Huyton with Roby CE Primary School

Mastery Progression Policy

Updated: September 2023

Mastery Mathematics

At Huyton with Roby, all pupils will experience the 'mastery approach' to learning maths, using the underlying principles of the Maths No Problem mastery programme. We want pupils to build a deeper understanding of concepts that will enable them to apply their learning in different situations.

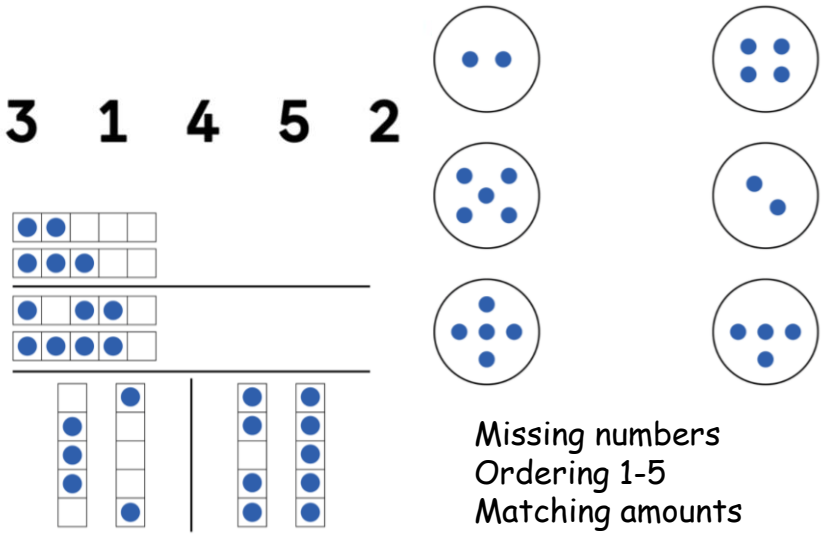
Children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations. This progression policy works alongside our calculation policy to outline the different strategies that should be taught and used in Year 1 to Year 6 in line with the requirements of the 2014 Primary National Curriculum.

By following the Maths No Problem scheme of work, all children will move broadly through the content at the same pace. They will be given time to think deeply about the maths which will encourage differentiation through strategies and understanding rather than acceleration.

Foundation & Year 1

Counting

Foundation

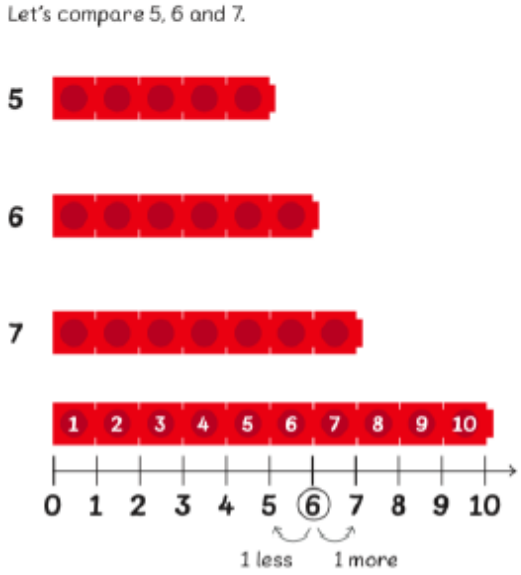


Missing numbers
Ordering 1-5
Matching amounts
Comparing numbers

Year 1

One or two more and less than numbers to 40

Comparing and ordering numbers



Counting

Year 1

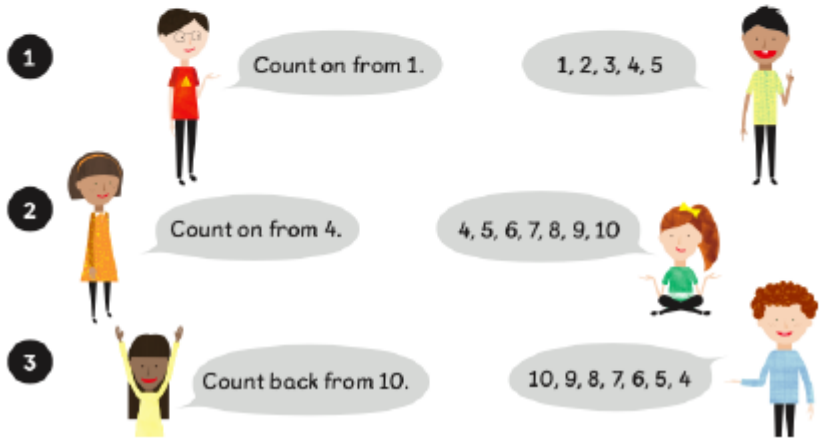
Recap counting backwards and forwards within 10

In Focus

7	3	4	2	6	8	9	10	1	

Arrange the numbers in order.
What is the missing number?

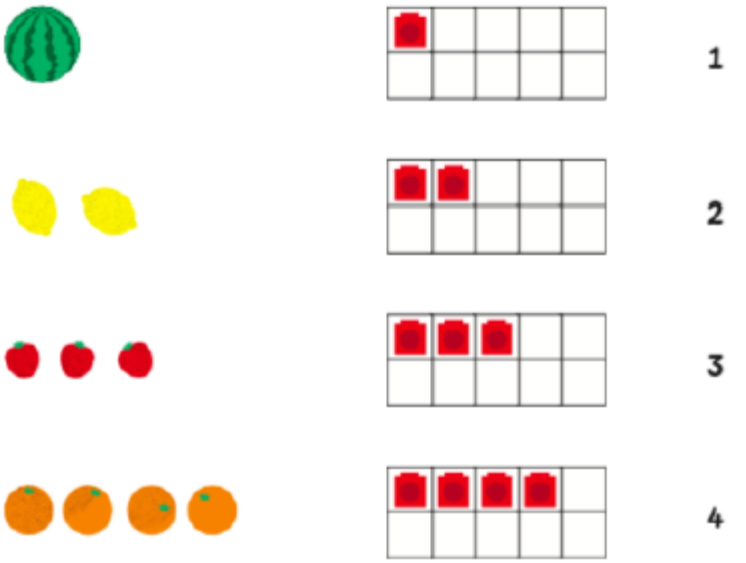
Let's Learn



Year 1

Continuing with practical resources, but moving onto pictorial and abstract much more quickly

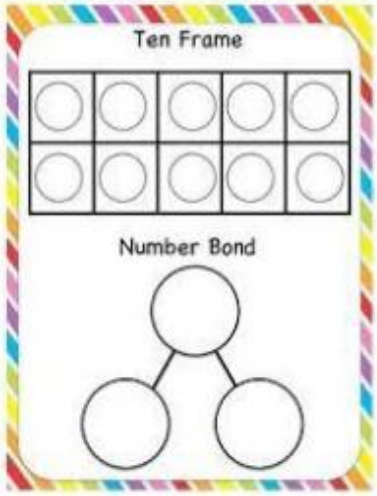
Let's Learn



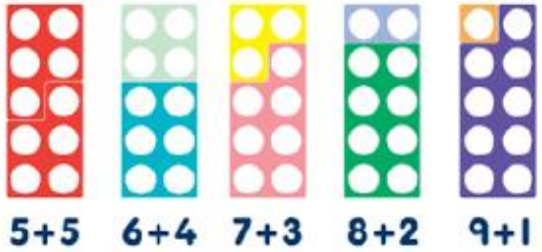
Number bonds

Year 1

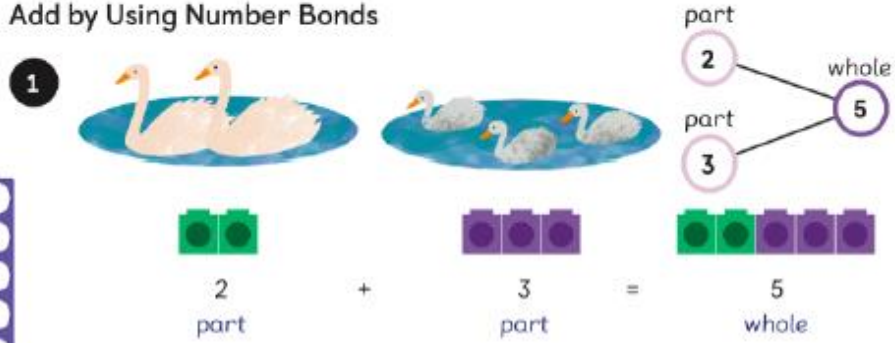
Foundation



Number bonds to 10 using practical resources before introducing + - = signs

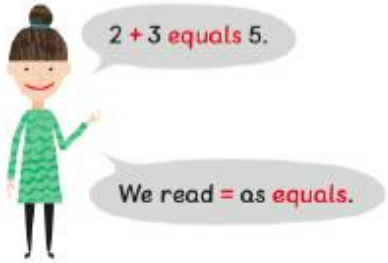


Add by Using Number Bonds



There are 5 swans altogether.

2 + 3 = 5 is an addition equation.
We read it as two plus three equals five.

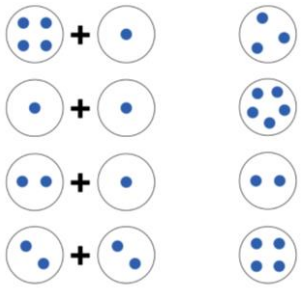


Using part-part-whole to show different ways of making the same number

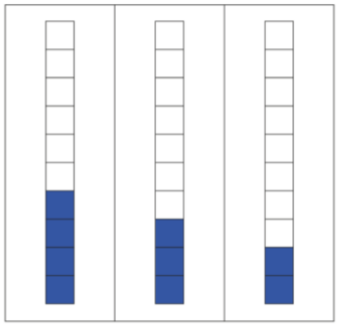
Adding

Foundation

Composition of numbers
Making 5
Breaking 5
Adding to 10
Counting on

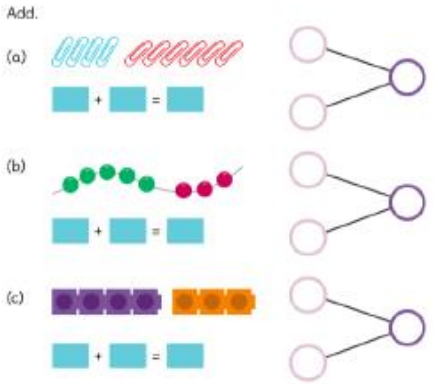


1	+	4	3
2	+	3	4
2	+	2	5
3	+	1	4
2	+	1	5

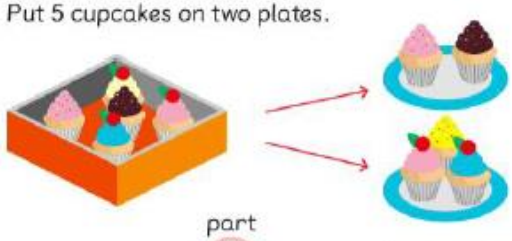


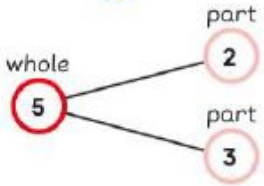
Adding to 10 with concrete or pictorial resources, using the symbols and number formation

Year 1



Put 5 cupcakes on two plates.

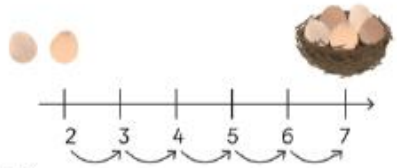




2 and 3 make 5.

This is a **number bond**.

How many eggs are there in total?

