Progression in methods taught at Mickleover Primary for written calculations

Dear Parents

Please find attached a progression of the methods that your child will encounter in each phase when learning written methods for addition , subtraction, multiplication and division. They have been taken from the school Calculation Policy which can be found in full, on the school website in the 'Parents' section. Please retain your copy for reference but they will also be available on the School Website.

Please find time to look through the methods used, as these will be the methods that your child will be taught in class in this and future years. It can be helpful for parents to ask their child to show them and explain the methods that they are being taught in school. The ability to explain will aid their understanding. Please refrain from supporting your child by teaching other methods which do not form part of our policy.

Please return the slip below indicating that you have received this document and should you require any clarification of the methods being taught please comment below. We are hoping to run workshops in the Autumn Term 2016.

Many thanks

Mrs M. Harrison (KS 2 Maths Coordinator)
Mrs S. Sharpe   (KS 1 Maths Coordinator)

I have received a copy of the progression of written calculation methods. _____

I would be interested in attending a workshop on   Ks1 ☐   ks 2 ☐

Addition ☐   Subtraction ☐   Multiplication ☐   Division ☐

Ks2 Copy

Progression in written addition methods

Year 3	Year 4	Year 5	Year 6
Add numbers with up to three digits, using formal written method of columnar addition	Add numbers with up to 4 digits using the formal written methods of columnar addition. Carry below the line and cross off when added into the calculation	Add whole numbers with more than 4 digits, including using formal methods (columnar)	There is an expectation that children will continue to practise and use the formal written method for larger numbers and decimals and use these methods when solving problems, when appropriate (see previous year's guidance for methods).

Year 3:

Stage 1 no exchange and expanded

```
 21    20+1
+17    10+7
 38    30+8
```

Stage 2 with exchange and expanded

```
  25       20 + 5
+ 17       10 + 7
  42       30 + 12= 42
```

Stage 3 begin to represent as vertical alongside expanded

```
  67  (60 + 7)          67
+ 24  (20 + 4)        + 24
        80 +11 = 91     11 (7 + 4)
                        80  (60 + 20)
                        91
```

Stage 4 more than two numbers recorded vertically

```
 24
 67
+12
 13  (4+7+2)
 90  (20+60+10)
103  (90+13)
```

Year 4:

```
  625         783
+  48       +  42
  673         825
```

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

```
  5 2 0 9
+ 3 1 9 2
  8 4 0 1
```

Year 5:

```
 23587
+ 1475
 25062
 50124
```

```
  5 2 0 9
+ 3 1 9 2
  8 4 0 1
```

Begin to add two or more decimal fractions with up to three digits and the same number of decimal places;

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

Know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 3.2 m – 280 cm.
when working with decimals, always make each number have the same amount of digits to the right of the decimal point

```
          3.70
3.7 +2.35  + 2.35
          6.05
```

Add fractions with the same denominator within one whole	Add fractions of the same denominators	Add fractions with same denominators and multiples of the same number	$2\frac{1}{4} + 1\frac{1}{6} = 1\frac{3}{12} + 1\frac{2}{12} = 3\frac{5}{12}$

Year 3:

$$\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$$

Year 4:

$$1\frac{1}{6} + \frac{4}{6} = 1\frac{5}{6}$$

Year 5:

$$1\frac{1}{6} + \frac{4}{6} = 1\frac{5}{6}$$

$$\frac{1}{4} + \frac{1}{8} = \frac{2}{8} + \frac{1}{8} = \frac{3}{8}$$

Year 6:

Pupils should add fractions with different denominators and mixed numbers using the concept of equivalent fractions.
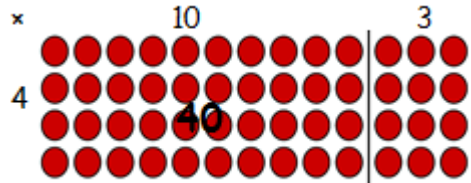
Progression in written subtraction methods

