Trinity and St.Michael's

Visual Calculation Policy

2021-2022

"Don't withhold good from someone who deserves it, when it is in your power to do so."
Proverbs 3 Verse 27

Do everything in

1 Corinthians 16:13-14

Do everything in

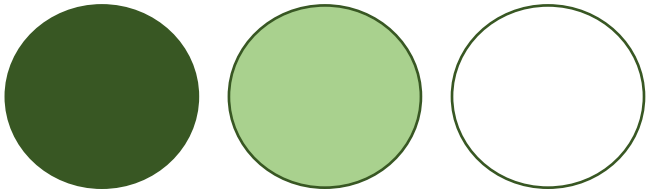
1 Corinthians 16:13-14

Introduction

This document briefly outlines the methods used in the four rules of calculation. The methods are put into Key Stages. However, it is at the teacher's discretion how and when children move from one method to another. Teachers may find that children can move quickly to more abstract concepts lower down the school. Likewise, teachers might feel that going over and reminding children of more concrete and pictorial methods higher up the school is of importance.
This policy is a 'Visual Calculation Policy'. This means it is useful for reference for both parents and teachers but more information can be found in the full calculation policy.

It is worth noting that this document only includes the visual aid and explanation of how to work with addition, subtraction, multiplication and division. It does not go into detail as to how these are used within other topics (such as work with fractions, ratio etc.)

Addition



Do everything in

Love

1 Corinthians 16:13-14

Addition

Key Stage One

Do everything in

Love

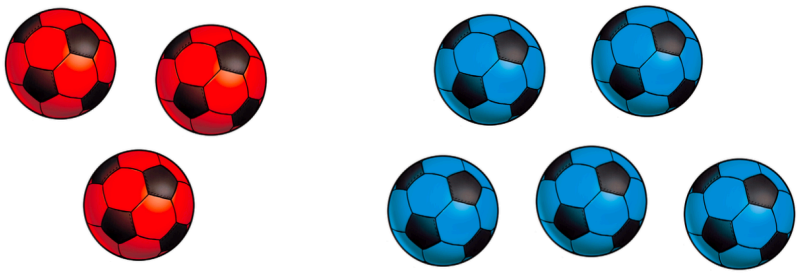
1 Corinthians 16:13-14

In Key Stage One things start 'Concrete'. This means we use physical objects to help the children learn how to add. This can be done with any objects but school has purchased special Maths equipment to help with this process. This equipment includes 'Numicon' and 'Base Ten'.

A1: Objects & Pictures

1

"In the PE cupboard there were 3 red footballs and 5 blue footballs.
How many footballs altogether? Answer: 8"

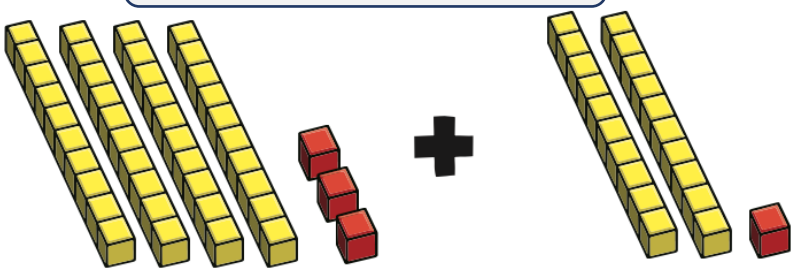


3 + 5 = 8

Numicon

9 + 3

Base Ten



43 + 21

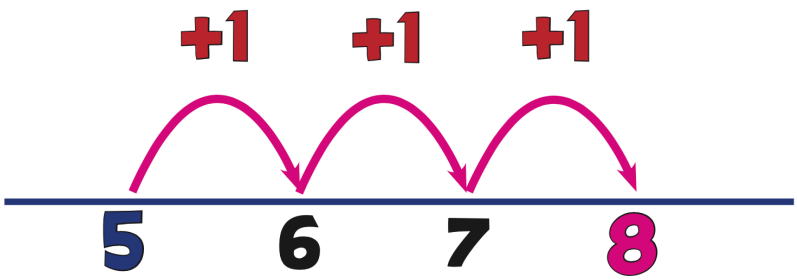
Addition

Key Stage One

Following this, children will start using their fingers to count on in jumps. This may well start by counting up one at a time. Next, children will be asked to use their ten number bonds to get to the ten above (the numbers that ends with a zero) and continue counting. When children develop a better understanding we may ask them to PARTITION a number (breaking it into tens and ones).

