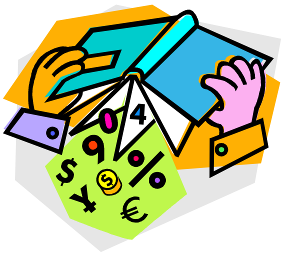
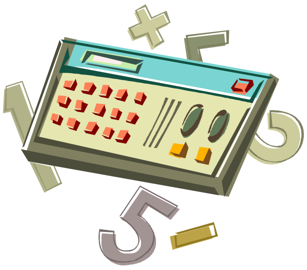
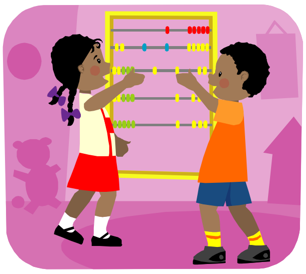
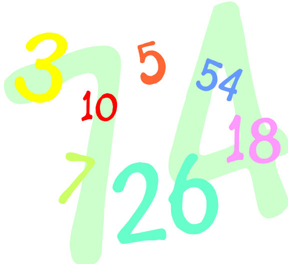





Supporting your child in Mathematics

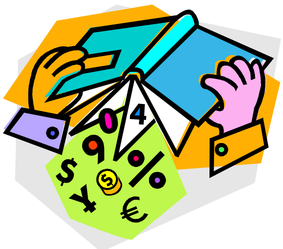
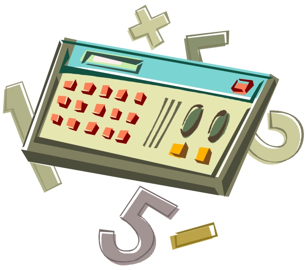
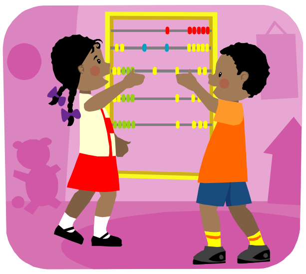
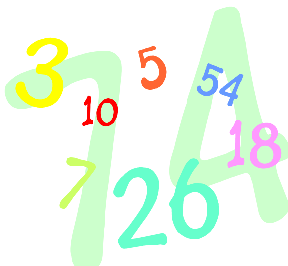
SARISBURY CHURCH OF ENGLAND JUNIOR SCHOOL

LOVE
HOPE
FORGIVENESS

A guide to Calculation Strategies for parents

Sarisbury Church of England Junior School

January 2014

Introduction

Since the introduction of the National Numeracy Strategy in 1999, there has been an ever increasing belief that children should be able to use mental maths and both informal and formal jottings in order to solve calculation problems. Teaching and learning in maths is now very interactive in its approach and there is less emphasis on learning formal methods initially, but introducing them as children's understanding grows. Children are encouraged to be able to share and choose appropriate strategies and methods to suit the question or problem they are solving. Each child will progress through a variety of strategies, at their own pace, ensuring their confidence before being introduced to more formal methods.

The objective of any calculation is to be able to solve a worded problem relating to real life experiences. Therefore, we introduce a wide variety of language that the children are likely to come across in real life situations. Understanding and interpreting this language is a key skill and is fundamental to becoming a confident mathematician.

A confident mathematician is able to not only interpret the language but also choose the most effective and efficient strategy to solve a problem.

This booklet is designed to offer guidance on the methods your child uses in class. It will help you to encourage your child as they progress through each stage of their learning.

Contents

Years 3 – 6

Years 3-6 build on the understanding of the number system and the mental calculation strategies taught in Reception to Year 2.

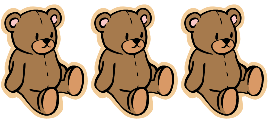
Children are all individual, as is the speed at which they develop their understanding of mathematics. It is important that we recognise the appropriate level of challenge for each child so that they can make progress and build on what they already know. Introducing a new level too quickly, before a complete understanding is reached, will lose some children's confidence. However, some children are intuitive mathematicians and will be motivated by a challenge no matter what stage of development they have reached. They will find the challenge of something they cannot immediately do exciting and motivating.

