

# Calculation Policy 2024 - 2025



**PACE**  
MODERN BRITISH SCHOOL  
DUBAI, UAE

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Approved By:  
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## CALCULATION POLICY

Over the years much has changed in the teaching and learning of maths. The calculation methods used by children today in many cases differ from those used by adults when they were at school. This can cause anxiety, with parents and carers unsure whether they should teach children particular methods.

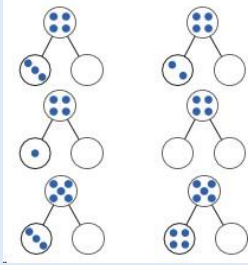
The purpose of this booklet is to provide guidance and information about the types of calculation methods that the children at PACE MBS are being taught and are using from Foundation up to Year 8.

This policy lays out the expectations for both mental and written calculations for the 4 number operations and has been created to support the teaching of a mastery approach to mathematics. This is underpinned using models and images that support conceptual understanding and this policy promotes a range of representations to be used across the year groups. Mathematical understanding is developed through the use of representations that are first of all concrete (e.g. Dienes apparatus and place value counters), and then pictorial (e.g. bar models) to facilitate abstract working (e.g. standard written methods). This policy is a guide through an appropriate progression of representations and if at any point a pupil is struggling with the abstract, they should revert to familiar pictorial and/or concrete materials/representations as appropriate.

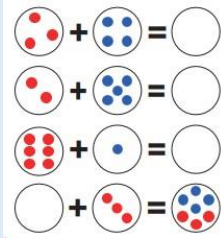
Although this policy sets out the main methods of mental and written calculations to be taught, it has been appended with a list of recommendations and effective practice teaching ideas aimed at informing and enhancing teaching across all the primary phases. Many of these ideas come from the NCETM's Calculation Guidance document (published October 2015) which is intended to sit alongside a school's calculation policy.



Conceptual Subitising



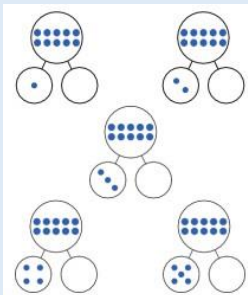
Composition of 5



Composition of 10



Adding 1, 1 More



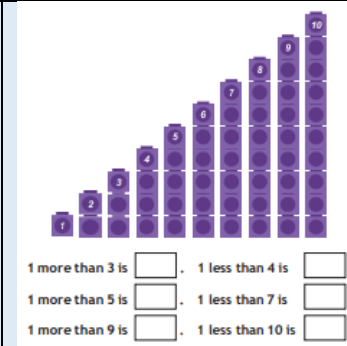
Pupils are able to recognise a quantity by combining groups that have not needed to be counted. Pupils may see 5 items as 3 items and 2 items.

Pupils are able to demonstrate all possible whole number compositions of 5, including recognising and showing 5 on a five frame and using a number bond diagram.

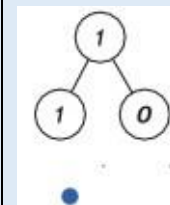
Pupils are able to demonstrate all possible whole number compositions of 10, including recognising and showing 10 on a ten frame and using a number bond diagram.

Pupils relate adding 1 to 1 more than the starting number.

Doubles



Adding zero

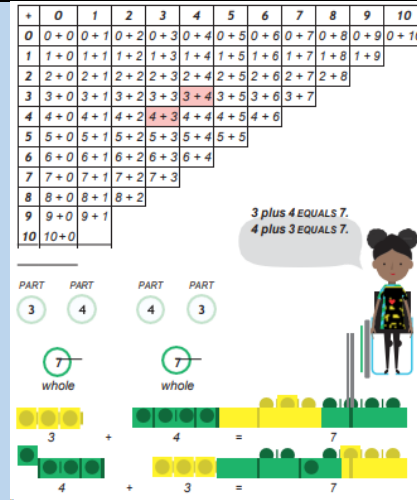


Pupils understand doubles up to  $5 + 5$ . This forms the basis of generalising about near doubles. Pupils should also develop an awareness that the sum of any whole number that is doubled will be an even number.

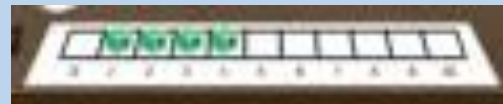
Pupils understand zero can be added to any number but the number will remain unchanged.

Year 1

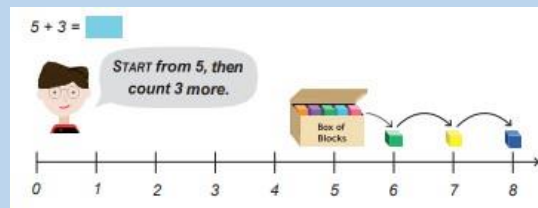
Part – Part – Whole



Using a Number Track



Counting on Using a Number Line



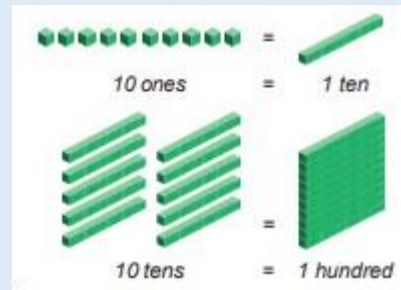
Pupils develop automatic recall of number bonds to 10. This can be shown using a ten frame, a NUMBER bond diagram and written as an equation. This understanding can be related to adding tens, hundreds and so on when used with a sound understanding of place value.

Pupils are first introduced to a linear number system through the number track. This is a precursor to the number line. Pupils may benefit from placing items on the number track as they count and add, before moving on to use the more abstract number line.

Pupils move from a number track to a number line, starting from zero and having marked increments of 1. The use of the number line is further developed when counting starts from a given number, relying on pupils' ability to



Base 10 Blocks



Formal Written Method

$43 + 8 =$

START by ADDING the ones.

3 ones + 8 ones = 11 ones  
11 ones = 1 ten and 1 one

tens	ones
4	3
<hr/>	
1	1

RENAME 10 ones AS 1 ten.

tens	ones
4	3
<hr/>	
1	1
<hr/>	
5	1

Then ADD the tens.

4 tens + 1 ten = 5 tens  
 $40 + 10 = 50$   
 $43 + 8 = 51$

There ARE 51 bottles of water in total.

progresses to a number line shown with intervals of 10 when adding 2-digit numbers that do not have any ones.

The use of base 10 blocks provides a representation of the place value, primarily of 2-digit numbers. This representation is related to the formal written method but also encourages pupils to use their understanding of adding the same noun to add 2-digit numbers. For example,  $20 + 30$  can be understood as 2 tens + 3 tens. The sum of these numbers is 50 or 5 tens. An understanding of place value will support addition as well as subtraction, multiplication and division.

This is a procedural method that relies on a pupil's conceptual understanding of addition. This begins without renaming and progresses to the renaming of 10 ones into 1 ten. Pupils understand that at this stage, they start with the addition of the ones before they add the tens. This method is supported with base 10 block representation. The formal written method is always accompanied by a written equation to ensure that the relationship between the representations is made.





Formal Written Method

The image illustrates the formal written method for addition through several components:

- Base 10 Blocks:** Shows 2 orange hundred blocks and 87 orange ten and one blocks representing 287. It also shows 5 green hundred blocks representing 500. A final set shows 7 orange hundred blocks representing the sum 787.
- Grid:** A 2x3 grid where the top row contains the blocks for 287 and 500, and the bottom row contains the blocks for 787.
- Formal Written Method:**

	h	t	o
	2	8	7
+	5	0	0
<hr/>			
	7	8	7
- Word Problem:**  $287 + 500 = 787$   
*787 fans watched the game in total.*
- Number Line Diagram:** A number line starting at 0, with a point at 287 and another at 500. An arrow points from 287 to 500. Below the line, 87 and 200 are marked, with arrows pointing to the 287 and 500 positions respectively.
- Equations:**  $200 + 500 = 700$   
 $87 + 700 = 787$

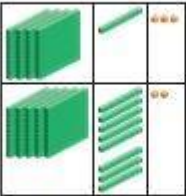
200 + 500 can be understood as 2 hundreds + 5 hundreds. The sum of these numbers is 700 or 7 hundreds. Progression is made by adding ones, then tens and finally hundreds before the addition of all 3 is undertaken. An understanding of place value will support addition as well as subtraction, multiplication and division.

This procedural method progresses from the renaming of 10 ones into 1 ten to include the renaming of 10 tens to 1 hundred. The procedure remains unchanged from Year 2. Pupils understand that at this stage, they start with the addition of the ones, then the tens, then finally the hundreds. This method is supported with base 10 block representation. The formal written method is always accompanied by a written equation to ensure that the relationship between the representations is made.

