Place Value

The position of each digit (single number) in a number tells us the value of the digit in the number.

Using 4693 as an example:

4	6	9	3
4 Thousands	6 Hundreds	9 Tens	3 Units

So the number 4693 is made up of 4 thousands, 6 hundreds, 9 tens and 3 units.

In the classroom, children will always be able to see the 'place Value Headings' displayed.

M	HTh	TTh	Th	H	T	U	.	t	h
Millions	Hundred of thousands	Tens of thousands	Thousands	Hundreds	Tens	Units	Decimal Point	Tens	hundreths

These 'Place Value Headings' help children read and write large numbers. When we read large numbers, we group the 'thousands' together, e.g.

5 842 012.63 - Five million, eight hundred and forty-two thousand and twelve point six three

Please note that when writing these numbers, children are encouraged to group digits in 'threes' rather than ude commas as commas can become confusing with a decimal point.

The 'Place Value Headings' are also used to help children understand the way our number system works.

E.g. When a number is multiplied by 10, all the digits move one place to the left.

28 x 10 becomes 280

M	HTh	TTh	Th	H	T	U	.	t	h
					2	8			
				2	8	0			

Similarly, when dividing by 100, all digits move two places to the right.

5729 / 100 becomes 57.29

M	HTh	TTh	Th	H	T	U	.	t	h
			5	7	2	9			
					5	7	.	29	

Children will notice that when a whole number is multiplied by 10, a zero appears on the end of the number. This is a useful observation, but should not be taught as a rule as this does not hold with decimals and can cause confusion at a later stage.

Addition

Adding Mentally

Understanding of place value helps children partition numbers enabling them to add more easily.

Partitioning is the splitting or breaking up of a number into its place value parts.

E.g. 43 can be split into 40 tens and 3 units.

Adding 43 and 24 using partitioning

43 + 24

First add the forty to the twenty

40 + 20 = 60

43 + 24

Then add the three and the four

3 + 4 = 7

Now put the two answers together

60 + 7 = 67

When adding using pencil and paper, children are encouraged to write one number on top of the other rather than side by side. This discipline keeps units, tens, hundreds etc in the correct column and

ensures greater understanding and accuracy. Working on squared paper helps this process and children are encouraged to put one digit (single number) in each square.

43 + 24

	40	+	3		
+	20	+	4		
	60	+	7	=	67

This partitioned method leads on to an expanded column method where the numbers are written in columns.

	T	U	
	4	3	
+	2	4	
		7	Adding the units first (3+4)
	6	0	Adding the tens (40+20)
=	6	7	

This leads to the most compact efficient way of adding called a Column method. Sometimes children will refer to this as a 'sandwich sum'.

Column Method

In this method, recording is reduced further. Carry digits are recorded as small numbers below the line using the words 'carry one ten' or 'carry one hundred'.

	H	T	U
	1	2	8
+		4	7
	1	7	5
		1	

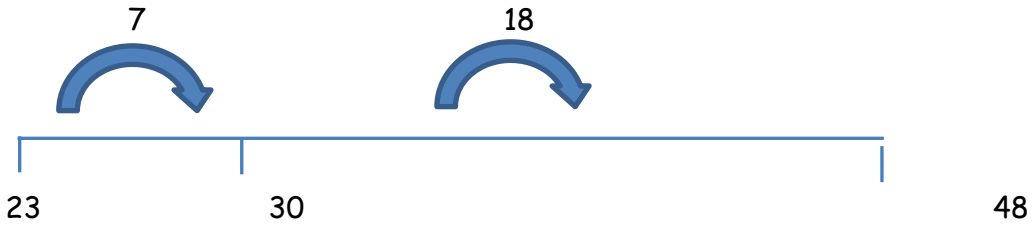
- Start on the right with the units
- 8 + 7 = 15
- This is made up of 1 ten and 5 units
- Put the 5 in the units column and carry 1 ten in to the tens column
- Next add the tens column remembering to add the extra ten (20 + 40 + 10 = 70)
- Record this as a 7 in the tens column (one hundred add nothing equals one hundred)
- Record this as 1 on the hundreds column

Once learned, this method can be used with larger whole numbers and decimals. It becomes quick and efficient.

