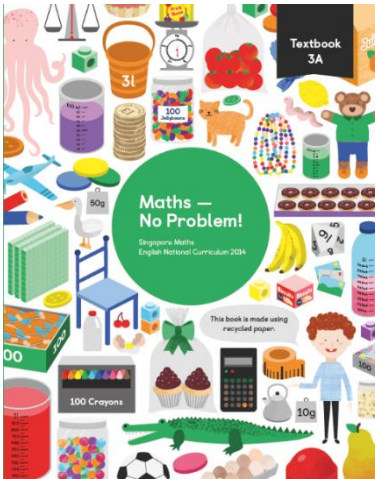
St Joseph's Calculation Policy for families

Year 3



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 3 Addition

Addition in Year 3 includes:

- adding numbers mentally, including:
  - a three-digit number and ones
  - a three-digit number and tens
  - a three-digit number and hundreds

- adding numbers with up to three digits, using formal written methods of columnar addition

- estimate the answer to a calculation and use inverse operations to check answers

- solving problems, including missing number problems, using number facts, place value, and more complex addition.

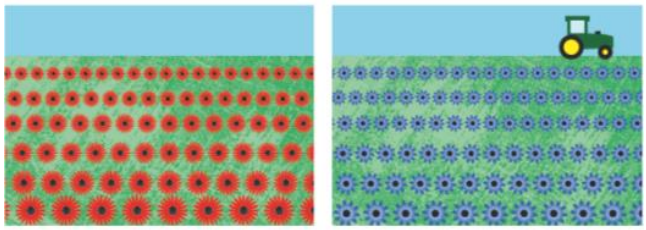
Pupils practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100.

Pupils use their understanding of place value and partitioning, and practise using column addition and subtraction with increasingly large numbers up to three digits to become fluent.

Key Vocabulary

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

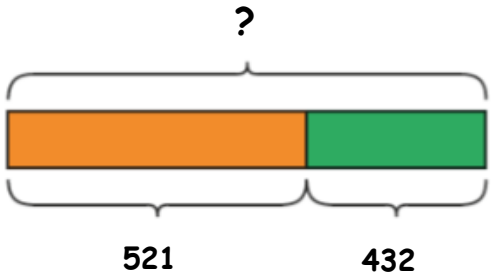
Simple addition problem:

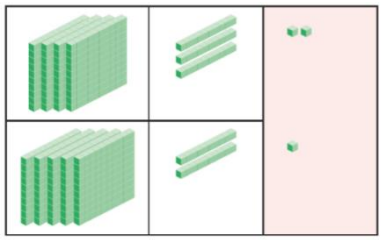
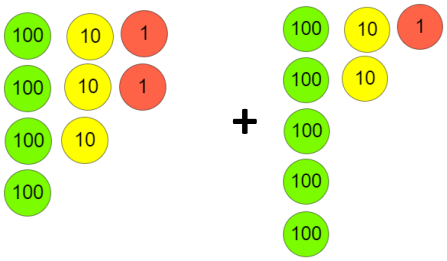
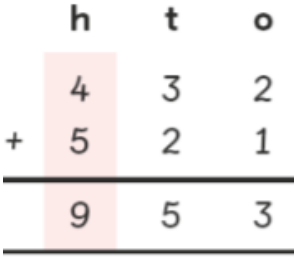


432 flowers 521 flowers

How many flowers are there altogether?

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
		
Pupils will use equipment such as place value counters or Dienes equipment (as seen above) to make both of the 3-digit numbers that they are adding together. The equipment is then used to complete the calculation. **Step One** Pupils are taught to add the ones together first. **2 ones + 1 one = 3 ones (3)**	Once pupils are secure in using concrete equipment to solve simple addition problems, they move onto drawing the equipment for themselves. They may draw Dienes equipment or place value counters. They are encouraged to draw their equipment to represent the hundred, tens and ones in columns to aid their understanding of place value. As with the concrete method, they are taught to add the ones together first, then move onto the tens and finally the hundreds.	Once pupils have secured adding using concrete and pictorial methods, they move on to the written, column method as shown above. It is further reinforced that they odd the ones first, then the tens and finally the hundreds. Pupils are reminded of the importance of lining up their hundreds, tens and ones in columns accurately.

