Multiplication and Division Calculation Policy

at Newark Hill Academy

MULTIPLICATION KEY TEACHING POINTS

3 x 4 Is this 3 groups of 4 or 4 groups of 3?

At Newark Hill Academy we say: without a picture or a context to tell us which is the multiplicand and which is the multiplier, it can be either.

(N.B. White Rose follow the Shanghai way of working which only allows the multiplier first, so this would be 3 groups of 4; NCETM encourages children to see this both ways so is in line with our policy.)

Start by representing this with an array so that children can see both 3 lots of 4 and 4 lots of 3.

Also represent as repeated groups  and 

The Language of Multiplication

factor x factor = product A factor is a whole number, so this wouldn't be appropriate language when multiplying decimals

multiplicand x multiplier = product When we have a picture or a context, we can tell which number is the multiplier and which number is the multiplicand.

Multiplicand is **2**	Multiplier is **4**

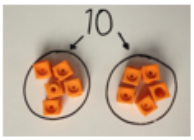
The **2** represents the number of flowers, the **4** represents the number of vases.

Structure and Language of Division

Division has two different structures that are explored separately.

Division as grouping (quotitive) :

10 objects put in groups of 5

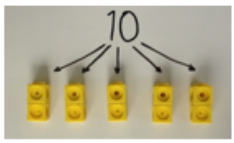


How many 5s are there in 10?
The 5s are either kept together (quotitive) or the 5s are distributed (partitive).

I have 20 cakes and I share them equally between five people. How many cakes will they each get?

Division as sharing (partitive):

10 objects shared into 5 groups



£480 ÷ 8 = £60

DIVIDEND DIVISOR QUOTIENT

There are 15 biscuits and I put them into bags of five. How many bags do I need?

Year 1
Multiplication and Division

Objectives

- 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.

Key Skills

Multiplication

- Count in multiples of 2, 5 and 10.
- Solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.
- Make connections between arrays, number patterns, and counting in twos, fives and tens.
- Begin to understand doubling using concrete objects and pictorial representations.

Division

- Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations arrays with the support of the teacher
- Through grouping and sharing small quantities, pupils begin to understand, division, and finding simple fractions of objects, numbers and quantities.
- They make connections between arrays, number patterns, and counting in twos, fives and tens.

Vocabulary

Multiplication

groups of, lots of, times, array, altogether, multiply, count

Division

share, share equally, one each, two each…, group, groups of, lots of, array

Year 1 Multiplication

Immerse children in practical opportunities to develop understanding of multiplication and division.

Key skills:
Explore equal and unequal groups
Skip count in 2s, 5s and 10s.
Recognise the structure of multiplication as repeated addition

Counting in steps ('skip' counting)

Count in 2s

Count in 10s and 5s

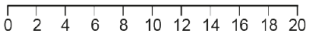


Figure 10: number line to support counting in multiples of 2

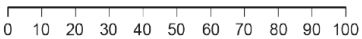


Figure 11: number line to support counting in multiples of 10

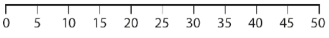
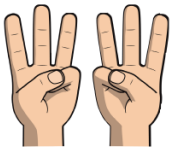


Figure 12: number line to support counting in multiples of 5

Doubling and halving
Find doubles to double 5 using fingers

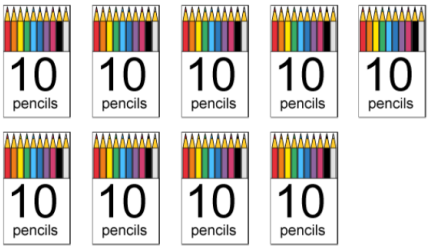


1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

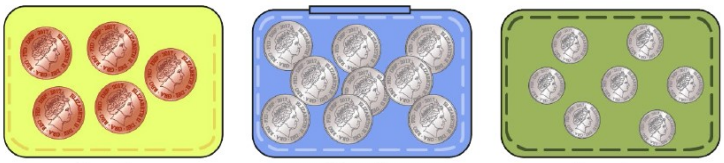
Multiply with concrete objects, arrays and pictorial representations.

How many wheels are there altogether? Count in groups of 2.

How many pencils are there?



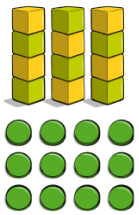
How much money is in each purse?



Grouping

Begin to use visual and concrete arrays and sets of objects to find the answer to 'three groups of four' or ' two groups of five' etc

Three groups of four



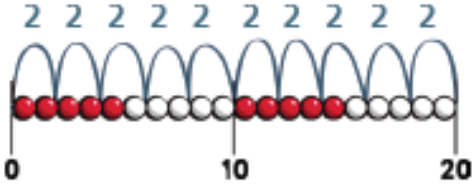
Pupils should also practise counting in two ways: counting the total number of objects using skip counting, or counting the number of repeated groups. This will prepare pupils for multiplication and division in year 2.

Year 1 Division

Immerse children in practical opportunities to develop understanding of multiplication and division.

