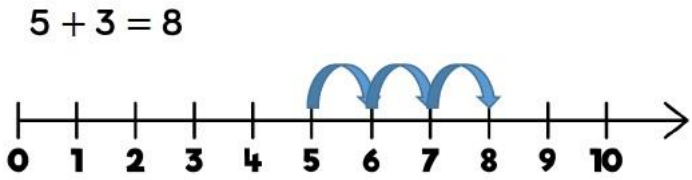
Calculation Progression

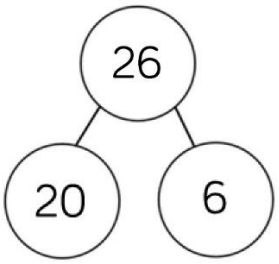
We teach maths using concrete, pictorial and abstract representations.

Concrete – children should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

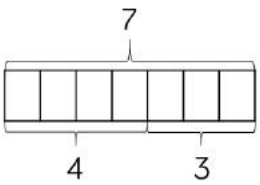
Pictorial – alongside this, children should use pictorial representations. These representations can then be used to help reason and solve problems.

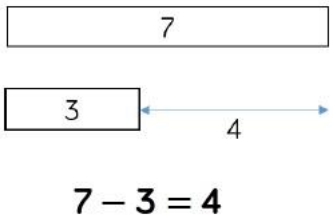


Number line

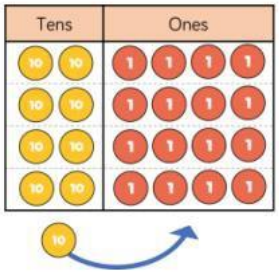


Part/whole model





Single and multiple bars



Place value counters

Abstract – both concrete and pictorial representations should support children's understanding of abstract methods. Children are introduced to the abstract concept at a symbolic level, using numbers and mathematical symbols.

Addition

Pupils should recognise that the addition of two numbers can be done in any order (commutative).

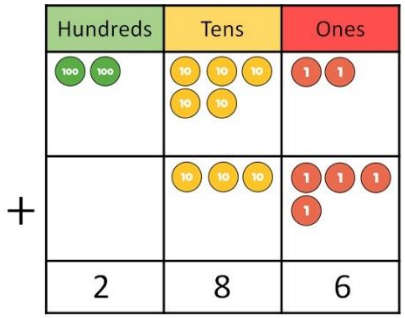
Mathematical vocabulary: more, plus, total, sum, altogether, increase

Year 3

Add numbers with up to three digits.

Without exchange

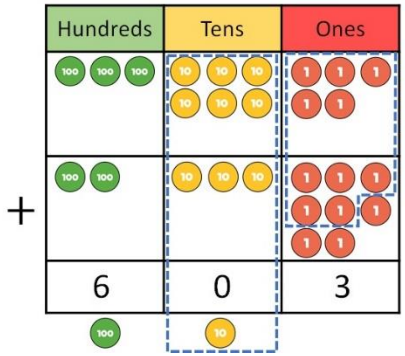
252 + 34 = 286



	H	T	O
	2	5	2
+		3	4
	2	8	6

With exchange

238 + 365 = 603



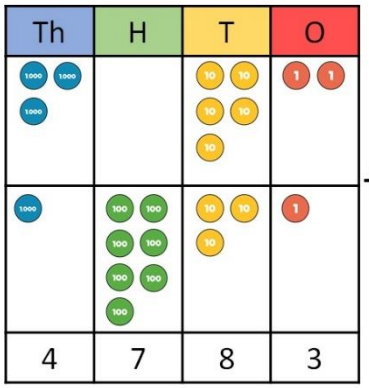
	H	T	O
	3	6	5
+	2	3	8
	6	0	3
	1	1	

Year 4

Add numbers with up to four digits.

