Primary Maths Calculation Policy
Pencil and Paper Procedures

This procedure is reviewed annually to ensure compliance with current regulations

Approved/reviewed by	
Head of Primary & Secondary	
Date of review	August 2024
Date of next review	August 2025

Introduction

Over the years much has changed in the teaching and learning of maths. The calculation methods used by children today are in many cases different from those used by adults when they were at school. This can cause anxiety, with parents and carers unsure whether or not they should teach children particular methods.

The purpose of this booklet is to provide guidance and information about the types of calculation methods that the children at Dubai British School are being taught and are using from Foundation up to Year 6.

The calculation methods taught today gradually build on the children's understanding over a period of time. They have been introduced after research programmes have shown them to be effective. The aim is to teach children calculation methods which they understand, can use correctly, and can use confidently to solve problems.

The Primary National Strategy gives a great deal of emphasis to children learning to use a whole range of mental calculation methods properly, before they move on to written calculations. These mental methods will involve the children writing or drawing things to help them. These are often called "jottings" and might well involve using a number line.

This does not mean that written methods are not seen as important. It is expected that children in Year 6 will have a written method for each operation + - x ÷ which they can use reliably to solve problems. The written methods that children use will not necessarily involve lining the numbers up in columns, since there are other effective methods which we will look at in this booklet.

x	20	3
7	140	21

Notes to accompany the Calculation Policy

1.   The columns for each year group are intended to be for the standard level. Teachers use their year group as a starting point for planning, but in order to meet the needs of the individuals there will be need to look forward or back.

2.   When using a number line, show counting on above the line and counting back below the line. Include an arrow to show direction.

82   87   97   +14   +100   +10

-5   -10

186   200   300   35   44   -1   45
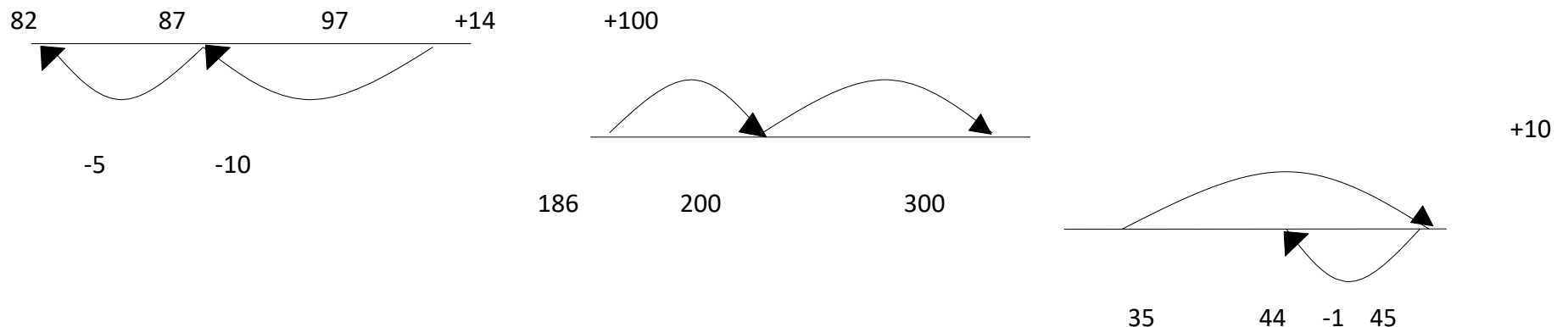
3.   Using calculators is encouraged for checking answers in all year groups. In years 5 and 6, when written methods are secure, calculators can be used if it is the most efficient method of calculation.

4.   Estimating is encouraged from foundation to year 6 by the use of apparatus, rounding and using the inverse operation.

5.   The methods of calculations taught within each year group should be applied to other areas, including measurement and problem solving.

Addition

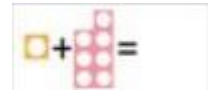| Foundation	Year 1	Year 2
Note: Recording the numerals is not expected until F2, term 3. Prior to this teachers will model simple addition and subtraction using formal notation. Children will be encouraged to use their own pictorial recording to represent quantities and the results of simple calculations.	**Oral and practical** Continue practical work as in foundation. Working with apparatus, including bead strings and unifix to 20.	**+ = signs and missing numbers** Continue using a range of equations as in Year 1 but with appropriate, larger numbers. Extend to $14 + 5 = 10 + \bullet$ and adding three numbers

Foundation

Oral and practical Songs and rhymes.
Dice and number games.
Counting objects in groups.
Unifix cubes.
Cutting and sticking.
Number stories, e.g. There are 3 crabs in the sand and 2 in the water. How many are there altogether? Drawing.

