Cadmore End Primary School Calculations Policy May 2021

Year 1 - 6

Introduction and rationale

The Cadmore End calculations policy has been written in conjunction with the Hamilton trust scheme adopted by the school in 2020. https://www.hamilton-trust.org.uk/maths/

The idea of this policy is to promote consistency throughout the whole school and strengthen assessment practise in maths. This whole-school strategy will continue to strengthen pupil's own learning and assessment results.

Having a clear and consistent curriculum strategy throughout our school enables teachers to ensure that children are hearing consistent language and using progressive methods that build from one year to the next.

Our whole school approach facilitates teacher communication about objectives, assessment and children's achievement in every year group.

Calculation Strategies

Hamilton's calculation strategies set out methods of mental and written methods for addition, subtraction, multiplication and division from Year 1 through to Year 6. Articulated for each year group, these methods ensure consistency of teacher input and progression in pupil learning. They spell out the steps that children need to take to master these four operations. By ensuring that the language is pedagogically correct, the strategy helps promote understanding in Key Stage 1, while laying the correct building blocks for understanding with greater sophistication in Key Stage 2.

This policy enables teachers and pupils to easily see how one year builds on from another. Teachers have layout models that are clear and mathematically correct so that children do not build up misconceptions through their early years that they will need to unpick later.

Addition/Subtraction Calculation Strategy

The addition/subtraction calculation strategy covers place value and its use in mental and written addition and subtraction from Year 1 through to Year 6. Counting on, counting up, number facts and compact and expanded column addition are progressively described and illustrated.

Addition and subtraction are inverse operations. Right from the start children are taught these as related operations. There are four number sentences (two using + and two using -) which can be written to express the relationship between 4 and 6 and 10. It is key to a good

understanding of addition and subtraction that 6 + [] = 10 and 10 - 6 = [] are seen as ways of expressing the same question.

Multiplication/Division Calculation Strategy

The multiplication/division calculation strategy covers mental and written multiplication and from Year 1 through to Year 6. Clever counting, grouping, doubling and halving, grid multiplication and short and long written division are progressively described and illustrated.

Multiplication and division are inverse operations. Right from the start children are taught these as related operations. There are four number sentences (two using x and two using ÷ which can be written to express the relationship between 5 and 9 and 45. It is key to a good understanding of division that [] x 5 = 45 and 45 ÷ 5 = [] are seen as ways of expressing the same question.

Year 1

+ Addition

Using place value
Count on in ones/counting in tens, *e.g. knowing 45 + 1 or 45 + 10 without counting on in ones.*

$45 + \boxed{} = 50$ $65 + \boxed{} = 70$

$85 + \boxed{} = 90$

Counting on
Count on in ones, *e.g. 11 + 2 =* and *7 + 4 =*
Count on in tens, *e.g. 45 + 20 as 45, 55, 65*

Using number facts
'Story' of 4, 5, 6, 7, 8 and 9, *e.g. 7 = 7 + 0 or 6 + 1 or 5 + 2 or 4 + 3.*
Number bonds to 10, *e.g. 5 + 5 , 6 + 4, 7 + 3, 8 + 2, 9 + 1, 10 + 0.*

$6 + \boxed{} = 10$ $7 + \boxed{} = 10$

| 10 |
| 5 | ? |
$5 + \boxed{} = 10$

| 10 |
| 9 | ? |
$9 + \boxed{} = 10$

> Bead strings and 1-100 number grid help counting on/back in tens.

> Missing number sentences, $3 + [] = 7$, link addition and subtraction.
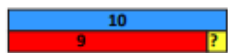
Patterns using known facts, *e.g. 4 + 3 = 7 so we know 24 + 3, 44 + 3, 74 + 3, etc.*
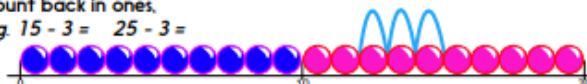
.

- Subtraction

Using place value
Count back in 1s/Count back in 10s.
Say one less than any number to 100.
Say 10 less <u>without</u> counting back in ones.

$33 - 10 = 23$

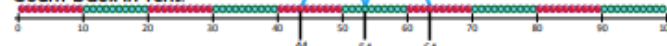| 1 | 2 | 3 | 4 | 5 |
11	12	13	14	15
21	22	23	24	25
31	32	33	34	35
41	42	43	44	45

Subtracting by taking away
Count back in ones,
e.g. 15 - 3 =   25 - 3 =
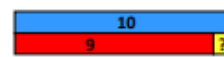
Count back in tens.

Using number facts
'Story' of 4, 5, 6, 7, 8 and 9, *e.g. 7 - 1 = 6, 7 - 2 = 5, 7 - 3 = 4, etc.*
Number bonds to 10, *e.g. 10 - 1 = 0, 10 - 2 = 8, 10 - 3 = 7, etc.*

$10 - \boxed{} = 7$

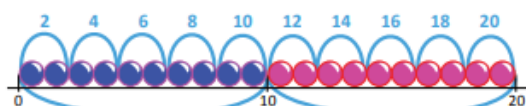| 10 |
| 9 | ? |
$10 - \boxed{} = 9$

Patterns using known facts,
e.g. 10 - 7 = 3 so we know 30 - 7 = ?

x Multiplication

Counting in steps ('Clever' counting)
Count in 2s and 10s.

