LKS2 Calculation Policy

Concrete, Pictorial, Abstract Approach

One of the key principles behind the Singapore Maths approach and Maths Mastery is based on the concrete, pictorial, abstract approach. This approach identifies three steps (or representations) that are necessary for pupils to develop an understanding of different concepts.

1. Concrete Representation

Pupils are first introduced to an idea or skill using real objects. In division, for example, this might be done by separating apples amongst children. This is a 'hands on' approach and all classrooms have a wide range of practical resources available for pupils to use.

2. Pictorial Representation

Pupils are encouraged to relate their concrete understanding to pictorial representations. These representations may be a diagram or a picture of the Mathematical problem.

3. Abstract Representation

This is the symbolic stage – the pupils use Mathematical symbols to represent problems, for example 12 x 2 = 24. Whilst this Calculation Policy aims to show the Concrete / Pictorial / Abstract approach to the different calculations, it is not always noted further up the year groups. However, it is expected that the Concrete / Pictorial / Abstract approach is used continuously in all new learning and calculations, even when not noted.

Year 3 - Addition

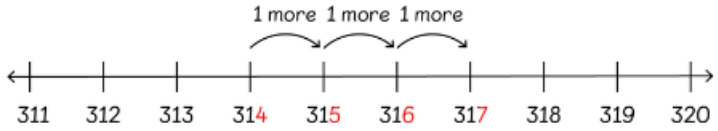
Jersey Curriculum for Mathematics – Statutory Requirements for Year 3: Number – Addition and Subtraction
Pupils should be taught to:
• Add and subtract numbers mentally, including:
  ○ a three-digit number and ones
  ○ a three-digit number and tens
  ○ a three-digit number and hundreds
• Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction with and without renaming.
• Estimate the answer to a calculation and use inverse operations to check answers.
• Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

Key Vocabulary

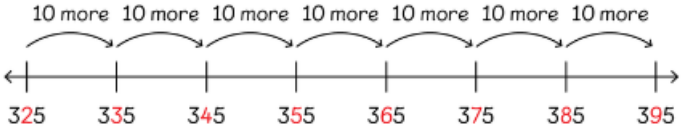
Add, increase, total, plus, sum, more, altogether, column addition, estimate, inverse, double, near double, one more, ten more, one hundred more, How many more to make … ?, How many more is … than … ?, How much more is … ?

In Year 3, pupils will be taught to add numbers to at least 1 000 using the counting on and column method for addition, and they will also learn mental methods. Pupils will be encouraged to think about when the most appropriate time is to use each method. They will use the methods taught to solve word problems, for example, visualising the problems using a number line.