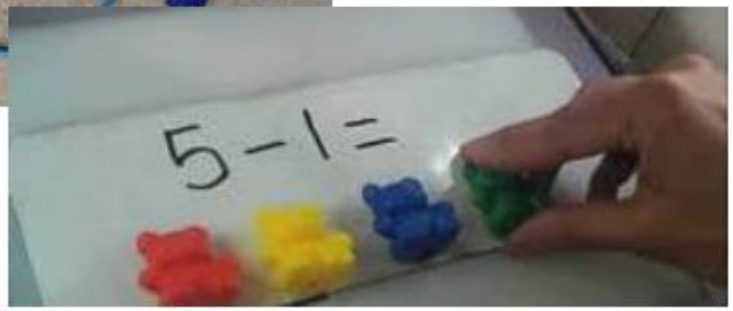


2 + 5 = 7

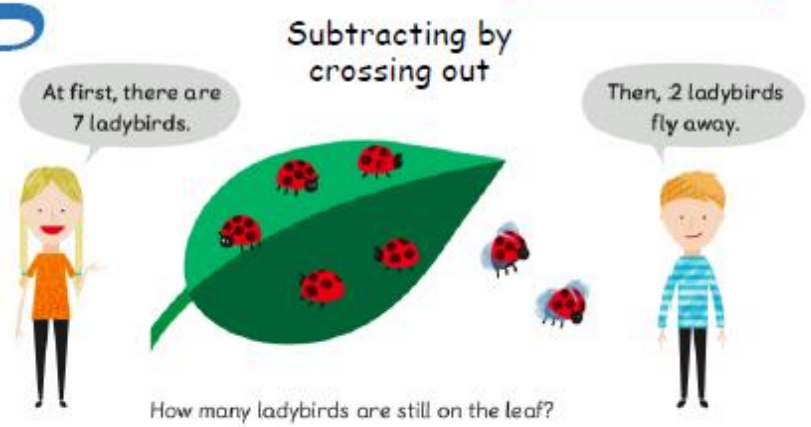
Subtracting

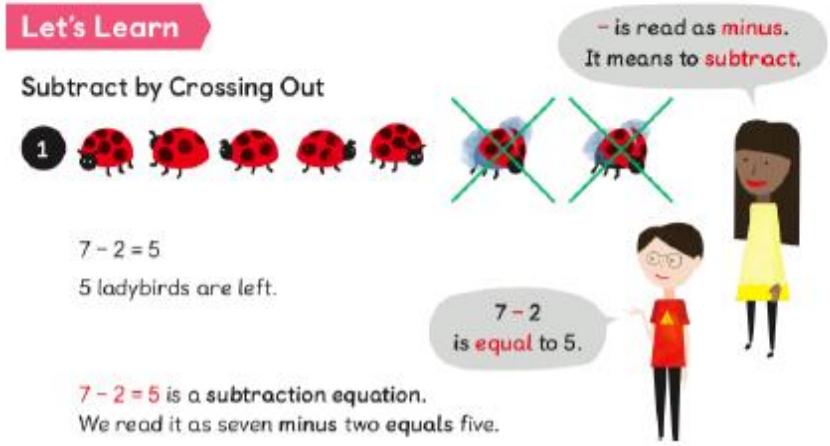
Foundation

Subtracting within 10 by physically removing the object



Year 1

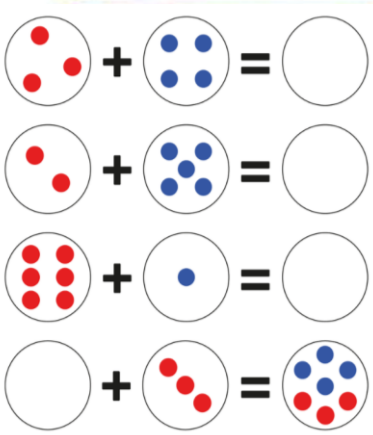


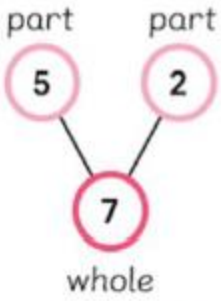


Subtracting

Foundation

Part-part-whole model:





Children will use the part-part-whole diagram to add and subtract numbers.

Looking at part-part-whole method for subtraction

Year 1

Looking at part-part-whole method for subtraction and recognising how it links to addition.

In Focus

How many boys do not wear glasses?

There are 4 boys.
3 boys wear glasses.

Let's Learn

Subtract by Using Number Bonds

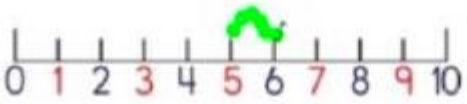
4 – 3 = 1
whole part part

Subtracting

Year 1

Foundation

Number lines:



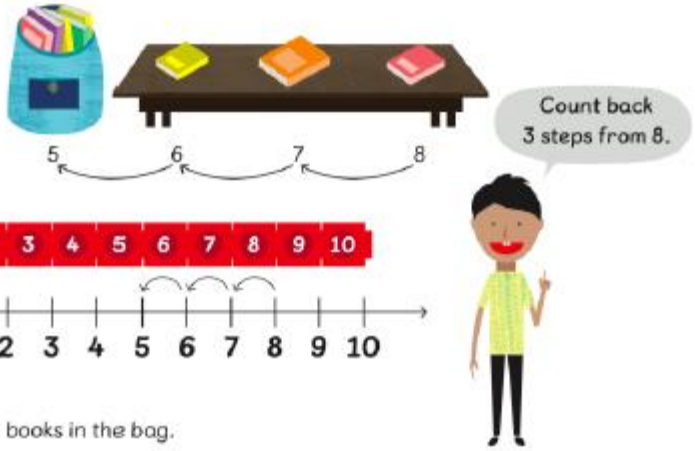
Children will be able to use a number line to count, as well as using it to take away or add one.
This will be for numbers up to 20.

In Focus

How many books are there in the bag?

Subtract by Counting Back

8 – 3 = ?



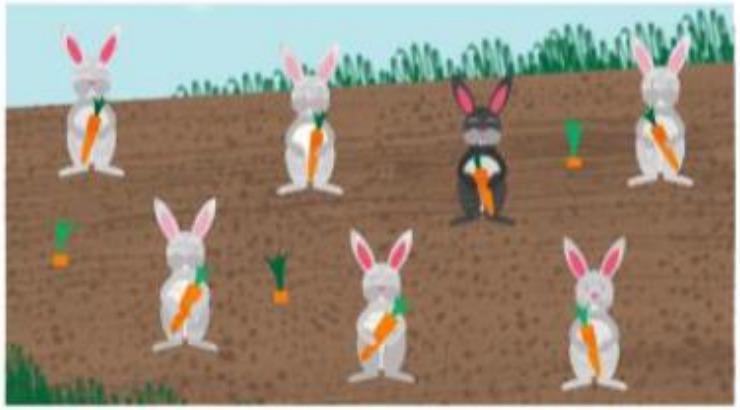
8 – 3 = 5

There are 5 books in the bag.

Subtracting

Year 1

In Focus



Make subtraction stories.

Subtraction

Year 1

In Focus

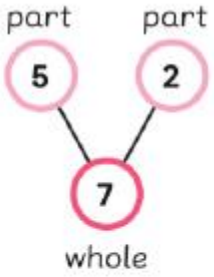
How many of the children are girls?

Solving picture problems

Let's Learn

How many apples are there altogether?

$5 + 2 = 7$ or $2 + 5 = 7$



How many apples are red?

$7 - 2 = 5$

How many apples are green?

$7 - 5 = 2$

Family facts

Subtraction

Year 1

Subtract by counting back.

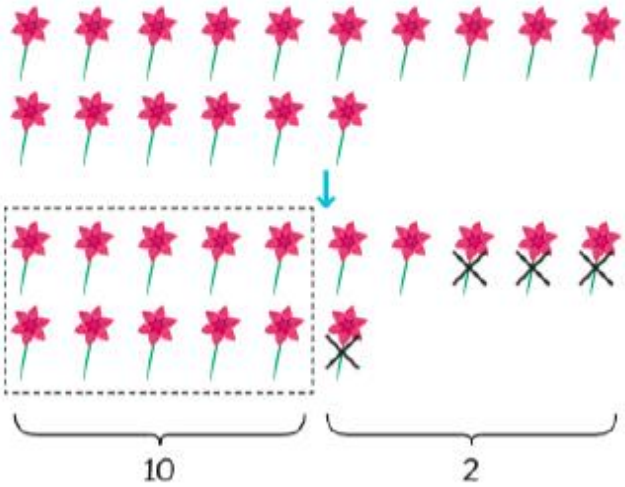
11	12	13	14	15	16	17	18	19	20

(a) 15 − 2 = ▭ (b) 17 − 3 = ▭

Children learn to subtract a ones number from the ones by partitioning two-digit numbers into tens and ones

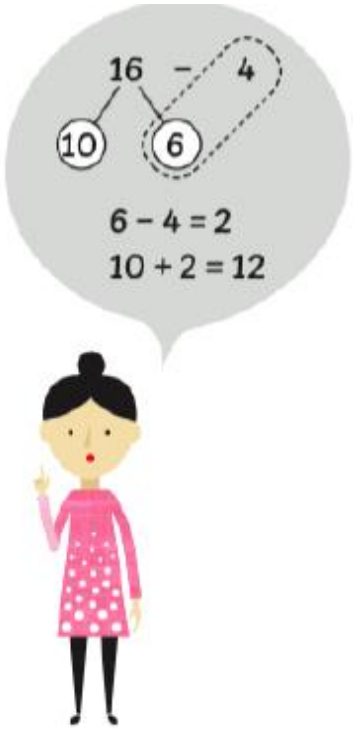
Subtract Ones

1 16 − 4 = ?



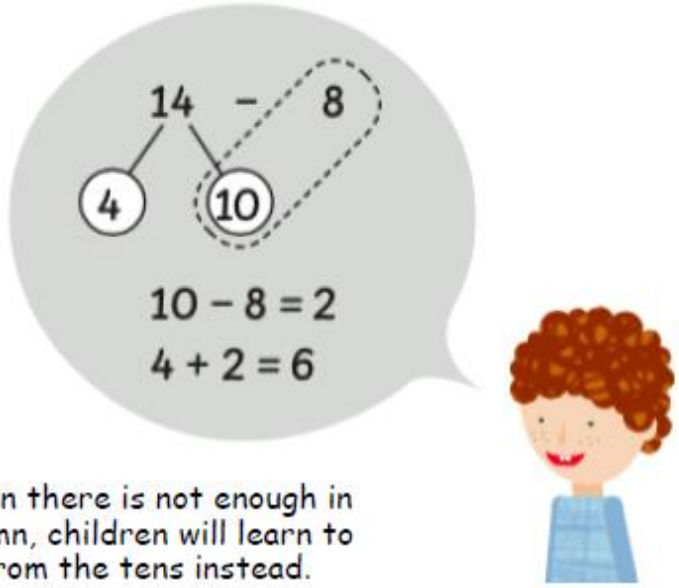
16 − 4 = 12

There are 12 flowers left.