Without exchange

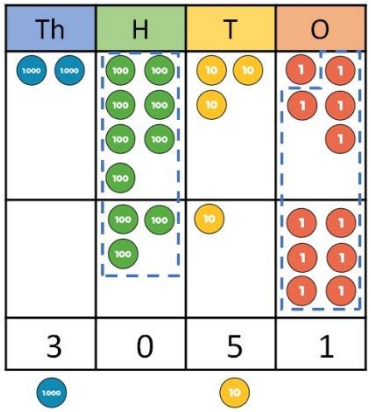
1,731 + 3,052 = 4,783



	Th	H	T	O
	3	0	5	2
+	1	7	3	1
	4	7	8	3

With exchange

	Th	H	T	O
	2	7	3	5
+		3	1	6
	3	0	5	1
	1		1	



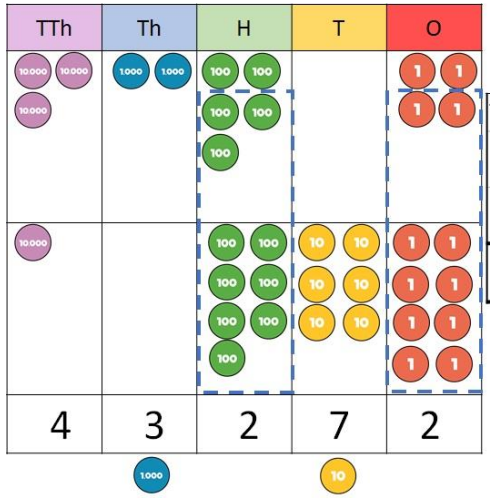
Year 5/6

Add whole numbers with more than four digits.

Add numbers with up to 3 decimal places.

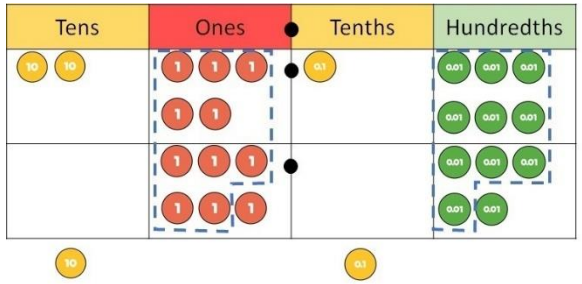
More than four digits

32,504 + 10,768 = 43,272



	TTh	Th	H	T	O
	3	2	5	0	4
+	1	0	7	6	8
	4	3	2	7	2
		1		1	

Decimals



	T	O	t	h
	2	5 •	1	6
+		6 •	0	5
	3	1 •	2	1
	1		1	

25.16 + 6.05 = 31.21

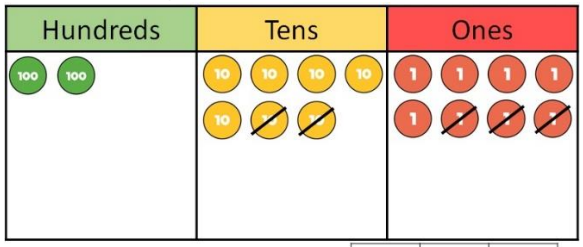
Subtraction

Mathematical vocabulary: take away, difference, less than, minus, decrease, fewer than, reduce

Year 3

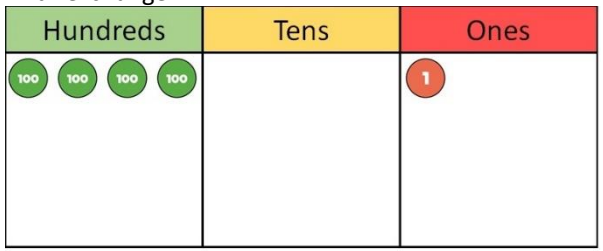
Subtract numbers with up to three digits.

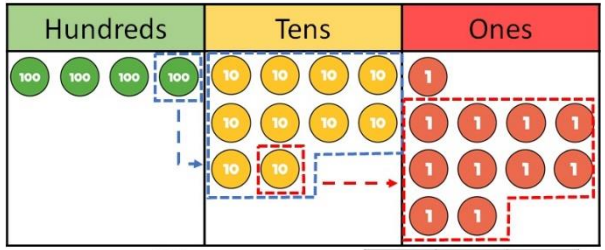
Without exchange

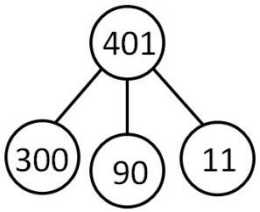


	H	T	O
	2	7	8
−		2	3
	2	5	5

With exchange







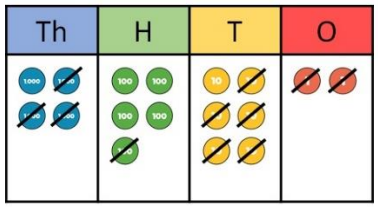
	H	T	O
	~~3~~ 2	~~9~~ 10	~~1~~ 11
−	2	3	9
	1	6	2

Year 4

Subtract numbers with up to four digits.

