Parklands Junior School

Calculation Policy 2019-2020

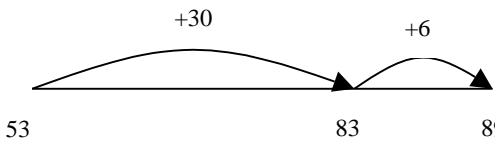| NC Objectives	Year 3: Mental addition	
Add and subtract numbers mentally, including: a three-digit number and 1s, a three digit number and 10s, a three digit number and 100s.	**Using place value** **Count in 100s** e.g. *Know 475 + 200 as 475, 575, 675* 350 375 400 425 450 475 500 525 550 575 600 625 650 675 700 725 **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* $36 + 53 = 53 + 30 + 6$ $\quad = 83 + 6$ $\quad = 89$ +30 +6 53 83 89	**Counting on** 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. *364 + 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*
Year 3: Written addition		
Add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction. **Solve problems, including missing number problems, using number facts, place value and more complex addition and subtraction**	**Expanded column addition** Misconception Child does not understand what each number represents. 2 3 7 + 8 9 1127 Children need to be secure on place value with two digit numbers before moving on to 3 digit numbers. **Children need to be moving between concrete and pictorial methods before attempting the abstract** 5 1 Children can draw a representation of the grid to further support their understanding, carrying the	**Standard column addition** **Abstract:** 3 8 9 3 + 1 1 3 1 Once confident with using expanded addition, children can attempt to use standard method involving adding of single digits.

ten **underneath** the line
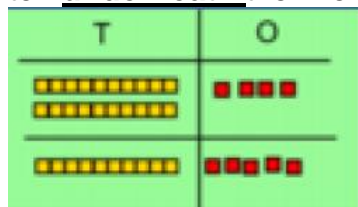
Model using Dienes or numicon. Add together the ones first, then the tens.

Build on partitioning to develop expanded column addition with two 3-digit numbers
e.g. *466 + 358*

```
    400   60   6
+   300   50   8
    700  110  14  = 824
```

Use expanded column addition where digits in a column add to more than the column value

e.g. *466 + 358*

```
    400   60   6
    300   50   8
+   100   10
    800   20   4
```

Compact column addition with 3- and 4-digit numbers Recognise like fractions that add to 1

e.g. *1/4 + 3/4*
e.g. *3/5 + 2/5*

NC objectives	Year 3: Mental subtraction	
Add and subtract numbers mentally, including: a three-digit number and 1s, a three digit number and 10s,	**Taking away** Use place value to subtract e.g. *348 – 300* e.g. *348 – 40* e.g. *348 – 8* **3 4 8**	**Counting up** Find a difference between two numbers by counting up from the smaller to the larger e.g. *121 – 87*

a three digit number and 100s.

Take away multiples
 of 10, 100 and £1
e.g. *476 – 40 =*
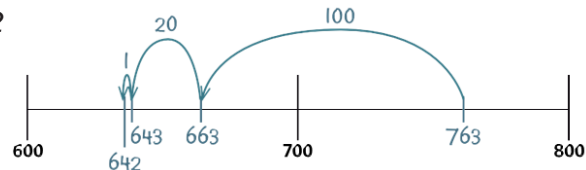 *436*
e.g. *476 – 300 = 176*
e.g. *£4·76 – £2 = £2·76*
Partitioning
 e.g. *68 – 42 as 60 – 40 and 8 – 2*
 e.g. *£6·84 – £2·40 as £6 – £2 and 80p – 40p*
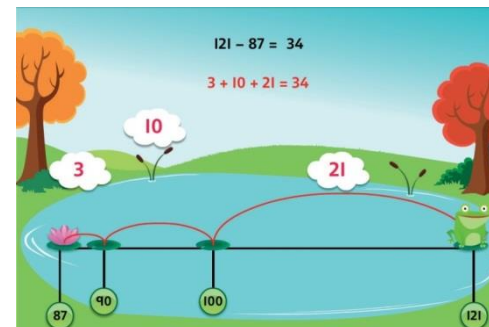
Count back in 100s, 10s then 1s
 e.g. *763 – 121 as 763 – 100 (663) – 20 (643) – 1*
 = 642

Subtract near multiples of
10 and 100 e.g. *648 – 199*
e.g. *86 – 39*

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*

	Year 3: Written subtraction	
	Children need to be secure on place	

Add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction.
        Solve problems, including missing number problems, using number facts, place value and more complex addition and

value with two digit numbers before moving on to 3 digit numbers.
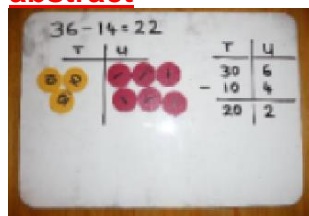

Misconception

Child does not understand what each number represents.
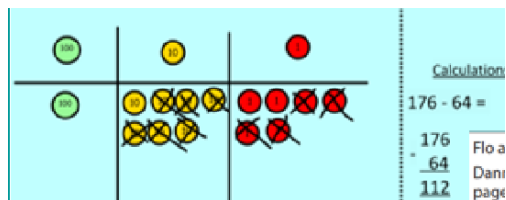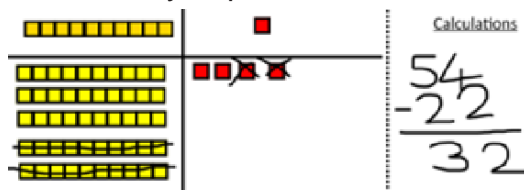
2 3 7 -

