Calculation Policy for Maths

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January 2022

Priorslee Academy 2022

	Language to be used		
Addition	Add	Plus	Sum - the total amount resulting from the **addition** of two or more numbers, amounts, or item.
	Total	Increase	Greater
	Make	More	Altogether
Subtraction	Take away	Subtract	Difference
	Less	Minus	Decrease
	How many left?		
Multiplication	Lots of	Repeated addition	Multiply
	Product - a number that you get to by **multiplying** two or more other numbers together.	Groups of	Multiple
	Array	Times	
Division	Share	Groups of	Repeated subtraction
	Shared between	Split	Divide
Some useful vocabulary	**Partition** – splitting the number into smaller units e.g. tens and ones **Bridging** – Bridging through 10 and 100 are methods that help children to add numbers mentally e.g. 9+6=15, 9+1=10 then 10+5 = 15. **Dienes** – manipulative for teaching place value and calculations. **Commutativity** - you can swap numbers around and still get the same answer when you add or when you multiply. For example, 6 + 4 = 10, 10 - 4 = 6. **Systematically** - Having a pattern or order to the way you work **Inverse** - The opposite in effect. The reverse of. **Integer** - A number, which is not a fraction, a whole number. **Remainder** - The number which is left over in a division in which one quantity does not exactly divide another. **Exchange** - Regrouping means to exchange 10 of a particular place value column for 1 of the next place value columns.		

Addition – Year 1

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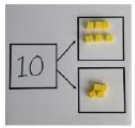
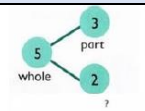
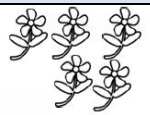
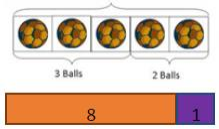
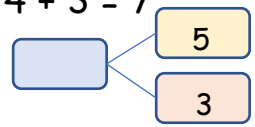
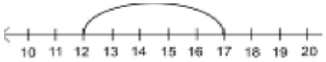
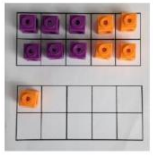
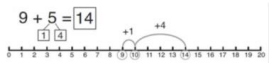
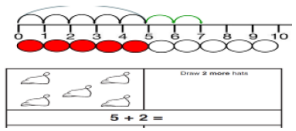
Objective and Strategy	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part-whole model.	   Use part whole model. Use cubes to add two numbers together as a group of in a bar. 	   Use pictures to add two numbers together as a group or in a bar.	4 + 3 = 7  10 = 6 + 4 Use the part-part whole diagram as shown above to move into the abstract.
Starting at the bigger number and counting on.	 Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.	12 + 5 = 17  Start at the larger number on the number line and count on in ones or in one jump to find the answer.	5 + 12 = 17 Place the larger number in your head and count on the smaller number to find your answer.
Regrouping to make 10. *This is an essential skill for column addition later.*	 6 + 5 = 11  Start with the bigger number and use the smaller number to make 10. Use ten frames.	 3 + 9 = Use pictures or a number line. Regroup or partition the smaller number using the part-part whole model to make 10. 	7 + 4 = 11 If I am at seven, how many more do I need to make 10? How many more do I add on now? 1
Represent and use number bonds and related subtraction facts within 20.	 2 more than 5		Emphasis should be on the language… '1 more than 5 is equal to 6.' '2 more than 5 is 7.' '8 is 3 more than 5.'

Addition – Year 2

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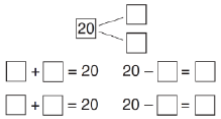
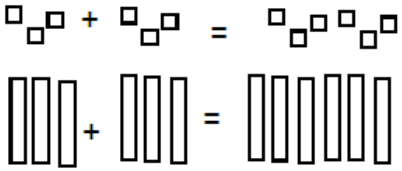
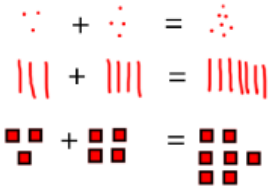
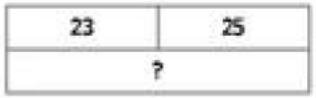
Objective and Strategy	Concrete	Pictorial	Abstract
Adding multiples of ten.	50 = 30 + 20  Model using dienes and bead strings.	 3 tens + 5 tens = _____ tens 30 + 50 = _____ Use representations for base ten.	20 + 30 = 50 70 = 50 + 20 40 + ___ = 60
Use known number facts. Part-part whole	 Children explore ways of making numbers within 20.		___ + 1 = 16 16 – 1 = ___ 1 + ___ = 16 16 - ___ = 1
Using known facts		 Children draw representations of H, T and O.	3 + 4 = 7 Leads to 30 + 40 = 70 Leads to 300 + 400 = 700
Bar model	 3 + 4 = 7	 7 + 3 = 10	 23 + 25 = 48

