

Brookhurst Primary School

Calculation Policy 2020

01 January 2020

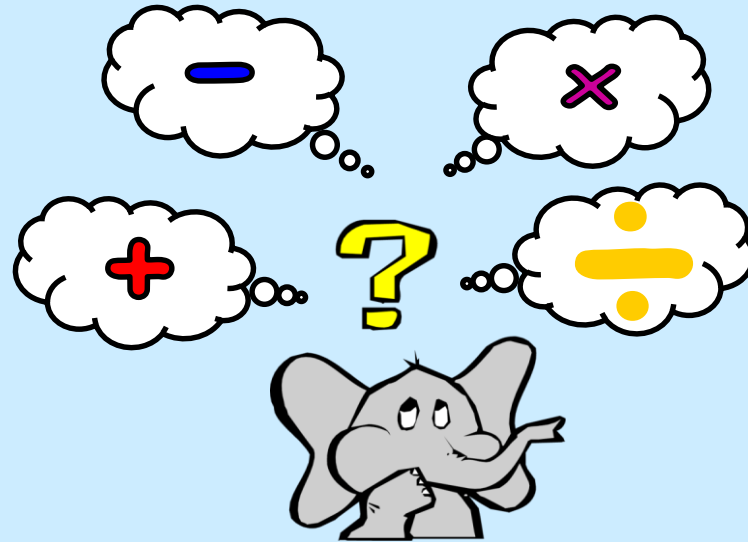
Author : Anna Archer

Approved : Ms A Stanton

Staff Name	Last Open	Signature Date
Mr M Hughes	04-03-2021	04-03-2021
Ms A Stanton	27-09-2017	07-01-2021
Mrs S Uddin	23-11-2017	23-11-2017
Mrs K Whipp	01-03-2018	01-03-2018
Mrs L Wythe	26-09-2017	08-02-2021
Emma Hugill	05-12-2017	05-12-2017
James Fullbrook	13-09-2018	07-01-2021
Lauren Brough	01-09-2019	10-01-2021
Lucy Hartwright	19-01-2019	07-01-2021
Georgia Morris	04-02-2021	04-02-2021
Anna Archer	03-07-2020	28-04-2021
Becky Gunthorpe	09-07-2020	09-07-2020
Gill Howell	Not Yet	Not Yet
Alex Oldham	08-07-2020	14-06-2021
Stephanie Beamish	01-07-2021	01-07-2021
Claire Honey	27-09-2020	27-09-2020
Charlotte Lidgard	17-09-2020	19-04-2021
Verity Maclean	Not Yet	Not Yet
Olivia Whatcott	Not Yet	Not Yet
Amy Sexton	Not Yet	Not Yet
Mrs E Moon	13-04-2021	13-04-2021
Mrs C Clarke	25-11-2017	25-11-2017
Mrs T Henderson	18-09-2017	07-02-2021
Ms F Hughes	Not Yet	Not Yet
Mrs R Jones	22-11-2017	13-01-2021
Mrs G Lindsay	Not Yet	Not Yet
Mrs T Taylor	23-05-2018	20-06-2018
Mrs K Waterfield	07-12-2017	21-01-2021
Mrs J Weston	21-09-2017	21-09-2017
Chair of Full Governing Body	Not Yet	Not Yet
Gina Reynolds	31-01-2018	31-01-2018
Chrissy Wales	01-04-2020	24-04-2020
Richard Cargill	Not Yet	Not Yet
Stella Newman	16-12-2019	16-12-2019
Sioban Mulherin	24-03-2020	08-01-2021
Cathryn Clarke	Not Yet	Not Yet
Sofia Gryparis	Not Yet	Not Yet
Teresa Henderson	Not Yet	Not Yet
Christine Wales	Not Yet	Not Yet
Siobhan Mulherin	Not Yet	Not Yet
Elisabeth Ingham	Not Yet	Not Yet

Jonathan Turton	01-04-2021	01-04-2021
Robert Nash	Not Yet	Not Yet
Julie Byrne	Not Yet	Not Yet
Billy Jarvis	Not Yet	Not Yet
Rachel Chowanietz	Not Yet	Not Yet

Mathematics Calculation Policy



Commissioned by The PiXL Club Ltd.
June 2016

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About PiXL's Calculation Policy

- The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school.

- Age stage expectations:

The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014 and the method(s) shown for each year group should be modelled to the vast majority of pupils. However, it is vital that pupils are taught according to the pathway that they are currently working at and are showing to have 'mastered' a pathway before moving on to the next one. Of course, pupils who are showing to be secure in a skill can be challenged to the next pathway as necessary.

- Choosing a calculation method:

Before pupils opt for a written method they should first consider these steps:

Can I do it in my head using a mental strategy?



Could I use some jottings to help me?



Should I use a formal written method to work it out?

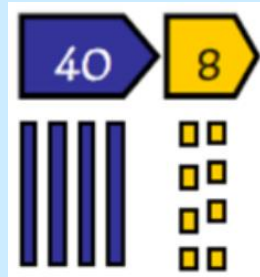
Calculation Guidance Principles

- *Develop children's fluency with basic number facts*
- *Develop children's fluency in mental calculation*
- *Develop children's understanding of the = symbol*
- *Teach inequality alongside teaching equality*
- *Use empty box problems*
- *Use intelligent practice*
- *Expose mathematical structure and work systematically*
- *Move between the concrete and the abstract*
- *Contextualise the mathematics*

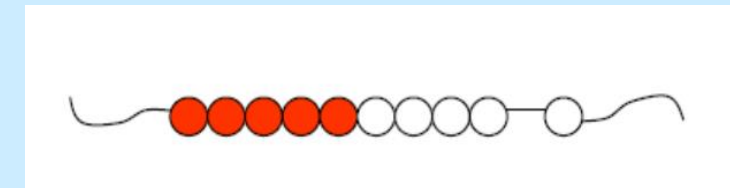
Addition

Concrete resources:

- 100 square
- Number lines
- Bead strings
- Straws
- Dienes
- Place value cards
- Place value dice
- Place value counters
- Numicon



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
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



sum addition total

make more

and plus

add increase

altogether

+

Addition: Reception

Early learning goals:

Number






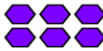



- ✓ Have a deep understanding of numbers to 10, including the composition of each number.
- ✓ Subitise (recognise quantities without counting) up to 5.
- ✓ Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 and some number bonds to 10.

Early learning goals:

Numerical Patterns

- ✓ Verbally count beyond 20, recognising the pattern of the counting system.
- ✓ Compare quantities of up to 10 in different contexts, recognising when one quantity is greater than or the same as the other quantity.

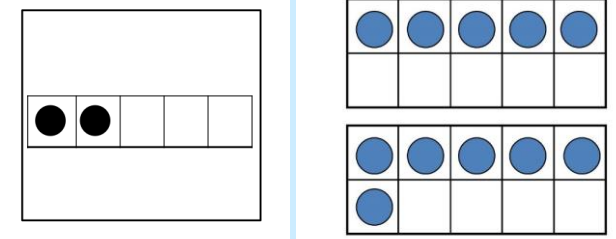
Have a deep understanding of numbers to 10 and recognise quantities.

1 one 	2 two 	3 three 
4 four 	5 five 	6 six 
7 seven 	8 eight 	9 nine 

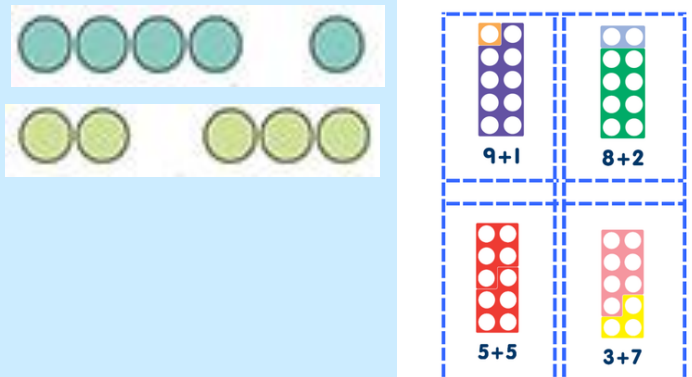
Count on in ones and say which number is one more than a given number using a number line or number track to 20 end beyond.

1	2	3	4	5	6	7
13	12	11	10	9	8	
14						
15	16	17	18	19	20	


Use a five and tens frame to become familiar with the tens structure.



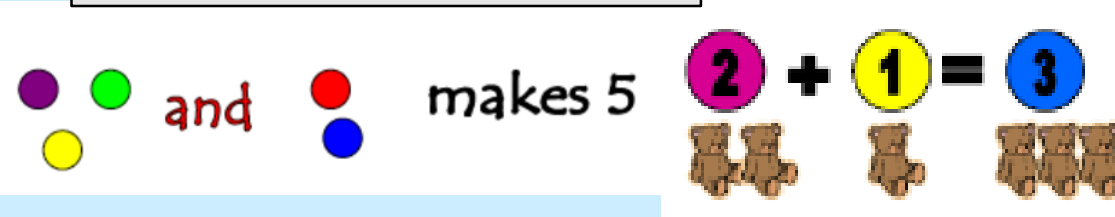
Use pictorial representations for number bonds to 5 and 10.