Adding by making 100

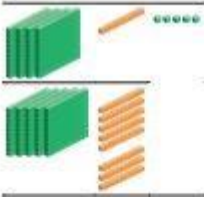
$413 + 582 =$

Step 1 Add the ones.  
 $3 \text{ ones} + 2 \text{ ones} = 5 \text{ ones}$



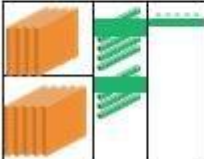
h	t	o
4	1	3
+	5	8
		2
		5

Step 2 Add the tens.  
 $1 \text{ ten} + 8 \text{ tens} = 9 \text{ tens}$



h	t	o
4	1	3
+	5	8
		2
		5
		9

Step 3 Add the hundreds.  
 $4 \text{ hundreds} + 5 \text{ hundreds} = 9 \text{ hundreds}$



h	t	o
4	1	3
+	5	8
		2
		5
		9
9	9	5

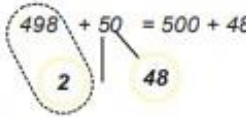
$413 + 582 = 995$

Estimating

Adding Fractions

$498 + 50 =$

$498 + 50 = 500 + 48$



Pupils are given the opportunity to further develop their number sense by using a 'make 100' strategy with numbers that are 'near hundreds'. They use their part-whole understanding to rename a given number to make 100. For example,  $498 + 50$  can be renamed as  $498 + 2 + 48$ . Pupils add 2 to 498 to make 500, then add the remaining 48.

Pupils use their number sense to recognise numbers close to a hundred and how estimation can help accuracy in completing a precise calculation.

Pupils use their understanding of adding the same noun when adding fractions with the same denominator. The adding of fractions uses equations and is supported through pictorial representation.

I HAD 593 points.  
593 is ABOUT 600.

I HAD 695 points.  
695 is ABOUT 700.

I HAD 498 points.  
498 is ABOUT 500.

Lulu                      Sam                      Hannah

$600 + 50 = 650$                        $700 + 70 = 770$                        $500 + 50 = 550$

1 sixth And 5 sixths make 6 sixths.

$\frac{1}{6} + \frac{5}{6} = 1$

$6 + 6 = 6$   
 $= 1$

Year 4

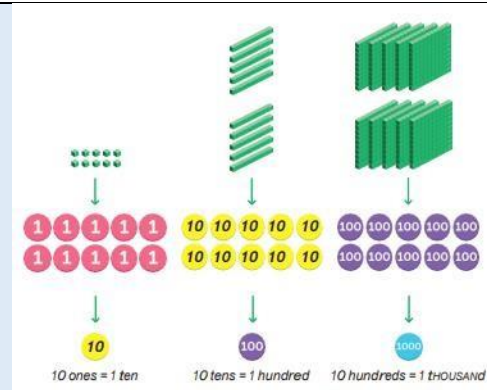
Part-Part-Whole

A number can be expressed AS A sum of the values of its digits.

$1436 = 1000 + 400 + 30 + 6$

This is a mathematical structure that underpins all addition situations. Numbers can be understood in terms of their parts; understanding that the parts are part of a larger collection. The bar model is used as a representation of a problem that can be related to a part-whole addition situation. Pupils develop an understanding of the parts and the whole within an equation.

Base 10 Blocks



Place-Value Counters

$4506 + 3125 =$

Step 1 Add the ones.  
6 ones and 5 ones = 11 ones.  
Rename the ones.  
11 ones = 1 ten and 1 one

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4	5	0	6
+	3	1	2
			7

Formal Written Method

$4188 + 3245 =$

4	1	8	8
+	3	2	4
		1	3
		1	2
		3	0
		3	0
		7	0
		7	4
		3	3
2	6	1	2
+	4	2	6
6	8	7	6

Add the ones.  
 Add the tens.  
 Add the hundreds.  
 Add the thousands.

The use of base 10 blocks provides a representation of the place value of 3-digit numbers. This representation is related to the formal written method but also encourages pupils to use their understanding of adding the same noun. In Year 4, a transition between base 10 blocks and place-value counters takes place.

Place-value counters are used to represent addition situations. This transition relies on pupils understanding the value of each counter without being able to count its physical attributes. Pupils will have the opportunity to rename 10 counters of the same value to 1 counter with a value 10 times greater and vice versa. The idea of composing and decomposing at a rate of 10 should be well understood at this stage.


Pupils will have the opportunity to use a long and short version of this procedural method. In the long representation, the sum of adding each place is shown in its entirety before being added to find the final sum. In the short representation, the sum of each place is shown as part of the total sum and as a small number added to an existing place when a ten of

Estimating the Sum

Start by estimating.

$$4188 \approx 4200$$
$$3245 \approx 3200$$
$$4200 + 3200 = 7400$$

The ANSWER will be ABOUT 7400.



Making 10 and making 100

**make 10**

$$4072 + 8 = \square$$
$$4072 + 8 = 4070 + 10$$
$$4072 + 8 = 4080$$

**make 100**

$$97 + 5213 = \square$$
$$97 + 5213 = 100 + 5210$$
$$= 5310$$


Adding Using Compensation

1 Lulu used this method to find the sum of 3067 And 9.

$$3067 + 10 = 3077$$
$$3067 + 9 = 3076$$

1 less

I know ADDING 9 is 1 less THAN ADDING 10.




2 Ravi used this method to find the sum of 98 And 5262.

$$100 + 5262 = 5362$$
$$98 + 5262 = 5360$$

2 less

I know ADDING 98 is 2 less THAN ADDING 100.



one place is made. The procedure remains unchanged from Year 2.

Estimation is introduced as an approach to start a calculation. Estimation is a skill that helps develop number sense. Pupils are expected to be able to decide if an answer is reasonable. Beginning a calculation with estimation is developed during the addition chapter.

A mental method that involves renaming numbers to make 10 or 100 before finding the sum. Pupils develop their number sense by recognising numbers close to a ten or close to a hundred and renaming a number in the equation to bring a number to the nearest 10 or nearest 100 without having to compensate the sum.

A mental method that uses a similar equation in which a number in the original calculation is shown to the nearest 10 or 100 before carrying out the calculation. This calculation is used to help find the sum of the original equation.

Adding Fractions

$$\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$$

Pupils use their understanding of adding the same noun when adding fractions with the same denominator. The adding of fractions uses equations and is supported through pictorial representation. Pupils use their understanding of equivalence to ensure denominators are the same before carrying out the addition.

Year 5

Counting on Using Place-Value Counters

$32\,541 + 24\,000 =$

Count on 4000 in 1000s.

32541, 33541, 34541, 35541, 36541

Counting on Using Number Lines

Count on 24 000 from 32 541.

$32\,541 + 4\,000 = 36\,541$

$36\,541 + 10\,000 = 46\,541$

$46\,541 + 10\,000 = 56\,541$

$32\,541 + 24\,000 = 56\,541$

Formal Written Method

$$\begin{array}{r} 15\,000 \\ + 17\,000 \\ \hline 32\,000 \end{array}$$

5 THOUSANDS + 7 THOUSANDS = 12 THOUSANDS  
12 THOUSANDS = 1 ten THOUSAND + 2 THOUSANDS

$15\,000 + 17\,000 = 32\,000$

Pupils use place-value counters to support counting on in thousands to find the sum.

Pupils count in thousands and ten thousands, using a number line to show this counting on method.

Place-value counters are used to represent the formal written method. The procedure remains unchanged from Year 2.

Adding Fractions

Add  $\frac{1}{2}$ ,  $\frac{1}{6}$  And  $\frac{3}{12}$ .

$$\frac{1}{2} + \frac{1}{6} + \frac{3}{12} = \frac{6}{12} + \frac{2}{12} + \frac{3}{12}$$

$$\frac{1}{2} + \frac{1}{6} + \frac{3}{12} = \frac{6+2+3}{12}$$

$$= \frac{11}{12}$$

Adding Decimals

0.1 + 0.2 = 0.3

Adding Decimals Using the Formal Written Method

$$\begin{array}{r} \text{£ } 1.80 \\ + \text{£ } 0.70 \\ \hline \text{£ } 2.50 \end{array}$$

Pupils use their understanding of adding the same noun when adding fractions with the same denominator. The adding of fractions uses equations and is supported through pictorial representation. Pupils use their understanding of equivalence to ensure denominators are the same before carrying out the addition.

Pupils use their understanding of adding the same nouns when adding tenths. Tenths are represented using bar models, written words and equations.

The procedure for adding decimals using a formal written method is the same as when adding whole numbers, but attention needs to be given to the decimal point. The decimal point does not represent a place but separates the whole from the fractional part of a number. Careful alignment is needed when adding decimal numbers using a formal written method.



Year 6

Addition within Order of Operations

First, carry out All the operations in ( ).  
Next, perform All the multiplication And division.  
Then, calculate All the Addition And subtraction.

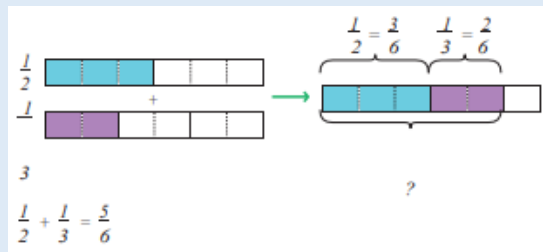
Calculate.

