

Newport CE Junior School - Calculation policy  
Policy reflects: concrete (do it!) abstract (see it!) visual (remember it!) communication (record it!)

# Newport CE Junior School

## Calculation Policy

Revised February 2015

(Associated Policies: Maths Policy, Mental Maths Policy, Maths Curriculum Policy, Marking Policy, Assessment Policy and Homework Policy)

## **Newport CE Junior School - Calculation policy**

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

This policy has been designed to develop fluency, reasoning and problem solving in accordance with the 2014 National Curriculum. It provides a consistent and smooth progression with the four operations.

This calculation policy shows stages in accordance with age related expectations indicated in the 2014 National Curriculum however it is vital pupils are taught according to the stage they are at and move on when appropriate for the individual.

It is important calculations are given a real life context or problem solving approach to develop children's understanding of the purpose of calculation and to recognise when operations and methods are relevant.

### **THE AIMS OF THIS CALCULATION POLICY**

- To support consistency in the teaching of written calculation across the school.
- To strengthen continuity and progression in children's understanding and development of written calculation.
- To form a core set of methods children will experience and build upon.
- To embed models and images that develop conceptual understanding.
- To provide reference and guidance for teachers, teaching assistants, parents and school governors.

### **SOLVING A CALCULATION**

Each classroom displays and promotes use of the RUCSAC process: Read the question; Understand the question; Choose the operation; Solve the question; Answer the question and Check the answer.

### **USE OF FORMAL AND INFORMAL RECORDING**
















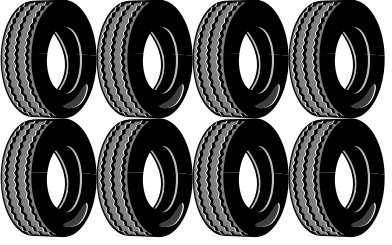
Children are taught the difference between formal and informal recording and are taught to make decisions between these ways of working when solving problems.

### **MENTAL, WRITTEN AND CALCULATOR METHODS**

See Mental Maths policy for additional guidance. This calculation policy scaffolds the children's progress in their ability to make decisions between mental, written and calculator methods. Calculator skills are taught through Mathematics and ICT, children value the calculator as a mathematical tool.

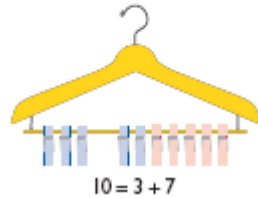
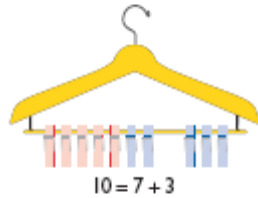
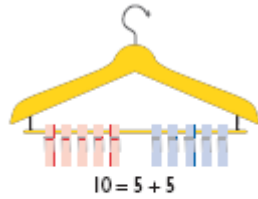
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Addition	Subtraction	Multiplication	Division
<p style="text-align: center;"><b><u>Stage A</u></b></p> <p>Counting objects, partitioning and recombining sets using practical apparatus.</p> <p>Understand that the number gets bigger.</p> <p>Addition is commutative.</p> <p>Use number tracks to develop counting skills, forwards and backwards.</p> <p><a href="#"><u>COUNTING ITP</u></a></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; align-items: center;"> <div style="text-align: center;">  <p><math>1 + 1 = 2</math> double 1 is 2</p> </div> <div style="text-align: center;">  <p><math>2 - 1 = 1</math> half of 2 is 1</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  <p><math>2 + 2 = 4</math> double 2 is 4</p> </div> <div style="text-align: center;">  <p><math>4 - 2 = 2</math> half of 4 is 2</p> </div> </div>	<p style="text-align: center;"><b><u>Stage A</u></b></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. <a href="#"><u>MODELS AND IMAGES CHARTS</u></a></p> <p>(To be used for lots of oral examples)</p> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  <p><math>5 + ? = 10</math></p> </div> <div style="text-align: center;">  <p><math>10 - 5 = ?</math></p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  <p><math>6 + ? = 10</math></p> </div> <div style="text-align: center;">  <p><math>? + 6 = 10</math></p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  <p><math>10 - 6 = ?</math></p> </div> <div style="text-align: center;">  <p><math>10 - 4 = 6</math></p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  <p><math>9 + ? = 10</math></p> </div> <div style="text-align: center;">  <p><math>? + 9 = 10</math></p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  <p><math>10 - 9 = ?</math></p> </div> <div style="text-align: center;">  <p><math>10 - ? = 9</math></p> </div> </div>	<p style="text-align: center;"><b><u>Stage A</u></b></p> <p>Jumping along number lines in jumps of 1, 2, 5 &amp; 10.</p> <p>Repeated addition, practical demonstrations. (<i>Models and Images charts</i>)</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; margin-top: 10px;">  <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;"><b><u>Stage A</u></b></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><a href="#"><u>GROUPING ITP</u></a></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; margin-top: 20px;">  </div>

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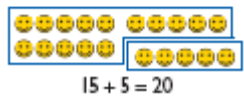
We have 10 pegs on the coathangers, how can we split them into 2 groups? Is there another way? How can you be sure you have got them all?