Know that counting on is a strategy for addition. Use numbered number lines to 20.



Begin to relate addition to combining two groups of objects using practical resources, role play, stories and songs.



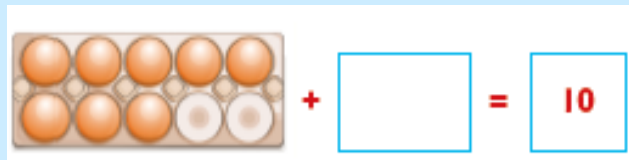
Addition: Year 1

- Year 1 statutory requirements :
- ✓ Count to and across 100, forwards beginning with 0 or 1, or from any given number.
 - ✓ Given a number, identify one more.
 - ✓ Read, write and interpret mathematical statements involving addition (+), and equals (=) signs.
 - ✓ Represent and use number bonds and related subtraction facts within 20
 - ✓ Add one-digit and two-digit numbers to 20, including zero.
 - ✓ Solve one-step problems that involve addition using concrete objects and pictorial representations, and missing number problems.

Identify and represent numbers using objects and pictorial representations (multiple representations)



Memorise and reason with number bonds to 10 and 20 in several forms.



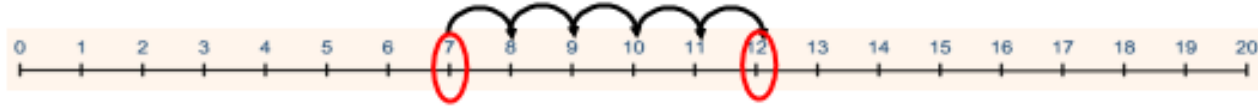
<p>6 + 4 = 10 4 + 6 = 10 10 - 4 = 6 10 - 6 = 4</p> <p>Tens Frame</p>	<p>6 + 4 = 10 4 + 6 = 10 10 - 4 = 6 10 - 6 = 4</p> <p>Part Whole Model</p>	<table border="1" style="margin: 0 auto;"> <tr><td colspan="2" style="text-align: center;">10</td></tr> <tr><td style="text-align: center;">6</td><td style="text-align: center;">4</td></tr> </table> <p>6 + 4 = 10 4 + 6 = 10 10 - 4 = 6 10 - 6 = 4</p> <p>Bar Model</p>	10		6	4
10						
6	4					

Count on in ones to and across 100 and find one more than a given number.

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
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

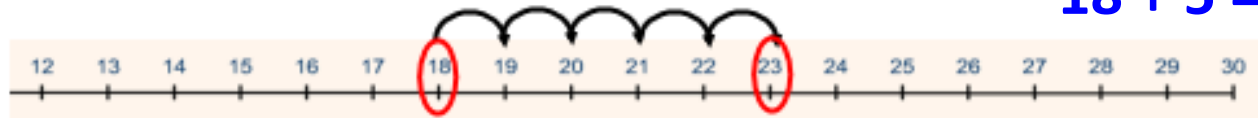
Addition: Year 1

Use concrete resources and a number line to support the addition of numbers. Know and use strategy of finding the larger number, and counting on in ones from this number.



1 digit + 1 digit

$$7 + 5 = 12$$



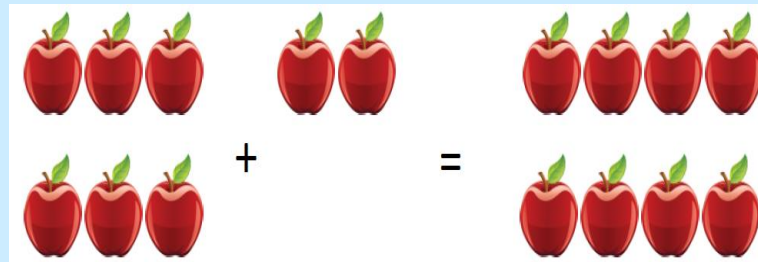
2 digit + 1 digit

$$18 + 5 = 23$$

Begin to use the + and = signs to write calculations in a number sentence.

Solve one-step problems using concrete objects and pictorial representations.

Tom picks 6 apples and Raj picks 2 apples.
How many apples do they have altogether?

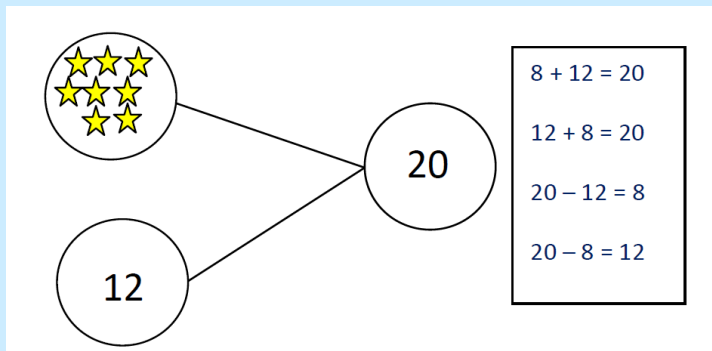


Addition: Year 2

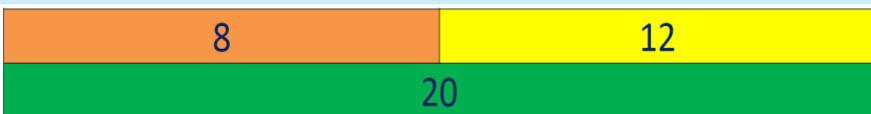
Year 2 statutory requirements :

- ✓ Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts to 100.
- ✓ Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.
- ✓ Add numbers using concrete objects, pictorial representations, and mentally, including:
 - a two-digit number and ones
 - a two-digit number and tens
 - two two-digit numbers
 - adding three one-digit numbers.
- ✓ Solve problems with addition including those involving numbers, quantities and measures.

Memorise and reason with number facts to 20 in several forms.

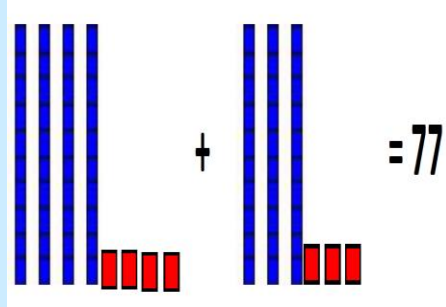


Partition two 2-digit numbers using a variety of models and images.

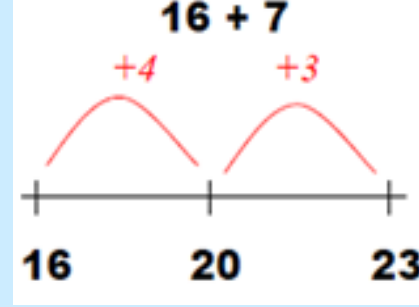


Addition: Year 2

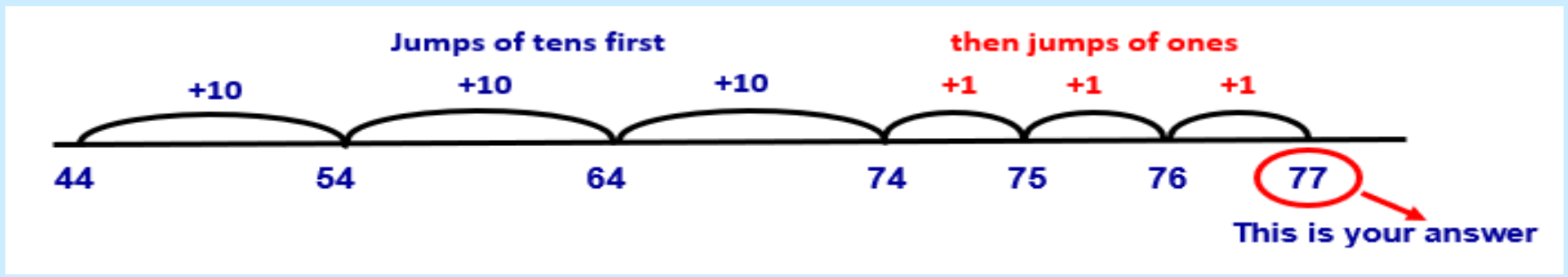
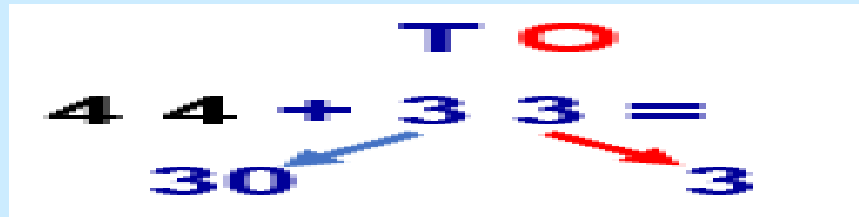
Add 2 digit number and ones



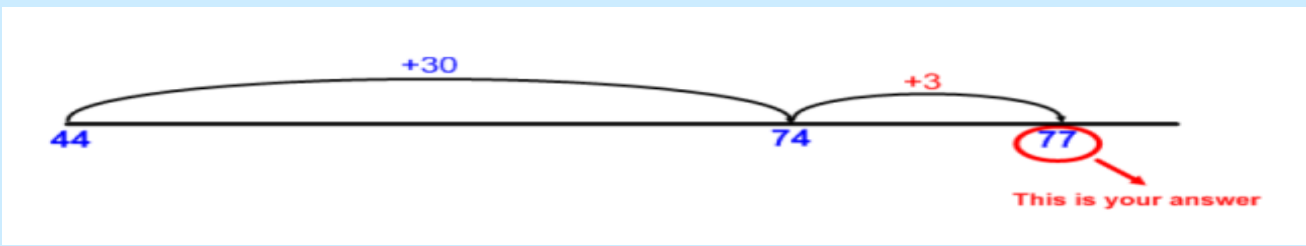
Add 2 digit number and tens



Use partitioning to add two 2-digit numbers using concrete resources and/or a numbered number line and then progressing to an empty number line.



