



Portsmouth Primary

Calculation Policy



Mathematics will be one of the cores of children's learning throughout their time at Portsmouth Primary Nursery and Primary School and the need for a clear, progressive policy which is understood throughout the school is vital.

This policy explains the methods used to help our pupils with calculations. The methods we are advocating are in line with the National Curriculum and also taken from the Hampshire Maths scheme which is used across year 1 -6. All staff in school work from this document so that we can ensure the consistency of our approach and can make sure that the children move onto the next step when they are ready whilst ensuring appropriate progression through from EYFS to the end of KS2.

Whichever of the four operations of addition, subtraction, multiplication and division is being taught children need to experience all of the following steps to completely understand it. How much time children spend in each stage will be appropriate to their development and teacher assessment of their learning needs. They may also revisit the different stages at any time as it is not a linear process.

- 1) Practical use of concrete objects (CONCRETE)
- 2) Use of pictures, models and jottings to represent and support mental or written calculation (PICTORIAL)
- 3) Use of an appropriate mental strategy or written method alongside the written calculation. (ABSTRACT)



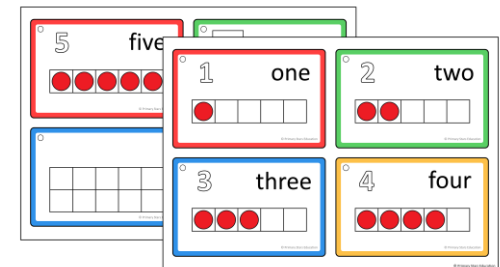
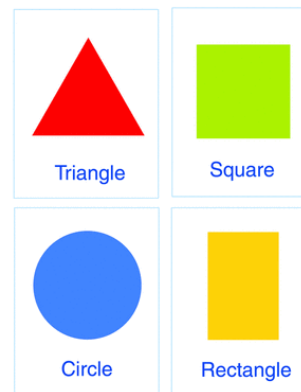
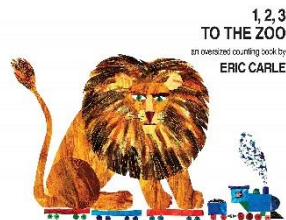
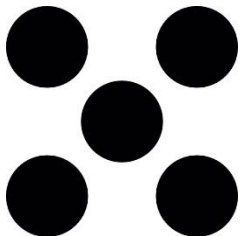
Portsmouth Primary Maths Calculation Policy Early Years Foundation Stage - Nursery

The statutory framework for the early years foundation states that:

Developing a strong grounding in number is essential so that all children develop the necessary building blocks to excel mathematically.

Our aim within the nursery is to give children a range of frequent and varied opportunities to count confidently, develop a deep understanding of numbers to 5 and explore the relationships and patterns within these numbers. Using the children's interests to tailor their experiences, we aim to foster positive attitudes and engagement for all and get them ready to progress to their first year in primary school. For the very youngest children, numbers and counting are introduced through nursery rhymes and stories to make it fun and engage their interest.

During their time they will use a range of manipulatives and real life objects to practice their one to one correspondence and subitise small numbers to build fluency. In addition, the curriculum will include rich opportunities for children to develop their spatial reasoning skills across all areas of mathematics including shape, space and measures. Underpinning all these experiences will be the development and acquisition of language which will be key. Adults model consistently important vocabulary and the language needed to develop their understanding and help look for patterns and relationships within the different areas of maths.

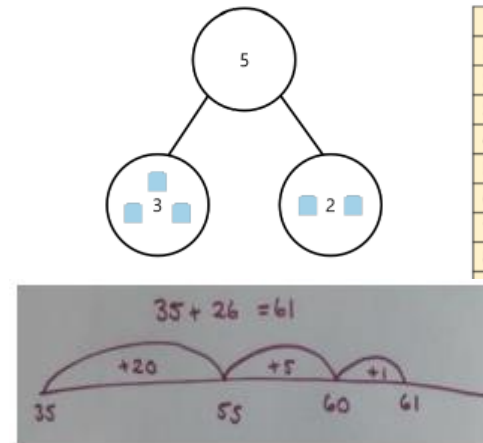
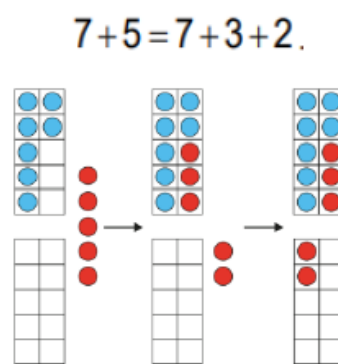
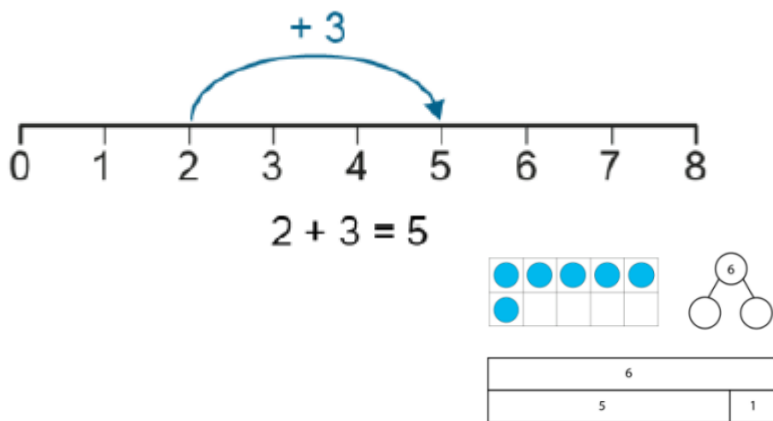




Portsmouth Primary Maths Calculation Policy

Mental Maths Addition: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationship. New vocabulary for each year group is shown in red.*

Year R (ELGs)	Year 1	Year 2
<ul style="list-style-type: none"> Have a deep understanding of the numbers to 10, including their composition Automatically recall number bonds up to 5 (including subtraction facts) <p>Models & Resources: Number tracks, number lines, Numicon, multilink, counters, tens frames, bead strings, part whole models, bar models</p>	<ul style="list-style-type: none"> Add one-digit and two-digit numbers to 20, including zero Represent and use number bonds within 20 <p>Models & Resources: Number tracks, number lines, Numicon, multilink, bar models, counters, tens frames, bead strings, part whole models, dienes, 100 squares</p>	<ul style="list-style-type: none"> add numbers using concrete objects, pictorial representations, and mentally, including: <ul style="list-style-type: none"> a two-digit number and ones a two-digit number and tens two two-digit numbers adding three one-digit numbers recall and use addition facts to 20 fluently, and derive and use related facts up to 100 <p>Models & Resources: Number lines, Numicon, multilink, bar models, counters, tens frames, bead strings, part whole models, dienes, 100 squares</p> <p>Children should be moving towards drawing their own number lines by the end of year 2.</p>
<p>Key vocabulary: add, count on, and, more, total, altogether, sum, plus</p>	<p>Key vocabulary: add, count on, and, more, total, altogether, sum, plus addition</p>	<p>Key vocabulary: add, count on, and, more, total, altogether, sum, addition, commutative, plus, inverse, difference, greater</p>



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

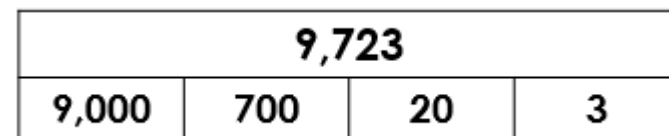
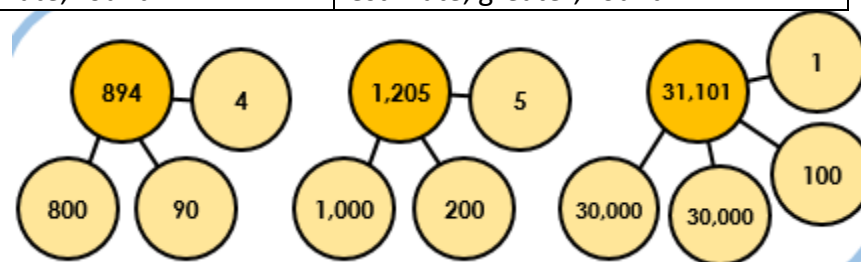
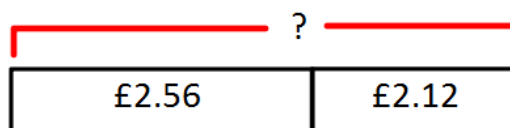
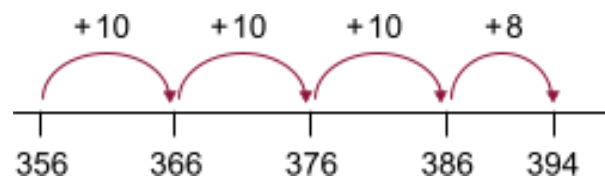
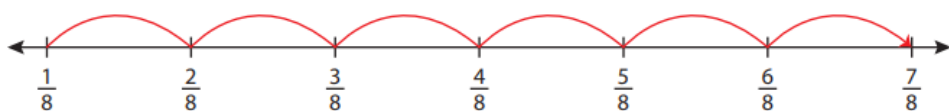