Subtraction

Children are encouraged to think of subtraction as the difference between two numbers. This can be represented on a number line.

When calculating the difference between 23 and 48 we are 'counting on' from 23 to 48. Children can make whatever size jumps they want, but it is often easier to jump to the nearest 10 or 100.



The difference is 7 + 18 = 25, so 48 – 23 = 25

This method mimics the mental method of subtraction. It can lead to the beginnings of a column method as shown below. It is important when doing this, that children take care to line up the numbers under the place headings, as with addition.

	T	U		
	4	8		
	2	3	-	
		7		(30) This represents the jump to 30 on the number line
+	1	8		(48) This represents the jump to 48 on the number line
	2	5		The answer is achieved by adding the jumps

Before moving on to a fully compact column method, children may use a decomposition method. This reinforces their understanding of place value and partitioning.

Subtraction by Decomposition

Example: 563 – 278

Partitioning both numbers gives:

500 + 60 + 3
\- 200 + 70 + 8

Since it would not be possible to take 8 away from 3, the '63' is partitioned into 50 and 13 and the calculation can be re-written as:

500 + 50 + 13
\- 200 + 70 + 8

Having sorted out the units column, children look at the 'tens' column and notice that 70 cannot be taken from 50. It is necessary to partition the 550 in a different way to get round this problem. If 550 is partitioned into 400 and 150 the calculation can be rewritten as:

400 + 150 + 13
\- 200 + 70 + 8
200 + 80 + 5

The subtraction can then be carried out, starting with the units column and moving left, giving an answer of 285.

Clearly this method is longwinded, but is important that children understand what they are doing before they can be expected to progress to the fully compact method shown below.

Starting with a similar example: 487 – 231

	H	T	U	
	4	8	7	7 – 1 = 6
-	2	3	1	80 – 30 = 50
	2	5	6	400 – 200 = 200

Please note that we are not using the word 'borrowing' as this implies playing back and clearly this does not happen.

To check the answer children are encouraged to add the answer (256) to the number above (231). They should add up to the top number (256 + 231 = 487)

Eventually children should be able to use this efficient written method to cope with any subtractions.
Example: 476 - 259

	H	T	U
	4	6 ~~7~~	1 3
-	2	5	9
	2	1	4

Starting at the units:

- You cannot take 9 from 3 so you need to take a 'ten' from the tens column. 3 becomes 13 and 70 becomes 60 because you have taken one 'ten'
- 13 – 9 = 4
- Moving to the tens column: 60 – 50 = 10
- Moving to the hundreds column: 400 – 200 = 200

Please note that we are not using the word 'borrowing' as this implies paying back and clearly this does not happen.

Example: 563 – 278

	H	T	U
	4 ~~5~~	1 5 ~~6~~	1 3
-	2	7	8
	2	8	5

This example shows the same calculation used for the earlier decomposition method. It shows how the same thinking and understanding can lead to a much more efficient compact method. This is what we are aiming for!

Multiplication

To multiply successfully, children need to be able to recall their times table facts to 10 x 10.

Mental Multiplication using partitioning

47 x 6 = (40 x 6) + (7 x 6) ← Partitioning 47 into 40 and 7
= 240 + 42
= 282

- Tens and units are multiplied separately
- These are then added to find the answer

The grid method

This is a convenient an organised way to record a multiplication calculation. It follows on naturally from the partitioning method.

E.g. 38 x 7

X	7
30	210
8	56
	266

← Multiply each part by 7

Add carefully to get the answer, taking care to line up digits

Partition 38

This method can easily be extended for larger whole numbers and decimals.

Expanded short multiplication

The next step is to move towards a column method, which shows the working.

Example: 38 x 7

30	+	8	
X		7	
2	1	0	← 30 multiplied by 7 = 210
	5	6	← 8 multiplied by 7 is 56
2	6	6	← Add 210 and 56 to get the answer

Short multiplication

Here, the recording is reduced by writing the carry digits below the line.

H	T	U
	3	8
	X	7
2	6	6
	5	

- Multiply 7 by 8 to give 56
- Write the 6 in the units column and carry the 5 to the tens column to represent the fifty
- Multiply the 7 by 30 to give 210
- Add the carried 50 to give 260
- Write the 2 in the hundreds column and the 6 in the tens column

This method can be extended to multiply a 2-digit number by a 2-digit number (long multiplication).

