Calculations policy

Independent Learners for Life

whatever it takes

Year 4

ADDITION AND SUBTRACTION

Year group 4

NC end of year statements	Non statutory guidance
Pupils should be taught to: • add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate • estimate and use inverse operations to check answers to a calculation • solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.	Pupils continue to practise both mental methods and columnar addition and subtraction with increasingly large numbers to aid fluency (see Mathematics Appendix 1).
Pre-requisite skills • Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens and ones) • Count on/back in 1s, 10s, 100s, and 1000s from any number • Find 1000 more or less than a given number • Count forwards and backwards across multiples of 100 and multiples of 1000 to • 10 000 • Order and compare numbers beyond 1000 • Be able to flexibly partition numbers with up to 4 digits: 218 = 190 + 28; 4,023= 3,900 + 123 • Identify, represent and estimate numbers using different structured apparatus and representations • Understand fractional notation – that the demoninator indicates how many pieces the 'whole' has been divided into and the numerator indicates the how many of those pieces hare being considered.	**Associated skills** • Count in multiples of 6, 7, 9, 25 and 1000 • Count backwards through zero to include negative numbers • Read Roman numerals to 100 (I to C) and understand how, over time, the numeral system changed to include the concept of zero and place value. • Count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten • Round any number to the nearest 10, 100 or 1000 • To use compensating as a non-computational strategy for adding and subtracting? • To develop strategies for comparing and adjusting calculations? • Add and subtract fractions with the same denominator. • Recognise and write decimal equivalents of any number of tenths or hundredths

Number facts:
• Use knowledge of number facts to 10 to derive pairs of numbers that total 100 • Use knowledge of number facts to 10 to derive pairs of multiples of 50 that total 1000

ADDITION	OPPORTUNITIES FOR PROBLEM SOLVING	SUBTRACTION
Progression in mental addition	**What else do you know?**	Progression in mental subtraction
Continue to use mental strategies and informal jottings for calculations which do not require formal written methods	If you know 345 + 18 = 363, what other facts to do know?	Continue to use mental strategies and informal jottings for calculations which do not require formal written methods
Add 9, 19, 29 or 11, 21, 31 to any 2 digit number by		Subtract 9, 19, 29 or 11, 21, 31 to any 2 digit number by

adjusting numbers and compensating 365 + 29 = 364 + 30		adjusting numbers and compensating 378 − 29 = 379 - 30

Left column (Addition):

adjusting numbers and compensating 365 + 29 = 364 + 30
Add 2 digit multiples of 10 40 + 70
Add multiples of 100, crossing the 1,000 boundary 500 + 700
Calculate what to add to a 2 or 3 digit number to make 100 or the next higher multiple of 100 58 + ☐ =100   486 + ☐ = 500   731 + ☐ = 800
Calculate what to add to a 4 digit multiple of 100 to make the next higher multiple of 1000 3200 + ☐ = 4000   8400 + ☐ = 9000
Add unit to any 3 or 4 digit number, crossing the tens boundary 629 + 3   6745 + 8
Add any pair of 2 digit numbers including crossing the tens boundary 45 + 27
Add a 2 digit to a 3 digit number, not crossing tens or hundreds boundary 456 + 23
Progression in written addition

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

bit.ly/stmargsaddition

Middle column:

True/False?
24 + 46 = 23 + 47
How do you know without working it out?

When adding 10 to a 3 or 4 digit number, ony the 10s digit changes?
When adding 100 to a 3 or 4 digit number, only the 100s digit changes?

Are these number sentences true or false?
6.7 + 0.4 = 6.11   8.1 − 0.9 = 7.2
Give your reasons.

Use known number facts and knowledge of the inverse to derive related facts 36 + 19 = 55, so 55 − 19 = 36

Hard and easy questions
Which questions are easy / hard?
13323 - 70 =   12893 + 300 =
19354 - 500 =   19954 + 100 =
Explain why you think the hard questions are hard?

Convince me

☐   - 666 = 8 ☐5

What is the largest possible number that will go in the rectangular box?   What is the smallest? Convince me

Making an estimate
Which of these number sentences have the answer that is between 550 and 600
1174 - 611   3330 − 2779   9326 - 8777
What did you use to help you?

Give me a calculation where the answer will be more than 100. Explain why you chose those numbers and how you know this.

