

## Year 1 Addition and Subtraction

## Objectives

- read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs
- represent and use number bonds and related subtraction facts within 20
- add and subtract one-digit and two-digit numbers to 20, including zero
- solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = -9.

## Key Skills

## Addition

- Read and write numbers to 100 in numerals, incl. 1—20 in words
- Recall bonds to 10 and 20, and addition facts within 20
- Count to and across 100
- Count in multiples of 1 2, 5 and 10
- Solve simple 1-step problems involving addition, using objects, number lines and pictorial representations.

## **Subtraction**

- Given a number, say one more or one less.
- Count to and over 100, **forward and back**, from any number.
- Represent and use subtraction facts to 20 and within 20.
- Subtract with **one-digit and two-digit** numbers to 20, including zero.
- Solve one-step problems that involve addition and subtraction, using concrete objects (ie bead string, objects, cubes) and pictures, and missing number problems.
- Read and write numbers from 0 to 20 in numerals and words.

### Vocabulary Addition

add, more, plus, and, put together, make, altogether, total, equal to, equals, double, most, count on, number line, addend, sum

#### Subtraction

equal to, take, take away, less, subtract, leaves, difference, how many more, how many fewer / less than, most, least, count back , how many left, how much less is\_?

It is very important for pupils to be able to add and subtract within 10, fluently, by the end of year 1. This should be taught and practised until pupils move beyond counting forwards or backwards in ones, to more efficient strategies and eventually to automatic recall of these number facts. This is necessary before pupils move on to additive calculation with larger numbers.

The 66 addition facts within 10 are shown on the grid below. The number of addition facts to be learnt is reduced when commutativity is applied and pupils recognise that 3 + 2, for example, is the same as 2 + 3. Pupils must also have automatic recall of the corresponding subtraction facts, for example 5 - 3 and 5 - 2.

+	0	1	2	3	4	5	6	7	8	9	10		
0	0 + 0	0+1	0+2	0+3	0 + 4	0+5	0+6	0+7	0+8	0+9	0+10		
1	1+0	1+1	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9			
2	2+0	2 + 1	2+2	2+3	2 + 4	2 + 5	2+6	2+7	2+8				
3	3+0	3 + 1	3+2	3+3	3 + 4	3 + 5	3+6	3+7					
4	4+0	4 + 1	4+2	4+3	4 + 4	4+5	4+6		-				
5	5+0	<b>5</b> + <b>1</b>	5 + 2	5 + 3	5 + 4	5+5							
6	6+0	6+1	6+2	6+3	6 + 4		-						
7	7+0	7 + 1	7+2	7 + 3									
8	8+0	8 + 1	8+2										
9	9+0	9 + <b>1</b>			Strate	gies							
10	10 + 0	Exa	mple strategy 1: Example strategy 2:										

#### Language focus

"I know that double 3 is equal to 6, so 4 plus 3 is equal to 7."



Figure 8: tens frames with counters showing derivation of a 'near-double' addition calculation

#### Language focus

"If I subtract 2 from an even number I get the previous even number, so 6 minus 2 is equal to 4."



Figure 9: tens frames with counters showing that subtracting 2 from an even number gives the previous even number

# Year 1 Addition

Immerse children in practical opportunities to develop understanding of addition and subtraction. Children will be introduced to the **part, part, whole model.** 



## Children should:

- Have access to a wide range of counting equipment, everyday objects, number tracks and number lines, and be shown numbers in different contexts.
- Pupils should also learn that equations can be written in different ways, including:
- -varying the position of the equals symbol (for example, 5-23 = and 35-2 = )
- -for addition, the addends can be written in either order and the sum remains the same (commutativity)
- Solve missing box problems, using concrete objects and number line addition to solve them
- Pupils must also learn to relate addition and subtraction contexts and equations to mathematical diagrams such as bar models, number lines, tens frames with counters, and partitioning diagrams.



#### Language focus

Figure 16: 8 represented as 6

nd 2 with base 10 number

19: 8 represe

tally marks: 5 and 3

Figure 17: 8 represented as

Figure 20: 8 repres

bead string: 7 and 1

Figure 15: 8 represented as 3

🌭 🛳 🛳

rows of 4

ers and 5 fingers

"I know that double 3 is equal to 6, so 4 plus 3 is equal to 7."





