

Newport Infant School

Maths Calculation Policy

Date of Policy Creation	January 2015
Policy Lead	Emma Stanley Sarah Bowen
Date of Policy Adoption by Governing Body	26 February 2015
Frequency of review	Every 3 years
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Other related policies -

Maths Policy

Teaching and learning Policy

Newport Junior School Calculation Policy (developed collaboratively)

MIBBs and Talk for Maths prompts

Mathematics Calculation Policy
Newport Infant School
Recording methods FS to Year 3

The need to have a coherent, progressive policy, which is understood throughout the school and by parents and carers, is of great importance.

The booklet details:-

- Aims and rationale
- Recording methods for addition, subtraction, multiplication and division.

Aims and Rationale

Children are introduced to the processes of calculation through practical, oral and mental activities. The mental methods in the Primary Framework for teaching maths will be taught systematically from Reception onwards and pupils will be given regular opportunities to develop the necessary skills. As children begin to understand the underlying ideas, they develop ways of:-

- Recording to support their thinking and calculation methods
- Using particular methods that apply to special cases
- Interpreting and using the signs and symbols involved
- Sharing written methods encourages children to think about the mental strategies that underpin them and to develop new ideas











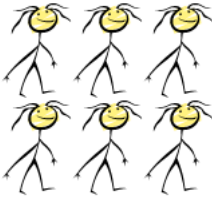
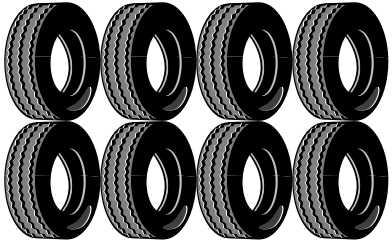
As children's methods are strengthened and refined, so too are their informal written methods. These methods become more efficient and lead to efficient written methods that can be used more generally.

Early practical, oral and mental work *must lay the foundations* by providing children with a good understanding of:-

- How the four operations build on efficient counting strategies
- Place value
- Number facts

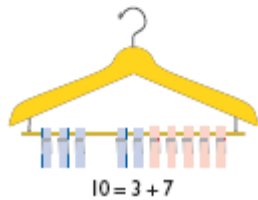
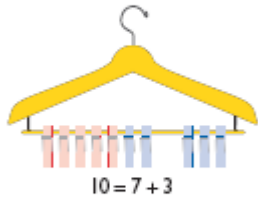
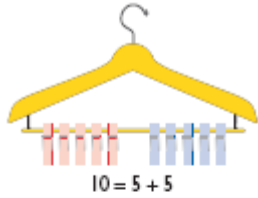
Recording Methods

Foundation	Year 1	Year 2	Year 3
DRAWING PICTURES AND MARKS			
	USING SIGNS AND SYMBOLS		
	DRAWING NUMBER LINES		
		USING INFORMAL JOTTINGS	
EXPLAINING IN WORDS (Talk for Maths)			

