



St Andrew's C.E. Primary School

'Where young minds grow and young hearts learn to care'



Calculation Policy

+ -

Addition and Subtraction

Aims

This policy is designed to give children a smooth progression of skills from the early years to year 6. Each method leads in to the next so that previous learning is built upon and children learn consistent strategies that will enable them to master skills. Children should be taught according to their ability and not their age as it is vital that each stage is embedded and children develop a secure understanding of methods without any misconceptions. Visual examples are given and key vocabulary/references to important notes are highlighted in red so that the layout of calculations and the vocabulary we teach remains consistent throughout the school. Children should have opportunities to explore concrete, pictorial and abstract representations of calculation at all stages. This will ensure that they develop a secure understanding of addition and subtraction. Mastery examples are given for each stage as a reminder that all children must have opportunities to master their skills by solving problems and reasoning in a variety of contexts before moving on to the next stage.

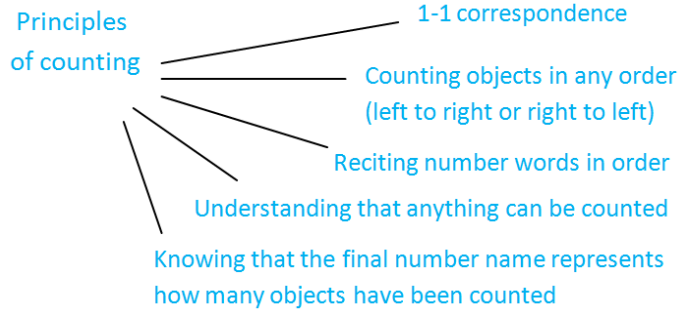
Addition and Subtraction EYFS - KS1

Early Years

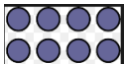
Mental strategies:
Recall number bonds to 10

Early Learning Goal EYFS

- Mathematics Numbers: Children count reliably with numbers 1-20, place them in order and say which number is one more or one less than a given number.
- Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer.



-Subitising to 10 - When objects up to 10 are arranged in different ways children still recognise the quantity without counting e.g. children will see this as 2 sets of 4 and know the total is 8.



-Unitising 10- Children need to understand how to regroup whenever they have 10 in preparation for place value.

E.g. 10 cubes make a rod/10 bricks make a house.

Stage 1

Mental strategies:
Recall number bonds to 20
To know doubles to 20
Add a single digit to 10

National Curriculum Expectations Year 1

- 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 $7 = \square - 9$.

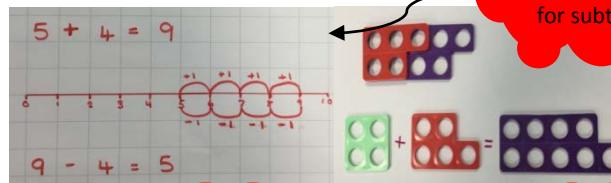
-Provide a variety of practical experiences for adding and subtracting using real life and mathematical resources.

-Number bonds should be explored in a range of representations to develop instant recall to 10/20



- Drawing can be used with numbers to 20 as a support.

-Number lines should be introduced alongside practical representations.



+ above number line.
- below number line.

Teach vocabulary of 'ones' not units.

Children need to be taught to count on to find the difference as well as counting back for subtraction.

Stage 2

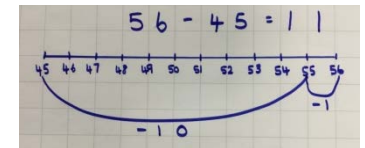
Mental strategies:
Recall pairs of multiples of 10 which total 100
Double multiples of 10
+/- multiples of 10 to any number up to 100

National Curriculum Expectations Year 2

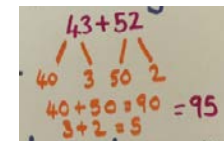
Solve problems with addition and subtraction:

- 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.

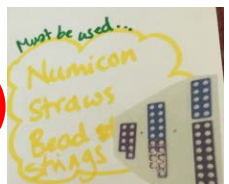
-Develop number lines- children need to be taught to use number lines efficiently by counting on and back in steps and using knowledge of number bonds.