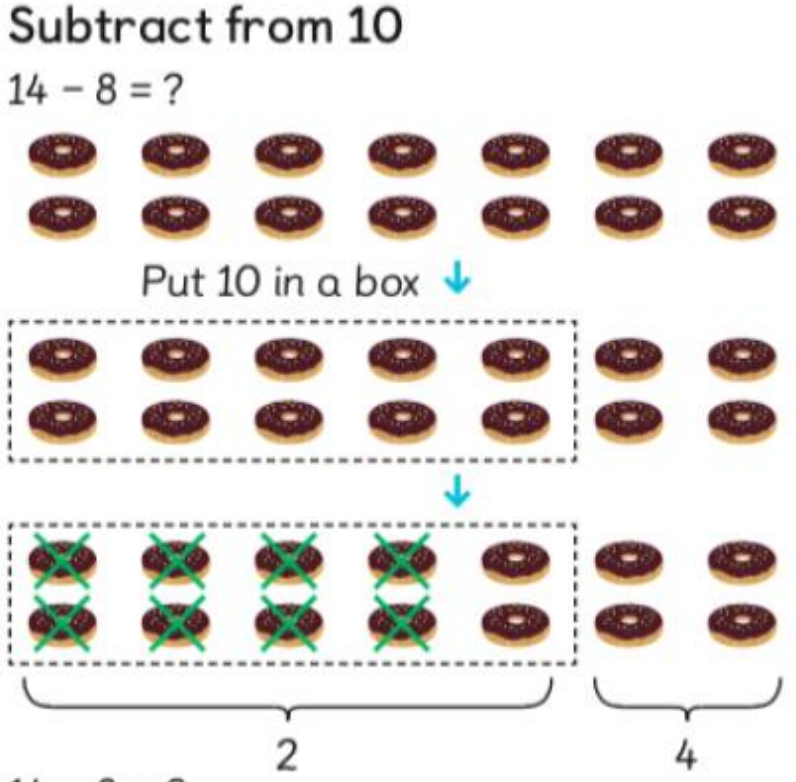


Subtraction

Year 1

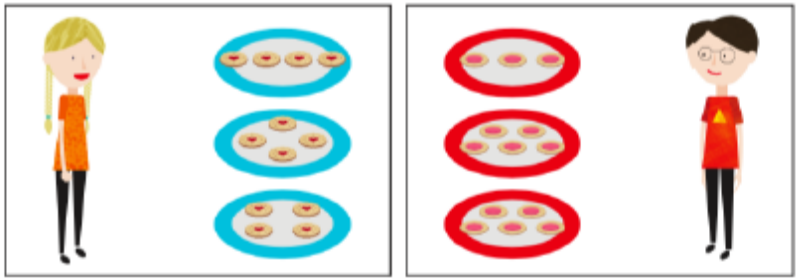


However, when there is not enough in the tens column, children will learn to subtract from the tens instead.



Multiplication

Year 1



Equal groups

Equal rows (arrays)

Adding equal groups

There are 4 trays.

4 trays of 5 = 20
4 groups of 5 = 20
4 fives = 20

There are 20 altogether.

rows

5 in one row

fives =

There are altogether.

Year 1 also look at sharing for division

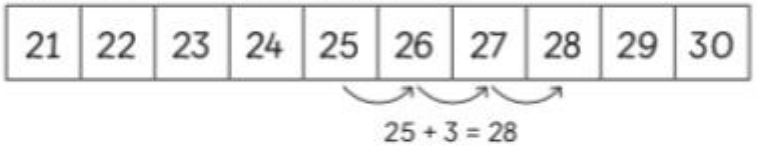

Year 2

Adding

Year 2

Adding numbers to 100

Method 1 Count on from 25.

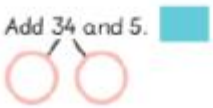


Method 2 Add ones.

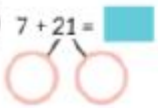
25 + 3 = 28

Recapping methods taught in Year

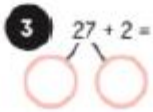
1. Add 34 and 5. ☐



2. 7 + 21 = ☐



3. 27 + 2 = ☐

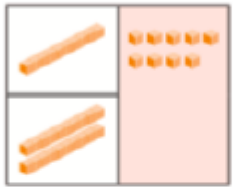


Adding – no renaming

Year 2

Method 3 Use ▭ to add.

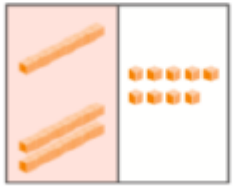
Step 1 Add the ones.



	tens	ones
	1	9
+	2	0
		9

Step 2 Add the tens.

1 ten + 2 tens = 3 tens



	tens	ones
	1	9
+	2	0
	3	9

19 + 20 = 39

Adding – with renaming

Year 2

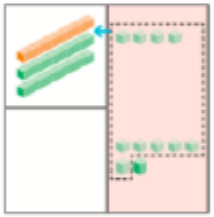
Renaming means carrying

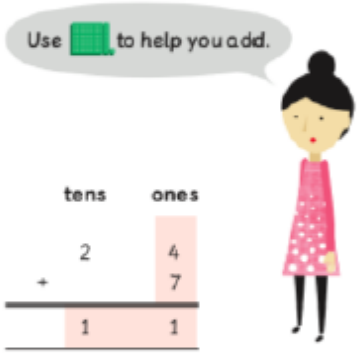
Step 1 Add the ones.

4 ones + 7 ones = 11 ones

Regroup the ones.

11 ones = 1 ten and 1 one

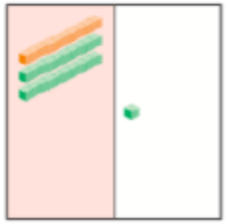




	tens	ones
	2	4
+		7
	1	1

Step 2 Add the tens.

1 ten + 2 tens = 3 tens



24 + 7 = 31

	tens	ones
	2	4
+		7
	1	1
+	2	0
	3	1

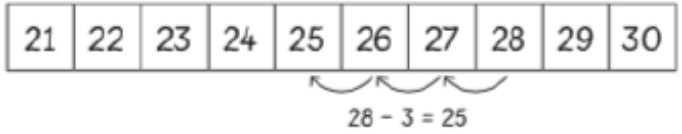
Subtracting

Year 2

Subtracting numbers within 100

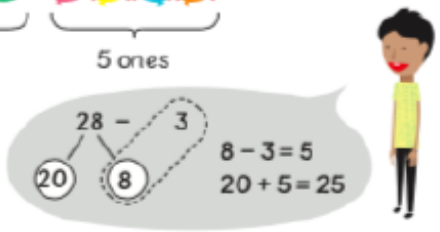
Subtract 3 from 28.

Method 1 Count back from 28.



Method 2 Subtract ones.

28 – 3 = 25



Recapping methods taught in Year 1

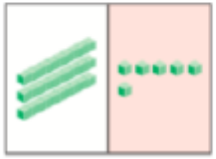
Subtracting – no renaming

Year 2

Subtracting numbers within 100

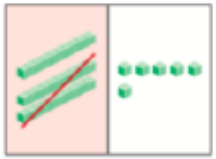
Method 3 Use  to subtract.

Step 1 Subtract the ones.



	tens	ones
	3	6
–	2	0
		6

Step 2 Subtract the tens.
3 tens – 2 tens = 1 ten



	tens	ones
	3	6
–	2	0
	1	6

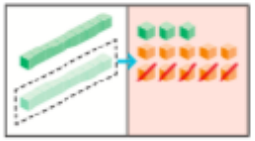
36 – 20 = 16

Beginning practically with dienes before moving onto column subtraction
Number bond method is taught alongside both methods

Subtracting – with regrouping

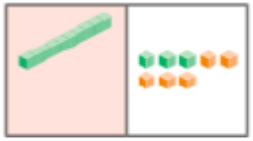
Year 2

Step 1 Regroup 1 ten into 10 ones.
Subtract the ones.
13 ones – 5 ones = 8 ones



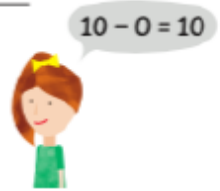
	tens	ones
	~~2~~ 1	~~3~~ 13
–		5
		8

Step 2 Subtract the tens.



23 – 5 = 18

	tens	ones
	~~2~~ 1	~~3~~ 13
–		5
	1	8



Multiplication

Year 2

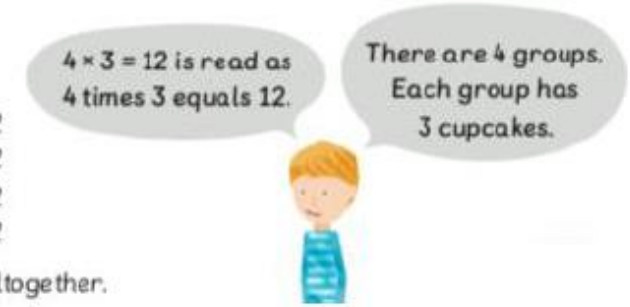
2, 5 and 10 times tables

In Focus

Equal groups

How many cupcakes are there altogether?

Let's Learn

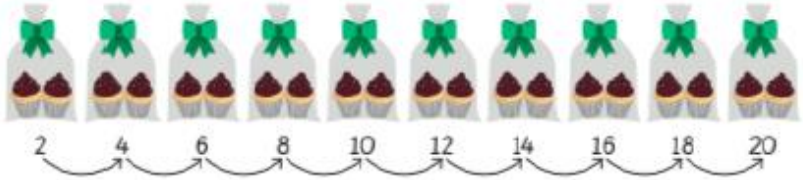


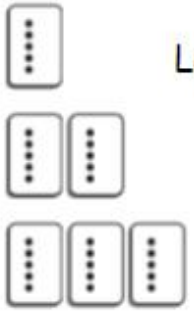
3 + 3 + 3 + 3 = 12
4 threes = 12
4 groups of 3 = 12
4 × 3 = 12

There are 12 cupcakes altogether.

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

Number lines and hundred squares





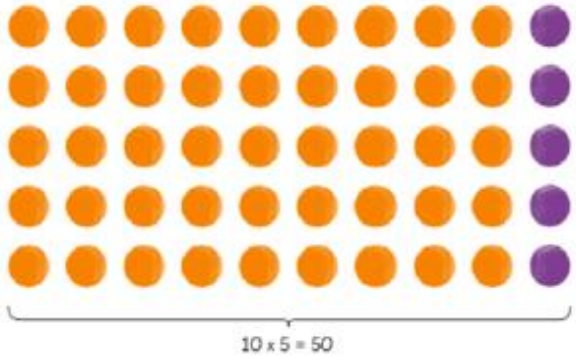
Language and repeated addition

1 x 5 = 5

2 x 5 = 10

3 x 5 = 15

Arrays



Division

2, 5 and 10 times tables **Year 2**

Grouping

Put 2 chocolates in each bag.

Emma gets 10 bags of chocolate.

$20 \div 2 = 10$ is a **division equation**.
$20 \div 2 = 10$ is read as twenty **divided** by two **equals** ten.

Sharing

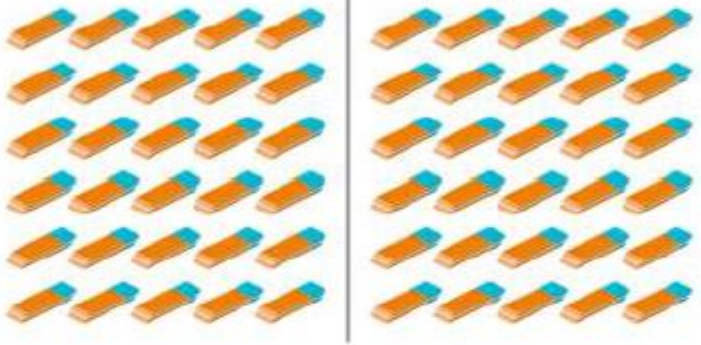
There are 18 sausages.

Put 18 sausages equally on 2 plates.

There are 9 sausages on each plate.

$18 \div 2 = 9$

'Groups of' vs 'equal groups'



Put into groups of 5.

There are ☐ groups.

Put into 5 equal groups.

There are ☐  in each group.

