

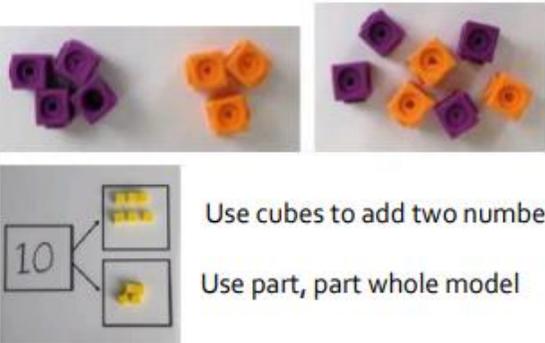
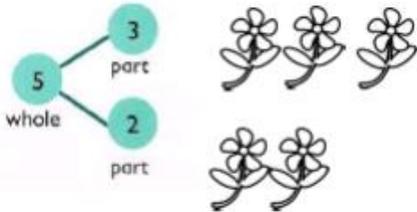
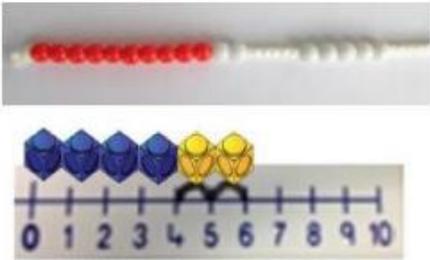
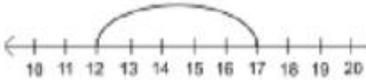
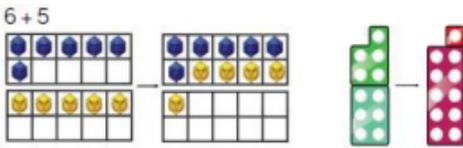
Kirkstall St Stephen's Calculation Policy



This calculation policy has been developed from the White Rose Calculation Policy: working document, which was written as a guide to indicate the progression through Addition, Subtraction, Multiplication and Division in Years 1 – 6.

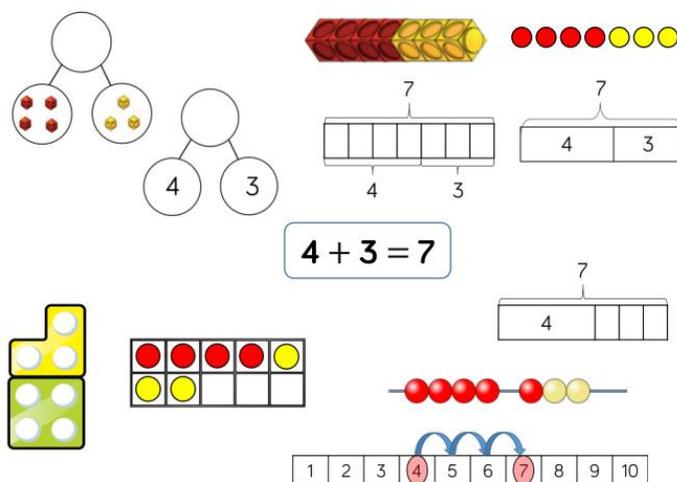
Addition

EYFS will use concrete resources and pictorial representations to teach the following objectives. If, or when ready, staff will move children on to the use of simple abstract concepts which suit EYFS learners.

Objective and strategy	Concrete	Pictorial
<p>Combining 2 parts to make a whole Use a variety of resources e.g. shells, teddy bears, cars. Part-whole models</p>	 <p>Use cubes to add two numbers together. Use part, part whole model</p>	 <p>Use pictures to add two numbers together.</p>
<p>Counting on</p>	 <p>Start with the larger number and count on 1 by 1 to find the answer.</p>	 <p>Start at the larger number and count on in ones to find the answer.</p>
<p>Regrouping to make 10 Using a ten frames and counters/cubes or numicon.</p>	 <p>$6 + 5$</p>	<p>This objective is only taught using concrete manipulatives unless pupils are ready.</p>

