!

- 1 - Can I do it in my head using a mental strategy?*
- 2 - Can I use some jottings to help me?*
- 3 - Which written method should I use?*

The following pages are intended to give a brief and hopefully parent friendly guide to the way we teach and develop the key calculation methods in school.

If anything puzzles you or you want to ask more, please pop in and we will be happy to help.

Addition

Parent's guide

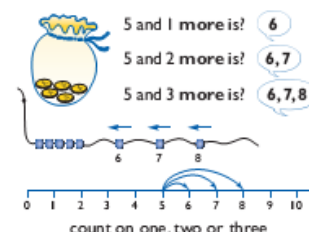


Reception and Year 1

Children learn that addition is the combining of 2 (or more) groups of objects to make a total number. A lot of their work is practical.

By the end of the reception year they should be able to add numbers with totals up to 10 and by the end of year 1 they should know by heart facts such as doubles ($3 + 3 = 6$) and pairs of numbers that make 10 ($2 + 8 = 10$). They should be able to work with totals up to 20 and write them eg $14 + 3 = 17$

Children are encouraged to count on from one number to the next.



Years 2 and 3

In Years 2 and 3 children begin to learn how to add two, 2 digit numbers progressing to two 3 digit numbers. They need to have a good understanding of place value (eg 34 is made up of 3 tens and 4 units) to be able to do this. Using practical apparatus they learn how to add in columns.

At home you can draw squares, lines and dots to represent the 100, 10 and unit base 10 blocks that we use in school. When they are ready they learn to use an 'expanded column method' to add before moving on to the 'standard compact method'.

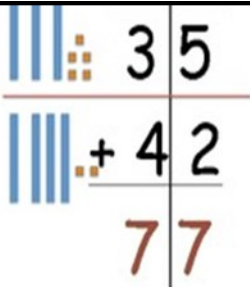
To begin with we control the numbers we give them to add, so that the total of any column is 9 or less. When they are ready we teach them how to 'carry'.



Years 4, 5 and 6

In Years 4, 5 and 6 children develop their skills and efficiency in adding using the standard column method with increasingly more complex numbers.

The main steps



1 First step
Children work practically -

■ = ten ■ = 1

Keep the totals of columns to 9 or less

2 Expanded column method

Always start by adding the units, then tens etc.

If the total is more than 9 in any column write the numbers in the correct column.

When adding the tens we say 5 tens add 7 tens rather than fifty add eighty.

When the total of tens is more than 100 watch out they don't write 111 or 112 etc. Remind them there are 12 tens which is 120. At school we say multiples of ten always have a 0 in the units column.

Example of expanded column addition.

	H	T	U
256		2	56
+ 73		7	3
			9
	1	2	0
+ 200	2	0	0
	3	2	9

3 Standard column method

When children are secure with the expanded method we show them the standard method.

We go step by step so they learn to carry the units before they learn to carry the tens.

As they progress they learn to add more than 2 numbers, numbers with different numbers of digits and decimal numbers.

The most common errors are from not adding in the carried

numbers and not putting the numbers in the correct columns.

Examples of standard column method

£	2	3	5	9		2	3	4	8	1
+ £		7	5	5			1	3	6	2
	3	1	1	4		2	4	8	4	3
	1	1	1						1	

'carry' under the line

	19.01	+ 3.65	+ 0.7
	T	U	t h
	1	9	0 1
		3	6 5
		0	7 0
	2	3	3 6
	1		

↓ add in the zero

Subtraction

Parent's Guide

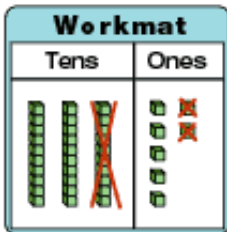
Reception and Year 1

Children learn that subtraction is taking away. A lot of their work is practical. They start by working with numbers up to 10 and build up to taking away numbers within 20 (17 - 6). They are encouraged to count back from one number to the next. By the end of year 1 they should be remembering some subtraction facts.

Children also learn that subtraction is finding the difference between 2 numbers and link this to how many more and how many less.

They learn to match up what is the same and know that what is left is the difference.

$$9 - 6 = 3$$



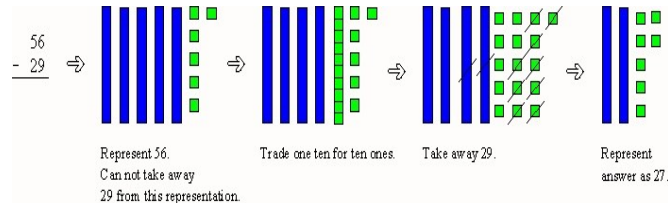
Years 2 and 3

In Years 2 and 3 children begin to learn how to subtract two, 2 digit numbers progressing to two 3 digit numbers. They need to have a good understanding of place value (eg 34 is made up of 3 tens and 4 units) to be able to do this. Using practical apparatus they learn how to subtract in columns.