Addition	Subtraction	Multiplication	Division
<p style="text-align: center;"><u>Reception</u></p> <p>Counting objects, partitioning and recombining sets using practical apparatus.</p> <p>Understand that the number gets bigger.</p> <p>Addition is commutative.</p> <p>Use number tracks to develop counting skills, forwards and backwards.</p> <p><u>COUNTING ITP</u></p> <p>Pictorial recording of practical experiences.</p> <p>Teacher modelling of number sentences and addition as commutative.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>$1 + 1 = 2$ double 1 is 2</p> </div> <div style="text-align: center;">  <p>$2 - 1 = 1$ half of 2 is 1</p> </div> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>$2 + 2 = 4$ double 2 is 4</p> </div> <div style="text-align: center;">  <p>$4 - 2 = 2$ half of 4 is 2</p> </div> </div>	<p style="text-align: center;"><u>Reception</u></p> <p>Know that the number gets smaller because objects have been removed from the set.</p> <p>Practical models of subtraction</p> <p>Counting back on fingers, orally, number lines.</p> <p>Find the difference, counting on. <u>MODELS AND IMAGES CHARTS</u></p> <p>(To be used for lots of oral examples)</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>$5 + ? = 10$</p> </div> <div style="text-align: center;">  <p>$10 - 5 = ?$</p> </div> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>$6 + ? = 10$ $10 - 6 = ?$</p> </div> <div style="text-align: center;">  <p>$? + 6 = 10$ $10 - 4 = 6$</p> </div> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>$9 + ? = 10$ $10 - 9 = ?$</p> </div> <div style="text-align: center;">  <p>$? + 9 = 10$ $10 - ? = 9$</p> </div> </div>	<p style="text-align: center;"><u>Reception</u></p> <p>Jumping along number lines in jumps of 1, 2, 5 & 10.</p> <p>Repeated addition, practical demonstrations. (Models and Images charts)</p> <p>Doubles and grouping Grouping is a random arrangement of a quantity into equal groups.</p> <p>Arrays are a rectangular arrangement to show the equal groups.</p> <div style="text-align: center;">  <p><i>This is an array</i></p> </div> <p>Use of arrays to show that multiplication is commutative. Changing the order does not affect the answer. Peg boards are a useful model.</p> <p>Use the language of 'lots of', 'groups of' and 'sets of' for 'x'.</p>	<p style="text-align: center;"><u>Reception</u></p> <p>Counting on and back in steps of 1, 2 and 10.</p> <p>Sharing equally and halving objects in practical contexts.</p> <p>Pictorial recording.</p> <p>Grouping, in practical contexts.</p> <p><u>GROUPING ITP</u></p> <p>Use cross curricular links (PE) and purposeful objects such as sock and shoes/ animals in the ark to get into groups. Sharing models such sharing an apple or a Satsuma.</p> <p><i>How many cars can you make if you have 8 wheels?</i></p> <div style="text-align: center;">  </div>

Newport Infant School Calculation Policy

Policy reflects: concrete (do it!); abstract (see it!); visual (remember it!); communication (record it!)



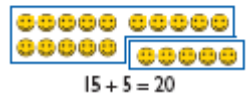
We have 10 pegs on the coathangers, how can we split them into 2 groups? Is there another way? How can you be sure you have got them all?

Once numbers can be written, number sentences can be recorded.

Modelling of commutative layout.

To have experience of '=' sign as last stage in calculation.

[ADDITION AND SUBTRACTION EXCEL](#)



[NUMBER FACTS ITP](#)

Practical demonstrations of take away.

There were 9 balloons. Two popped. How many are left?



$9 - 2 = 7$

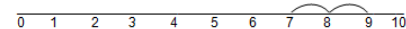
Find the difference where numbers are close together.



"How many more do I add to 7 to get to 9?"

[DIFFERENCE ITP](#)

$9 - 7 = 2$



Vertical number line to show the difference. Number ladders.



$2 + 2 + 2 + 2 + 2 = 10$

$2 \times 5 = 10$

2 multiplied by 5

5 pairs

5 hops of 2

[GROUPING ITP](#)

Pictures to show 2 lots of 3 or 3 lots of 2.

Newport Infant School Calculation Policy


Policy reflects: concrete (do it!); abstract (see it!); visual (remember it!); communication (record it!)

	$9 - 7 = 2$ 9) 8) 7)		

Year 1

Key skills of knowing number bonds to 10.

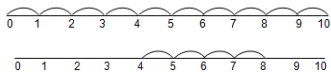
Develop knowledge of fact families, e.g. 2, 5, 7.

	$7 = 5 + 2$	$2 + 5 = 7$
	$7 - 2 = 5$	$7 - 5 = 2$

EXCEL ADDITION AND SUBTRACTION TRIOS

Counting forwards and recording on a number line.

All answers to be recorded in a number sentence following any informal recording.



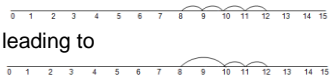
COUNTING ON AND BACK ITP NUMBER LINE ITP

$4 + 8 =$

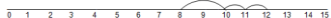
Reordering – biggest number first.

$8 + 4 =$

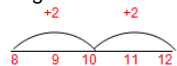
Recording in number sentences and communication along number lines or with informal written methods.



leading to

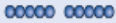



leading to



Children to show notation

Addition is the inverse of subtraction. Fact family.

	$15 = 12 + 3$	$3 + 12 = 15$
	$15 - 3 = 12$	$15 - 12 = 3$

Year 1

Subtraction sentences and jumps (backwards for take away – left and forwards for difference – right) along number lines.

