Maths No Problem & Calculation Policy Information

KS2

Contents

- Introduction to Maths No Problem
- Overview of the National Curriculum
- Lesson structure for a MNP lesson
- Progression in key methods from Year 3 to Year 6
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Introduction to Maths – No Problem!

- Based on the evidence-based approach developed in Singapore.
- Fully aligned with the 2014 English National Curriculum for maths.
- The Maths — No Problem! Primary Series was assessed by the DfE's expert panel, which judged that it met the core criteria for a high quality textbook to support teaching for mastery.
- By incorporating established learning research into a highly effective approach, Singapore has become a "laboratory of maths teaching". The Primary Maths Series is founded on the international research of Piaget, Dienes, Bruner, Skemp and Vygotsky and has been tested and refined over the last 30 years in Singapore.

Teaching maths for mastery

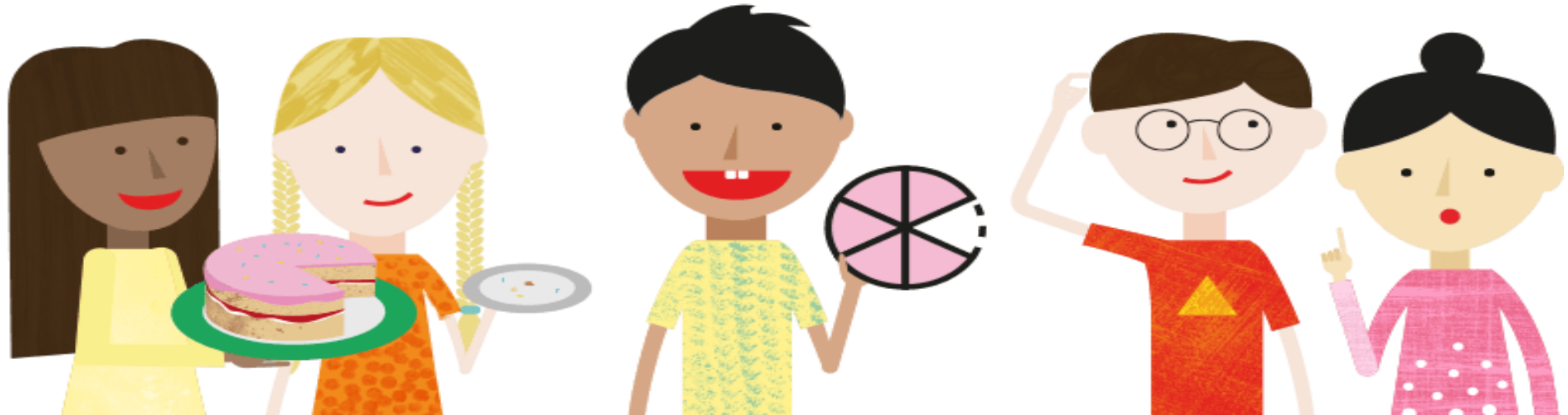
The whole class works through the programme of study at the same pace with ample time on each topic before moving on. Ideas are revisited at higher levels as the curriculum spirals through the years.

Differentiated activities

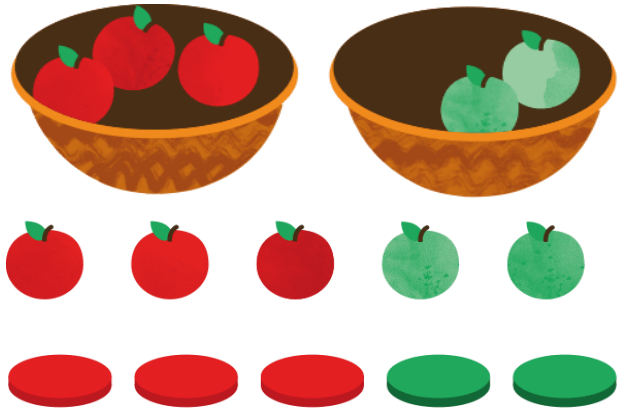
Tasks and activities are designed to be easy for pupils to enter while still containing challenging components. For advanced learners, the textbooks also contain non-routine questions for pupils to develop their higher-order thinking skills

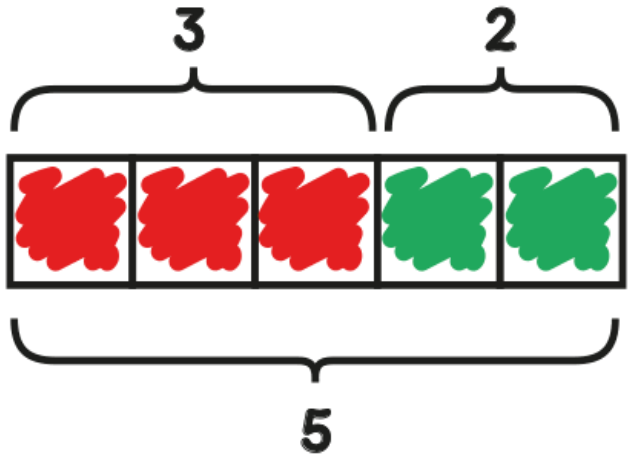
Problem solving·

Lessons and activities are designed to be taught using problem-solving approaches to encourage pupils' higher level thinking. The focus is on working with pupils' core competencies, building on what they know to develop their relational understanding, based on Richard Skemp's work.



Concrete, Pictorial, Abstract (CPA) approach





$$3 + 2 = \boxed{5}$$

Concrete step of CPA

Concrete is the “doing” stage. This stage brings concepts to life by allowing children to experience and handle physical (concrete) objects. For example, if a problem involves adding pieces of fruit, children can first handle actual fruit.

Pictorial step of CPA

Pictorial is the “seeing” stage. Here, visual representations of concrete objects are used to model problems. This stage encourages children to make a mental connection between the physical object they just handled and the abstract pictures, diagrams or models that represent the objects from the problem.

Abstract step of CPA

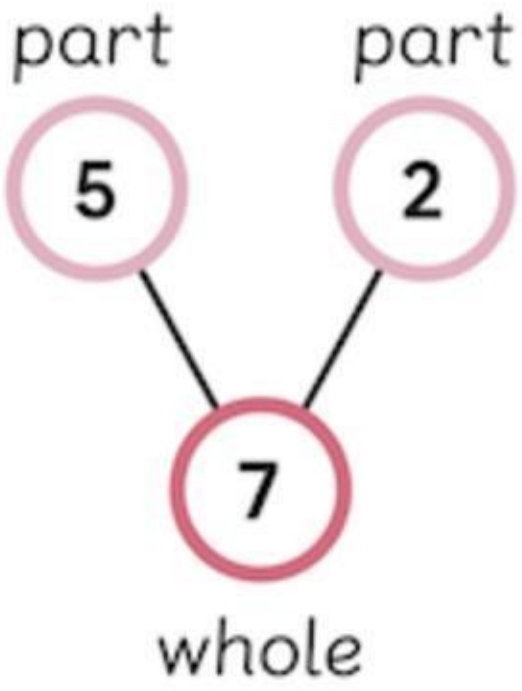
Abstract is the “symbolic” stage. Children use abstract symbols to model problems and need a solid understanding of the concrete and pictorial stages of the problem.

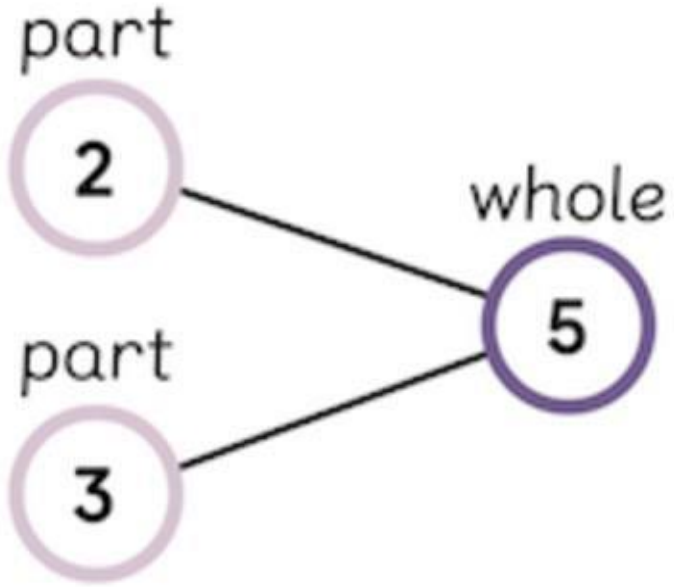
Children are introduced to the concept at a symbolic level, using only numbers, notation, and mathematical symbols (+, -, x and ÷)

Number Bonds

Number bonds show how numbers are split or combined.

An essential strategy of Singapore maths, number bonds reflect the ‘part-part-whole’ relationship of numbers.





Number bonds are represented by circles connected by lines.

The ‘**whole**’ is written in the first circle, while the ‘**parts**’ are in the adjoining circles.

Bar modelling

Bar modelling is an essential maths mastery strategy.

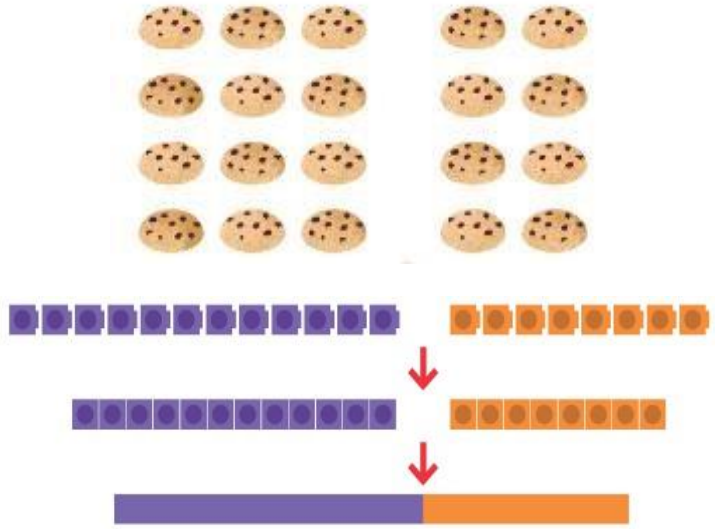
A Singapore-style of maths model, bar modelling allows pupils to draw and visualize mathematical concepts to solve problems.

Sam bakes 20 cookies.
What if he gives some away?

What if Sam gives away 8 cookies?

20 − 8 = ☐

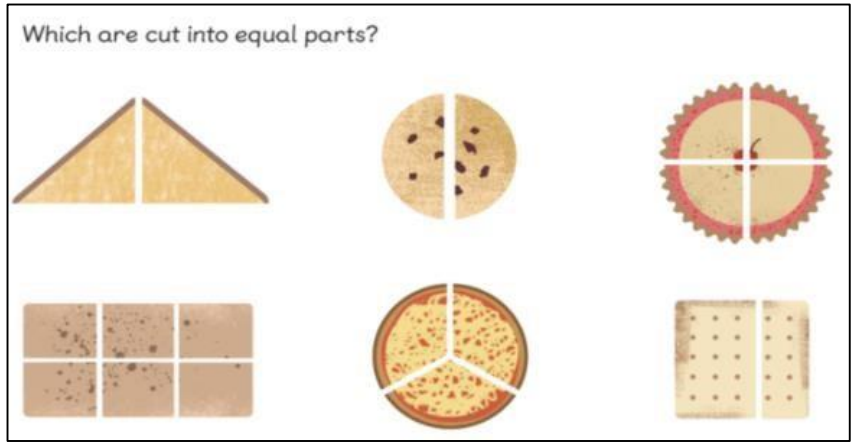
Then, Sam would have ☐ cookies left.



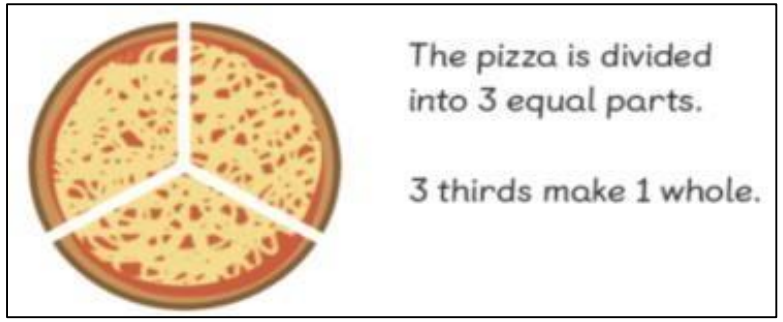
Fractions

In Singapore, the understanding of fractions is rooted in the (CPA) model, where children use paper squares and strips to learn the link between the concrete and the abstract.

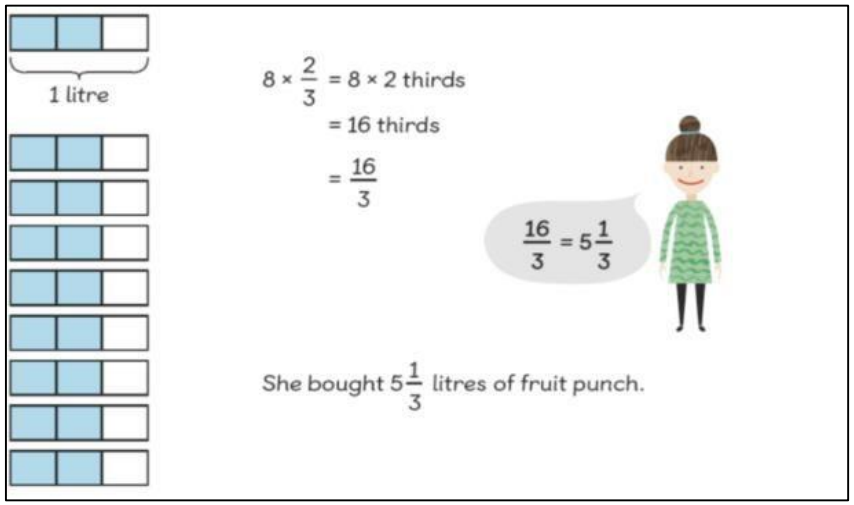
1. Finding equal parts



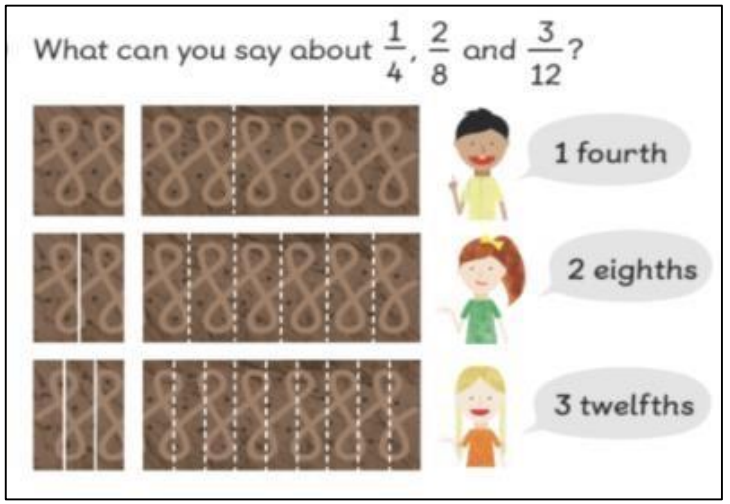
2. Naming equal parts



3. Operations involving fractions



4. Equivalent fractions



Variation

The questions and examples are carefully varied by expert authors to encourage pupils to think about the maths. Rather than provide mechanical repetition, the examples are designed to deepen pupils' understanding and reveal misconceptions.

Year 3

Number Patterns

1 Fill in the blanks.

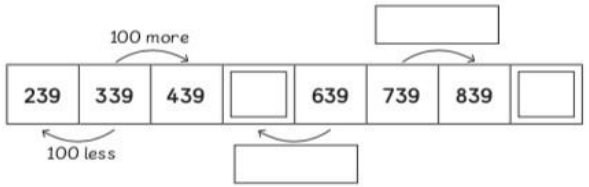
(a) 100 more than 200 is ☐. (b) 100 less than 300 is ☐.

(c) 100 less than 783 is ☐. (d) 100 more than 499 is ☐.

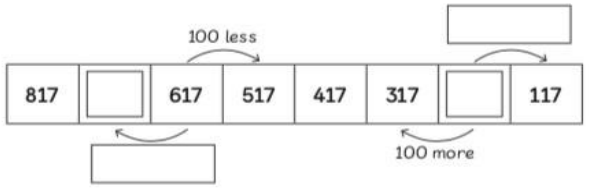
(e) 100 less than 999 is ☐. (f) 100 more than 900 is ☐.

2 Look at each number pattern and fill in the blanks.

(a)



(b)



3 Look at each number pattern and fill in the blanks.

(a) 90, ☐, 290, 390, ☐, 590, 690

Each number is ☐ more than the number before it.

(b) 925, 825, 725, ☐, ☐, 425, 325

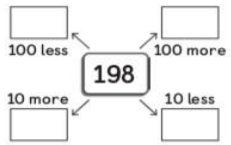
Each number is 100 ☐ than the number before it.

(c) ☐, 900, 800, 700, ☐, 500, 400

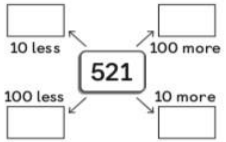
Each number is ☐ less than the number before it.

4 Fill in the blanks.

(a)



(b)



Making Number Patterns

1 Complete the table.

Number	1 more than the number	10 more than the number	100 more than the number
5938			
8999			

Number	1 less than the number	10 less than the number	100 less than the number
4818			
2791			

2 Complete the number patterns.

(a) 430, 530, ☐, ☐, 830, ☐

(b) 7560, ☐, ☐, 7590, ☐, 7610

3 Find the missing numbers.

(a) 1429 is ☐ more than 1419.

(b) 3299 is 1 less than ☐.

(c) ☐ is 100 more than 1923.

(d) ☐ more than 5550 is 5650.

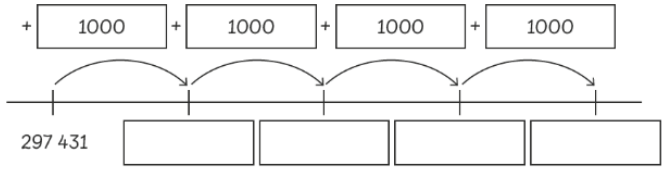
(e) 10 less than 2903 is ☐.

Year 4

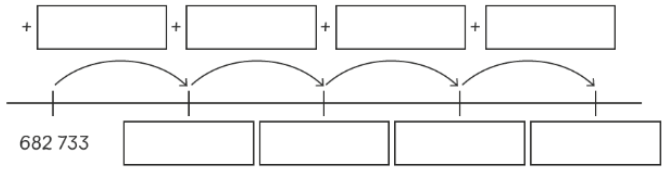
Variation

Count on and fill in the blanks.

(a) 297 431 + 4000 = ☐



(b) 682 733 + 40 000 = ☐



Year 5

Add and give your answer in the simplest form.

(a) $\frac{2}{5} + \frac{2}{5} =$ ☐

(b) $\frac{2}{7} + \frac{4}{7} =$ ☐

(c) $\frac{4}{9} + \frac{2}{9} =$ ☐ = ☐

(d) $\frac{3}{8} + \frac{1}{8} =$ ☐ = ☐

Add.

(a) $\frac{5}{8} + \frac{1}{4}$ = ☐ + ☐ = ☐

(b) $\frac{1}{6} + \frac{5}{12}$ = ☐ + ☐ = ☐

Multiply.

375 × 10 = ☐	375 × 9 = ☐
375 × 30 = ☐	375 × 39 = ☐
375 × 60 = ☐	375 × 69 = ☐

Add and show your answer in the simplest form.

(a) $\frac{2}{3} + \frac{1}{6}$ = $\frac{\square}{6} + \frac{\square}{6}$ = ☐

(b) $\frac{3}{8} + \frac{1}{4}$ =

(c) $\frac{1}{12} + \frac{3}{4}$ =

(d) $\frac{3}{14} + \frac{2}{7}$ =

(e) $\frac{1}{6} + \frac{1}{4}$ =

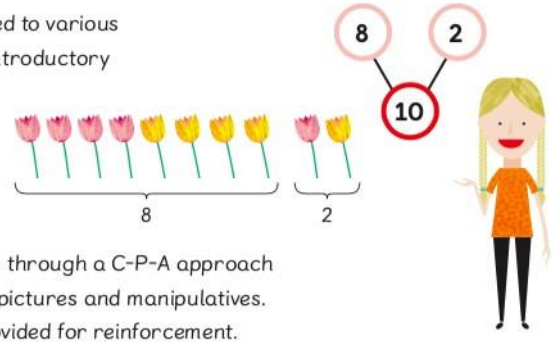
(f) $\frac{1}{2} + \frac{2}{7}$ =

Year 6

MNP children

In Focus

Includes questions related to various lesson objectives as an introductory activity for pupils.



Let's Learn

Introduces new concepts through a C-P-A approach with the use of engaging pictures and manipulatives. Guided examples are provided for reinforcement.

Guided Practice

Comprises questions for further consolidation and for the immediate evaluation of pupils' learning.

Mind Workout

Challenging non-routine questions for pupils to apply relevant heuristics and to develop higher-order thinking skills.

Activity Time

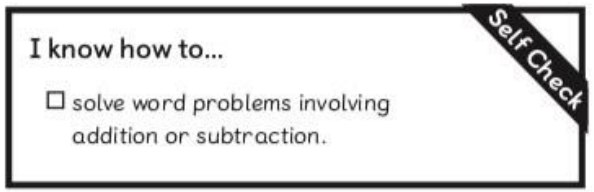
Provides pupils with opportunities to work as individuals or in small groups to explore mathematical concepts or to play games.

Maths Journal

Provides pupils with opportunities to show their understanding of the mathematical concepts learnt.

Self Check

Allows pupils to assess their own learning after each chapter.



All of these elements make up the MNP programme. In most lessons, children will explore an 'In Focus' problem, journal and complete the guided practice each lesson.

The other parts, children will have the opportunity to do ones a topic.