When children are ready to record numerals the following are possible ways to record simple calculations.

Combining sets

$3 + 2 =$
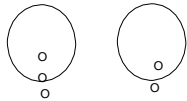
Identifying and generating numbers using Numicon

Finding one more than a given number

1	2	3	4	5	6	7	8	9	10
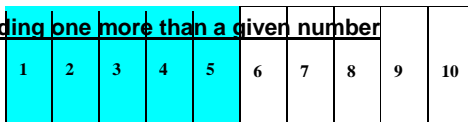
$4 + 1 =$

Number lines (numbered)
Number bonds to 10. (May extend to using number lines to 20).

0 1 2 3 4 5 6 7 8 9 10

Year 1

Generating and solving number sentences with Numicon

$\square + $ =

Number bonds using Numicon

10 =   1+9   2+8   3+7
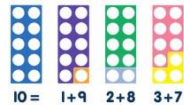
+ = signs and missing numbers
$3 + 4 = \bullet$ $\bullet = 3 + 4$
$3 + \bullet = 7$ $7 = \bullet + 4 \bullet$
$+ 4 = 7$ $7 = 3 + \bullet \bullet +$
$\nabla = 7$ $7 = \bullet + \nabla$
Promoting covering up of operations and numbers.

Number lines (numbered)
Teacher models first.
Children record by - drawing jumps on prepared lines
                    - constructing own lines

$7 + 4$

0 1 2 3 4 5 6 7 8 9 10 11 12

Empty number lines
$5 + 3$

5   6   7   8

Extend to bridging through 10, e.g. $8 + 5 = 13$

+2   +3

8   10   13

Year 2

$32 + \bullet + \bullet = 100$ $35 = 1 + \bullet + 5$

Partition into tens and ones and recombine
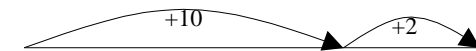$12 + 23 = 10 + 2 + 20 + 3$
$\qquad = 30 + 5$
$\qquad = 35$
refine to partitioning the second number only:

$23 + 12 = 23 + 10 + 2$
$\qquad = 33 + 2$
$\qquad = 35$

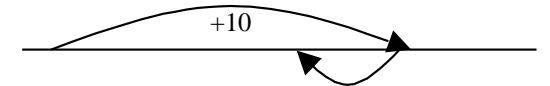+10   +2

23   33   35

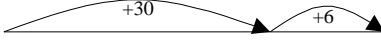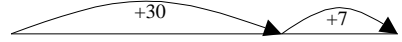*Add 9 or 11 by adding 10 and adjusting by 1*
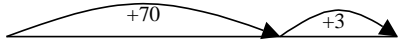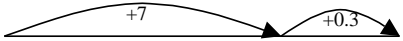
$35 + 9 = 44$

+10

35   44   45   -1

Addition

Year 3	Year 4	Year 5	Year 6
+ = signs and missing numbers Continue using a range of equations as in Year 1 and 2 but with appropriate, larger numbers.	**+ = signs and missing numbers** Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.	**+ = signs and missing numbers** Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.	**+ = signs and missing numbers** Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Year 3

Partition into tens and ones and recombine
Partition both numbers and recombine.
47 + 36 = 40 + 7 + 30 + 6 **OR** 47 + 36
      = 70 + 13
      = 83   70 + 13 = 83
Refine to partitioning the second number only e.g.
36 + 53 = 53 + 30 + 6
      = 83 + 6
      = 89

```
        +30        +6
    53         83      89
```

Add a near multiple of 10 to a two-digit number
Continue as in Year 2 using number lines but with appropriate numbers
e.g. 35 + 19 is the same as 35 + 20 – 1.

pencil and paper procedures (Term 3)
83 + 42 = 125

More able

```
  80 + 3          83    OR      83
+ 40 + 2        + 42          + 42
 120 + 5 =125    120            5
                   5          120
                 125          125
```

Year 4

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

```
        +30            +7
   55           85       92
```

Add the nearest multiple of 10, then adjust
Continue as in Year 2 and 3 but with appropriate numbers e.g. 63 + 29 is the same as 63 + 30 - 1

