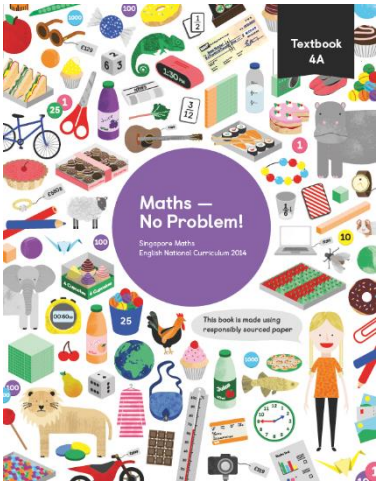
St Joseph's Calculation Policy for families

Year 4



Dear parents,

This Calculation Policy sets out the methods used in school to help your children with calculations. It has been written to meet the requirements of the National Curriculum 2014, and gives pupils a consistent and smooth progression of learning in calculations across the school. It works alongside the highly effective Singapore style of teaching from the scheme **Maths No Problem!**

Children are taught strategies to develop and strengthen their mental agility daily. They also need to be able to apply written calculation skills in order to:

- represent work that has been done practically
- support, record and explain mental calculations
- keep track of steps in a longer task
- work out calculations that are too difficult to do mentally

This policy shows methods that pupils will be taught within their respective year group, in the order they are taught. Children will be encouraged to develop their confidence in choosing and using a strategy that they know will get them to the correct answer as efficiently as possible.

Concrete, Pictorial, Abstract (CPA):

A key principle behind the Singaporean methods used in Maths No Problem! is the concrete, visual and abstract approach. Children are firstly introduced to an idea or skill by acting it out with real, **concrete** objects (a hands – on approach). They then move onto the **pictorial** (visual) stage, where they relate the concrete understanding to visual representations. The final **abstract** stage is a chance for them to represent problems by using mathematical calculations. The CPA approach is used continuously in all new learning and calculations throughout the school.

I hope the progression of skills you see in this booklet helps you when supporting your child at home.

Mrs. Corr

Maths Lead

Year 4 Addition

Addition in Year 4 includes:

- adding numbers with up to 4 digits using the formal written methods of columnar addition where appropriate. The pupils progress from the expanded method, where they make links with place value to the compact method, where they rename and regroup where necessary.

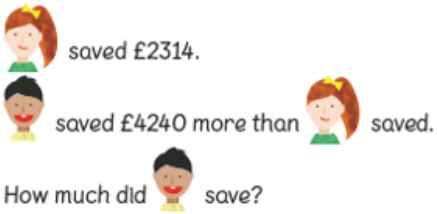
- estimating and using inverse operations to check answers to a calculation.
- solving addition and subtraction two-step problems in context, deciding which operations and methods to use and why.

Pupils continue to practise both mental methods and columnar addition with increasingly large numbers to aid fluency.

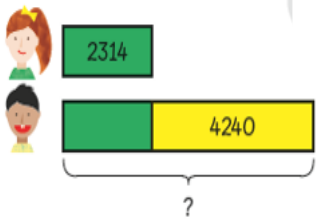
Key vocabulary:

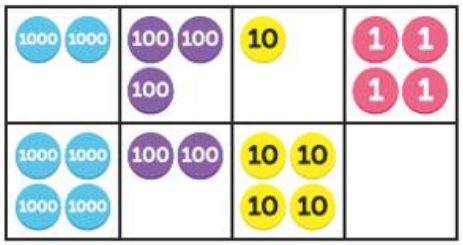
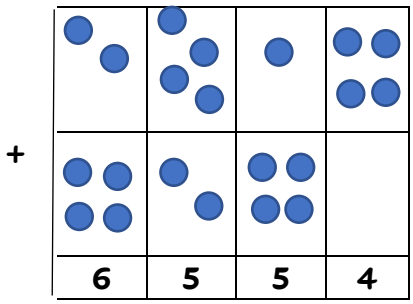
sum, total, parts and wholes, plus, add, altogether, more, is equal to, is the same as, rename, regroup.

