Calculation Strategies Year R – Year 6

This document should be read in conjunction with the Caldecote Maths Curriculum

November 2022

Contents

IMPORTANT:

**This document sets out the new calculation strategies taught in each year group.**

Children will underline continue to use and consolidate methods taught in previous year groups.

Addition & Subtraction

EYFS: addition & subtraction

Pupils will experience practical calculation opportunities using a wide variety of practical equipment including small world play, role play, counters, cubes and Numicon.
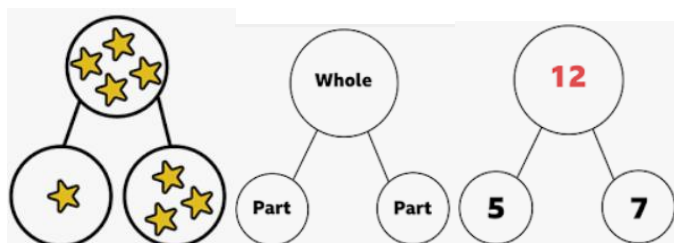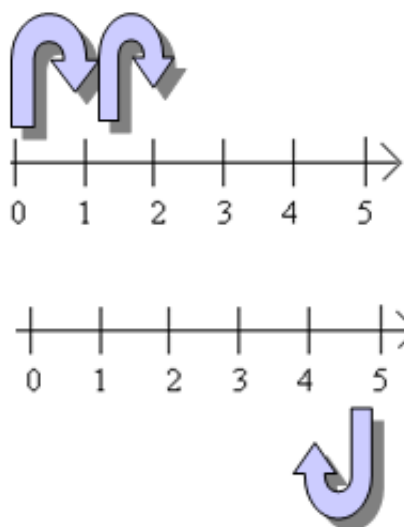
Part-part whole model

Five is a part, seven is a part and twelve is the whole.

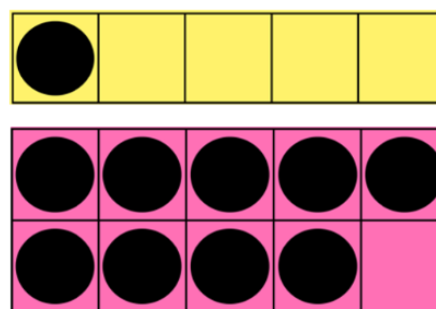**Manipulatives such as cubes, Numicon and other objects**

$$2 + 5$$

Adding and subtracting within 10 using fingers

Ten and Five Frames

Those who are ready may record their own calculations by beginning to use mathematical symbols =, +

Number lines – count on and back, using Numicon or cubes to support.

Pictorial representations. Subtracting by crossing out.
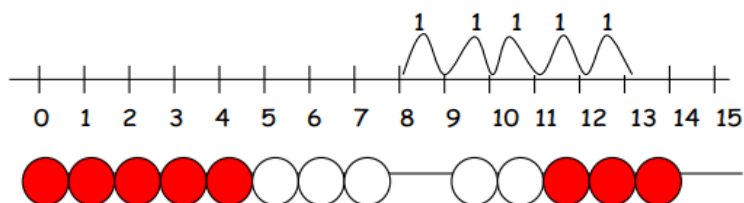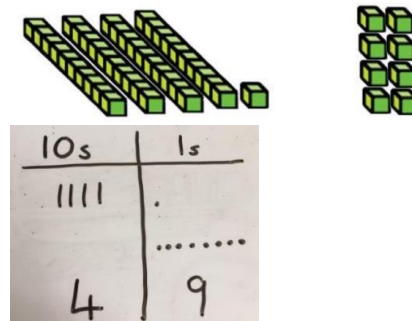
$$5 - 1 = 4$$
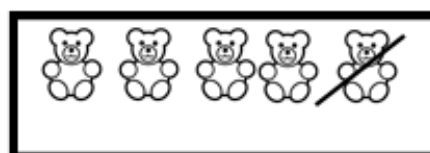
Year 1: Addition & Subtraction
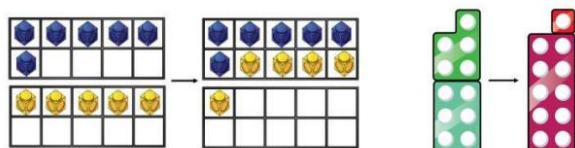
Number lines

Pupils use number lines along with bead strings or a Rekenrek to illustrate addition and subtraction, including bridging through ten e.g. by counting on 2 then counting on three or counting back 3 then 2.