☐ ÷ 5 = ☐

Commutative and inverse calculations

$5 \times 2 = 10$ —— $10 \div 2 = 5$

$2 \times 5 = 10$ —— $10 \div 5 = 2$

Lower Key Stage 2

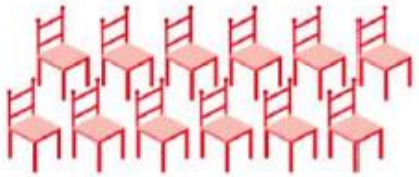
Adding

Recapping methods taught in Year 1 and 2

Year 3

Adding numbers to 1000

6 blue chairs



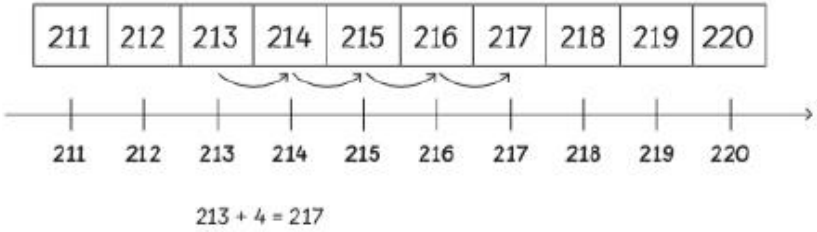
12 red chairs

How many chairs are there altogether?

We can write a family of addition and subtraction facts.

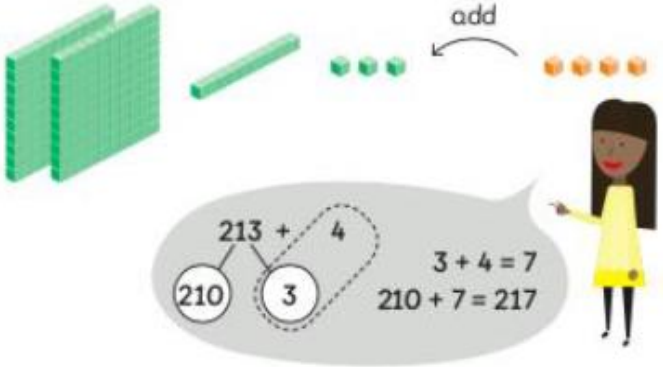
6 + 12 = 18 18 − 12 = 6

12 + 6 = 18 18 − 6 = 12



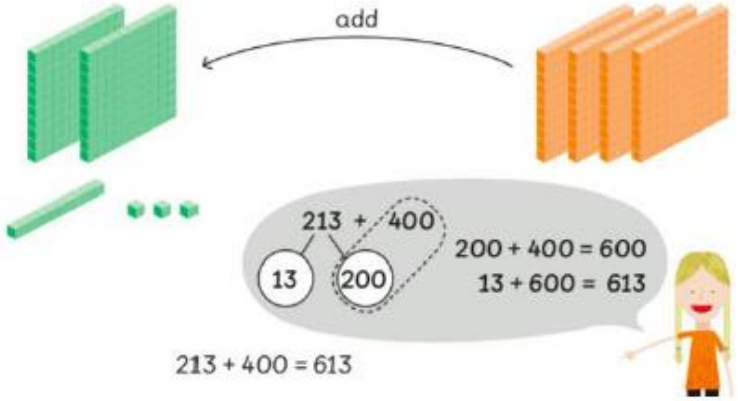
213 + 4 = 217

Adding ones, tens and hundreds



213 + 4 = 217

There were 217 books in the bookcase.



213 + 400 = 613

Adding

Year 4

Children are expected to be secure in methods taught in Year 3

Let's estimate.

$$\begin{array}{r} 5\,7\,0\,0 \\ +\ 1\,2\,0\,0 \\ \hline 6\,9\,0\,0 \\ \hline \end{array}$$

Children are expected to estimate answers to check accuracy

Find the sum of 2034 and 9.

2034 + 10 = 2044

2034 + 9 = 2043

1 less

Why is the sum 1 less?

Learning mental strategies to add

Find the sum of 98 and 4142 by adding mentally.

98 + 4142 = ☐

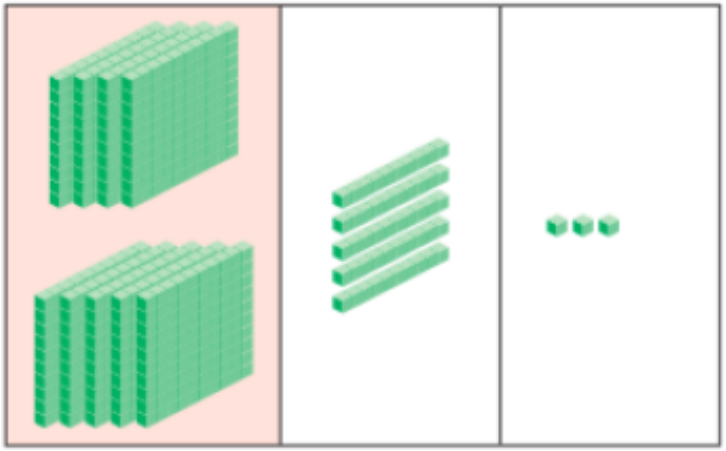
make 100

98 + 4142 = 100 + 4140

= 4240

Adding – no renaming

Year 3



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

432 + 521 = 953

Beginning practically with dienes before moving onto column addition
Number bond method is taught alongside both methods

Adding – no renaming

Year 4

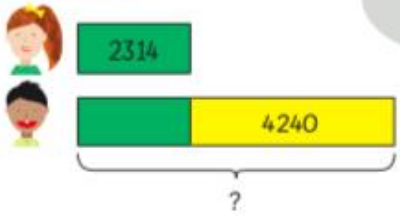
Let's Learn

1

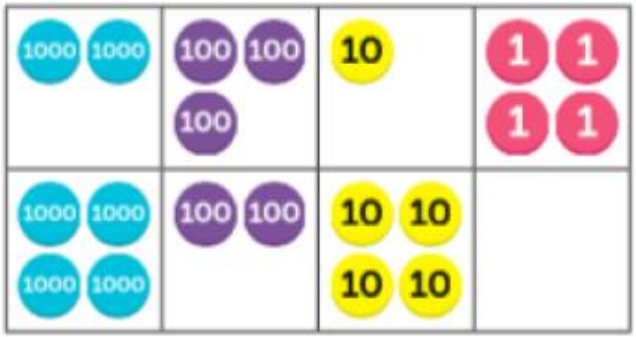

saved £2314.


saved £4240 more than  saved.

How much did  save?



Find the sum of 2314 and 4240.



	2	3	1	4
+	4	2	4	0
	6	5	5	4

Step 1 Add the ones.
4 ones + 0 ones = 4 ones

Step 2 Add the tens.
1 tens + 4 tens = 5 tens

Step 3 Add the hundreds.
3 hundreds + 2 hundreds = 5 hundreds

Step 4 Add the thousands.
2 thousands + 4 thousands = 6 thousands

2314 + 4240 = 6554

Adding – with renaming

Renaming means carrying

Year 3

Expected to solve a larger number of abstract calculatons

1 (a) 153 + 2 = ☐

(b) 153 + 20 = ☐

(c) 153 + 200 = ☐

2 (a) 214 + 3 = ☐

(b) 214 + 30 = ☐

(c) 214 + 300 = ☐

3 (a) 325 + 14 = ☐

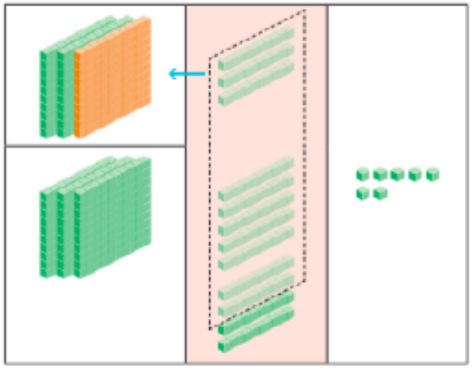
	h	t	o
	3	2	5
+		1	4
	☐	☐	☐

(b) 236 + 543 = ☐

	h	t	o
	2	3	6
+	5	4	3
	☐	☐	☐

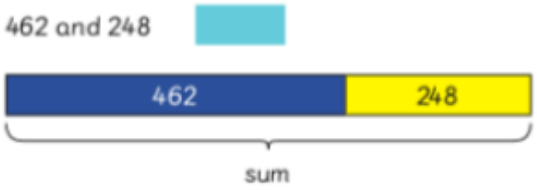
Add the tens.
3 tens + 9 tens = 12 tens
Regroup the tens.
12 tens = 1 hundred + 2 tens

Secure understanding of place value to 1000

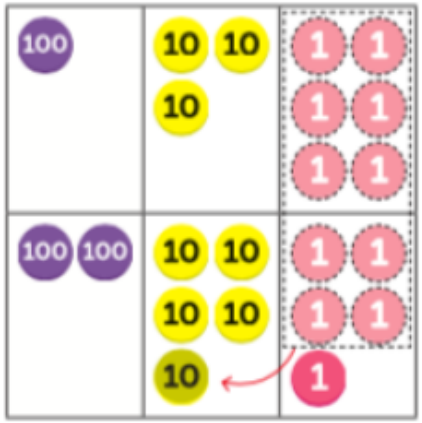


	h	t	o
	1 2	3	6
+	3	9	1
		2	7

Year 4



	4	6	2
+	2	4	8



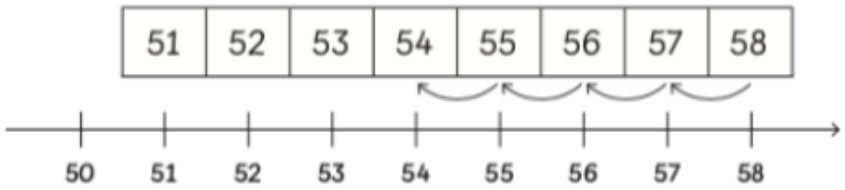
Recapping methods taught in Year 3, as well as applying it to measure problems straight away (e.g., money)

Subtracting

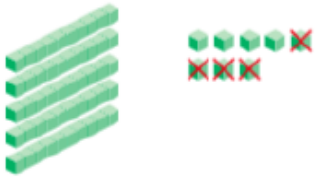
Year 3

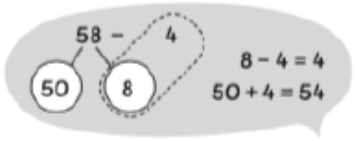
Subtracting numbers within 1000

Method 1 Count back from 58.



Method 2 Subtract ones.





58 – 4 = 54

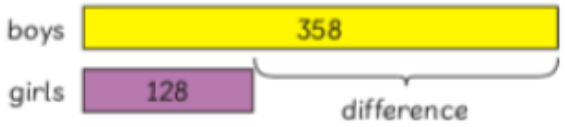
Sam had 54 cookies left.

Recapping methods taught in Year 1 and 2

Year 4

Subtracting numbers within 10,000

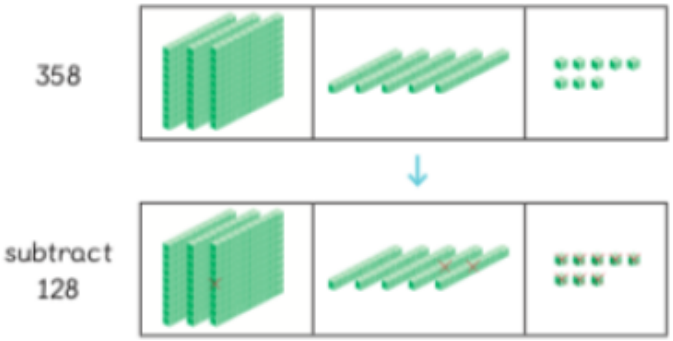
Find the difference between 358 and 128.



358 – 128 = ☐

When we subtract numbers, we get the difference.

