Fulbrook Middle School

Calculation Policy

Addition

Each of these methods is progressive and your child needs to be secure and confident in each ones use before they move onto the next one.

Number Bonds

1 + 9 = 10

2 + 8 = 10

3 + 7 = 10

4 + 6 = 10

5 + 5 = 10

These are the first five number bonds to 10 and it is these pairs that the children need to recognise, as 9 + 1 also equals 10. Noticing this will minimalize the amount your child needs to memorise.

It is vital that children are confident with their number bonds to 10 and are able to recall them accurately and efficiently. They should then be able to link this information to number bonds to 20 and 100 using knowledge of place value.

E.g. 2 + 8 = 10

12 + 8 = 20

2 + 18 = 20

20 + 80 = 100

Learning the inverse of these will also be helpful to the children. For example knowing 8 + 2 = 10 should mean that they know 10 – 8 = 2

The place value link is that 100 is ten times bigger than 10, so the numbers within the calculation need to be ten times bigger.

Games and methods to help this process can be found on the following websites:

http://www.primaryresources.co.uk/maths/mathsA3.htm

http://www.primaryresources.co.uk/maths/mathsC1.htm

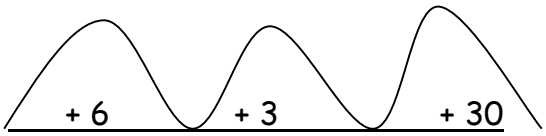
http://hltastaffroom.blogspot.co.uk/2008/02/flip-flaps-or-flip-flops-for-numeracy.html

http://resources.woodlands-junior.kent.sch.uk/maths/

On a number line:

At first children will record their counting on number lines, and then later move to recording of calculations on a number line. For addition we always encourage the children to add the ones first and then the tens, hundreds, etc. This gets them into good habits for when they move onto the column method.

64 + 39

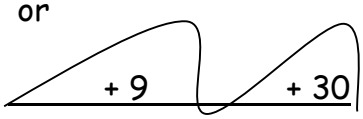


64 70 73 103

64 + 39 = 103

This method encourages them to use their knowledge of number bonds to 10

or



64 73 103

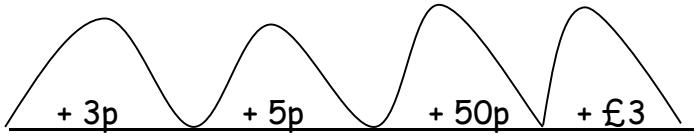
64 + 39 = 103

The number line *should* be a flexible strategy that allows children to reach the answer in a way that best suits them.

42.7m + 35.8m

42.7 43 43.5 48.5 78.5

42.7m + 35.8m = 78.5m



4.27 £4.30 £4.35 £4.85 £7.85

As shown this method can be used for measure, money, time, etc.

Time isn't a metric unit so knowing that 60 minutes is in an hour is the key.

Using partitioning and the column method:

This is more of a mental method for the children and these are the jottings that they may need to make to help them with the process.

A) 64 + 9 = 73

+ 30 = 103

$$\begin{array}{r} 64 \\ +\,39 \\ \hline 13 \\ +\,90 \\ \hline 103 \end{array}$$

First add the ones, then the tens and finally add those up together.

547 + 378 = 500 + 300 + 40 + 70 + 7 + 8
= 800 + 110 + 15
= 925

$$\begin{array}{r} 547 \\ +\,378 \\ \hline 800 \\ 110 \\ 15 \\ \hline 925 \end{array}$$

$$\begin{array}{r} 547 \\ +\,378 \\ \hline 15 \\ 110 \\ 800 \\ \hline 925 \end{array}$$

$$\begin{array}{r} 3968 \\ 5493 \\ \hline 8000 \\ 1300 \\ 150 \\ 11 \\ \hline 9461 \end{array}$$

$$\begin{array}{r} 53.2 \\ 4.9 \\ \hline 50.0 \\ 7.0 \\ 1.1 \\ \hline 58.1 \end{array}$$

