# Calculations policy


*Independent Learners for Life*

*whatever it takes*

Year 6

# ADDITION AND SUBTRACTION

Year group **6**

| **NC end of year statements** | **Non statutory guidance** |
|---|---|
| Pupils should be taught to:<br>• perform mental calculations, including with mixed operations and large numbers<br>• use their knowledge of the order of operations to carry out calculations involving the four operations<br>• solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why<br>• solve problems involving addition, subtraction, multiplication and division<br>• use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. | Pupils practise addition, subtraction, multiplication and division for larger numbers, using the formal written methods of columnar addition and subtraction, short and long multiplication, and short and long division (see Mathematics Appendix 1).<br><br>They undertake mental calculations with increasingly large numbers and more complex calculations.<br><br>Pupils round answers to a specified degree of accuracy, for example, to the nearest 10, 20, 50 etc., but not to a specified number of significant figures.<br><br>Pupils explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9. |
| **Pre-requisite skills**<br>• Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit<br>• Round any whole number to a required degree of accuracy<br>• Understand the place value of each digit in numbers with up to 3 decimal places<br>• Count forwards and backwards with positive and negative numbers, through 0<br>• Order positive and negative numbers | **Associated skills**<br>• Use negative numbers in context and calculate intervals across zero |

**Number facts**

| ADDITION | OPPORTUNITIES FOR PROBLEM SOLVING | SUBTRACTION |
|---|---|---|
| Progression in mental addition | | Progression in mental subtraction |
| Continue to use mental strategies and informal jottings for calculations which do not require formal written methods | Solve multi step problems, choosing which operations to use. | Continue to use mental strategies and informal jottings for calculations which do not require formal written methods |
| Use knowledge of known number facts to calculate addition of 2 numbers with 2 decimal places, without crossing the tenths or units boundary<br>£7.71 - £3.24 | Continue to make use of the relationship between addition and subtraction to identify related facts<br>1.58 + 4.97 = ….. | Use knowledge of known number facts to calculate a subtraction of 2 numbers with 2 decimal places without crossing the tenths or units boundary<br>£7.86-£3.24, |
| Add 0.9, 1.9, 2.9 or 1.1, 2.1, 3.1 by adding 1, 2, 3…. and adjusting | Missing numbers:<br>6.32 + ☐ = 8 | Subtract 0.9, 1.9, 2.9 or 1.1, 2.1, 3.1 by subtracting 1, 2, 3…. and adjusting |
| Add 4 digit multiples of 100<br>5700 + 2500 | | Find a difference between a multiple of 1000 and a 4 digit number by counting up from the smaller to the larger: |

| | | |
|---|---|---|
| | □ + □ = 1.68 | 8000 - 2785 |
| Know what to add to a unit with 2 decimal places to make the next higher whole number or tenth<br>6.45 to make 7 4.81 to make 5 7.36 to make 7.4 | Which questions are easy/hard? Explain why<br>213323 – 70 =<br>512893 + 37 =<br>8193.54 – 5.9 = | Subtract 4 digit multiples of 100 6100 - □ = 3700 |
| Add a pair of decimal fractions less than 1 and with up to 2 decimal places<br>0.67 + 0.2 0.67 + □ = 0.87 | Give me an easy calculation that has large numbers. Give me a hard calculation that has small numbers. Explain what makes it easy or hard. | Subtract a pair of decimal fractions less than 1 and with up to 2 decimal places<br>0.5 – 0.31 0.5 - □ = 0.19 |
| | | Use known number facts to calculate intervals of positive and negative numbers across 0. |
| Progression in written addition | **Missing symbols:** | Progression in written subtraction |
| Extend column method of addition to numbers with up to 5 digits and 3 decimal places | 6 □ 12.3 = 61.9 □ 11.9 | Extend column method of subtraction to numbers with up to 5 digits and 3 decimal places |
| Children to follow *progression in written calculations* video tutorials.<br>**bit.ly/stmargsaddition** | **What else do you know?**<br>If you know 86.7 + 13.3 = 100, what other facts do you know?<br><br>Convince me<br>Three 4 digit numbers total 12435. What could they be?<br><br>**Make an estimate**<br>Circle the number that is the best estimate for the answer to 932.6 – 931.05<br>1.3 1.5 1.7 1.9<br><br>Use the digits 2, 3, 6, 7 and 9 to make an addition calculation with a total of 9,999<br><br>**Always/sometimes/never true?**<br>The sum of 2 consecutive triangular numbers is a square number?<br><br>The difference between a 2 digit number and its reverse is always a multiple of 9. | Children to follow *progression in written calculations* video tutorials.<br>**bit.ly/stmargssubtraction** |

