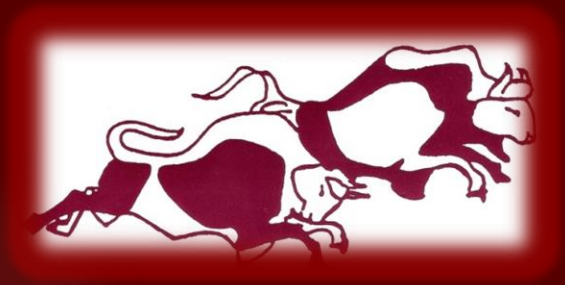
Maths at Mickleover Primary School

Understanding the written calculation methods used for teaching addition and subtraction from FS through to Year 6

The aim of this workshop today is to share the calculation methods we use at Mickleover Primary School, so that you are confident in supporting your child at home.



The Maths National Curriculum

Children should:

- Become **fluent** in the fundamentals of mathematics, through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

- **Reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations and developing an argument, justification or proof using mathematical language.

- **Solve problems** by applying their mathematics to a variety of problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

At Mickleover Primary, we recognise the importance of a common and progressive approach to the introduction of standard written methods, to ensure that children have secure calculation skills that are appropriate to their understanding of number.

As pupils progress in their maths, they become ready to handle more formal written methods that in many cases increase efficiency. However, pupils are not be moved onto these methods before their conceptual understanding of each operation is sound.

Although the focus of this school policy is on pencil and paper procedures, it is important to recognise that the ability to calculate mentally lies at the heart of numeracy. Mental calculation should be seen as complementary to written recordings, as in every written method there is an element of mental processing.

Concrete apparatus is be used throughout the school to scaffold and support the learning of written methods.

- Each child has a maths track, from which are selected their maths targets.
  It is these targets that underpin the progress that children make with written calculations.

Maths Target Track

Name: _____

START	
Say the numbers in order to 10	
Count a set of objects up to 5	
Recognise numerals 1-5 (out of sequence)	
Say the numbers 0-20	
Count a set of objects up to 20	
Recognise numerals 0-10 (out of sequence)	
Say 1 more than any number between 0-10	
Say 1 less than any number between 0-10	
Recognise numerals 0-20	

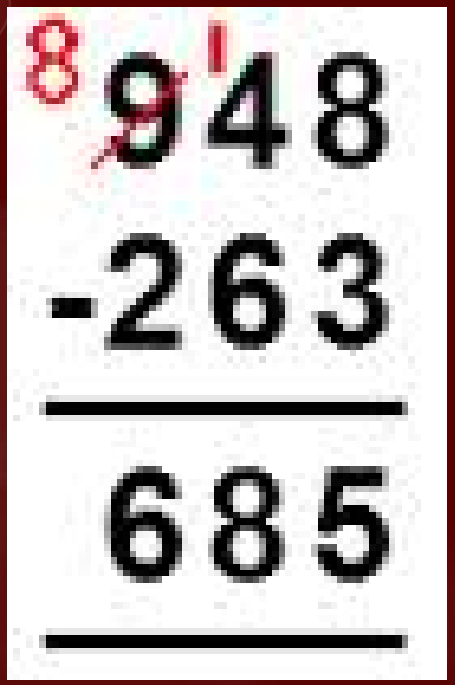
Know by heart all number bonds that total 20	
Know by heart all bonds of multiples of 10 up to 100	
Know by heart all doubles to 20 (double 20 = 40)	
Know by heart all halves of numbers to 20 (half of 20 = 10)	
Know by heart all x and ÷ facts for 2 (up to12x2)	
Know by heart all x and ÷ facts for 10 (up to 12x10)	
Know by heart all x and ÷ facts for 5 (up to 12 x 5)	
Know all sums and differences of multiples of 10 up to 100	
Know by heart all number bonds that total 100	

