

Newdale Primary

Maths Calculation Policy – Number Sense and Subtraction



Nursery

A key priority of Newdale's maths curriculum is to ensure that all children develop a strong sense of number and place value. Children will continually encounter numbers in the world around them. But the ability to recognise the symbols connected to numbers, and name it, is very different from understanding the 'number sense' of it, and it is the development of this latter skill that is crucial to a child's mathematical ability.

It is important to recognise that just because a child can recite number names in order, does not necessarily mean that they can count.

As with learning the alphabet, children can recall a sequence of numbers by rote without any real grasp or understanding of what they mean (hence young children often leave out numbers as they count). Gaining familiarity with number names through songs and rhymes is of course helpful, but emphasis should be placed on helping children make links between these number names and the number of objects they represent.

EYFS Development Matters 2020

In the Nursery, as well as teaching the children to count objects, significant attention is given to helping the children to recognise number and the development of mental representations. In order to do this, much of their experience with number play in the early years will involve concrete, movable objects.



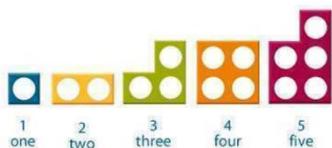
EYFS Development Matters Statements for birth to 3 years– Ladybugs and Little Acorns

Expectations in number:

- Combine objects like stacking blocks and cups. Put objects inside others and take them out again
- Take part in finger rhymes with numbers.
- React to changes of amount in a group of up to three items.
- Compare amounts, saying 'lots', 'more' or 'same'.
- Counting-like behaviour, such as making sounds, pointing or saying some numbers in sequence.
- Count in everyday contexts, sometimes skipping numbers - '1-2-3-5.'

Representations of number:

Using concrete, physical objects.



Key vocabulary and knowledge shared with the children:

Concepts of quantity (How many....?), equality (Is this the same as....?) and inequality (Which has more....?)

Modelling combining sets of small quantities.

Removing objects from a set/eating them to show the amount is now smaller.

Abstract – activities that demonstrate knowledge and skills:

Spoken number names - *One, once, alone, first.*

Number rhymes to secure the order of the numbers. Counting Back rhymes to support subtraction: 5 little men in a flying saucer, 5 little ducks, 5 currant buns.

Mark making and graphics to represent a small number in the context of play.

Mark making and graphics to represent a small quantity to compare in the context of play.

Opportunities to identify numbers in the environment

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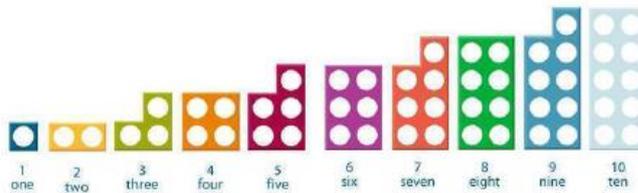
EYFS Development Matters Statements for 3-4 Years – Mighty Oakes

Expectations in number:

- Fast recognition of up to 3 objects, without having to count them individually ('subitising').
- Recite numbers past 3.
- Say one number for each item in order: 1,2,3,4,5.
- Know that the last number reached when counting a small set of objects tells you how many there are in total ('cardinal principle').
- Show 'finger numbers' up to 5.
- Link numerals and amounts: for example, showing the right number of objects to match the numeral, up to 5.
- Experiment with their own symbols and marks as well as numerals.
- Solve real world mathematical problems with numbers up to 5.
- Compare quantities using language: 'more than', 'fewer than'.

Representations of number:

Using Numicon to support in number recognition.



Key vocabulary and knowledge shared with the children:

- Comparing numbers 1,2 and 3 – 'bigger' and 'smaller'
- Stable ordering numbers 1 to 3 and beyond
- Using counting strategies and subitising to identify the number of concrete objects in the set.
- Saying the number names in order from 1-5.
- Show finger numbers up to 5.
- Use the language of more/fewer. Adults to model language to the children.

Abstract – activities that demonstrate knowledge and skills:

- Subitise quantities up to the value of 3. Show children multiple representations of the number 3. (Linea, dice, Numicon.)
- Understand that the quantity gets smaller when we subtract(Use of real life and counting objects).

