KEY STAGE 1

NUMERACY PRESENTATION

MULTIPLICATION AND DIVISION

EARLY MULTIPLICATION .

‘A large part of teaching foundation skills and facts effectively is sorting out not what to teach but when and how to teach them. A set of number facts is best taught at a stage when children are able to fit the facts into their knowledge of the patterns and overall structure of the number system’

-*The National Numeracy strategy- Guide for professional development. DfEE*

This presentation will hopefully help you understand the basic building blocks of multiplication and division that your child will begin to address in Key Stage 1, the kind of misconceptions that can arise and examples of activities to help your child.

STRATEGIES FOR LEARNING.

Children's learning can be divided into five areas of learning:

Kinaesthetic:	memorising and understanding through movement such as finger counting.
Visual:	some children have a good visual memory and can 'see' facts on the page or a board.
Oral:	some children remember by 'hearing' facts repeated. Chanting, rhymes and songs are good examples of this.
Written:	the experience of writing things down can consolidate facts for some children illustrating how facts connect together when they are presented in written form.
Pattern:	recall of facts are often aided when a patterned structure is provided or devised.

BUILDING THE BASICS.

There are three *main* areas that cover the simple principles that children will need to look at to develop a good understanding of multiplication and division at *Key Stage 1*.

- Counting, properties of numbers and number sequences.

- Doubling and halving.

- Addition and subtraction

As children progress into the juniors multiplication and division skills rely upon a greater knowledge of the whole number system taking account of topics such as place value.

COUNTING, PROPERTIES OF NUMBERS AND NUMBER SEQUENCES.

Outcomes given in the National Numeracy Strategy provide a progressive framework for children's learning.

- Count on/ back in 1's and then 10's from any small number (to 100)

- Count in steps of 2 from and back to 0.

- Count in steps of 5 from and back to 0.

- These counting patterns are reinforced through money work with the recognition of 1p, 2p, 5p and 10p pieces and finding totals with these.

- Count on steps of 3 from 0.

- Recognise and extend number sequences with differences of 1,2 or 3.

- Count up to 100 objects by grouping in 2s, 5s and 10s.

- Count on in steps of 3 or 4 to at least 30.

- Use patterns of similar calculations.

COUNTING, PROPERTIES OF NUMBERS AND NUMBER SEQUENCES.

Counting pattern activities:

2	4	6									
									20	22	24

Types of questions: Fill in 16 on these number lines *or* fill in the missing numbers/ continue the pattern. These questions check to see if a child can spot a counting pattern and relate to the objectives discussed.

1	3	6		15	21						

A counting pattern sum given on last years SATs:

47	42	37			22	17	12

COUNTING, PROPERTIES OF NUMBERS AND NUMBER SEQUENCES.

3, 6, 9, 12…. 16, 14, 12, 10….

Describe each pattern. What is the rule? What are the next three numbers in each sequence?

Place a ring round the multiples of 10:

30 23 35 10 70 45 40 22 12

Create a sequence with the numbers 6 and 12 in it.

Count on three tens from 50.

Count back five tens from 80.

Counting round a circle in tens from 53 who will say 93?

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

A visual pattern such as this could be a valuable aid when introducing a multiplication pattern and can be used initially to reinforce the children's counting skills. Division calculations can also be derived.

COUNTING, PROPERTIES OF NUMBERS AND NUMBER SEQUENCES.

Use patterns of similar calculations.

Here the pattern should provide a child with a framework to answer a question that otherwise they would find difficult.

34 + 9 = 43

44 + 9 = 53

54 + 9 = 63

64 + 9 = 73

74 + 9 = ?

Misconceptions can arise when a child does not have sufficient knowledge of the number system to know that 80 would come after 70, the child may not see the pattern or may use an inappropriate strategy such as counting on fingers to attain the answer.

To further assess a child's understanding provide patterns with less examples in.

COUNTING, PROPERTIES OF NUMBERS AND NUMBER SEQUENCES.

Multiplication patterns differ slightly in that a child may need to take the preceding answer and add on to it which displays an awareness that multiplication is a form of repeated addition. Using these tables children can also derive division facts.

4x 1 = 4

4 x 2 = 8

4 x 3 = 12

4 x 4 = 16

4 x 5 = 20

4 x 6 = 24

4 x 7 = ?

