Calculations Policy

Policy Creation and Review	
Author(s)	**Boleyn Trust Governing Body**
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EYFS: Reception

Addition & Subtraction	Multiplication, Division & Fractions
Pupils should be taught to: **Recognise some numerals of personal significance.** **Recognises numerals 1 to 5.** **Counts up to three or four objects by saying one number name for each item.** **Counts actions or objects which cannot be moved.** **Counts objects to 10, and beginning to count beyond 10.** **Counts out up to six objects from a larger group.** **Selects the correct numeral to represent 1 to 5, then 1 to 10 objects.** **Counts an irregular arrangement of up to ten objects.** **Estimates how many objects they can see and checks by counting them.** **Uses the language of ‘more’ and ‘fewer’ to compare two sets of objects.** **Finds the total number of items in two groups by counting all of them.** **Says the number that is one more than a given number.** **Finds one more or one less from a group of up to five objects, then ten objects.** **In practical activities and discussion, beginning to use the vocabulary involved in adding and subtracting.** **Records, using marks that they can interpret and explain.** **Begins to identify own mathematical problems based on own interests and fascinations.** **Early Learning Goal** **Children count reliably with numbers from one to 20.** **Children place the numbers in order and say which number is one more or one less than a given number.** **Using quantities and objects, they add and subtract two single-digit numbers; count on or back to find the answer.**	**Pupils should be taught to:** They solve **problems, including doubling, halving and sharing.**

Addition	**Subtraction**	**Multiplication**	**Division**
Begin to relate addition to combining two groups of objects **Make a record in pictures, words or symbols of addition activities already carried out.**	**Begin to relate subtraction to ‘taking away’** **Make a record in pictures, words or symbols of subtraction activities already carried out**	**Real life contexts and use of practical equipment to count in repeated groups of the same size:** **Count in twos; fives; tens**	**Share objects into equal groups up to 10, then 20** **Use related vocabulary** **Activities might include:**

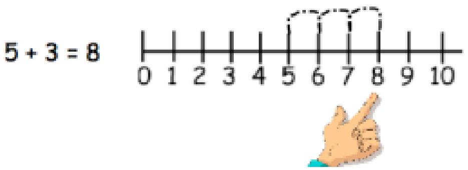
Construct number sentences to go with practical activities

Use of games, songs and practical activities t o begin using vocabulary
Solve simple word problems using their fingers

Can find one more to ten, then 20

If I add one more elephant, how many elephants will I have?

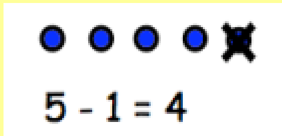
Use a number line. They jump forwards along the number line using finger.



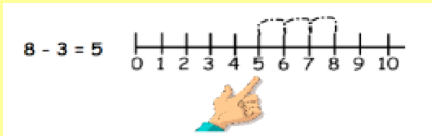
Use of games, songs and practical activities to begin using vocabulary

Construct number sentences to go with practical activities

Relate subtraction to taking away and counting how many objects are left.

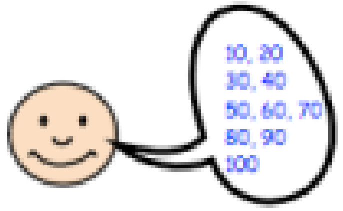


Can find one less to ten, then 20.

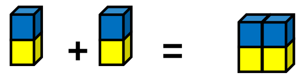


Counting backwards along a number line using finger.

Also chanting in 2s, 5s and 10s.



Begin to double to 5 using concrete resources.



2 + 2 = 4

3 + 3 = 6

- Sharing of milk at break time
- Sharing sweets on a child's birthday
- Sharing activities in the home corner
- Count in tens/twos
- Separate a given number of objects into two groups (addition and subtraction objective in reception being preliminary to multiplication and division)

Count in twos, tens
How many times?
How many are left/left over?
Group
Answer
Right, wrong
What could we try next?
How did you work it out?
Share out
Half, halve

Year 4		
Addition & Subtraction	**Multiplication & Division**	Fractions
Pupils should be taught to: • **add and subtract numbers with**	**Pupils should be taught to:** • **recall multiplication and division facts**	**Pupils should be taught to:**

Year 1		
Addition & Subtraction	**Multiplication & Division**	Fractions
Pupils should be taught to: • **Read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs** • **Represent and use number bonds and related subtraction facts within 20** **13 + 7 = 20 20 – 7 = 13** • **Add and subtract one-digit and two-digit numbers to 20, including zero** **11 + 5 16 – 0** • **Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as** **7 = ? - 9.**	**Pupils should be taught to:** • **Begin to count in 2s, 5s and 10s.** • **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.**	**Pupils should be taught to:** • **Recognise, find and name a half as one of two equal parts of an object, shape or quantity.** • **Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity.**

Calculation Policy Guidance

Addition

Using place value

Count in 1s
e.g. *45 + 1*

Count in 10s
e.g. *45 + 10 without counting on in 1s*

34	44	46
44		46
54	55	56

Add 10 to any given 2-digit number

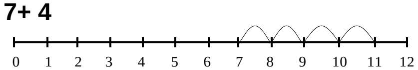
Using base 10 resources as well as 100 square

Counting on

The Number Line
Children use a numbered line to count on in ones. Children use number lines and practical resources to support calculation and teachers *demonstrate* the use of the number line.

Add two 1-digit numbers

7+ 4



Subtraction

Using place value

Count back in 1s
e.g. 67 - *1*

Count back in 10s
e.g. *67 - 10 without counting on in 1s*

46	47	48
56	57	58
66		68

Count back in 10s from any given 2-digit number

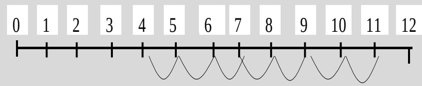
Using base 10 resources as well as 100 square

Taking away

Count back in 10s
e.g. *53 – 20 as 53, 43, 33*

Number lines (numbered)

11 – 7
(Counting back)



Multiplication

Counting in Steps

Use a variety of concrete resources

Counting in 2s e.g. counting socks, shoes, animal's legs, bead strings…

Counting in 5s e.g. counting fingers, fingers in gloves, toes, bead strings…

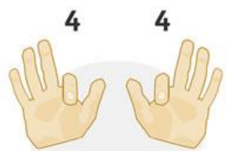
Counting in 10s e.g. fingers, toes, bead strings, hundred square …

Doubling

Use Multilink cubes …

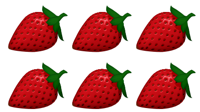
Double to 5 using fingers

e.g. double 4.



Grouping

Begin to use visual and concrete arrays or 'lots of' to find how many sets of a smaller number makes a larger number.



Looking at rows
3 + 3

Looking at columns
2 + 2 + 2

3 lots of 2
2 lots of 3

Division

Counting in Steps

Use a variety of concrete resources

Counting in 2s e.g. counting socks, shoes, animal's legs, bead strings…

Counting in 5s e.g. counting fingers, fingers in gloves, toes, bead strings…

Counting in 10s e.g. fingers, toes, bead strings, hundred square …

Doubling & Halving

Find half of even numbers up to 20, including realising that it is hard to halve an odd number

Grouping

Begin to use visual and concrete arrays and 'sets of' objects to find the answers to questions.

For e.g. Sorting objects into 2s / 3s/ 4s etc

How many pairs of socks are there?

There are 12 crocus bulbs. Plant 3 in each pot. How many pots are there?

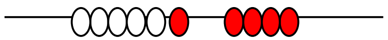
Using number facts

'Story' of 4, 5, 6, 7, 8 and 9

e.g. *7 = 7 + 0, 6 + 1, 5 + 2, 4 + 3*

Number bonds to 10

e.g. *5 + 5, 6 + 2, 7 + 3, 8 + 2, 9 + 1, 10 + 0*



Use patterns based on known facts when adding

e.g. *4 + 3 = 7*

so we know 24 + 3, 44 + 3, 74 + 3

Demonstrate mental addition

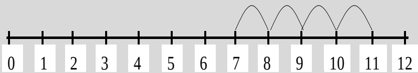
Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'.

2 = 1+ 1
2 + 3 = 4 + 1
3 = 3
2 + 2 + 2 = 4 + 2

Missing numbers need to be placed in all possible places.

3 + 4 = □	□ = 3 + 4
3 + □ = 7	7 = □ + 4
□ + 4 = 7	7 = 3 + □
□ + ∇ = 7	7 = □ + ∇

The difference between 7 and 11 (Counting up)



Recording by
- drawing jumps on prepared lines
- constructing own lines

(Teachers model jottings appropriate for larger numbers)

Using number facts

'Story' of 4, 5, 6, 7, 8 and 9

e.g. 'Story' of 7 is

7 – 1 = 6, 7 – 2 = 5, 7 – 3 = 4 etc

Number bonds to 10

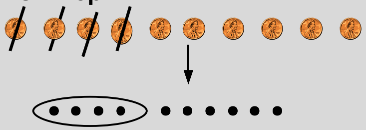
e.g. *10 – 1 = 9, 10 – 2 = 8, 10 – 3 = 7*

Subtract using patterns of known facts

e.g. *7 – 3 = 4 so we know 27 – 3 = 24, 47 – 3 = 44, 77 – 3 = 74*

Concrete objects/Pictures / marks

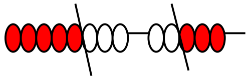
Sam spent 4p. What was his change from 10p?