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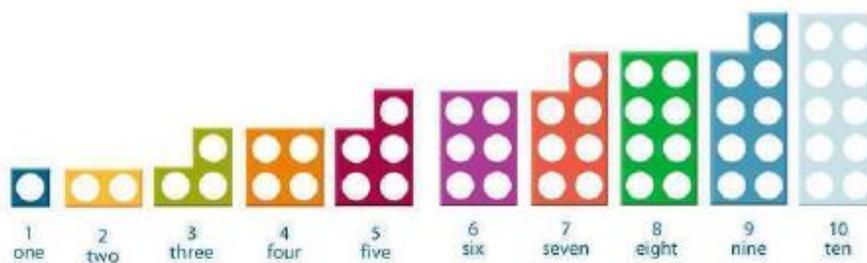
EYFS Development Matters Statements for 3-4 Years : End of Mighty Oaks and Beginning of the year in Reception.

Expectations in number:

- Fast recognition of up to 5 objects, without having to count them individually ('subitising').
- Recite numbers past 5.
- Say one number for each item in order: 1,2,3,4,5.
- Know that the last number reached when counting a small set of objects tells you how many there are in total ('cardinal principle').
- Show 'finger numbers' up to 5.
- Link numerals and amounts: for example, showing the right number of objects to match the numeral, up to 5.
- Experiment with their own symbols and marks as well as numerals.
- Solve real world mathematical problems with numbers up to 5.
- Compare quantities using language: 'more than', 'fewer than'.

Representations of number:

Using Numicon to support in number recognition.



Key vocabulary and knowledge shared with the children:

Quantity and Number recognition to 5.

Number order.

Children know the quantity is linked to the number. To 5 to begin with extend to 10 when confident.

Number structure.

Subitising to 5.

Modelling the subtracting objects, recognising that the quantity has decreased.

Using counting strategies and subitising to identify the number of concrete/pictorial objects in the set.

To understand that the set gets smaller the more you take away.

Abstract – activities that demonstrate knowledge and skills:

Represent a quantity by drawing or by using graphics. (using drawings to show a resource)

Mark making and graphics to represent numbers to 5 and beyond in their play.

Graphics and attempts at numerals in the correct orientation.

Mark making and numerals to replicate the concrete and pictorial model.

Graphics and numerals to show the subtraction.

Understand that the number will get smaller when you subtract.

Counting back from 5-0 then 10-0.

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EYFS Development Matters Statements for Reception

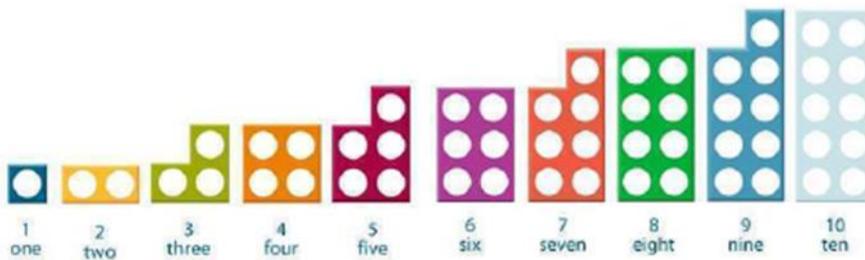
Expectations in number:

- Count objects, actions and sounds.
- Subitise.
- Link the number symbol (numeral) with its cardinal number value.
- Count beyond ten.
- Compare numbers.
- Understand the 'one more than/one less than' relationship between consecutive numbers.
- Explore the composition of numbers to 10.
- Automatically recall number bonds for numbers 0–10. Automatically recall number bonds for numbers 0–10.

Representations of number:

To use Numicon to get a greater understanding of numbers to 10. It will help children to be more confident when subitising and finding bonds to 10.

Staff to ensure there are displays that model quantity, number and numicon.

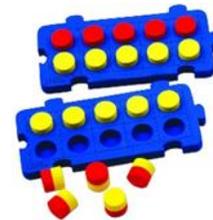


Say which numbers are 1 more or 1 less, using representations where appropriate

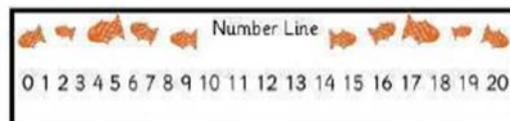
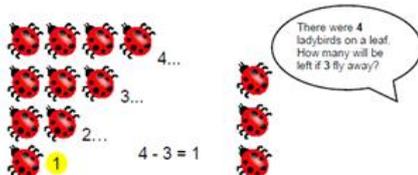
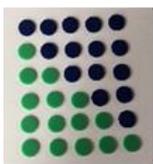
Using tens frames to begin to understand numbers and how they are made.