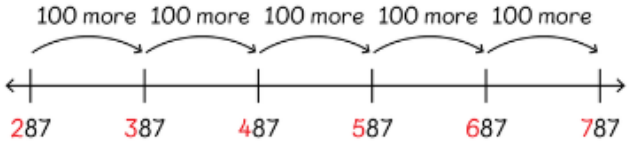
Method 1 – Addition by counting on



314 + 3 = 317



325 + 70 = 395

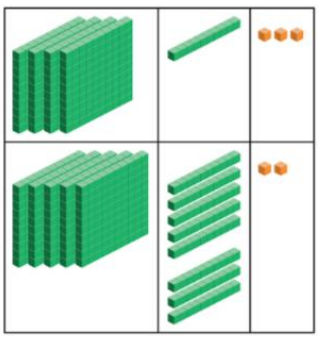


287 + 500 = 787

Method 2 – Addition using the column method

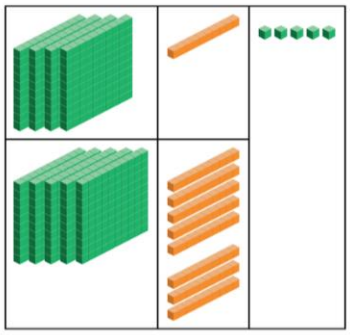
413 + 582 = ▭

Step 1 Add the ones.
3 ones + 2 ones = 5 ones



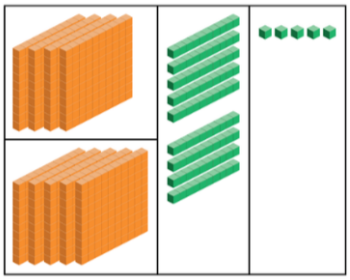
	h	t	o
	4	1	3
+	5	8	2
			5

Step 2 Add the tens.
1 ten + 8 tens = 9 tens



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

Step 3 Add the hundreds.
4 hundreds + 5 hundreds = 9 hundreds



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

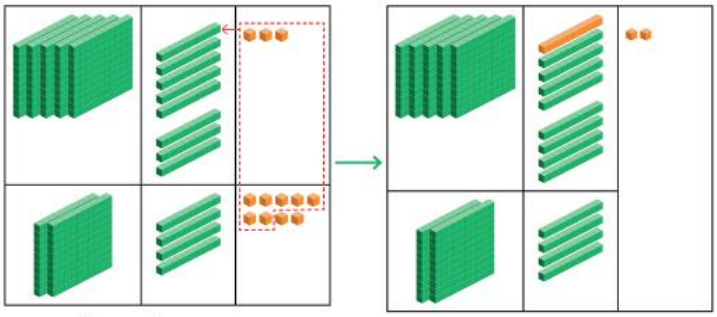
413 + 582 = 995

995 people visited the art gallery altogether.

Addition with renaming

583 + 249 =

Step 1 Add the ones.
3 ones + 9 ones = 12 ones

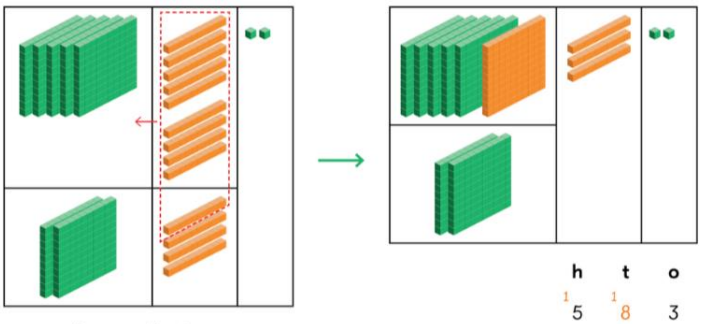


Rename the ones.
12 ones = 1 ten + 2 ones

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

Step 2 Add the tens.

1 ten + 8 tens + 4 tens = 13 tens



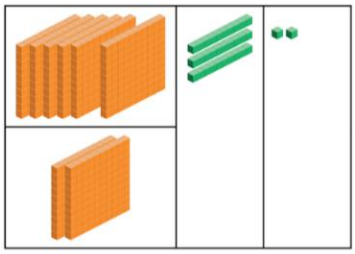
Rename the tens.

13 tens = 1 hundred + 3 tens

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

Step 3 Add the hundreds.

1 hundred + 5 hundreds + 2 hundreds = 8 hundreds



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

583 + 249 = 832

The lorries have to deliver 832 boxes altogether.

Mental Strategies

- Add numbers mentally, including a three-digit number and a single-digit number, a three-digit number and a multiple of ten and a three-digit number and a multiple of one hundred.
- Estimate the answer to a calculation and use inverse operations to check answers.
- To know pairs that total one thousand (multiples of one hundred).
- To calculate ten or one hundred more than any given number.

Year 3 - Subtraction

Jersey Curriculum for Mathematics – Statutory Requirements for Year 3: Number – Addition and Subtraction

Pupils should be taught to:

- Add and subtract numbers mentally, including:
  - a three-digit number and ones
  - a three-digit number and tens
  - a three-digit number and hundreds
- Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction with and without renaming.

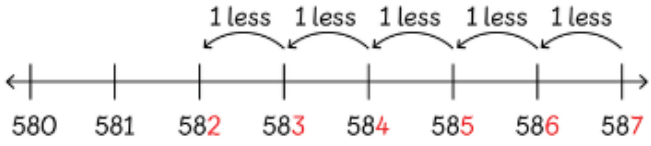
- Estimate the answer to a calculation and use inverse operations to check answers.
- Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

Key Vocabulary

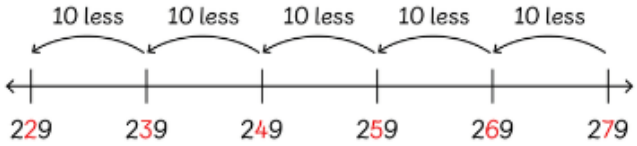
Leave, subtract, less, minus, column subtraction, inverse, exchange, How many are left / left over ?, difference between, How more fewer is … than … ?, How much less is … ?, equals, is the same as, sign, multiples of tens and hundreds.

In Year 3, pupils will be taught to subtract numbers to at least 1 000 using the counting back and column method for subtraction, and they will also learn mental methods for subtraction. Pupils will be encouraged to think about when the most appropriate time is to use each method. They will use the methods taught to solve word problems, visualising the problems using the bar model. The part-whole model will continue to be used to explore inverse operations.