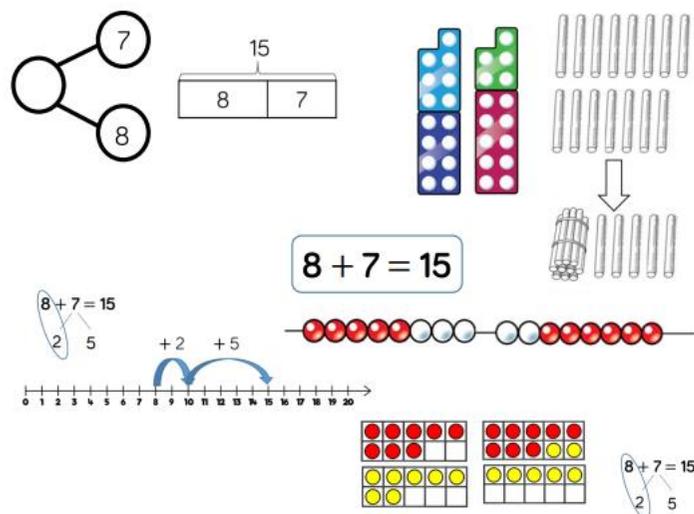
Year 1/2

Skill: Add 1-digit numbers within 10



When adding numbers to 10, children can explore both aggregation and augmentation. The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation. The combination bar model, ten frame, bead string and number track all support augmentation.

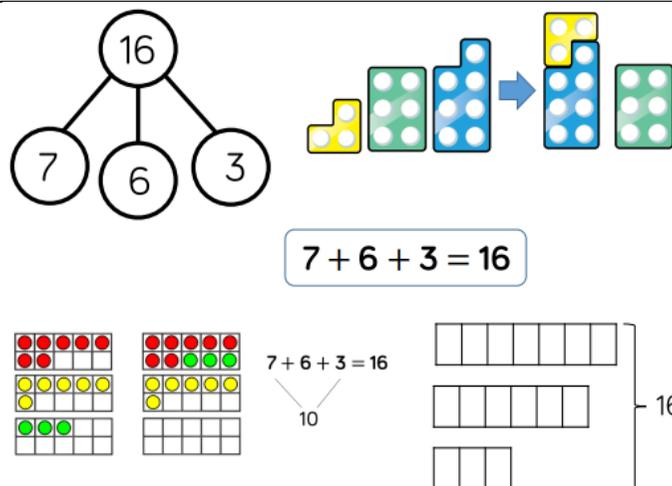
Skill: Add 1 and 2 digit numbers to 20



When adding one digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. Different manipulatives can be used to represent this exchange. Concrete resources are used alongside number lines to support children in understanding how to partition their jumps.



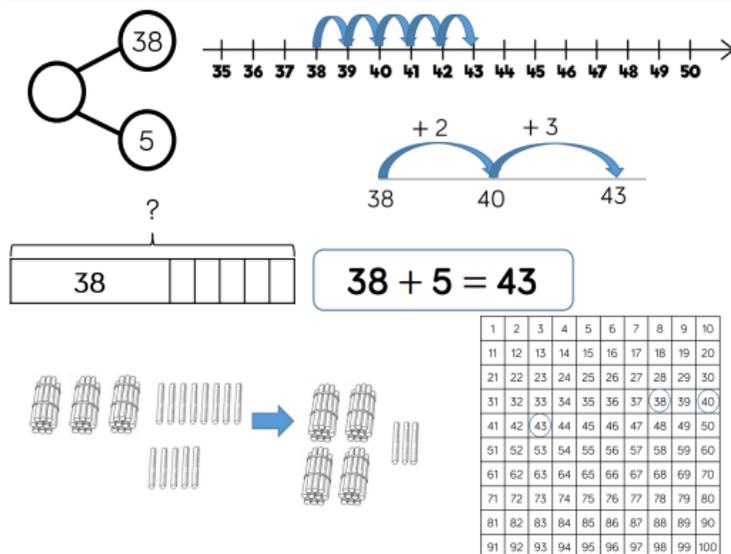
Skill: Add three 1 digit numbers



When adding three 1 digit numbers, children are encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently. This supports children in their understanding of commutativity. Manipulatives that highlight number bonds to 10 are effective when adding three 1 digit numbers.