Use base-ten blocks

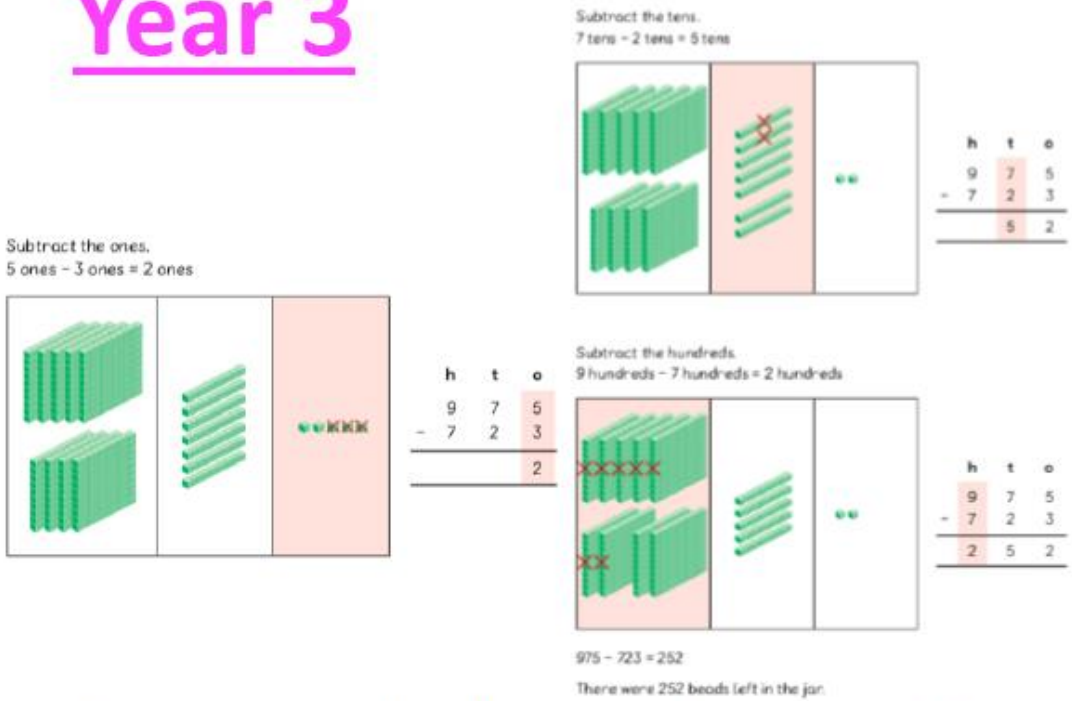


	3	5	8
–	1	2	8
	2	3	0

The difference between 358 and 128 is 230.

Subtracting – no regrouping

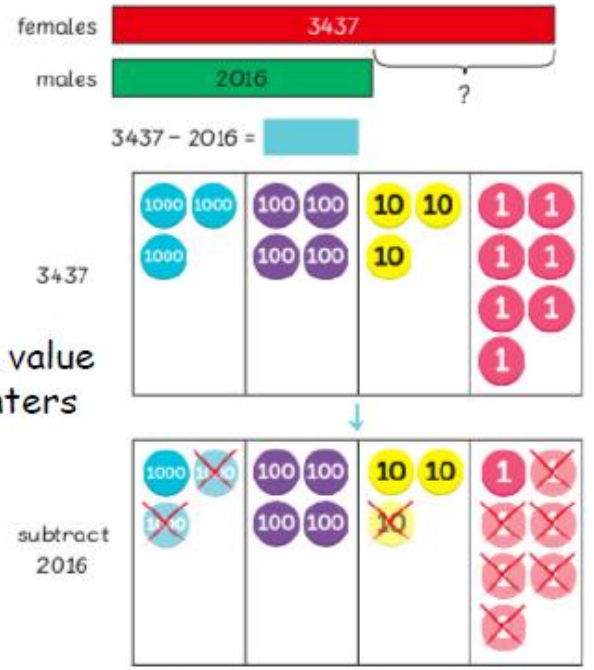
Year 3



Beginning practically with dienes before moving onto column subtraction

Number bond method is taught alongside both methods

Year 4

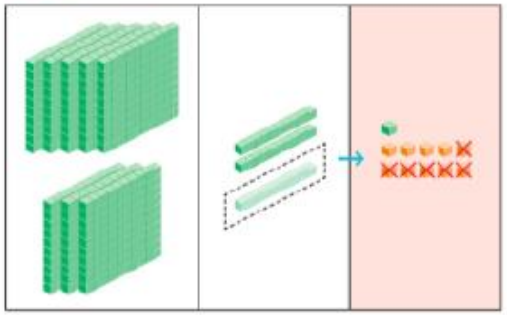


Year 5 are expected to be secure with no regrouping

Subtracting – with regrouping

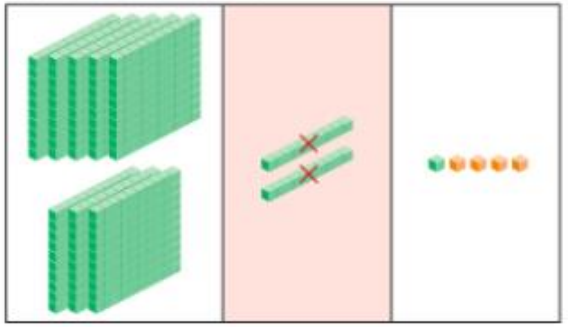
Year 3

Step 1 Regroup 1 ten into 10 ones.
Subtract the ones.
11 ones − 6 ones = 5 ones



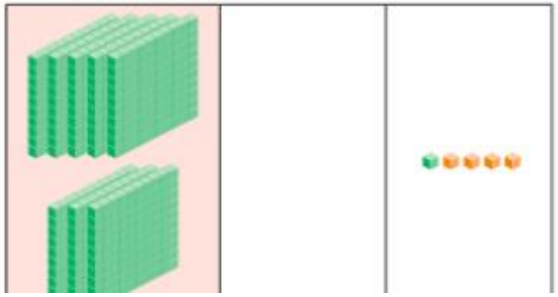
	h	t	o
	8	~~2~~ 3	~~11~~ 1
−		2	6
			5

Step 2 Subtract the tens.
2 tens − 2 tens = 0 tens



	h	t	o
	8	~~2~~ 3	~~11~~ 1
−		2	6
		0	5

Step 3 Subtract the hundreds.



	h	t	o
	8	~~2~~ 3	~~11~~ 1
−		2	6
	8	0	5

Beginning practically with dienes before moving onto column subtraction

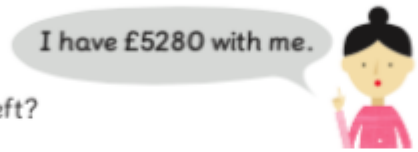
Number bond method is taught alongside both methods

Subtracting – with regrouping

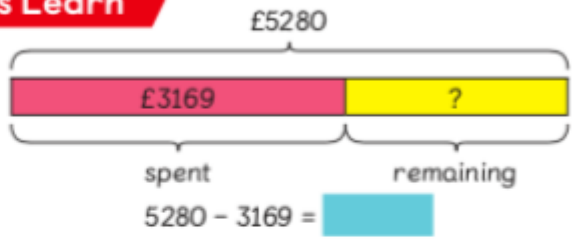
Year 4

In Focus

After Ruby spent £3169, how much was left?

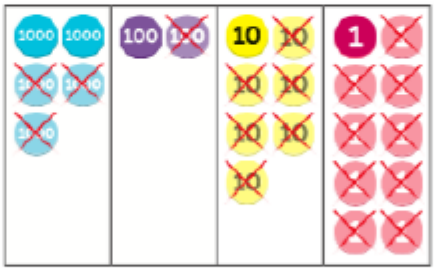


Let's Learn



	5	2	7 $\not{8}$	10 $\not{0}$
–	3	1	6	9

subtract 3169



	5	2	7 $\not{8}$	10 $\not{0}$
–	3	1	6	9
	2	1	1	1

5280

5 thousands	2 hundreds	7 tens	10 ones
– 3 thousands	– 1 hundred	– 6 tens	– 9 ones
2 thousands	1 hundred	1 ten	1 one

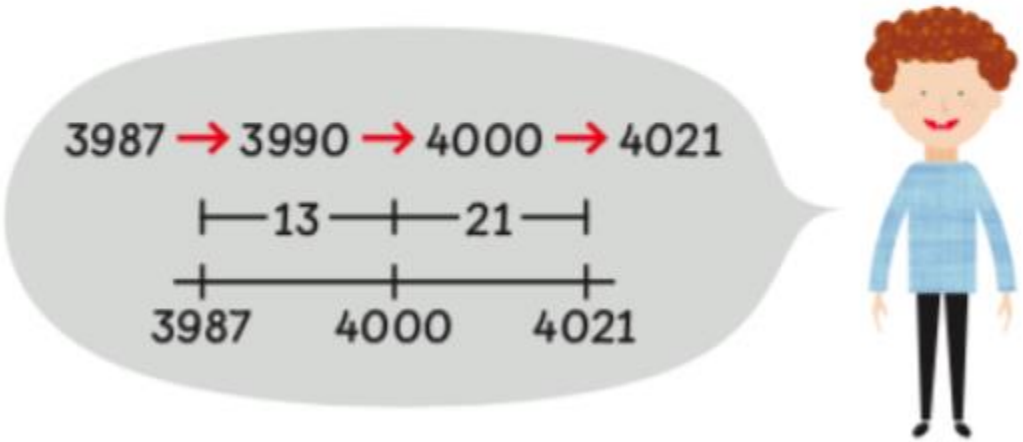
Children are encouraged to use the inverse calculation to check their answers

	2	1	1	1
+	3	1	6	9
	5	2	8	0

Subtracting Year 4 & Year 5

Learning mental strategies to subtract

4021 – 3987 = ☐



Multiplication

Year 3

3, 4 and 8 times tables

Equal groups

1 group of 3
1 × 3 = 3

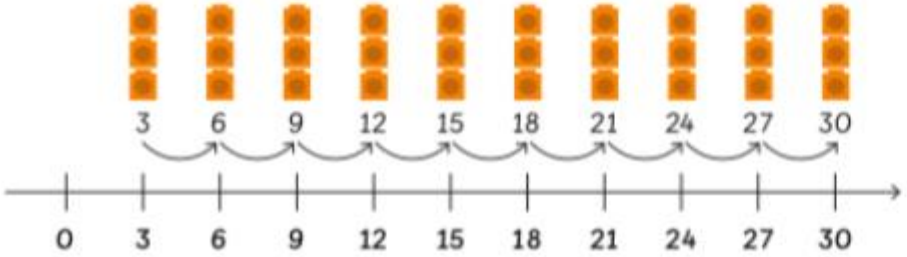
2 groups of 3
2 × 3 = 6

3 groups of 3
3 × 3 = 9

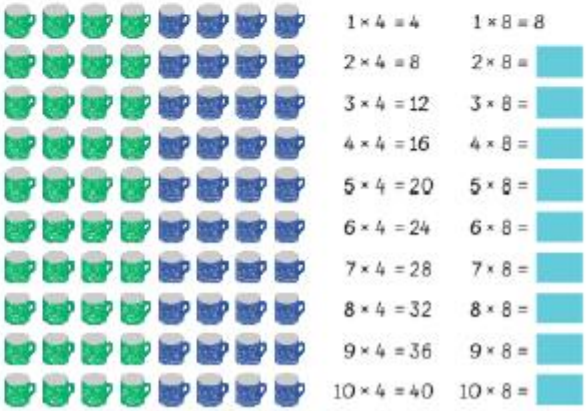
Language and repeated addition

Count in threes.

