Kingfisher CE Academy Calculation Guidance

Addition

Key Language: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to', 'is the same as'

Year	Concrete	Pictorial	Abstract
EYFS / Year 1	Combining two parts to make a whole (Use resources e.g. eggs, shells, bear, cars ect…)	Children represent the cubes using dots or crosses. They could put each part into a part whole model.	4 + 3 = 7 Four is a part, 3 is a part and the whole is 7.
Year 1	Counting on using number lines, Numicon or cubes.	A bar model which encourages children to count on rather than count all.	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2

Year	Concrete	Pictorial	Abstract
Year 1	Regrouping to make 10. Use ten frames and counters/ cubes or using numicon. 6 + 5	Children draw the ten frame and couters/ cubes.	Children develop an understanding of equality e.g. $$6 + \square = 11$$ $$6 + 5 = 5 + \square$$ $$6 + 5 = \square + 4$$
Year 2	TO + O using base 10. Continue to develop understanding of partitioning and place value. 41 + 8	Children represent the base 10 e.g. lines for tens and dots for ones.	41 + 8 $$1 + 8 = 9$$ $$40 + 9 = 49$$
Year 2	TO + TO using base 10. Continue to develop understanding of partitioning and place value. 36 + 25	Children to represent the base 10 in a place value chart.	Draw corresponding base 10. Add ones. Record. Add tens. Record under. Ones and Tens. Record.

Year	Concrete	Pictorial	Abstract
Year 3 and KS2	Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.	Children to represent the counters or base 10 in a place value chart, circling when they make an exchange. This can be completed alongside the column method.	Formal column method. The children must understand what happens when they exchange. Draw the base 10 to correspond. Show the exchange.

Year 4 - complete 4 digit problems using the above methods

Year 5 - complete 4, 5 and 6 digit problems using the above methods.

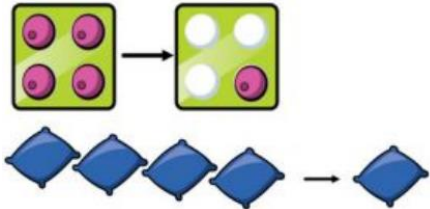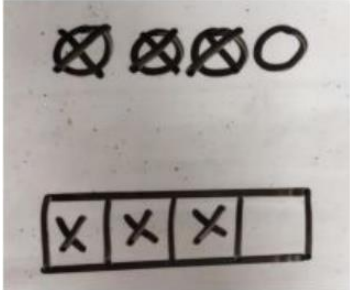Year 6 - complete decimal place problems using the above methods
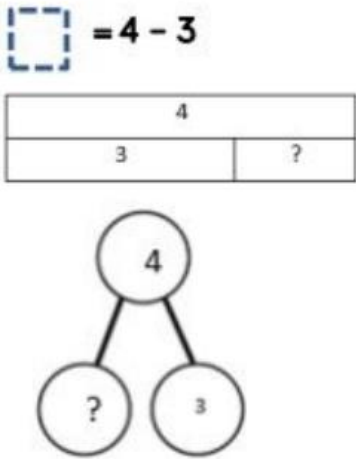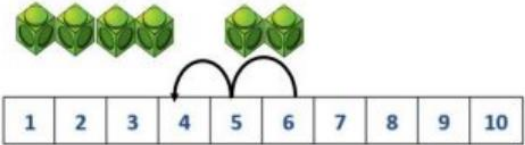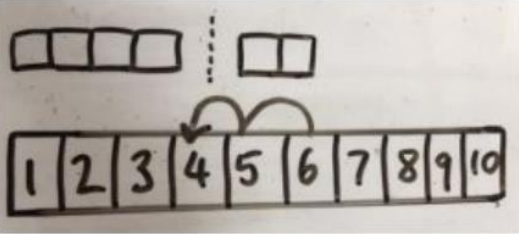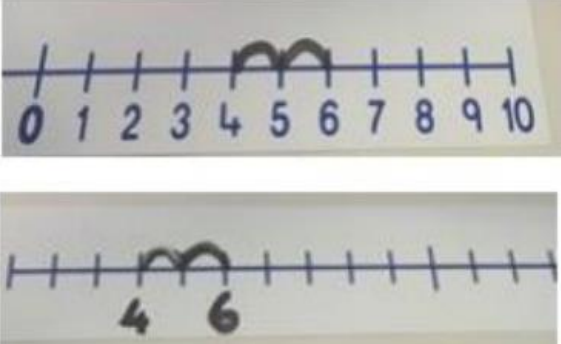
Explain it or problem-solving ideas

