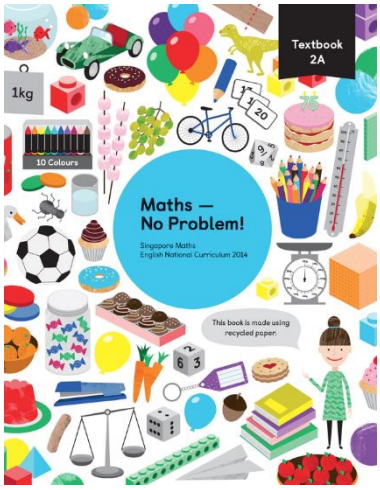
St Joseph's Calculation Policy for families

Year 2



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 2 Addition

Addition in Year 2 includes:

- solving addition problems:
  - using concrete objects and pictorial representations, including those involving numbers, quantities and measures
  - applying increased knowledge of mental and written methods
- recalling and using addition facts to 20 fluently, and derive and use related facts up to 100
- adding numbers using concrete objects, pictorial representations, and mentally, including:
  - a two-digit number and ones
  - a two-digit number and tens
  - two two-digit numbers
  - adding three one-digit numbers
- showing that addition of two numbers can be done in any order (commutative)
- recognising and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

Pupils extend their understanding of the language of addition and subtraction to include sum and difference.

Pupils practise addition and subtraction to 20 to become increasingly fluent in deriving facts such as using 3 + 7 = 10; 10 – 7 = 3 and 7 = 10 – 3 to calculate 30 + 70 = 100; 100– 70 = 30 and 70 = 100 – 30. They check their calculations, including by adding, to check subtraction and adding numbers in a different order, to check addition (for example, 5 + 2 + 1 = 1 + 5 + 2 = 1 + 2 + 5). This establishes commutativity and associativity of addition.

Recording addition and subtraction in columns supports place value and prepares for formal written methods with larger numbers.

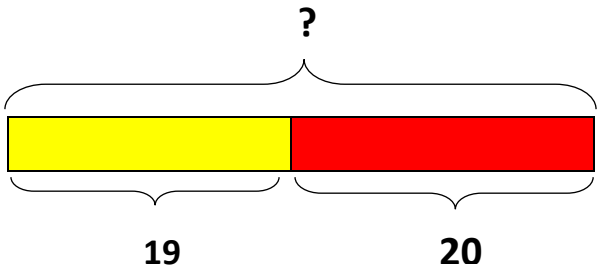
Key Vocabulary

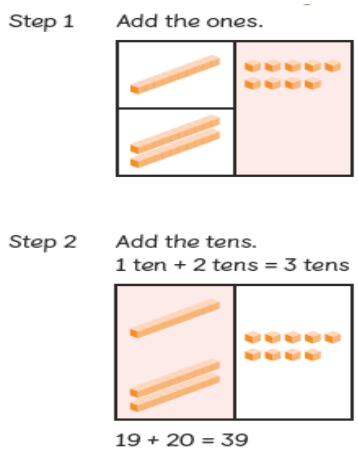
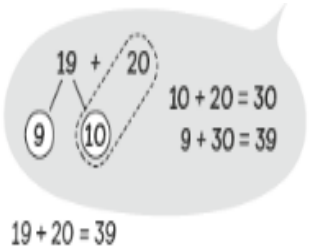
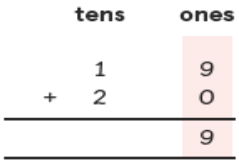
sum, total, parts and wholes, plus, add, altogether, more, is equal to, is the same as

Simple addition of multiples of 10 problem:

How many grapes do they have in all?

When solving an addition problem pupils are encouraged to draw a bar model like this to help them to understand the problem. They are taught that when they add they are given the 2 'parts' and are expected to find the 'whole'.



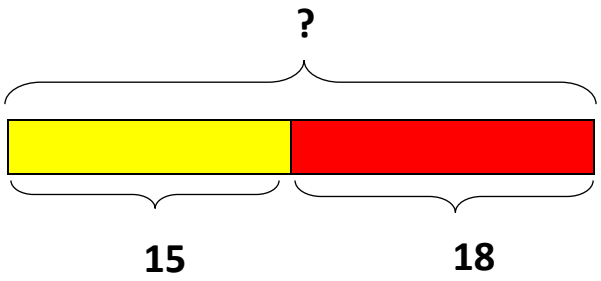
Concrete	Pictorial	Abstract
Simple addition – adding multiples of 10 	1. Count in tens  2. Add the tens 	Expanded addition  
An addition word problem is focussed on. Concrete materials are used to explore the problem. Pupils use equipment such as Dienes and a place value grid to explore how many	Pupils solve the problem using pictorial methods such as a number line and a part whole model. <u>Method 1</u> They are taught to put the number in their head and	Once children have secured adding using concrete and pictorial methods, they move on to the written method as shown above.