8 9
_____

667
_____

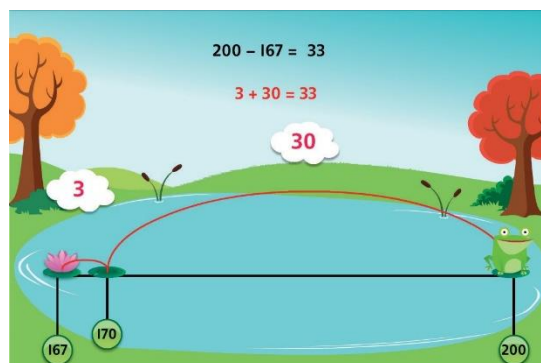**Children need to be moving between concrete and pictorial methods before attempting the abstract**

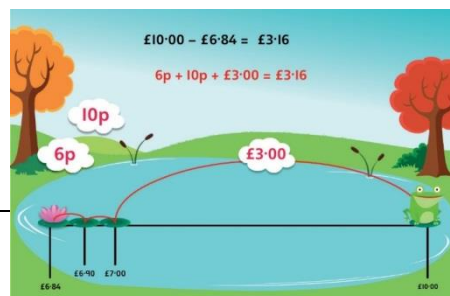Show how you partition numbers to subtract.

Draw the Base 10 or PV counters alongside the written calculation to help show working.

<u>Use of a number line is important for partitioning and subtracting</u>

Develop counting up subtraction e.g. *200 – 167*

Use counting up subtraction to find change from £1, £5 and £10 e.g. *£10·00 – £6·84*

Year 3: Mental multiplication

Recall and use multiplication and division facts for 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

Counting in steps ('clever' counting)

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	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Using a number line

Grouping

Recognise that multiplication is commutative e.g. $4 \times 8 = 8 \times 4$

Multiply multiples of

Doubling and halving

Find doubles of numbers to 50 using partitioning

e.g. *double 48*
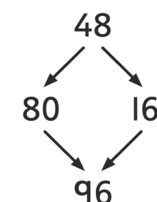
Use doubling as a strategy in multiplying by 2

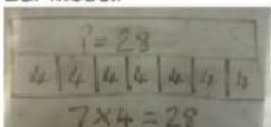e.g. *18 × 2 is double 18 = 36*

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

	10 by 1-digit numbers e.g. *30 × 8 = 240*	Represent multiplication facts using Numicon and bead strings: 8x3=24 Represent using Diennes: 13 x4 13 x4 Bar Model: ?=28 4 4 4 4 4 4 4 7×4=28

	Year 3: Written multiplication	
Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit	**Children need to be secure on the 2,3,4 5 and 8 times tables by the end of the year. Children with poor times table skills will find it difficult to apply this to bigger numbers.**	

numbers times one-digit numbers using mental and progressing to formal written methods

Children need to visually see what happens when a number is multiplied before moving on to the columnar method.

Grid multiplication

Build on partitioning to develop grid multiplication
 e.g. *23 × 4*

×	20	3
4	80	12	= 92

Children need to show an understanding of
multiplying with multiples of 10.
e.g. *20 x 4 = 80*
       70 x 4 = 280
       80 x 5 = 400

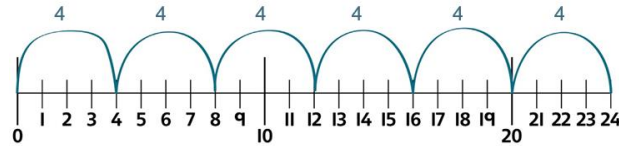|	Year 3: Mental division

Recall and use multiplication and division facts for 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

Counting in steps ('clever' counting)
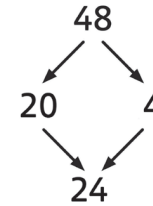
Count in 2s, 3s, 4s, 5s, 8s and 10s

Children need to understand that division is based on repeated addition. They can identify patterns on numbers lines and hundred squares

Doubling and 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

Grouping

Relate division to multiplications 'with holes in'
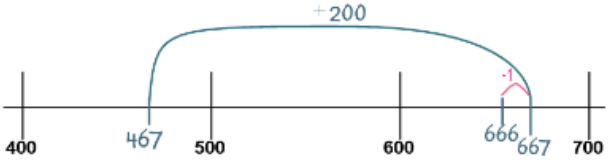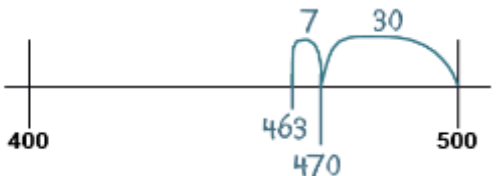
e.g. _ *× 5 = 30 is the same calculation as*

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*

	Year 3: Written division	
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	<u>**Children need to be secure on the 2,3,4,5,8 times tables by the end of the year. Children with poor times tables skills will find it difficult to apply division.**</u> Perform divisions just above the 10th multiple using written jottings, understanding how to give a remainder as a whole number Use division facts to find unit and simple non-unit fractions of amounts within the times-tables e.g. *3/4 of 48 is 3 × (48 ÷ 4) = 36* **Remainders** 16 ÷ 3 = 5 r1 Sharing - 16 shared between 3, how many left over?	

NC objectives	Year 4: Mental addition	
Add and subtract	**Using place value** Count in 1000s	**Using number facts** Number bonds to 100 and to the next

| numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.

Estimate and use inverse operations to check answers to a calculation. | e.g. *Know 3475 + 2000 as 3475, 4475, 5475*
Partitioning
e.g. *746 + 40*
e.g. *746 + 203 as 700 + 200 and 40 and 6 + 3*
e.g. *134 + 707 as 100 + 700 and 30 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* | 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* |

	Year 4: Written addition	
Solve	Children will continue to apply their knowledge of place	Extend to decimals in the context of money (vertically)

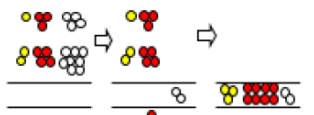| addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why | value to add larger numbers.

