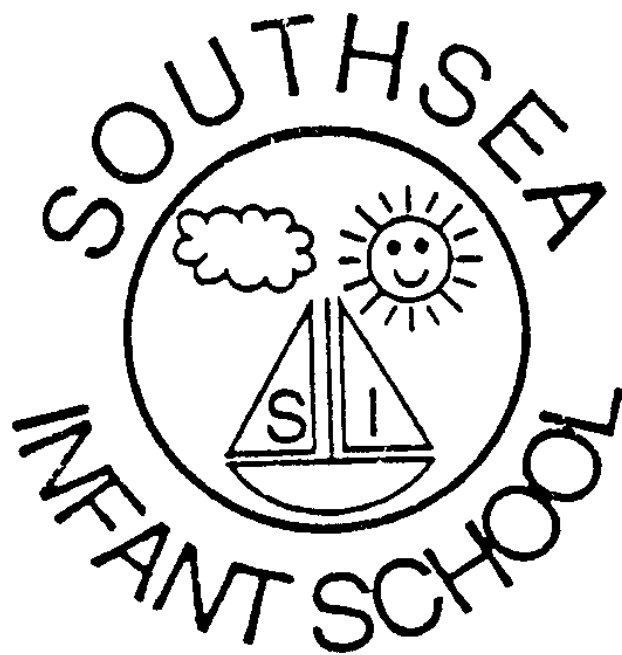


Southsea Infant School



Maths
Calculation Policy

December 2015

This policy contains the key pencil and paper procedures that are to be taught across Southsea Infant School. It has been written to ensure consistency and progression throughout the school.

Specific strategies have been assigned for calculations to be taught within each year group. However, although these methods will be taught to the majority of children in the year group, it should not be at the expense of genuine understanding and readiness. Children who are confident in using the methods for their year group should be given every opportunity to extend and deepen their understanding through the provision of a rich variety of problem solving activities that allow them to apply their knowledge before being moved on.

Although the main focus of this policy is on pencil and paper procedures, it is important to recognise that the ability to calculate mentally lies at the heart of numeracy. Mental calculation is not at the exclusion of written recording and should be seen complementary to, and not as separate, from it. In every written method there is an element of mental processing. Written recording both helps children to clarify their thinking and supports and extends the development of more fluent and sophisticated mental strategies.

The long-term aim is for children to be able to select an efficient method, of their choice, that is appropriate for a given task. They should do this by always asking themselves:

- ◆ Can I do it mentally?
- ◆ Can jottings or drawings help me do it mentally?
- ◆ If not, what efficient method can I use?
- ◆ Do I need to use concrete resources to help me with the calculation, or to check the answer I have arrived at?



At whatever stage in their learning, and whatever method is being used, children's strategies must still be underpinned by a secure and appropriate knowledge of number facts, along with those mental skills that are needed to carry out the process and judge if it was successful. Daily counting, work on number bonds and multiplication facts is therefore essential in all year groups. Secure understanding of place value should also be constantly reinforced.

Early Maths Skills in Year R

In reception children are taught:

- Rote counting of movements/objects to 5, 10 and 20.

E.g. counting 10 jumps, or 5 claps

- Counting with 1:1 correspondence to 5, 10 and 20

E.g. pointing to or moving an object as they count it, to ensure each is only counted once.

- To match a quantity to the correct numeral



matched to a card displaying 4

- To begin to represent or mark make numbers using objects, drawings or numbers

- To count, recognise, read and order numbers to 20

- Count groups of objects in a set

- E.g.



- Find 1 more and 1 less than a group of objects or a given number

- Find the total in 2 sets by counting all the objects. (adding 2 single-digit numbers)

Eg

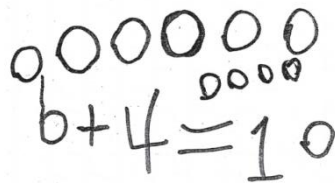


Count all the stars to find the total

- Begin to use the language of more and fewer when comparing two sets of objects and in practical activities the language associated with addition and subtraction.

- Record their addition and subtraction using objects, dots, pictures or numbers.