Counting on in ones

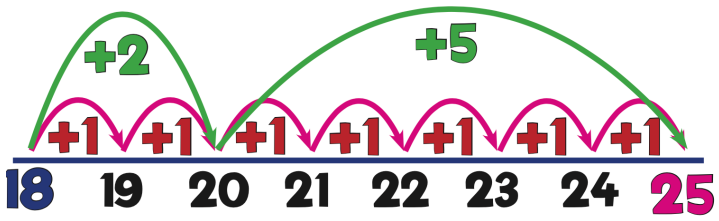
A2: Counting On
1



5 + 3 = 8

A2b: Counting On
1 Bridging 10

Getting to the ten above

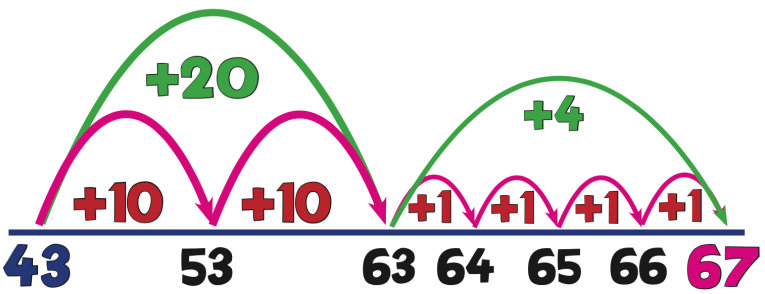


18 + 7 = 25

A3: Forwards Jump
2

43 + 24 = 67

Partitioning into TENS and ONES on Numberline



Addition

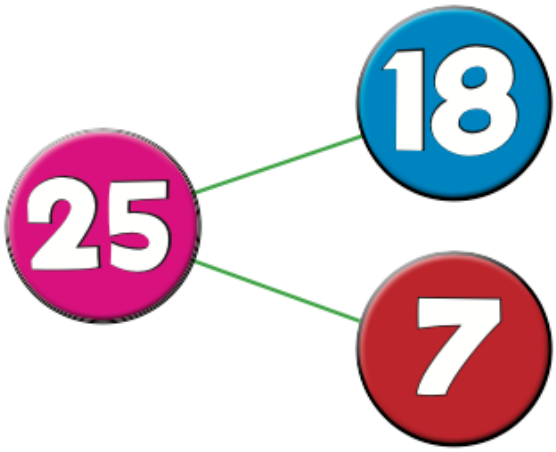
Do everything in

1 Corinthians 16:13-14

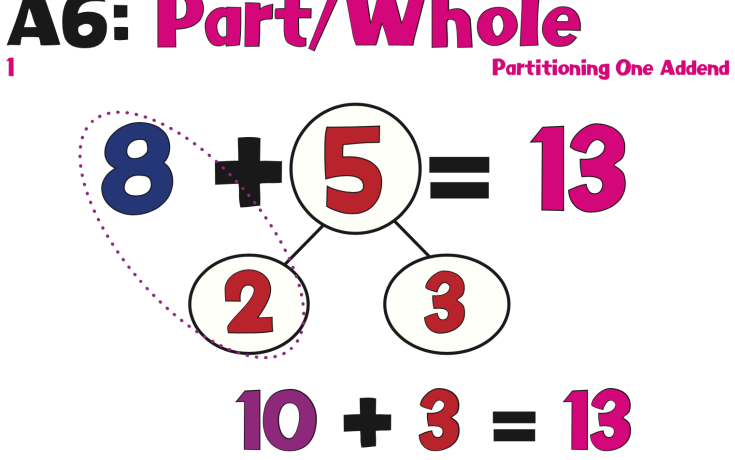
Key Stage One

The Part Whole Method allows children to visually see numbers turning into a larger number. Once we have solidified the understanding of how to partition a number this is then enforced and the children continue to look at ways we can chop numbers into smaller pieces to make them easier to deal with. This is then used through the Part Whole Partitioning method. Finally, towards the end of Key Stage One, some children may look at partitioning in a more abstract form without a numberline.

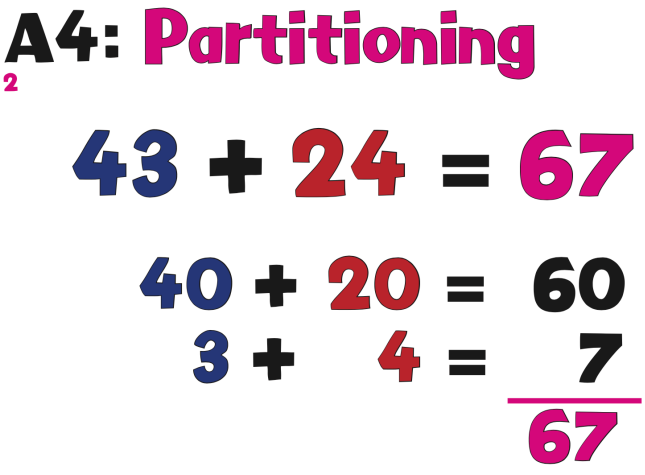
Part Whole



Part Whole Partitioning



Partitioning



Do everything in

1 Corinthians 16:13-14

Addition

Key Stage Two

Much like throughout Key Stage One, the key to addition in Key Stage Two is partitioning. The children start off the key stage by partitioning into tens and ones (eventually including hundreds). This then moves onto a more formal numberline.

Partitioning

A4c: Partitioning
2/3

86 + 48 = 134

80 + 40 = 120

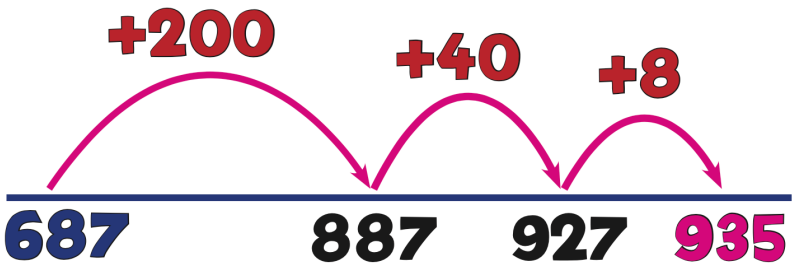
6 + 8 = 14

134

Partitioning on a numberline

A3d: Forwards Jump
3

687 + 248 = 935



Do everything in

1 Corinthians 16:13-14

Key Stage Two

By the end of Key Stage Two, all children will be comfortable with column addition. This may start with Expanded Column Addition. With this method, children are able to partition each column into ones, tens and hundreds before adding them up at the bottom. This will then lead to the more traditional column addition where numbers are carried beneath the columns.