At home you can draw squares, lines and dots to represent the 100, 10 and unit base 10 blocks that we use in school.

To begin with we control the numbers we give them so there is no need to 'exchange' or 'borrow' from a number in another column.

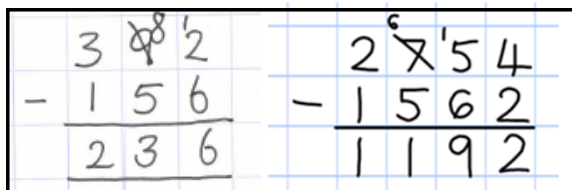
Tens	Ones
3	7
1	2
2	5



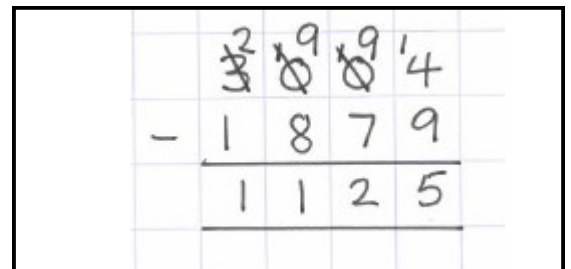
Years 4, 5 and 6

In Year 4, 5 and 6 children develop their skills and efficiency in subtracting using the standard column method with increasingly more complex numbers.

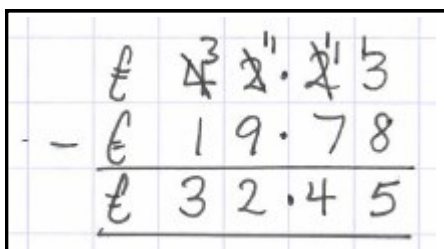
Examples of standard column method — known as decomposition



Say '9 tens take away 5 tens rather than ninety take away fifty' etc.



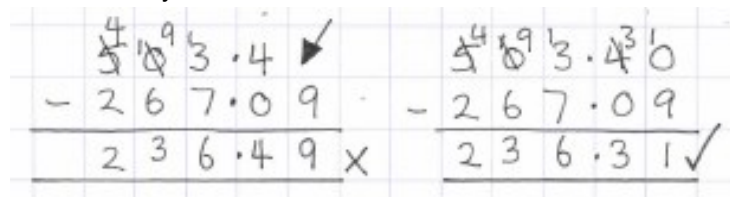
Remind children they can't 'borrow from the thousands and give it straight to the units'. They have to be systematic and exchange column by column.



The decimal point does not have a column it goes on the line.

503.4—267.09

Children need to remember to add the 'missing 0' to the first number or they make this mistake.



Multiplication

X

Parent's Guide

Reception and Year 1

Children start by learning number rhymes and to count in steps of 2 then 10 and finally 5. In Year 1, they begin to link repeated addition to multiplication by making groups of the same number of objects. They learn about double numbers eg double 4 is 8.



3 groups of 2 makes 6.

Years 2 and 3

Children learn to put groups of objects into ordered rows and columns. We call these arrays. Through this they learn that 3×5 is the same as 5×3 . We start by saying 3 'lots of' 5 makes 15.

The 'array' is key to helping children understand multiplication, division and fractions.

$$5 + 5 + 5 = 15$$

$$5 \times 3 = 15$$



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

$$3 \times 5 = 15$$

Years 3,4,5 and 6

The array is further developed to show children how to multiply bigger numbers eg 23×8 . Initially, working practically they learn how to split a 2 digit number and then multiply it by a 1 digit number. We call this the 'grid method'. From here we show how to extend this grid to multiply two, 2 digit numbers eg 34×53 . Most children then learn how to multiply using the standard method, however some children prefer to continue to use the grid method for multiplying two, 2 digit numbers.

Examples and progression of 'grid method'.

$$3 \times 12 = 36$$

x	10	2
3		

$$3 \times 12 = 36$$

x	10	2
3		

$$3 \times 12 = 36$$

x	10	2
3	30	6

$$42 \times 23 = 966$$

x	40	2
20	800	40
3	120	6

Examples of standard method

$$\begin{array}{r} 452 \\ \times 3 \\ \hline 1356 \end{array}$$

when multiplying tens say - 3 x 5 tens is 15 tens

carry under

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

$$\begin{array}{r} 32.7 \\ \times 4 \\ \hline 130.8 \end{array}$$

Multiplication tables.

Children start to learn their tables in Year 2. By the end of Year 2 children should know the 2,5 and 10 times tables and be able to recall any fact without having to recite the whole table. Eg $3 \times 5 = 15$, $6 \times 2 = 12$.