Lower KS2 National Curriculum

- The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the 4 operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers.
- Pupils should develop their ability to solve a range of problems, including with simple fractions and decimal place value.
- Pupils are encouraged to draw with increasing accuracy and develop mathematical reasoning so they can analyse shapes and their properties. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number.
- By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work.
- Pupils should read and spell mathematical vocabulary correctly and confidently, using their growing word-reading knowledge and their knowledge of spelling.

Upper KS2 National Curriculum

- The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio.
- Pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems.
- Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them.
- By the end of year 6, pupils should be fluent in written methods for all 4 operations, including long multiplication and division, and in working with fractions, decimals and percentages.
- Pupils should read, spell and pronounce mathematical vocabulary correctly.


Year 3, Year 4
Year 5 & Year 6

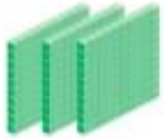
Place value

Year 3

Numbers to 1000

100
one hundred

200
two hundred



300
three hundred

What is the value of each digit in 530?

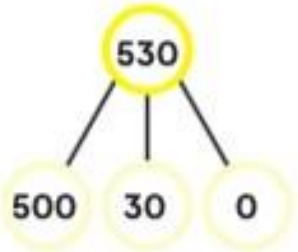
hundreds	tens	ones
5	3	0

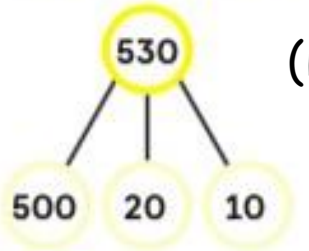
530 = ☐ hundreds + ☐ tens + ☐ ones

530 = ☐ + ☐ + ☐

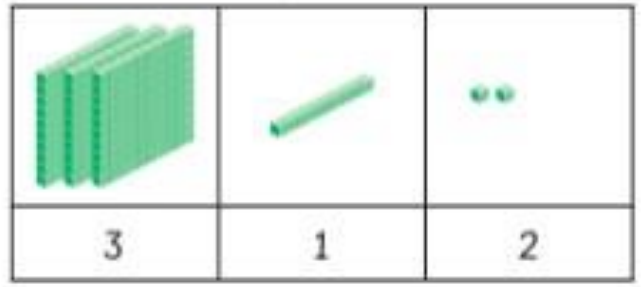
The value of the digit 5 is 500. 500
The value of the digit 3 is 30. 30
The value of the digit 0 is 0. 0

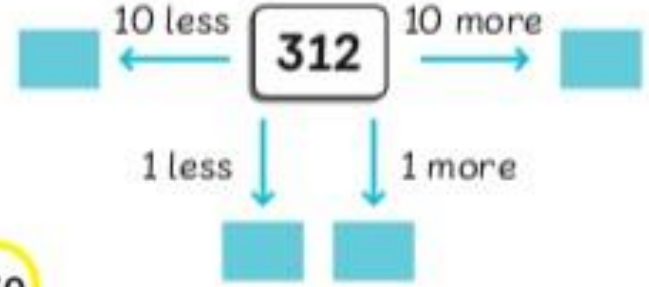
→ 530





Fill in the missing numbers.



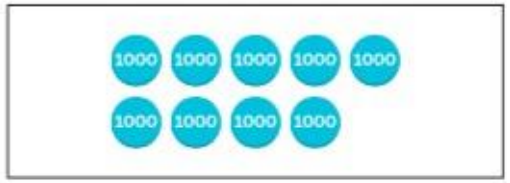


Number patterns
(in 1, 2, 5, 10, 3, 4 and 8)

Place value

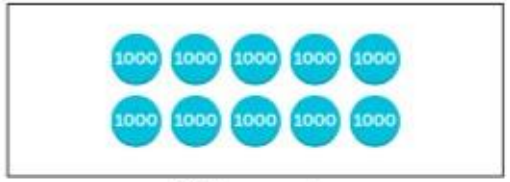
Year 4

Numbers to 10,000



9 thousands

9000
nine thousand



10 thousands

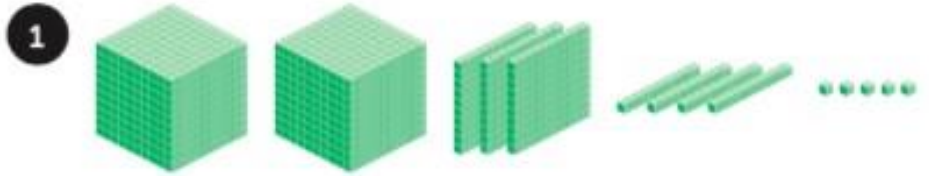
10 000
ten thousand

10 thousands = 10 000

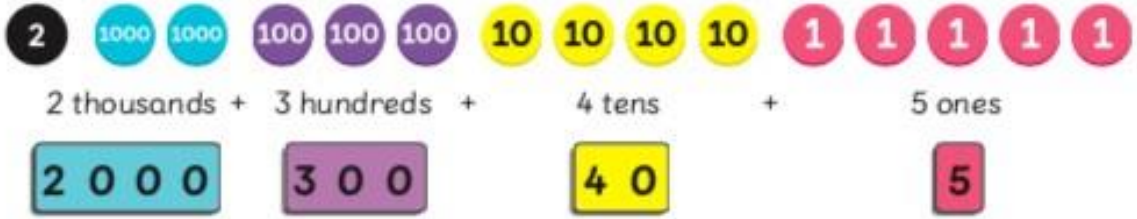
Use a place-value chart.

2 thousands + 3 hundreds + 4 tens + 5 ones

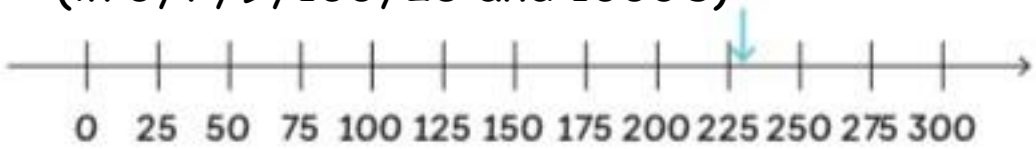
thousands	hundreds	tens	ones
2	3	4	5



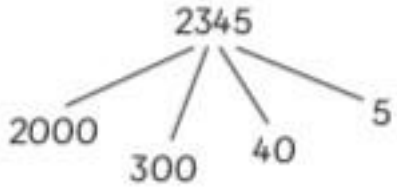
2 thousands + 3 hundreds + 4 tens + 5 ones



Number patterns
(in 6, 7, 9, 100, 25 and 1000's)



2345 = 2000 + 300 + 40 + 5



2345 is a 4-digit number.

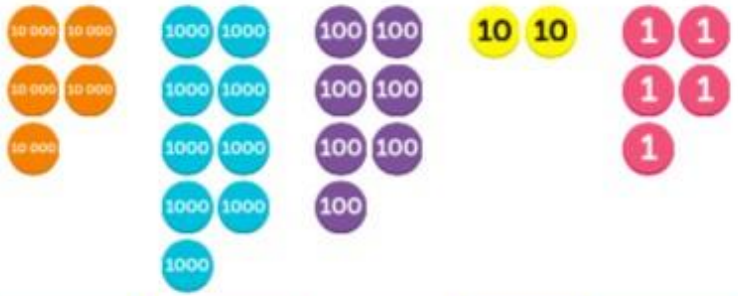
We write 2345 as two thousand, three hundred and forty-five.

Place value

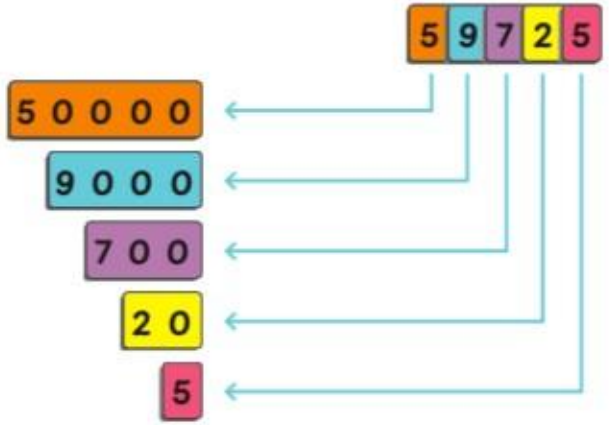
Year 5

Numbers to 1,000,000

Show 59 725 using number discs.



ten thousands	thousands	hundreds	tens	ones
5	9	7	2	5



One hundred and twenty thousand, one hundred and ten

Comparing and ordering

makes the following numbers.

1	8	2	3	0	0	182 300
	2	3	6	7	0	23 670
	2	3	6	6	5	23 665

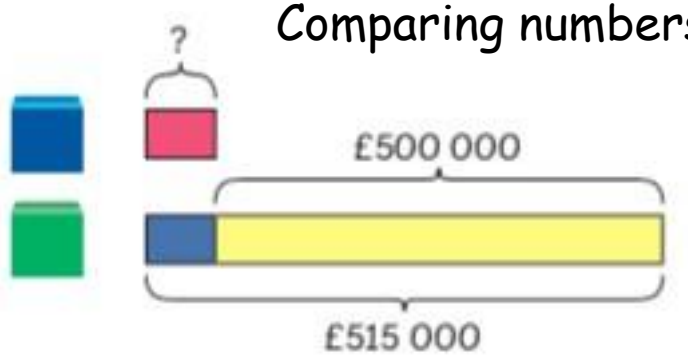
182 300 is the greatest.

23 665 is less than 23 670.

23 665 < 23 670 < 182 300

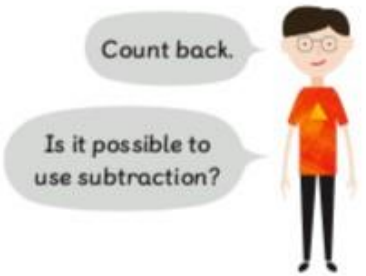
Find the price of each object.

Comparing numbers

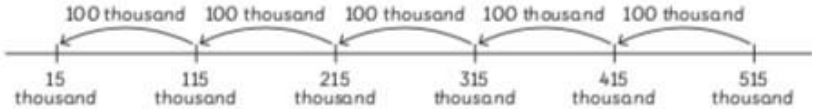


Method 1 Make a list.

515 000
415 000
315 000
215 000
115 000
15 000



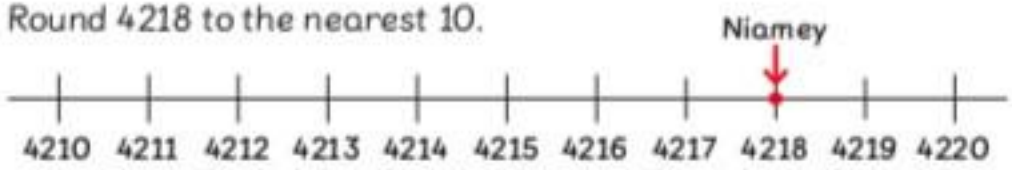
Method 2 Use a number line.



Place value

Year 4 & Year 5

Round 4218 to the nearest 10.



Round 4218 to the nearest 100.

Rounding to the nearest 10, 100 and 1000

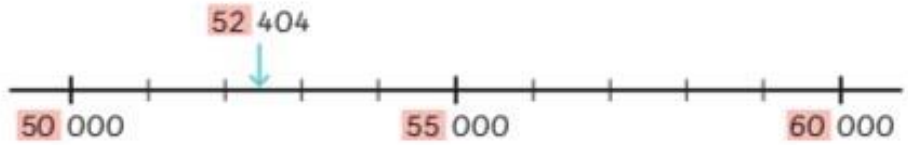
Round 2078 to the nearest 1000.

In Focus

Ravi's mother went shopping.
She bought a handbag for £58, a pair of shoes for £73 and a dress for £35.
Estimate the total cost of these three items.

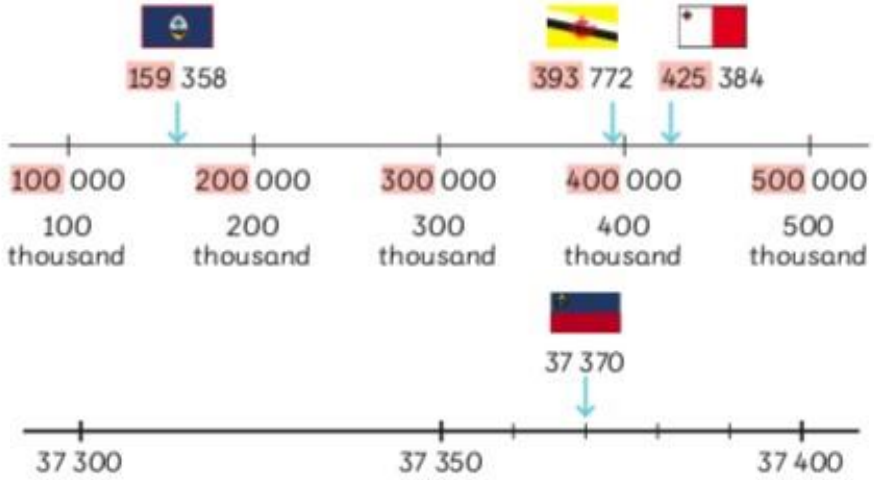
Rounding to estimate money and distance

St James' Park can seat 52 404.



52 404 is closer to 50 000 than to 60 000.

Rounding to the nearest 100, 1000, 10 000 and 100,000



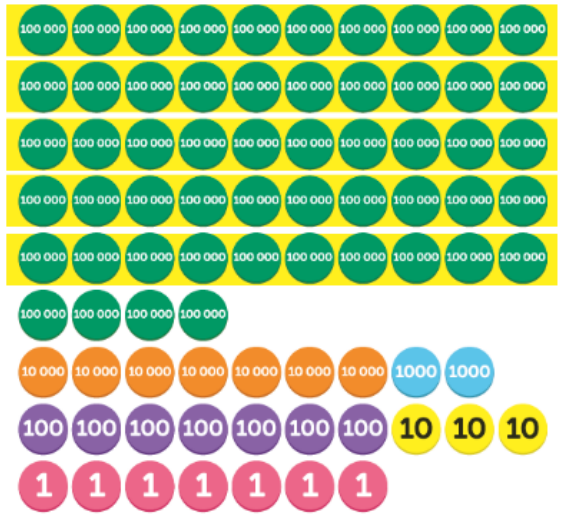
37 370 is closer to 37 400 than to 37 300.

Place value

Year 6

Reading and writing numbers up to 10 million

Show 5 472 737 using number discs.



Show 5 472 737 on a place-value chart.

millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones
5	4	7	2	7	3	7

The digit 5 is in the millions place.
It stands for 5 millions or 5 000 000.

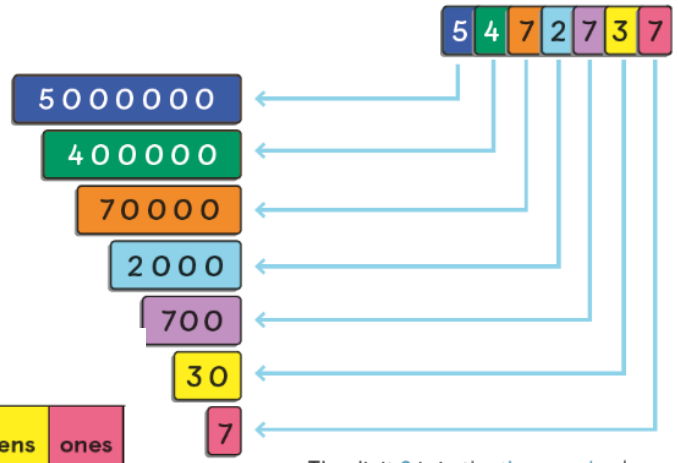
The digit 4 is in the hundred thousands place.
It stands for 4 hundred thousands or 400 000.

The digit 7 appears more than once.
7 is in the ten thousands place.
It stands for 70 000.

7 is also in the hundreds place.
It stands for 700.

7 is also in the ones place.
It stands for 7.

5 472 737 = ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐

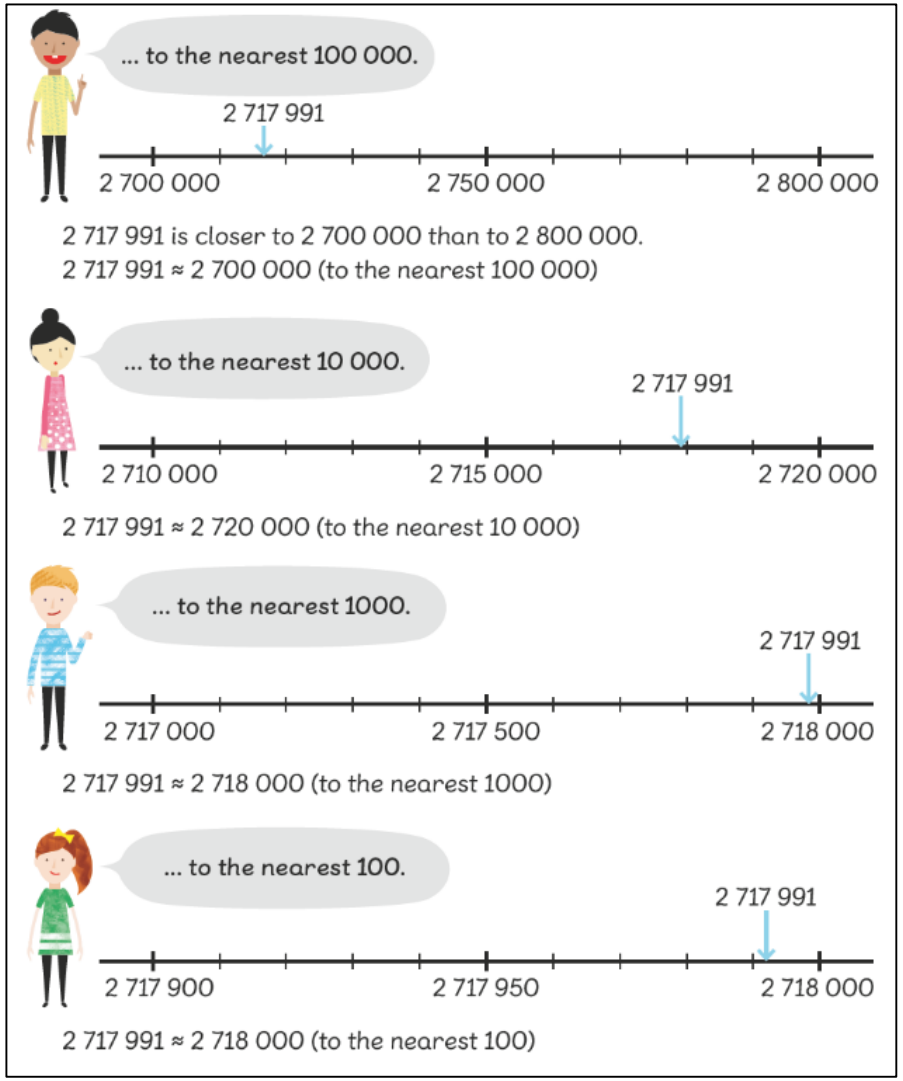


The digit 2 is in the thousands place.
It stands for 2000.

The digit 3 is in the tens place.
It stands for 30.

5 472 737 = 5 000 000 + 400 000 + 70 000 + 2000 + 700 + 30 + 7

We write 5 472 737 as five million, four hundred and seventy-two thousand, seven hundred and thirty-seven.

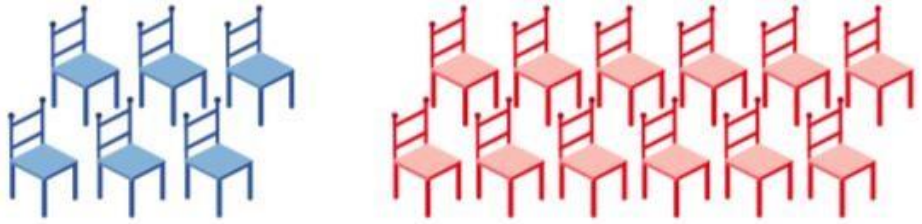


Adding

Recapping methods taught in Year 1 and 2.

Year 3

Adding numbers to 1000.



6 blue chairs

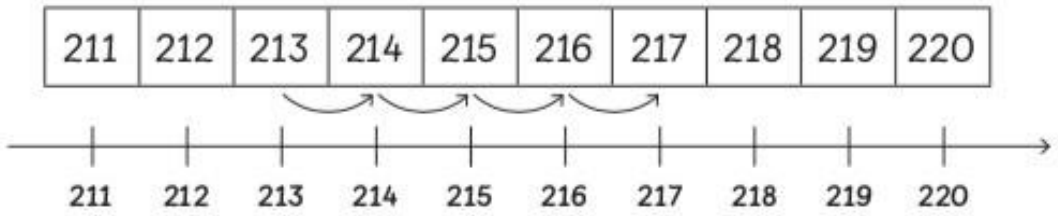
12 red chairs

How many chairs are there altogether?

We can write a family of addition and subtraction facts.