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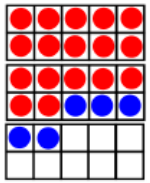
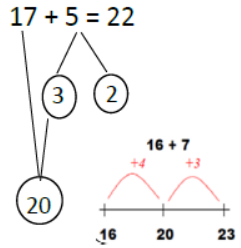
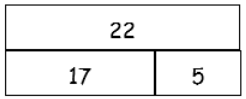
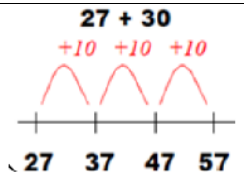
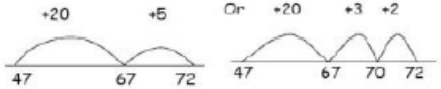
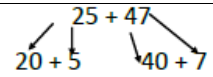
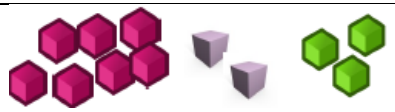
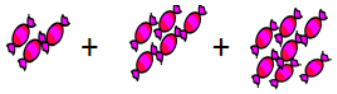
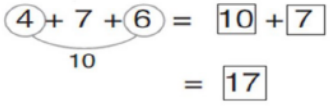
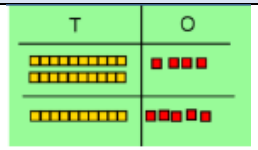
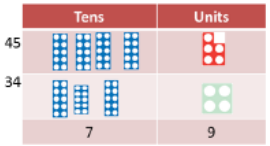
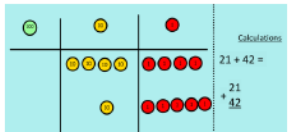
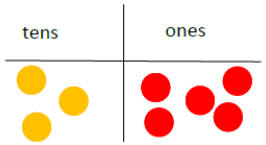
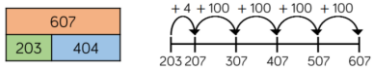
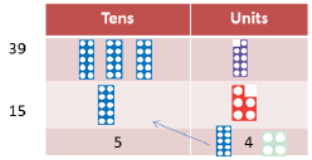
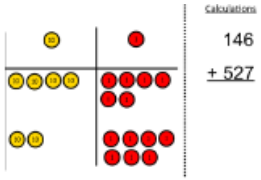
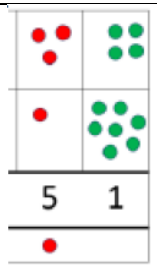
Objective and Strategy	Concrete	Pictorial	Abstract
Add a 2-digit number and ones.	 17 + 5 = 22 Use ten frame to make 'magic ten.' Children explore the pattern. 17 + 5 = 22 27 + 5 = 32	Use part-part whole model number line to model.  and	17 + 5 = 22 Explore related facts 17 + 5 = 22 5 + 17 = 22 22 – 17 = 5 22 – 5 = 17 
Add a 2-digit number and tens.	 25 + 10 = 35 Explore that the ones digit does not change.		27 + 10 = 37 27 + 20 = 47 27 + ___ = 57
Add two 2-digit numbers	 Model using dienes, place value counters and numicon.	 Use number line and bridge ten using part whole if necessary.	 20 + 40 = 60 5+ 7 =12 60 + 12 = 72 Column addition can be used to extend learning.
Add three 1-digit numbers	 Combine to make 10 first if possible, or bridge 10 then add third digit.	 Regroup and draw representations 	 Combine the two numbers that make/bridge ten then add on the third.

Addition – Year 3

Objective and Strategy	Concrete	Pictorial	Abstract
Column Addition – no regrouping (friendly numbers) Add two or three 2 or 3-digit numbers.	 Model using dienes or numicon. Add together the ones first, then the tens.   Move to using place value counters.	Children move to drawing the counters using a tens and one frame.  The use of bar models and number lines are also used. 	$\begin{array}{r} 223 \\ +\ 114 \\ \hline 337 \end{array}$ Add the ones first, then the tens, then the hundreds.
Column Addition with regrouping.	 Exchange ten ones for a ten. Model using numicon and place value counters. 	 Children can draw a representation of the grid to further support their understanding, carrying the ten **underneath** the line.	$\begin{array}{rcr} 20 & + & 5 \\ 40 & + & 8 \\ \hline 60 & + & 13 \end{array} = 73$ Start by partitioning the numbers before formal column to show the exchange. $\begin{array}{r} 536 \\ +\ 85 \\ \hline 621 \\ \hline 11 \end{array}$