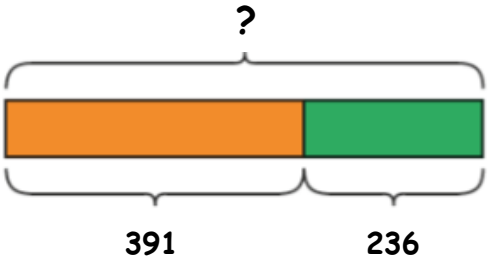
Step Two Add the tens together next. **3 tens + 2 tens = 5 tens (50)** **Step Three** Then finally add the hundreds together. **4 hundreds + 5 hundreds = 9 hundreds (900)** **Step Four** They finish by writing the whole equation out, recombining the hundreds, tens and ones to form a single 3-digit number. **432 + 521 = 953**		

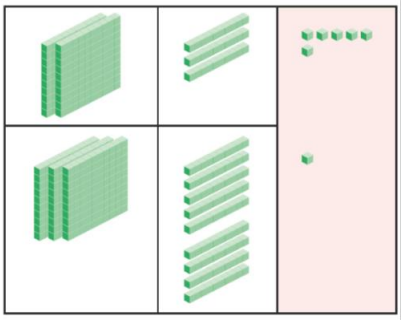
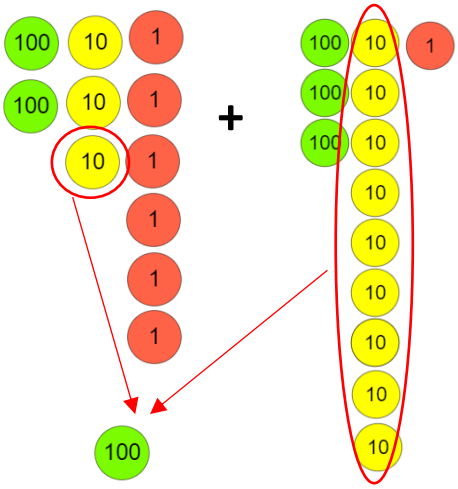
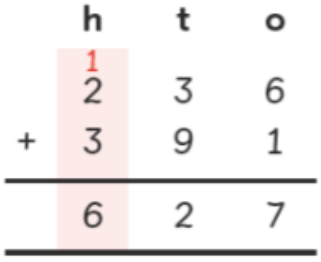
Addition with renaming problem:

Lulu made 236 chocolate cookies and 391 vanilla cookies.

How can we find the total number of cookies Lulu made?

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
		
As with the simple addition problem, pupils begin by using equipment such as Dienes equipment or place value counters to make both 3-digit numbers. They then use the equipment to find the total. **Step One** Children are taught to add the ones together first.	Once pupils are secure in using concrete equipment to solve addition problems with renaming, they move onto drawing the equipment for themselves. They may draw Dienes equipment or place value counters. Pupils are encouraged to draw their equipment to represent the hundreds, tens and ones in columns to aid with their	Once they have secured renaming using concrete and pictorial methods, they move on to the written method as shown above. They are reminded to add the ones first, the tens next and finish with the hundreds. They write the renamed number at

6 ones + 1 one = 7 ones (7) **Step Two** Pupils are taught to add the tens together next. **3 tens + 9 tens = 12 tens** They are then taught that the 10 tens would need to be renamed for a hundred. Therefore, leaving them with... **1 hundred + 2 tens (20)** Carrying the hundred into step 3. **Step Three** They finally add the hundreds together. **2 hundreds + 3 hundreds = 5 hundreds (500)** **5 hundreds + 1 hundred = 6 hundreds (600)** **Step Four** They finish by recombining the hundreds, tens and ones to find the total. **236 + 391 = 627**	understanding of the place value. As shown above, they are also encouraged to show where they have renamed. As with the concrete method, they are taught to add the ones together first, then move onto the tens and finally the hundreds.	the top of the column that it is being added into as can be seen in the example above. They are reminded of the importance of lining up their hundreds, tens and ones in columns accurately.

Year 3 Subtraction

Subtraction in Year 3 includes:

- subtracting numbers mentally, including:
  - a three-digit number and ones
  - a three-digit number and tens
  - a three-digit number and hundreds

- subtracting numbers with up to three digits, using formal written methods of columnar addition

- estimate the answer to a calculation and use inverse operations to check answers

- solving problems, including missing number problems, using number facts, place value, and more complex addition.