Conceptual variation; different ways to ask children to solve 21 + 34
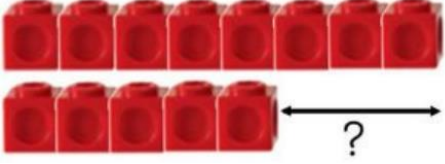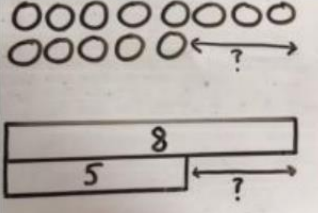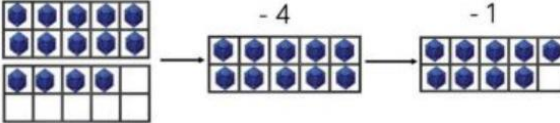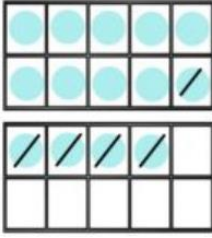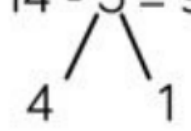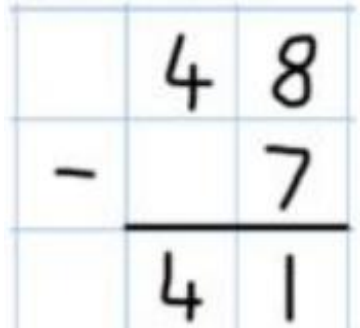
Word problems:
In year 3, there are 21 children and in year 4, there are 34 children.
How many children in total?

$21 + 34 = 55$. Prove it

$$21 + 34 =$$

$$\square = 21 + 34$$

Calculate the sum of twenty-one and thirty-four.

$$\begin{array}{r} 21 \\ +34 \\ \hline \end{array}$$

Missing digit problems:

10s	1s
10 10	1
10 10 10	?
?	5
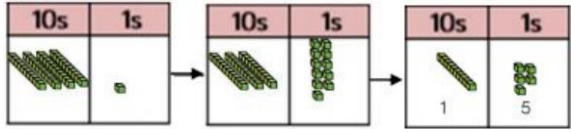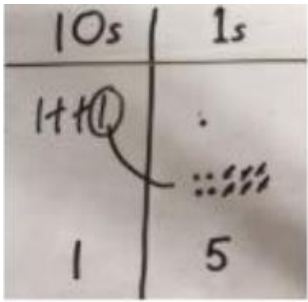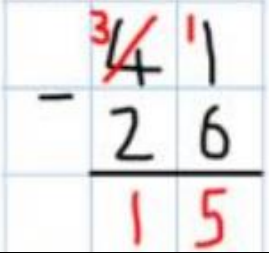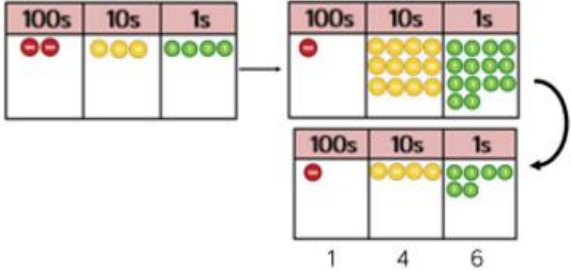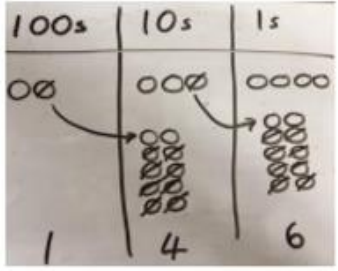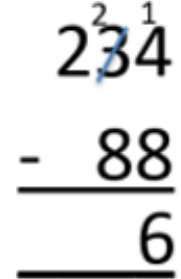
Subtraction

Key Language: take away, less than, the difference, subtract, minus, fewer, decrease.