Addition and subtraction
using tens and ones with manipulatives
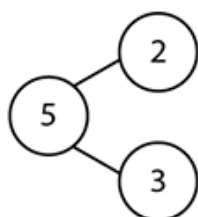e.g. 41 + 8

Ten Frames and Numicon

6 + 5

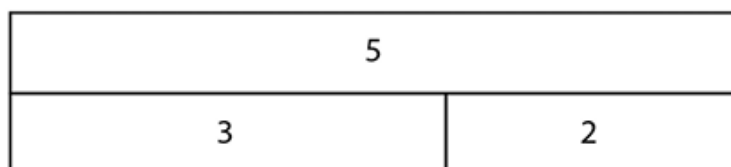Regrouping to make 10 using ten frames and counters/cubes or Numicon.

Part-Part-Whole Diagrams

2 + 3 = 5

Cherry representation:

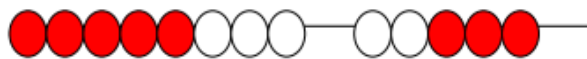Bar model:

Year 2: Addition & Subtraction

Number lines
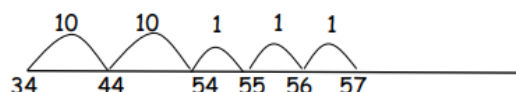Bread strings are used to illustrate addition and subtraction.
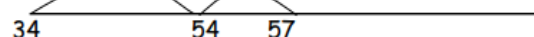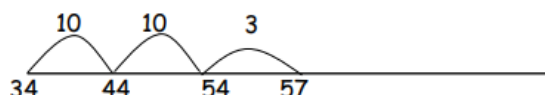8 + 5 = 13 (Count on 2 and then 3)
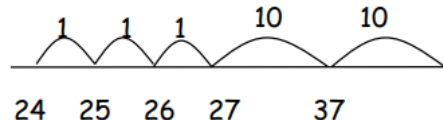13 – 5 = 8 (Count back 3 and then 2)

Count on in tens and ones

34 + 23 = 57
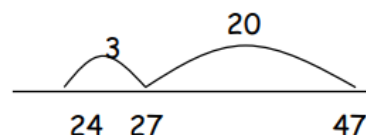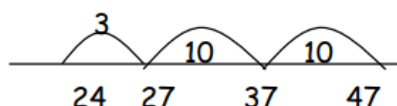
Pupils to become more efficent by adding the units in one jump (using the known fact 4 + 3 = 7)

Count back in tens and ones

Pupils become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4)

Partitioning
In preparation for efficient/formal written methods, pupils will use jottings of partitioning alongside part-part whole models and bar models.

23 + 45
20 + 40 = 60
3 + 5 = 8
60 + 8 = 68

92 – 47 =
80 – 40 = 40
12 – 7 = 5
92 – 40 – 7 = 45

Column Method without Regrouping

```
  267              67
+  85            + 24
   12              11
  140              80
  200              91
  352
```

Compensation
Pupils will use empty number lines to support compensation understanding.

49 + 73 = 122
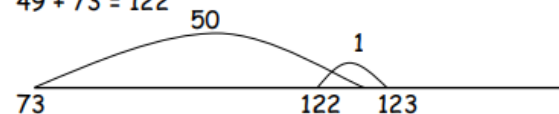
Redistribution

32 + 59 =

31 + 60 = 91

Hundred Square
Adding and subtraction using 100 square. Pupils learn to jump horizontally (add and subtract 1) as well as vertically (add and subtract 10).