Simple addition problem:



When solving an addition problem, pupils are encouraged to draw a bar model to help them to visualise what they are being asked to do.



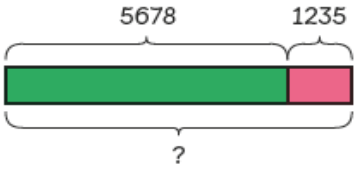
Concrete	Pictorial	Abstract
Place value grid and number discs: 	**Drawing a place value grid** 	**Expanded addition** 2 3 1 4 + 4 2 4 0 4 5 0 5 0 0 6 0 0 0 6 5 5 4 **Compact addition** 2 3 1 4 + 4 2 4 0 6 5 5 4
An addition word problem is focussed on. *Pupils represent the numbers with a place value grid and number discs, and add the values together.*	*Pupils represent the values pictorially with a bar model. This helps them to visualise what they will need to do when calculating.* *They can draw a place value grid and work through the addition beginning with the smaller value.*	**Add the ones** (4 ones + 0 ones = 4 ones) **Add the tens** (1 ten + 4 tens = 5 tens) **Add the hundreds** (3 hundreds + 2 hundreds = 5 hundreds) **Add the thousands** (2 thousands + 4 thousands = 6 thousands)

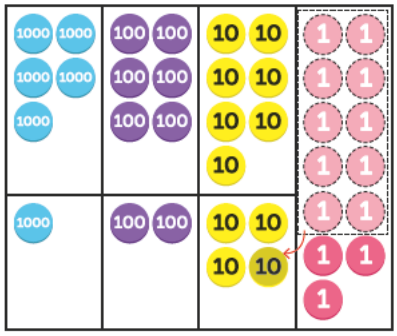
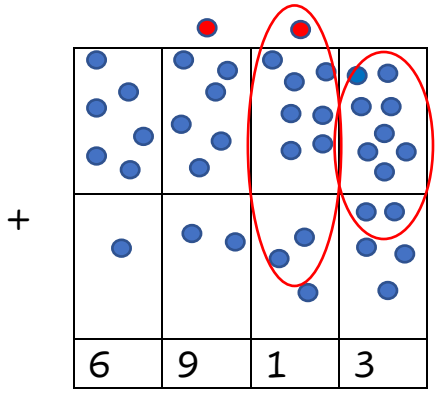
Addition with renaming problem:

The population of a village was 5678.
Then it increased by 1235 people.

What was the population of the village after the increase?

When solving an addition problem, pupils are encouraged to draw a bar model to help them to visualise what they are being asked to do.



Concrete	Pictorial	Abstract
Place value grid and number discs	**Place value grid**	**Compact addition**
		$\begin{array}{r} {\scriptstyle 1}\ {\scriptstyle 1}\ \ \\ 5\ 6\ 7\ 8 \\ +\ 1\ 2\ 3\ 5 \\ \hline 6\ 9\ 1\ 3 \end{array}$
An addition word problem is focussed on. A bar model image is given to help them visualise the problem. *Pupils can represent the values with a place value grid and number discs, and add them together.*	*Pupils can draw their own place value grid or Base 10, and work through the addition.* *They talk through renaming and regrouping.*	**Add the ones:** *8ones + 5ones = 13 ones.* *Rename the ones: 1 ten and 3 ones.* **Add the tens:** *7tens + 3tens + 1ten = 11 tens* *Rename the 11tens: 1hundred and 1ten* **Add the hundreds:** *6hundreds + 2hundreds +* **1hundred** *= 9hundreds* **Add the thousands:** *5thousands + 1thousand = 6thousands*

Year 4 Subtraction

Subtraction in Year 4 includes:

- subtracting numbers with up to 4 digits using the formal written method of columnar subtraction where appropriate. The pupils make links with place value, and rename and regroup where necessary.
- estimating and using inverse operations to check answers to a calculation
- solving addition and subtraction two-step problems in context, deciding which operations and methods to use and why.