Pupils practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100.

Pupils use their understanding of place value and partitioning, and practise using column addition and subtraction with increasingly large numbers up to three digits to become fluent.

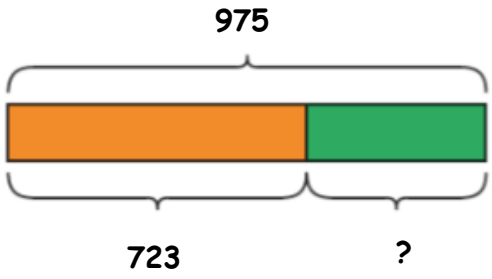
Key Vocabulary

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

Simple subtraction problem:

There were 975 beads in a jar.
Emma used 723 beads to make some necklaces.
How many beads were left in the jar?

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'.



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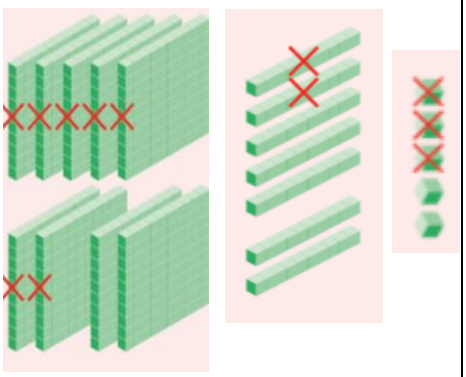
		

	h	t	o
	9	7	5
−	7	2	3
	2	5	2

Pupils will use equipment such as place value counters or Dienes equipment (as seen above) to make the 3-digit number that they are starting with and subtracting from. They then physically remove the correct amount of equipment to find the answer. **Step One** Subtract the ones first: **5 ones – 3 ones = 2 ones (2)** **Step Two** Next, subtract the tens: **7 tens – 2 tens = 5 tens (50)** **Step Three** Subtract the hundreds. **9 hundreds – 7 hundreds = 2 hundreds (200)** **Step Four** Finally, write the whole equation out and recombining the hundreds, tens and ones. **975 – 723 = 252**	Once pupils are secure in using concrete equipment to solve simple subtraction problems they move onto drawing the equipment for themselves. They may draw Dienes equipment or place value counters. They draw the equipment to represent the hundreds, tens and ones in columns which assists their understanding of place value. They cross out to show what they have subtracted as shown in the example above. They begin subtracting the ones first, then move onto the tens and finally the hundreds.	Once secure in subtracting using concrete and pictorial methods, they move on to the written method. They are reminded to start subtracting the ones, then the tens and finally the hundreds. They are reminded of the importance of lining up their hundreds, tens and ones in columns accurately.

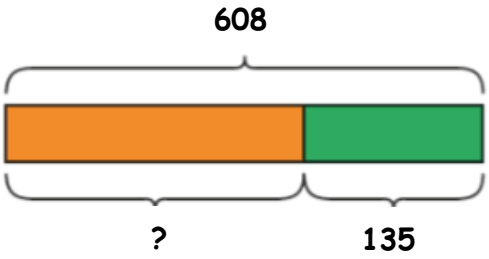
Subtraction with renaming problem

 has 608 stickers in her collection.

 has 135 fewer stickers than  .

What is the number of stickers that  has?

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'.



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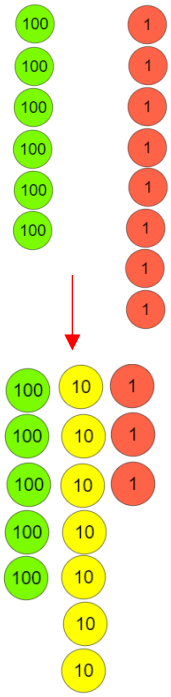
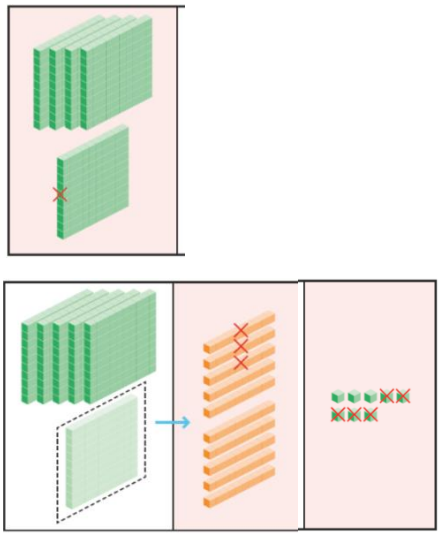
		h t o 5 10 6 0 8 − 1 3 5 4 7 3

