South Gloucestershire Council

St Chad's Patchway CE VC Primary School

Mathematics Policy Statement

"Learning to love, loving to learn."

Contents

Rational

Maths is an integral part of everyday life. It is a whole network of concepts and relationships which provide a way of viewing and making sense of the world. The study of maths helps us to develop the thinking skills necessary to tackle and solve problems we will encounter.

Aims

1. To ensure that all children are introduced to every aspect of the National Curriculum for Mathematics and the Early Years Foundation Stage Framework which are appropriate to their level of development and learning.

2. To ensure that the National Curriculum for Mathematics and the Early Years Foundation Stage Framework are covered in depth, with regular reinforcement and consolidation in each area.

3. To provide a broad, well balanced breadth of learning experiences which are supported by a variety of approaches and resources, with regular use of ICT.

4. To nurture within each child a sense of enjoyment and confidence in maths, alongside a fascination of mathematics.

5. To enhance the attainment of pupils with special educational needs, promoting self-esteem through achievement, in line with the school Single Equality, S.E.N. and G.T. policies.

Principles of Practice

1. Maths should be presented using a variety of approaches to support the National Curriculum for Mathematics and the Early Years Foundation Stage. Children will have an hour of mathematics throughout the day in KS1 and 2, which will include a mental maths emphasis and a clear focus on direct, instructional teaching, this may also include cross curricular opportunities. The Reception class will receive a discrete session of mathematical content once a day and their learning will be reinforced with mathematical play opportunities.

2. By following the school's own scheme of work (see Appendix 1) and the Early Years Foundation Stage, plans will ensure that children are taught appropriately to their level and that the topics are regularly reinforced and consolidated. Teachers will identify differentiated curricular targets and then plan opportunities for children to achieve these. Regular observation and assessment will ensure children are progressing, learning at their level and next steps are being identified. Optional SAT testing and APP will be used to support these judgements.

3. Through careful planning and preparation we aim to ensure that maths will be taught using a variety of methods and opportunities:
    - Differentiated calculating strategies for mental, informal written, formal written methods (see calculation appendix for the four number operations).
    - Exposition by the teacher and pupil
    - Discussion between pupil/teacher and pupil/pupil
    - Appropriate practical activities and mathematical games
    - Oral discussion work
    - Consolidation and practice of fundamental skills and routines e.g. tables, number bonds
    - Problem solving and investigation activities
    - Open and closed tasks
    - Individual, group and whole class discussions and activities
    - Working with computers as a mathematical tool
    - Cross curricular activities, where appropriate
    - Calculator activities
    - Homework activities

4. The National Curriculum for Mathematics offers everyone involved in teaching children aged from 4 to 11 an opportunity to continue the progress made in raising standards by embedding the ethos and principles of the school. Children are encouraged to choose their own methods when tackling problems and to select appropriate resources that they may access independently. Every opportunity will be taken to celebrate children's success. We have adopted a common approach to teaching methods for the calculation of the four main operations (See calculation appendix). The use of intervention groups will focus on building the confidence of target children.

5. Every pupil's access to the National Curriculum for Mathematics and the Early Years Foundation Stage will be ensured through the S.E.N and Gifted

and Talented policies. Differentiation should be considered in the majority of mathematics lessons and can be done in various ways: stepped activities, common tasks, resourcing, grouping, guided maths etc.

Signed.. Chair of Governors Date......................

PROGRESSION THROUGH CALCULATIONS FOR ADDITION

MENTAL CALCULATIONS
(ongoing)
These are a **selection** of mental calculation strategies:
See NNS Framework Section 5, pages 30-41 and Section 6, pages 40-47

Counting On
Holding a number in your head and counting on (using fingers)

Mental recall of number bonds

6 + 4 = 10	☐ + 3 = 10
25 + 75 = 100	19 + ☐ = 20

Adjusting Adding 9/11 etc

Use near doubles
6 + 7 = double 6 + 1 = 13

Addition using partitioning and recombining
34 + 45 = (30 + 40) + (4 + 5) = 79

Counting on or back in repeated steps of 1, 10, 100, 1000
86 + 57 = 143 (by counting on in tens and then in ones)
460 - 300 = 160 (by counting back in hundreds)

Add the nearest multiple of 10, 100 and 1000 and adjust
24 + 19 = 24 + 20 – 1 = 43
458 + 71 = 458 + 70 + 1 = 529

Use the relationship between addition and subtraction

36 + 19 = 55	19 + 36 = 55
55 – 19 = 36	55 – 36 = 19

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE.

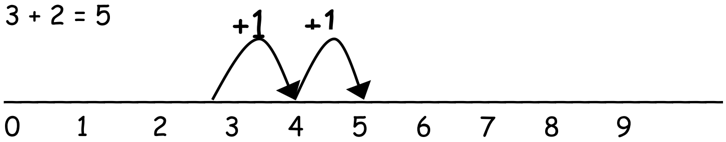
<u>YR and Y1</u>

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.

Pictorial representations that introduce how to write a number sentence.
The children will use the symbols + and = to record their addition sum in a number sentence.

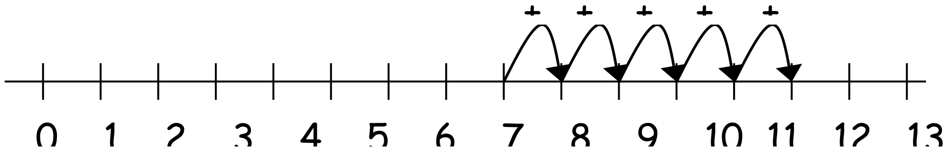
They use numberlines and practical resources to support calculation and teachers *demonstrate* the use of the numberline.

3 + 2 = 5



Children then begin to support their own calculations using a numbered line to count on in ones.

8 + 5 = 13



Children are taught on a hundred square by counting on.
Children may progress to adding by partitioning the smaller number into tens and units.
E.g. 47 + 23. First add the tens and then the units.

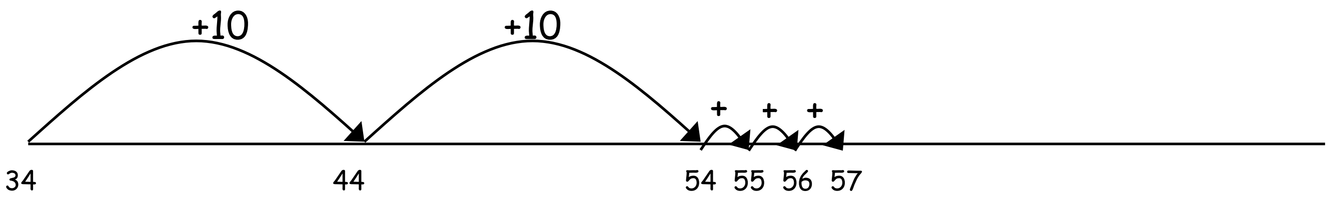
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

<u>Y2</u>

Children will begin to use ‘empty number lines’ themselves starting with the larger number and counting on.

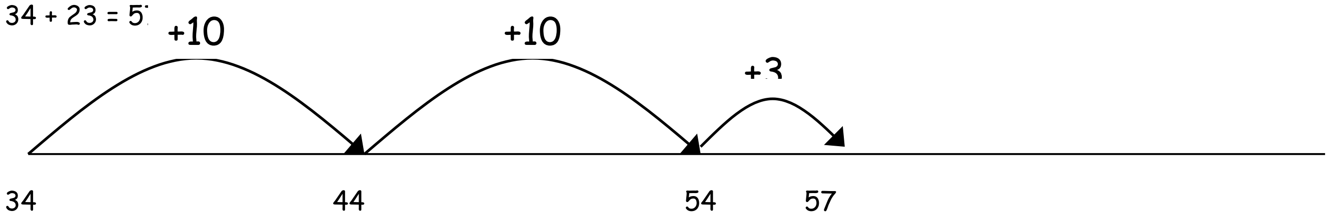
✓ First counting on in tens and ones.

34 + 23 = 57



✓ Then helping children to become more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7).

34 + 23 = 57



✓ Followed by adding the tens in one jump and the units in one jump.