What happens if I take 6 away from 10. How many have I got left?

Knowledge of number bonds and to look for relationships between addition and subtraction facts.



Use objects to subtract two single-digit numbers by counting back to find the answer. The first step into subtraction is to learn how to count backwards. To progress onto subtraction on a number line by counting back the correct amount of jumps. Understand you should always start with the largest number when subtracting.



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EYF5 Development Matters Early Learning Goals

Expectations in Number and Number Sense

Number

- Have a deep understanding of number to 10, including the composition of each number.
- Subitise (recognise quantities without counting) up to 5.
- Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts.

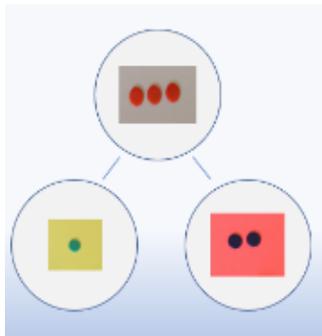
Numerical Patterns

- Verbally count beyond 20, recognising the pattern of the counting system.
- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity.
- Explore and represent patterns within numbers up to 10, including evens and odds, double facts

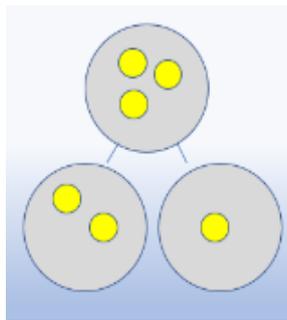
Representations of Number

Introduction to the part / part whole model

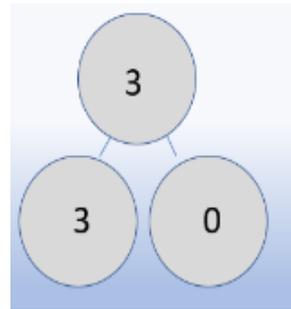
Real life objects



Counters

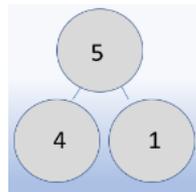
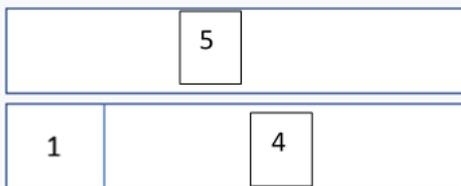


Number digits



Children will then utilise this strategy to solve simple subtractions.

To use a bar model to show the equality and the Part / Part whole model to look for relationships in addition and subtraction.



$$3 + \square = 6$$

$$1 + 5 = \square$$

$$\square + 0 = 6$$

$$3 + 3 = \square$$

$$5 + \square = 6$$

Missing number problems with alternative placement of the equals sign.

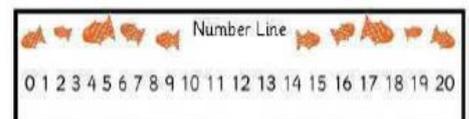
$$6 = 6 + \square$$

$$6 = \square + 5$$

$$6 = 2 + \square$$

$$6 = \square + 3$$

$$6 = \square + \square + 3$$



By doing this Children will be able to recall facts for number bonds to 5, and begin number bonds to 10 and doubles facts.

Key vocabulary and knowledge shared with the children:

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Count verbally beyond 20, pausing at each multiple of 10 to draw out the structure, for instance when playing hide and seek, or to time children getting ready.

To recognise the pattern of the counting system.

Counting using cardinality and subitising with amounts up to 10.

Concepts of commutativity, effect of zero and inverse relationships.

Using patterns and systematic models.

Conceptual and procedural variation.

Model with concrete mathematical resources how to add two groups by counting or by counting on.

Subtraction to be modelled as removing and counting back.

To see numerals and pictures of numbers (how many are in the set) to add and subtract with. To subitise these quantities.

To understand what even and odd numbers are.

Abstract – activities that demonstrate knowledge and skills:

Represent a quantity by using graphics. (using drawings to show a resource e.g. Numicon, counters)

Writing numerals in order.