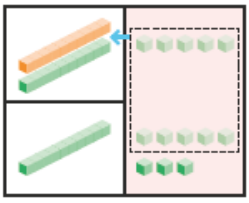
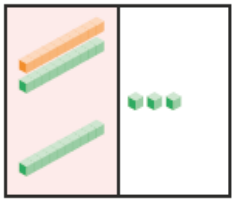
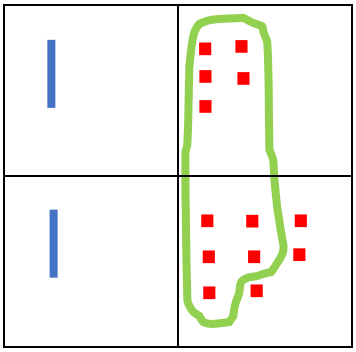
tens and ones are each number. They are taught to always add the ones first and then the tens.	then count on in multiples of 10. e.g. 19, 29, 39 <u>Method 2</u> They are taught to partition the number into tens and ones then add the multiples of 10 and finally add the ones.	**Add the ones** (9 ones + 0 ones = 9 ones) **Add the tens** (1 ten + 2 tens = 3 tens)

Addition with renaming problem:

How many cupcakes are there now?

When solving an addition problem pupils are encouraged to draw a bar model like this to help them to understand the problem. They are taught that when they add they are given the 2 'parts' and are expected to find the 'whole'.



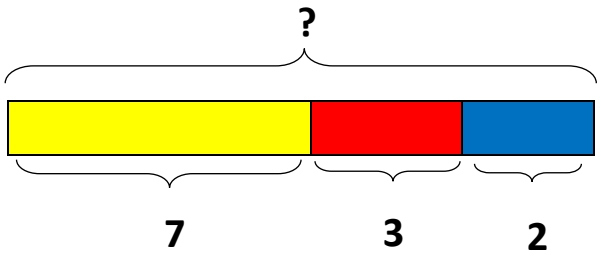
Concrete	Pictorial	Abstract
Add 15 and 18. Step 1 Add the ones. 5 ones + 8 ones = 13 ones Regroup the ones. 13 ones = 1 ten and 3 ones  Step 2 Add the tens. 1 ten + 1 ten + 1 ten = 3 tens  15 + 18 = 33		tens ones 1 5 + 1 8 1 3 tens ones 1 5 + 1 8 1 3 + 2 0 3 3
An addition word problem is focussed on. Concrete materials are used to explore the problem.	Pupils solve the problem using pictorial methods such as a number line,	Once the pupils have secured adding using concrete and pictorial methods, they move on

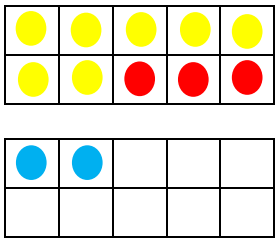
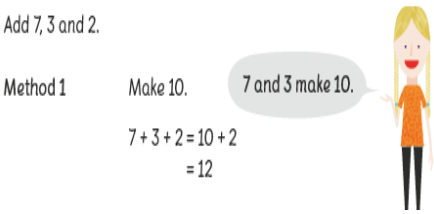
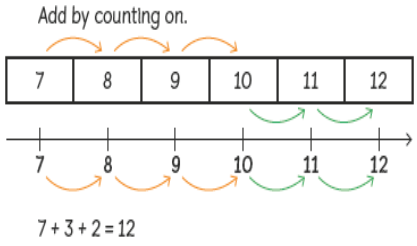
Pupils use equipment such as Dienes and a place value grid to explore how many tens and ones are each number. They are taught to always add the ones first and then the tens.	part whole model and bar models. They may also draw pictures to represent the equipment they have previously used in the concrete stage such as Dienes or counters.	to the written method as shown above. **Add the ones:** 5 ones + 8 ones = 13 ones. Rename the ones: 1 ten and 3 ones. **Add the tens:** 1 ten + 2 tens = 3 tens Answer = 33

Addition of three numbers problem:

Can you add to find out how many flowers there are in total?