Missing numbers

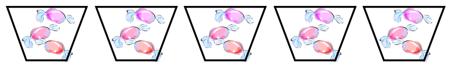
7 - 3 = □	□ = 7 - 3
7 - □ = 4	4 = □ - 3
□ - 3 = 4	4 = 7 - □
□ - ∇ = 4	4 = □ - ∇

Use of bead strings to model groups of 5 or 10.



Pictures / marks

There are 3 sweets in one bag.
How many sweets are there in 5 bags?



Jo has 12 Lego wheels. How many cars can she make?

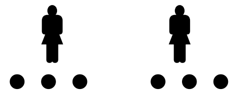
How many towers of three can I make with twelve cubes?

Sharing

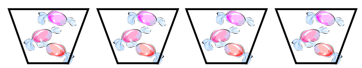
Practical activities involving sharing, distributing cards when playing a game, putting objects onto plates, into cups, hoops etc.

Begin to find half or a quarter of a quantity using sharing

6 sweets are shared between 2 people. How many do they have each?



12 sweets are shared between 4 bowls. How many sweets in each bowl?



Year 2		
Addition & Subtraction	**Multiplication & Division**	Fractions
Pupils should be taught to: **add and subtract numbers mentally, including:** • **solve problems with addition and subtraction:** ○ **using concrete objects and pictorial representations, including those involving numbers, quantities and measures** ○ **applying their increasing knowledge of mental and written methods** • **recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100** • **add and subtract numbers using concrete objects, pictorial representations, and mentally, including:** ○ **a two-digit number and ones** **23 + 5 23-5** ○ **a two-digit number and tens** **41 + 20 55 - 10** ○ **two two-digit numbers** **22 + 45 70 - 20** ○ **adding three one-digit numbers** **3 + 4 + 5** • **show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot** **3 + 4 = 7 and 4 + 3 = 7 (commutative)** • **recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems.** **6 + ? = 10 10 - ? = 6 10 - ? = 4**	**Pupils should be taught to:** • **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** **7 X 5 = 15 and 5 X 7 = 15 (commutative)** • **solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.**	**Pupils should be taught to:** • **recognise, find, name and write fractions $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{4}$ and $\frac{3}{4}$ of a length, shape, set of objects or quantity** • **write simple fractions for example, $\frac{1}{2}$ of 6 = 3 and recognise the equivalence of** $\frac{2}{4}$ **and** $\frac{1}{2}$

Calculation Policy Guidance

Addition

Using place value

Know 1 more or 10 more than any number

e.g. ***1 more than 67***

e.g. ***10 more than 85***

Using base 10 resources

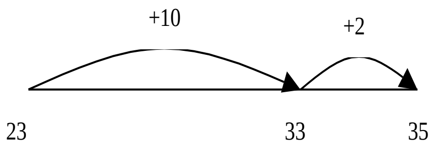
Partition into tens and ones and recombine

12 + 23 = 10 + 2 + 20 + 3
= 30 + 5
= 35

Using place value cards

refine to partitioning the second number only:

23 + 12 = 23 + 10 + 2
= 33 + 2
= 35



Counting on

Add 10 and multiples of 10 to a given 1- or 2-digit number (start by using a number line).

e.g. ***76 + 20 as 76, 86, 96 or in one hop: 76 + 20 = 96***

Subtraction

Using place value

Know 1 less or 10 less than any number

e.g. ***1 less than 74***

e.g. ***10 less than 82***

Using base 10 resources

Partition into tens and ones and recombine

37 - 12 = 30 - 10 + 7-2
= 20 + 5
= 25

Using place value cards

refine to partitioning the second number only:

37 – 12 = 37 – 10 – 2
= 27 – 2
= 25

Taking away

Subtract 10 and multiples of 10

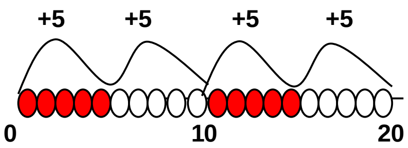
e.g. ***76 – 20 as 76, 66, 56 or in one hop: 76 – 20 = 56***

Subtract two 2-digit numbers by counting back in 10s, then in 1s
e.g. *67 – 34 as 67 subtract 30 (37) then count back 4 (33)*

Multiplication

Counting in Steps

Count in 2s, 5s and 10s



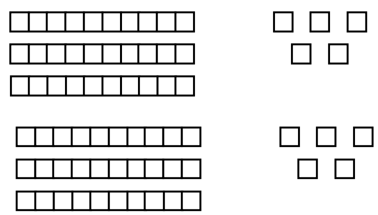
Begin to count in 3s

Halving & doubling

Understand that halving is the inverse of doubling and derive and recall doubles of all numbers to 20 and the corresponding halves.

Begin to know doubles of multiples of 5 to 100

e.g. ***double 35 is 70***

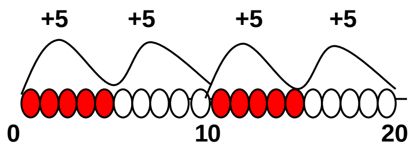


Begin to double 2-digit numbers less than 50 with 1s digits of 1, 2, 3, 4 or 5

Division

Counting in Steps

Count in 2s, 5s and 10s

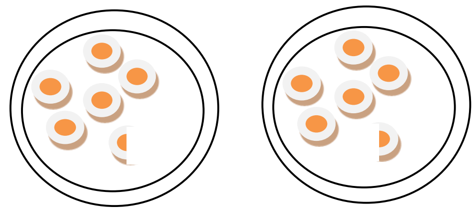


Begin to count in 3s

Halving & doubling

Find half of numbers up to 40, including realising that half of an odd number gives a remainder of 1 or an answer containing a $\frac{1}{2}$

e.g. $\frac{1}{2}$ ***of 11 = 5*** $\frac{1}{2}$



Begin to know half of multiples of 10 to 100
e.g. ***half of 70 is 35***

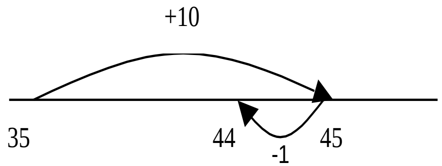
Add two 2-digit numbers by counting on in 10s, then in 1s

e.g. *55 + 37 as 55 + 30 (85) + 7 =92*

<u>Add near multiples of 10</u>

Add 9 or 11 by adding 10 and adjusting by 1

35 + 9 = 44



Or
e.g. *46 + 19*
e.g. *63 + 21*

<u>Using number facts</u>

Know pairs of numbers which make the numbers up to and including 12

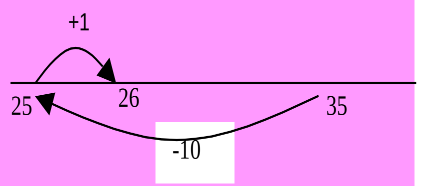
e.g. *8 = 4 + 4, 3 + 5, 2 + 6, 1 + 7, 0 + 8*

e.g. *10 = 5 + 5, 4 + 6, 3 + 7, 2 + 8, 1 + 9, 0 + 10*

Use patterns based on known facts when adding

e.g. *6 + 3 = 9, so we know 36 + 3 = 39, 66 + 3 = 69, 56 + 3 = 59*

Subtract 9 , 11, 19 or 21
35 – 9 = 26



<u>Using number facts</u>

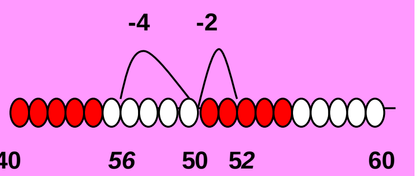
Know pairs of numbers which make the numbers up to and including 12 and derive related subtraction facts

e.g. *10 – 6 = 4, 8 – 3 = 5, 5 – 2 = 3*

Subtract using patterns of known facts

e.g. *9 – 3 = 6, so we know 39 – 3 = 36, 69 – 3 = 66, 89 – 3 = 86*

Bridging 10
e.g. *52 – 6 as 52 – 2 (50) – 4 = 46*

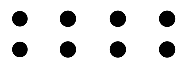


<u>Grouping</u>

Use arrays and repeated addition to find answers to multiplication

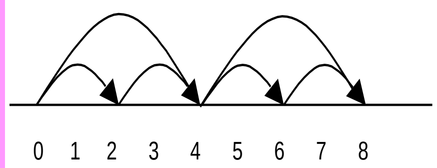
e.g. *4 × 2 as four lots of two things*

e.g. *4 × 2 as four steps in the 2s count as well as two lots of 4*

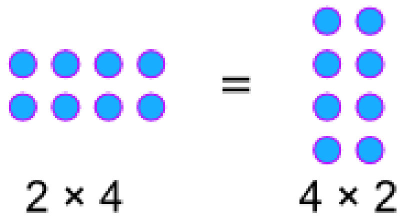


4 x 2 or 4 + 4

2 x 4 or 2 + 2 + 2 + 2



Understand the commutative law that 2 × 4 can be worked out as two 4s or four 2s



<u>Using number facts</u>

<u>Grouping</u>
Link to counting and understanding number strand

Count up to 100 objects by grouping them and counting in tens, fives or twos

Relate division to multiplication by using arrays or towers of cubes to find answers to division

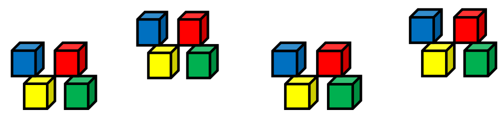
e.g. 'How many towers of five cubes can I make from twenty cubes?'

as _ × 5 = 20 and also as 20 ÷ 5 = _

Relate division to 'clever' counting and hence to multiplication
e.g. 'How many fives do I count to get to twenty?'