**Additional resources**

**White Rose Maths** - fluency, reasoning, problem solving - whiterosemaths.com

**Times Table Rockstars** - fluency - bit.ly/stmargsttrockstars

**Nrich** - reasoning and problem solving - rich.maths.org

**Learning by Questions** - fluency, reasoning, problem solving - lbq.org

**bit.ly/stmargsmathsvideos**

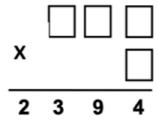
**MULTIPLICATION AND DIVISION**

Year group **6**

| **NC end of year statements** | **Non statutory guidance** |
|---|---|
| • multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication<br>• divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context<br>• divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context<br>• perform mental calculations, including with mixed operations and large numbers<br>• identify common factors, common multiples and prime numbers<br>• use their knowledge of the order of operations to carry out calculations involving the four operations<br>• solve problems involving addition, subtraction, multiplication and division<br>• use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.<br>• solve problems involving addition, subtraction, multiplication and division<br>• use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy. | Pupils practise addition, subtraction, multiplication and division for larger numbers, using the formal written methods of columnar addition and subtraction, short and long multiplication, and short and long division (see Mathematics Appendix 1).<br>They undertake mental calculations with increasingly large numbers and more complex calculations.<br>Pupils continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency.<br>Pupils round answers to a specified degree of accuracy, for example, to the nearest 10, 20, 50 etc., but not to a specified number of significant figures.<br>Pupils explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9.<br>Common factors can be related to finding equivalent fractions |
| **Pre-requisite skills**<br>• Read, write, order and compare numbers up to 10 000 000 and determine the value of each digit<br>• Round any whole number to a required degree of accuracy<br>• Use negative numbers in context, and calculate intervals across zero<br>• Use knowledge of place value and multiplication facts to make reasonable estimates when dividing by single or 2 digit numbers. | **Associated skills**<br>round any whole number to a required degree of accuracy<br>• Use knowledge of place value to multiply decimals with up to 2 places<br>• Associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375 for a simple fraction 3/8<br>• identify common factors, common multiples and prime numbers<br>• use common factors to simplify fractions; use common multiples to express fractions in the same denomination<br>• calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres ($cm^3$) and cubic metres ($m^3$), and extending to other units [for example, $mm^3$ and $km^3$ )<br>• solve problems involving similar shapes where the scale factor is known or can be found |

| **Number facts** |
|---|

| MULTIPLICATION | OPPORTUNITIES FOR PROBLEM SOLVING | DIVISION |
|---|---|---|
| Progression in mental multiplication | | Progression in mental division |
| Use known doubling facts to mentally calculate:<br>• doubles of 3 digit numbers<br>• times tables beyond 12 e.g. 24 times table by doubling the 12 times table<br>• doubles of decimal numbers with 3 decimal places | **True/false** (and how do you know?)<br>1.2 ÷ 6 =2<br><br>Which two numbers total 0.12:<br>0.1 0.5 0.05 0.7 0.07 0.2<br>Explain your thinking<br><br>Explain how you find the missing number:<br><br>11.07 + ☐ = 18.45<br><br>**Making links**<br><br>If 7 × 8 = 56 what is 0.07 × 8? Give some other decimal facts that are linked to this multiplication fact.<br><br>0.7 x 8 = 5.6 How can you use this fact to solve these calculations? 0.7 x 0.08 = 0.56 ÷ 8 =<br><br>What number multiplied by 8 gives 4.8?<br><br>Fill the blanks with +, -, x or ÷ to make these calculations correct, using the correct order of operations<br><br>14 ☐ 2 ☐ 3 = 2 12 ☐ 6 ☐ 12 = 1<br><br>Using any combination of +, -, x, ÷ and ÷, make a total of 24 with each of the given sets of digitss.<br><br>1 2 8 9 =<br>5 5 9 9 =<br><br>Is there only one solution to each of these problems?<br><br>**Missing Operations** | Find sixth by halving thirds, twelfths by halving sixths and twentieths by halving tenths |
| Develop strategies for multiplication such as doubling one side and halving the product 50 x 14 100 x 14 = 1400 ÷ 2 = 700 | | Use knowledge of factors to divide 378 ÷ 21:<br>378 ÷ 3 = 126 126 ÷7 = 18 |
| Use known factors to multiply 35 x 18<br><br>35 x 6 = 210 then 210 x 3 | | Use distributive law to derive unknown facts:<br>624 ÷ 6:<br>600 ÷ 6 = 100 24 ÷ 6 = 4<br>100 + 4 = 104 |
| Use distributive law to derive unknown facts<br>17 x 25 by calculating 10 x 25 and adding 7 x 25 | | Use knowledge of place value and number relationships to calculate with decimals<br>5.4 ÷ 9 = 0.6 as 9 × 6 = 54 and 9 × 0.6 = 5.4 |
| Multiply a number on either side of a multiple of 10 by multiplying by the multiple of 10 and adjusting 49 x 32. Calculate 50 x 32 and subtract 32 | | |
| Recognise that knowing 0.75 x 4 = 3, you also know other facts 3 ÷ 4 = 0.75 3 ÷ 0.75 = 4 | | |
| Use knowledge of place value and number relationships to calculate with decimals<br>0.7 × 3 = 2.1 as 7 tenths × 3 = 21 tenths or 2.1 | | |
| Multiply decimal fractions by 10 or 100 | | |
| | | |