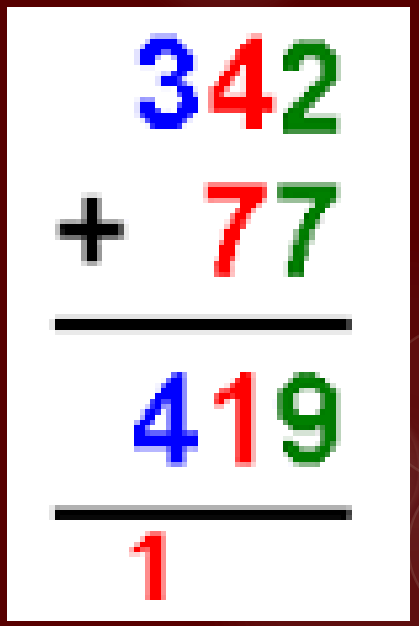
Name: _____

Keep going!	
Double any digit with up to 1 decimal place	
Halve any digit with up to 1 decimal place	
Recall quickly x facts to 12x 12	
Use multiplication facts to x pairs of multiples of 10 and 100 e.g. 30 x 70 / 40 x 200	
Know the factors of all timetable answers up to 12 x 12	
Know by heart all the squares of numbers between 1 and 12	
Know by heart all squares of multiples of 10	
Recognise and recall factors of numbers up to 100 and	

Relate fractions to their decimal representations 0.5 $\frac{1}{2}$ 0.25 $\frac{1}{4}$ 0.75 $\frac{3}{4}$ 0.2 1/5 0.3 r 1/3	
Find 50% 25% 10% 5% and 1% of a given number (up to 1000	
Know equivalent fractions, decimals and percentages for all quarters, tenths, fifths and eighths	
Order different fractions by changing them to decimals	
Know timetable facts up to 20 x 20 using knowledge of times tables (4 x 17 = 4 x 10+4 x 7)	
Recognise and use cubed numbers	
Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000	

When our children leave Mickleover Primary School we expect them to be able to add and subtract large numbers using the standard written algorithm. In order to achieve this they need a secure understanding of the column methods. We achieve this through a progression of concrete, pictorial and abstract experience, from the foundation stage up to year 6.





How do we achieve this?


2 4 0 3 0 0
6 0 0 7 0 9
1 1 1
4 3 6
8 2 0 9 0 0

Number Sense!

Children need to understand our number system, starting with counting numbers, building an understanding of how our numbers work and fit together. This includes exploring place value and comparing and ordering numbers then

applying this understanding

in different contexts.

Recalling facts

- It is important that children recognise number bonds, different pairs of numbers with the same total.

7 + 3

10

6 + 4

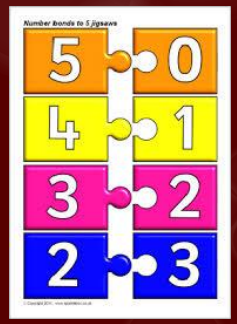
6 + 2

8

3 + 2

5

1 + 4



6 + 1

7

3 + 4

6 + 3

5 + 4

9

6

3 + 3

Place Value

- Place value is at the heart of the number system. All digits have a value and a secure understanding of this will enable children to use and understand different calculation methods.

Progression in written addition methods

Foundation 2

Children find the total of objects in 2 groups by counting all of them.

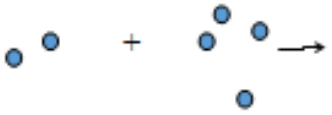
- Through practical activities, using fingers and through discussion they will begin to use the vocabulary involved in addition.

'You have five apples and I have two apples. How many apples altogether?'

- They will record pictorially then numerically
  5 + 2 = 7 apples

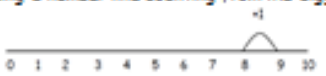
Children add 2 single digit numbers by counting on.

- Through practical activities, children to begin counting on, starting from the highest number.



4 + 2 = 6

- Using a number line counting from the biggest number.



8 + 1 = 9

Children will find one more than a given number.

- Through songs, rhymes and practical activities children develop a sense of number.
- Children will use number line to find one more than a given number .

Year 1

Children, read, write and interpret mathematical statements involving addition (+) and the equals (=).

- Through practical activities, using rods, cubes, numicon, number beads, number lines and 100 squares .

5 + 3 =

Children add one- digit and two-digit numbers within 20, including zero

- Using practical equipment children combine groups, counting from the largest.
- Using a number line to add two numbers together , encouraging children to start from the largest number.