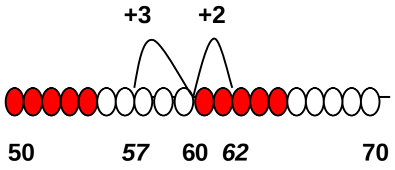
<u>Sharing/Fractions</u>

Find one half, one quarter and three quarters of shapes and sets of objects
e.g. find a quarter of 16 cubes by sorting the cubes into four piles



1 Whole			
$\frac{1}{2}$		$\frac{1}{2}$	
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

Bridging 10
e.g. *57 + 5 = 57 + 3 (60) + 2 = 62*



Add three or more 1-digit numbers, spotting bonds to 10 or doubles

e.g. *3 + 5 + 3 = 6 + 5 = 11*

e.g. *8 + 2 + 4 = 10 + 4 = 14*

Demonstrate mental addition

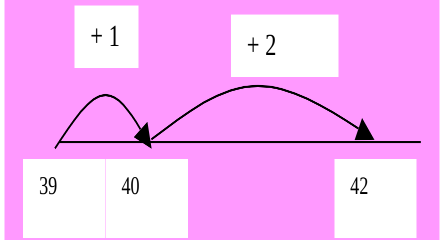
Missing numbers
Continue using a range of equations as in Year 1 but with appropriate, larger numbers.

Extend to
14 + 5 = 10 + □
and adding three numbers
32 + □ + □ = 100   35 = 1 + □ + 5

Counting up

Find a small difference by counting up

e.g. 42 – 39 = 3



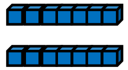
Demonstrate mental subtraction

Missing numbers

Continue using a range of equations as in Year 1 but with appropriate numbers.

Extend to 14 + 5 = 20 - □

Know doubles to double 20
e.g. *double 7 is 14*



Start learning ×2, ×5, ×10 tables, relating these to ‘clever’ counting in 2s, 5s, and 10s

e.g. *5 × 10 = 50, and five steps in the 10s count = 10, 20, 30, 40, 50*

Partitioning

15 x 2

20 + 10 = 30

Demonstrate mental multiplication

Understand that multiplication is the inverse of division and vice versa.

Missing numbers

Be able to complete number sentences where a missing number is shown by a symbol:

7 x 2 = □	□ = 2 x 7
7 x □ = 14	14 = □ x 7
□ x 2 = 14	14 = 2 x □
□ x ∇ = 14	14 = □ x ∇

Using number facts

Know half of even numbers to 24

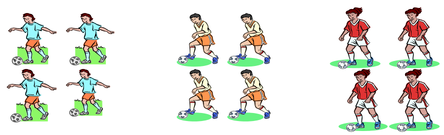
Know ×2, ×5 and ×10 division facts

Begin to know ×3 division facts

In the context of money count forwards and backwards using 2p, 5p and 10p coins

Practical grouping e.g. in PE

12 children get into teams of 4 to play a game. How many teams are there?



Demonstrate mental division

Understand that division is the inverse of multiplication and vice versa.

Missing numbers

Be able to complete number sentences where a missing number is shown by a symbol:

6 ÷ 2 = □	□ = 6 ÷ 2
6 ÷ □ = 3	3 = 6 ÷ □
□ ÷ 2 = 3	3 = □ ÷ 2
□ ÷ ∇ = 3	3 = □ ÷ ∇

Year 3		
Addition & Subtraction	**Multiplication & Division**	Fractions
Pupils should be taught to: **add and subtract numbers mentally, including:** • **a three-digit number and ones** **122+7 122-7** • **a three-digit number and tens** **230+50 230-50** • **a three-digit number and hundreds** **245+400 445-200** • **add and subtract numbers with up to three digits, using the efficient written methods of column addition and subtraction** • **estimate the answer to a calculation and use inverse operations to check answers** • **solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.**	**Pupils should be taught to:** • **recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables (prior knowledge- year 2 should know the 2, 5, 10 times 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 efficient written methods** • **solve problems, including missing number problems, involving multiplication and division. Solve problems (e.g. 3 hats and 4 coats, how many different outfits are there?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).**	**Pupils should be taught to:** • **count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10** • **recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators** • **recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators** • **recognise and show, using diagrams, equivalent fractions with small denominators** • **add and subtract fractions with the same denominator within one whole** **[for example, $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$]** • **compare and order unit fractions, and fractions with the same denominators** • **solve problems that involve all of the above.** •

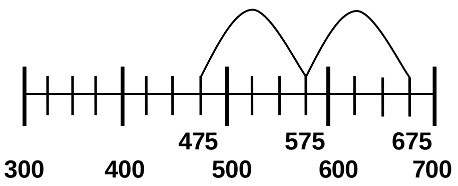
Calculation Policy Guidance

Addition

Mental Methods

Using place value

Count in 100s
e.g. *Know 475 + 200 as 475, 575, 675*



Add multiples of 10, 100 and £1

e.g. *746 + 200*

e.g. *746 + 40*

e.g. *£6·34 + £5 as £6 + £5 and 34p*

Partitioning

e.g. *£8·50 + £3·70 as £8 + £3 and 50p + 70p and combine the totals: £11 + £1·20*

e.g. *347 + 36 as 300 and 40 + 30 and 7 + 6 and combine the totals: 370 + 13 = 383*

e.g. *68 + 74 as*
60 + 70 = 130
8 + 4 = 12

and combine the totals:
130 + 12 = 142

Use place value cards to support

Counting on

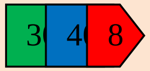
Subtraction

Mental Methods

Taking away

Use place value to subtract

e.g. *348 – 300*
e.g. *348 – 40*
e.g. *348 – 8*



Take away multiples of 10, 100 and £1

e.g. *476 – 40 = 436*
e.g. *476 – 300 = 176*
e.g. *£4·76 – £2 = £2·76*

Partitioning

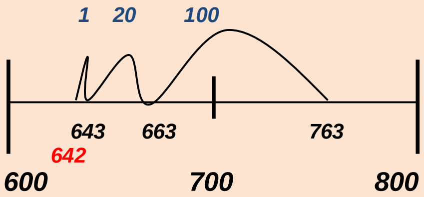
e.g. *68 – 42*
as 60 – 40 and 8 – 2

e.g. *£6·84 – £2·40*
as £6 – £2 and 80p – 40p

Use coins to reinforce real life scenario

Count back in 100s, 10s then 1s

e.g. *763 – 121*
as 763 – 100 (663) – 20 (643) – 1 = 642



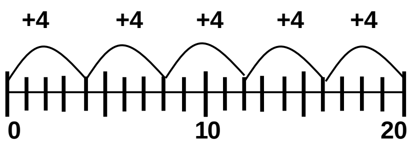
Multiplication

Mental Methods

Counting in Steps

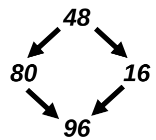
Count in 2s, 3s, 4s, 5s, 8s and 10s

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	94	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



Doubling & Halving

Find doubles of numbers to 50 using partitioning
e.g. *double 48*



Use doubling as a strategy in multiplying by 2
e.g. *18 × 2 is double 18 = 36*

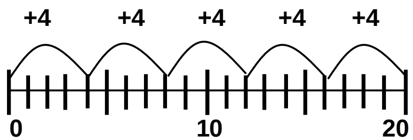
Division

Mental Methods

Counting in Steps

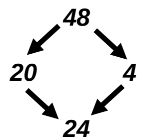
Count in 2s, 3s, 4s, 5s, 8s and 10s

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	94	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



Doubling & Halving

Find half of even numbers to 100 using partitioning
e.g. *find half of 48*

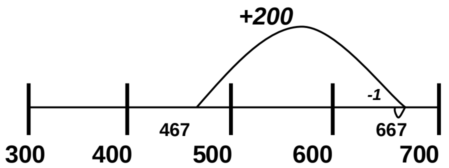


Use halving as a strategy in dividing by 2
e.g. *36 ÷ 2 is half of 36 = 18*
Find half of odd numbers

Calculation Policy Guidance

Add two 2-digit numbers by adding the multiple of 10, then the 1s
e.g. *67 + 55 as 67 + 50 (117) + 5 = 122*

Add near multiples of 10 and 100
e.g. *67 + 39*
e.g. *467 + 199*



Add pairs of 'friendly' 3-digit numbers
e.g. *548 + 120*

Count on from 3-digit numbers
e.g. *247 + 34 as 247 + 30 (277) + 4 = 281*

Using number facts

Know pairs which total each number to 20
e.g. *7 + 8 = 15*
e.g. *12 + 6 = 18*

Number bonds to 100
e.g. *35 + 65*
e.g. *46 + 54*
e.g. *73 + 27*

Add to the next 10 and the next 100
e.g. *176 + 4 = 180*
e.g. *435 + 65 = 500*

Use base 10 and bead strings to support.