Pupils continue to practise both mental methods and columnar subtraction with increasingly large numbers to aid fluency.

Key language:

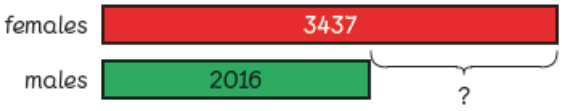
take away, less than, the difference, subtract, minus, fewer, decrease, regroup, rename.

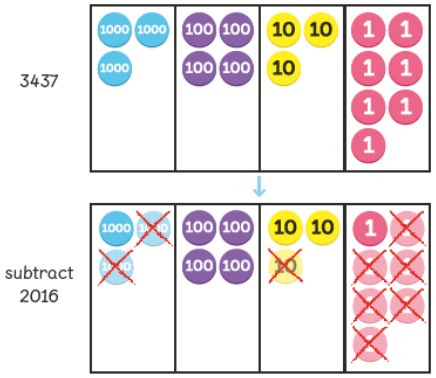
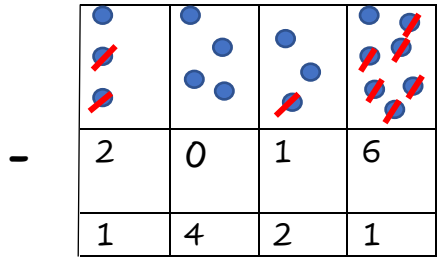
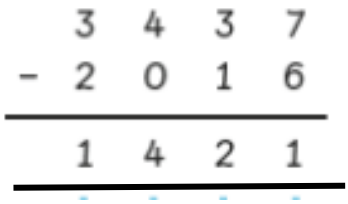
Simple subtraction problem:

In a popular reality television competition, there were 3437 female contestants and 2016 male contestants.

How many more female contestants than male contestants were there?

When solving an subtraction problem, pupils are encouraged to draw a bar model to help them to visualise what they are being asked to do.

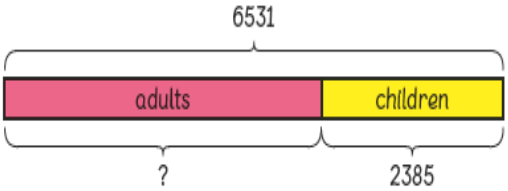


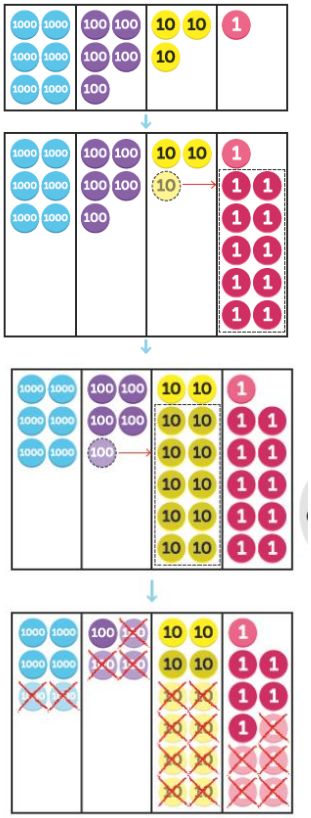
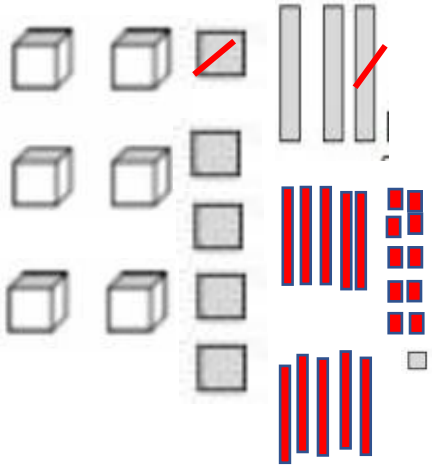
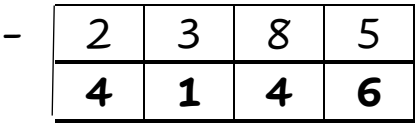
Concrete	Pictorial	Abstract
Place value grid and number discs: 	**Place value grid** 	**Simple subtraction** 
A subtraction word problem is focussed on. Pupils represent the numbers with a place value grid and number discs, and subtract.	Pupils model the subtraction with a bar model to visualise the problem, and ensure they are secure with the calculation. They can represent the calculation by drawing a place value grid or Base 10, and working through the subtraction. As they subtract, they cross off.	**Subtract the ones:** 7ones – 6ones = 1one **Subtract the tens:** 3tens – 1ten = 2tens **Subtract the hundreds:** 4hundreds – 0hundreds = 4hundreds **Subtract the thousands:** 3thousands – 2thousands = 1thousand