B)

$$\begin{array}{r} 64 \\ +\,39 \\ \hline 103 \\ \textcircled{1} \end{array}$$

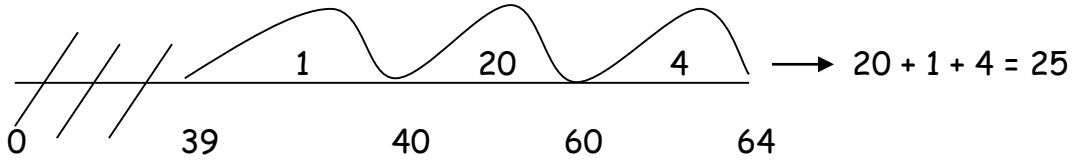
The children need to understand that the 1 being carried is the 10 from 9 + 4 = 13. (As it's a 10 it belongs in the tens column)

Subtraction

On a number line:

We now use the counting on method and use vocabulary such as finding the difference when tackling subtraction problems.

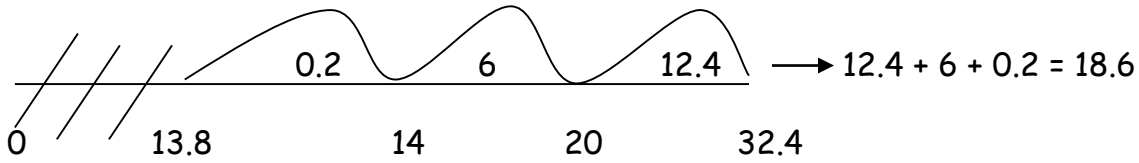
64 - 39



64 - 39 = 25

The take away part of this calculation is from 0 to 39. Then count on from 39 to 64. You can see that the children are again applying their knowledge of number bonds to 10.

32.4 – 13.8 = 18.6



£24.53 - £16.85 = £7.68

Using partitioning:

64 - 30 = 34
34 - 9 = 25

This is more of a mental method for the children and these are the jottings that they may need to make to help them with the process.

Using column methods: (Written method)

$$\begin{array}{r} 64 \\ -\ 39 \end{array} = \begin{array}{r} 60 + 4 \\ -\ 30 + 9 \end{array} = \begin{array}{r} 50 + 14 \\ -\ 30 + 9 \end{array}$$

$$20 + 5 = 25$$

When deconstructing (exchanging) the children need to understand that each row must always equal the number they started with.

Formal written method

$$\begin{array}{r} 64 \\ -\ 39 \end{array} \qquad \begin{array}{r} {}^{5}\not{6}\,{}^{14}\not{4} \\ -\ 39 \\ \hline 25 \end{array}$$

For example; 64 = 60 + 4 = 50 + 14

However it is written, they still always equal 64.

1062 - 598 =

$$\begin{array}{r} 1062 \\ -\ 598 \end{array} \qquad \begin{array}{r} {}^{0}\not{1}\,{}^{9}\not{0}\,{}^{15}\not{6}\,{}^{12}\not{2} \\ -\ 598 \\ \hline 464 \end{array}$$

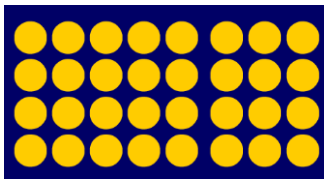
Multiplication

Mental multiplication

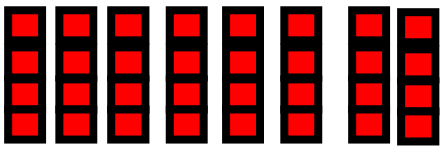
It is vital that children know their times tables up to 12 x 12 as this makes tackling written methods of multiplication much easier. They need to recognise that multiplication can be performed either way (is commutative) and therefore they can use this to help them with times tables they are not as confident with. For example;