Graphics and attempts at numerals in the correct orientation.

Graphics and numerals to show the addition and subtraction strategy they used.

To represent additions and subtractions with graphics and then with numerals and symbols.

Graphics and numerals.

Numicon to solve subtraction /number bond questions.

Bar Model representations.

Part / Part Whole diagram.

By the End of Reception

Developing a strong grounding in number is essential so that all children develop the necessary building blocks to excel mathematically. Children should be able to count confidently, develop a deep understanding of the numbers to 10, the relationships between them and the patterns within those numbers. By providing frequent and varied opportunities to build and apply this understanding – such as using manipulatives, including small pebbles and ten-frames for organising counting – children will develop a secure base of knowledge and vocabulary from which mastery of mathematics is built. In addition, it is important that the curriculum includes rich opportunities for children to develop their spatial reasoning skills across all areas of mathematics including shape, space and measures. It is important that children develop positive attitudes and interests in mathematics, look for patterns and relationships, spot connections, 'have a go', talk to adults and peers about what they notice and not be afraid to make mistakes.

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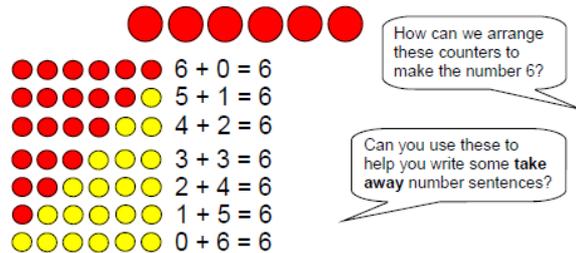
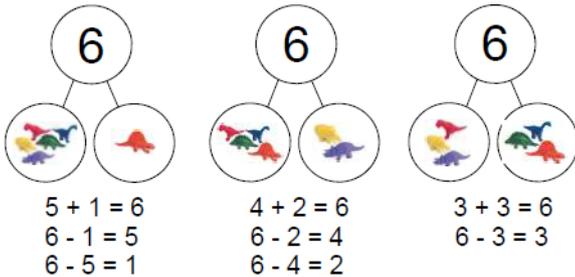
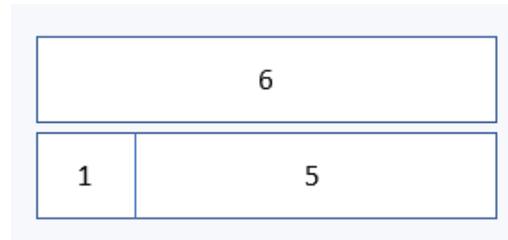
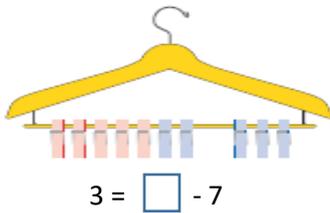
Year 1

Expectations in number and subtraction

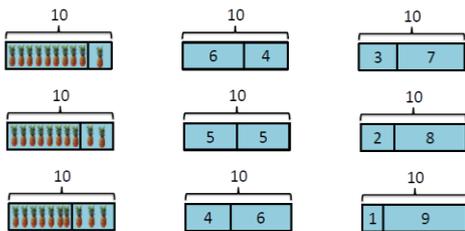
- Key Skills: Represent and use number bonds and related subtraction facts within 20
- Subtract one and two digit numbers to 20, including 0. Use the associated language of subtraction
- Solve one step problems which involve subtraction using concrete objects and pictorial representations.
- Solve missing number problems
- Count on or back in 1s.
- Record subtraction by showing jumps along number lines. Use the number line to backwards from the largest.

Underline the number to be subtracted. Once a basic number sense has developed for the numbers up to ten (see the Foundation Stage section of the calculation policy), children must establish a **strong sense of 'ten'**. Children will become familiar with the 'tenness' of ten using a variety of practical resources:

Representations of number:



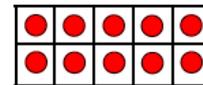
Number Bonds



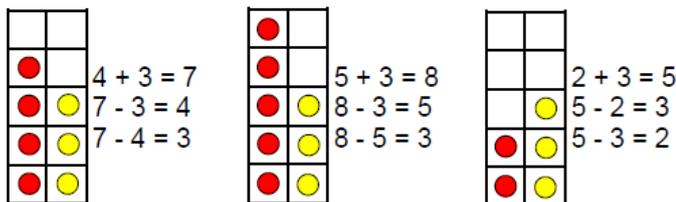
Use of bar model to represent bonds to 10 and 20 as an aid to subtract.