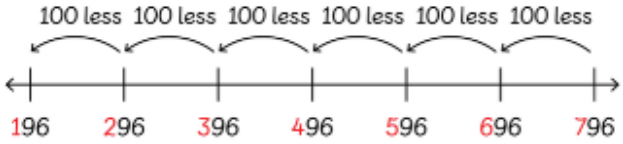
Method 1 – Subtraction by counting back



587 – 5 = 582



279 – 50 = 229

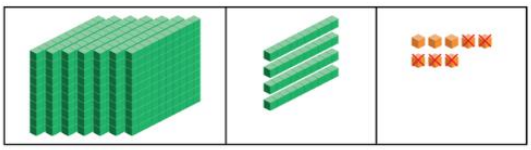


796 – 600 = 196

Method 2 – Subtraction using the column method

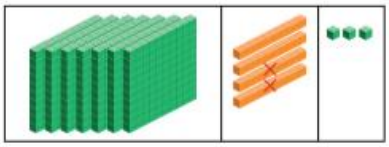
748 − 425 = ☐

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



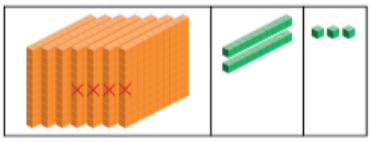
	h	t	o
	7	4	8
−	4	2	5
			3

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



	h	t	o
	7	4	8
−	4	2	5
		2	3

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

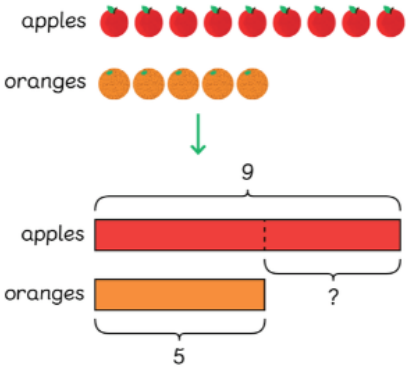


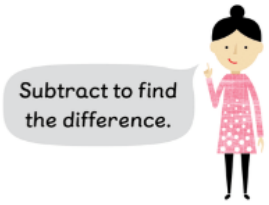
	h	t	o
	7	4	8
−	4	2	5
	3	2	3

748 − 425 = 323

Method 3 – Subtraction using bar models

There are 9 apples. There are 5 oranges.
Draw bars to show the number of apples and oranges.





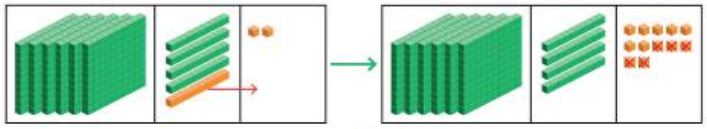
9 − 5 = 4

There are 4 more apples than oranges.

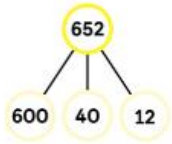
Subtracting with renaming

652 − 25 = ☐

Step 1 Rename 1 ten as 10 ones.
Subtract the ones.

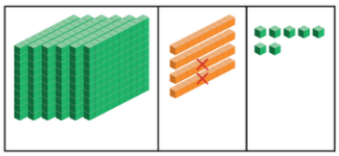


12 ones − 5 ones = 7 ones



h	t	o
6	4 5	12 2
−	2	5
		7

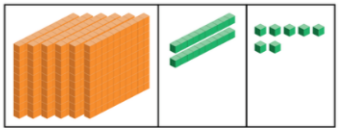
Step 2 Subtract the tens.



h	t	o
6	4 5	12 2
−	2	5
	2	7

4 tens − 2 tens = 2 tens

Step 3 Subtract the hundreds.



h	t	o
6	4 5	12 2
−	2	5
6	2	7

6 hundreds − 0 hundreds = 6 hundreds

652 − 25 = 627

Mental Strategies

- Subtract numbers mentally, including a single-digit number from a three-digit number, a multiple of ten from a three digit number, a multiple of a hundred from a three-digit number.
- Estimate the answer to a calculation and use inverse operations to check answer.

Year 3 - Multiplication

Jersey Curriculum for Mathematics – Statutory Requirements for Year 3: Number – Multiplication and Division

Pupils should be taught to:

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods and introducing renaming.

- Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Key Vocabulary

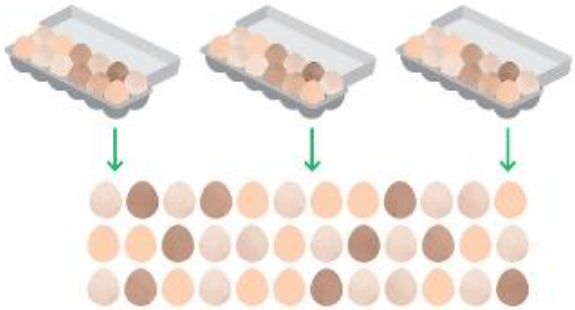
Multiply, times, groups of, equal groups of, multiple of, multiplied by, estimate, inverse, grid multiplication, expanded column multiplication, partition, commutative, associative, product.