#### Add one-digit and two-digit numbers to 20 including 0

Use numbered number lines to add, by counting on in ones. Encourage children to start with the **larger** number and count on.

# Year 1 Subtraction

7 - 2 = 5

Figure 29: bar model and subtraction

equation (7 - 2 = 5)

### Subtract from numbers up to 20

Pupils should learn to compose and partition numbers within 10 before moving on to formal addition and subtraction. Start with expressions (no = sign) before moving onto equations that have an = sign.



7 - 3 = 4

subtraction equation (7 - 3 = 4)

oning model and

Partitioning

Pupils must understand that, in partitioning situations, the subtraction symbol represents a splitting up or differentiating of the whole.

igure 32: cherry partiti

The problem "There are 6 children altogether. 2 children are wearing coats. How many are not wearing coats?" is represented by 6-24 = . Here, the subtraction symbol represents the separation of the 2 children wearing coats, and so, the number of children not wearing coats is exposed.



8 - 3



#### Reduction

Pupils must also be able to write and interpret expressions and equations to represent reduction (decreasing a quantity by taking some away). Note that 'take away' should only be used to describe the subtraction operation in reduction contexts.



How many children are in the bumper car now?



#### Difference



Children use number sense when solving problems.

#### Language focus

"If I subtract 2 from an even number I get the previous even number, so 6 minus 2 is equal to 4."



Figure 9: tens frames with counters showing that subtracting 2 from an even number gives the previous even number

## **Addition and Subtraction**

Year 2

## Objectives

• solve problems with addition and subtraction:

- using concrete objects and pictorial representations, including those involving numbers, quantities and measures

- applying their increasing knowledge of mental and written methods
- recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
- add and subtract numbers using concrete objects, pictorial representations, and mentally, including:
  - a two-digit number and ones
  - a two-digit number and tens
  - two two-digit numbers
  - adding three one-digit numbers
- show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
- recognise and use the inverse relationship between addition and subtraction and use this to check
   calculations and solve missing number problems.

## Key Skills

#### Addition

- Add a 2-digit number and ones (e.g. 27 + 6)
- Add a 2-digit number and tens (e.g. 23 + 40)
- Add pairs of 2-digit numbers (e.g. 35 + 47) and add three single-digit numbers (e.g. 5 + 9 + 7)
- Show that adding can be done in any order (the commutative law).
- Recall bonds to 20 and bonds of tens to 100 (30 + 70 etc.)
- Count in steps of 2, 3 and 5 and count in tens from any number.
- Understand the place value of 2-digit numbers (tens and ones)
- Compare and order numbers to 100 using < > and = signs.
- Read and write numbers to at least 100 in numerals and words.
- Solve problems with addition, using concrete objects, pictorial representations, involving numbers, quantities and measures, and applying mental and written methods.

#### Subtraction

- Recognise the place value of each digit in a two-digit number.
- Recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100.
- Subtract using concrete objects, pictorial representations, 100 squares and mentally, including: a two-digit number and ones, a two-digit number and tens, and two two-digit numbers.
- Show that subtraction of one number from another cannot be done in any order.
- Recognise and use inverse relationship between addition and subtraction, using this to check calculations and missing number problems.
- Solve simple addition and subtraction problems including measures, using concrete objects, pictorial representation, and also applying their increasing knowledge of mental and written methods.
- Read and write numbers to at least 100 in numerals and in words.

#### Vocabulary Addition

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, addition, column, tens boundary

#### **Subtraction**

equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is\_? difference, count on, strategy, partition, tens, units

# Year 2 Addition

#### Add across 10

Pupils need to have a strategy for confidently and fluently carrying out calculations such as: 7+ 5 = 12 For both addition across 10, tens frames and partitioning diagrams can be used to support pupils as they learn about these strategies.

First, pupils should learn to add three one-digit numbers by making 10, for example,

7 +3 +2 = 10 + 2. They can then relate this to

addition of two numbers across 10, by partitioning one of the addends, for example 7 + 5 = 7 + 3 + 2

#### 1) Add within 100 (2 multiples of ten, ones to/from a two-digit number and multiples of ten to/from a twodigit number)

Tens frames, Dienes and partitioning diagrams can be used to support pupils as they learn how to relate these calculations to one-digit calculations. Throughout, pupils should use spoken language to demonstrate their reasoning.