Addition – Year 4-6

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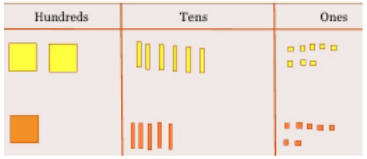
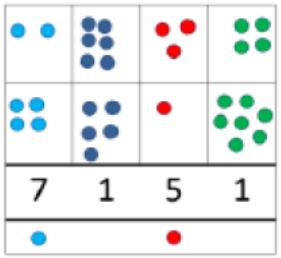
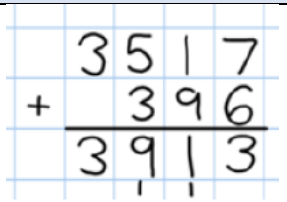
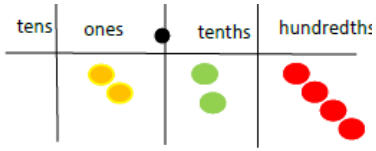
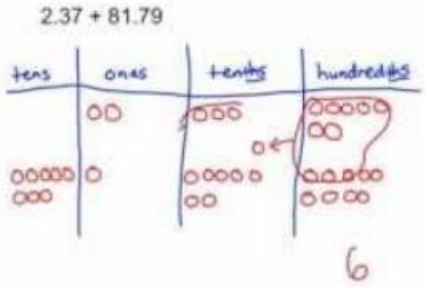
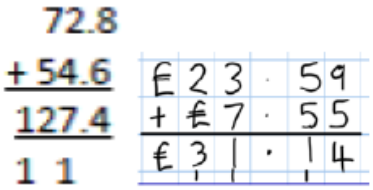
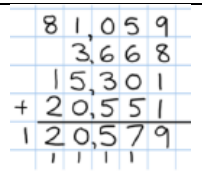
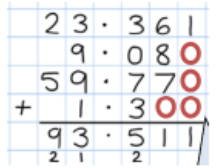
Objective and Strategy	Concrete	Pictorial	Abstract
Y4 – add numbers with up to 4 digits.	Children continue to use dienes or place values counters to add, exchanging ten ones for a ten and ten tens for a hundred and ten hundreds for a thousand. 	 Draw representations using place value counters.	 Continue from previous work to carry hundreds as well as tens. Relate to money and measures.
Y5 – add numbers with more than 4 digits. Add decimals with 2 decimal places, including money.	As Year 4.  Introduce decimal place value counters and model exchange for addition.		
Y6 – add several numbers of increasing complexity. Including adding money, measure and decimals with different numbers of decimal points.	As Year 5.	As Year 5.	 Insert zeros for place holders. 

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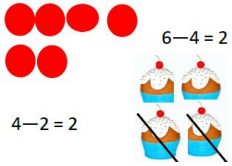
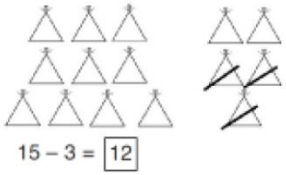
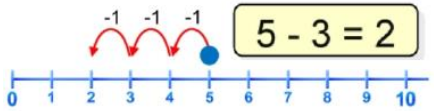
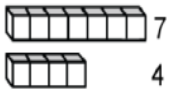
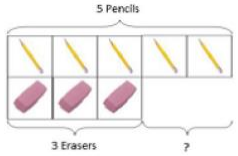
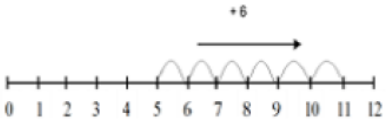
Subtraction – Year 1

Objective and Strategy	Concrete	Pictorial	Abstract
Taking away ones.	Use physical objects, counters, cubes etc to show how objects can be taken away. 	 Cross out drawn objects to show what has been taken away.	7—4 = 3 16—9 = 7
Counting back.	 Move objects away from the group, counting backwards.  Move the beads along the bead string as you count backwards.	 Count back in ones using a number line.	Put 13 in your head, count back 4. What number are you at?
Find the difference.	Compare objects and amounts.  'Seven is 3 more than four' 'I am 2 years older than my sister'  Lay objects to represent bar model.	Count on using a number line to find the difference. 	Hannah has 12 sweets and her sister has 5. How many more does Hannah have than her sister?

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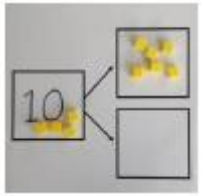
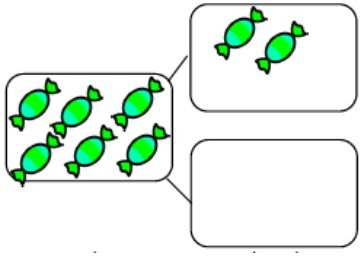
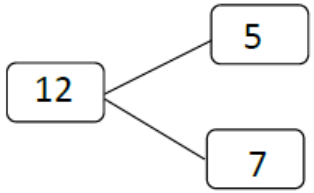
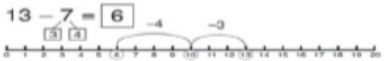
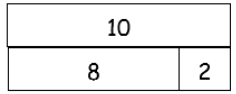
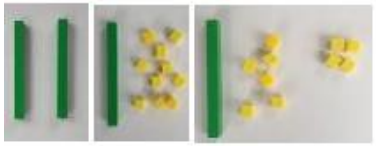
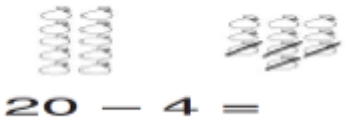
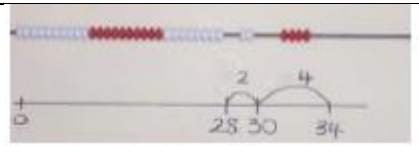
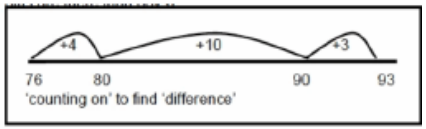
Subtraction – Year 1