-Children need to learn how to partition and recombine any 2 digit number.



A range of practical resources must be used alongside calculations to develop understanding of place value.



- Teach bridging 100 e.g. $74 + 28$.

Teach vocabulary of 'ones' not units.

Mastery Example NCETM

I'm thinking of a number. I've subtracted 5 and the answer is 7. What was the number I was thinking of. Explain how you know.

I'm thinking of a number. I've added 8 and the answer is 19. What number was I thinking of? Explain how you know?

All maths should be practical in EYFS unless children show evidence of mastery and are working at Greater depth. If introducing a number line, use alongside practical resources.

Mastery Example NCETM

Write the numbers 1-5 in each row so that each row and column adds up to the same number, called the 'magic number'. What is the magic number?



Children should not be moved on to working with numbers above 20 unless there is evidence of mastery and that they are working at greater depth.

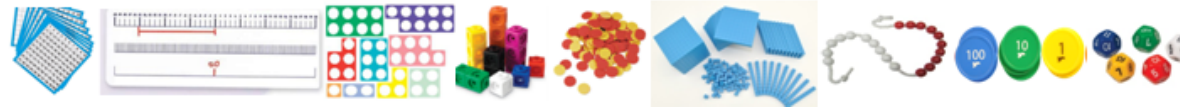
Mastery Example NCETM

An odd number + an odd number + an odd number = an even number. Is this sometimes, always or never true? Explain your reasoning.

Children should not move on to larger numbers or different methods unless there is evidence of mastery and children are working at greater depth.

Possible resources

Numicon, Dienes, multi-link, counters, number lines, hundred squares, counting beads, abacus, place value counters, Lego, cars, dice, real world objects e.g. conkers, leaves, socks, gloves.



Addition

Concrete	Pictorial	Abstract
<p>Use cubes to add two numbers together as a group or in a bar.</p>	<p>Use pictures to add two numbers together as a group or in a bar.</p>	<p>Use the part-part whole diagram as shown above to move into the abstract.</p>
<p>Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.</p>	<p>Start at the larger number on the number line and count on in ones or in one jump to find the answer.</p>	<p>Place the larger number in your head and count on the smaller number to find your answer.</p>
<p>Start with the bigger number and use the smaller number to make 10.</p>	<p>Use pictures or a number line. Regroup or partition.</p>	<p>If I am at seven, how many more do I need to make 10. How many more do I add on now?</p>
<p>Put 4 and 6 together to make 10. Add on 7.</p>	<p>Add together three groups of objects. Draw a picture to recombine the groups to make 10.</p>	<p>Combine the two numbers that make 10 and then add on the remainder.</p>

Subtraction

Concrete	Pictorial	Abstract
<p>Use physical objects, counters, cubes etc to show how objects can be taken away.</p>	<p>Cross out drawn objects to show what has been taken away.</p>	<p>18 - 3 = 15</p>
<p>Make the larger number in your subtraction. Move the beads along your bead string or move counters as you count backwards in ones.</p>	<p>Count back on a number line or number track.</p>	<p>Put 13 in your head, count back 4. What number are you at? Use your fingers to help.</p>
<p>Compare amounts and objects to find the difference.</p>	<p>Count on to find the difference.</p>	<p>Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.</p>
<p>Link to addition-use the part whole model to help explain the inverse between addition and subtraction.</p>	<p>Use a pictorial representation of objects to show the part, part, whole model.</p>	<p>Move to using numbers within the part whole model.</p>
<p>14 - 9 =</p>	<p>13 - 7 = 6</p>	<p>16 - 8 =</p>

Vocabulary

add, more, make, sum, total, altogether, double, one more, two more ... ten more, How many more to make ...? How many more is ... than ...? How much more is ...? take away, How many are left/left over? How many have gone? one less, two less, ten less ... How many fewer is ... than ...? How much less is ...? difference between, digit equals, is the same as, number bonds/pairs, missing number, number sentence, equals, symbol, method, operation, count on, count back, regroup, steps, mental method

Addition and Subtraction LKS2

Stage 3

National Curriculum Expectations Year 3

Add and subtract numbers mentally, including:

- A three-digit number and ones
- A three-digit number and tens
- A three-digit number and hundreds
- Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
- Estimate the answer to a calculation and use inverse operations to check answers
- Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

-Teach expanded column addition.

$$\begin{array}{r} 453 + 121 = 574 \\ \begin{array}{r} 400 \quad 50 \quad 3 \\ + 100 \quad 20 \quad 1 \\ \hline 500 \quad 70 \quad 4 \end{array} \\ 365 + 219 = 584 \\ \begin{array}{r} 300 \quad 60 \quad 5 \\ + 200 \quad 10 \quad 9 \\ \hline 500 \quad 80 \quad 4 \end{array} \end{array}$$

- Teach expanded decomposition.

$$\begin{array}{r} 271 - 155 = 116 \\ \begin{array}{r} 200 \quad 70 \quad 1 \\ - 100 \quad 50 \quad 5 \\ \hline 100 \quad 10 \quad 6 \end{array} \end{array}$$

-Teach inverse to 'undo' calculation and check answers.

Mental strategies

Recognise pairs of number which total 100 e.g.

$$32 + 68$$

Use number bond knowledge to find bonds to 1000

+/- near multiples of 10/100

Stage 4

National Curriculum Expectations Year 4

- 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.

- Teach column addition.

$$\begin{array}{r} 100 \quad 100 \quad 10 \quad 10 \quad 10 \quad 1 \\ + 100 \quad 10 \quad 10 \quad 10 \quad 10 \quad 1 \\ \hline 200 \quad 20 \quad 20 \quad 20 \quad 20 \quad 2 \end{array}$$

- Teach column decomposition.

$$\begin{array}{r} 271 - 155 = 116 \\ \begin{array}{r} 200 \quad 70 \quad 1 \\ - 100 \quad 50 \quad 5 \\ \hline 100 \quad 10 \quad 6 \end{array} \end{array}$$

Mental strategies

Use knowledge of number bonds to find what must be added to decimals to make next whole number
Apply place value and number bonds knowledge to larger numbers

Children should be extended to adding 3 two digit numbers or 3 three digit numbers as this is harder than bigger numbers.

Link to decimals in the context of money and measures.
Number lines must be used for time and money.
Children should also be introduced to rounding and estimating to check calculations.

Children need to learn when it is more efficient to count on to find the difference.

-Consolidate inverse to check answers to calculations.

Mastery Example NCETM

For positive integers are the following statements always, sometimes or never true.

- The sum of 2 odd numbers is even.
- The sum of 3 odd numbers is even.
- Adding 5 to a number ending in 6 will sum to a number ending in 1
- Adding 8 to a number ending in 2 will always sum to a multiple of 10.

Explain why in each case.

Children should not be moved on to working with numbers above 999 or other methods unless they show mastery and are working at greater depth.

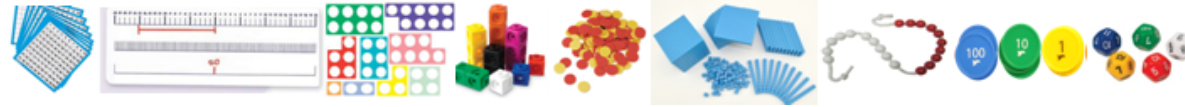
Mastery Example NCETM

Write 3 calculations where you would use mental strategies and 3 where you apply a column method. Explain the decision you made for each calculation.

Children should be able to identify whether mental strategies could be used instead of column method. They should solve calculations with any 4 digit number and decimals to 1dp in any context with resources of their choice to demonstrate mastery.

Possible resources

Numicon, Dienes, multi-link, counters, number lines, hundred squares, counting beads, abacus, place value counters, Lego, cars, dice, real world objects e.g. conkers, leaves, socks, gloves.