EXCEL ADDITION AND SUBTRACTION TRIOS

Check with the inverse.

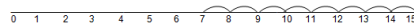
Know that 6 can be thought of as 5 and 1.



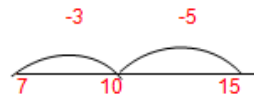
6 is 5 and 1 more

Know that 8 is 5 and 3, therefore subtract 5 then 3.

$15 - 8 = 7$



leading to

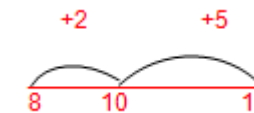
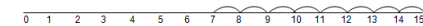


Children to show notation

Find the difference by counting on along a number line.

$15 - 8 =$

Reinforce the role of the number sentence.

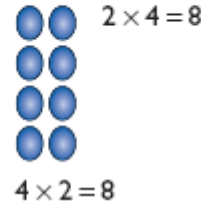
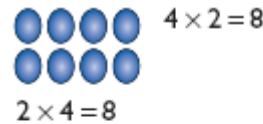


Children to show notation

Year 1

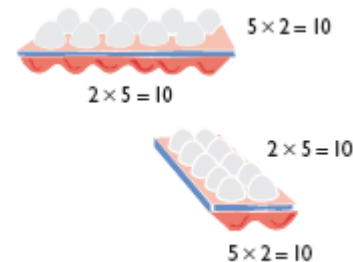
Pictorial repeated addition. Grouping is a random arrangement of a quantity into equal groups.

Arrays are a rectangular arrangement to show the equal groups.



Counting in 2s, 5s and 10s and begin counting in 3s.

Introduce the x symbol once repeated addition is understood.



Year 1

With practical equipment:

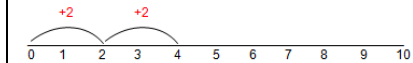
Counting on and back in 2s, 5s and 10s and begin counting in 3s.

Grouping as repeated addition along the number line.

Introduce the ÷ symbol once repeated addition (grouping) is understood.

GROUPING ITP

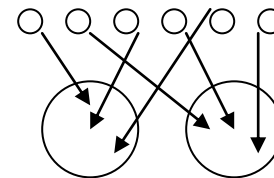
If I have got 4, how many groups of 2 have I got?



Grouping and sharing practically. (NB If the answer is in the same units as the dividend, it is sharing. If the answer is in different units, it is grouping.)

Record sharing by using pictorial notation

There are 6 cakes and 2 children. How many cakes will they each get? One for you and one for you.



Using shapes to represent a missing number.

$$\square + \circ = \triangle \quad \square + \square = \triangle$$

$$5 + 4 = 9 \quad 6 + 6 = 12$$

Adding more than two numbers

Strategy to include looking for facts or bonds that are useful e.g. bonds up to and including 10, doubles or adding 10 to a given number.


$$6 + 3 + 4 = 13$$

$$6 + 3 + 4 + 7 + 2 = 22$$

Children to show notation

Compensation strategy

$$5 + 9 =$$

$$5 + 10 - 1$$


Children to show notation

Doubles then near doubles

$$5 + 6 =$$

$$5 + 5 + 1 = 11$$

$$7 + 8 =$$

$$8 + 8 - 1 = 15$$

Decision making

Using statements such as

Ben did $14 + 9 = 23$
How could he have done it?

To know that the = sign means 'the same as' and can appear in a different place within a calculation; $14 = 8 + 6$, $7+6=8+5$

Use patterns to find answers to subtractions

$$10 + 4 =$$

$$10 - 4 =$$

$$20 + 4 =$$

$$20 - 4 =$$

EXCEL PATTERNS OF CALCULATION


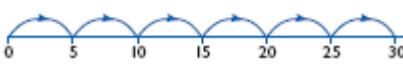
Decision making

$$17 - \square = 12$$

Sam works out

$$17 - 5 = 12.$$

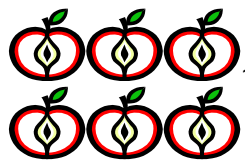
How could he have done this?