Children need to be moving between concrete and pictorial methods before attempting the abstract

Model using Dienes/PV counters to show the carrying into the next column.
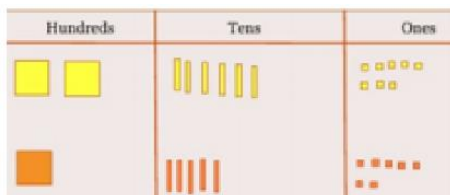
Build on expanded column addition to develop compact column addition with larger numbers

e.g. *1466 + 4868*

 | Introduce decimal PV counters and model exchange for addition
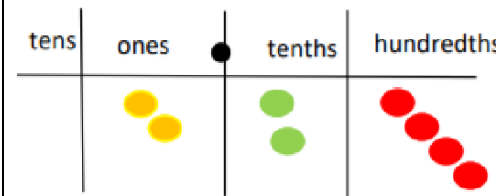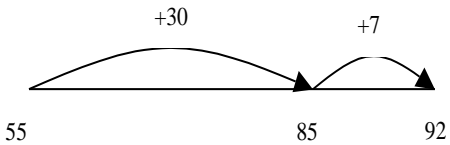
£ 2.50 + £ 1.75 = £ 4.25
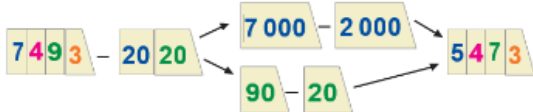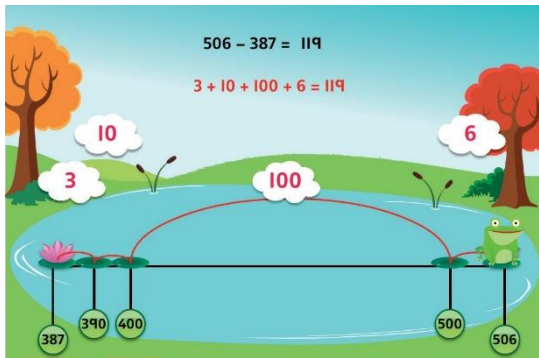
  £ 2.50
+ £ 1.75
  £ 4.25
     ₁

(Revert to expanded methods if the children experience any difficulty.)

Add like fractions
        e.g. *3/8 + 1/8 + 1/8* |

Misconception

Child does not understand what each number represents.

1237 +

189

2127

Compact column addition with larger
numbers e.g. *5347 + 2286 + 1495*

$$
\begin{array}{r}
5347 \\
2286 \\
+\ 1495 \\
121 \\
\hline
9128 \\
\end{array}
$$

Partition into tens and ones and recombine
Either partition both numbers and recombine or partition the
second number only e.g.
55 + 37 = 55 + 30 + 7
= 85 + 7
= 92

55   85   92

Year 4: Mental subtraction		
Add and subtract numbers with up to 4 digits using the formal written methods of	**Taking away** Use place value to subtract e.g. *4748 – 4000* 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*	**Counting up** Find a difference between two numbers by counting up from the smaller to the larger e.g. *506 – 387* e.g. *4000 − 2693*

| **columnar addition and subtraction where appropriate.**

Estimate and use inverse operations to check answers to a calculation. | 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*

7 4 9 3 – 20 20 → 7 000 – 2 000 → 5 4 7 3
               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
   £34.86 - £19.99 |

Using number facts
Number bonds to £1
 and £10 e.g. *£1·00*
 – 86p = 14p
 e.g. *£10·00 – £3·40 = £6·60* |

	Year 4: Written subtraction	
Solve addition and subtraction two-step	**Children will continue to apply their knowledge of place value to add larger numbers.**	

| problems in contexts, deciding which operations and methods to use and why |

| |
| | **Children need to be moving between concrete and pictorial methods before attempting the abstract**

Start with one exchange before moving onto subtraction with two exchanges.

Calculations

234
- 88

Calculations

234
- 88
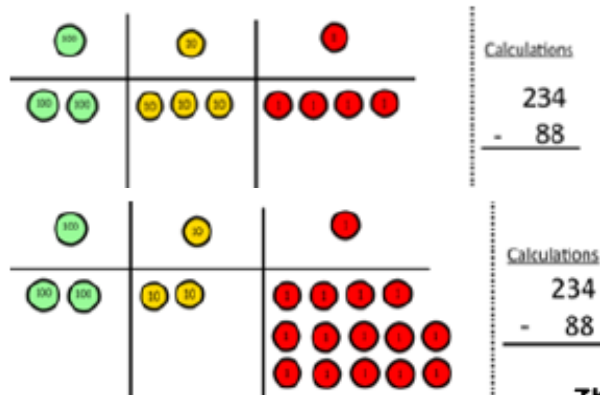
Make the larger number with the place value counters. Start with the ones, can I take away 8 from 4 easily? I need to exchange one of tens for ten ones. | This visual representation will lead to an understanding of subtracting any number including decimals.

$$
\begin{array}{ccccc}
 & 5 & 12 & & 1 \\
2 & \cancel{6} & \cancel{3} & . & \cancel{0} \\
 & 2 & 6 & . & 5 \\
\hline
2 & 3 & 6 & . & 5 \\
\end{array}
$$ |

Draw counters onto a PV grid and show what you
have taken away by crossing the counters out as
well as clearly showing the exchanges you make.

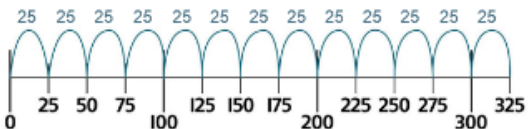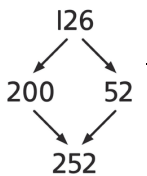Expanded column subtraction with 3- and 4-digit
numbers e.g. *726 – 358*

```
      600  110  16
      7̶0̶0̶  2̶0   6̶
   −  300   50   8
      300   60   8
```

Begin to develop compact column subtraction e.g. *726 –
358*

```
      6  11  16
      7̶  2̶   6̶
   −  3  5   8
      3  6   8
```

Children will have a clear understanding of which each number

represents and the idea behind 'borrowing' a number.