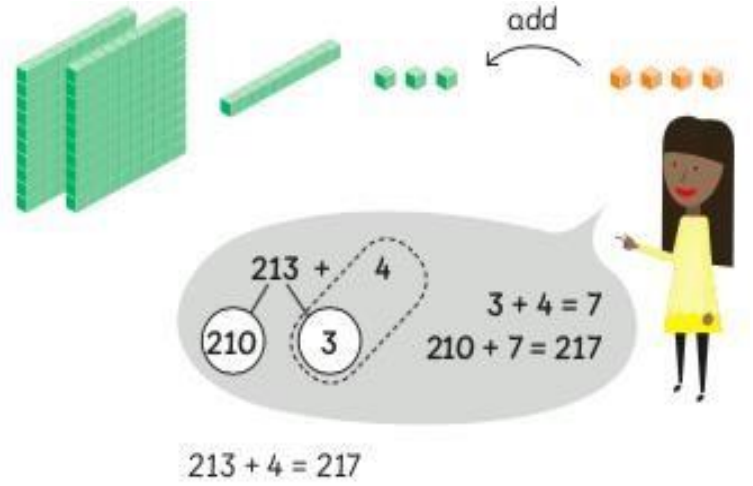
6 + 12 = 18 18 − 12 = 6

12 + 6 = 18 18 − 6 = 12



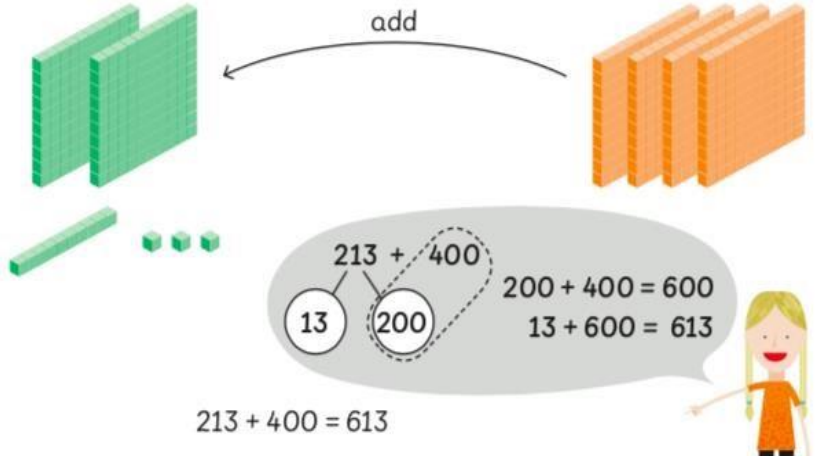
213 + 4 = 217

Adding ones, tens and hundreds.



213 + 4 = 217

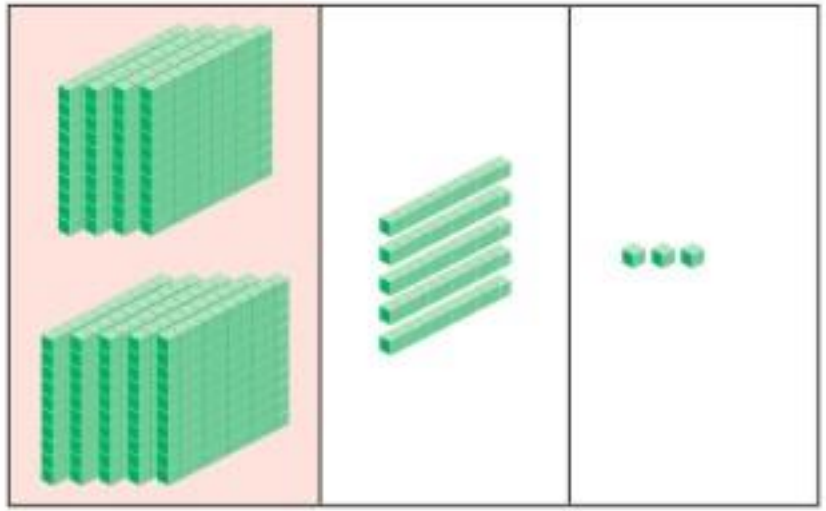
There were 217 books in the bookcase.



213 + 400 = 613

Adding – 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

Year 4

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

Let's estimate.

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

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 = ☐

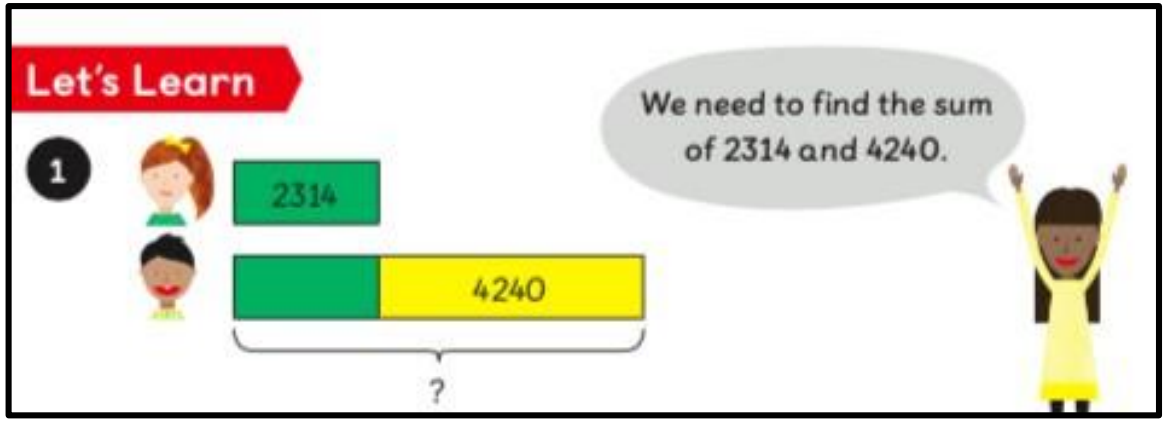
make 100

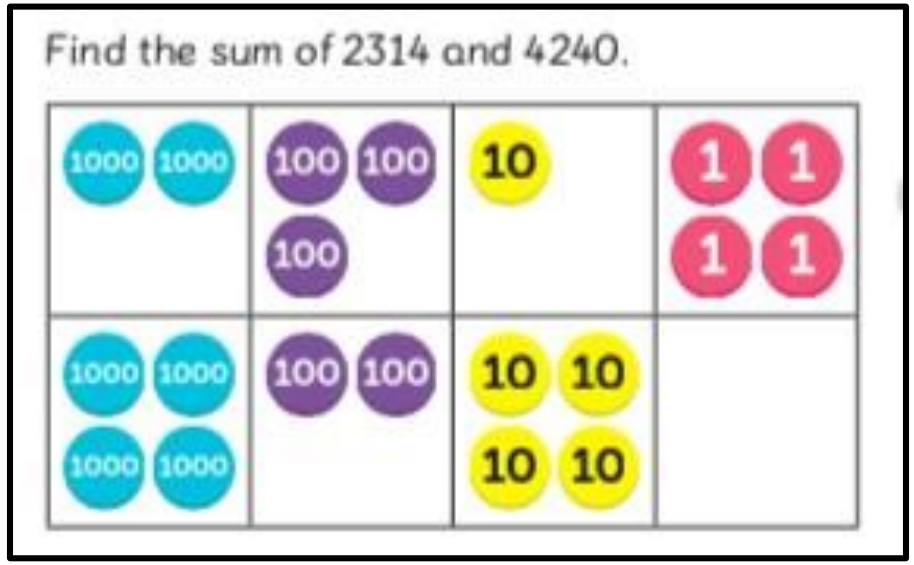
98 + 4142 = 100 + 4140

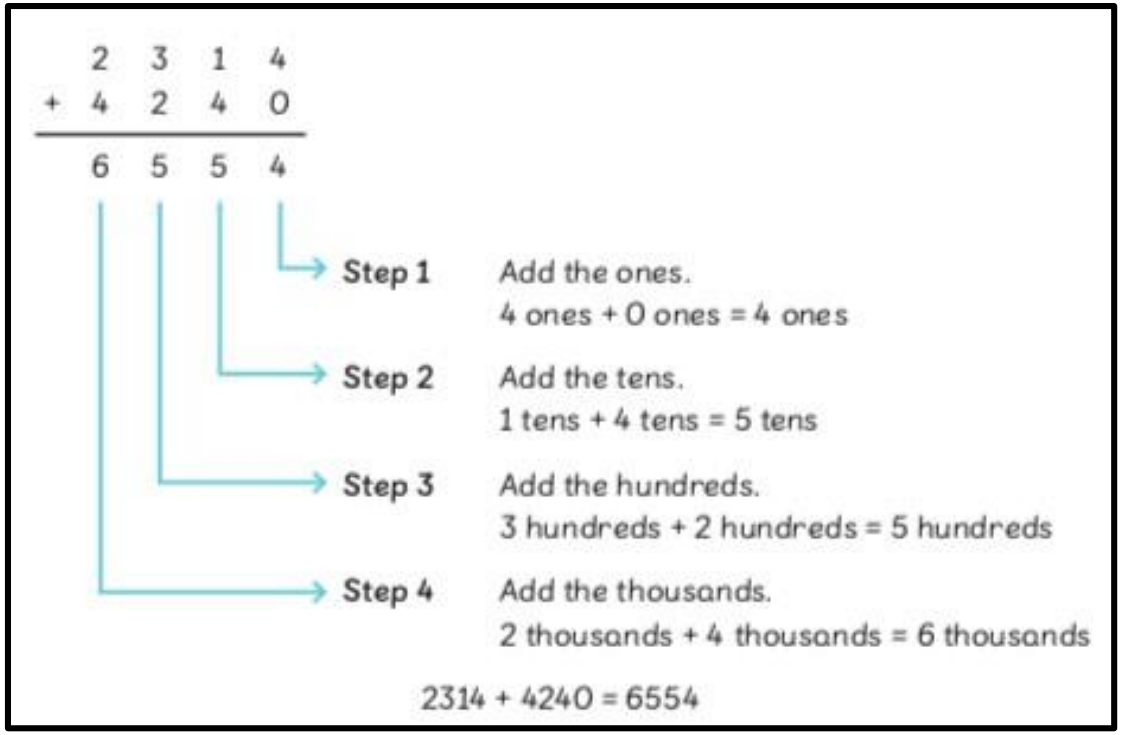
= 4240

Adding – no renaming

Year 4







Adding – with renaming

Year 3

Expected to solve a large number of abstract calculations

1 (a) 153 + 2 = ☐

(b) 153 + 20 = ☐

(c) 153 + 200 = ☐

2 (a) 214 + 3 = ☐

(b) 214 + 30 = ☐

(c) 214 + 300 = ☐

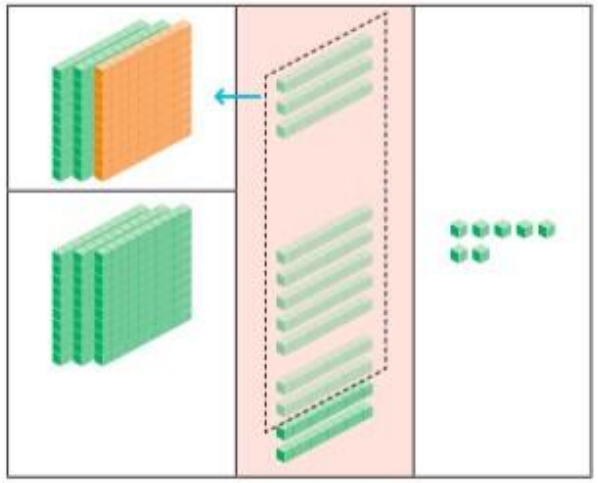
3 (a) 325 + 14 = ☐

	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

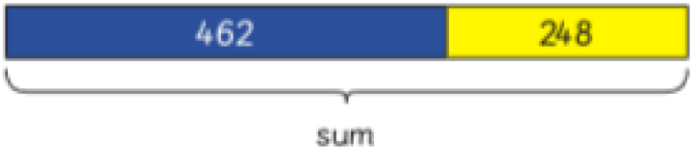


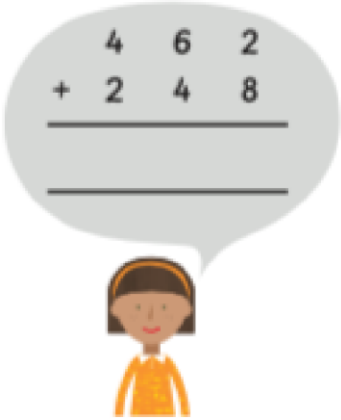
Secure understanding of place to 1000.

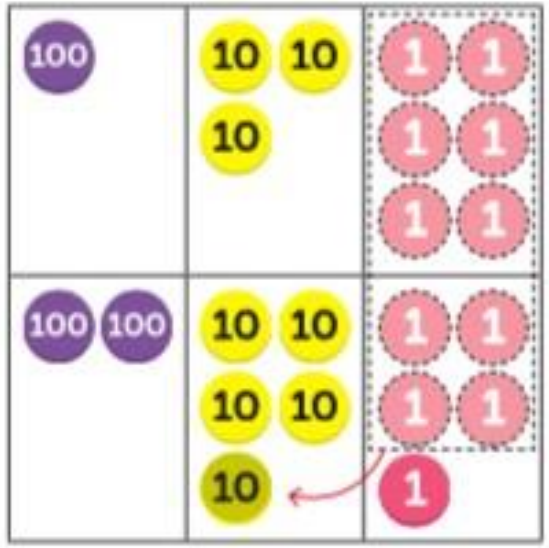
	h	t	o
	1 2	3	6
+	3	9	1
		2	7

Year 4

462 and 248 ☐



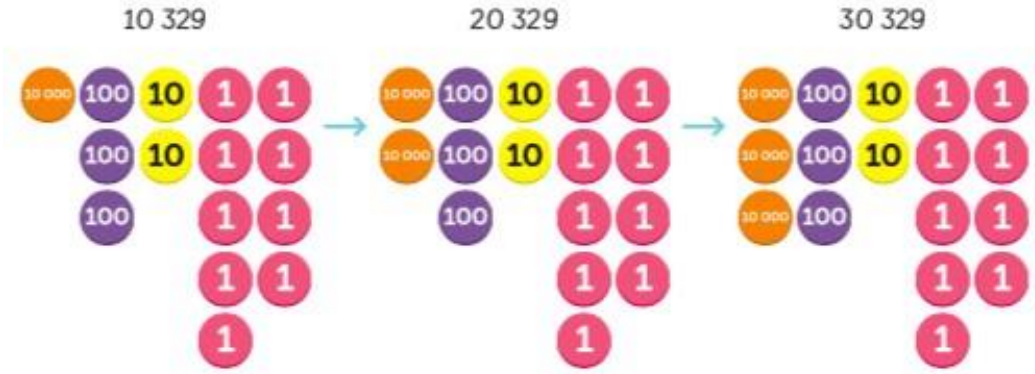




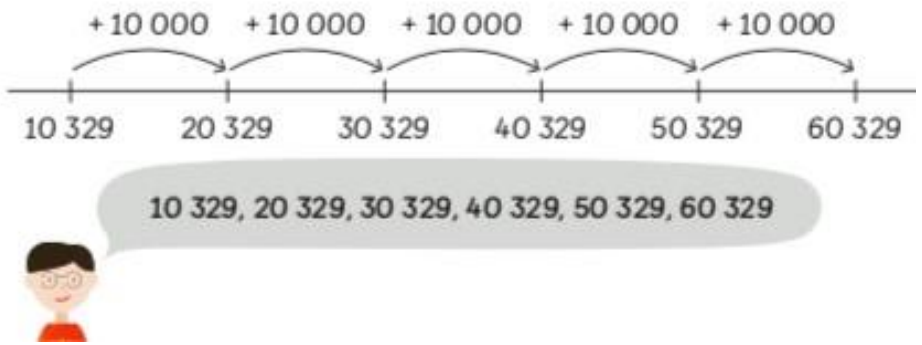
Recapping methods taught in Year 3, as well as applying it to measure problems straight away (e.g., money).

Adding

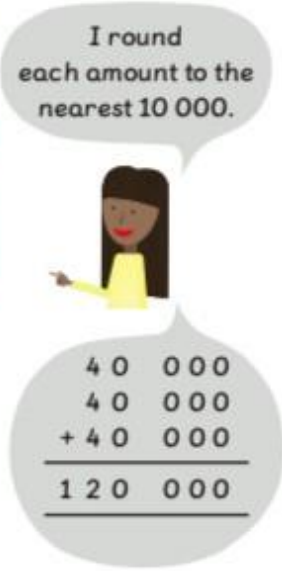
Year 5



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

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

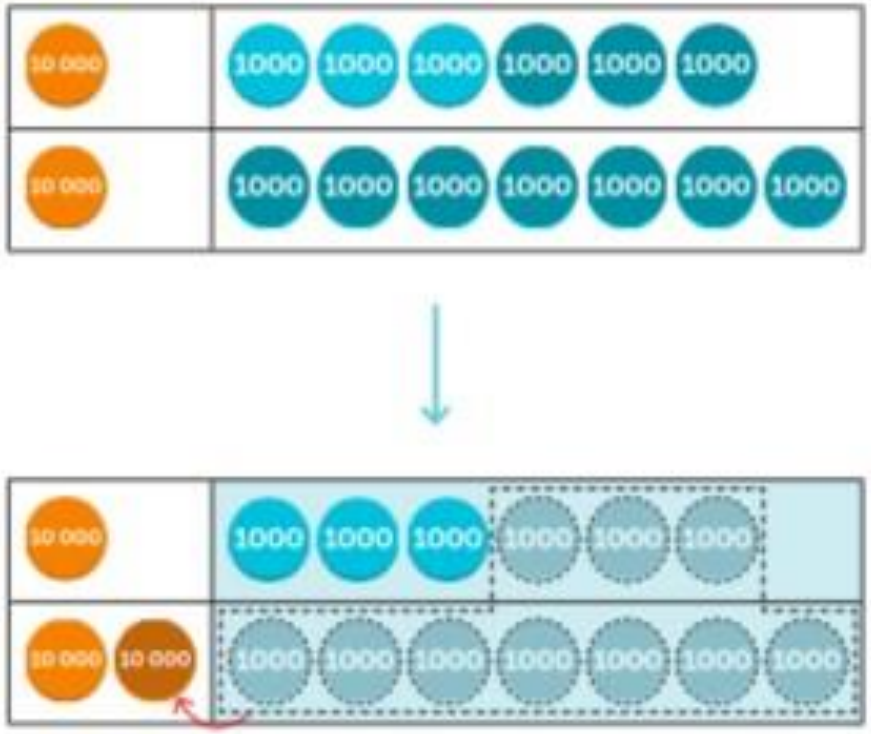
Adding key facts to simplify

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

Adding – with renaming

Year 5

16 000 + 17 000 =



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

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

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

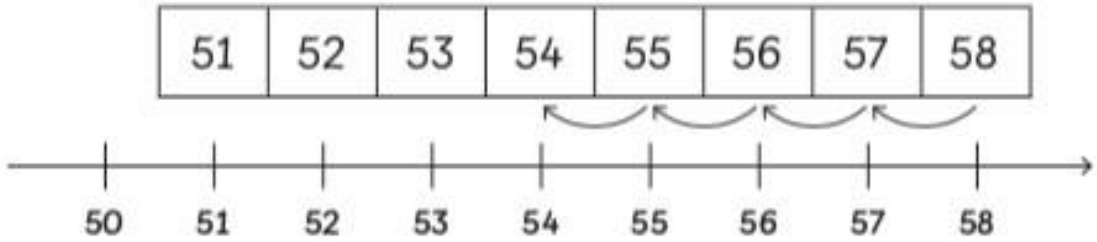
Place value counters to visually support column addition

Subtracting

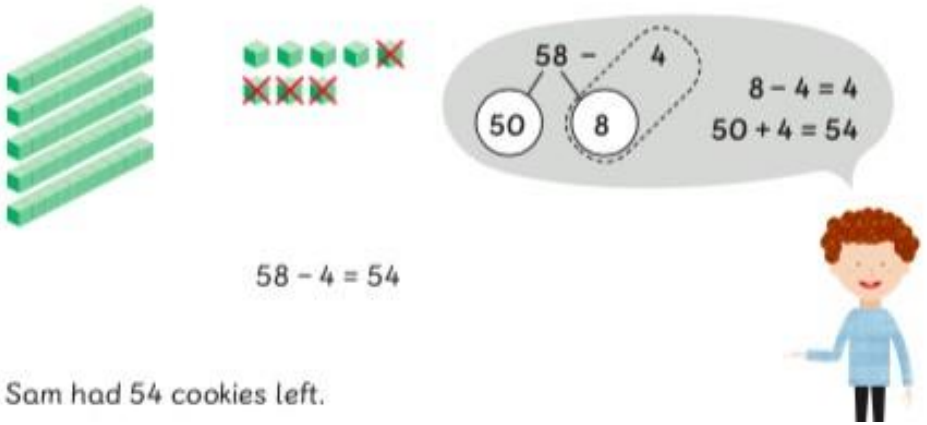
Year 3

Subtracting numbers within 1000

Method 1 Count back from 58.



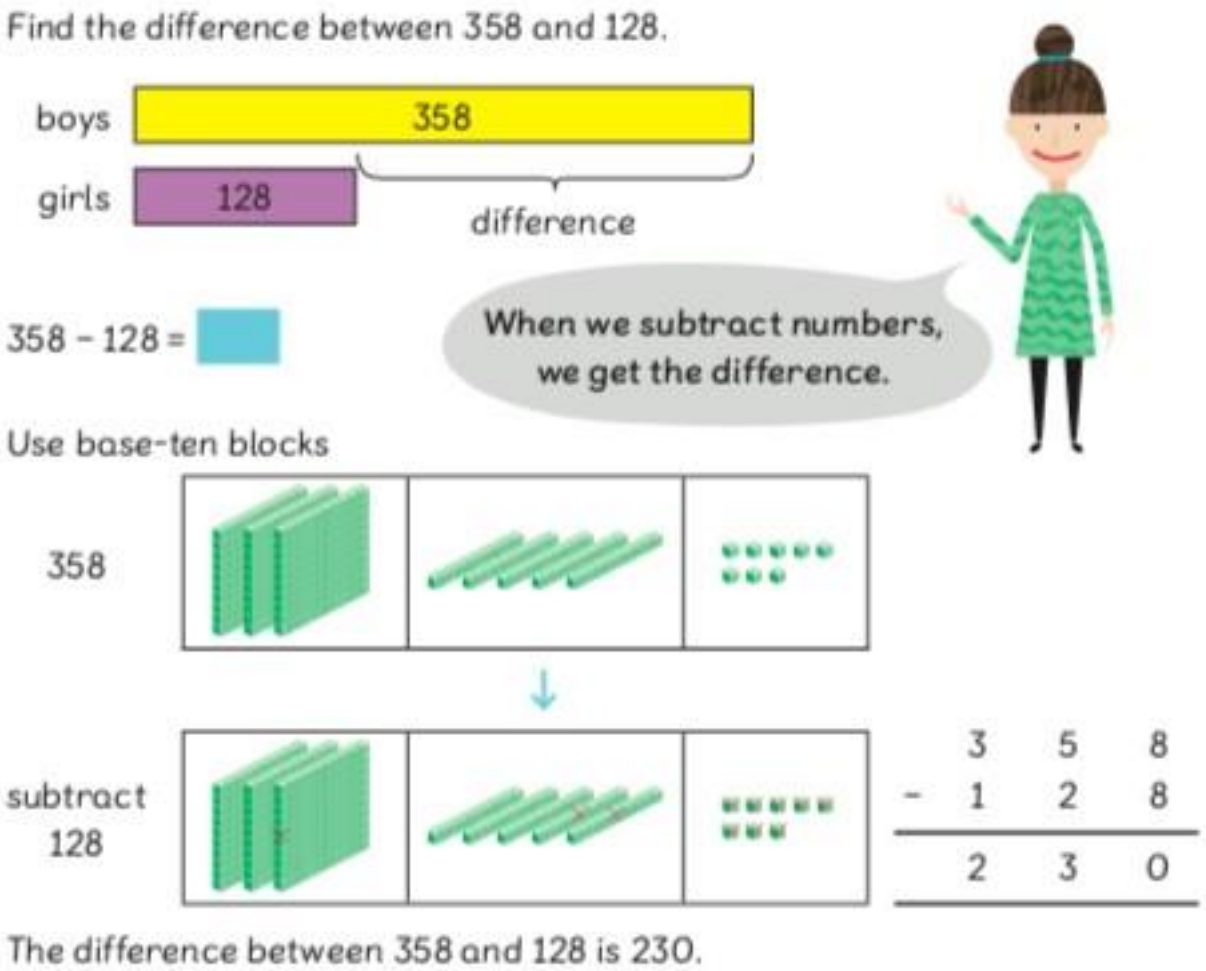
Method 2 Subtract ones.



