Written methods in Division

Stage 1: 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.

Stage 2: 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?
OO / OO / OO

Repeated addition using a number line or bead bar

+3   +3   +3   +3   12÷3=4

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

Using symbols to stand for unknown numbers to complete equations using inverse operations
£ ÷ 2 = 4   20 ÷ r = 4   £ ÷ r = 4

Stage 3:
Repeated addition using a number line
Children will use an empty number line to support their calculation.

+4   +4   +4   +4   +4   +4   24÷4=6

0   4   8   12   16   20   24

Children should also move onto calculations involving remainders.

+4   +4   +4   +4   +4   +4   +1   25÷4=6 r1

0   4   8   12   16   20   24   25

Stage 4: Children will develop their use of repeated Addition to be able to subtract multiples of the divisor.

+60 (20x3)   +3   +3   +3   +3   +2   74÷3=24r2

0   60   63   66   69   72   74

This method will be used for calculations with or without a remainder.
Then onto the vertical method:

Short division TU ÷ U

```
    7 2
+   3 0     10x
    4 2
+   3 0     10x
    1 2
-+  1 2      4x
      0
        =  24
```

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.

Stage 5: Children will continue to use written methods to solve short division TU ÷ U. Children can start to subtract larger multiples of the divisor, e.g. 30x

Stage 6: Children will continue to use written methods 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 its lowest terms.

www.**mayfield.**cambs.sch.uk/

Don't forget our 'How to Help at Home' Leaflet for ideas and tips.

Mayfield Maths Calculation Leaflet

**MAYFIELD PRIMARY SCHOOL**
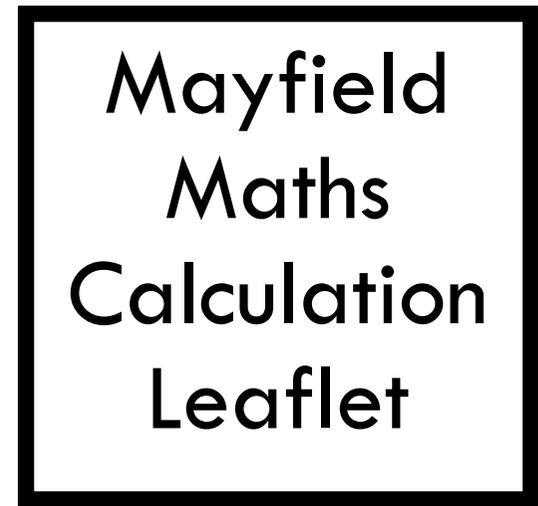
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Written stages in Addition

Stage 1: Use numberlines and practical resources to *support* calculation. Teachers *demonstrate* the use of the numberline. Children then begin to use numbered lines to support their own calculations using a numbered line to count on in ones.

Bead strings or bead bars can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3.
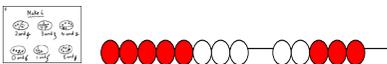

Stage 2: Children will begin to use 'empty number lines' themselves starting with the larger number and counting on.

First counting on in tens and ones.

```
  +10      +10     +1 +1 +1        34+23=57

34     44        54 55 56  57
```
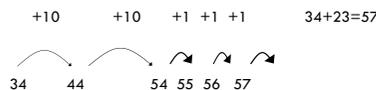
Then helping children to become more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7).

```
  +10      +10      +3           34+23=57

34     44          54    57
```
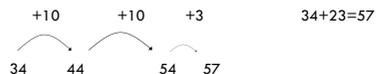
*Followed by adding the tens in one jump and the units in one jump.

```
   +20          +3              34+23=57

34          54      57
```
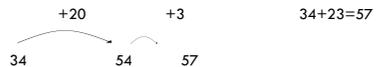
Stage 3: Children will continue to use empty number lines with increasingly large numbers, including compensation where appropriate.

Count on from the largest number irrespective of the order of the calculation.
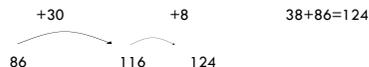
```
  +30             +8             38+86=124

86        116       124
```

Compensation

```
   +40           -2             38+86=124

86             124   126
```

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 – record mental methods using partitioning .