When solving an addition problem pupils are encouraged to draw a bar model like this to help them to understand the problem. They are taught that when they add they are given the 'parts' and are expected to find the 'whole'.



Concrete	Pictorial	Abstract
	Method 1  Method 2  	$7+3+2=10+2$ $=12$
An addition word problem is focussed on. Concrete materials are used to explore the problem. This often includes providing the children with resources that represent the problem. E.g. counters to represent the flowers and pieces of paper to represent the pots.	Pupils solve the problem using pictorial methods such as a number line or 10 frame. **Method 1** The pupils are taught to use their previous knowledge of number bonds to add the numbers together first.	The calculation is represented with an addition equation. Pupils are expected to read and understand the equation in order o answer it correctly and, where necessary. draw on their previous

Pupils will often use a 10 frame to help them discover the number bonds, which will support them with their rapid recall.	**Eg: 7 + 3 = 10 then add the 2 = 12.** **<u>Method 2</u>** The pupils are taught to use a numberline and add the second number by counting on, and then add the third number by continuing to count on.	knowledge of number bonds.

Year 2 Subtraction

Subtraction in Year 2 includes:

- solving subtraction problems:
  - using concrete objects and pictorial representations, including those involving numbers, quantities and measures
  - applying their increasing knowledge of mental and written methods

- recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100

- subtract numbers using concrete objects, pictorial representations, and mentally, including:
  - a two-digit number and ones
  - a two-digit number and tens
  - 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 and use this to check calculations and solve missing number problems.

Pupils extend their understanding of the language of addition and subtraction to include sum and difference.

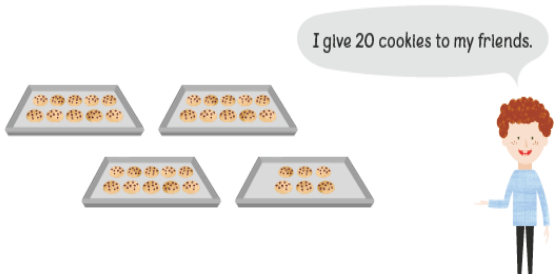
Pupils practise addition and subtraction to 20 to become increasingly fluent in deriving facts such as using 3 + 7 = 10; 10 – 7 = 3 and 7 = 10 – 3 to calculate 30 + 70 = 100; 100– 70 = 30 and 70 = 100 – 30. They check their calculations, including by adding, to check subtraction and adding numbers in a different order, to check addition (for example, 5 + 2 + 1 = 1 + 5 + 2 = 1 + 2 + 5). This establishes commutativity and associativity of addition.

Recording addition and subtraction in columns supports place value and prepares for formal written methods with larger numbers.

Key Vocabulary

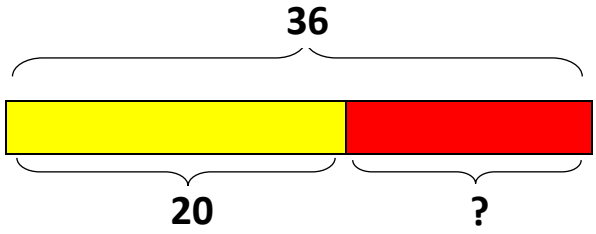
take away, less than, difference, subtract, minus, fewer, decrease

Simple subtraction problem:



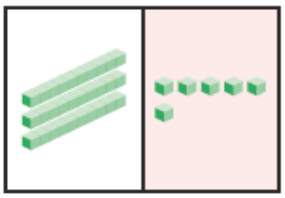
How many cookies are left?

When solving a subtraction problem like this, pupils are encouraged to draw a bar model to help them to understand what is being asked of them before solving the calculation. They are taught that when they are given the 'whole' and a 'part' then they must perform a subtraction to find the other 'part'



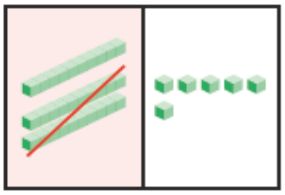
Concrete

Step 1 Subtract the ones.



Step 2 Subtract the tens.

3 tens – 2 tens = 1 ten



36 – 20 = 16

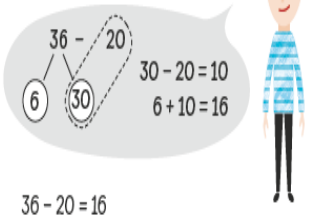
Pictorial

Subtract 20 from 36.

Method 1 Count back in tens from 36.