Pupils use equipment such as number discs or Dienes to make the 3-digit starting number and subtract from this. Note that they are still to leave room for a column even if there is 0 in that column. They begin to remove the correct amount of equipment to find the answer. **Step One** Subtract the ones first. **8 ones – 5 ones = 3 ones (3)** **Step Two** Subtract the tens next but at the moment there are no tens. **Rename one of the hundreds for 10 tens, putting 1 hundred counter back and replacing it with 10 tens counters.** **10 tens – 3 tens = 7 tens (70)** **Step Three** Finally subtract the hundreds: **5 hundreds – 1 hundred = 4 hundreds (400)** **Step Four** Write the whole equation out, recombining the hundreds, tens and ones. **608 – 135 = 473**	Once secure in using concrete equipment to solve subtraction with renaming problems they move onto drawing the equipment for themselves. They represent the hundreds, tens and ones in columns to aid their understanding of place value. They cross out to show what has been subtracted as shown in the example above. **They show where they have renamed a hundred for 10 tens.** They begin subtracting the ones first, then move onto the tens and finally the hundreds.	Once they have secured subtracting with renaming using concrete and pictorial methods, they move on to the written method. Pupils are reminded to start subtracting the ones, then the tens and finally the hundreds as with simple subtracting. They are reminded of the importance of lining up their hundreds, tens and ones in columns accurately. **When renaming, pupils cross out the original number and write in the new number above (0 becomes 10 in the example). They must also cross out the number in the column that they have renamed from and write the new number above (6 becomes 5 in the example).**

Year 3 Multiplication

Multiplication in Year 3 includes:

- recalling and using multiplication facts for the 3, 4 and 8 multiplication tables
- writing and calculating mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency. Through doubling, they connect the 2, 4 and 8 multiplication tables.

Pupils develop efficient mental methods, for example, using commutativity and associativity (for example, 4 × 12 × 5 = 4 × 5 × 12 = 20 × 12 = 240) and multiplication and division facts (for example, using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (for example,30 × 2 = 60, 60 ÷ 3 = 20 and 20 = 60 ÷ 3).

Pupils develop reliable written methods for multiplication, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written expanded method of multiplication.

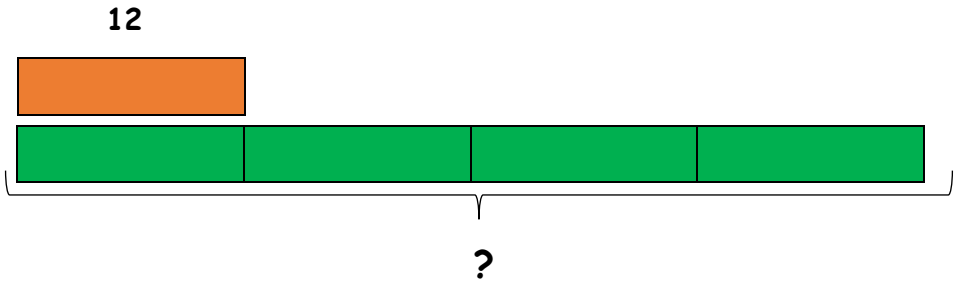
Pupils solve simple problems in contexts, deciding which of the four operations to use and why. These include measuring and scaling contexts, (for example, four times as high, eight times as long etc.) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).

