

# Progression in Mental Strategies for the New Curriculum

## Y1

To read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs. Concept of equality.

To represent and use number bonds and related subtraction facts within 20

To add and subtract 1-digit and 2-digit numbers to 20, including zero

To show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot using numbers to 20

To understand the inverse relationship between addition and subtraction

To solve missing number problems such as  
 $7 = ? - 9$

To solve one-step problems that can involve addition and subtraction, using concrete objects and pictorial representations

To understand multiplication (repeated addition) using arrays

To understand division (grouping and sharing)

To understand that the x sign means repeated addition

To solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

To show that multiplication of two numbers can be done in any order using arrays

## Mental methods or strategies:

order numbers when adding, e.g. put the larger number first

count on or back in ones, twos or tens

partition small numbers, e.g.  $8 + 3 = 8 + 2 + 1$

partition and combine tens and ones

partition: double and adjust, e.g.  $5 + 6 = 5 + 5 + 1$

partition: bridge through 10 and multiples of 10 when adding and subtracting

partition and combine multiples of tens and ones

use knowledge of pairs making 10

partition: count on in tens and ones to find the total

partition: count on or back in tens and ones to find the difference

partition: add a multiple of 10 and adjust by 1

partition: double and adjust

use patterns of last digits, e.g. 0 and 5 when counting in fives

# Progression in Mental Strategies for the New Curriculum

Y2

To read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs  
Using an appropriate range of numbers.

To recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

To add and subtract numbers using concrete objects, pictorial representations, and mental methods, including:

- A 2-digit number and ones
- A 2-digit number and multiples of tens
- Two 2-digit numbers
- Adding three 1-digit numbers

To show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot using 2 digit numbers

To recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems

To solve missing number problems using balanced equations

To solve problems with addition and subtraction:

- using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- applying my increasing knowledge of mental and written methods

To recall and use multiplication facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

To recall and use division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

To calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division (÷) and equals (=)

To solve problems involving multiplication and division using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

To show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot

**Mental methods or strategies:**

reorder numbers when adding

identify pairs totalling 10 or multiples of 10, 20 and 100

partition: add tens and ones separately, then recombine

partition: count on in tens and ones to find the total

partition: count on or back in tens and ones to find the difference

partition: add or subtract 10 or 20 and adjust

partition: double and adjust

partition: double the tens and ones separately, then recombine

use knowledge that halving is the inverse of doubling and that doubling is equivalent to multiplying by two

use knowledge of multiplication facts from the 2, 5 and 10 times-tables, e.g. recognise that there are 15 objects altogether because there are three groups of five

# Progression in Mental Strategies for the New Curriculum

## Y3

To add and subtract numbers mentally.

To estimate the answer to a calculation and use inverse operations to check answers

To solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

To recall and use multiplication and division for the 3,4 and 8 times tables

To write and calculate mathematical statements for multiplication and division using the multiplication facts that they know including TU x U,

To recognise and use commutativity in mental calculations .

To understand the effect of dividing a one- or two- digit number by 10 and 100

To solve problems, including missing number problems, involving multiplication and division, including integer scaling problems and correspondence problems in which n objects are connected to m objects

### Mental methods or strategies:

count on or back in hundreds, tens and ones

partition: add tens and ones separately, then recombine

partition: subtract tens and then ones, e.g. subtracting 27 by subtracting 20 then 7

subtract by counting up from the smaller to the larger number

partition: add or subtract a multiple of 10 and adjust, e.g.  $56 + 29 = 56 + 30 - 1$ , or  $86 - 38 = 86 - 40 + 2$

partition: double and adjust

use knowledge of place value and related calculations,

e.g. work out  $140 + 150 = 290$  using  $14 + 15 = 29$

partition: when doubling, double the tens and ones separately, then recombine

partition: when halving, halve the tens and ones separately, then recombine

use knowledge that halving and doubling are inverse operations

recognise that finding a unit fraction is equivalent to dividing by the denominator and use knowledge of division facts

recognise that when multiplying by 10 or 100 the digits move one or two places to the left and zero is used as a place holder