(A)  $(1 + 3) \times 5 - 7 =$

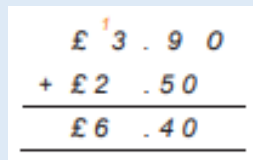
(b)  $1 + (3 \times 5) - 7 =$

(c)  $(1 + 3) \times (7 - 5) =$

Adding Fractions



Adding Decimals



Pupils utilise the previous addition skills within mixed operation equations. Addition is carried out after multiplication and division. If only addition and subtraction are present in an equation, pupils work from left to right.

**(BIDMAS)**

Pupils use their understanding of adding the same noun when adding fractions with the same and different denominators.

Pupils use their understanding of equivalence to ensure the nouns and the denominators are the same before the calculation is completed.

Pupils use their understanding of adding the same nouns when adding decimal numbers. They use place-value knowledge and composing and decomposing at a rate of 10 when adding decimals. The procedure remains the same as adding whole numbers.

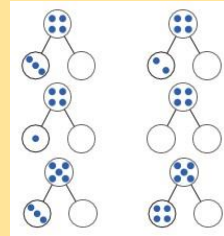


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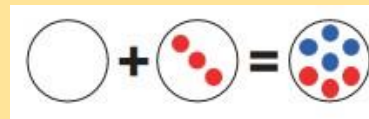
Perceptual Subitising

	0	zero
•	1	one
••	2	two
•••	3	three
••••	4	four
•••••	5	five

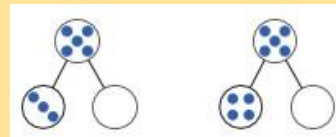
Part-Part-Whole



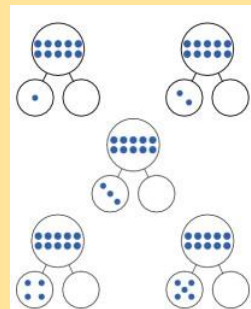
Conceptual Subitising



Composition of 5



Composition of 10



A key development underpinning the ability to subtract is subitising. Perceptual subitising is when pupils can recognise the quantity of items in groups up to 5 without counting each item.

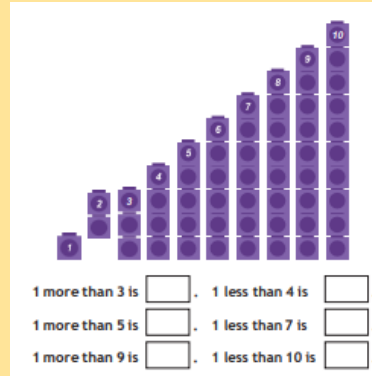
This is a mathematical structure that underpins subtraction situations. Numbers can be understood in terms of their parts; understanding that the parts are part of a larger collection.

Pupils are able to recognise different quantities by combining within a group without counting them. Pupils can combine these quantities to find the whole amount. This skill is used when subtracting small amounts.

Pupils are able to demonstrate all possible whole number compositions of 5, including recognising and showing 5 on a five frame and using a number bond diagram.

Pupils are able to demonstrate all possible whole number compositions of 10, including recognising and showing 10 on a ten frame and using a number bond diagram.

Subtracting 1, 1 Less

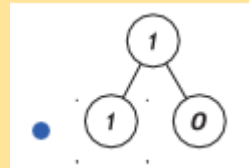


1 more than 3 is  . 1 less than 4 is  .  
1 more than 5 is  . 1 less than 7 is  .  
1 more than 9 is  . 1 less than 10 is  .

Doubles

10	Half	<input type="text"/>
8	Half	<input type="text"/>
2	Half	<input type="text"/>
6	Half	<input type="text"/>
4	Half	<input type="text"/>

Subtracting Zero



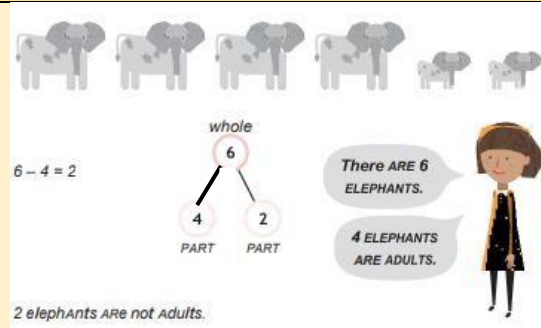
Pupils relate subtracting 1 to one less than the starting number.

By knowing doubles, pupils can find half of a quantity that remains after half the quantity is subtracted.

Pupils understand zero can be subtracted from any number, but the number will remain unchanged.

Year 1

Part-Part-Whole



$6 - 4 = 2$

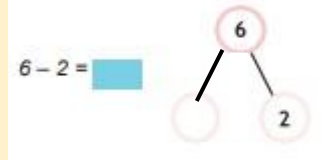
whole: 6  
PART: 4    PART: 2

There ARE 6 ELEPHANTS.  
4 ELEPHANTS ARE ADULTS.

2 elephants ARE not Adults.

This is a mathematical structure that underpins subtraction situations. Numbers can be understood in terms of their parts; understanding that the parts are part of a larger collection. Pupils develop an understanding of the parts and the whole within an equation.

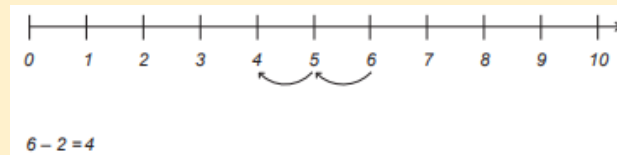
Number Bonds to 10



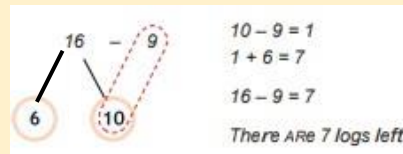
Using a Number Track



Counting Back Using a Number Line



Subtracting from 10



Pupils develop automatic recall of number bonds to 10. This can be shown using a ten frame, a number bond diagram and written as an equation. This understanding can be related to subtracting tens, hundreds and so on when used with a sound understanding of place value.


Pupils are first introduced to a linear number system through the number track. This is a precursor to the number line. Pupils may benefit from placing items on the number track as they count and subtract before moving on to use the more abstract number line.

Pupils move from a number track to a number line, starting from zero and having marked increments of 1. The use of the number line is further developed when counting back starts from a given number, relying on pupils' ability to locate and count back from a given number.

Pupils use their part-whole understanding to rename a number into its component parts in order to subtract from 10 within an equation.



Base 10 Blocks



Use  to help you.

5 ones - 1 one = 4 ones  
 $5 - 1 = 4$

5 tens - 1 ten = 4 tens  
 $50 - 10 = 40$

5 tens = 50



Formal Written Method

	
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8 ones - 0 ones = 8 ones  
 $8 - 0 = 8$

tens	ones
5	8
- 4	0
<hr/>	
	8

	
--	--

5 tens - 4 tens = 1 ten  
 $50 - 40 = 10$   
 $58 - 40 = 18$

tens	ones
5	8
- 4	0
<hr/>	
1	8

The use of base 10 blocks provides a representation of the place value primarily of 2-digit numbers. This representation is related to the formal written method but also encourages pupils to use their understanding of subtracting the same noun to subtract 2-digit numbers. For example,  $50 - 30$  can be understood as 5 tens - 3 tens. The difference between the numbers is 20 or 2 tens. An understanding of place value will support subtraction as well as addition, multiplication and division.

This is a procedural method that relies on a pupil's conceptual understanding of subtraction. Initially, this begins without renaming and progresses to the renaming of 1 ten into 10 ones. Pupils understand that at this stage, they start with the subtraction of the ones before they subtract the tens. This method is supported with base 10 block representation. The formal written method is always accompanied by a written equation to ensure that the relationship between the representations are made.





## Base 10 Blocks

h	t	o
7	9	6
-	6	0
1	9	6

$796 - 600 = 196$

There were 196 people left At the Airport.

796 - 600 = 196

700 - 600 = 100  
96 + 100 = 196

## Formal Written Method

507 - 143 =

Step 1 Subtract the ones.

h	t	o
5	0	7
-	1	4
		4

7 ones - 3 ones = 4 ones

Step 2 Rename 1 hundred as 10 tens. Subtract the tens.

h	t	o
5	0	7
-	1	4
	6	4

10 tens - 4 tens = 6 tens

Step 3 Subtract the hundreds.

h	t	o
5	0	7
-	1	4
3	6	4

4 hundreds - 1 hundred = 3 hundreds

507 - 143 = 364

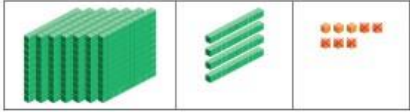
The use of base 10 blocks provides a representation of the place value of 3-digit numbers. This representation is related to the formal written method but also encourages pupils to use their understanding of subtracting the same noun to subtract from 3-digit numbers. For example,  $700 - 400$  can be understood as 7 hundreds - 4 hundreds. The difference between these numbers is 300 or 3 hundreds. Progression is made by subtracting ones, then tens and finally hundreds before the subtraction of all 3 places is undertaken. An understanding of place value will support subtraction as well as addition, multiplication and division.