Ten-Frames:

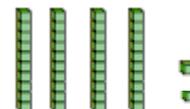
A ten-frame is a great tool for embedding an understanding of ten. By placing counters in different arrangements on the frame, children can begin to generate various mental images of the number ten, as well as how other numbers relate to it.



I have 10 counters. If I take away 4 of them, I will have 6 left.



Introduction to dienes to represent tens and ones



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Through all of the above, children should start to recognise the relationship between addition and subtraction facts.

Subtract any one-digit or two-digit number up to (and including) 20.

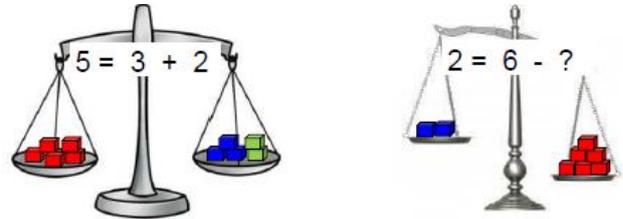
Concrete, movable objects will support this process, as per above.

15 -  = Including solving missing number problems.

Understand that the equals sign (=) is a sign of equivalence.

Many children develop the misconception that the answer to a calculation is on the right hand side of the equals sign. Scales can be used to help children explore the idea that both sides of a calculation must balance

It is important that the children experience the equals sign (=) in different positions. By writing calculations either side of the equals sign (e.g. $2+4=5+1$), the children will not just interpret it as meaning 'the answer'

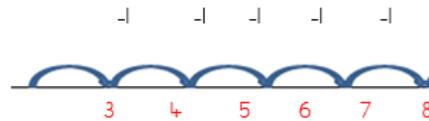


Informal written strategies for subtraction

Use the number line to count backwards from the largest. Underline the number to be subtracted.

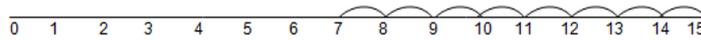
There were 8 biscuits in the box. Pete ate 5. How many biscuits were left?

$$8 - 5 = 3$$



Subtracting bridging over 10: counting in 1s

$$15 - 8 = 7$$

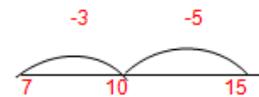


Build on finding the difference when the numbers are close together.

There are 6 boys and 4 girls. How many more girls are there than boys?

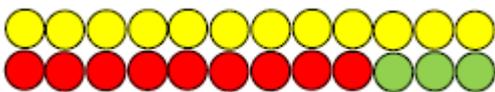
Using number bonds for subtraction

Know that numbers can be split to help solve a calculation so; 8 can be thought of as 5 and 3.



$$15 - 8 = 7$$

Children should begin to understand subtraction as both taking away and finding the difference between.

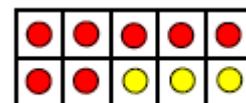


12	
3	9

The difference between 12 and 9 is 3 or $12 - 9 = 3$

Through all of the activities, the children should start to see that addition and subtraction are related operations. For example: $7 + 3 = 10$ is related to $7 = 10 - 3$.

This understanding can be supported with a tens frame:



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Year 2

Expectations in number and subtraction

Key skills: Count in steps of 2, 3, 5 and 10 from any number backwards.

Solve problems with subtractions using concrete objects and pictorial representations, including numbers, quantities and measures.

Apply knowledge of written methods to subtract.

Subtract numbers using concrete objects, pictorial representations and mentally including

- TU – U TU – Tens number TU – TU

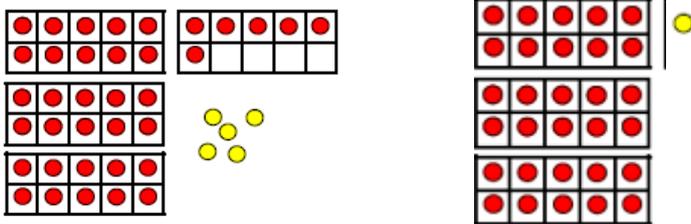
Understand that subtraction has to be done in the order set out in the question / largest number to go first.