Expanded Column Addition

A7d: Expanded Column Addition

3

100	10	1
6	8	7
+ 2	4	8
	1	5
1	2	0
8	0	0
9	3	5

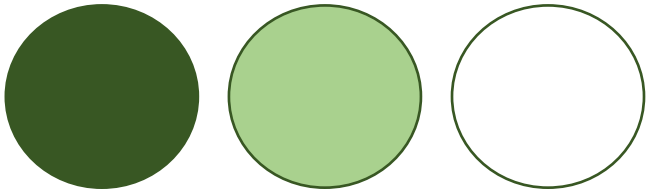
Column Addition

A8e: Column Addition

3

100	10	1
	7	3 8
+	5	2 4
1	2	6 2
1		1

Subtraction



Do everything in

1 Corinthians 16:13-14

Subtraction

Key Stage One

Do everything in

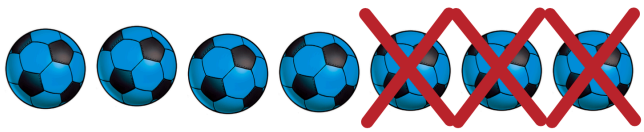
1 Corinthians 16:13-14

In Key Stage One things start 'Concrete'. This means we use physical objects to help the children learn how to add. This can be done with any objects but school has purchased special Maths equipment to help with this process. This equipment includes 'Numicon' and 'Base Ten'. It is important to note that the language used with subtraction may change so we are finding 'How many more' rather than 'take away'. In this case, the approach when working with concrete objects may change.

S1: Objects & Pictures

Removing Items (Taking Away)

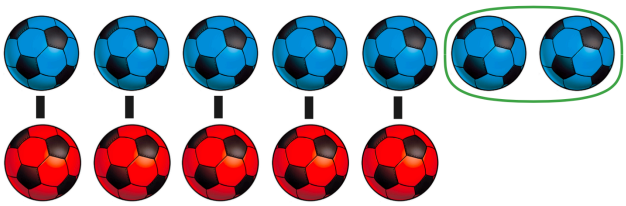
"There were 7 footballs in the PE cupboard. 3 of them were taken out. How many were left in the cupboard? Answer: 4"



7 - 3 = 4

S1a: Objects and Pictures

Comparing Sets



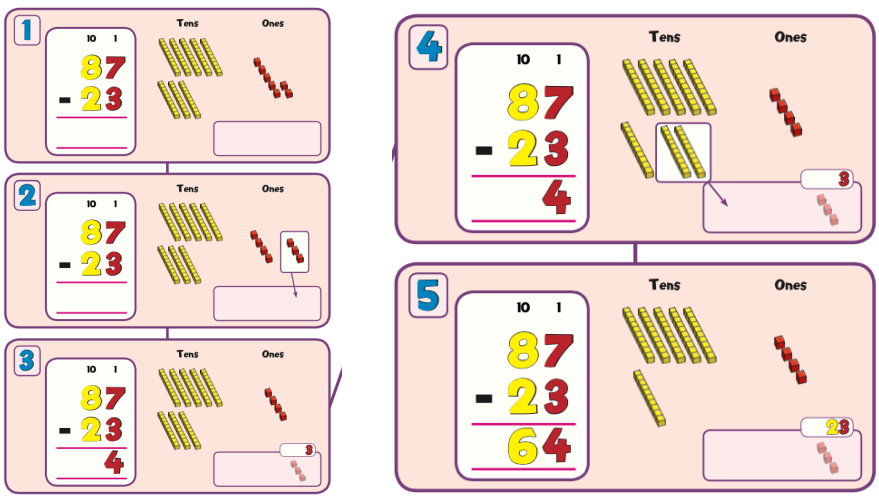
7 - 5 = 2

"There were 7 blue footballs and 5 red footballs? How many more blue footballs were there than red?" (What is the difference?)

Numicon

9 - 3

Base Ten



Do everything in

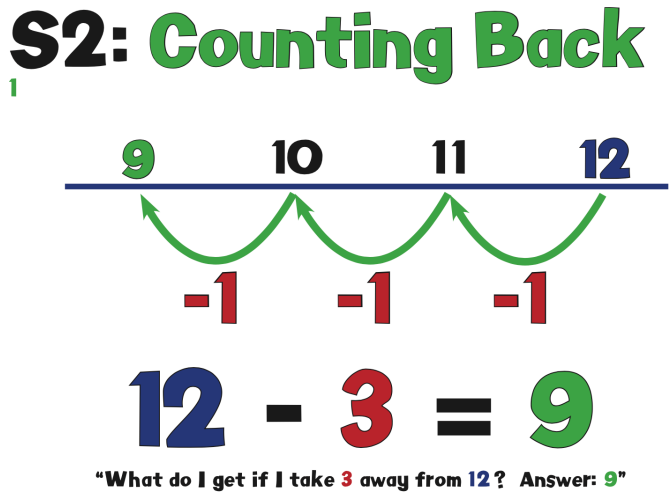
1 Corinthians 16:13-14

Subtraction

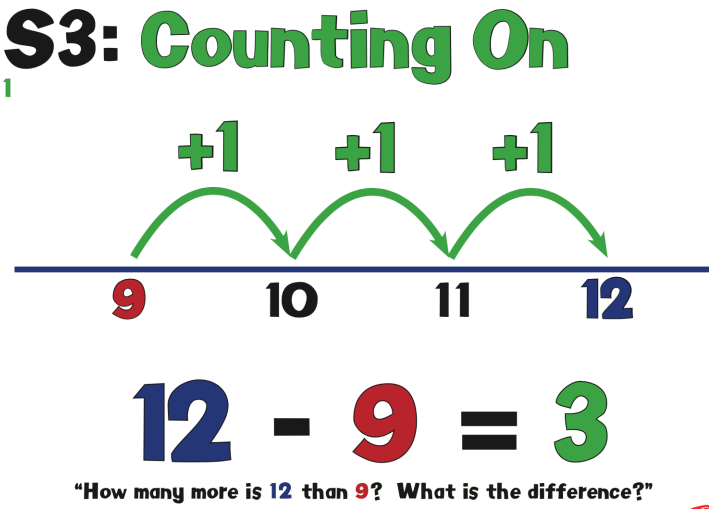
Key Stage One

In its simplest form on a numberline, children may learn about counting back in ones. Starting with the larger number on the right, the child will count back the amount that has been subtracted. Much like this concrete objects, children may learn to 'find the difference' in this instance they would write the two numbers they are subtracting from one another and count from one to the other. Both of these forms can be done with larger numbers through partitioning.