As children gain confidence with adding on tens and ones, they should be taught to combine the jumps on an empty number line.



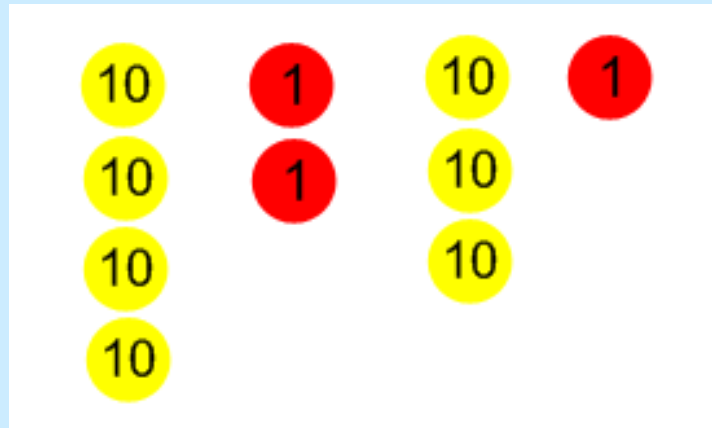
Addition: Year 3

- Year 3 statutory requirements :
- Find 10 or 100 more than a given number.
 - Recognise the place value of each digit in a three-digit number (hundreds, tens, ones).
 - Add numbers with up to three digits, using formal written methods of columnar addition.

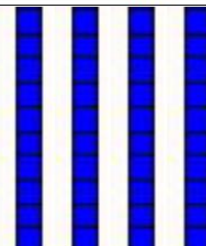
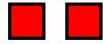
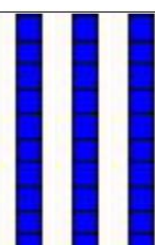

Use expanded column method with place value resources to support the conceptual understanding of adding numbers up to three digits **with no regrouping**.

$42 + 31 = 73$

$$\begin{array}{r}
 40 + 2 \\
 30 + 1 \\
 \hline
 70 + 3
 \end{array}$$



OR

Tens	Ones
	
	
70	3



Addition: Year 3

Progress to using the expanded column method with place value resources to support the conceptual understanding of adding numbers up to three digits **with regrouping**.

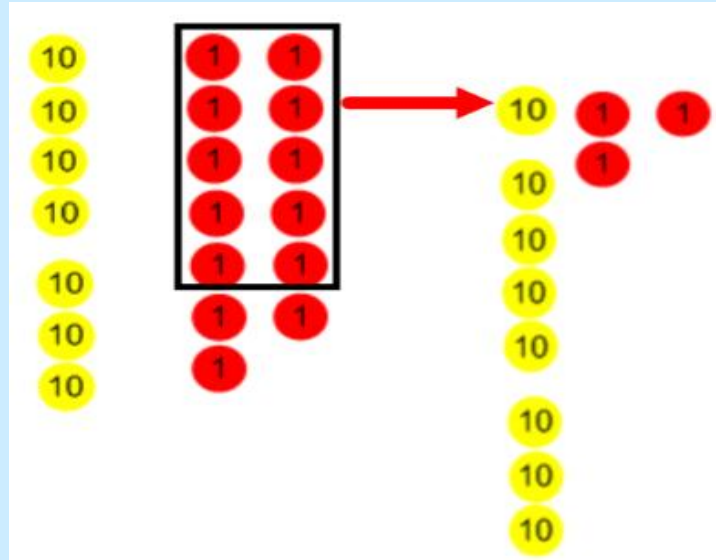
$$47 + 36 = 83$$

$$40 + 7$$

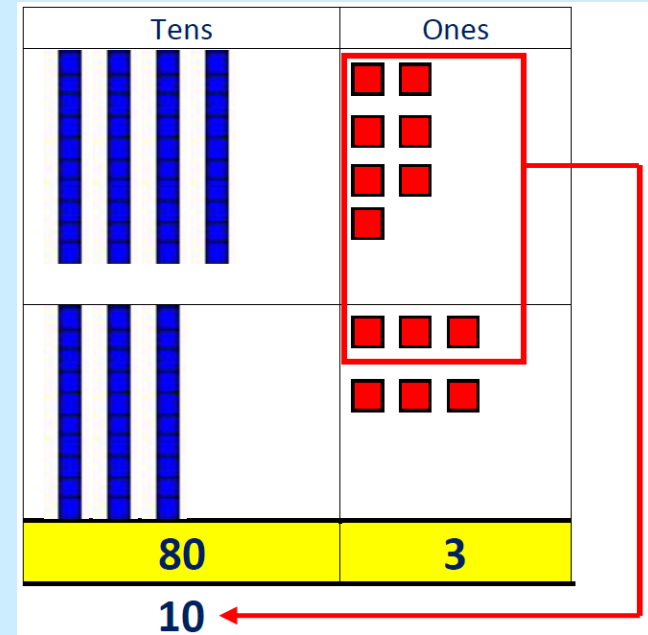
$$30 + 6$$

$$80 + 3$$

$$10$$



OR



Extend to using the expanded column method to add three digit numbers + three digit numbers **with regrouping**.

$$367 + 185 = 552$$

$$300 + 60 + 7$$

$$100 + 80 + 5$$

$$500 + 50 + 2$$

$$100 \quad 10$$

Note: The regrouped ten or regrouped hundred is just as important as any other number, therefore, it should be written as clear and as large as any other number, and placed at the **bottom** of the column in which it is to be added.

Addition: Year 4

Year 4 statutory requirements :

- Find 1000 more than a given number.
- Add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate.
- Solve addition two-step problems in contexts, deciding which operations and methods to use and why,

Build on learning from Year 3 and model how expanded method links to compact column addition method.

$$\begin{array}{r}
 40 + 7 \\
 \underline{30 + 6} \\
 \underline{80 + 3} \\
 10
 \end{array}
 \longrightarrow
 \begin{array}{r}
 47 \\
 \underline{+36} \\
 83 \\
 1
 \end{array}$$

$$\begin{array}{r}
 300 + 60 + 7 \\
 \underline{100 + 80 + 5} \\
 \underline{500 + 50 + 2} \\
 100 \quad 10
 \end{array}
 \longrightarrow
 \begin{array}{r}
 367 \\
 \underline{+185} \\
 552 \\
 11
 \end{array}$$

Note: The regrouped ten or regrouped hundred is just as important as any other number, therefore, it should be written as clear and as large as any other number, and placed at the **bottom** of the column in which it is to be added.

By the end of year 4, pupils should be adding numbers up to 4 digits using compact column addition method.

$$\begin{array}{r}
 5271 \\
 \underline{+2357} \\
 7628 \\
 1
 \end{array}$$

Addition: Year 5 & 6

Year 5 statutory requirements :

- Add whole numbers with more than 4 digits using formal written methods of columnar addition.
- Add numbers mentally, with increasingly large numbers.
- Solve addition multi-step problems in contexts, deciding which operations and methods to use and why.
- Solve problems involving numbers up to three decimal places

Year 6 statutory requirements :

- Pupils are expected to solve more complex addition and subtraction problems

In year 5 and 6 pupils should be adding numbers using compact column addition method. **Note:** The regrouped ten, hundred, thousand is just as important as any other number, therefore, it should be written as clear and as large as any other number, and placed at the **bottom** of the column in which it is to be added.

$$\begin{array}{r}
 46892 \\
 + 32758 \\
 \hline
 79650 \\
 \hline
 111
 \end{array}$$

When adding decimals, it is essential that the decimal point does not move and kept in line.

Where necessary, a zero should be added as a **place holder**.