Language focus "4 plus 3 is equal to 7. So 4 tens and plus 3 tens is equal to 7 tens."

### 2) Add within 100 (any 2 two-digit numbers)

To add 2 two-digit numbers, pupils need to combine onedigit addition facts with their understanding of two-digit place value. Pupils should first learn to add 2 multiples of ten and 2 ones before moving on to the addition of 2 twodigit numbers, for example:

Language focus "First I partition both numbers. Then I add the tens.

= 65 + 3

Then I add the ones. Then I combine all of the tens and all of the ones."

Pupils can then learn to be more efficient, by partitioning just one addend, for example: 45 + 23 = 45 + 20 + 3

#### Pupils do not need to learn formal writ-

ten methods for addition in Year 2, but column addition could be used as an alternative way to record two-digit calculations at this stage.

For calculations such as 26 + 37, pupils can begin to think about the 2 quantities arranged in columns under place-value headings of tens and ones.

They can use counters, dienes or draw dots for support.

Figure 21: adding 2 two-digit numbers using 10s and 1s column	S

37 + 26 = 63

50 + 13 = 63

+20 = 50

6 = 13



10s

000

00



Figure 9: Dienes and equations to support adding a multiple of 10 to a two-digit number



Figure 11: Dienes and an equation to support adding 2 two-digit numbers 40 . 20 . 5 . 2 60 . 0

	40 + 20 + 5 + 5 = 60 + 6 = 66
•	40 + 5 + 20 + 3 = 60 + 8 = 68
,	45 + 23 = 60 + 8 = 68



1s

00000

00000





## Year 2 Subtraction

Pupils should practise additive calculation within 10 until they have automatic recall of the additive facts. Fluency in these facts is required for pupils to succeed with addition and subtraction across 10 (and for additive calculation with larger numbers). (66 +/- Facts on Page 3)

#### Subtract across 10

Use the 'subtracting through 10' strategy (partitioning the subtrahend) - part of the subtrahend is subtracted to reach 10, then the rest of the subtrahend is subtracted from 10

#### OR

Figu

re 8: finding the difference

the 'subtracting from 10' strategy (partitioning the minuend) - the subtrahend is subtracted from 10, then the difference between the minuend and 10 is added.

Finding the difference- pupils should recognise problems with difference and relate them to subtraction



There are 5 red cars and 3 blue cars. What is the difference between the number of red cars and blue cars?

Pupils should be able to recognise contextual problems involving finding a difference, phrased as 'find the difference', 'how many more' and 'how many fewer'. Pupils may solve these problems by relating them to either a missing addend equation or to subtraction, applying known facts and strategies.



#### 1) Subtract within 100 (2 multiples of ten, ones to/from a two-digit number and multiples of ten to/from a two-digit number) Tens frames, Dienes and partitioning diagrams



Figure 10: tens frames with counters, and number lines, to support subtracting ones from a multiple of 10

### 2) Add and subtract within 100 (any 2 two-digit numbers).

When pupils learn to subtract one two-digit number from another, the progression is similar to that for addition. Pupils can first learn to subtract a multiple of ten and some ones from a two-digit number, and then connect this to the subtraction of one two-digit number from another, for ex-

ample:

There is an important difference compared to the addition strategy: pupils should not partition both two-digit numbers for subtraction as this can lead to errors, or calculations involving negative numbers, when bridging a multiple of 10, for example:

$$45-20-3 = 25-3 = 22 or = 22 
45-23 = 45-20-3 = 25-3 = 22 = 22 
45-23 = 45-20-3 = 42-20 = 22 = 2 = 22 = 22 = 2 = 22 = 2 = 2 = 2 = 22 = 2 = 2 = 2 = 2 = 2 = 2 = 2 = 2$$



$$\begin{array}{rcl}
-20 - 3 = 25 - 3 & 45 - 3 - 20 = 42 - 20 \\
= 22 & \text{or} & = 22 \\
-23 = 45 - 20 - 3 & 45 - 23 = 45 - 3 - 20 \\
= 25 - 3 & = 42 - 20 \\
\end{array}$$