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

Key Stage 2: addition and subtraction

Making Connections

92 – 47 = **45**
47 + 3 = 50
92 – 50 = 42
42 + 3 = **45**

$$92 - 47$$
50 42
3

Re-distrubtion with the same difference

92 – 47
+3   +3
95 – 50 = 45

Column Method

```
    3  3  6  4              3  .  5  6
 +     2  4  7           +  2  .  4  7
 ─────────────          ──────────────
    3  6  1  1              6  .  0  3
 ─────────────          ──────────────
       1  1                       1
```

Step 1: Line the up the digits using their place value knowledge.
Step 2: Begin with adding the ones. 4 + 7 = 11. The 1 stays in the ones column and the 1 (ten) is **re-grouped** and is placed in the tens column.
Step 3: Add the tens digits. 6 tens + 4 tens = 10 tens. Add the 1 ten from the bottom. This totals 11 tens.
Step 4: The 1 ten stays in the tens column and the 10 tens (100) is re-grouped and is placed under the hundreds column.
Step 5: 3 hundreds + 2 hundreds = 5 hundreds. Add the 1 hundred from below which makes 6 hundreds.
Step 6: Add the thousands

```
    6     6                2     13
    7 ⁰7 ¹2                3 . 4 ¹2
 -  3  2  2  6          -  1 .  7  6
 ─────────────         ──────────────
    3  8  4  6             1  .  6  6
```

Step 1: Line up the digits using their place value knowledge.
Step 2: Begin with subtracting the digits in the ones column. There aren't enough ones to subtract 6 therefore 1 ten is **exchanged** from the tens column into the ones column. There are now 6 tens and 12 ones.
Step 3: 12 – 6 = 6
Step 4: 6 tens – 2 tens = 4 tens
Step 5: There aren't enough hundreds so 1 thousand is exchanged for 10 hundred. 6 thousand is left.
Step 6: 10 hundreds – 2 hundreds = 8 hundreds
Step 7: 6 thousands – 3 thousands = 3 thousands

Multiplication

EYFS: Multiplication

Children will experience equal groups of objects and will count in 2s. They will work on practical problem solving activities involving equal sets or groups. They will explore this through learning opportunities such as through role play and play dough.
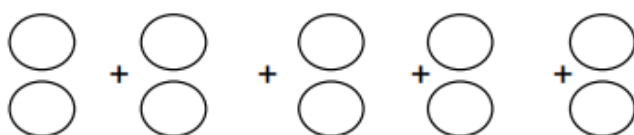
They may record simple drawings.

Year 1: Multiplication

Pupils will continue to see multiplication in real life situations such as egg boxes and ice cube trays.

Pupils understand that multiplication is repeated addition and that it can be done by counting **equal** steps/groups.

2 + 2 + 2 + 2 + 2 = 10

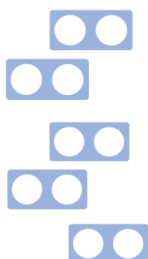How many legs do three teddies have?   How many shoes are there? Count in groups of two.

Arrays

Pupils are introduced to an array. They understand that 2 x 4 is the same as 5 x 2.
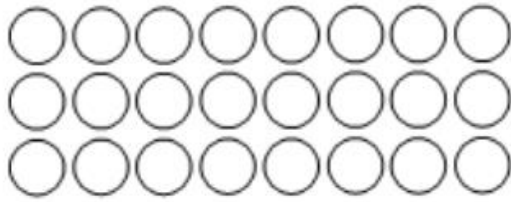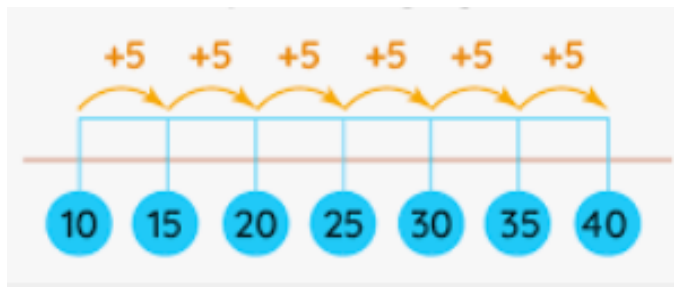
2 x 4 array