Year 3/4

Skill: Add 1 digit and 2 digit numbers to 100



When adding single digits to a two digit number, children are encouraged to count on from the larger number. They should also apply their knowledge of number bonds to add more efficiently e.g. 8 + 5 = 13 so 38 + 5 = 43



Skill: Add two 2 digit numbers to 100

38 + 23 = 61

Tens	Ones
38	23

Tens	Ones
38	23
+ 1	
61	

Skill: Add numbers with up to 3 digits

265 + 164 = 429

Hundreds	Tens	Ones
265	164	

Hundreds	Tens	Ones
265	164	
+ 1		
429		

Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits. Children will write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.



<p>Skill: Add numbers with up to 4 digits</p>	<p>$1,378 + 2,148 = 3,526$</p>	<p>Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits. Children will write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.</p>

Year 5/6

<p>Skill: Add numbers with more than 4 digits</p>	<p>$104,328 + 61,731 = 166,059$</p>	<p>Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.</p>



Skill: Add with up to 3 decimal places

3.65 + 2.41 = 6.06

3.	6	5
2.	4	1
1		
6.	0	6

Ones	Tenths	Hundredths
1 1 1	0.1 0.1 0.1	0.01 0.01 0.01
1 1	0.1 0.1 0.1	0.01 0.01
1	0.1	0.01

Ones	Tenths	Hundredths
1 1 1	0.1 0.1 0.1	0.01 0.01 0.01
1 1	0.1 0.1 0.1	0.01 0.01
1	0.1	0.01

Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1,2 and then 3 decimal places. Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.



Subtraction

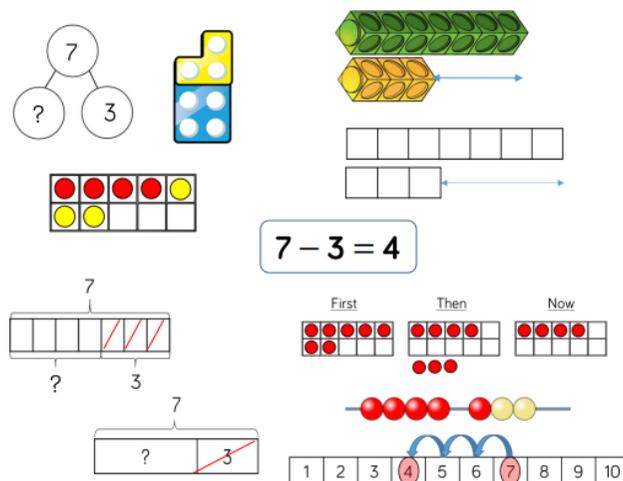
EYFS

	Concrete	Pictorial
Taking away ones	<p>Physically taking away and away and removing objects from a whole (ten frames, Numicon, cubes and other items should be used)</p>	<p>Children will use drawings to visualise the equation then cross out to represent subtraction.</p>
Counting back	<p>Using number lines or number tracks children, children start with 6 and count back 2.</p> <p>$6 - 2 = 4$</p>	<p>Children to represent what they see pictorially e.g.</p>
Part whole model	<p>Link to addition- use the part whole model to help explain the inverse between addition and subtraction.</p> <p>If 10 is the whole and 6 is one of the parts. What is the other part?</p>	<p>Use a pictorial representation of objects to show the part whole model.</p>
Making 10 Using a ten frame	<p>$14 - 5$</p>	<p>This objective is only taught using concrete manipulatives unless pupils are ready.</p>