Pencil and paper procedures
358 + 73 = 431
Either   **OR**

```
  300+50+8                   358
+    70+3                     73
 300+120+11 = 431             11
120
                             300
                             431
```
Extend to decimals in the context of money (vertically)
£ 2.50 + £ 1.75 = £ 4.25
  £ 2.50
+ £ 1.75
  £ 4.25
     1

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

Year 5

Partition into hundreds, tens and ones and recombine
Either partition both numbers and recombine or partition the second number only e.g.
358 + 73 = 358 + 70 + 3
      = 428 +
      = 431

```
        +70            +3
   358          428      431
```

Add or subtract the nearest multiple of 10 or 100, then adjust
Continue as in Year 2, 3 and 4 but with appropriate numbers e.g. 458 + 79 = is the same as 458 + 80 - 1

Pencil and paper procedures
Leading to formal method, showing numbers carried underneath.
```
  358
+  73
  431
   11
```

Extend to numbers with at least four digits
          3587 + 675 = 4262
```
  3587
+  675
  4262
  111
```

Revert to expanded methods if the children experience any difficulty.
Extend to decimals (same number of decimals places) and adding several numbers (with different numbers of digits).
Model negative numbers using a number line.

Year 6

Partition into hundreds, tens, ones and decimal fractions and recombine
Either partition both numbers and recombine or partition the second number only e.g.
35.8 + 7.3 = 35.8 + 7 + 0.3
        = 42.8 + 0.3
        = 43.1

```
        +7            +0.3
  35.8         42.8      43.1
```

Add the nearest multiple of 10, 100 or 1000, then adjust
Continue as in Year 2, 3, 4 and 5 but with appropriate numbers including extending to adding 0.9, 1.9, 2.9 etc

Pencil and paper procedures
Extend to numbers with any number of digits and decimals with 1 and 2 decimal places.
124.9 + 117.25 = 242.15

```
   124.9
+ 117.25
  242.15
     11
```

Revert to expanded methods if the children experience any difficulty.
Extend to decimals (either one or two decimal places).

Subtraction		
Foundation	**Year 1**	**Year 2**

Foundation

Oral and Practical work
Songs and rhymes
Dice and number games
Counting groups of objects and removing some and counting again – emphasising inverse of addition.
Unifix cubes
Cutting and sticking
Number stories using objects, e.g. How many are there altogether? How many are there now? (after some have been removed.)
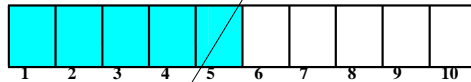
Pictures / marks
Take away two

5 – 2 =

Finding 1 less than a given number
Number tracks

5 – 1 =

Counting back

Counting back in 1's orally from different totals up to 20.

End of term 3 – more able draw on prepared number lines.

0 1 2 3 4 5 6 7 8 9 10
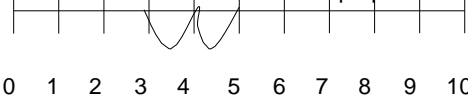
Year 1

Oral and practical
Continue as in foundation with apparatus, including bead strings and unifix, using numbers within 20.

Pictures / marks
Sam spent 4p. What was his change from 10p? Extend to

20p

Generating and solving number sentences with Numicon

9 - 3 = 6
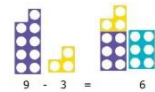
- = signs and missing numbers
7 - 3 = •	• = 7 - 3
7 - • = 4	4 = • - 3
• - 3 = 4	4 = 7 - •
• - ∇ = 4	4 = • - ∇

 Number lines (numbered and semi structured)
  11 – 7
(Counting back)
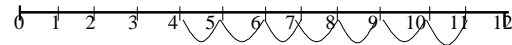
 The difference between 7 and 11
(Counting up)

0   1   2   3   4   5   6   7   8   9   10   11   12
Recording by - drawing jumps on prepared lines
               - constructing own lines
(Teachers model jottings appropriate for larger numbers)

Year 2

- = signs and missing numbers
Continue using a range of equations as in Year 1 but with appropriate numbers.
Extend to 14 + 5 = 20 - •

Find a small difference by counting up

42 – 39 = 3
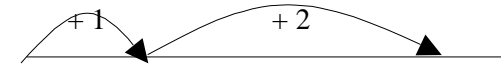
39   40   42

Subtract 9 or 11. Begin to add/subtract 19 or 21
35 – 9 = 26
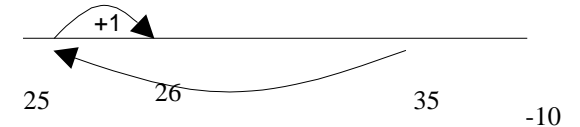
25   26   35   -10