158 + 46:

Right column (Subtraction):

adjusting numbers and compensating 378 − 29 = 379 - 30
Subtract 2 digit multiples of 10 130 - 50
Subtract multiples of 100, crossing the 1,000 boundary 1200 - 500
Calculate a difference between two numbers with up to 4 digits lying close to a multiple of 10, 100 or 1000, using mental jottings if necessary. 92 - 89   403 - 386   4000 - 3993
Subtract a unit from a multiple of 100 or 1000 900 - 7   40000 - 3
Subtract a unit from a 3 or 4 digit number crossing the tens boundary 905 - 7   4641 - 3   7003 - 6899
Subtract any pair of 2 digit numbers including crossing the tens boundary 62 - 27

Subract pairs of 2 digit numbers 75 - 37
Subtract a 2 or 3 digit from a 3 digit number not crossing tens or hundreds boundary
            678 - 34   678 - 234
Subtract multiples of 100, crossing the 1000 boundary
            4236 - 300

Progression in written subtraction

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

bit.ly/stmargssubtraction

Children to follow *progression in written calculations* video tutorials. **bit.ly/stmargsaddition**	Without calculating the answer, can you tell me…..: …….if the answer will be less than/greater than 200? …….if the answer will be even/odd? **How do you know?** Always, sometimes,never Is it always sometimes or never true that the difference between two odd numbers is odd? *Pupils to be given a selection of real life problems.* Sort these problems into ones that involve addition and ones that involve subtraction. What did you do that helped you decide?	Children to follow *progression in written calculations* video tutorials. **bit.ly/stmargssubtraction**

Continue to encourage the use of apparatus to help secure conceptual understanding of formal written methods

Although by the end of Y4, children are recording addition and subtraction calculations using a compact column method, it is important to ensure that mental calculations are seen as the first resort. When faced with a calculation, children should ask themselves 'Can I do this entirely in my head? Can I do this with the aid of jottings or do I need to use the column method?'

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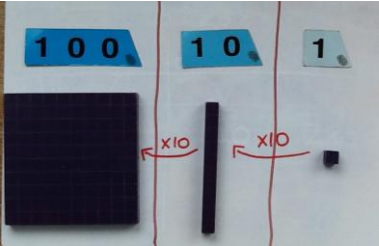
Learning by Questions - fluency, reasoning, problem solving - lbq.org

bit.ly/stmargsmathsvideos

MULTIPLICATION AND DIVISION

Year group **4**

NC end of year statements	Non statutory guidance
Pupils should be taught to: • recall multiplication and division facts for multiplication tables up to 12 × 12 • use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers • recognise and use factor pairs and commutativity in mental calculations • multiply two-digit and three-digit numbers by a one-digit number using formal written layout • solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.	Pupils continue to practise recalling and using multiplication tables and related division facts to aid fluency. Pupils practise mental methods and extend this to three-digit numbers to derive facts, (for example 600 ÷ 3 = 200 can be derived from 2 x 3 = 6). Pupils practise to become fluent in the formal written method of short multiplication and short division with exact answers (see Mathematics Appendix 1). Pupils write statements about the equality of expressions (for example, use the distributive law 39 × 7 = 30 × 7 + 9 × 7 and associative law (2 × 3) × 4 = 2 × (3 × 4)). They combine their knowledge of number facts and rules of arithmetic to solve mental and written calculations for example, 2 x 6 x 5 = 10 x 6 = 60. Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as the numbers of choices of a meal on a menu, or three cakes shared equally between 10 children.
Pre-requisite skills • Count in multiples of 6, 7 9 25 and 1,000 • Know 2, 3 4 5 8 and 10 • Need to understand the effects of x by 10 and 100 • Know how to use pv counters to show numbers • Use the commutative property of multiplying and the inverse relationship between dividing and multiplying to speed up fluent recall of multiplying and dividing facts • Generalize and explain the effects of multiplying by 0 and by 1 • Use the commutative property of multiplying and the inverse relationship between dividing and multiplying to speed up fluent recall of multiplying and dividing facts • Use inverse relationships between multiplying and dividing to record number trios and find solutions to different problems including missing number problems • Know that three numbers can be multiplied together in any order and the product will be the same	**Associated skills** • Recognize and count forwards and backwards in sequences of multiples of all numbers to 12 • Notice patterns in sequences of multiples, explain the rule for the sequence and use this to find missing numbers • Understand that the factors of a number are those numbers that can be divided into it without leaving a remainder • Find pairs of factors • Find common multiples for two or more sequences • Recognise and show, using diagrams, families of common equivalent fractions • Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number • Recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$

Number facts
recall multiplication and division facts for multiplication tables up to 12 × 12 Recognise/identify multiples, factors and prime numbers