Number lines and hundred squares



Arrays



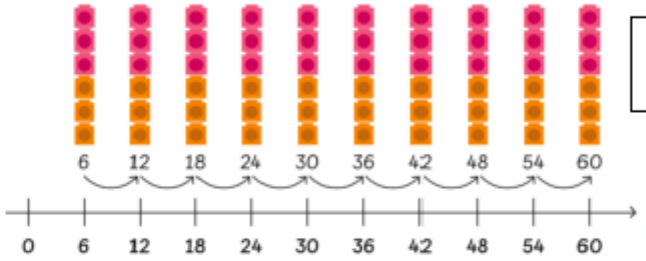
Multiplication

Year 4

6, 7, 9, 11 and 12 times tables

2 groups of 6
2 × 6 = 12

3 groups of 6
3 × 6 = 18



By the end of Year 4, children are expected to know ALL of their times tables

3 × 10 = 30

3 × 1 = 3

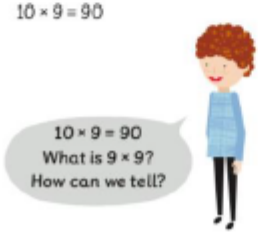
2 × 7 = 14

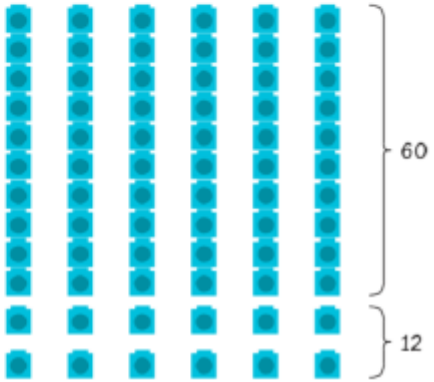
3 × 7 = 21

3 × 11 = 30 + 3
= 33

6 × 12 = 72

10 rows of 9 = 90
10 × 9 = 90





Division

3, 4 and 8 times tables

Year 3

Grouping

Put 12 into groups of 4.

$12 \div 4 = 3$

3 plates are needed.

'Groups of' vs 'equal groups'

We can make a family of multiplication and division equations.

Family of commutative and inverse calculations

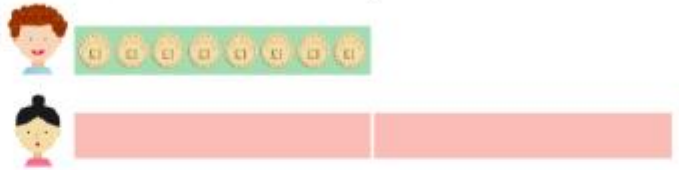
In Focus

How many coins does have?

Let's Learn

Word problems with bar models

1



Method 1 $8 + 8 = 16$

Method 2 $2 \times 8 = 16$

has 16 coins.

Division

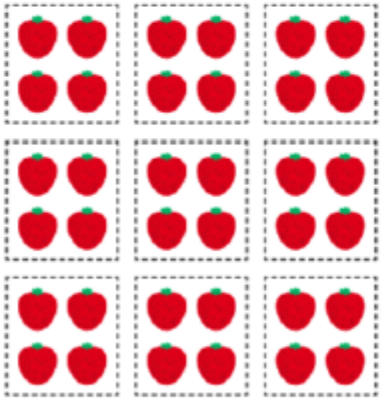
Year 4

6, 7, 9, 11 and 12 times tables

36 ÷ 9 = ?

'equal groups' **vs** 'groups of'

Placing into 9 equal groups



36 ÷ 9 = 4

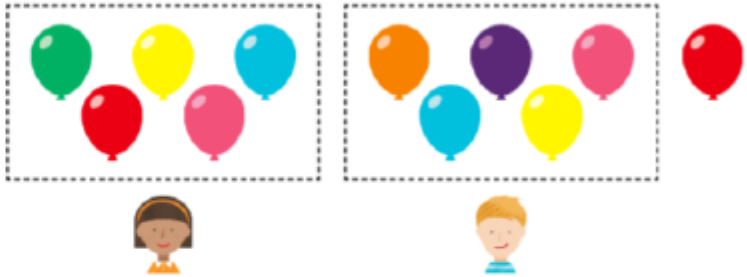
Each group has 4 strawberries.

Placing in groups of 9

36 ÷ 9 = 4

There are 4 groups.

There were 11 balloons.



11 ÷ 2 = 5 remainder 1

The quotient is 5 and the remainder is 1.
Each friend got 5 balloons.
There was 1 balloon left over.

Children are introduced to the concept of remainders

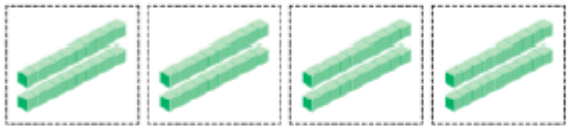
Further multiplication

Year 3

1. Using place value

	o
	2
×	4
	8

Multiply 2 ones by 4
2 × 4 = 8

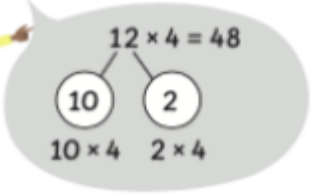


	t	o
	2	0
×		4
	8	0

Multiply 2 tens by 4
20 × 4 = 80

There are 80 oranges in the 4 boxes altogether.

2. Number bond method



	t	o
	2	3
×		4
	1	2
+	8	0
	9	2

3. Bridged column multiplication

4. Short multiplication

Step 1

	t	o
	2	3
×		8
		4

3 ones × 8 = 24 ones
24 ones = 2 tens + 4 ones

Step 2

	h	t	o
		2	3
×			8
	1	8	4

2 tens × 8 = 16 tens
16 tens + 2 tens = 18 tens

23 × 8 = 184

The product of 23 and 8 is 184.

Further multiplication

Year 4

Recap: bridged and short multiplication

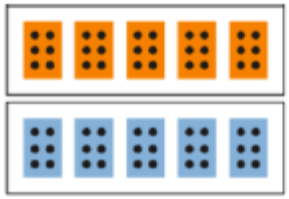
$$\begin{array}{r} 2\ 3 \\ \times\ \ \ 6 \\ \hline 1\ 8 \\ +\ 1\ 2\ 0 \\ \hline 1\ 3\ 8 \end{array} \qquad \begin{array}{r} {\scriptstyle 1}\ \ \\ 2\ 3 \\ \times\ \ \ 6 \\ \hline 1\ 3\ 8 \end{array}$$

New: multiplying 3 numbers

$2 \times 5 \times 6 = 10 \times 6 = 60$

$2 \times 5 \times 6$

$2 \times 5 = 10$



$2 \times 5 \times 6 = 10 \times 6 = 60$

What is the product of 9 and 30?

$9 \times 30 =$ ☐

Method 1	Method 2
30	$9 \times 3 = 27$
30	9×3 tens $= 27$ tens
30	$9 \times 30 = 270$
30	
30	**Method 3**
30	$9 \times 30 = 9 \times 3 \times 10$
30	$= 9 \times 3 \times 10$
30	$= 27 \times 10$
+ 30	$= 27$ tens
	$= 270$

Which method is best?

Recap multiplying by a multiple of 10

Further multiplication

Year 4

$$\begin{array}{rrrr} & 4 & 7 & 3 \\ \times & & & 2 \\ \hline & & & 6 \\ & 1 & 4 & 0 \\ + & 8 & 0 & 0 \\ \hline & 9 & 4 & 6 \end{array}$$

Recap:
Bridged and short multiplication

$$\begin{array}{rrrr} & \overset{1}{4} & 7 & 3 \\ \times & & & 2 \\ \hline & 9 & 4 & 6 \end{array}$$

New: multiplying by multiples of 100

$7 \times 300 =$ ☐

Method 1

300
300
300
300
300
300
+ 300
2100

Method 2

$7 \times 3 = 21$
7 × 3 hundreds = 21 hundreds
$7 \times 300 = 2100$

Method 3

$7 \times 300 = 7 \times 3 \times 100$
$= 7 \times 3 \times 100$
$= 21 \times 100$
= 21 hundreds
= 2100

21 hundreds = 2100

Which method is best?

Further division

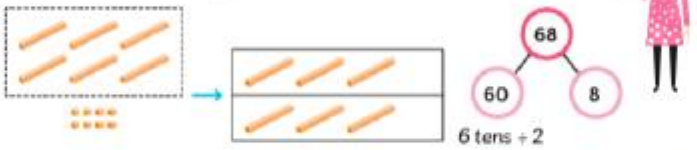
Year 3

1. Number bond method

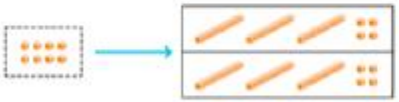
To find the number of sweets each person gets, divide 68 by 2.

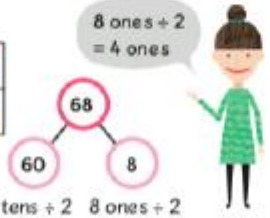
$68 \div 2 =$ ☐

Step 1 Divide 6 tens by 2.



Step 2 Divide 8 ones by 2.

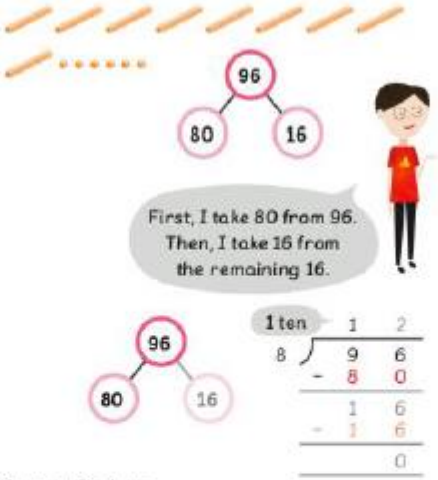




Step 3 Add the results.

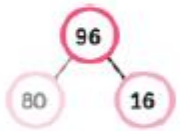
$68 \div 2 = 30 + 4 = 34$

Each person gets 34 sweets.



$$\begin{array}{r|ll} & 1 & 2 \\ 8 & 9 & 6 \\ - & 8 & 0 \\ \hline & 1 & 6 \\ - & 1 & 6 \\ \hline & & 0 \end{array}$$

2. Long division method



16 ones ÷ 8 = 2 ones

1 ten + 2 ones = 12

96 ÷ 8 = 12

$$\begin{array}{r|ll} & 1 & 2 \\ 8 & 9 & 6 \\ - & 8 & 0 \\ \hline & 1 & 6 \\ - & 1 & 6 \\ \hline & & 0 \end{array}$$

2 ones

$$\begin{array}{r|ll} & 1 & 2 \\ 8 & 9 & 6 \\ - & 8 & 0 \\ \hline & 1 & 6 \\ - & 1 & 6 \\ \hline & & 0 \end{array}$$

