Year 4

Small Steps Guidance and Examples

Block 2: Addition and Subtraction

White Rose Maths

Overview

Small Steps

NC Objectives

Add and subtract 1s, 10s, 100s and 1000s

Add two 4-digit numbers – no exchange

Add two 4-digit numbers – one exchange

Add two 4-digit numbers – more than one exchange

Subtract two 4-digit numbers – no exchange

Subtract two 4-digit numbers – one exchange

Subtract two 4-digit numbers – more than one exchange

Efficient subtraction

Estimate answers

Checking strategies

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.

1s, 10s, 100s, 1,000s

Notes and Guidance

Building on Year 3, children use their knowledge of adding and subtracting hundreds, tens and ones as well as introducing adding thousands.

This can be done using concrete representations (Base 10, place value counters) before moving to abstract and mental methods.

Mathematical Talk

Which is the highest value counter?

Can you make the same number using Base 10?
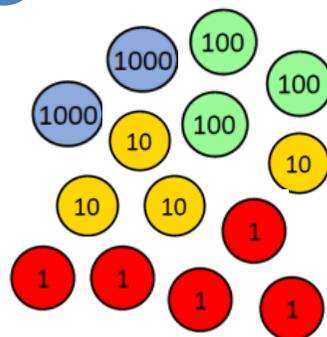
Which place value column are we focusing on?

If we are adding tens, is it only the tens column that changes?

5382 + 5 tens- Will only the tens column change?

Which other column will change?

Varied Fluency

1. Here is a number.

Add 3 thousands to the number. Which counter did you use?

Add 3 hundreds to the number. What number do you have now?

Subtract 3 tens from the number. Which counters do you need to take away?

Add five ones to the number. How many ones do we have? Can we exchange our ones for a ten?

2. Here is a number.

Thousands	Hundreds	Tens	Ones
5	3	8	2

Add three hundreds to the number.

Subtract 4 thousands.

Subtract 2 ones.

Add 5 tens.

What number do you have now?

3. Complete:

3456 + 1000 =   734 – 400 =
7234 + 500 =   6218 – 200 =
3821 + 700 =   715 + 50 =
8527 – 2000 =   4060 – 200 =

1s, 10s, 100s, 1,000s

Reasoning and Problem Solving

Which questions are easy?
Which questions are hard?

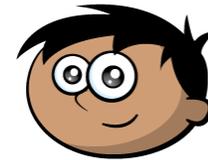$$8,7273 + 4 =$$
$$8,273 + 4 \text{ tens} =$$
$$8,273 - 500 =$$
$$8,273 - 5 \text{ thousands} =$$

Why are some easier than others?

8,273 + 4 and
8,273 –
5 thousands are
easier
because you do
not
cross any
boundaries.

8,723 + 4 tens
and
8,273 – 500 are
harder because
you
have to cross
boundaries and
make
an exchange.

Jack says:

When I add hundreds to a number, only the hundreds column will change

Do you agree with Jack?
Explain your answer.

I do not agree
with Jack
because when
you add
hundreds to a
number
and end up with
more
than ten
hundreds you
will affect the
thousands
column as well.

Add two 4-digit Numbers

Notes and Guidance

From Year 3 children should have an understanding of addition of 3-digit numbers.

Moving on from the previous step of adding and subtracting 1s, 10s, 100s, 1000s, children begin adding 2 four-digit numbers with no exchange.

Children will use a place value grid to support understanding alongside column addition.

Mathematical Talk

Which is the larger number? Why?

Compare place value columns – which column has a greater number of thousands/hundreds/tens/ones?

When we add, what happens in the ones column? The tens? The hundreds? The thousands? What has changed?

How is the question different when we add a 4-digit number to a 3-digit number?

Varied Fluency

1 Add the place value counters together.

1,000s	100s	10s	1s
1000 1000 1000	100 100	10 10 10 10	1 1
1000 1000	100 100	10	1 1 1

Can you write this as a calculation? (3,242 + 2,213)
Now complete the question 3,242 + 213 in the same way.
What is the same and what's different?
Look at how the place value columns are lined up in the new question.
How is our answer different? Why?