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<p><b>Y4</b></p> <p>To add and subtract numbers mentally.</p> <p>To estimate and use inverse operations to check answers to a calculation</p> <p>To recall multiplication and division facts up to 12x12</p> <p>To use place value, known and derived facts to multiply and divide mentally, To multiply and divide by 0 and 1; to divide by 1;</p> <p>To multiply together three numbers</p> <p>To recognise and use factor pairs and commutativity in mental calculations</p> <p>To understand the effect of dividing a one- or two- digit number by 10 and 100, identifying the value of the digits in the answer as units, tenths and hundredths</p>	<p><b>Mental methods or strategies:</b></p> <p>count on or back in hundreds, tens, ones and tenths</p> <p>partition: add hundreds, tens or ones separately, then recombine</p> <p>subtract by counting up from the smaller to the larger number</p> <p>add or subtract a multiple of 10 or 100 and adjust</p> <p>partition: double and adjust</p> <p>use knowledge of place value and related calculations, e.g. <math>6.3 - 4.8</math> using <math>63 - 48</math></p> <p>use knowledge of multiplication facts up to <math>12 \times 12</math> and place value, e.g. <math>7 \times 8 = 56</math> to find <math>70 \times 8</math>, <math>7 \times 80</math></p> <p>use partitioning and the distributive law to multiply, e.g. <math>13 \times 4 = (10 + 3) \times 4 = (10 \times 4) + (3 \times 4) = 40 + 12 = 52</math></p>
<p><b>Y5</b></p> <p>To add and subtract (calculate) numbers mentally with increasingly large numbers</p>	<p><b>Mental methods or strategies:</b></p>

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To use rounding and the inverse to estimate and check answers to calculations and determine, in the context

use knowledge of place value and related calculations, e.g.  $680 + 430$ ,  $6.8 + 4.3$ ,  $0.68 + 0.43$  can all be worked out using the related calculation  $68 + 43$

use knowledge of place value and of doubles of two-digit whole numbers

partition: double and adjust

partition: add or subtract a whole number and adjust, e.g.  $4.3 + 2.9 = 4.3 + 3 - 0.1$ ,  $6.5 - 3.8 = 6.5 - 4 + 0.2$

To multiply and divide numbers mentally using known facts

multiply or divide by 4 or 8 by repeated doubling or halving

To multiply and divide whole numbers and those involving decimals by 10, 100 and 1000

form an equivalent calculation, e.g. to multiply by 5, multiply by 10, then halve; to multiply by 20, double, then multiply by 10

To understand how to find factors of known multiples and recognise that factors need to be in pairs.

use knowledge of doubles/halves and understanding of place value, e.g. when multiplying by 50 multiply by 100 and divide by 2

use knowledge of division facts, e.g. when carrying out a division to find a remainder

use understanding that when a number is multiplied or divided by 10 or 100, its digits move one or two places to the left or the right relative to the decimal point, and zero is used as a place holder

use knowledge of multiplication and division facts and understanding of place value, e.g. when calculating with multiples of 10

use knowledge of equivalence between fractions and percentages, e.g. to find 50%, 25% and 10%

use knowledge of multiplication and division facts to find factor pairs

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<p><b>Y6</b></p> <p>To perform mental calculations, including with mixed operations and large numbers</p> <p>To use brackets in simple calculations and know to calculate brackets first</p> <p>To use knowledge of the order of operations to carry out calculations</p> <p>To use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy</p> <p>To perform mental calculations, including with mixed operations and large numbers</p> <p>To multiply and divide whole numbers and those involving decimals by 10, 100 and 1000</p> <p>To identify common factors, common multiples and prime numbers.</p> <p>To find prime numbers of composite numbers quickly and efficiently.</p>	<p><b>Mental methods or strategies:</b></p> <p>use knowledge of place value and related calculations, e.g. <math>680 + 430</math>, <math>6.8 + 4.3</math>, <math>0.68 + 0.43</math> can all be worked out using the related calculation <math>68 + 43</math></p> <p>use knowledge of place value and of doubles of two-digit whole numbers</p> <p>use brackets in simple calculations and BODMAS</p> <p>partition: use partitioning and the distributive law to divide tens and ones separately, e.g. <math>92 \div 4 = (80 + 12) \div 4 = 20 + 3 = 23</math></p> <p>form an equivalent calculation, e.g. to divide by 25, divide by 100, then multiply by 4; to divide by 50, divide by 100, then double</p> <p>use knowledge of the equivalence between fractions and percentages and the relationship between fractions and division</p> <p>recognise how to scale up or down using multiplication and division, e.g. if three oranges cost 24p: one orange costs <math>24 \div 3 = 8</math>p four oranges cost <math>8 \times 4 = 32</math>p</p> <p>Use knowledge of multiplication and division facts to identify factor pairs and numbers with only two factors</p>