Example: 56 x 27

Th	**H**	**T**	**U**	
		5	6	
		X 2	7	
1	1	2	0	(20 x 56)
	3	9	2	(7 x 56)
1	5	1	2	
		1		

Division

When children are first introduced to the concept of division they are most likely to think of it as 'sharing'.

E.g. If 30 apples are to be divided between 5 people, how many will each person get?

If the apples are shared out one-by-one until none are left, it becomes clear that each person ends up with 6 apples.

E.g. If 48 bottles are packed in boxes of 12, how many boxes are needed?

This becomes an exercise of 'repeated subtraction' where each group of 12 bottles are put in a box until no bottles are left. It is then necessary to count how many boxes have been used.

As children become more familiar with their multiplication and division facts (times tables) and with subtracting multiples of 10, they can be introduced to a more formal way of division calculation.

E.g. 81 / 3

81 / 3 = (60 + 21) / 3
= (60 / 3) + (21 / 3)
= 20 + 7
= 27

Here, 81 is split into 60, the highest multiple of 3 and 10, that is less than 81, to give 60 + 21. Each number is then divided by 3.

The short division method is recorded like this:

```
    20 + 7
3 | 60 + 21
```

This is then shortened to:

```
    2   7
3 | 8   2 1
```

Here, the small carry digit '2' represents the 2 tens that have been exchanged for 20 units. The 27 written above the line represents the answer: 20 + 7, or 2 tens and 7 units.

'Expanded' method (also known as 'chunking')

E.g. 76 / 4

4	7	6		
-	4	0	(4 x 10)	Repeated subtraction of multiples of 4, until nothing remains, leave an answer of 19.
	3	6		
-	3	6	(4 x 9)	
		0		

E.g. 196 / 6

6	1	9	6	
	-	6	0	(6 x 10)
	1	3	6	
	-	6	0	(6 x 10)
		7	6	
	-	6	0	(6 x 10)
		1	6	
	-	1	2	(6 x 2)
			4	

Repeated 'chunks' or multiples of 6 are subtracted. Initially children subtract several 'chunks' but with practice can cut down the number of stages by looking for larger multiples.

To get the answer add the number of multiples of 6 that have been subtracted – in this case 10 + 10 + 10 + 2 = 32

The answer is 32 remainder 4 (after subtracting 32 'sixes' there are 4 remaining and this needs to be shown in the answer.

This method is useful to explain the concept of division and is useful in reminding children of the link between division and subtractions have been carried out.

As children become confident with their multiplication and division facts (times tables) and are sound in their understanding of pace value and partitioning, they can make progress with the more compact 'short division' for larger numbers.

Short Division

Example: 258 / 3

	H	T	U
		8	6
3	2	2 5	1 8

The carry digit '2' represents the 2 hundreds exchanged for 20 tens. This is recorded as a small digit in front of the 5 giving 25 tens to be divided by 3. Since 25 / 3 = 8 remainder 1, the 8 is recorded above the 5 I the tens column and the remaining 1 ten is carried and shown as a small digit in front of the 8 giving 18. Since 18 / 3 = 6, a 6 is recorded above the 8 in the units column.

Learning Multiplication Tables

Once the concept of multiplication is understood as a more efficient operation than repeated addition, a child needs to learn their 'times tables' (from 1 to 10). This is necessary to enable a child to progress to harder multiplication and division on paper. However, it is a good idea anyway, as simple multiplications come up all the time in maths and in real life.

There are many different ways to help a child achieve success but basically they must become familiar with all the multiples of the numbers 1 to 10 (the answers) up to the 10^{th} multiple and they must be able to relate these answers to a multiple fact.

E.g. The fourth multiple of 8 is 32 and the related fact is 4 x 8 = 32.

The following suggestions may help your child learn their 'times tables'.

Interactive games

There are many web-based games; often against the clock that prove popular. The following websites are known to be popular with our current Year 5, but a search will reveal many other possibilities.

http://www.bbc.co.uk/skillswise/numbers/wholenumbers/multiplication/timestables/game.shtml

www.mathsisfun.com/timestable.html

http://www.woodlands-unior.kent.sch.uk/maths/timestable/

http://www.transum.org/software/tablesmaster/tablesmaster.asp

Commercial games

There are a variety of games involving boards, flash cards and dice that can help a child learn in a fun and competitive way.