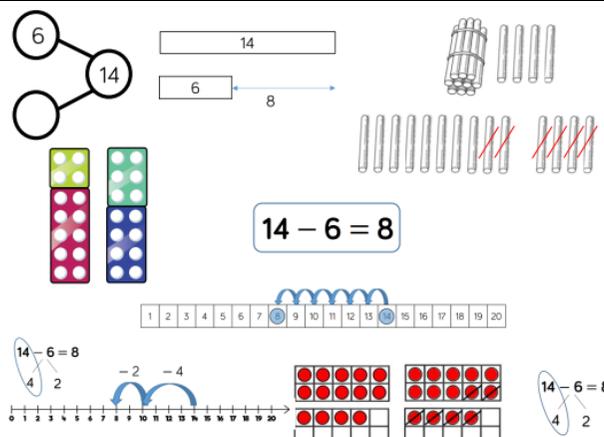
Year 1/2

Skill: Subtract 1 digit numbers within 10



Part whole models, bar models, ten frames and number shapes support partitioning. Ten frames, number tracks, single bar models and bead strings support reduction. Cubes and bar models with two bars can support finding the difference.

Skill: Subtract 1 and 2 digit numbers to 20



When subtracting one digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. Children will be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.



Skill: Subtract 1 and 2 digit numbers to 100

65

28

65

? 28

$65 - 28 = 37$

Tens	Ones
65	
-28	
37	

At this stage, children will use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient. Children can also use a blank number line to count on to find the different. They will be encouraged to jump in multiples of 10 to become more efficient.

Year 3 /4

Skill: Subtract numbers with up to 3 digits

435

273 ?

273 ?

$435 - 273 = 262$

Hundreds	Tens	Ones
435		
-273		
262		

Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3 digits. Children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.



Skill: Subtract numbers with up to 4 digits

4,357

2,735 ?

4,357

2,735 ?

$$4,357 - 2,735 = 1,622$$

Thousands	Hundreds	Tens	Ones
4	3	5	7
2	7	3	5
1	6	2	2

Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 4 digits. Children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.

Year 5 / 6

Skill: Subtract numbers with more than 4 digits

294,382

182,501 ?

294,382

182,501 ?

$$294,382 - 182,501 = 111,881$$

HTh	TTh	Th	H	T	O
2	9	4	3	8	2
1	8	2	5	0	1
1	1	1	8	8	1

Place value counters or plain counters on a place value grid are the most effective concrete resources when subtracting numbers with more than 4 digits. At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.



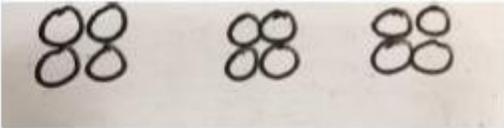
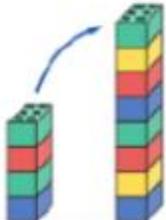
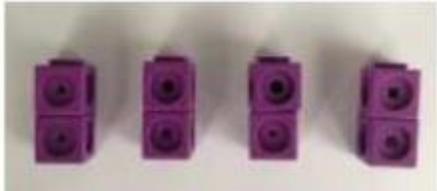
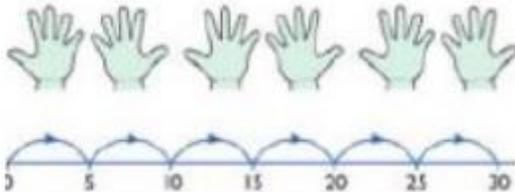
Skill: Subtract with up to 3 decimal places

$5.43 - 2.7 = 2.73$

Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1,2 and then 3 decimal places. Children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracted money and other measures.

Multiplication

EYFS

	Concrete	Pictorial
<p>Recognising and making equal groups. Only in 2's, 5's and 10's.</p>	<p>There are 4 equal groups with 2 in each group. 2,4,6,8 There are 8 altogether</p> 	 <p>Children to represent the practical resources in a picture. Counting in 2's, 5's and 10's.</p>
<p>Doubling</p>	 <p>Use practical activities to show how to double a number.</p>	<p>Draw pictures to show how to double a number.</p> <p>Double 4 is 8</p> 
<p>Counting in multiples. Use cubes, Numicon and other objects in the classroom. Only in 2's, 5's and 10's.</p>	<p>Count in multiples supported by concrete objects in equal groups</p>  	<p>Use a number line or pictures to continue support when counting in multiples of 2, 5 and 10.</p> 



Year 1/2

Skill: Solve 1 step problems using multiplication

One bag holds 5 apples.
How many apples do 4 bags hold?

$$5 + 5 + 5 + 5 = 20$$

$$4 \times 5 = 20$$

$$5 \times 4 = 20$$

Children represent multiplication as repeated addition in many different ways. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally. In Year 2, children are introduced to the multiplication symbol.

