

Addition & Subtraction

Calculation Policy

Written by: Kathryn Murphy & Ameeta Monteiro

Last Review date: July 2023

Next Review date: July 2024

EYFS:

The principal goal of teaching maths in EYFS is to ensure that children can count reliably with numbers from one to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they will learn to add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **End of year expectations** | **Concrete** | **Pictorial** | **Abstract** | **Using and applying** |
| Say which number is one more or less than a given number to 20. | Using fingers to add one more. | Drawing pictures and adding another to make a total. | http://www.twinkl.co.uk/image/resource_preview_xlarge/T-N-1243-One-More-One-Less-Dice-Activitiy-Worksheet_ver_1.jpg | I have 13 sweets. I eat one. How many have I got left?  Jack has four buckets of water, Jill ha 9 buckets of water. How many buckets of water do they have altogether? |
| Add two single-digit numbers using quantities and objects and count on to find the answer.  (including doubling 2 single digit numbers) |  |  |  | I have 13 sweets. I eat one. How many have I got left?  Jack has four buckets of water, Jill ha 9 buckets of water. How many buckets of water do they have altogether? |

Key Stage 1:

* The principal focus of mathematics teaching in key stage 1 is to ensure that pupils develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with practical resources (for example, concrete objects and measuring tools).
* By the end of year 2, pupils should know the number bonds to 20 and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **End of year expectations** | **Rapid recall** | **Mental calculation** | **Language** | **Using and applying** |
| **Year 1** | Count to and across 100, forwards and backwards, beginning with 0 or one, or from any given number  Count, read and write numbers to 100 in numerals; count in multiples of twos, fives and tens  1 more or less than a number | Add and subtract 1-digit and 2-digit numbers to 20, including 0 | Add  Addend  Sum  Altogether  Total  Take away  Difference  More than  Less than  Equal to  Part  Whole | I’m thinking of a number. I’ve subtracted 5 and the answer is 7. What number was  I 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.  I know that 7 and 3 is 10. How can I find 8 + 3? How could you work it out?  Show children a price list with items costing up to 20p.  I have 20p to spend. If I spend 20p exactly, which two items could I buy?  And another two, and another two. |
| **Year 2** | Count in steps of two, three, and five from 0, and in tens from any number, forward and backward | 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 2-digit number and ones * a 2-digit number and tens * two 2-digit numbers * adding three 1-digit numbers   Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot 5 | Sum  Difference  Minuend  Subtrahend  Inverse  Calculate  Partition  Two-digit | Solve problems with addition and subtraction:  using concrete objects and pictorial representations, including those involving numbers, quantities and measures  applying an increasing knowledge of mental and written methods |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **End of Year 1 expectations** | **Concrete** | **Pictorial** | **Conceptual** | **Using & applying** | |