- using number bonds and related addition facts within 20 which have been learned.
- Using a 100 square to add in steps of 1 or 10.

12 13 14 15 13 + 2 = 15

Children solve missing number problems by counting on from the given number. eg 10 + ____ = 16

Year 2

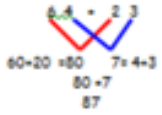
Children solve problems with addition using concrete objects and pictorial representations. Children will learn to add –:

1. A two digit number and ones
2. A two digit number and tens
3. Two two-digit numbers
4. Three one-digit numbers

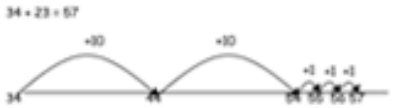
- Using place value knowledge children combine Tens and Ones to add.

T	O
1	3
2	1

10 + 20 = 30
3 + 1 = 4
30 + 4 = 34



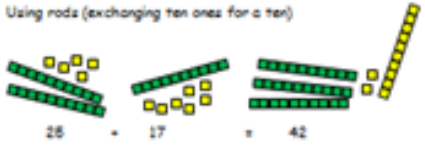
- Using an empty number line to add two-digit numbers.



- Using Tens and Ones apparatus children add by combining groups, counting from the largest.

Using Tens and Ones apparatus children add by combining groups, where 10 ones are exchanged for a Ten .

Using rods (exchanging ten ones for a ten)



Progression in written subtraction methods

Foundation 2

Children will engage in a variety of counting songs, rhymes and practical activities to develop a sense of number.

Children will find one less than a given number.

- In practical activities , using objects and fingers they will begin to use the vocabulary involved in subtraction

You have five apples and I eat one apple. How many apples left?

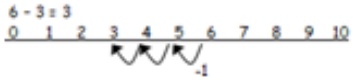
- They will record pictorially then numerically
  5- 1 = 4 apples

Children subtract from 2 single digit numbers, by counting back to find the answer

- Using objects then pictures, chiuldren subtract a single digit number

5 subtract 3 = 2

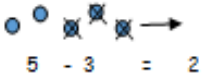
- Using a number line children count back below the line to show subtraction.



Year 1

Children read, write & interpret mathematical statements involving subtraction (-) & equals (=).

- Through practical activities, using rods, cubes, numicom, number beads, number lines and 100 squares .



5 - 3 = 2

Children subtract one-digit & two-digit numbers to 20, including zero.

- Using a number line to subtract a number, counting back below the line.

- using number bonds and related addition facts within 20 which have been learned.
- Using a 100 square to add in steps of 1 or 10.

Children begin to find the difference using subtraction.

Year 2

Chilen subtract numbers using concrete objects and pictorial representations. . Children will learn to subtract -:

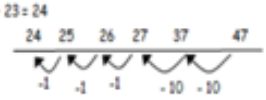
- A two digit number and ones
- A two digit number and tens
- Two two-digit numbers

- Using knowledge of addition and subtraction families and the inverse relationship ed addition and subtraction.

3 + 2 = 5 2 + 3 = 5 Number
5 - 2 = 3 5 - 3 = 2 families

48 + 36 = 84 so 84 - 36 = 48 Inverse

- Using place value knowledge children subtract Tens and Ones.



- Using Tens and Ones apparatus children subtract by removing rods where 10 ones are exchanged for a Ten .

subtract 7 by exchanging a ten rod for 10 units

42-27= 15

Progression in written addition methods

Year 3

Add numbers with up to three digits, using formal written method of columnar addition

Stage 1 no exchange and expanded

$$\begin{array}{r} 21 \\ +17 \\ \hline 38 \end{array} \qquad \begin{array}{r} 20+1 \\ 10+7 \\ \hline 30+8 \end{array}$$

Stage 2 with exchange and expanded

$$\begin{array}{r} 25 \\ +17 \\ \hline 42 \end{array} \qquad \begin{array}{r} 20+5 \\ 10+7 \\ \hline 30+12=42 \end{array}$$

Stage 3 begin to represent as vertical alongside expanded

$$\begin{array}{r} 67 \quad (60+7) \\ +24 \quad (20+4) \\ \hline 80+11=91 \end{array} \qquad \begin{array}{r} 67 \\ +24 \\ \hline 11\,(7+4) \\ 80\ (60+20) \\ \hline 91 \end{array}$$