In Year 3, pupils will learn how to multiply and divide by 3, 4, and 8. Pupils will be taught how to calculate multiplication equations using the multiplication facts that they know. They will be taught the difference between sharing and grouping as well as the commutative law in multiplication.

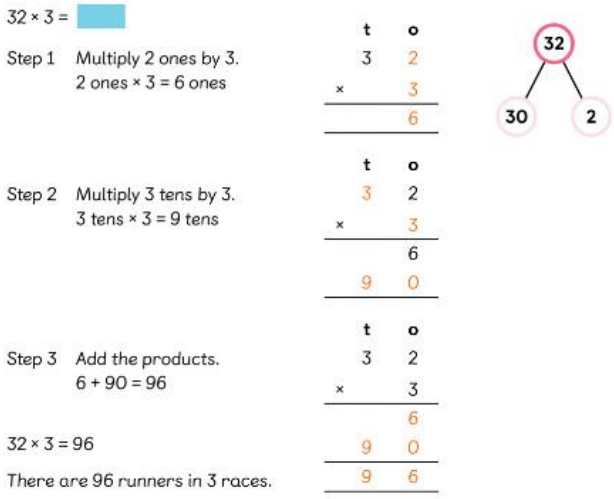
Method 1 – Multiplication using times tables

Children are familiar with 2s, 5s and 10s. In Year 3, children learn the 3s, 4s and 8s times tables.

Method 2 – Multiplication using pictorial representations and repeated addition



Method 3 – Multiplication using the column method



Mental Strategies

- Count forwards and backwards in multiples of 4, 8, 50 and 100.

- Know the 3, 4, and 8 times tables (in and out of order).
- Connect the 2, 4 and 8 times tables through doubling.
- Use knowledge of place value to calculate multiplication (eg: 2x2=4, 2x20=40,2x200=400).

Year 3 - Division

Jersey Curriculum for Mathematics – Statutory Requirements for Year 3: Number – Multiplication and Division

Pupils should be taught to:

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

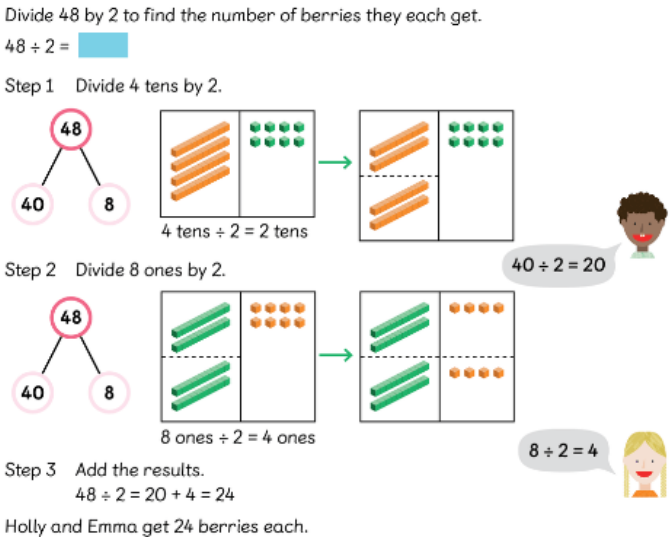
Key Vocabulary

Divided by, divide, divided into, grouping, short division, remainder, inverse.

In Year 3, pupils will learn how to multiply and divide by 3, 4, and 8. Pupils will be taught how to calculate division equations using the multiplication facts that they know, as well as how to divide using the part-whole model.

Method 1 – Division using times tables.

Method 2 – Division using the part-whole model.



Mental Strategies

- Know the division facts from the 3, 4 and 8 times tables.
- Use knowledge of place value to calculate division (eg: 14 divided by 2 = 7, 140 divided by 2 = 70, 1400 divided by 2 = 700).

Year 4 - Addition

Jersey Curriculum for Mathematics – Statutory Requirements for Year 4: Number – Addition and Subtraction

Pupils should be taught to:

- Add and subtract numbers with up to 4 digits using written methods of columnar addition and subtraction where appropriate.
- Estimate and use inverse operations to check answers to a calculation.
- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.