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**



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

$2 \times 5 = 10$

2 multiplied by 5

5 pairs

5 hops of 2

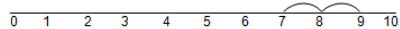
**GROUPING ITP**

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

# Newport CE Junior School - Calculation policy

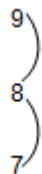
Policy reflects: concrete (do it!) abstract (see it!) visual (remember it!) communication (record it!)

$$9 - 7 = 2$$



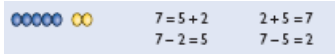
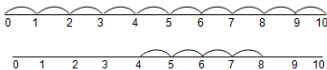


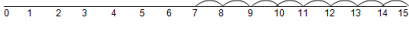
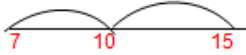
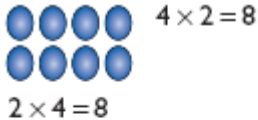
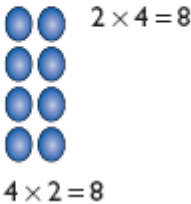
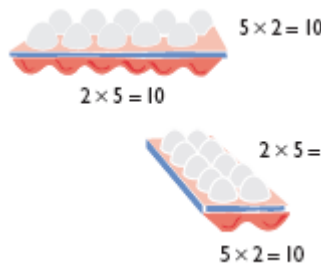
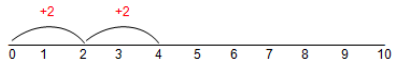
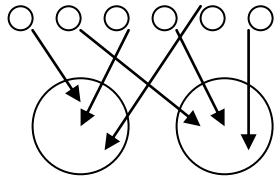
Vertical number line to show the difference. Number ladders.

$$9 - 7 = 2$$



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<p><b><u>Stage B</u></b></p> <p>Key skills of knowing number bonds to 10.</p> <p>Develop knowledge of fact families, e.g. 2, 5, 7.</p>  <p><b><u>EXCEL ADDITION AND SUBTRACTION TRIOS</u></b></p> <p>Counting forwards and recording on a number line.</p> <p>All answers to be recorded in a number sentence following any informal recording.</p>  <p><b><u>COUNTING ON AND BACK ITP NUMBER LINE ITP</u></b></p> <p>4 + 8 =</p> <p>Reordering – biggest number first.</p> <p>8 + 4 =</p> <p>Recording in number sentences and communication along number lines or with informal written methods.</p> 	<p><b><u>Stage B</u></b></p> <p>Subtraction sentences and jumps (backwards for take away – left and forwards for difference – right) along number lines.</p> <p><b><u>EXCEL ADDITION AND SUBTRACTION TRIOS</u></b></p> <p>Check with the inverse.</p> <p>Know that 6 can be thought of as 5 and 1.</p>  <p>6 is 5 and 1 more</p> <p>Know that 8 is 5 and 3, therefore subtract 5 then 3.</p> <p>15 – 8 = 7</p>  <p>leading to</p>  <p><i>Children to show notation</i></p> <p>Find the difference by counting on along a number line.</p> <p>15 – 8 =</p> <p>Reinforce the role of the number sentence.</p>	<p><b><u>Stage B</u></b></p> <p>Pictorial repeated addition. Grouping is a random arrangement of a quantity into equal groups.</p> <p>Arrays are a rectangular arrangement to show the equal groups.</p>   <p>Counting in 2s, 5s and 10s and begin counting in 3s. Introduce the x symbol once repeated addition is understood.</p> 	<p><b><u>Stage B</u></b></p> <p>With practical equipment:</p> <p>Counting on and back in 2s, 5s and 10s and begin counting in 3s.</p> <p>Grouping as repeated addition along the number line.</p> <p>Introduce the ÷ symbol once repeated addition (grouping) is understood.</p> <p><b><u>GROUPING ITP</u></b></p> <p>If I have got 4, how many groups of 2 have I got?</p>  <p>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</p> <p><i>There are 6 cakes and 2 children. How many cakes will they each get? One for you and one for you.</i></p> 

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leading to

*Children to show notation*

**Addition is the inverse of subtraction. Fact family.**

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

**Using shapes to represent a missing number.**

$\square + \circ = \triangle$     $\square + \square = \triangle$   
 $5 + 4 = 9$     $6 + 6 = 12$

**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**

$5 + 6 =$   
 $5 + 5 + 1 = 11$

*Children to show notation*

**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

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?

$20 \div 5 = 4$

6

"How many groups of 5 are there in 20?"

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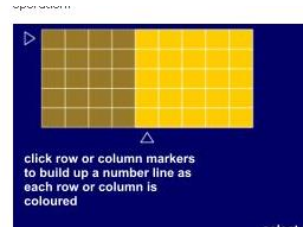
$$7 + 8 =$$
$$8 + 8 - 1 = 15$$

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;  $14 = 8 + 6$ ,  $7+6=8+5$**

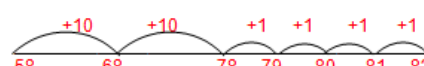
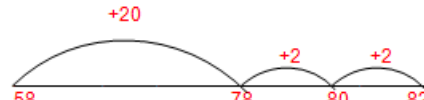
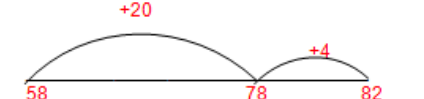
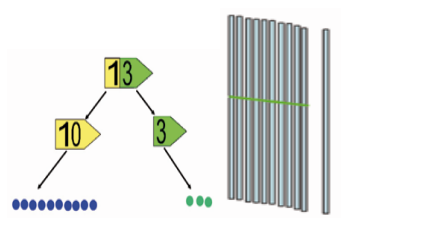
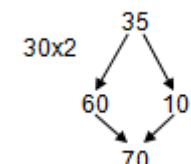
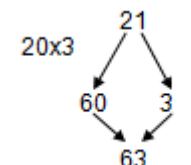


In the example above with 5 rows and 9 columns, when you select to count along the columns the given calculation is:  
 $5 \times 9 = 45$  [the 5 is multiplied by 9].  
Selecting to count along rows gives:  
 $9 \times 5 = 45$  [the 9 is multiplied by 5].