Partitioning on a numberline TU – TU (revise Yr1 partitioning of units if appropriate)

In Year 1, a great deal of emphasis is placed on generating different mental images and internal representations of number, with a view to build up a bank of facts about them. In order to achieve this, a wide variety of concrete and pictorial resources are used to support the children's investigations.

The expectation in Year 2 is that children should now be able to recall these number facts to 20 from memory, no longer requiring concrete resources, as frequently, to support them.

Representations of number:



$$36 - 5 =$$

Model, using the 10s frames how the amount is decreasing

Fill in the missing numbers. What do you notice?

27	
15	?

12	15
?	

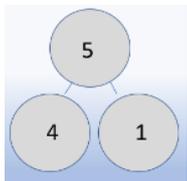
37	
15	?

23	14
?	

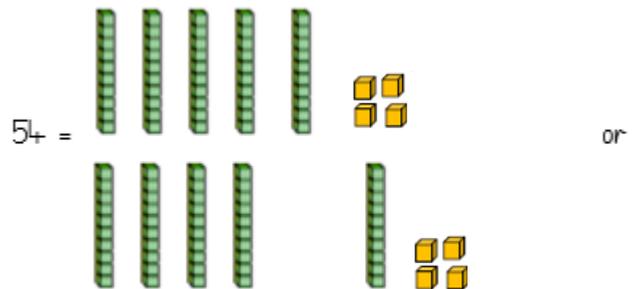
13	14
?	

	57
15	?

Use of the bar model to represent known facts



Introduced to rearranging with Dienes TU numbers so that 54 is seen as 5 tens and 4 units and also a 40 and 14, as a mental aid to subtract.

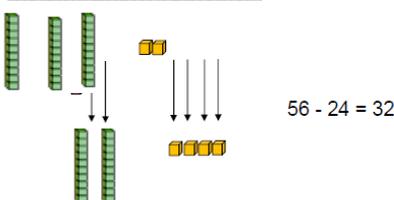


A hundred square is a useful tool with regards to enabling children to subtract 10s from any number. It will also reinforce the idea that the units don't change but that the tens increase or decrease respectively. For example:

$$64 - 20 = 44$$

34	35	36	37
44	45	46	47
54	55	56	57
64	65	66	67

Informal written methods



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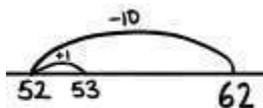


Children can also use this knowledge to help them subtract 9 or 11, by adding/ subtracting 10 and then adjusting by 1.

$27 - 11 =$



Developing into recoding on the number line



Use Base 10 to rearrange and exchange numbers when they are unable to subtract the unit digit

$32 - 14 =$

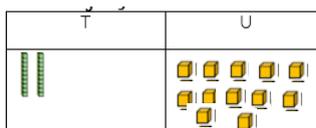
'What do you notice about the units digits in both numbers?'

'Can you subtract 4 from 2?'



'What do we need to do with one of the tens from the 32?'

- Exchange it for Units.

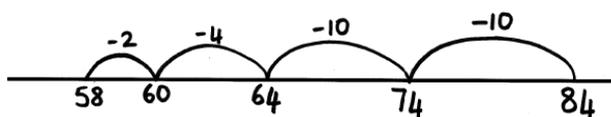


Practical modelling of exchange and removal of the 14

'We can now take the 14 away'

Children can solve subtraction calculations on a number line in the same way; they start on the biggest number and then take away the tens, followed by the units, using number sense to help in partitioning.

$84 - 26 =$



Take away 10, take away 10, take away 4 (landmark number) then take away 2

Find the difference by counting on

Know they can also find the difference by counting on along a number line, begin to make decisions about which method is the most appropriate.

Children will record their workings informally to start with.

5	6	-	2	4	=		
5	6	-	2	0	=	3	6
3	6	-	4	=	3	2	

Formal written methods

5	0	+	6		
-	2	0	+	4	
3	0	+	2	=	3 2

More formal method ready for Year 3

Recognise that subtraction is the inverse of addition – please see subtraction for Year 2 guidance for examples.