This procedural method progresses from the renaming of 10 ones into 1 ten to include the renaming of 10 tens to 1 hundred when necessary. The procedure itself remains unchanged from Year 2. Pupils understand that at this stage, they start with the subtraction of the ones, then the tens, then finally the hundreds. This method is supported with base 10 block representation. The formal written method is always accompanied by a written equation to ensure that the relationship

Inverse Operation

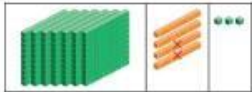
$748 - 425 =$   

Step 1 Subtract the ones.  
8 ones - 5 ones = 3 ones

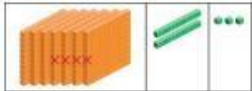


	h	t	o
	7	4	8
-	4	2	5
			3

Difference Using a Bar Model




Step 3 Subtract the hundreds.  
7 hundreds - 4 hundreds = 3 hundreds



	h	t	o
	7	4	8
-	4	2	5
	3	2	3

$748 - 425 = 323$   
323 tomatoes are left.

Check your ANSWER using ADDITION.  
 $323 + 425 = 748$



between the representations are made.

Pupils should understand that subtraction is the inverse operation of addition. They are encouraged to check completed subtraction calculations using addition.

Pupils are required to find the difference in a comparison problem when represented by a bar model. To find the difference, the known part is subtracted from the quantity it is being compared to. The comparison model reinforces the understanding of difference in subtraction.

Year 4


Part-Part-Whole

432		
400	20	12
<u>-100</u>	<u>-10</u>	<u>-9</u>
<u>300</u>	<u>10</u>	<u>3</u>

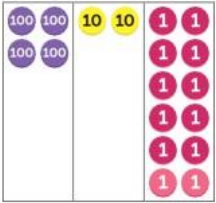
This is a mathematical structure that underpins subtraction situations. Numbers can be understood in terms of their parts; understanding that the parts are part of a larger collection. Pupils develop an understanding of the parts and the whole within an equation.

Place-Value Counters

What is the difference between 432 and 119?




There ARE not enough ones.  
RENAME 1 ten AS 10 ones.

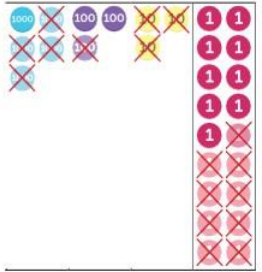


$$\begin{array}{r} 432 \\ -119 \\ \hline 300 \quad 10 \quad 3 \end{array}$$

Formal Written Method



RENAME 1 ten to 10 ones.

$$\begin{array}{r} 5348 \\ -4139 \\ \hline 1209 \end{array}$$


Now there ARE enough ones to SUBTRACT.

$$\begin{array}{r} 5348 \\ -4139 \\ \hline 1209 \end{array}$$

Place-value counters are used to represent subtraction situations. This transition from base 10 blocks relies on pupils understanding the value of each counter without being able to count its physical attributes. Pupils will have the opportunity to rename 1 counter to 10 counters with a value 10 times smaller in order to carry out a formal written method. The idea of decomposing at a rate of 10 should be well understood at this stage.

Pupils will use the formal written method initially without renaming, and then move to subtraction that requires renaming. The procedure remains the same as learned in Year 3 but the numbers increase to include 4-digit numbers being subtracted from 4-digit numbers.

## Using Addition to Check Subtraction

5348

5000 300 30 18

Step 1 Subtract the ones.  
18 ones - 9 ones = 9 ones


Step 2 Subtract the tens.  
3 tens - 3 tens = 0 tens

Step 3 Subtract the hundreds.  
3 hundreds - 1 hundred = 2 hundreds

Step 4 Subtract the thousands.  
5 thousands - 4 thousands = 1 thousand

5348 - 4139 = 1209

Check.

$$\begin{array}{r} 1209 \\ + 4139 \\ \hline 5348 \end{array}$$


## Mental Methods


3002 - 198 = 2804

3002

2802 200

3002 - 198 = 2802 + 2

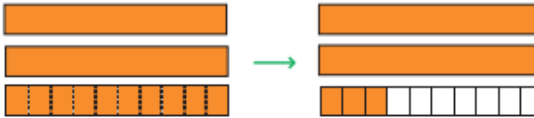

200 - 198 = 2



## Subtracting Fractions

$3 - \frac{7}{10} = 2\frac{10}{10} - \frac{7}{10} = 2\frac{3}{10}$

$2 \frac{1}{1} = 2\frac{10}{10}$

Pupils are encouraged to check subtraction calculations by adding the parts (the subtrahend and the difference) to ensure the sum is equal to the whole (the minuend).

Mental subtraction methods include partitioning the minuend to simplify the subtraction calculation. The approach shown is supported by an understanding of number bonds to 10 and to 100.

Pupils use their understanding of subtracting the same nouns when subtracting fractions with the same denominator. The subtraction of fractions or finding the difference between fractions is supported through pictorial representation. Pupils use their understanding of equivalence to ensure denominators are the same before carrying out the subtractions.

Year 5

Counting Back Using Place-Value Counters

Subtract 3000 from 650452.  
Start At 650452. Count back in 1000s.

How CAN I count BACK from 50000?

You could EXCHANGE for ten 1000.

650452      650452      647452

$650452 - 3000 =$

Counting Back Using Number Lines

Count back 30 000 from 153 672.

10 THOUSAND less

123672      133672      143672      153672

$153672 - 30000 =$

Formal Written Method

$55400 - 13700 =$

Rename 1 thousand as 10 hundreds.

Subtract 7 hundreds from 14 hundreds.

Subtract the thousands.      Subtract the ten thousands.

$$\begin{array}{r} 55400 \\ - 13700 \\ \hline 41700 \end{array}$$

$$\begin{array}{r} 55400 \\ - 13700 \\ \hline 41700 \end{array}$$

Pupils use place-value counters to support counting back in thousands to find the difference.

Pupils count back in thousands and ten thousands, using a number line to show this counting back method.

Place-value counters are used to represent the formal written method. The procedure to subtract using numbers up to 6-digits using the formal written method remains the same as when it was first introduced. Pupils begin at the least value place and work to the left through the places to find the difference. Renaming takes place when a calculation in a place cannot be done. Again, this procedure is the same as when this was first learned and requires the renaming of the

Checking Using Estimation and Addition


$75\ 241 - 34\ 658 = 40\ 583$

4 0 5 8 3	
+ 3 4 6 5 8	
-----	
7 5 2 4 1	



*I checked my ANSWER using ADDITION.*


$75\ 241 - 34\ 658 \approx 75\ 000 - 35\ 000 = 40\ 000$

*I checked my ANSWER using ESTIMATION.*



Subtracting Fractions

	$1 - \frac{1}{6} = \frac{6}{6} - \frac{1}{6} = \frac{5}{6}$
	$\frac{5}{6} - \frac{5}{12} = \frac{10}{12} - \frac{5}{12} = \frac{5}{12}$



Subtracting Decimals

Find the difference between 0.7 kg And 0.3 kg.

0.7 kg						
0.3 kg						
}			}			
0.3 kg			?			

$0.7 - 0.3 = 0.4$

minuend. The renaming of the minuend is also represented using a number bond, providing the foundation for mental methods that require renaming.

Pupils are encouraged to check the reasonableness of their answers by initially finding an estimated difference. When using estimation to check, pupils initially round to the nearest thousand before calculation. When using addition to check the difference, pupils add the difference and the subtrahend to check it is equal to the minuend.

Pupils use their understanding of subtracting the same nouns when subtracting fractions with the same denominator. The subtraction of fractions or finding the difference between fractions is supported through pictorial representation. Pupils use their understanding of equivalence to ensure denominators are the same before carrying out the subtractions.

Pupils use their understanding of subtracting the same nouns when subtracting tenths. Tenths are represented using bar models, written words and equations.

Subtracting Decimals  
Using the Formal Written  
Method

Find the difference between £3.40 And £2.50.

£ 3 . 4 0  
- £ 2 . 5 0  
-----  
£ 0 . 9 0

Subtracting Decimals  
Using Equivalence

$4 - 0.6 = 3.4$

$1 - 0.6 =$    

1 = 10 tenths  
0.6 = 6 tenths

The same procedure for subtracting decimals using a formal written method is the same as when subtracting whole numbers but attention needs to be given to the decimal point. The decimal point does not represent a place but separates the whole from the fractional part of a number. Careful alignment is needed when subtracting decimal numbers using a formal written method.

Pupils use their understanding of equivalence to subtract a decimal from a whole number. For example, when calculating  $4 - 0.6$  we can rename 4 as 40 tenths, so the calculation becomes 40 tenths – 6 tenths. Once the nouns are the same, the subtraction can be carried out. 40 tenths – 6 tenths = 34 tenths = 3.4

Year 6

Subtraction within Order  
of Operations

First, carry out All the operations in ( ).  
Next, perform All the multiplication And division.  
Then, calculate All the Addition And subtraction.

$15 - 4 \times 3 = 15 - 12 = 3$        $(15 - 4) \times 3 = 11 \times 3 = 33$

Follow the order of OPERATIONS. Multiply, then SUBTRACT.