Subtraction with regrouping and renaming problem:

6531 people signed up for a run.
2385 of them are children.
How many adults signed up?

When solving a subtraction problem, pupils are encouraged to draw a bar model to help them to visualise what they are being asked to do.



Concrete	Pictorial	Abstract
Place value grid 	**Dienes**  	$\begin{array}{rcccc} & 6 & \cancel{5}^{4} & \cancel{3}^{12} & \cancel{1}^{11} \\ - & 2 & 3 & 8 & 5 \\ \hline & 4 & 1 & 4 & 6 \end{array}$
A subtraction word problem is focussed on. Pupils represent the values with a place value grid and number discs, and subtract. As they work through the subtraction, they regroup and rename accordingly.	Pupils model the subtraction with a bar model so that they can visualise the problem. They then use their own drawing of a place value grid or Base 10, and subtract. They talk through the process of regrouping and renaming carefully.	**Subtract the ones:** 1one – 5ones = cannot be done. So **regroup** and **rename** the tens and ones. 11ones – 5ones = 6ones. **Subtract the tens:** 2tens – 8tens = cannot be done. So, **regroup** and **rename** the hundreds and

		tens: 12tens – 8tens = 4tens. **Subtract the hundreds:** 4hundreds – 3hundreds = 1hundreds **Subtract the thousands:** 6thousands – 2thousands = 4thousands

Year 4 Multiplication

Multiplication in Year 4 includes:

- recalling multiplication facts for multiplication tables up to 12 × 12
- using place value, known and derived facts to multiply mentally, including: multiplying by 0 and 1; multiplying together three numbers
- recognising and use factor pairs and commutativity in mental calculations
- multiplying two-digit and three-digit numbers by a one-digit number using formal written layout
- solving problems including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Pupils continue to practise recalling and using multiplication tables and related facts to aid fluency.

Pupils practise mental methods and extend this to three-digit numbers to derive facts, (for example 600 ÷ 3 = 200 can be derived from 2 x 3 = 6).

Pupils practise to become fluent in the formal written method of expanded and compact multiplication, renaming and regrouping where necessary.

Pupils write statements about the equality of expressions (for example, use the distributive law 39 × 7 = 30 × 7 + 9 × 7 and associative law (2 × 3) × 4 = 2 × (3 × 4)). They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, 2 x 6 x 5 = 10 x 6 = 60.

Pupils solve two-step problems in context, such as correspondence questions, choosing the appropriate operation, working with increasingly harder numbers.

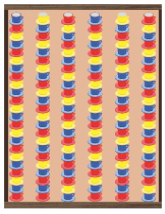
Key language:

double, times, multiplied by, the product of, groups of, lots of, equal groups, rename.