Without exchange

4,562 − 3,152 = 1,410

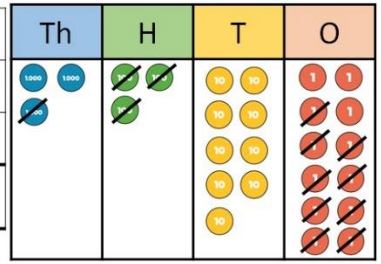


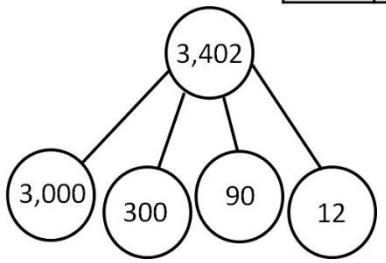
	Th	H	T	O
	4	5	6	2
−	3	1	5	2
	1	4	1	0

With exchange

3,402 − 1,309 = 2,093

	Th	H	T	O
	3	~~4~~ 3	~~0~~ 9	12
−	1	3	0	9
	2	0	9	3



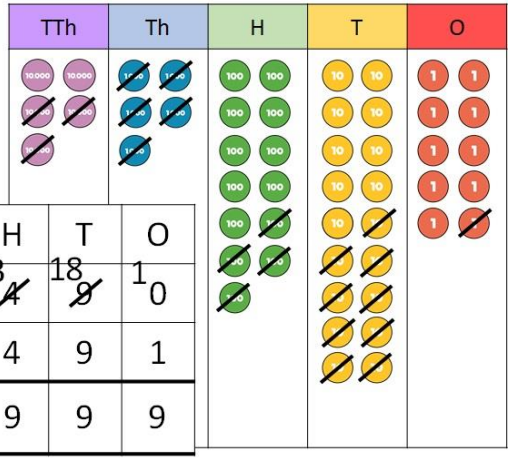


Year 5/6

Subtract whole numbers with more than four digits.
Subtract numbers with up to 3 decimal places.

More than four digits

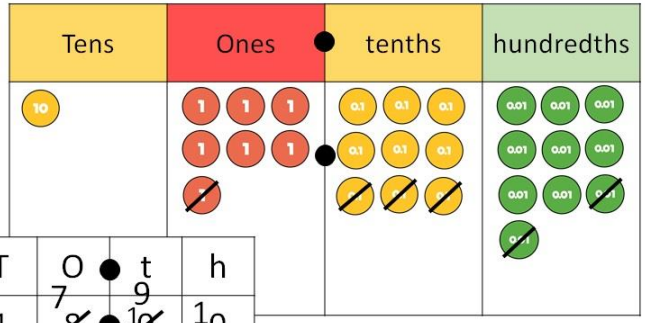
56,490 − 35,491 = 20,999



	TTh	Th	H	T	O
	5	~~6~~ 5	~~4~~ 13	~~9~~ 18	10
−	3	5	4	9	1
	2	0	9	9	9

Decimals

18 − 1.32 = 16.68



	T	O ●	t	h
	1	~~8~~ 7 ●	~~0~~ 9	10
−		1 ●	3	2
	1	6 ●	6	8

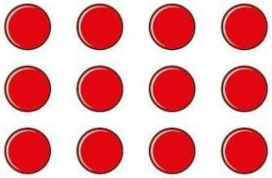
Multiplication

Pupils should recognise that the multiplication of two numbers can be done in any order (commutative).
Mathematical vocabulary: lots of, groups of, times, multiple, product

Year 3

Multiply whole numbers up to 2 digits x 1 digit.
Recall 2, 5, 10, 3, 4 and 8 times tables.

Using arrays



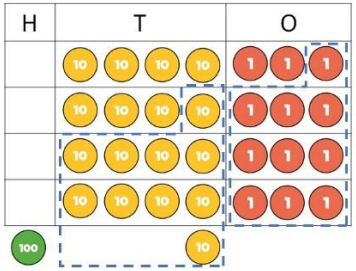
4 + 4 + 4 = 12
3 × 4 = 12
3 + 3 + 3 + 3 = 12
4 × 3 = 12

Understand that multiplication is repeated addition and commutative (changing the order of the numbers does not change the product).