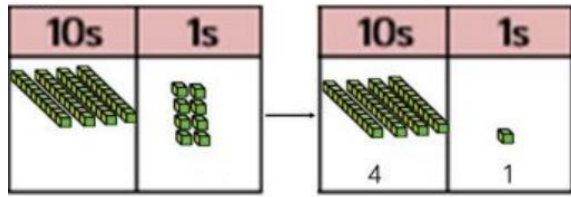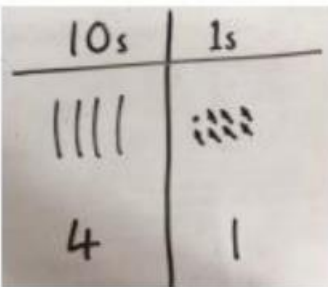| Year	Concrete	Pictorial	Abstract
EYFS/ Year 1	Physically taking away and removing objects from a whole (ten frames, numicon, cubes and other items). 4 - 3 = 1	Children to draw the concrete resources and cross out the correct amount. The bar model can also be used.	
EYFS/ Year 1	Counting back (using number lines or number tracks) Children start with 6 and count back 2. 6 - 2 = 4	Children represent what they see pictorially	Children to represent the calculation on the number line or track and show their jumps. Children should use an empty number line.

Year	Concrete	Pictorial	Abstract
EYFS/ Year 1	Finding the difference (using cubes, numicon or other objects). Calculate the difference between 8 and 5.	Children to draw the cubes/ other concrete objects which they have used or use the bar model to illustrate what they need to calculate.	Find the difference between 8 and 5. 8 – 5, the difference is ☐ Children to explore why 9 - 6 = 8 – 5 = 7 – 4 have the same difference.
Year 1 / Year 2	Making 10 using 10 frames. 14 - 5	Children present the ten frame pictorially and discuss what they did to make 10.	Children show how they can make 10 by partitioning the subtrahend. 14 - 5 = 9 /\ 4 1 14 – 4 = 10 10 – 1 = 9
Year 2	Column method using base 10. 48 - 7	Children represent the base 10 pictorially.	Column method or children could count back 7. Draw base 10 to correspond to column method. Cross off the ones.

Year	Concrete	Pictorial	Abstract
Year 2	Column method using base 10 and having to exchange. 41 - 26	Represent the base 10 pictorially, remembering to show the exchange.	Formal column method. Draw corresponding base 10, circle the exchange and then show the exchange on the numbers. The children must understand that when they exchange 10 they still have 41. 41 = 30 + 11
Key stage 2	Column method using place value counters or base 10. 234 – 88 = 146	Represent the place value counters pictorially; remembering to show what has been exhanged. This can be completed alongside the column method.	Formal column method. The children must understand what happens when they have crossed out digits.

Year 4 - complete 4 digit problems using the above methods

Year 5 - complete 4, 5 and 6 digit problems using the above methods

Year 6 - complete decimal place problems using the above methods

Year 4, 5 and 6 - Compensation method for numbers which can be easily rounded

Conceptual variation; different ways to ask children to solve 391 - 186

391

?   186
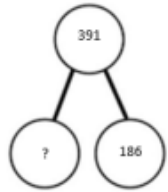
391	
186	?

Raj spent £391, Timmy spent £186. How much more did Raj spend?

Calculate the difference between 391 and 186.

☐ = 391 – 186

391
-186
_____

What is 186 less than 391?