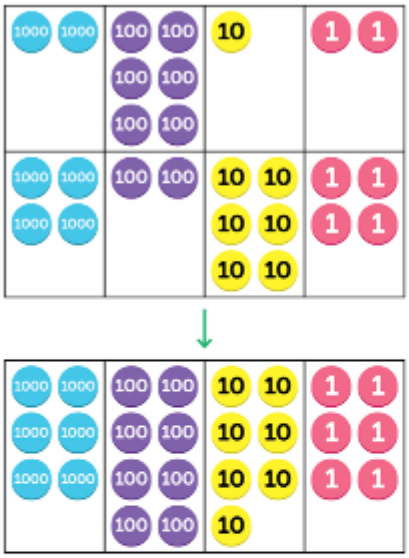
Key Vocabulary

add, addition, more, plus, increase, sum, total, altogether, score, double, near double, tens boundary, hundreds boundary, thousands boundary, inverse.

In Year 4, pupils will be taught to add with numbers up to 10 000. They will use the column method for addition and they will also learn mental methods. Pupils will be encouraged to think about when the most appropriate time is to use each method. They will use the methods taught to solve word problems, for example, visualising the problems using the bar model.

Method 1 – Addition using column addition

£2612 + £4264 = ☐



Add the ones.
2 ones + 4 ones = 6 ones

Add the tens.
1 ten + 6 tens = 7 tens

Add the hundreds.
6 hundreds + 2 hundreds = 8 hundreds

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

	2	6	1	2
+	4	2	6	4
	6	8	7	6

2612 + 4264 = 6876

The flights to Australia cost £6876.

[Method 2 – Addition using mental strategies]

Find the sum of 4072 and 8 by adding mentally.

make 10

4072 + 8 = ☐

4072 + 8 = 4070 + 10

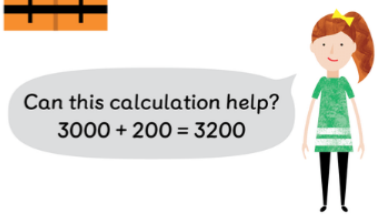
4072 + 8 = 4080

Find the total cost of the two items by adding mentally.

make 3000

2998 + 199 = 3000 + 197
= 3197

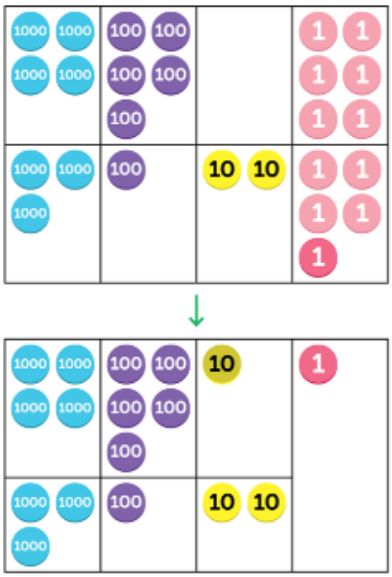
The total cost is £3197.



[Addition with renaming]

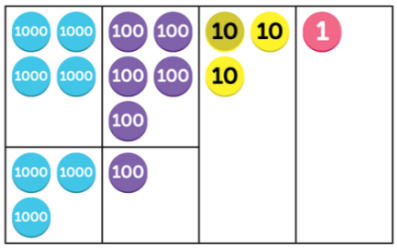
4506 + 3125 = ____

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



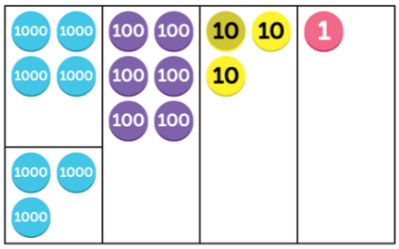
$$\begin{array}{r} {}^{1} \\ 4\ 5\ 0\ 6 \\ +\ 3\ 1\ 2\ 5 \\ \hline 1 \end{array}$$

Step 2 Add the tens.
0 tens + 2 tens + 1 ten = 3 tens



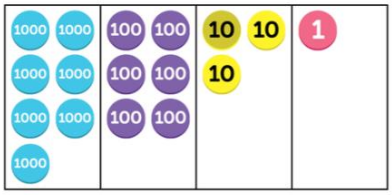
$$\begin{array}{r} {}^{1} \\ 4\ 5\ 0\ 6 \\ +\ 3\ 1\ 2\ 5 \\ \hline 3\ 1 \end{array}$$

Step 3 Add the hundreds.
5 hundreds + 1 hundred = 6 hundreds



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

Step 4 Add the thousands.
4 thousands + 3 thousands = 7 thousands



$$\begin{array}{rcccc} & 4 & 5 & {}^{1}0 & 6 \\ + & 3 & 1 & 2 & 5 \\ \hline & 7 & 6 & 3 & 1 \end{array}$$

4506 + 3125 = 7631

Mental Strategies

- Add numbers mentally, including a four-digit number and multiples of one thousand.
- Use knowledge of doubles to derive related facts (eg: 15+16=31 because 15+15=30 and 30+1=31). Know number pairs that total one thousand (multiples of ten).
- Estimate the answer to a calculation and use inverse operations to check answers.