Objective and Strategy	Concrete	Pictorial	Abstract
Represent and use number bonds and related subtraction facts within 20. Part-part whole model.	 Link to addition. Use part-part whole model to model the inverse. If 10 is the whole and 6 is one of the parts, what's the other part? 10 – 6 = 4	 Use pictorial representations to show the part.	Move to using numbers within the part whole mode. 
Make 10.	14 – 9  Make 14 on the ten frame. Take 4 away to make ten, then take one more away so that you have taken 5.	13—7  Jump back 3 first, then another 4. Use ten as the stopping point.	16 – 8 How many do we take off first to get to 10? How many left to take off?
Bar model.	 5 – 2 = 3		 10 = 8 + 2 10 = 2 + 8 10 – 2 = 8 10 – 8 = 2

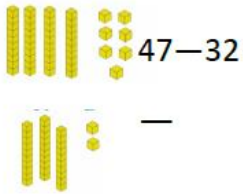
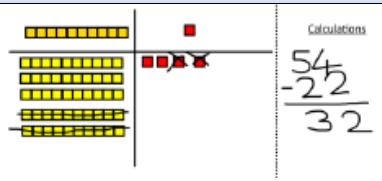
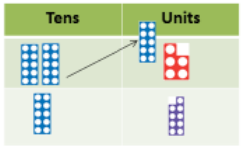
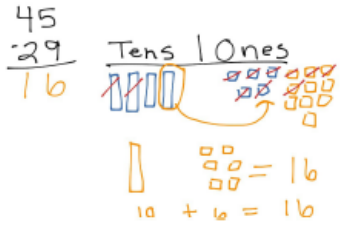
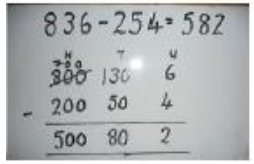
Subtraction – Year 2

Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Regroup a ten into ten ones.	 Use a place value chart to show how to change a ten into ten ones, use the term 'take and make.'		20 – 4 = 16
Partitioning to subtract without regrouping. *'Friendly numbers'*	34 – 13 = 21 Use Dienes to show how to partition the number when subtraction without regrouping. 	Children draw representation of dienes and cross off.  43—21 = 22	43 – 21 = 22
Make ten strategy *Progression should be crossing one ten, crossing more than one ten, crossing the hundreds.*	 34 – 28 Use a bead bar or bead strings to model counting to next ten and the rest.	 Use a number line to count on to next ten and then the rest.	93 – 76 = 17

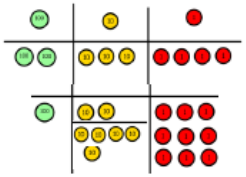
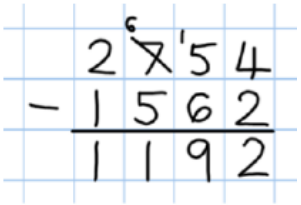
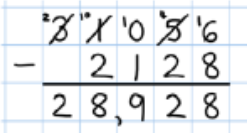
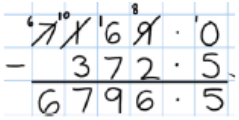
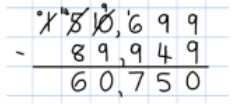
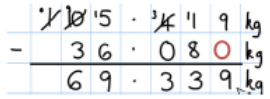
Subtraction – Year 3

Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Column subtraction without regrouping (friendly numbers).	 Use base 10 or numicon to model.	 Draw representation to support understanding.	47 − 24 = 23 40 + 7 − 20 + 4 20 + 3 Intermediate step may be needed to lead to clear subtraction understanding. 
Column subtraction with regrouping.	 Being with base 10 or numicon. Move to place value counters, modelling the exchange of a ten into ten ones. Use the phrase 'take and make' for exchange.	 Children may draw base ten or place value counters and cross off.	 Begin by partitioning in place value counters.  Then move to formal method.

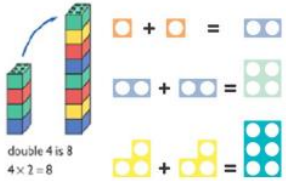
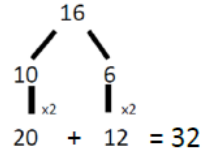
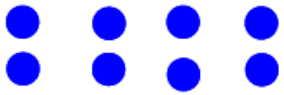
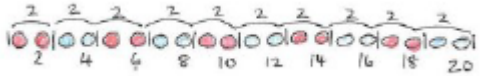
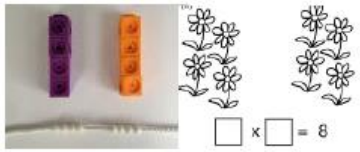
Subtraction – Year 4-6

Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Subtracting tens and ones. Year 4 subtract with up to 4 digits. *Introduce decimal subtraction through context of money.*	234 – 179  Model process of exchange using numicon, base ten and then move to place value counters.	Children to draw place value counters and show their exchange – see y3.	 Use the phrase 'take and make' for exchange.
Year 5 – Subtract with at least 4 digits, including money and measures. *Subtract with decimal values, including mixtures of integers and decimals and aligning the decimal.*	As Year 4.	Children to draw place value counters and show their exchange – see Y3	 Use zeros for placeholders. 
Year 6 – Subtract with increasingly large and more complex numbers and decimal values.			 