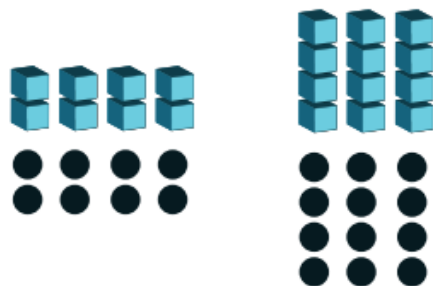2 4 6 8 10 12 14 16 18 20

Doubling and halving
Find doubles to double 6 using fingers.
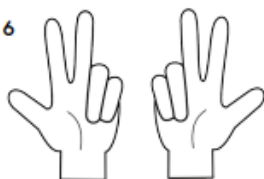
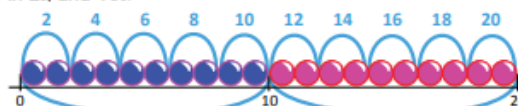> 'Clever' counting is an excellent basis for multiplication and division.

Grouping
Begin to use visual and concrete arrays and 'sets of' objects to find the answers to '3 lots of 4' or '2 lots of 5', etc.

÷ Division

Couting in steps ('Clever' counting)
Count in 2s, and 10s.

2 4 6 8 10 12 14 16 18 20

Doubling and halving
Find half of even numbers up to 12 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 *how many towers of 3 can I make with 12 cubes?'*

Sharing
Begin to find half of a quantity using sharing, *e.g half of 16 cubes by giving one each repeatedly to two children.*

> Division must be presented as the inverse of multiplication (grouping).

8

Year 2

+ Addition

Using place value
Know 1 more or 10 more than any number, e.g. 1 more than 67 or 10 more than 85.

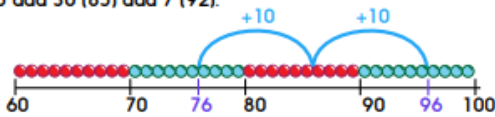Partitioning, e.g. 55 + 37 as 50 + 30 and 5 + 7 finally combining the two totals: 80 + 12.

$$50 + 30 = 80$$
$$5 + 7 = 12$$
$$80 + 12 = 92$$

> Bead strings and 1-100 number grid help counting on/back in tens.

Counting on
Add ten and mupltiples of ten, e.g. 76 + 20 as 76 , 86, 96 or in one hop 76 + 20. Add two 2-digit numbers by counting on in tens and then in ones, e.g. 55 + 37 as 55 add 30 (85) add 7 (92).
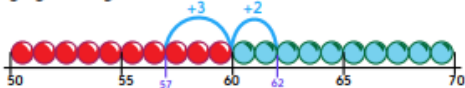
+10   +10

60   70   76   80   90   96   100

Add near multiples, e.g. 46 + 19 or 63 + 21.

Using number facts
Know pairs of numbers which make the numbers up to and including 10, e.g. 8 = 4&4, 3&5, 2&6, 1&7 and 10 = 5&5, 4&6, 3&7, 2&8, 1&9, 0&10.
Patterns of known facts, e.g. 6 + 3 = 9, so we know 36 + 3 = 39, 66 + 3 = 69, 53 + 6 = 59.
Bridging ten, e.g. 57 + 5 as 57 add 3 then add 2 more.

+3   +2

50   55   57   60   62   65   70

> Missing number sentences, 3 + [] = 7, link addition and subtraction.

Adding three or more single-digit numbers, spotting bonds to 10 or doubles, e.g. 6 + 7 + 4 + 2 as 10 + 7 + 2.

- Subtraction

Using place value
Know 1 less or 10 less than any number, e.g. 1 less than 74 or 10 less than 82.

Partitioning, e.g. 55 - 32 as 50 - 30 and 5 - 2 combining the answers: 20 + 3.

$$50 - 30 = 20$$
$$5 - 2 = 3$$
$$55 - 32 = 23$$

Taking away
Subtract ten and multiples of ten, e.g. 76 - 20 as 76, 66, 56 or in one hop 76 - 20 = 56. Subtract two 2-digit numbers by counting back in tens then in ones, e.g. 67 - 33 as 67 subtract 30 (37) then count back 3 (34).
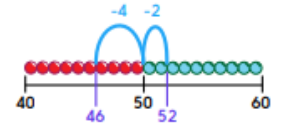
-3   -30

30   34 37 40   50   60   67 70
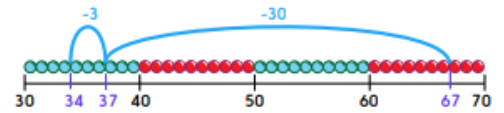
Subtracting near multiples, e.g. 74 - 21 or 57 - 19.

Using number facts
Know pairs of numbers which make the numbers up to and including 10, e.g. 10 - 6 = 4, 8 - 3 = 5, 5 - 2 = 3, etc.
Patterns of known facts, e.g. 9 - 6 = 3, so we know 39 - 6 = 33, 69 - 6 = 63, 89 - 6 = 83.

Bridge ten, e.g. 52 - 6 as 52 subtract 2 then subtract 4 more.

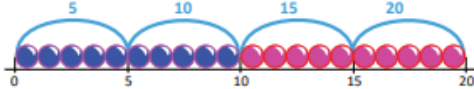-4   -2

40   46   50   52   60

Counting up
Find a difference between two numbers on a line, e.g. 51 - 47.

x Multiplication

Counting in steps ('Clever' counting)
Count in 2s, 5s and 10s.