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Year 3

Expectations in number and subtraction

Key skills: Find 10 or 100 less than any given number. Subtract numbers mentally, including

- HTU – U HTU – Tens number HTU – H

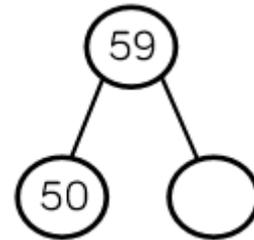
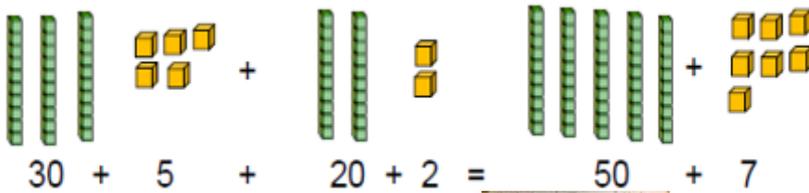
Subtract numbers with up to 3 digits, using formal written methods of column subtraction

Estimate the answer and use the inverse to check answers.

Solve problems involving missing number problems and more complex subtraction.

Subtract fractions with the same denominator.

Representations of number:



Hundreds	Tens	Units	
400	20	6	426
+ 100			526
+ 10			436
+ 7			427

4	2	6	+ 100	5	2	6	500	20	6
4	0	2	+ 10	4	3	6	400	30	6
4	0	0	+ 1	4	2	7	400	20	7

Move to place value counters as a visual representation



Formal written methods

When subtracting, children should start by consolidating simple examples of the **expanded columnar method**, whereby the units and tens in the first number are always **greater than** the second number (in the example below, 4 is greater than 1, 70 is greater than 20)

	6	0	0	+	7	0	+	4		
-	1	0	0	+	2	0	+	1		
	5	0	0	+	5	0	+	3	=	553

Expanded written method to ensure secure knowledge of place value

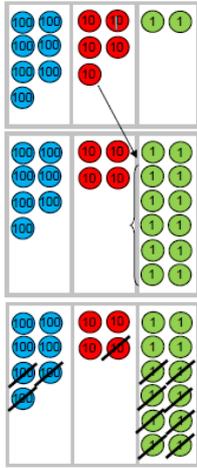
Once the children are familiar with this method, you can consolidate the idea of **exchanging**. Place value counters resources can be used to support the children.

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$752 - 318 =$

With the example $752 - 318$, there are currently not enough units to take away 8. It is therefore necessary to exchange one of the tens into units.



$$\begin{array}{r}
 700 + \cancel{50} + 2 \\
 - 300 + 10 + 8 \\
 \hline
 400 + 30 + 4 = 434
 \end{array}$$

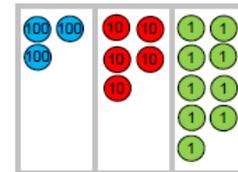
This gives 12 units and 4 tens. Now the calculation can be completed as normal.
= 434

$923 - 564 =$

At the moment we can't do $3 - 4$ so we exchange a ten for 10 units. Now we can do $13 - 4 = 9$

However, we now can't do $10 - 60$ so we need to exchange a hundred for 10 tens.

Now we can do $110 - 60 = 50$ and $800 - 500 = 300$



Leaving us with 359

Recordings to be shown in books as, when secure with the method

$$\begin{array}{r}
 800 + 10 \\
 \cancel{900} + \cancel{20} + 3 \\
 - 500 + 60 + 4 \\
 \hline
 300 + 50 + 9 = 359
 \end{array}$$

Consolidate using expanded decomposition methods to include: ThHTU – HTU ThHTU – ThHTU and decimals (2dp)

Expanded Decomposition with decimals

$$\begin{array}{r}
 \pounds \\
 8.95 \\
 -4.38 \\
 \hline
 4.57
 \end{array}$$

N.B – When subtracting amounts of money from numbers such as £20 or calculating time intervals, use a number line as the most efficient method.

$$\begin{array}{r}
 \pounds \\
 8.95 \\
 -4.38 \\
 \hline
 4.57
 \end{array}$$

Use of the Bar model to calculate and solve addition (and subtraction) problems

a) Jesse is trying to solve the problem:

There are 479 pupils in a school. 132 of the pupils are boys.
How many pupils are girls?

b) Jesse draws a diagram to help.