Year 4 – Subtraction

Jersey Curriculum for Mathematics – Statutory Requirements for Year 4: Number – Addition and Subtraction

Pupils should be taught to:

- Add and subtract numbers with up to 4 digits using written methods of columnar addition and subtraction where appropriate.
- Estimate and use inverse operations to check answers to a calculation.
- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.

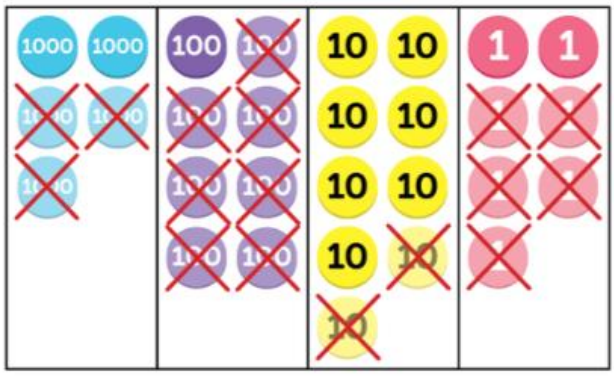
Key Vocabulary

Subtract, subtraction, minus, decrease, leave, How many are left / left over ?, difference between, How many fewer is … than … ?, How much less is … ?, equals, the same as, column subtraction, multiples of a thousand, inverse.

In Year 4, pupils will be taught to subtract with numbers up to 10 000. They will use the column method for subtraction and they will also learn mental methods for subtraction. Pupils will be encouraged to think about when the most appropriate time is to use each method. They will use the methods taught to solve word problems, visualising the problems using the bar model. The part-whole model will continue to be used to explore inverse operations.

Method 1 – Subtraction by using place value discs to support column subtraction

5897 m − 3725 m = ☐



Step 1 Subtract the ones.
7 ones − 5 ones = 2 ones

Step 2 Subtract the tens.
9 tens − 2 tens = 7 tens

Step 3 Subtract the hundreds.
8 hundreds − 7 hundreds = 1 hundred

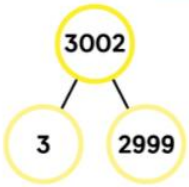
Step 4 Subtract the thousands.
5 thousands − 3 thousands = 2 thousands

	5	8	9	7
−	3	7	2	5
	2	1	7	2

5897 − 3725 = 2172

Method 2 – Subtraction using mental strategies

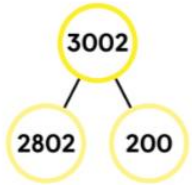
3002 − 198 = ☐



	2	9	9	9
−		1	9	8
	2	8	0	1

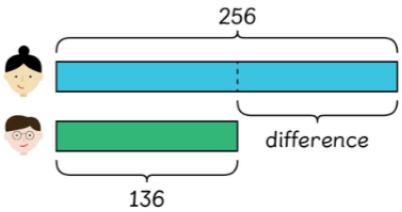
2999 − 198 = 2801
3002 − 198 = 2804

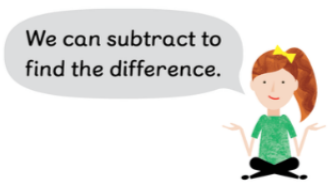
3002 − 198 = 2804



3002 − 198 = 2802 + 2

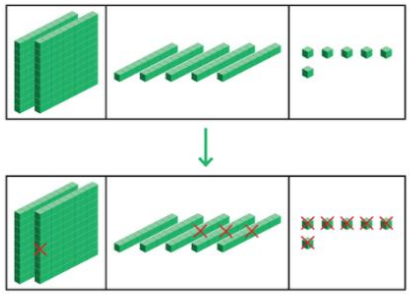
Method 3 – Subtraction using bar models





256 − 136 = ☐

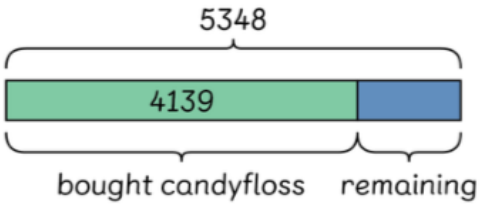
Use base 10 materials to subtract.