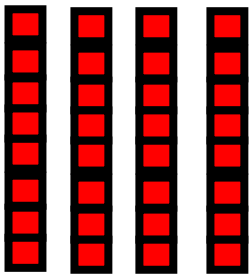
8 x 4 = 32 but 4 x 8 also = 32

We show this by using visual representations such as arrays…

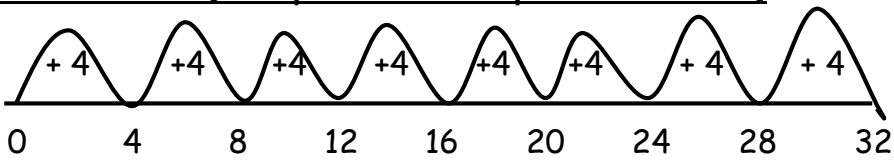


… or centicubes/multilink cubes.

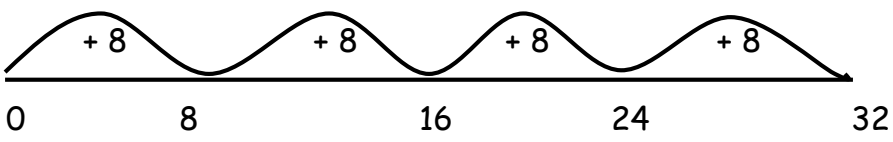




Number Line (multiplication as repeated addition)



8 x 4 = 32



4 x 8 = 32

Multiplication is a shorter, quicker way of adding the same number repeatedly. This method teaches this concept.

Using partitioning:

45 x 3 =	40 x 3	120
	+ 5 x 3	+ 15
		135

This is more of a mental method for the children and these are the jottings that they may need to make to help them with the process.

Using grid method:

185 x 34

X	**100**	**80**	**5**
30	3000	2400	150
4	400	320	20

\+

3 0 0 0
2 4 0 0
1 5 0
4 0 0
3 2 0
2 0
6 2 9 0
1

48 x 9.4

X	**40**	**8**
9	360	72
0.4	16	3.2

3 6 0
7 2
1 6
3.2
4 5 1. 2
1 1

Short Multiplication

24 × 6 becomes

2 4
× **6**
1 4 4
2

Answer: 144

342 × 7 becomes

3 4 2
× **7**
2 3 9 4
2 1

Answer: 2394

2741 × 6 becomes

2 7 4 1
× **6**
1 6 4 4 6
4 2

Answer: 16 446

Long Multiplication

```
   1 8 5
 x   3 4
 -------
     2 0      (4 x 5)
   3 2 0      (4 x 80)
   4 0 0      (4 x 100)
+  1 5 0      (30 x 5)
 2 4 0 0      (30 x 80)
 3 0 0 0      (30 x 100)
 ---------
 6 2 9 0
 1
```

```
   1 8 5
 x   3 4
 -------
   7 4 0
   3 2
+5 5 5 0
 2 1
 ---------
 6 2 9 0
 1
```

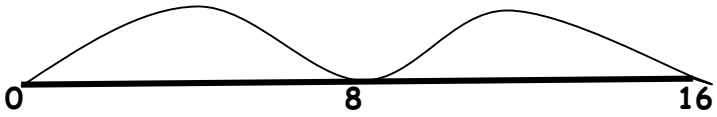
Division

Division is the inverse (opposite) of multiplication and it therefore requires a good knowledge of times tables in order for calculations to be completed accurately and efficiently. For example if you know 5 x 8 = 40 then the children need to use this knowledge to work out that 40 ÷ 8 = 5 and that 40 ÷ 5 = 8.

As with multiplication, division is recorded with objects, arrays, number lines or number sentences.

* * * * * * * *
* * * * * * * *

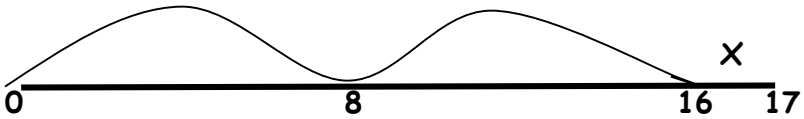
16 ÷ 8 = 2



I start at zero and count in 8s until I get to 16. That's two eights.