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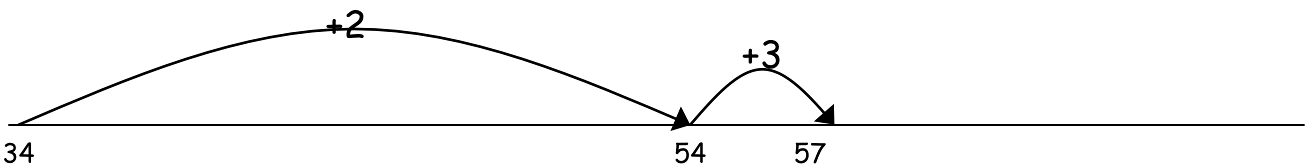
34 + 23 = 57



✓ Children add on a hundred square by partitioning the smaller number into tens and units. They will progress to adding the tens in one jump and then the units in one jump. E.g. 47 + 23.

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

The formal written method of partitioning is introduced.

136 + 127 = 100 + 100 = 200
30 + 20 = 50
6 + 7 = 13
200 + 50 + 13 = 263

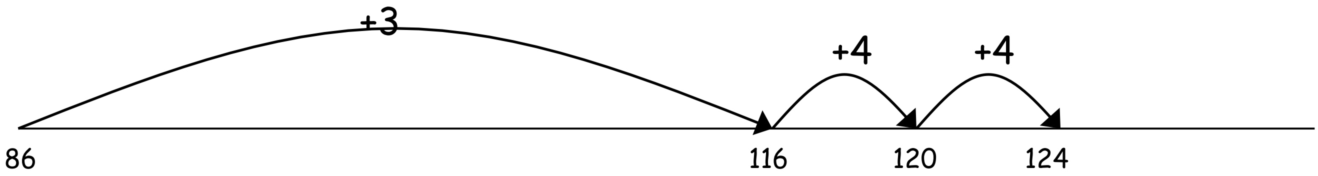
- Write out the sum, largest number first.
- Add the hundreds, then the tens and finally the units.
- Add the hundreds, tens and units together.

<u>**Y3**</u>

Children will continue to use empty number lines with increasingly large numbers, including compensation where appropriate.

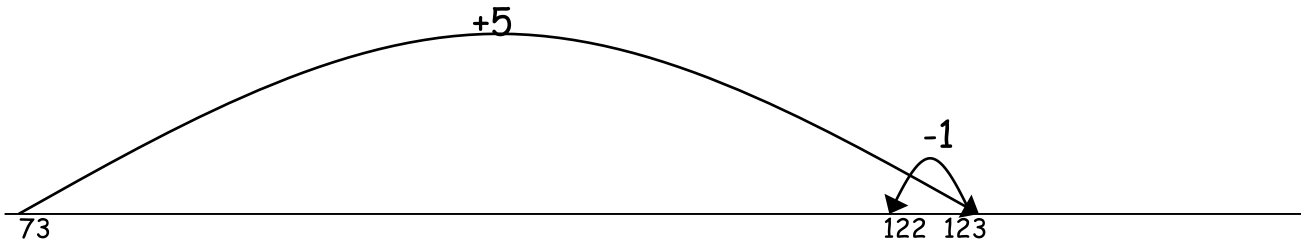
✓ Count on from the largest number irrespective of the order of the calculation.

38 + 86 = 124



✓ Adjusting

49 + 73 = 122

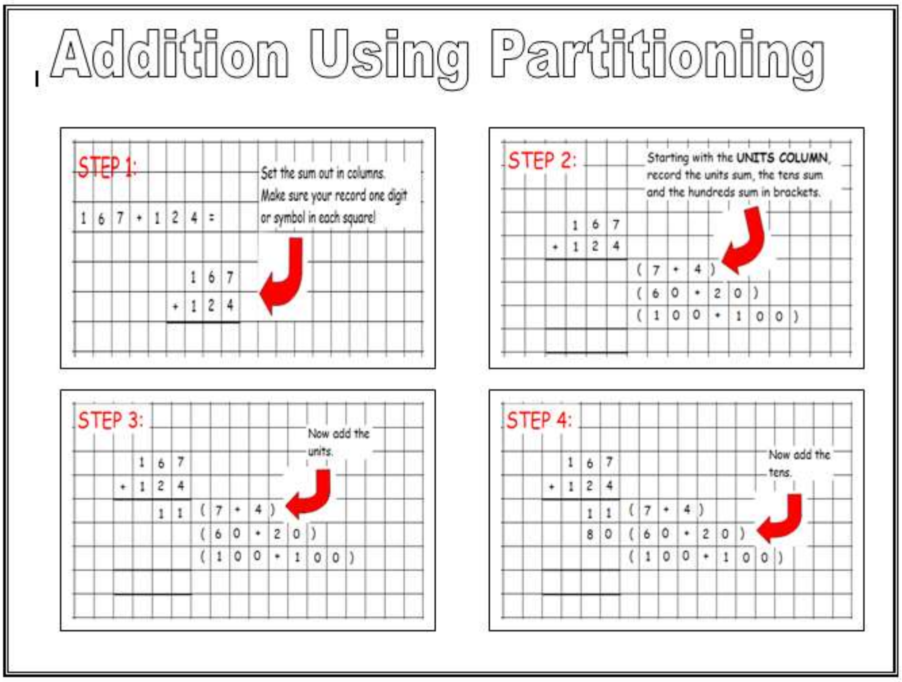


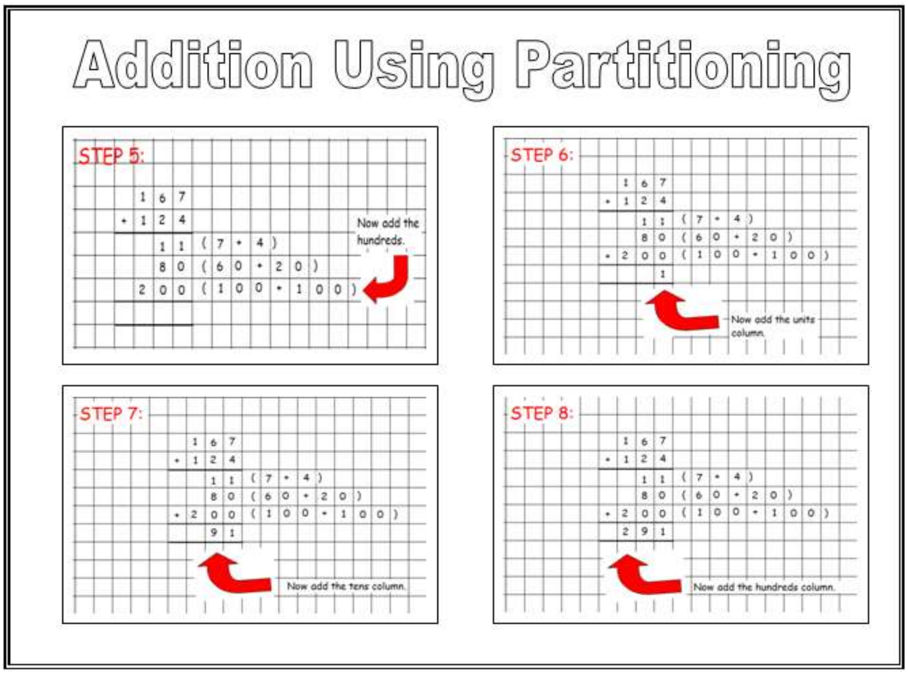
Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

✓ Adding most significant digits first, then moving to adding least significant digits.

$$\begin{array}{rl} 67 & \\ +\ 24 & \\ \hline 80 & (60 + 20) \\ 11 & (\ 7 +\ 4) \\ \hline 91 & \end{array}$$

$$\begin{array}{rl} 267 & \\ +\ 85 & \\ \hline 200 & \\ 140 & (60 + 80) \\ 12 & (\ 7 +\ \ 5) \\ \hline 352 & \end{array}$$





<u>Y4</u>

From this, children will begin to carry below the line.