Counting in steps ('clever' counting)

Count in 2s

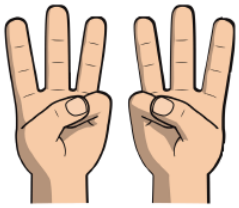


Count in 10s and 5s

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Doubling and halving

Find doubles to double 5 using fingers

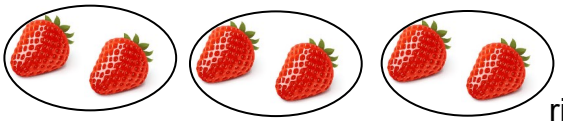


Group and share small quantities

Using objects, diagrams and pictorial representations to solve problems involving both **grouping** and **sharing.**

Grouping:

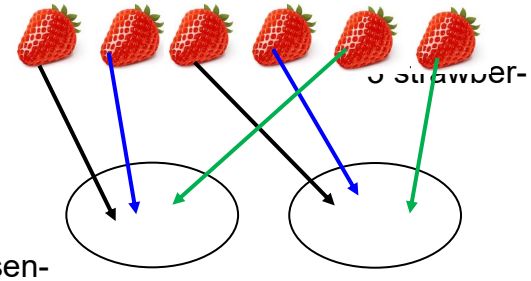
There are 6 strawberries, how many people can have 2 strawberries each?



3 people

Sharing:

There are 6 strawberries shared between 2 people, how many do they each get?



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Children should :

- use lots of practical apparatus, arrays and picture representations
- Be taught to understand the difference between **'grouping'** objects (How many groups of 2 can you make?) and '**sharing'** (Share these sweets between 2 people)
- Be able to count in multiples of 2s, 5s and 10s.
- Find **half** of a group of objects by sharing into 2 equal groups.

Example division problem in a familiar context:

There are 5 children on this table and there are 15 pieces of fruit to share between them. If we share them equally, how many will we each get?

Can they work it out and give a division statement… ?

"15 shared between 5 people gives you 3 each."

Year 2 Multiplication and Division

Objectives

- recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs
- show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
- solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Key Skills

Multiplication

- Count in steps of 2, 3 and 5 from zero, and in 10s from any number.
- Recall and use multiplication facts from the **2, 5 and 10** multiplication tables, including recognising odds and evens.
- Write and calculate number statements **using the x and = signs**.
- Show that multiplication can be done in any order (commutative).
- Solve a range of problems involving multiplication, using concrete objects, arrays, repeated addition, mental methods, and multiplication facts.
- Pupils use a variety of language to discuss and describe multiplication.

Division

- Count in steps of 2, 3, and 5 from 0
- Recall and use multiplication and division facts for the **2, 5 and 10** multiplication tables, including recognising odd and even numbers.
- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the x, ÷ and = signs.
- Show that multiplication of two numbers can be done in any order (commutative) and divi-

Vocabulary

Multiplication

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times...

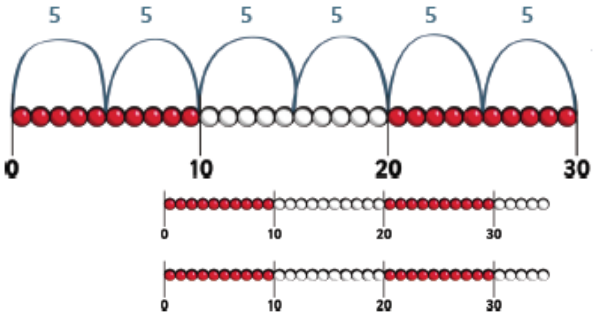
Division

share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over

Year 2 Multiplication

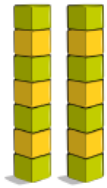
Counting in steps ('skip' counting)

Count in 2s, 5s, 10s

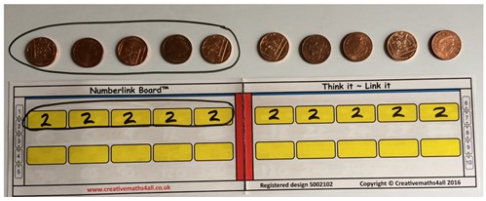


Doubling

Know doubles to double 20



Show me five lots of 2



Begin to know doubles of multiples of 5 to 100 E.g. double 35 is 70

Begin to double 2-digits numbers less than 50 with 1s digits of 1, 2, 3, 4, or 5

Multiply using arrays and repeated addition (using at least 2s, 5s and 10s)

Use arrays:

Relate to 'skip' counting

5 x 3 = 15

5 x 3 = 3 + 3 + 3 + 3 + 3 = 15

3 x 5= 5 + 5 + 5 = 15

3 x 5 = 15

Use arrays to help teach children to understand the commutative law of multiplication and give examples such as 3 x _ = 6

Pupils must first be able to recognise equal groups. To better understand and identify equal groups, pupils should initially explore both equal and unequal groups. Pupils should then learn to describe equal groups with words.

Figure 12: recognising equal groups – 3 groups of 5 eggs

Language focus

"There are 3 equal groups of eggs."

"There are 5 eggs in each group."

"There are 3 groups of 5."

Language focus

"The 3 represents the number of groups."

"The 5 represents the number of eggs in each group."

"The 15 represents the total number of eggs."

Children must be able to recall multiplication facts for 2, 10 and 5 x tables. Through regular practice in school and at home. Children will be tested on each times table, achieving bronze (times table facts in order), silver (times tables fact in a random order) and gold (related division facts).

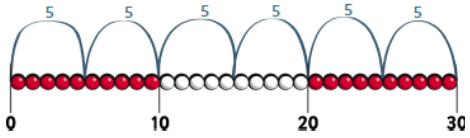
Begin to know 3 x tables.