First, do the SUBTRACTION in the ( ). Then multiply.

Pupils utilise the previous subtraction skills within mixed operation equations. Subtraction is carried out after multiplication and division. If only addition and subtraction are present in an equation, pupils work from left to right. (BIDMAS)










Arrays


There ARE 3 groups of 2




2      2      2

3 groups of 2 = 6  
3 twos = 6  
There ARE 6

2, 4, 6



Doubles



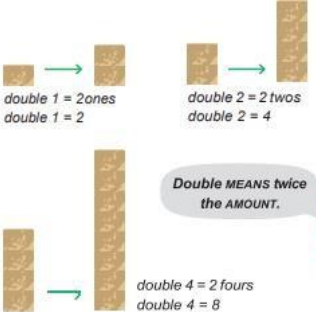

1 row of 5 = 5

2 rows of 5 = 10

3 rows of 5 =

3 rows of 5  
3 fives = 15  
There ARE 15 children Altogether.

There ARE 3 rows.




double 1 = 2 ones  
double 1 = 2

double 2 = 2 twos  
double 2 = 4

double 4 = 2 fours  
double 4 = 8

Double MEANS twice the AMOUNT.

JACOB uses 8 blocks next.



counting in multiples of 2, 5 and 10 supported by discrete, countable representations.

Multiplication is represented by arrays, beginning with making equal rows and further developing the language associated with arrays. For example: 'There are 3 rows of 5. There are 15 altogether.'

The diagrams used to support learning how to double numbers, not only show equal groups of 2 being added each time, but also show the pattern scaling up and each 'tower' being twice the height of the tower just before it. Pupils can develop the language associated with multiplication by describing the growing block pattern. This also provides the basis for understanding halving, in which the representation scales down.

Year 2

Equal Groups

There ARE 5 groups of 3 ORANGES.

3 + 3 + 3 + 3 + 3 = 15

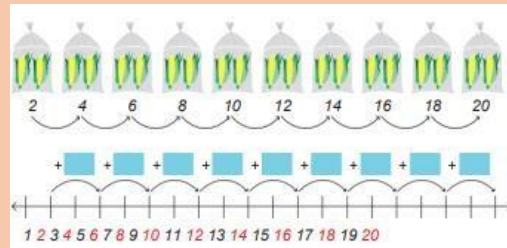
There ARE 15 oranges in total.

5 threes = 15  
5 groups of 3 = 15  
5 × 3 = 15  
5 times 3 EQUALS 15

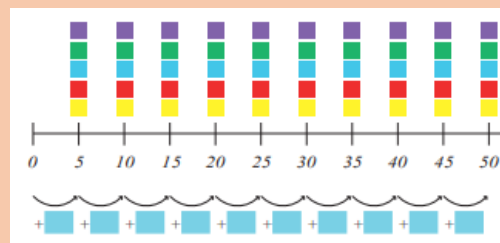
We read  $5 \times 3 = 15$  as 5 times 3 EQUALS 15.

\* MEANS to multiply.

Counting in 2s, 5s and 10s



Number Line



Associated Facts

$6 \times 5 =$

5 × 5 = 25

How can this help us work out  $6 \times 5$ ?

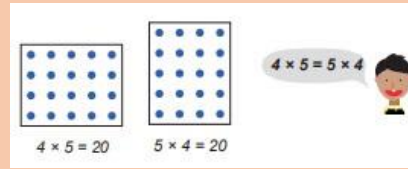
Pupils learn to recognise groups that are equal in quantity, initially using like items and then progressing to different items. Pupils understand that equal groups can be represented by concrete items, diagrams and written numbers. In Year 2, the progression to multiplication from repeated addition is shown as  $3 + 3 + 3 + 3 + 3$  being equal to 5 groups of 3 and 5 groups of 3 being equal to  $5 \times 3$ . Pupils read  $5 \times 3$  as 5 groups of 3.

When a pupil knows that the size of a group is 2, 5 or 10 and the group size remains consistent, they can count in multiples of 2, 5 and 10 to find the product. Counting in multiples is supported by representation on a number line.

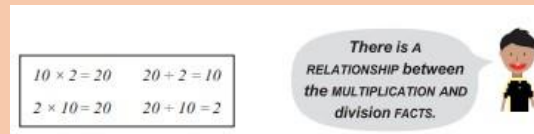
Counting in multiples is shown on a number line. The increasingly abstract nature of the number line is shown as intervals change from 1 to 2, 5 and 10.

As pupils become more fluent and their understanding of their times tables increases, they are expected to use this knowledge to calculate associated facts. A pupil should be

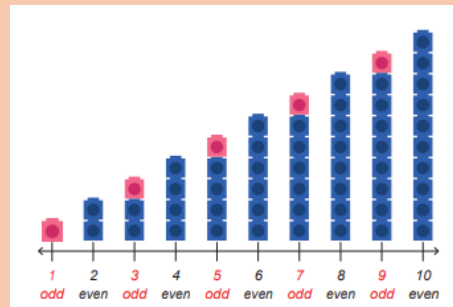
Commutativity



Fact Families



Odd and Even Numbers



able to relate  $10 \times 5$  to  $9 \times 5$ , knowing that the latter expression is 1 group of 5 less. So,  $9 \times 5 = 50 - 5$ .

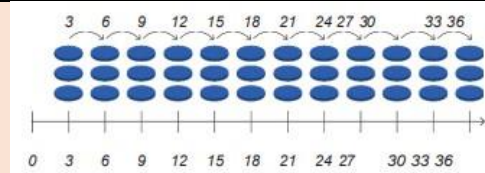
Pupils learn that the order of the factors in an equation does not affect the product. This is supported pictorially through the use of arrays.

Pupils relate multiplication and division and see the connection between them when completing fact families. Pupils develop an understanding that factor  $\times$  factor = product and product  $\div$  factor = factor. Once the understanding of this is secure, pupils can relate this to both multiplication and division situations.

Pupils develop an understanding that even numbers can be put into groups of 2 exactly but when odd numbers are grouped in twos, there is always 1 remaining.

Year 3

Counting in 3s, 4s and 8s

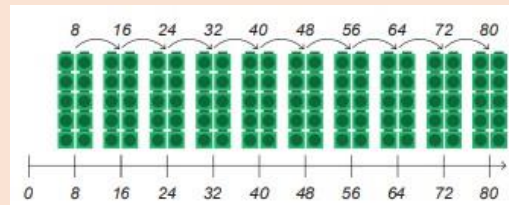


When a pupil knows that the size of a group is 3, 4 and 8 and the group size remains consistent, they can count in multiples of 3, 4 and 8 to find the product. Counting in multiples is supported by representation on a number line.

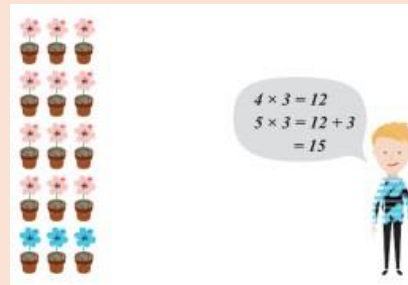
Equal Groups



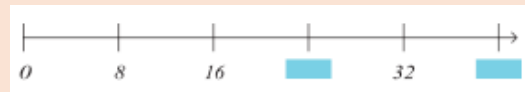
Number Line



Associated Facts



Number Patterns



Multiplication by 3, 4 and 8 is shown initially using equal groups. Specific language is used to support these examples, in this case '4 groups of 3', and this is immediately followed by the equation  $4 \times 3$ . This forms the basis of using known facts to find unknown facts.

Counting in multiples is shown on a number line. Multiples of 3, 4 and 8 are used as the intervals on a number line to support skip counting using these multiples.

Once the understanding of multiplication as the adding of equal groups is secure, this knowledge can be used to find unknown facts. For example, if a pupil knows  $5 \times 3$  as 5 groups of 3, they can understand that  $6 \times 3$  is simply 1 more group of 3. So,  $6 \times 3 = 15 + 3$ ;  $4 \times 3$  is seen as 1 group fewer than  $5 \times 3$ ;  $4 \times 3 = 15 - 3$ . This structure is used in all multiplication tables.

Pupils count in multiples of 3, 4 or 8 to identify missing multiples in a sequence. This reinforces the products found within the 3, 4 and 8 times tables.

Commutativity

There ARE 5 rows of 8 mushrooms.  
 $5 \times 8 = 40$

There ARE 8 rows of 5 mushrooms.  
 $8 \times 5 = 40$

5  $\times$  8 is the SAME AS 8  $\times$  5.

There ARE 40 mushrooms.

Fact Families

$$12 \div 3 = 4$$
$$4 \times 3 = 12$$

12

Multiplication Using Bar Models

I CAN see 6 hens.

There ARE twice AS MANY hens in the red hen house.

How many hens ARE in the red hen house?

There ARE 6 hens outside.

2  $\times$  6 = 12

There ARE 12 hens in the red hen house.

The representation of multiplication as an array is used to further develop the understanding of commutativity. Having first understood multiplication as [ ] groups of [ ], pupils develop an understanding that  $5 \times 3$  can also be read as 5 multiplied 3 times. Pupils should have a firm understanding that the order the factors are multiplied in does not change the product.