Missing digit calculations

$$3 \quad 9 \quad \square$$
$$- \quad \square \quad \square \quad 6$$
$$\square \quad 0 \quad 5$$
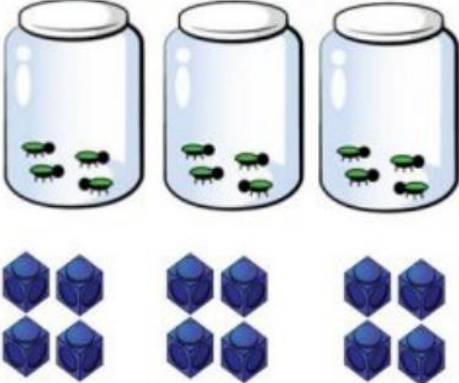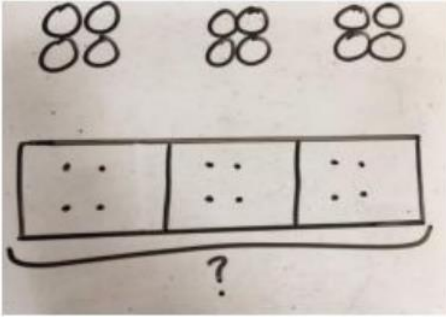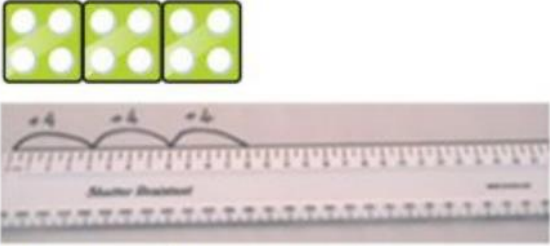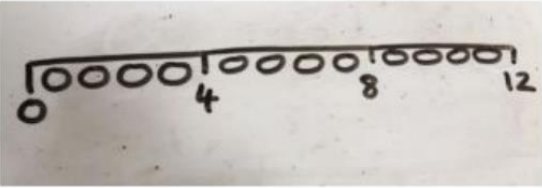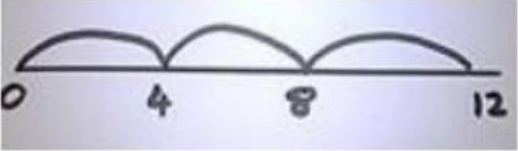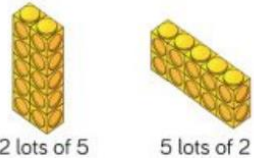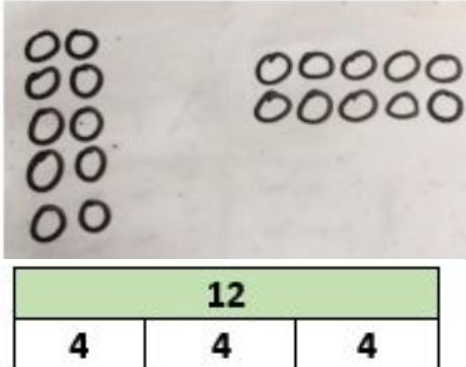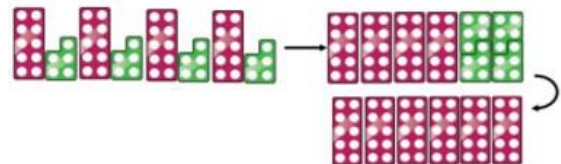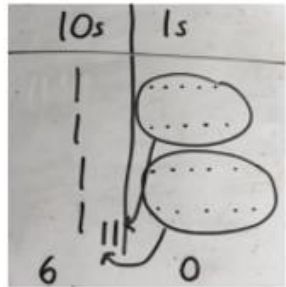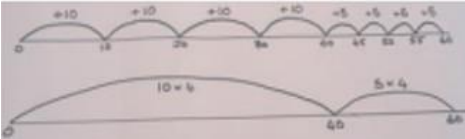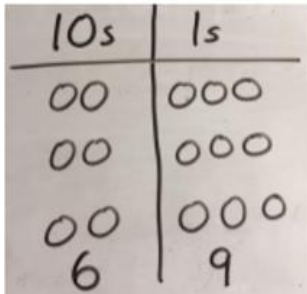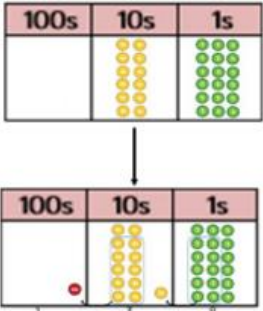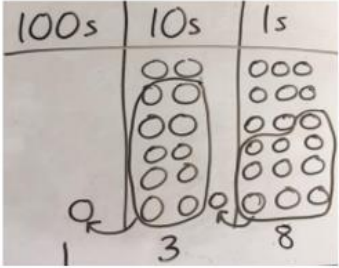
Kingfisher CE Academy Calculation Guidance

Multiplication

Key Language: double, times, multiplied by, the product of, groups of, lots of, equal groups
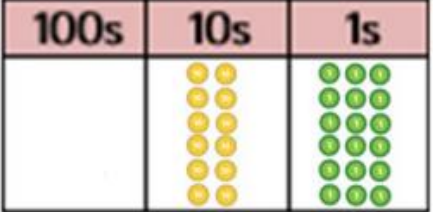
Year	Concrete	Pictorial	Abstract
EYFS/ Year 1	Repeated grouping/ repeated addition 3 x 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group. 	Children represent the practical resources in the picture and use a bar model.	
KS1	Number lines to show repeated groups- 3 x 4 	Represent this pictorially alongside a number line e.g. 	Abstract number line showing three jumps of four. 3 x 4 = 12