Figure 6: using the 'subtracting through 10' strategy to calculate 15 minus 9

strategy to calculate 15 minus 9

## Year 3 Addition and Subtraction

## Objectives

- Add and subtract numbers mentally
- 3 digit number and 1s
- 3 digit number and 10s
- 3 digit number and 100s
- Add and subtract numbers with up to 3 digits using formal written methods of columnar addition and subtraction.
- Estimate the answer to a calculation and use inverse operations to check the answers
- Solve problems including, missing number problems, using number facts, place value, and more complex addition and subtraction

## Key Skills

## Addition

- Read and write numbers to 1000 in numerals and words.
- Add 2-digit numbers mentally, incl. those exceeding 100.
- Add a three-digit number and ones mentally (175 + 8)
- Add a three-digit number and tens mentally (249 + 50)
- Add a three-digit number and hundreds mentally (381 + 400)
- Estimate answers to calculations, using inverse to check answers.
- Solve problems, including missing number problems, using number facts, place value, and more complex addition.
- Recognise place value of each digit in 3-digit numbers (hundreds, tens, ones.)
- Continue to practise a wide range of mental addition strategies, ie. number bonds, adding the nearest multiple of 10, 100, 100 and adjusting, using near doubles, partitioning and recombining.

#### **Subtraction**

- Subtract mentally a: 3-digit number and ones, 3-digit number and tens, 3-digit number and hundreds.
- Estimate answers and use inverse operations to check.
- Solve problems, including missing number problems.
- Find 10 or 100 more or less than a given number.
- Recognise the place value of each digit in a 3-digit number .
- Counting up differences as a mental strategy when numbers are close together or near multiples of 10 (see examples above)
- Read and write numbers up to 1000 in numerals and words.
- Practise mental subtraction strategies, such as subtracting near multiples of 10 and adjusting

## Vocabulary

#### Addition

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, vertical, \_\_carry<sup>6</sup>, expanded, compact, addend, inverse,

#### Subtraction

equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is\_? difference, count on, strat-egy, partition, tens, units exchange, decrease, hundreds, value, digit, minuend, subtrahend, inverse,

Developing mental fluency with addition and place value involving 3-digit numbers, then establish more formal methods. Use empty number lines, concrete equipment (Base 10, beadstrings etc.) to build confidence and fluency in mental addition skills.

Year 3 Addition

0 100 200 300 400 500 600 700 800 900 1000

#### Fluently add within and across 10

Before pupils begin work on columnar addition, it is essential that pupils have automatic recall of addition and subtraction facts within and across 10.



5+9=146+2+1=9

Within-column calculations:

**Complements to 100** 

4+4=8

Figure 11: columnar addition of 465 and 429

#### Scaling number facts by 10

Apply place-value knowledge to known additive

facts (scaling facts by 10), for example: 8+6=14 so 80+60=140. Pupils can begin by using tens frames and counters as they did for calculation across 10, but now using 10-value counters

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#### Written Strategies

#### **Column Addition**

Beginning with calculations that do not involve regrouping (no columns sum to 10 or more) pupils should:

- learn to lay out columnar calculations with like digits correctly aligned
- learn to work from right to left, adding the least significant digits first. Teachers should initially use place-value equipment, such as Dienes, to model the algorithms and help pupils make connections to what they already know about addition and subtraction.

Pupils should use unitising language to describe within-column calculations.

#### Language focus

"3 ones plus 5 ones is equal to 8 ones." "4 tens plus 2 tens is equal to 6 tens."

Pupils must also learn to carry out columnar addition calculations that involve regrouping. Dienes can be used to model the calculations, and to draw attention to this.

For calculations with more than 2 addends, pupils should add the digits within a column in the most efficient order.



Throughout, pupils should continue to recognise the inverse relationship between addition and subtraction. Pupils may represent calculations using partitioning diagrams or bar models, and should learn to check their answers using the inverse operation.



Figure 20: columnar addition with no regrouping: calculation and Dienes representation







## Fluency of mental addition

The full set of addition calculations that pupils need for columnar addition are shown underneath. The number of facts to be learnt is reduced when commutativity is applied and pupils recognise that 7+ 5, for example, is the same as 5+ 7.