Stage 4 more than two numbers recorded vertically

$$\begin{array}{r} 24 \\ 67 \\ +12 \\ \hline 13\ (4+7+2) \\ 90\ (20+60+10) \\ 103\ (90+13) \end{array}$$

Add fractions with the same denominator within one whole

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

Year 4

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

$$\begin{array}{r} 625 \\ +\ 48 \\ \hline 673 \end{array} \qquad \begin{array}{r} 783 \\ +\ 42 \\ \hline 825 \end{array}$$

$$\begin{array}{r} 256 \\ +\ 127 \\ \hline 383 \end{array}$$

$$\begin{array}{r} 5209 \\ +\ 3192 \\ \hline 8401 \end{array}$$

Add fractions of the same denominators

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

Year 5

Add whole numbers with more than 4 digits, including using formal methods (columnar)

$$\begin{array}{r} 23587 \\ +\ 1475 \\ \hline 25062 \\ 50124 \end{array}$$

12 1

$$\begin{array}{r} 5209 \\ +\ 3192 \\ \hline 8401 \end{array}$$

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

$$\begin{array}{r} 38.36 \\ +\ 27.95 \\ \hline 66.31 \end{array}$$

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

3.7 + 2.35

$$\begin{array}{r} 3.70 \\ +\ 2.35 \\ \hline 6.05 \end{array}$$

Add fractions with same denominators and multiples of the same number

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

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

Year 6

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).

$$2\tfrac{1}{4} + 1\tfrac{1}{6} = 1\tfrac{3}{12} + 1\tfrac{2}{12} = 3\tfrac{5}{12}$$

Pupils should add fractions with different denominators and mixed numbers using the concept of equivalent fractions.

Progression in written subtraction methods

Year 3

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

Stage 1 – expanded with no exchange

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

Stage 2 – expanded with exchange

Step 1

The calculation should be read as e.g. 1 minus/take/subtract 6

71 = 70 + 1
- 46 = - 40 + 6

Step 2

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

when confident
Step 3

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

754
- 86

Step 1: 700 + 50 + 4 − 80 + 6
Step 2: 700 + 40 + 14 − 80 + 6 *(adjust from T to U)*
Step 3: 600 + 140 + 14 − 80 + 6 *(adjust from H to T)*
600 + 60 + 8 = 668
Step 4: ~~600~~ ~~700~~ + ~~140~~ ~~50~~ + 14 − 80 + 6
600 + 60 + 8 = 668

Subtract fractions with the same denominator within one whole

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

Year 4

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

6 14 1
~~7~~ 5 4
- 8 6
6 6 8

	5	6^{5}	$^{1}2$
-	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

Subtract fractions with the same denominator

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

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'