Portsmouth Primary Maths Calculation Policy

Mental Maths Addition: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships. New vocabulary for each year group is shown in red.*

Year 3	Year 4	Year 5	Year 6
<ul style="list-style-type: none"> add numbers mentally, including: <ul style="list-style-type: none"> a three digit number and ones a three digit number and tens a three digit number and hundreds estimate the answer to a calculation <p>Models & Resources: Number lines, bead strings, bar models, dienes, PV counters, part whole models,</p>	<ul style="list-style-type: none"> find 1000 more than a given number Continue to practise adding numbers mentally including adding one, tens or hundreds to a four digit number estimate to check answers to a given calculation <p>Models & Resources: Number lines, bar models, dienes, PV counters, part whole models,</p>	<ul style="list-style-type: none"> Add numbers mentally with increasingly large numbers (up to 1,000,000) Use rounding to check answers to calculations <p>Models & Resources: Number lines, bar models, dienes, PV counters, part whole models,</p>	<ul style="list-style-type: none"> Perform mental calculations, including with mixed operations and large numbers (over 1,000,000) Use estimation to check answers to calculations <p>Models & Resources: Number lines, bar models, dienes, PV counters, part whole models,</p>
<p>Key vocabulary: add, count on, and, more, total, altogether, sum, addition, plus, inverse, difference, , greater, estimate</p>	<p>Key vocabulary: add, count on, and, more, total, altogether, sum, addition, plus, inverse, difference, greater, estimate, round</p>	<p>Key vocabulary: add, count on, and, more, total, altogether, sum, addition, plus, inverse, difference, greater, estimate, round</p>	<p>Key vocabulary: add, count on, and, more, total, altogether, sum, addition, plus, inverse, difference, estimate, greater, round</p>

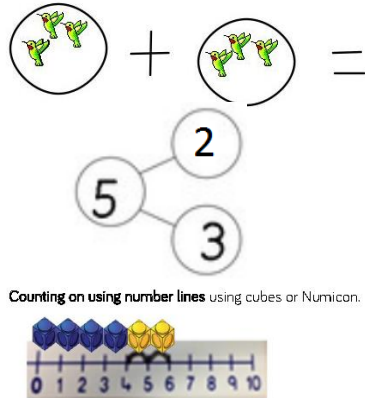
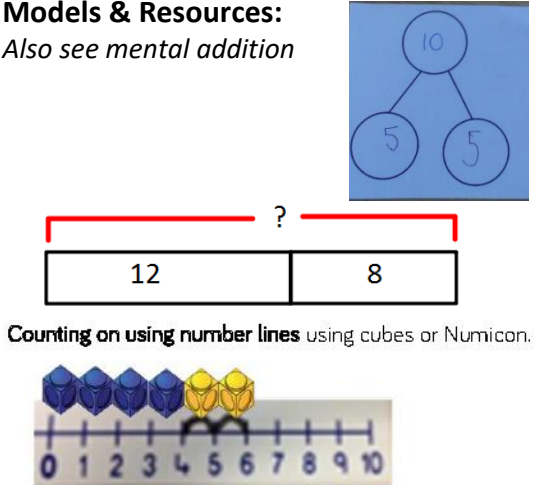
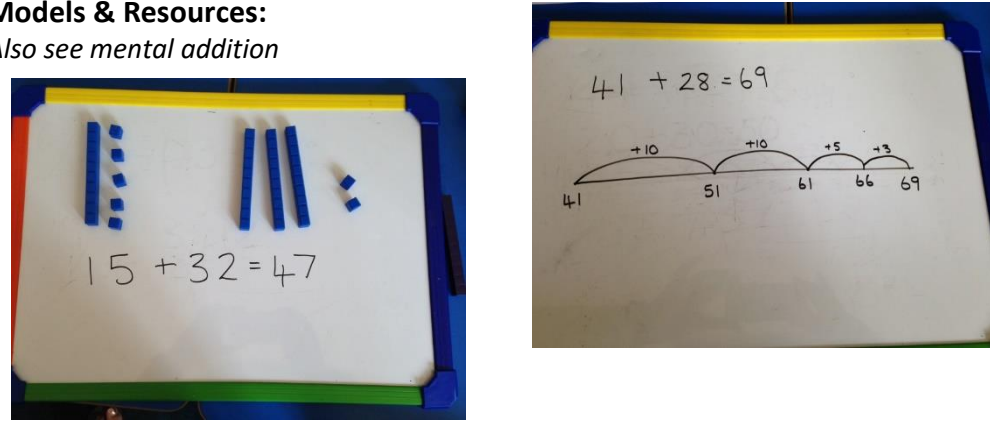
$$\frac{1}{8} + \frac{6}{8} = \frac{7}{8}$$





Portsmouth Primary Maths Calculation Policy

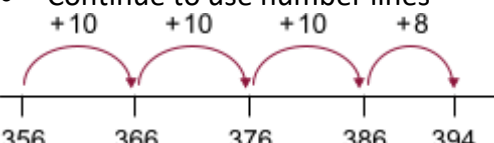
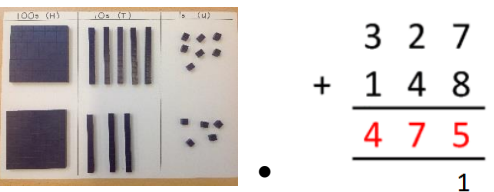
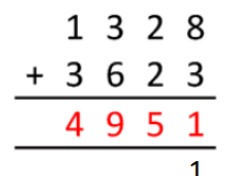
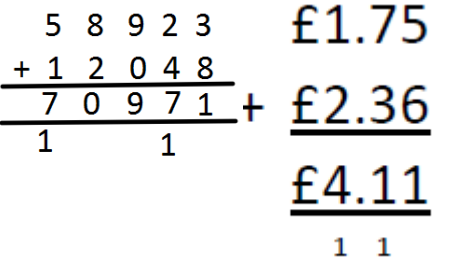
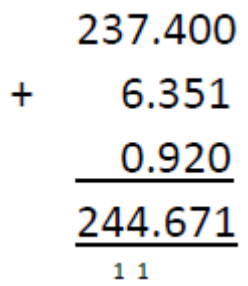
Addition: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships depending on the child's appropriate stage of understanding. New vocabulary for each year group is shown in red.*

Year R (ELGs)	Year 1	Year 2
<ul style="list-style-type: none"> Have a deep understanding of the numbers to 10, including their composition Automatically recall number bonds up to 5 (including subtraction facts) 	<ul style="list-style-type: none"> Read and write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) add one-digit and two-digit numbers to 20, including zero solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = ? - 9$ 	<ul style="list-style-type: none"> solve problems with addition involving numbers, quantities and measures add numbers using concrete objects, pictorial representations, and mentally, including: <ul style="list-style-type: none"> a two-digit number and ones a two-digit number and tens two two-digit numbers adding three one-digit numbers show that addition of two numbers can be done in any order (commutative) recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.
<p>Models & Resources: Also see mental addition</p>  <p>Counting on using number lines using cubes or Numicon.</p>	<p>Models & Resources: Also see mental addition</p>  <p>Counting on using number lines using cubes or Numicon.</p>	<p>Models & Resources: Also see mental addition</p> 
<p>Key vocabulary: add, count on, and, more, total, altogether, sum, plus</p>	<p>Key vocabulary: add, count on, and, more, total, altogether, sum, plus, addition</p>	<p>Key vocabulary: add, count on, and, more, total, altogether, sum, addition, plus, inverse, commutative, difference</p>



Portsmouth Primary Maths Calculation Policy

Addition: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships depending on the child's appropriate stage of understanding. New vocabulary for each year group is shown in red.*