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Addition	Subtraction	Multiplication	Division
<p style="text-align: center;"><b><u>Stage C</u></b></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><a href="#">COUNTING ON AND BACK ITP</a> <a href="#">NUMBER LINE ITP</a></p> <p><b>Adding:</b>  <math>TU + TU = TU</math>                      and when secure moving on to  <math>TU + TU = HTU</math>  <math>HTU + TU = HTU</math></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 style="text-align: center;"><b><u>Stage C</u></b></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><a href="#">PLACE VALUE ITP</a></p> <p><b>Partitioning the second number strategy</b></p> <p>76 – 43 =                      76 – 40 = 36                      36 – 3 = 33</p> <p>73 – 46 =                      73 – 40 = 33                      33 – 6 = 27</p>	<p style="text-align: center;"><b><u>Stage C</u></b></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><a href="#">MULTIPLICATION BOARD ITP</a> <a href="#">MULTIPLICATION TABLES ITP</a></p> <p>Doubles are same as x2.</p> <p>Vocabulary of double, multiply, groups of, sets of, lots of etc.</p> <p><b>Partitioning strategy for doubling.</b></p> <p>Double 35</p>  <p>A lolly costs 21p. How much do 3 cost?</p>  <p><b>Decision making</b>                      Children investigate statements and solve word problems using appropriate methods such as mental/ jottings/ numberline.</p>	<p style="text-align: center;"><b><u>Stage C</u></b></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><a href="#">MULTIPLICATION AND DIVISION TRIOS SPREADSHEET</a></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>(<a href="#">OVERCOMING BARRIERS</a> L2-L3 knowing and using number facts)</p> <p><b>Record using the correct division symbol.</b></p> <p><b>Use of number lines to record repeated addition.</b></p> <p><b>Practical apparatus to support concept. Introduce the vocabulary of remainder.</b></p> <p><b>Practical contexts to be used so that the calculation is not in the abstract.</b></p>

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Record partitioned steps in number sentences underneath each other and add mentally.

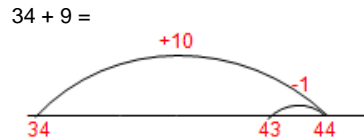
$$\begin{aligned} 24+58= \\ 20+50=70 \\ 4+8=12 \\ 70+12=82 \end{aligned}$$

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

$13 + 14 = \square$

$\text{Double } 14 = 28$

$28 - 1 = 27$

or

$\text{Double } 13 = 26$

$26 + 1 = 27$

[EXCEL MISSING SIGNS AND NUMBERS](#)

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



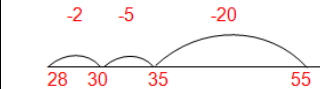
[PLACE VALUE DOTS EXCEL SPREADSHEET](#)

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

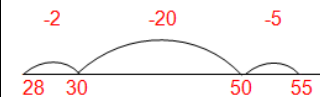
$55 - 27$

Rearranging strategy

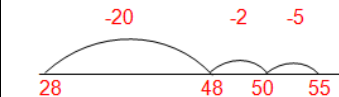
Partitioning the 27 into 20, 5 and 2.



or

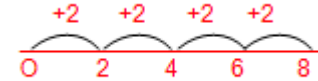


or



$55 - 27 = 28$

Grouping



"How many groups of 2 are there in 8?"

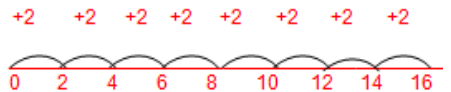
The number of jumps tells you the number of groups.

[DOUBLING AND HALVING SPREADSHEET](#)

$16 \div 2 =$

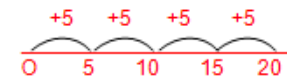
"How many groups of 2 are there in 16?"

"I know that dividing by 2 is the same as halving."



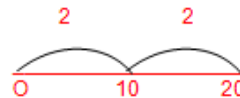
Jump size depends on knowledge and confidence of child. (See D)

$20 \div 5 =$



4 jumps

or moving away from + notation

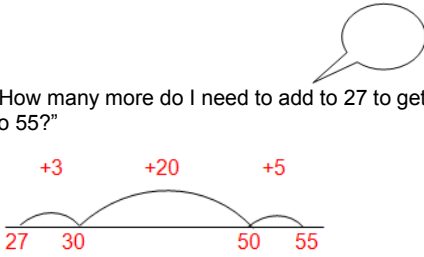
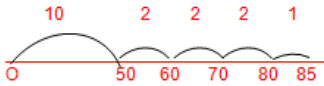
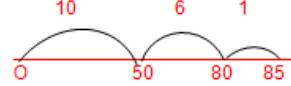