Key language

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

Simple multiplication problem:

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



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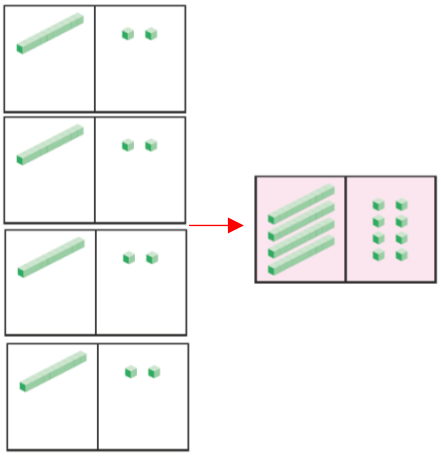
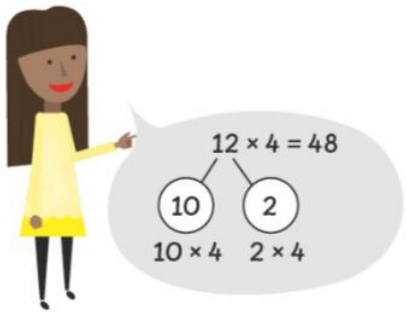
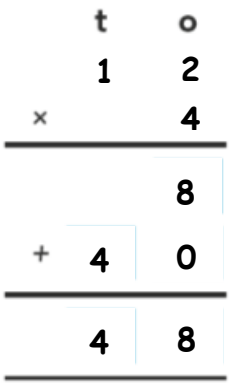
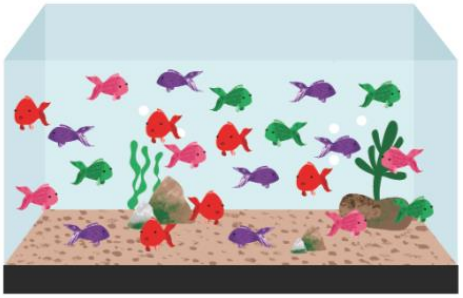
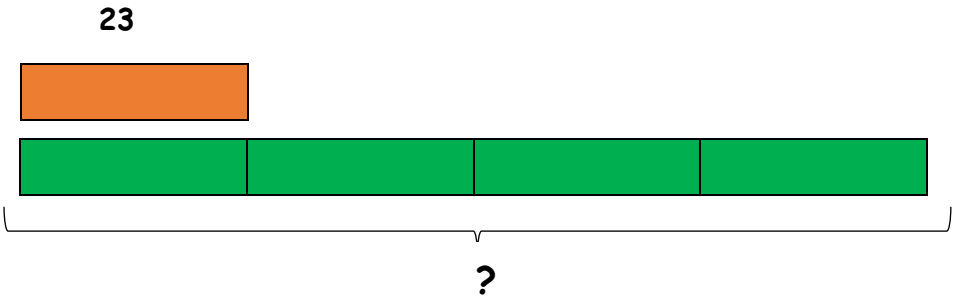
		
Pupils use equipment such as Dienes or number discs to physically make the correct groups to solve the problem. **Step One** Multiply the ones. **2 ones x 4 = 8 ones** **Step Two** Multiply the tens. **1 ten x 4 = 4 tens** **Step Three** Recombine the tens and ones. **4 tens + 8 ones = 48**	Once they 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 have previously used or using a part whole model to support them in partitioning the number before solving.	**Step One** Multiply the ones. **2 ones x 4 = 8 ones** This is written underneath in the ones column. **Step Two** Multiply the tens. **1 ten x 4 = 4 tens (40)** This is written underneath with an add sign next to it. **Step Three** Recombine the tens and ones to find the answer. **4 tens + 8 ones = 48** **12 x 4 = 48**

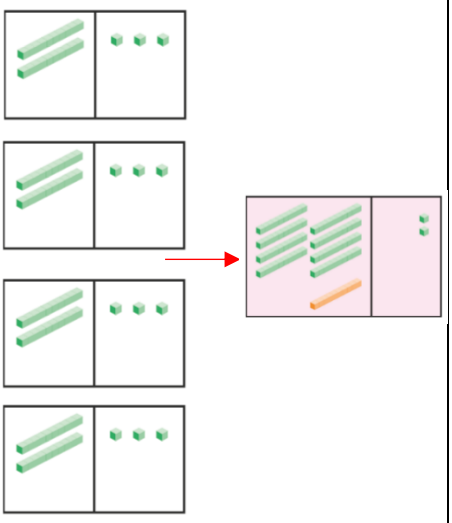
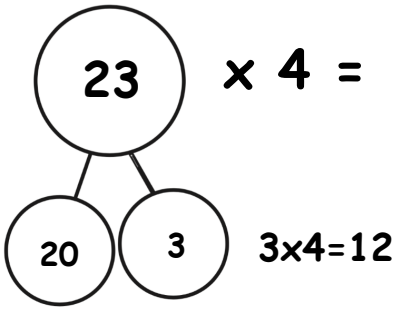
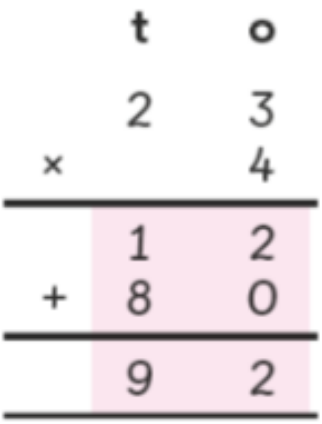
Multiplication with renaming problem:

One tank has 23 fish.
How many fish are there in 4 tanks?



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



Concrete	Pictorial	Abstract
	 **20 x 4 = 80** **23 x 4 = 80 + 12** **23 x 4 = 92**	
Pupils use equipment such as Dienes or numbers discs to physically make the correct groups to solve the problem. **Step One** Multiply the ones. **3 ones x 4 = 12 ones** ***Rename 10 ones for a ten.*** **Step Two** Multiply the tens.	*Once they are secure with using the concrete method to solve multiplication problems, they move onto pictorial methods. This may include drawing the equipment that they previously used, or using a part whole model to support them in partitioning the number before solving.*	**Step One** Multiply the ones. **3 ones x 4 = 12 ones** This is written underneath, ensuring that it is written correctly into the tens and ones columns. **Step Two** Multiply the tens. **2 tens x 4 = 8 tens (80)**

2 tens x 4 = 8 tens ***+ 1 ten = 9 tens*** ***They remember to add the ten that has been renamed.*** **Step Three** Recombine the tens and the ones. **9 tens + 2 ones = 92**		This is written underneath with an add sign next to it. **Step Three** Recombine the numbers from step one and step two and write the final answer underneath as seen in the example above. **23 x 4 = 92**

Year 3 Division

Division in Year 3 includes:

- recalling and using multiplication and division facts for the 3, 4 and 8 multiplication tables
- writing and calculating mathematical statements for division using the multiplication tables that they know, using mental and progressing to formal written methods
- solving division problems, including missing number problems.

Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency. Through doubling, they connect the 2, 4 and 8 multiplication tables.

Pupils develop efficient mental methods and multiplication and division facts (for example, using $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 = 6 \div 3$) to derive related facts (for example $30 \times 2 = 60$, $60 \div 3 = 20$ and $20 = 60 \div 3$).

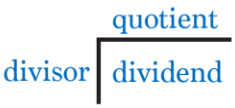
Pupils develop reliable written methods for division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of division. They learn that division is a process of repeated subtraction. When calculating, they subtract groups of the multiple they are dividing by.

Pupils are taught 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. In Year 3, they are introduced to long division, which displays repeated subtraction of multiples to solve division problems.

Pupils solve simple problems in contexts, deciding which of the four operations to use and why. These include measuring and scaling contexts, (for example, four times as high, eight times as long etc.) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).

Key language

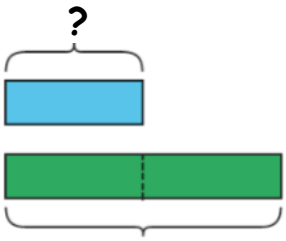
share, group, divide, divided by, half

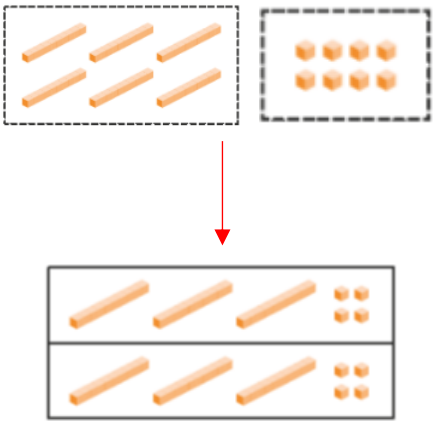


Simple division problem:

Sam and Charles share 68 sweets equally among themselves.
How many sweets will each person get?