$12.5 + 23.7$

$$\begin{array}{r}
 12.5 \\
 + 23.7 \\
 \hline
 36.2 \\
 \hline
 1
 \end{array}$$

$34.5 + 27.43$

$$\begin{array}{r}
 34.50 \\
 + 27.43 \\
 \hline
 61.93 \\
 \hline
 1
 \end{array}$$

Subtraction

Concrete resources:

- 100 square
- Number lines
- Bead strings
- Straws
- Dienes
- Counting stick
- Place value dice
- Place value cards
- Place value counters



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
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



subtract
 count on count back
 fewer ——— less
 take away minus
 difference



Subtraction: Reception

Early learning goals:

Number

✓ Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10.

Early learning goals:

Numerical Patterns

✓ Compare quantities of up to 10 in different contexts, recognising when one quantity is less than or the same as the other quantity.

5 little ducks went swimming one day...

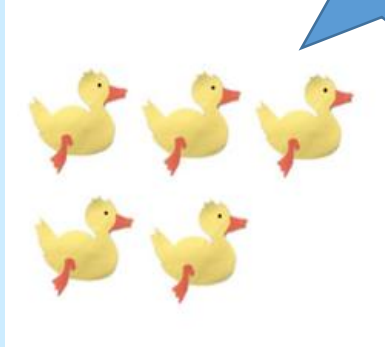
Say which number is one less than a given number using a number line or number track to 20.



Begin to count backwards in familiar contexts such as number rhymes or stories.

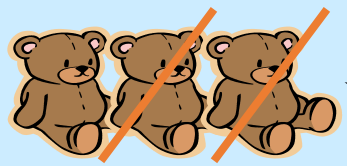


10 Green Bottles sitting on the wall ...



Recall subtraction facts for number bonds to 5 then 10.

Begin to relate subtraction to 'taking away' using concrete objects and role play.

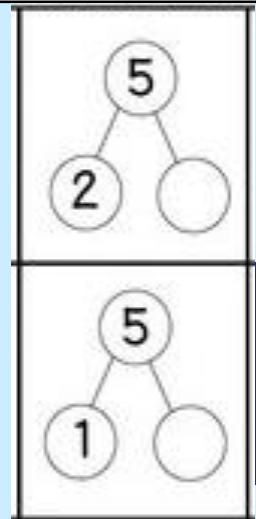
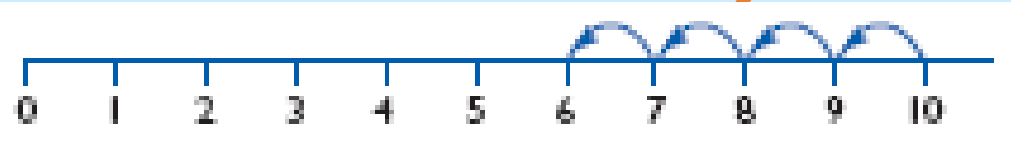


Three teddies **take away** two teddies leaves one teddy

If I **take away** four shells there are six left



Count backwards along a number line to 'take away'

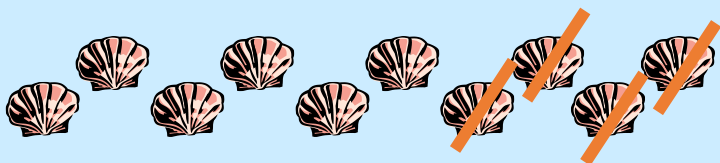
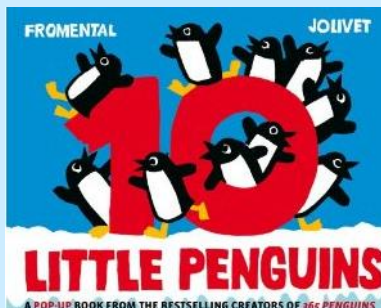


Subtraction: Year 1

Year 1 statutory requirements:


- ✓ Say which number is one less than a given number.
- ✓ Represent and use number bonds and related subtraction facts within 20.
- ✓ Read, write and interpret mathematical statements involving subtraction (-) and equals (=) signs.
- ✓ Subtract one-digit and two-digit numbers to 20, including zero.
- ✓ Solve one-step problems that involve subtraction using concrete objects and pictorial representations, and missing number problems.

Understand subtraction as take away. Use practical resources, pictorial representations, role play, stories and rhymes.



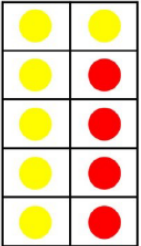
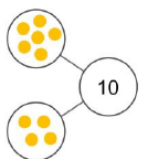
Use number bonds and related subtraction facts within 20.

$$16 - \square = 10$$

$$20 - \square = 15$$


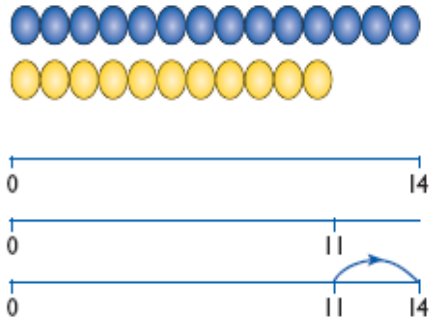
Count back in ones and find one less than a given number.

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
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

 $6 + 4 = 10$ $4 + 6 = 10$ $10 - 4 = 6$ $10 - 6 = 4$	 $6 + 4 = 10$ $4 + 6 = 10$ $10 - 4 = 6$ $10 - 6 = 4$	<table border="1"> <tbody> <tr><td colspan="2">10</td></tr> <tr><td>6</td><td>4</td></tr> </tbody> </table> $6 + 4 = 10$ $4 + 6 = 10$ $10 - 4 = 6$ $10 - 6 = 4$	10		6	4
10						
6	4					
Tens Frame	Part Whole Model	Bar Model				

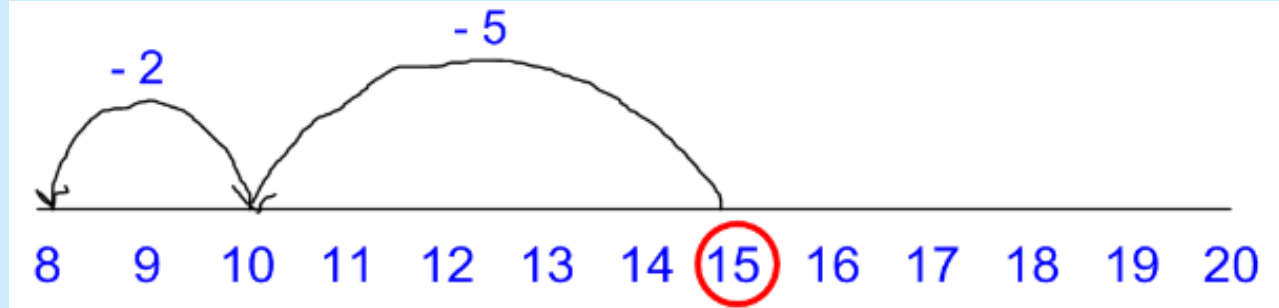
Subtraction: Year 1

Counting on should only be used when the language used is 'find the difference', 'difference between' and 'distance between'.



The difference between 11 and 14 is 3.
 $14 - 11 = 3$
 $11 + \square = 14$

Use number line to support the subtraction of numbers. Know and use strategy of **counting back** to subtract one-digit and two-digit numbers to 20.



$$15 - 7 = 8$$

Solve one-step problems using concrete objects and pictorial representations.

Dan has 12 football stickers.
 He gives 4 to Ben.
 How many stickers does he have left?



12

- 4 =

8

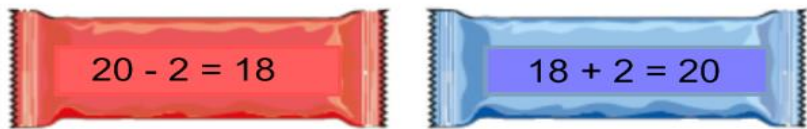
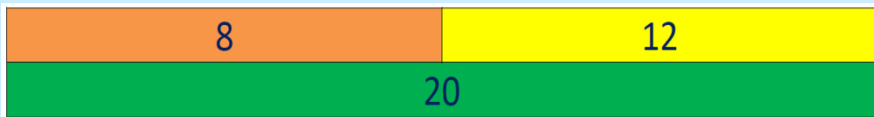
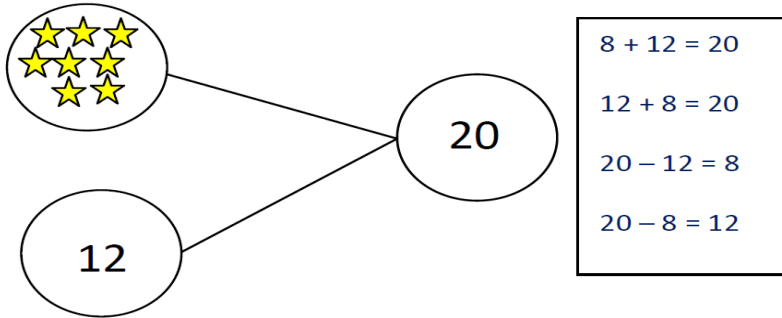
Begin to use the - and = signs to write calculations in a number sentence.