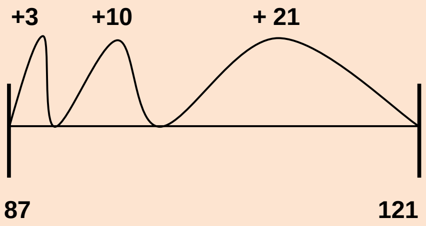
Missing numbers
e.g.
19 + ? = 33
? + 14 = 33
10 + ? + 50 = 100
? + ? + ? = 100

Subtract near multiples of 10 and 100

e.g. *648 – 199*
e.g. *86 – 39*

Counting up

Find a difference between two numbers by counting up from the smaller to the larger
e.g. *121 – 87*



Using number facts

Know pairs which total each number to 20
e.g. *20 – 14* = 6

Number bonds to 100
e.g. *100 – 48 = 52*
e.g. *100 – 35 = 65*

Use base 10 and bead strings to support.

Subtract using number facts to bridge back through a 10

e.g. *42 – 5 = 42 – 2 (40) – 3 = 37*

Missing numbers
e.g. 36 – 17 = ?
? - 15 = 19
? - ? = 19
20 - ? - ? = 5

Grouping

Recognise that multiplication is commutative
e.g. *4 × 8 = 8 × 4*

Multiply multiples of 10 by 1-digit numbers
e.g. *30 × 8 = 240*

Multiply 'friendly' 2-digit numbers by 1-digit numbers
e.g. *13 × 4*

Using number facts

Know doubles to double 20
e.g. *double 15 is 30*

Know doubles of multiples of 5 to 100

e.g. *double 85 is 170*

Know ×2, ×3, ×4, ×5, ×8, ×10 tables facts

Missing numbers

Be able to complete number sentences where a missing number is shown by a symbol:

e.g.
6 x ? = 18
6 x 10 = ?
20 = ? x 5
? x 3 = 18
? x ? = 24

Grouping

Recognise that division is not commutative
e.g. *16 ÷ 8 does not equal 8 ÷ 16*

Relate division to multiplications 'with holes in'

e.g. *? × 5 = 30 is the same calculation as 30 ÷ 5 = ?*
thus we can count in 5s to find the answer

? × £5 = £30

Divide multiples of 10 by 1-digit numbers
e.g. *240 ÷ 8 = 30*

Begin to use subtraction of multiples of 10 of the divisor to divide numbers above the 10th multiple

e.g. *52 ÷ 4 is*
10 × 4 (40) and 3 × 4 (12)
= 13

Using number facts

Know half of even numbers to 40
Know half of multiples of 10 to 200
e.g. *half of 170 is 85*
Know ×2, ×3, ×4, ×5, ×8, ×10 division facts

Calculation Policy Guidance

347 + ? = 447

Written Methods

Stage 1

Build on partitioning to develop expanded column addition with two 3-digit numbers

e.g. *466 + 358*

```
400 + 60 + 6
300 + 20 + 6
700 + 80 + 12   =  792
```

Use base 10 to support the secure understanding of place value

Stage 2

Ladder Vertical addition to support place value.

Use base 10 to support the secure understanding of place value

```
  4 6 6
+ 3 2 6
    1 2
    8 0
  7 0 0
  7 9 2
```

Encourage children to use the correct place value language e.g.

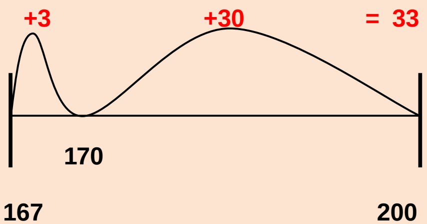
For the middle column children should be taught to say "60+20=80 rather than 6+2 = 8"

Written Methods

Stage 1

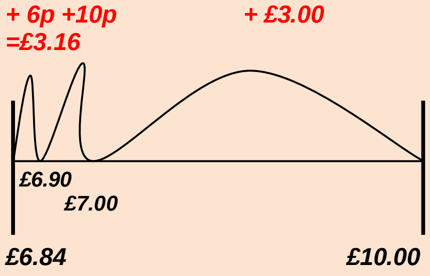
Build on finding the difference by developing counting up subtraction

e.g. *200 – 167 = 33*



Use counting up subtraction to find change from £1, £5 and £10

e.g. *£10·00 – £6·84 = £3.16*



Written Methods

Stage 1

Build on partitioning to develop grid multiplication

e.g. *23 × 4*

X	20	3
4	80	12

= 92

Stage 1/2

Ladder column multiplication with TU x U

```
   87
 X  4
   28   ( 4 x 7)
  320   ( 4 x 80)
  348
```

Written Methods

Perform divisions just above the 10th multiple using written jottings, understanding how to give a remainder as a whole number.

E.g. Sharing - 16 shared between 3, how many left over?

16 ÷ 3 = 5 r1

Short division

By the end of the year short division without carrying over.

```
  2 2        1 1 1
4|8 8      8|8 8 8
```

Fractions

Use division facts to find unit and simple non-unit fractions of amounts within the times-tables

e.g. $\frac{3}{4}$ *of 48 is 3 × (48 ÷ 4) = 36*

Stage 3

Use base 10 to support the secure understanding of place value

Compact column addition with two or more 3-digit numbers or towers of 2-digit numbers
e.g. ***347 + 286 + 495***

$$\begin{array}{r} {\scriptstyle 2\ 1\ \ } \\ 3\ 4\ 7 \\ 2\ 8\ 6 \\ \underline{4\ 9\ 5} \\ 1\ 1\ 2\ 8 \end{array}$$

Compact column addition with 3- and 4-digit numbers

Fractions

Recognise like fractions that add to 1

$$\frac{5}{7} + \frac{2}{7} = \frac{7}{7} = 1$$

$$\frac{3}{4} + \frac{1}{4} = \frac{4}{4} = 1$$

Stage 2

Expanded column subtraction. **The key to the subtraction 343 – 1 27 is to partition 43 as 300 + 30 + 13, allowing 200 +20 + 7 to be subtracted from 300 + 30 + 13 to give 100+ 10 + 6 = 116. This links clearly to the column subtraction:**

$$\begin{array}{r} {\scriptstyle 30\quad 13} \\ 40 + 3 \\ \underline{-\ 20 + 7} \\ 10 + 6 \end{array} \qquad - \qquad \begin{array}{r} {\scriptstyle 30\quad\ 13} \\ 300 + \cancel{40} + \cancel{3} \\ \underline{200 + 20 + 7} \\ 100 + 10 + 6 \end{array}$$

Use base 10 to support the secure understanding of place value

Stage 3

Compact column subtraction with 2- and 3-digit numbers

$$\begin{array}{rrrr} & & {\scriptstyle 3} & {\scriptstyle 1} \\ & 3 & 4 & \cancel{3} \\ - & 2 & 2 & 7 \\ \hline & 1 & 1 & 6 \end{array} \qquad \begin{array}{rrrr} & {\scriptstyle 5} & {\scriptstyle 1} & \\ & \cancel{6} & 2 & 7 \\ - & 1 & 3 & 2 \\ \hline & 4 & 9 & 5 \end{array}$$

Fractions

Recognise complements of any fraction to 1

e.g. $1 - \frac{1}{4} = \frac{3}{4}$

e.g. $1 - \frac{3}{5} = \frac{2}{5}$

up to 4 digits using the efficient written methods of column addition and subtraction

- 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.

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 E.g know 12x4 is the same as 4x12
- 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. Show equal statements use the distributive law
-

  39 × 7 = (30 × 7) + (9 × 7)

  and associative law

  (2 × 3) × 4 = 2 × (3 × 4)
- Practise mental methods and extend this to three- digit numbers to derive facts, for example 200 × 3 = 600
  600 ÷ 3 = 200

- recognise and show, using diagrams, families of common equivalent fractions
- count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten.
- 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
- add and subtract fractions with the same denominator
- recognise and write decimal equivalents of any number of tenths or hundredths
- recognise and write decimal equivalents to $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{3}{4}$
- find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths
- round decimals with one decimal place to the nearest whole number
- compare numbers with the same number of decimal places up to two decimal places
- solve simple measure and money problems involving fractions and decimals to two decimal places.