5   10   15   20

0   5   10   15   20
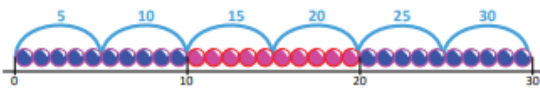
Begin to count in 3s.

Doubling and halving
Begin to know doubles of multiples of 5 to 100, e.g. double 35 is 70.

Grouping
Use arrays to find answers to multiplication and relate to 'clever' counting, e.g. 3 x 4 as three lots of four things and 6 x 5 as six steps in the 5s count as well as six lots of five.

5   10   15   20   25   30

0   10   20   30

Understand that 5 x 3 can be worked out as three 5s or five 3s.

Use number facts
Know doubles to double 20

> Division, grouping, is the inverse of multiplication.

Double 7 = 14

Start learning 2x, 5x, 10x tables, relating these to 'Clever counting' in 2s, 5s, and 10s, e.g. 5 x 10 = 50, and 10, 20, 30, 40, 50 is five steps in the tens count.

> 'Clever' counting is an excellent basis for multiplication and division.

÷ Division

Counting in steps ('Clever' counting)
Count in 2s, 5s and 10s

5   5   5

0   5   10   15
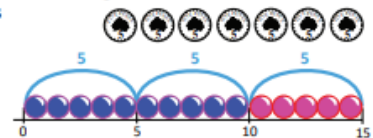
Doubling and halving
Find half of numbers up to 40, including realising that half of an odd number gives a remainder of 1 or an answer containing a ½.
Begin to know half of multiples of 10 to 100, e.g. half of 70 is 35.

Grouping
Relate division to multiplication by using arrays of towers of cubes to find anwers to division, e.g. how many towers of five cubes can I make from 20 cubes as ☐ x 5 = 20 and also as 20 ÷ 5 = ?

Relate division to 'clever' counting and hence to multiplication, e.g. how many 5s do I count to get to 20?

Sharing
Begin to find half or a quarter of a quantity using sharing, e.g. ¼ of 16 cubes by sorting the subes into four piles.
Find ¼, ½, ¾ of small quantities.

half of 20 is...

20	
?	?

Using number facts
Know halves of even numbers to 24.
Know 2x, 5x and 10x division facts.
Begin to know 3x division facts.

Year 3

+ Addition

Using place value
Count in hundreds, e.g. knowing 475 + 200 as 475, 575, 675.

Add multiples of 10, 100 and £1,
e.g. 746 + 200 or 746 + 40 or
£6.34 + £5 as £6 + £5 and 34p.

Partitioning, e.g. 68 + 74 as 60 + 70 and 8 + 4 and
combine the totals: 130 + 12 = 142
Or £8.50 + £3.70 as £8 + £3 and 50p + 70p and combine: £11 + £1.20.

Counting on
Add 2-digit numbers by adding the multiple of ten then the ones,
e.g. 67 + 55 as 67 add 50 (117) add 5 (122).
Add near multiples of 10 and 100, e.g. 67 + 39 or 364 + 199.

225 + 49
+50   -1
225   274   275
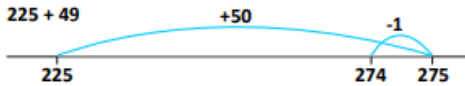
Count on from 3-digit nos, e.g. 247 + 34 as 247 + 30 (277)
then 277 + 4 = 281.

Using number facts
Number bonds to 100, e.g. 35 + 65, 46 + 54, 73 + 27, etc.

100	
65	35

Add to next ten and next hundred, e.g. 176 + 4 = 180, 435 + 65 = 500, etc.

Subtraction is both taking away and - importantly - difference.

*We no longer count in 1s but use PV and number facts.*

- Subtraction

Taking away
Use place value to subtract, e.g. 358 – 300 or 348 – 40 or 348 – 8.
Taking away multiples of 10, 100 and £1, e.g. 476 – 40 = 436,
476 – 300 = 176, £4.76 - £2 = £2.76.
Partitioning, e.g. 68 – 42 as 60 – 40 and 8 – 2 or
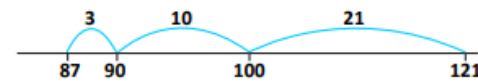£6.84 - £2.40 as £6 - £2 and 80p – 40p.
Count back in hundreds, tens and then ones,
e.g. 763 – 121 as 763 – 100 (663) then subtract 20 (643)
then subtract 1 (642).
Subtract near multiples, e.g. 648 – 199 or 86 – 39.
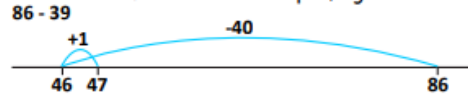
86 - 39
+1   -40
46 47   86

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

3   10   21
87   90   100   121

Using number facts
Number bonds to 100, e.g. 100 – 35 = 65, 100 – 48 = 52, etc.

100	
48	?

+ Written Addition

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

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

Expanded column addition with 'carrying'.