MULTIPLICATION	OPPORTUNITIES FOR PROBLEM SOLVING	DIVISION
Progression in mental multiplication		Progression in mental division
Demonstrate and explain the effects of multiplying by 0 and by 1	Explain how to use inverse operations to check answers to a calculation Find missing numbers in calculations involving adding, subtracting and multiplying	Demonstrate and explain the effect of dividing by 1
Use known number facts and mental strategies to derive new facts when multiplying Explain the rule for multiplying by 10 and 100: and use to multiply any 2 and 3 digit number by 10 or 100 Use place value and known facts to multiply a multiple of 10 by a unit: 2 x 3 = 6 20 x 3 = 60 200 x 3 = 600 Using doubling • Double any multiple of 5 up to 100 • Use known doubling facts to: • double any 2 digit number by partitioning double 34 = double 30 and double 4 • To multiply by 4 by doubling and doubling again. 15 x 4 = double 15 and double 30 • To multiply by 8, multiply by 4 and then double • Multiply by 20, multiply by 10 and double	Make and use connections between multiplying number trios, multiples and factors **Missing numbers** 72 = ☐ x ☐ Which pairs of numbers could be written in the boxes? **Making links** Eggs are bought in boxes of 12. I need 140 eggs; how many boxes will I need to buy? **Making links** How can you use factor pairs to solve this calculation? 13 x 12 (13 x 3 x 4, 13 x 3 x 2 x 2, 13 x 2 x 6) **Use a fact** 63 ÷ 9 = 7 Use this fact to work out: 126 ÷ 9 = 252 ÷ 7 = **Prove It** What goes in the missing box? 6 ☐ x 4 = 512 Prove it. **How close can you get?** ☐☐☐ X 7 Using the digits 3, 4 and 6 in the calculation above how close can you get to 4500? What is the largest product? What is the smallest product?	Use known number facts and mental strategies to derive new facts when dividing Explain the rule for dividing by 10 and 100 and use to divide ThHTU by 100, 100 or 10 6 ÷ 3 = 2 60 ÷ 3 = 20 600 ÷ 3 = 200 Use the relationships between numbers 270 ÷ 3 = 90 270 ÷ 30 = 9 27 ÷ 30 = 0.9 270 ÷ 300 = 0.9 Use halving • Halve any multiple of 10 to 200 • Half of 56 is half of 50 and half of 6 • Find quarters and eighths by halving • Using the relationship between doubling and halving to multiply by 5: multiply by 10 and then halve

Multiply TU by U by multiplying tens first and then the units 24 x 7   20 x 7 then 4 x 7

$$24 \times 7 = 168$$
$$20 \times 7 = 140$$
$$4 \times 7 = 28$$

| 2 | 4 |
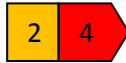
$$234 \times 12 = 2808$$
$$200 \times 12 = 2400$$
$$30 \times 12 = 360$$
$$4 \times 12 = 48$$

| 2 | 0 | 4 |

Use rounding to work out that £1.99 × 3 = £6.00 – 3p

Always, sometimes, never?
Is it always, sometimes or never true that an even number that is divisible by 3 is also divisible by 6? Explain your reasoning

Is it always, sometimes or never true that the sum of four even numbers is divisible by ?.

All numbers have an even number of factors.

All multiples of 4 are also multiples of 8

'Multiplication always increases the size of a number.
'Division always decreases the size of a number.

Use the inverse
Use the inverse to check if the following calculations are correct:
23 x 4 = 92   117 ÷ 9 = 14

Size of an answer
Will the answer to the following calculations be greater or less than 300
152 x 2=   78 x 3 =   87 x 3 =   4 x 74 =

Write statements about equality of expressions.

27 = 3 x 9
4 x 6 = 3 x 8

Multiply by 9 or 11, by multiplying by 10 and then adjusting

$9 \times 7 = 10 \times 7 - 1 \times 7$

Use multiplying and dividing facts to find fractions of amounts
4 x 6 = 24 so ¼ of 24 = 6   ¾ of 24 = 18

¾   ¼
¼ of 24 = 6
¾ of 24 = 3×6

Using known facts
If you know 12 x 9 = 108, you also know other facts:
9 x 12 = 108   108÷ 9 = 12   108 ÷ 12 =9

39 x 7 = (30 x 7) + (9 x 7) – *distributive* law
(2 x 3) x 4 = 2 x (3 x 4) – *associative* law
2 x 6 x 5 = 10 x 6 – rules of arithmetic
'Double and double again is the same as multiplying by 3? True or false?'
'Investigate the effect of multiplying by 2 then multiplying by 3.'

Using place value.
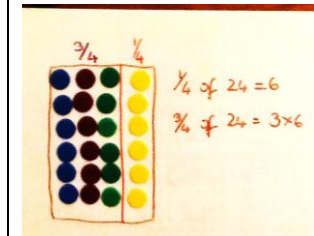
Understand that the way a remainder is expressed depends on the context of the problem

There are 62 sweets to share between 8 people. Everyone can have 7 sweets each and there will be 6 left over

If I have £62 and tickets cost £8 each, I can only buy 7 tickets

There are 62 cakes and one box holds 8 cakes. I will need 8 boxes for my cakes.