| Identify one more or one less. | Counting on and back using familiar objects and resources.      One more  One less | Introduce bar models to compare quantities. | Introduction to + - and = symbols to create number sentences.  5 – 1 = 4  4 + 1 = 5  Missing number problems.  4 = □ - 1  5 = □ + 1  □ – 1 = 5  □ + 1 = 8 | 5 people were on a bus.  1 **more** person got on.  How many people are there **altogether**?  I have £6.  My brother has £1 **less** than me.  How much money does he have?  Use the numbers 3 to 8. How many pairs can you find which have **difference** of 1? | |
| Use addition as combining groups (aggregation). | Counting using familiar objects and resources. | Drawing pictures    Bar models. | Using number sentences and beginning to calculate mentally.  7 + 2 = 9  2 + 7 = 9  9 = 2 + 7  Missing number problems.  9 = □ + 5  Using number sentences and beginning to calculate mentally by keeping a number in their head and counting on.  7 + 2 = 9  2 + 7 = 9  9 = 2 + 7  Missing number problems.  9 = □ + 5 | I bought 5 sweets.  My friend gave me 4 more.  How many do I have in **total**?  How many different additions can find with a total of 9? | |
| Addition as counting on (augmentation). | Counting using familiar objects and resources. | Counting on using a number line.    5 + 2 = 7  *‘2 more than 5 is 7.’*  Bar model comparisons. |
| Doubling and halving numbers within 20 (as repeated addition and subtraction). | Using familiar objects and resources. | Using a variety of models and images. | Using number sentences and beginning to calculate mentally.  6 + 6 =  Double 9 =  14 = Double …  Half of 18 = …  10 = half of….  7 = 14 - □  4 + □ = 8 | Class 1 has 8 girls.  Class 2 has **double** the number of girls.  How many girls are there in Class 2?  How many **doubles** can you find which include the number 4?  E.g. Double 4 = 8  Double 2 = 4  Double 7 = 14 etc. | |
| Add and subtract 1-digit and 2-digit numbers to 20, including 0 | Using familiar objects and resources. | Using number lines.    Using bar models | Using number sentences and calculating mentally.  13 + 4 = 17 17 = 13 + 4  4 + 13 = 17 17 = 4 = 13  17 – 4 = 13 13 = 17 - 4  17 – 13 = 4 4 = 17 - 13  Missing number problems.  15 = □ + 6  18 - □ = 4 | My sister is 17.  My brother is 9.  What is the **difference** **between** their ages?  Class 1 collected £7 for charity. Class 2 collected £8. If they **put** their money **together**, how much would they have? | |
| Represent and use number bonds and related subtraction facts within 20 to add and subtract 1-digit and 2-digit numbers to 20, including 0 | Using familiar objects and resources.  **Addition facts**      **Subtraction facts** | Using number lines.  Jumping in 1s    Jumping in 10s and units  Using bar models | Using number sentences and calculating mentally.  13 + 4 = 17 17 = 13 + 4  4 + 13 = 17 17 = 4 + 13  17 – 4 = 13 13 = 17 - 4  17 – 13 = 4 4 = 17 - 13  Missing number problems.  15 = □ + 6  18 - □ = 4 | | My foot is 19cm long.  My friend’s foot is 14cm long.  **Calculate** the **difference** between the lengths.  How many additions/ subtractions can you make with an even/odd answer?  Which patterns can you see in the numbers you have used? |