36 - 20 = 16

Method 2 Subtract tens.



36 - 20 = 16

Abstract

	tens	ones
	3	6
–	2	0
		6

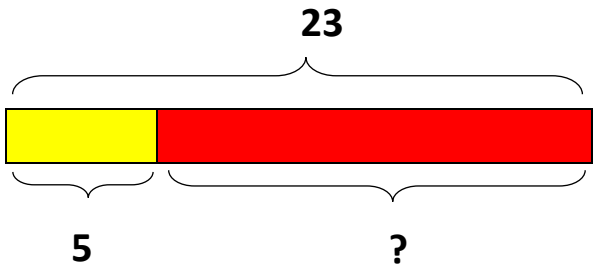
	tens	ones
	3	6
–	2	0
	1	6

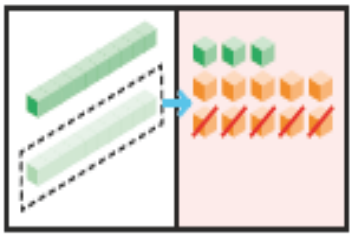
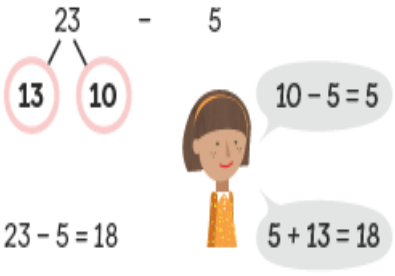
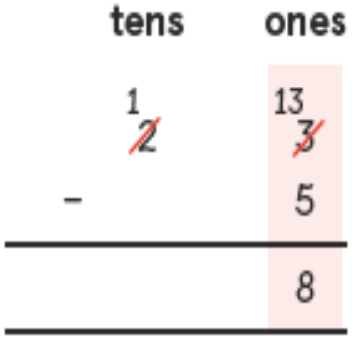
A subtraction word problem is focussed on. The problem is usually linked to a concept that the pupils will be able to relate to. Pupils will use resources such as Dienes or number discs to help them explore the problem. They start by subtracting the ones **6 ones – 0 ones = 6 ones.** Pupils continue to use the Dienes to subtract the tens. **3 tens – 2 tens = 1 ten.** They write the equation out, clearly displaying the answer: **36 – 20 = 16**	Once they are secure using the concrete materials, they solve the problem using pictorial methods, such as a number line to count back or a part whole model. They may choose to draw a picture of the resources they have used. **Method 1 (shown above)** Pupils use their previous knowledge to count back in multiples of ten. **Method 2 (shown above)** They partition the number into tens and ones before subtracting. **e.g. 36 = 3 tens and 6 ones**.	Once pupils have secured subtracting using concrete and pictorial methods, they move on to the written method. Children are reminded to start subtracting the ones first and then the tens. Pupils are reminded of the importance of lining up the tens and ones in columns accurately. **Subtract the ones:** **6 ones – 0 ones = 6 ones** **Subtract the tens:** **3 tens – 2 tens = 1 ten**

Subtraction with renaming problem:

There are 23 pencils.
5 pencils are removed.
How many pencils are left in the holder?

When solving a subtraction problem like this, pupils are encouraged to draw a bar model to help them to understand what is being asked of them before solving the calculation. They are taught that when they are given the 'whole' and a 'part' then they must perform a subtraction to find the other 'part'.



Concrete	Pictorial	Abstract
Regroup 1 ten into 10 ones. Subtract the ones. 13 ones – 5 ones = 8 ones 	Method 1 Subtract 5 from 10. 	
Pupils will use equipment such as number discs or Dienes (as seen above) to make the 2-digit number that they are starting with and subtracting from. They will need to rename the tens during this	Once the pupils are secure in using concrete equipment to solve subtraction with renaming problems they move onto drawing the equipment for themselves. Pupils are encouraged to draw equipment to	Once the pupils have secured subtracting with renaming using concrete and pictorial methods, they move on to the written method. Pupils are reminded to begin by subtracting the ones and then the tens.