Addition	**Subtraction**	**Multiplication**	**Division**

Calculation Policy Guidance

Mental Methods

Using place value

Count in 1000s
e.g. ***Know 3475 + 2000 as 3475, 4475, 5475***

Partitioning

e.g. ***746 + 40***
e.g. ***746 + 203 as 700 + 200 and 6 + 3***
e.g. ***134 + 707 as 100 + 700 and 4 + 7***

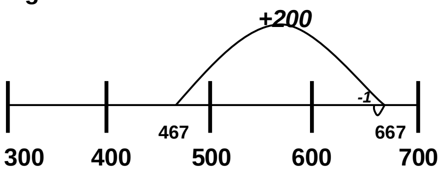
Counting on

Add 2-digit numbers to 2-, 3- and 4-digit numbers by adding the multiple of 10 then the 1s

e.g. ***167 + 55 as 167 + 50 (217) + 5 = 222***

Add near multiples of 10, 100 and 1000

e.g. ***467 + 199***
e.g. ***3462 + 2999***



Count on to add 3-digit numbers and money

e.g. ***463 + 124 as 463 + 100 (563) + 20 (583) + 4 = 587***

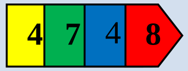
e.g. ***£4·67 + £5·30 as £9·67 + 30p***

Using number facts

Mental Methods

Taking away

Use place value to subtract
e.g. 4748 – 4000
e.g. 4748 – 8



Take away multiples of 10, 100, 1000, £1, 10p or 0·1

e.g. 8392 – 50
e.g. 6723 – 3000
e.g. £3·74 – 30p
e.g. 5·6 – 0·2

Partitioning

e.g. £5·87 – £3·04 as £5 – £3 and 7p – 4p
e.g. 7493 – 2020
as 7000 – 2000 and
90 – 20

Count back

e.g. 6482 – 1301 as 6482 – 1000 (5482) – 300 (5182) – 1 = 5181

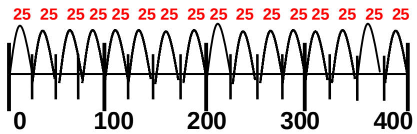
Subtract near multiples of 10, 100, 1000 or £1

e.g. 3522 – 1999
e.g. £34·86 – £19·99

Counting up

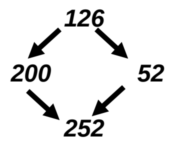
Mental Methods

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



Doubling and halving

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



Begin to double amounts of money
e.g. ***£3·50 doubled is £7***

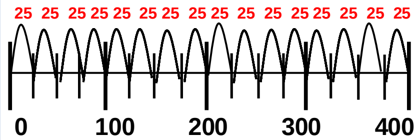
Use doubling as a strategy in multiplying by 2, 4 and 8

e.g. ***34 × 4 is double 34 (68) doubled again = 136***

Grouping

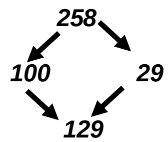
Mental Methods

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



Doubling and halving

Find half of even numbers to 200 and beyond using partitioning
e.g. ***find half of 258***



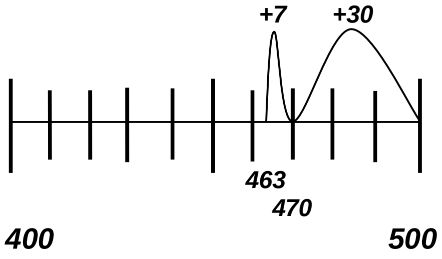
Begin to halve amounts of money
e.g. ***£9 halved is £4·50***

Use halving as a strategy in dividing by 2, 4 and 8
e.g. ***164 ÷ 4 is half of 164 (82) halved again = 41***

Grouping

Calculation Policy Guidance

Number bonds to 100 and to the next multiple of 100
e.g. *288 + 12 = 300*
e.g. *1353 + 47 = 1400*
e.g. *463 + 37 = 500*



Number bonds to £1 and to the next whole pound

e.g. *63p + 37p = £1*
e.g. *£3·45 + 55p = £4*

Add to the next whole number

e.g. *4·6 + 0·4*
e.g. *7·2 + 0·8*

Missing numbers

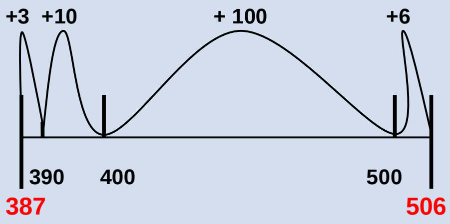
Be able to complete missing number sentences:

E.g

54 + ? = 100
? + 14 = 39
10 + ? + 50 = 120
? + ? + ? = 100
347 + ? = 540

Written Methods

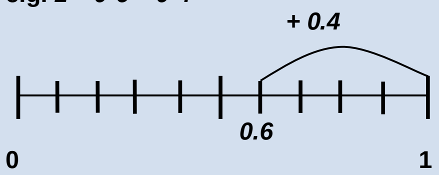
Find a difference between two numbers by counting up from the smaller to the larger
e.g. *506 – 387*
e.g. 4000 – 2693



Using number facts

Number bonds to 10 and 100 and derived facts

e.g. *100 – 76 = 24*
e.g. *1 – 0·6 = 0·4*

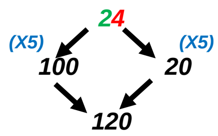


Number bonds to £1 and £10

e.g. *£1·00 – 86p = 14p*
e.g. *£10·00 – £3·40 = £6·60*

Missing numbers
Be able to complete missing number sentences:
e.g. 100 – 17 = ?
? - 15 = 50
? - ? = 20
100 - ? - ? = 10
Written Methods

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



Multiply multiples of 100 and 1000 by 1-digit numbers using tables facts
e.g. *400 × 8 = 3200*

Multiply near multiples by rounding
e.g. *24 × 19 as (24 × 20) – 24 = 456*

Using number facts

Know times-tables up to 12 × 12

Written Methods

Use multiples of 10 times the divisor to divide by 1-digit numbers above the tables facts
e.g. *45 ÷ 3=15*

10 × 3 = 30	***(15 left over)***
5 × 3 = 15	***(0 left over)***
15 x 3 = 45	

Divide multiples of 100 by 1-digit numbers using division facts
e.g. *3200 ÷ 8 = 400*

Using number facts

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

Written Methods

Stage 1

Build on Ladder Vertical addition to develop compact column addition with larger numbers

e.g. *1466 + 4868*

$$\begin{array}{r} 1\,4\,6\,6 \\ +\,\underline{4\,8\,6\,8} \\ 1\,4 \\ 1\,2\,0 \\ 1\,2\,0\,0 \\ \underline{5\,0\,0\,0} \\ 6\,3\,3\,4 \end{array}$$

Stage 2

Compact column addition with larger numbers

e.g. *5347 + 2286 + 1495*

$$\begin{array}{l} 1\;\;2\;\;1 \\ 5\;\;3\;\;4\;\;7 \\ 2\;\;2\;\;8\;\;6 \\ \underline{1\;\;4\;\;9\;\;5} \\ 9\;\;1\;\;2\;\;8 \end{array}$$

Use ladder and compact column addition to add amounts of money

Fractions

Add like fractions

e.g. $\frac{3}{8} + \frac{1}{8} + \frac{1}{8}$

Stage 1

Build on finding the difference by developing counting up subtraction for change from £10, £20 and £50.

e.g. *Buy a computer game for £34·75 using £50*

+ 5p +20p +£5.00 + £10.00 = £15.25

£34.75 *£50.00*

Stage 2

Expanded subtraction method

e.g. 8.95 - 4.38 = 4.57

$$\begin{array}{r} 0\,.\,8 \quad 0\,.\,15 \\ 8\,.\,00 + \cancel{0\,.\,9} + \cancel{0\,.\,05} \\ -\;\underline{4\,.\,00 + 0\,.\,3 + 0\,.\,08} \\ \underline{4\,.\,00 + 0\,.\,5 + 0\,.\,07} \end{array} \quad =4\,.57$$

Stage 2/3

$$\begin{array}{r} 8\;\;1 \\ 8.\cancel{9}5 \\ -\;\underline{4.\,3\,8} \\ \underline{4.\,5\,7} \end{array} \qquad \begin{array}{r} 3444 \\ -\;\underline{122} \\ \underline{3322} \end{array} \qquad \begin{array}{r} 3\;\;1 \\ \cancel{4}\,3\,5\,3 \\ -\;\underline{1\,6\,1\,2} \\ \underline{2\;\,7\,4\,1} \end{array}$$

Fractions

Subtract like fractions

e. g. $\frac{3}{8} - \frac{1}{8} = \frac{2}{8}$

Stage 1

Use grid multiplication to multiply 3-digit numbers by 1-digit numbers
e.g. *253 × 6*

X	200	50	3
6	1200	300	18

= 1518

Use a ladder vertical written algorithm (o multiply 3-digit numbers by 1-digit numbers
e.g. *253 × 6*

$$\begin{array}{rl} 2\;5\;3 & \\ X \qquad \underline{6} & \\ 1\;8 & (6\;X\;3) \\ 3\;0\;0 & (6\;X\;50) \\ \underline{1\;2\;0\;0} & (6\;X\;200) \\ 1\;5\;1\;8 & \end{array}$$

Stage 2

Use grid multiplication to multiply 2-digit numbers by 2-digit numbers

e. g. *16 × 48*

X	10	6
40	400	240
8	80	48

$$\begin{array}{r} =\;6\,4\,0 \\ =\;\underline{1\,2\,8} \\ \underline{7\,6\,8} \end{array}$$

Use a written version of a mental method to divide 2- and 3-digit numbers by 1-digit numbers

e.g. *86 ÷ 3 as 20 × 3 (60) and 8 × 3 (24), remainder 2*

$$\begin{array}{r} 86 \\ 20 \times 3 = \underline{60} \\ 64 \\ 8 \times 3 = \underline{24} \\ 2 \end{array} \qquad 86 \div 3 = 28\ r\ 2$$