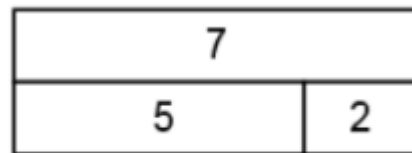
Year 3	Year 4	Year 5	Year 6
<ul style="list-style-type: none"> add numbers with up to three digits, using formal written methods of columnar addition where appropriate solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction 	<ul style="list-style-type: none"> add numbers with up to 4 digits using the formal written methods of columnar addition where appropriate solve addition and subtraction two step problems in contexts, deciding which operations and methods to use and why 	<ul style="list-style-type: none"> add whole numbers with more than 4 digits up to 1,000,000 including using formal written methods (columnar addition) where appropriate solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to do and why 	<ul style="list-style-type: none"> solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to do and why
<p>Models & Resources:</p> <ul style="list-style-type: none"> Continue to use number lines  Column method using base 10 or place value counters to support  Moving to formal column method by the end of Year 3 	<p>Models & Resources:</p> <ul style="list-style-type: none"> Continue to use number lines Secure Year 3 methods. (Use dienes/ PV counters where appropriate to support understanding.) Moving on to securing formal column method for up to 4 digits  NB: Numbers should always be carried underneath and should be small 	<p>Models & Resources:</p> <ul style="list-style-type: none"> Continue to use number lines Secure formal column method for larger numbers and with decimals in context.  	<p>Models & Resources:</p> <ul style="list-style-type: none"> Continue to use number lines Use formal column method for large numbers, different sized numbers and decimals in different contexts. 
<p>Key vocabulary: add, count on, and, more, total, altogether, sum, addition, plus, inverse, commutative, difference exchange</p>	<p>Key vocabulary: add, count on, and, more, total, altogether, sum, addition, plus, inverse, commutative, difference, exchange</p>	<p>Key vocabulary: add, count on, and, more, total, altogether, sum, addition, plus, inverse, commutative, difference, exchange</p>	<p>Key vocabulary: add, count on, and, more, total, altogether, sum, addition, plus, inverse, commutative, difference, exchange</p>



Portsmouth Primary Maths Calculation Policy

Mental Maths Subtraction: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships. New vocabulary for each year group is shown in red.*

Year R (ELGs)	Year 1	Year 2
<ul style="list-style-type: none"> Have a deep understanding of the numbers to 10, including their composition Automatically recall number bonds up to 5 (including subtraction facts) <p>Models & Resources: Number tracks, number lines, Numicon, multilink, counters, tens frames, bead strings, part whole models, bar models</p>	<ul style="list-style-type: none"> Count in twos, fives and tens Subtract one-digit and two-digit numbers to 20, including zero Represent and use number bonds and related subtraction facts within 20 <p>Models & Resources: Number tracks, number lines, Numicon, multilink, bar models, counters, tens frames, bead strings, part whole models, dienes, 100 squares</p>	<ul style="list-style-type: none"> Subtract numbers using concrete objects, pictorial representations, and mentally, including: <ul style="list-style-type: none"> a two-digit number and ones a two-digit number and tens two two-digit numbers subtracting three one-digit numbers recall and use subtraction facts to 100 <p>Models & Resources: Number lines, Numicon, multilink, bar models, counters, tens frames, bead strings, part whole models, dienes, 100 squares Children should be moving towards drawing their own number lines by the end of year 2.</p>
<p>Key vocabulary: take away, less, fewer, minus, count back, between</p>	<p>Key vocabulary: take away, less, fewer, minus, count back, between, subtract</p>	<p>Key vocabulary: take away, less, fewer, minus, difference, count back, between, subtract,</p>



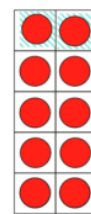
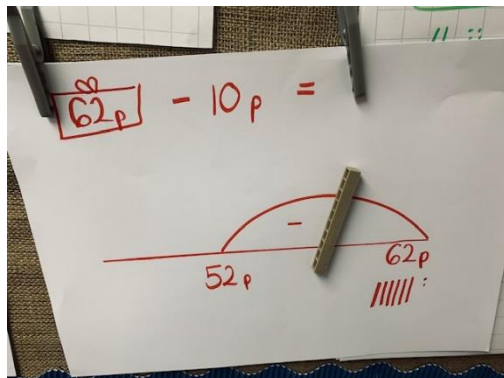
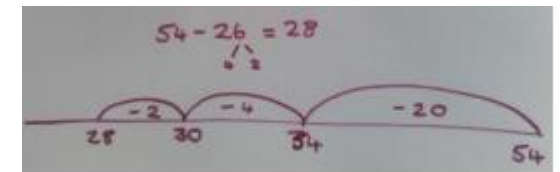
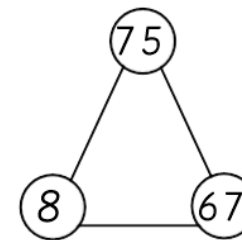
$$7 - 2 = 5$$

$$75 - 8 = 67$$

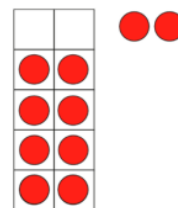
$$75 - 67 = 8$$

$$8 + 67 = 75$$

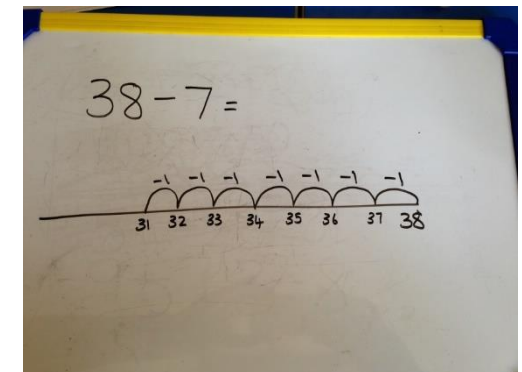
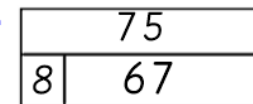
$$67 + 8 = 75$$



$$8 + 2 = 10$$



$$10 - 2 = 8$$





Portsmouth Primary Maths Calculation Policy

Mental Maths Subtraction: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships. New vocabulary for each year group is shown in red.*

Year 3	Year 4	Year 5	Year 6
<ul style="list-style-type: none"> subtract numbers mentally, including: <ul style="list-style-type: none"> a three digit number and ones a three digit number and tens a three digit number and hundreds estimate the answer to a calculation <p>Models & Resources: Number lines, bead strings, bar models, dienes, PV counters, part whole models,</p>	<ul style="list-style-type: none"> find 1000 less than a given number Continue to practise subtracting numbers mentally including subtracting one, tens or hundreds to a four digit number estimate to check answers to a given calculation <p>Models & Resources: Number lines, bar models, dienes, PV counters, part whole models,</p>	<ul style="list-style-type: none"> Subtract numbers mentally with increasingly large numbers Use rounding to check answers to calculations <p>Models & Resources: Number lines, bar models, dienes, PV counters, part whole models,</p>	<ul style="list-style-type: none"> Perform mental calculations, including with mixed operations and large numbers Use estimation to check answers to calculations <p>Models & Resources: Number lines, bar models, dienes, PV counters, part whole models,</p>
<p>Key vocabulary: subtract, take away, less, fewer, minus, difference, count back, between, estimate</p>	<p>Key vocabulary: subtract, take away, less, fewer, minus, difference, count back, between, estimate, round</p>	<p>Key vocabulary: subtract, take away, less, fewer, minus, difference, count back, between, estimate, round</p>	<p>Key vocabulary: subtract, take away, less, fewer, minus, difference, count back, between, estimate, round</p>

Part Part Whole
↓ ↓ ↓
 $329 + 414 = 743$

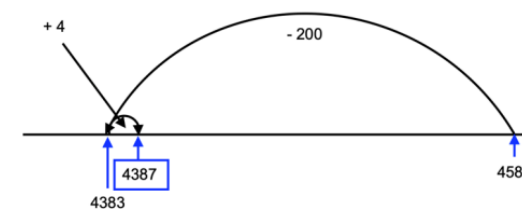
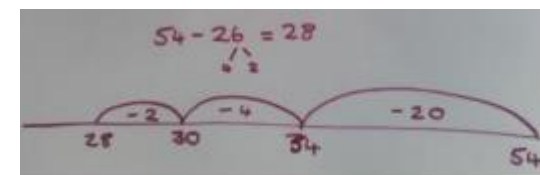
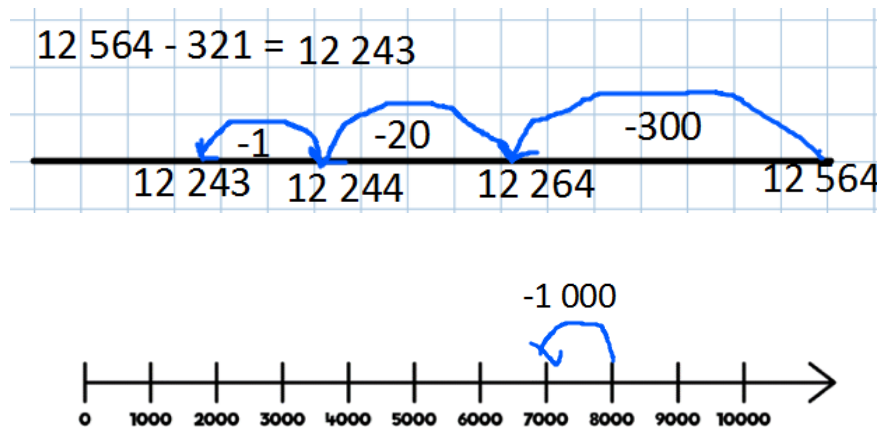
743	
329	414