Subtraction: Year 2

Year 2 statutory requirements:

- Recall and use subtraction facts to 20 fluently, and derive and use related facts to 100.
- Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.
- Subtract numbers using concrete objects, pictorial representations, and mentally, including:
 - a two-digit number and ones
 - a two-digit number and tens
 - two two-digit numbers
 - adding three one-digit numbers.

Memorise and reason with number facts to 20 in several forms.

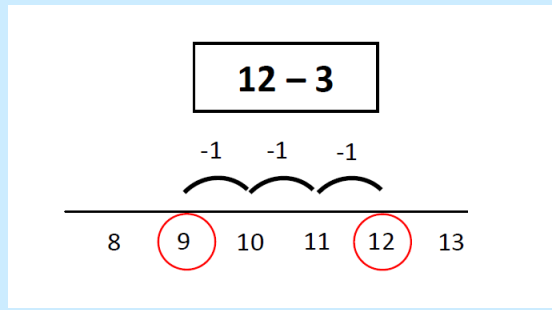


Partition two 2-digit numbers using a variety of models and images.

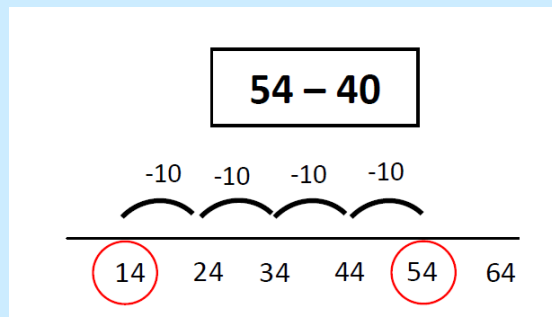


Subtraction: Year 2

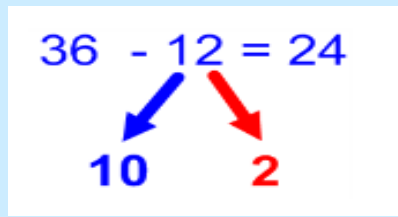
Subtract 2 digit and ones



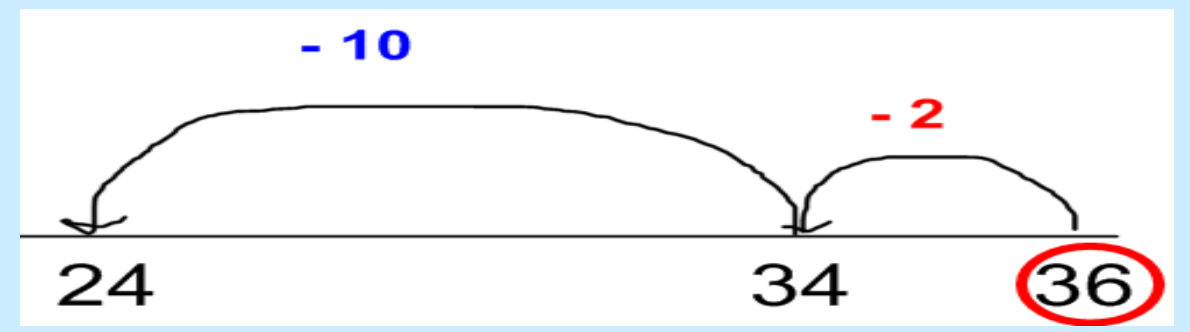
Subtract 2 digit and tens



Use partitioning to subtract two 2-digit numbers using concrete resources and/or a numbered number line and then progressing to an empty number line.



OR



Subtraction: Year 3

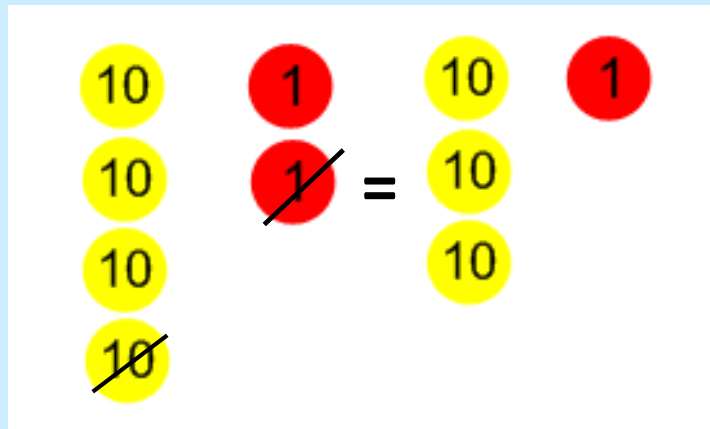
Year 3 statutory requirement:

- Find 10 or 100 less than a given number.
- Recognise the place value of each digit in a three-digit number (hundreds, tens, ones).
- Subtract numbers with up to three digits, using formal written methods of column subtraction.
- Subtract numbers mentally, including:
 - A three-digit number and ones
 - A three-digit number and tens
 - A three-digit number and hundreds.

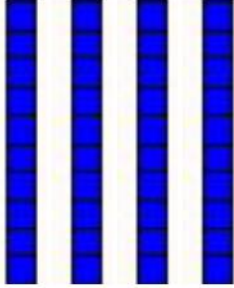

Use expanded column method with place value resources to support the conceptual understanding of subtracting numbers with up to three digits **with no exchanging**.

$$42 - 11 = 31$$

$$\begin{array}{r}
 40 + 2 \\
 - 10 + 1 \\
 \hline
 30 + 1
 \end{array}$$



OR

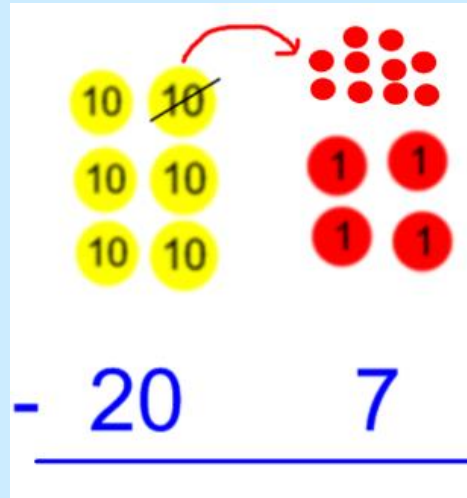
Tens	Ones
	
- 10	- 1
30	1

Subtraction: Year 3

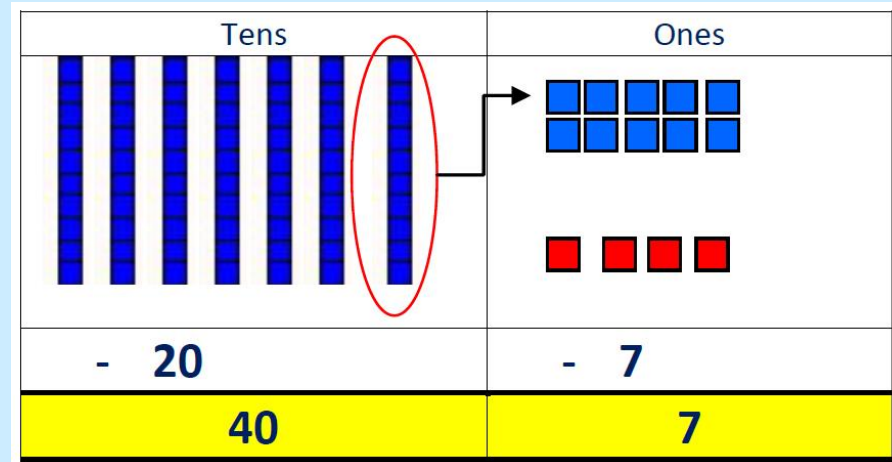
Progress to using the expanded column method with place value resources to support the conceptual understanding of subtracting numbers with up to three digits *with exchanging tens and/or hundreds*.

$$74 - 27 = 47$$

$$\begin{array}{r}
 60 + 14 \\
 \cancel{70} + \cancel{4} \\
 - 20 + 7 \\
 \hline
 40 + 7
 \end{array}$$



OR



In this example to subtract 7 ones from 4 ones we need to **exchange** a ten for ten ones. We now can subtract 7 ones from 14 ones.

Extend to using the expanded column method to subtract three digit numbers from three digit numbers.

$$537 - 254 = 283$$

$$\begin{array}{r}
 400 + 130 \\
 \cancel{500} + \cancel{30} + 7 \\
 - 200 + 50 + 4 \\
 \hline
 200 + 80 + 3
 \end{array}$$

Note: The exchanged ten or hundred is just as important as any other number, therefore, it should be written as clear and as large as any other number, and placed at the **top** of the column which has been adjusted.