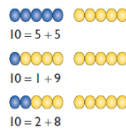
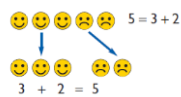
E.g.


$$6 + 4 = 10$$

Addition

Year 1 - Developing a secure understanding of number

Number bonds



Use bonds of 10 to calculate bonds of 20
i.e $6 + 4 = 10$ therefore $16 + 4 = 20$



Count all



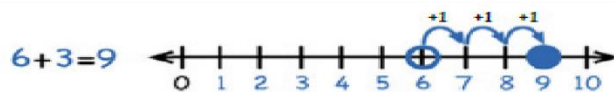
Count on



Using a 100 square to count on

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Written method - Count on, using a structured number line, starting with the larger number in a number sentence, and then count on in 1's



Children should:

- Have access to a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different contexts.
- Use number tracks/number lines to record on (prepared and children's own)
- Read and write the addition (+) and equals (=) signs within number sentences.
- Interpret addition number sentences and solve missing box problems using concrete objects and number line addition to solve them.

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

- This builds on from prior learning of adding by combining 2 sets of objects into one group (5 cubes and 3 cubes) in early years.

Key Vocabulary

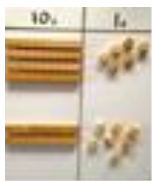
Add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on

Key skills for addition, number and place value at **Year 1**:

- ◆ Read and write numbers to 100 in numerals, including 1 – 20 in words
- ◆ Recall number bonds to 10 and 20, and addition facts within 20
- ◆ Count to and across 100, forwards and backwards, beginning with 1, or from any given number ◆ Count in multiples of 1, 2, 5 and 10
- ◆ Read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs
- ◆ Given a number identify one more or one less
- ◆ Solve simple 1-step problems involving addition, using objects, number lines and pictorial representations.
- ◆ Realise the effect of adding zero to a number
- ◆ Know that addition is commutative and can be done in any order (unlike subtraction)

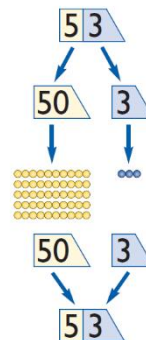
Year 2 - Developing a secure understanding of number

Using dienes to partition and recombine
 $46 + 27 =$
 $40 + 20 = 60$



$$60 + 13 = 73$$

Using arrow cards to partition and recombine



$25 + 29$ by adding 30 then subtract 1 (round and adjust)



Written methods - Add 2-digit numbers and 1-digit numbers

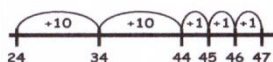
When children are secure working on a structured number line and with place value to 100 move on to using an unstructured or blank number line.

$$14 + 5 = 19$$



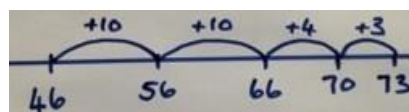
Written methods - Add pairs of 2 digit numbers

$$24 + 23 = 47$$

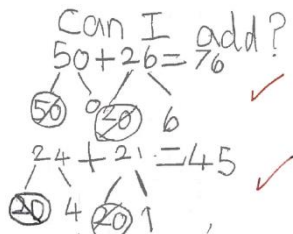


$$46 + 27 = 73$$

Count in tens then bridge to the next multiple of 10



Written methods - Add pairs of 2 digit numbers using partitioning



Written methods - Partitioned Column method

When secure with adding tens and units.

$$23 + 34 = 57$$

	2	0	+	3	
+	3	0	+	4	
5					0
					7
					= 57

Step 1

Only provide examples that DO NOT cross the tens boundary until they are secure with the method itself.

$$58 + 43 = 101$$

	5	0	+	8	
+	4	0	+	3	
9					0
					1
					1
					= 101

Step 2

Once children can add a multiple of ten to a 2-digit number mentally (e.g. $80 + 11$), they are ready for adding pairs of 2-digit numbers that DO cross the tens boundary

Children should:

- Continue to use practical equipment to support written methods so that children can reinforce their understanding
- Continue to recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

Key vocabulary

sum, tens, units, partition, addition, column, tens boundary

Key skills for addition, number and place value at **Year 2**:

- ◆ 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 single-digit numbers (e.g. $5 + 9 + 7$)
- ◆ Show that adding can be done in any order (the commutative law), and subtraction can not
- ◆ Recall number bonds to 20 and number bonds of tens to 100 (eg $30 + 70$)
- ◆ Count in steps of 2, 3 and 5 and count in tens from any number forwards and backwards
- ◆ Understand the place value of 2-digit numbers (tens and ones)
- ◆ Compare and order numbers to 100 using $<$ $>$ and $=$ signs
- ◆ Round any number to the nearest 10
- ◆ Read and write numbers to at least 100 in numerals and in words
- ◆ Solve problems with addition, using concrete objects, pictorial representations, involving numbers, quantities and measures, and applying mental and written methods.
- ◆ Recognise and use the inverse relationship between addition and subtraction. use this to check calculations and solve missing number problems

Subtraction

Year 1 - Developing a secure understanding of number

Children consolidate understanding of subtraction practically showing subtraction on bead strings, using cubes etc., and in familiar contexts and are introduced to more formal recording using number lines.

Number bonds



$$10 - 5 = 5$$



$$10 - 9 = 1$$



$$10 - 8 = 2$$

6 less than 10 is 4



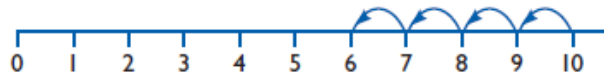
Count out, then how many are left

$$7 - 4 = 3$$



Count back in 1's on a structured number line with numbers to 20

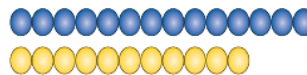
$$10 - 4 = 6$$



Finding the difference

This will be introduced practically with the language "find the difference between" and "how many more" in a range of familiar contexts

7 is 3 more than 4



The difference between 11 and 14 is 3.

$$14 - 11 = 3$$

$$11 + \square = 14$$



Key vocabulary

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

Key skills for subtraction at Year 1

- Given a 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 zero.
- Solve one-step problems that involve addition and subtraction, using concrete objects (ie bead string, objects, cubes) and pictures. Solve missing number problems.
- Read and write numbers from 0 to 100 in numerals and words.

Mental Subtraction

Children should start recalling subtraction facts up to and **within** 10 and 20, and should be able to subtract 0.

$$10 - 4 = 6 \quad 7 - 3 = 4 \quad 20 - 6 = 14 \quad 15 - 7 = 8 \quad 14 - 0 = 14$$

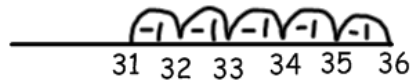
Year 2 - Developing a secure understanding of number

Children continue to consolidate understanding of subtraction practically showing subtraction on bead strings, using cubes and dienes etc., and in familiar contexts. They would consolidate use of more formal recording using number lines.

Subtract on an empty number line by counting back

This strategy will be used for:

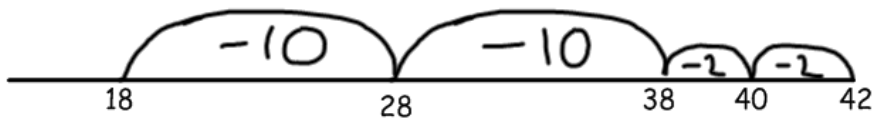
- 2 digit - numbers subtract 1 digit numbers e.g. $36 - 5$



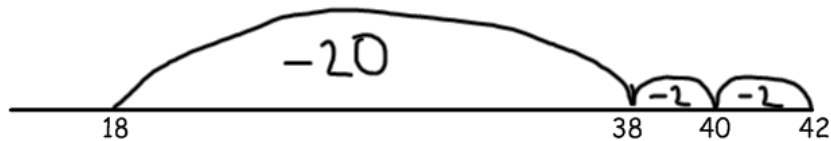
- 2 digit - numbers subtract 1 digit numbers bridging ten e.g. $36 - 7$ (jumping back to the nearest multiple of 10)



- Subtract pairs of 2 digit numbers e.g. $42 - 24 = 18$



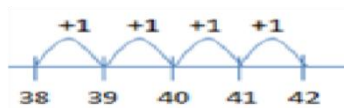
Progressing to more efficient jumps back



