# Calculations policy

*Independent Learners for Life*

*whatever it takes*

Year 3

# ADDITION AND SUBTRACTION

Year group **3**

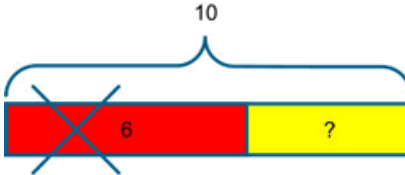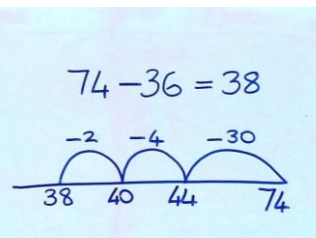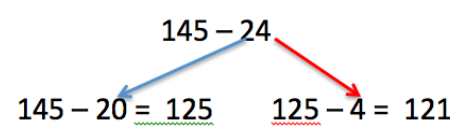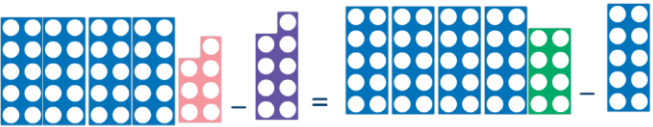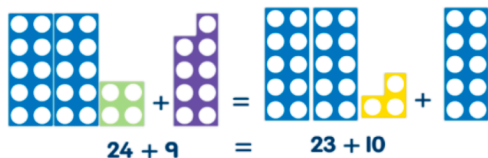| NC end of year statements | Non statutory guidance |
|---|---|
| Pupils should be taught to:<br><br>• add and subtract numbers mentally, including: ⬚ a three-digit number and ones ⬚ a three-digit number and tens ⬚ a three-digit number and hundreds<br>• add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction<br>• estimate the answer to a calculation and use inverse operations to check answers<br>• solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction. | Pupils practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100.<br><br>Pupils use their understanding of place value and partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to three digits to become fluent (see Mathematics Appendix 1). |
| **Pre-requisite skills**<br><br>• Read and write numbers to at least 1000<br>• Recognise the place value of each digit in a three-digit number (hundreds, tens, ones).<br>• Compare and order numbers up to 1000<br>• Count in 10s to 100 and beyond from any number<br>• Find 10 more /less than any 2 digit number<br>• Flexibly partition 2 and 3 digit numbers e.g. 58 = 40 + 18 or 30 +28; 368 = 250 + 118; 326 = 290+ 36<br>• Use developing ideas of number to solve problems including practical problems<br>• Use structured equipment such as Base 10 and Numicon in games/activities involving exchanging ten units for a 10 stick or 10 shape. | **Associated skills**<br><br>• Count from 0 in multiples of 4, 8, 50 and 100<br>• Count in hundreds to 1000 and beyond from any number<br>• Finding 10 or 100 more or less than a given number up to 1,000<br>• Round 2 digit numbers to the nearest multiple of 10<br>• Identify, represent and estimate numbers using structured materials including a number line.<br>• Use scales on measuring equipment, such as kitchen scales and a measuring jug, graduated in fives, tens, hundreds<br>• Recognise the value represented by place value counters (ones, tens and hundreds) and demonstrate this in exchanging games<br>• Recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10<br>• Count up and down in tenths.<br>• Compare and order unit fractions with the same denominator.<br>• Add and subtract fractions with the same denominator within one whole (e.g. $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$) |

**Number facts:**
• Know pairs of multiples of 5 and 10 that total 100
• Know pairs of multiples of 100 that total 1000.
• Use knowledge of addition and subtraction facts of numbers up to 10 in calculations using 3 digit numbers