3. Move onto problem solving involving these methods and bar models

Further division

Year 4

$4 \div 4 =$ ▢

1 1 1 1

$4 \div 4 = 1$

$40 \div 4 =$ ▢

10 10 10 10

$40 \div 4 = 10$

$400 \div 4 =$ ▢

100 100 100 100

$400 \div 4 = 100$

Method 1

Method 2

4 hundreds ÷ 4

8 ones ÷ 4

4)	4	0	8	
	− 4			
			8	
	−		8	
			0	

		1		
4)	4	0	8	
	− 4			
			8	
	−		8	
			0	

		1	0	2
4)	4	0	8	
	− 4			
			8	
	−		8	
			0	

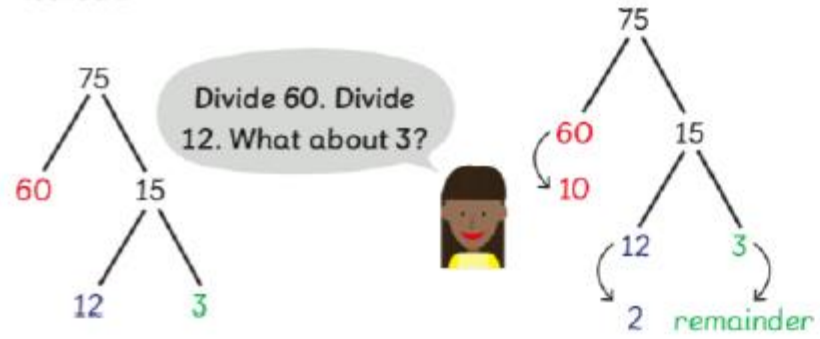
$408 \div 4 = 102$

Further division

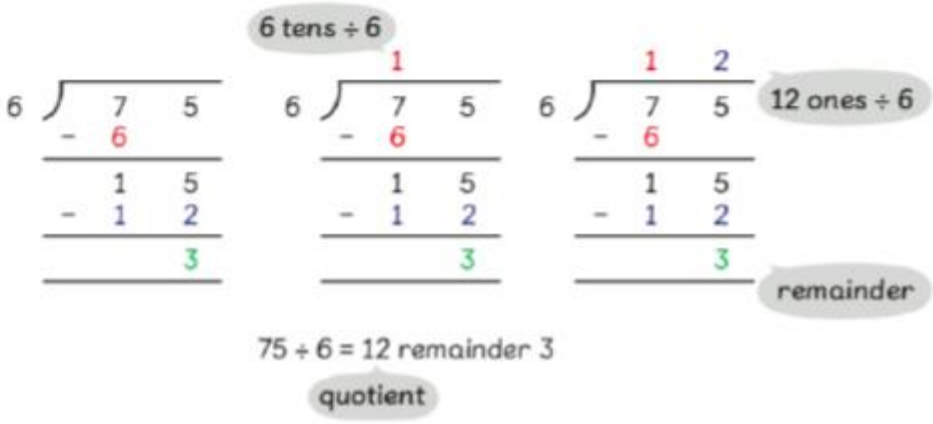
Year 4

Once confident with the partitioning and long division methods, remainders are introduced using these methods

Method 1



Method 2



75 ÷ 6 = 12 remainder 3

quotient

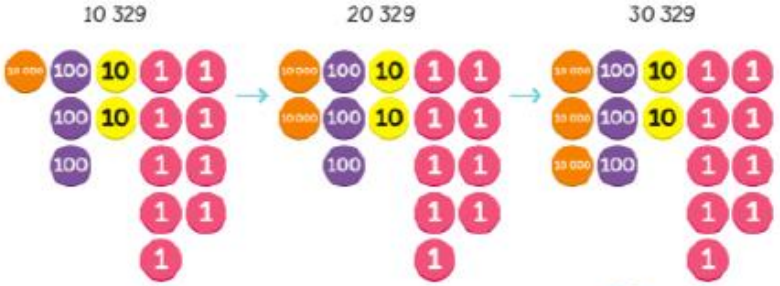
It is not possible to put 75 children into 6 equal groups.

Move onto problem solving involving these methods and bar models

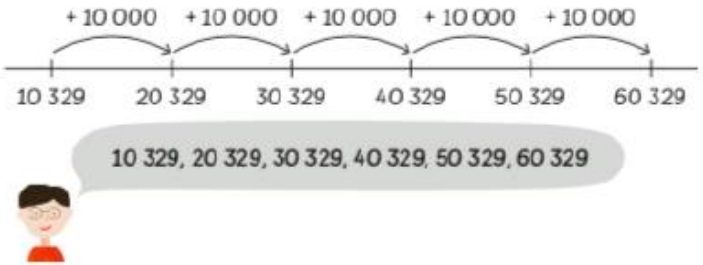

Upper
Key
Stage 2

Adding

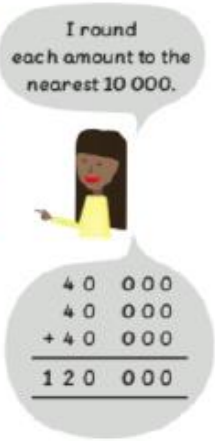
Year 5



Adding by counting on



	A	B	C
1	Date	Trip	Fare
2	13 September	Airport to Hotel	150 000
3	14 September	Hotel to Office	40 000
4		Office to Hotel	45 000
5	15 September	Hotel to Office	43 000
6		Office to Hotel	42 000
7		Hotel to Restaurant	25 000
8		Restaurant to Hotel	21 000
9	16 September	Hotel to Office	46 000
10		Office to Airport	150 000
11			
12		Total for Taxi Fare	562 000



Rounding to add by estimate

$$\begin{array}{r} 37\,000 \\ +\,12\,000 \\ \hline \\ \hline \end{array}$$

Adding key facts to simplify

$$\begin{array}{r} 120\,000 \\ +\,120\,000 \\ \hline \\ \hline \end{array}$$

Adding – with renaming

Year 5

Place value counters to visually support column addition

16 000 + 17 000 = ☐

$$\begin{array}{r} 16\,000 \\ +\ 17\,000 \\ \hline \\ \hline \end{array}$$

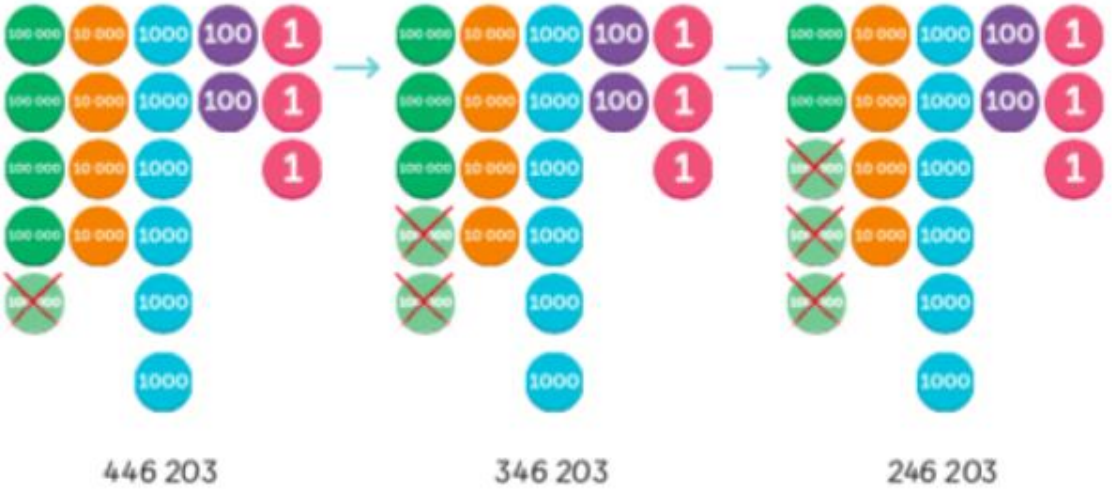
$$\begin{array}{r} {\scriptstyle 1} \\ 16\,000 \\ +\ 17\,000 \\ \hline 3\,000 \\ \hline \end{array}$$

$$\begin{array}{r} {\scriptstyle 1} \\ 16\,000 \\ +\ 17\,000 \\ \hline 33\,000 \\ \hline \end{array}$$

Subtracting

Year 5

Subtracting by counting back

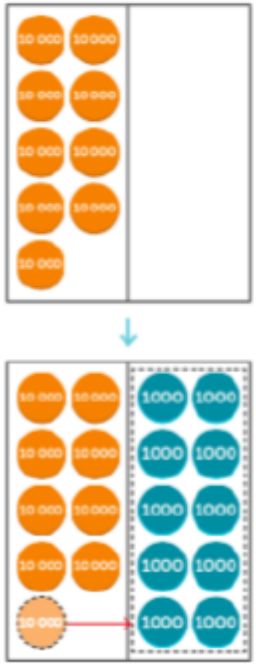


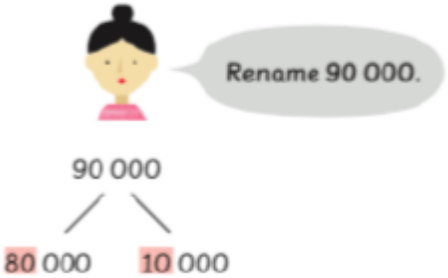
546 203, 446 203, 346 203, 246 203

Subtracting – with regrouping

Year 5

Place value counters to visually support column subtraction





$$\begin{array}{r} 90\ 000 \\ -\ 54\ 000 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} {\scriptstyle 8\ 10} \\ \cancel{90}\ 000 \\ -\ 54\ 000 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} {\scriptstyle 8\ 10} \\ \cancel{90}\ 000 \\ -\ 54\ 000 \\ \hline 36\ 000 \\ \hline \end{array}$$

80 123 – 79 654 = ☐

$$\begin{array}{r} 80\ 123 \\ -\ 79\ 654 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} {\scriptstyle 7\ 9\ \ 11} \\ \cancel{80}\ \cancel{1}23 \\ -\ 79\ 654 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} {\scriptstyle 7\ 9\ \ 10\ 12} \\ \cancel{80}\ \cancel{1}\cancel{2}3 \\ -\ 79\ 654 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} {\scriptstyle 7\ 9\ \ 10\ 11\ 13} \\ \cancel{80}\ \cancel{1}\cancel{2}\cancel{3} \\ -\ 79\ 654 \\ \hline 469 \\ \hline \end{array}$$

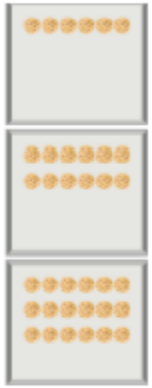
Regrouping in each place value column

Multiplication

Year 5

All times tables to 12 x 12

Finding multiples



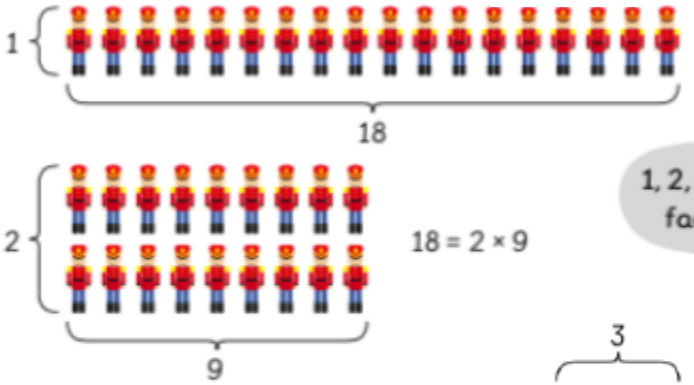
$1 \times 6 = 6$

$2 \times 6 = 12$

$3 \times 6 = 18$

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

Finding factors



1, 2, 9 and 18 are factors of 18.

Prime numbers

number	factors
5	1 and 5
7	1 and 7
4	1, 2 and 4
9	1, 3 and 9
6	1, 2, 3 and 6
8	1, 2, 4 and 8

5 and 7 are prime numbers.

4, 9, 6 and 8 are not prime numbers.

Common factors

Find the common factors of 48 and 64.

$48 = (1) \times 48$ $\quad 64 = (1) \times 64$

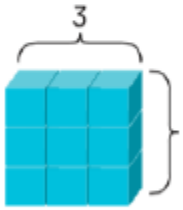
$48 = (2) \times 24$ $\quad 64 = (2) \times 32$

$48 = 3 \times (16)$ $\quad 64 = (4) \times (16)$

$48 = (4) \times 12$ $\quad 64 = (8) \times 8$

$48 = 6 \times (8)$

The common factors of 48 and 64 are 1, 2, 4, 8 and 16.



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

Square and cube numbers

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

27 is a cube.