Year	Concrete	Pictorial	Abstract
Year 2, 3, 4	Use arrays to illustrate commutativity. Also use counters and other objects. 2 x 5 = 5 x 2 2 lots of 5 5 lots of 2	Children represent the arrays pictorially. Bar model.	Children should use an array to write multiple calculations: $10 = 2 \times 5$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $5 + 5 = 10$
Year 3	Partition to multiply using numicon or base 10. $4 \times 15 = 60$	Children to represent the concrete manipulatives pictorially.	Children to be encouraged to show the steps they have taken. A number line can also be used. 4×15, 10 5 $10 \times 4 = 40$ $5 \times 4 = 20$ $40 + 20 = 60$
Year 4/5	Formal column method with place value counters (base 10 can also be used). $3 \times 23 = 69$	Children to represent the counters pictorially.	Children to record what it is they are doing to show understanding. 3×23 $3 \times 20 = 60$ 20 3 $3 \times 3 = 9$ $60 + 9 = 69$ $\begin{array}{r} 23 \\ \times\ 3 \\ \hline 69 \\ \hline \end{array}$

Year	Concrete	Pictorial	Abstract
Year 4/5	Formal column method with place value counters/ base 10. 6 x 23 = 138	Children to represent the counters/ base 10 pictorially.	Formal column method. Can draw corresponding base 10. $6 \times 23 =$ $\begin{array}{r} 23 \\ \times\ 6 \\ \hline 138 \\ \small{1\ 1} \end{array}$
Year 6	When the children start to multiply 3d x 3d= and 4d x 3d=. They must be confident with the abstract.		Formal column method. The children must understand what happens when they have crossed out digits. $\begin{array}{r} \small{1\ 2\ 4} \\ 2\ 4 \\ \times\quad 2\ 6 \\ \hline \small{}.7\ 4\ 4 \\ \small{1\quad 2} \\ 2\ .4\ 8\ 0 \\ \hline 3\ 2\ 2\ 4 \\ \small{1\ 1} \end{array}$ Answer: 3224

Explain it or problem-solving ideas

Conceptual variation; different ways to ask children to solve 6 × 23

23	23	23	23	23	23

?

Mai had to swim 23 lengths, 6 times a week.
How many lengths did she swim in one week?

With the counters, prove that 6 x 23 = 138

Find the product of 6 and 23

$6 \times 23 =$

$\boxed{} = 6 \times 23$

$\begin{array}{r} 6 \\ \times\ 23 \\ \hline \end{array} \qquad \begin{array}{r} 23 \\ \times\ 6 \\ \hline \end{array}$