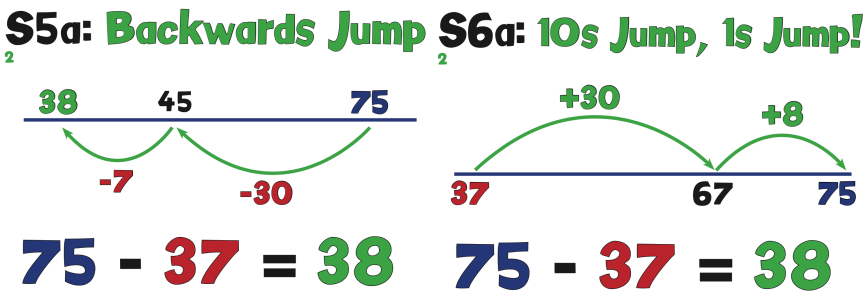
Counting back in ones



Finding the difference in ones



Partitioning into TENS and ONES on Numberline



Subtraction

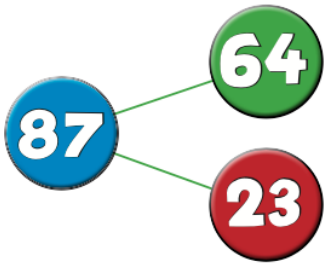
Key Stage One

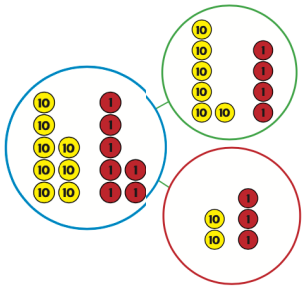
Do everything in

1 Corinthians 16:13-14

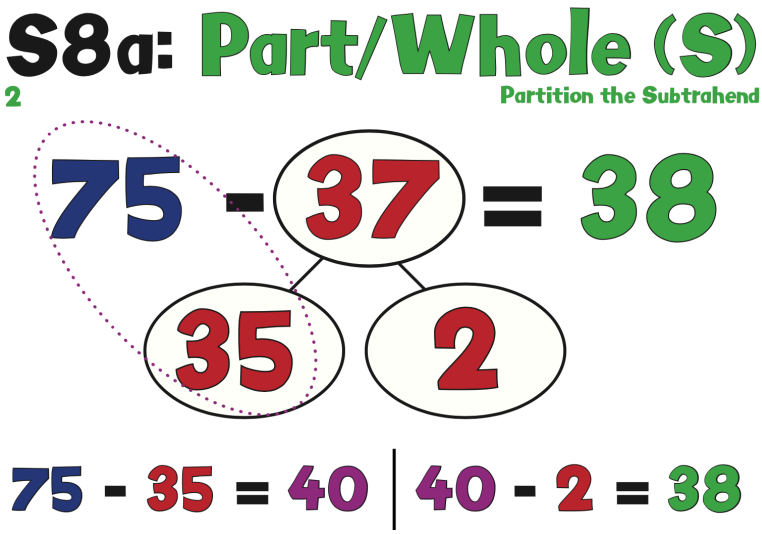
The Part Whole Method allows children to visually see numbers turning into a larger number. Once we have solidified the understanding of how to partition a number this is then enforced and the children continue to look at ways we can chop numbers into smaller pieces to make them easier to deal with. This is then used through the Part Whole Partitioning method.

Part Whole





Part Whole Partitioning



Subtraction

Do everything in

1 Corinthians 16:13-14

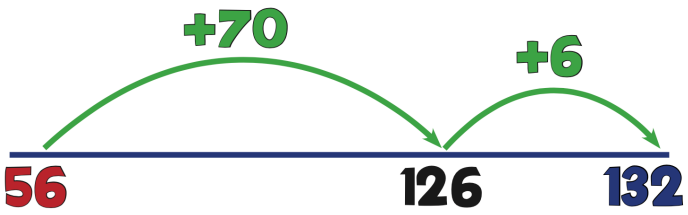
Key Stage Two

Key Stage Two begins by looking at numberlines. Children will start by counting on from the smaller amount to the larger. Children will then use their numberline to make jumps. This will take on the form of using their 10 and 100 number bonds to jump up bit by bit to the number they are subtracting from. Once children have developed that understanding of number and place value, they will look at traditional column subtraction where they will be asked to take tens and units from next door if their number is not large enough.

Numberline – Counting on

S6c: 10s Jump, 1s Jump!

3

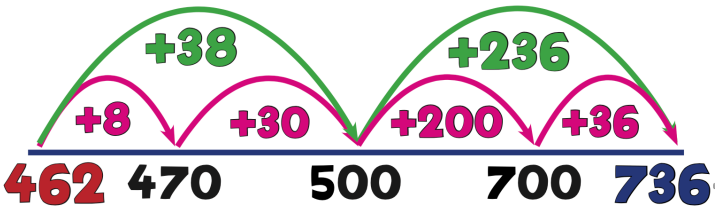


132 - 56 = 76

Numberline jumping

S7d: Big Jump!