625	783	367
+ 48	+ 42	+ 85
673	825	452
1	1	1 1

Using similar methods, children will:

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds;*
- ✓ *know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p.*

Y5

Children should extend the carrying method to numbers with at least four digits.

```
   587              3587
 + 475            +  675
  1062              4262
   1 1           1 1 1
```

Using similar methods, children will:

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more decimal fractions with up to three digits and the same number of decimal places;*
- ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 3.2 m – 280 cm.*

Y6

Children should extend the carrying method to number with any number of digits.

```
   7648            6584            42
 + 1486          + 5848          6432
   9134           12432           786
   1 11             1 11            3
                               + 4681
                                11944
                                  121
```

Using similar methods, children will

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more decimal fractions with up to four digits and either one or two decimal places;*
- ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 401.2 + 26.85 + 0.71.*

\+ - + - + - + - + - + - +

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

Children should not be made to go onto the next stage if:

1) **they are not ready.**
2) **they are not confident.**

Children should be encouraged to approximate their answers before calculating.
Children should be encouraged to check their answers after calculation using an appropriate strategy.
Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

PROGRESSION THROUGH CALCULATIONS FOR SUBTRACTION

MENTAL CALCULATIONS

(ongoing)
These are a **selection** of mental calculation strategies:
See NNS Framework Section 5, pages 30-41 and Section 6, pages 40-47

Mental recall of addition and subtraction facts

10 – 6 = 4	17 - ☐ = 11
20 - 17 = 3	10 - ☐ = 2

Find a small difference by counting up
82 – 79 = 3

Counting on or back in repeated steps of 1, 10, 100, 1000
86 - 52 = 34 (by counting back in tens and then in ones)
460 - 300 = 160 (by counting back in hundreds)
Holding a number in your head

Subtract the nearest multiple of 10, 100 and 1000 and adjust
24 - 19 = 24 - 20 + 1 = 5
458 - 71 = 458 - 70 - 1 = 387

Adjusting for 9/11

Use the relationship between addition and subtraction

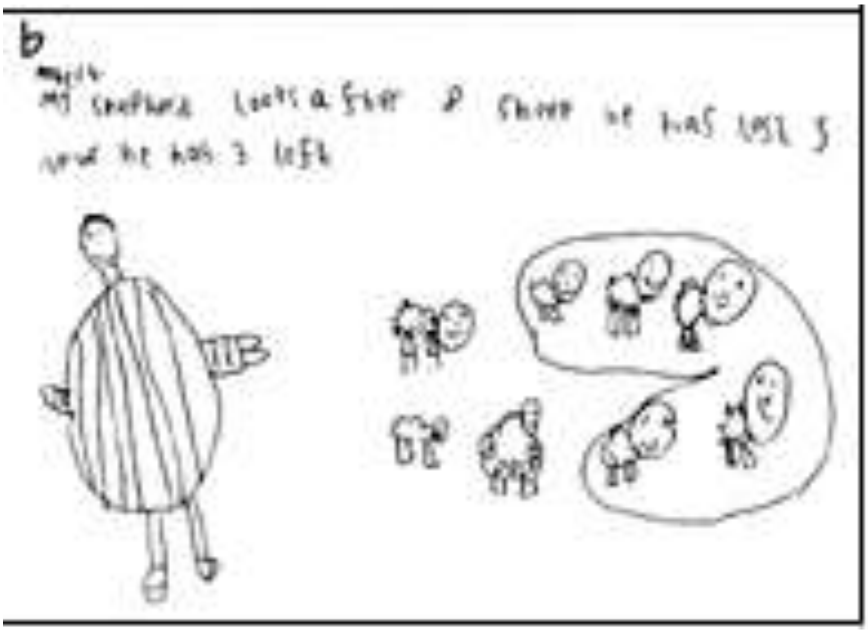
36 + 19 = 55	19 + 36 = 55
55 – 19 = 36	55 – 36 = 19

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

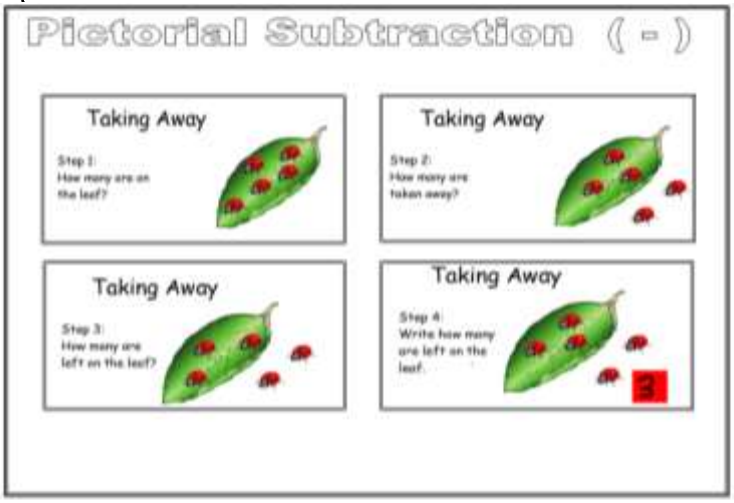
THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE.

<u>YR and Y1</u>

- ✓ Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures etc.

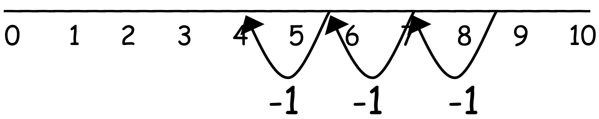


- ✓ Pictorial Representation



- ✓ They use numberlines and practical resources to support calculation. Teachers *demonstrate* the use of the numberline to record their workings out underneath.

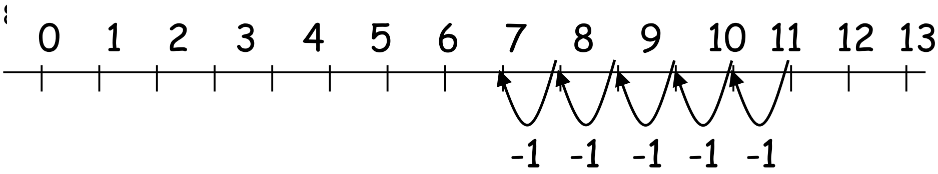
6 – 3 = 3



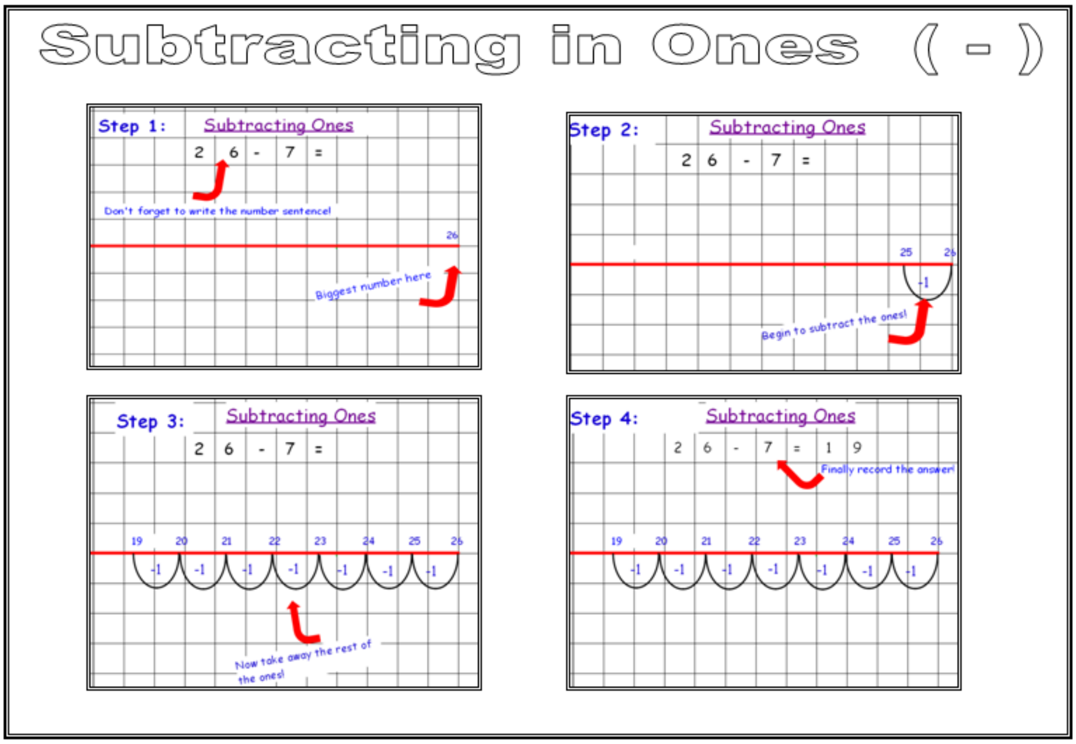
The numberline should also be used to show that 6 - 3 means the 'difference between 6 and 3' or 'the difference between 3 and 6' and how many jumps they are apart.

- ✓ Children then begin to use numbered lines to support their own calculations - using a
  numbered line to count back in ones.

13 – 5 = 8



- ✓ Followed by blank number lines to support their own calculations.



✓ Use a hundred square to count back in ones.

May progress to subtraction on a hundred square by starting on the main number and counting back first the tens and then the units. E.g. 57 – 13

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

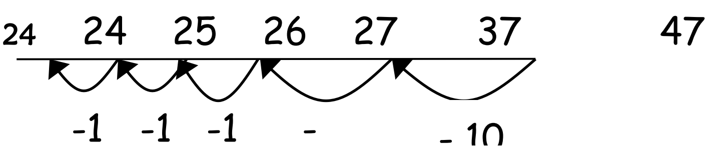
<u>Y2</u>

Children will begin to use empty number lines to support calculations.