Use known number facts and place value to subtract
(partition second number only)
37 – 12 = 37 – 10 – 2
         = 27 – 2
= 25

25   27   37
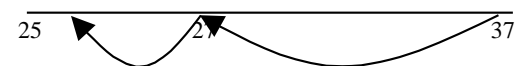
-2   -10

Subtraction			
Year 3	**Year 4**	**Year 5**	**Year 6**

- = signs and missing numbers

Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Find a small difference by counting up

Continue as in Year 2 but with appropriate numbers e.g. 102 – 97 = 5

Subtract mentally a 'near multiple of 10' to or from a two-digit number

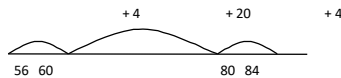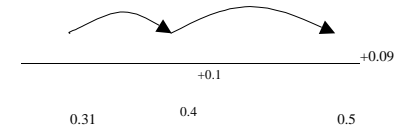Continue as in Year 2 but with appropriate numbers e.g. 78 – 49 is the same as 78 – 50 + 1

Use known number facts and place value to subtract

Continue as in Year 2 but with appropriate numbers e.g. 97 – 15 = 72

82   87   97

-5   -10
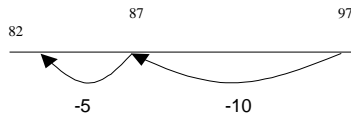
Pencil and paper procedures

Complementary addition
84 – 56 = 28

+ 4   + 20   + 4

56 60   80 84

$$\begin{array}{ll} & 84 \\ - \ 56 & \\ \to 60 & \\ & 20 \to 80 \\ & \underline{4} \to 84 \\ & \underline{28} \end{array}$$

Term 3 - could extend to vertical method. 4

- = signs and missing numbers Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Find a small difference by counting up
e.g. 5003 – 4996 = 7
This can be modelled on an empty number line (see complementary addition below).

Subtract the nearest multiple of 10, then adjust.
Continue as in Year 2 and 3 but with appropriate numbers.

Use known number facts and place value to subtract 92 – 15 = 77

77   82   92

-5   -10
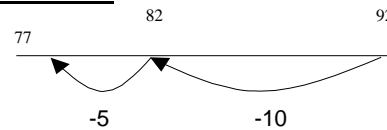
Pencil and paper procedures
Complementary addition – continue as year 3 with number line and/ or vertical method.
754 – 86 = 668

+14   +600   +54

86   100   700   754
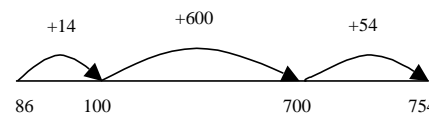
Expanded Method of decomposition
572 – 58 = 514

$$\begin{array}{l} \quad\quad 60 \ \ 12 \\ 500 + 7\!\!\!/0 + 2\!\!\!/ \\ \quad\ \underline{50 + 8} - \\ \underline{500 + 10 + 4} = 514 \end{array}$$

leading to

$$\begin{array}{r} 612 \\ 572 \\ \underline{58} - \\ \underline{514} \end{array}$$

Extend to decimals using 3 digit sums of money, with or without adjustment from pence to pounds.

- = signs and missing numbers Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Find a difference by counting up
e.g. 8006 – 2993 = 5013
This can be modelled on an empty number line (see complementary addition below).

Subtract the nearest multiple of 10 or 100, then adjust.
Continue as in Year 2, 3 and 4 but with appropriate numbers.

Use known number facts and place value to subtract 6.1 – 0.4 = 5.7

5.7   6.0   6.1

-0.3   -0.1
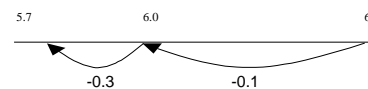
Pencil and paper procedures
Complementary addition including vertical method.
754 – 286 = 468

+14   +400   +54

286   300   700   754
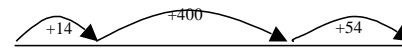
Expanded method of decomposition leading to compact recording.
757 – 259 = 498

$$\begin{array}{l} \mathbf{600\ \ 140\ \ 17} \\ 70\!\!\!/0 + 5\!\!\!/0 + 7\!\!\!/ \\ \underline{200 + 50 + 9} - \\ \underline{400 + 90 + 8} = 498 \end{array}$$

leading to

$$\begin{array}{r} \mathbf{61417} \\ 757 \\ \underline{259} - \\ \underline{498} \end{array}$$

Extend to decimals using the chosen method using decimal fractions with 3 digits and the same number of decimal places. E.g. £9.42 – 6.78 or 72.5km – 4.6km

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- = signs and missing numbers Continue using a range of equations as in Year 1 and 2 but with appropriate numbers.