3



736 - 462 = 274

Column Subtraction

S11a: Column Subtraction

2

10 1

$$\begin{array}{r} {}^{6}\cancel{7}^{1}5 \\ -\ 3\ 7 \\ \hline 3\ 8 \end{array}$$

Multiplication

Do everything in

1 Corinthians 16:13-14

Multiplication

Key Stage One

Do everything in

1 Corinthians 16:13-14

As with addition and subtraction, multiplication in Key Stage One begins with a more concrete method, using objects and images to to see patterns and groups. This will then begin to be applied to more traditional multiplication sums as seen below. Next, children will learn to add numbers repeatedly – first through images and then on a numberline. **It is important to note that this is how multiplication is learnt as a method, not how times tables are learnt.**

Concrete

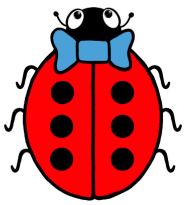
M1a: Objects and Pictures

1



Two groups of three
2 x 3

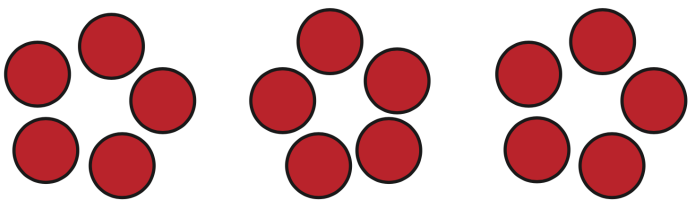
Five groups of Four
5 x 4


Repeated Addition

M2: Repeated Addition (Groups)

2

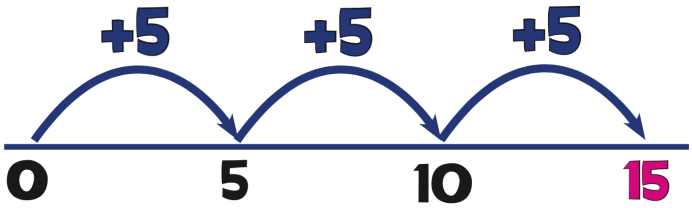


5 x 3 = 5 + 5 + 5 = 15

"5 multiplied by 3" means "5, 3 times", which gives "3 lots of 5"!

M2a: Repeated Addition (Number Line)

2



5 x 3 = 5 + 5 + 5 = 15

"5 times 3" means "5, 3 times!"

Multiplication

Key Stage One

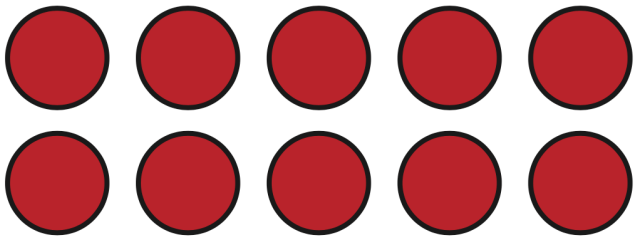
Do everything in

1 Corinthians 16:13-14

Towards the end of Key Stage One, children will begin to look at pictorial arrays. Using this, children are able to make groups of counters and find the answer to multiplication questions beyond the times tables they have learnt.

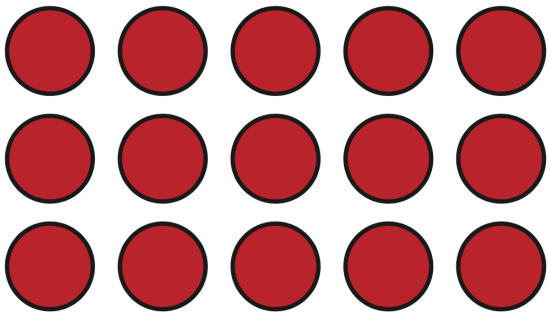
Arrays

M3: Arrays 1



"2 groups of 5 counters" or "5 groups of 2 counters" - "10 counters altogether"