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

Compact column addition with two or more 3-digit numbers
or towers of 2-digit numbers.

```
    347
    286
+   495
     21
   1128
```

Compact column addition with 3-digit numbers

Recognise fractions which add to 1, e.g. ¼ + ¾ or ⅖ + ⅗.
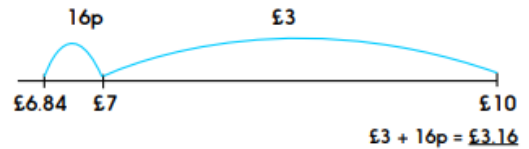
Counting up subtraction is a crucial mental strategy.

Important to see the visual image of fractions totalling one whole.

- Written Subtraction

Develop counting up subtraction.

3   30
167   170   200
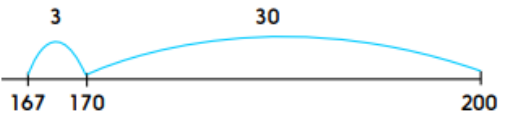
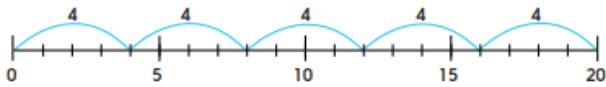Use counting up subtraction to find change from £1 and £10.

16p   £3
£6.84   £7   £10
£3 + 16p = £3.16

Recognise complements of any fraction to 1, e.g. 1 – ¼ = ¾
or 1 - ⅔ = ⅓.

x Multiplication

Counting in steps ('Clever' counting)
Count in 2s, 3s, 4s, 5s, 8s and 10s, e.g. colour the multiples on a 1-100 grid or use hops along a landmarked line.

```
       4      4      4      4      4
   ├──────┼──────┼──────┼──────┼──────┤
   0      5     10     15     20
```
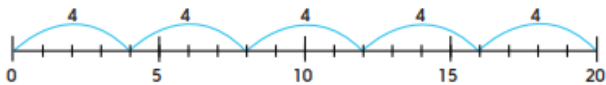
Doubling and halving
Find doubles to double 50 using partitioning.
Use doubling as a strategy in multiplying by 2,
e.g. 18 x 2 is double 18 (36).

$$48$$
$$80 \quad + \quad 16 = 96$$

Grouping
Recognise that multiplication is commutative, e.g. 4 x 8 = 8 x 4.
Multiply multiples of 10 by single-digit numbers, e.g. 30 x 8 = 240.
Multiply friendly 2-digit numbers by single-digit numbers, e.g. 13 x 4.

Using number facts
Know doubles to 20 and doubles of multiples of 5
to 100, e.g. double 45 is 90.
Know doubles of multiples of 5 to 100, e.g. double 85 is 170.
Know 2x, 3x, 4x, 5x, 8x, 10x tables facts.

x Written Multiplication

Build on partitioning to develop grid multiplication.

x	20	3	=
4	80	12	92

÷ Division

Counting in steps ('Clever' counting)
Count in 2s, 3s, 4s, 5s, 9s and 10s by colouring numbers on the 1-100 grid or using a landmarked line.

```
       4      4      4      4      4
   ├──────┼──────┼──────┼──────┼──────┤
   0      5     10     15     20
```
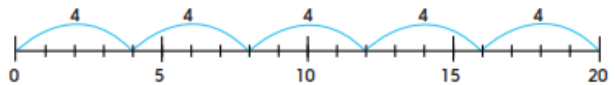
Doubling and halving
Find half of even numbers to 100 using partitioning.
Use halving as a strategy in dividing by 2,
e.g. 36 ÷ 2 is half of 36.

$$36$$
$$15 \quad + \quad 3 = 18$$

Doubling and halving form the basis of mental x & ÷ strategies.

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. ☐ x 5 = 30 is the same calculation as 30 ÷ 5 = ? thus we can count in 5s to find the answer.
Divide multiples of 10 by single-digit numbers, e.g. 240 ÷ 8 = 30.

Using number facts
Know halves of even numbers to 40.

28	
?	?

Know halves of multiples of 10 to 200, e.g. half of 170 is 85.
Know 2x, 3x, 4x, 5x, 8x, 10x division facts.
Use divison facts to find unit and simple non-unit fractions of amounts within the times tables, e.g. ¾ of 48 is 3 x (48 ÷ 4).

Number facts must be memorised and used on a daily basis.

Year 4

+ Addition

Using place value
Count in thousands, e.g. knowing 475 + 200 as 475, 575, 675.
Partitioning, e.g. 746 + 203 as 700 + 200 and 46 + 3
or 134 + 707 as 130 + 700 and 4 + 7.

> PV and number facts are central to mental strategies.

Counting on
Add 2-digit numbers by adding the multiple of ten then the ones, e.g. 67 + 55 as 67 add 50 (117) add 5 (122).
Add near multiples of 10, 100 and 1000, e.g. 467 + 199 or 3462 + 2999.

```
              +200            -1
    _____  ____
   467                  666  667
```

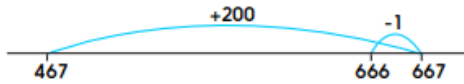Count on to add 3-digit numbers and money, e.g. 463 + 124 as
463 + 100 (563) + 20 (583) + 4 = 587 or £4.67 + £5.30 as £9.67 add 30p.

Using number facts
Number bonds to 100 and to next multiple of 100,
e.g. 463 + 37, 1353 + 47.

Number bonds to £1 and to the next whole pound,
e.g. £3.45 + 55p.
Add to the next whole number, e.g. 4.6 + 0.4 or 7.2 + 0.8.