Find a difference by counting up
e.g. 0.5 – 0.31 = 0.19
This can be modelled on an empty number line (see complementary addition below).
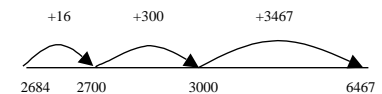
+0.09
+0.1

0.31   0.4   0.5

Subtract the nearest multiple of 10, 100 or 1000, then adjust
Continue as in Year 2, 3, 4 and 5 but with appropriate numbers.
Use known number facts and place value to subtract
Continue as year 5

Pencil and paper procedures
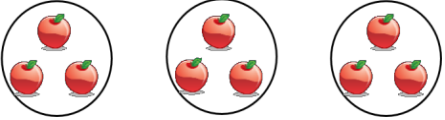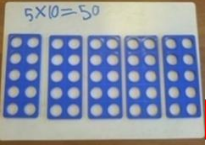Complementary addition including vertical method.
6467 – 2684 = 3783

+16   +300   +3467

2684 2700   3000   6467
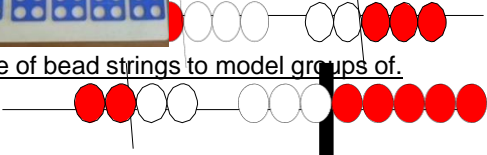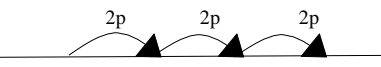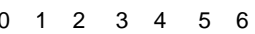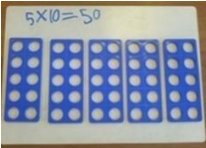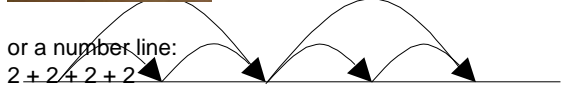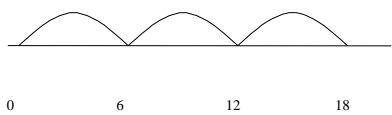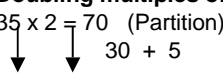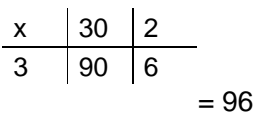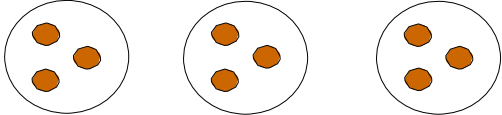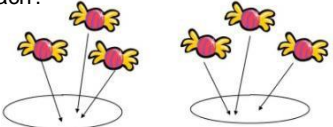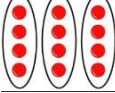
Compact decomposition
6467 – 2684 = 3783
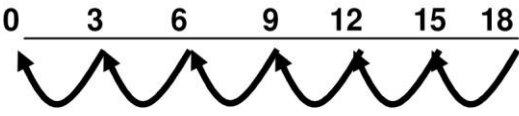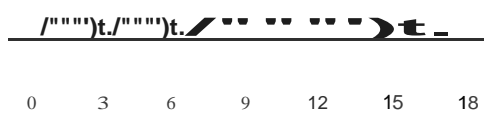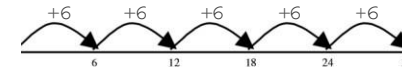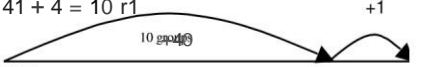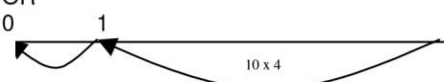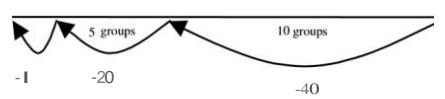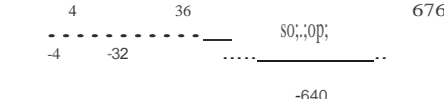
$$\begin{array}{r} \ ^{5\ 1 3 1 6} \\ \mathbf{6467} \\ - \ \underline{2684} \\ 3783 \end{array}$$