2 double jumps because  $5 \times 2 = 10$

$85 \div 5 =$

## Newport CE Junior School - Calculation policy

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

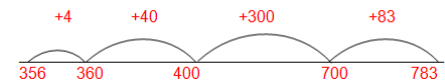
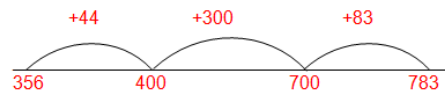
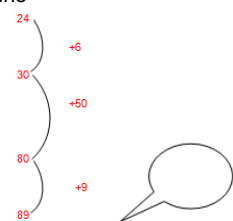
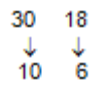
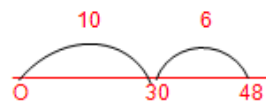
<p><b>Decision making (mental, jottings, numberline)</b> Statements and word problems.</p>	<p><b>Find the difference (counting on to the right)</b></p> <p><math>55 - 27 = 28</math></p>  <p>“How many more do I need to add to 27 to get to 55?”</p> <p><b>Subtract mentally pairs of multiples of 10 and 100, using known facts</b></p> <p><math>60 - 20 = 40</math> because <math>6 - 2 = 4</math></p> <p><math>700 - 300 = 400</math></p> <p>Continue to use the vertical number line.</p> <p><b>Use of apparatus (Diennes) to understand rearrangements, e.g. 55 as 40 and 15, not as part of calculations.</b></p> <p><b>BEADSTICKS ITP</b> to be used with Diennes to develop concept of exchange.</p> <p>(Beadstick and other place value ITPS)</p> <p><b>Decision making</b> Statements and word problems.</p>		 <p>or</p>  <p><b>Decision making</b> Children investigate statements and solve word problems using appropriate methods such as mental/ jottings/ numberline.</p>
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**Newport CE Junior School - Calculation policy**  
**Policy reflects: concrete (do it!) abstract (see it!) visual (remember it!) communication (record it!)**

Addition	Subtraction	Multiplication	Division
<p><b><u>Stage D</u></b></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> <div style="text-align: center;"> </div> <p><a href="#">NUMBER BOARDS (all stages onwards) for range of numbers</a>  <b>Start with least significant digit</b></p> $\begin{array}{r} 67 \\ + 24 \\ \hline 11 \text{ (7+4)} \\ + 80 \text{ (60+20)} \\ \hline 91 \end{array}$ <div style="text-align: right;"> </div> <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><b>625</b>  <b>+ 48</b>  <b>673</b></p>	<p><b><u>Stage D</u></b></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><a href="#">NUMBER BOARDS (all stages onwards) for range of numbers</a></p> <p><b>Reduction strategy</b></p> <p>783 – 356  <i>Partitioning the 356 into 300, 50 and 6.</i></p> <div style="text-align: center;"> </div> <p>783 – 356 = 427</p>	<p><b><u>Stage D</u></b></p> <p>Known table facts 2, 3,4,5,6, 8 and 10.</p> <p><a href="#">NUMBER DIALS ITP</a></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. 5x7=7x5).</p> <p><a href="#">MOVING DIGITS</a></p> <p><b>Consolidate arrays and repeated addition. Recalling facts.</b>  <b>4 x 5 = 20, 5 x 4 = 20.</b></p> <p>Informal recording of partitioned numbers  15 x 5 = 75  10 x 5 = 50  5 x 5 = 25</p> <p>27 x 3 = 81  20x3 = 60  7x3 = 21</p> <div style="text-align: right;"> </div> <p>"20 multiplied by 3 equals 60 and 7 multiplied by 3 equals 21. 60 add 21 equals 81."</p>	<p><b><u>Stage D</u></b></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> <p>21 ÷ 5 = 4 r 1</p> <p>Record using a number line, 30 ÷ 5 = 6</p> <div style="text-align: right;"> </div> <p>"What do I know about the number I am dividing by?"  "I know that 5 x 6 = 30"</p> <p>Repeated addition along a number line with jumps representing number of groups.</p> <p>37 ÷ 5 =</p> <div style="text-align: center;"> </div>

## Newport CE Junior School - Calculation policy

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

<p><b>Decision making.</b></p>	<p><b>Difference strategy</b></p> <p>“How many more do I need to get from 356 to 783?”</p>  <p>leading to</p>  <p><b>Both strategies need to record the answer in a number sentence.</b></p> <p><math>783 - 356 = 427</math> “783 subtract 356 equals 427”</p> $\begin{array}{r} 89 = 80 \quad 9 \\ - 24 = 20 \quad 4 \\ \hline 60 \quad 5 = 65 \end{array}$ <p style="text-align: right;">☺</p> <p>“9 subtract 4 equals 5 and 80 subtract 20 equals 60. 60 and 5 make 65”</p> <p>Vertical number line</p>  <p style="text-align: right;">☺</p> <p>“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.”</p>	<p><math>23 \times 8 =</math> <math>20 \times 8 = 160</math> <math>3 \times 8 = 24</math></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>20</td> <td>3</td> </tr> <tr> <td>8</td> <td></td> <td></td> </tr> </table> <p><math>23</math> <math>\underline{x \ 8}</math> <math>24 \ (8 \times 3)</math> <math>160 \ (8 \times 20)</math> <math>\hline 184</math></p> <p><b>Decision making</b></p>	x	20	3	8			<p><b>Use partitioning/re-arranging to find multiples of the divisor.</b></p> <p>Partitioning method <math>48 \div 3 =</math> “What do I know about 3 x tables?” “I know <math>3 \times 10 = 30</math>.”</p>  <p><math>48 \div 3 = 16</math></p> <p><math>10 \times 3 = 30</math>      <math>6 \times 3 = 18</math></p>  <p><b>Decision making</b></p>
x	20	3							
8									

## Newport CE Junior School - Calculation policy

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

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

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


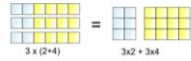


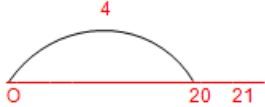


"1 to subtract 7 is tricky so I will rearrange 81 into 70 and 11. 11 subtract 7 equals 4 and 70 subtract 50 equals 20. 20 and 4 make 24."