equation (swap a ten for ten ones). **Step One** Pupils are taught to subtract the ones first but at the moment there are not enough tens. **Rename one of the tens for 10 ones. There are now 13 ones:** **13 ones – 5 ones = 8 ones** **Step Two** Subtract the tens: **1 ten – 0 ones = 1 ten** **Step Three** The whole equation is written out, and the tens and ones are recombined: **23 – 5 = 18**	represent the tens and ones in columns. They cross out to show what is subtracted. **The pupils are encouraged to show where they have renamed.** The ones are subtracted first, then the tens. Pupils are also taught how to use the part-whole model (shown above). Pupils partition 23 into 13 and 10. They then use their knowledge of number bonds to subtract 5 from 10: **10 – 5 = 5** Add the 5 to the 13 that remains: **5 + 13 = 18** Recombine: **23 – 5 = 18**	Pupils are reminded of the importance of lining up the tens and ones in columns accurately. **When renaming, cross out the original number and write the new number above (3 becomes 13 in the example). The renamed number is crossed out and the new number is written above (2 tens becomes 1 ten in the example).**

Year 2 Multiplication

Multiplication in Year 2 includes:

- recalling and using multiplication facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculating mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×), and equals (=) signs
- showing that multiplication of two numbers can be done in any order (commutative)
- solving problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Pupils use a variety of language to describe multiplication and division.

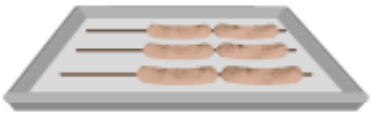
Pupils are introduced to the multiplication tables. They practise to become fluent in the 2, 5 and 10 multiplication tables and connect them to each other. They connect the 10 multiplication table to place value, and the 5 multiplication table to the divisions on the clock face. They begin to use other multiplication tables and recall multiplication facts, including using related division facts to perform written and mental calculations.

Pupils work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition. They begin to relate these to fractions and measures (for example, 40 ÷ 2 = 20, 20 is a half of 40). They use commutativity and inverse relations to develop multiplicative reasoning (for example, 4 × 5 = 20 and 20 ÷ 5 = 4).

Key language

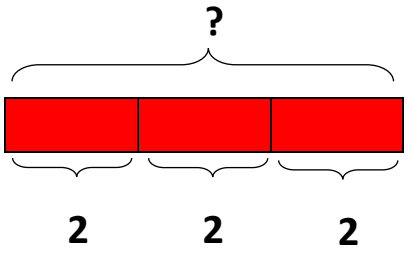
double, times, multiplied by, the product of, groups of, lots of, equal groups, array.

Multiplication problem:



How many sausages are there?

When solving a multiplication problem like this, pupils are encouraged to draw a model to support them in their working out.



Concrete	Pictorial	Abstract
1 stick has 2 sausages.  1 group of 2 1 × 2 = 2  2 groups of 2 2 × 2 = 4  3 groups of 2 3 × 2 = 6 There are 6 sausages altogether.		1 × 2 = 2 × 2 = 3 × 2 = 4 × 2 = 5 × 2 = 6 × 2 =
When using the concrete resources it is very important that the pupils understand they are making groups of 2. **1 group of 2 = 2** **1 x 2 = 2** **2 groups of 2 = 4** **2 x 2 = 4**	Once pupils are secure with using the concrete method to solve multiplication problems, they are encouraged to move onto pictorial methods. These may include drawing the equipment that they previously used. The pupils will also be taught how to use an	The pupils make a statement to explain how many groups, and how many are in each equal group. Using the correct language is very important, as it helps their understanding when explaining.

	array to represent their multiplication equation.	The pupils must understand that the equation **6 x 2** means there are **6 groups of 2**.

Year 2 Division

Division in Year 2 includes:

- recalling and using multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculating mathematical statements for division within the multiplication tables and write them using the division (÷), and equals (=) signs
- showing that, unlike multiplication, division of two numbers cannot be done in any order
- solving problems involving division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Pupils use a variety of language to describe multiplication and division.

Pupils are introduced to the multiplication tables. They practise to become fluent in the 2, 5 and 10 multiplication tables and connect them to each other. They connect the 10 multiplication table to place value, and the 5 multiplication table to the divisions on the clock face. They begin to use other multiplication tables and recall multiplication facts, including using related division facts to perform written and mental calculations.

Pupils work with a range of materials and contexts in which multiplication and division relate to grouping and sharing discrete and continuous quantities, to arrays and to repeated addition. They begin to relate these to fractions and measures (for example, 40 ÷ 2 = 20, 20 is a half of 40). They use commutativity and inverse relations to develop multiplicative reasoning (for example, 4 × 5 = 20 and 20 ÷ 5 = 4).