$743 - 329 = 414$

Whole Part Part
↓ ↓ ↓
 $614 - 527 = 87$

614	
527	87

$527 + 87 = 614$

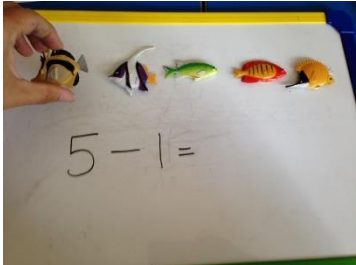
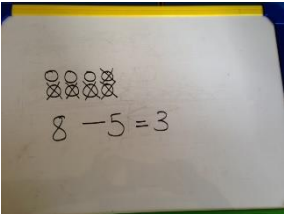
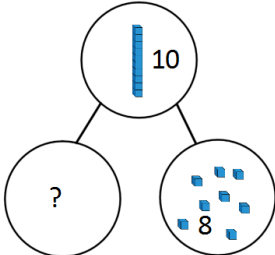
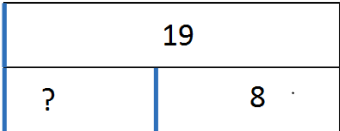

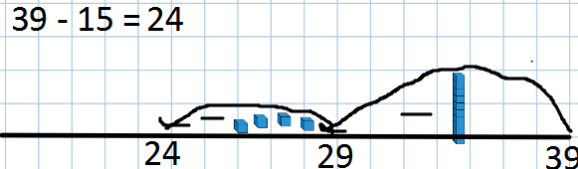
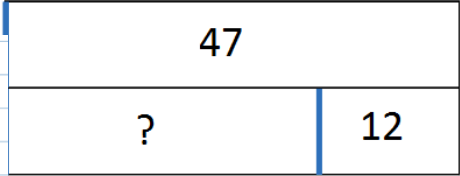
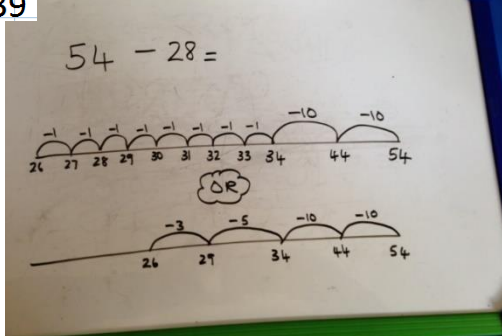
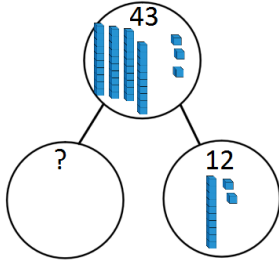


Rounding and adjusting



Portsmouth Primary Maths Calculation Policy

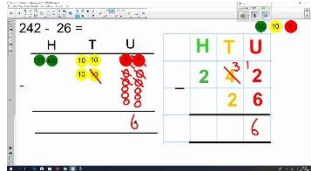
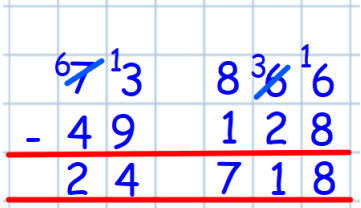
Subtraction: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of the conceptual relationships between addition and subtraction.*

Year R (ELGs)	Year 1	Year 2
<ul style="list-style-type: none"> Have a deep understanding of the numbers to 10, including their composition Automatically recall number bonds up to 5 (including subtraction facts) 	<ul style="list-style-type: none"> Read and write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) subtract one-digit and two-digit numbers to 20, including zero solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as $7 = ? - 9$ 	<ul style="list-style-type: none"> solve problems with subtraction involving numbers, quantities and measures subtract numbers using concrete objects, pictorial representations, and mentally, including: <ul style="list-style-type: none"> a two-digit number and ones a two-digit number and tens two two-digit numbers show that the subtraction of two numbers cannot be done in any order (not commutative) recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.
<p>Models & Resources: Also see mental subtraction</p>  	<p>Models & Resources: Also see mental subtraction</p>   <p>$20 - 5 = 15$</p> 	<p>Models & Resources: Also see mental subtraction</p> <p>$39 - 15 = 24$</p>  <p>$47 - 12 = ?$</p>   
<p>Key vocabulary: take away, less, fewer, minus, count back, between</p>	<p>Key vocabulary: take away, less, fewer, minus, count back, between, subtract</p>	<p>Key vocabulary: take away, less, fewer, minus, difference, count back, between, subtract,</p>



Portsmouth Primary Maths Calculation Policy

Subtraction: *Informal jottings (for example number lines) and concrete apparatus will be alongside more formal written methods in Key Stage 2 depending on the child's appropriate stage of understanding. New vocabulary for each year group is shown in red.*

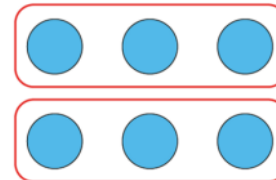
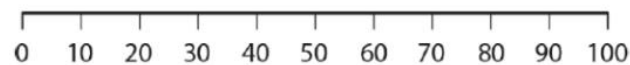
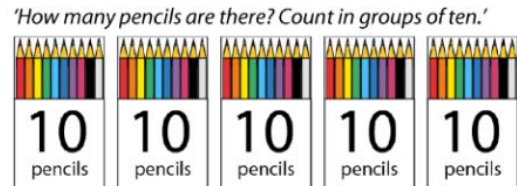
Year 3	Year 4	Year 5	Year 6
<ul style="list-style-type: none"> subtract numbers with up to three digits, using formal written methods of columnar subtraction where appropriate solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction 	<ul style="list-style-type: none"> subtract numbers with up to 4 digits using the formal written methods of columnar subtraction where appropriate solve addition and subtraction two step problems in contexts, deciding which operations and methods to use and why 	<ul style="list-style-type: none"> subtract numbers with more than 4 digits using the formal written methods of columnar subtraction where appropriate solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to do and why 	<ul style="list-style-type: none"> subtract whole numbers with more than 4 digits, including using formal written methods where appropriate solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to do and why
<p>Models & Resources:</p> <ul style="list-style-type: none"> Continue to use number lines Column method using base 10 or place value counters to support  <ul style="list-style-type: none"> Moving to formal column method by the end of Year 3 $\begin{array}{r} 4 \ 5 \ 6 \\ - 2 \ 1 \ 4 \\ \hline 2 \ 4 \ 2 \end{array}$	<p>Models & Resources:</p> <ul style="list-style-type: none"> Continue to use number lines Secure Year 3 methods. (Use dienes/ PV counters where appropriate to support understanding.) Moving on to securing formal column method for up to 4 digits $\begin{array}{r} ^3 ^1 \\ 2 \ 4 \ 5 \ 6 \\ - 1 \ 3 \ 8 \ 5 \\ \hline 1 \ 0 \ 7 \ 1 \end{array}$	<p>Models & Resources:</p> <ul style="list-style-type: none"> Continue to use number lines Secure formal column method for larger numbers and with decimals in context.  $\begin{array}{r} 6 \ 7 \ 1 \ 3 \\ - 4 \ 9 \\ \hline 6 \ 2 \ 1 \ 4 \end{array}$ $\begin{array}{r} 8 \ 3 \ 1 \ 6 \\ - 1 \ 2 \ 8 \\ \hline 8 \ 1 \ 8 \ 8 \end{array}$ $\begin{array}{r} 2 \ 1 \ 6 \ 7 \\ - 1 \ 8 \ 3 \\ \hline 2 \ 0 \ 3 \ 4 \end{array}$	<p>Models & Resources:</p> <ul style="list-style-type: none"> Continue to use number lines Use formal column method for large numbers, different sized numbers and decimals in different contexts. $\begin{array}{r} 5 \ 1 \ 3 \ 4 \ 1 \ 2 \ 8 \\ - 2 \ 5 \ 1 \ 7 \ 7 \\ \hline 3 \ 8 \ 2 \ 5 \ 1 \end{array}$ $5 - 3.54 =$ $\begin{array}{r} 5 \\ - 3.54 \\ \hline 1.46 \end{array}$
<p>Key vocabulary: subtract, take away, less, fewer, minus, difference, count back, between, estimate, exchange</p>	<p>Key vocabulary: subtract, take away, less, fewer, minus, difference, count back, between, estimate, exchange, round</p>	<p>Key vocabulary: subtract, take away, less, fewer, minus, difference, count back, between, estimate, exchange, round</p>	<p>Key vocabulary: subtract, take away, less, fewer, minus, difference, count back, between, estimate, exchange, round</p>



Portsmouth Primary Maths Calculation Policy

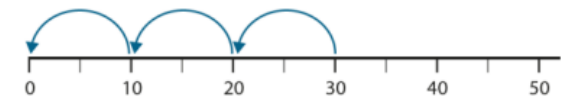
Mental strategies: Multiplication Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships. *New vocabulary for each year group is shown in red.*