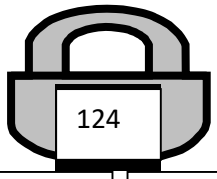
Calculations with remainders in the quotient (answer to a division question) are also recorded on a number line.

17 ÷ 8 = 2 with 1 left over



Bag and Box:

124 ÷ 4



10	10	10	10
10	10	10	10
10	10	10	10
1	1	1	1

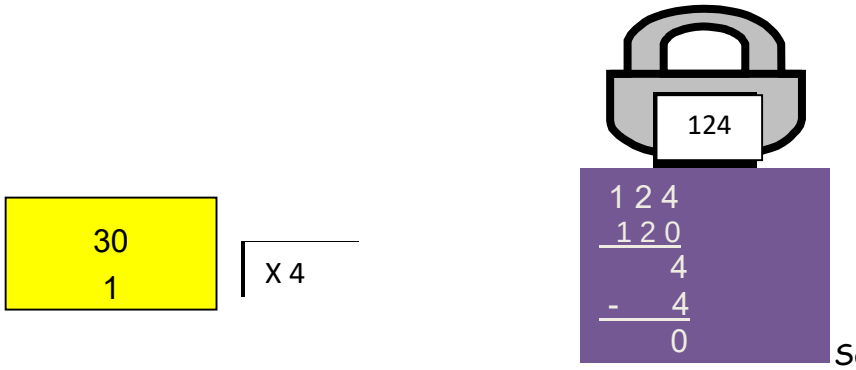
- 40 = 84
- 40 = 44
- 40 = 4
- 4 = 0

So 124 ÷ 4 = 31

The story goes: I have 124 sweets in a bag and I have 4 friends. I give each friend 10 sweets, so I have taken 40 sweets out of my bag leaving 84. . . Each friend has 31 in their pot so 124 ÷ 4 = 31. The children find this method very easy to use once they have understood how to set it out. When asked, the majority of children say they are confident with this method and use it as their preferred method.

Bag and Box next stage:

124 ÷ 4



So 124 ÷ 4 = 31

This time the method has been shortened. The children find this method very easy to use once they have understood the bag and box method. They can use either, but if there is a quicker method that is just as good at showing all stages of working and can be 'undone' to go back and check each stage then pupils are happier. This method is preferred by many to the chunking method that comes next as it is a more logical progression and shows the workings in a familiar way.

For many pupils, the addition of an "I know" section makes the calculation easy.

For 124 ÷ 4 the "I know" section could look like this:

I know

4 x 10 = 40

4 x 20 = 80

4 x 30 = 120

4 x 40 = 160 too many

So I will use 4 x 30

Division Continued

Chunking Method:

124 ÷ 4

4) 1 2 4
- 4 0 (4 x 10)
8 4
- 4 0 (4 x 10)
4 4
- 4 0 (4 x 10)
4
- 4 (4 x 1)
0

124 ÷ 4 = 31

4) 1 2 4
-1 2 0 (4 x 30)
4
- 4 (4 x 1)
0

124 ÷ 4 = 31

1354 ÷ 12

12) 1 3 5 4
- 1 2 0 0 (12 x 100)
1 5 4
- 1 2 0 (12 x 10)
3 4
- 2 4 (12 x 2)
1 0
= 12 x 112 r 10

1354 ÷ 12 = 112 r 10

Pupils realise that they can reduce the number of stages by using their times tables and place value knowledge to help them.

For example;

4 x 3 = 12

So 4 x 30 = 120

Short Division (Bus shelter method)

3 1
4) 1 2 4

No 4s can go into 1 so now look at the 100s and the 10s together.

3 fours can go into 12 so a 3 goes above.