Counting back

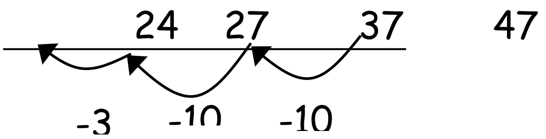
✓ First counting back in tens and ones.

47 – 23 = 24



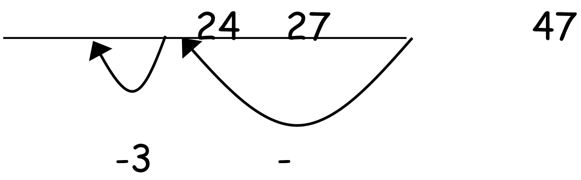
- ✓ Then helping children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4).

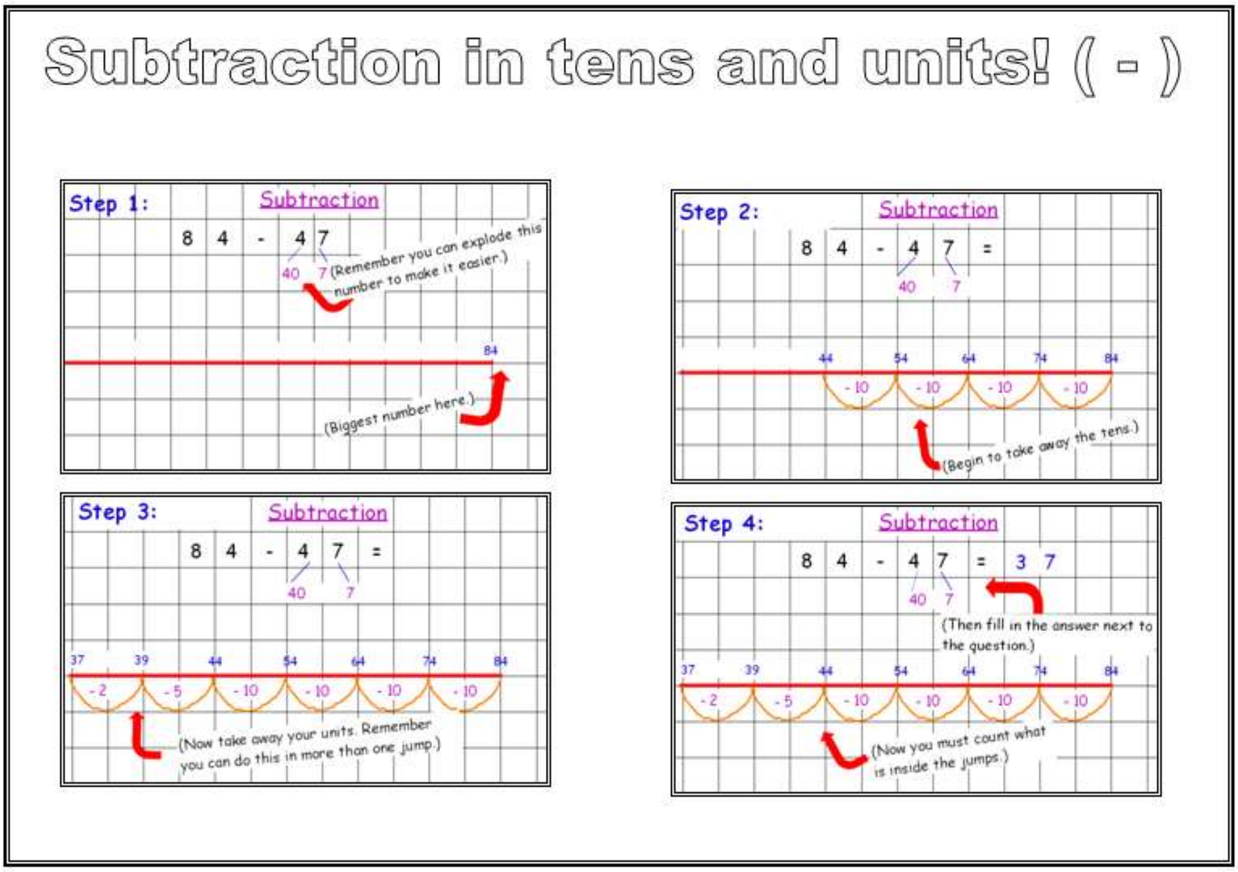
47 – 23 = 24



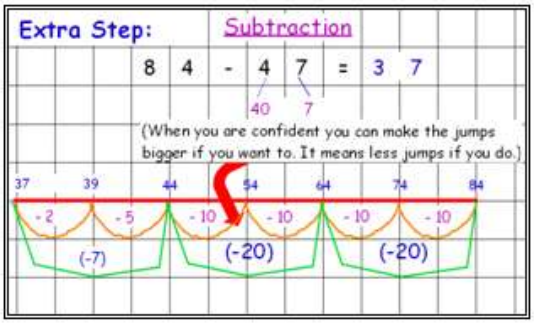
- ✓ Progressing by subtracting the tens in one jump and the units in one jump.

47 – 23 = 24





Subtraction in tens and units! (-)



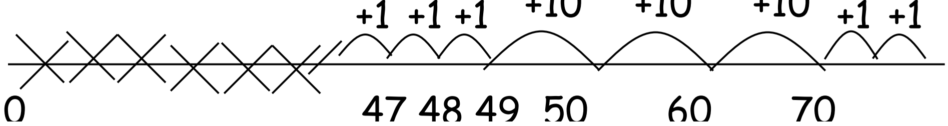
Counting on

If the numbers involved in the calculation are close together or near to multiples of 10, 100 etc, it can be more efficient to count on.

Count up from 47 to 82 in jumps of 10 and jumps of 1.

The number line should still show 0 so children can cross out the section from 0 to the smallest number. They then associate this method with ‘taking away’.

82 - 47



Help children to become more efficient with counting on by:

- ✓ Subtracting the units in one jump;
- ✓ Subtracting the tens in one jump and the units in one jump.

Hundred Square Subtraction

Subtract on a hundred square by starting on the main number and counting back first the tens and then the units. E.g. 57 – 13

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	-1 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	-40 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

Y3

Children will continue to use empty number lines with increasingly large numbers.
Children will begin to use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies.

Partitioning and decomposition

This process should be demonstrated using arrow cards to show the partitioning and base 10 materials to show the decomposition of the number.

NOTE When solving the calculation 89 – 57, children should know that 57 **does NOT EXIST AS AN AMOUNT** it is what you are subtracting from the other number. Therefore, when using base 10 materials, children would need to count out only the 89.

```
     89    =    80  +  9
  -  57              50  +  7
                30  +  2  =  32
```

Initially, the children will be taught using examples that do not need the children to exchange.

From this the children will begin to exchange.

```
     71    =            =
  -  46

  Step 1        70  +  1
              - 40  +  6

  Step 2       60  +  11
             - 40  +   6
                20  +  5   =   25
```

The calculation should be read as e.g. take 6

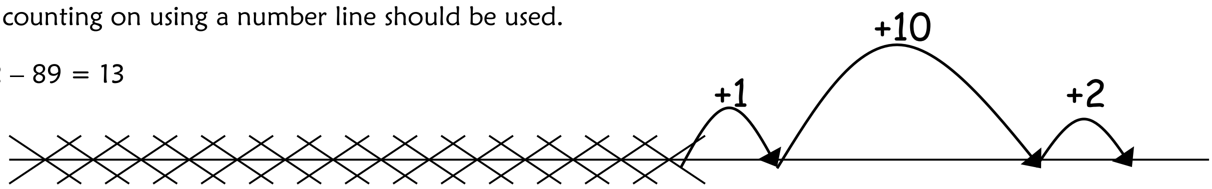
This would be recorded by the children as

```
          60
            70  +  ¹1
          - 40  +  6
             20  +  5  =  25
```

Children should know that units line up under units, tens under tens, and so on.

Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

102 – 89 = 13



0 89 90 100
102

Y4

Partitioning and decomposition

```
   754    =
 -  86

Step 1      700  +  50  +  4
          -          80  +  6

Step 2      700  +  40  +  14    (adjust from T to U)
          -          80  +  6

Step 3      600  + 140  +  14    (adjust from H to T)
          -          80  +  6
            600  +  60  +   8  =  668
```

This would be recorded by the children as

```
            600      140
            700  +  50  +  14
          -          80  +  6
            600  +  60  +  8  =  668
```

Decomposition

```
  614 1
   754
 -  86
   668
```

Children should:

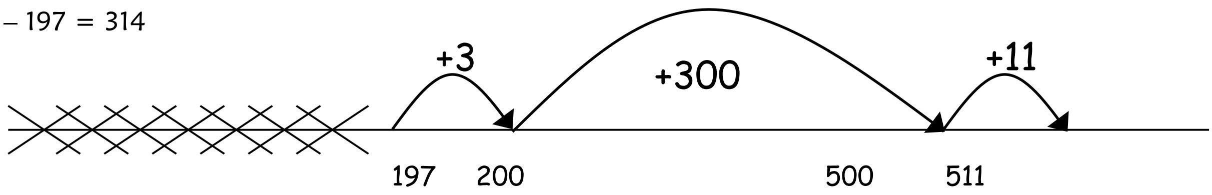
- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *using this method, children should also begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds;*
- ✓ *know that decimal points should line up under each other.*

For example:

NB If your children have reached the concise stage they will then continue this method through into years 5 and 6. They will not go back to using the expanded methods.

Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

511 – 197 = 314



Y5

Decomposition

```
  614 1
   754
```

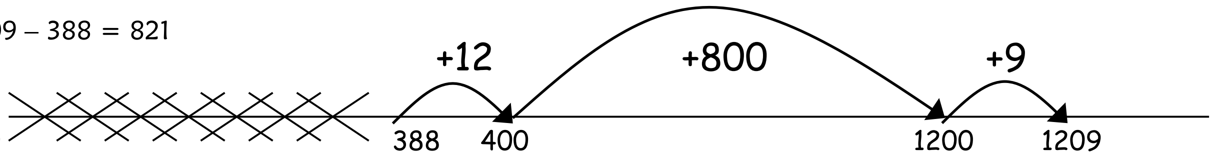
- 286
468

Children should:

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *begin to find the difference between two decimal fractions with up to three digits and the same number of decimal places;*
- ✓ *know that decimal points should line up under each other.*

Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

1209 – 388 = 821



Y6

Decomposition

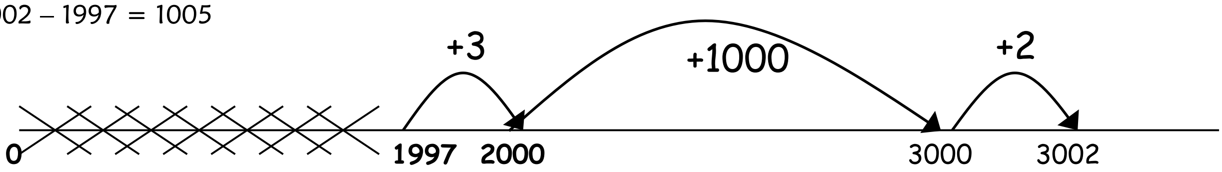
```
  5 13 1
   6467
//
 - 2684
   3783
```

Children should:

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *be able to subtract two or more decimal fractions with up to three digits and either one or two decimal places;*
- ✓ *know that decimal points should line up under each other.*

Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

3002 – 1997 = 1005



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

Children should not be made to go onto the next stage if:

3) they are not ready.
4) they are not confident.

Children should be encouraged to approximate their answers before calculating.
Children should be encouraged to check their answers after calculation using an appropriate strategy.
Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

PROGRESSION THROUGH CALCULATIONS FOR MULTIPLICATION

MENTAL CALCULATIONS

Doubling and halving
Applying the knowledge of doubles and halves to known facts.
e.g. 8 x 4 is double 4 x 4

Using multiplication facts

Tables should be taught everyday from Y2 onwards, either as part of the mental oral starter or other times as appropriate within the day.

Year 2 2 times table
5 times table
10 times table

Year 3 2 times table
3 times table
4 times table
5 times table
6 times table
10 times table

Year 4 Derive and recall all multiplication facts up to 10 x 10

Years 5 & 6 Derive and recall quickly all multiplication facts up to 10 x 10.

Using and applying division facts
Children should be able to utilise their tables knowledge to derive other facts.
e.g. If I know 3 x 7 = 21, what else do I know?
30 x 7 = 210, 300 x 7 = 2100, 3000 x 7 = 21 000, 0.3 x 7 = 2.1 etc

Use closely related facts already known
13 x 11 = (13 x 10) + (13 x 1)
= 130 + 13
= 143

Multiplying by 10 or 100
Knowing that the effect of multiplying by 10 is a shift in the digits one place to the left.
Knowing that the effect of multiplying by 100 is a shift in the digits two places to the left.

Partitioning
23 x 4 = (20 x 4) + (3 x 4)
= 80 + 12
= 102

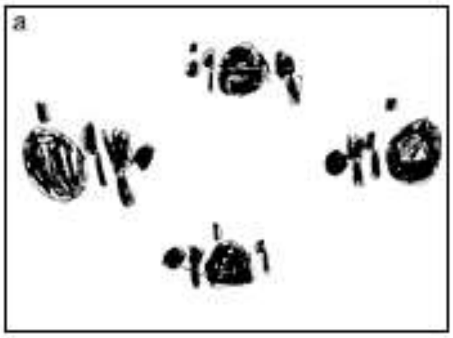
Use of factors
8 x 12 = 8 x 4 x 3

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE.

YR and Y1

Children will experience equal groups of objects and will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.



Y2

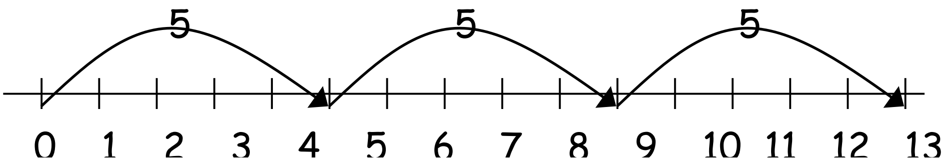
Children will develop their understanding of multiplication and use jottings to support calculation:

✓ **Repeated addition**

3 times 5 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x 3

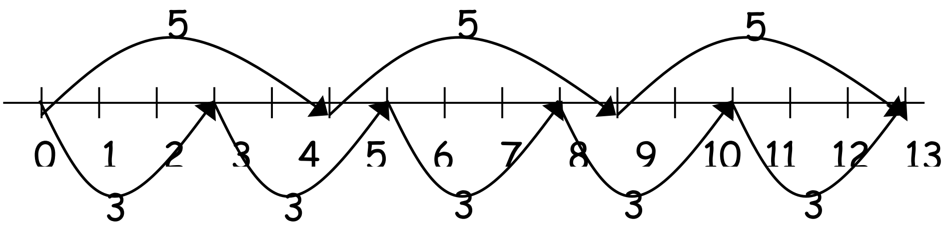
Repeated addition can be shown easily on a number line:

5 x 3 = 5 + 5 + 5



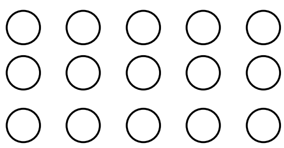
✓ **Commutativity**

Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.



✓ **Arrays**

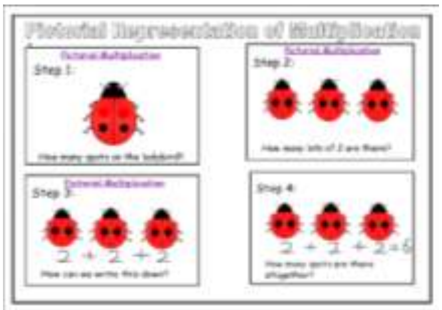
Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method. Real life examples such as baking trays and ice cube trays could be used.



5 x 3 = 15

3 x 5 = 15

✓ **Pictorial Representations of repeated addition**



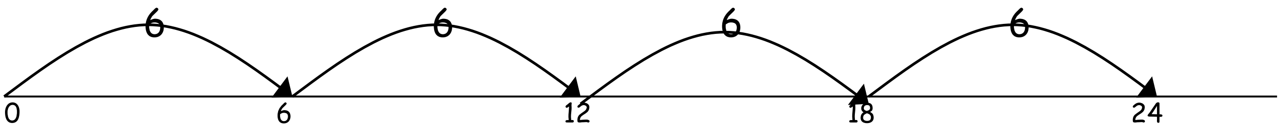
<u>Y3</u>

Children will continue to use:

✓ **Repeated addition**

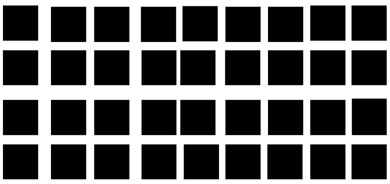
4 times 6   is   6 + 6 + 6 + 6 = 24   or   4 lots of 6   or   6 x 4

Children should use number lines to support their understanding.