Use counting up subtraction to find change from £10, £20, £50 and £100

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

Subtract like fractions
      e.g. *3/8 − 1/8 = 2/8*

Year 4: Mental multiplication	
Recall multiplication and division facts for multiplication tables up to 12x12 **Use place value, known and derived facts to multiply and divide mentally,**	**Counting in steps (sequences)** 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*

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

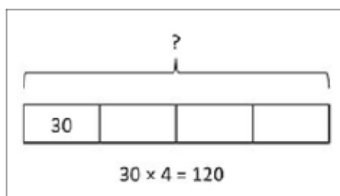| **including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers.** **Recognise and use factor pairs and commutatively in mental calculations**	Begin to double amounts of money e.g. *£3·50 doubled is £7* Use doubling as a strategy in multiplying by 2, 4 and 8 e.g. *34 × 4 is double 34 (68) doubled again = 136* Bar Model:	

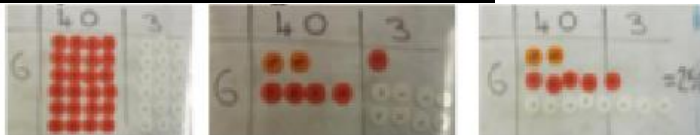| **Year 4: Written multiplication**		
Multiply two digit	**Children will continue to apply their knowledge of place value to add larger numbers.**	Use grid multiplication to multiply 2-digit numbers by 2-digit numbers

and three digit numbers by a one-digit number using formal written layout.

Grid method using PV counters:

Use grid multiplication to multiply 3-digit numbers by 1-digit numbers

e.g. *253 × 6*

×	200	50	3	
6	1200	300	18	= 1518

Use a vertical written algorithm (ladder) to multiply 3-digit numbers by 1-digit numbers

e.g. *253 × 6*

```
      2 5 3
  ×       6
  ─────────
    1 2 0 0 ← 6 × 200
      3 0 0 ← 6 × 50
  +     1 8 ← 6 × 3
  ─────────
    1 5 1 8
```

e.g. *16 × 48*

×	10	6	
40	400	240	= 640
8	80	48	= 128
			768

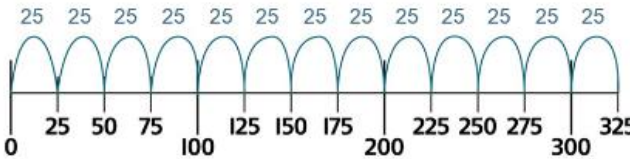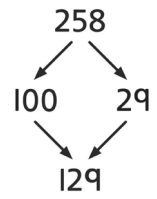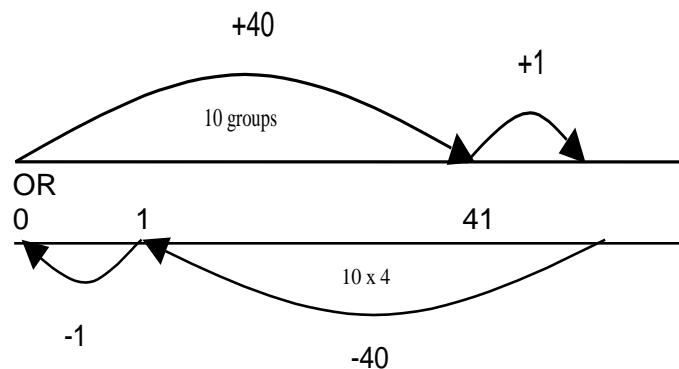|	**Year 4: Mental division**	
Recall multiplication	**Counting in steps (sequences)** Count in 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s, 10s, 11s,	**Grouping** Use multiples of 10 times the divisor to divide

and division facts for multiplication tables up to 12x12

Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers.

Recognise and use factor pairs and commutatively in mental calculations

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*

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*

Year 4: Written division

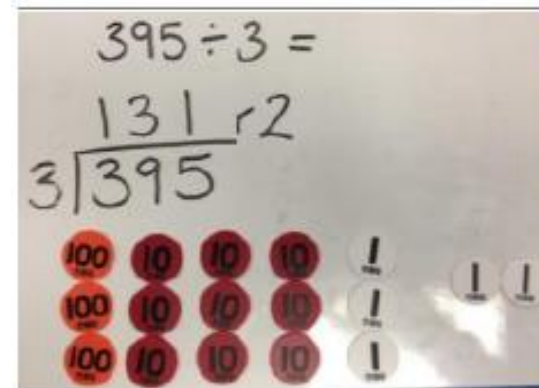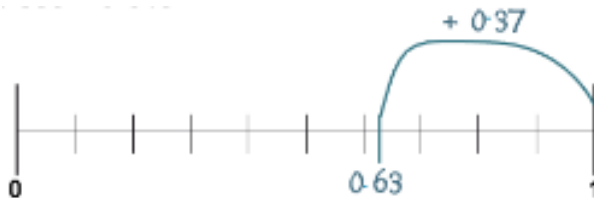| Multiply two digit and three digit numbers by a one-digit number using formal written layout. | **Children will continue to apply their knowledge of place value to division.** **Teachers to encourage children to use a range of strategies to solve a problem.**

Remainders
41 ÷ 4 = 10 r1

OR   41 = (10 x 4) + 1

Pencil and paper procedures
72 ÷ 5 lies between 50 ÷ 5 = 10 and 100 ÷ 5 = 20

    72
-   50   (10 groups) or (10 x 5)
    22
-   20   (4 groups) or (4 x 5)
    2

  Answer : 14 remainder 2

Fractions
  Use division facts to find unit and non-unit | More confident children will be able to apply their understanding to the short division method.