Year 3	Year 4	Year 5	Year 6
Subtract numbers with up to three digits, using formal written method of columnar subtraction	Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate	Subtract whole numbers with more than 4 digits, including using formal written method (columnar subtraction)	**As per Year 5**

Year 3

Subtract numbers with up to three digits, using formal written method of columnar subtraction

Stage 1 – expanded with no exchange

```
  8 9   =    80  +  9
- 5 7      - 50  +  7
            30  +  2  = 32
```

Stage 2 – expanded with exchange

Step 1

```
  7 1       70  +  1
- 4 6     - 40  +  6
```
The calculation should be read as e.g. 1 minus/take/subtract 6

Step 2

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

```
              60
             7̶0  +  ¹1
           - 40  +  6
             20  +  5   = 25
```

when confident
Step 3

```
    7 5 4
  -   8 6
```

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

Step 4   600   140
            7̶0̶0 + 5̶0̶ + ¹4
          -        80 + 6
            600 + 60 + 8 = 668

Year 4

Subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate

```
  6 ¹⁴1
  7̶5̶4̶
-   86
  668
```

	5	6⁵	¹2
-	3	1	9
	2	4	3

NOTE: In both examples, we have **'exchanged'** one of the six tens for ten ones. •

Children will 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

£3.50- £1.67

1.67- 0.3   1.67
                 - 0.30

Year 5

Subtract whole numbers with more than 4 digits, including using formal written method (columnar subtraction)

Use compact ('decomposition') method and the vocabulary 'exchange'

8⁷	¹6	.	3²	¹0
- 1	9	.	0	4
6	7	.	2	6

In this example, we have 'exchanged' one of the three tenths for ten hundredths

Year 6

As per Year 5

Year 3	Year 4	Year 5	Year 6
Subtract fractions with the same denominator within one whole $\frac{6}{7} - \frac{1}{7} = \frac{5}{7}$	Subtract fractions with the same denominator $\frac{1}{6} - \frac{4}{6} = \frac{3}{6}$	Subtract fractions with the same denominator and multiples of the same number $\frac{1}{4} - \frac{1}{8} = \frac{2}{8} - \frac{1}{8} = \frac{1}{8}$	Subtract fractions with different denominators $\frac{3}{4} - \frac{2}{3} = \frac{9}{12} - \frac{8}{12} = \frac{1}{12}$

Progression in written multiplication methods

Year 3	Year 4	Year 5	Year 6
Write and calculate statements for x and ÷ using tables they know, including for TU x U using mental and progressing to formal written methods.	Multiply two-digit and three-digit numbers by a one-digit number using formal written	Multiply numbers up to 4 digits by a one or two-digit number using a formal method, including long multiplication for two-digit numbers	Building on written methods in y5 children will become confident in using the formal written method for multiplication

Year 3

$13 \times 4 = (10 \times 4) + (3 \times 4)$

×	1	0	3		
4	4	0	1	2	= 5 2

$13 \times 4 = (10 \times 4) + (3 \times 4)$

$40 + 12 = 52$

Year 4

Multiply HTU x U or HT x U using grid method and vertical method alongside.

Ie 13 × 4

×	1	0	3		
4	4	0	1	2	= 5 2

```
   13
  X 4
   12    4 ×3
   40    4 × 10
   52
```

228 × 8

×	2	0	0		2	0	8			2	2	8
8	1	6	0	0	1	6	0	64			×	8

```
          6 4
 1 6 0 0         1 6 0
   1 6 0       1 6 0 0
     6 4       1 8 2 4
 1 8 2 4
```

Leading to in Y5
HTU x U   carrying above to avoid confusion with carrying below

```
 ¹2¹23
 X  6
 1338
```

Year 5

×	2	0		3				
1 0	2 0 0			3 0	=	2 3 0		
5	1 0 0		1	5	=	1 1 5	+	
						3 4 5		

```
  23
× 15
 +15  (5×3)
 100  (5×20)
  30 (10×3)
 200 (10×20)
 345
```