What is the calculation?
What is the product?
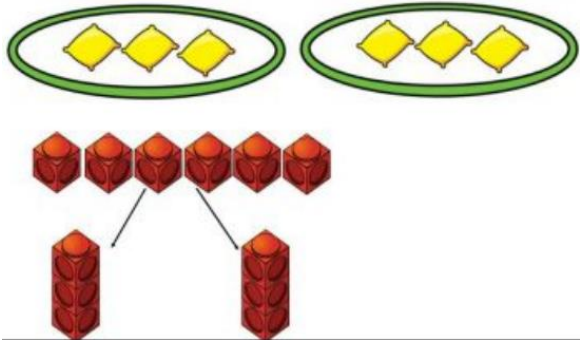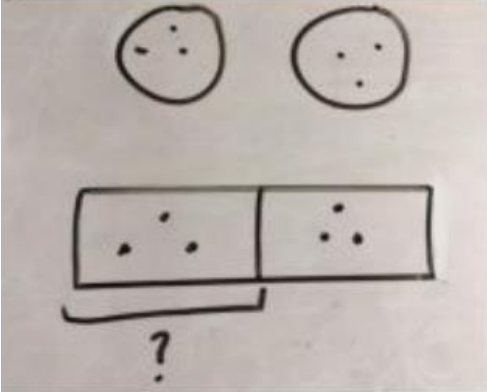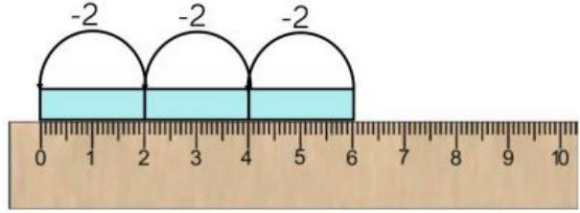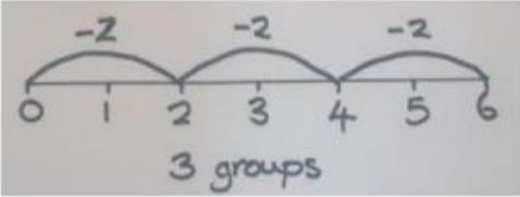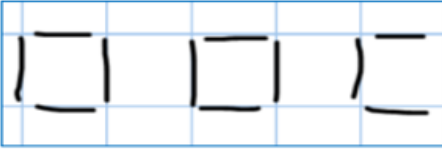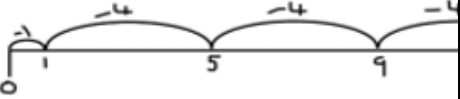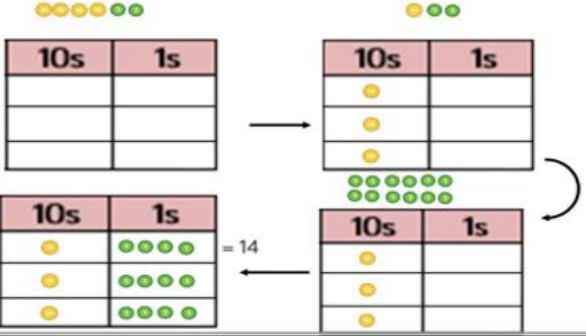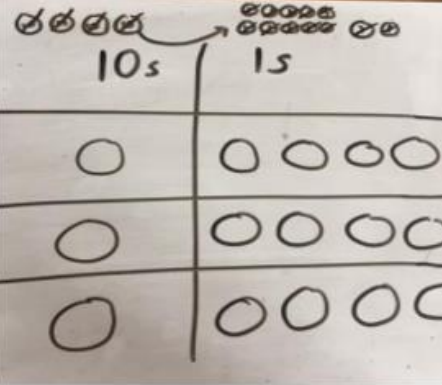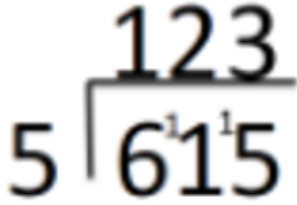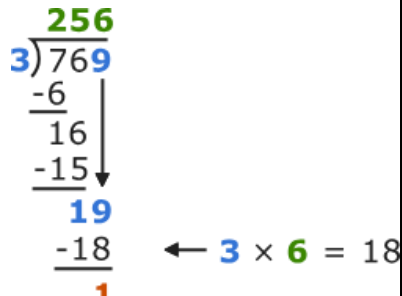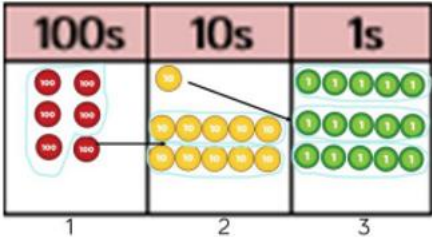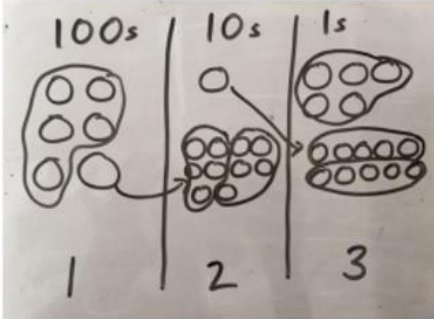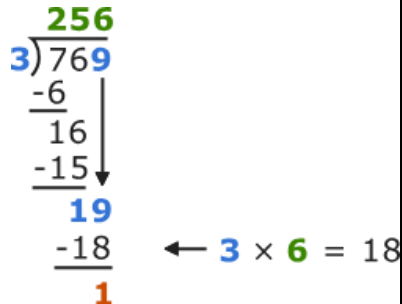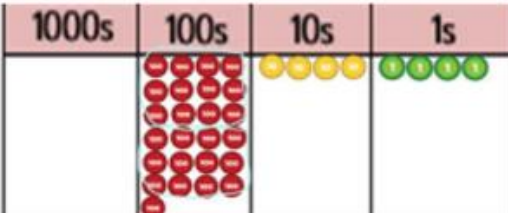
Kingfisher CE Academy Calculation Guidance