Without exchange

	T	O
	4	3
×		2
	8	6

With exchange



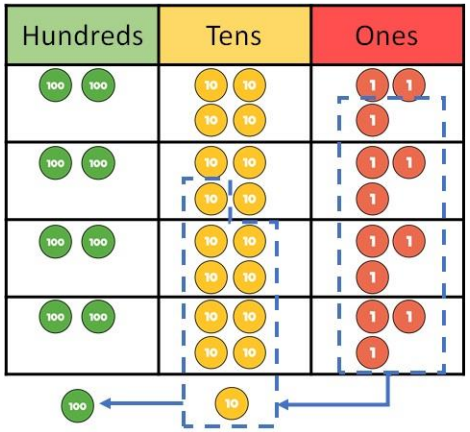
	H	T	O
		4	3
×			4
	1	7	2
	1	1	

Year 4

Multiply whole numbers up to 3 digits x 1 digit.
Recall all times tables up to 12 x 12.

Short multiplication

243 × 4 = 972



	H	T	O
	2	4	3
×			4
	9	7	2
	1	1	

Year 5

Multiply whole numbers up to
4 digits x 2 digits.

Long multiplication

First multiply by the digit in the ones column.

132 × 23

	Th	H	T	O
		1	3	2
×			2	3
		3	9	6
+				

(132 × 3)

Then multiply by the digit in the tens column remembering the place holder zero.
Add the two numbers together.

132 × 23

	Th	H	T	O
		1	3	2
×			2	3
		3	9	6
+	2	6	4	0
	3	0	3	6
	1	1		

(132 × 3)
(132 × 20)

Year 6

Multiply whole numbers up to 4 digits and decimals with up to 2 decimal places by whole numbers up to 2 digits.

Long multiplication

1,207 × 36

	TTh	Th	H	T	O
		1	2	0	7
×				3	6
		7	2	4	2
+	3	6	2	1	0
	4	3	4	5	2
	1				

(1,207 × 6)
(1,207 × 30)

Introduce multiplying decimal numbers by integers. Perform the calculation without the decimal point. The answer should have the same number of decimal places as the original numbers.

5.3 x 4 = 21.2

	T	O	ths
		5	3
×			4
		1	2
+	2	0	0
	2	1	2

Division

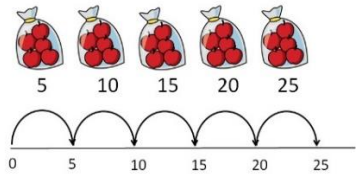
Mathematical vocabulary: share, group, factor, remainder

Year 3

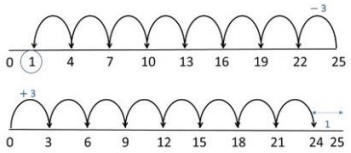
Divide whole numbers up to 2 digits by 1 digit.
Understand sharing, grouping and remainders.

Understand the link with multiplication and repeated addition/subtraction

$25 \div 5 = 5$



$25 \div 3 = 8$ r 1



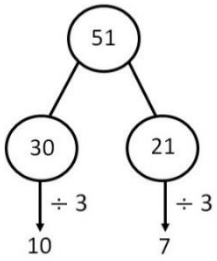
Represent in a bar model

18					
3	3	3	3	3	3

$18 \div 6 = 3$

Partition model

$51 \div 3 = 17$



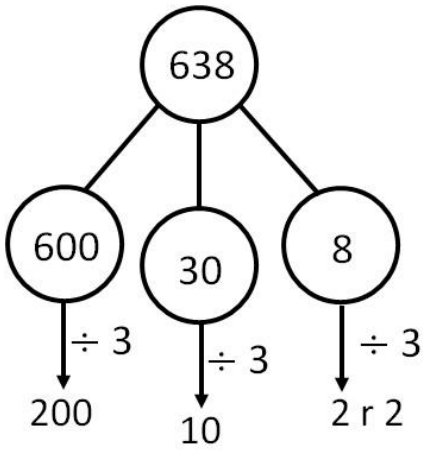
$10 + 7 = 17$

Year 4

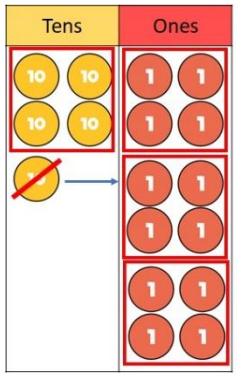
Divide whole numbers up to
3 digits by a 1-digit number.