| ADDITION | OPPORTUNITIES FOR PROBLEM SOLVING- | SUBTRACTION |
|---|---|---|
| Progression in mental addition | | Progression in mental subtraction |
| Use knowledge of place value and number facts to mentally add:<br>HTU + U, total less than 1,000<br>HTU + T, total less than 1,000<br>HTU + H, total less than 1,000 | Develop strategies for solving problems e.g. diagrams such as the Singapore Bar<br>**Addition**<br>**I have 6 red pencils and 4 yellow pencils. How many pencils do I have?**<br>(I combine two quantities to form the whole) | Use knowledge of place value and number facts to mentally subtract:<br>HTU - U 457 - 5<br>HTU + T 457 - 20<br>HTU + H 657 - 200 |
| Use mental strategies supported by informal jottings (empty number line or partitioning) to add:<br>TU + TU, crossing the tens boundary total no greater than 100<br>34 + 48<br><br>$34 + 48$<br><br>$34 + 40 = 74$     $74 + 6 + 2 = 82$<br><br>Progress to TU +TU total greater than 100<br>35+ 67<br><br>Extend to adding three or more numbers<br>35 + 4 + 6            35 + 23 + 3            35 + 23 + 30 | ?<br><br><br>**I have 6 red pencils and I buy 4 yellow pencils. How many pencils do I have?**<br>(The bar I started with increases in length)<br>?<br><br><br>**Subtraction**<br>**I had 10 pencils and I gave 6 away, how many do I have now?**<br>(This time we know the whole but only one of the parts, so the whole is partitioned and one of the parts removed to identify the missing part) | Use mental strategies supported by informal jottings (empty number line or partitioning) to subtract:<br>TU-TU, crossing the tens boundary, 74-36<br><br><br>$74 - 36 = 38$<br><br>HTU –TU, not crossing the tens boundary 145-24.<br><br>$145 - 24$<br><br>$145 - 20 = 125$     $125 - 4 = 121$ |
| Use knowledge of number facts to find complements to 100 | 10<br> | Subtract 9, 19, 29 or 11, 21, 31 from a 2 digit number by subtracting 10 or a multiple of 10 and adjusting<br><br><br>$47 - 9 = 48 - 10$ |
| Add 9, 19, 29 or 11, 21, 31 to a 2 digit number by adding 10 or a multiple of 10 and adjusting | **Tom has 10 pencils and Sam has 6 pencils. How many** | Subtract 9 or 11 from a 3 digit number by subtracting 10 and adjusting |

24 + 9 = 23 + 10

Add 9 or 11 to a 3 digit number by adding 10 and adjusting

| Progression in written addition |
| --- |

*Children should be able to exchange using concete apparatus (Base 10, Numicon) securely before introducing a compact written method*

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

**bit.ly/stmargsaddition**

---

more does Tom have?
(The bar is particularly valuable for seeing the difference between the two quantities)
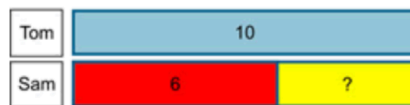


Pupils need to be secure that the same addition or subtraction number sentence can denote different structures of addition and subtraction:
 23+5 can indicate aggregation (altogether) or augmentation (increase)
67-34 can indicate either partitioning, decrease, comparison or inverse for subtraction

**What else do you know?**
If you know that 32+14=46, what is 46-26?

**True/false?**
32+14 = 33+13. Tell me how you know (without doing the calculation)

Use the relationship between addition and subtraction to recognise that when subtracting 2 numbers close together, it is easier to count up from the smaller number.

Which calculations are easy...hard? Why?
323 + 10          393 + 10               454 - 100     954 - 120
Explain why the hard questions are hard.
Can you give me another easy/hard calculation?

Give me an example of an addition/subtraction calculation with 3 digit numbes that you can calculate mentally.

Which calculations can you do in your head and which ones do you need to use some jottings?
 48 - 21     278 + 32          569 - 300          276 – 4
375 – 20               278 + 32               87 + 9          361 + 2

---

Find a small difference between a pair of numbers lying either side of a multiple of 100 from 100 to 1000 e.g. 605 – 596 by counting up from the smaller number

| Progression in written subtraction |
| --- |

*Children should be able to exchange securely using concete apparatus (Base 10, Numicon) before introducing a compact written method*

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

**bit.ly/stmargssubtraction**

What made you decide?

**Missing digits**
Which digit goes in the box?

$$5\ 4\ 6$$
$$+3\ \square\ 5$$
$$8\ 9\ 1$$

$$2\ \square\ 9$$
$$+5\ 4\ 8$$
$$8\ \square\ 7$$

$\square\square$ + $\square\square$ + $\square\square$ = 201. Each missing digit is either a 9 or a 1. Is there only 1 solution?

**Estimating**
Which calculations will give an answer between 50 and 60?
714 - 119          333 - 276          932 - 871
Give me another calculation where the answer will be within the same range. What did you need to think about?

**Always/sometimes/never**
Only the tens digit changes when you add 10 to a number.

Is it always, sometimes or never true that if you subtract a multiple of 10 from any number, the ones digit of that number stay the same?

Is it always, sometimes or never true that if you add 2 numbers together, you will get an even number?

Using the digits 1, 2, 3 and 4, can you create an addition calculation and a subtraction calculation involving 2-digit or 3-digit numbers where the answer could be:
- smaller than 150
- a multiple of 5
- an even number less than 60

What did you need to consider?