Year 3 / 4

Skill: Multiply 2 digit numbers by 1 digit numbers

	H	T	O
		3	4
x			5
	1	7	0
	1	2	

$$34 \times 5 = 170$$

Teachers will first look at the expanded column method before moving on to the short multiplication method. The place value counters should be used to support the understanding of the method rather than supporting the multiplication as children should use times table knowledge.



Skill: Multiply 3 digit numbers by 1 digit numbers

	H	T	O
	2	4	5
x			4
	9	8	0
	1	2	

$245 \times 4 = 980$

When moving to 3 digit by 1 digit multiplication, children will be encouraged to move towards the short, formal written method. Base 10 and place value counters continue to support the understanding of the written method. The number of exchanges needed will be limited and children will quickly move on from resources when multiplying larger numbers.

Year 5 / 6

Skill: Multiply 4-digit numbers by 1 digit numbers

	Th	H	T	O
	1	8	2	6
x				3
	5	4	7	8
	2		1	

$1,826 \times 3 = 5,478$

When multiplying 4 digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method. If children are multiplying larger numbers and struggling with their times tables. The use of multiplication grids will be encouraged so the children can focus on the use of the written method.

Kirkstall St Stephen's
Calculation Policy



Skill: Multiply 4 digit numbers by 2 digit numbers.

TTh	Th	H	T	O
	2	7	3	9
×			2	8
2	1	9	1	2
<small>2</small>	<small>5</small>	<small>3</small>	<small>7</small>	
5	4	7	8	0
<small>1</small>		<small>1</small>		
7	6	6	9	2

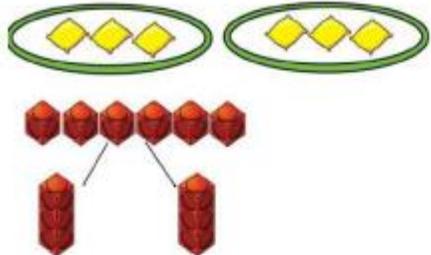
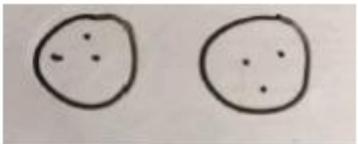
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$$2,739 \times 28 = 76,692$$

When multiplying 4 digits by 2 digits, children should be confident in the written method. If they are still struggling with times tables, multiplication grids provide support when focussing on this method. Exchanged digits should be consistently placed.

Division

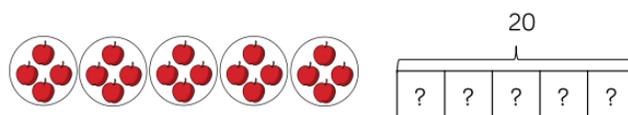
EYFS

	Concrete	Pictorial
Sharing objects into groups.	 <p>Sharing using a range of objects.</p>	 <p>Represent the sharing pictorially.</p>
Division as grouping	<p>Divide quantities into equal groups. Use cubes, counters and other objects.</p> 	<p>This objective is only taught using concrete manipulatives unless pupils are ready.</p>

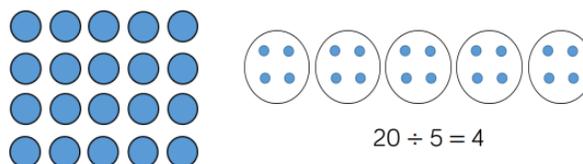


Year 1/2

Skill: Solve 1 step problems using multiplication (sharing)

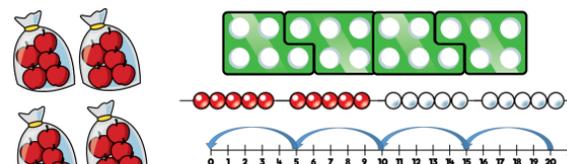


There are 20 apples altogether.
They are shared equally between 5 bags.
How many apples are in each bag?