With PV counters:

 |

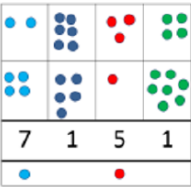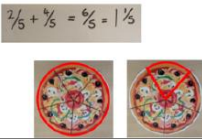| Multiply two digit and three digit numbers by a one-digit number using formal written layout. | **Children will continue to apply their knowledge of place value to division.** **Teachers to encourage children to use a range of strategies to solve a problem.**

Remainders
41 ÷ 4 = 10 r1

+40
+1
10 groups
OR
0   1   41
10 x 4
-1
-40
OR   41 = (10 x 4) + 1

Pencil and paper procedures
72 ÷ 5 lies between 50 ÷ 5 = 10 and 100 ÷ 5 = 20

    72
-   50   (10 groups) or (10 x 5)
    22
-   20   (4 groups) or (4 x 5)
    2

  Answer : 14 remainder 2

Fractions
  Use division facts to find unit and non-unit | More confident children will be able to apply their understanding to the short division method.

137 r 5
7) 9²6⁵4

With PV counters:

395 ÷ 3 =
131 r2
3) 395 |

	fractions of amounts within the times-tables e.g. *7/8 of 56 is 7 × (56 ÷ 8) = 48*	

NC objectives	Year 5: Mental addition	
Add and subtract numbers mentally with increasingly large numbers **Use rounding to check answers to calculations and determine, in the context of the problem, levels of accuracy** **Solve addition and subtraction multi-step problems in contexts deciding which operations and methods to use and why**	**Using place value** Count in 0·1s, 0·01s e.g. *Know what 0·1 more than 0·51 is* 		10s	1s	0·1s	0·01s
---	---	---	---
	0	5	1 | Partitioning e.g. *2·4 + 5·8 as 2 + 5 and 0·4 + 0·8 and combine the totals: 7 + 1·2 = 8·2* | 0·1	0·2	0·3	0·4	0·5	0·6	0·7	0·8	0·9	1
---	---	---	---	---	---	---	---	---	---
1·1	1·2	1·3	1·4	1·5	1·6	1·7	1·8	1·9	2
2·1	2·2	2·3	2·4	2·5	2·6	2·7	2·8	2·9	3
3·1	3·2	3·3	3·4	3·5	3·6	3·7	3·8	3·9	4
4·1	4·2	4·3	4·4	4·5	4·6	4·7	4·8	4·9	5
5·1	5·2	5·3	5·4	5·5	5·6	5·7	5·8	5·9	6
6·1	6·2	6·3	6·4	6·5	6·6	6·7	6·8	6·9	7
7·1	7·2	7·3	7·4	7·5	7·6	7·7	7·8	7·9	8
8·1	8·2	8·3	8·4	8·5	8·6	8·7	8·8	8·9	9
9·1	9·2	9·3	9·4	9·5	9·6	9·7	9·8	9·9	10		**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*

Add to the next 10 from a decimal number
e.g. *7·8 + 2·2 = 10*

Year 5: Written addition		
Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)	Children to continue using appropriate resources to support their reasoning skills. Emphasis to be put on to the reasoning. **Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.** Money:	Add related fractions e.g. *3/4 + 1/8 = 7/8* **Add or subtract the nearest multiple of 10 or 100, then adjust** Continue as in Year 2, 3 and 4 but with appropriate numbers e.g. 458 + 79 = is the same as 458 + 80 - 1

Sam [ ] + £6·20
Tom [ ]
} £67·80
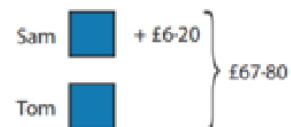
£67·80 – £6·20 = £61·60
£61·60 ÷ 2 = £30·80
Tom has £30·80

Bar Models

Expanded column addition for money leading to compact column addition for adding several amounts of money

e.g. *£14·64 + £28·78 + £12·26*
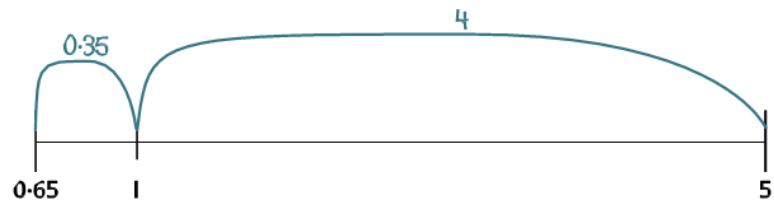
```
     £14   60p   4p
     £28   70p   8p
  +  £12   20p   6p
      £1   10p
  ─────────────────
     £55   60p   8p
```

Compact column addition to add pairs of 5-digit numbers Continue to use column addition to add towers of several larger numbers

Bar Models for adding decimals:

9·5	
3·8	5·7
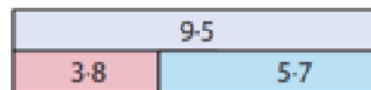
Use compact addition to add decimal numbers with up to 2 decimal places

e.g. *15·68 + 27·86*

$$
\begin{array}{r}
15·68 \\
+\ 27·86 \\
11·1 \\
\hline
43·54 \\
\hline
\end{array}
$$

Revert to expanded methods if the children experience any difficulty.