- Subtraction

Taking away
Use place value to subtract, e.g. 4748 - 4000 or 4748 - 8, etc.

Take away multiples of 10, 100, 1000, £1, 10p or 0.1, e.g. 8392 - 50 or 6723 - 3000 or £3.74 - 30p or 5.6 - 0.2.

Partitioning, e.g. £5.87 - £3.04 as £5 - £3 and 7p - 4p or 7493 - 2020 as 7000 - 2000 and 90 - 20.

Count back, e.g. 6482 - 1301 as 6482 - 1000, then - 300, then -1 (5181).
Subtract near multiples, e.g. 3522 - 1999 or £34.86 - £19.99.

Counting up
Find a difference between two numbers by counting up from the smaller to the larger, e.g. 506 - 387.

```
         3    10        100              6
      _____ _____  _____   ____
    387  390   400                500  506
```

100 + 10 + 6 + 3 – **119**

Using number facts
Number bonds to 10, 100 and derived facts,
e.g. 100 - 76 = 24, 1.0 - 0.6 = 0.4.

> Counting up is essential for money calculations and, later, decimals.

100	
76	24

Number bonds to £1 and £10,
e.g. £1.00 - 86p = 14p or £10 - £3.40 = £6.60.

+ Written Addition

Build on expanded column addition to develop compact column addition with larger numbers.

```
    1000   400   60   8
  + 4000   800   60   6
    1000   100   10
    6000   300   30   4
```

> Expanded methods firm up a robust understanding of place value.

Compact column addition with larger numbers.

```
    5 3 4 7
    2 2 8 6
  + 1 4 9 5
      1 2 1
    9 1 2 8
```

Use expanded and compact column addition to add amounts of money,
e.g. £3.24 + £2.58.

```
  £3   20p   4p              £3.24
  £2   50p   8p           +  £2.58
  £5   70p  12p  £5.82          1
                            £5.82
```

Add like fractions, e.g. ⅜ + ⅛ + ⅛.

- Written Subtraction

Expanded column subtraction.   Begin to use column subtraction.

```
  600  110   16          6   11  16
  700   20    6          7    2   6
- 300   50    8        -  3    5   8
  300   60    8          3    6   8
```

Use counting up subtraction to find change from £10, £20, £50 and £100,
e.g. £100 - £73.60.

```
      40p      £6              £20
     ____    ____   _____
  £73.60  £74     £80              £100
```

£20 + £6 + 40p = **£26.40**

Subtract like fractions, e.g. ⅜ - ⅛ = ⅜.

> Stress that decimals and fractions are parts of a whole.

x Multiplication

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 226.

226

$400 + 40 + 12 = \underline{452}$

> Facility in doubling and halving is key for mental x and ÷ strategies.

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 x 4 = double 34 (68) doubled again (136).

Grouping
Use partitioning to multiply 2-digit numbers by single-digit numbers.
Multiply multiples of 100 by single-digit numbers using tables facts,
e.g. 400 x 8 = 3200.
Multiply using near multiples by rounding, e.g. 24 x 19 as (24 x 20) - 24.

Using number facts
Know times tables up to 12 x 12.

> Stress that division is multiplication with 'holes' in.

÷ Division

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
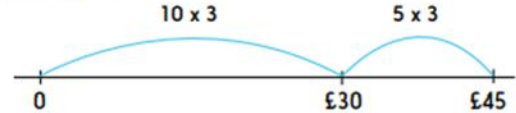Find halves of even numbers to 200 and beyond using partitioning.

344	
172	172

Begin to half 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
Use multiples of 10 times the divisor to divide by numbers <9 above the tables facts, e.g. 45 ÷ 3.

10 x 3   5 x 3

0   £30   £45

Divide multiples of 100 by single-digit numbers using division facts,
e.g. 3200 ÷ 8 = 4000.

Using number facts
Know times tables up to 12 x 12 and all related division facts.
Use division facts to find unit and non-unit fractions of amounts within the times tables, e.g. ⅞ of 56 is 7 x (56 ÷ 8).

x Written Multiplication

Use grid multiplication to multipy 3-digit by 1-digit numbers.

x	200	50	3
6	1200	300	18

= 1518

> If children understand place value they can develop fluency.

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

```
    253
x     6
  1200
   300
    18
  1518
```

÷ Written Division

Written version of a mental method:

☐ x 3 = 86   86 ÷ 3 = <u>28 r 2</u>

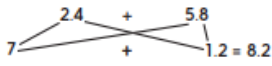20 x 3 = 60
───────
26

8 x 3 = 24
─────
2

Year 5

+ Addition

Using place value
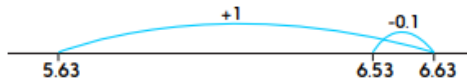Count in 0.1s, 0.01s, e.g. knowing what 0.1 more than 0.51 is.

Partitioning, e.g. 2.4 + 5.8 as 2 + 5 and
0.4 + 0.8 and combine the totals: 7 + 1.2 = 8.2.

> Subtracting by counting up is much less error prone.

2.4   +   5.8
7   1.2 = 8.2

Counting on
Add two decimal numbers by adding the ones then the tenths/hundredths,
e.g. 5.72 + 3.05 as 5.72 add 3 (8.72) then add 0.05 (8.77).
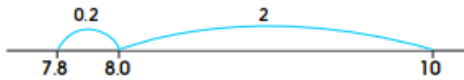Add near multiples of 1, e.g. 6.34 + 0.99 or 5.63 + 0.9.

```
        +1            -0.1
  5.63            6.53  6.63
```

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. 0.4 + 0.6
or 5.7 + 0.3.