| | | |
|---|---|---|
| | What operation is missing from each calculation?<br><br>12.85 ☐ 19 = 244.15<br><br>4806 ☐ 54 = 89<br>What do you know about each operation to help you with this problem?<br>How can you prove each of your answers are correct?<br>Can you explain your thinking to a partner?<br><br>**General Statements**<br>Can you find examples that make the following general statements?<br>• Dividing a whole number by one half makes the number twice as big<br>• Every whole number greater than 5 can be written as a sum of 3 prime numbers? True or False? | |
| Progression in written multiplication | | Progression in written division |
| Children to follow *progression in written calculations* video tutorials.<br><br>**bit.ly/stmargsmultiplication** | Use written multiplication and division methods to help solve one and two step problems involving money or measures<br><br>Can you create a word problem that will have the following calculation as its answer?<br>357 ÷ 12 = 29 r 9<br><br>**Missing Number Problems**<br><br>2.4 ÷ 0.3 = ☐ x 1.25<br>Which number could be written in the box?<br><br>Place the following digits 2, 7, 3, 4 into the calculation<br><br>  <br> | Children to follow *progression in written calculations* video tutorials.<br><br>**bit.ly/stmargsdivision** |

Children to follow *progression in written calculations* video tutorials.

bit.ly/stmargsmultiplication

**Prove It**

What goes in the box?

18☐4 ÷ 12 = 157

38☐5 ÷ 18 = 212.5

33☐2 ÷8=421.5

38 x☐.7 = 178.6

Prove it.

Use the following digits and make a calculation that will give you an answer as close to 500 as possible?

4 6 5 3 9 1

What facts do you know that could help you solve this?

How did you begin to solve this problem?

**Use a fact**

12 x 1.1 = 13.2 Use this fact to work out:

15.4 ÷ 1.1 = 27.5 ÷ 1.1 =

**Can you find?**

Can you find the smallest number that can be added to or subtracted from 87.6 to make it exactly divisible

identify common factors, common multiples and prime numbers

**Always, sometimes, never?**

- Is it always, sometimes or never true that dividing a whole number by a half makes the answer twice as big.
- Is it always, sometimes or never true that when you square an even number, the result is divisible by 4
- Is it always, sometimes or never true that multiples of 7 are 1 more or 1 less than prime numbers.

**Which is correct?**

Children to follow *progression in written calculations* video tutorials.

bit.ly/stmargsdivision

| | | |
|---|---|---|
| Children to follow *progression in written calculations* video tutorials.<br><br>**bit.ly/stmargsmultiplication** | Which of these number sentences is correct? 3 + 6 x 2 =15 6 x 5 – 7 x 4 = 92<br>8 x 20 ÷ 4 x 3 = 37<br><br>**Use the inverse**<br>Use the inverse to check if the following calculations are correct:<br>2346 x 46 = 332796 27.74 ÷ 19 = 1.46<br><br>**Size of an answer**<br>The product of a single digit number and a number with two decimal places is 21.34<br>What could the numbers be? | Children to follow *progression in written calculations* video tutorials.<br><br>**bit.ly/stmargsdivision** |