$$5 + 5 + 5 + 5 + 5 + 5 = 30$$

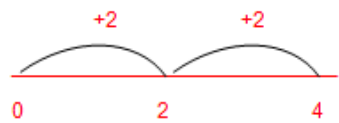
$$5 \times 6 = 30$$

5 multiplied by 6
6 groups of 5
6 hops of 5

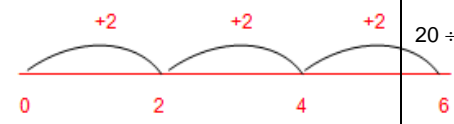


1 group of 3 = 3
2 groups of 3 = 6

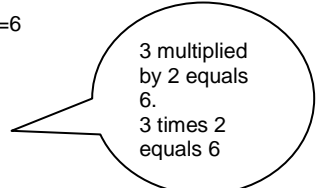

Doubles and grouping recorded on number lines

$$2 + 2 =$$


Children to show notation


$$2 + 2 + 2 =$$


Children to show notation

$$3 \times 2 = 6$$



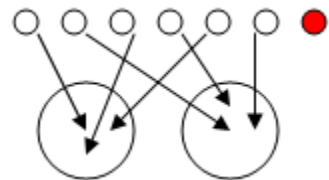
5 hops in 15. How big is each hop?

15 shared between 5

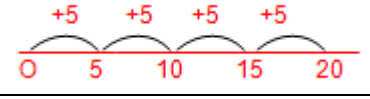


ii.


There are 7 cakes and 2 children. How many cakes will they each get? 'Leftovers' introduced.



There are 20 sweets in a bag. How many children can have 5 each?

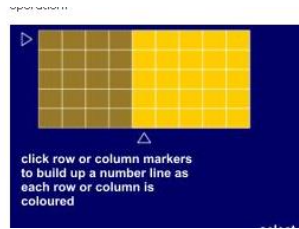


$20 \div 5 = 4$

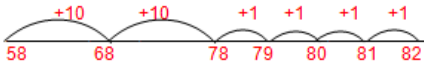
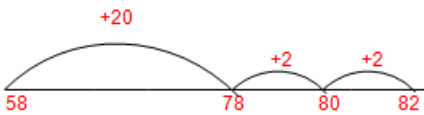
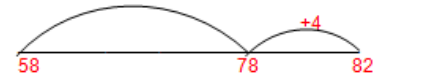
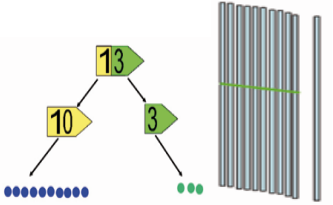
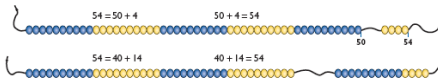
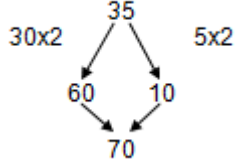
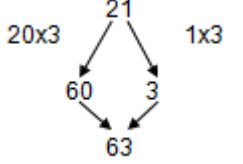


Newport Infant School Calculation Policy

Policy reflects: concrete (do it!); abstract (see it!); visual (remember it!); communication (record it!)



In the example above with 5 rows and 9 columns, when you select to count along the columns the given calculation is:
 $5 \times 9 = 45$ [the 5 is multiplied by 9].
Selecting to count along rows gives:
 $9 \times 5 = 45$ [the 9 is multiplied by 5].