Year 2 Division

Group and share using the ÷ and = sign. Show that division is not commutative.

Counting in steps ('skip' counting)

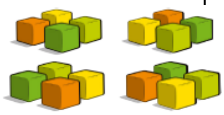
Count in 2s, 10s and 5s. Begin to count in3s



Sharing

Begin to find half or a quarter of a quantity using sharing e.g. find a quarter of 16 cubes by sharing the cubes into four piles.

Find 1/4, 1/2, 3/4 of small quantities

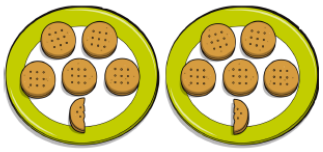


Halving

Find half of numbers up to 40, including realising that half of an odd number gives a remainder of 1 or answer containing a ½

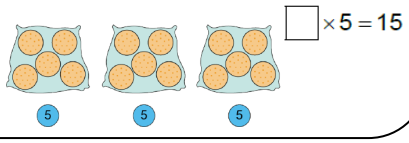
e.g. ½ of 11 = 5 ½

Begin to know half of multiples of 10 to 100



Grouping

Relate grouping problems where the number of groups is unknown to multiplication equation with a missing factor and to division equations (quotative division).



Written methods

Group and share

Using objects, diagrams and pictorial representations and grouping on a number line.

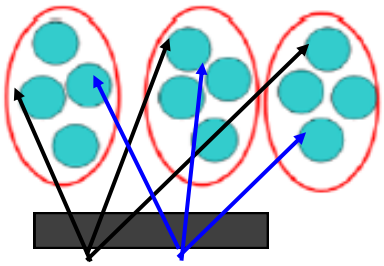
For grouping and sharing contexts, move to a common language for division: "How many …..s in …….?"

How many groups of 4 can be made with 12 stars?

Grouping:

4 **4** **4**

12 sweets shared between 3 people

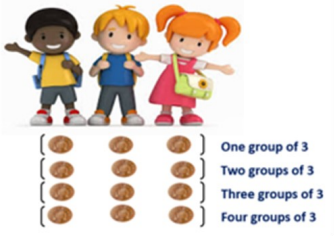


Use grouping (quotitive) and sharing (partitive) contexts as shown below.

Mo is putting 6 flowers into pots.

He puts 2 flowers into each pot.
How many pots does he need?

I have 12 pennies and I divide them between 3 children.
How many 3s are there in 12?



Dora has 10 sweets.

She shares them equally between 2 plates.

How many sweets are on each plate?

6 ÷ 2 = 3
What does each number represent?

12 ÷ 3 = 4
What does each number represent?

10 ÷ 2 = 5
What does each number represent?

Year 3
Multiplication and Division

Objectives

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- 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
- 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.

Key Skills

Multiplication

- Recall and use multiplication facts for the **2, 3, 4, 5, 8 and 10** multiplication tables, and multiply multiples of 10.
- Write and calculate number statements using the multiplication tables they know, including **2-digit x single -digit**, drawing upon mental methods, and progressing to reliable written methods.
- Solve multiplication problems, including missing number problems.
- Develop mental strategies using commutativity (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240)
- Solve simple problems in contexts, deciding which operations and methods to use.
- Develop efficient mental methods to solve a range of problems e.g using commutativity (**4 × 12 × 5** = 4 5 × 12 **= 20 × 12** = 240) and for missing number problems x 5 = 20, 3 x = 18, x = 32

Division

- Recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables (through doubling, connect the 2, 4 and 8s).
- 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.
- Solve problems, in contexts, and including missing number problems, involving multiplication and division.
- Pupils develop efficient mental methods, for example, using multiplication and division facts
- (e.g. using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, so 60 ÷ 3 = 20 and 20 = 60 ÷ 3).
- Pupils develop reliable written methods for division, starting with calculations of 2-digit numbers by 1-digit numbers and progressing to the formal written method of short division

Vocabulary

Multiplication

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times, _times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, units, value

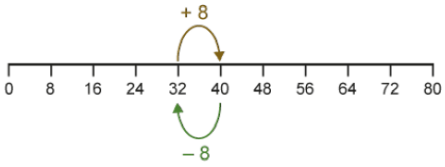
Division

share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, 'carry', left over, inverse, short division, 'remainder, multiple

Mental Strategies # Year 3 Multiplication

Counting in steps ('skip' counting)

Count in 2s, 3s, 4s, 5s, 8s, and 10s



Language focus

"factor times factor is equal to product"

"The order of the factors does not affect the product."

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Scaling facts by 10

Multiply multiples of 10 by 1-digit numbers using known number facts e.g. 3 x 8=24 so I know 30 x 8 = 240 as 30 is 10 times bigger.