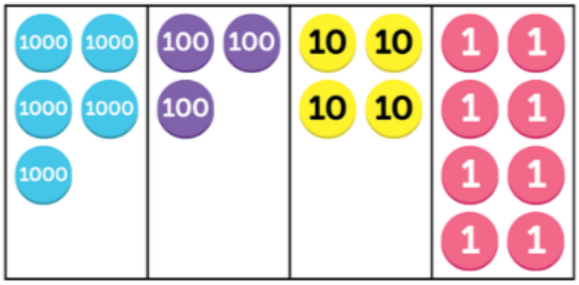
$$\begin{array}{r} 256 \\ -\ 136 \\ \hline 120 \end{array}$$

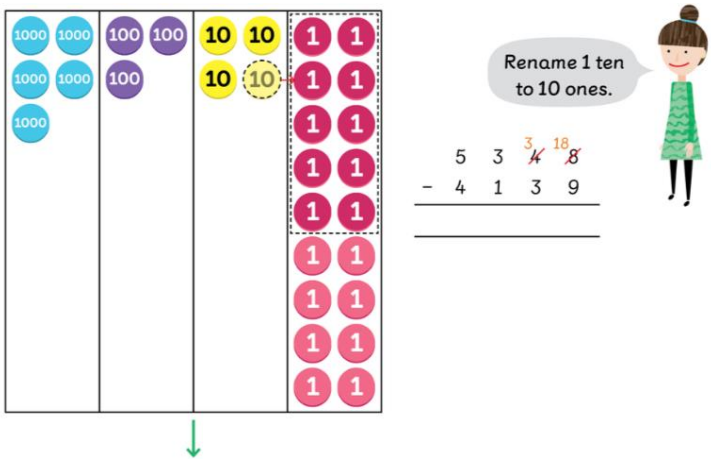
The difference between 256 and 136 is 120.
The difference between the number of points scored is 120.

Subtracting with renaming

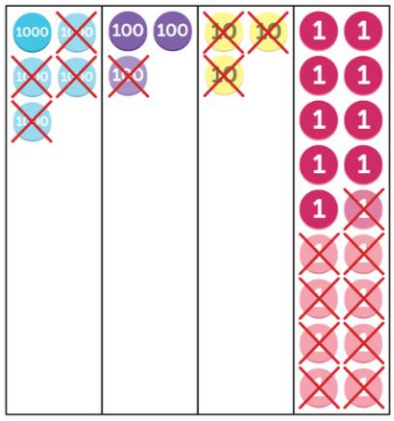


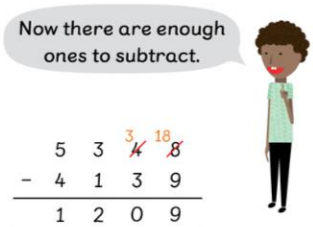
5348 − 4139 = ☐



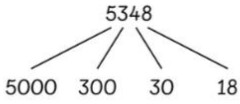


$$\begin{array}{r} 5\ \overset{3}{\not{4}}\ \overset{18}{\not{8}} \\ -\ 4\ 1\ 3\ 9 \\ \hline \\ \hline \end{array}$$





$$\begin{array}{r} 5\ 3\ {}^{3}\cancel{4}\ {}^{18}\cancel{8} \\ -\ 4\ 1\ 3\ 9 \\ \hline 1\ 2\ 0\ 9 \end{array}$$



$$\begin{array}{r} 5\ 3\ {}^{3}\cancel{4}\ {}^{18}\cancel{8} \\ -\ 4\ 1\ 3\ 9 \\ \hline 1\ 2\ 0\ 9 \end{array}$$

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

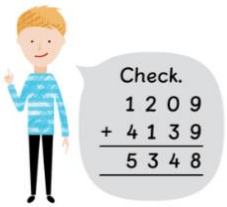
Step 2 Subtract the tens.
3 tens − 3 tens = 0 tens

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

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

5348 − 4139 = 1209

1209 people did not buy candyfloss.



Mental Strategies

- Subtract numbers mentally, including multiples of one thousand from a four-digit number.
- Use number pairs that total one thousand (multiples of ten) to calculate subtraction (eg: 1000 – 300 = 700).
- Estimate the answer to a calculation and use inverse operations to check answers.