Numicon
5 lots of 2 make 10

Year 2: Multiplication

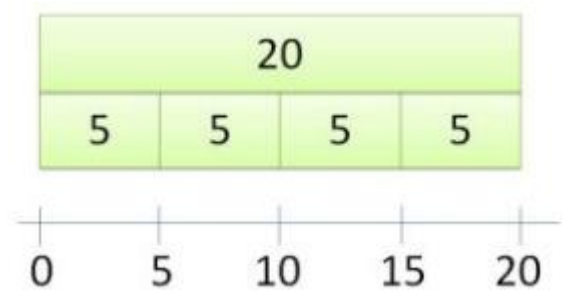Pupils will continue to use repeated addition and arrays.

$$3 \times 8 = 8 + 8 + 8 = 24$$

Number lines
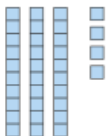
Bar Model representations

Year 3: Multiplication

Partitioning

Pupils use their partitioning knowledge to multiply a single digit by a two digit number. In doing this, they are introduced to the grid method. Visual imagery is used at this stage before moving onto abstract models.
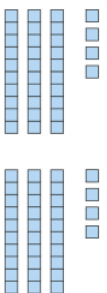
Partitioning

Step 1 – partition thirty-four.

$34 = 30 + 4$

- 'Thirty-four is equal to three tens and four ones.'
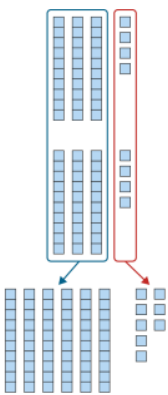
$34 = 3 \text{ tens} + 4 \text{ ones}$

Step 2 – make a copy of the representation (multiply by two):

34×2

- 'Three-tens-and-four-ones multiplied by two.'

Step 3 – multiply the tens and ones and recombine:

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

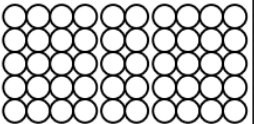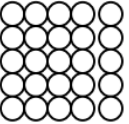- 'Three-tens-and-four-ones multiplied by two is equal to three tens multiplied by two and four ones multiplied by two.'

$3 \text{ tens} \times 2 = 6 \text{ tens}$
$4 \text{ ones} \times 2 = 8 \text{ ones}$

Grid Method

X	10	5
5		

x	100	30	8
7	700	210	56

```
 700
 200
+ 56
─────
 966
```

Year 4: Multiplication

Pupils will learn expanded multiplication leading onto short multiplication.

Expanded Method

Step 1 – write the factors:

10s	1s
3	4
×	2

Step 2 – multiply the single-digit number by the ones:

10s	1s
3	4
×	2
	8

2×4 ones = 8 ones

Step 3 – multiply the single-digit number by the tens:

10s	1s
3	4
×	2
	8
6	0

2×4 ones = 8 ones
2×3 tens = 6 tens

Step 4 – add the partial products:

10s	1s
3	4
×	2
	8
6	0
6	8

2×4 ones = 8 ones
2×3 tens = 6 tens

Short Multiplication

Step 1 – write the factors:

10s	1s
2	4
×	3

Step 2 – multiply the single-digit number by the ones and regroup:

10s	1s
2	4
×	3
	2
1	

3×4 ones = 12 ones
           = 1 ten + 2 ones

'Write "1" below the tens column and "2" in the ones column.'

Step 3 – multiply the single-digit number by the tens and add the tens from regrouping:

10s	1s
2	4
×	3
7	2
1	

3×2 tens = 6 tens

6 tens + 1 ten = 7 tens
'Write "7" in the tens column.'

Year 5 and 6: Long Multiplication for Larger Numbers

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

Step 1: Write the factors
Step 2: Multiply the ones digit by the ones digit and regroup
Step 3: Mutliply the tens digit by the ones digit and add the regrouped tens
Step 4: Multiply the hundreds digit by the ones digit and regroup
Step 5: Place a zero to show that it's ten times the size
Step 6: Multiply the ones digit by the tens digit
Step 7: Multiply the tens digit by the tens digit
Step 8: Multiply the hundreds digit by the tens digit
Step 9: Add the partial products

## Year 5 and 6: Long Multiplication for Larger Numbers

Division

EYFS and Year 1: Division

Pupils investigate sharing and putting items into equal groups. They will experience practical calculation opportunities using a wide variety of equipment such as through role play by acting out sharing.