Here we see how desirable it is for children to know a range of counting patterns in order to immediately spot the given pattern. This can then be related to multiplication and division as a mental activity.

Times tables go up to multiples of 10. Later 11 x 5 would be calculated as 10 x 5 + 1 x 5. This extends the knowledge base required to effectively multiply to include place value and partitioning.

DOUBLING AND HALVING.

This area is the beginning steps of both multiplication and division.

- Know doubles to 5 + 5.

- Use doubling and halving to solve problems.

- Fold shapes in half. Turn shapes through half turns. Tell the time to half past.

- Know doubles to 10 + 10. This extends to 15 + 15 and stating their corresponding halves later in year 2.

- Know that halving is the inverse of doubling.

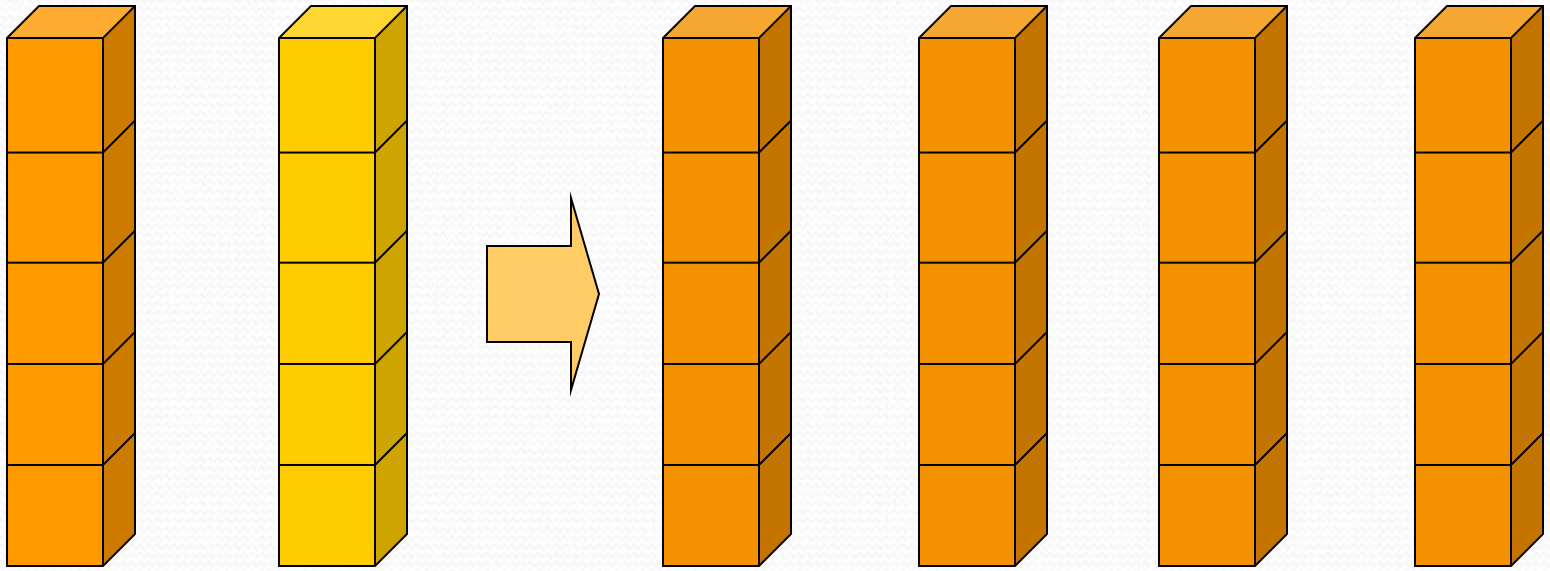
- Find halves and quarters of shapes and small numbers.

- Tell the time to quarter to and past the hour.

- Know that four quarters make one whole one and that two halves also make one whole one.

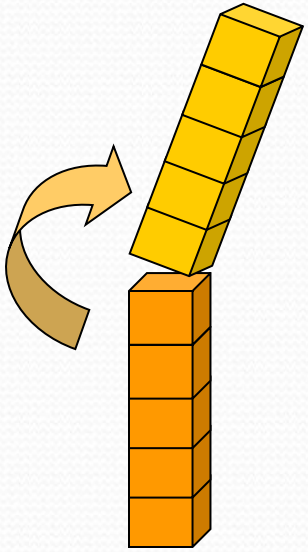
DOUBLING AND HALVING.