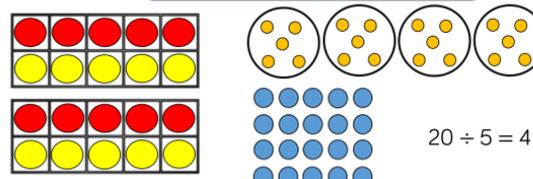


Children solve problems by sharing equal amounts into equal groups.
In year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally,

Skill: Solve 1 step problems using division (grouping)



There are 20 apples altogether.
They are put in bags of 5.
How many bags are there?



Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helped to show the link between multiplication and division.



Skill: Divide 2 digits by 1 digit (sharing with no exchange)

Tens	Ones

$48 \div 2 = 24$

When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones. Straws, base 10 and place value counters can all be used to share numbers into equal groups. Part-whole models can provide children with a clear written method that matches the concrete representation.

Year 3/4

Skill: Divide 2 digits by 1 digit (sharing with exchange)

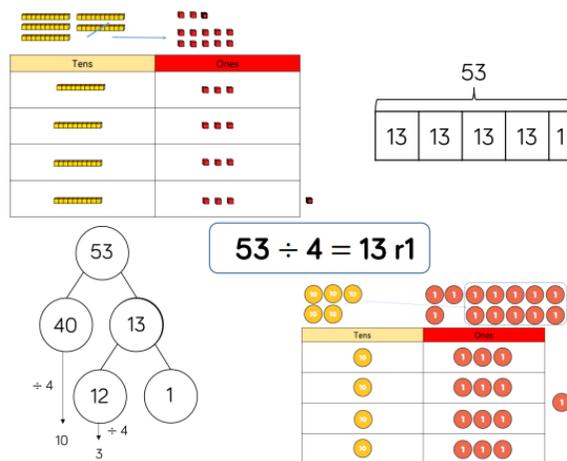
Tens	Ones

$52 \div 4 = 13$

When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones. Children will start with the equipment outside the place value grid before sharing the tens and ones equally between the rows. Flexible partitioning in a part-whole model supports this method.



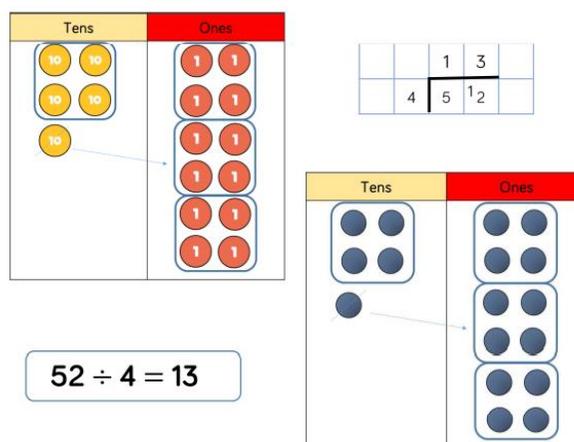
Skill: Divide 2 digits by 1 digit (sharing with remainders)



When dividing numbers with remainders children can use Base 10 and place value counters to exchange one ten for ten ones. Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made. Flexible partitioning in a part-whole model supports this method.

Year 5 / 6

Skill: Divide 2 digits by 1 digit (grouping)



When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor. Language is important at this step and questions such as the following should be used:
How many groups of 4 tens can we make?
How many groups of 4 ones can we make?

Remainders can also be seen as they are left ungrouped.



Skill: Divide 3 digits by 1 digit (grouping)

		2	1	4
	4	8	5	6

$856 \div 4 = 214$

Children continue to use grouping to support their understanding of short division when dividing a 3 digit number by a 1 digit number. Place value counters or plan counters can be used on a place value grid to support this understanding. Children can also draw their own counters and group them through a more pictorial method.

Skill: Divide 4 digits by 1 digit (grouping)

	4	2	6	6
2	8	5	3	2

$8,532 \div 2 = 4,266$

Place value counters or plain counters can be used on a place value grid to support children to divide 4 digits by 1 digit. Children can also draw their own counters and group them through a more pictorial method. Children will be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.