Automaticity in subtraction facts should also be developed through the application of the relationship between addition and subtraction, for example, pupils should recognise that if 7+5 = 12 then 12-5 = 7.

+	0	1	2	3	4	5	6	7	8	9	10	
0	0+0	0+1	0+2	0+3	0+4	0+5	0+6	0+7	0+8	0+9	0+10	
1	1+0	1+1	1+2	1+3	1+4	1+5	1+6	1+7	1+8	1+9	1+10	
2	2+0	2+1	2+2	2+3	2+4	2+5	2+6	2+7	2+8	2+9	2+10	
3	3+0	3+1	3+2	3+3	3+4	3+5	3+6	3+7	3+8	3+9	3+10	
4	4+0	4+1	4+2	4+3	4 + 4	4+5	4+6	4+7	4+8	4+9	4+10	
5	5+0	5+1	5+2	5+3	5 + 4	5+5	5+6	5+7	5+8	5+9	5+10	
6	6+0	6+1	6+2	6+3	6+4	6+5	6+6	6+7	6+8	6+9	6+10	
7	7+0	7+1	7+2	7+3	7+4	7+5	7+6	7+7	7+8	7+9	7+10	
8	8+0	8+1	8+2	8+3	8+4	8+5	8+6	8+7	8+8	8+9	8+10	
9	9+0	9+1	9+2	9+3	9+4	9+5	9+6	9+7	9+8	9+9	9+10	
10	10+0	10+1	10+2	10+3	10+4	10+5	10+6	10+7	10+8	10+9	10+10	

Develop mental fluency with subtraction and place value involving 3-digit numbers, then establish more formal methods. Use empty number lines, concrete equipment (Base 10, beadstrings, Numicon, hundred squares etc.) to build confidence and fluency in mental subtraction skills.

Year 3 Subtraction



Identifying core number facts: columnar subtraction	Within-column calculations
<sup>6</sup> <sup>1</sup> <sup>7</sup> 4 9 - 2 8 6	7 - 1 = 6 14 - 8 = 6 6 - 2 = 4
4 6 3	
Figure 12: columnar subtraction of 286 from 749	

14 - 6 = 8140 - 60 = 80

#### Scaling number facts by 10

During year 3, pupils develop automaticity in addition and subtraction facts within 20 .To be ready to progress to year 4, pupils must also be able to combine these facts with unitising in tens, including: • scaling known additive facts within 10, for example, 90 - 60 = 30

#### Calculate complements to 100

This important skill, because it is a prerequisite for calculating how much change is due when paying for an item.





#### Written Strategies Column Subtraction

Beginning with calculations that do not involve exchanging (no columns have a minuend smaller than the subtrahend), pupils should:

- learn to lay out columnar calculations with like digits correctly aligned
- learn to work from right to left, adding or subtracting the least significant digits first Teachers should initially use place-value equipment, such as Dienes, to model the algorithms and help pupils make connections to what they already know about addition and subtraction.

Pupils must also learn to carry out columnar subtraction calculations that involve exchange. Exchange build on pupils' understanding that 10 ones is equivalent to 1 ten, and that 10 tens is equivalent to 1 hundred. Dienes can be used to model the calculations, and to draw attention to the regrouping/exchange.

Throughout, pupils should continue to recognise the inverse relationship between addition and subtraction. Pupils may represent calculations using partitioning diagrams or bar models, and should learn to check their answers using the inverse operation.

628

274

354

sum

addend

addend

minuend

subtrahend

difference



## Year 4 Addition and Subtraction

#### Objectives

- add and subtract numbers with up to 4 digits using the formal 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 Skills

#### Addition

- Select most appropriate method: mental, jottings or written and explain why.
- Recognise the place value of each digit in a four-digit number.
- Round any number to the nearest 10, 100 or 1000.
- Estimate and use inverse operations to check answers.
- Solve 2-step problems in context, deciding which operations and methods to use and why.
- Find 1000 more or less than a given number.
- Continue to practise a wide range of mental addition strategies, ie. number bonds, add the nearest multiple of 10, 100, 1000 and adjust, use near doubles, partitioning and recombining.
- Add numbers with up to 4 digits using the formal written method of column addition
- Solve 2-step problems in contexts, deciding which operations and methods to use and why.
- Estimate and use inverse operations to check answers to a calculation.