Year 5: Mental subtraction

Add and subtract numbers mentally with increasingly large numbers

Use rounding to check answers to calculations and determine, in the context of the problem, levels of accuracy

Solve addition and subtraction

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*

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*

multi-step problems in contexts deciding which operations and methods to use and why	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 (or money) by counting up from the smaller to the larger e.g. *£12·05 − £9·59* e.g. *2009 – 869* 	e.g. *£100 – £66 using 66 + 34 = 100*
	Year 5: Written subtraction	
Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)	<u>**Children to continue using appropriate resources to support their reasoning skills. Emphasis to be put on to the reasoning.**</u> <u>**Children can draw a pictorial representation of the columns and use PV counters to further support their learning and understanding.**</u> **(as year 4)**	
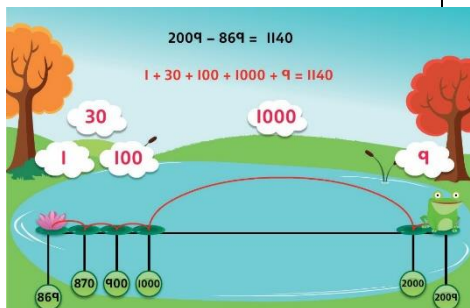
Compact column subtraction for numbers with up to
5 digits e.g. *16 324 – 8516*

$$
\begin{array}{ccccc}
0 & 15 & 13 & 1 & 14 \\
\cancel{1} & \cancel{6} & \cancel{3} & \cancel{2} & \cancel{4} \\
- & & 8 & 5 & 1 & 6 \\
\hline
 & 7 & 8 & 0 & 8 \\
\hline
\end{array}
$$
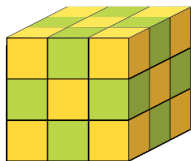
Continue to use counting up subtraction for subtractions
involving money, including finding change
e.g. *£50 − £28·76*

| 4p | 20p | £1 | | £20 |

£28·76 £28·80 £29 £30 £50
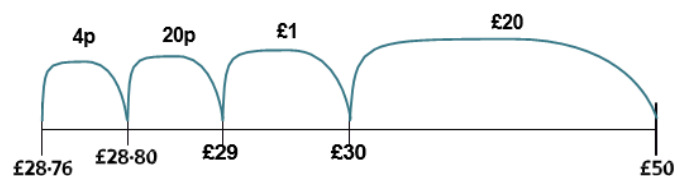
Use of a bar model in order to represent a 'part' during a missing no.
subtraction problem. This can be linked to decimals.

344−187=
344
187 | ?=157

6,505−1,599=4,906
6,505
?=4,906 | 1,599

Subtract related fractions

e.g. *3/4 − 1/8 = 5/8*

NB Counting up subtraction provides a default method for ALL children

Year 5: Mental multiplication

Identify multiples and factors including finding all factor pairs of a number and common factors of 2 numbers

Know and use vocabulary of prime numbers, prime factors and composite (non-prime) numbers

Establish whether a number up to 100 is prime and recall prime

Doubling and halving

Double amounts of money using partitioning

e.g. *double £6·73*

£6·73
£12   £1·46
£13·46

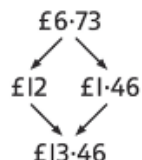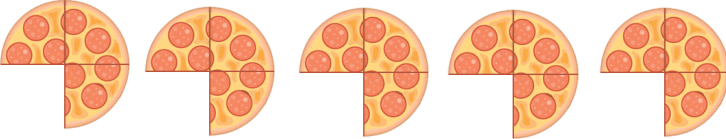Use doubling and halving as a strategy in multiplying by 2, 4, 8, 5 and 20

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 4 × 3 (12) and 0·5 × 3 (1·5) = 13·5*

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
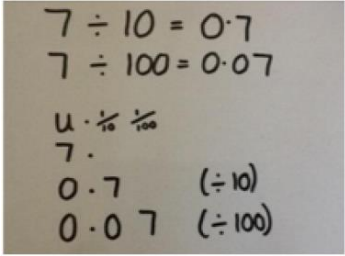
numbers up to 19 **Multiply and divide numbers mentally, drawing upon known facts** **Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000** **Recognise and use square numbers and cube numbers and the notation for squared and cubed** **Solve problems involving multiplication and division, including using their knowledge of factors and multiples,**	Multiply near multiples by rounding e.g. *32 × 29 as (32 × 30) – 32 = 928*	