M3: Arrays 2



3 x 5 = 15 or 5 x 3 = 15

Multiplication

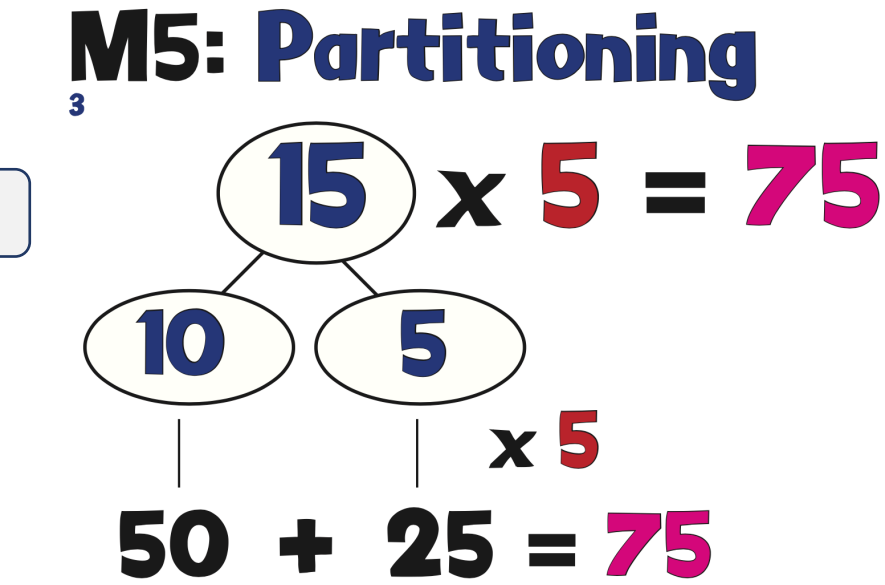
Key Stage Two

Do everything in

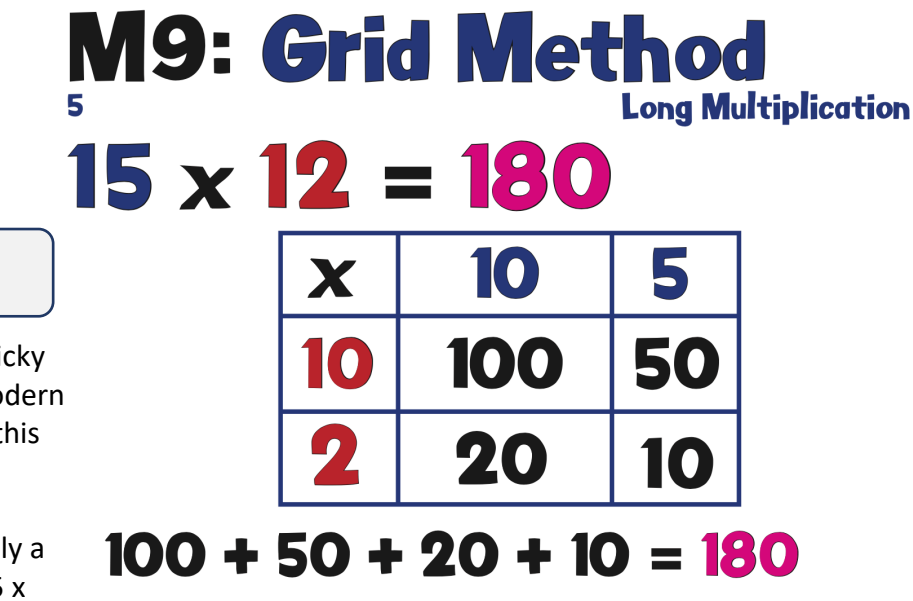
1 Corinthians 16:13-14

At Key Stage One, children will need to learnt their times tables up to 12 x 12 by the end of Year Four. If they work with numbers larger than this, they may, to start off with, begin to partition this number to make it easier to deal with. This then leads on to using the grid method where numbers can be partitioned and then added at the end to find the answer.

Partitioning



Grid Method



Grid method is often cited as a tricky one for parents as it is a more modern approach. The important part of this method is to first partition the numbers. Next, children must understand that, when we multiply a number that ends in a zero (e.g. 5 x 60) we can take away the zero to answer it before putting it back in (e.g. 5 x 6 = 30 so 5 x 60 = 300)

Multiplication

Key Stage Two

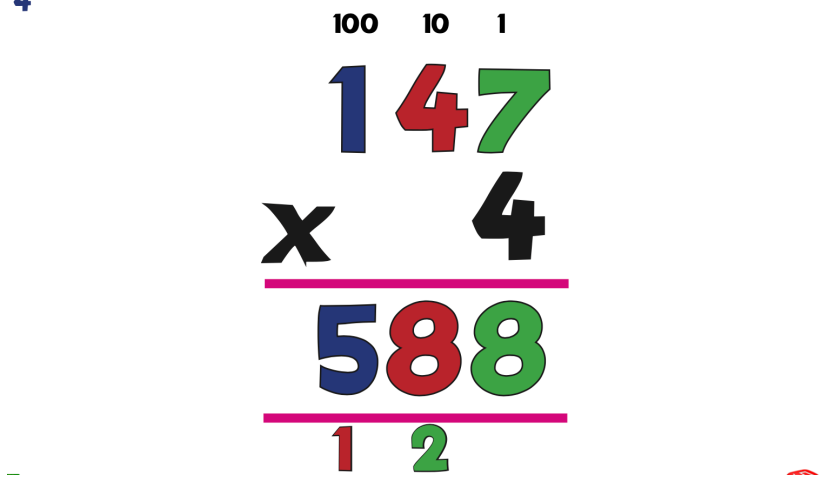
Do everything in

1 Corinthians 16:13-14

Once children have a solid understanding of how to partition larger numbers and multiply them, they will then be taught column addition. Once children start to multiply two digit numbers by two or three digit numbers they will learn long multiplication.