Year R (ELGs)	Year 1	Year 2
<ul style="list-style-type: none"> Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally. <p>Models & Resources: number lines, counters, multilink, bead string, Numicon, bar model</p>	<ul style="list-style-type: none"> Count in twos, fives and tens <i>Continue to double numbers up to 20</i> <p>Models & Resources: number lines, counters, multilink, bead string, Numicon, bar model</p>	<ul style="list-style-type: none"> Recall and use multiplication facts for the 2, 5 and 10 times tables including recognising odd and even numbers Show that multiplication of two numbers be done in any order (commutative) <i>Link multiplication to repeated addition</i> <p>Models & Resources: number lines, dienes, counters, multilink, Numicon, arrays, bar model</p>
<p>Key vocabulary: groups of, lots of, double</p>	<p>Key vocabulary: groups of, lots of, double, odd, even, times, multiply, multiplication, array</p>	<p>Key vocabulary: groups of, lots of, double, odd, even, times, multiply, multiplication, array, multiple, repeated addition, commutative, inverse</p>

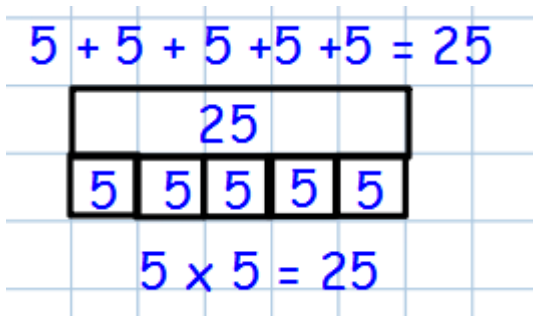
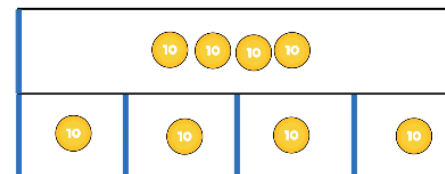


$$2 \times 3$$

This represents $3 + 3$.



$$2 + 2 + 2 + 2 = 8$$





Portsmouth Primary Maths Calculation Policy

Mental strategies: Multiplication: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships. New vocabulary for each year group is shown in red.*

Year 3	Year 4	Year 5	Year 6
<ul style="list-style-type: none"> Recall and use facts for the 3, 4 and 8 times tables Write and calculate mathematical statements for multiplication using tables that they know including for two digit times one-digit numbers using mental methods <p>Models & Resources: number lines, dienes, PV counters, multilink, Numicon, arrays, bar models</p>	<ul style="list-style-type: none"> Recall facts for multiplication tables up to 12 x 12 Use place value, known and derived facts to multiply and divide mentally including: multiplying by 0 and 1 & multiplying 3 numbers Recognise and use factor pairs and commutativity in mental calculations <p>Models & Resources: number lines, dienes, PV counters, multilink, Numicon, arrays, bar models</p>	<ul style="list-style-type: none"> Multiply numbers mentally drawing upon known facts Recall prime factors up to 19 Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 <p>Models & Resources: number lines, dienes, PV counters, multilink bar models, arrays</p>	<ul style="list-style-type: none"> Perform mental calculations, including with mixed operations and large numbers Identify common factors, common multiples and prime numbers Multiply simple pairs of proper fractions i.e. $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$ <p>Models & Resources: number lines, dienes, PV counters, multilink bar models, arrays</p>
<p>Key vocabulary: groups of, lots of, double, odd, even, times, multiply, multiplication, array, multiple, repeated addition, commutative, inverse,</p>	<p>Key vocabulary: groups of, lots of, double, odd, even, times, multiply, multiplication, array, multiple, repeated addition, commutative, inverse, scaling, factor pairs</p>	<p>Key vocabulary: groups of, lots of, times, multiply, multiplication, multiple, factor pairs, inverse, scaling, prime, factor, square, cube, prime factor</p>	<p>Key vocabulary: groups of, lots of, times, multiply, multiplication, multiple, factor pairs, prime, factor, square, cube, prime factor, scaling, common factor, common multiples</p>

$6 \times 2 = 12$

"Six times two can represent six groups of two." *"It can also represent two groups of six (or six, two times)."*

1^2 2^2 3^2
1 4 9

18 groups of 100 is 1,800

If I know that $3 \times 6 = 18$, I also know that... $3 \times 60 = 180$

$0.3 \times 6 = 1.8$ $30 \times 60 = 1\ 800$ etc.

$\frac{2}{5} \times \frac{2}{3} = ?$

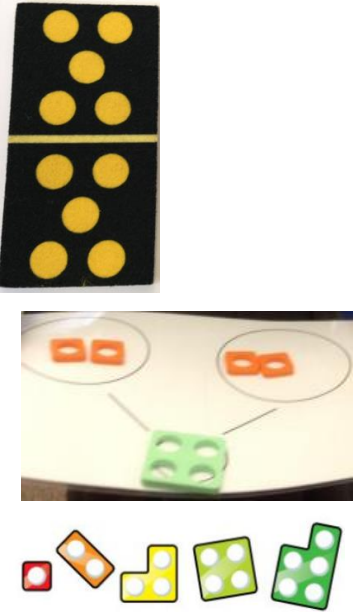
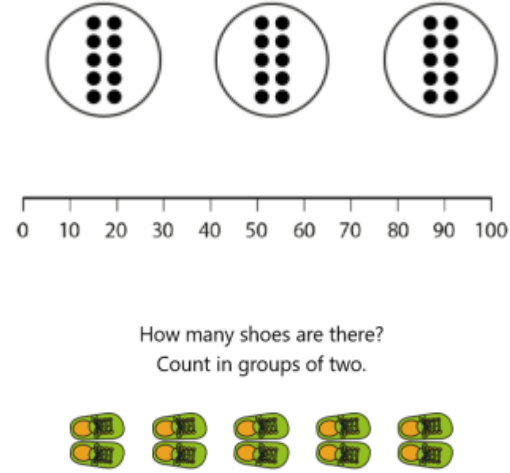
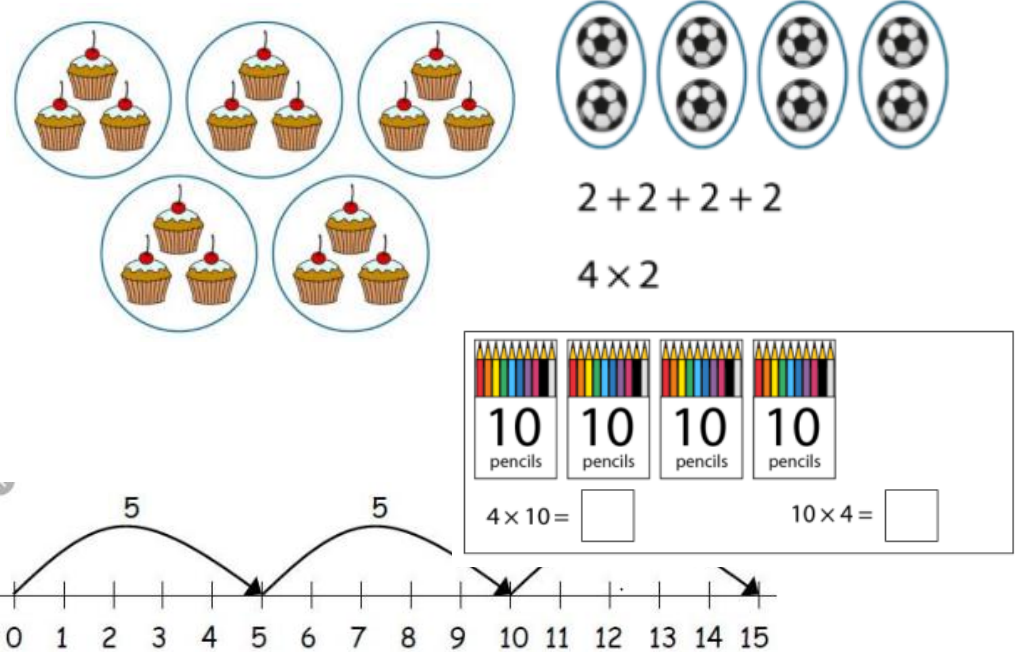




Portsmouth Primary Maths Calculation Policy

Multiplication: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships*

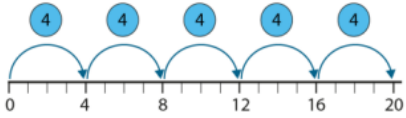
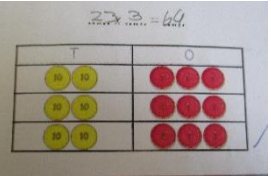
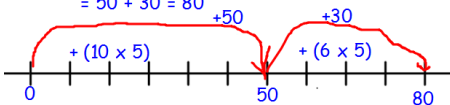
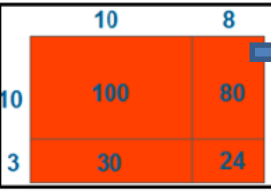
New vocabulary for each year group is shown in red.