2 Complete the missing numbers.

$$4\,\square\,6\,\square$$
$$+2\,5\,\square\,1$$
$$\overline{\square\,7\,8\,9}$$

Add two 4-digit Numbers

Reasoning and Problem Solving

Tamsin adds 2 numbers together that total 4,444

> Both numbers have 4 digits.
>
> All the digits in both numbers are even.

Tamsin

What could the numbers be? Prove it. How many ways can you find?

Possible answers:

2,222 + 2,222
2,244 + 2,200
2,224 + 2,220
2,442 + 2,002
2,242 + 2,202
2,424 + 2,020
2,422 + 2,022
2,444 + 2,000

This includes 0 as an even number.

There are more possible pairs of numbers.

This question could include a discussion about whether 0 is an odd or an even number and why.
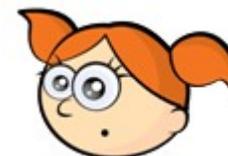
Two children completed the following calculation:

1,234 + 345

> When I added 1,234 and 345 together I got 1,589.

Suri   Eleanor

> I added 1,234 to 345 and I got 4,684.

Both of the children have made a mistake in their calculations.

Calculate the actual answer to the question.

What mistakes did they make?

Actual answer:

1,579

Suri's mistake was a miscalculation for the 10s column, adding 30 and 40 to get 80 rather than 70.

Eleanor's mistake was a place value error, placing the 3 hundred in the thousands column and following the calculation through incorrectly.

Add two 4-digit Numbers

Notes and Guidance

Prior to this step, children must be confident in adding two 4 digit numbers with no exchange.

Children will again use a place value grid to support understanding alongside column addition.

They will explore exchanges as they occur in different place value columns and look for similarities/differences.

Mathematical Talk

What is the maximum number of counters you can have in each place value column?

What happens in a place value column when there are more than ten counters?
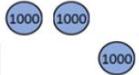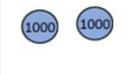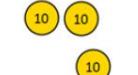
What happens when we exchange?

Which counters are exchanged? What are they exchanged for? Where do they move to?

How does this work when exchanging ten 1s? Ten 10s? Ten 100s?

Varied Fluency

1 Add the place value counters together.

Look at the result for each column; what do you notice?

Exchange ten ones for a 10 counter and move it to the tens column.

What is the final result?

Now write the same calculation in numbers, showing the exchanged 10 underneath the tens column.

2 Daniel buys a new laptop costing £1,265. He also buys a new mobile phone costing £492. What is the total cost?

His friend, Paul, buys a smart watch for £342.

How much money have they spent altogether?

Add two 4-digit Numbers

Reasoning and Problem Solving

What is the missing four digit number?

The missing number is 2,554.

You could work it out by thinking about what is added to 5 to make 9 and so on.

Some children might use the inverse and subtract 6,395 from 8,949 to find the answer.

Anne, Beth and Alex are working out the solution to the following calculation: $6,374 + 2,823$

Anne's strategy:

$$6,000 + 2,000 = 8,000$$
$$300 + 800 = 110 \quad 70 + 20 = 90$$
$$4 + 3 = 7$$
$$8,000 + 110 + 90 + 7 = 8,207$$

Beth's strategy:

$$\begin{array}{r} 6{,}374 \\ +\,2{,}823 \\ \hline 8{,}197 \end{array}$$

Alex's strategy:

$$\begin{array}{r} 6{,}374 \\ +\,2{,}823 \\ \hline 7 \\ 90 \\ 1{,}100 \\ 8{,}000 \\ \hline 9{,}197 \end{array}$$

Alex is correct with 9,197

Anne has miscalculated $300 + 800$, forgetting to exchange a ten hundreds to make a thousand (showing 11 tens instead of 11 hundreds)

Beth has forgotten to show and add on the exchanged thousand.

Add two 4-digit Numbers

Notes and Guidance

Building on adding two 4-digit numbers with one exchange, children explore multiple exchanges as they occur in different place value columns and look for similarities/differences.

Mathematical Talk

Compare the place value counters method with the numeric representation – how do they relate?
How did we make the extra 10 place value counter?
What does the '1' in the tens column show?
How did we make the extra 1000 place value counter?
What does the '1' in the thousands column show?
State: 'We have exchanged ten ones to make one ten'. 'We have exchanged ten hundreds to make one thousand'.