Recapping methods taught in Year 1 and 2

Year 4

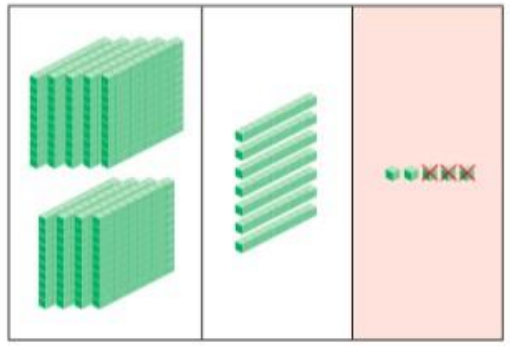
Subtracting numbers within 10,000



Subtracting – no regrouping

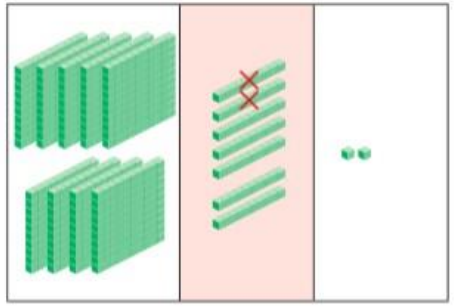
Year 3

Subtract the ones.
5 ones – 3 ones = 2 ones



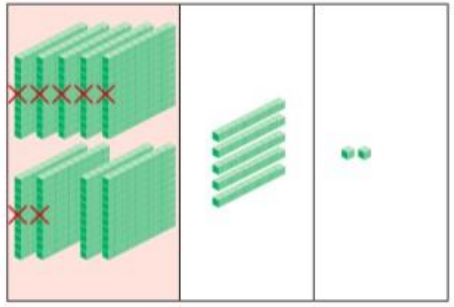
	h	t	o
	9	7	5
–	7	2	3
			2

Subtract the tens.
7 tens – 2 tens = 5 tens



	h	t	o
	9	7	5
–	7	2	3
		5	2

Subtract the hundreds.
9 hundreds – 7 hundreds = 2 hundreds



	h	t	o
	9	7	5
–	7	2	3
	2	5	2

975 – 723 = 252

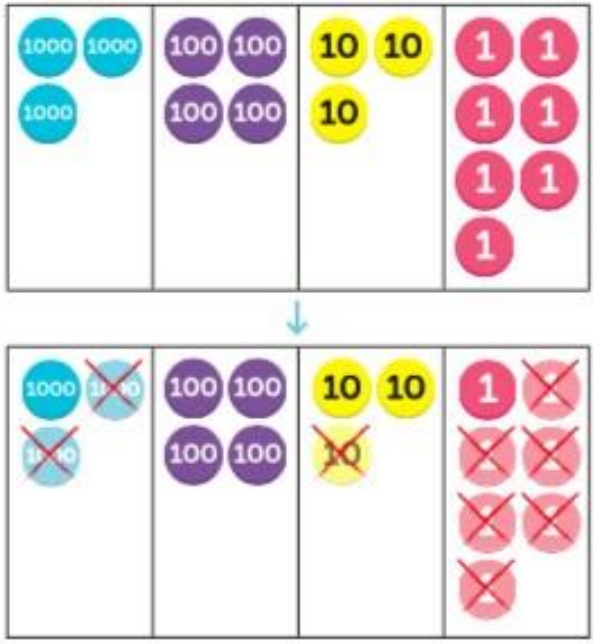
There were 252 beads left in the jar.

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

Year 4

3437 – 2016 =

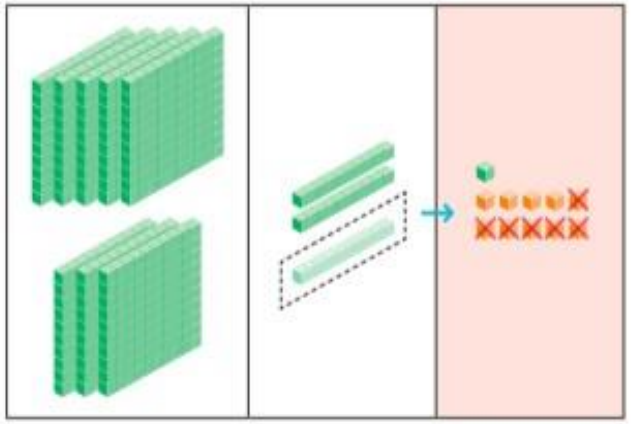
Place value counters



Subtracting – with regrouping

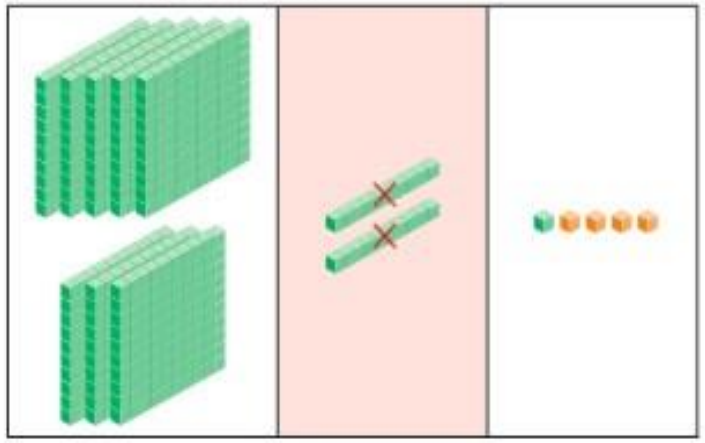
Year 3

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



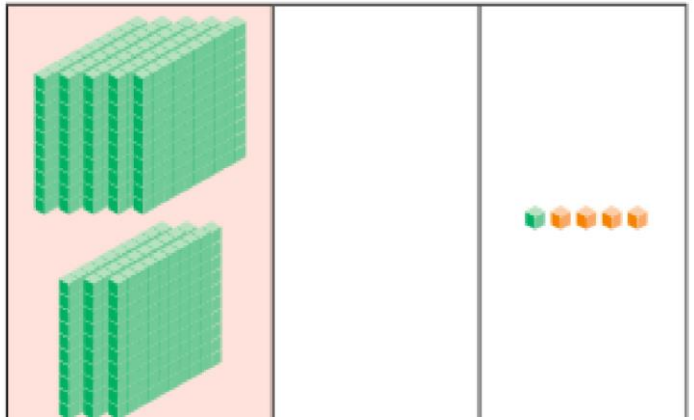
	h	t	o
	8	~~2~~ 1	~~11~~ 1
–		2	6
			5

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



	h	t	o
	8	~~2~~ 1	~~11~~ 1
–		2	6
		0	5

Step 3 Subtract the hundreds.



	h	t	o
	8	~~2~~ 1	~~11~~ 1
–		2	6
	8	0	5

Beginning practically with dienes before moving onto column subtraction

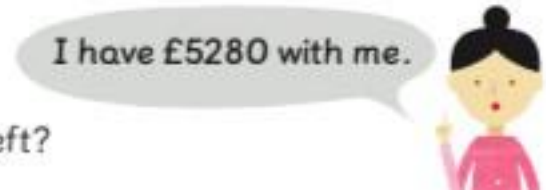
Number bond method is taught alongside both methods

Subtracting – with regrouping

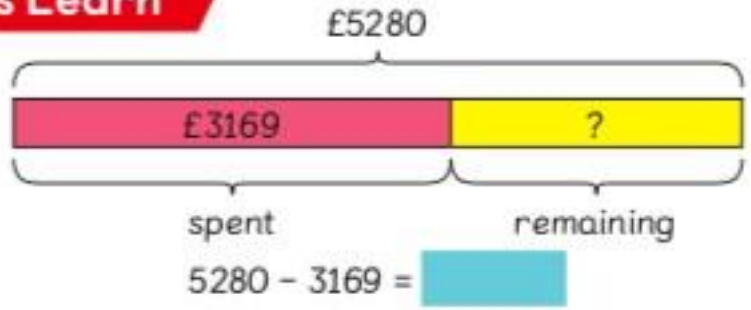
Year 4

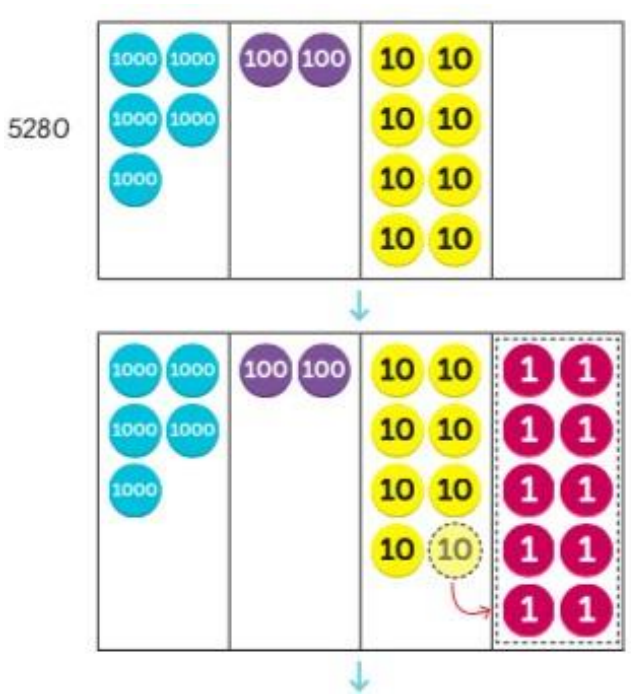
In Focus

After Ruby spent £3169, how much was left?

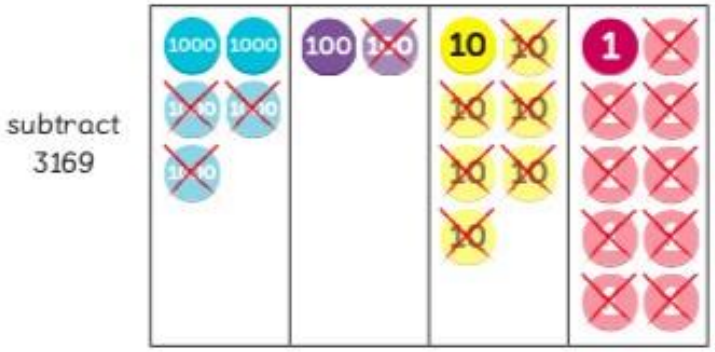


Let's Learn

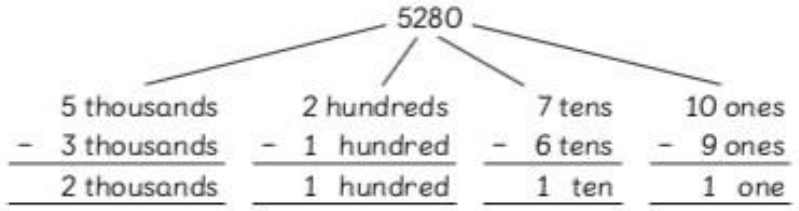




$$\begin{array}{r} 5\ 2\ \overset{7}{\cancel{8}}\ \overset{10}{\cancel{0}} \\ -\ 3\ 1\ 6\ 9 \\ \hline \\ \hline \end{array}$$



$$\begin{array}{r} 5\ 2\ \overset{7}{\cancel{8}}\ \overset{10}{\cancel{0}} \\ -\ 3\ 1\ 6\ 9 \\ \hline 2\ 1\ 1\ 1 \\ \hline \end{array}$$



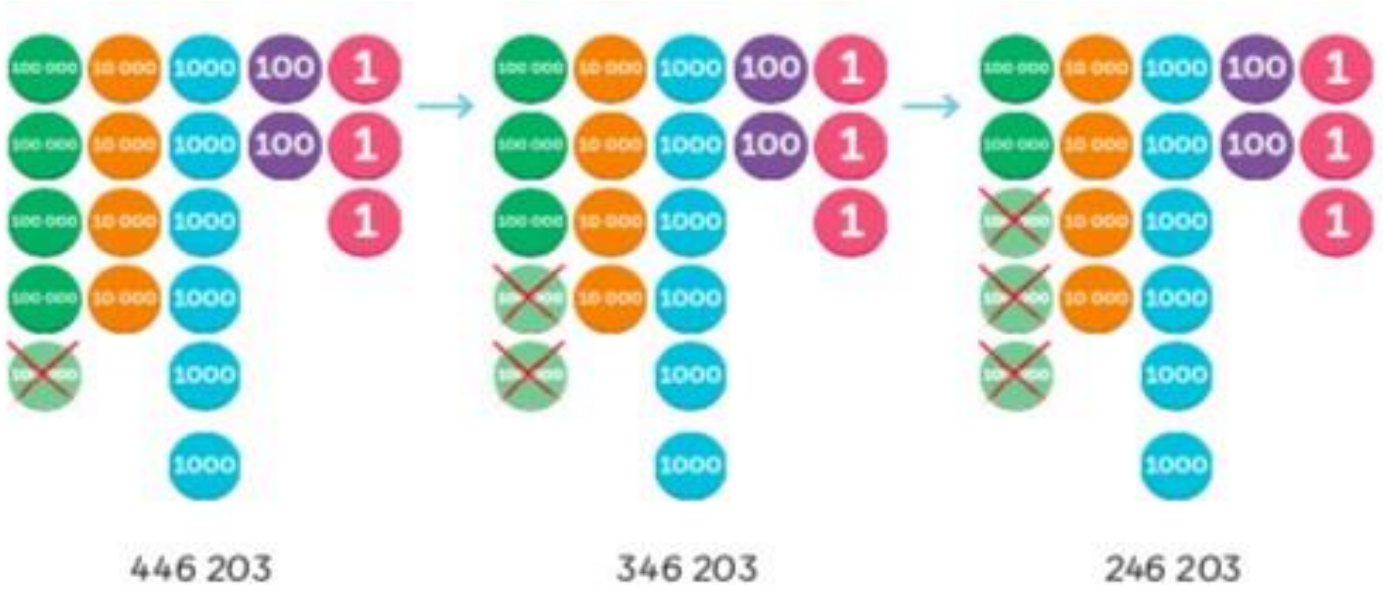
Children are encouraged to use the inverse calculation to check their answers

$$\begin{array}{r} 2\ 1\ 1\ 1 \\ +\ 3\ 1\ 6\ 9 \\ \hline 5\ 2\ 8\ 0 \\ \hline \end{array}$$

Subtracting

Year 5

Subtracting by counting back

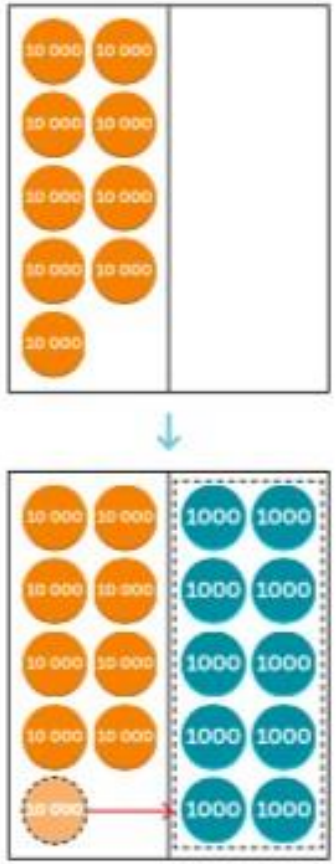


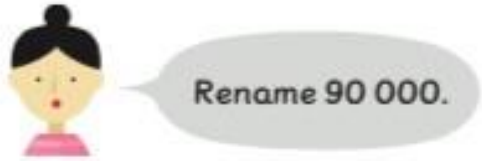
Subtracting – with regrouping

Year 5

Year 5 are expected to be secure with subtracting without regrouping

Place value counters to visually support column subtraction





90 000

80 000 10 000

	9 0	0 0 0
−	5 4	0 0 0

	8 10		
	~~9~~ ~~0~~	0 0 0
−	5 4	0 0 0

	8 10		
	~~9~~ ~~0~~	0 0 0
−	5 4	0 0 0
	3 6	0 0 0

80 123 − 79 654 = ☐

	8 0	1 2	3
−	7 9	6 5	4

	7 9	11		
	~~8~~ ~~0~~	~~1~~	2	3
−	7 9	6	5	4

		10		
	7 9	~~11~~ 12		
	~~8~~ ~~0~~	~~1~~ ~~2~~	3	
−	7 9	6	5	4

		10 11		
	7 9	~~11~~ ~~12~~ 13		
	~~8~~ ~~0~~	~~1~~ ~~2~~ ~~3~~		
−	7 9	6	5	4
		4	6	9

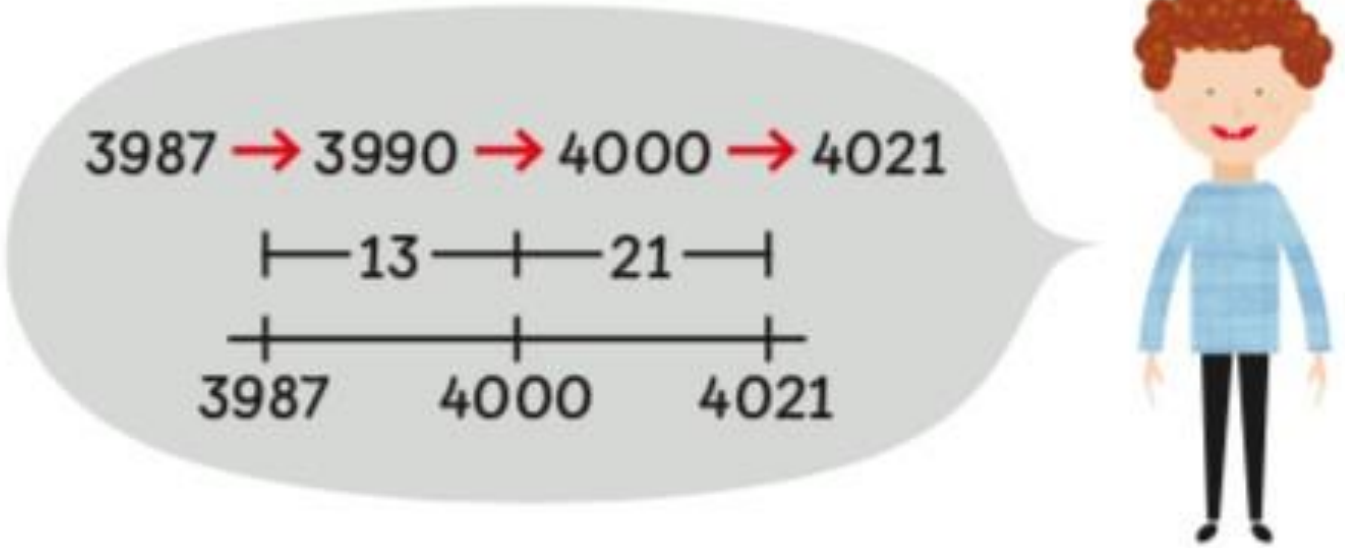
Regrouping in each place value column

Subtracting

Year 4 & Year 5

Learning mental strategies to subtract

4021 – 3987 = ☐



Using 4 operations on whole numbers

Year 6

Brackets
Indices
Multiplication Division
Addition Subtraction

1 wrote this expression:

$6 + 5 - 1 - 2 - 3 - 4$

When there are only + and −, calculate from left to right.

$6 + 5 - 1 - 2 - 3 - 4 = 1$

$6 + 5 = 11$

2 wrote this expression:

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

Perform the calculations in ( ) first.

$3 \times 4 + 2 - (6 + 5 + 1)$
$= 3 \times 4 + 2 - 12$
$= 12 + 2 - 12$
$= 14 - 12$
$= 2$

For + and −, calculate from left to right.

Multiply before adding.

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

3 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?

4 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 BIDMAS to help them solve problems where there is more than one operation in a calculation.

Bar modelling

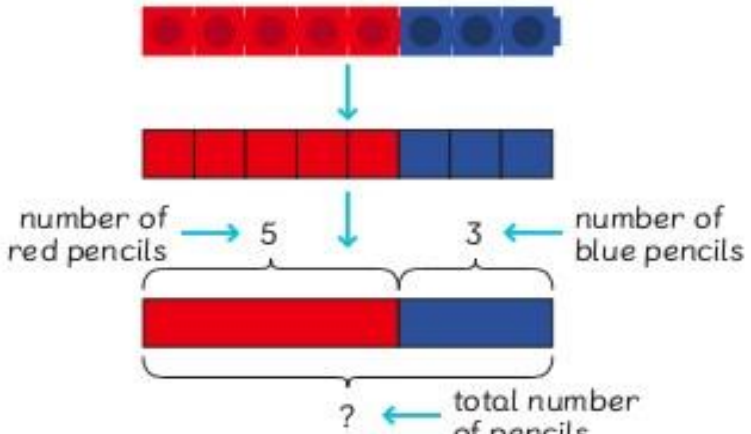
Applying addition and subtraction skills to word problems with bar models to assist

Year 3

Children will be taught that the numbers they are working with are too large to create practically so a bar model represents these numbers instead.