#### **Subtraction**

- Subtract by counting on where numbers are close together or they are near to multiples of 10, 100 etc.
- Children select the most appropriate and efficient methods for given subtraction calculations.
- Estimate and use inverse operations to check answers.
- Solve addition and subtraction 2-step problems, choosing which operations and methods to use and why.
- Solve simple measure and money problems involving fractions and decimals to two decimal places.
- Find 1000 more or less than a given number.
- Count backwards through zero, including negative numbers.
- Recognise place value of each digit in a 4-digit number Round any number to the nearest 10, 100 or 1000
- Solve number and practical problems that involve the above, with increasingly large positive numbers.

#### Vocabulary

#### Addition

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, vertical, "carry", expanded, compact, addend, **thousands**, **hundreds**, **digits**, inverse, **decimal places**, **decimal point**, **tenths**, **hundredths**, **thousandths** 

#### Subtraction

equal to, take, take away, less, minus, subtract, leaves, distance be-tween, how many more, how many fewer / less than, most, least, count back , how many left, how much less is\_? difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit, subtrahend, minuend, inverse, **decimal places, decimal point, tenths, hundredths, thousandths** 

# Year 4 Addition

#### Develop confidence at calculating mentally with larger numbers including decimal numbers using the full range of strategies

As well as being able to partition numbers in the 'standard' way (into individual place value units), pupils must also be able to partition numbers in 'non-standard' ways, and carry out related addition and subtraction calculations, for example:

Reason about the location of any four-digit number in the linear number system, including identifying the previous and next multiple of 1,000 and 100, and rounding to the nearest of each.

8,000 8,100 8,200 8,300 8,400 8,500 8,600 8,700 8,800 8,900 9,000 Figure 8: using a number line to identify the previous and next multiple of 100

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100 100

100 100

100 100

100 100

(100)

100

#### Scaling number facts by 100

Apply place-value knowledge to known additive and multiplicative number facts (scaling facts by 100), for example: 8+6=14 so 800+600 =1,400

For calculations such as 800 + 600 = 1,400, pupils can begin by using tens frames and counters as they did for calculation across 10 (Year 2) and across 100 (Year 3), but now using 100-value counters.

1,003 + 10 = 1,113





+ 97



0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000 Figure 7: using a number line to identify the previous and next multiple of 1,000

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Explore different methods of bridging the thousands boundary, including the numberline, bar model and part part whole model.





#### Written Strategies

A

Column Addition	6,	5	8	4			3,	3	6	2
Use the calculation approaches learnt for 3 digit numbers (Year 3) to be applied +	2,	7	3	9		+		6	4	9
when adding 4 digit numbers (including tenths and hundredths)	9,	3	2	3	-		4,	0	1	1
Children should pay attention to placing digits in the correct columns, making	1	1	1		-		1	1	1	
sure to start adding digits from the ones column. Concrete apparatus can be used to										
develop confidence. Once children are confident, children will be able to extend this		1,	6	4	9			1.	3	6
method to 4 digit numbers.		3,	1	0	4		+	1.	6	8
Give children opportunities to solve missing number problems starting with no re-	+		5	1	6		_			
grouping, then regrouping once, then regrouping more than once.		5.	2	6	9		_			
		1		1						
Jition with no regrouping     Addition with regrouping once     Addition with regrouping more than once       3     3     4     3										
+, 5 7 +, 5 5 +, 5 7										
7,879 5,729 8,239										,
									_	

## Year 4 Subtraction

### **Mental Strategies**

Develop mental fluency with subtraction using a range of strategies. Children are encouraged to think about the best method for the numbers involved – more details is provided in the spine materials 1.22. Use empty number lines, concrete equipment (Base 10, beadstrings, Numicon, hundred squares etc.) to build confidence and fluency in mental subtraction