Subtraction: Year 4

Year 4 statutory requirements:

- Find 1000 less than a given number.
- Subtract numbers with up to four digits, using formal written methods of columnar subtraction where appropriate.
- Solve subtraction two-step problems in contexts, deciding which operations and methods to use and why.

Build on learning from Year 3 and model how expanded method links to compact column subtraction method.

$ \begin{array}{r} 60 + 14 \\ \cancel{70} + \cancel{4} \\ - 20 + 7 \\ \hline 40 + 7 \end{array} $	→	$ \begin{array}{r} 6 \\ \cancel{7}^1 4 \\ \hline 27 \\ \hline 47 \end{array} $	→	$ \begin{array}{r} 400 + 130 \\ \cancel{500} + \cancel{30} + 7 \\ - 200 + 50 + 4 \\ \hline 200 + 80 + 3 \end{array} $	→	$ \begin{array}{r} 4 \\ \cancel{5}^1 \cancel{3} 7 \\ - 254 \\ \hline 283 \end{array} $
---	---	---	---	---	---	--

By the end of year 4, pupils should be subtracting numbers up to 4 digits using compact column subtraction method.

$$\begin{array}{r}
 78\overset{3}{4}2 \\
 - 1829 \\
 \hline
 6013
 \end{array}$$

Note: The exchanged ten or hundred is just as important as any other number, therefore, it should be written as clear and as large as any other number, and placed at the **top** of the column which has been adjusted.

Subtraction: Year 5 & 6

Year 5 statutory requirements :

- Subtract whole numbers with more than 4 digits using formal written methods of columnar subtraction.
- Subtract numbers mentally, with increasingly large numbers.
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.
- Solve problems involving numbers up to three decimal places.

Year 6 statutory requirements: pupils are expected to solve more complex addition and subtraction problems

In year 5 and 6 pupils should be subtracting numbers using compact column subtraction method. **Note:** The exchanged ten or hundred is just as important as any other number. Therefore, it should be written as clear and as large as any other number, and placed at the **top** of the column which has been adjusted.

$$\begin{array}{r}
 8 \qquad \qquad \qquad 7 \\
 \cancel{9} \quad ^1 6 \quad 7 \quad \cancel{8} \quad ^1 3 \\
 - \\
 \hline
 5 \quad 8 \quad 7 \quad 3 \quad 5 \\
 \hline
 3 \quad 8 \quad 0 \quad 4 \quad 8
 \end{array}$$

When subtracting decimals, it is essential that the decimal point does not move and kept in line.

Where necessary, a zero should be added as a *place holder*.

$$\begin{array}{r}
 4 \\
 \cancel{5} \cdot ^1 3 \quad 7 \\
 - 2 \cdot 5 \quad 4 \\
 \hline
 2 \cdot 8 \quad 3
 \end{array}$$

	1	10	15	.	4	11	9	kg
-		3	6	.	0	8	0	kg
		6	9	.	3	3	9	kg

Multiplication



Concrete resources

Place value counters

Dienes

Place value charts

Arrays

Multiplication squares

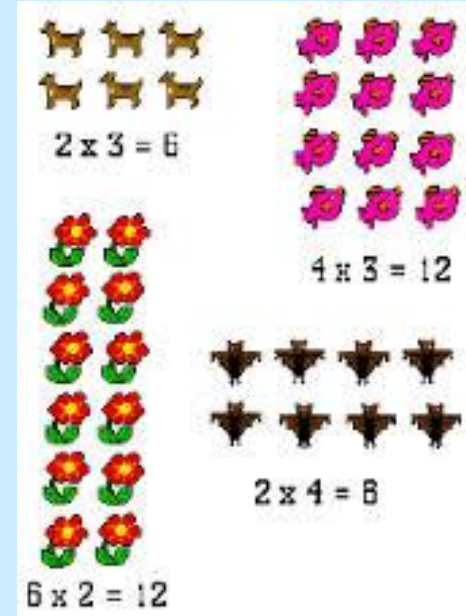
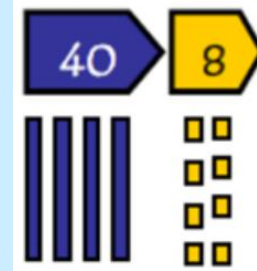
100 square

Number lines

Blank number lines

Counting stick

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100



multiplication **product**
once, twice, three times
double **groups of**
repeated addition **lots of**
array, row, column **multiply**
times **multiple**





Multiplication: Reception

Early learning goals:

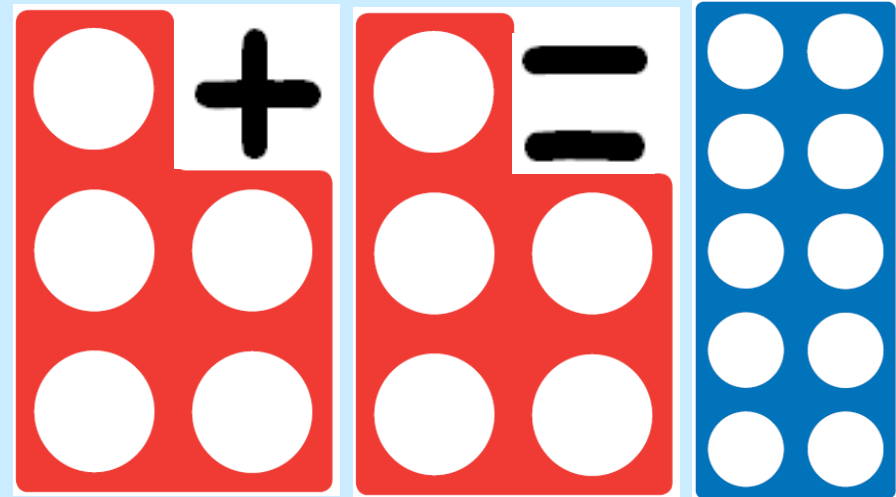
Number

✓ Automatically recall (without reference to rhymes, counting or other aids) double facts

Use pictorial representations and concrete resources to gain a deep understanding of number bonds to 5 then 10.

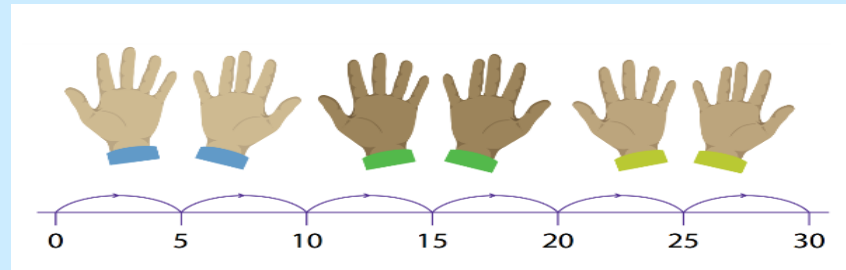
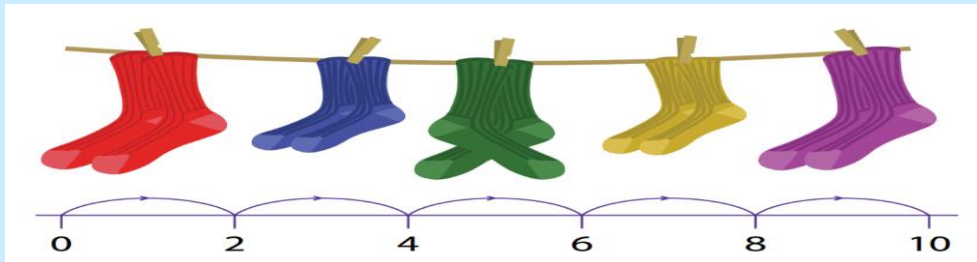
 $1 + 1 = 2$	 $2 + 2 = 4$	 $3 + 3 = 6$	 $4 + 4 = 8$
---	--	--	---

Use pictorial representations and concrete resources to double numbers to 10.



Two red ten-frames are shown. The first has a plus sign (+) between them, and the second has an equals sign (=) between them. To the right is a blue ten-rod with ten white circles arranged in two columns of five.

Use concrete sources, role play, stories and songs to begin counting in twos, fives and tens.

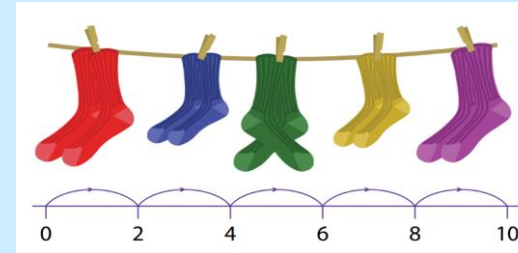
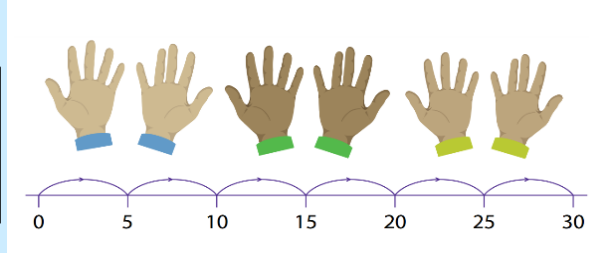


Multiplication: Year 1

Year 1 statutory requirement:

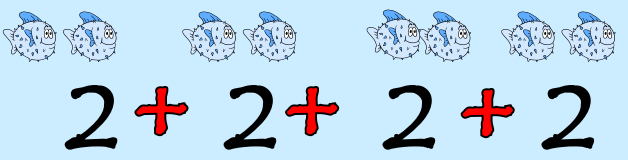
✓ Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Count in twos, fives and tens using practical resources, role play, stories and songs.