Music and Chanting

If your child enjoys music and seems to pick up song lyrics easily, a times table CD set to music may help. There are different ones available and they can be bought from high street and internet stationers and book shops.

In school your child will be tested each week in Year 5 using and 11 x 11 grid as shown below. The numbers 1 – 10 will be called out randomly and placed along the top and down the left hand side of the grid. The children then fill in the answers to each multiplication fact as quickly as they can. It is hoped that, by regularly practising, a child will be able to beat their previous best score. Once children have got to the stage where they get all 100 facts correct, they are then aiming to beat their fastest time. In doing this, children are able to see how they are doing and respond well to the challenge of improving each week. Sometimes parents find this method a good way of testing and helping their children at home.

At the back of this document, we have included a blank times tables square for your information and to use at home.

Other areas

Parents can help with other practical applications of maths.

Children are expected to have a knowledge of time as a measure. In recent years, it has become more fashionable for children to wear digital watches, but in Year 5 they are still expected to be able to tell the time using a traditional analogue clock. During Year 5 children will be introduced to the idea of the 24-hour clock and its uses in timestables. Any practical exposure to time-related problems will be beneficial to your child.

Although we now live in a 'plastic money' era, money will always remain a practical area of calculation. It is helpful for children to be given the opportunity to handle money and have some experience of money related calculations.

Supporting Maths in Practical Everyday Contexts

Shopping

- Rounding amounts to the nearest pound/estimation of total bill
- Comparing prices by considering size of container/quantity
- Percentages – sales and discounts
- Weighing self-serve items
- Units of measure mass, capacity
- Fractions – quantity/size depending on number of people to serve
- Looking at shape of packets/containers – nets of 3D shapes

Trip in a car

- Distance travelled – understanding of how far a mile/km is
- Speed – meaning of mph
- Timing of a journey given an average speed
- Amount of fuel needed
- Use of AA route finder/sat nav – grids, coordinates, scale
- Counting cars – tally by colour – consider most popular (mode)
- Shapes of road signs

Baking a cake / preparing a meal

- Measuring/weighing of ingredients – looking at amounts recorded on packets
- Shape of containers/tin
- Lining cake tin – nets
- Adapting recipes for different numbers of people – ratio and proportion
- Cooking time
- Link to shopping – price per person
- Serving cake/pizza – discussion of fractions and angles
- Preparing vegetable – how many for certain number of people

Time

- Telling the time using analogue clock
- Reading timetables – bus/train
- Reference to time/how long things will take
- TV programme guide – how long programmes last
- General timing – how long to get home from school

Calendar

- Having a calendar on display so days, dates, months become familiar number of days in each month

Using money

- Managing pocket money
- Keeping a record of saving – how long will it take to save a set amount
- Budgeting to buy a friend's birthday present and card
- Doing jobs – hourly rate
- Making up games involving money

Holidays

- Finding destination on a map – looking at scale/how far?
- Currency conversions – mental approximations
- Packing/sorting clothes – weight limits
- Temperature
- Time Zones
- Height – mountains
- Sun cream – factor/timing of re-application
- Sandcastle/shell/pebble shapes
- Admission charges for a family

DIY

- Planning – scale drawing
- Re-arranging room layout – will items fit?
- How many tiles/carpet/wallpaper – area
- Quantities of materials – volume/capacity
- Measuring

Sports / Activities

- Scores
- League tables – goal average
- Playing darts – subtraction, doubles, trebles
- Interesting facts/profiles of sportsmen/women
- Training programmes – time/distance

Gardening/Outside

- Planning – area/perimeter of lawn/patio
- How many times up and down with a lawn mower? How many times does it need emptying?
- Planting – symmetry
- How many buckets of water for car washing?

Noticing patterns

- Tiling/paving stones – patios/bathrooms/shopping centres/churches – repeating patterns, symmetry, tessellating patterns, shape recognition
- Plants/flowers – how many leaves/petals? – line symmetry/rotational symmetry
- Patterns in design – packaging, advertising
- Food shapes – in packet of biscuits