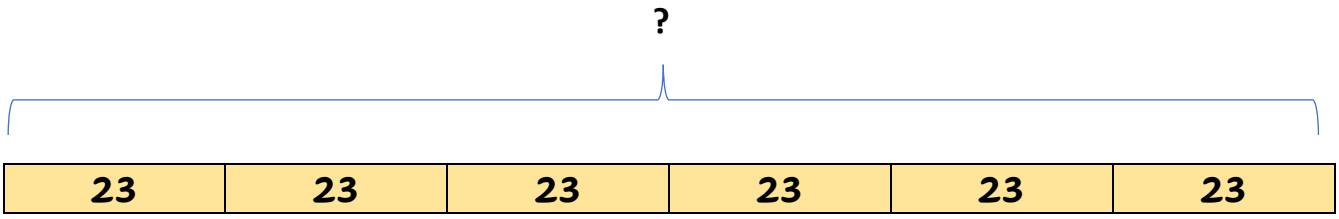
Multiplication problem:

A café in New York uses cups and saucers in their interior design.

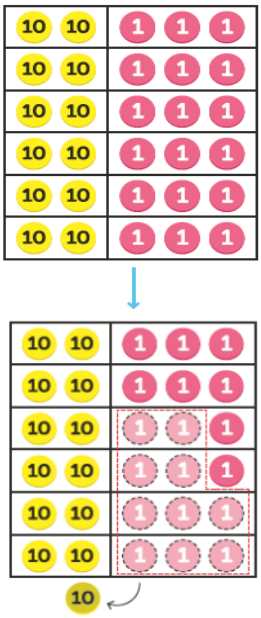
How many sets of cups and saucers are there?

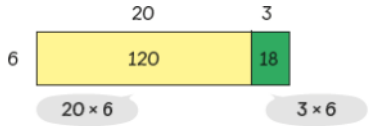


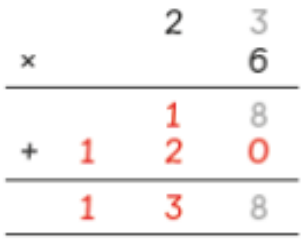
When solving a multiplication problem, pupils are encouraged to draw a bar model to help them to visualise what they are being asked to do.



Concrete	Pictorial	Abstract
Place value grid	**Multiplication grid**	**Expanded method**







Expanded method:

Multiply the ones:
3ones x 6 = 18ones (rename as 1ten and 8ones, and place the answer 18 on the first answer line)

Multiply the tens:
2tens x 6 = 12tens (rename as 1hundred and 2 tens, and place the answer 120 on the second answer line)

Recombine:
18ones + 120ones = 138ones)

A multiplication word problem is focussed on. Pupils model the multiplication with a place value grid and number discs, and multiply. They notice that renaming might be required.	They can make the link between 6 rows of 23 by drawing a multiplication grid. Here they are partitioning the Tens and Ones and multiplying each by 6	**Compact method**  **Compact method:** **Multiply the ones:** 3ones x 6 = 18ones (rename as 1ten and 8ones, and place the 8 on the ones answer line). **Multiply the tens:** 2tens x 6 = 12tens + 1ten = 13tens (rename as 1hundred and 3 tens, and place the answer on the tens and hundreds answer line).

Year 4 Division

Division in Year 4 includes:

- recalling multiplication and related division facts for multiplication tables up to 12 × 12
- using place value, known and derived facts to divide mentally, including dividing by 1
- dividing two-digit and three-digit numbers by a one-digit number using formal written layout.

Pupils continue to practise recalling and using multiplication tables and related facts to aid fluency.

Pupils practise mental methods and extend this to three-digit numbers to derive facts, (for example 600 ÷ 3 = 200 can be derived from 2 x 3 = 6).

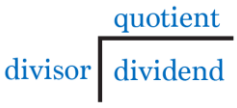
Pupils practise to become fluent in the formal written method of division. They learn that division is a process of repeated subtraction. When calculating, they subtract groups of the multiple they are dividing by.

Pupils continue to use number bonds and partitioning to split the dividend into manageable parts. They use their knowledge of multiplication, number bonds and repeated subtraction to support the division process of grouping and sharing. They are introduced to long division (which displays repeated subtraction of multiples to solve division problems) in Year 3 and build on this learning in Year 4.

Pupils solve two-step problems in context, such as correspondence questions, choosing the appropriate operation, working with increasingly harder numbers.

