

Mental methods children are taught which will enable them to effectively use empty number lines and complementary addition for subtraction

Reception	<p>Recite the number names in order, continuing the count forward or backwards from a given number.</p> <p>Begin to relate subtraction to 'taking away'.</p> <p>Remove a smaller number from a larger number and find how many are left by counting back.</p> <p>Begin to find out how many have been removed from a larger group of objects by counting up from a number.</p> <p>Work out by counting how many more are needed to make a larger number.</p>
Year 1	<p>Count on or back in ones from any small number, and in tens from and back to zero.</p> <p>Begin to know what each digit in a two-digit number represents. Partition a 'teens' number and begin to partition larger two-digit numbers.</p> <p>Within the range 0 to 30, say the number that is 1 or 10 more or less than any given number.</p> <p>Know by heart all pairs of numbers with a total of 10.</p> <p>Begin to know addition facts for all pairs of numbers with a total of at least 10, and the corresponding subtraction facts.</p> <p>Use known number facts and place value to add or subtract a pair of numbers mentally within the range 0 to at least 10, then 0 to at least 20.</p>
Year 2	<p>Count on or back in ones or tens, starting from any two-digit number.</p> <p>Know what each digit in a two-digit-number represents, and partition two-digit numbers into a multiple of tens and ones.</p> <p>Say the number that is 1 or 10 more or less than any given two-digit number.</p> <p>Know by heart all addition and subtraction facts for each number to at least 10, all pairs of numbers with a total of 20, all pairs of multiples with a total of 100.</p> <p>Find a small difference by counting up from the smaller to the larger number.</p> <p>Add/subtract 9/11 by adding/subtracting 10 and adjusting by 1.</p> <p>Begin to add/subtract 19/21.</p> <p>Use known number facts and place value to add/subtract mentally.</p>
Year 3	

	<p>Count on or back in tens or hundreds, starting from any two- or three-digit number.</p> <p>Know what each digit represents, and partition three-digit numbers into a multiple of 100, a multiple of ten and ones.</p> <p>Say the number that is 1, 10 or 100 more or less than any two- or three-digit number.</p> <p>Know by heart all addition and subtraction facts for each number to 20 and all pairs of multiples of 100 with a total of 1000.</p> <p>Derive quickly all pairs of multiples of 5 with a total of 100.</p> <p>Find a small difference by counting up from the smaller to the larger number.</p> <p>Add and subtract mentally a near multiple of 10 to or from a two-digit number, by adding or subtracting a multiple of ten then adjusting.</p>
Year 4	<p>Partition numbers into thousands, hundreds, tens and ones.</p> <p>Add/subtract 1, 10, 100 or 1000 to/from any integer and count on or back in tens, hundreds or thousands from any whole number up to 10 000.</p> <p>Consolidate knowing by heart addition and subtraction facts for all numbers to 20.</p> <p>Derive quickly all number pairs that total 100, all pairs of multiples of 50 with a total of 1000.</p> <p>Find a small difference by counting up.</p> <p>Count on or back in repeated steps of 1, 10 or 100.</p> <p>Add or subtract the nearest multiple of 10 then adjust.</p> <p>Use known number facts and place value to add or subtract mentally.</p>
Year 5	<p>Know what each digit represents in a number with up to two-decimal places.</p> <p>Derive quickly decimals that total 1, all two-digit pairs that total 100, all pairs of multiples of 50 with a total of 1000.</p> <p>Find differences by counting up through next multiple of 10, 100 or 1000.</p> <p>Add/subtract the nearest multiple of 10 or 100 then adjust.</p> <p>Use known number facts or place value for mental addition and subtraction.</p>
Year 6	<p>Know what each digit represents in a number with up to three</p>

	decimal places. Consolidate finding a difference by counting on. Add/subtract the nearest multiple of 10, 100 or 1000, then adjust. Use known number facts and place value to consolidate mental addition/subtraction.
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All the above objectives help consolidate understanding of subtraction questions using empty number lines and complementary addition.

What mental strategies support children's understanding of decomposition?

"If an emphasis on mental calculation is expected to lead to the development of written algorithms based on these strategies then it is important to ask why we need to introduce subtraction by decomposition. This appears to represent a confusion in the aims, and to my knowledge, there are no references in the research or professional literature, on children's idiosyncratic mental algorithms, to any children having invented or discovered the decomposition algorithm for themselves."

Ian Thompson (Issues for Classroom Practice in England)