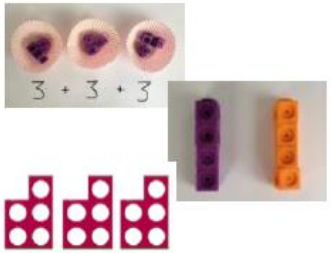
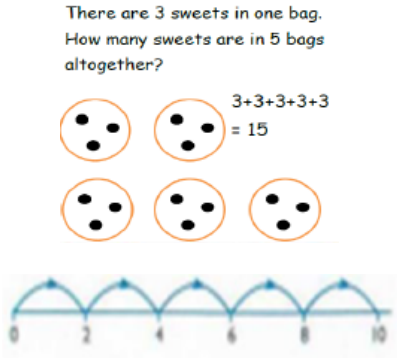
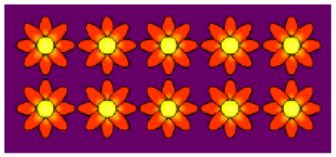
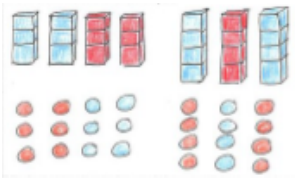
Multiplication – Year 1

Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Doubling.	Use practical activities using manipulatives including cubes and numicon to demonstrate doubling. 	Draw pictures to show how to double numbers. Double 4 is 8 	Partition a number and then double each part before recombining it back together. 
Counting in multiples.	Count the groups as children are skip counting, children may use their fingers as they are skip counting. 	 Children make representations to show counting in multiples. 	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25, 30
Making equal groups and counting the total.	 Use manipulatives to create equal groups.	Draw  to show 2 x 3 = 6 Draw and make representations.	2 x 4 = 8

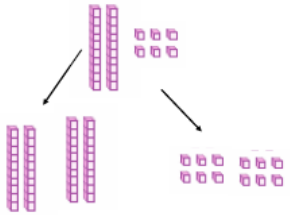
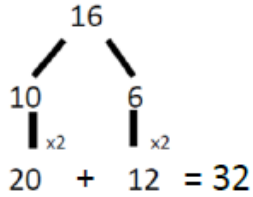
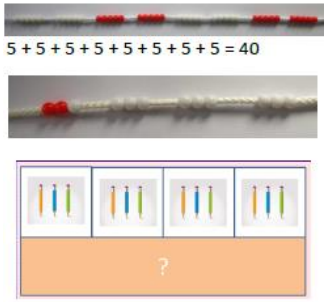
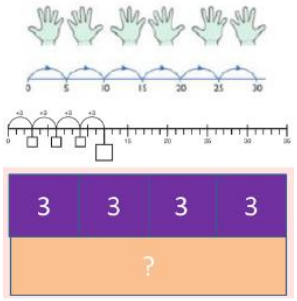
Multiplication – Year 1

Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Repeated addition	 Use different objects to add equal groups.	Use pictorial including number lines to solve problems. 	Write addition sentences to describe objects and pictures. 
Understanding arrays	Use objects laid out in arrays to find the answers to 2 lots of 5, 3 lots of 2 etc. 	Draw representations of arrays to show understanding. 	3 x 2 = 6 2 x 5 = 10

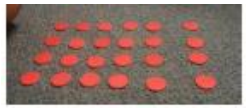
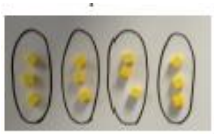
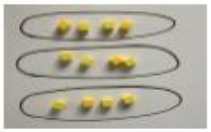
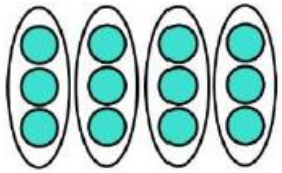
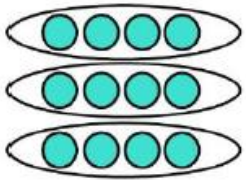
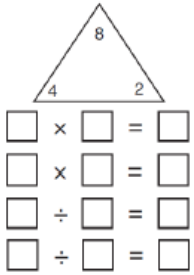
Multiplication – Year 2

Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Doubling	Model doubling using dienes and place value counters.  40 + 12 = 52	Draw pictures and representations to show how to double numbers.	Partition a number and then double each part before recombining it back together.  20 + 12 = 32
Counting in multiples of 2, 3, 4, 5, 10 from 0. (repeated addition)	Count the groups as children are skip counting, children may use their fingers as they are skip counting. Use bar models.  	Number lines, counting sticks and bar models should be used to show representation of counting in multiples.  	Count in multiples of a number aloud. Write sequences with multiples of numbers. 0, 2, 4, 6, 8, 10 0, 3, 6, 9, 12, 15 0, 5, 10, 15, 20, 25, 30 $4 \times 3 = \square$