Partition model

$638 \div 3 = 212$ r2



Short division



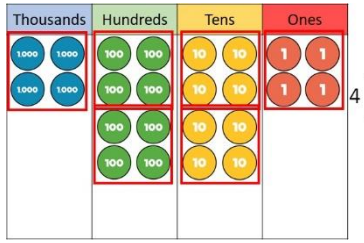
$$4\overline{)5\,{}^{1}2} \quad 1\ 3$$

Year 5

Divide whole numbers up to
4 digits by a 1-digit number.

Short division

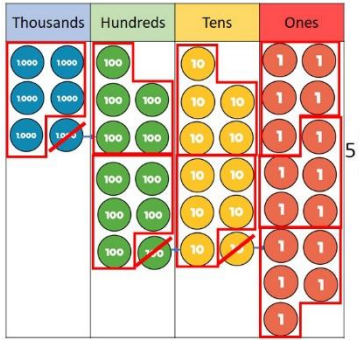
$4884 \div 4 = 1221$



$$4\overline{)4\ 8\ 8\ 4} \quad 1\ 2\ 2\ 1$$

With exchange

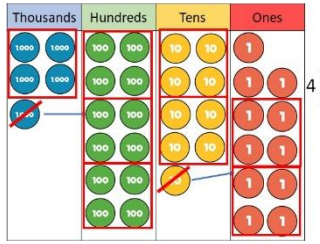
$6115 \div 5 = 1223$



$$5\overline{)6\ {}^{1}1\ {}^{1}1\ {}^{1}5} \quad 1\ 2\ 2\ 3$$

With remainder

$5291 \div 4 = 1322$ r3



$$4\overline{)5\ {}^{1}2\ 9\ {}^{1}1} \quad 1\ 3\ 2\ 2\text{ r}3$$

Year 6

Divide whole numbers and decimals up to
4 digits by a number up to 2 digits.

Long division

$591 \div 19 = 31$ r2

19	38	57	76	95	114	133	152	171	190

		3	1
19	5	9	1
–	5	7	
		2	1
–		1	9
			2

Interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context
e.g.

$$8\overline{)3\ {}^{3}4} \quad 0\ 4\text{ r}2$$

A remainder can be written as a fraction with the divisor as the denominator.

$34 \div 8 = 4\frac{2}{8}$

Calculate as a decimal

$34 \div 8 = 4.25$

$$8\overline{)3\ {}^{3}4\ .{}^{2}0\ {}^{4}0} \quad 0\ 4\ .\ 2\ 5$$

Fractions, Decimals and Percentages

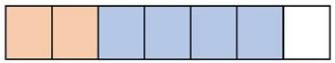
Mathematical vocabulary: proper, improper, unit, mixed, numerator, denominator, equivalent, common factor/multiple, simplify

Year 3

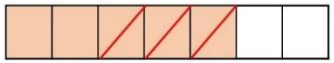
Recognise equivalent fractions.
Add and subtract fractions with the same denominator within one whole.
Find fractions of quantities.

Add and subtract fractions with the same denominator.

$\frac{2}{7}+\frac{4}{7}=\frac{6}{7}$



$\frac{5}{7}-\frac{3}{7}=\frac{2}{7}$

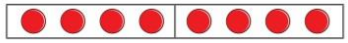


Recognise equivalent fractions

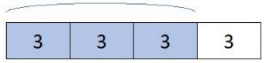
$\frac{1}{2}=\frac{2}{4}$

Find fractions of quantities.

$\frac{1}{2}$ of 8 = 4



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

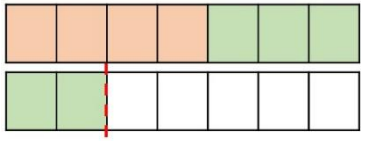


Year 4

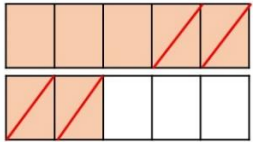
Add and subtract fractions with the same denominator.
Recognise tenths and hundredths in decimal numbers and divide by 10 and 100.