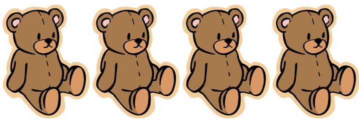
At the beginning of Year 3, and for a lot of children throughout Year 3, pupils will continue to use concrete objects and visual models and images they have been introduced to in Reception to Year 2. Some of these images continue to be used through to Year 6 to develop and support place values and decimals.

Addition

Addition calculations are supported by concrete objects and visual images initially.

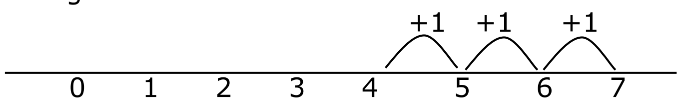
Counting up in ones





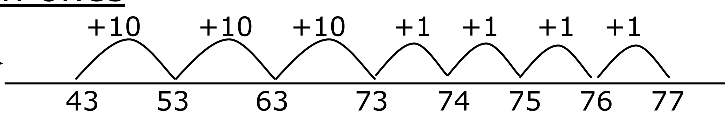
3 + 4 = 7

Using concrete objects
Beginning to start with the largest number first, using a structured number line



Counting up in tens and then ones

E.g. 43 + 34=
Using an unstructured number line



Addition calculations are initially presented horizontally.   Partitioning is a key skill, as is working from left to right.

E.g. 43 + 34 =

= (40 + 3) + (30 + 4)
= (40 + 30) + (3 + 4)
= 70 + 7
= 77

Partition the numbers into hundreds, tens and ones and then add each column

At the end of the calculation put the number back together

E.g. 362 + 29 = →

300	60	2	
	20	9	
300	80	11	300 + 90 + 1 = 391

Splitting the digits into hundreds, tens and ones

E.g. 536 + 157 = →

500 + 100 = 600
30 + 50 = 80
6 + 7 = 13 600 + 90 + 3 = 693

Vertical method

The method of approaching the calculation from right to left (adding the least significant digits first) leads into the method of 'carrying' below the line.

E.g.

```
    4 3 4
  + 5 4 7
  -------
      1 1  (4+7)
      7 0 (30+40)
    9 0 0 (400+500)
    -----
    9 8 1
```

→

```
    4 3 4
  + 5 4 7
  -------
    9 8 1
      1
```

By Year 6 children should be able to choose an appropriate method according to the numbers in the question.

E.g. 325 + 437 + 175= Children should see straight away number bonds which will help them.

325 + 175 = 500 so they need to add 500 + 437 = 937

E.g. 1398 + 4327 =

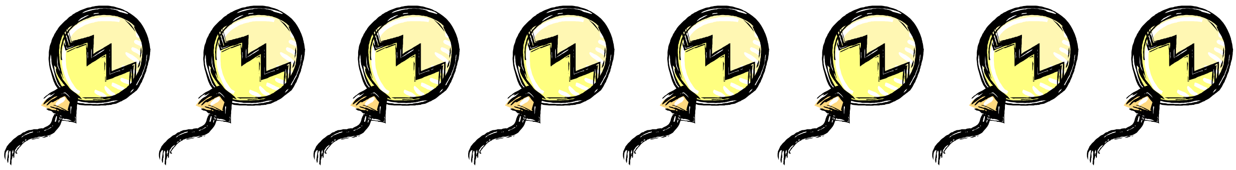
4327 + 1400 = 5727
5727 – 2 = 5725
(compensate for rounding 1398 to 1400)

By the end of Year 4, the new National Curriculum would expect most children to be confident in the use of formal addition strategies.

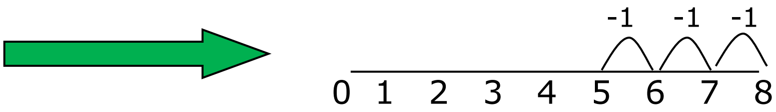
Subtraction

As with addition, calculations are supported by concrete objects and visual images initially. It is important to identify the fact that children cannot choose to start with the biggest number first as subtraction is not commutative. (It makes a difference if you take 8 from 3 rather than 3 from 8.) As in addition, subtraction calculations are initially presented horizontally to the children.