Add to the next ten from a decimal number,
e.g. 7.8 + 2.2 = 10.

> Knowledge of number bonds underpins mental stratgegies.

```
    0.2          2
 7.8   8.0            10
```
2 + 0.2 = 2.2.

- Subtraction

Taking away
Using place value to subtract decimals, e.g. 4.58 - 0.08 or 6.26 - 0.2, etc.
Take away multiples of powers of 10, e.g. 15, 672 - 300 or 4.82 - 2 or
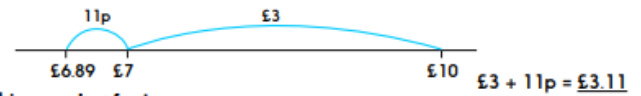2.71 - 0.5 or 4.68 - 0.02.
Partition or count back, e.g. 3964 – 1051 or 5.72 – 2.01.
Subtract near multiples, e.g. 86,456 – 9999 or 3.58 – 1.99.

Counting up
Find a difference between two numbers by counting up from the smaller
to the larger, e.g. 2009 - 869.

```
    31      100        1000            9
 869  900       1000          2000  2009
```
1000 + 100 + 31 + 9 – 1140
Find change using shopkeepers' addition, e.g. buy toy for £6.89 using £10.

```
    11p              £3
 £6.89  £7                    £10
```
£3 + 11p = £3.11

Using number facts
Derived facts from number bonds to 10 and 100, e.g. 2 – 0.45 using
45 + 55 = or 100 or 3.00 – 0.86 using 86 + 14 = 100.

100	
86	14

Number bonds to £1, £10 and £100, e.g. £4.00 - £3.86p = 14p or
£100 - £66 using 66 + 34 = £100.

+ Written Addition

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

```
  £14   60p   4p
  £28   70p   8p
+ £12   20p   6p
   £1   10p
  £55   60p   8p      £55.68
```

> Expanded version first embeds understanding of place value.

Compact column addition to add pairs of 5-digit numbers.

Continue to use column addition to add towers of several larger numbers.

Use compact addition to add decimal
numbers with up to two places.

```
   15.68
 + 27.86
   11.1
   43.54
```

Adding fractions with related denominators,
e.g. ¼ + ⅜ = ⅝.

- Written Subtraction

Compact column subtraction for numbers with up to 5 digits,
e.g. 16,324 - 8516.

```
  0  15  13  1  14
-  1   6   3  2   4
       8   5  1   6
       7   8  0   8
```

Continue to use counting up subtraction for subtractions involving money,
including finding change or, e.g. £50 - £28.76.
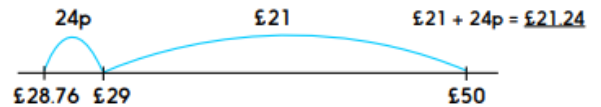
```
     24p              £21              £21 + 24p = £21.24
 £28.76  £29                    £50
```

Use counting up subtraction to subtract decimal numbers,
e.g. 4.2 – 1.74.
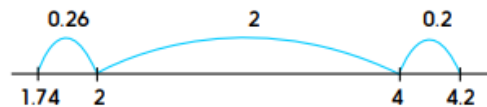
```
     0.26           2          0.2
 1.74  2                    4   4.2
```
2 + 0.26 + 0.2 = 2.46

> Equivalent fractions are the basis for + and - fractions.

Subtracting fractions with related denominators,
e.g. 1¼ - ⅜ as 1⅜ - ⅜ or ⅞ - ⅜ = ¼.

x Multiplication

Doubling and halving
Double amounts of money using partitioning,
e.g. £6.73 doubled is double £6 (£12) plus
double 73p (£1.46).
Use doubling and halving as a strategy in multiplying by 2, 4, 8, 5 and 20,
e.g. 58 x 5 = ½ of 58 (29) x 10 (290).

> Partitioning remains a key skill throughout.

£6.73

£12 + £1.46 = £13.46

Grouping
Multiply decimals by 10, 100, 1000,
e.g. 3.4 x 100 = 340.

100s	10s	1s	.	0.1s
		3	.	4
3	4	0		

Use partitioning to multiply friendly 2-digit and 3-digit numbers by
single-digit numbers, e.g. 402 x 6 as 400 x 6 (2400) and 2 x 6 (12).

Use partitioning to multiply decimal numbers by
single-digit numbers, e.g. 4.5 x 3 (4 x 3) + (4 x 0.5).

> Learning times tables involves BOTH multiplication and division facts.

Multiply using near multiples by rounding,
e.g. 32 x 29 as (32 x 30) – 32

Using number facts
Use times tables facts up to 12 x 12 to multiply multiples of the multiplier,
e.g. 4 x 6 = 24 so 4 x 6 = 240 and 400 x 6 = 2400.
Know square numbers and cube numbers.

÷ Division

Doubling and halving
Halve amounts of money using partitioning, e.g. half of £14.84 as half of
£14 and half of 84p.

£14.84

£7 + 42p = £7.42

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.

Grouping
Divide numbers by 10, 100, 1000 to obtain decimal answers with up to
three places, e.g. 340 ÷ 100 = 3.4.