Add and subtract fractions with the same denominator.

$\frac{4}{7}+\frac{5}{7}=\frac{9}{7}=1\frac{2}{7}$



$1\frac{2}{5}-\frac{4}{5}=\frac{3}{5}$



Divide by 10 and 100

Th	H	T	O	tth	hth
	●●	●	●●		
	2	1	2		

When a number is divided by 10 the digits move one place to the right.

Th	H	T	O	tth	hth
		●●	●	●●	
		2	1	2	

When a number is divided by 100 the digits move two places to the right.

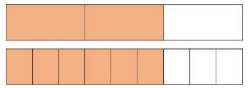
Th	H	T	O	tth	hth
			●●	●●	
			2	1	2

Year 5

Find equivalent fractions.
Recognise and convert between improper fractions and mixed numbers.
Add and subtract fractions with denominators that are multiples of the same number.
Multiply fractions by whole numbers.

Find equivalent fractions.

$\frac{2}{3}=\frac{6}{9}$ (×3 above, ×3 below)

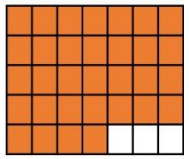


Improper fraction to mixed number.

$\frac{32}{7}$ means $32 \div 7$

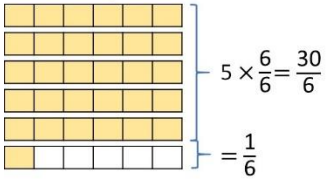
$32 \div 7 = 4$ r4

$= 4\frac{4}{7}$



Mixed number to improper fraction.

$5\frac{1}{6}=\frac{31}{6}$

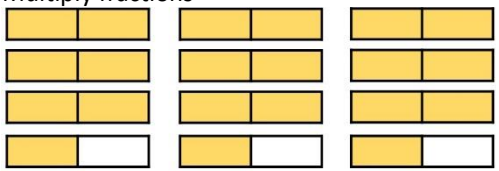


Add and subtract fractions

$3\frac{5}{6}+1\frac{2}{3}=\frac{23}{6}+\frac{5}{3}=\frac{23}{6}+\frac{10}{6}=\frac{33}{6}=5\frac{3}{6}$

$2\frac{1}{12}-1\frac{3}{4}=\frac{25}{12}-\frac{7}{4}=\frac{25}{12}-\frac{21}{12}=\frac{4}{12}=\frac{1}{3}$

Multiply fractions



$3\frac{1}{2}\times 3=\frac{7}{2}\times 3=\frac{21}{2}=10\frac{1}{2}$

Year 6

Add and subtract fractions with different denominators and mixed numbers.
Multiply pairs of fractions.
Divide fractions by whole numbers.
Convert fraction to decimal or percentage equivalents.

Simplify using common factors

Factors of 35: 1, 5, 7, 35

Factors of 40: 1, 2, 4, 5, 8, 10, 20, 40

$\frac{35}{40}=\frac{7}{8}$ (÷5 above, ÷5 below)

Add/subtract using common multiples

$2\frac{1}{2}+1\frac{4}{5}=\frac{5}{2}+\frac{9}{5}=\frac{25}{10}+\frac{18}{10}=\frac{43}{10}=4\frac{3}{10}$

Multiples of 2: 2, 4, 6, 8, 10

Multiples of 5: 5, 10

Multiply fractions

$1\frac{3}{5}\times\frac{2}{3}=\frac{8}{5}\times\frac{2}{3}=\frac{16}{15}=1\frac{1}{15}$

Divide fractions

$\frac{4}{5}\div 3=\frac{4}{5}\times\frac{1}{3}=\frac{4}{15}$

Convert fraction to decimal

$\frac{3}{8}$ $\quad 3 \div 8$ $\quad 8\overline{)3.^{3}0^{6}0^{4}0}$ $\quad 0.375$

Convert fraction to percentage
Find an equivalent fraction with 100 as the denominator or convert to decimal first.

Convert decimal to percentage
Multiply by 100
e.g. 0.67x100 = 67 so 0.67=67%