	8^{7}	$^{1}6$	.	3^{2}	$^{1}0$
-	1	9	.	0	4
	6	7	.	2	6

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

Subtract fractions with the same denominator and multiples of the same number

$\frac{3}{4} - \frac{1}{8} = \frac{6}{8} - \frac{1}{8} = \frac{5}{8}$

Year 6

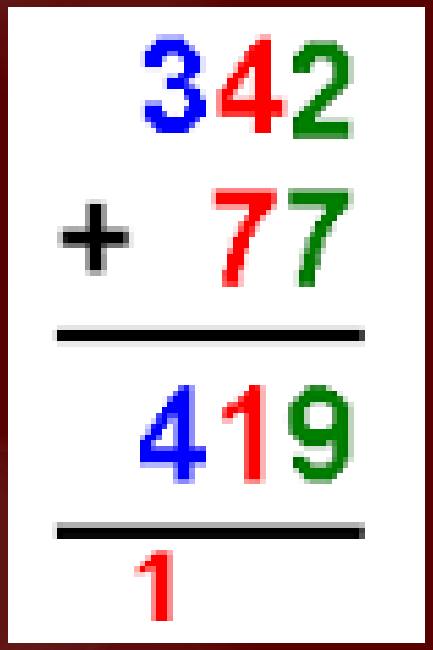
As per Year 5

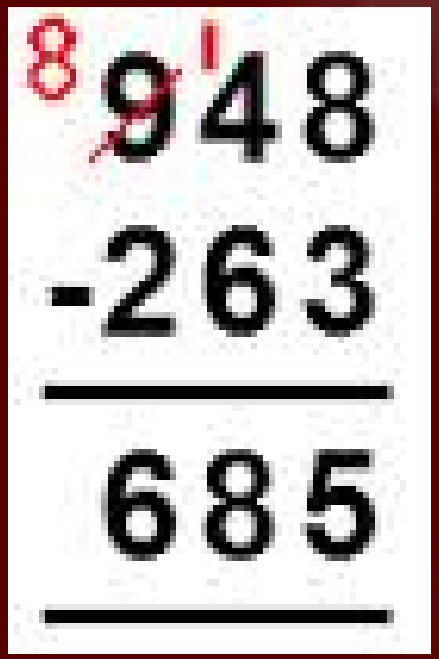
Subtract fractions with different denominators

$\frac{3}{4} - \frac{2}{3}$ • $\frac{9}{12} - \frac{8}{12}$ • $\frac{1}{12}$

Column methods

- Children with a secure understanding of place value will better understand the column method for addition and subtraction.

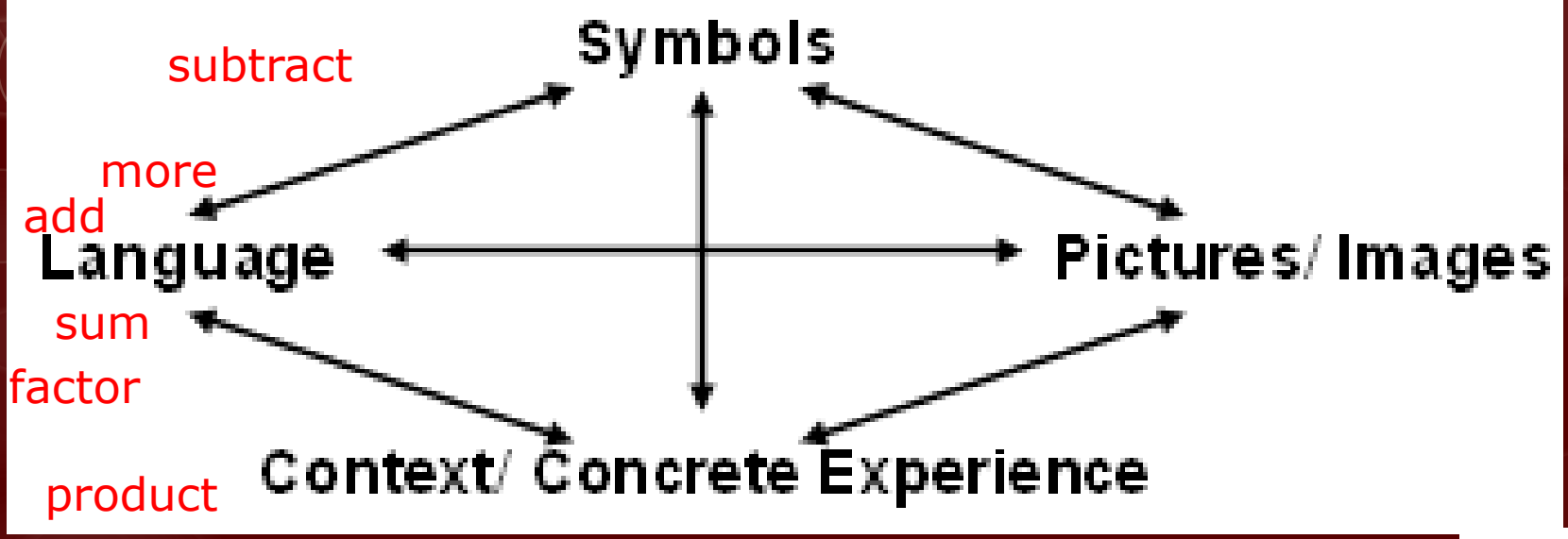




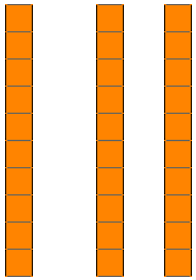
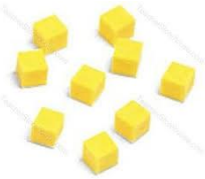
- Understanding place value will help children see the relationship between the columns.