Doubling is the first stage of addressing multiplication at a conceptual stage. Adding the same number twice introduces the type of addition required at the basic level of multiplication. Patterned counting provides the next stage to solving a multiplication sum.



Resources such as cubes help to visualise the concepts and skills required and help illustrate the use of times tables. They provide a visual way of spotting and addressing any misconceptions.

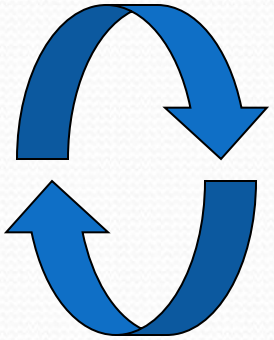
DOUBLING AND HALVING.



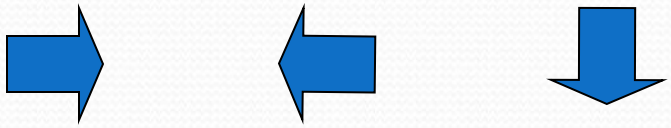
Halves are introduced through splitting shapes in to two equal parts. This can then be done with cubes to introduce the concept of halving numbers.

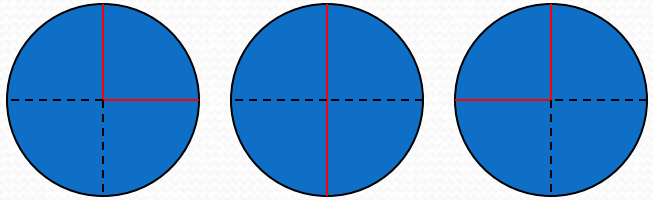
It also provides a practical example of how halves and doubles operate as inverse calculations.

Other use of fractions introducing the basic concept of division include time and angles of turns.



Full, half and quarter turns.





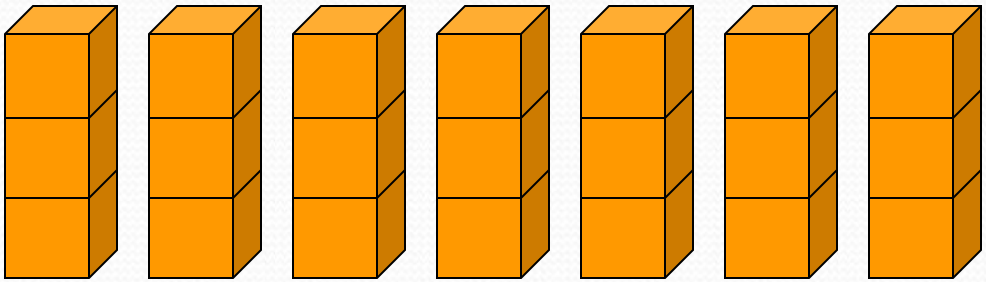
Quarter past, half past and quarter to.

ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION

Year 1	Year 2
Understand the operation of addition.	Understand multiplication as repeated addition.
Understand the operation of subtraction.	Understand division as repeated subtraction, grouping or sharing.
Know addition can be done in any order.	
Use +, - and = signs to record work.	Use +, - , ÷, x and = signs to record work.
Recognise ☐ as representing a number in + and – sums and inverse operations.	Recognise ☐ as representing a number in +, - , ÷ and x sums and inverse operations.
	Recall facts of 10, 2 and 5 x tables.
	Recognise doubles of multiples of 5 and halves of multiples of 10.
Solve simple 1 step + and - problems.	Solve simple 1 step +, -, x and ÷ problems.

ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION

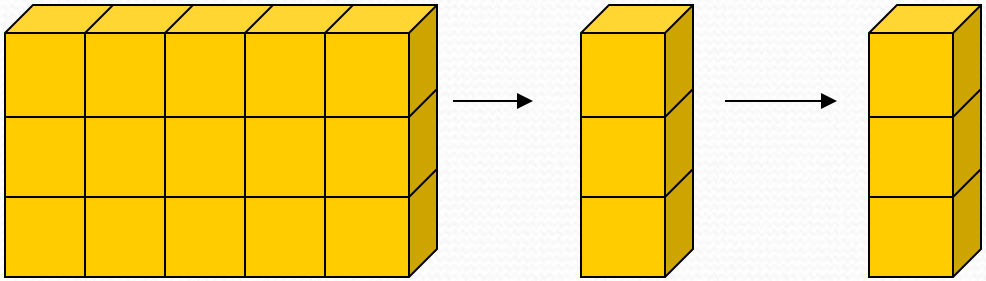
Multiplication as repeated addition.