1 four can go into 4 so a 1 goes above

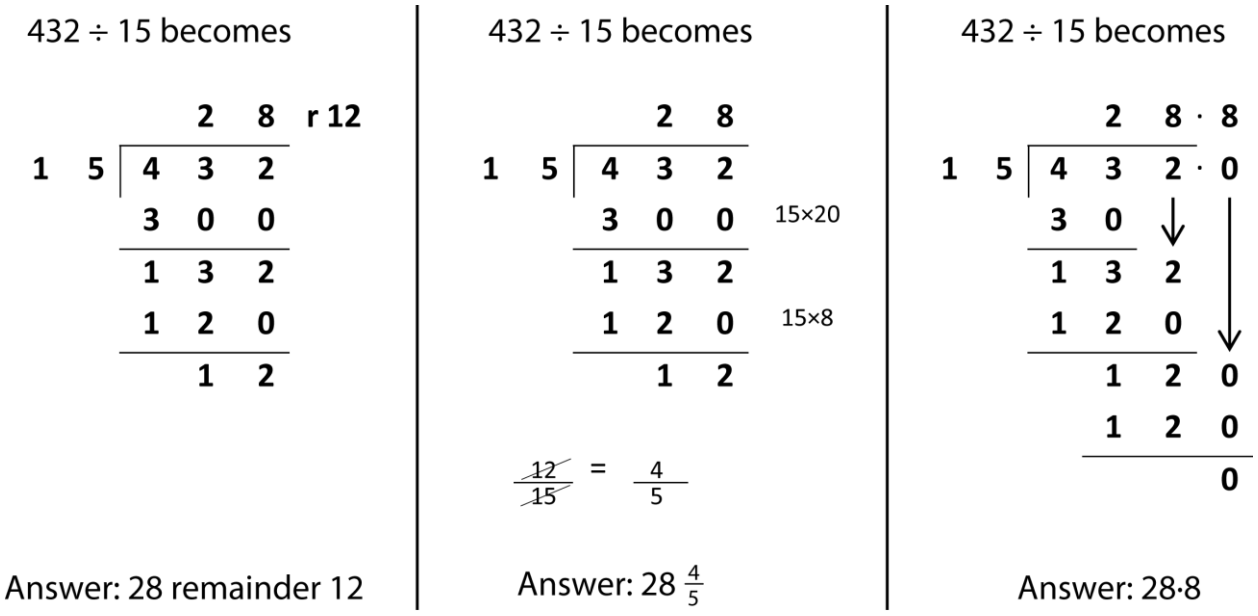
1 6 5 5
5) $8^{3}2^{2}7_{2}5$

1 five can go into 8 with remainder 3. This is carried to the next digit.

6 fives can go into 32 with remainder 2. This is carried to the next digit

5 fives can go into 27 with remainder 2. This is carried over to the next digit, which becomes 25 and 5 fives go into 25

Long Division



Conclusion

It is really important to us at Fulbrook that the children are happy and confident in their knowledge and use of maths and therefore we allow the children to use methods that they are comfortable with until they are ready to move on. We will teach the children the next, more advanced method when we feel they are ready and would understand the maths that it involves. We discourage the mechanical process of just solving a calculation and insist that the children can explain each stage of the method they are using. This allows them to apply their knowledge and methods to different situations.

By the end of Key Stage 2 (year 6) pupils should:

- be efficient with their knowledge of number bonds and apply them to different situations
- have a secure knowledge of place value, including decimals
- know their times tables up to 12 x 12 and the inverse of these (by the end of year 4)

- know the language/vocabulary for all four operations
- be confident for at least one method for each operation
- be able to apply their knowledge of number to 'real life' situations
- multiply and divide by 10, 100 and 1000 including decimals.

By the end of year 8 pupils should:

- be confident with manipulating numbers
- recognise links between numbers
- apply number rules to algebra such as BIDMAS and negatives
- apply Key Stage 2 skills/operations/knowledge into other areas of the mathematics curriculum