Finding the difference

Children are taught to recognise that when numbers are close together, it is more efficient to count on the difference. They need to be clear about the relationship between addition and subtraction.

$$42 - 38 = 4$$



Written method - Introduce partitioned column subtraction method

Introduce where **no exchanging** is required.

$$89 - 35 = \underline{54}$$

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

Key Vocabulary

equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is_? difference, count on, strategy, partition, tens, units

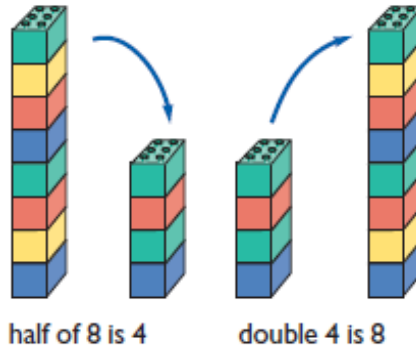
Key skills for subtraction at Year 2

- 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, number lines and mentally, including: a two digit number and ones, a two-digit number and tens, and two two-digit numbers.
- Show that subtraction of one number from another cannot be done in any order.
- Recognise and use the inverse relationship between addition and subtraction, using this to check calculations and missing number problems.
- Solve simple subtraction problems including measures, using concrete objects, pictorial representation, and also applying their increasing knowledge of mental and written methods.
- Read and write numbers to at least 100 in numerals and in words.

Early multiplication and division skills in Year R

In reception children are taught to:

- Find doubles of all numbers up to double 10
- Find half of objects

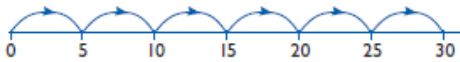


- Share objects into groups.
- Use these skills to solve problems

Multiplication

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

Using concrete objects



$$2 + 2 + 2 + 2 + 2 = 10$$

$$5 \times 2 = 10$$

5 multiplied by 2

5 pairs

5 hops of 2

$$5 + 5 + 5 + 5 + 5 + 5 = 30$$

$$6 \times 5 = 30$$

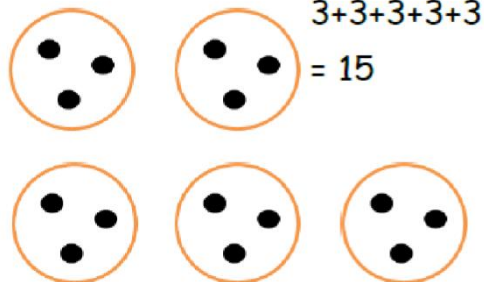
6 multiplied by 5

6 groups of 5

6 hops of 5

Using pictorial representations

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



Using arrays


$$4 \times 2 = 8$$

$$2 \times 4 = 8$$


$$2 \times 4 = 8$$

$$4 \times 2 = 8$$

Key Vocabulary

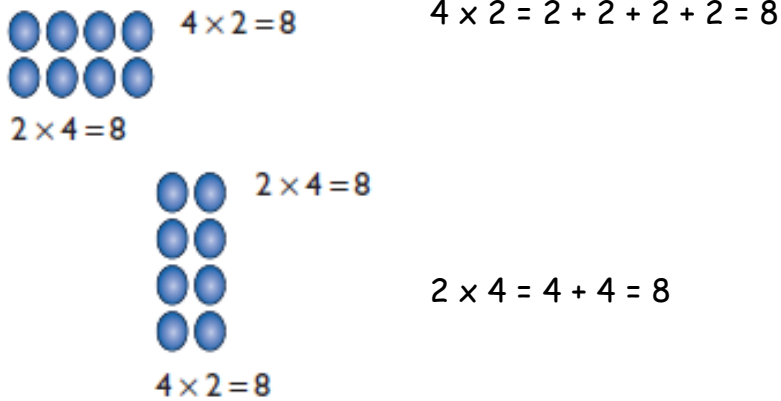
- groups of, lots of, times, array, altogether, multiply, count

Key skills for multiplication at Year 1:

- Count in multiples of 2, 5 and 10.
- Solve one-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 up to double 10.