Varied Fluency

1 Complete the following calculation, with place value counters and in written form.
Remember to start with the ones column.

$$\begin{array}{r} 4{,}844 \\ +\ 2{,}156 \\ \hline \end{array}$$

2 What interesting thing happens with this question?
Can you explain what is happening? Why?
Make some more questions that create a 'chain' of exchanges.

3 Write <, > or = in each of the circles to make the number sentences correct:

3,456 + 789 ◯ 1,810 + 2,436

2,829 + 1,901 ◯ 2,312 + 2,418

7,542 + 1,858 ◯ 902 + 8,496

1,818 + 1,999 ◯ 3,110 + 707

Add two 4-digit Numbers

Reasoning and Problem Solving

Luke says:
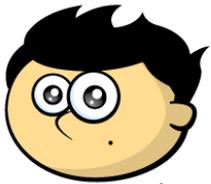
When I add two numbers together I will only ever make up to one exchange in each column.

Is Luke correct?
Explain your answer

Luke is correct. When adding any two numbers together, the maximum value in any given column will be 18 (e.g. 18 ones, 18 tens, 18 hundreds). This means that only one exchange can occur in each place value column. Children may explore what happens when more than two numbers are added together.

Complete:

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

Greg says that 'there is more than one answer for the missing numbers in the hundreds column'. Is he correct?
Explain your answer.

The solution shows the missing numbers for the ones, tens and thousands columns. Greg is correct; the missing numbers in the hundreds column must total 1,200 (the additional 100 has been exchanged). Possibilities are 900+300, 800+400, 700+500, 600+600.

$$
\begin{array}{r}
6\,?\,3\,8 \\
+\ 2\,?\,8\,7 \\
\hline
9{,}3\,2\,5 \\
\hline
\scriptstyle 1\ 1\ 1
\end{array}
$$

Subtract two 4-digit Numbers

Notes and Guidance

Building on Year 3, children use their knowledge of subtracting using the formal column method to subtract 2 four digit numbers.

Children will be focusing on no exchange and will be concentrating on the correct place value.

Mathematical Talk

Why is it important that we start subtracting the ones first? What could happen if we didn't?

Can you use place value counters to make this number? Can you use pictorial representations? Does this help you?

What happens when we take away all of the hundreds? Thousands? How does the number change?

What happens when we do not subtract anything from the value?

Varied Fluency

1 Subtract 2,332 from the number below.

2 Complete this subtraction problem.

	Thousands	Hundreds	Tens	Ones
	7	6	4	6
-	4	3	3	5

3 Using a place value grid work out the following.

$$2,348 - 235 = \underline{\hspace{1cm}}$$
$$\underline{\hspace{1cm}} = 4,572 - 2,341$$
$$6,582 - 582 = \underline{\hspace{1cm}}$$
$$\underline{\hspace{1cm}} = 7,262 - 7,151$$

Subtract two 4-digit Numbers

Reasoning and Problem Solving

Chloe is performing a column subtraction with two four digit numbers.

The larger number has a digit total of 35. The smaller number has a digit total of 2.

Use cards to help you find the numbers.

What could Chloe's subtraction be?

How many different options can you find?

Possible answers:

$9998 - 1100 = 8898$
$9998 - 1010 = 8988$
$9998 - 1001 = 8997$
$9998 - 2000 = 7998$
$9989 - 1100 = 8889$
$9989 - 1010 = 8979$
$9989 - 1001 = 8988$
$9989 - 2000 = 7989$
$9899 - 1100 = 8799$
$9899 - 1010 = 8889$
$9899 - 1001 = 8898$
$9899 - 2000 = 7899$
$8999 - 1100 = 7899$
$8999 - 1010 = 7889$
$8999 - 1001 = 7998$
$8999 - 2000 = 6999$

There are counters to the value of 3,470 on the table but some have been covered by the splat.
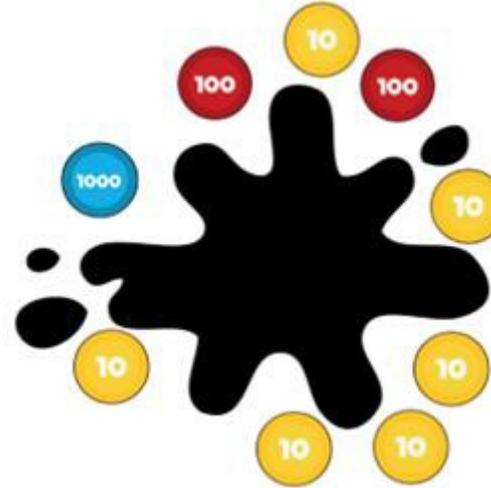
How many different ways can you make the missing amounts?