Use the 10th, 20th, 30th ... multiple of the divisor to divide friendly 2-digit
and 3-digit numbers by single-digit numbers,
e.g. 186 ÷ 6 as 30 x 6 (180) and 1 x 6 (6).

Find unit and non-unit fractions of large amounts, e.g. ⅗ of 265 is
3 x (265 ÷ 5).

Using number facts
Use division facts from the times tables up to 12 x 12 to divide mutiples
of powers of ten of the divisor, e.g. 3600 ÷ 9 using 36 ÷ 9.

x Written Multiplication

Short multiplication of 2-digit, 3-digit and 4-digit numbers by
1-digit numbers.

```
    387
  x   6
    54
  2322
```

> The closer division is linked to multiplication the better.

Long multiplication of 2-digit, 3-digit and 4-digit numbers by teen numbers.

```
    387
  x  14
   3870
   15⁴⁸
    11
   5418
```

> Visual images are essential to multiplying and dividing fractions.

Grid multiplication of numbers with up to 2
decimal places by single-digit numbers.

£8.65 x 7

	£8	60p	5p	
x7	£56	£4.20	35p	£60.55

NB: Grid multiplication provides a default method for ALL children.

Multiplying fractions by single-digit numbers, e.g. ¾ x 6 = ¹⁸⁄₄ which is
4 ¾ = 4 ½.

÷ Written Division

Written version of a mental strategy for 3-digit ÷ 1-digit numbers.

```
☐ x 6 = 326          326 ÷ 6 = 54 r 2
50 x 6 = 300
         26
 4 x 6 = 24
                         2
       54 r 2
```

Short divison of 3-digit and 4-digit numbers by single-digit numbers.

```
     1 2 6 4
  6 | 7 ¹5 ³8 ²4
```

Year 6

+ Addition

Using place value
Count in 0.1s, 0.01s, 0.001s, e.g. knowing what 0.001 more than 6.725 is.
Partitioning, e.g. 9.54 + 3.25 as 9 + 3 and
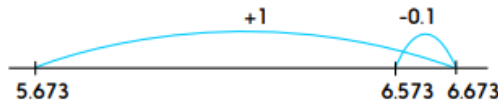0.5 + 0.2 and 0.04 + 0.05 to get 12.79.

10s	1s	.	0.1s $\frac{1}{10}$s	0.01s $\frac{1}{100}$s
	9	.	5	4
	3	.	2	5
1	2	.	7	9

> Subtracting by counting up is much less error prone.

Counting on
Add two decimal numbers by adding the ones then the tenths/hundredths or thousandths, e.g. 6.314 + 3.006 as 6.314 add 3 (9.314) then add 0.006 (9.32).
Add near multiples of 1, e.g. 6.345 + 0.999 or 5.673 + 0.9.

+1 ... -0.1
5.673 ... 6.573 6.673

Count on from large numbers, e.g. 16,375 + 12,003.

> Knowledge of number bonds underpins mental strategies.

Using number facts
Number bonds to 1 and to the next multiple of 1, e.g. 0.63 + 0.37 or 2.355 + 0.645.
Add to next ten, e.g. 4.62 + 0.38.

5	
4.62	?

- Subtraction

Taking away
Use place value to subtract decimals, e.g. 7.782 - 0.08 or 16.263 - 0.2, etc.
Take away multiples of powers of 10, e.g. 132,956 - 400 or 686,109 - 40,000 or 7.823 - 0.5.
Parition or count back, e.g. 3964 - 1051 or 5.72 - 2.01.
Subtract near multiples, e.g. 360,078 - 99,998 or 12.831 - 0.99.

Counting up
Count up to subtract numbers from multiples of 10, 100, 1000, 10,000
Find a difference between two decimal numbers by counting up from the smaller to the larger, e.g. 1.2 - 0.87.

0.2 + 0.13 = 0.33

0.13 ... 0.2
0.87 ... 1 ... 1.2
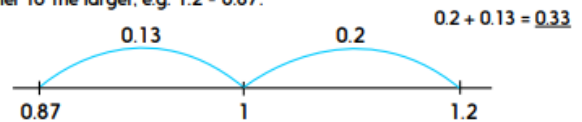
Using number facts
Derived facts from number bonds to 10 and 100, e.g. 0.1 - 0.075 using 75 + 25 = 100 or 5 - 0.65 using 65 + 35 = 100.

Number bonds to £1, £10 and £100,
e.g. £7.00 - £4.37 or £100 - £66.20
using 20p + 80p = £1 and £67 + £33 = £100.

£100	
£67	£33

+ Written Addition

Compact column addition for adding several large numbers and decimals with up to two places.

> Children must be able to do expanded as well as compact to show understanding.

Compact column addition with money.

```
  £14.64        £14   60p   4p
  £28.78        £28   70p   8p
+ £12.26      + £12   20p   6p
   11.1          £1   10p
  £55.68        £55   60p   8p    £55.68
```

Adding fractions with unlike denominators,
e.g.   ¾ + ⅓ = 1 1/12   or   2 ¾ + 1 ⅓ = 3 1/12

¾ + ⅓
= 9/12 + 4/12
= 13/12
= 1 1/12

> Understanding equivalent fractions is absolutely key here.

- Written Subtraction

Compact column subtraction for large numbers.