Skill: Divide multi digits by 2 digits (short division)

		0	3	6
	12	4	4	7
			3	2

$$432 \div 12 = 36$$

$$7,335 \div 15 = 489$$

		0	4	8	9
	15	7	7	13	13
			3	3	5

15	30	45	60	75	90	105	120	135	150
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When children begin to divide up to 4 digits by 2 digits, written methods become the most accurate as concrete and pictorial representations become less effective. Children can write out multiples to support their calculations with larger remainders. Children will also solve problems with remainders where the quotient can be rounded as appropriate.

Skill: Divide multi-digits by 2 digits (long division)

		0	3	6
1	2	4	3	2
	-	3	6	0
			7	2
	-	7	2	
				0

(x30) $12 \times 1 = 12$
 $12 \times 2 = 24$
 $12 \times 3 = 36$
 $12 \times 4 = 48$
 $12 \times 5 = 60$
 (x6) $12 \times 6 = 72$
 $12 \times 7 = 84$
 $12 \times 8 = 96$
 $12 \times 7 = 108$
 $12 \times 10 = 120$

$$432 \div 12 = 36$$

$$7,335 \div 15 = 489$$

		0	4	8	9
15	7	3	3	5	
	-	6	0	0	0
		1	3	3	5
	-	1	2	0	0
			1	3	5
	-		1	3	5
					0

(x400) $1 \times 15 = 15$
 $2 \times 15 = 30$
 $3 \times 15 = 45$
 $4 \times 15 = 60$
 $5 \times 15 = 75$
 (x9) $10 \times 15 = 150$

Children can also divide by 2 digit numbers using long division. Children can write out multiples to support their calculations with larger remainders. Children will also solve problems with remainders where the quotient can be rounded as appropriate.

Kirkstall St Stephen's
Calculation Policy



Skill: Divide multi digits
by 2 digits (long
division)

$$372 \div 15 = 24 \text{ r}12$$

			2	4	$\frac{4}{5}$
1	5	3	7	2	
	-	3	0	0	
			7	2	
	-		6	0	
			1	2	

			2	4	r	1	2
1	5	3	7	2			
	-	3	0	0			
			7	2			
	-		6	0			
			1	2			

- 1 × 15 = 15
- 2 × 15 = 30
- 3 × 15 = 45
- 4 × 15 = 60
- 5 × 15 = 75
- 10 × 15 = 150

$$372 \div 15 = 24 \frac{4}{5}$$

When a remainder is left at the end of a calculation, children can either leave it as a remainder or convert it to a fraction. This will depend on the context of the question. Children can also answer questions where the quotient needs to be rounded according to the context.



Addend - A number to be added to another.

Aggregation - combining two or more quantities or measures to find a total.

Augmentation - increasing a quantity or measure by another quantity.

Commutative - numbers can be added in any order.

Complement - in addition, a number and its complement make a total e.g. 300 is the complement to 700 to make 1,000

Difference - the numerical difference between two numbers is found by comparing the quantity in each group.

Exchange - Change a number or expression for another of an equal value.

Minuend - A quantity or number from which another is subtracted.

Partitioning - Splitting a number into its component parts.

Reduction - Subtraction as take away.

Subitise - Instantly recognise the number of objects in a small group without needing to count.

Subtrahend - A number to be subtracted from another.

Sum - The result of an addition.

Total - The aggregate or the sum found by addition.



Array – An ordered collection of counters, cubes or other item in rows and columns.

Commutative – Numbers can be multiplied in any order.

Dividend – In division, the number that is divided.

Divisor – In division, the number by which another is divided.

Exchange – Change a number or expression for another of an equal value.

Factor – A number that multiplies with another to make a product.

Multiplicand – In multiplication, a number to be multiplied by another.

Partitioning – Splitting a number into its component parts.

Product – The result of multiplying one number by another.

Quotient – The result of a division

Remainder – The amount left over after a division when the divisor is not a factor of the dividend.

Scaling – Enlarging or reducing a number by a given amount, called the scale factor