Addition	Subtraction	Multiplication	Division
<p><u>Year 2</u></p> <p>Emphasis on mental calculation.</p> <p>Combining sets to make a total.</p> <p>Progression in use of informal recording including the number line.</p> <p>Answers to be recorded as part of a number sentence.</p> <p>Reordering strategy.</p> <p>COUNTING ON AND BACK ITP NUMBER LINE ITP</p> <p>Adding: $TU + TU = TU$ and when secure moving on to $TU + TU = HTU$ $HTU + TU = HTU$</p> <p>24 + 58</p>  <p>adding in 10s and 1s</p>  <p>add 20, bridge the 10</p>  <p>add 20 and then 4</p> <p>Record partitioned steps in number sentences underneath each other and add mentally.</p> <p>24+58=</p>	<p><u>Year 2</u></p> <p>Place value, partitioning and recombining.</p> <p>Rearranging of numbers so that 36 can be seen as 30 and 6 or as 20 and 16.</p> <p>Partitioning of numbers into T and U then HTU. Know what each digit represents.</p> <p>TU – TU HTU – TU</p>   <p>PLACE VALUE ITP</p> <p>Partitioning the second number strategy</p> <p>76 – 43 = $76 - 40 = 36$ $36 - 3 = 33$</p> <p>73 – 46 = $73 - 40 = 33$ $33 - 6 = 27$</p>	<p><u>Year 2</u></p> <p>Using tables facts 2s, 10s and 5s and 3s and 4s.</p> <p>Be able to partition a 2 digit number.</p> <p>MULTIPLICATION BOARD ITP MULTIPLICATION TABLES ITP</p> <p>Doubles are same as x2.</p> <p>Vocabulary of double, multiply, groups of, sets of, lots of etc.</p> <p>Partitioning strategy for doubling.</p> <p>Double 35</p>  <p>A lolly costs 21p. How much do 3 cost?</p>  <p>Decision making Children investigate statements and solve word problems using appropriate methods such as mental/ jottings/ numberline.</p>	<p><u>Year 2</u></p> <p>Understand division as repeated addition, grouping.</p> <p>Table facts (see multiplication).</p> <p>Division facts corresponding to the 2, 10, 5, 3 and 4 times tables.</p> <p>Use x and ÷ signs.</p> <p>MULTIPLICATION AND DIVISION TRIOS SPREADSHEET</p> <p>Count a handful of beads by grouping them in fives. How many groups of 5 are there? How many are left? Can you write a division sentence to describe this?</p> <p>How many lengths of 6 m can you cut from 48m of rope? Write the number fact that represents this. How did you work it out?</p> <p>OVERCOMING BARRIERS L2-L3 knowing and using number facts)</p> <p>Record using the correct division symbol.</p> <p>Use of number lines to record repeated addition.</p> <p>Practical apparatus to support concept. Introduce the vocabulary of remainder.</p> <p>Practical contexts to be used so that the calculation is not in the abstract.</p>

Newport Infant School Calculation Policy

Policy reflects: concrete (do it!); abstract (see it!); visual (remember it!); communication (record it!)

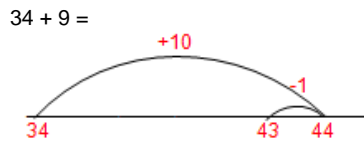
20+50=70
4+ 8=12
70+12=82

Introduce column addition without crossing the boundary

$$\begin{array}{r} 24 \text{ (20+4)} \\ +53 \text{ (50+3)} \\ \hline 77 \text{ (70+7)} \end{array}$$

Check answers by repeating addition in different order or by an equivalent calculation.

Compensation strategy



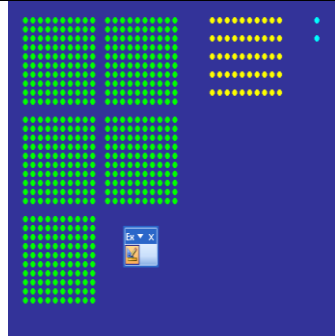
Near doubles

13 + 14 =
Double 14 = 28
28 - 1 = 27
or
Double 13 = 26
26 + 1 = 27

[EXCEL MISSING SIGNS AND NUMBERS](#)

Adding zero leaves a number unchanged/
adding ten to a number keeps units digit constant.

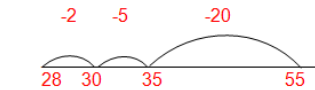
Decision making (mental, jottings, numberline)
Statements and word problems.



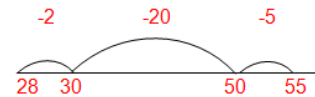
[PLACE VALUE DOTS EXCEL SPREADSHEET](#)

Counting back (left) from the larger number in partitioned steps of the smaller number to reach the unknown.

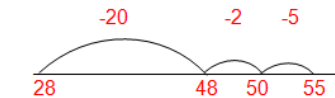
55 - 27
Rearranging strategy
Partitioning the 27 into 20, 5 and 2.



or



or

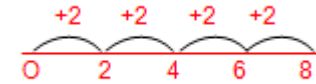


55 - 27 = 28

Find the difference (counting on to the right)

55 - 27 = 28

Grouping

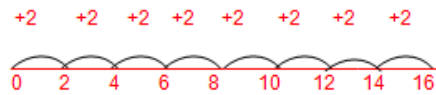


“How many groups of 2 are there in 8?”