#### Written Strategies

#### Column Subtraction 76 X 5<sup>1</sup>4<sup>1</sup>2<sup>1</sup>8 Recap previous learning on subtracting three digit numbers (Y3 Spine 1.21), and how this can be applied to four digit numbers (including tenths and 3 7 8 2,78 9 hundredths) 5 2,8 9 3,74 9 Children should pay attention to placing digits in the correct column so ensure they start by subtracting digits from the right. Encourage children to 5 3 make their calculations clear to follow where exchanging (for example, ex-0 changing one ten for ten ones) is necessary. 2 4 8 Give children opportunities to solve missing number problems starting with . no exchanging, then exchanging once, then exchanging more than once. Estimate Subtraction with exchanging once Subtraction with exchanging three times Subtraction with no exchanging Calculate 8 8 3 4 Check it! 7 3, 0 7 4 , 4 5 5 3, 7 5 8

## Year 5 Addition and Subtraction

#### Objectives

- add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)
- add and subtract numbers mentally with increasingly large numbers
- use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

## Key Skills

#### Addition

- Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies ie. add the nearest multiple of 10, 100, 100 and adjust; use near doubles, inverse, partitioning and re-combining; using number bonds.
- Use rounding to check answers and accuracy.
- Solve multi-step problems in contexts, deciding which operations and methods to use and why.
- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.
- Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000.
- Add numbers with more than 4 digits using formal written method of columnar addition.

#### Subtraction

- Subtract numbers mentally with increasingly large numbers .
- Use rounding and estimation to check answers to calculations and determine, in a range of contexts, levels of accuracy .
- Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.
- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.
- Count forwards or backwards in steps of powers of 10 for any given number up to 1 million.
- Interpret negative numbers in context, counting forwards and backwards with positive and negative in-tegers through 0.
- Round any number up to 1 million to the nearest 10, 100, 1000, 10 000 and 100 000.

#### Vocabulary Addition

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, "carry", expanded, compact, vertical, thousands, hundreds, digits, inverse & decimal places, decimal point, tenths, hundredths, thousandths

#### Subtraction

equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back, how many left, how much less is\_? difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal point, decimal

# Year 5 Addition

#### **Mental Strategies**

Develop confidence at calculating mentally with larger numbers and decimal numbers. Using the full range of strategies, including practical equipment such as counters and dienes. Decimal numbers were introduced in Year 4 (Spine 1.23 and 1.24) however recap may be needed. Podictributing the addende

		Redistributing the addends— same sum rule!											
Non-bridging		7,656	+ 8	39,994 =	7,650 + 90,000	5	.3 +	3.98	=	9.28			
3,000 + 2,000 =		7,650	5			- 0.02		+ 0.	02				
<ul> <li>Bridging</li> </ul>			Sec. 1					$\downarrow$					
7,000 + 5,000 =		7,656	+ 3	89,994	<b>=</b> 97,650 ◀	5.	28 +	4.0	=	9.28			
Connected calculations		- 6		+ 6		Usir	ng the s	ame su	ım ru	le in balance			
143,000 + 4,000 -		v		v			equations						
<ul> <li>Doubling</li> </ul>		7,650	+	90,000	= 97,650 -		+ 0	.45 =	16.4	45 + 30.25			
16,000 + 16,000 =						_							
Near 'whole-ten' or 'whole-hunda	red thousands'	Using b	s to 100										
19,000 + 29,000 =		helps v	with Ł	ith bonds to			"I've subtracted 16 from 16.45, so I must add 16 to 30.25 to keep the sum the same."						
Partitioning		100,00		'l'v to									
284,000 + 37,000 = 284,000 + 16,00	0 + 21,000		23,00	00 +	77,000			+ 1	6				
=		20	0,000	3,000 7,00	<u>,</u> , , , , , , , , , , , , , , , , , ,		46.25 +	- 0.45	= 16.45	5 + 30.25			
• Bar me	odel			10,000				-	16				
Transfor	ming												
Using the inverse to solve 168,000	9+ =437,000					Part–par	rt–whole mo	odels					
problems to					?			(10,000)					
437,000	0-168,000=			1.5	2.1	0.9		$\succ$		/			
$\backslash$			7				_		$\sum$				
	437,000	?	-	4.2	8.5 5 1.75	2.75	?	) (	9,000				