Concrete

Pictorial

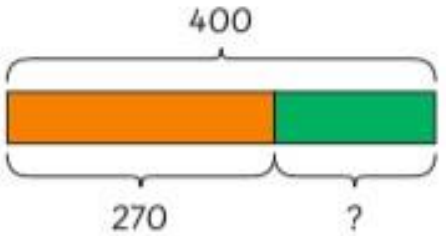


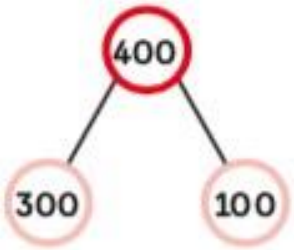
Abstract

5 + 3 = 8 or 3 + 5 = 8

There are 8 pencils altogether.

Subtract 270 from 400.





	h	t	o
	~~3~~ 4	~~10~~ 0	0
−	2	7	0
	1	3	0

400 − 270 = ☐

300 − 200 = ☐

100 − 70 = ☐

Hannah had 130 tarts left.

Comparative bar model

Bar modelling

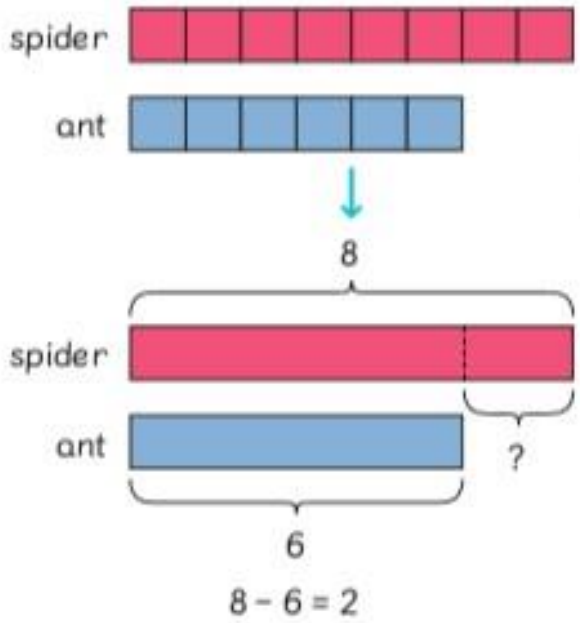
Year 3

Applying addition and subtraction skills to word problems with bar models to assist

Comparing two values

How many more legs does a spider have than an ant?

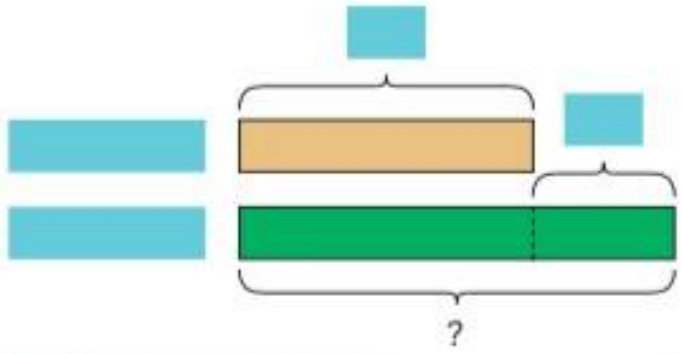
A spider has 8 legs.
An ant has 6 legs.



8 – 6 = 2

A spider has 2 more legs than an ant.

Lulu has 205 beads.
Holly has 40 more beads than Lulu.
How many beads does Holly have?



Holly has ▭ beads.

Part – part – whole bar model

Bar modelling

In Focus

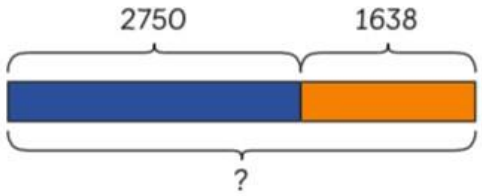
A baker made 2750 chocolate cookies and 1638 vanilla cookies.
He sold 3195 cookies altogether.
How many cookies did he have left?

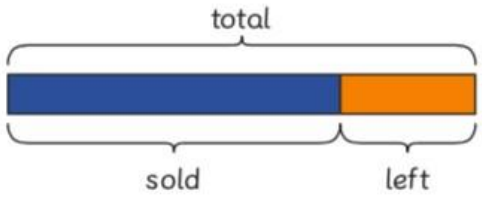
Understand the problem

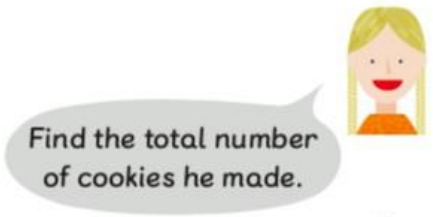
Who?	 baker
What?	  cookies

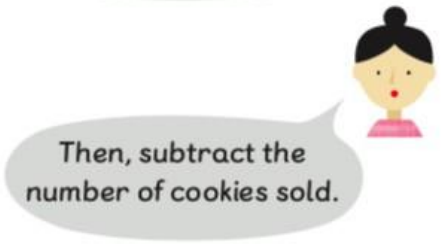
Complex multi-step word problems

Make a plan









Carry out the plan

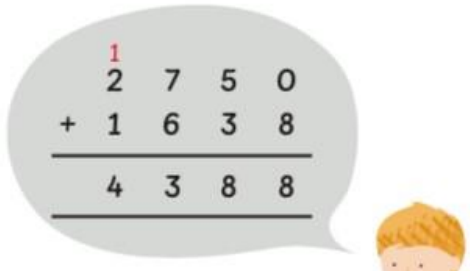
2750 + 1638 = 4388

The baker baked 4388 cookies.

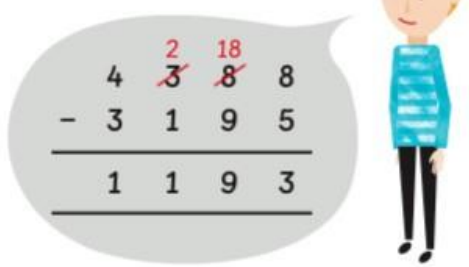
4388 − 3195 = 1193

He had 1193 cookies left.

Column addition and subtraction



$$\begin{array}{r} {\scriptstyle 1} \\ 2\ 7\ 5\ 0 \\ +\ 1\ 6\ 3\ 8 \\ \hline 4\ 3\ 8\ 8 \end{array}$$



$$\begin{array}{r} {\scriptstyle 2\ \ 18} \\ 4\ \cancel{3}\ \cancel{8}\ 8 \\ -\ 3\ 1\ 9\ 5 \\ \hline 1\ 1\ 9\ 3 \end{array}$$

Check

Cookies sold	3195
Cookies left	1193
Cookies baked	4388

$$\begin{array}{r} 3\ 1\ 9\ 5 \\ +\ 1\ 1\ 9\ 3 \\ \hline 4\ 3\ 8\ 8 \end{array}$$

Part – part – whole bar model

Year 4

Involves the skill of checking.

Bar modelling

Year 4

In Focus

On Saturday, 3018 people attended a funfair. 850 more people attended the funfair on Saturday than attended it on Sunday.

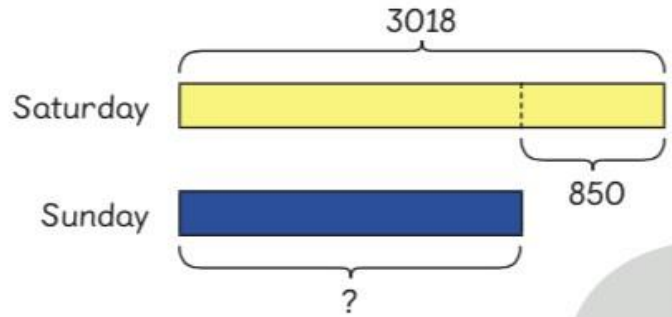
Altogether, how many people attended the funfair over the two days?

Understand the problem

Who?	 people
What?	funfair

Make a plan

Carry out the plan

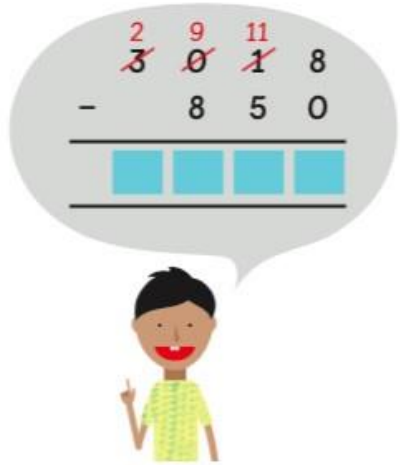


3018 − 850 = 2168

2168 people attended the funfair on Sunday.

			1	
Saturday	3	0	1	8
Sunday +	2	1	6	8
	5	1	8	6

3018 + 2168 = 5186

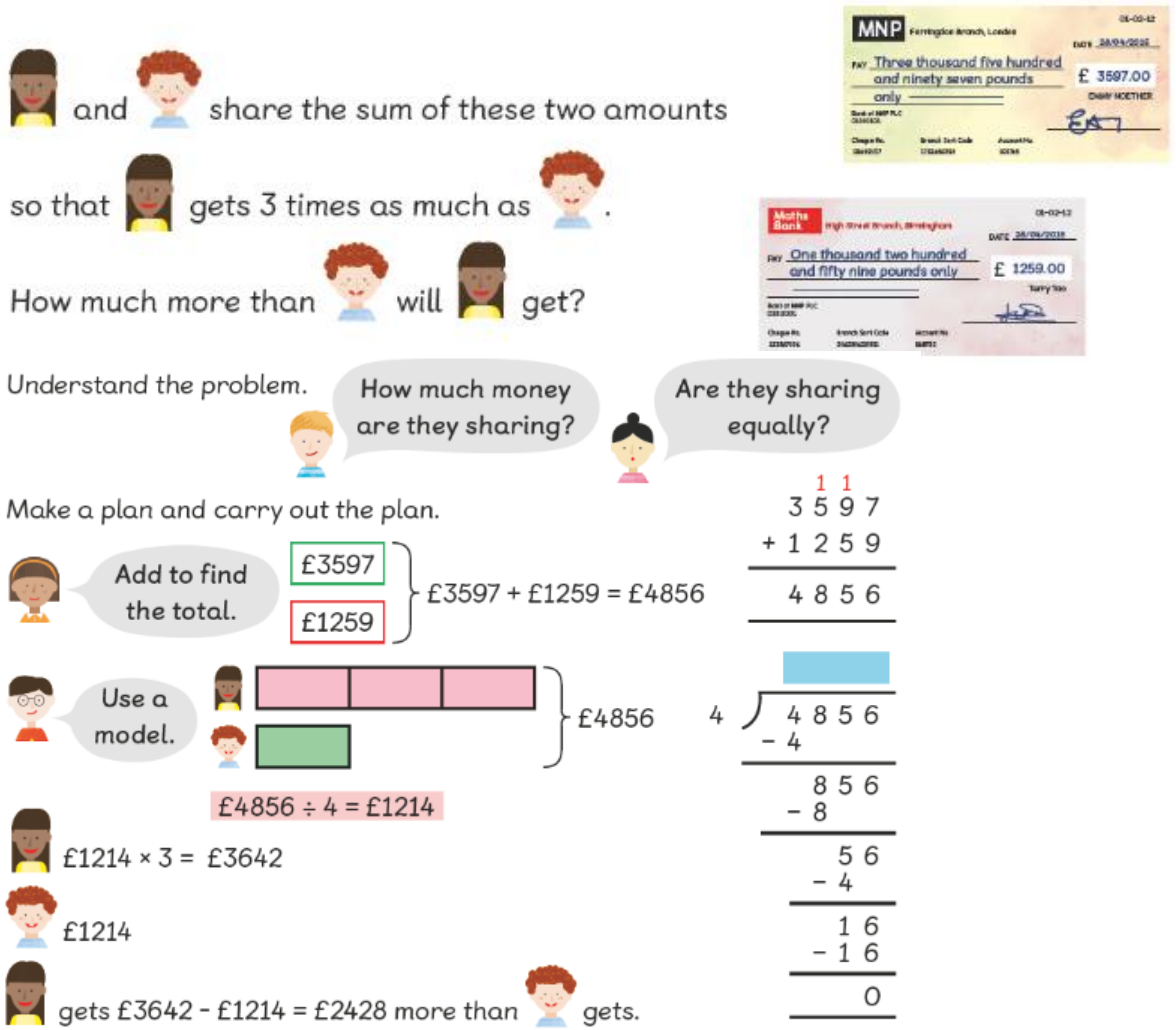


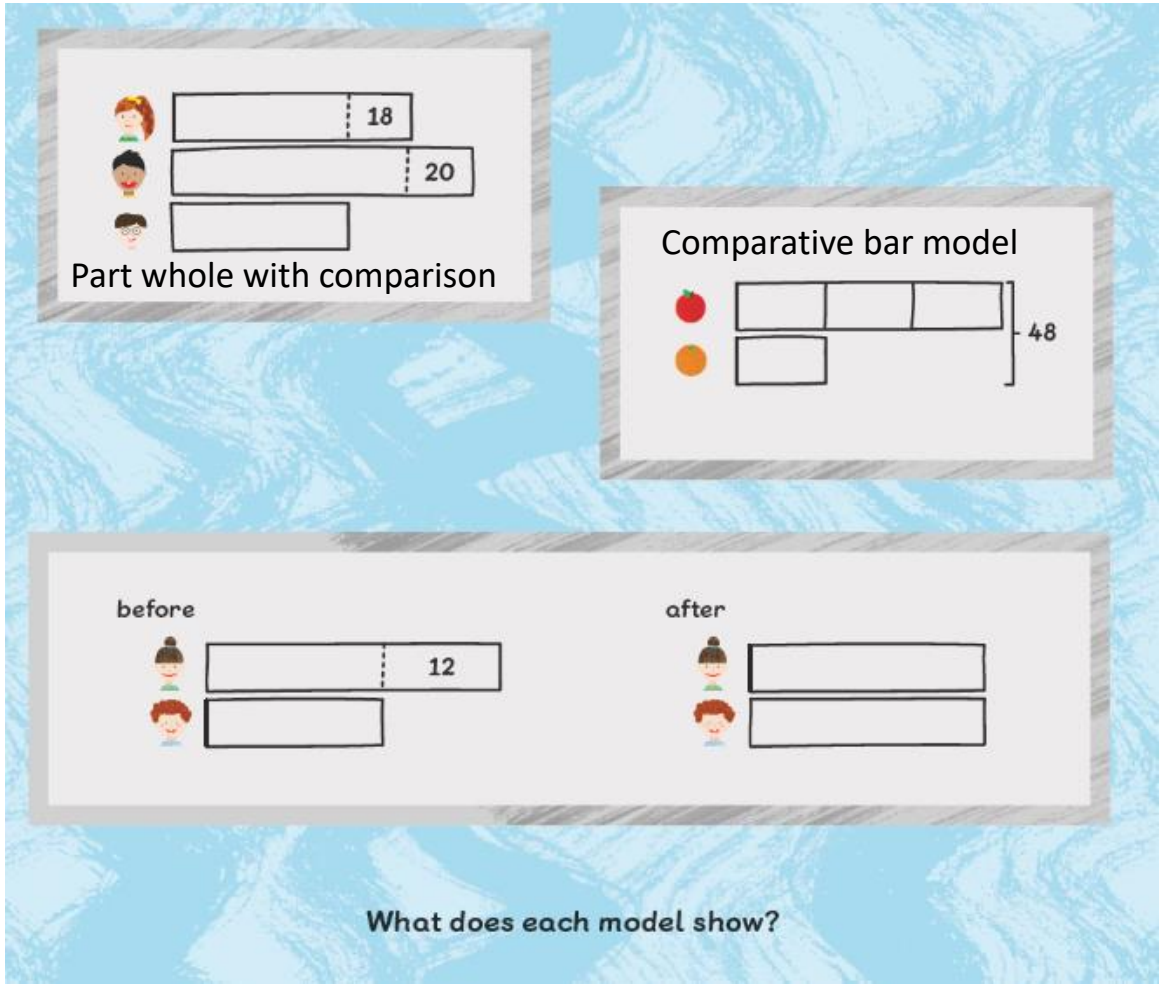
Comparative bar model

Bar modelling

Year 5

Children in year 5 will begin to use a range of different bar models to solve a range of problems





Bar modelling

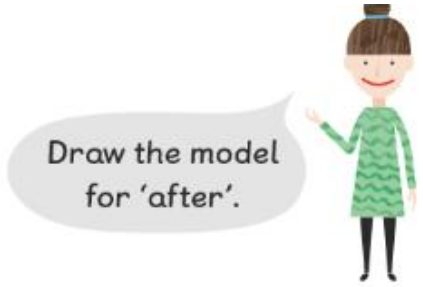
By year 6, children should be able to use a range of different types of bar models to solve word problems

Year 6

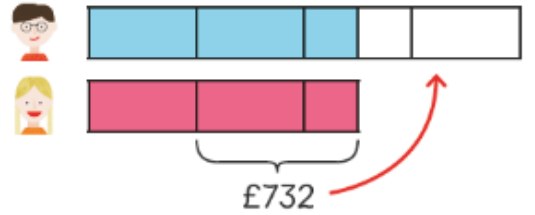
Understand	Plan	Do
The population of Atos is three times that of Bem.	Let's draw bar models.	Atos Bem
The population of Atos is 30 000 more than that of Cinder.		Atos Cinder 30 000
The total population is 390 000.		Atos Bem Cinder 390 000 30 000

At first, and had the same amount of money. After gave £732, had 4 times as much money as had.

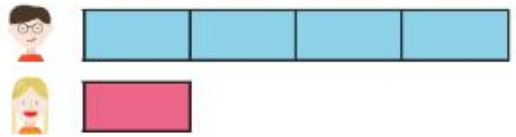
How much money did and have altogether?

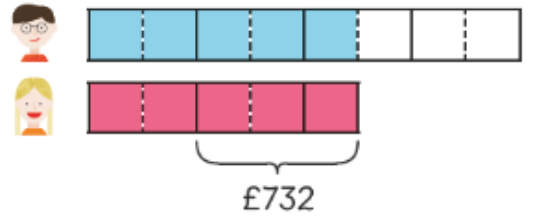


before



after





3 units = £732

1 unit = £732 ÷ 3

= £244

Multiplication

Year 3 3, 4 and 8 times tables

Equal groups

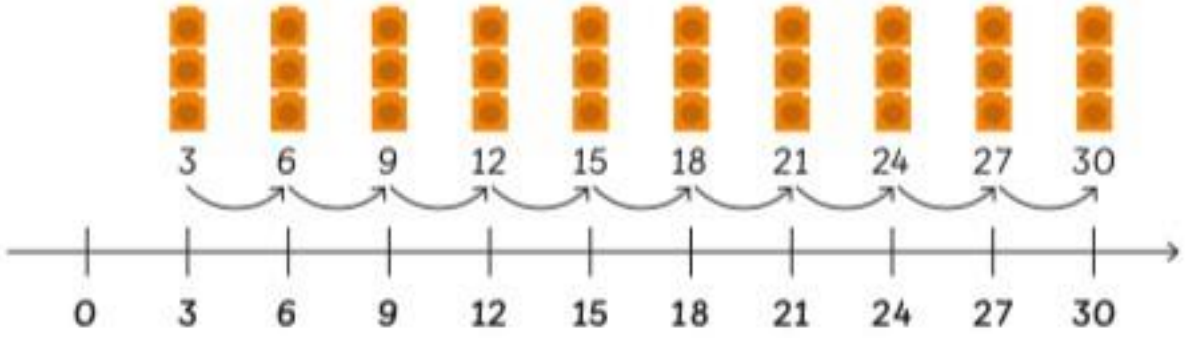
1 group of 3
1 × 3 = 3

2 groups of 3
2 × 3 = 6

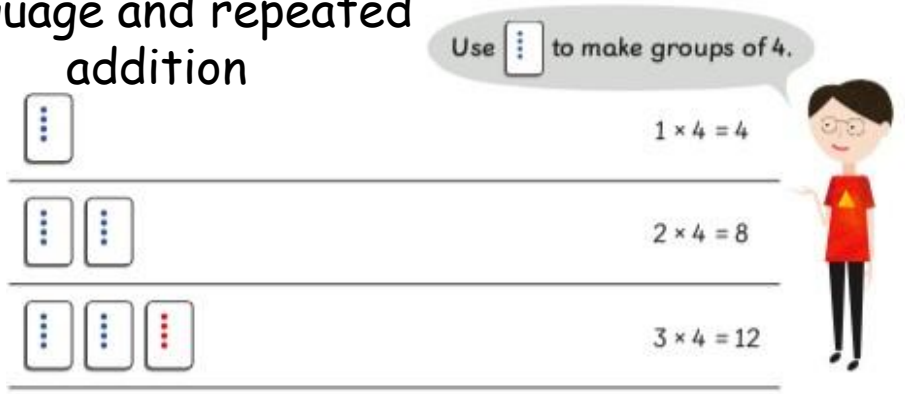
3 groups of 3
3 × 3 = 9

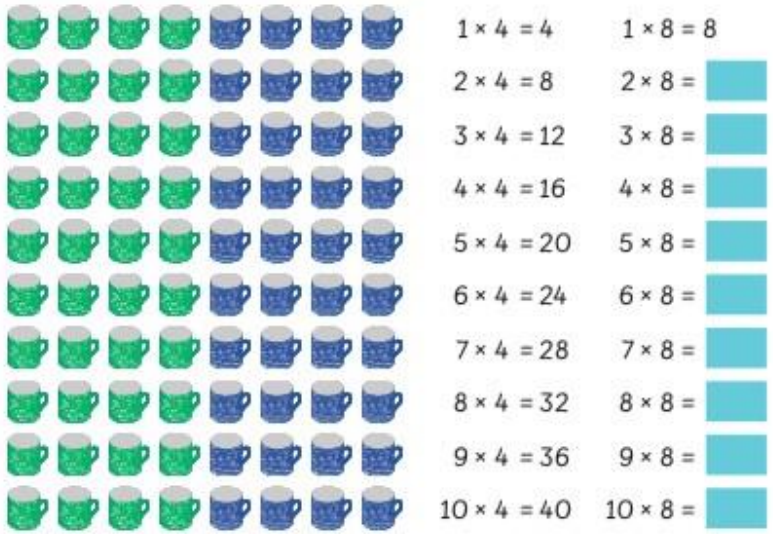
Count in threes.