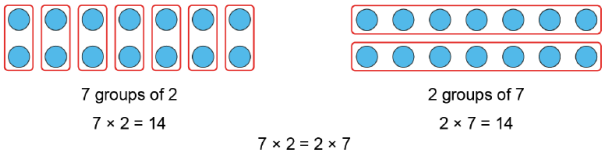
$8+6=14$ and $14-6=8$

so

$80+60=140$ and $140-60=80$

Grouping

Recognise that multiplication is commutative e.g. 7x2=2x7

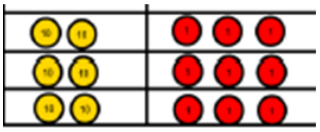


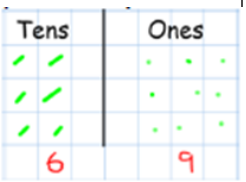
7 × 2 = 2 × 7

Written methods

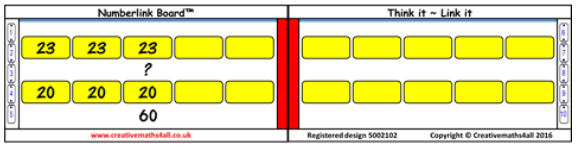
Multiply 2-digits by a single digit number using column multiplication.

Represent the calculation using **place value counters/Dienes** initially. Estimate the answer using the Numberlink Boards.



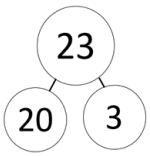


Estimate products before using the written method.



Initially use numbers which do not involve regrouping.

23 x 3



$$\begin{array}{r} 23 \\ \times\ 3 \\ \hline 69 \end{array}$$

"3 times 3 equals 9. 2 times 3 equals 6."

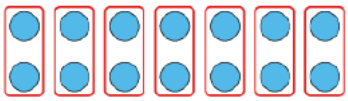
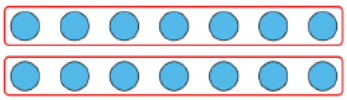
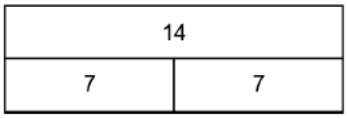
Formal column multiplication will be introduced in Y4– you may introduce the layout to Y3 children but it is not compulsory that they are secure in the method at this stage.

Children must be able to recall multiplication facts for 2, 3, 4, 5, 8 and 10 times tables. Through regular practice in school and at home. Children will be tested on each times table, achieving bronze (times table facts in order), silver (times tables fact in a random order) and gold (related division facts).

Year 3 Division

Group and share using the ÷ and = sign.

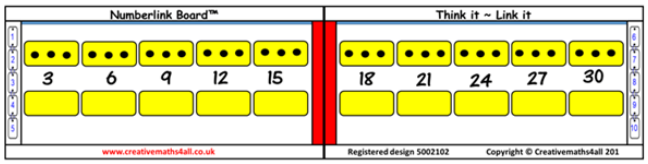
Pupil will be solving division calculations using known division facts from the 5,10, 2, 4 and 8 times table. They must use these known facts to solve both quotitive (grouping) and partitive (sharing) contextual problems. Arrays can be used to show how known division facts can applied to two different division structures.

Quotitive division	Partitive division
I need 14 ping-pong balls. There are 2 ping-pong balls in a pack. How many packs do I need?	£14 is shared between 2 children. How much money does each child get?
 14 ÷ 2 = 7	 14 ÷ 2 = 7
	
Figure 27: using an array and bar model to show that 14 divided into groups of 2 is equal to 7	**Figure 28: using an array and bar model to show that 14 shared between 2 is equal to 7**
Language focus "7 times 2 is 14, so 14 divided by 2 is 7." "14 divided into groups of 2 is equal to 7."	**Language focus** "7 times 2 is 14, so 14 divided by 2 is 7." "£14 shared between 2 is equal to £7 each."
I need 7 packs of ping-pong balls.	Each child gets £7.

Using the Numberlink Board™ for Division

Before moving to division, explore multiples of 3 using multiplication.

24 = 3 x 8 24 is equal to 8 groups of 3.



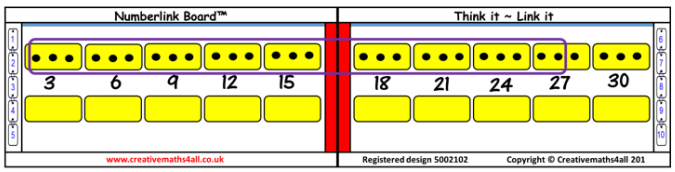
What is 24 divided by three? 24 ÷ 3 = 8
How many groups of three are there in 24?

1. Focus on the same times table; **link x and ÷** ; use fluency time to **focus on difficult facts** e.g. 3xs, 4xs, 6xs, 7xs, 8xs, 9xs

Using the Numberlink Board™ for Division

When moving to division with remainders, explore other numbers using multiplication.

26 = 3 x 8 + 2 26 is equal to 8 groups of 3 plus two.



How many groups of three are there in 26?
There are eight groups of 3 and 2 remaining. 26 ÷ 3 = 8r 2

Explore numbers between multiples, this e stablishes understanding of division with remainders.
"Give me a number which is 1 more than a multiple of 3." "Give me a number which is 2 more than a multiple of 3."
"Give me a number which is 3 more than multiple of 3. What do you notice?"

Year 4
Multiplication and Division

Objectives

- 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.