Year R (ELGs)	Year 1	Year 2
<ul style="list-style-type: none"> Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally. 	<ul style="list-style-type: none"> Solve one step problems involving multiplication and division by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher 	<ul style="list-style-type: none"> Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the \times, \div and $=$ signs Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts
<p>Models & Resources: <i>Also see mental multiplication</i></p> 	<p>Models & Resources: <i>Also see mental multiplication</i></p> 	<p>Models & Resources: <i>Also see mental multiplication</i></p> 
<p>Key vocabulary: groups of, lots of, double, equal groups, pair, odd, even</p>	<p>Key vocabulary: groups of, lots of, double, odd, even, times, multiple, multiply, multiplication, array</p>	<p>Key vocabulary: groups of, lots of, double, odd, even, times, multiply, multiplication, array, multiple, repeated addition, commutative, inverse</p>



Portsmouth Primary Maths Calculation Policy

Multiplication: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships alongside more formal written methods in Key Stage 2 depending on the child's appropriate stage of understanding. New vocabulary for each year group is shown in red.*

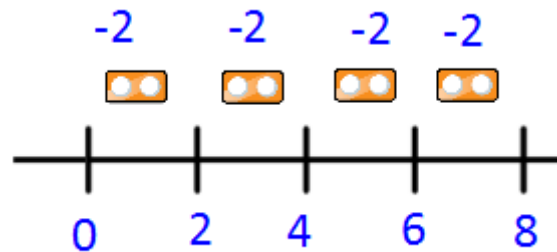
Year 3	Year 4	Year 5	Year 6						
<ul style="list-style-type: none"> Write and calculate mathematical statements for multiplication using the multiplication tables they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods. 	<ul style="list-style-type: none"> Multiply two-digit and three-digit numbers by a one-digit number using formal written method. 	<ul style="list-style-type: none"> Multiply up to 4 digits by a one-digit or two-digit number using a formal written method, including long multiplication for two-digit numbers. Multiply proper fractions and mixed numbers by whole numbers 	<ul style="list-style-type: none"> Multiply up to 4 digits by a two-digit number using the formal written method of long multiplication. Multiply one digit numbers with up to two decimal places by whole numbers 						
<p>Models & Resources: Also see mental multiplication</p> <ul style="list-style-type: none"> Continue to use number lines  Using PV counters to support understanding for grid method:  Moving to grid method: <table border="1" data-bbox="107 1120 609 1200"> <tr> <td>x</td> <td>20</td> <td>2</td> </tr> <tr> <td>4</td> <td>80</td> <td>8</td> </tr> </table> <p style="text-align: center;">80 + 8 = 88</p> 	x	20	2	4	80	8	<p>Models & Resources: Also see mental multiplication</p> <ul style="list-style-type: none"> Continue to use number lines $16 \times 5 = 10 \times 5 + 6 \times 5$ $= 50 + 30 = 80$  Refresh the grid method and then show how relates to the expanded method using PV counters or dienes to support as necessary $\begin{array}{r} 13 \\ \times 4 \\ \hline 12 \text{ (3 x 4)} \\ 40 \text{ (10 x 4)} \\ \hline 52 \end{array}$ Formal short multiplication (initially using PV counters/dienes to support) NB: Carrying MUST be underneath. 	<p>Models & Resources: Also see mental multiplication</p> <ul style="list-style-type: none"> Continue to use number lines Securing formal method for multiplying by a one-digit Introduce long multiplication for two-digit numbers alongside PV counters and area models to support as necessary $\begin{array}{r} 342 \\ \times 7 \\ \hline 2194 \end{array}$  NB: Carrying MUST be underneath. 	<p>Models & Resources: Also see mental multiplication</p> <ul style="list-style-type: none"> Continue to use number lines Securing long multiplication method form Year 5. Using formal written methods to multiply a decimal by a one-digit number: e.g. 0.16×3 using short multiplication method. $\begin{array}{r} 0.16 \\ \times 3 \\ \hline 0.48 \end{array}$ Then progress onto multiplying a decimal by a two-digit number. <ul style="list-style-type: none"> e.g. $1.4 \times 36 = (14 \times 36) \div 10$
x	20	2							
4	80	8							
<p>Key vocabulary: groups of, lots of, double, odd, even, times, multiply, multiplication, array, multiple, repeated addition, commutative, inverse</p>	<p>Key vocabulary: groups of, lots of, double, odd, even, times, multiply, multiplication, array, multiple, repeated addition, commutative, inverse, scaling, factor pairs</p>	<p>Key vocabulary: groups of, lots of, times, multiply, multiplication, multiple, factor pairs, inverse, scaling prime, factor, square, cube, prime factor</p>	<p>Key vocabulary: groups of, lots of, times, multiply, multiplication, multiple, factor pairs, prime, factor, square, cube, prime factor, inverse, scaling common factor, common multiples</p>						



Portsmouth Primary Maths Calculation Policy

Mental strategies: Division: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships. New vocabulary for each year group is shown in red.*

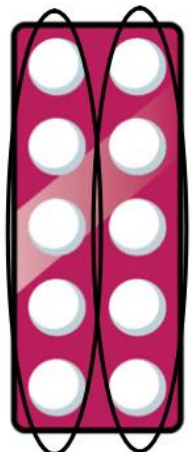
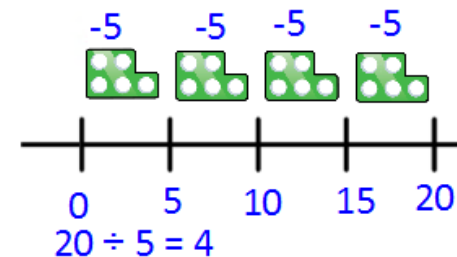
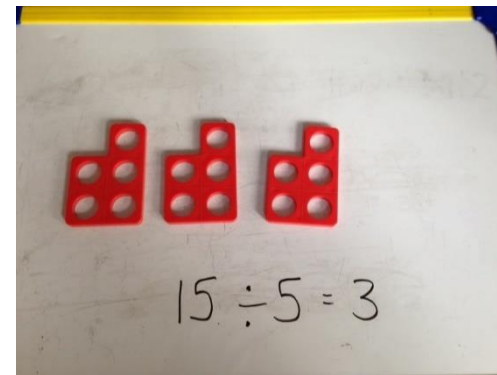
Year R (ELGs)	Year 1	Year 2
<ul style="list-style-type: none"> Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally. <p>Models & Resources: number lines, counters, multilink, bead string, Numicon, bar model</p>	<ul style="list-style-type: none"> Counting in twos, fives and tens <i>Continue to share small quantities and halve numbers to 20</i> <p>Models & Resources: number lines, counters, multilink, bead string, Numicon, bar model</p>	<ul style="list-style-type: none"> Recall and use division facts for the 2, 5 and 10 times tables including recognising odd and even numbers Show that division of one number by another cannot be done in any order (not commutative) <i>Link division to repeated subtraction</i> <p>Models & Resources: number lines, dienes, counters, multilink, Numicon, arrays, bar model</p>
<p>Key vocabulary: share, halve, groups of, equal groups, odd, even</p>	<p>Key vocabulary: share, halve, groups of, equal groups, odd, even lots of, divide,</p>	<p>Key vocabulary: share, halve, groups of, lots of, divide, equal groups, odd, even arrays, division, repeated subtraction, commutative,</p>



I have 8 cakes to share between 2 people.



How many do they get each?



$$10 \div 2 = 5$$

$$30 \div 3 = ?$$

30		
?	?	?