Short division

$$3\overline{)396}^{\,132}$$

$$3\overline{)306}^{\,102}$$

$$4\overline{)3^{3}28}^{\,0\,82}$$

Fractions

Use division facts to find unit and non-unit fractions of amounts within the times-tables

e.g. $\frac{7}{8}$ *of 56 is 7 × (56 ÷ 8) = 49*

Pupils should be taught to:

- add and subtract whole numbers with more than 4 digits, including using efficient written methods (column addition and subtraction)
- add and subtract numbers mentally with increasingly large numbers (e.g. 12 462 – 2 300 = 10 162).
- use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Pupils should be taught to:

- Identify multiples and factors, including finding all factor pairs
- solve problems involving multiplication and division where larger numbers are used by decomposing them into their factors
- 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 numbers using an efficient 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 efficient written method of short division and interpret remainders appropriately for the context e.g. what does the remainder represent? One fifth? What would the remainder be as a decimal? etc.
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000

Multiplication & Division continued

Pupils should be taught to:

- compare and order fractions whose denominators are all multiples of the same number
- identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths
- recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number

  [for example, $\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$]
- add and subtract fractions with the same denominator and denominators that are multiples of the same number
- multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams
- read and write decimal numbers as fractions [for example, 0.71 = $\frac{71}{100}$]
- recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents
- round decimals with two decimal places to the nearest whole number and to one decimal place
- read, write, order and compare numbers with up to three decimal places

Fractions continued

	Pupils should be taught to: • recognise and use square numbers and cube numbers, and the notation for squared (X^2) and cubed (X^3) • solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign • Apply all the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations.	**Pupils should be taught to:** • solve problems involving number up to three decimal places • recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal • solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those fractions with a denominator of a multiple of 10 or 25.

Addition	Subtraction	Multiplication	Division
Mental Methods	Mental Methods	Mental Methods	Mental Methods

Calculation Policy Guidance

Using place value

Count in 0·1s, 0·01s
e.g. *Know what 0·1 more than 0·51 is*

Partitioning

10s	1s	0.1s	0.01s
	0	5	1

e.g. *2·4 + 5·8 as 2 + 5 and 0·4 + 0·8 and combine the totals:*

7 + 1·2 = 8·2

Counting on

Add two decimal numbers by adding the 1s, then the 0·1s/0·01s

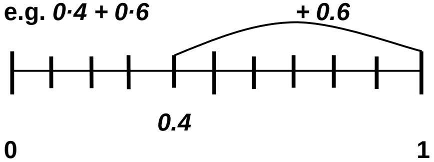
e.g. *5·72 + 3·05 as 5·72 + 3 (8·72) + 0·05 = 8·77*

Add near multiples of 1
e.g. *6·34 + 0·99*
e.g. *5·63 + 0·9*

Count on from large numbers
e.g. *6834 + 3005 as 9834 + 5*

Using number facts

Number bonds to 1 and to the next whole number
e.g. *5·7 + 0·3*
e.g. *0·4 + 0·6*



Taking away

Use place value to subtract decimals

e.g. *4·58 – 0·08*
e.g. *6·26 – 0·2*

Take away multiples of powers of 10

e.g. *15 672 – 300*
e.g. *4·82 – 2*
e.g. *2·71 – 0·5*
e.g. *4·68 – 0·02*

Partitioning or counting back

e.g. *3964 – 1051*
e.g. *5·72 – 2·01*

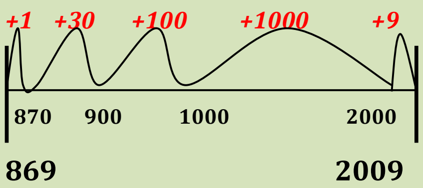
Subtract near multiples of 1, 10, 100, 1000, 10 000 or £1

e.g. *86 456 – 9999*
e.g. *3·58 – 1·99*

Counting up

Find a difference between two numbers by counting up from the smaller to the larger

e.g. *£12·05 – £9·59*
e.g. *2009 – 869 = 1140*

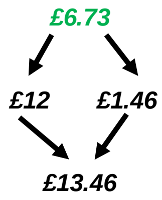


Find change using shopkeepers' addition

e.g. *Buy a toy for £6·89 using £10·00*

Doubling and halving

Double amounts of money using partitioning
e.g. *double £6·73*



Use doubling and halving as a strategy in multiplying by 2, 4, 8, 5 and 20

e.g. *58 × 5 is half of 58 × 10 (580) = 290*

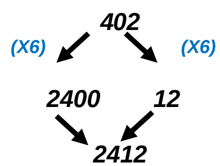
Grouping

Multiply whole numbers and decimals by 10, 100, 1000

e.g. *3·4 × 100 = 340*

Use partitioning to multiply 'friendly' 2- and 3-digit numbers by 1-digit numbers

e.g. *402 × 6 as*
400 × 6 (2400) and 2 × 6 (12) = 2412

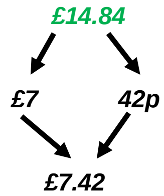


Use partitioning to multiply decimal numbers by 1-digit numbers

e.g. *4·5 × 3 as*

Doubling and halving

Halve amounts of money using partitioning
e.g. *half of £14·84 is half of £14 (£7) plus half of 84p (42p)*



Use doubling and halving as a strategy in dividing by 2, 4, 8, 5 and 20

e.g. *115 ÷ 5 as*
double 115 (230) ÷ 10 = 23
or
115 ÷ 10 = 11.5 then double = 23

Grouping

Divide numbers by 10, 100, 1000 to obtain decimal answers with up to 3 decimal places
e.g. *340 ÷ 100 = 3·4*

Use the 10th, 20th, 30th … multiple of the divisor to divide 'friendly' 2- and 3-digit numbers by 1-digit numbers

e.g. *186 ÷ 6 as*
30 × 6 (180) and 1 × 6 (6)

30 × 6 = 180	*(6 left over)*
1 × 6 = 6	*(0 left over)*
31 x 6 = 186	

Using number facts

Calculation Policy Guidance

Add to the next 10 from a decimal number

e.g. *7·8 + 2·2 = 10*

<u>Missing numbers</u>

e.g. 77.26 + ? = 80

43,871 + ? = 50,000

Written Methods

Use the compact column addition for adding several amounts of money

e.g. *£14·64 + £28·78 + £12·26*

$$\begin{array}{r} {\scriptstyle 1\ 1\ .\ 1\ \ } \\ 1\,4\,.\,6\,4 \\ +\,2\,8\,.\,7\,8 \\ \underline{1\,2\,.\,2\,6} \\ \underline{5\,5\,.\,6\,8} \end{array}$$

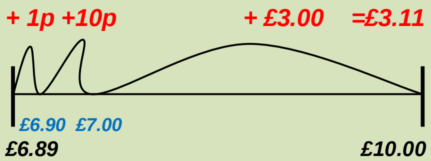
Also:

- to add pairs of 5-digit numbers
- to add towers of several larger numbers
- to add decimal numbers with up to 2 decimal places

Fractions

Add related fractions

e.g. $\frac{3}{4} + \frac{1}{8} + \frac{7}{8}$

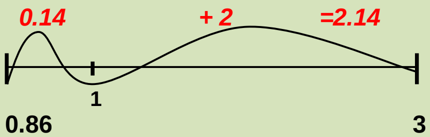


Find a difference between two amounts of money by counting up

Using number facts

Derived facts from number bonds to 10 and 100

e.g. *2 – 0·45 using 45 + 55 = 100*
e.g. *3 – 0·86 using 86 + 14 = 100*



Number bonds to £1, £10 and £100

e.g. *£4·00 – £3·86*
e.g. *£100 – £66 using 66 + 34 = 100*

<u>Missing numbers</u>
What must be subtracted from a decimal with units and tenths to make the next whole number,

e.g. 8.4 - ? = 8

<u>Use knowledge of place value</u> and related calculations, e.g.

6.3 – 4.8 using 63 – 48

Written Methods

4 × 3 (12) and 0·5 × 3 (1·5) = 13·5

Multiply near multiples by rounding

e.g. *32 × 29 as (32 × 30) – 32 = 928*

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*

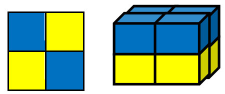
40 × 6 = 240 and
400× 6 = 2400

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

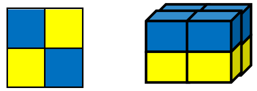
Short multiplication of 2-, 3- and 4-digit numbers by 1-digit numbers
e.g. *435 × 8*

$$\begin{array}{r} 4\ 3\ 5 \\ \underline{X\qquad 8} \\ \underline{3\ 2\ {}^{4}8\ 0} \end{array}$$

Long multiplication of 2-, 3-and 4-digit numbers by 'teen' numbers
e.g. *48 × 16*

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

Know square numbers and cube numbers



Written Methods

Use a written version of a mental strategy to divide 3-digit numbers by 1-digit numbers

e.g. *326 ÷ 6 as 50 × 6 (300) and 4 × 6 (24), remainder 2*

$$\begin{array}{rr} & 326 \\ 50 \times 6 = & \underline{300} \\ & 26 \\ 4 \times 6 = & \underline{24} \\ & 2 \end{array} \qquad 326 \div 6 = 54\ r\ 2$$