Key Skills

Multiplication

- Count in multiples of 6, 7, 9, 25 and 1000
- Recall multiplication facts for **all multiplication tables up to 12 x 12.**
- Recognise place value of digits in up to 4-digit numbers
- Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multiply 3 numbers.
- Use commutativity and other strategies mentally 3 x 6 = 6 x 3 , 2 x 6 x 5 = 10 x 6 , 39x7 = 30 x 7 + 9 x 7.
- Solve problems with increasingly complex multiplication in a range of contexts.
- Count in multiples of 6, 7, 9, 25 and 1000
- Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)

Division

- **Recall multiplication and division facts for all numbers up to 12 x 12.**
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying and dividing by 10 and 100 and 1.
- Pupils practise to become fluent in the formal written method of short division with exact answers when dividing by a one-digit number
- Pupils practise mental methods and extend this to three-digit numbers to derive facts, for example 200 × 3 = 600 so 600 ÷ 3 = 200
- Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.

Vocabulary

Multiplication

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, groups of, sets of, lots of, equal groups, times, multiply, times as big as, once, twice, three times... partition, grid method, total, multiple, product, sets of, **inverse**

Division

share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, „carry", remainder, multiple, divisible by, factor

Key information for the Y4 Team– MTC Check

The national curriculum requires pupils to recall multiplication table facts up to 12×12, and this is assessed in the multiplication tables check. For pupils who do not have automatic recall of all of the facts by the time of the check, fluency in facts up to 9×9 should be prioritised in the remaining part of year 4. The facts to 9×9 are particularly important for progression to year 5, because they are required for formal written multiplication and division.

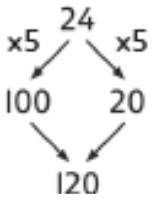
The 36 multiplication facts that are required for formal written multiplication are as follows.

2×2							
3×2	3×3						
4×2	4×3	4×4					
5×2	5×3	5×4	5×5				
6×2	6×3	6×4	6×5	6×6			
7×2	7×3	7×4	7×5	7×6	7×7		
8×2	8×3	8×4	8×5	8×6	8×7	8×8	
9×2	9×3	9×4	9×5	9×6	9×7	9×8	9×9

Mental Strategies # Year 4 Multiplication

Grouping– Scaling numbers facts by 100.

Use partitioning to multiply 2-digit numbers by 1-digit numbers e.g. 24 x 5

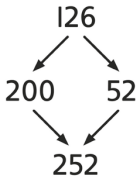


Multiply multiples of 100 and 100 by 1-digit numbers using tables facts
e.g. 4x8=32 so make it 100 times bigger,
400 x 8 = 3200

Th	H	T	U
3	2	0	0

Doubling and halving

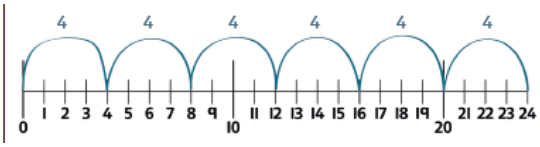
Find doubles to 100 and beyond using partitioning e.g. double 126



Begin to double amounts of money
e.g. £3.50 doubled
Is £7

Counting in steps (sequences)

Count in 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s, 10s, 11s, 12, 25s, 50s, 100s and 1000s



Written methods

Multiply 2 and 3 digits by a single digit number, using all multiplication tables up to 12x12– using the short multiplication method.

Informal written method:

$34 \times 2 = 30 \times 2 + 4 \times 2$
$= 60 + 8$
$= 68$

Multiplication algorithm – expanded layout:

100s	10s	1s
	2	6
×		4
	2	4
	8	0
1	0	4

- 4×6 ones $= 24$ ones $= 2$ tens $+ 4$ ones
- 4×2 tens $= 8$ tens
- 8 tens $+ 2$ tens $+ 4$ ones $= 10$ tens $+ 4$ ones
  $= 1$ hundred $+ 4$ ones

Multiplication algorithm – compact layout:

$$\begin{array}{r} 2\ 6 \\ \times\quad 4 \\ \hline 1\ 0\ 4 \\ \hline 2 \end{array}$$

Multiplication algorithm – expanded layout:

1,000s	100s	10s	1s
	3	6	7
×			4
		2	8
	2	4	0
1	2	0	0
1	4	6	8

- 4×7 ones $= 28$ ones
  $= 2$ tens $+ 8$ ones
- 4×6 tens $= 24$ tens
  $= 2$ hundreds $+ 4$ tens
- 4×3 hundreds $= 12$ hundreds
  $= 1$ thousand $+ 2$ hundreds

Multiplication algorithm – compact layout:

$$\begin{array}{r} 3\ 6\ 7 \\ \times\quad 4 \\ \hline 1\ 4\ 6\ 8 \\ \hline 2\ 2 \end{array}$$

Follow the steps in the Y4 Spine materials 2.14 Short Multiplication Unit.

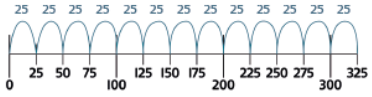
Children must be able to recall multiplication facts for 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 times tables. Through regular practice in school and at home. Children will be tested on each times table, achieving bronze (times table facts in order), silver (times tables fact in a random order) and gold (related division facts).

Year 4 Division

Group and share using the ÷ and = sign.