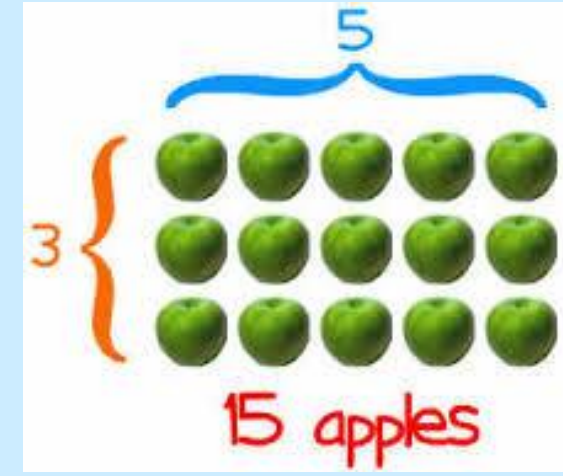
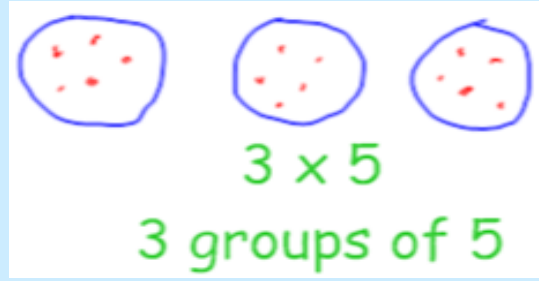


Use arrays

Understand multiplication as repeated addition – use concrete objects to support understanding.



Use pictorial representations



Multiplication: Year 2

Year 2 statutory requirement:

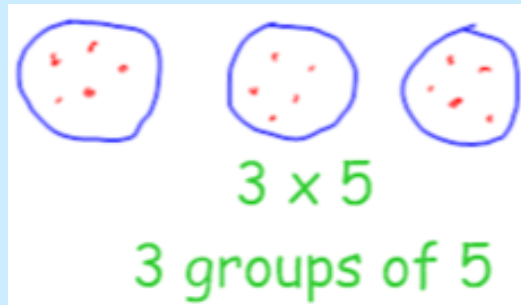
- ✓ Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.
- ✓ Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs.
- ✓ Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.
- ✓ Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Further develop understanding multiplication as repeated addition.

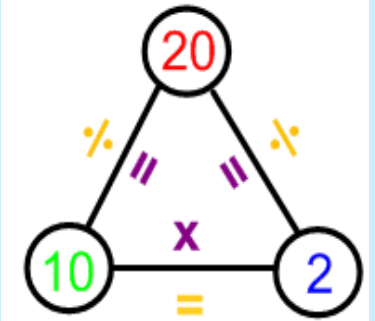
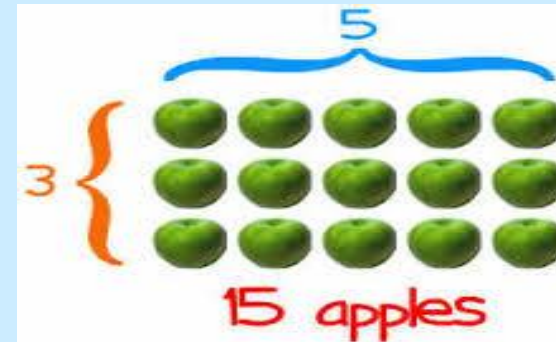


$5 + 5 + 5$
or
 5×3

Use pictorial representations

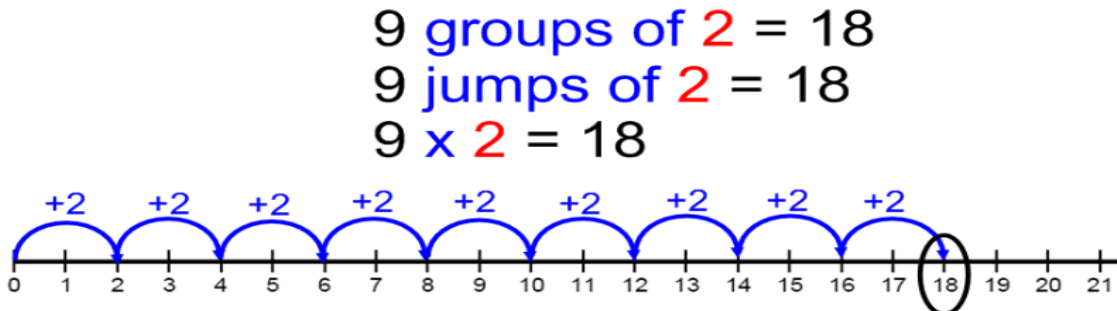


Use arrays



Recall multiplication and division facts for 2, 5, 10

Model and bridge link from repeated addition to solving multiplication problems using a number line.

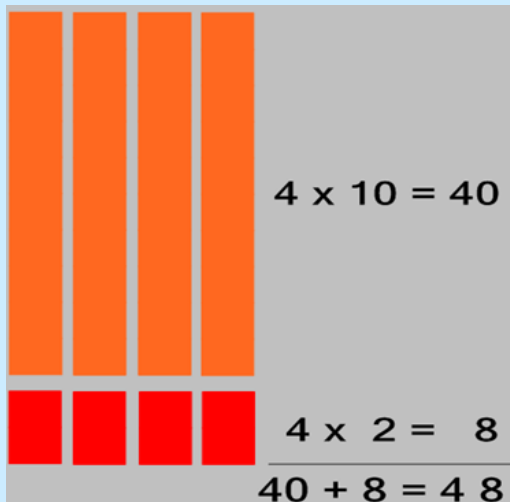




Develop recall of multiplication facts (alongside inverse of the corresponding division facts).

x	3	4	8	x	4	?	?
5				?	8	6	10
6				6	24	18	30
4				?	32	24	40

$12 \times 4 = 48$



Multiplication: Year 3

Year 3 statutory requirements:

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

Use concrete resources to develop conceptual understanding of the compact method introduced in Year 4.

x	10	2
4		

OR

x	10	2
4	40	8

$$\begin{array}{r}
 10 + 2 \\
 \times \quad 4 \\
 \hline
 8 \\
 40 \\
 \hline
 48
 \end{array}$$



The yellow ribbon is 4 times as long as the red ribbon. What is its length?

Multiplication: Year 4

Year 4 statutory requirement:

- ✓ Recall multiplication and division facts for multiplication tables up to 12×12
- ✓ Use place value, known and derived facts to multiply and divide mentally, including: multiply two-digit and three-digit numbers by a one-digit number using formal written layout.
- ✓ Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

X	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144


Build on learning from Year 3 and model how grid method and/or expanded method links to compact short multiplication.

x	30	6
4		



$30 + 6$	36
$\times 4$	$\times 4$
<hr/>	<hr/>
24	144
$+ 120$	2
<hr/>	<hr/>
144	

Develop recall of multiplication facts (alongside the inverse of the corresponding division facts).



2 eggs
150g flour
180g sugar

Use knowledge of times tables to solve scaling problems.

Susie wants to bake 12 cupcakes people.
The ingredients given are for four cupcakes.
How much flour will she need?

	<u>Cupcakes</u>	<u>Flour</u>
	4	150g
$\times 3$	12	900g

Multiplication: Year 5

Year 5 statutory requirements:

- ✓ Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.
- ✓ Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000

Build on learning from Year 4 and use concrete resources if needed to multiply numbers up to 4 digits by **one digit** using compact short multiplication.

$$\begin{array}{r}
 643 \times 8 \\
 \hline
 5144 \\
 \hline
 32
 \end{array}$$

x	600	40	3
50	30,000	2,000	150
4	2,400	160	12

Reinforce the connection between the grid method to multiply numbers up to 4 digits by **two digit** using long multiplication.

$$\begin{array}{r}
 643 \\
 \times 54 \\
 \hline
 2572 \\
 11 \\
 +32150 \\
 21 \\
 \hline
 34722
 \end{array}$$

To multiply by 10, 100, 1000 children should use place value charts to show that the digit moves a column (s) to the left. The value of the digit is increasing by 10, 100 or 1000 times.

Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
		3	6	4	2	

X 10

Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
	3	6	4	2		

Multiplication: Year 6

Year 6 statutory requirements:

- ✓ Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.
- ✓ Multiply one-digit numbers with up to two decimal places by whole numbers.