By the end of Year 3 children are expected to have also learnt the 3,4 and 8 times tables.

Children are expected to know all the tables up to 12×12 by the end of Year 4.

At school we will help children develop ways to learn 'tables' facts but then we expect them to practise for a few minutes every day at home to enable them to know them 'by heart'. If children know their tables well it gives them confidence and an advantage in maths.

Division

Parent's Guide



Reception and Year 1

Children learn to half, share and group objects. Much of the work is practical.

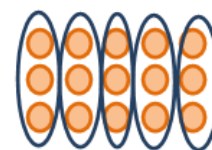
How many groups of 4 stars can I make out of 12?



Years 2 and 3

As with multiplication, children use the 'array' to learn about division. The focus changes from sharing things, eg there are 15 sweets to share between 3 children—How many will each child have? To grouping—How many groups of 3 in 15? Children learn to link tables facts to division. $15 \div 3 = 5$ because $3 \times 5 = 15$ etc.

How many groups of 3 are in 15?



Years 3, 4, 5 and 6

Once children are secure in their understanding of grouping and division and have a good recall of tables facts they start to learn standard **short division** using the 'bus shelter' method. It is essential that children have a good recall of tables facts to succeed with this method. There is a gradual progression in complexity of the numbers used; starting with numbers that easily divide, to examples where there is carrying and remainders, working up to being able to divide any number including numbers with decimals and knowing different ways of dealing with a remainder.

Year 6

In Year 6 we also teach children **long division**.

Examples of short (and long division)

Progression from 2 to 3 then 4 digit numbers by a 1 digit number

Step 1 No remainders in the final answer and no carrying

Step 2 No remainders but with carrying

Step 3 Trickier numbers— model how to carry remainders from one number to the next; how to deal with a 0

Step 4 With remainders

step 1

$$\begin{array}{r} 23 \\ 3 \overline{)69} \end{array}$$

step 2

$$\begin{array}{r} 134 \\ 4 \overline{)536} \end{array}$$

step 3

$$\begin{array}{r} 140 \\ 6 \overline{)840} \end{array}$$

step 4

$$\begin{array}{r} 135r3 \\ 5 \overline{)678} \end{array}$$

Remainders as fractions and decimals

$574 \div 15$ becomes

$$\begin{array}{r} 38 \\ 15 \overline{)574} \end{array}$$

Answer: $38 \frac{4}{15}$

$511 \div 35$ becomes

$$\begin{array}{r} 14.6 \\ 35 \overline{)511.0} \end{array}$$

Answer: 14.6

Long division

$$\begin{array}{r} 16 \\ 23 \overline{)368} \end{array}$$

List of multiples to support

23
46
69
92
115
138

Mental Methods and Recall of Number Facts

Although it is vital that children can calculate using written methods they will be hindered and lose confidence if they do not have a secure and quick recall of key number facts including 'tables'.

At school we help our children to develop ways that will support them to learn the key number bonds and tables. If the children can work on these at home for a couple of minutes each day it really makes a difference.

A summary of the basic order of learning these facts is:

- pairs of numbers that make 10 exactly eg $4 + 6$
- double numbers up to $5 + 5$
- all addition and subtraction facts within 10 eg $2 + 7$ or $9 - 5$
- counting in 2s, 10s and 5s.
- Addition and subtraction facts with in 20 eg $13 + 6$ or $17 - 12$

These addition and subtraction facts should be known by the end of Year 2

Multiplication Tables

- Year 2 - 2 10 5
- Year 3 - 3 4 8
- Year 4 - 6 7 9 11 12 square numbers e.g. 9×9

The new curriculum now expects that children will know their all their tables to 12x12 'by heart' by the end of Year 4.

This means not just reciting the table but being able to recall any fact when needed

Eg 6×8 , $72 \div 12$

Children will continue to revisit and extend tables knowledge in Years 5 and 6 eg 30×4 , 90×50 , $1/4$ of 36

Ways to support your child to practise tables.

- Recite them in order.
- Question and answer—you call out the table and the child says or writes the answer.
- Practise writing the tables and saying them as they write them.
- Simple pairs games made from rectangular bits of paper, like playing cards.
Set 1 numbered 1—12 and the other set numbered with the multiples of the table, eg 4, 8, 12, 16 etc. The children then spread out one set of cards and match them up with the other set as they say the tables.
- There are also many websites with interactive games.

Useful Websites

<http://resources.woodlands-junior.kent.sch.uk/maths/timestable/interactive.htm> - links to lots of games

www.maths-games.org/times-tables-games.html

www.teachingtables.co.uk/

www.topmarks.co.uk/maths-games/7-11-years/multiplication-and-division

www.crickweb.co.uk/ks2numeracy-multiplication.html

www.nessy.com/tablesofdoom/

www.mathsisfun.com/timestable.html