- Multiply proper fractions & mixed numbers by whole numbers,

$\frac{1}{4} \times 5 = 1\frac{1}{4}$

Year 6

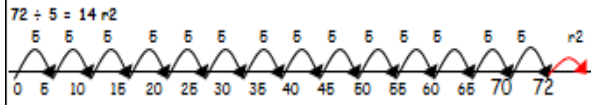|	1	2	3
X			6
	7	3	8

```
 ¹1 ²2 3
 ×    1 6
   7 3 8
1 2 3 0
1 9 6 8
```
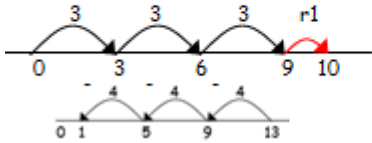
- Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example 1/4 x 1/2 = 1/8]
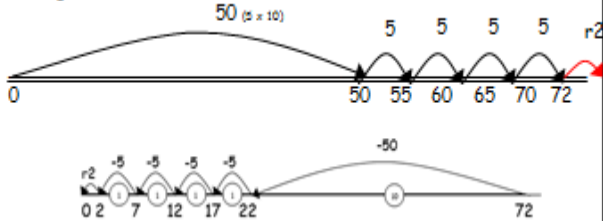
Progression in written methods for division

Year 3

1) Solve division through repeated addition or subtraction that involves remainders, e.g. $10 \div 3 = 3$ r1
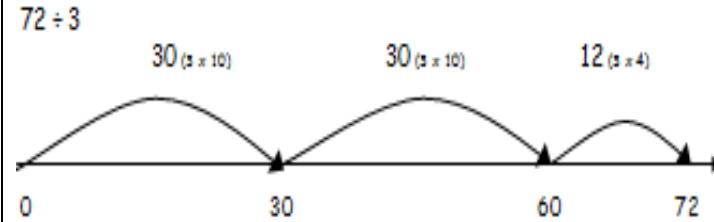

$72 \div 5 = 14$ r2

Moving onto (when the dividend is more than ten times the divisor):

Year 4

Then onto the vertical method:

Supported by the number line method initially

$72 \div 3$

$$3 \overline{)\; 72}$$
$$-\; \underline{30} \qquad 3 \times \text{\small(10)}$$
$$42$$
$$-\; \underline{30} \qquad 3 \times \text{\small(10)}$$
$$12$$
$$-\; \underline{12} \qquad 3 \times \text{\small(4)}$$
$$0 \qquad\quad 24 \leftarrow$$

Year 5

Using rods/counters on laminated grids to support long division by chunking initially $972 \div 36$

$$36 \overline{)972}$$
$$\underline{720} \qquad \text{(20)} \times 36$$
$$252$$
$$\underline{180} \qquad \text{(5)} \times 36$$
$$72$$
$$\underline{72} \qquad \text{(2)} \times 36$$
$$0 \qquad 27 \text{ answer}$$

Supported by the use of a "shopping list"

$360 \;(36 \times 10)$

$720 \;(36 \times 20)$

$1080 \;(36 \times 30)$

Year 6

Divide numbers up to four-digit by two-digit number using the short ('bus stop') method

$3018 \div 8$

	0	7	6	2
8	6	⁶0	⁴9	¹6

	0	3	7	7	.	2	5
8	3	³0	⁶1	⁵8	.	²0	⁴0

or 377 r 2 or 377 $^2/_8$

Extended to decimals:

	0	2	4	7	.	7	9
5	1	¹2	²3	³8	.	³9	⁴5

Long division for 2 digit numbers

$$\begin{array}{r} 3\;4\;3 \\ 18 \overline{)6\,1\,7\,4} \\ \underline{5\,4} \\ 7\,7 \\ \underline{7\,2} \\ 5\,4 \\ \underline{5\,4} \\ 0 \end{array}$$

Divide a fraction by a whole number $3/4 \div 5 = 3/20$