Build on learning from Year 5 multiplying numbers using compact short multiplication and long division.

$$\begin{array}{r}
 643 \times 8 \\
 643 \\
 \times 8 \\
 \hline
 5144 \\
 32 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 643 \\
 \times 54 \\
 \hline
 2572 \\
 11 \\
 +32150 \\
 21 \\
 \hline
 34722
 \end{array}$$

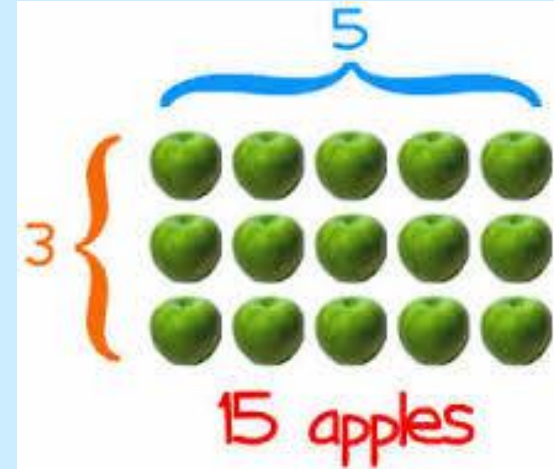
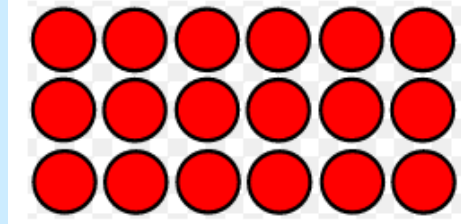
Use compact short multiplication to multiply decimal number by whole number.

$$\begin{array}{r}
 7.68 \\
 \times 4 \\
 \hline
 30.72 \\
 23 \\
 \hline
 \end{array}$$

Division

Concrete resources:

- Arrays
- Multiplication squares
- 100 square
- Number lines
- Blank number lines
- Counting stick
- Place value apparatus

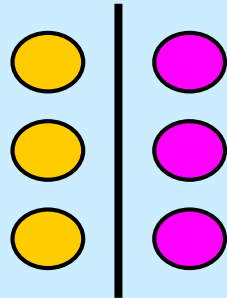
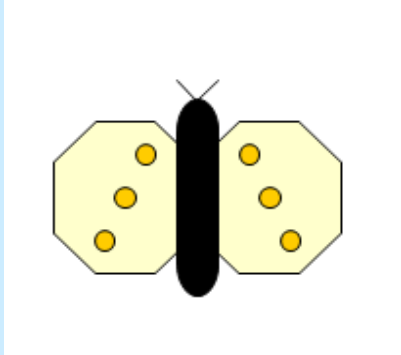


divided by group
 into lots of $\frac{\bullet}{\text{—}} \bullet$ into groups of
 divisible remainder halve
 half factor

Division: Reception

There are no Early Learning Goals that focus on division, however the children learn to halve and share.

Use pictorial representations and concrete resources to halve numbers to 10.



Begin to share quantities using practical resources, role play, stories and songs.



Role play example:
It is the end of the party and the final two teddies are waiting for their party bags. Provide empty party bags and a small collection of items such as gifts, balloons and slices of cake. Ask the children to share the objects between the two bags.

Division: Year 1

Year 1 statutory requirement:

- solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Understand division as **sharing** using concrete resources.



Pictorial representation of sharing **12 gold coins** between 2, 3 and 4 pirates!



$$12 \div 2$$



$$12 \div 3$$



$$12 \div 4$$

Begin to understand division as **grouping** using concrete resources.

12 into groups of 2

$$12 \div 2 = 6$$

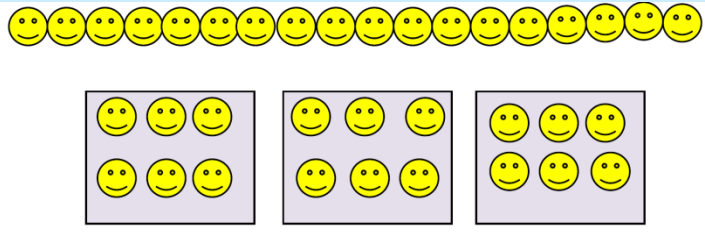


Division: Year 2

Year 2 statutory requirement:

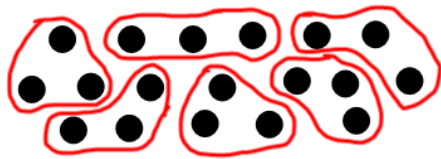
- ✓ Recall and use division facts for 2, 5 and 10 multiplication tables.
- ✓ Calculate mathematical statements for multiplication and division within the multiplication tables and write then using the multiplication (x), division (/) and equals (=) signs.
- ✓ Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.
- ✓ **Find 1/3; 1/4; 2/4; 3/4 of a length, shape, set of objects or quantity**

Further develop understanding of difference between **sharing** and **grouping** using concrete resources.



18 smiley faces shared between 3 classes.

18 into groups of 3
 $18 \div 3 = 6$

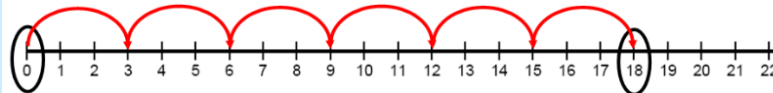


Model division as grouping on a number line (ITP 'Grouping')

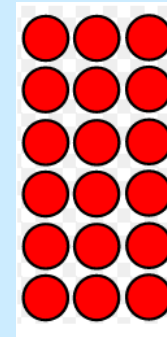


Children use numbered number lines to divide using grouping.

18 into groups of 3 = 6 groups
 18 into jumps of 3 = 6 jumps
 $18 \div 3 = 6$



Reinforce division through the use of arrays.

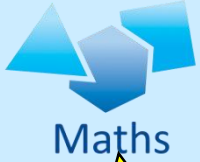


$$18 \div 3 = 6$$

$$18 \div 6 = 3$$

Remember to develop connections between fractions and division and rephrase this calculation as 1/3 of 18 is the same as $18 \div 3 = 6$.

Division: Year 3 & 4



See video link in 'notes' to consider how to develop conceptual understanding of division using dienes.

Year 3 statutory requirement:

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

Year 4 statutory requirement: **Note** - there isn't a statutory objective for division. However, Y4 statutory multiplication objectives are to (1) recall multiplication and division facts for multiplication tables up to 12×12 and (2) multiply two-digit and three-digit numbers by a one-digit number using formal written layout so we will build on the connections between multiplication and division.

$$\begin{array}{r} 32 \\ 3 \overline{) 96} \end{array}$$

Limit numbers to NO remainders in the answer OR carried (each digit must be a multiple of the divisor).

$$\begin{array}{r} 18 \\ 4 \overline{) 732} \end{array}$$

Limit numbers to NO remainders in the final answer, but with remainders occurring within the calculation.

$$\begin{array}{r} 218 \\ 4 \overline{) 8732} \end{array}$$

Extend to 3-digit number first where the divisor can go into the first number and then progress to when the divisor cannot go into the first number.

$$\begin{array}{r} 037 \\ 5 \overline{) 1835} \end{array}$$

Remember to develop connections between fractions and division and rephrase these calculations as $\frac{1}{3}$ of 96; $\frac{1}{4}$ of 72, $\frac{1}{4}$ of 872 and $\frac{1}{5}$ of 185. Note: Year 3 fraction objective - *Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators*; Year 4 fraction objective: *solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number.*

Division: Year 5

Year 5 statutory requirement:

✓ divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.

Further secure pupils' understanding of compact short division.

$$218 \div 8 =$$
$$27 \text{ r } 2$$
$$8 \overline{) 2158}$$

Extend to expressing results in different ways according to the context, including with remainders as fractions, as decimals or by rounding. For example:

- Whole number remainder = $27 \text{ r } 2$
- Fraction remainder = $27 \frac{2}{8} = 27 \frac{1}{4}$
- Decimal remainder = $27 \frac{1}{4} = 27 \frac{25}{100} = 27.25$

Division: Year 6

Year 6 statutory requirement:

✓ divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context

Continue to use compact short division to divide numbers up to 4 digits by a 1-digit whole number.

$$218 \div 8 =$$

$$27 \text{ r } 2$$

$$8 \overline{) 2158}$$

- Whole number remainder = $27 \text{ r } 2$
- Fraction remainder = $27 \frac{2}{8} = 27 \frac{1}{4}$
- Decimal remainder = $27 \frac{1}{4} = 27 \frac{25}{100} = 27.25$

Use long division to divide numbers up to 4 digits by a 2-digit whole number.

$$24 \overline{) 588}$$

$$\begin{array}{r} 024 \text{ r } 12 \\ - 48 \\ \hline 108 \\ - 96 \\ \hline 12 \end{array}$$