7 x 3 = seven lots of 3 = 3 + 3 + 3 + 3 + 3 + 3 + 3

Division as repeated subtraction or grouping.

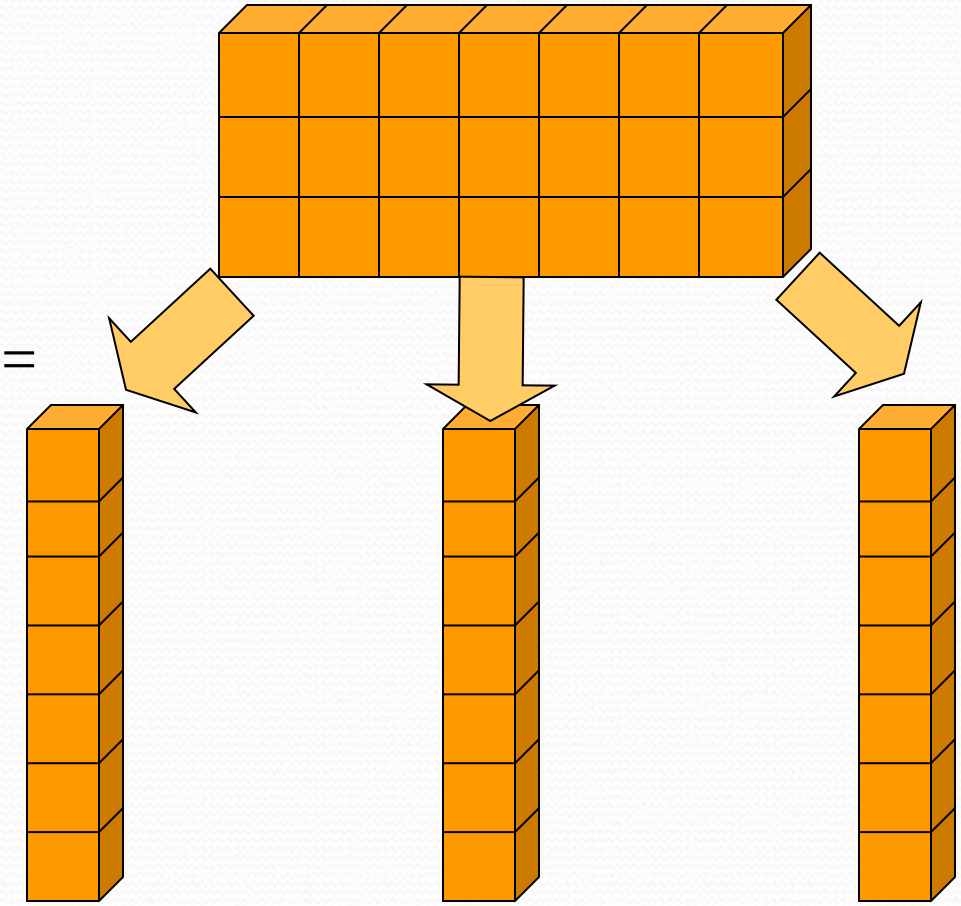
21 ÷ 3 = 21 grouped into 3's = 21 –3 –3 –3 –3 –3 –3 –3



Here three is subtracted each time to provide 7 'groups' of cubes.

ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION

Division as sharing.



$21 \div 3 =$

7 each.

Division is addressed after multiplication just as subtraction has been taught after addition.

ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION

Vocabulary can confuse children and so looking at multiplication as ‘lots of’ and division as ‘shared by’ provide an easier route to understanding these operations before the correct terminology is introduced. It can also help children solve problems which are very language dependent.

A sound understanding of multiplication and division as well as their inverse relationship is needed to answer questions of greater complexity such as:

5 x ___ = 30 ___ ÷ 9 = 2

UNDERSTANDING A CHILD'S PERSPECTIVE.

Understanding children's difficulties with multiplication:

Change the number names 0, 1, 2, 3 etc. for letters A, B, C, D this puts you at the same level as a child. To answer the questions you must not translate these letters into numbers.