Number lines and hundred squares



Language and repeated addition





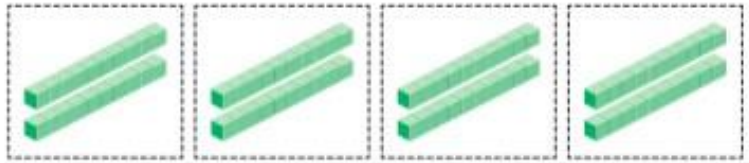
Further multiplication Year 3

3, 4 and 8 times tables

1. Using place value

Multiply 2 ones by 4
2 × 4 = 8

	o
	2
×	4
	8

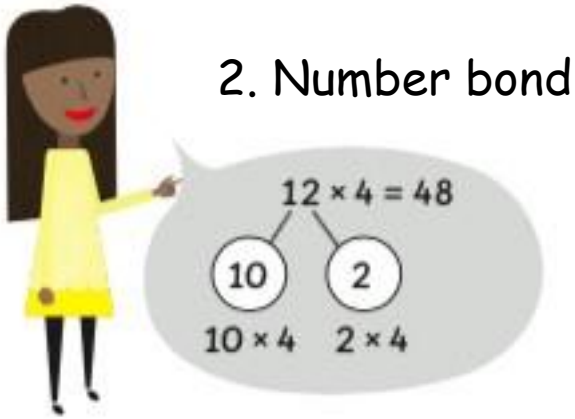


Multiply 2 tens by 4
20 × 4 = 80

	t	o
	2	0
×		4
	8	0

There are 80 oranges in the 4 boxes altogether.

2. Number bond method



3. Bridged column multiplication

	t	o
	2	3
×		4
	1	2
+	8	0
	9	2

4. Short multiplication

Step 1

	t	o
	2	3
×		8
		4

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

Step 2

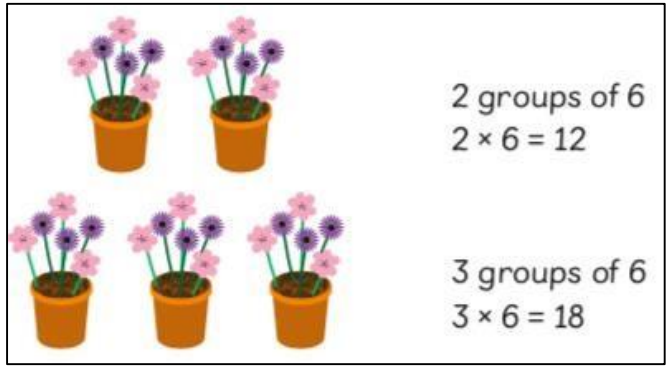
	h	t	o
		2	3
×			8
	1	8	4

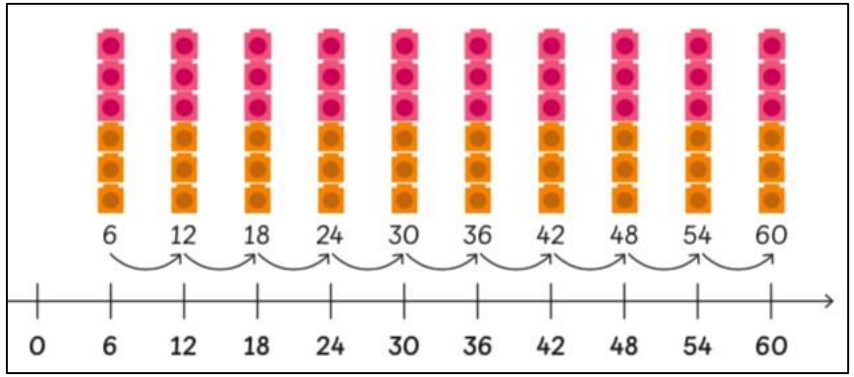
23 × 8 = 184

The product of 23 and 8 is 184.

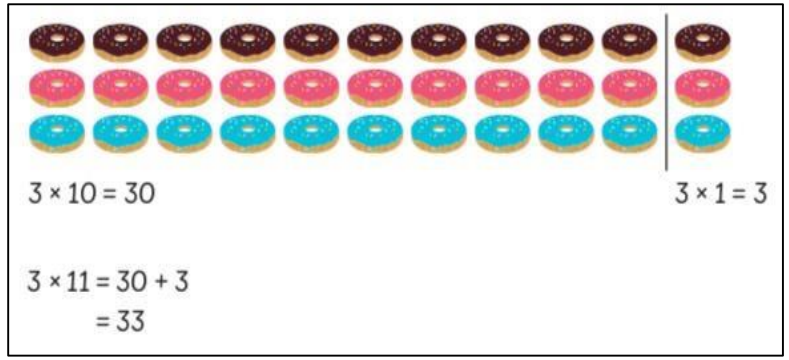
2 tens × 8 = 16 tens
16 tens + 2 tens = 18 tens

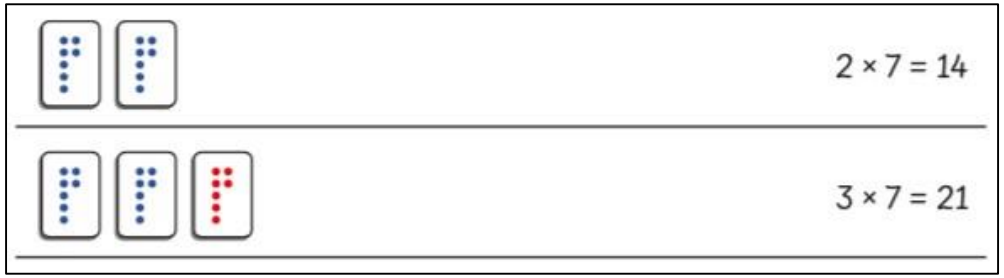
Multiplication Year 4 7, 9, 11 and 12 times tables

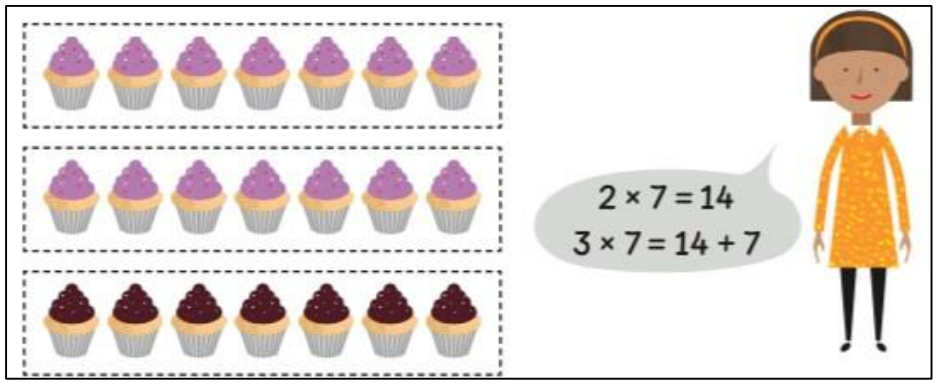


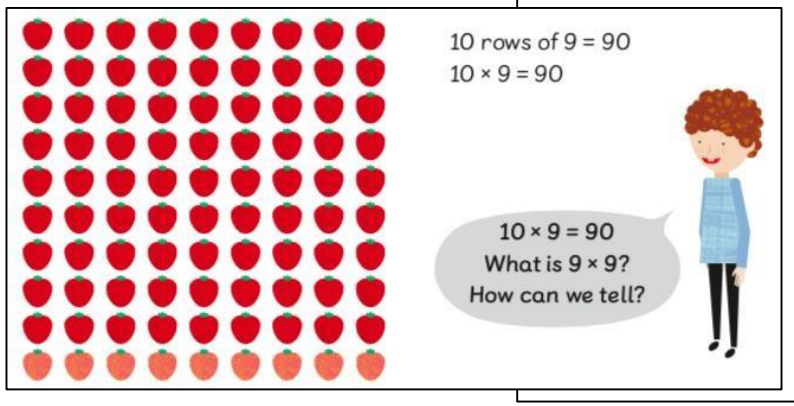


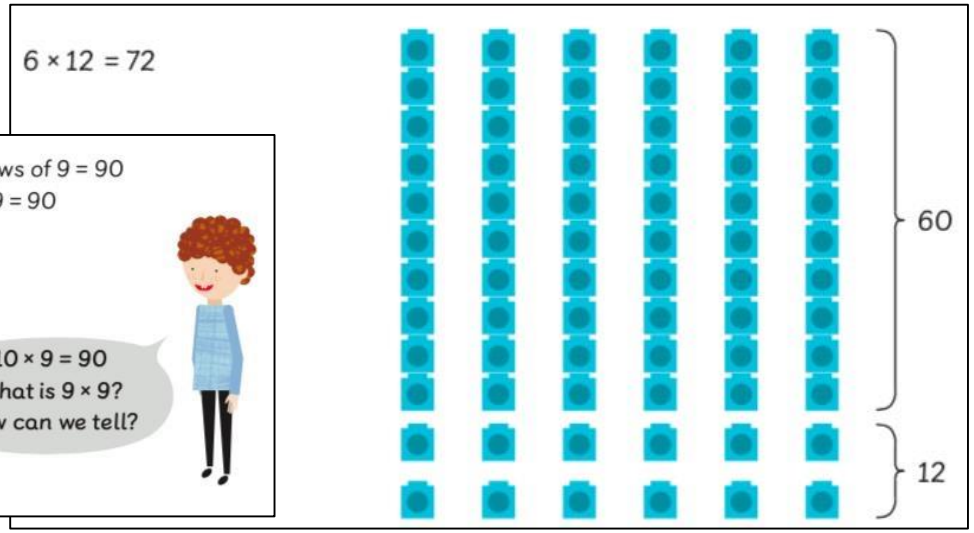
By the end of Year 4, children are expected to know ALL of their times tables up to 12 x 12











Further multiplication

Year 4 7, 9, 11 and 12 times tables

$$\begin{array}{rrr} & 2 & 3 \\ \times & & 6 \\ \hline & 1 & 8 \\ + & 1\,2 & 0 \\ \hline & 1\,3 & 8 \\ \hline \end{array}$$

$$\begin{array}{rrr} & {\scriptstyle 1}\,2 & 3 \\ \times & & 6 \\ \hline & 1\,3 & 8 \\ \hline \end{array}$$

What is the product of 9 and 30?

$9 \times 30 =$ ☐

Method 1

30
30
30
30
30
30
30
30
30
+ 30

Method 2

$9 \times 3 = 27$
9×3 tens $= 27$ tens
$9 \times 30 = 270$

Method 3

$9 \times 30 = 9 \times 3 \times 10$
$= 9 \times 3 \times 10$
$= 27 \times 10$
$= 27$ tens
$= 270$

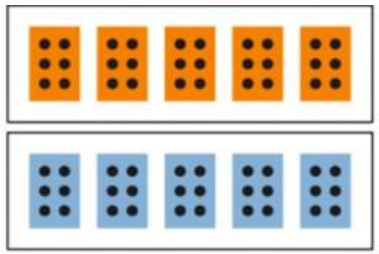
Which method is best?

10	10	10
10	10	10
10	10	10
10	10	10
10	10	10
10	10	10
10	10	10
10	10	10
10	10	10

$2 \times 5 \times 6$

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

$2 \times 5 = 10$



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

Further multiplication

Year 4

	4	7	3
×			2
			6
	1	4	0
+	8	0	0
	9	4	6

Recap:

Bridged and short multiplication

	1		
	4	7	3
×			2
	9	4	6

New: multiplying by multiples of 100

7 × 300 = ☐

Method 1

300
300
300
300
300
300
300
+ 300
2100

Method 2

7 × 3 = 21
7 × 3 hundreds = 21 hundreds
7 × 300 = 2100

Method 3

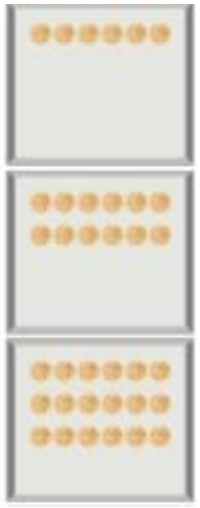
7 × 300 = 7 × 3 × 100
= 7 × 3 × 100
= 21 × 100
= 21 hundreds
= 2100

21 hundreds = 2100

Which method is best?

Multiplication Year 5 All times tables to 12 x 12

Finding multiples



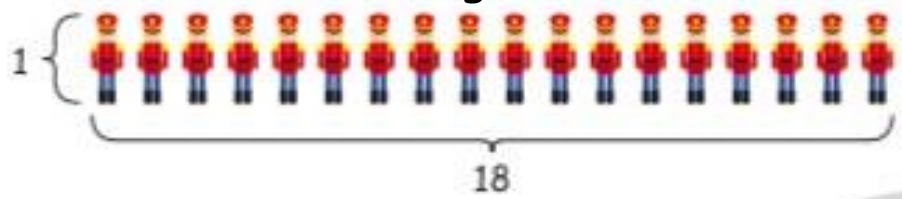
$1 \times 6 = 6$

$2 \times 6 = 12$

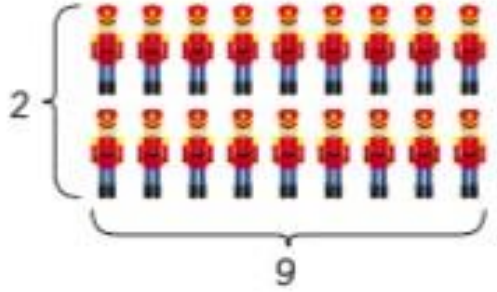
$3 \times 6 = 18$

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



$18 = 1 \times 18$



$18 = 2 \times 9$

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.

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

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

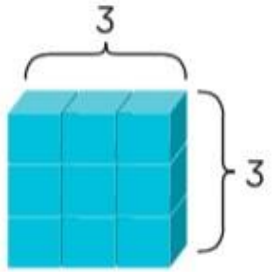
$48 = 3 \times (16)$ $\quad$ $64 = (4) \times (16)$

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

$48 = 6 \times (8)$

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

Square and cube numbers



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

Further multiplication

Year 5

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

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

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

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

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

Recap:
Bridged and short multiplication but with larger numbers

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

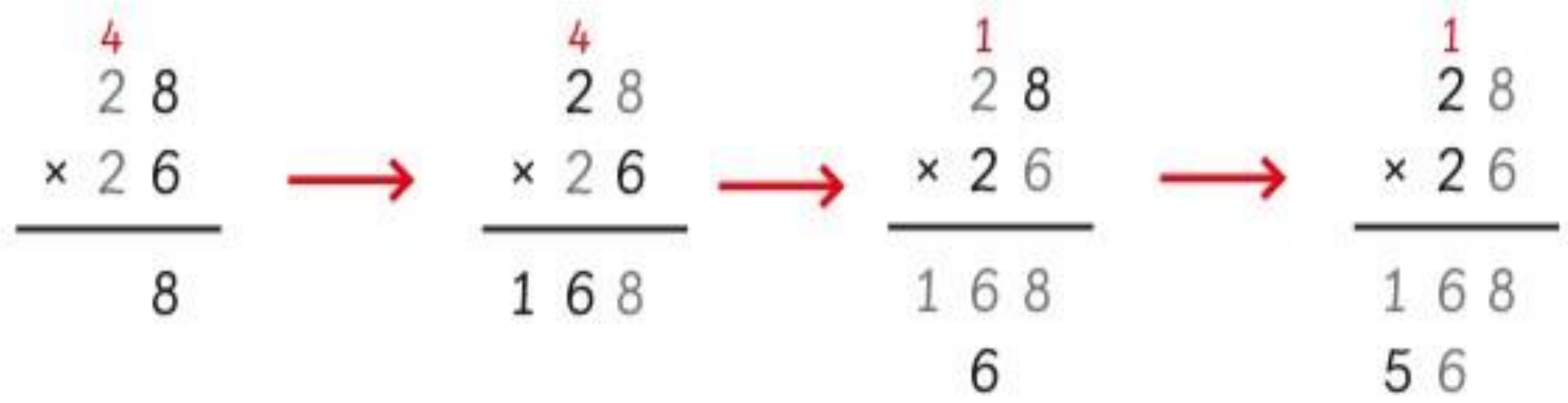
$2718 \times 4 = 10\,872$

Further multiplication

Year 5

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

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



Multiplication

Year 5

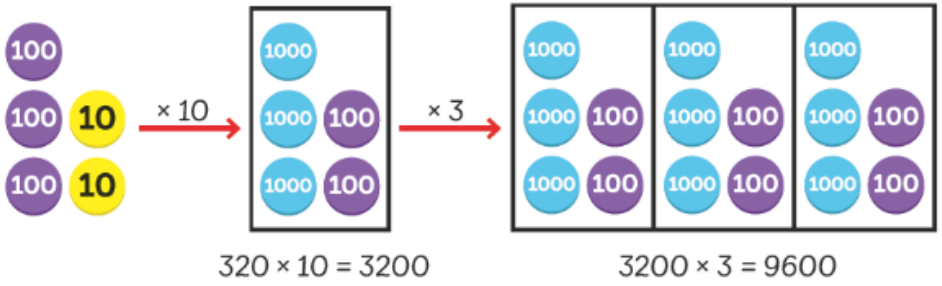
12×10	12×100	12×1000
10 10 10 10 10 10 10 10 10 10 10 10	100 100 100 100 100 100 100 100 100 100 100 100	1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000
$12 \times 10 = 12 \times 1$ ten $= 12$ tens	$12 \times 100 = 12 \times 1$ hundred $= 12$ hundreds	$12 \times 1000 = 12 \times 1$ thousand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

Multiplication

Year 6

Multiplying 3 digit numbers by 2 digit numbers

320 × 31 = ☐



320 × 10 = 3200

3200 × 3 = 9600

320 × 30 = 9600

320 × 1 = 320

320 × 31 = 9920

Using partitioning to multiply

Multiplying using long multiplication

320 × 31 = ☐

$$\begin{array}{r} 320 \\ \times\ 30 \\ \hline 9600 \end{array} \qquad \begin{array}{r} 320 \\ \times\ 1 \\ \hline 320 \end{array} \rightarrow \begin{array}{r} 320 \\ \times\ 31 \\ \hline 9600 \\ +\ 320 \\ \hline 9920 \end{array}$$

114 × 24 = ☐

$$\begin{array}{r} 114 \\ \times\ 20 \\ \hline 2280 \end{array} \qquad \begin{array}{r} 114 \\ \times\ 4 \\ \hline 456 \end{array} \rightarrow \begin{array}{r} 114 \\ \times\ 24 \\ \hline 2280 \\ +\ 456 \\ \hline 2736 \end{array}$$

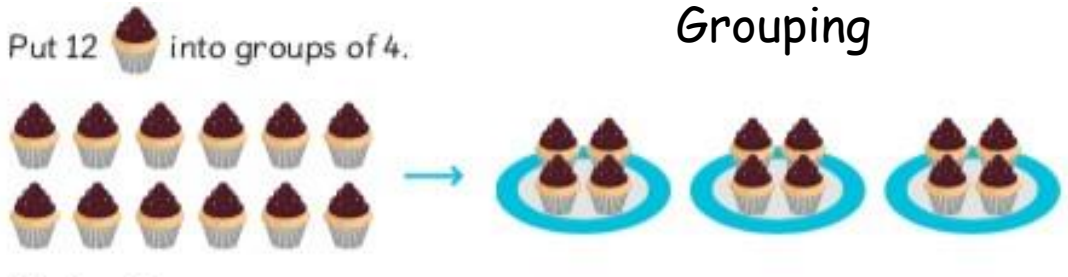
2280 → 114 × 20

456 → 114 × 4

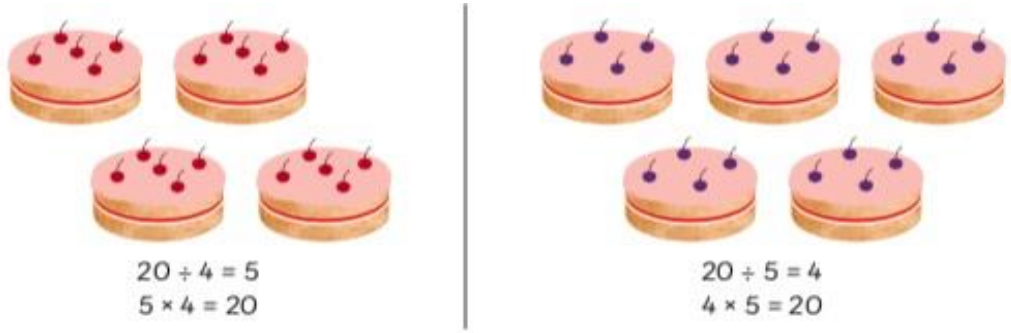
Division

Year 3 3, 4 and 8 times tables

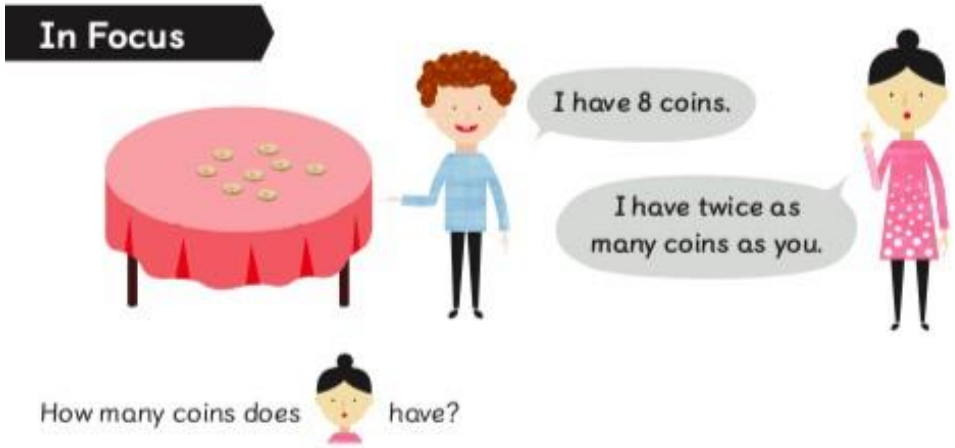
Grouping



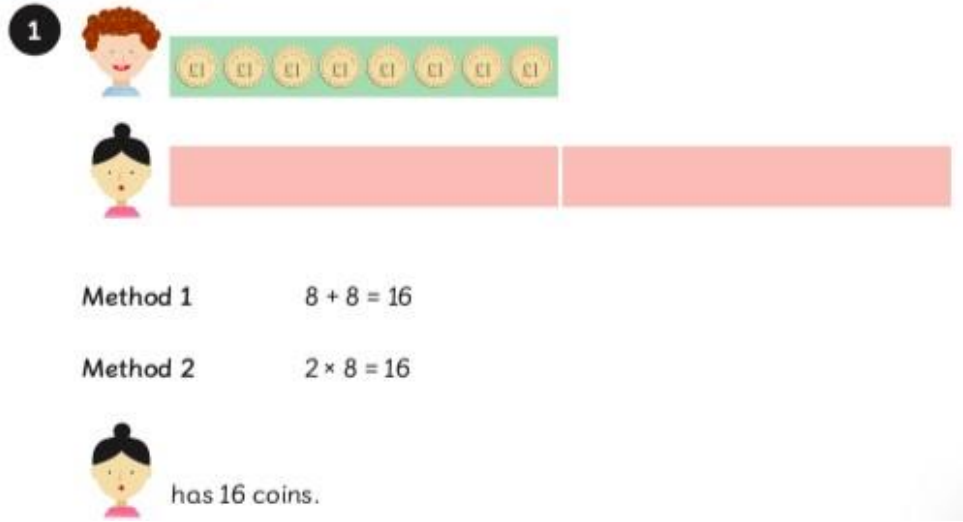
'Groups of' vs 'equal groups'