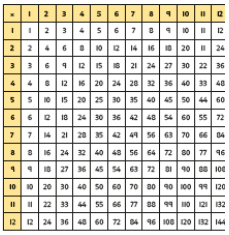
Counting in steps ('skip' counting)

Count in 2s,3s,4s,5s,6s,7s,8s,9s,10s,11,12s, 25s,50s,100a and 1000s

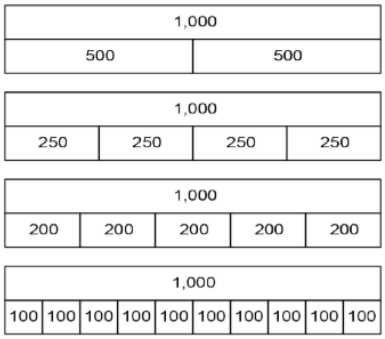


Using number facts

Know times-tables up to 12 × 12 and all related division f



Dividing multiples: Divide 1,000 into 2,4, 5 or 10 equal parts. This is important as these are inter-vals commonly found in measures/ graphing scales



Grouping

Use multiples of 10 times the divisor to divide by 1-digit numbers above the tables facts

e.g. *45 ÷ 3 as 10 × 3 (30) and 5 × 3 (15)*

Divide multiples of 100 by 1-digit numbers using division facts

e.g. *3200 ÷ 8 = 400*

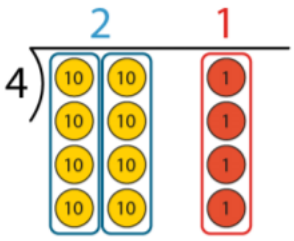
Written methods

Divide up to 3-digit numbers by a single digit– using the short division method.

Comparing horizontal equations with the short-division algorithm:

84 ÷ 4 = 21	$4\overline{)84}$ → 21
dividend ÷ divisor = quotient	divisor ⟌ dividend → quotient

Algorithm with place-value counters – summary:



8 tens ÷ 4 = 2 tens

4 ones ÷ 4 = 1 one

- *'Eight tens and four ones divided between four is equal to two tens and one one.'*
- *'Each child gets twenty-one sticks.'*

$4\overline{)84}$ → 21

- 8 tens ÷ 4 = 2 tens
  'Write "2" in the tens column.'
- 4 ones ÷ 4 = 1 one
  'Write "1" in the ones column.'

$4\overline{)56}$ → 14

With exchanging

$4\overline{)621}$ → 153

Follow the steps in the Y4 Spine materials 2.15 Short Division Unit.

Year 5
Multiplication and Division

Objectives

- identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
- know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- establish whether a number up to 100 is prime and recall prime numbers up to 19
- multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers
- multiply and divide numbers mentally drawing upon known facts
- divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000

recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})

- solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
- solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign
- solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

Key Skills

Multiplication

- Identify multiples and factors, using knowledge of **multiplication tables to 12x12.**
- Solve problems where larger numbers are decomposed into their factors
- Multiply and divide integers and decimals by 10, 100 and 1000
- Recognise and use square and cube numbers and their notation
- Solve problems involving combinations of operations, choosing and using calculations and methods appropriately.

Division

- Recall multiplication and division facts for all numbers up to 12 x 12 (as in Y4).
- Multiply and divide numbers mentally, drawing upon known facts.
- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two number.
- Solve problems involving multiplication and division where larger numbers are decomposed into their factors.
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.
- Use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.
- Work out whether a number up to 100 is prime, and recall prime numbers to 19.
- Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context
- Use multiplication and division as inverses.
- Interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (e.g. 98 ÷ 4 = 24 r 2 = 241/2 = 24.5 ≈ 25).
- Solve problems involving combinations of all four operations, including understanding of the equals sign, and including division for scaling by different fractions and problems involving simple rates.

Year 5
Multiplication and Division

Vocabulary

Multiplication

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, _times as big as, once, twice, three times..., partition, grid method, **carry‘** , total, multiple, product, inverse, square, factor, integer, decimal, short/long multiplication,

Division

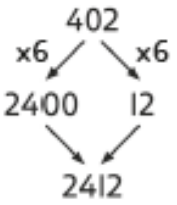
share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, „carry", remainder, multiple, divisible by, factor, inverse, **quotient, prime number, prime factors, composite number (non-prime)**

Mental Strategies

Year 5 Multiplication

Grouping

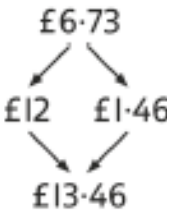
Multiply whole numbers and decimals by 10, 100, 1000 e.g. 3.4 x 100= 340
Use partitioning to multiply 'friendly' 2 and 3-digit numbers by 1-digit numbers
Use partitioning to multiply decimal numbers by 1-digit numbers
e.g. 4.5 x 3 as 4 x3 =12 and 0.5 x3 = 1.5 12 + 1.5 = 13.5



Children must be able to recall and apply multiplication facts up to 12 x 12

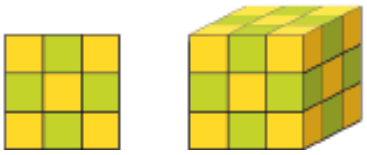
Doubling and halving

Double amounts of money using partitioning.
Use doubling and halving as a strategy in multiplying by 2, 4, 8, 5 and 20



Using number facts

Use times-tables facts up to 12 × 12 to multiply multiples of 10/100 of the multiplier
e.g. *4 × 6 = 24 so 40 × 6 = 240 and 400 × 6 = 2400*
Use knowledge of factors and multiples in multiplication
e.g. *43 × 6 is double 43 × 3*
e.g. 28 × 50 is half of 28 × 100 (2800) = 1400
Know square numbers and cube numbers