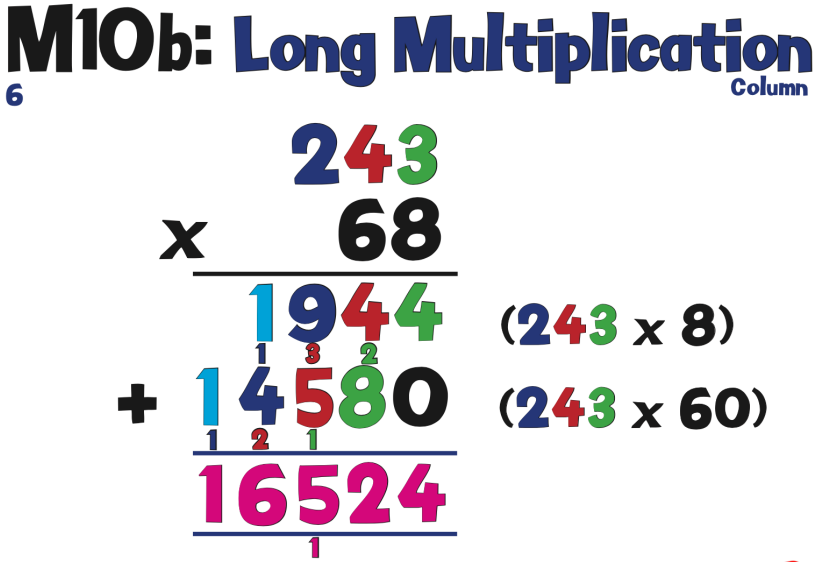
Column Multiplication

M8b: Column Multiplication

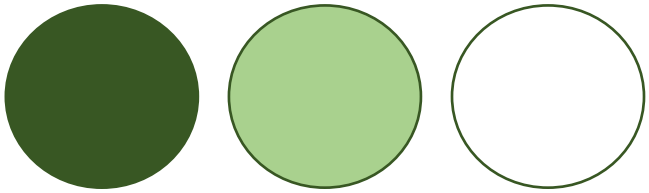


Long Multiplication

M10b: Long Multiplication



Division



Do everything in

1 Corinthians 16:13-14

Division

Key Stage One

Do everything in

1 Corinthians 16:13-14

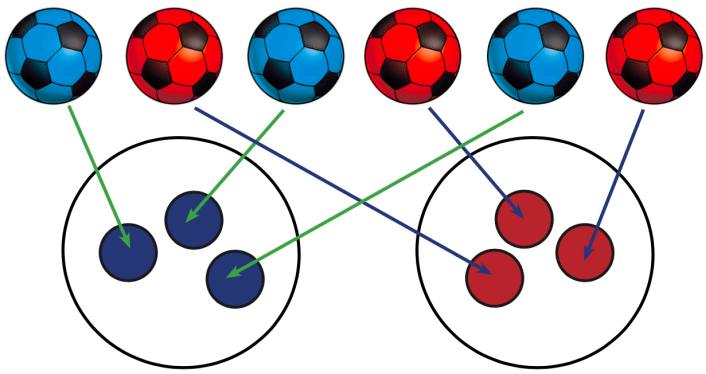
Division, as with all other areas, starts with concrete objects. Children will be asked to share these items into groups. The link with multiplication made clearer as the children go through the school. Once a concrete understanding has been achieved, children will use pictorial grouping. Children will write out circles or dots and group them by drawing around the.

Concrete

D1: Objects and Pictures

1

Sharing



"If I share 6 footballs fairly into 2 bags, how many footballs in each bag?" Answer: 3

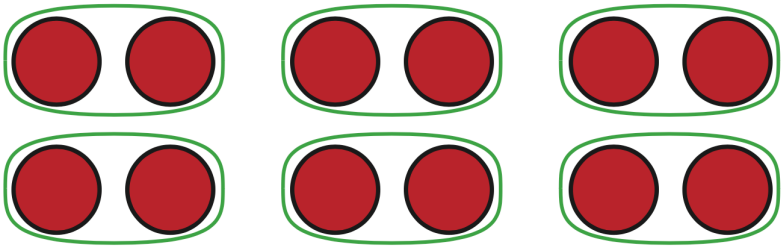
Pictorial Grouping

D4: Division as Grouping

2

12 ÷ 2 = 6

"How many groups of 2 can I fit into 12?" Answer: 6



Division

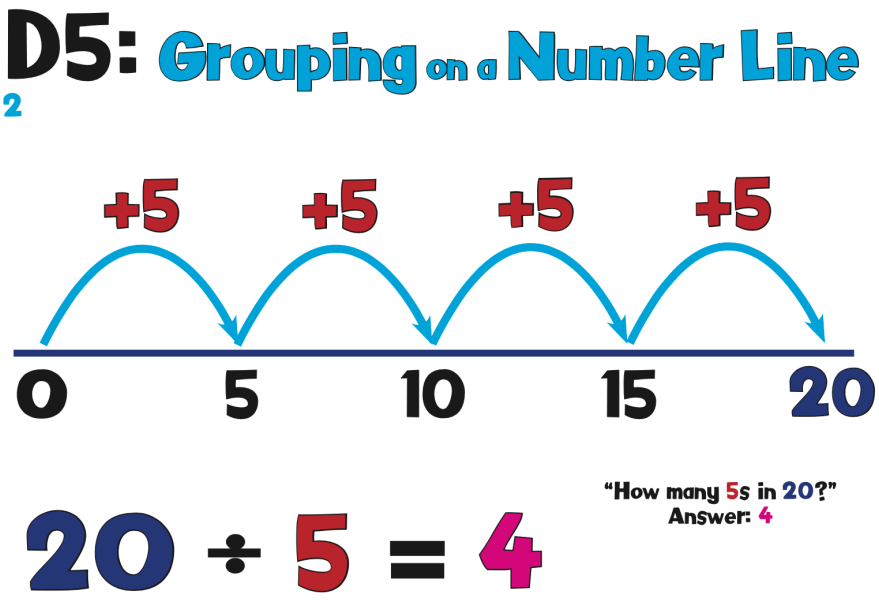
Key Stage Two

Do everything in

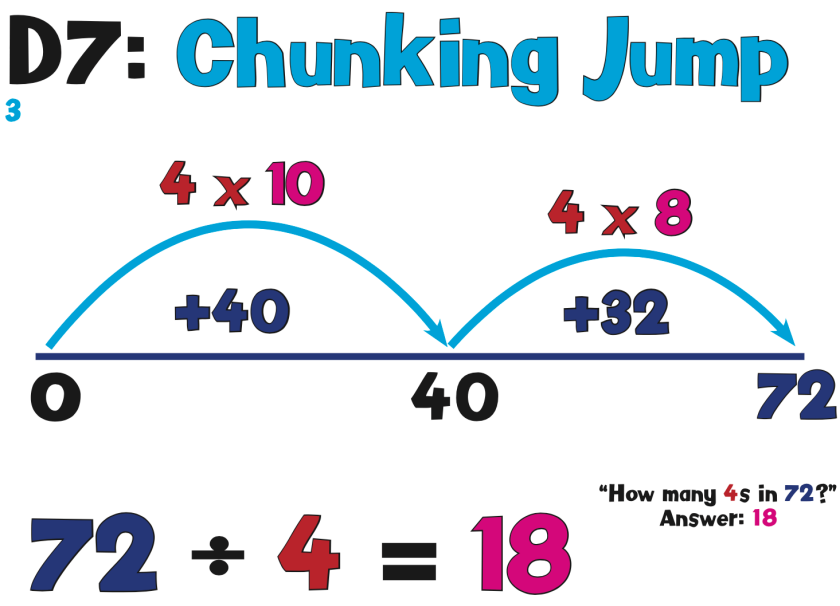
1 Corinthians 16:13-14

The next step after groupings pictorially is to use a numberline. Children will start at zero and count up using the divisor (the number they are dividing by) to the dividend (the number they are dividing - see below). If children are showing great proficiency in their use of the numberline, they may well then look at dividing a larger number and using chunks to get to the dividend. E.g. if we are dividing 72 by 4 we know that 10 x 4 is 40 and we would go from there to get to 72 (see below)