Addition

<p>25 + 25 =</p> <p>Add the ones first. Children then regroup when they have 10. Then add the 10s.</p>	<p>Once confident with practical representations of hundreds, tens and ones, children can use drawings/pictures to support their calculations.</p> <p>$6 + 3 + 4 + 7 + 2 + 7 = 29$</p> <p>$10 + 10 + 9$</p>
<p>24 + 15 =</p> <p>Add together the ones first then add the tens. Use the Dienes first before moving onto place value counters.</p>	<p>After practically using the Dienes and place value counters, children can draw the counters to help them to solve additions.</p> <p>Calculations</p> <p>$21 + 42 =$</p> <p>21 $+ 42$</p>

Subtraction

<p>Use Dienes to make the bigger number then take the smaller number away.</p> <p>Draw Dienes or place value counters alongside the written calculation to help to show working.</p> <p>Calculations</p> <p>$47 - 24 = 23$</p> <p>$47 - 24 = 23$</p> <p>This will lead to a clear written column subtraction.</p> <p>32 $- 12$ 20</p>	<p>Use Dienes to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.</p> <p>Make the larger number with the place value counters</p> <p>Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.</p> <p>Calculations</p> <p>$234 - 88 =$</p> <p>When confident, children can find their own way to record the exchange/regrouping.</p> <p>Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.</p> <p>Calculations</p> <p>$234 - 88 =$</p> <p>Children can start their formal written method by partitioning the number into clear place value columns.</p> <p>Moving forward the children use a more compact method.</p>
<p>Use Dienes to make the bigger number then take the smaller number away.</p> <p>Draw Dienes or place value counters alongside the written calculation to help to show working.</p> <p>Calculations</p> <p>$176 - 64 =$</p> <p>$176 - 64 =$</p>	<p>Use Dienes to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.</p> <p>Make the larger number with the place value counters</p> <p>Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.</p> <p>Calculations</p> <p>$234 - 88 =$</p> <p>When confident, children can find their own way to record the exchange/regrouping.</p> <p>Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.</p> <p>Calculations</p> <p>$234 - 88 =$</p> <p>Children can start their formal written method by partitioning the number into clear place value columns.</p> <p>Moving forward the children use a more compact method.</p>

Vocabulary

Increase, decrease, calculation, strategy, equation, balance, equivalent to, integer, decimal, represents, decimal point, negative number, round, sequence, compare, strategy, reduce, boundary, relationship, consecutive, pattern, rule, logical

Addition and Subtraction UKS2

Stage 5

National Curriculum Expectations Year 5

- 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

-Column Addition

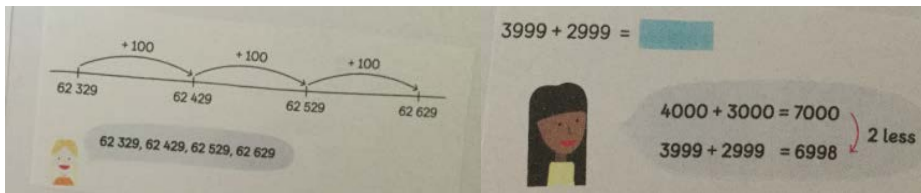
-Decomposition

Strengthening use/understanding of decimals

Rounding and estimating to check calculations

Explore negative numbers in the context of measures

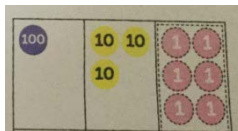
Strengthen use of number line and mental strategies to solve calculation efficiently.



- Reasoning

Build on previous skills and develop understanding by giving children rich and varied problem solving tasks in a variety of contexts.

Children must use resources to support their understanding of increasingly complex problems.



Vocabulary-
Hundreds/Tens/Ones
(not units).

Mastery Example NCETM

True or False?
 $3999 - 2999 = 4000 - 3000$
 $3999 - 2999 = 3000 - 2000$
 $2741 - 1263 = 2742 + 1264$
 $2741 - 1263 = 2731 - 1253$
 $2741 + 1263 = 2742 - 1252$

Explain your reasoning.

Mental strategies

Recall +/- facts for near multiples of 10
Use knowledge of near doubles and halves to quickly solve calculations

Stage 6

National Curriculum Expectations Year 6

- 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
- Develop efficient strategies to solve problems involving addition and subtraction
- Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.

-Children should continue to build on the strategies they have learnt in more complex problems/contexts.

Children should always be encouraged to justify answers using mathematical vocabulary in order to challenge their understanding. They should be able to explain their choice of method ensuring that it is efficient.