Sharing into equal groups

They will develop ways of recording calculations using pictures. The concept of remainders should be discussed as it arises. 'There is one left. Each bowl has four apples and there is one leftover.'
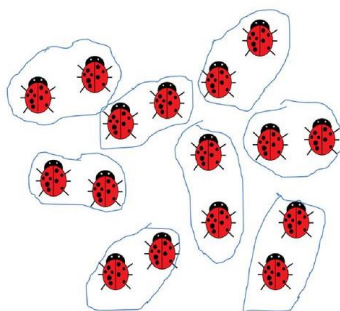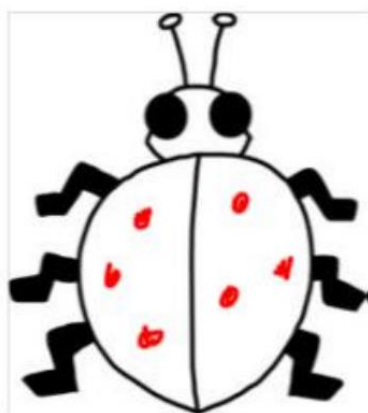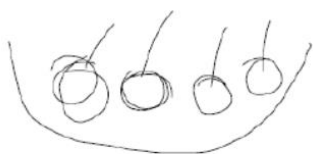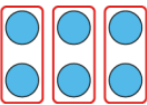
Year 2: Division

Pupils will continue to use practical equipment to represent equal groups and sharing to divide. Pupils will also identify unequal and equal groups and recognise that there can sometimes be a remainder.
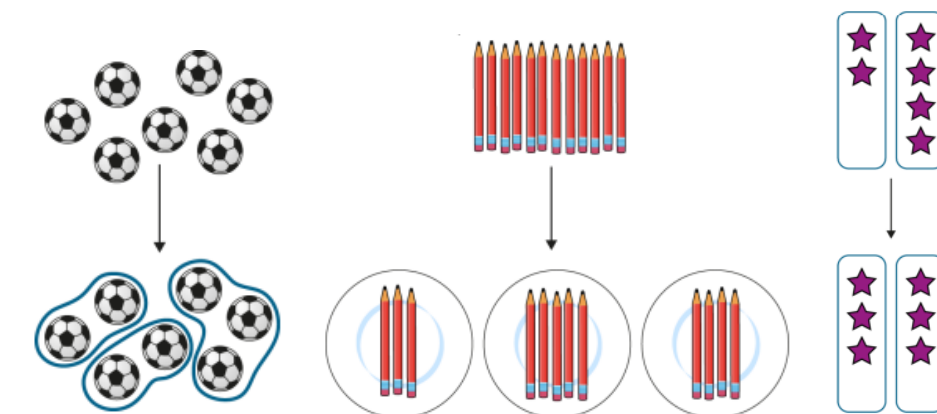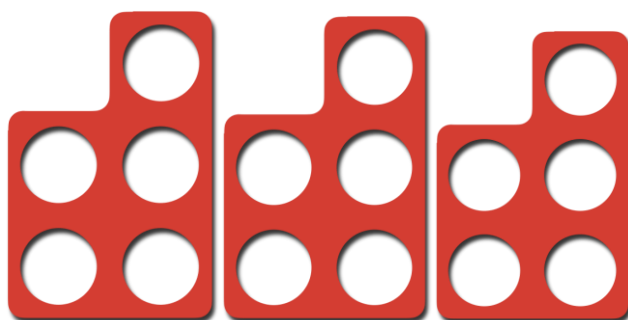
Bar model representations

Pupils will use multiplication facts to help divide.