#### Written Strategies

5 7 9,000

Pupils should recap from Year 4 extended columnar addition methods to 5 and 6 digit number (and up to 2 decimal places). Pupils must be able to add 2 or more numbers using columnar addition, including calculations whose addends have different numbers of digits. For calculations with more than 2 addends, pupils should add the digits within a column in the most efficient order. Start where there is no grouping necessary. Provide children with ample practice

For the fourth example below, efficient choices could include:

beginning by making 10 in the tenths column • making double-6 in the ones column

Empty decimal places can be filled with zero to show the place 6·3 274.1 With place-value headings 4 7.5 2 Thousands Ones 1.4 9 100s 10s 1s 100s 10s 1s 1 9 5 · 8 8 1·7 **0** 3 6 5 0 0 0 1 4 2 5.62 0 0 0 6 9 9 129.2 2 0 5 7 9 0 0 3 · 3 Without place-value headings Model how to add a thousands 3 6 5,0 0 0 separator comma to make it + 2 1 4,0 0 0 easier to read the sum.

9

## Year 5 Subtraction

Develop mental fluency with subtraction using a range of strategies. Children are encouraged to think about the best method for the numbers involved.



## Year 6 Addition and Subtraction

## Objectives

- perform mental calculations, including with mixed operations and large numbers
- use their knowledge of the order of operations to carry out calculations involving the four operations
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

### Key Skills

#### **Addition**

- Perform mental calculations, including with mixed operations and large numbers, using and practising a range of mental strategies.
- Solve multi-step problems in context, deciding which operations and methods to use and why.
- Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.
- Read, write, order and compare numbers up to 10 million and determine the value of each digit.
- Round any whole number to a required degree of accuracy.
- Pupils understand how to add mentally with larger numbers and calculations of increasing complexity.

#### Subtraction

- Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.
- Read, write, order and compare numbers up to 10 million and determine the value of each digit
- Round any whole number to a required degree of accuracy
- Use negative numbers in context, and calculate intervals across zero.
- Children need to utilise and consider a range of mental subtraction strategies, jottings and written methods before choosing how to calculate.

### Vocabulary

#### Addition

add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, "carry", expanded, compact, vertical, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths

#### Subtraction

equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is\_? difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit, inverse, tenths, hundredths, decimal point, decimal

# Year 6 Addition

#### **Mental Strategies**

Develop confidence at calculating mentally with larger numbers and decimal numbers. Using the full range of strategies:

Using place value Bridging through 60 when calculating Count in 0.1s, 0.01s, 0.001s with time Using known e.g. Know what 0.001 more • Bridging through multiples of 1,10,100 facts than 6.725 is 4.85 + 2.36 = 4.85 + 263+37=100 Partitioning = 6.85+ 0.15 + 0.21 0.63+0.37=1 = 7.21e.g. 9.54 + 3.23 as 9 + 3, 0.5 + 0.2 and 0.04 + 0.03, to Counting on give 12.77 Add two decimal numbers by adding the 1s. then the Rounding and adjusting 0.1s/0.01s/0.001s e.g. 6·314 + 3·006 as 6·314 + 3 (9·314) + 7.62+4.9 0.006 = 9.32+5 Add near multiples of 1 e.g. 6·345 + 0·999 e.g. 5·673 + 0·9 12.62 12.52 7.62 -0.1

#### Written Strategies

Add several numbers of increasing complexity including money, measures and decimals with different numbers of decimal places.

To support understanding children should physically make and carry out the calculation using base 10 or other apparatus then compare their practical version with the written form to develop conceptual understanding. 2 3

3

9

9

1

3

1

9

8

+

8

5

9

2

Ο

0

7

3

5

2

1

0

0

0

1

6

8

7

0

1

Adding several numbers with different numbers of decimal places (including money and measures):

- Tenths, hundredths and thousandths should be correctly aligned, with the decimal point lined up vertically
- Zeros could be used in any empty decimal places, to show there is no value to add.
- Cross out the "carries" when they have been added.

Adding several numbers with more than 4 digits.

## Year 6 Subtraction

Develop mental fluency with subtraction using a wide range of strategies when calculating including decimal and increasingly larger numbers. Children are encouraged to think about the best method for the numbers involved.