Counting backwards in steps of one



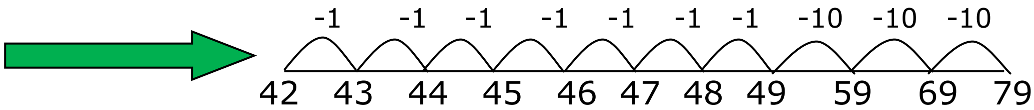
8 − 3 = 5



Using a structured number line

Counting backwards in steps of tens and ones

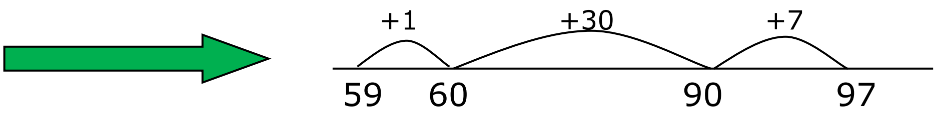
E.g. 79 − 37=



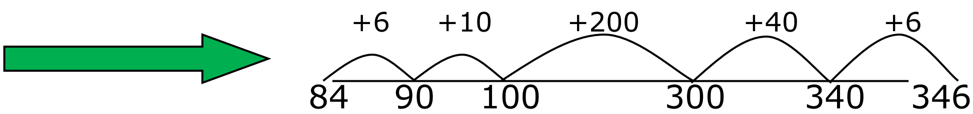
Using an unstructured number line

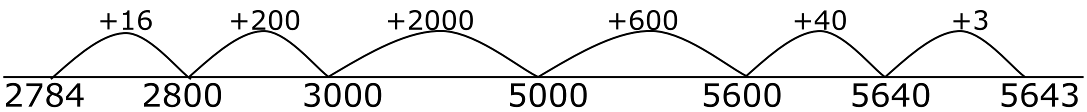
Counting up from the smaller to the larger number (finding the difference)

E.g. 97 − 59 =



E.g. 346 − 84 =





so 16+ 200+ 2000 +600 +40 +3 = 2859

Partitioning- Splitting the smallest number into its hundreds, tens and ones then subtracting

→ 36 – 10 = 26
26 – 2 = 24

moving onto:

E.g. 487 – 35 = →

	400	80	7	
-		30	5	
	400	50	2	= 452

This will lead into transferring 10 into the ones column: 'taking a ten'

E.g. 962 – 258 = →

	900	60	2
-	200	50	8

→

		50	10+	
	900	~~60~~	2	
-	200	50	8	
	700	0	4	= 704

→

		5	1
	9	~~6~~	2
-	2	5	8

Following on from this, children should be able to transfer 100 to the tens column.

E.g. 863 – 287 = →

	800	60	3
-	200	80	7

→

700	100+50	10+
~~800~~	~~60~~	3
-200	80	7
500	70	6

→

	7	15	1
	~~8~~	~~6~~	3
-	2	8	7
	5	7	6

Sometimes children need to choose the most appropriate method:

E.g. 7002 – 3994 =
Rather than solving this formally, we would hope that the children would see that 3994 is nearly 4000 and therefore this could be solved through counting on:

3994 to 4000 → 6
4000 to 7000 → 3000
7000 to 7002 → 2 so the difference is 3000 + 6 + 2 = 3008

By the end of Year 4, the new National Curriculum would expect most children to be confident in the use of formal subtraction strategies.

Multiplication

By the end of Year 3 children need to have learnt facts for the 2, 3, 4, 5 and 10 times tables and begin to know the 6 times tables. They need to be able to derive the corresponding division facts quickly. Foundations for these are laid down at the earliest stages of counting in Reception to Year 2 and multiplication is introduced in Year 2. Children do need to learn the multiplication facts for each table before moving onto the next.

At the beginning of Year 3 children need to recognise groups of a number being represented by practical resources or images.