✓ **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



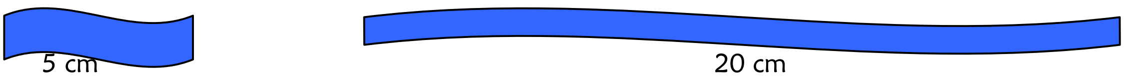
4 x 9 = 36

9 x 4 = 36

Children will also develop an understanding of

✓ **Scaling**

e.g. Find a ribbon that is 4 times as long as the blue ribbon



✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

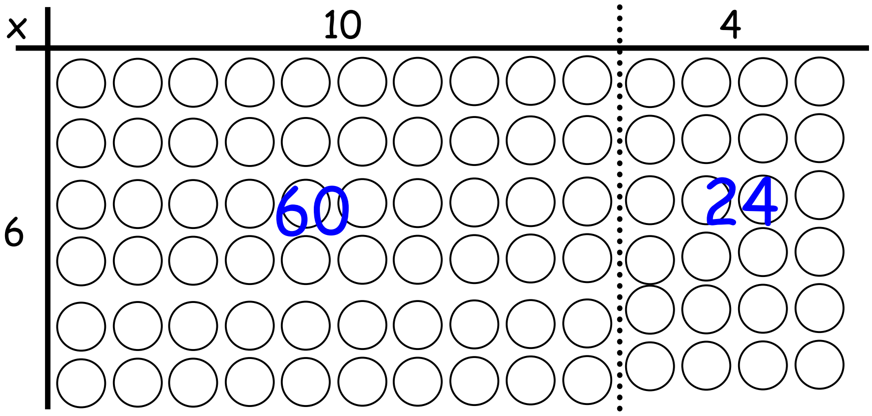
☐ x 5 = 20   3 x △ = 18   ☐ x O = 32

✓ **Partitioning**

38 x 5 = (30 x 5) + (8 x 5)
= 150 + 40
= 190

Y4

Children will continue to use arrays where appropriate leading into the grid method of multiplication.



(6 x 10) + (6 x

60 + 24

84

TU x U
(Short multiplication – multiplication by a single digit)

23 x 8
Children will approximate first
23 x 8 is approximately 25 x 8 = 200

x	20	3
8	160	24

$$\begin{array}{r} 160 \\ +\ \ 24 \\ \hline 184 \\ \hline \end{array}$$

Compact Multiplication
For use when multiplying by 12 or under.

TU x U
23 x 8

$$\begin{array}{r} 23 \\ \text{X}\ \underline{\quad 8} \\ \underline{16\quad} \\ 184 \\ 2 \end{array}$$

Step 1 – 3 x 8 = 24
Step 2 – 2 x 8 =

Y5

Grid method

HTU x U
(Short multiplication – multiplication by a single digit)

346 x 9
Children will approximate first
346 x 9 is approximately 350 x 10 = 3500

x	300	40	6
9	2700	360	54

$$\begin{array}{r} 2700 \\ +\ \ 360 \\ +\ \ \ \ 54 \\ \hline 3114 \\ \hline {\scriptstyle 11} \end{array}$$

TU x TU

(Long multiplication – multiplication by more than a single digit)

72 x 38
Children will approximate first
72 x 38 is approximately 70 x 40 = 2800

x	70	2
30	2100	60
8	560	16

$$\begin{array}{r} 2100 \\ +\ \ 560 \\ +\ \ \ \ 60 \\ +\ \ \ \ 16 \\ \hline 2736 \\ \hline {\scriptstyle 1\ \ \ \ } \end{array}$$

Compact Division
For use when multiplying by numbers 12 and under.

HTU x U

346 x 9

$$\begin{array}{r} 346 \\ \times\ \ \ \ 9 \\ \hline 3114 \\ \hline {\scriptstyle 4\,5\ } \end{array}$$

Step 1 – 6 x 9 = 54
Step 2 – 4 x 9 = 36
Step 3 – 3 x 9 = 27

Using similar methods, they will be able to multiply decimals with one decimal place by a single digit number, approximating first. They should know that the decimal points line up under each other.

e.g. **4.9 x 3**

Children will approximate first
4.9 x 3 is approximately 5 x 3 = 15

$$\begin{array}{r} 4.9 \\ \times\ \ \ \ 3 \\ \hline 14.7 \\ \hline {\scriptstyle 2\ \ \ } \end{array}$$

Step 1 – 9 x 3 = 27
0.9 x 3 = 2.7
Step 2 – 4 x 3 = 12

<u>Y6</u>

ThHTU x U
(Short multiplication – multiplication by a single digit)

4346 x 8

Children will approximate first
4346 x 8 is approximately 4346 x 10 = 43460

$$\begin{array}{r} 4346 \\ \times \quad 8 \\ \hline 34768 \\ \hline {\scriptstyle 2\ 3\ 4} \end{array}$$

Step 1 - 6 x 8 = 48
Step 2 – 4 x 8 = 32
Step 3 – 3 x 8 = 24
Step 4 – 4 x 8 = 32

HTU x TU
(Long mult

372 x 24

Children will approximate first
372 x 24 is approximately 400 x 25 = 10000

x	300	70	2
20	6000	1400	40
4	1200	280	8

$$\begin{array}{r} 6000 \\ +\ 1400 \\ +\ 1200 \\ +\ 280 \\ +\ 40 \\ +\ 8 \\ \hline 8928 \\ \hline {\scriptstyle 1\quad} \end{array}$$

Using similar methods, they will be able to multiply decimals with up to two decimal places by a single digit number and then two digit numbers, approximating first. They should know that the decimal points line up under each other.

For example:

4.92 x 3

Children will approximate first
4.92 x 3 is approximately 5 x 3 = 15

$$\begin{array}{r} 4.92 \\ \text{X} \qquad 3 \\ \hline 14.76 \\ \hline {\scriptstyle 2\qquad} \end{array}$$

Step 1 – 2 x 3=6
0.02 x 3 = 0.06
Step 2 – 9 x 3 = 27
0.9 x 3 = 2.7
Step 3 – 4 x 3 = 12

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

Children should not be made to go onto the next stage if:

5) they are not ready.
6) they are not confident.

Children should be encouraged to approximate their answers before calculating.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

PROGRESSION THROUGH CALCULATIONS FOR DIVISION

MENTAL CALCULATIONS
(ongoing)
These are a **selection** of mental calculation strategies:
See NNS Framework Section 5, pages 52-57 and Section 6, pages 58-65

Doubling and halving
Knowing that halving is dividing by 2

Deriving and recalling division facts

Tables should be taught everyday from Y2 onwards, either as part of the mental oral starter or other times as appropriate within the day.

Year 2 2 times table
5 times table
10 times table

Year 3 2 times table
3 times table
4 times table
5 times table
6 times table
10 times table

Year 4 Derive and recall division facts for all tables up to 10 x 10

Year 5 & 6 Derive and recall quickly division facts for all tables up to 10 x 10

Using and applying division facts
Children should be able to utilise their tables knowledge to derive other facts.
e.g. If I know 3 x 7 = 21, what else do I know?
30 x 7 = 210, 300 x 7 = 2100, 3000 x 7 = 21 000, 0.3 x 7 = 2.1 etc

Dividing by 10 or 100
Knowing that the effect of dividing by 10 is a shift in the digits one place to the right.
Knowing that the effect of dividing by 100 is a shift in the digits two places to the right.

Use of factors
378 ÷ 21 378 ÷ 3 = 126 378 ÷ 21 = 18
126 ÷ 7 = 18

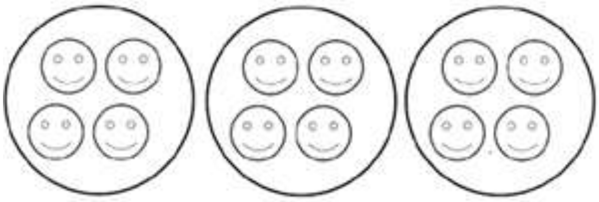
Use related facts
Given that 1.4 x 1.1 = 1.54
What is 1.54 ÷ 1.4, or 1.54 ÷ 1.1?

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF CHILDREN TO ACHIEVE.