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

Use counting up subtraction when dealing with money,
e.g. £100 – £78.56 or £45.23 - £27.57.

£21 + 44p = £21.44

44p ... £21
£78.56 £79 ... £100
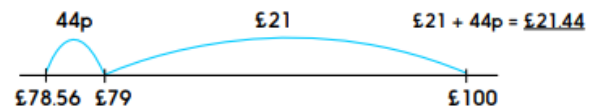
Use counting up subtraction to subtract decimal numbers,
e.g. 13.1 – 2.37.
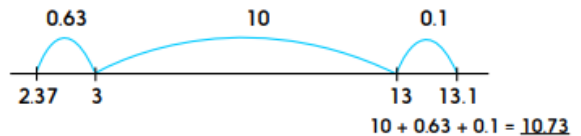
0.63 ... 10 ... 0.1
2.37 3 ... 13 13.1

10 + 0.63 + 0.1 = 10.73

Subtracting fractions with unlike denominators,
e.g. 1¼ - ⅔
= ¾ - ⅔
= 15/12 - 8/12
= 7/12

x Multiplication

Doubling and halving
Double decimal numbers with up to 2-places using partitioning, e.g. 36.73 doubled is double 36 (72) plus double 0.73 (1.46).

$$36.73$$

$$72 \quad + \quad 1.46 = \underline{73.46}$$

> Understanding how to partition numbers underpins many calculation strategies.

Use doubling and halving as strategies in mental multiplication.

Grouping
Use partioning as a strategy in mental multiplication, as appropriate, e.g. 3060 x 4 as (3000 x 4) + (60 x 4) or 8.4 x 8 as 8 x 8 (64) and 0.4 x 8 (3.2)

Use factors in mental multiplication,
e.g. 421 x 6 as 421 x 3 (1263) doubled (2526)
or 3.42 x 5 as half of 3.42 x 10.

Mutliply decimal numbers using near multiples by rounding,
e.g. 4.3 x 19 as 4.3 x 20 (86 – 4.3).

Using number facts
Use times tables facts up to 12 x 12 in mental multiplication of large numbers or numbers with up to two decimal places,
e.g. 6 x 4 = 24 and 0.06 x 4 = 0.24.

÷ Division

Doubling and halving
Halve decimal numbers with up to 2-places using partitioning,
e.g. half of 36.86 if half of 36 (18) plus half of 0.86 (0.43).

$$36.86$$

$$18 \quad + \quad 0.43 = \underline{18.43}$$

Use doubling and halving as strategies in mental division,
e.g. 216 ÷ 4 is half of 216 (108) and half of 108 (54).

Grouping
Use 10th, 20th, 30th, ... or 100th, 200th, 300th ... multiples of the divisor to divide large numbers, e.g. 378 ÷ 9 as 40 x 9 = 360 and 2 x 9 = 18 so, the answer is 42.
Use test for divisibility, e.g. 135 divides by 3 as 1 + 3 + 5 = 9 and 9 is in the 3x table.

$$\square \; x \; 9 = 378$$
$$\underline{40} \; x \; 9 = 360$$
$$18$$
$$\underline{2} \; x \; 9 = 18$$
$$0$$
$$\underline{42}$$

> Division as grouping,
> i.e. the inverse of multiplication,
> is a key concept.

Using number facts
Use division facts from the times tables up to 12 x 12 to divide decimal numbers by single-digit numbers, e.g. 1.17 ÷ 3 is $\frac{1}{100}$ of 117 ÷ 3 (0.39).

x Written Multiplication

Short multiplication of 2-digit, 3-digit and 4-digit numbers by 1-digit numbers.

$$\begin{array}{r} 3875 \\ \times \quad 6 \\ \hline 543 \\ \hline 23250 \end{array}$$

> Short versions of multiplication and division are more important and useful than the long versions.

Long multiplication of 2-digit, 3-digit and 4-digit numbers by 2-digit numbers.

$$\begin{array}{r} 258 \\ \times \quad 16 \\ \hline 2580 \\ 15\,^3\!4^4 8 \\ 1 \\ \hline 4128 \end{array}$$

Short multiplication of decimal numbers using x 100 and ÷100,
e.g. 13.72 x 6 as 1372 x 6 ÷100.

Short multiplication of money,
e.g. £13.72 x 6 or £23.67 x 3.

$$\begin{array}{r} £23.67 \\ \times \quad 3 \\ \hline 122 \\ \hline £71.01 \end{array}$$

Grid multiplication of numbers with up to 2 decimal places by single-digit numbers.

Multiplying proper and improper fractions, e.g. ¾ x ⅔.

x	300	40	5	
20	6000	800	100	6900
6	1800	240	30	2070
				8970

÷ Written Division

Short division of 3-digit and 4-digit numbers by single-digit numbers.

$$\begin{array}{r} 1264 \\ 6\,|\,7\,^1 5\,^3 8\,^2 4 \end{array}$$

Long division of 3-digit and 4-digit numbers by two–digit numbers.

$$\begin{array}{r|r} 200+50+1 & 15 \\ 15\,|\,3765 & 30 \\ 3000 & 45 \\ \hline 765 & 60 \\ 750 & 75 \\ \hline 15 & 90 \end{array}$$

> **NB: Grid multiplication provides a default method for ALL children.**

Divide fractions by whole numbers, e.g. ¼ ÷ 3 = 1⁄12.