5 lots of 2
or 2 + 2 + 2 + 2 + 2
or 2 five times
or 5 x 2
or 2 x 5

This then leads onto the children being able to recognise the way an array can be expressed.
For example 12 can be expressed as 4 groups of 3 or 3 groups of 4.
It can also be expressed as 6 multiplied twice (double 6) or 2 multiplied 6 times.

By the end of Year 4 children should know all multiplication facts up to 12 x 12.
The children should be able to recall facts within 5 seconds and be able to use them to assist with calculations quickly and efficiently. The 4 times tables is taught as double 2 times tables, 6 times tables as double 3, eight times tables as double 4; children are taught to understand and use the links between tables facts. It is important that children really understand what the numbers are, not just learn by rote.

To know what happens to a number when it is multiplied by 10.

E.g. 2 x 1 = 2 is similar to 2 x 10 = 20, but because the digit 1 is now worth one ten as opposed to one, e.g. ten times larger, we use a place holder. Therefore, the answer is also larger by a factor of 10. The children enjoy spotting similarities in the digit patterns in the calculation and can then investigate what happens when the number grows by a factor of 100 or even 1000.

The grid method

This method is generally introduced during the lower Key Stage and when the children's understanding of place value is very secure. The grid method makes organising the multiplication of larger numbers clearer and simpler.

E.g. 23 x 8 Partition 23 as (20 + 3)

X	20	3
8	160	24

So 23 x 8= 160 + 24
= 184

When solving these kinds of multiplication problems, children should be encouraged to estimate a reasonable answer first by rounding the numbers to the nearest 10.

E.g. 62 X 39
Estimate → 60 x 40 = 6 x 4 x 10 x 10 = 2400

X	30	9
60	1800	540
2	60	18

So 62 x 39 = 1800 + 540 + 60 + 18 = 2418

Then, children will begin to record in a more formal way…

62 x 39 →

```
     62
   x 39
   ----
     18  +  (9 x 2)
    540     (9 x 60)
     60     (30 x 2)
   1800     (30 x 60)
   ----
   2418
```

This method will then be able to be used confidently with larger numbers in the hundreds. Children need to have a very secure understanding of place value to move onto multiplying decimals. The partitioning method is again used and children would be expected to estimate the answer first by rounding the number to the nearest whole number:

4.92 x 3
4.92 to the nearest whole number is 5.
5 x 3 = 15

```
   4 x 3 =   1 2
0.90 x 3 =   2 . 7 0
0.02 x 3 =+  0 . 0 6
            ---------
            1 4 . 7 6
```

If children can do the 'quick grid' method above successfully, move onto:

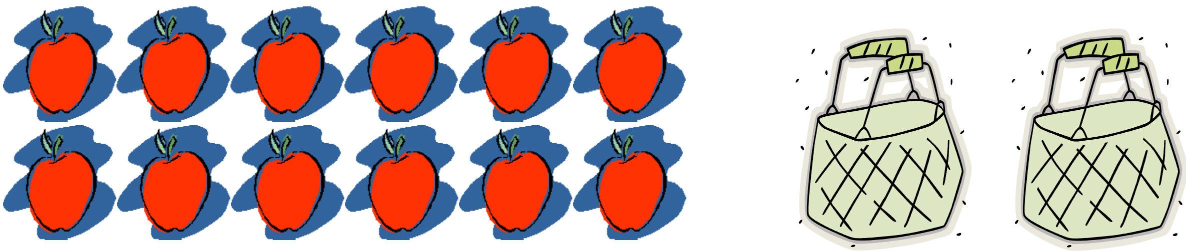
```
  3 4 2            6 3                    2 1
    X 7          X 2 1                  1 6 3
 -------        -------                 x 2 4
2 3 9 4            6 3   (1 x 63)      -------
  2 1          1 2 6 0   (20x63)        6 5 2
                -------               3 2 6 0
               1 3 2 3                -------
                                      3 9 1 2
                                       1
```

Division

Presenting children with a real context for their calculations is important for all areas of mathematical investigation. However, in division, the nature of the context affects how the calculation may be approached and the necessity to round up or down.
Division is introduced to children during Key Stage 1as 'sharing equally between' or 'how many groups of'. They are not expected to use formal methods at this stage. The emphasis is still on their mental skills and knowing how to interpret the language of division.