Year 2 - Multiply using arrays and repeated addition

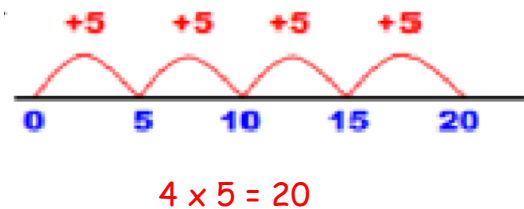
Using arrays pictorially or practically



Use arrays to help teach children the commutative law of multiplication (it doesn't matter which way round you put the numbers the answer will always be the same)

Use repeated addition on a number line

Starting from zero, make equal jumps up on a number line to work out multiplication facts and write multiplication statements using \times and $=$ signs.



Use Mental Recall:

Children should begin to recall multiplication facts for 2, 5 and 10 times tables through practice in counting and understanding of the operation.

Key vocabulary:

- groups of, lots of, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, double, once, twice, three times...

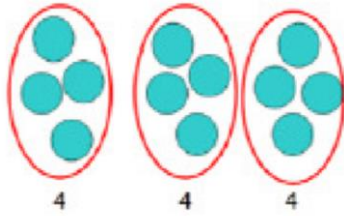
Key skills for multiplication at Year 2:

- Count in steps of 2, 3 and 5 from zero, and in 10s from any number.
- Recall and use multiplication facts from the 2, 5 and 10 multiplication tables, including recognising odds and evens. Connect the tables to each other—connect the ten times table to place value and the 5 times table to the divisions on a clock.
- Write and calculate number statements using the \times and $=$ signs.
- Show that multiplication can be done in any order (commutative).

Division

Year 1 - Using concrete objects, pictorial representations and arrays

Using sharing



12 shared between 3 is 4

We share 1 at a time between the groups until all the items are gone.

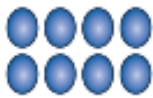
Example division problem in a familiar context:

There are 6 pupils on this table and there are 18 pieces of fruit to share between us. If we share them equally, how many will we each get?

Can they work out and give a division statement ...?

"18 shared between 6 people gives you 3 each."

Using arrays



$$8 \div 4 = 2$$



$$8 \div 2 = 4$$

Children should:

- Use lots of practical apparatus, arrays and picture representations
- Be able to count in multiples of 2s, 5s and 10s.
- Find **half** of a group of objects by sharing into 2 equal groups.

Key vocabulary:

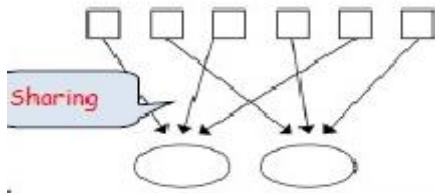
- share, share equally, one each, two each..., group, groups of, lots of, array

Key skills for division at Year 1

- Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations arrays with the support of the teacher
- Through grouping and sharing small quantities, pupils begin to understand, division, and finding simple fractions of objects, numbers and quantities.
- They make connections between arrays, number patterns, and counting in twos, fives and tens.

Year 2 - Grouping and sharing

Using sharing (can be done with concrete objects, or pictorially)



There are 6 sweets shared between 2 people, how many do they each get?

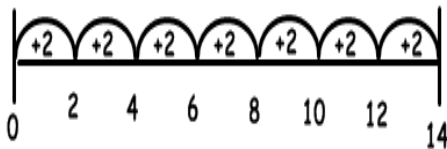
Grouping (can be done with concrete objects, or pictorially)



There are 12 stars, how many people can have 4 each?

Using repeated addition on a number line

(no remainders and use multiples children can easily count in 2s, 3s, 5s and 10s)



$$14 \div 2 = 7$$

Jumping forwards in equal jumps of the divisor (in this case 2)

There are 7 jumps therefore:

$$14 \div 2 = 7$$

Key vocabulary:

- Array, divide, divided by, divided into, division, grouping, number line, left, left over

Key skills for division at Year 2:

- Count in steps of 2, 3, 5, and 10 from 0
- Recall and use multiplication and division facts for the 2, 3, 5 and 10 multiplication tables, including recognising odd and even numbers.
- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the \times , \div and $=$ signs.
- Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.
- Solve problems involving multiplication and division, using materials, arrays, repeated addition, repeated subtraction and mental strategies.
- Methods, and multiplication and division facts, including problems in contexts.