[BEADSTICKS ITP](#)

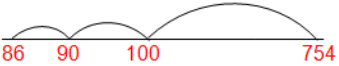

**Decision making**

**Newport CE Junior School - Calculation policy**  
**Policy reflects: concrete (do it!) abstract (see it!) visual (remember it!) communication (record it!)**

Addition	Subtraction	Multiplication	Division								
<p style="text-align: center;"><b><u>Stage E</u></b></p> <p>Continue with HTU + HTU, then extend to ThHTU + ThHTU.</p> <p>Approximate using the most significant digit, rounding skills.</p> <p>Check using the inverse.</p> <p>Refer to the carried digit as a ten or a hundred.</p> <div style="text-align: center;">  </div> $\begin{array}{r} 587 \\ + 475 \\ \hline 1062 \\ 11 \end{array}$ <p>“7 add 5 equals 12. That’s 2 units and 1 ten to carry over.              80 add 70 equals 150 and the one ten to carry makes 160. That’s 6 tens and 100 to carry over. 500 add 400 equals 900 and the one hundred to carry makes 1000”</p> $\begin{array}{r} 7648 \\ + 1486 \\ \hline 14 \\ 120 \\ 1000 \\ +8000 \\ \hline 9134 \end{array}$ $\begin{array}{r} 7648 \\ + 1486 \\ \hline 9134 \\ 111 \end{array}$	<p style="text-align: center;"><b><u>Stage E</u></b></p> <p>HTU – TU, then HTU – HTU.              (ThHTU – ThHTU)              (THHTU – HTU)</p> <p>Extend to simple decimals with or without exchange from pence to pounds.</p> <p>Ensure that all calculation is checked before started for any other possible ‘tricky’ bits.</p> <p>Ensure that the setting out is accurate.</p> $754 - 86 = 668$ <p><b>Take away (left)</b></p> $\begin{array}{r} -6 \quad -80 \\ 668 \quad 674 \quad 754 \end{array}$ <p>or</p> $\begin{array}{r} -2 \quad -80 \quad -4 \\ 668 \quad 670 \quad 750 \quad 754 \end{array}$ <p>or</p> $\begin{array}{r} -80 \quad -6 \\ 668 \quad 748 \quad 754 \end{array}$ <p><b>Find the difference (right)</b></p>	<p style="text-align: center;"><b><u>Stage E</u></b></p> <p>Know table facts up to 12 x 12</p> <p>Approximate first.</p> <p>Partitioning / distributive law, e.g. 28x4 can be split up into 25x4 add 3x4 or 30x4 subtract 2x4.</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;"> <p style="font-size: small;">Distributive Law <span style="float: right;"><a href="#">more...</a></span></p> <p style="font-size: x-small;">The Distributive Law says that multiplying a number by a group of numbers added together is the same as doing each multiplication separately</p> <p style="font-size: x-small;">Example: <math>3 \times (2 + 4) = 3 \times 2 + 3 \times 4</math></p> <p style="font-size: x-small;">So the “3” can be “distributed” across the “2+4” into 3 times 2 and 3 times 4.</p> <div style="text-align: center; margin-top: 5px;">  </div> </div> <p>Pupils to explain the effect of multiplying by 10 and 100.</p> <p>Addition to be done mentally.</p> <p>HTU and TU x U.</p> <p>Record using grid notation and expanded short multiplication.</p> $346 \times 9$ <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px 5px;">x</td> <td style="padding: 2px 5px;">300</td> <td style="padding: 2px 5px;">40</td> <td style="padding: 2px 5px;">6</td> </tr> <tr> <td style="padding: 2px 5px;">9</td> <td style="padding: 2px 5px;"></td> <td style="padding: 2px 5px;"></td> <td style="padding: 2px 5px;"></td> </tr> </table>	x	300	40	6	9				<p style="text-align: center;"><b><u>Stage E</u></b></p> <p>Know division facts corresponding to tables up to 12 x 12</p> <p>Approximate first using multiplication facts.</p> <p>Divide any integer up to 1000 by 10.</p> <div style="text-align: center;">  </div> <p>“900 ÷ 10 = 90 because the digits move one place to the right”</p> <p style="color: blue; text-decoration: underline;">MOVING DIGITS ITP</p> <p>Recap the finding of remainders on the number line first.</p> $21 \div 5$ <div style="text-align: center;">  </div> <p>“What do I know? I know that 21 is not a multiple of 5, so there will be a remainder.”</p> $21 \div 5 = 4r1$ <div style="text-align: center;">  </div> <p>Jump size depends on knowledge and confidence of child. (See D)              This could also be shown as jumps of +5 along the number line resulting in 4 jumps</p>
x	300	40	6								
9											

# Newport CE Junior School - Calculation policy

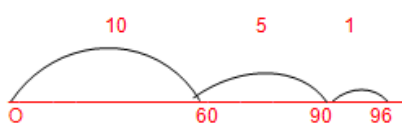
Policy reflects: concrete (do it!) abstract (see it!) visual (remember it!) communication (record it!)