squares and cubes **Solve problems involving addition subtraction multiplication and division and a combination of these, including understanding the meaning of the equals sign**	
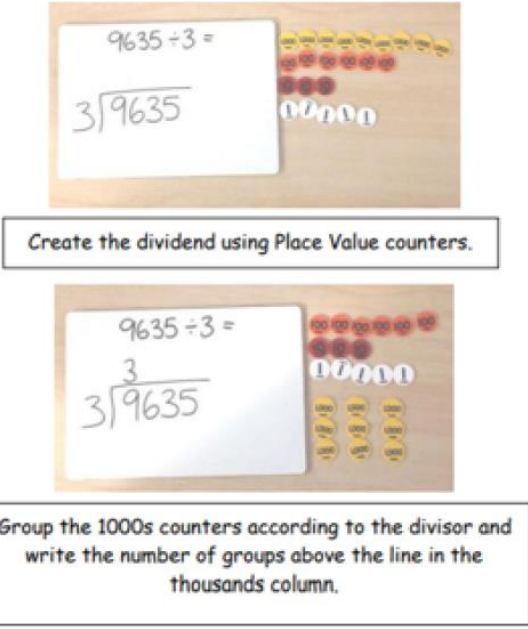
	Year 5: Written multiplication	
| **Multiply numbers up to 4 digits by a one or two-digit number using a formal written method, including long multiplication** | Short multiplication of 2-, 3- and 4-digit numbers by 1-digit numbers<br>e.g. *435 × 8*<br><br>```
  4 3 5
×     8
  2 4
─────────
3 4 8 0
```<br><br>Long multiplication of 2-, 3-and 4-digit numbers by 'teen' numbers<br>e.g. *48 × 16* | Multiply fractions by 1-digit numbers<br>e.g. *3/4 × 6 = 18/4 = 4 2/4 = 4 1/2*<br><br><br><br>**NB Grid multiplication provides a default method for ALL children** |

for two-digit numbers **Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates**	$$\begin{array}{r} 4\ 8 \\ \times\ 1\ 6 \\ \hline 4\ 8\ 0 \\ 2\ 8\ ^4 8 \\ 1 \\ \hline 7\ 6\ 8 \end{array}$$ Grid multiplication of numbers with up to 2 decimal places by 1-digit numbers e.g. *1·34 × 6* 	×	1	0·3	0·04	
---	---	---	---	---

6	6	1·8	0·24	= 8·04		Extend to simple decimals with one decimal place.
						
						12.5
						x 2
						  1.0 (2.0 x 0.5)
						  4.0 (2.0 x 2.0)
						20.0 (2.0 x 10.0)
						25.0

Year 5: Mental division		

Identify multiples and factors including finding all factor pairs of a number and common factors of 2 numbers	**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)*
	
	£14·84
	£7 42p
	£7·42
		Using number facts
		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

Know and use 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 and divide numbers mentally, drawing upon known facts
 	
Multiply and divide whole numbers and those involving decimals by
	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*
	
	Divide numbers by 10, 100, 1000 to obtain decimal answers with up to 3 decimal places
	  e.g. *340 ÷ 100 = 3·4*
	
	$7 ÷ 10 = 0·7$
	$7 ÷ 100 = 0·07$
	
	$u · \frac{1}{10} \frac{1}{100}$
	$7 ·$
	$0·7$　　$(÷10)$
	$0·07$　$(÷100)$
	
	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)*
	
	$186 ÷ 6 = \Box$
	
	$\Box × 6 = 186$　　$186 ÷ 6 = 31$
	$30 × 6 = 180$
	　　　　　　6
	$1 × 6 = \quad 6$
	　　　　　　0
	31	

10, 100 and 1000 **Recognise and use square numbers and cube numbers and the notation for squared and cubed** **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		
Year 5: Written division		
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 **Solve problems involving multiplication and division,**	<u>**Children to continue to use appropriate resources to support understanding of division**</u> Short division using PV counters 9635 ÷ 3 = 3⟌9635 Create the dividend using Place Value counters. 9635 ÷ 3 = 3 3⟌9635 Group the 1000s counters according to the divisor and write the number of groups above the line in the thousands column.	

including scaling by simple fractions and problems involving simple rates

9635 ÷ 3 =

Group the 100s counters according to the divisor and write the number of groups above the line in the hundreds column.

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

4 6 r 1

3 | 1 3 ¹9

Give remainders as whole numbers or as fractions Find unit and non-unit fractions of large amounts   e.g. *3/5 of 265 is 3 × (265 ÷ 5) = 159*

Long division

353 ÷ 15 = 23 r 8

Turn improper fractions into mixed numbers and vice versa

NC objectives	Year 6: Mental addition	
Perform mental calculations with mixed operations to carry out calculations involving the four operations **Solve multi-step problems in contexts, deciding which operations and methods to use and why** **Solve problems involving addition and**	**Using place value** Count in 0·1s, 0·01s, 0·001s e.g. *Know what 0·001 more than 6·725 is* 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 multiple s of 1 e.g. *6·345* + *0·999* e.g. *5·673 + 0·9*	**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*

subtraction	Count on from large numbers
	e.g. *16 375 + 12 003 as 28 375 + 3*
Use estimation to check calculations and determine, in the context of the problem, an appropriate degree of accuracy.	

	Children use their previous learning of addition to solve more complex addition, subtraction, multiplication and division problems. Children can use the resources to either physically or pictorially explain their mathematical thinking.	Partition into hundreds, tens, ones and decimal fractions
	Compact column addition for adding several large numbers and decimal numbers with up to 2 decimal places	and recombine
	Compact column addition with money e.g. £14·64 + £28·78 + £12·26	Either partition both numbers and recombine or partition the second number only e.g. 35.8 + 7.3 = 35.8 + 7 + 0.3 = 42.8 + 0.3 = 43.1
		+7 +0.3
		35.8 42.8 43.1

$$£14·64$$
$$+ £28·78$$
$$£12·26$$
$$11·1$$
$$£55·68$$

81,059 + 3,668 + 15,301 + 20,551 = 120,579

Add unlike fractions, including mixed numbers

e.g. *1/4 + 2/3= 11/12*

e.g. *2 1/4 + 1 1/3 = 3 7/12*

Year 6: Mental subtraction	
Taking away	**Using number facts**
Use place value to subtract decimals	Derived facts from number bonds to 10 and 100 e.g. *0·1 – 0·075 using 75 + 25 = 100*
e.g. *7·782 – 0·08*	e.g. *5 – 0·65 using 65 + 35 = 100*
e.g. *16·263 – 0·2*	
Take away multiples of powers of 10 e.g. *132 956 – 400*	Number bonds to £1, £10 ,£100 and £1000 e.g. *£7·00 – £4·37*
e.g. *686 109 – 40 000*	e.g. *£100 – £66·20 using 20p + 80p = £1 and £67 + £33 = £100*
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* 	

Year 6: Written subtraction	
Children use their previous learning of subtraction to solve more complex problems. Children can use the resources to either physically and pictorially explain their mathematical thinking,	Subtract unlike fractions, including mixed numbers e.g. *3/4 – 1/3 = 5/12* e.g. *2 3/4 – 1 1/3 = 1*

Compact column subtraction for large numbers e.g. *34 685 – 16 458*