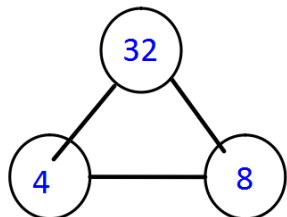
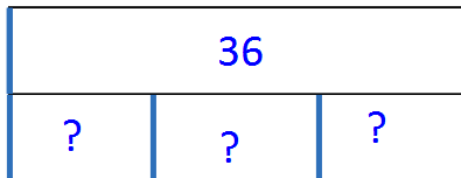


Portsmouth Primary Maths Calculation Policy

Mental strategies: Division: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships. New vocabulary for each year group is shown in red.*

Year 3	Year 4	Year 5	Year 6
<ul style="list-style-type: none"> Recall and use division facts for the 3, 4 and 8 multiplication tables Write and calculate mathematical statements for division using the tables that they know, including for two-digit numbers times one digit numbers <p>Models & Resources: number lines, dienes, PV counters, multilink, Numicon, arrays, bar models</p>	<ul style="list-style-type: none"> Recall division facts for multiplication tables up to 12 x 12 Use place value, known and derived facts to divide mentally including dividing by 1 Recognise and use factor pairs in mental calculations <p>Models & Resources: number lines, dienes, PV counters, multilink, Numicon, arrays, bar models</p>	<ul style="list-style-type: none"> Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers Recall prime numbers up to 19 Divide numbers mentally drawing upon known facts <p>Models & Resources: number lines, dienes, PV counters, multilink bar models</p>	<ul style="list-style-type: none"> Perform mental calculations, including with mixed operations and large numbers Identify common factors, common multiples and prime numbers Divide proper fractions by whole numbers i.e. $\frac{1}{3} \div 2 = \frac{1}{6}$ <p>Models & Resources: number lines, dienes, PV counters, multilink bar models</p>
<p>Key vocabulary: share, halve, groups of, lots of, divide, arrays, division, repeated subtraction, commutative, odd, even</p>	<p>Key vocabulary: share, halve, groups of, lots of, divide, arrays, division, repeated subtraction, scaling, factor pair</p>	<p>Key vocabulary: share, halve, groups of, lots of, divide, arrays, division, repeated subtraction, factor pair, scaling, prime, factor, square, cube, prime factor, composite</p>	<p>Key vocabulary: share, halve, groups of, lots of, divide, division, factor pair, prime factor, prime, factor, scaling, square, cube, composite, common factor</p>

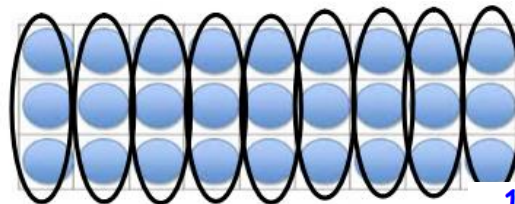
$$36 \div 3 = ?$$



$$4 \times 8 = 32 \quad 8 \times 4 = 32$$

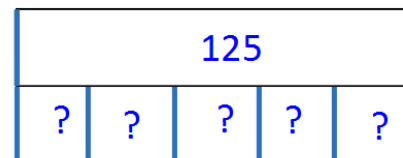
$$32 \div 8 = 4 \quad 32 \div 4 = 8$$

$$4 \times 2 \times 8 = ? \times 2$$



$$27 \div 9 = 3$$

$$125 \div 5 = ?$$



prime composite


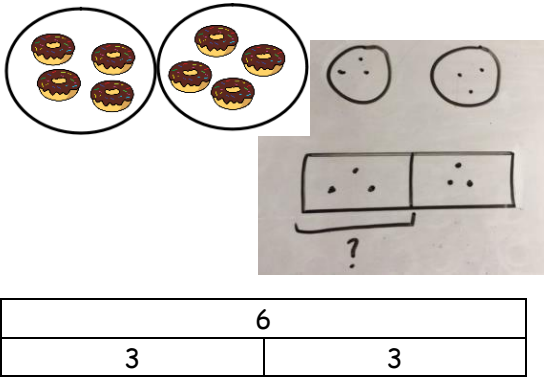

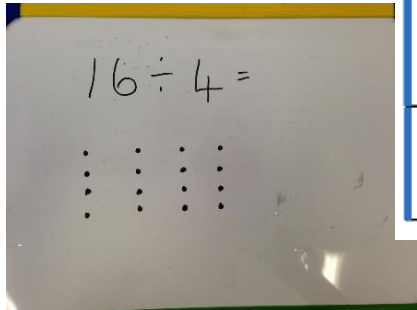
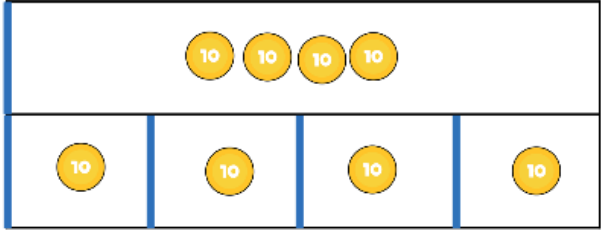
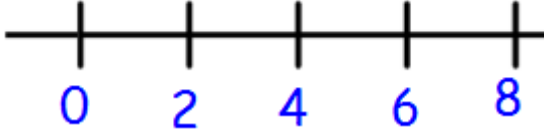
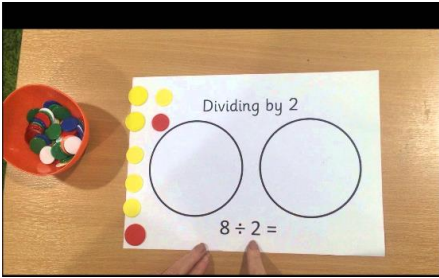


If I know that $40 \div 5 = 8$, what else do I know?

$$400 \div 5 = 80 \quad 4 \div 5 = 0.8 \quad 400 \div 50 = 8$$

Portsmouth Primary Maths Calculation Policy

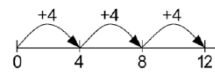
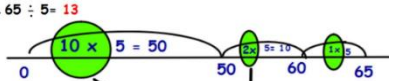
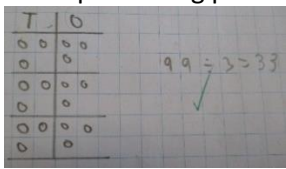
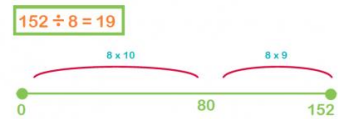
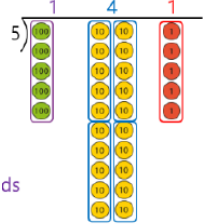
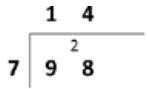
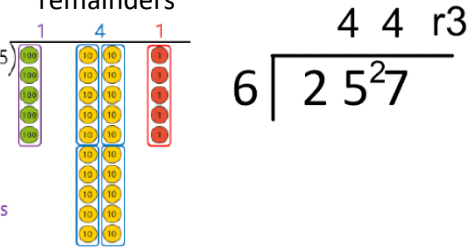
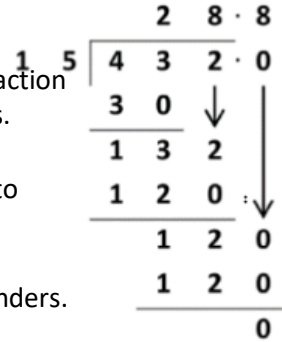
Division: *Informal jottings (for example number lines) and concrete apparatus will be used to develop an understanding of conceptual relationships. New vocabulary for each year group is shown in red.*

Year R (ELGs)	Year 1	Year 2
<ul style="list-style-type: none"> Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally. 	<ul style="list-style-type: none"> Solve one step problems involving multiplication and division by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher 	<ul style="list-style-type: none"> Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the x, ÷ and = signs Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts
<p>Models & Resources: Also see mental division</p> 	<p>Models & Resources: Also see mental division</p>  <p>I have 8 socks.</p>  <p>How many groups of 2 can I make?</p>	<p>Models & Resources: Also see mental division</p> <p>$4 \times 10 = 40$ $40 \div 10 = 4$</p>   <p>$8 \div 2 = 4$</p>  
<p>Key vocabulary: share, halve, groups of, equal groups, odd, even</p>	<p>Key vocabulary: share, halve, groups of, equal groups, odd, even lots of, divide,</p>	<p>Key vocabulary: share, halve, groups of, equal groups, odd, even lots of, divide, arrays, division, repeated subtraction, commutative, odd, even</p>



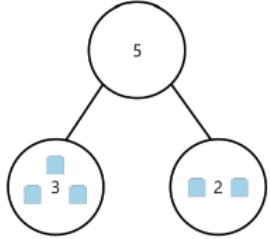
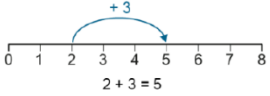

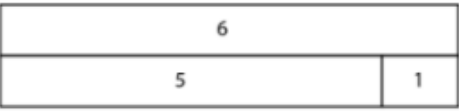
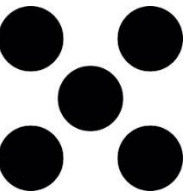
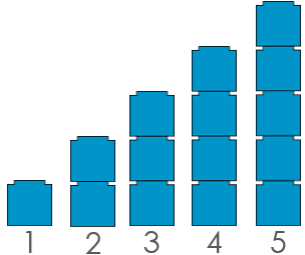
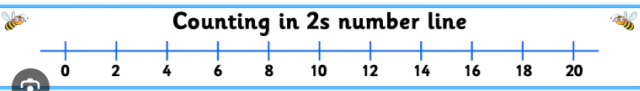
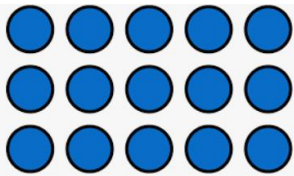