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

**bit.ly/stmargssubtraction**

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

**bit.ly/stmargsaddition**

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

**bit.ly/stmargssubtraction**

When using structured apparatus for calculations involving 'exchanging', ensure children are secure with counting sticks and/straws before using Base 10 or Numicon. Once they have demonstrated understanding of using these, progress to place value counters (these are more abstract than structured apparatus as they are tokens)

When using apparatus to model the column method of subtraction, ensure that only the minuend (the number being subtracted from) is represented with apparatus and the subtrahend (the number being subtracted) is represented by either digit cards or place value cards.

When using the expanded method of recording, ensure number is written as '400 and 50 and 3' rather than 400 + 50 + 3

**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**

Year group **3**

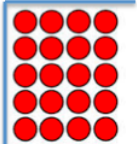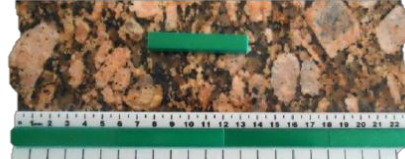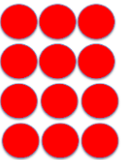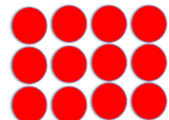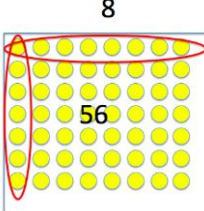| NC end of year statements | Non statutory guidance |
|---|---|
| • recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables<br>• write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods<br>• solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects. | Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency. Through doubling, they connect the 2, 4 and 8 multiplication tables.<br>Pupils develop efficient mental methods, for example, using commutativity and associativity (for example, $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) and multiplication and division facts (for example, using $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 = 6 \div 3$) to derive related facts (for example, $30 \times 2 = 60$, $60 \div 3 = 20$ and $20 = 60 \div 3$).<br>Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of short multiplication and division.<br>Pupils solve simple problems in contexts, deciding which of the four operations to use and why. These include measuring and scaling contexts, (for example, four times as high, eight times as long etc.) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children). |
| **Pre-requisite skills**<br>• Count from 0 in mutliples of 4, 8, 50 and 100<br>• Know 2, 5 and 10 times tables<br>• Know 1, 2, 3, 4, 5, 8 and 10 times tables<br>• Begin to understand the effect of multiplication and division by 10 and 100.<br>• Understand that multiplying is a form of calculating used instead of repeated adding and recognize when they need to multiply to solve a problem<br>• Read multiplying number sentences<br>• Represent multiplying problems with structured apparatus and arrays<br>• Recognize that dividing can be expressed as finding 'how many groups are there in … ?'<br>• Read, build with structured apparatus, and write dividing number sentences using the '÷' symbol<br>• Know that we use dividing to solve problems involving sharing as well as those involving grouping<br>• Write dividing sentences in response to problems illustrated by arrays, Numicon Shapes or number rods<br>• Use the inverse relation between multiplying and dividing when solving sharing problems | **Associated skills**<br>• Understand the effect of multiplying by 1, 10 and 100<br>• Count forwards and backwards in sequences of multiples within their working range<br>• Recognize when a given number is a multiple of 2, 3, 4, 5, 8, or 10 (at this stage a few children may recognize common multiples but this is not a milestone)<br>• Notice patterns in sequences of multiples, explain the rule for the sequence and use this to find missing numbers<br>• Count in multiples of 25 and 50<br>• Find halfway between two multiples of 10 and two multiples of 100<br>• Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators<br>• Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators<br>• Recognise and show, using diagrams, equivalent fractions with small denominators |