Extend to decimals using decimal fractions with up to 3 digits and either 1 or 2 decimal places. E.g. 324.9 – 7.25 or 14.24 – 8.7

Multiplication		
Foundation	Year 1	Year 2

Foundation

Practical and oral
Circle time
Games
Songs and rhymes
Counting in ones, twos and tens
Matching pairs, e.g socks

Repeated addition
Groups of objects with the same number, counting how many in each group and finding how many altogether.

Recording
Drawing, e.g. petals on flowers – draw 3 petals on each flower.

Term 3 – may record numerals to show how many in each group.

Year 1

Practical and Oral
Continue as foundation but including counting fives
Knowing doubles of numbers to 10

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

(Recording on a number line modelled by the teacher when solving problems)
Numicon to count sets

Use of bead strings to model groups of.

Repeated addition
Teacher models 3 + 3 + 3 = 9 for sets of objects
Use of coins

Teacher models number line

0   1   2   3   4   5   6

Year 2

x = signs and missing numbers

7 x 2 = •	• = 2 x 7
7 x • = 14	14 = • x 7
• x 2 = 14	14 = 2 x •
• x ∇ = 14	14 = • x ∇

Arrays and repeated addition

4 x 2 or 4 + 4

2 x 4
or repeated addition using numicon

or a number line:
2 + 2 + 2 + 2

0   1   2   3   4   5   6   7   8

Doubling multiples of 5 up to 50
15 x 2 = 30

Partition

15 x 2   OR   15 x 2
10 + 5

                                            20 + 10 = 30

20 + 10 = 30

Multiplication			
Year 3	Year 4	Year 5	Year 6

Year 3

x = signs and missing numbers
Continue using a range of equations as in Year 2 but with appropriate numbers.

Number lines
6 x 3

0   6   12   18

Arrays and repeated addition
Continue to understand multiplication as repeated addition and continue to use arrays (as in Year 2).
Doubling multiples of 5 up to 50
35 x 2 = 70 (Partition)
        30 + 5

60 + 10 = 70

Pencil and paper procedures
Use known facts and place value to carry out simple multiplications partitioning using grid method, e.g. 32 x 3 = 96

x	30	2
3	90	6

= 96

Year 4

x = signs and missing numbers
Continue using a range of equations as in Year 2 but with appropriate numbers

Partition
23 x 4 = 92

23 x 4 = (20 x 4) + (3 x 4)
       = (80) + (12)
       = 92

OR
Use the grid method of multiplication (as below)

Pencil and paper procedures
Grid method (TU x U)

X	20	3
7	140	21

23 x 7 is approximately 20 x 10 = 200

= 161

Extend more able children to HTU x U.
172 x 6 is approximately 200 x 6 = 1200

X	100	70	2
6	600	420	12

= 1032

Year 5

x = signs and missing numbers
Continue using a range of equations as in Year 2 but with appropriate numbers

Partition
47 x 6 = 92
47 x 6 = (40 x 6) + (7 x 6)
       = (240) + (42)
       = 282
Pencil and paper procedures
Grid method (HTU x U and TU x TU)
72 x 38 is approximately 70 x 40 = 2800

X	70	2
30	2100	60
8	560	16

2160
+ 576
2736

Standard method: (HTU x U and TU x TU)
346 x 9 is approximately 350 x 10 = 3500

346
  9
2700   (300 x 9)   leading to
 360   (40 x 9)
  54   (6 x 9)
3114

346 X
X   9
3114
4 5

72 x 38 is approximately 70 x 40 = 2800
  72
x 38
2160   (72 x 30)
576   (72 x 8)
2736
  1

4.9 Extend to simple x 3 decimals with
12.0 (4.0 x 3) one decimal 2.7
(0.9 x 3)   place.
14.7

Year 6

x = signs and missing numbers
Continue using a range of equations as in Year 2 but with appropriate numbers

Partition
87 x 6 = 522
 87 x 6 = (80 x 6) + (7 x 6)
        = (480) + (42)
        = 522

Pencil and paper procedures
Grid method (ThHTU x U and HTU x TU)
372 x 24 is approximately 400 x 20 = 8000

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

Standard method continue as Year 5:
(ThHTU x U and HTU x TU)
352 x 27 is approximately 350 x 30 = 10500

 352
x 27
7040   (352 x 20)
2464   (352 x 7)
9504

Extend to decimals with up to two decimal places. 12.5 x2.5
25.0   (2.5 x 10.0)
5.0   (2.5 x 2.0)
1.25 (2.5 x 0.5)
31.25
Moving to formal methods of multiplication for decimals. Carrying numbers underneath.