$3470 - 1260 = 2210$

Possible answers:

- two 1000s, two 100s and one 10

- twenty-two 100s and one 10

- twenty-two 100s and ten 1s

There are more possible answers.

Subtract two 4-digit Numbers

Notes and Guidance

Building on Year 3, children use their knowledge of subtracting using the formal column method to subtract 2 four digit numbers.

Children will be learning how to carry out this calculation with one exchange taking place within any column.

Mathematical Talk

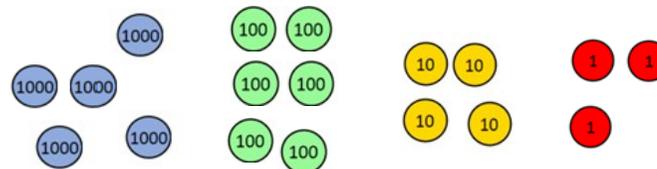What happens when the digit we are subtracting from is smaller?
What are the strategies we use?
Which number do we exchange?

Can you use concrete or pictorial representations to help?

Varied Fluency

1. Here is a number.

Subtract 4,345.
What is your answer?
Can you subtract 5 from 3?
What do you have to do?
You exchange a 10 – what does your number become that you are subtracting from?

2. Complete the calculation.
What do we do?
Where do we exchange from? Why do we exchange from there?

$$\begin{array}{r} 4578 \\ -\ 3643 \\ \hline \end{array}$$

3. Find the difference between 6,528 and 469 using column subtraction.

Subtract two 4-digit Numbers

Reasoning and Problem Solving

Three Primary Schools join together to go on a school visit to The Deep in Hull. 1,235 people go on the trip. There are 1,179 children and 27 teachers. The rest are parents.

How many parents are there?

What do you need to do first?

Which operation do you use?

Add children and teachers together first.

$1,179 + 27 = 1,206$

Subtract this from total number of people.

$1,235 - 1,206 = 29$

29 parents

Find the missing numbers that could go into the boxes.

Give reasons for your answers.

$$\boxed{} - 1,345 = 4\boxed{}6$$

What is the greatest number that could go in the first box?

What is the smallest?

How many possible answers could you have?

What is the pattern between the numbers?

What method did you use?

Possible answers:

1,751 and 0
1,761 and 10
1,771 and 20
1,781 and 30
1,791 and 40
1,801 and 50
1,811 and 60
1,821 and 70
1,831 and 80
1,841 and 90

1,841 is the greatest
1,751 is the smallest

There are 10 possible answers

Both numbers increase by 10

Subtract two 4-digit Numbers

Notes and Guidance

Building on the previous step, children explore what happens when a subtraction has more than one exchange.

Here it is important that children focus on when an exchange is and isn't needed.

Mathematical Talk

What happens when the digit we are subtracting from is smaller? What are the strategies we use? Which number do we exchange?

What happens when we have to exchange from more than one number?

Can we use the inverse to check our calculation?

Varied Fluency

1 Use place value counters to complete the subtractions. Remember to exchange between the columns when you cannot subtract easily.

$$
\begin{array}{r} 5783 \\ -\ 894 \\ \hline \end{array}
\qquad
\begin{array}{r} 6737 \\ -\ 759 \\ \hline \end{array}
$$

2 Find the missing 4-digit number.
What are you going to do to solve the problem?
Which operation are you going to do? Why?

$$
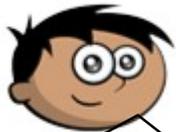\begin{array}{r} ????\ \\ +\ 4678 \\ \hline 7431 \end{array}
$$

3 A shop has 8,435 magazines.
367 are sold in the morning and 579 are sold in the afternoon.
How many magazines are left?