Mastery Example NCETM

Use this number sentence to write down 3 more pairs of decimal numbers to sum 3.

$1.6 + 1.4 = 3$

If I keep subtracting 3 from 397 I will get to 0. Do you agree or disagree? Explain your reasoning.

Vocabulary-
Hundreds/Tens/Ones
(not units).

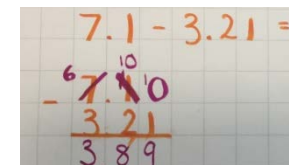
Nrich Example

Kangaroo Subtraction

Each of the letters K, A, N, G, R, O represent a different digit.

$$\begin{array}{r} \text{KAN} \\ - \text{GAR} \\ \hline \text{OO} \end{array}$$

What is the possible value of the number KAN?



Children must demonstrate mastery in a wide range of contexts in order to be working at greater depth. They should be able to justify and reason using a wide range of technical vocabulary.

Mastery Example WhiteRose

3 Here is a rule for generating a sequence.

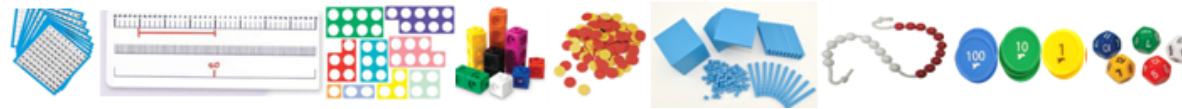
Multiply the previous term by 3 and subtract 4

The second term of the sequence is 5

Find the difference between the first and fourth terms of the sequence.

Possible resources

Numicon, Dienes, multi-link, counters, number lines, hundred squares, counting beads, abacus, place value counters, Lego, cars, dice, real world objects e.g. conkers, leaves, socks, gloves.



Addition

Concrete	Pictorial	Abstract
<p>Make both numbers on a place value grid.</p> <p>146 + 527</p> <p>Add up the units and exchange 10 ones for one 10.</p> <p>146 + 527</p> <p>Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.</p> <p>This can also be done with Dienes to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100.</p> <p>As children move on to decimals, money and decimal place value counters can be used to support learning.</p>	<p>Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.</p> <p>7 1 5 1</p> <p>2 3 . 3 6 1 9 . 0 8 0 5 9 . 7 7 0 + 1 . 3 0 0 9 3 . 5 1 1 2 1 2</p>	<p>Start by partitioning the numbers before moving on to clearly show the exchange below the addition.</p> $\begin{array}{r} 20 + 5 \\ 40 + 8 \\ 60 + 13 = 73 \end{array}$ <p>536 + 85 621 11</p> <p>As the children move on, introduce decimals. Money can be used here.</p> $\begin{array}{r} 72.8 \\ + 54.6 \\ \hline 127.4 \\ 11 \end{array}$ $\begin{array}{r} £ 23.59 \\ + £ 7.55 \\ \hline £ 31.14 \\ 11 \end{array}$

Subtraction

Concrete	Pictorial	Abstract
<p>Use Dienes to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.</p> <p>Make the larger number with the place value counters</p> <p>Calculations</p> $\begin{array}{r} 234 \\ - 88 \\ \hline \end{array}$ <p>Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.</p> <p>Calculations</p> $\begin{array}{r} 234 \\ - 88 \\ \hline \end{array}$ <p>Now I can subtract my ones. Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.</p> <p>Calculations</p> $\begin{array}{r} 234 \\ - 88 \\ \hline 146 \end{array}$ <p>Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.</p>	<p>Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.</p> <p>When confident, children can find their own way to record the exchange/regrouping.</p> <p>Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.</p>	<p>Children can start their formal written method by partitioning the number into clear place value columns.</p> <p>Moving forward the children use a more compact method.</p> <p>This will lead to an understanding of subtracting any number including decimals.</p> $\begin{array}{r} 512.1 \\ - 26.3 \\ \hline 236.8 \end{array}$

Vocabulary

Increase, decrease, calculation, strategy, equation, balance, equivalent to, integer, decimal, represents, decimal point, negative number, round, sequence, compare, strategy, reduce, boundary, relationship, consecutive, pattern, rule, logical