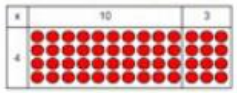
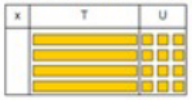
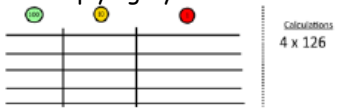
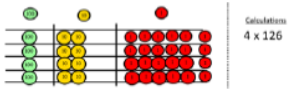
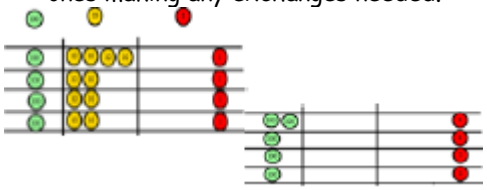
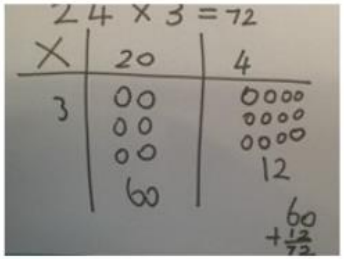
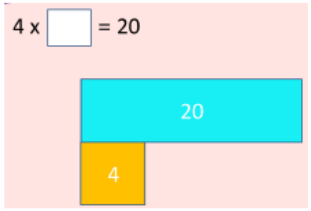
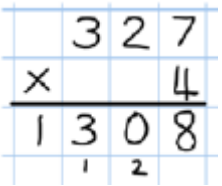
Multiplication – Year 2

Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Multiplication is commutative	Create arrays using counters, cubes and numicon.    Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer.  	Use representations of arrays to show different calculations and explore commutativity.  	$12 = 3 \times 4$ $12 = 4 \times 3$ Use an array to write multiplication sentences and reinforce repeated addition.  $5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$
Using the inverse *This should be taught alongside division, so pupils learn how they work alongside each other.*			2 x 4 = 8 4 x 2 = 8 8 ÷ 2 = 4 8 ÷ 4 = 2 8 = 2 x 4 8 = 4 x 2 2 = 8 ÷ 4 4 = 8÷ 2 Show all 8 related fact family sentences.

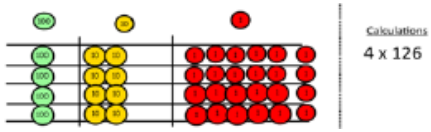
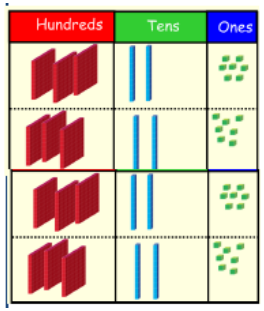
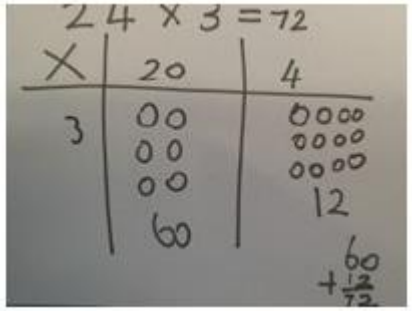
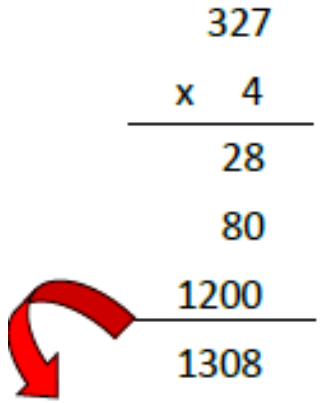
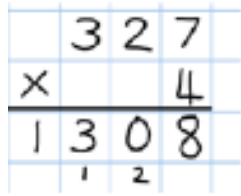
Multiplication – Year 3

Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Grid method	Show the links with arrays to first introduce the grid method.  4 rows of 10 4 rows of 3 Move onto base ten to move towards a more compact method.  4 rows of 13 Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.  Calculations 4 x 126 Fill each row with 126.  Calculations 4 x 126 Add up each column, starting with the ones making any exchanges needed.  Then you have your answer.	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as show below.  Bar model are sued to explore missing numbers.  	Relate the drawn counters method to the short multiplication method. 

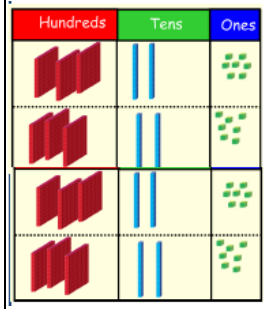
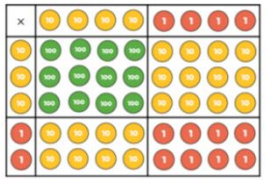
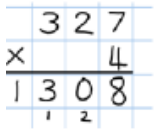
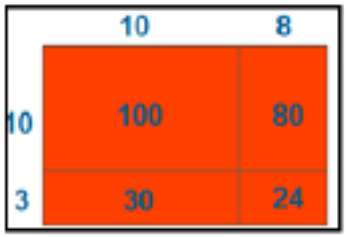
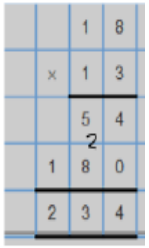
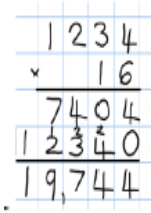
Multiplication – Year 4