Short division of 3- and 4-digit numbers by 1-digit numbers
e.g. *139 ÷ 3*

$$\begin{array}{r} \underline{0\ \ 4\ \ 6\ \ 5}\ \ r1 \\ 3\,\big)\,1\ {}^{1}3\ {}^{1}9\ {}^{1}6 \end{array}$$

Give quotients as remainders or as fractions

465 r1 or 465 $\frac{1}{3}$

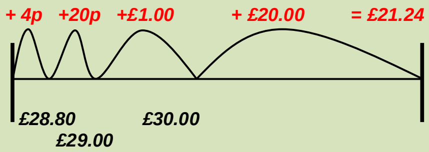
Fractions

Compact column subtraction for numbers with up to 5 digits

e.g. 92,*452 – 12,168*

$$\begin{array}{rrrrrr} & 9 & 2 & {}^{3}\cancel{4} & {}^{14}\cancel{5} & {}^{1}2 \\ - & 1 & 2 & 1 & 6 & 8 \\ \hline & 8 & 0 & 2 & 8 & 4 \end{array}$$

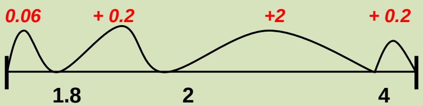
Continue to use counting up subtraction for subtractions involving money, including finding change e.g. ***£50 − £28·76***



£28.76 ***£50.00***

Use counting up subtraction to subtract decimal numbers

e.g. ***4·2 – 1·74 = 2.46***



1.74 **4.2**

Fractions

Subtract related fractions

e.g. $\frac{3}{4} - \frac{1}{8} = \frac{6}{8} - \frac{1}{8} + \frac{5}{8}$

Counting up subtraction provides a default method for ALL children

$$\begin{array}{rrrr} & & 4 & 8 \\ & \times & 1 & 6 \\ \hline & 2 & 8 & 8 \\ + & 4 & 8 & 0 \\ \hline & 7 & 6 & 8 \end{array}$$

NB: Use a different colour for numbers that have already been carried over and added in the first part of the sum as well as the place holder.

Partition multiplication of numbers with up to 2 decimal places by 1-digit numbers
e.g. ***1·34 × 6 =***

1.00 X 6 = 6.00
0.30 X 6 = 1.80
<u>0.04 X 6 = 0.24</u>
<u>1.34 X 6 = 8.04</u>

Fractions

Multiply fractions by 1-digit numbers e.g.

e.g. $\frac{3}{4}$ **X 6 =** $\frac{18}{4}$ **= 4** $\frac{2}{4}$ **= 4** $\frac{1}{2}$

Use concrete fraction pieces to secure knowledge.

Grid multiplication provides a default method for ALL Children

Find unit and non-unit fractions of large amounts
e.g.

$\frac{3}{5}$ *of 265 is* *3 × (265 ÷ 5) = 159*

$$\begin{array}{r|l} & 0\ \ 5\ \ 3 \\ \hline 5 & 2\ \ {}^{2}6\ \ {}^{1}5 \end{array}$$

53 X 3 = 159

Turn improper fractions into mixed numbers and vice versa

$\frac{15}{4} = 3\frac{3}{4}$

$5\frac{2}{6} = \frac{32}{6}$

Calculation Policy Guidance

Addition & Subtraction	Multiplication & Division	Fractions
Pupils should be taught to: • solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why • solve problems involving addition, subtraction, multiplication and division • use their knowledge of the order of operations to carry out calculations involving the four operations • use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy. • perform mental calculations, including with mixed operations and large numbers	**Pupils should be taught to:** • multiply multi-digit numbers up to 4 digits by a two-digit whole number using the efficient written method of long multiplication • divide numbers up to 4 digits by a two-digit whole number using the efficient written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context • identify common factors, common multiples and prime numbers	**Pupils should be taught to:** • use common factors to simplify fractions; use common multiples to express fractions in the same denomination • compare and order fractions, including fractions > 1 • add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions • multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, $\frac{1}{4}$ x $\frac{1}{2}$ = $\frac{1}{8}$] • divide proper fractions by whole numbers [for example, $\frac{1}{3}$ ÷ 2 = $\frac{1}{6}$] • associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example $\frac{3}{8}$] • identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places

Addition	**Subtraction**	**Multiplication**	**Division**

Calculation Policy Guidance

Pupils should practice addition, subtraction, multiplication and division for larger numbers, using the efficient written methods of column addition and subtraction, short and long multiplication, and short and long division.

Mental Methods

Using place value

Count in 0·1s, 0·01s, 0·001s

e.g. *Know what 0·001 more than 6·725 is*

10s	1s	0.1s	0.01s	0.001s
	6	7	2	5

Partitioning
e.g. *9·54 + 3·23 as 9 + 3, 0·5 + 0·2 and 0·04 + 0·03, to give 12·77*

Counting on

Add two decimal numbers by adding the 1s, then the 0·1s/0·01s/0·001s

e.g. *6·314 + 3·006 as*
6·314 + 3 (9·314) + 0·006 = 9·32

Add near multiples of 1
e.g. *6·345 + 0·999*
e.g. *5·673 + 0·9*

Count on from large numbers
e.g. *16, 375 + 12 ,003 as 28 375 + 3*

Add near doubles of decimals,

e.g. 2.5 + 2.6

Mental Methods

Taking away

Use place value to subtract decimals

e.g. *7·782 – 0·08*
e.g. *16·263 – 0·2*

Take away multiples of powers of 10

e.g. *132 956 – 400*
e.g. *686 109 – 40 000*
e.g. *7·823 – 0·5*

Partitioning or counting back

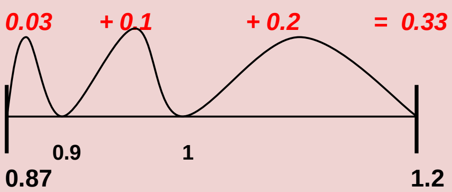
e.g. *3964 – 1051*
e.g. *5·72 – 2·01*

Subtract near multiples of powers of 10

e.g. *360 078 – 99 998*
e.g. *12·831 – 0·99*

Counting up

Find a difference between two decimal numbers by counting up
from the smaller to the larger
e.g. *1·2 – 0·87*



Mental Methods

Doubling and halving

Double decimal numbers with up to 2 places using partitioning
e.g. *double 36·73*

£36.73

£72 *£1.46*

£73.46

Use doubling and halving as strategies in mental multiplication

Grouping

Use partitioning as a strategy in mental multiplication, as appropriate
e.g. *3060 × 4 as*

3000 × 4 (12 000) and 60 × 4 (240) = 12 240

e.g. *8·4 × 8 as*
8 × 8 (64) and 0·4 × 8 (3·2) = 67·2

Use factors in mental multiplication
e.g. *421 × 6 as*

421 × 3 (1263) doubled = 2526

e.g. *3·42 × 5 as*
half of 3·42 × 10 = 17·1

Mental Methods

Doubling and 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)*

36.86

18 *0. 43*

18.43

Use doubling and halving as strategies in mental division

Grouping

Use the 10th, 20th, 30th, … or 100th, 200th, 300th … multiples of
the divisor to divide large numbers
e.g. *378 ÷ 9 as 40 × 9 (360) and 2 × 9 (18), remainder 2*

40 × 9 = 360 *(20 left over)*
<u>2 × 9 = 18</u> *(2 left over)*
<u>42 x 9 = 378</u>

3 80 ÷ 9 = 4 2 r2

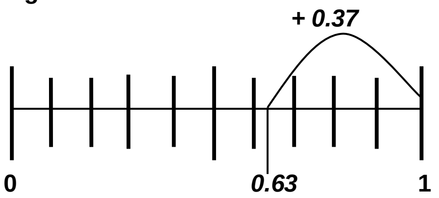
Use tests for divisibility
e.g. *135 divides by 3, and 9 as 1 + 3 + 5 = 9 and 9 is in the ×3 and x 9 tables*

Calculation Policy Guidance

Using number facts

Number bonds to 1 and to the next multiple of 1

e.g. *0·63 + 0·37*
e.g. *2·355 + 0·645*



Add to the next 10
e.g. *4·62 + 5·38*

Demonstrate mental addition

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

Written Methods

Compact column addition for adding several large numbers and decimal numbers with up to 2 decimal places.

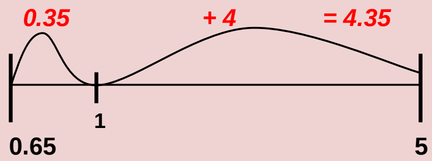
```
  1    1 1
   192 452
+   12 168
   204 620
```

Compact column addition with money

Using number facts

Derived facts from number bonds to 10 and 100

e.g. *0·1 – 0·075 using 75 + 25 = 100*
e.g. *5 – 0·65 using 65 + 35 = 100*



Number bonds to £1, £10 and £100

e.g. *£7·00 – £4·37*
e.g. *£100 – £66·20*
using 20p + 80p = £1
and £67 + £33 = £100

Demonstrate mental addition

Use knowledge of place value and related calculations, e.g.