8,435			
367	579		?

Subtract two 4-digit Numbers

Reasoning and Problem Solving

Max and Will solve a problem.

Max

When I subtract 546 from 3,232 my answer is 2,714.

Will

When I subtract 546 from 3,232 my answer is 2,686.

Who is right?
Which answer is correct?
Explain your reasons why.
Why is one of the answers wrong?

Will is correct as
3,232 – 546 = 2,686

Max is incorrect because he did not exchange the 2 and the 3 and subtracted the bottom numbers from the top.

There were 2,114 visitors to the museum on Saturday.
650 more people visited the museum on Saturday than on Sunday.

MUSEUM

Altogether how many people visited the museum over the two days?

What do you need to do first to solve this problem?

First you need to find the number of visitors on Sunday

which is
2,114 - 650 = 1,464

Then you need to add Saturday's visitors to that number to solve the problem.

1,464 + 2,114 = 3,578

Efficient Subtraction

Notes and Guidance

Here children build on their understanding of column subtraction and mental methods to find the most efficient methods of subtraction.

Children compare the different methods of subtraction and discuss whether they would partition, take away or find the difference.

Mathematical Talk

Is the column method always the most efficient method?
When we find the difference, what happens if we take one off each number? Is the difference the same? How does this help us when subtracting large numbers?
When is it more efficient to count on rather than use the column method?
Can you represent your subtraction in a part whole model or a bar model?

Varied Fluency

1. Sam, Lucas and Jemima are solving the calculation
7000 – 3582
Here are their methods.
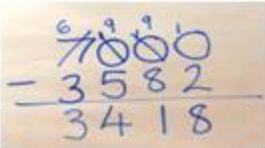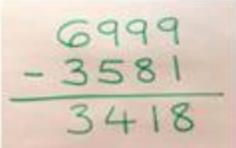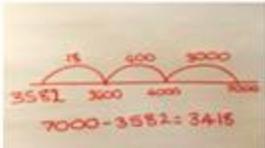
Who is correct? Can you explain how each child has reached their answer? Whose method is the most efficient?
Use the different methods to solve 4000 – 2831

2. Find the missing numbers.
What methods did you use?
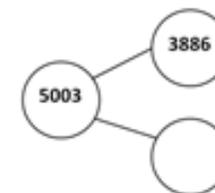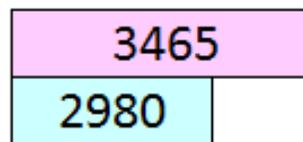
Efficient Subtraction

Reasoning and Problem Solving

Jamal has £1000.

He buys a scooter for £345 and a skateboard for £110.

How much money does he have left?

Show 3 different methods of finding the answer.

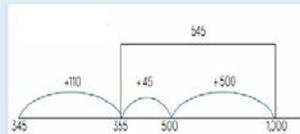Explain how you completed each one.

Which is the most effective method?

$$345 + 110 = 455$$
$$1000 - 455 = 545$$

He has £545 left

$$345 + 110 = 455$$
$$999 - 454 = 545$$

He has £545 left

Above I have used column method, taken one off each number to find the difference and found the difference by counting on. Below I used counting on the number line.

Look at each pair of calculations below. Which one out of each pair of calculations has the same difference as 2450 – 1830?

2,451 – 1,831 =	2,451 – 1,829 =
2,500 – 1,880 =	2,500 – 1,780 =
2,449 – 1,829 =	2,449 – 1,831 =

When is it useful to use difference to solve subtractions?

2,451 – 1,831
Added one to each number

2,500 – 1,880
Added 50 to both numbers

2,449 – 1,829
Subtracted one from each number

Difference is 620

Estimate Answers

Notes and Guidance

In this step, children use their knowledge of rounding to estimate answers for calculations and word problems.

They build on their understanding of near numbers in Year 3 to make sensible estimates.

Mathematical Talk

Which numbers shall I round my numbers to?

Why should I round to this number? Why should an estimate be quick?

When, in real life, would we use an estimate?

Varied Fluency

1. Match the calculations with a good estimate for the number sentence.

345 + 1,234		3,000 + 6,000
2,985 + 6,325		3,500 + 1,200
3,541 + 1,179		350 + 1,200
2,135 + 6,292		2,000 + 6,000

2. Sita is estimating her number sentences. She rounds her numbers to the nearest thousand, hundred and ten to give different estimates.