30x12=360

360÷12=30   3x12=36   3x120=360

30x1.2=3.6   36÷12=3
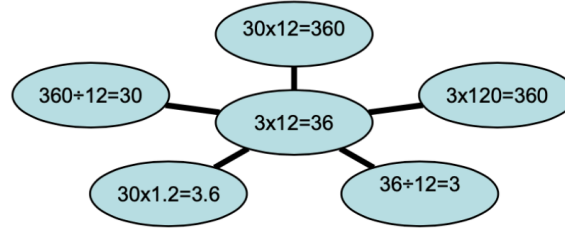
Missing number problems

	100s	10s	1s
	3	[ ]	2
x			7
		1	4	(2x7)
	2	8	0	(40x7)
2	[ ]	0	0	(300x7)
2	3	[ ]	4

Investigating
'Using the digits 1, 2, 3 and 4, what is the largest product you can make?
Smallest product? Closest product to ....? Even/odd product?

'What strategies would you use to multiply together 3 numbers?'
Spot the mistake / What went wrong?

Generalising
'The largest remainder is always one less than the divisor.'
'The effect of multiplying and dividing by 0 and 1'

True or false?
'Some remainders can be easily expressed as fractions / decimal fractions?'

Estimation/approximation
What would ... be a reasonable answer to this calculation?
What would be a reasonable answer?
Is your answer reasonable?

Use known multiplying facts and the distributive property to derive other multiplation facts

Use factor pairs and commutativity in calculations
2 x 50 = 100   2 x 5 x 10
50 x 2 = 100   5 x 10 x 2

Progression in written multiplication

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

bit.ly/stmargsmultiplication

To use multiplying facts to check short written dividing calculations
For example, use an array of 56 counters in rows of 7 to show 56 ÷ 7

Progression in written division

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

bit.ly/stmargsdivision

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

bit.ly/stmargsmultiplication

Inverse operations
Using the inverse to check calculations

$65 \div 4 = 16r1$ $(16 \times 4) + 1 = 65$

Use the inverse to solve missing number problems

$\square\square \div 6 = 7$ $6 \times 7 = \square$

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

bit.ly/stmargsdivision

Additional resources

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Year Four Maths Organiser

Fraction Decimal Equivalence

1/10 = 0.1	4/10 = 0.4	7/10 = 0.7	10/10 = 1	¾ = 0.75
2/10 = 0.2	5/10 = 0.5	8/10 = 0.8	½ = 0.5	1/100 = 0.01
3/10 = 0.3	6/10 = 0.6	9/10 = 0.9	¼ = 0.25	23/100 = 0.23

Roman Numerals

I	1	IX	9
II	2	X	10
III	3	XI	11
IV	4	X11	12
V	5	L	50
VI	6	C	100
VII	7	D	500
VIII	8	M	1000

Coordinates

Coordinate Grid	
Finding the coordinates of a point. *(x then y)*	The point (12,5) is 12 units along, and 5 units up.

Geometry

Perimeter		The distance around the outside of the shape.
Area		The amount of space taken up by a 2D shape.

Angles

Acute Angle	1º to 89º	An **Acute Angle** is less than 90°. 54° This is an acute angle
Right Angle	90º	90° This is a right angle
Obtuse Angle	91º to 179º	> 90° < 180° Obtuse Angle
Reflex Angle	181º to 359º	>180° < 360° This is a reflex angle
Full Turn	360º	360°

Multiplication Tables

X	7	6	12	11
1	7	6	12	11
2	14	12	24	22
3	21	18	36	33
4	28	24	48	44
5	35	30	60	55
6	42	36	72	66
7	49	42	84	77
8	56	48	96	88
9	63	54	108	99
10	70	60	120	110
11	77	66	132	121
12	84	72	144	132

Triangles

Equilateral	All three sides and angles equal.	60° 60° 60°
Isosceles	Two sides and angles equal.	
Scalene	All three sides and angles of different sizes.	13 9 14
Right Angled	A triangle with a right angle. Can be isosceles or scalene.	

Quadrilaterals

Rectangle	• Four sides • Opposite sides parallel • Opposite sides equal length • Four right angles	
Parallelogram	• Four sides • Opposite sides parallel	
Rhombus	• Four equal sides • Opposite sides parallel • Opposite angles equal	
Kite	• Four sides • Pairs of adjacent sides equal • Angles where adjacent sides meet are equal • Diagonals intersect at right angles	

Place Value Grid

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