Grouping on a Numberline



Chunking Numberline



Division

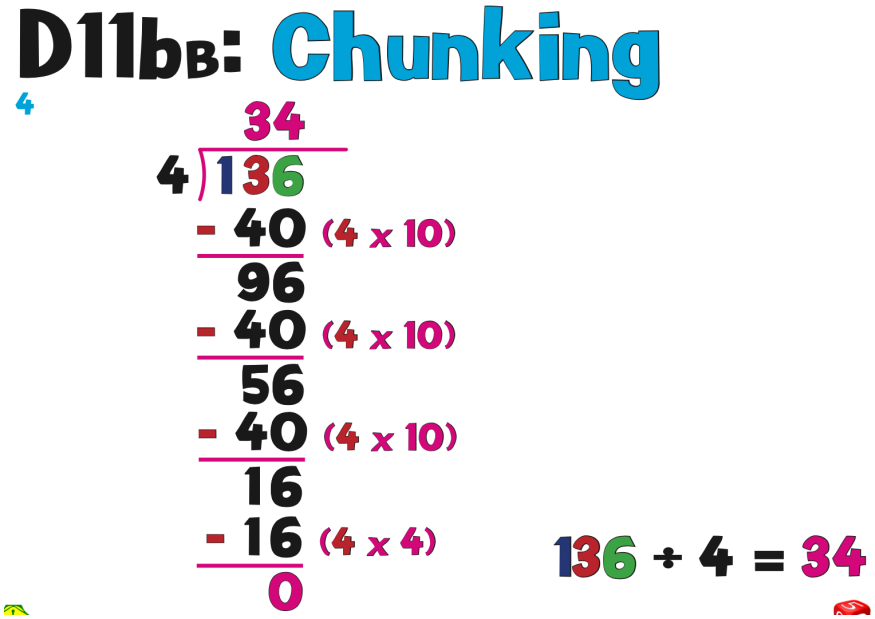
Key Stage Two

Do everything in

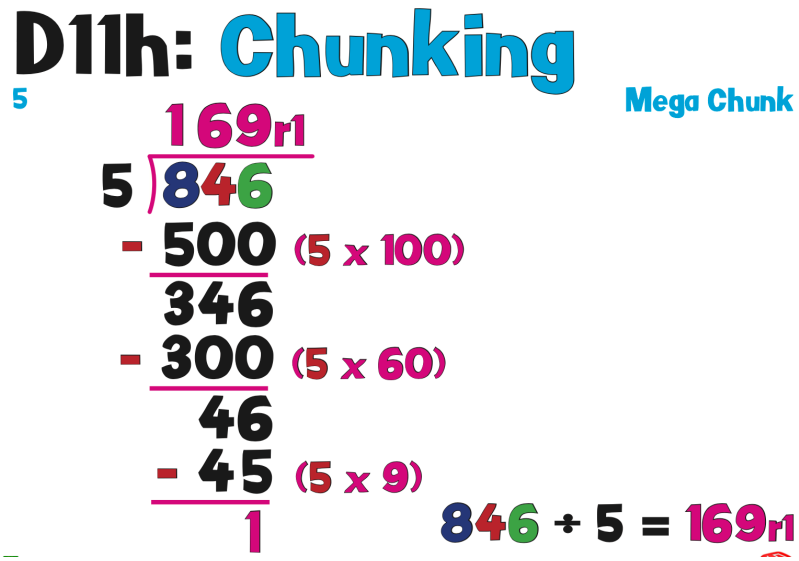
1 Corinthians 16:13-14

When we start to divide by larger numbers, we will start with chunking. Chunking is a method that emphasises the importance of understanding number and place value. We start by taking chunks of our divisor away (for example, if we are dividing by 4, we take away chunks of 10 x 4 (40) from the larger number. This way, instead of taking away four each time, we can deal with the number a lot quicker. Once we get down to a number below 40, we then deal with it like a regular division question. Finally, we add all the fours we have taken away altogether. If the number is larger, we may take away 100 of our divisor at a time (see below).

Chunking



Large Chunking



Division

Key Stage Two

Do everything in Love

1 Corinthians 16:13-14

Once we fill children have a good grasp of division being the inverse of multiplication and how we are finding how many divisors we can fit into a dividend we approach short division (otherwise known as 'the bus stop method'). Here, children see how many divisors go into each digit. Remainders are carried over from left to right. Once we deal with dividing by larger numbers (e.g. 59 as seen below), children will be asked to write this knew times table next to their working out (as seen below) before answering it like short division.

Short Division

D10g: Short Division

$5978 \div 7 = 854$

$$7\overline{)5^{5}9^{3}7^{2}8}$$
$$854$$

Long Division (short division method).

D12b: Long Division

Short Division Method

$$59\overline{)2^{2}2^{22}4^{47}2}$$
$$38$$

1 x 59 – 59
2 x 59 = 118
3 x 59 = 177
4 x.....