The number of jumps tells you the number of groups.

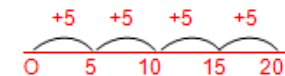
[DOUBLING AND HALVING SPREADSHEET](#)

16 ÷ 2 =
“How many groups of 2 are there in 16?”
“I know that dividing by 2 is the same as halving.”

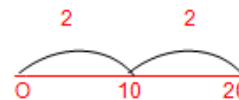


Jump size depends on knowledge and confidence of child. (See D)

20 ÷ 5 =



4 jumps
or moving away from + notation



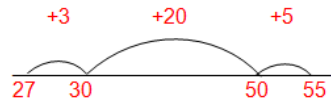
2 double jumps because 5x2 =10

85 ÷ 5 =

Newport Infant School Calculation Policy

Policy reflects: concrete (do it!); abstract (see it!); visual (remember it!); communication (record it!)

“How many more do I need to add to 27 to get to 55?”



Subtract mentally pairs of multiples of 10 and 100, using known facts

$60 - 20 = 40$ because $6 - 2 = 4$

$700 - 300 = 400$

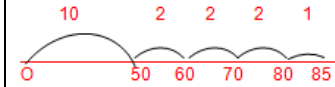
Continue to use the vertical number line.

Use of apparatus (Diennes) to understand rearrangements, e.g. 55 as 40 and 15, not as part of calculations.

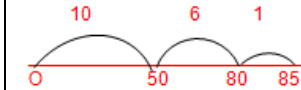
BEADSTICKS ITP to be used with Diennes to develop concept of exchange.

(Beadstick and other place value ITPS)

Decision making
Statements and word problems.

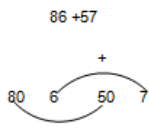
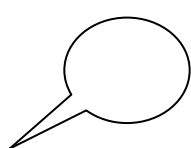
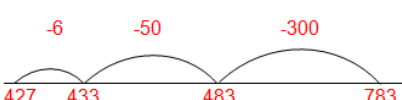
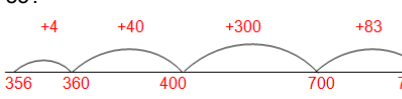


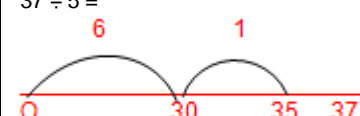


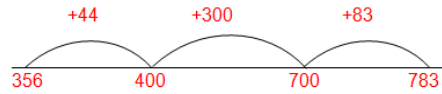
or



Decision making

Children investigate statements and solve word problems using appropriate methods such as mental/ jottings/ numberline.