<p>12:45 7:36 <u>+ 24:50</u> 0:11 1:20 13:00 <u>30:00</u> <u>44:31</u></p> <p><b><u>NUMBER BOARDS</u></b></p>	<p style="text-align: center;">+4   +10   +654</p>  <p><b>Decomposition</b> (Continue with Diennes and/or money as appropriate)</p> $\begin{array}{r} 754 \\ - 86 \\ \hline \end{array} \quad \begin{array}{r} 700 \\ - 600 \\ \hline 600 \end{array} \quad \begin{array}{r} 50 \\ - 60 \\ \hline 60 \end{array} \quad \begin{array}{r} 4 \\ - 8 \\ \hline 8 \end{array} = 668$ $\begin{array}{r} 754 \\ - 86 \\ \hline \end{array} \quad \begin{array}{r} 600 \\ - 600 \\ \hline 600 \end{array} \quad \begin{array}{r} 140 \\ - 60 \\ \hline 60 \end{array} \quad \begin{array}{r} 14 \\ - 8 \\ \hline 8 \end{array} = 668$ <p><i>"It's tricky to take 6 from 4 and 80 from 50. I need to rearrange the number. I will exchange one ten from 50 which leaves 40 and makes 14 in the units. 40 to subtract 80 is tricky. I will <b>exchange</b> one hundred from 700 and make 140. 140 subtract 80 equals 60 and 600 subtract 0 equals 600."</i></p> <p><b>Decomposition</b></p> $\begin{array}{r} \pounds \\ 895 \\ -438 \\ \hline \end{array} \quad \begin{array}{r} \pounds \\ 8 \cdot 90 \ 5 \\ 4 \cdot 30 \ 8 \\ \hline 4 \cdot 50 \ 7 \end{array} = 4.57$ $\begin{array}{r} \pounds \\ 895 \\ -438 \\ \hline \end{array} \quad \begin{array}{r} \pounds \\ 7 \cdot 80 \ 15 \\ 4 \cdot 30 \ 8 \\ \hline 4 \cdot 50 \ 7 \end{array} = 4.57$	<p>346 <u>x 9</u> 54 (9 x 6) 360 (9 x 40) <b>2700 (9 x 300)</b> <b>3114</b></p> <p><b>Decision making</b> Children investigate statements and solve word problems using appropriate methods. Children are also given examples of x9 and encouraged to think about using methods such as x10 and subtracting x1.</p>	<p>and a remainder of 1. <b>Use problems in contexts that require the answer to be rounded up or down following the remainder.</b> Eg 35 children to sleep four to a tent. How many tents do we need?</p> <p>Continue to use partitioning/re-arranging method.</p> <p>69 ÷ 3 =</p> <p>'What do I know about 3 x tables?' "I know 3 x 10 = 30."</p> $\begin{array}{ccc} 30 & 30 & 9 \\ \downarrow & \downarrow & \downarrow \\ 10 & 10 & 3 \end{array}$ <p>69 ÷ 3 = 23 or</p> <p>30 ÷ 3 = 10 30 ÷ 3 = 10 9 ÷ 3 = 3 69 ÷ 3 = 23</p> <p>Fractions relate to division. ÷ 4 is the same as halve and halve again.</p> <p>Recognise that division is non-commutative.</p> <p>Know that a number cannot be divided by 0.</p> <p>Begin to use chunking method for TU by U division (additive chunking/chunking up).</p> <p>96 ÷ 6</p>  <p><i>"What do I know? 6 x 10 = 60"</i></p>
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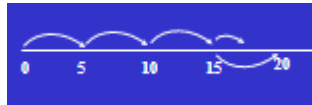
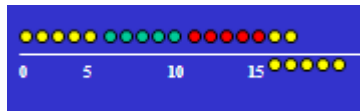

## Newport CE Junior School - Calculation policy

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

	$  \begin{array}{r}  \overset{6}{\cancel{7}}\overset{14}{\cancel{8}}\overset{1}{\cancel{4}} \\  - \quad 286 \\  \hline  468  \end{array}  $		<div style="text-align: center;"> <math display="block">  \begin{array}{r}  60 \quad 36 \\  \downarrow \quad \downarrow \\  10 \quad 6 \\  96 \div 6 = 16  \end{array}  </math> </div>  <p>96 ÷ 6</p> <p><i>"What do I know?"</i></p> <p>Set up partial multiple table:</p> <p>1 → 6  2 → 12  4 → 24  10 → 60  5 → 30</p> <p>leads to</p> $  \begin{array}{r}  60 \text{ (10)} \\  + 30 \text{ (5)} \\  \hline  90 \\  + 6 \text{ (1)} \\  \hline  96  \end{array}  $ <p>96 ÷ 6 = 16</p>
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## Newport CE Junior School - Calculation policy

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Addition	Subtraction	Multiplication	Division																	
<p style="text-align: center;"><b><u>Stage F</u></b></p> <p>Add with increasingly large numbers using the compact method.</p> <p>Extend methods to include decimals to two decimal places.</p>	<p style="text-align: center;"><b><u>Stage F</u></b></p> <p>Subtract with increasingly large numbers using the compact method.</p> <p>Extend methods to include decimals to two decimal places.</p>	<p style="text-align: center;"><b><u>Stage F</u></b></p> <p>Th HTU , HTU , TU x TU and U</p> <p>28 x 27</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>x</td><td>20</td><td>8</td></tr> <tr><td>20</td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td></tr> </table> <p>Addition to be done mentally or across followed by column addition</p> $  \begin{array}{r}  28 \\  \times 27 \\  \hline  56 \text{ (7x8)} \\  140 \text{ (7 x20)} \\  400 \text{ (20x8)} \\  \hline  756  \end{array}  $ <p>28 X 27 = 756</p> <p>Multiply in different contexts</p> <p>£2.73 x 3 £2.73 x 3 = 273p x 3</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>x</td><td>200</td><td>70</td><td>3</td></tr> <tr><td>3</td><td></td><td></td><td></td></tr> </table> <p>Followed by appropriate addition calculation.</p> <p>273p x 3 = 819p = £8.19</p>	x	20	8	20			7			x	200	70	3	3				<p style="text-align: center;"><b><u>Stage F</u></b></p> <p>Know division facts corresponding to tables up to 12 x 12 and be able to apply them.</p> <p>Use the relationship between multiplication and division.</p> <p>Extend chunking method to include ThHTU by U, with an integer remainder.</p> <p>Dividing up to 10,000 by 10/100.</p> <p>Check with inverse operation. Use of calculator.</p> <p>Use the number line to find remainders and express the quotient as a fraction or decimal.</p> <p><a href="#">DIVISION WITH REMAINDERS PPT</a> (example given below) 17 ÷ 5 "What do I know? 17 is not a multiple of 5".</p>   
x	20	8																		
20																				
7																				
x	200	70	3																	
3																				