Portsmouth Primary Maths Calculation Policy

Division

Year 3	Year 4	Year 5	Year 6
<ul style="list-style-type: none"> Write and calculate mathematical statements for \div using the \times tables they know progressing to formal written methods for two digits \div one digit i.e. $84 \div 4 = ?$ Solve problems including missing number problems, involving division including correspondence problems 	<ul style="list-style-type: none"> Consolidate using division for numbers up to 1000 using known facts such as $60 \div 3 = 20$ so $600 \div 3 = 200$ Consolidate using formal written methods for two digits by one digit and extend to three digits by one digit <p>From suggestions in non-statutory guidance</p>	<ul style="list-style-type: none"> Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context Solve problems involving division including using their knowledge of factors, multiples, squares and cubes Solve problems involving division including scaling by simple fractions 	<ul style="list-style-type: none"> Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders and with answers up to two decimal places
<p>Models & Resources:</p> <ul style="list-style-type: none"> Continue to use number lines $12 \div 4 = 3$ Understand division as grouping $65 \div 5 = 13$ Sharing using PV counters and then representing pictorially   	<p>Models & Resources:</p> <ul style="list-style-type: none"> Continue to use number lines Use dienes and then images to support moving to formal written method Formal short division moving towards remainders in summer term   	<p>Models & Resources:</p> <ul style="list-style-type: none"> Continue to use number lines Use Y4 method if children need support with understanding. Use formal short division, interpreting remainders in context Later, chn look at decimal & fraction remainders 	<p>Models & Resources: $432 \div 15$ becomes</p> <ul style="list-style-type: none"> Continue to use number lines Revise Y5 short division method with fraction and decimal remainders. Teach formal long division method for up to four digits by two digits. Start with no remainders. Then move to fraction remainders before decimal remainders 
<p>Key vocabulary: share, halve, groups of, lots of, divide, arrays, division, repeated subtraction, commutative, odd, even, remainder</p>	<p>Key vocabulary: share, halve, groups of, lots of, divide, arrays, division, repeated subtraction, remainder, scaling, factor pair</p>	<p>Key vocabulary: share, halve, groups of, lots of, divide, arrays, division, repeated subtraction, remainder, factor pair, scaling, prime, factor, square, cube, prime factor</p>	<p>Key vocabulary: share, halve, groups of, lots of, divide, division, factor pair, scaling, remainder, prime factor, prime, factor, square, cube, common factor</p>

Portsmouth Primary Maths Calculation Policy
Appendix – Core models and images



Year R	Year 1	Year 2				
<p>cherry model</p>  <p>unitary number line</p>  <p>5 and 10s frame and double sided counters</p>  <p>bar model</p>  <p>Hungarian dice patterns</p>  <p>Numberblocks</p> 	<p>As Year R plus...</p> <p>Problem solving sentence stems:</p> <p>First... Then... used alongside bar models Now... number lines in 2s, 5s and 10s(non-unitary)</p>  <p>10s frames and double sided counters 100 squares arrays</p> 	<p>As Year 1 plus...</p> <p>Problem solving sentence stems:</p> <p>First... Then... used alongside bar models Next... (if 2 step problem only) Now... For every... there are...</p> <p>Example:</p> <table border="1" data-bbox="1482 635 2123 730"> <tr> <td>For every 1 hour</td> <td>there are 60 minutes</td> </tr> <tr> <td> </td> <td> </td> </tr> </table> <p>Link time to fractions</p> 	For every 1 hour	there are 60 minutes		
For every 1 hour	there are 60 minutes					

Portsmouth Primary Maths Calculation Policy

Year 3

As KS1 plus...

Problem solving sentence stems:

First...

Then... used alongside bar models

Next... (if 2 step problem only)

Now...

For every... there are...

Example:

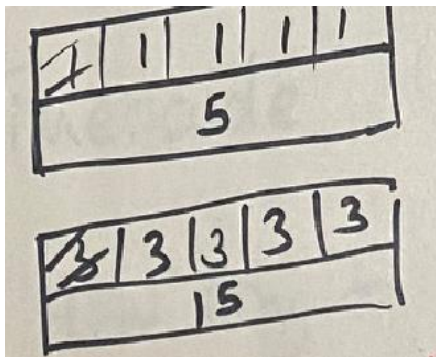
For every £1	there are 100 pence
So £4	is 400 pence

Equivalent fractions or fractions of amounts using bar models:

part	part
whole	

$$\frac{1}{2} = \frac{4}{8}$$

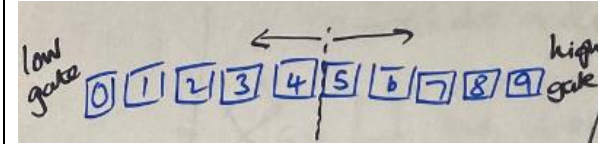
Change number of equal parts based on fraction when finding equivalence!



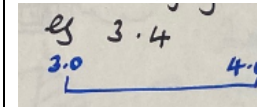
Year 4

As Year 3 plus...

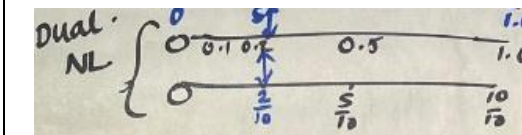
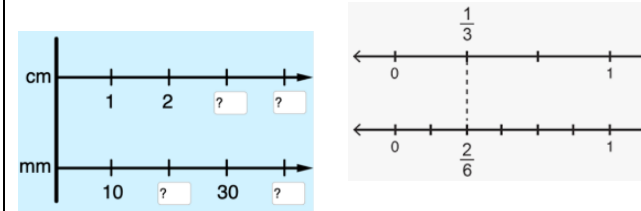
Rounding -> Identify the gate keepers



Rounding on a number line with gate keepers identified:



Double number lines: for FDP or measures!



Gattegno or G-chart for x and ÷ 10 and 100

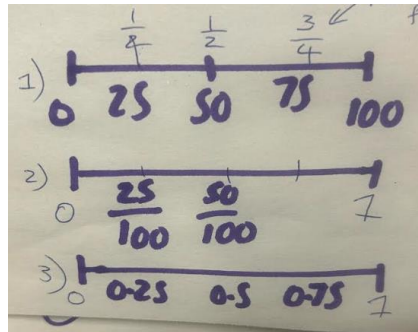
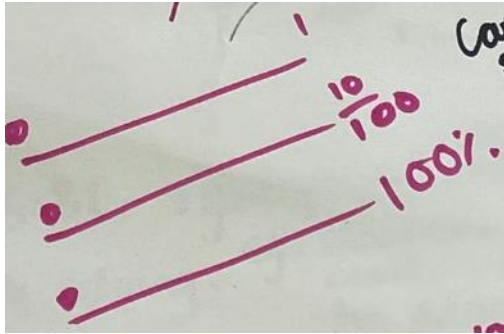
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

Portsmouth Primary Maths Calculation Policy

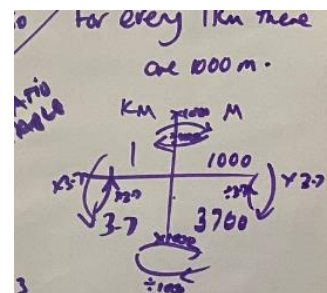
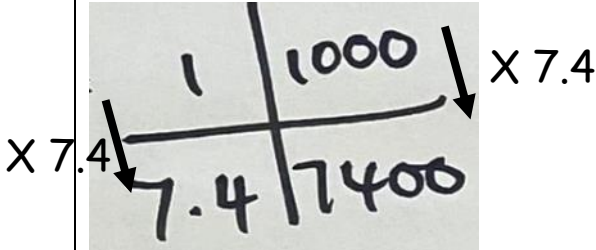
Year 5

As Year 4 plus...

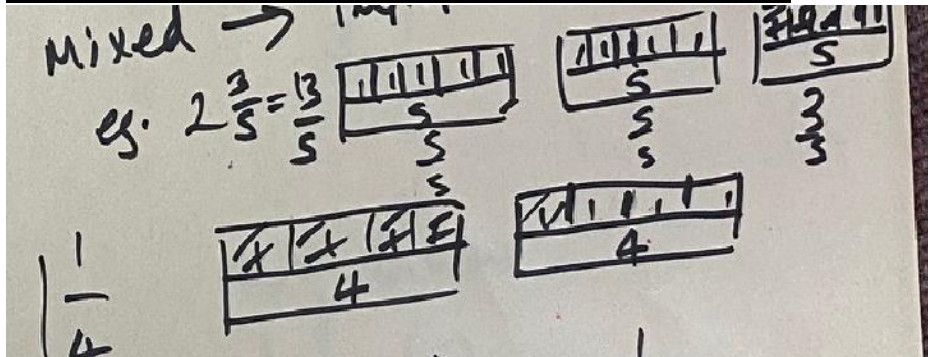
Triple number lines (FDP)



Ratio tables (Building on the For every... there are...)



Bar models for mixed numbers/improper fractions



Year 6

As Year 5 plus...

Developing the G charts for finding % of an amount