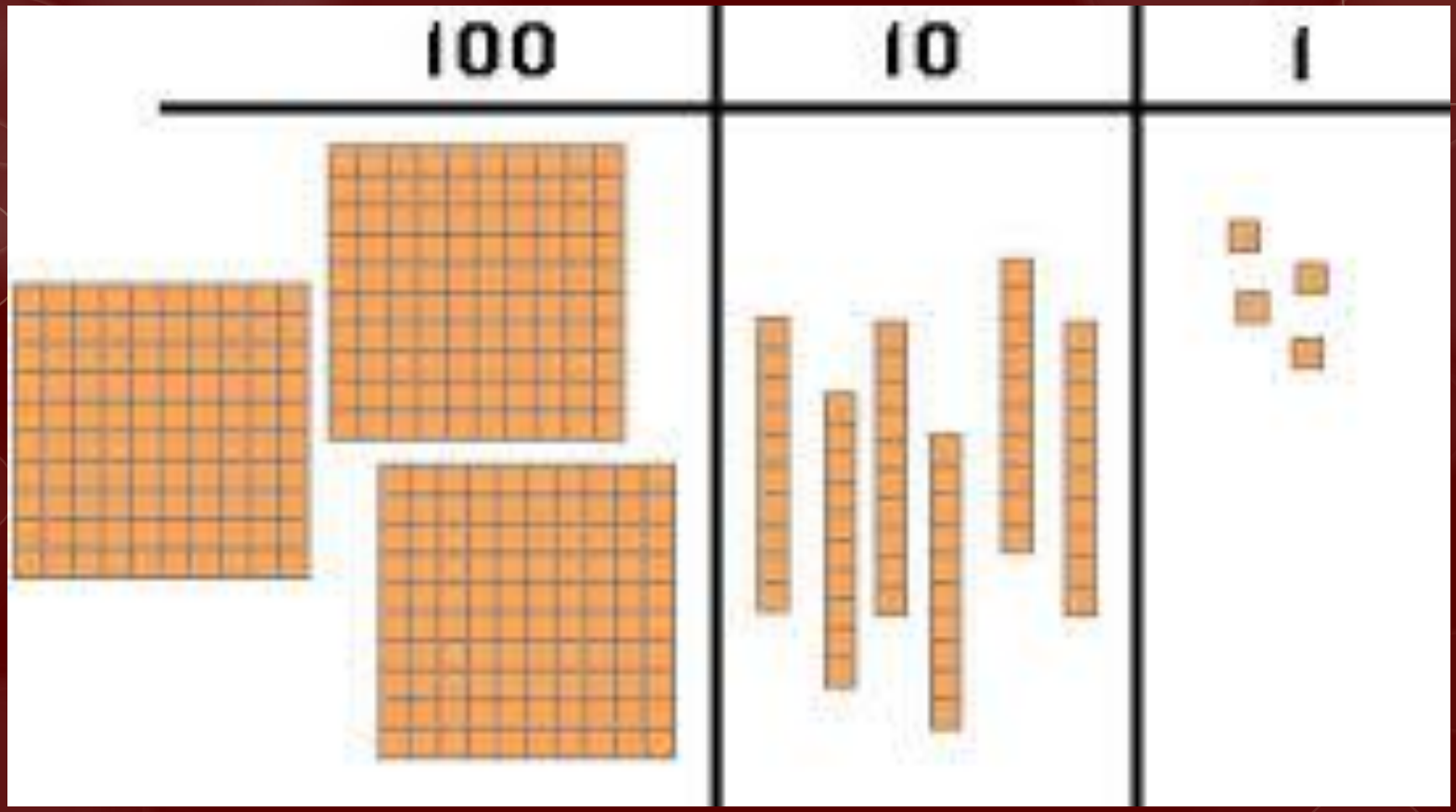
Maths at Mickleover

= + x %



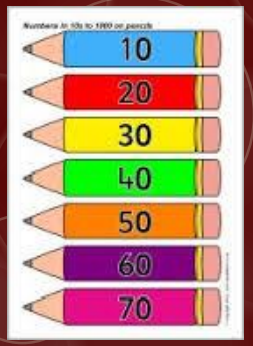
Here is a receipt for some shopping. How much did I spend? How much change did I get from £20?