Lower Key Stage 2:

* The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers.
* At this stage, pupils should develop their ability to solve a range of problems, including with simple fractions and decimal place value. By the end of year 4, pupils should have learnt their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **End of year expectations** | **Rapid recall** | **Mental calculation** | **Language** | **Using and applying** |
| Year 3 | Count from 0 in multiples of 4, 8, 50 and 100  Work out if a given number is greater or less than 10 or 100  Recognise the place value of each digit in a 3-digit number (hundreds, tens, and ones) | Add and subtract numbers mentally, including:   * a 3-digit number and ones * a 3-digit number and tens * a 3-digit number and hundreds | Carry  Exchange  Compact  Expanded  Boundary  Column | Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction  Flo and Jim are answering a problem:  Danny has read 62 pages of the class book, Jack has read 43. How many more pages has Danny read than Jack?  Flo does the calculation 62 + 43. Jim does the calculation 62–43. |
| Year 4 | Count in multiples of 6, 7, 9, 25 and 1000  Count backwards through 0 to include negative numbers |  | Increase  Decrease  Tenths  Hundredths | Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate  Solve addition and subtraction two-step problems in context, deciding which operations and methods to use and why  Write three calculations where you would use mental calculation strategies and three  where you apply a column method.  **Explain the decision you made for each calculation**. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year 3:** | **Concrete** | **Pictorial** | **Conceptual**  **applying** | **Using & applying** | |
| Add and subtract numbers **with up to** three digits, using formal written methods of columnar addition and subtraction | 352 + 165  Combining the tens and exchanging for a 100.    235 – 83  (Move 83 down to show what’s left – exchange a hundred for tens). | Children to draw deines, HTU grids and number lines to support their calculations, as above. | Expanded methods crossing tens ***or*** hundreds boundaries but ***not*** both.      Progression onto compact methods: | Use the digits 1, 2, 3, 4 and 5. Make a 2 digit and a 3-digit number. Add them together. Find ways you can make 168, 483, 339.  Use the digits 0, 1, 2, 3 and 4. Make a 3-digit number then reverse the digits. Add your two numbers. Repeat with other examples. What do you notice? |
| **HTU ± HTU**  Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction | Follow methods shown in Year 3  using apparatus to cross both boundaries. E.g.  438 + 385 =  624 – 257 =  http://sensorychange.co.uk/wp-content/uploads/2014/01/IMG_5023.jpg | Children to draw deines, HTU grids and number lines to support their calculations. | Expanded column methods. | My book has 426 pages. I am on page 137. How many more pages do I have to read until I am half way through my book? |
| **TU - HTU**  Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction | 304 – 137  (Move 137 down to show what’s left – exchange a hundred for tens; then exchange a ten for units).  http://sensorychange.co.uk/wp-content/uploads/2014/01/IMG_5023.jpg | Children to draw deines, HTU grids and number lines to support their calculations. (as above). | Expanded column method    Progression onto column methods: | Use the digits 2 to 8 and make two 3-digit numbers. Find the difference.  How many pairs of numbers can you find where the difference is: a 3-digit number with consecutive digits? e.g. 572 – 449 = 123 |
| **Year 4** | **Concrete** | **Pictorial** | **Conceptual** | **Using and applying** |
| Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate | Follow process shown in Year 3.   * Addition crossing one boundary. * Addition crossing more than one boundary. * Subtraction with exchanging through one boundary. * Subtraction with exchanging through more than one boundary. * Subtraction with exchanging through zero.   http://sensorychange.co.uk/wp-content/uploads/2014/01/IMG_5023.jpg | Addition  Children to draw deines, ThHTU grids and number lines to support their calculations.  E.g.    Subtraction  **Counting on when finding a small difference**  e.g. 5003 – 4996 = 7  ../Desktop/Screen%20Shot%202017-02-17%20at%2017.09.38.png  Counting back to subtract  Use of number facts to count back to find the difference.  1754 – 568 = 1186  Screen%20Shot%202017-01-24%20at%2017.33.35.png  For those children with a secure mental image of the number line they could record the jumps only. | Addition  Horizontal Expansion  1367 + 1185 = 552  1000 + 300 + 60 + 7  1000 + 100 + 80 + 5  2000 + 400 +140 +12 =2544  **By the end of year 4, children should be using a formal written method for addition.**  1367 + 236 =  1367  + 236  1603  11  ***It is crucial to know or be able to derive key number facts TU + TU mentally or with jottings before progressing.***  Missing numbers.  1352 + 165 = □  □ + 2265 = 3517  3522 + □ = 5517  Subtraction  Expanded decomposition  252 – 114 =    Partitioning each number and working from right to left, subtracting the bottom number from the top. Where the subtraction is not possible i.e. 2 – 4 can’t be done, the next value is “REPARTITIONED”. So, “repartition 50 + 2 into 40 + 12”. It is important to cross out the whole number and replace completely. Do NOT put a ‘one in the air’! (It is not a 1, it is a 10.) Then repeat the subtraction  Compact decomposition  ../Desktop/Screen%20Shot%202017-02-17%20at%2016.55.03.png  It is still vital that the correct language of place value is used. The tens are REPARTITIONED (not “’borrow’ a 1” and it is not “7 takeaway 2” but “700 takeaway/subtract/ minus 200”). | I walked 1360m, 2764m and then 2188m. How much further do I have to walk until I have travelled 7 km?  Use the following numbers: 2, 2, 3, 4, 4, 5, 7, 7, 8, 8 and 9. Make a pair of 4-digit numbers with a difference of: 1, 10, 100, 1000. How many ways can you do it? |
| **U.t ± U.t** | Addition without crossing boundaries:    2.3 + 1.5  Exchanging tenths for a new unit:    1.7 + 2.5  Subtraction without crossing boundaries:    3.6 – 2.1 (Move 2.1 down to show what’s left).  Exchanging a unit for tenths.    3.4 – 1.7 (Move 1.7 down to show what’s left). | Number line for addition and subtraction  **Use known number facts and place value to add**  2.3 + 1.5 = 3.8  ../Desktop/Screen%20Shot%202017-02-17%20at%2017.10.56.png    **Use known number facts and place value to subtract.**  ../Desktop/Screen%20Shot%202017-02-17%20at%2017.13.45.png  ../Desktop/Screen%20Shot%202017-02-17%20at%2017.13.55.png | Expanded methods.  2.3 + 1.5 =        Compact column methods. | I ran across the playground in 9.4 seconds. My brother was 1.5 seconds faster than me. My sister was 2.7 seconds slower than my brother.  How long did my sister take to run across the playground?  Use the digits 0 to 9. Make two decimals (units and tenths). Add them together. How many pairs can you make with a total of 10? |
| **U.th ± U.th** | Develop process shown in U.t ± U.t   * Addition crossing one boundary. * Addition crossing more than one boundary. * Subtraction with exchanging through one boundary. * Subtraction with exchanging through more than one boundary. * Subtraction with exchanging through zero. | **Number line.** | Expanded methods to develop concepts of place value with hundredths.  Compact column methods as above. | Any 2 books cost £8.00 in a sale.  The price of my books would have been £3.89 and £5.75 before the sale. How much money did I save by buying the books in the sale?  Use the digits 1 to 9. Make 3 decimals (units tenths and hundredths) and subtract them from 20. What’s the closest answer to zero you can make? |