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



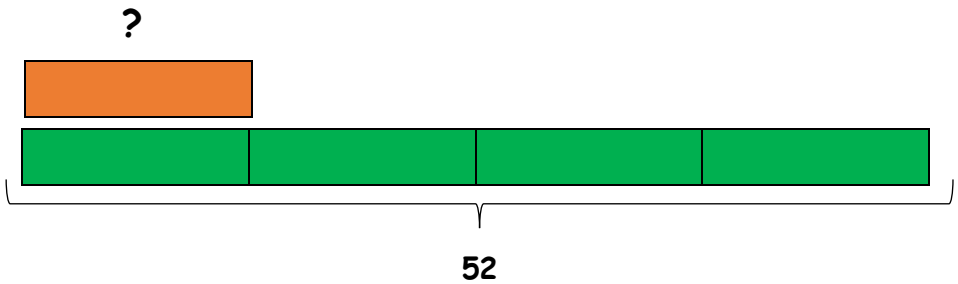
Concrete	Pictorial	Abstract
		3 4 2 | 6 8 - 6 0 8 - 8 0
Pupils make the number that they are dividing (dividend) using either Dienes equipment or number discs. They divide the equipment into the correct number of groups starting with the tens and then the ones. **Step One** Divide the tens. **6 tens ÷ 2 = 3 tens (30)** **Step Two** Divide the ones. **8 ones ÷ 2 = 4 ones**	Once they are secure with the concrete method of division, they are introduced to using the part-whole model to support them. They are encouraged to partition the number to make it easier to divide.	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 2 groups of 30 (3 tens). They can write alongside 2 x 30.

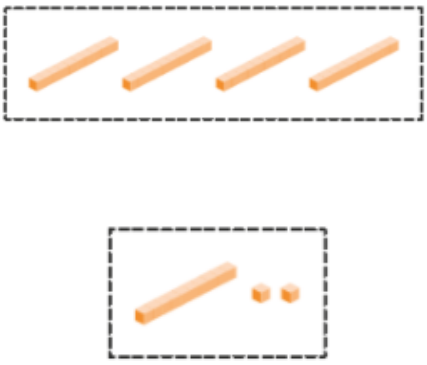
Step Three Recombine the tens and the ones. **68 ÷ 2 = 3 tens + 4 ones** **68 ÷ 2 = 34**		60 is subtracted from 68. **Step two** Use the 2x table and equipment to see that 8 = 2 x 4 They may write 2 x 4 alongside Subtract 8 to leave 0 **Step three** At this point they see how many groups of 2 were used. 30 + 4 = 34 So 34 is inserted on top as the answer.

Division with regrouping and renaming problem:

A shopkeeper has 52 ice creams.
She packs them equally into 4 boxes.
How many ice creams are there in each box?

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
	 **40 (4 tens) ÷ 4 = 10 (1 ten)** **12 ÷ 4 = 3 ones**	1 3 4 ⟌ 5 2 - 4 0 1 2 - 1 2 0
Pupils make the dividing number (dividend) using either Dienes equipment or number discs. If the number of tens is not a multiple of the divisor (4) then children should split the number so that both parts are able to be divided. **In this case into 40 and 12.** **The ten in 12 is renamed as 10 ones.**	Once they are secure with the concrete method of division, they are introduced to using the part-whole model to support them. They use the part-whole model to split the number into two parts that are both divisible by 4. They can draw the equipment used to support their understanding.	They are reminded to view division as repeated subtraction. **Step One** Using the 4x table, what can they pull out of 52? They can see that 52 can be made from 40 and 12. They can use equipment here to see that 40 (4tens) is 4 groups of 10 (1 ten).

Step One Divide the first part by the divisor. **4 tens ÷ 4 = 1 ten (10)** **Step Two** Divide the second part by the divisor. **12 ones ÷ 4 = 3 ones** **Step Three** Recombine the two parts. **1 ten + 3 ones = 13 ones** **Answer** **52 ÷ 4 = 13**		They can write alongside 4 x <u>10.</u> 40 is subtracted from 52. **Step two** Use the 4x table and equipment to see that 12 = 4 x 3 They may write 4 x <u>3</u> alongside Subtract 12 to leave 0 **Step three** At this point they see how many groups of 4 were used. 10 + 3 = 13 So 13 is inserted on top as the answer.

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'