DUBAI BRITISH SCHOOL EMIRATES HILLS

Division		
Foundation	Year 1	Year 2

Foundation

Practical and oral

Songs and rhymes
Making groups/piles of 2 using objects (relate to x)
Finding partners, e.g. getting into 2"s in PE, how many pairs are there?
Extend more able by asking how many balls do I need to get out if each pair will have 1?

Sharing out between people by giving 1 each – is there an easier way to do this? E.g. 2 at a time.

Each friend gets 3 cookies

Year 1

Practical and oral
Continue as foundation

Numicon to make number using equal groups

14÷2=7

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

Cutting cakes/pizzas in half, sharing relating to fractions, e.g. finding half of a group of objects.

Knowing halves of even numbers to 20.

Year 2

÷ = signs and missing numbers

6 ÷ 2 = •   • = 6 ÷ 2
6 ÷ • = 3   3 = 6 ÷ •
• ÷ 2 = 3   3 = • ÷ 2
• ÷ ∇ = 3   3 = • ÷ ∇

Understand division as sharing and grouping

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

6÷ 2 can be modelled as:

Grouping – There are 6 sweets. How many people can have 2 each? (How many 2's make 6?)

0   2   4   6

Understanding the relationship between x and ÷ (using the inverse)

4 x 3 = 12
12 ÷ 3 = 4
12 ÷ 4 = 3

Division

Year3	Year 4	Year 5	Year 6

+ = signs and missing numbers
Continue using a range of equations as in Year 2 but with appropriate numbers.

Understand division as sharing and grouping
18 + 3 can be modelled as:
Sharing -18 shared between 3 (see Year 2 diagram)
OR

Or

Grouping - How many 3's make 18?

0   3   6   9   12   15   18

Remainders

16 ÷ 3 = 5 r1
Sharing - 16 shared between 3, how many left *over?*
Grouping- How many 3's make 16, how many left *over?*
e.g.

0   3   6   9   12   15 16

+ = signs and missing numbers
Continue using a range of equations as in Year 2 but with appropriate numbers.

Sharing and grouping
30 ÷ 6 can be modelled as:
grouping-groups of 6 taken away and the number of groups counted e.g.

+6   +6   +6   +6   +6
6   12   18   24   30

sharing –sharing among 6, the number given to each person

Remainders
41 + 4 = 10 r1   +1

10 groups

OR
0   1

10 x 4
41

-1   -40

OR   41 =(10x4)+ 1

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

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

Answer : 14 remainder 2

+ = signs and missing numbers
Continue using a range of equations as in Year 2 but with appropriate numbers.

Sharing and grouping
Continue to understand division as both sharing and grouping (repeated subtraction).

Remainders
Quotients expressed as fractions or decimal fractions
61 ÷ 4 = 15 ¼ or 15.25

+40   +20   +1

OR

0   21   61

5 groups   10 groups

-l   -20   -40

Pencil and paper procedures
256 ÷ 7 lies between 210 ÷ 7 = 30 and 280 ÷ 7 = 40

256
....:J).   (10 groups)   or (10 x 7)
186
140   (20 groups)   or (20 x 7)
46
42   (6 groups)   or
4   (36 groups)   or (36)

Answer: 36 remainder 4

+ = signs and missing numbers
Continue using a range of equations as in Year 2 but with appropriate numbers.

Sharing and grouping
Continue to understand division as both sharing and grouping (repeated subtraction).

Remainders
Quotients expressed as fractions or decimal fractions
676 ÷ 8 = 84.5

+640   +32   +4

OR

4   36   676
-4   -32
-640

Pencil and paper procedures
977 ÷ 36 is approximately 1000 ÷ 40 = 25

977   977
360   (10x36) -   720   (20 x 36)
617   257
360   (10x36) refine   180   (5 x 36)

257   **to**   77
180   (5 x 36)   - 72   (2 x 36)
77   5
7   (2 x 36)
5

Answer: 27 ⅚hs