## Newport CE Junior School - Calculation policy

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

		<table border="1" data-bbox="1058 277 1362 334"> <tr> <td>x</td> <td>4000</td> <td>300</td> <td>40</td> <td>6</td> </tr> <tr> <td>8</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p data-bbox="1041 378 1209 402">4346 x 8 = 34768</p> $  \begin{array}{r}  32000 \\  2400 \\  320 \\  + 48 \\  \hline  34768  \end{array}  $ $  \begin{array}{r}  4346 \\  \times 8 \\  \hline  48 \text{ (} 8 \times 6 \text{)} \\  320 \text{ (} 8 \times 40 \text{)} \\  2400 \text{ (} 8 \times 300 \text{)} \\  32000 \text{ (} 8 \times 4000 \text{)} \\  \hline  34768  \end{array}  $ <p data-bbox="1041 873 1444 1092"> <b>Decision making</b>  <b>Children investigate statements and solve word problems using appropriate methods.</b>  <b>Children investigate alternative methods such as compensation strategies and doubling and halving and discuss when these might be most appropriate and efficient.</b> </p>	x	4000	300	40	6	8					<div data-bbox="1472 240 1619 370" style="background-color: blue; color: white; padding: 5px; display: inline-block;"> <math>3 \frac{2}{5}</math> </div> <p data-bbox="1472 394 1562 443"> <math>3 \frac{2}{5} = 3.4</math> </p> <p data-bbox="1472 448 1839 516">             From knowledge of decimal/fraction equivalents or by converting <math>\frac{2}{5}</math> into <math>\frac{4}{10}</math> </p> <p data-bbox="1472 540 1818 565" style="background-color: yellow;"> <b>Short division with 'bus stop' notation</b> </p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="1472 589 1646 732"> </div> <div data-bbox="1661 589 1835 732"> </div> </div> <div data-bbox="1734 760 1839 857" style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; margin: 10px auto;"></div> <p data-bbox="1472 857 1860 1052">             "483 divided by 7. 4 hundreds cannot be shared equally between 7, so exchange the 100s for 40 tens. I now have 48 tens which shared equally between 7 is 6 with a remainder of 6 tens. Exchange the 6 tens for 60 units, we now have 63 units. 63 divided equally between 7 equals 9. The answer is 69."         </p> <p data-bbox="1472 1076 1860 1125">             Use Diennes or place value equipment to model.         </p> <p data-bbox="1472 1344 1650 1369"> <b>Decision making</b> </p>
x	4000	300	40	6									
8													