> Original calculation: $3,625 + 4,277 =$
> Thousands: $4,000 + 4,000 = 8,000$
> Hundreds: $3,600 + 4,300 = 7,900$
> Tens: $3,630 + 4,280 = 7,910$

Which is the best estimate?
An estimate is supposed to be quick, which is the least effective estimate?
Decide whether to round to the nearest 10, 100 or 1000 for the following calculations.

$4,623 + 3,421=$ $9,732 - 6,489=$ $8,934 - 1,187=$

Estimate Answers

Reasoning and Problem Solving

A game to play for two people.

The aim of the game is to get a number as close to 5,000 as possible.
Each child rolls a 1-6 die and chooses where to put the number on their grid. Once they have each filled their grid, they add up their totals to see who is the closest.

	?	?	?	?
+	?	?	?	?

$$\begin{array}{r} 2,345 \\ +\, 2,666 \end{array}$$

In the example above the total is 5,011

The aim of the game could be changed, e.g. Aim for a number above/below 5,000 Aim to make the highest/lowest number possible etc

The estimated answer to a calculation is 3,400.
The numbers in the calculation were rounded to the nearest 100 to find an estimate.
What could the numbers be in the original calculation?

Children find any pair of numbers that round to the nearest hundred to make 3,400 altogether. e.g.

2,343 + 1,089 =

4,730 – 1,304 =

Use the number cards and + or - to make three calculations with an estimated answer of 2,500

1,295
1,120
4,002
1,489
3,812
1,449

3,812 – 1,295 can be estimated as 3,800 – 1,300 = 2,500

4,002 – 1,489 can be estimated as 4,000 – 1,500 = 2,500

1,449 + 1,120 can be estimated as 1,400 + 1,100 = 2,500

Checking Strategies

Notes and Guidance

In this step, children need to explore ways of checking to see if an answer is reasonable.

Checking using inverse is to be encouraged so that children are using a different method and not just potentially repeating an error, for example, if they add in a different order.

Mathematical Talk

How can you tell if your answer is sensible?

What is the inverse of addition? What is the inverse of subtraction?

Varied Fluency

1. $2,300 + 4,560 = 6,860$
   Use a subtraction to check the answer to the addition. Is there more than one subtraction we can do to check the answer?

2. If we know $3,450 + 4,520 = 7,970$, what other addition and subtraction facts do we know?

   _____ + _____ = _____

   _____ - _____ = _____

   _____ - _____ = _____

   Does the equal sign have to go at the end? Could we write an addition or subtraction with the equals sign at the beginning? How many more facts can you write now?

3. Complete the pyramid.
   Which calculations do you use to find the missing numbers? Which strategies do you use to check your calculations?
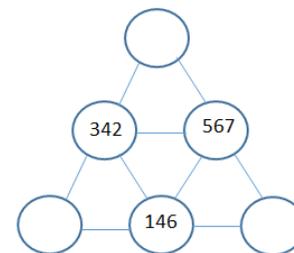
Checking Strategies

Reasoning and Problem Solving

Here is a number sentence.

$$350 + 278 + 250$$

Add the numbers in different orders to find the answer.
Is one order of adding easier? Why?

Create a rule when adding more than one number of what to look for in a number.

It is easier to add 350 and 250 to make 600 and then add on 278 to make 878.
We can look for making number bonds to 10, 100 or 1000 to make it easier to add more than one number.

I completed an addition and then used the inverse to check my calculation.
When I checked my calculation, the answer was 3,800
One of the other numbers was 5,200
What could the calculation be?

Possible answers:
5,200 – **1,400** = 3,800
9,000 – 5,200 =3,800

In the number square below, each horizontal row and vertical column adds up to 1,200
Find the missing numbers.
Is there more than one option?

897		
		832
	762	

Check the rows and columns using the inverse and adding the numbers in different orders.

Possible answers:
There are many correct answers
Top row missing boxes need to total 303.
Middle row total 368 Bottom row total 438

897	270	33
200	168	832
103	762	335

This grid could be adapted to contain more numbers to help children access it more easily.