Multiplication

Year 5

12×10	12×100	12×1000
10 10 10 10 10 10 10 10 10 10 10 10	100 100 100 100 100 100 100 100 100 100 100 100	1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000
$12 \times 10 = 12 \times 1$ ten $= 12$ tens	$12 \times 100 = 12 \times 1$ hundred $= 12$ hundreds	$12 \times 1000 = 12 \times 1$ thousand $= 12$ thousands

Further multiplication

Year 5

$$
\begin{array}{r}
2\,7\,1\,8 \\
\times \quad\quad 4 \\
\hline
3\,2 \\
4\,0 \\
2\,8\,0\,0 \\
+\ 8\,0\,0\,0 \\
\hline
1\,0\,8\,7\,2 \\
\hline
\end{array}
$$

$$
\begin{array}{r}
{}^{3} \\
2\,7\,1\,8 \\
\times \quad\quad 4 \\
\hline
2 \\
\hline
\end{array}
\qquad
\begin{array}{r}
{}^{3} \\
2\,7\,1\,8 \\
\times \quad\quad 4 \\
\hline
7\,2 \\
\hline
\end{array}
\qquad
\begin{array}{r}
{}^{2}\quad{}^{3} \\
2\,7\,1\,8 \\
\times \quad\quad 4 \\
\hline
8\,7\,2 \\
\hline
\end{array}
\qquad
\begin{array}{r}
{}^{2}\quad{}^{3} \\
2\,7\,1\,8 \\
\times \quad\quad 4 \\
\hline
1\,0\,8\,7\,2 \\
\hline
\end{array}
$$

$2718 \times 4 = 10\,872$

<u>Recap:</u>
Bridged and short multiplication but with larger numbers

Place value counters are initially used alongside the column method to support pictorially

Further multiplication

Year 5

$$\begin{array}{r} {\scriptstyle 1\ \ \ } \\ {\scriptstyle 4\ \ \ } \\ 28 \\ \times\ 26 \\ \hline 168 \\ +\ 56 \\ \hline 728 \\ \hline \end{array} \quad \begin{array}{l} \longrightarrow 28 \times 6 \\ \longrightarrow 28 \times 20 \end{array}$$

New:
Multiplying 2 and 3 digit numbers by 2-digit numbers

$$\begin{array}{r} {\scriptstyle 4\ \ \ } \\ 28 \\ \times\ 26 \\ \hline 8 \end{array} \longrightarrow \begin{array}{r} {\scriptstyle 4\ \ \ } \\ 28 \\ \times\ 26 \\ \hline 168 \end{array} \longrightarrow \begin{array}{r} {\scriptstyle 1\ \ \ } \\ 28 \\ \times\ 26 \\ \hline 168 \\ 6 \end{array} \longrightarrow \begin{array}{r} {\scriptstyle 1\ \ \ } \\ 28 \\ \times\ 26 \\ \hline 168 \\ 56 \end{array}$$

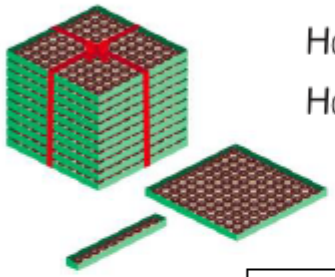
Further division

Year 5

How many can we get from 4792 ?

How many can we get from 4792 ?

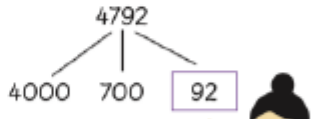
How many can we get from 4792 ?



Dividing by 100

How many can we get from 4792?

contains 100 pieces.



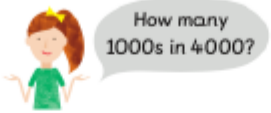
4700 ÷ 100 = 47

47 hundreds ÷ 1 hundred = 47

Dividing by 1000

How many can we get from 4792?

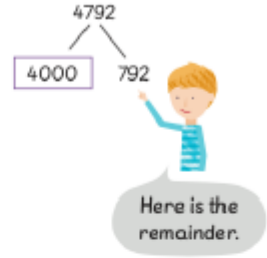
contains 1000 pieces.



There are 4 in 4000.

4000 ÷ 1000 = 4

4 thousands ÷ 1 thousand = 4



Dividing by 10

How many can we get from 4792?

contains 10 pieces.

4790 ÷ 10 = 479

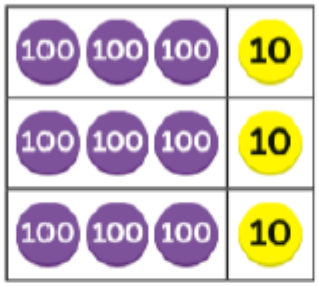
479 tens ÷ 1 ten = 479

Further division

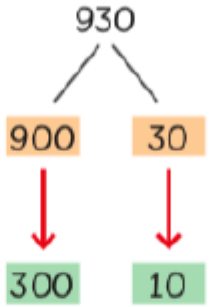
Year 5

Dividing with place value counters

930 ÷ 3



Dividing a hundreds number with long division



$$3\overline{)930}$$

$$930 - 900 = 300$$

$$300 \div 3 = 100$$

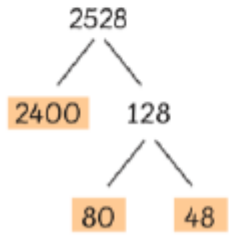
$$30 - 30 = 0$$

$$30 \div 3 = 10$$

$$100 + 10 = 110$$

2528 ml ÷ 8 = ▭

Dividing a thousands number with long division



$$8\overline{)2528}$$

$$2528 - 2400 = 128$$

$$128 \div 8 = 16$$

$$128 - 80 = 48$$

$$48 \div 8 = 6$$

$$16 + 6 = 316$$

$$4\overline{)108} \rightarrow 4\overline{)10^{2}8} \rightarrow 27$$

Short division

$$3\overline{)51} \rightarrow 3\overline{)5^{2}1} \rightarrow 17$$

Four Operations

Year 6

Exploring the use of the four operations within expressions

wrote this expression:

$2 \times 3 \times 6 \div 4 - 5 - 1$

For × and ÷, calculate from left to right.

$2 \times 3 \times 6 \div 4 - 5 - 1$
$= 6 \times 6 \div 4 - 5 - 1$
$= 36 \div 4 - 5 - 1$
$= 9 - 5 - 1$
$= 3$

Subtract from left to right.

$2 \times 3 \times 6 \div 4 - 5 - 1 = 3$

Can you make an expression that has the value of 4? How about the values of 5 or 6?

made a different expression that has the value of 3.

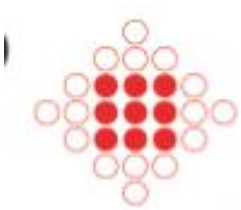
$(1 + 2) \div 3 \times 4 + 5 - 6$

Step 1: Perform the calculation in the brackets first.
Step 2: Multiply or divide whichever comes first.
Step 3: Add or subtract whichever comes first.

$(1 + 2) \div 3 \times 4 + 5 - 6 = 3$

$1 + 2 = 3$
$3 \div 3 = 1$
$1 \times 4 = 4$
$4 + 5 = 9$
$9 - 6 = 3$

Using a mixture of the four operations confidently



1 + 3

3 × 3

This is an expression.

$4 \times (1 + 3) + 3 \times 3 =$ ☐

Step 1: Perform the calculation in ( ).
Step 2: Multiply.
Step 3: Add.

$1 + 3 = 4$
$4 \times 4 = 16$
$3 \times 3 = 9$
$16 + 9 = 25$

Multiplication

Year 6

320 × 31 =

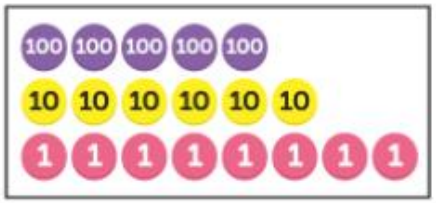
Long multiplication

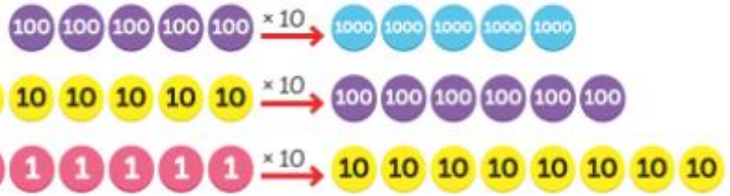
	3	2	0		3	2	0		3	2	0
×		3	0	×		1		×		3	1
	9	6	0	0		3	2	0	9	6	0	0
								+		3	2	0
									9	9	2	0

	3	2	0		3	2	0		3	2	0
×		3	0	×		1		×		3	1
	9	6	0	0		3	2	0		3	2	0
								+	9	6	0	0
									9	9	2	0

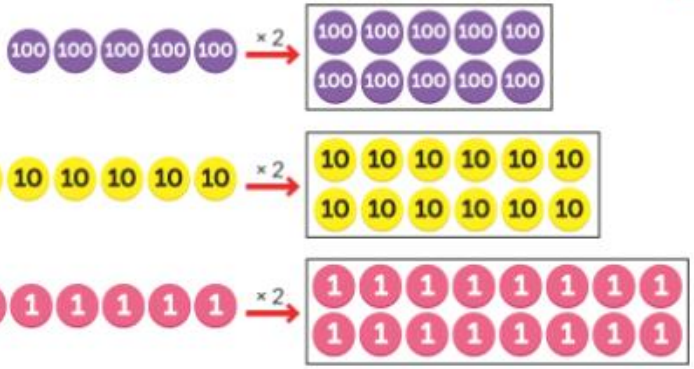
Use of place value discs to represent the multiplication process can be used

1 12 × 568 =





10 × 568 = 5680



2 × 568 = 1136

10 × 568 = 5680

2 × 568 = 1136

12 × 568 = 6816

		1	1	
		5	6	8
×				2
1	1	3	6	

Multiplication

Year 6

Common multiples

multiples of 3	multiples of 4	multiples of 6
3	4	6
6	8	12
9	12	18
12	16	24
15	20	30
18	24	36
21	28	42
24	32	48
27	36	54
30	40	60
33	44	66
36	48	72

Common factors

Find the common factors of 156 and 132.

156 = 1 × 156
156 = 2 × 78
156 = 3 × 52
156 = 4 × 39
156 = 6 × 26
156 = 12 × 13

132 = 1 × 132
132 = 2 × 66
132 = 3 × 44
132 = 4 × 33
132 = 6 × 22
132 = 11 × 12

1, 2, 3, 4, 6, 12 are all the common factors of 156 and 132. So 12 is the largest common factor.

Prime numbers

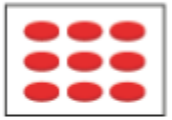
Find the factors of 5.

The only way to arrange 5 in a rectangular arrangement is  .

5 has only two factors, 1 and itself.
5 is a prime number.

Find the factors of 9.

9 = 1 × 9



9 = 3 × 3

The factors of 9 are 1, 3 and 9.
9 has more than 2 factors.

9 is not a prime number.
9 is a composite number.

Division

Year 6

Long division

7192 ÷ 31 = ☐

```
        ☐ ☐ ☐
31 ) 7 1 9 2
   - 3 1 0 0      100
     4 0 9 2
   - 3 1 0 0      100
       9 9 2
     - 3 1 0       10
       6 8 2
     - 3 1 0       10
       3 7 2
     - 3 1 0       10
         6 2
       - 6 2        2
           0
```

```
        ☐ ☐ ☐
31 ) 7 1 9 2
   - 6 2 0 0  → 6200 ÷ 31 = 200
       9 9 2
     - 9 3 0  → 930 ÷ 31 = 30
         6 2
       - 6 2  → 62 ÷ 31 = 2
           0
```

7192 ÷ 31 = ☐

Long division through partitioning