Addition	Subtraction	Multiplication	Division
<p><u>Year 3</u></p> <p>Counting on in multiples of 100s, 10s or units using a number line.</p> <p>HTU + TU Cross the 10s/100s boundary.</p>  <p>NUMBER BOARDS (all stages onwards) for range of numbers Start with least significant digit</p> $\begin{array}{r} 67 \\ + 24 \\ \hline 11 \text{ (7+4)} \\ + 80 \text{ (60+20)} \\ \hline 91 \end{array}$  <p>"7 add 4 equals 11 and 60 add 20 equals 80. 1 + 0 = 1 and 1 ten + 8 tens = 9 tens"</p> $\begin{array}{r} 625 \\ + 48 \\ \hline 13 \text{ (5+8)} \\ 60 \text{ (20 + 40)} \\ + 600 \text{ (600 + 0)} \\ \hline 673 \end{array}$ <p>All language in the context of the place value and the mental addition of the totals to be done in any order.</p> <p>625 + 48 673</p> <p>Decision making.</p>	<p><u>Year 3</u></p> <p>Counting backwards and forwards beyond zero, negative and positive numbers.</p> <p><i>-5 is negative 5 and minus 5</i></p> <p>TU – TU, HTU – TU, HTU – HTU.</p> <p>Lead on to decomposition method in expanded format.</p> <p>Ensure understanding of number partitioning and exchange.</p> <p>Least significant digit is always dealt with first to establish if the exchange is needed.</p> <p>Check for mental approach first before written method. "Can I do this in my head?"</p> <p>NUMBER BOARDS (all stages onwards) for range of numbers</p> <p>Reduction strategy</p> $783 - 356$ <p>Partitioning the 356 into 300, 50 and 6.</p>  $783 - 356 = 427$ <p>Difference strategy</p> <p>"How many more do I need to get from 356 to 783?"</p>  <p>leading to</p>	<p><u>Year 3</u></p> <p>Known table facts 2, 3,4,5,6, 8 and 10.</p> <p>NUMBER DIALS ITP</p> <p>Refer to multiplication tables ITPs above.</p> <p>Refer to Page 60 Overcoming barriers L2-L3 for further guidance.</p> <p>Multiply by 10 / 100, understanding the shift in the digits.</p> <p>Know what each digit represents, partition a three digit number.</p> <p>Commutative law (the principle that the order of two numbers in a multiplication calculation makes no difference, e.g. $5 \times 7 = 7 \times 5$).</p> <p>MOVING DIGITS</p> <p>Consolidate arrays and repeated addition. Recalling facts. $4 \times 5 = 20$, $5 \times 4 = 20$.</p> <p>Informal recording of partitioned numbers $15 \times 5 = 75$</p> $10 \times 5 = 50$ $5 \times 5 = 25$ $27 \times 3 = 81$ $20 \times 3 = 60$ $7 \times 3 = 21$ 	<p><u>Year 3</u></p> <p>Understand division as repeated addition.</p> <p>Know all corresponding tables facts for 2, 3,4,5,6, 8 and 10.</p> <p>Know what each digit represents in a HTU number.</p> <p>Use numbers that will generate remainders. r notation for the remainder.</p> $21 \div 5 = 4 \text{ r } 1$ <p>Record using a number line, $30 \div 5 = 6$</p>  <p>"What do I know about the number I am dividing by?" "I know that $5 \times 6 = 30$"</p> <p>Repeated addition along a number line with jumps representing number of groups.</p> $37 \div 5 =$ 



Both strategies need to record the answer in a number sentence.

$783 - 356 = 427$
 "783 subtract 356 equals 427"

$$\begin{array}{r} 89 = 80 \quad 9 \\ - 24 = 20 \quad 4 \\ \hline 60 \quad 5 = 65 \end{array}$$

"9 subtract 4 equals 5 and 80 subtract 20 equals 60. 60 and 5 make 65"

Vertical number line



"Add 6 to 24 to make 30. Add 50 to 30 to make 80. Add 9 to 80 to make 89. So 6 add 50 add 9 equals 65."

$$\begin{array}{r} 81 = 80 \quad 1 \\ - 57 \quad 50 \quad 7 \\ \hline \quad \quad \quad = 24 \end{array}$$

$$\begin{array}{r} 81 = 70 \quad 11 \\ - 57 \quad 50 \quad 7 \\ \hline \quad \quad \quad = 24 \end{array}$$

"1 to subtract 7 is tricky so I will rearrange 81 into 70 and 11. 11 subtract 7 equals 4 and 70 subtract 50 equals 20. 20 and 4 make 24."

BEADSTICKS ITP
 Decision making

"20 multiplied by 3 equals 60 and 7 multiplied by 3 equals 21. 60 add 21 equals 81."

$$\begin{array}{l} 23 \times 8 = \\ 20 \times 8 = 160 \\ 3 \times 8 = 24 \end{array}$$

x	20	3
8		

$$\begin{array}{r} 23 \\ \times 8 \\ \hline 24 \quad (8 \times 3) \\ 160 \quad (8 \times 20) \\ \hline 184 \end{array}$$

Decision making

Use partitioning/re-arranging to find multiples of the divisor.

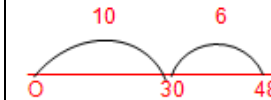
Partitioning method
 $48 \div 3 =$
 'What do I know about 3 x tables?'
 "I know $3 \times 10 = 30$."



$$48 \div 3 = 16$$

$$10 \times 3 = 30$$

$$6 \times 3 = 18$$



Decision making