Priorslee Academy 2022

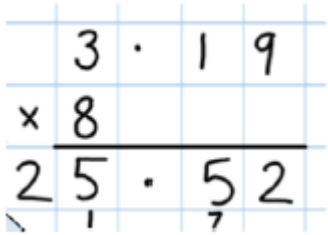
Objective and Strategy	Concrete	Pictorial	Abstract
Column multiplication Move to multiplying 3 digit numbers by 1 digit. (Year 4 expectation)	Use place value counters to show how we are finding groups of a number. Fill each row with 126. We are multiplying by 4 so we need 4 rows.  Children can continue to be supported by place value counters at this stage of multiplication. This initially done where there is no regrouping. 321 x 2 = 642.  It is important at this stage that they always multiply the ones first. The corresponding long multiplication is modelled alongside.	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as show below.  Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.	 

Multiplication – Year 5-6

Priorslee Academy 2022

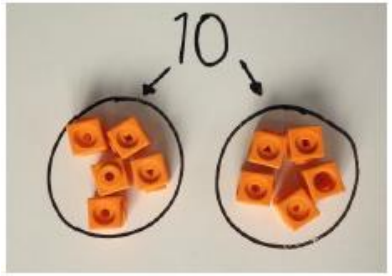
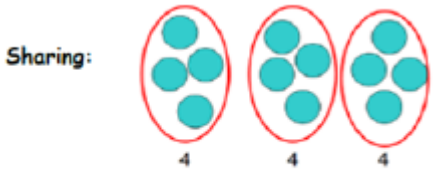
Objective and Strategy	Concrete	Pictorial	Abstract
Column multiplication for 3 and 4 digits x 1 digit	 It is important at this stage that they always multiply the ones first. Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping. 321 x 2 = 642.	Base 10 method:  × | 40 | 4 30 | 1,200 | 120 2 | 80 | 8 Grid Method: × | 300 | 20 | 7 4 | 1200 | 80 | 28	327 x 4 28 (7 x 4) 80 (20 x 4) 1200 (300 x 4) 1308 
Column multiplication	Manipulatives may still be used with the corresponding long multiplication modelled alongside.		 18 x 3 on the first row. (8 x 3 – 24, carrying the 2 for 20, then 1 x 3) 18 x 10 on the 2nd row. Show multiplying by 10 by putting zero in the ones column.  (1234 x 6) (1234 x 10)

Multiplication – Year 6

Multiplying decimals up to 2 decimal places by a single digit.			Remind children that the single digit belongs in the ones column. Line up the decimal points in the question and the answer.  Alternatively, children can convert the number to a whole number 25.1 x 8 becomes 251 x 8. Then, the number would be divided to convert the answer to the correct decimal places. 251 x 8 = ____ divided by 10

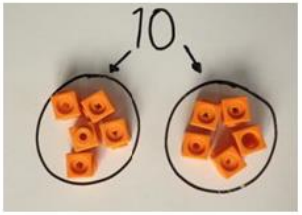
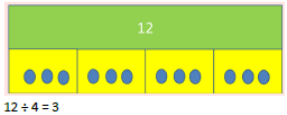
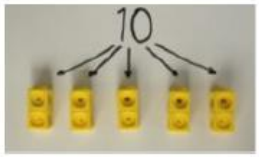
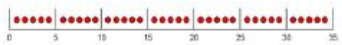
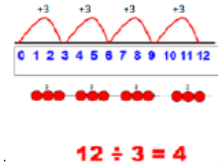
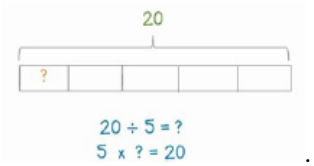
Division – Year 1

Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Division as sharing	   I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.  8 shared between 2 is 4.  12 shared between 3 is 4	12 shared between 3 is 4.

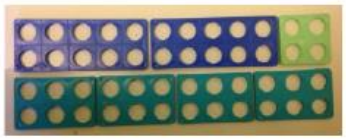
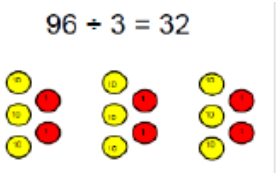
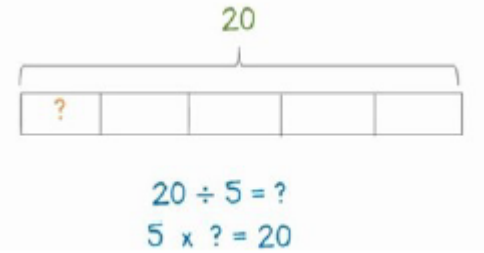
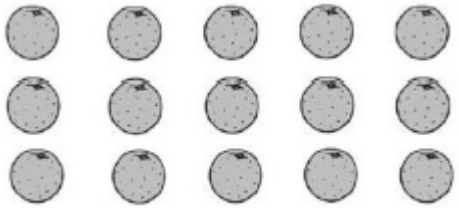
Division – Year 2

Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Division as sharing.	 I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.  8 divided by 2 equals 4. Children use bar modelling to show and support understanding. 	$12 \div 3 = 4$
Division as grouping.	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.  	Use number lines for grouping.  $12 \div 3 = 4$ Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how may would be within each group 	$28 \div 7 = 4$ Divide 28 into 7 groups. How many are in each group?