The relationship between multiplication and division is shown using fact families. The product is a result of multiplying factors and dividing the product by a factor will equal the factor used during multiplication.

Bar models are used in multiplicative comparison problems. Pupils use multiplication skills to determine quantities in comparison to another quantity. Language such as ‘twice as many’, ‘three times as many’ and so on is developed in relation to multiplicative comparison problems.

Base 10 Blocks

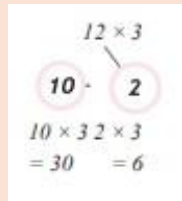
Multiply 2 tens by 4.



$4 \times 2 \text{ tens} = 8 \text{ tens}$   
 $4 \times 20 = 80$

8 tens = 80

Number Bonds

$12 \times 3$   
  
 $10 \times 3 = 30$   
 $2 \times 3 = 6$

Written Formal Method

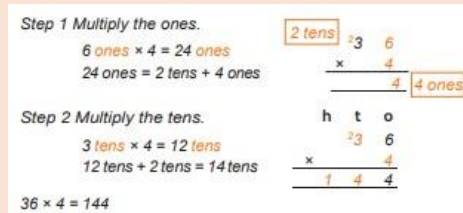
Step 1 Multiply the ones.

$6 \text{ ones} \times 4 = 24 \text{ ones}$   
 $24 \text{ ones} = 2 \text{ tens} + 4 \text{ ones}$

Step 2 Multiply the tens.

$3 \text{ tens} \times 4 = 12 \text{ tens}$   
 $12 \text{ tens} + 2 \text{ tens} = 14 \text{ tens}$

$36 \times 4 = 144$



Base 10 blocks are used to support the understanding of multiplication of 2-digit numbers. Language and understanding is developed through the representation of  $3 \times 20$  as  $3 \times 2 \text{ tens} = 6 \text{ tens}$ . Pupils use known multiplication tables to 10 together with the place-value names of the digits being used to carry out the multiplication.

Number bonds are used to show numbers partitioned into tens and ones before being multiplied. The examples being used move from a number bond relating to an equation to an equation and the formal written method.

This method is used to multiply a 2-digit number by a 1-digit number. Initially, the method shows the product of the multiplication of the ones, then the product of the multiplication of the tens, before adding the products to find the total. This method progresses to include renaming and finally moves to a shortened form of the written method. The method is finally shown as a version of the formal written method, in which the product of the multiplication of each place is shown as a single product, with any



renaming added above each place in the multiplication.

Year 4

Counting in 6s, 7s, and 9s

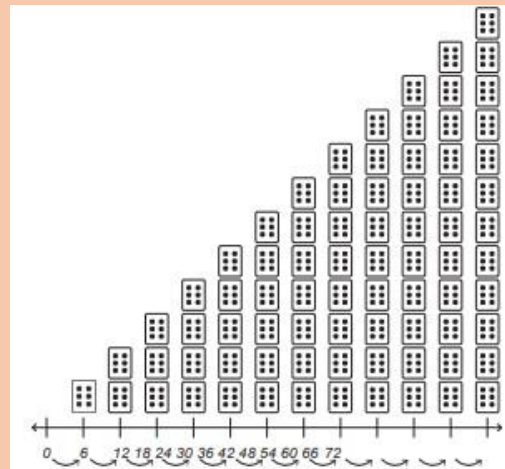
Count on in sixes.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30

Equal Groups



Number Line



When pupils know that the size of a group is 6, 7 and 9 and the group size remains consistent, they can count in multiples of 6, 7 and 9 to find the product. Counting in multiples is supported by representation on a number line using intervals of 6, 7 and 9.

Multiplication by 6, 7 and 9 is shown initially using equal groups. Specific language is used to support these examples, in this case '4 groups of 6', and this is immediately followed by the equation  $4 \times 6$ . This forms the basis of using known facts to find unknown facts.

Counting in multiples is shown on a number line. Multiples of 6, 7 and 9 are used as the intervals on a number line to support skip counting using these multiples. A growing pattern in multiples of 6, 7 and 9 is also shown to support pupils' understanding.



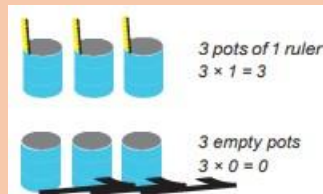
Multiplying by 11 and 12  
Using Associated Facts



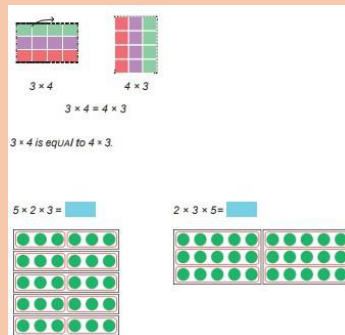
Fact Families



Multiplying by 0 and 1



Commutativity



Learning to multiply by 11 and 12 is supported by partitioning 11 and 12 and using the 10 TIMES table as the basis for initial understanding, building towards immediate recall.

Fact families are used in the introduction of division, represented using arrays to show the relationship between factors and a product. Pupils relate  $6 \times 11 = 66$  to  $66 \div 6 = 11$ . They understand that multiplication can be used in division calculations.


Pupils initially use their understanding of 'groups of' to understand multiplying by zero. For example,  $0 \times 4$  is read as 'There are zero groups of 4'. Pupils' understanding then moves to read  $0 \times 4$  as zero multiplied 4 times. The language is an extension of what they have already learned about multiplication.

Arrays are used to support the understanding of commutativity. Pupils learn the pattern of  $a \times b = b \times a$ . Regardless of the order in which the factors are multiplied, the product remains the same. The commutative property is further developed through the

Multiplying Multiples of 10

30 is equal to 3 tens.

$$5 \times 3 = 15$$

$$5 \times 3 \text{ tens} = 15 \text{ tens} = 150$$


$$5 \times 30 = 150$$

Formal Written Method

2 1 8	
x        4	
-----	
3 2	→ 8 × 4 = 32
4 0	→ 10 × 4 = 40
+ 8 0 0	→ 200 × 4 = 800
-----	
8 7 2	→ 218 × 4 = 872
-----	

multiplication of 3 numbers. 3 factors are multiplied in different orders and the product remains the same.

Pupils learn to scale a product by a factor of 10 when multiplying a multiple of 10. For example, we know  $3 \times 4 = 12$ , therefore the product of  $30 \times 4$  is 10 times greater:  $30 \times 4 = 120$ . Naming the place value of the digit supports this approach and pupils relate a known fact to multiplying multiples of 10. For example, we can read  $30 \times 4$  as 3 tens  $\times$  4. So, 3 tens  $\times$  4 = 12 tens or 120. We would expect pupils to generalise and see that  $30 \times 4 = 3 \times 4 \times 10$ . While this isn't formalised, this forms the basis of the distributive property of multiplication.

Pupils use formal written methods, short and long, to multiply a 2-digit number by a 1-digit number. Initially the long method is used, showing the product of the multiplication of the ones, tens and hundreds, before adding the products to find the total. Pupils are shown the corresponding short formal written method so can make the links between the two procedures. Multiplication then moves from a 2-digit number by a 1-digit number to a 3-digit number by



## Prime Numbers

This is A rectangle.

These ARE not rectangles.

There is only one way to ARRANGE 17 CARDS.

$$17 = 1 \times 17$$

17 only HAS two factors, 1 And itself. 17 is A prime number.

## Composite Numbers

$$6 = 1 \times 6$$

$$6 = 2 \times 3$$

$$8 = 1 \times 8$$

$$8 = 2 \times 4$$

$$10 = 1 \times 10$$

$$10 = 2 \times 5$$

2 is the only even prime number.  
All other multiples of 2 have more than two factors.

## Square and Cube Numbers

Holly would need 9 SQUARE tiles to MAKE A LARGER SQUARE.

$$1 \times 1 = 1^2 = 1$$

$$2 \times 2 = 2^2 = 4$$

$$3 \times 3 = 3^2 = 9$$

SAM would need 27 cubes to MAKE A LARGER cube.

$$1 \times 1 \times 1 = 1^3 = 1$$

$$2 \times 2 \times 2 = 2^3 = 8$$

$$3 \times 3 \times 3 = 3^3 = 27$$

same factors. Pupils may go on to generalise about common factors. For example, all integers that end in 0 or 5 have 5 as a common factor.

Following on from finding factors, pupils use rectangular arrangements to identify a pattern presented by prime numbers. Pupils find that prime numbers can only be arranged in a single rectangular pattern. This leads them to see that certain numbers only have two factors. These numbers, integers greater than 1, are called prime numbers.

Once pupils have a sound understanding of multiples, factors and prime numbers, the term 'composite numbers' is used to describe integers, greater than 1, that have more than two factors.