Strategies for Division - sharing

There are 12 apples and two bags. When shared equally, how many apples will go in each bag?
12 ÷ 2 =

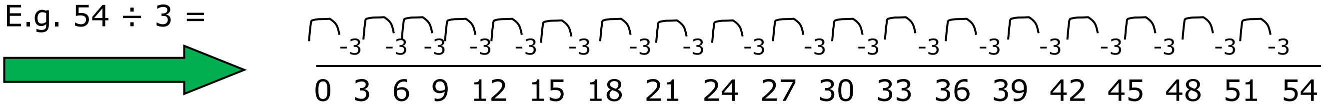


Strategies for Division – grouping

There are 20 cream cakes. Each person has 5 cream cakes. How many people are there?
20 ÷ 5 = How many 5's in 20?

The method of grouping develops into the method of repeated subtraction.

E.g. 54 ÷ 3 =



Counting in 'groups of' on a number line is further developed when the children begin to apply their number knowledge as the context demands.

Using multiples of the divisor

54 ÷ 3 =

54 can be split into 30 and 24
(10 lots of 3) and (8 lots of 3)

This process is then further developed when we begin to teach the strategy of 'Chunking'. Children use their knowledge of table facts. Chunking is a useful strategy as it introduces the notion of efficiency and solving the calculation in fewer steps.
It is often recorded like this and set out as follows:

```
  54
 -30  (10 lots of 3)
 ----
  24
- 24  (8 lots of 3)
 ----
   0
```

In division, the nature of the problem will affect the 'rounding' of the answer.

- Do they need to ignore the remainder?

(How many complete cakes can each child have if there are 61 cakes and 3 people?)

- Does it need to be represented as a fraction or a decimal?

(How many cakes does each child get if 61 are shared equally between 3 people?)

- Does the number need to be rounded up or down?

(How many bags are needed to hold 61 cakes if each bag can hold 6?)
(How many full bags will be made from 61 cakes if each bag can hold 6 cakes?)

All of these questions need to be carefully interpreted in order to get the correct answer.

E.g. Set in a context~ There are 249 balls in bags of 6. How many full bags are there?
Or: There are 249 children to take on a school trip. Each coach can take 6 children.
How many coaches are needed?

```
     249
 -    60   (10 lots of 6)
 -------
     189
 -    60   (10 lots of 6)
 -------
     129
 -    60   (10 lots of 6)
 -------
      69
 -    60   (10 lots of 6)
 -------
       9
 -     6    (2 lots of 6)
 -------
       3 left over
```

The answer is 10 + 10 + 10 + 10 + 1 r3 (41r3)

The child will now need to decide whether to round the answer up or down.
As children progress through these stages they are expected to estimate a reasonable answer first.

E.g. 892 ÷ 32 = By using rounding this approximates to 900 ÷ 30 = 30

```
  892
- 320   (10 lots of32)
  572
- 320   (10 lots of 32)
  252
- 160   (5 lots of 32)
   92
-  64   (2 lots of 32)
   28  left over
```

This can be shortened to :

```
  892
- 640   (20 lots of 32)
  252
- 160   ( 5 lots of 32)
   92
-  64   (2 lots of 32)
   28
```

so 892 ÷ 32 is 10 + 10 + 5 + 2 = 27r28, which relates to our estimation of approximately 30 times.

```
    1 4           8 6 r2            4 5 r1
 7 |9 ²8      5 |4 ³3 2      1 1 |4 9 ⁵6
```

```
      2 8
1 5 |4 3 2
     3 0 0
     1 3 2
     1 2 0
       1 2
```

We hope you find this booklet useful and informative

Have fun working with your child

Please remember, your child's teacher will be pleased to give any further advice on ways in which you can support your child's learning in maths when working at home.