**Number facts**
- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables

| MULTIPLICATION | OPPORTUNITIES FOR PROBLEM SOLVING | DIVISION |
|---|---|---|
| Progression in mental multiplication | | Progression in mental division |
| Know what happens when you multiply a number by 10 | Demonstrate with apparatus/diagrams that multiplication is commutative but that division is not. | Know what happens when you divide a number by 10 |
| Multipy a unit by 1, 10 or 100 | | Divide a 3 digit multiple of 100 by 10 or 100 |
| Develop mental strategies to support memory for multiplication facts<br>Use doubing facts to derive unknown facts:<br>Double the 2 times table to get the 4 times table and double the 4 times table to get the 8 times table | Use the link between multiplication and division to work out missing number calculations 4 x ☐ = 20<br> | Find quarters by finding half and then half again |
| Double any multiple of 5 up to 50 | | Halve any multiple of 10 to 100 |
| Multiply a 2 digit multiple of 10 up to 50 by 2,3,4,5 or 10 | Derive associated multiplication and division facts from known facts<br>If 30 x 4 = 120, then:<br>40 x 3 = 120          120 ÷ 3 = 40          120 ÷ 4 = 30.<br><br>**Use a fact** | Use the relationship between multiplication and division to write a division sentence for a corresponding multilcation sentence    6 x 4 = 24        How many 6s in 24?<br> |
| Multiply a 2 digit number by 2,3,4,5 or 10 withoout crossing the tens boundary | Given three related numbers, write the corresponding multiplication and division statements | Know that multiplying has a commutative property and use this when solving dividing questions |
| Use knowledge of place value to derive new facts<br><br>2        x 3  =  6<br>20       x 3  =  80<br>200      x 3  =  600 | Use a known fact to derive related facts<br>4 x 6 = 24 so 24 ÷ 6 = 4<br><br>How does 4 × 6 = 24 help you to solve these calculations?<br>40 x 6 =                    20 x 6 =                    24 x 6 = | Use knowledge of place value to derive new facts<br>6 ÷ 3 = 2<br>60 ÷ 3 = 20<br>600 ÷ 3 = 200 |
| Know and use the commutative property of multiplying<br><br>3 x 4          4 x 3 | Use 20 x 3 = 60 to work out<br>21 x 3=          22 x 3=        23 x 3=          24 x 3=<br><br>**Missing numbers**<br>24 = ☐ x ☐ Which pairs of numbers could be written in the boxes? | Using an array (manageable) to explore the connection between grouping and sharing |

<table>
<tr>
<td>

Solve missing number problems involving multiplication and division.

☐ x 5 = 20    3 x ☐ = 18    ☐ x ☐ = 32

</td>
<td colspan="2">

**Making links**
Cards come in packs of 4. How many packs do I need to buy to get 32 cards?

**Prove It**
What goes in the boxes?

| X | ? | ? |
|---|---|---|
| 4 | 80 | 12 |

Prove it.

**How close can you get?**
☐☐ × ☐
Using the digits 2, 3 and 4 in the calculation, how close can you get to 100? What is the largest product? What is the smallest product?

</td>
<td>



8

7    56

56 ÷ 7

56 in groups of 7          56 shared between 7

Solve number puzzles and real life problems involving division

*How many lengths of 10m can you cut from an 80 m length of rope?*

Make up a number story to match 20 ÷ 4.
*If I share 38 sweets between 5 friends, will there be any left over?*

</td>
</tr>
</table>

---

Build on mental strategies for multiplying simple TU x U
Partitioning: 12 x 4 = (10 x 4) + (2 x 4)
Commutativity: 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12
Known facts: 2 x 4 to calculate 20 x 4

Record using informal jottings, child initiated.

**True or false?**
All the numbers in the two times table are even.
There are no numbers in the three times table that are also in the two times table.

**Use the inverse**
Use the inverse to check if the following calculations are correct  23 x 4 = 82
117 ÷ 9 = 14

Know whether to round up or down to solve division problems involving remainders.
*A taxi holds 5 people. How many taxis do we need to take 17 people home from a party?*
*6 eggs fill an egg box. How many egg boxes can I fill with 20 eggs?*

Encourage children to use pictorial images to help calculate and decide on the answer

---

Solve problems involving multiplication as scaling

*Make a red tower with 5 cubes. Now make a blue tower that is 3 times as high*.
Link to measurement

Illustrate scaling up with structured apparatus and use the language of scaling and ratio to explain solutions
*Image of linking cubes/cuisenaire rods*

**Estimating**
Will the answer to the following calculations be greater or less than 80 23 x 3=
32 x 3 = 42 x 3 = 36 x 2=

Function machine

Solve problems involving division as ratio
Image of 2 cube red tower and 6 cube blue tower
*How much smaller is the red tower than the blue tower?*
Link to measurement

Illustrate ratio problems with structured apparatus and use the language of scaling and ratio to explain their solutions

---

Use knowledge of multiplication to divide numbers beyond known tables facts.

| Progression in written multiplication | | Progression in written division |
|---|---|---|
| Children to follow *progression in written calculations* video tutorials.<br><br>**bit.ly/stmargsmultiplication** | | 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**

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

**bit.ly/stmargsdivision**

**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

11

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

**bit.ly/stmargsmathsvideos**

# Year Three Maths Organiser

## Number Bonds To 100

| | | | | | |
|---|---|---|---|---|---|
| 0 | 100 | 20 | 80 | 35 | 65 |
| 5 | 95 | 25 | 75 | 40 | 60 |
| 10 | 90 | 30 | 70 | 45 | 55 |
| 15 | 85 | | | 50 | 50 |