Written methods

Multiply up to 4-digits by 1 or 2-digits

- **Step 1 - short multiplication (compact method) for multiplying by 1 digit (which the children learnt in Y4 and can be applied to larger number. Refer to Y4 if chidlren need to start of with the expanded method.**

Multiplication algorithm – compact layout:

	3	6	7
×			4
	1	4	6	8
		2	2	

- **Step 2 - long multiplication for multiplying by 2-digits, starting with the 2 digit multiplied by 2 digits and then moving on to 3 and 4 digits by 2 digits.**

No regrouping required

	3	1	
×		2	4
1	2	4	
6	2	0	
7	4	4	

	100s	10s	1s	
		2	7	
×		2	3	
		8	1	27 × 3
	5	4	0	27 × 20
	6	2	1	
	1			

Regrouping required– position at the top

	1,000s	100s	10s	1s	
		3	1	2	
×			2	8	
	2	4	9	6	312 × 8
	6	2	4	0	312 × 20
	8	7	3	6	
		1			

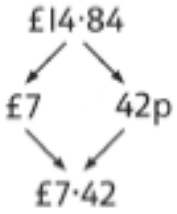
	10,000s	1,000s	100s	10s	1s	
		3	1	2	6	
×				2	8	
	2	5	0	0	8	3,126 × 8
	6	2	5	2	0	3,126 × 20
	8	7	5	2	8	

Follow the steps in the Y6 Spine materials 2.23 Multiplication strategies for larger numbers and long multiplication.

Year 5 Division

Halving

Half amounts of money using partitioning *eg half of £14.84 is half of £14 (£7) plus half of 84p (42p)*

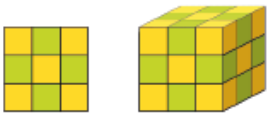


Using halving as a strategy for dividing by 2, 4 , 8

Using number facts

Use division facts from the times tables up to 12 x 12 to divide multiples of powers of 10 of the divisor *e.g 3600 ÷9* using *36 ÷ 9*

Know square numbers and cube numbers.



Grouping

Divide numbers by 10, 100, 1000, to obtain decimal answers with up to 3 decimal place**s**

***e**.g 340 ÷ 100 = 3.4*

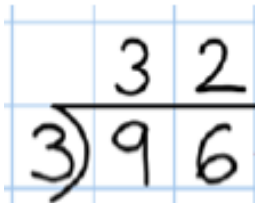
Written methods

Divide up to 4-digits by a single digit, including those with remainders

Step 1: Introduce short division when children are secure with division on a number line. Start with carefully selected examples requiring no calculating of remainders at all.

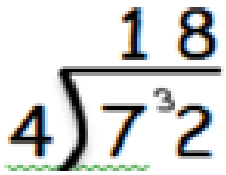
Remind children of correct place value, that 96 is equal to 90 and 6, but in short division, pose:

- How many 3's in 9? = 3, and record it above the **9 tens**.
- How many 3's in 6? = 2, and record it above the **6 units**.



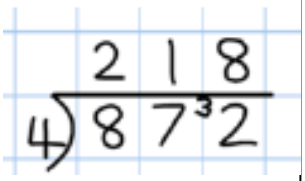
Step 2: Short division (2-digits) with remainders within the calculation

Move on to using this method when remainders occur within the calculation (e.g. 96 ÷ 4), and be taught to "carry" the remainder onto the next digit.



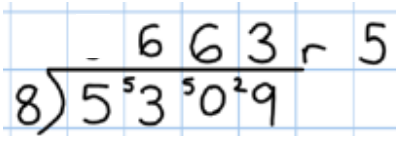
Step 3: Short division (3-digits) with remainders within the calculation

Pupils move onto dividing numbers with up to **3-digits** by a single digit,



Step 4: Short division (4-digits) with remainders within the calculation

Now that pupils are introduced to examples that give rise to remainder answers, division needs to have a real life problem solving context, where **pupils consider the meaning of the remainder and how to express it,** ie. as a fraction, a decimal, or as a rounded number or value , depending upon the context of the problem.



Long Division

When children are secure with short division, progress long division to dividing any number by a 2-digit number e.g. 4356 ÷ 17. This is a Y6 expectation. See Y6 for method.

Year 6
Multiplication and Division

Objectives

- multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication
- 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
- 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
- perform mental calculations, including with mixed operations and large numbers
- identify common factors, common multiples and prime numbers
- use their knowledge of the order of operations to carry out calculations involving the four operations
- solve problems involving addition, subtraction, multiplication and division
- use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.

Key Skills

Multiplication

- Recall multiplication facts for all times tables up to **12 x 12 (as Y4 and Y5).**
- Multiply multi-digit numbers, up to 4-digit x 2-digit using long multiplication.
- Perform mental calculations with mixed operations and large numbers.
- Solve multi-step problems in a range of contexts, choosing appropriate combinations of operations and methods.
- Estimate answers using round and approximation and determine levels of accuracy.

Division

- Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations
- 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. Use short division where appropriate.
- Perform mental calculations, including with mixed operations and large numbers.
- Identify common factors, common multiples and prime numbers.
- Use estimation to check answers to calculations and determine accuracy, in the context of a problem.
- Use written division methods in cases where the answer has up to two decimal places.
- Solve problems which require answers to be rounded to specified degrees of accuracy.