Family of commutative and inverse calculations



Word problems with bar models



Further division

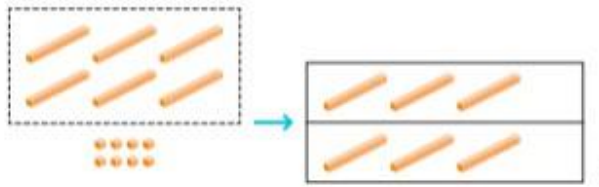
Year 3

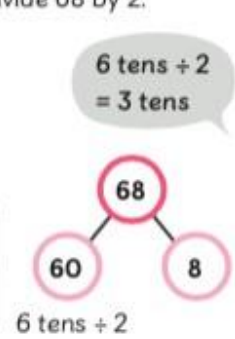
1. Number bond method

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

$68 \div 2 =$ ☐

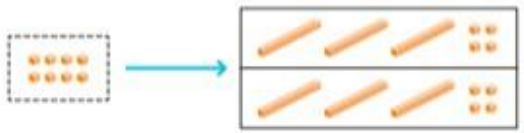
Step 1 Divide 6 tens by 2.

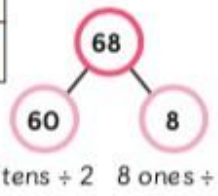




6 tens ÷ 2

Step 2 Divide 8 ones by 2.



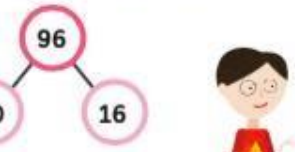


6 tens ÷ 2 8 ones ÷ 2

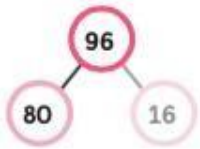
Step 3 Add the results.

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

Each person gets 34 sweets.



First, I take 80 from 96. Then, I take 16 from the remaining 16.



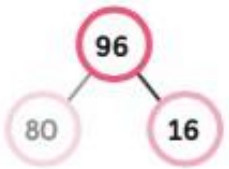
8 tens ÷ 8 = 1 ten

1 ten

	1	2
8	9	6
	− 8	0
	1	6
	− 1	6
		0

	1	2
8	9	6
	− 8	0
	1	6
	− 1	6
		0

2. Long division method



16 ones ÷ 8 = 2 ones

	1	2	2 ones
8	9	6	
	− 8	0	
	1	6	
	− 1	6	
		0	

1 ten + 2 ones = 12

96 ÷ 8 = 12

	1	2
8	9	6
	− 8	0
	1	6
	− 1	6
		0

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

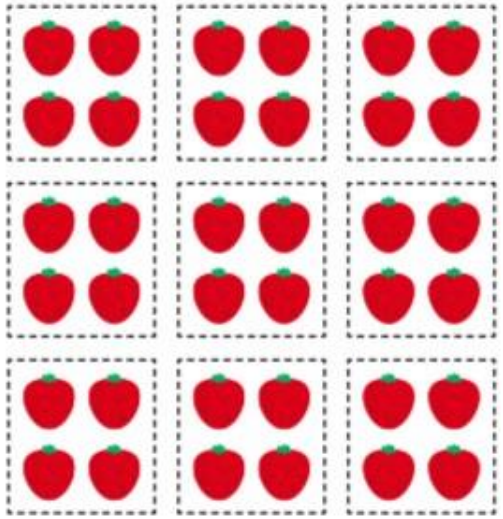
Division

Year 4 6, 7, 9, 11 and 12 times tables

36 ÷ 9 = ?

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

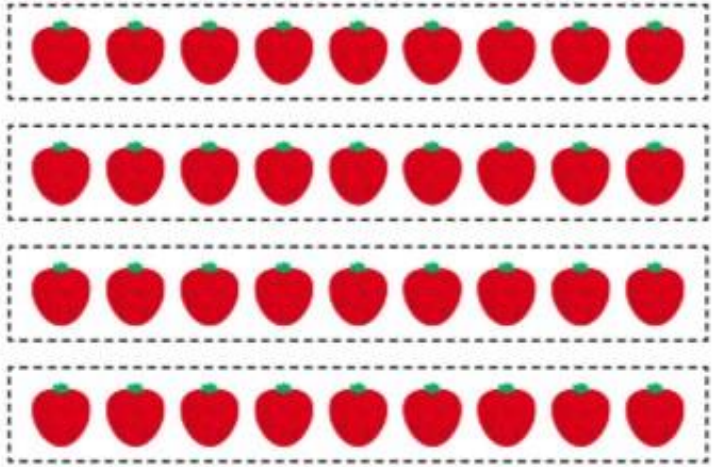
Placing into 9 equal groups



36 ÷ 9 = 4

Each group has 4 strawberries.

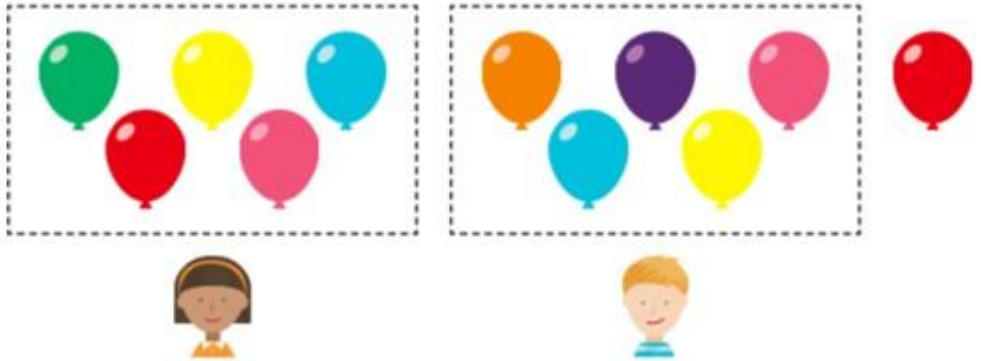
Placing in groups of 9



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 division

Year 4

$4 \div 4 =$ ▢

$4 \div 4 = 1$

$40 \div 4 =$ ▢

$40 \div 4 = 10$

$400 \div 4 =$ ▢

$400 \div 4 = 100$

Method 1

Method 2

4 hundreds ÷ 4

8 ones ÷ 4

$$
\begin{array}{r|l}
4 & 408 \\
-\,4 & \\
\hline
 & 8 \\
- & 8 \\
\hline
 & 0
\end{array}
\qquad
\begin{array}{r|l}
4 & 408 \\
-\,4 & 1 \\
\hline
 & 8 \\
- & 8 \\
\hline
 & 0
\end{array}
\qquad
\begin{array}{r|l}
4 & 408 \\
-\,4 & 102 \\
\hline
 & 8 \\
- & 8 \\
\hline
 & 0
\end{array}
$$

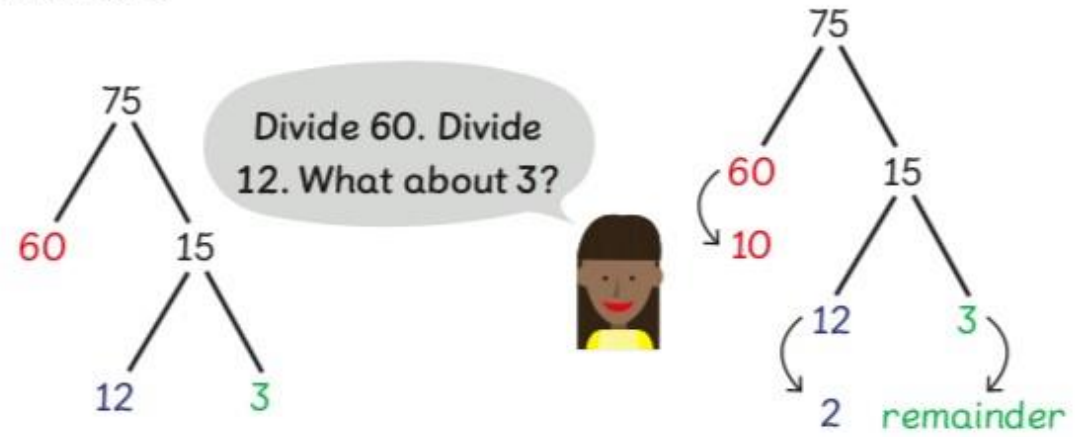
$408 \div 4 = 102$

Further division

Year 4

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

Method 1



Method 2

6 tens ÷ 6

$$\begin{array}{r} 1 \\ 6\overline{)\,7\;5} \\ -\;6 \\ \hline 1\;5 \\ -\;1\;2 \\ \hline 3 \end{array}$$

12 ones ÷ 6

$$\begin{array}{r} 1\;2 \\ 6\overline{)\,7\;5} \\ -\;6 \\ \hline 1\;5 \\ -\;1\;2 \\ \hline 3 \end{array}$$

remainder

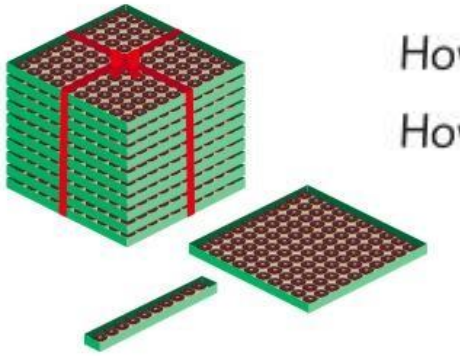
75 ÷ 6 = 12 remainder 3

quotient

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

Move onto problem solving involving these methods and bar models.

Division Year 5



How many can we get from 4792 ?

How many can we get from 4792 ?

How many can we get from 4792 ?

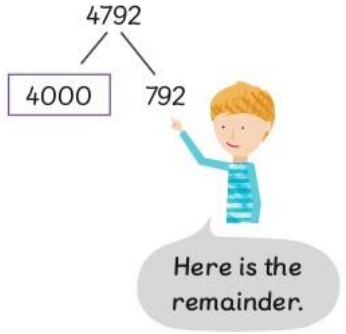
Dividing by 1000

How many can we get from 4792?

contains 1000 pieces.

There are 4 in 4000.

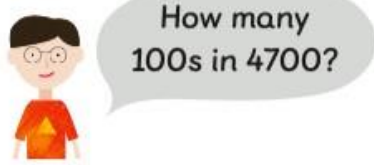
4000 ÷ 1000 = 4
4 thousands ÷ 1 thousand = 4



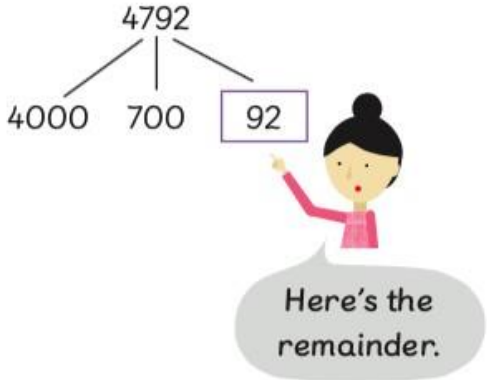
Dividing by 100

How many can we get from 4792?

contains 100 pieces.



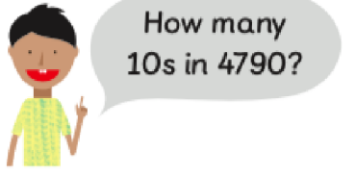
4700 ÷ 100 = 47
47 hundreds ÷ 1 hundred = 47



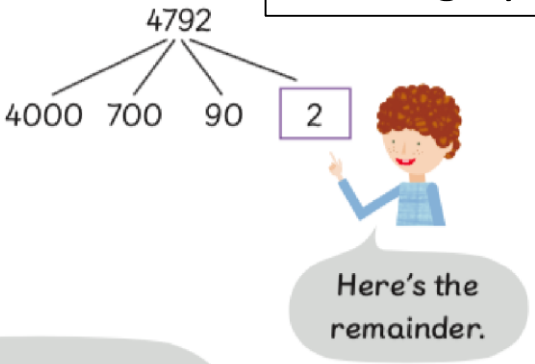
Dividing by 10

How many can we get from 4792?

contains 10 pieces.

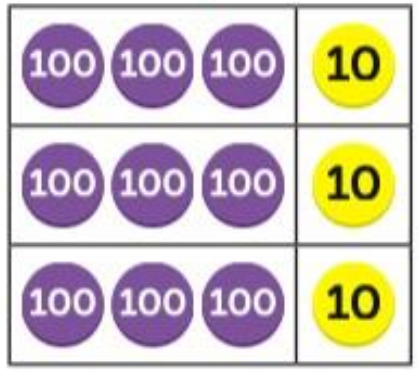


4790 ÷ 10 = 479
479 tens ÷ 1 ten = 479

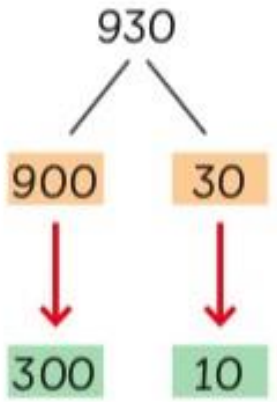


Further division Year 5

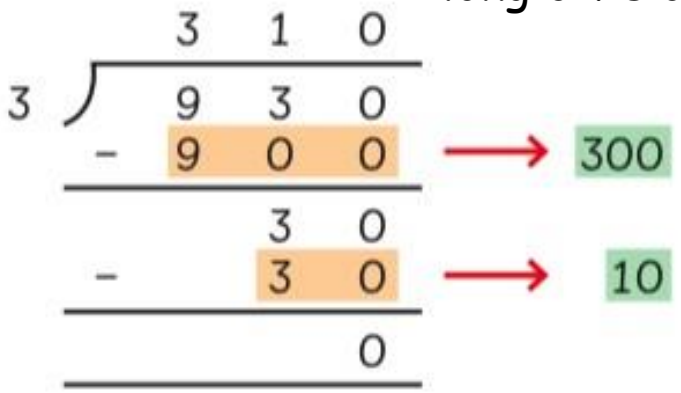
930 ÷ 3



Dividing with place value counters



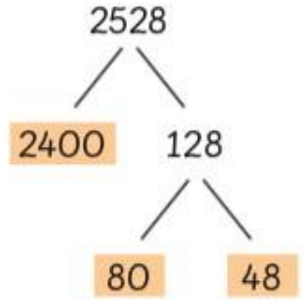
Dividing a number with 3-digits using long division

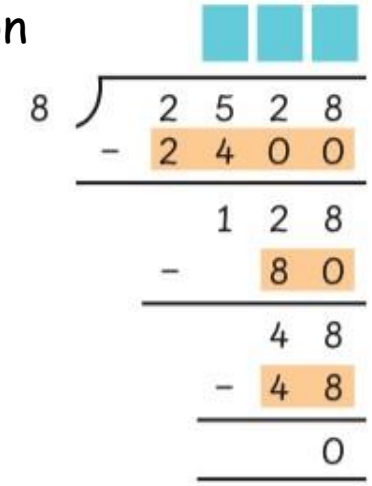


Short division

2528 ml ÷ 8 = ▭

Dividing a number with 4-digits using long division





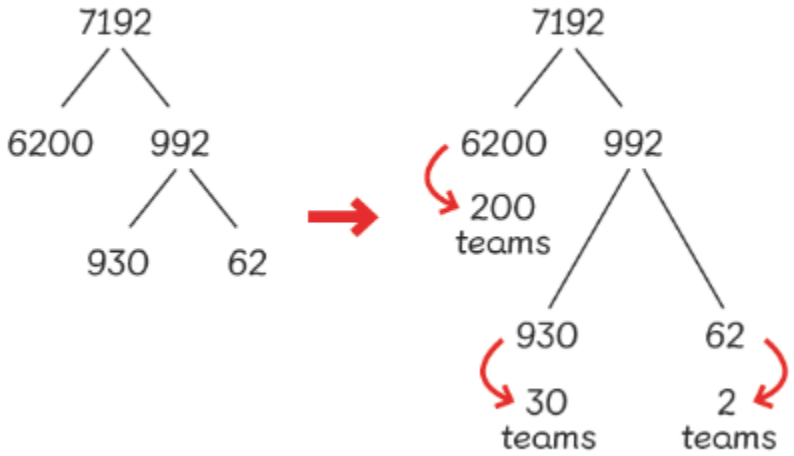
Division

Year 6

Dividing 3 and 4 digit numbers by 2 digit numbers.

7192 ÷ 31 = ☐

Using partitioning to divide.



7192 ÷ 31 = 232

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		

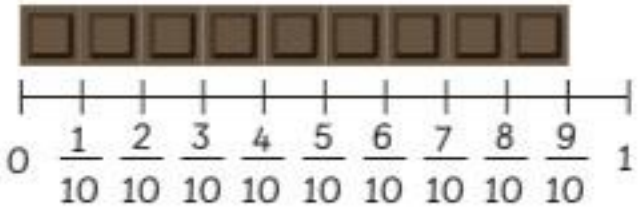
31) 7 1 9 2	
− 6 2 0 0	→ 6200 ÷ 31 = 200
9 9 2	
− 9 3 0	→ 930 ÷ 31 = 30
6 2	
− 6 2	→ 62 ÷ 31 = 2
0	

Using long division to divide.

Fractions

Year 3

Tenths

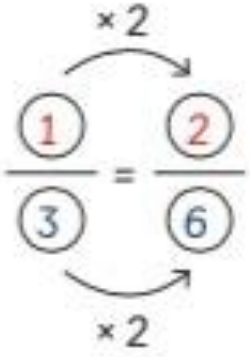


9 tenths

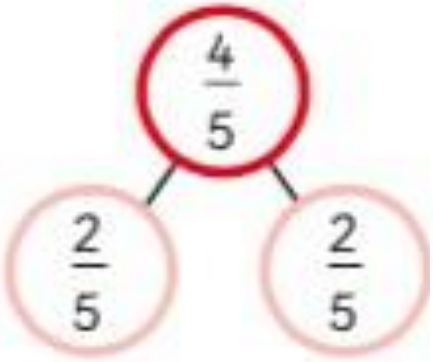
Finding equivalent and simplifying fractions

$\frac{6}{8}$

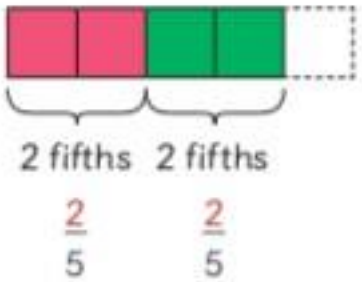
$\frac{3}{4}$



Adding fractions

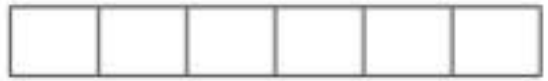


Add $\frac{2}{5}$ and $\frac{2}{5}$.



Finding fractions of amounts and sharing more than one

$\frac{5}{6}$ of 18 =

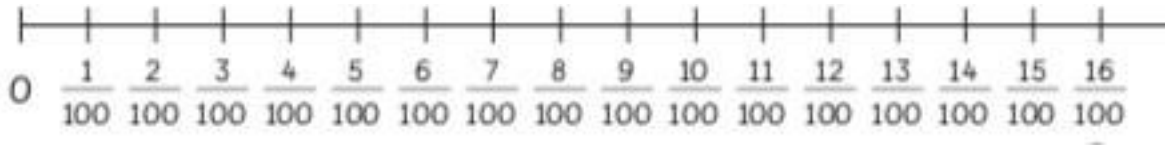


Move onto problem solving involving these methods and bar models

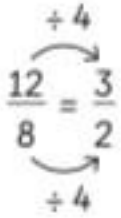
Fractions

Year 4

Hundredths



Equivalent and simplified fractions



8 smaller parts become 2 larger parts.

4 smaller parts become 2 larger parts.

Mixed and improper fractions

There are 2 whole cakes and 5 sixths of a cake.