Year 4 -Multiplication

Jersey Curriculum for Mathematics – Statutory Requirements for Year 4: Number – Multiplication and Division

Pupils should be taught to:

- Recall multiplication and division facts for multiplication tables up to 12 × 12.
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.
- Recognise and use factor pairs and commutativity in mental calculations.
- Multiply two-digit and three-digit numbers by a one-digit number using a written layout.
- Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

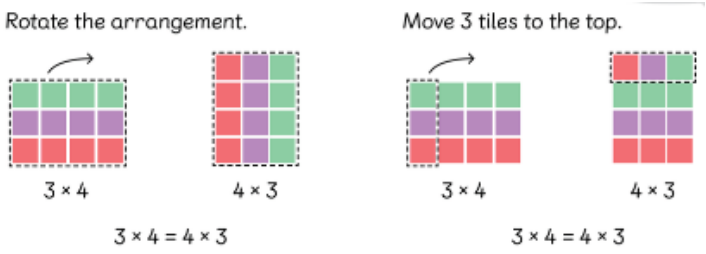
Key Vocabulary

Multiply, multiplied by, product, short multiplication, partition, distributive law, commutative, groups of, multiply, times, multiples, inverse.

In Year 4, pupils will learn how to multiply and divide by 6, 7, 9, 11 and 12. Pupils will be taught how to calculate multiplication equations using the multiplication facts that they know. They will be taught the difference between sharing and grouping as well as the commutative law in multiplication.

Method 1 – Multiplication using times tables (6s, 7s, 9s, 11s and 12s)

Method 2 – Multiply the same two numbers



3 × 4 is equal to 4 × 3.

Method 3 – Multiplication using the column method (short multiplication)

Step 1 Multiply 2 ones by 4.

$$\begin{array}{rr} 1 & 2 \\ \times & 4 \\ \hline & 8 \end{array} \longrightarrow 2 \times 4 = 8$$

Step 2 Multiply 1 ten by 4.

$$\begin{array}{rr} 1 & 2 \\ \times & 4 \\ \hline & 8 \\ + \ 4 & 0 \\ \hline 4 & 8 \end{array} \longrightarrow 10 \times 4 = 40$$

Lulu's mum is buying 48 eggs.

Mental Strategies

- Know all times tables up to and including 12 x 12 (by the end of Year 4).
- Recognise and use factor pairs (eg: factor pairs for numbers up to and including 10).
- Know that TU x 5 is TU x 10 then divide by 2 (eg: 18 x 5 = (18 x 10) divided by 2 = 90).

Year 4 - Division

Jersey Curriculum for Mathematics – Statutory Requirements for Year 4: Number – Multiplication and Division

Pupils should be taught to:

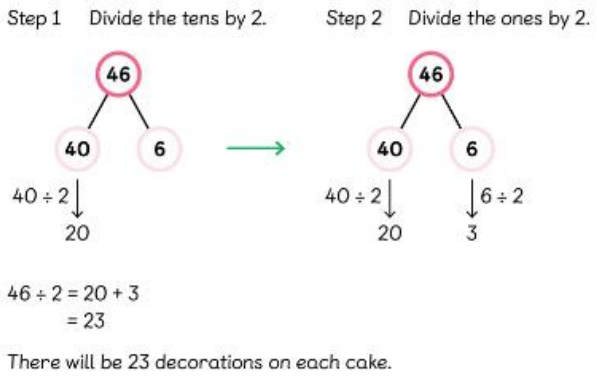
- Recall multiplication and division facts for multiplication tables up to 12 × 12.
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.
- Recognise and use factor pairs and commutativity in mental calculations § multiply two-digit and three-digit numbers by a one-digit number using a written layout.
- Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Key Vocabulary

Factor, divisor, divided by, divided into, remainder, divisible by, equivalent, short division, quotient, inverse, multiples.

In Year 4, pupils will learn how to multiply and divide by 6, 7, 9, 11 and 12. Pupils will be taught how to calculate division equations using the multiplication facts that they know, as well as how to divide using the part-whole model.

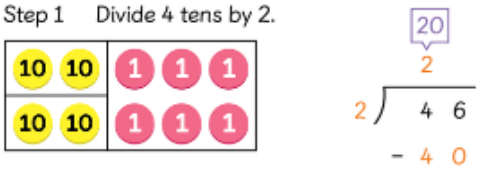
Method 1 – Division by using part-whole diagrams



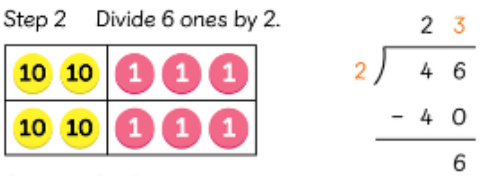
46 ÷ 2 = 20 + 3
= 23

There will be 23 decorations on each cake.

Method 2 – Division using the short division method



4 tens ÷ 2 = 2 tens
40 ÷ 2 = 20



6 ones ÷ 2 = 3 ones
6 ÷ 2 = 3

46 ÷ 2 = 23

Mental Strategies

- Know all related division facts for all times tables up to 12 times tables (by the end of Year 4).