⬤ ⬤ ⬤ ⬤ ⬤ ⬤	*'There are six counters.'*
(three groups of two circles) 6 2 | 2 | 2 $6 = 2 + 2 + 2$ $6 = 3 \times 2 \qquad 6 = 2 \times 3$	• *'There are three groups of two; there are six altogether.'* • *'Six is divided into groups of two. There are three groups.'* • *'Six is divided into three groups of two.'*

Numicon

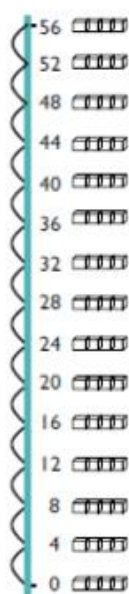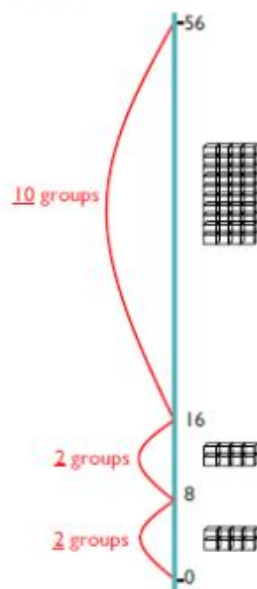# 5 x 3

Year 3: Division

Repeated Subtraction

Stage 1
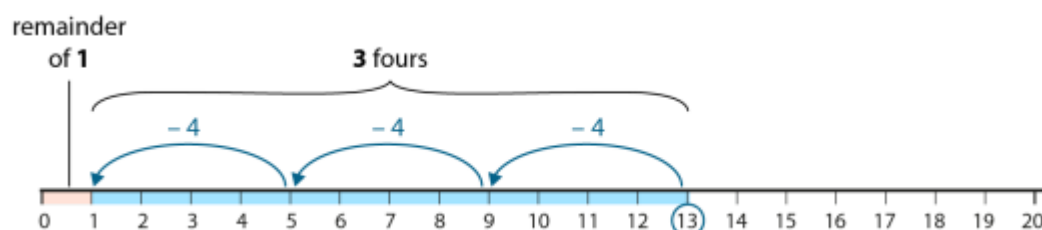$56 \div 4 = 14$ (groups of 4)

Stage 2
$56 \div 4 = 10$(groups of 4) + 2(groups of 4) + 2(groups of 4)
= 14(groups of 4)

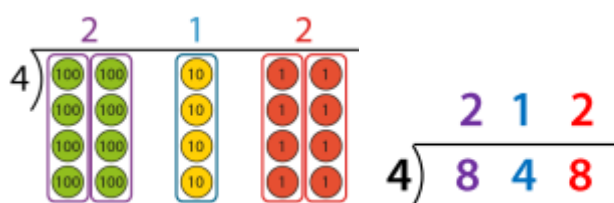## Year 4: Division

Repeated subtraction with remainders

Partitioning leading to short division

Step 1: Write the divisor and dividend
Step 2: Share/group the hundreds
Step 3: Share/group the tens
Step 4: Share/group the ones

Year 5: Short Division

98 ÷ 7 becomes

```
      1   4
    ┌─────────
    │    2
  7 │ 9   8
```

Answer: 14

432 ÷ 5 becomes

```
      8   6   r 2
    ┌─────────────
    │        3
  5 │ 4   3   2
```

Answer: 86 remainder 2

Step 1: Set up your question as follows.
Step 2: How many 7's go into 9? The answer is 1 with 2 remaining. The 2 moves along to the next digit to make 28.
Step 3: How many 7's go into 28? The answer is 4 with no remainder.
Step 4: The final answer is 14.

Year 6: Long Division

```
        2   9   r5
   25) 7   3   0
       5   0  ↓
       2   3   0
       2   2   5
       0   0   5
```

	× 25
1	25
2	50
4	100
5	125
8	200
10	250

Step 1: Write the divisor, frame and dividend
Step 2: How many 25's are in 7? 0.
Step 3: How many 25's in 73? 2 x 25 = 50. Write 2 above the bus stop.
Step 4: Now subtract 50 from 73. You are left with 23.
Step 5: Bring the 0 ones down to make 230.
Step 6: How many 25's are in 230? 9 x 25 = 225.
Step 7: Write 9 above the bus stop.
Step 8: Subtract 225 from 230 which is equal to 5.
Step 9: You are left with 5 remaining.