**Additional resources**

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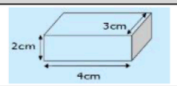
# Upper KS2 Maths Organiser

| Cube Numbers | | Cube Roots | |
|---|---|---|---|
| $1^3$ | 1 | $\sqrt{1}$ | 1 |
| $2^3$ | 8 | $\sqrt{8}$ | 2 |
| $3^3$ | 27 | $\sqrt{27}$ | 3 |
| $4^3$ | 64 | $\sqrt{64}$ | 4 |
| $5^3$ | 125 | $\sqrt{125}$ | 5 |

| Square Numbers | | Square Roots | |
|---|---|---|---|
| $1^2$ | 1 | $\sqrt{1}$ | 1 |
| $2^2$ | 4 | $\sqrt{4}$ | 2 |
| $3^2$ | 9 | $\sqrt{9}$ | 3 |
| $4^2$ | 16 | $\sqrt{16}$ | 4 |
| $5^2$ | 25 | $\sqrt{25}$ | 5 |
| $6^2$ | 36 | $\sqrt{36}$ | 6 |
| $7^2$ | 49 | $\sqrt{49}$ | 7 |
| $8^2$ | 64 | $\sqrt{64}$ | 8 |
| $9^2$ | 81 | $\sqrt{81}$ | 9 |
| $10^2$ | 100 | $\sqrt{100}$ | 10 |
| $11^2$ | 121 | $\sqrt{121}$ | 11 |
| $12^2$ | 144 | $\sqrt{144}$ | 12 |
| $13^2$ | 169 | $\sqrt{169}$ | 13 |

| Prime Numbers | | | |
|---|---|---|---|
| 2 | 17 | 41 | 67 |
| 3 | 19 | 43 | 71 |
| 5 | 23 | 47 | 73 |
| 7 | 29 | 53 | 79 |
| 11 | 31 | 59 | 83 |
| 13 | 37 | 61 | 89 |

| Numbers | |
|---|---|
| 0 | a number with no value that comes between the positive and negative numbers |
| positive number | a number more than 0 |
| negative number | a number less than 0 |
| prime number | A number with exactly two factors, itself and one. |
| composite number | A number with more than two factors. |

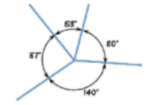
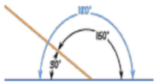
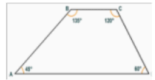
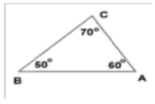
| Geometry | |
|---|---|
| volume |  |
| Volume = length x height x depth | |



| Statistics | |
|---|---|
| mean | the sum of all data points divided by the number of data points |

| Circle Geometry | |
|---|---|
| radius | a straight line from the centre to the circumference |
| chord | a straight line joining two points on the circumference |
| diameter | a chord which passes through the centre |
| circumference | the distance once around the circle |

| Roman Numerals | |
|---|---|
| I | 1 |
| V | 5 |
| X | 10 |
| L | 50 |
| C | 100 |
| D | 500 |
| M | 1000 |

| Angle Totals | |
|---|---|
|  | Angles around a point total 360º |
|  | Angles on a straight line total 180º |
|  | Angles in a quadrilateral total 360º |
|  | Angles in a triangle total 180º |



| Factors and Multiples | |
|---|---|
| **factors** | numbers we multiply together to get other numbers |
| **multiple** | the result of multiplying a number by an integer |
| **HCF** | Highest Common Factor - the largest factor shared by two or more numbers |
| **LCM** | Lowest Common Multiple - the smallest number that is a multiple of two or more numbers. |

**Multiplication Grid**

| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| **2** | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 |
| **3** | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 |
| **4** | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 |
| **5** | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| **6** | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 |
| **7** | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 | 77 | 84 |
| **8** | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 |
| **9** | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 | 99 | 108 |
| **10** | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 |
| **11** | 11 | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 110 | 121 | 132 |
| **12** | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 144 |

**Place Value Grid**

| | millions | hundred thousands | ten thousands | thousands | hundreds | tens | ones | | tenths | hundredths | thousandths |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Numeral** | 1,000,000 | 100,000 | 10,000 | 1000 | 100 | 10 | 1 | ● | 0.1 | 0.01 | 0.001 |