Upper Key Stage 2:

* The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio.
* At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems.
* By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **End of year expectations** | **Rapid recall** | **Mental calculation** | **Language** | **Using and applying** |
| Year 5 | All times tables up to 12 x 12 | Add and subtract numbers mentally with increasingly large numbers (e.g. 12 462 – 2300 = 10 162)  Rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy. | Thousandths | Solve problems involving numbers up to three decimal places *(Taken from Y5 Fractions, Decimals and Percentages)* |
| Year 6 | All times tables up to 12 x 12 |  |  | Solve addition and 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 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year 5** | **Concrete** | **Pictorial** | **Conceptual** | **Using and applying** |
| Add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction) | Follow process shown in Year 3 & 4.   * Addition crossing one boundary. * Addition crossing more than one boundary. * Subtraction with exchanging through one boundary. * Subtraction with exchanging through more than one boundary. * Subtraction with exchanging through zero.   http://sensorychange.co.uk/wp-content/uploads/2014/01/IMG_5023.jpg | Addition  Number line  10,483 + 3,243 =  Screen%20Shot%202017-02-17%20at%2017.31.10.png  Subtraction  **Counting on when finding a small difference**  e.g. 5003 – 4996 = 7  ../Desktop/Screen%20Shot%202017-02-17%20at%2017.09.38.png  Counting back to subtract  Use of number facts to count back to find the difference.  11,754 – 2,542 = 9,212  Screen%20Shot%202017-02-17%20at%2017.58.00.png | Addition  Formal written method.  10,483 + 3243 =  10483  + 3243  13726  11  Revert to horizontal expansion methods if the children experience any difficulty – refer to year 4.  Missing numbers.  12,352 + 3,165 = □  □ + 2,265 = 12,517  3,522 + □ = 15,517  Addition of money and decimals.      Subtraction  Compact decomposition  ../Desktop/Screen%20Shot%202017-02-17%20at%2016.55.03.png  **It is still vital that the correct language of place value is used. The tens are REPARTITIONED (not “’borrow’ a 1” and it is not “7 takeaway 2” but “700 takeaway/subtract/ minus 200”).**    Revert to expanded decomposition methods if the children experience any difficulty – refer to year 4.  Missing numbers.  1352 - 165 = □  □ - 2265 = 1517  3522 - □ = 1517  Subtraction of decimals. | I travelled to 3 different cities. The distances of my journeys were: 1982 m, 15642 m and 12108m. What was the total distance travelled in metres? How far did I travel in km?  Use the digits 3, 4, 6 and 7. Make a 4-digit number and subtract it from 10,000. What are the largest and smallest answers? Which answer is closest to 5000? Find the digital roots of your answers. What do you notice?  Use the digits 0 to 7. Make two decimals (units, tenths, hundredths and thousandths). Add them and find the nearest whole number to your answer. How many totals can you find where the nearest whole numbers is…4, 5, 12? Etc. |
| **Year 6** | **Concrete** | **Pictorial** | **Conceptual** | **Using and applying** |
| Continue to add and subtract whole numbers with more than four digits, including using formal written methods (columnar addition and subtraction) | Follow process shown in Year 3 & 4.   * Addition crossing one boundary. * Addition crossing more than one boundary. * Subtraction with exchanging through one boundary. * Subtraction with exchanging through more than one boundary. * Subtraction with exchanging through zero.   http://sensorychange.co.uk/wp-content/uploads/2014/01/IMG_5023.jpg | Addition  Number line  10,483 + 3,243 =  Screen%20Shot%202017-02-17%20at%2017.31.10.png  **Partition into hundreds, tens, ones and decimal fractions and recombine**  Either partition both numbers and recombine or partition the second number only e.g.  35.8 + 7.3 = 35.8 + 7 + 0.3  = 42.8 + 0.3  = 43.1    Subtraction  **Counting on when finding a small difference**  e.g. 5003 – 4996 = 7  ../Desktop/Screen%20Shot%202017-02-17%20at%2017.09.38.png  Counting back to subtract  Use of number facts to count back to find the difference.  11,754 – 2,542 = 9,212  Screen%20Shot%202017-02-17%20at%2017.58.00.png | Addition  Formal written method.    Revert to horizontal expansion methods if the children experience any difficulty – refer to year 4.  Missing numbers.  12,352 + 3,165 = □  □ + 2,265 = 12,517  3,522 + □ = 15,517  Addition of money and decimals.    Subtraction  Compact decomposition  ../Desktop/Screen%20Shot%202017-02-17%20at%2016.55.03.png  **It is still vital that the correct language of place value is used. The tens are REPARTITIONED (not “’borrow’ a 1” and it is not “7 takeaway 2” but “700 takeaway/subtract/ minus 200”).**  Revert to expanded decomposition methods if the children experience any difficulty – refer to year 4.  Missing numbers.  1352 - 165 = □  □ - 2265 = 1517  3522 - □ = 1517  Subtraction of decimals.  Screen%20Shot%202017-02-17%20at%2018.19.57.png  When subtracting decimals with different numbers of decimal places, children should be taught and encouraged to make them the same through identification that 2 tenths is the same as 20 hundredths, therefore, 0.2 is the same value as 0.20. | I travelled to 3 different cities. The distances of my journeys were: 1982 m, 15642 m and 12108m. What was the total distance travelled in metres? How far did I travel in km?  My friend travelled 31.9km, how much further did he travel than me?  Use the digits 3, 4, 6 and 7. Make a 4 digit number and subtract it from 10,000.  What are the largest and smallest answers?  Which answer is closest to 5000?  Find the digital roots of your answers.  What do you notice?  Use the digits 1 to 9. Make a 4 digit and a 5 digit number. Find the difference. Which pairs of numbers give you an answer closest to…80000, 75000, 70000 etc?  Use the digits 1 to 9. Make 2 decimals (unit, tenths, hundredths and thousandths). Find the difference. How many differences can you find which equal 1.234? |