Place a (✓) by the correct diagram.

132	479
Girls	

132	479
Girls	

479	132
Girls	

c) How many pupils are girls?

Newdale Primary

Maths Calculation Policy – Number Sense and Subtraction



Year 4

Expectations in number and subtraction

Key Skills: Count backwards through 0 to include negative numbers.

Find 1000 less than a given number.

Subtract numbers with up to 4 digits using the compact method of subtraction.

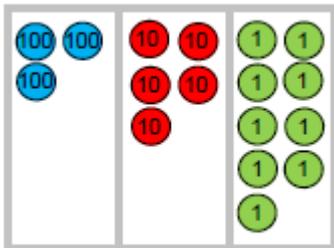
Estimate and use the inverse to check answers to a calculation.

Solve subtraction two step problems in context, deciding which operations to use and why.

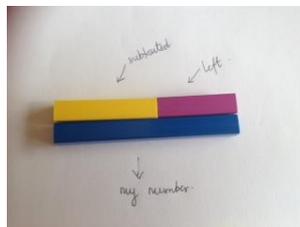
Subtract fractions with the same denominator.

Compact Decomposition - **Key Skill:** Children are taught to cross out the numbers and replace them with the exchanged number.

Representations of number:



Place value counters can still be used to reinforce place value



Representations using the bar model

Formal written methods

Compact columnar subtraction method: Ensure number positioning is consistent and placed above the correct column when exchanging from the number on the top row.

$$\begin{array}{r} 599 \\ - 234 \\ \hline 365 \end{array}$$

$$\begin{array}{r} 674 \\ - 121 \\ \hline 553 \end{array}$$

$$\begin{array}{r} 7\overset{4}{\cancel{8}}2 \\ - 318 \\ \hline 434 \end{array}$$

$$\begin{array}{r} 8\overset{9}{\cancel{9}}23 \\ - 564 \\ \hline 359 \end{array}$$

Extending rapidly to 4 digit numbers, once secure:

$$\begin{array}{r} 7\overset{7}{\cancel{8}}\overset{5}{\cancel{6}}4 \\ - 2498 \\ \hline 5366 \end{array}$$

$$\begin{array}{r} 2\overset{2}{\cancel{3}}2\overset{0}{\cancel{1}}1 \\ - 1602 \\ \hline 1609 \end{array}$$

$$\begin{array}{r} 8\overset{9}{\cancel{9}}\overset{9}{\cancel{0}}3 \\ - 4628 \\ \hline 1275 \end{array}$$

Newdale Primary Maths Calculation Policy – Number Sense and Subtraction



Year 5 / 6

Expectations in number and addition

Key Skills: Count backwards in steps of 10 from any given number up to 1,000,000

Compact method used as standard for all written calculations

Count backwards with positive and negative whole numbers, including through 0.

Subtract whole numbers with more than 4 digits, including the use of column subtraction formal written method.

Subtract mentally with increasingly large numbers

e.g. $12,462 - 2300 = 10,162$

Solve subtraction multi step problems in contexts, deciding which operations and methods to use and why.

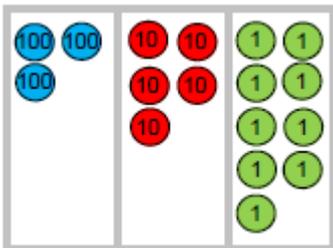
Subtract fractions with the same denominator and denominators that are multiples of the same number.

Compact Decomposition

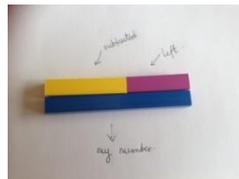
Key Skill: Children are taught to cross out the numbers and replace them with the exchanged number

Ensure number positioning is consistent

Representations of number:



Place value counters can still be used to reinforce place value



Representations using the bar model

Subtract whole numbers with more than 4 digits.

Children should continue to consolidate their understanding of the **compact columnar subtraction** methods using numbers with more than 4 digits.

	7			5			
	8	4	,	5	1	3	
-	5	8	,	1	0	9	
	2	6	,	4	5	4	

Year 6:

Key Skills: Calculate negative number intervals, including across 0.

Perform mental calculations including with mixed operations and large numbers.

Solve subtraction multi step problems in contexts, deciding which operations and methods to use and why.

Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.