## Multiplication and Division – Derived Facts



$3 \times 4 = 12$
$4 \times 3 = 12$
$12 = 3 \times 4$
$12 = 4 \times 3$
$12 \div 3 = 4$
$12 \div 4 = 3$
$4 = 12 \div 3$
$3 = 12 \div 4$

## Fractions

| | |
|---|---|
| $\frac{1}{2}$ | one half |
| $\frac{1}{3}$ | one third |
| $\frac{2}{3}$ | two thirds |
| $\frac{1}{4}$ | one quarter |
| $\frac{3}{4}$ | three quarters |
| $\frac{1}{5}$ | one fifth |
| $\frac{1}{6}$ | one sixth |
| $\frac{1}{7}$ | one seventh |
| $\frac{1}{8}$ | one eighth |
| $\frac{1}{9}$ | one ninth |

## Days in a Month

| | |
|---|---|
| January | 31 |
| February | 28* |
| March | 31 |
| April | 30 |
| May | 31 |
| June | 30 |
| July | 31 |
| August | 31 |
| September | 30 |
| October | 31 |
| November | 30 |
| December | 31 |
| Leap year is 366 days with 29 days in February | |

## Measurements

| mm in a cm | 10 mm = 1 cm | m in a km | 1000m = 1km |
|---|---|---|---|
| mm in a m | 1000 mm = 1 m | g in a kg | 1000g = 1 kg |
| cm in a m | 100 cm = 1 m | ml in a l | 1000 ml = 1 l |
| 60 seconds in a minute. | 60 minutes in an hour. | | 24 hours in one day. |
| 7 days in a week. | | 12 months in one year. | |

## Telling The Time



| 2.05 | five past two |
|---|---|
| 3.10 | ten past three |
| 19.20 | twenty past seven |
| 16.25 | twenty-five past four |
| 8.35 | twenty-five to nine |
| 21.40 | twenty to ten |
| 5.50 | ten to six |
| 12.55 | five to one |

## Multiplication Tables

| X | 4 | 8 | 3 | 6 | 9 |
|---|---|---|---|---|---|
| 1 | 4 | 8 | 3 | 6 | 9 |
| 2 | 8 | 16 | 6 | 12 | 18 |
| 3 | 12 | 24 | 9 | 18 | 27 |
| 4 | 16 | 32 | 12 | 24 | 36 |
| 5 | 20 | 40 | 15 | 30 | 45 |
| 6 | 24 | 48 | 18 | 36 | 54 |
| 7 | 28 | 56 | 21 | 42 | 63 |
| 8 | 32 | 64 | 24 | 48 | 72 |
| 9 | 36 | 72 | 27 | 54 | 81 |
| 10 | 40 | 80 | 30 | 60 | 90 |
| 11 | 44 | 88 | 33 | 66 | 99 |
| 12 | 48 | 96 | 36 | 72 | 108 |

## 2D Shapes

| triangle | a three sided polygon |
|---|---|
| quadrilateral | a four sided polygon |
| pentagon | a five sided polygon |
| hexagon | a six sided polygon |
| heptagon | a seven sided polygon |
| octagon | an eight sided polygon |
| nonagon | a nine sided polygon |
| decagon | a ten sided polygon |
| hendecagon | an eleven sided polygon |
| dodecagon | a twelve sided polygon |

## Geometry

| Vertical | | Parallel | |
|---|---|---|---|
| Horizontal |  | | |
| Perpendicular |  | Right Angle | 90° |
| Quarter Turn | 1 right angle quarter turn 90° | Three-quarter Turn | 3 right angles 3 quarter turns 270° |
| Half Turn | 2 right angles 2 quarter turns or half turn 180° | Full Turn | 4 right angles 4 quarter turns or full turn 360° |
| Perimeter | | 4cm 3cm 3cm 4cm The total distance around the outside of a shape. Perimeter = 14cm | |

## 3D Shapes

| Prisms and Pyramids |  |
|---|---|

triangular prism, square prism, rectangular prism, pentagonal prism, hexagonal prism, octagonal prism

triangular pyramid, square pyramid, rectangular pyramid, pentagonal pyramid, hexagonal pyramid, octagonal pyramid

## Place Value Grid

| | thousands | hundreds | tens | ones | | tenths | hundredths |
|---|---|---|---|---|---|---|---|
| Numeral | 1000 | 100 | 10 | 1 | ● | 0.1 | 0.01 |