## Newport CE Junior School - Calculation policy

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

		<p><b>Examples:</b></p> <p>24x99 could be done using the grid method, but could also be calculated by x100 and subtracting 24x1.</p> <p>24 x25 could be done using the grid method, but could also be calculated by 24x100, halving to find x50 and halving again to find x 25. or using doubling and halving, 24 x25=12x50 =6 x100</p>	<p><a href="#">(OVERCOMING BARRIERS)</a> Level 4 to Level 5 – Questions.) Word problems, e.g. 200 people attended a concert. <math>\frac{1}{5}</math> of the people had complimentary tickets. The rest paid £7.50 each. How much money was collected from selling tickets?</p> <p>Money and measures, e.g. Which is longer: <math>\frac{3}{4}</math> of an hour or 2500 seconds?</p> <p><b>Partitioning method for HTU.</b></p> <p>847 ÷ 7 “What do I know? I know 7x12 = 84 so 7 x120 = 840”</p> $  \begin{array}{r}  847 \\  840 \quad 7 \\  \downarrow \quad \downarrow \\  120 \quad 1  \end{array}  $ <p>847 ÷ 7 = 121</p> <p><a href="#">(OVERCOMING BARRIERS)</a> Level 4 to Level 5 typical questions)</p> <p>Work out 575 ÷ 25, explaining your method.</p> <p>Peter says that, if you want to divide a number by 12, you can divide it by 4 then by 3. Is he right? Explain how you know. Work out 768 ÷ 12 using Peter's method and using another method. Do you get the same answer?</p> <p>How many 35p packets of stickers can I buy with £5? Explain how you know.</p>
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			<p>Coaches have 56 seats for passengers. How many coaches are needed to take 275 people on a trip?</p> <p>Complete this calculation: <math>943 \div 41 = 2\boxed{\phantom{00}}</math></p> <p>Work out whether or not 29 is a factor of 811.</p>
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Addition	Subtraction	Multiplication	Division
<p style="text-align: center;"><b><u>Stage G</u></b></p> <p>Promote decision making so that pupils choose an appropriate method/strategy.</p> <p>Continue the use of informal methods and number lines.</p> <p>Ensure understanding of standard written method.</p> <p>Continue ThHTU + ThHTU then calculations with any number of digits.</p> <p>Approximate using the most significant digits and a feel for the 'whole' number.</p> <p>Appropriate teaching/use of the calculator including interpreting the display, e.g. money or measures.</p> <p><i>Calculator display 0.37 is then interpreted as 37p in the context of money. Remind 4p = 0.04 Calculator display £1.4 is interpreted as £1.40</i></p> $\begin{array}{r} 7648 \\ + 1486 \\ \hline 9134 \\ 111 \end{array}$ <p>Decimal points are fixed on the line with digits in the squares.</p> <p>Decimals, fill 'empty columns' with zeros.</p>	<p style="text-align: center;"><b><u>Stage G</u></b></p> <p>ThHTU – ThHTU then any number of digits.</p> <p>Appropriate use of a calculator including interpretation of displays.</p> <p>Money, measures and real life contexts.</p> $\begin{array}{r} 6467 - 2684 \\ \phantom{6}^{5131} \\ \del{6}467 \\ - 2684 \\ \hline 3783 \end{array}$ $3249 - 725$ $\begin{array}{r} 1181 \\ 324\del{9}0 \\ - 725 \\ \hline 31765 \end{array}$ <p>136 – 28 =</p> $136 - 28 = 108$	<p style="text-align: center;"><b><u>Stage G</u></b></p> <p>ThHTU x TU and HTU x TU and including decimals.</p> <p>TU x TU</p> $\begin{array}{r} 78 \\ \times 42 \\ \hline 16 \quad (2 \times 8) \\ 140 \quad (2 \times 70) \\ 320 \quad (40 \times 8) \\ +2800 \quad (40 \times 70) \\ \hline 3276 \end{array}$ <p>Compact (long)</p> $\begin{array}{r} 78 \\ \times 42 \\ \hline 156 \\ 3120 \\ \hline 3276 \end{array}$ <p>Involve decimals, money and measures through approximation and appropriate use of the calculator.</p> <p>Addition either mentally or by column addition.</p>	<p style="text-align: center;"><b><u>Stage G</u></b></p> <p>Know all multiplication facts and corresponding division facts to 12 x 12 and beyond and be able to apply them.</p> <p>Explain the effect of dividing by 1000.</p> <p>Extend methods to include Th HTU by TU.</p> <p>Continue to use the short division method when the two digit divisor is up to 12 or is a easily recognisable multiple eg 20, 25 or 50.</p> <p>Use a calculator appropriately, approximating first.</p> <p>Use of calculator for interpreting the quotient by entering a fraction to find the decimal equivalent.</p> <p>Mathsonline.org-long division</p> <p>Use long division only with pupils who are secure with number sense and place value.</p> <p>384 ÷ 16  <i>"What do I know about the divisor?"</i>  <i>Record partial tables.</i></p>

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<p>1249 + 725</p> $\begin{array}{r} 12490 \\ + 725 \\ \hline 13215 \\ 11 \end{array}$	<p>leading to</p> <p>146 - 276</p> <p style="text-align: center; color: red;">+004 +02 +116</p>	<p><b>Decimals. Teach children how to use known facts to build new facts according to the place value required, e.g.</b></p> <p>3x4 = 12 3x0.4 = 1.2 3x0.04 = 0.12</p> <p>0.75 x 6</p> <p>0.7 x 6 = 4.2 0.05 x 6 = 0.3 0.75 x 6 = 4.5</p> <p><b>Grid method based upon very secure place value.</b></p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">x</td> <td style="padding: 2px;">0.7</td> <td style="padding: 2px;">0.05</td> </tr> <tr> <td style="padding: 2px;">6</td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> </tr> </table> <p>Overcoming Barriers L4/5</p> <p>Mike works out that 14 x 12 = 168. What is 14 x 1.2? How do you know?</p> <p>Use a written method to calculate 24 x 13. What do you need to change to show a similar method to work out 2.4 x 13?</p> <p>Use a written method to find the area of a swimming pool which is 25 m long and 7.5 m wide.</p> <p>Complete the missing sections to work out 35 x 2.1 :</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">X</td> <td style="padding: 2px;">□</td> <td style="padding: 2px;">0.1</td> </tr> <tr> <td style="padding: 2px;">30</td> <td style="padding: 2px;">60</td> <td style="padding: 2px;">□</td> </tr> <tr> <td style="padding: 2px;">5</td> <td style="padding: 2px;">□</td> <td style="padding: 2px;">0.5</td> </tr> </table>	x	0.7	0.05	6			X	□	0.1	30	60	□	5	□	0.5	<p><i>Long division (thinking not generally recorded)</i></p> $\begin{array}{r} \underline{24} \\ 16 \overline{) 386}4 \\ \underline{-32} \downarrow \\ 64 \\ \underline{-64} \\ 0 \end{array}$ <p style="margin-left: 100px;"><i>(38 ÷ 16 = 2 r 6; 2 x 16 = 32) (bring the 4 down) (16 into 64 = 4; 4 x 16 = 64) (no remainder)</i></p> <p><b>Continue to make use of partitioning and the number line for repeated addition where appropriate.</b></p> <p>944 ÷ 22 = What do I know about the divisor?</p> <p>Express the remainder as a fraction or decimal.</p> <p>Overcoming Barriers L4/5</p> <p>Division giving a decimal answer, e.g. Divide 9 by 5 giving your answer as a decimal.</p> <p>Missing number calculations, e.g.</p> <p>□ ÷ 8 = 0.04;</p> <p>0.6 x □ = 4.2</p>
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