Key language:

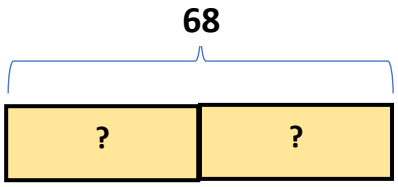
share, group, divide, divided by, half, dividend, divisor, quotient, remainder



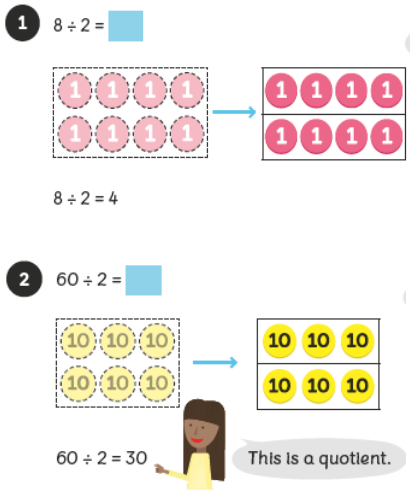
Division problem:

Mr. Smith has a collection of 68 old postcards. Ruby and Ravi share them equally. How many postcards should each take?

When solving a division problem, pupils are encouraged to draw a bar model to help them to visualise what they are being asked to do.



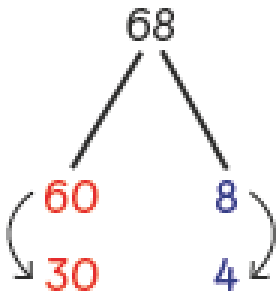
Concrete	Pictorial	Abstract
Number discs	**Part-whole model**	**Long division, with no remainder:**



A division word problem is focussed on.

Pupils model the division with number discs, and divide by sharing and grouping.

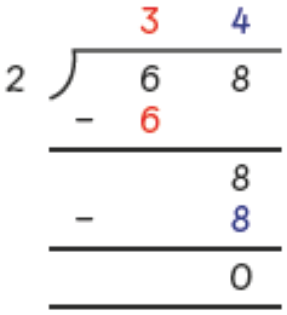
They use the number discs, start by dividing the Ones by 2.
Then divide the Tens by 2.
Add together the Tens and Ones.



Numbers can be partitioned, divided by the divisor and the outcomes recombined to produce the answer (quotient).

Using a part-whole model to partition, first divide the ones by 2, then the tens by 2.

Add together the Tens and Ones.



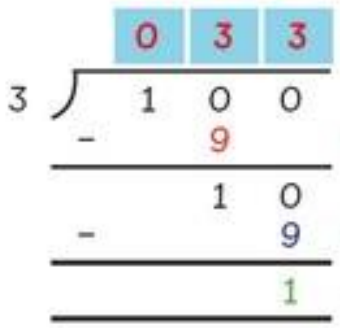
They are reminded to view division as **repeated subtraction.**

Step One
Using the 2x table, what can they pull out of 68? They can see that 68 can be made from 60 and 8.

They can use equipment here to see that 60 (6tens) is shared between 2, so each gets 3tens. They have shared all of their tens, there are none left.

They may write the answer 3tens above.

Step two
Use the 2x table and equipment to see that

		8ones shared between 2 = 4ones. They check that all of the ones have been shared. They may write the answer 4ones above.
		Long division with remainder:  In this example, 100 can be regrouped as 90 and 10. Then follow the same process as before. 9 ones are subtracted as the 10 is made up of 9 ones and 1one, when dividing by 3. 1one is the remainder. The answer can be written: **33r1**

What can you do to help at home?

- Be positive
- Talk about maths with your child
- Involve your child in any maths activity (shopping, cooking, DIY) and let your child lead where they can
- Talk about maths in sport
- Look at number puzzles in papers or magazines
- Share strategies and methods used at school (allow your child to be the expert)

A thought to finish:

'Good mathematics is not about how many answers you know – it's how you behave when you don't know'