47 +76 = 40 +70 +7+ 6 = 110 +13 = 123

Leading to

 40 + 7

 70 + 6

110+13 = 123   **Adding the most significant digits first, then moving to add the least significant**

```
    6 7                    2 6 7          first  (Preparation for carrying)
+   2 4                +    8 5
    8 0 (60+20)            1 2 (7+5)
    1 1 ( 7+ 4)           1 4 0 (60+80)
    9 1                    2 0 0
                           3 5 2
```

Stage 4:

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

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

*It is important to know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p.

Stage 5: Children should extend the carrying method to numbers with at least four digits, including decimals.

Written stages in Subtraction

Stage 1: 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. They use numberlines and practical resources to support calculation. Teachers *demonstrate* the use of the numberline.
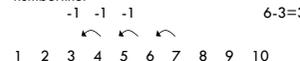
```
   -1  -1  -1               6-3=3

1  2  3  4  5  6  7  8  9  10
```

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 the <u>difference in value</u> between the numbers.

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

Stage 2 Children will begin to use empty number lines to support calculations.

First counting back in tens and ones
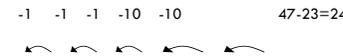
```
  -1    -1    -1    -10   -10            47-23=24

24    25   26   27        37        47
```

Children should then begin to subtract the units in one jump and the tens in one jump (similar to addition).

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 (find the difference).

```
     +4           +20              47-23=24

0               23    27        47
```

Stage 3: 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 *Initially, the children will be taught using examples that do not need the children to exchange.*

```
  8 9   =   8 0 + 9
 -5 7       5 0 + 7
            3 0 + 2   = 32
```

From this the children will begin to exchange

```
       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 in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used. A numberline can also be used for subtracting decimals.

Stage 4: Children should be secure in a method for subtraction. There should be no pressure for children to have to progress through all the methods too quickly. Some children may leave Year 6 confidently working in subtraction on a number line.

Partitioning and decomposition

```
         600       140
       700   +  50   + ¹4

   -           80  +  6

       600  +  60  +  8  =  668
```

Decomposition   6 14 1

```
      7 5 4

      - 8 6

      6 6 8
```

Stage 5: Children should extend the decomposition method to numbers with any number of digits, including decimals. Numberlines and mental methods should also be used, if more efficient than decomposition.

Written stages in Multiplication

Stage 1: 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.

Stage 2: 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

```
      5         5         5

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
```
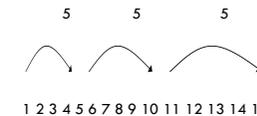
Commutativity: Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.

```
      5         5         5

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

   3      3      3      3      3
```
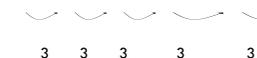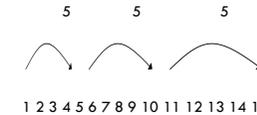
Arrays: Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.

5x3=15

3x5=15

Stage 3: Children will also develop an understanding of:
 Scaling e.g. Find a ribbon that is 4 times as long as the blue ribbon

 5cm

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

£ x 5 = 20   3 x r = 18   £ x š = 32

Partitioning

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

Stage 4: Children will continue to use arrays where appropriate leading into the grid method of multiplication.

```
X          10          4

   OOOOOOOOOOOO      (6x10) + (6x4)

   OOOOOOOOOOOO

6  OOOOOOOOOOOO       60  + 24

   OOOOOOOOOOOO

   OOOOOOOOOOOO       =84

   OOOOOOOOOOOO
```
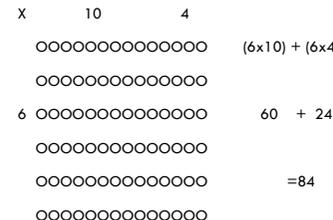
Grid method: TU x U
(Short multiplication – multiplication by a single digit)
23 x 8 (Children will approximate first)

23 x 8 is approximately 25 x 8 = 200

```
                                    x    20    3

                                  8   160   24    160+24=184
```

Stage 5: Grid method: Extended to HTUxU and TUxTU and also decimals e.g. U.txU (4.3x7)

Stage 6: Grid method: Extended to THTUxU and THTUxTU and also decimals to 2decimal places e.g. U.t h xU (4.38x7)