680 - 430 = 250
6.8 - 4.3 = 2.5
0.68 + 0.43 = 0.25

Written Methods

Compact column subtraction for large numbers
e.g.

```
          3  14  1
  1 9 2 ~~4~~ ~~5~~ 2
- 1 1 2 1 6 8
  1 8 0 2 8 4
```

Multiply decimal numbers using near multiples by rounding
×6 ×6

e.g. *4·3 × 19 as (4·3 × 20) – 4·3 = 81·7*

Using number facts

Use times-tables facts up to 12 × 12 in mental multiplication of large numbers or numbers with up to 2 decimal places

e.g. *6 × 4 = 24 and 0·06 × 4 = 0·24*

Written Methods

Short multiplication of 2-, 3- and 4-digit numbers by 1-digit numbers
e.g. *3743 × 6*

```
    3 7 4 3
x         6
  4   2 1
  2 2 4 5 8
```

Long multiplication of 2-, 3- and 4-digit numbers by 2-digit numbers
e.g. *456 × 38*

```
      4 5 6
x       3 8
    4 4
    3 6 4 8
  1   1
  1 3 6 8 0
  1 7 3 2 8
    1 1
```

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 = 0.39*

is

117 ÷ 3 = 39
39 ÷ *100 = 0.39*

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

Written Methods

Short division of 3- and 4-digit numbers by 1-digit numbers using quotients as fractions or decimals.

e.g. *1396 ÷ 5*

Fraction

```
   0  2  7  9 1/5
5| 1 ¹3 ³9 ⁴6        = 279 1/5
```

Decimal

```
   0  2  7  9 .  2
5| 1 ¹3 ³9 ⁴6 . ¹0   = 279.2
```

e.g. *£14·64 + £28·78 + £12·26*

$$\begin{array}{r} {\scriptstyle 1\;1\;.\;1} \\ 1\,4\,.\,6\,4 \\ +\;2\,8\,.\,7\,8 \\ \underline{1\,2\,.\,2\,6} \\ \underline{5\,5\,.\,6\,8} \end{array}$$

Fractions

Add unlike fractions, including mixed numbers
e.g.

$$\frac{1}{4} + \frac{2}{3} = \frac{3}{12} + \frac{8}{12} = \frac{11}{12}$$

or

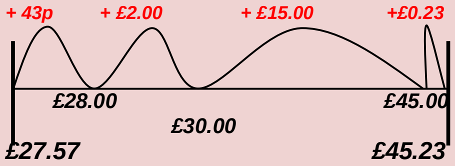
$$2\tfrac{1}{4} + 1\tfrac{1}{3} =$$

$$2\tfrac{3}{12} + 1\tfrac{4}{12} = 3\tfrac{7}{12}$$

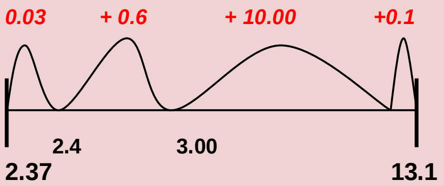
Use counting up for subtractions where the larger number is a multiple or near multiple of 1000 or 10 000

Use counting up subtraction when dealing with money

e.g. *£100 – £78·56*
e.g. *£45·23 – £27·57 = £17.66*



Use counting up subtraction to subtract decimal numbers
e.g. *13·1 – 2·37 = 10.73*



OR

Compact column subtraction with money
e.g. *£28·7 - £12·96*

$$\begin{array}{r} {\scriptstyle 7\;\;.\,16\;1} \\ 2\,\cancel{8}\,.\,\cancel{7}\,0 \\ -\;\underline{1\,2\,.\,9\,6} \\ \underline{1\,5\,.\,7\,4} \end{array}$$

<u>Multiplying decimals</u>

Partition multiplication of numbers with up to 2 decimal places by 1-digit numbers

e.g. 25·*34 × 6 =*

$$\begin{array}{rcr} 20.00 \times 6 &=& \overset{1}{1}20.00 \\ 5.00 \times 6 &=& 30.00 \\ 0.30 \times 6 &=& 1.80 \\ \underline{0.04 \times 6} &=& \underline{0.24} \\ \underline{25.34 \times 6} &=& \underline{152.04} \end{array}$$

Short multiplication of decimal numbers (including money) using

× 10 and ÷ 10 or

× 100 and ÷ 100

Multiply decimals by firstly calculating how many times bigger (10, 100 , 1000 etc)

22.3 x5 (multiply the first number by 10 to make the whole number, 223).

Then use Short / long written multiplication (in this case short multiplication)

$$\begin{array}{r} 2\;2\;3 \\ \underline{\text{x}\qquad\quad 5} \\ {\scriptstyle 1\;\;1\;\;} \\ \underline{1\;1\;1\;5} \end{array}$$

Divide the answer by how many times you made it bigger in the first place.

1115 ÷ 10 = 111.5

So 22.3 x 5 = 111.5

<u>Multiplying 2 decimal numbers.</u>

Long division of 3- and 4-digit numbers by 2-digit numbers

e.g. *4176 ÷ 13*

$$\begin{array}{r} 0\;3\;\;2\;1\;\text{r}3 \\ 13\,\overline{)\,{}^{3}\cancel{4}\;{}^{1}1\;7\;6} \\ -\;\underline{3\;9\;0\;0} \\ 2\;7\;6 \\ -\;\underline{2\;6\;0} \\ 1\;6 \\ -\;\underline{1\;3} \\ 3 \end{array} \qquad \begin{array}{r} 0\;3\;2\;1\,\text{r}\,3 \\ 13\,\overline{)\,{}^{3}\cancel{4}\;{}^{1}1\;7\;6} \\ -\;\underline{3\;9}\;\;\;\; \\ 2\;7\;\;\; \\ -\;\underline{2\;6}\;\;\; \\ 1\;6 \\ -\;\underline{1\;3} \\ 3 \end{array}$$

Level 5/6

$$\begin{array}{r} 0\;3\;4\;8\,.\,1\;6 \\ 12\,\overline{)\,{}^{3}\cancel{4}\;{}^{1}1\;7\;8\,.\,0\;0} \\ -\;\underline{3\;6\;0\;0}\;\;\;\;\;\; \\ \cancel{4}5\;{}^{1}7\;8\;\;\;\;\;\; \\ -\;\underline{4\;8\;0}\;\;\;\;\;\; \\ 9\;8\;\;\;\;\;\; \\ -\;\underline{9\;6}\;\;\;\;\;\; \\ \cancel{1}2\,.\,{}^{1}0\;\;\; \\ -\;\underline{1\,.\,2}\;\;\; \\ \cancel{0}\,.\,{}^{7}8{}^{1}0 \\ -\;\underline{0\,.\,7\;2} \\ 0\,.\,0\;8 \end{array}$$

Give remainders as whole numbers, fractions or decimals

348 r2 or $348\frac{2}{12} = 348\frac{1}{6}$ or 348.16

Fractions

Subtract unlike fractions, including mixed numbers
e.g.

$$\frac{3}{4} - \frac{1}{3} = \frac{9}{12} + \frac{4}{12} = \frac{5}{12}$$

$$2\frac{3}{4} - 1\frac{1}{3} =$$

$$2\frac{9}{12} - 1\frac{4}{12} = 1\frac{5}{12}$$

Counting up subtraction provides a default method for ALL children

E.g. 33.6 X 2.5 = 84

(33.6 x 10) x (2.5 X 10) =

To make both of these numbers a whole number you multiply each one by 10.

10 x 10 = 100 times bigger overall

$$\begin{array}{r} 3\,3\,6 \\ \times \quad 2\,5 \\ \hline 1\,6\,8\,0 \\ 6\,7\,2\,0 \\ \hline 8\,4\,0\,0 \\ \hline \end{array}$$

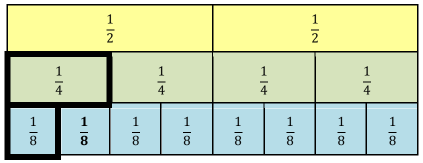
8,400 ÷ 100 = 84

Fractions

Multiply simple pairs of proper fractions
e.g. $\frac{1}{2}$ X $\frac{1}{4}$ = $\frac{1}{8}$

$\frac{1}{2}$ X $\frac{1}{4}$ **actually means** $\frac{1}{4}$ ÷ 2 = $\frac{1}{8}$

or $\frac{1}{2}$ ÷ 4 = $\frac{1}{8}$



Grid multiplication provides a default method for ALL children

Use place value to divide 1- and 2-place decimals by numbers ≤ 12

e.g. ***3.65 ÷ 5 as***

(365 ÷ 5) ÷ 100 = 0·73

$$5\overline{)3\;{}^{3}6\;{}^{1}5} = 0\;7\;3$$

73 ÷ 100 = 0.73

Fractions

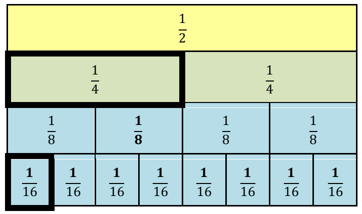
Divide proper fractions by whole numbers

$$\frac{3}{4} \div 4 = \frac{3}{4} \times \frac{1}{4}$$

Which actually means $\frac{1}{4} \div 4 = \frac{1}{16}$

$\frac{1}{16}$ **x 3 means 3 lots of** $\frac{1}{16} = \frac{3}{16}$

So $\frac{3}{4} \div 4 = \frac{3}{16}$



By the end of year 6, children will have a range of calculation methods, mental and written. Selection of methods will depend upon the numbers involved.