Vocabulary

Multiplication

groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times... partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short / long multiplication, „carry", **tenths, hundredths, decimal**

Division

share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, „carry", remainder, multiple, divisible by, factor, inverse, **quotient, prime number, prime factors, composite number (non- prime),** **common factor**

Year 6 Multiplication

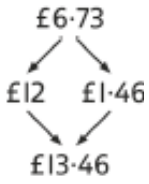
Mental Strategies

Grouping

Use partitioning as a strategy in mental, as appropriate
E.g. 3060 x 4 as 3000 x 4 = 12,000 and 60 x 4 = 240, 12,00+240 = 12,240
E.g. 8.4 x 8 as 8 x 8 = 64, and 0.4 x 8 = 3.2, 64 +3.2 = 67.2
Use factors in mental multiplication
E.g. 421 x 6 as 421 x 3 = 1263 doubled = 2526

Doubling and halving

Double decimal numbers with up to 2 places using partitioning



Using number facts

Use times tables facts up to 12x12 in mental multiplication of large numbers or with numbers with up to 2 decimal places
E.g. 6 x 4 = 24, 0.06 x 4 = 0.24

Written methods

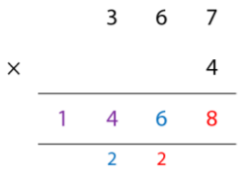
Short multiplication with up to 2 decimal places by a single digit

- **Short multiplication for multiplying by 1 digit**

Use **short multiplication** to multiply numbers with **more than 4-digits by a single digit**; to multiply money and measures, and to **multiply decimals with up to 2d.p. by a single digit.**

To use the same method taught in Y4.

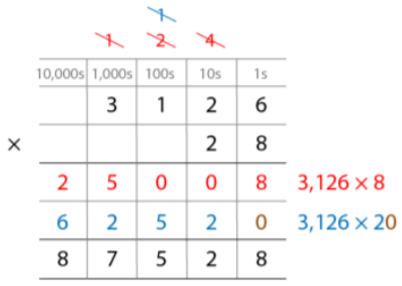
Multiplication algorithm – compact layout:



Follow the steps in the Y4 Spine materials 2.14 Short Multiplication Unit.

- **Long multiplication for multiplying by 2-digits**

Use **long multiplication** to multiply numbers with **at least 4 digits by a 2-digit number.**



	10,000s	1,000s	100s	10s	1s	
		3	1	2	6	
×				2	8	
	2	5	0	0	8	3,126 × 8
	6	2	5	2	0	3,126 × 20
	8	7	5	2	8	

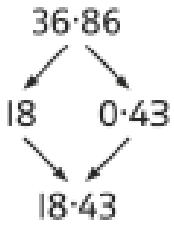
Follow the steps in the Y6 Spine materials 2.23 Multiplication strategies for larger numbers and long multiplication.

Year 6 Division

Halving

Halve decimal numbers with up to 2 places using partitioning

e.g. *half of 36·86 is half of 36 (18) plus half of 0·86 (0·43)*



Using number facts

Use division facts from the times-tables up to 12 × 12 to divide decimal numbers by 1-digit numbers e.g. *1·17 ÷ 3 is* 1/100 of 117 ÷ 3 (39)

Know tests of divisibility for numbers divisible by 2, 3, 4, 5, 9, 10 and 25

Grouping

Divide numbers by 10, 100, 1000, to obtain decimal answers with up to 3 decimal place**s**

***e**.g 340 ÷ 100 = 3.4*

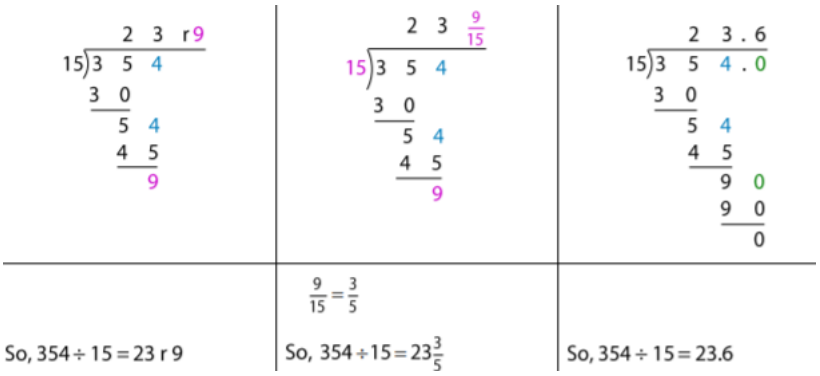
Written methods

Divide at least 4-digits by both single digit and 2-digit numbers (including decimal numbers)

Short division for dividing by a single digit– Look at Y4/Y5 section for method.

Short division with remainders and how they can be represented: Whole number, proper fraction and decimal fraction

Follow the guidance from NCTEM Spine 2.24– Dividing with two digit divisors

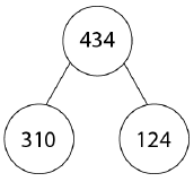


Dividing by 2-digits– the strategies that will be taught:

	×21
1	21
2	42
3	
4	84
5	105
6	
7	
8	168
9	
10	210

Encourage children to make ratio charts like above.

Partitioning

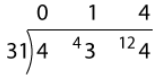


310 ÷ 31 = 10

124 ÷ 31 = 4

434 ÷ 31 = 14

Short division



Long division