```
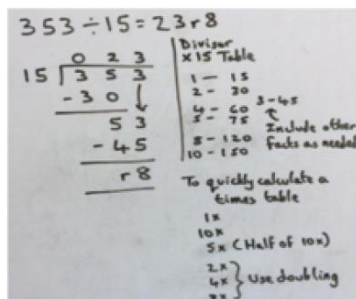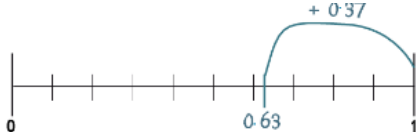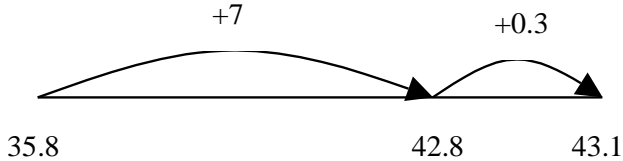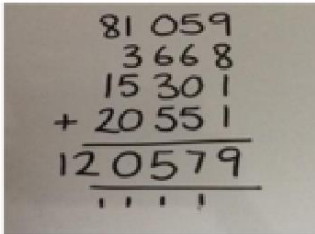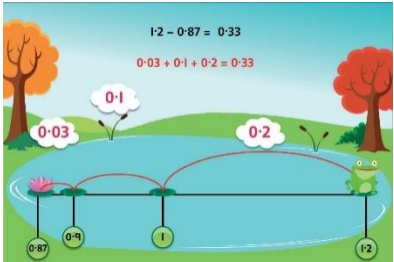  2  14      7  15
  3̶  4̶  6   8̶  5̶
- 1  6  4   5  8
  1  8  2   2  7
```

$$\frac{4}{6} - \frac{1}{3} = \frac{2}{6}$$

$$\frac{1}{3} = \frac{2}{6}$$

$$\frac{4}{6} - \frac{2}{6} = \frac{2}{6}$$

NB Counting up subtraction provides a default method for ALL children

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*

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

$3 \cdot 21 - 1 \cdot 8 =$

$$
\begin{array}{r}
\overset{2}{3} \cdot {}^{1}21 \\
- \ 1 \cdot 8\,0 \\
\hline
2 \cdot 41 \\
\hline
\end{array}
$$

Zero used as place holder

	Year 6: Mental multiplication	
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**	**Doubling and halving** Double decimal numbers with up to 2 places using partitioning e.g. *double 36·73* £6·73 £12 £1·46 £13·46 Use doubling and halving as strategies in mental multiplication **Grouping** Use partitioning as a strategy in mental multiplication, as	**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*

| operations to carry out calculations involving the 4 operations

Use estimation to check answers to calculations and determine, in the context of the problem, an appropriate degree of accuracy | 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*
Multiply decimal numbers using near multiples by rounding e.g. *4·3 × 19 as (4·3 × 20) − 4·3 = 81·7* | |

	Year 6: Written multiplication	
Multiply multi-digit numbers up to 4 digits by a two-digit whole	Short multiplication of 2-, 3- and 4-digit numbers by 1-digit numbers e.g. *3743 × 6*	Grid multiplication of numbers with up to 2 decimal places by 1-digit numbers e.g. *6·76 × 4*

×	6	0·7	0·06	
4	24	2·8	0·24	= 27·04

| number using the formal written method of long multiplication | 3 7 4 3
×   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
×   3 8
1 3 6 8 0
3 6 4 4 8
1 1
―――――
1 7 3 2 8

Short multiplication of decimal numbers using × 100 and ÷ 100
e.g. *13·72 × 6 as (1372 × 6) ÷ 100 = 82·32*
Short multiplication of money e.g.
£13·72 × 6
£ 1 3.7 2
×   6
2 4 1
―――――
£ 8 2 .3 2 | Multiply simple pairs of proper fractions
e.g. 1/2 × 1/4 = 1/8

NB Grid multiplication provides a default method for ALL children

Extend to decimals with up to two decimal places.

12.5
x2.5
 1.25 (2.5 x 0.5)
 5.0   (2.5 x 2.0)
25.0   (2.5 x 10.0)
31.25 |

Year 6: Mental division

| Perform mental calculations | **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)* | **Using number facts** |

, 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 4 operations

Use estimation to check answers to calculations and determine,

36·86

18   0·43

18·43

Use doubling and halving as strategies in mental division

Grouping (chunking)

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*

186 ÷ 6 = ☐

☐ × 6 = 186   186 ÷ 6 = 31
30 × 6 = 180
                      6
1 × 6 =   6
                      0
31

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

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

in the context of the problem, an appropriate degree of accuracy		

	Year 6: Written division	
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	<u>**Children use their previous learning to solve more complex division problems. Children can use resources to either physically or pictorially explain their mathematical thinking.**</u> Short division of 3- and 4-digit numbers by 1-digit numbers e.g. *139 ÷ 3* $$\begin{array}{r} 4\ 6\ \text{r}\,1 \\ 3\,\overline{)\,1\ 3\ {}^1 9} \end{array}$$ Long division of 3- and 4-digit numbers by 2-digit numbers e.g. *4176 ÷ 13*	Begin to apply division methods to decimal numbers. Either through long or short division $$5\,\overline{)\,68.5}$$ So, $6.85 \div .5 = 13.7$

| **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, and interpret according to the context** | $$300 + 20 + 1, r\, 3 \qquad 4176 \div 13 = 321\ r\ 3$$ $$13\,\overline{)\,4176}$$ $$\underline{-3900}$$ $$276$$ $$\underline{-260}$$ $$16$$ $$\underline{-13}$$ $$3$$ Give remainders as whole numbers, fractions or decimals Use place value to divide 1- and 2-place decimals by numbers ≤ 12 e.g. *3.65 ÷ 5 as (365 ÷ 5) ÷ 100 = 0·73* Divide proper fractions by whole numbers | Dividing decimals: $$^1/_3 \div 2 = {}^1/_6$$ |