C x F =

Steps to follow:

1. Work out what the value of C is.
2. Remember that A = 0.
3. Count on to C remember this.
4. Count on up to F.
5. Devise a strategy to count the two numbers up together.
6. Count up answer or use place value to work out the answer.

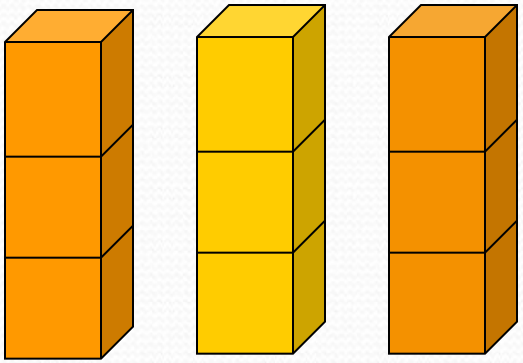
BA x F =

BF ÷ F =

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	B	C	D	E	F	G	H	I	J	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	CA

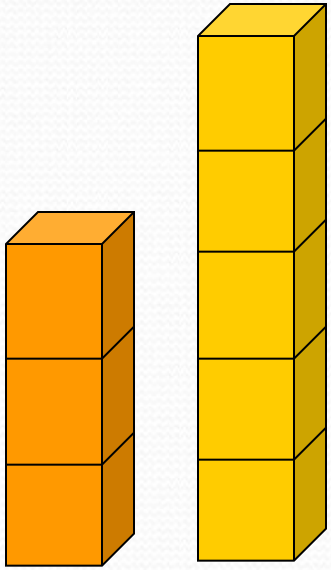
MISCONCEPTIONS WITH APPARATUS.

3 x 5



A common misconception is to multiply the first number by itself (a misconception brought about by doubling).

= 20 incorrect counting strategy by counting initially in 5's then 10's.



Adding rather than repeated addition is brought about by the similarity in the mathematical symbol or a lack of strategies to cope with multiplication.

Making the jump from using and counting cubes to counting in patterns is a large one.

LEARNING FROM MISCONCEPTIONS.

There are 18 sweets and 3 children. The children share out the sweets. How many sweets will they each get?

Some possible answers:

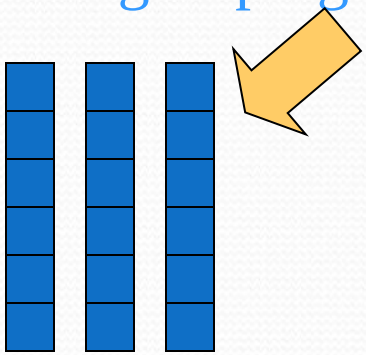
16- The child has subtracted and has double counted 18. .

5- The child has attempted to divide but when counting in threes has counted inaccurately

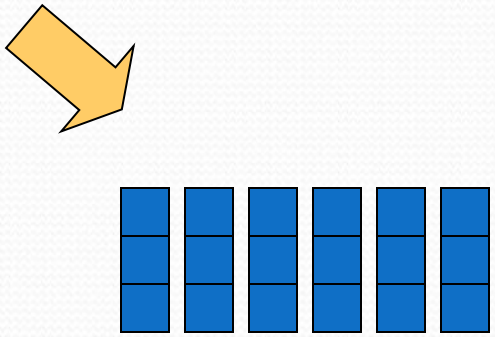
9- The child has halved the number as it is a ‘sharing’ sum.

LEARNING FROM MISCONCEPTIONS.

3- The child has worked out the answer with cubes and counted the number of cubes in each group rather than counting the number of groups, this is a mixture of sharing and grouping strategies.



Visual- sharing



Kinaesthetic- repeated subtraction

Aural: Chanting times table to derive the answer.

201- Inappropriate use of a number operation (adding instead of multiplying) and an incorrect form of recording. 20 and 1.

LEARNING FROM MISCONCEPTIONS.

Other points to bear in mind.

Be careful when questions are presented in a different manner or placed into a different context.

These misconceptions can be combined such as counting on for a division sum as well as counting from the wrong number.

Answers can just be made up / estimated.

The best source of information regarding misconceptions is your child. The best question you can ask is ‘can you show me how you worked it out?’

Don’t expect a child who cannot count backwards to be able to do simple division.