YR and Y1

Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.

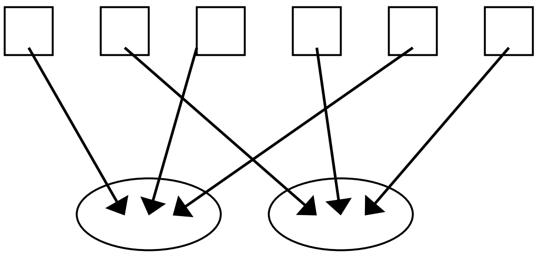


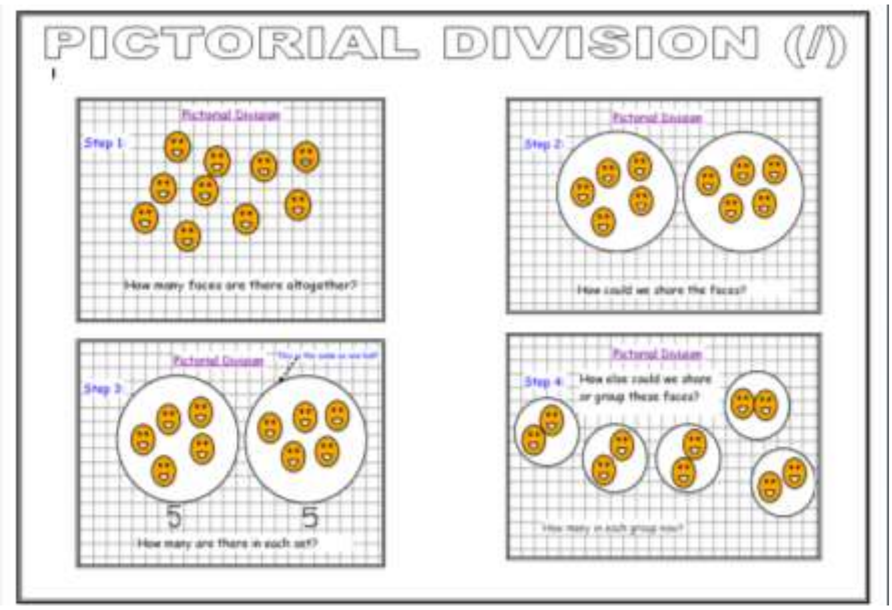
Y2

Children will develop their understanding of division and use jottings to support calculation

✓ Sharing equally

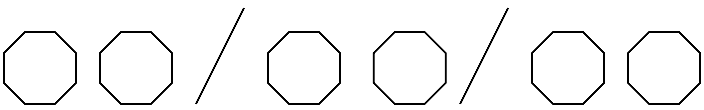
6 sweets shared between 2 people, how many do they each get?





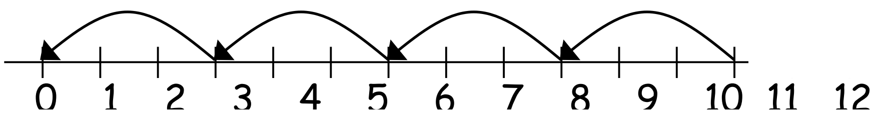
✓ Grouping or repeated subtraction

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



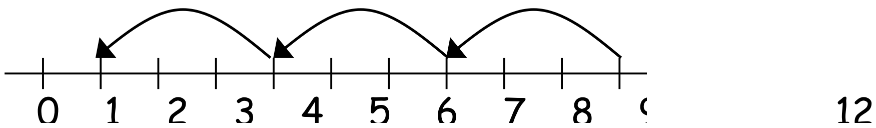
✓ Repeated subtraction using a number line or bead bar

12 ÷ 3 = 4



Children will be introduced to remainders using this method.

10 ÷ 3 = 3 r 1



✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations. Also missing symbols instead of numbers as well.**

□ ÷ 2 = 4   20 ÷ △ = 4   □ ÷ △ = 4

<u>Y3</u>

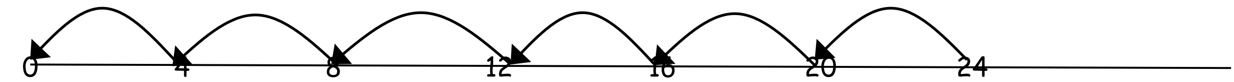
Ensure that the emphasis in Y3 is on grouping rather than sharing.

Children will continue to use:

✓ **Repeated subtraction using a number line**

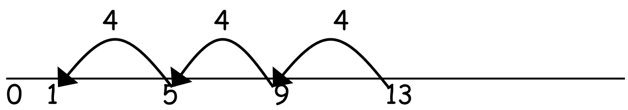
Children will use an empty number line to support their calculation.

24 ÷ 4 = 6



Children should also move onto calculations involving remainders.

13 ÷ 4 = 3 r 1



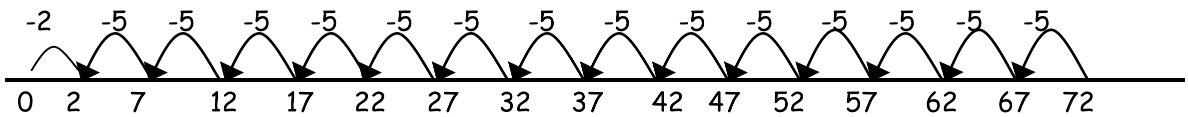
✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

26 ÷ 2 = □   24 ÷ △ = 12   □ ÷ 10 = 8

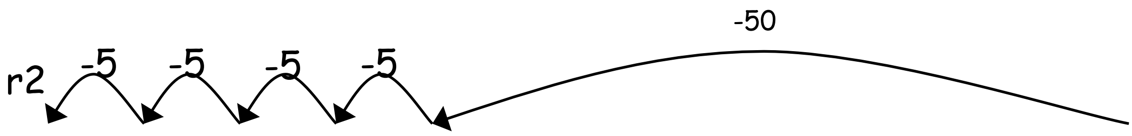
<u>Y4</u>

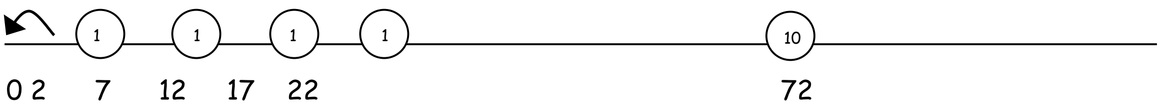
Children will develop their use of repeated subtraction to be able to subtract multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar.

72 ÷ 5



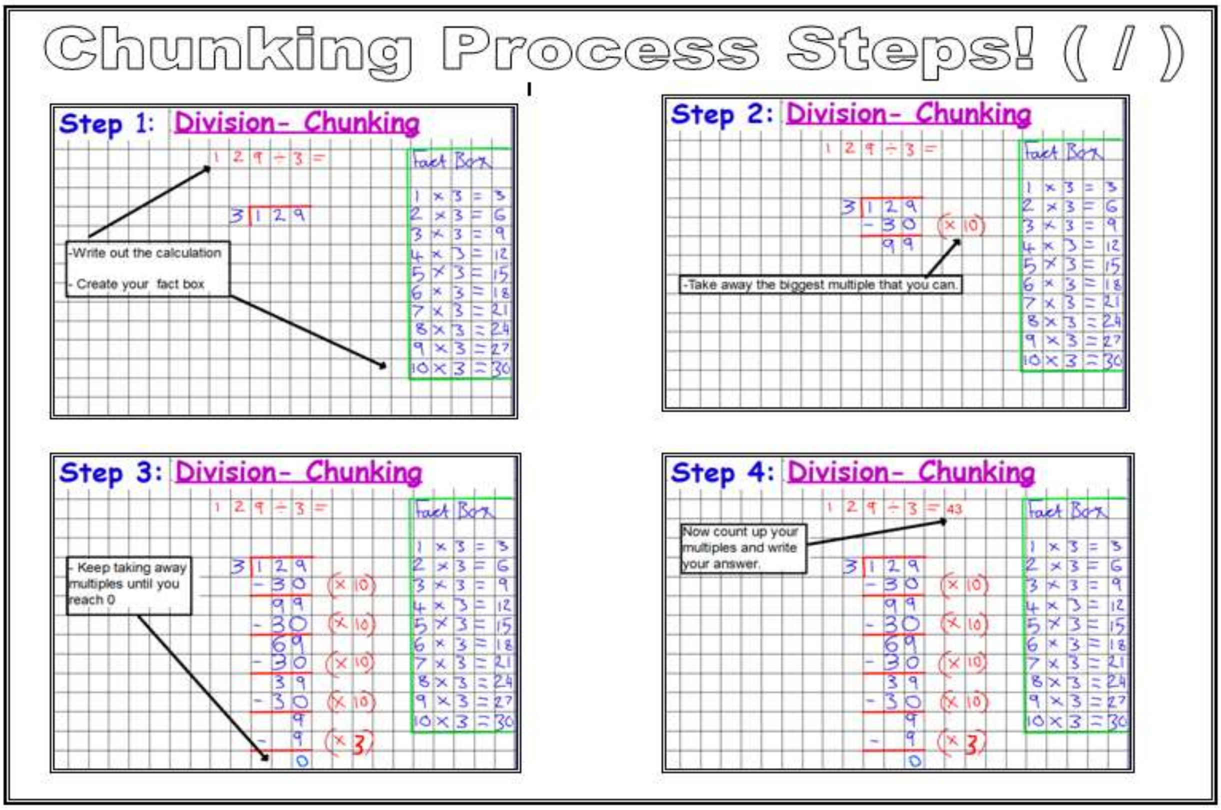
Moving onto:





Then onto the vertical method:

Chunking



TU ÷ U

72 ÷ 3

```
3 ) 72
  - 30    10x
    42
  - 30    10x
    12
  -  6     2x
     6
  -  6     2x
     0
```

Answer : 24

Leading to subtraction of other multiples.

96 ÷ 6

```
     1 6
6 )  96
```

- 60 10x

36

- 36 6x

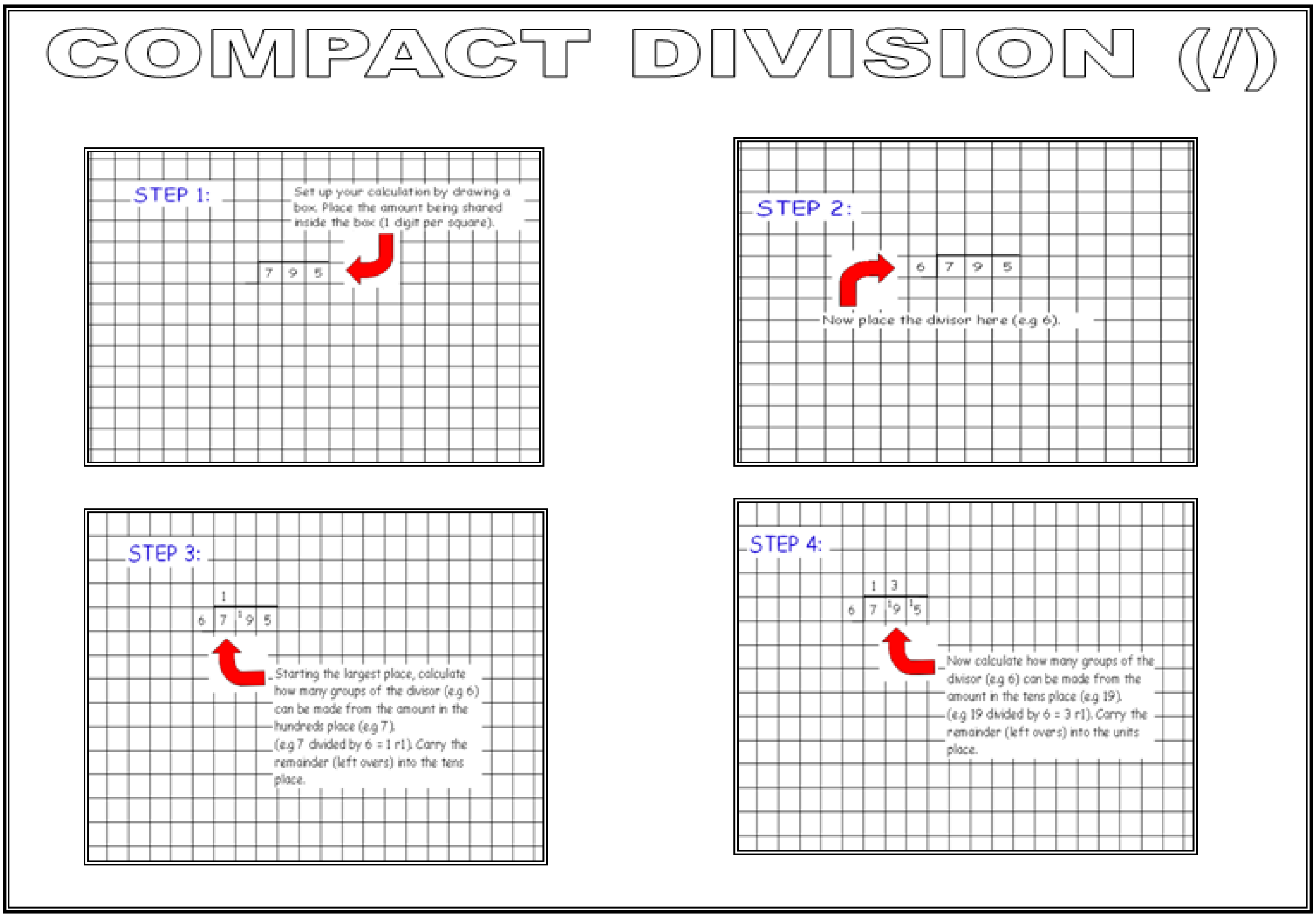
0

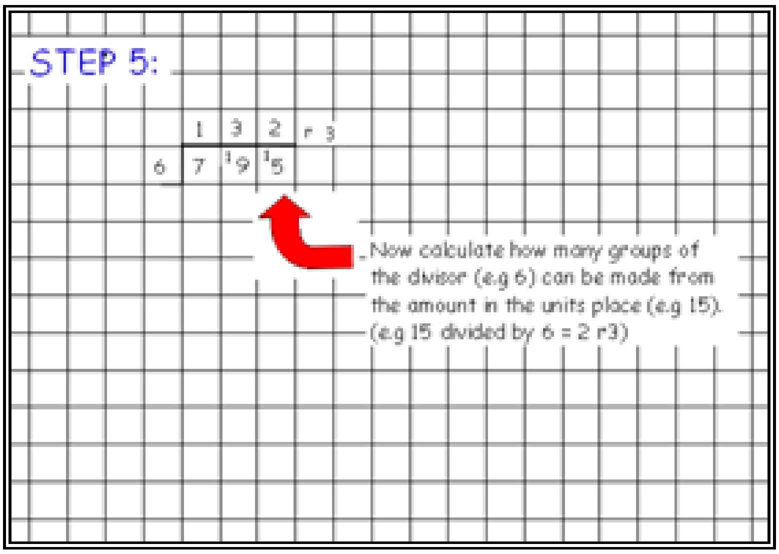
↓

Answer : 16

When dividing by numbers 12 and under, a short version of division will be used. We call this compact division.

Compact Division





Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. For example 62 ÷ 8 is 7 remainder 6, but whether the answer should be rounded up to 8 or rounded down to 7 depends on the context.

e.g. I have 62p. Sweets are 8p each. How many can I buy?
Answer: 7 (the remaining 6p is not enough to buy another sweet)

Apples are packed into boxes of 8. There are 62 apples. How many boxes are needed?
Answer: 8 (the remaining 6 apples still need to be placed into a box)

<u>Y5</u>

Children will continue to use written methods such as **chunking** and **compact division** to solve short division TU ÷ U and HTU ÷ U.
Children can start to subtract larger multiples of the divisor, e.g. 30x

Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. For example 240 ÷ 52 is 4 remainder 32, but whether the answer should be rounded up to 5 or rounded down to 4 depends on the context.

<u>Y6</u>

Children will continue to use written methods, **chunking** and **compact division**, to solve short division TU ÷ U and HTU ÷ U.

Any remainders should be shown as fractions, i.e. if the children were dividing 32 by 10, the answer should be shown as $3\ ^{2}/_{10}$ which could then be written as $3\ ^{1}/_{5}$ in it's lowest terms.

Extend to decimals with up to two decimal places. Children should know that decimal points line up under each other.

87.5 ÷ 7 USE COMPACT?

12.5	
7) 87.5	
- 70.0	10x
17.5	
- 14.0	2x
3.5	
- 3.5	0.5x
0	

Answer : 12.5

\+ - + - + - + - + - + - +

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

Children should not be made to go onto the next stage if:

7) they are not ready.
8) they are not confident.

Children should be encouraged to approximate their answers before calculating.
Children should be encouraged to check their answers after calculation using an appropriate strategy.
Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.