Division
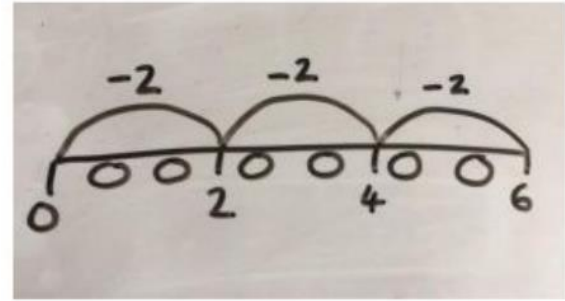
Key Language: share, group, divide, divided by, half, inverse

Year	Concrete	Pictorial	Abstract
EYFS / Year 1 / Year 2	Sharing using a range of objects. 6 ÷ 2 	Represent the sharing pictorially. 	Children should use their 2 times table facts. 6 ÷ 2 = 3
Year 2	Repeated subtraction using cubes, counters and other manipulatives. 6 ÷ 2 3 groups of 2	Children represent repeated subtraction pictorially. 	Abstract number line to represent the equal groups that have been subtracted.

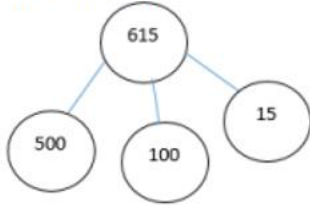| Year	Concrete	Pictorial	Abstract
Year 3	2 digit ÷ 1 digit number with remainders using lollipop sticks, rods or bundling sticks. 13 ÷ 4 Use of lollipop sticks to form wholes- squares are made because we are dividing by 4. There are 3 whole squares, with 1 left over.	Children represent the lollipop sticks pictorially. There are 3 whole squares, with 1 left o	Children should be encouraged to use their times table knowledge. 13 ÷ 4 = 3 r 1 '3 groups of 4, remainder 1.' They can also use a number line to show repeated addition.
Year 3	Sharing using place value counters or base 10. 42 ÷ 3 = 14 	Children represent the place value counters or base 10 pictorially. 	Children should be able to make sense of the place value counters and write calculations to show the process. 42 ÷ 3 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14
Year 4	Short division scaffold 	Long division scaffold (Preparation for Year 5 & 6). *Divide, multiply and subtract, bring it down, bring it up/ repeat.* 	

Year	Concrete	Pictorial	Abstract
Year 4/5/6	Short division using place value counters to group 615 ÷ 5= 1. Make 615 with counters. 2. How many groups of 500s can you make with 600? 3. Exchange 100 for 10 tens. 4. How many groups of 5 ten counters can you make with 11 ten counters? 5. Exchange 1 ten for 10 ones. 6. How many groups of 5 ones can you make with 15 ones?	Represent the place value counters pictorially. 	Use the short division method to calculate.
Year 5	See above.	Long division scaffold (Preparation for Year 5 & 6). *Divide, multiply and subtract, bring it down, bring it up/ repeat.*	
Year 6	Long division using counters 2544 ÷ 12 = We can't group 2 thousands into groups of 12 so will exchange them. We can group 24 hundreds into groups of 12 which leaves with 1 hundred. 		

Year	Concrete		Pictorial	Abstract

Year	Concrete	Pictorial	Abstract
| *Year 6-* *continued* |  After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens. | ```
  0 2 1
12 2544
   24
   14
   12
    2
``` | |
| |  After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 group of 12, which leaves no remainder. | ```
  0 2 1 2
12 2544
   24
   14
   12
   24
   24
    0
``` | |

Explain it or problem-solving ideas

Conceptual variation; different ways to ask children to solve 615 ÷ 5

Using the part whole model below, how can you divide 615 by 5 without using short division? (part-whole: 615 → 500, 100, 15)	I have £615 and share it equally between 5 bank accounts. How much will be in each account? 615 pupils need to be put into 5 groups. How many will be in each group?	$5\overline{)615}$ $615 \div 5 =$ $\Box = 615 \div 5$	What is the calculation? What is the answer? (place value chart: 100s, 10s, 1s)