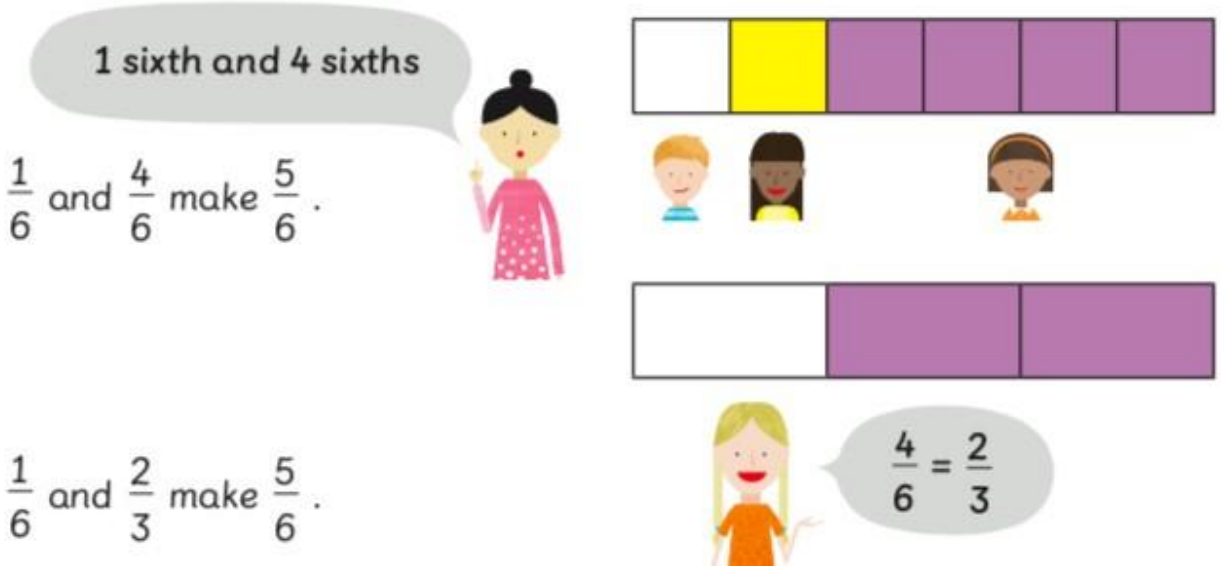
$2 + \frac{5}{6} = 2\frac{5}{6}$

$2\frac{5}{6}$ is a mixed number.

Also: adding and subtracting fractions then finding the simplified form of the answering

Fractions Year 5

Improper fractions, mixed numbers and simplifying



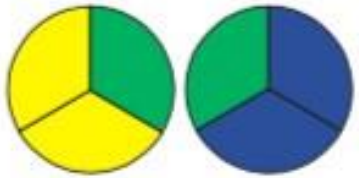
Adding fraction pairs before adding fractions with different denominators

Sharing objects to write as improper and mixed numbers

$5 \div 3 = 1\frac{2}{3}$

3 apples shared equally among 3 friends.

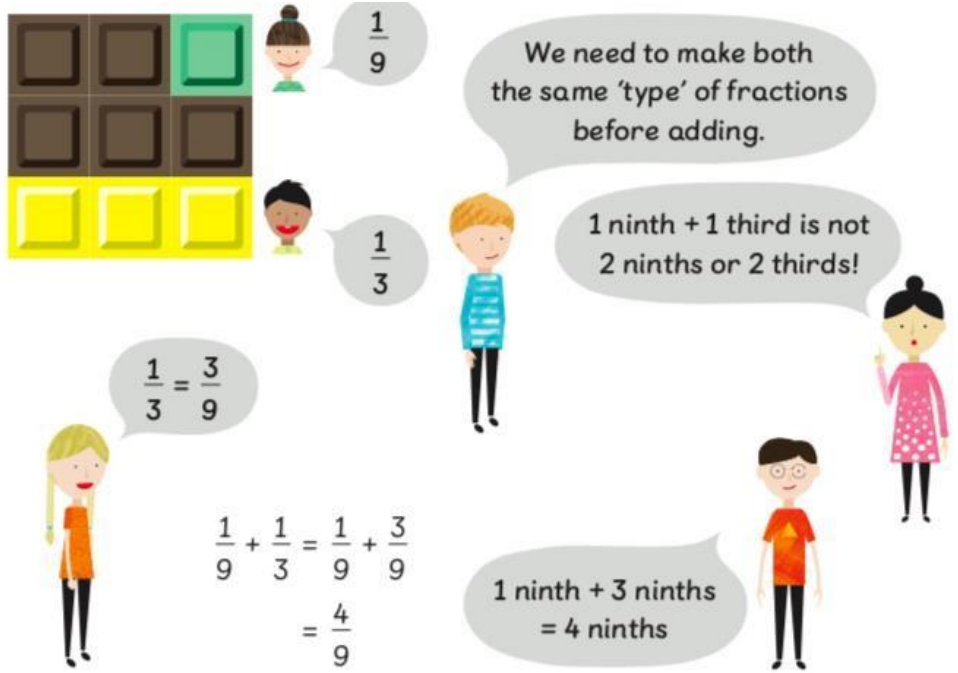
$3 \div 3 = 1$



The remaining 2 apples are shared equally among 3 friends.

$2 \div 3 = \frac{2}{3}$

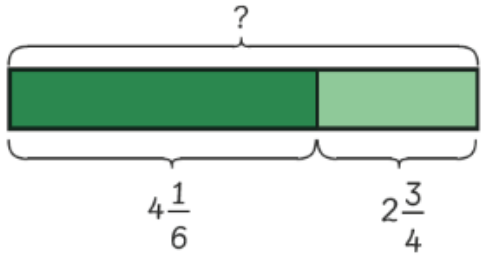
Making denominators the same and simplifying the answers.



Fractions

Year 6

$4\frac{1}{6} + 2\frac{3}{4} = \square$



Adding mixed numbers, improper fractions and proper fractions with different denominators

$4\frac{1}{6} + 2\frac{3}{4} = 4\frac{2}{12} + 2\frac{9}{12}$

$= 6\frac{11}{12}$

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

$\frac{3}{4} = \frac{9}{12}$

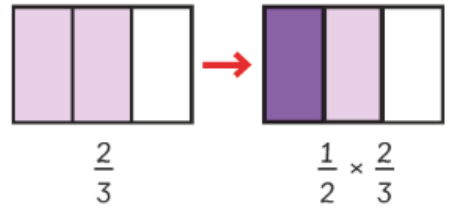
Why did we use 12 as a common denominator?

What if it is $4\frac{5}{6} + 2\frac{3}{4}$?

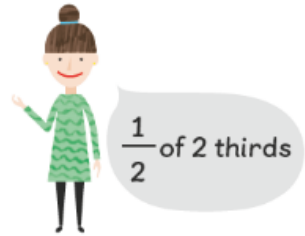
has a mass of $6\frac{11}{12}$ kg.

Multiplying fractions by fractions. Moving on from multiplying fractions by whole numbers

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

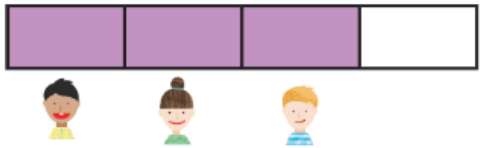


$\frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$



$\frac{1}{2}$ of 2 thirds

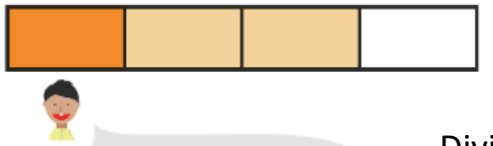
$\frac{3}{4} \div 3 = \frac{\square}{\square}$



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

Each person gets $\frac{1}{4}$ of the bar of chocolate.

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



I receive a fraction of $\frac{3}{4}$ of the bar.

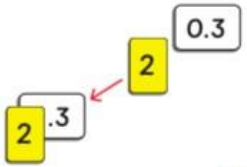
$\frac{3}{4} \div 3 = \frac{1}{3} \times \frac{3}{4} = \frac{\square}{\square}$

Dividing fractions by whole numbers

Decimals

Year 4

1	0.1 0.1
1	0.1

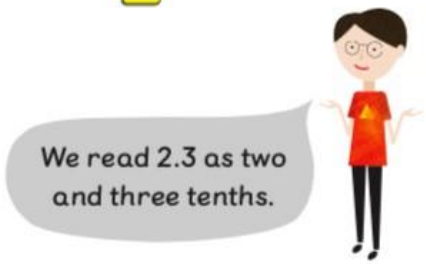


ones	tenths
2	3

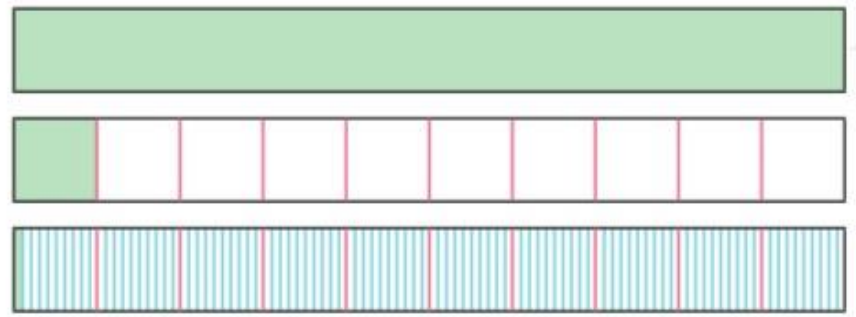
2 ones + 3 tenths
= 2 + 0.3
= 2.3

The digit 2 stands for 2 ones.

The digit 3 stand for 3 tenths.



tenths



Other areas covered by decimals:

- Comparing and ordering
- Rounding
- Number patterns
- Dividing whole numbers

tens	ones	tenths	hundredths
0	8	1	3

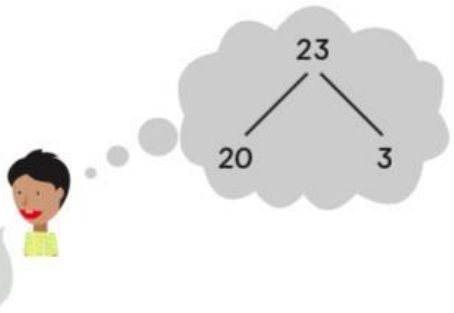
tens	ones	tenths	hundredths
0	3	1	8

The digit 3 stands for 3.

The digit 1 stands for $\frac{1}{10}$.

The digit 8 stands for $\frac{8}{100}$.

20 ÷ 10 = 2
3 ÷ 10 = 0.3
23 ÷ 10 = 2.3



14 ÷ 100 = ▭

10 ÷ 100 = 0.1
4 ÷ 100 = 0.04
14 ÷ 100 = 0.14

hundredths

tens	ones	tenths
2	3	

÷ 10 →

tens	ones	tenths
	2	3

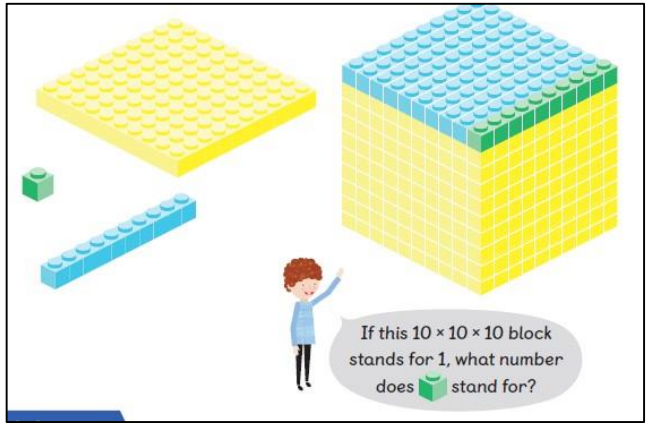
tens	ones	tenths	hundredths
1	4		

÷ 100 →

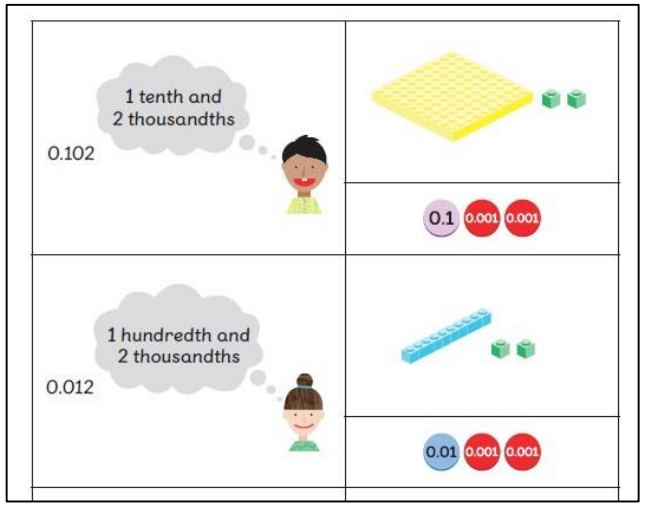
tens	ones	tenths	hundredths
	0	1	4

Decimals

Year 5

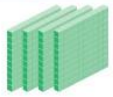
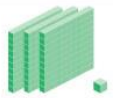


thousandths

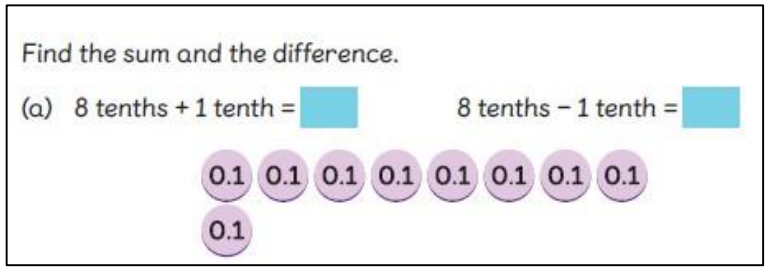


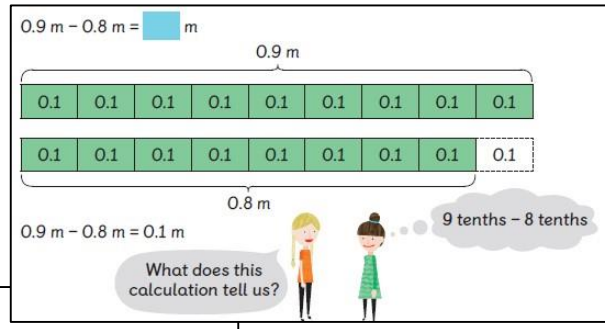
Other areas covered by decimals:

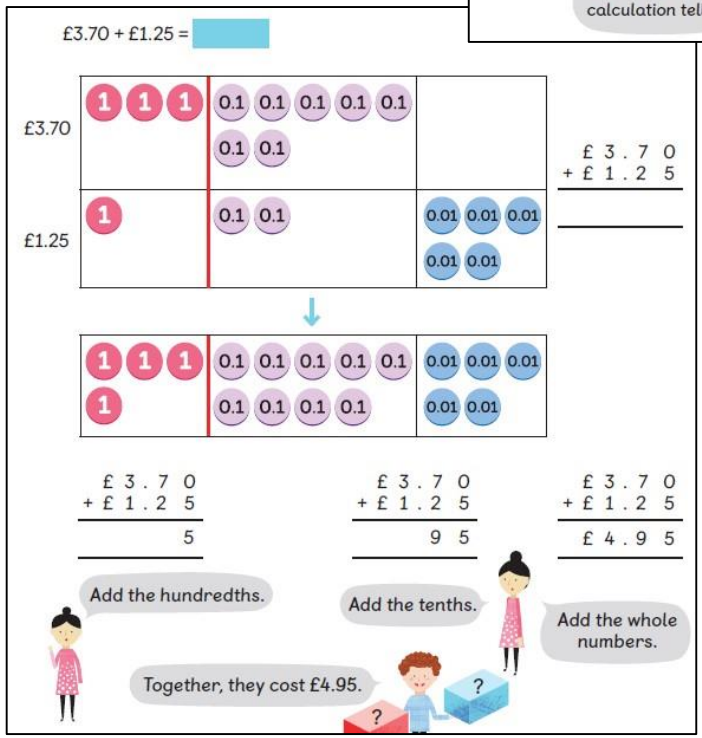
- Comparing and ordering
- Money
- Weight
- Rounding
- Perimeter

using four pieces	in numerals	in words
	$\frac{4}{10} = 0.4$	4 tenths
	$\frac{31}{100} = 0.31$	31 hundredths
	$\frac{301}{1000} = 0.301$	301 thousandths

Representing in fractions and decimals







Adding and subtracting decimals

SATs

- Opportunities for consolidation
- SAT practice every half term
- SATs information evening
- Positive and confident mindset

Multiplication tables check

- From the 2019/20 academic year onwards, schools in England should have be required to administer an online multiplication tables check(MTC) to Year 4 pupils.
  Due to COVID-19, these have not happened. This academic year (2021-2022) will be the first year where Year 4 pupils will be required to take this check.

- The national curriculum specifies that pupils should be taught to recall the multiplication tables up to and including 12×12 by the end of Year 4.

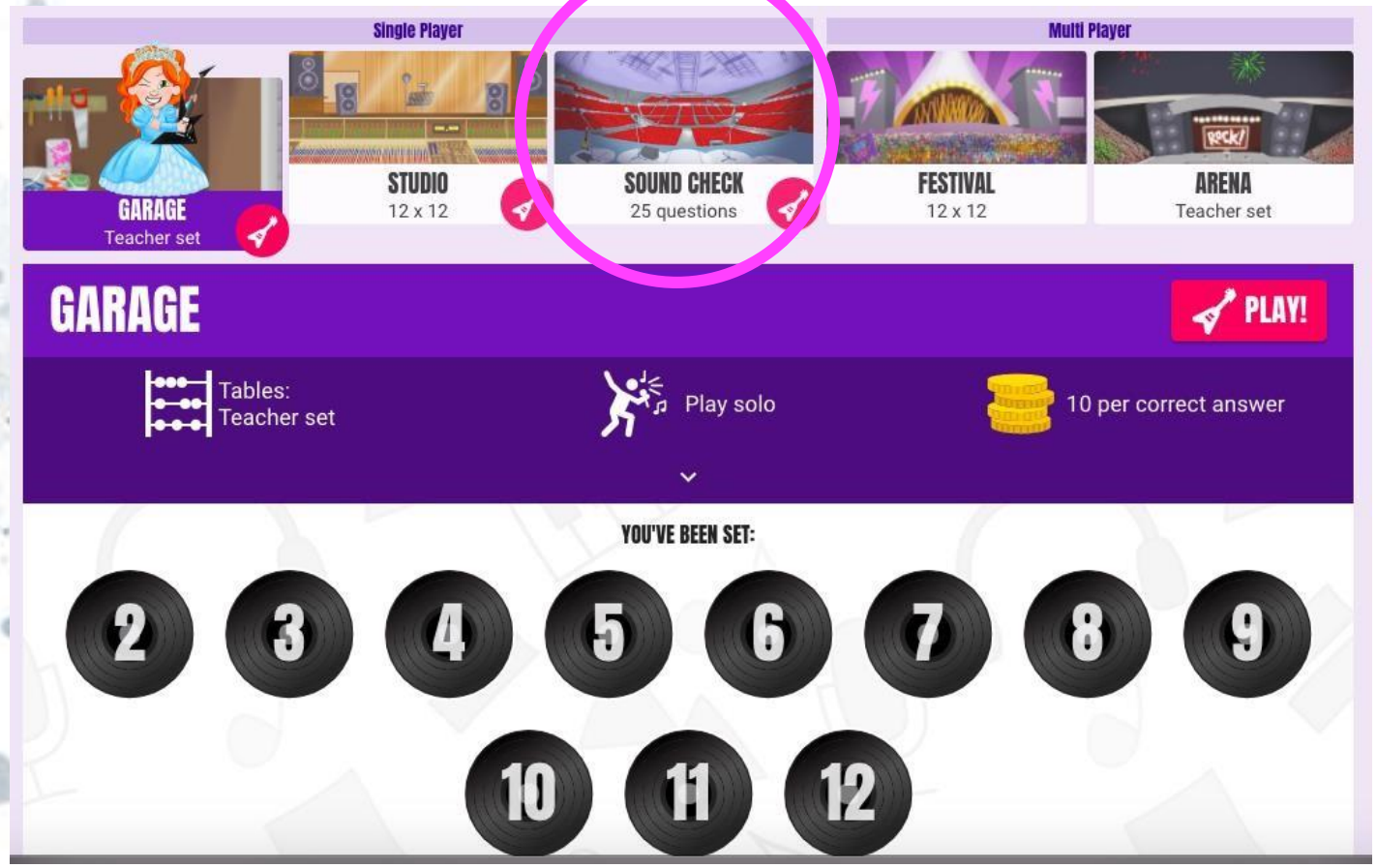
- The purpose of the MTC is to determine whether pupils can recall their times tables fluently, which is essential for future success in mathematics. It will help schools to identify pupils who have not yet mastered their times tables, so that additional support can be provided.

- From half term, all children will be taking part in an hour long times table lesson each week. This will ensure a solid foundation and for children who already know them to consider in greater depth.

Multiplication tables check

TIMES TABLES ROCKSTARS

'Sound check' is great practise for the multiplication tables check



How to help at home

Year 3:

- Supporting your child in being able to recall their times tables, especially the 2,5 and 10.
- In year 3, they will focus on the 3, 4 and 8 times table so these are also good ones to practice!
- Supporting them in practicing their number bonds to 10 and being able to add single digit numbers.
- Reading the time is first introduced in Year 3 and this is a brilliant exercise to be able to practice at home.
- Developing a passion and positive mindset for maths.
- Supporting your child with their fortnightly maths homework.

Year 4:

- Helping you child recall all times tables up to 12x12 in order and mixed.
- Supporting them in moving from number bonds to 10 and linking that with number bonds to 100
- Supporting opportunities where maths can be used in real life and allowing your child to apply these skills to situations
- Estimating

How to help at home

Year 5 and 6:

- Talk to your child about what they have been learning at school
- Continue to support them in remembering, recalling and using their times tables
- Provide support if needed with their fortnightly maths homework
- Allow them the opportunity to use maths in real life, when the situation arises.