Pupils are introduced to both square and cube numbers by the physical representation described by their names. These representations lead to abstraction, with pupils understanding that square numbers are the product of a number multiplied by itself and a cube

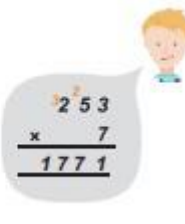
Multiplying by 10, 100 and 1,000

$$5 \times 1000 = \text{[redacted]}$$
$$5 \times 1 \text{ thousand} = 5 \text{ thousands}$$
$$5 \times 1000 = 5000$$

Written formal Method

Multiply 253 by 17.

253	
× 17	
1771	
+ 2530	
4301	



The illustration shows a boy's head next to a speech bubble. Inside the bubble is a short multiplication method for 253 by 7, with the result 1771. The numbers are arranged as follows: 253, × 7, 1771. There are small circles above the 5 and 3 in 253, and above the 7 in the multiplier.

number is the product made by multiplying a number twice by itself.

Pupils build on their understanding of multiplication by factors of 10. They see that when a factor is made 10 times greater, the product is 10 times greater. Pupils use their knowledge of times tables to underpin multiplying by 10, 100 and 1000, so  $5 \times 1000$  is equal to  $5 \times 1$  thousand = 5 thousands or 5000. This follows a pattern that has been introduced in previous years.

Pupils use formal written methods, short and long, to multiply a 3-digit number by a 1-digit number; then move on to multiplying a 4-digit number by a 1-digit number. Initially the long method is used, showing the product as a result of multiplying each place. Pupils then progress to the short formal written method making a link between the two procedures. Next, pupils learn to multiply a 2-digit number by a 2-digit number, then a 3-digit number by a 2-digit number. Links are made to the formal written procedure that they know. Pupils work systematically through the procedure progressing from multiplying by ones to multiplying by tens and ones.



Common Factors

1 row of 18 bags  
 $1 \times 18 = 18$

2 rows of 9 bags  
 $2 \times 9 = 18$

3 rows of 6 bags  
 $3 \times 6 = 18$

1, 2, 3, 6, 9 AND 18 ARE FACTORS of 18.

Common Multiples

Multiples of 4	4	8	12	16	20	24	28	32	36	40	44	48
Multiples of 6	6	12	18	24	30	36	42	48	54	60	66	72
Multiples of 8	8	16	24	32	40	48	56	64	72	80	88	96

24 And 48 Are common multiples of 4, 6 And 8.

Prime Numbers

$8 = 5 + 3$

$10 = 7 + 3$

$16 = 11 + 5$

8 is A COMPOSITE number. 5 AND 3 ARE prime numbers.

CAN ALL even numbers be written AS the sum of two prime numbers?

Multiplying Fractions

$\frac{1}{3} \times \frac{1}{2} =$

= 1 l of juice

$\rightarrow$   $\frac{1}{3} \times \frac{1}{2} l$

$\frac{1}{3}$  of  $\frac{1}{2} l$  is  $\frac{1}{6} l$ .

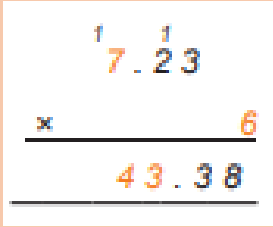
$\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

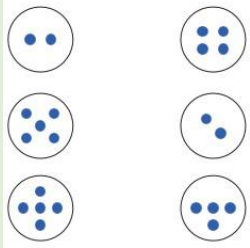
Prior learning is expanded on by finding common factors within more challenging word problems. Pupils are encouraged to partition larger numbers into known multiples to determine if the given number is a factor.

Pupils are introduced to common multiples with the understanding that they are a multiple of 2 or more numbers.

Pupils' understanding of prime numbers is expanded through the use of Goldbach's conjecture, that all even numbers greater than 2 can be expressed as the sum of two prime numbers.

Pupils learn to multiply proper fractions by proper fractions. They read fractions to support multiplication, so  $\frac{1}{3} \times \frac{1}{5}$  is read as 'What is  $\frac{1}{3}$  of  $\frac{1}{5}$ ?' Bar models are used to represent these problems pictorially. Pupils

	<p>Multiplying Decimals</p>		<p>progress to realise that the numerators can be multiplied and the denominators can be multiplied, but before this procedure can be embedded, pupils must have a deep understanding of what the equation means.</p> <p>Pupils use the same formal written method procedure as they have previously. Pupils need to pay special attention to the places of the digits in the multiplication. It is important that they do not see the decimal point as a place but rather as a symbol used to separate the whole parts from the decimal parts of a mixed number.</p>
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Division			
Year Group	Strand/Topic	Representation	Key Idea
FS2	Equal Groups		<p>Pupils learn to recognise groups that are equal in quantity, initially using like items and then progressing to different items. Pupils understand that equal groups can be represented by concrete items, diagrams and written numbers. Pupils need to be secure in the abstraction principle of counting the quantity of items regardless of the</p>





Counting in 2s, 5s and 10s

10 medals ARE SHARED EQUALLY Among 5 friends.  
How many medals does each friend get?

Divide 10 MEDALS into 5 groups.

Each friend gets 2 medals.

I CAN use to help me count in tens AND ones.

They share a set amount of items equally between a number of groups. The number of groups is known and pupils find the number of items in each group.

Pupils start to count in multiples of 2 and multiples of 10, then progress to counting in multiples of 2, 5 and 10 supported by discrete, countable representations.

Year 2

Grouping

There Are 16 bagels.  
Divide 16 by 2 to find the number of groups.

I put 2 BAGELS in EACH box.  
There ARE 8 groups of 2.

Sharing

There Are 16 flowers.  
Elliott cuts the flowers And puts them EQUALLY into 2 vases.

There are 8 flowers in each vase.

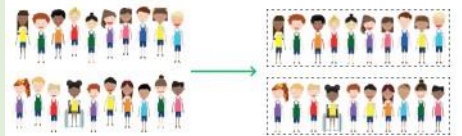
$16 \div 2 = 8$

Pupils initially use grouping for division. They put items into equal groups to find the number of equal groups that can be made from a set amount.

Pupils move from division through grouping to division through sharing. They share a set amount of items equally between a number of groups. The number of groups is known and pupils find the number of items in each group.

Division by 2, 5 and 10

20 children can be put into teams of 10.



$20 \div 10 = 2$   
There ARE 2 EQUAL teams. There ARE 2 groups of 10 children.


$2 \times 10 = 20$

$10 \times 2 = 20$	$20 \div 2 = 10$
$2 \times 10 = 20$	$20 \div 10 = 2$


There is A RELATIONSHIP between the MULTIPLICATION AND division FACTS.

This is A multiplication and division fact family.

Odd and Even Numbers



2 cubes can be put into A group of 2.  
4 cubes can be put into groups of 2.  
6 cubes can be put into groups of 2.  
2, 4 And 6 ARE even numbers.



1 cube cannot be put into A group of 2.  
3 cubes cannot be put into groups of 2.  
5 cubes cannot be put into groups of 2.  
7 cubes cannot be put into groups of 2.  
1, 3, 5 And 7 ARE odd numbers.


Pupils start to make the connection between division and multiplication. They see amounts as equal groups and relate this to multiplication.

Pupils develop an understanding that even numbers can be put into groups of 2 exactly. Numbers that can be put into groups of 2 and have 1 remaining are described as odd numbers.

Year 3

Dividing by 3, 4 and 8

Sam put 32 cobs of corn into 4 equal groups.



4 groups of 8 is 32.  
 $4 \times 8 = 32$

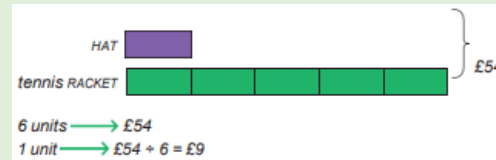
$32 \div 4 = 8$   
Each group has 8 cobs of corn.

Pupils are introduced to the division of numbers by 3, 4 and 8 using grouping initially. They make groups of 3, 4 and 8 and then move on to sharing a total.

Division within Word Problems



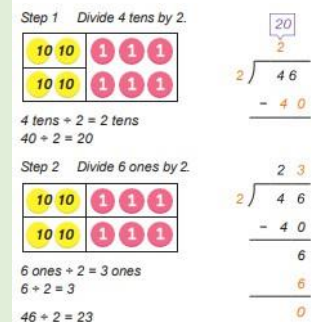
Word Problems Involving Division



Dividing by 1




Dividing 2-Digit Numbers

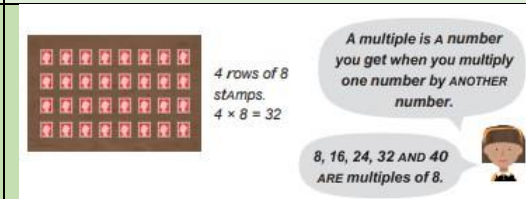
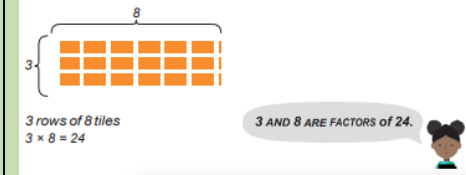
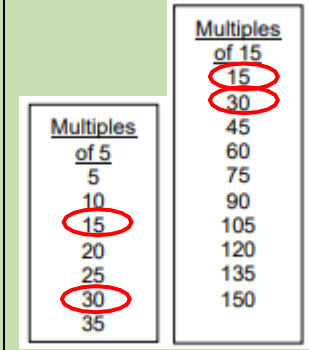


Division word problems are supported by the use of arrays and bar models, reinforcing the idea of equal groups. Pupils relate the representations of the problems to the equations given. comparison division models are also used to determine amounts when two separate amounts are compared.