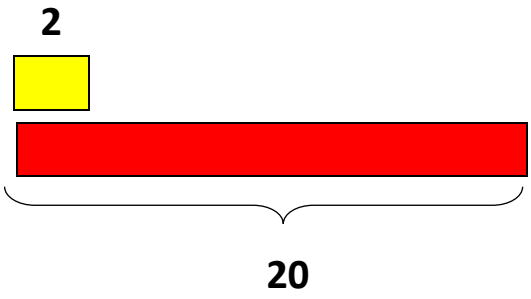
Key language

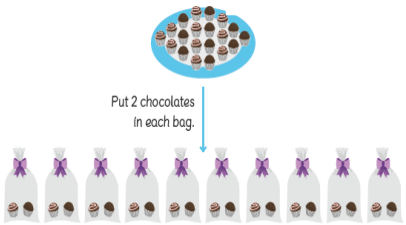
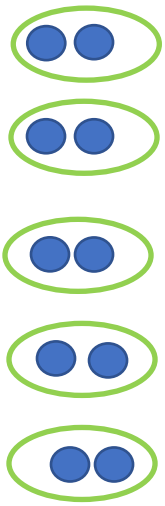
share, group, divide, divided by, half

Division with grouping problem:

How many bags of chocolate can Emma get?

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.



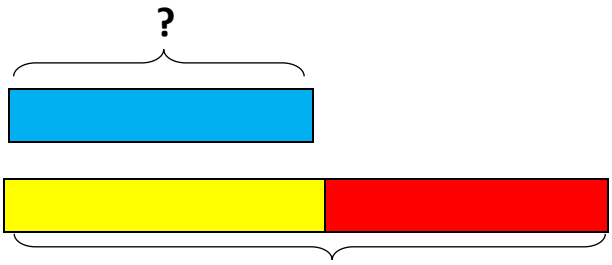
Concrete	Pictorial	Abstract
		2 ÷ 2 = 4 ÷ 2 = 6 ÷ 2 = 8 ÷ 2 = 10 ÷ 2 = 12 ÷ 2 = 14 ÷ 2 = 16 ÷ 2 = 18 ÷ 2 = 20 ÷ 2 =
A division word problem is focussed on and the pupils will use resources to represent the problem. They may use counters to represent the cupcakes and pieces of paper to represent the bags.	Pupils use pictures or shapes to represent quantities. They represent grouping by drawing a circle around each set. It is very important to talk about what each part of the equation is representing. **E.g. 8 = the 'cupcakes'** **2** = how many 'cupcakes' are in each bag/group.	The pupils make a statement to explain how many 'cupcakes' there are to share, and how many are grouped into each 'bag'.

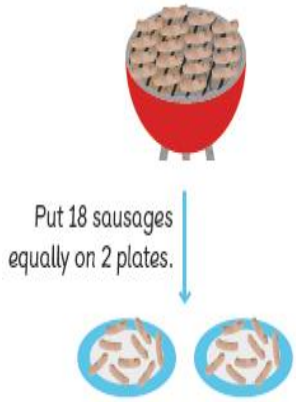
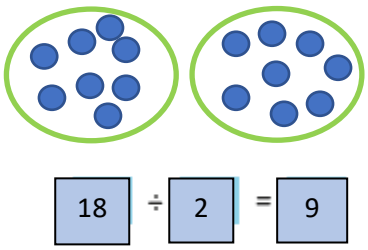
It is important that the children understand the 'bag' is the group.	**4** = how many bags/groups there are.	

Division with sharing problem:

How can the sausages be put equally on 2 plates?
What is the number of sausages on each plate?

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
		**2 ÷ 2 =** **4 ÷ 2 =** **6 ÷ 2 =** **8 ÷ 2 =** **10 ÷ 2 =** **12 ÷ 2 =** **14 ÷ 2 =** **16 ÷ 2 =** **18 ÷ 2 =** **20 ÷ 2 =**
A division word problem is focussed on. Concrete materials are used to explore the problem. The pupils use may use counters or cubes to explore what is being shared (the sausages),	Pupils use shapes or pictures to represent quantities to share into the given number of groups.	The pupils make a statement to explain how many cookies there are to share, and how many are grouped for each child. The children will talk about each part of the equation.

and pieces of paper to show how many groups they need to share by (2 plates). They then physically share the 18 'sausages' between the 2 'plates'		**Eg:** **18 ÷ 2 = 9** 18 sausages shared between 2 plates equals 9 sausages on each plate. **18 =** number of 'sausages'. **2 =** number of 'plates'. **9 =** number of 'sausages' on each 'plate'.

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'