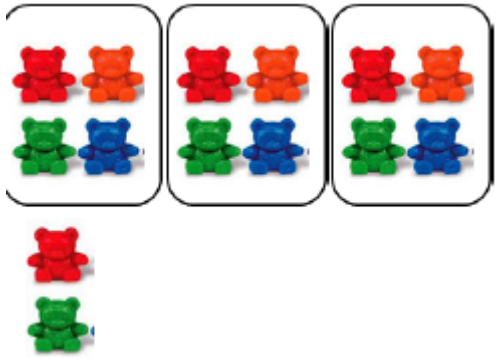
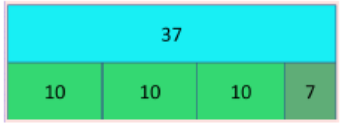
Division – Year 3

Priorslee Academy 2022

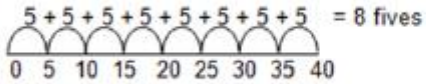
Objective and Strategy	Concrete	Pictorial	Abstract
Division as grouping	Use cubes, counters, objects or place value counters to aid understanding.  24 divided into groups of 6 = 4 	Continue to use bar modelling to aid solving division problems. 	How many groups of 6 in 24? 24 ÷ 6 = 4
Division with arrays	 Link division to multiplication by creating as array and thinking about the number sentences that can be created. E.g. 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	Draw an array and use lines to split that array into groups to make multiplication and division sentences. 	Find the inverse of multiplication and division sentences by creating eight linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7 28 = 7 x 4 28 = 4 x 7 4 = 28 ÷ 7 7 = 28 ÷ 4

Division – Year 3

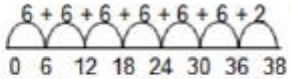
Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Division with remainders.	14 ÷ 3 = Divide objects between groups and see how much is left over. 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  Draw dots and group them to divide an amount and clearly show a remainder.  Use bar models to show division with remainders.  	Complete written divisions and show the remainder using r. 

Example without remainder:
40 ÷ 5
Ask "How many 5s in 40?"



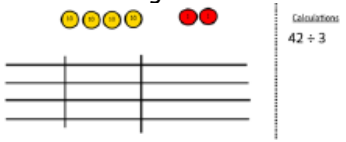
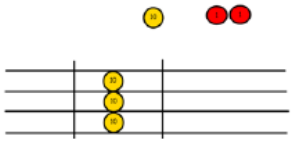
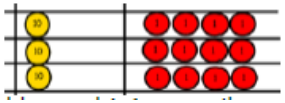
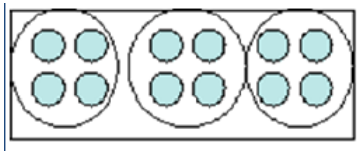
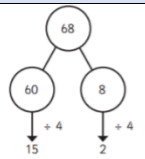
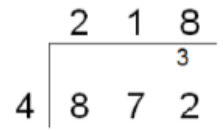
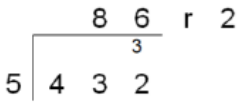
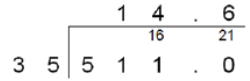
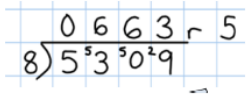
Example with remainder:
38 ÷ 6



For larger numbers, when it becomes inefficient to count in single multiples, bigger jumps can be recorded using known facts.

Division – Year 4-6

Priorslee Academy 2022

Objective and Strategy	Concrete	Pictorial	Abstract
Divide at least 3 digit numbers by 1 digit. Short division	 Use place value counters to divide using the bus stop method alongside.  Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.  We exchange this ten for ten ones and then share the ones equally among the groups.  We look how much in 1 group so the answer is 14.	Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.  Encourage them to move towards counting in multiples to divide more efficiently.	 68 ÷ 4 = 17 (Year 4 only) Begin with divisions that divide equally with no remainder.  Move onto divisions with a remainder.  Finally move into decimal places to divide the total accurately.  

Division – Year 6

Priorslee Academy 2022

Long Division

h t o

$$\begin{array}{r} 061 \\ 4\overline{)247} \\ -4 \\ \hline 3 \end{array}$$

th h t o

$$\begin{array}{r} 0402 \\ 4\overline{)1609} \\ -8 \\ \hline 1 \end{array}$$

t o

$$\begin{array}{r} 29 \\ 2\overline{)58} \\ -4 \\ \hline 18 \\ -18 \\ \hline 0 \end{array}$$

	0	4	8	9	
15	7	3	3	5	
–	6	0	0	0	(×400)
	1	3	3	5	
–	1	2	0	0	(×80)
		1	3	5	
–		1	3	5	(×9)
				0	

Short Division

	1	2	2	3	
4	4	8	9	$^{1}2$	

		1	2	2	3		
4	4	8	9	$^{1}4$		r2	