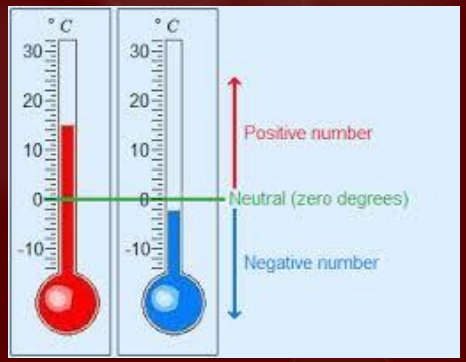
thousands	hundreds	tens	ones
	 		

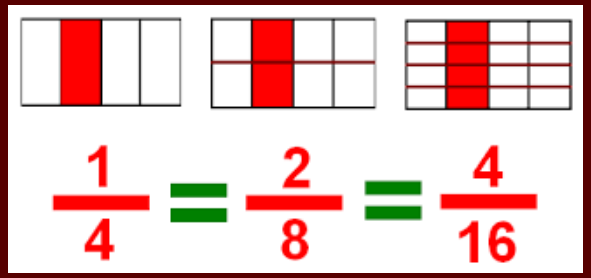

100
10
1

Keep Counting!

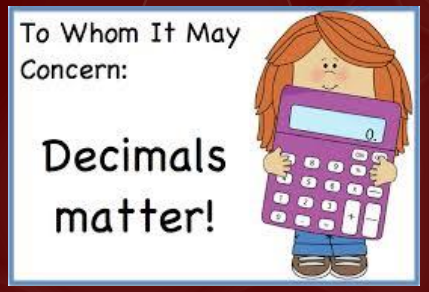
- Backwards and forwards in 10s, 100s, 1000s.
- Counting in decimals.
- Counting in fractions.
- Counting into negatives.







Decimal	*Words*	*Fraction*
0.1	1 tenth	$\frac{1}{10}$
0.01	1 hundredth	$\frac{1}{100}$
0.001	1 thousandth	$\frac{1}{1000}$



Look at all the different methods we can use to help us with addition.

Use our fingers

Count on in our head

Partitioning and then combining Tens and Ones

23 + 10 = 33

37 + 20 = 57

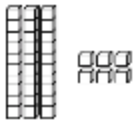
25 + 40 = 65

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

Use a 100 square and our knowledge or T and O.

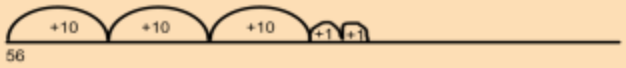
Numicon

Tens and Ones apparatus



We choose different methods for different addition problems.

56 + 32 =

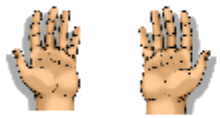


Use a number line and our knowledge or T and O.

As well as

- Doubles and near doubles
- Number bonds
- Drawing pictures

Look at all the different methods we can use to help us to subtract.



Use our fingers

Count back in our head

Partitioning and then combining Tens and Ones

36 - 24 =

30 - 20 6 - 4

30 - 20 =10
6 - 4 = 2
36 - 24 = 12

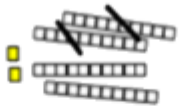
36 - 24 =

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

Use a 100 square and our knowledge or T and O.

Numicon

take away from Tens and Ones apparatus



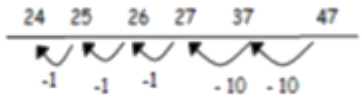
42- 20

We choose different methods for different addition problems.

As well as

- halving
- Number bonds
- count on
- find the difference
- Drawing pictures

47 - 23 = 24



Use a number line and our knowledge or T and O.

How can I Help my child?

- Talk to your child about what they are doing in Maths.
- Ask them to explain and show you how to do.
- Always be positive! The Mastery curriculum believes that everyone can achieve in maths if they have an 'I can ' attitude.