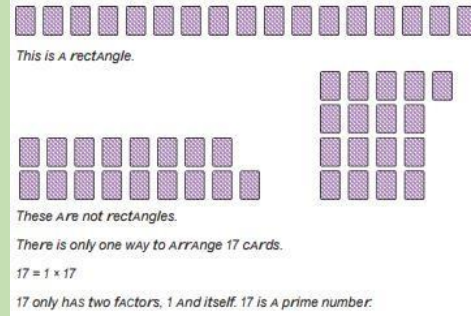
Pupils look for a pattern and generalise about dividing by 1. They systematically work through dividing a single amount by 4, 3, 2 and finally 1 to make observations about the number of groups and the size of each group.

Pupils initially use place-value counters to support the division of 2-digit numbers, then move on to use a long formal written method. The long written method shows the systematic division of parts of the dividend resulting in the quotient.

	Dividing 3-Digit Numbers		The same procedure used for dividing 2-digit numbers is used for dividing 3-digit numbers. Place-value counters are used to represent the problem before moving on to use the long formal written method.
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Year 5	<p>Finding Multiples</p> <p>Finding Factors</p> <p>Finding Common Factors</p>	  	<p>Pupils use arrays to recognise multiples as the total number once a number is multiplied by another number. Skip counting is related to multiples as it is shown on a number line. Pupils also look for patterns when identifying multiples on number squares.</p> <p>The same rectangular arrangement that was used to find multiples is used to identify factors. The pictorial representation leads to an understanding that factors are the numbers we multiply to produce a product.</p> <p>Pupils learn that when multiple numbers share the same factors, we can describe those factors as common factors. Pupils will begin to generalise about common factors. For example, all whole numbers ending in zero will have 5 as a multiple.</p>
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Prime and Composite Numbers



This is A rectangle.

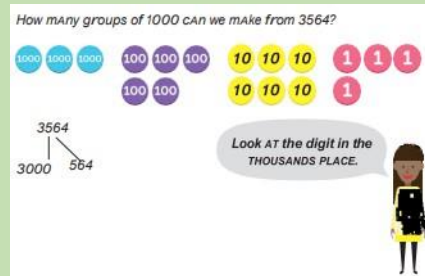
These Are not rectangles.

There is only one way to Arrange 17 cards.

$17 = 1 \times 17$

17 only has two factors, 1 And itself. 17 is A prime number.

Dividing by 10, 100 and 1,000



How many groups of 1000 can we make from 3564?

Look AT the digit in the THOUSANDS PLACE.

3564

3000 564

Dividing without Remainder



640

600 40

Pupils use their understanding of rectangular arrays to look for prime numbers. They learn that any number that can only be made into a single rectangular array is a prime number. In describing this array, they make the connection that prime numbers only ever have two factors, itself and 1. They also learn that numbers with two or more factors can be described as composite numbers.

Place-value counters and number bonds are initially used to represent division problems involving dividing by 10, 100 and 1000. Pupils use their understanding of place value to support the division calculations. For example, 35 hundreds  $\div$  1 hundred = 35.

Pupils use place-value counters and number bond diagrams to support their understanding of the long formal written method for division. Pupils are shown how numbers can be partitioned into known multiples before carrying out the division.







Dividing by a 2-Digit Number with Remainder

Which division method do you prefer?

Common Multiples

<b>Multiples of 4</b>	4	8	12	16	20	24	28	32	36	40	44	48
<b>Multiples of 6</b>	6	12	18	24	30	36	42	48	54	60	66	72
<b>Multiples of 8</b>	8	16	24	32	40	48	56	64	72	80	88	96

written method. Once the long method is understood, pupils move on to divide using a short formal written method. While the process remains the same, the notation changes to keep it within the short division structure.

The process used when dividing by a 2-digit number without a remainder stays the same when dividing with remainders. The process results in remainders that cannot be put into the equal group size as whole numbers. The context of the problem suggests the form that the remainder will take and pupils decide on the best representation for the remainder depending on the context. Pupils also use a unitary method of division to solve more complex word problems. Within these problems, they also use brackets to show the partitioning of numbers and how this can be used to support calculation in division problems.

Pupils work systematically through problems looking for common multiples of given numbers.

Common Factors

1 row of 18 bags  
 $1 \times 18 = 18$

2 rows of 9 bags  
 $2 \times 9 = 18$

3 rows of 6 bags  
 $3 \times 6 = 18$

1, 2, 3, 6, 9 AND 18  
ARE FACTORS of 18.

Prime Numbers

Elliott has 7 square tiles.

Elliott can only make 1 rectangular arrangement.

1 row of 7  
 $1 \times 7 = 7$

The factors of 7 are 1 and 7.  
7 is a **prime number**.

Dividing Fractions by Whole Numbers

$\frac{3}{4} \div 4 =$

$\frac{3}{4} \div 4 = \frac{1}{4} \times \frac{3}{4} = \frac{3}{16}$

4      4      4      16

Pupils use long division to find common factors of given numbers. The method used to find common factors progresses to arrays and using tables to systematically find possible common factors.

Arrays are used as they have been previously, looking for rectangular patterns. Pupils see that numbers that can only be made into 1 rectangular arrangement are prime numbers with factors of itself and 1.

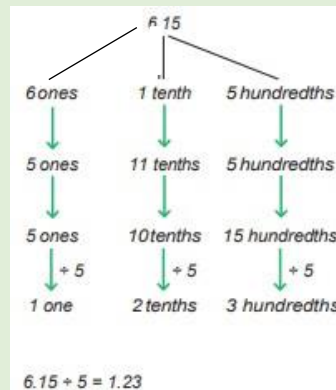
Pupils relate dividing fractions by a whole number to multiplying by its reciprocal. So, dividing by 4 is related to multiplying by  $\frac{1}{4}$ . We also read this as ' $\frac{1}{4}$  of'. The procedure of dividing fractions by whole numbers is supported by the use of bar models and pictorial representation.

Dividing Decimals without Renaming

$$\begin{array}{r}
 2 \overline{) 8.42} \\
 \underline{- 8} \phantom{.0} \\
 0.4 \phantom{0} \rightarrow 2 \times 4 \\
 \underline{- 0.4} \phantom{0} \rightarrow 2 \times 0.2 \\
 0.02 \phantom{0} \\
 \underline{- 0.02} \phantom{0} \rightarrow 2 \times 0.01 \\
 0
 \end{array}$$

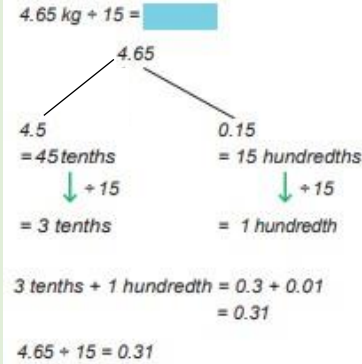
Initially, place-value counters are used to show the division procedure that should be well known by pupils at this stage. The long formal written method is then used to divide decimal numbers without renaming the dividend. The procedure for long division does not change. Pupils need to be mindful of the placement of the digits and remember that the decimal point does not represent a place. Simply, the decimal point separates the whole and fractional parts of a number.

Dividing Decimals with Renaming

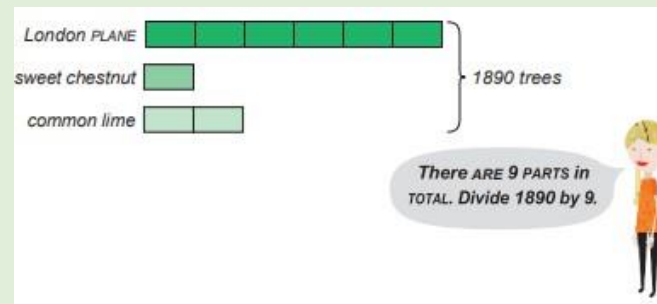


Initially, place-value counters are used to show the division procedure that should be well known by pupils at this stage. The long formal written method is then used to divide decimal numbers without a remainder. The procedure for long division with renaming does not change from what pupils have experienced previously. Pupils need to be mindful of the placement of the digits and remember that the decimal point does not represent a place. Simply, the decimal point separates the whole and fractional parts of a number.

Dividing Decimals by a 2-Digit Whole Number



Ratio



Algebra

$x$	18	3	90
$\frac{x}{3}$			

Pupils initially divide decimal numbers by 2-digit whole numbers where the dividend is easily broken into multiples of the divisor. Number bonds demonstrate the partitioning in order to divide using long and short formal written methods of division.

Pupils use a unitary method involving division to determine quantities in ratio problems. This approach is supported by the use of bar models.

Pupils use their understanding of division to determine unknown values with algebraic expressions and equations.