Holmer C of E Academy Maths Written Calculation Policy 2022-2023

This policy supports our Maths progression document which is based on White Rose vs 4. Progression within each area of calculation is in line with the programme of study in the 2014 National Curriculum. This calculation policy should be used to support children to develop a deep understanding of number and calculation. This policy has been designed to teach children through the use of concrete, pictorial and abstract representations.

- **Concrete** representation— a pupil is first introduced to an idea or skill by acting it out with real objects. This is a 'hands on' component using real objects and is a foundation for conceptual understanding.
- **Pictorial** representation – a pupil has sufficiently understood the 'hands on' experiences performed and can now relate them to representations, such as a diagram or picture of the problem.
- **Abstract** representation—a pupil is now capable of representing problems by using mathematical notation, for example 12 x 2 = 24.

It is important that conceptual understanding, supported by the use of representation, is secure for all procedures. Reinforcement is achieved by going back and forth between these representations.

Mathematics Mastery

At the centre of the mastery approach to the teaching of mathematics is the belief that all children have the potential to succeed. They should have access to the same curriculum content and, rather than being extended with new learning, they should deepen their conceptual understanding by tackling challenging and varied problems. Similarly, with calculation strategies, children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations. This policy outlines the different calculation strategies that should be taught and used in Year 1 to Year 6 in line with the requirements of the 2014 Primary National Curriculum.

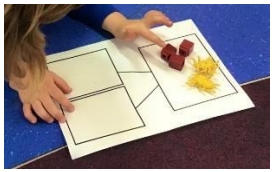
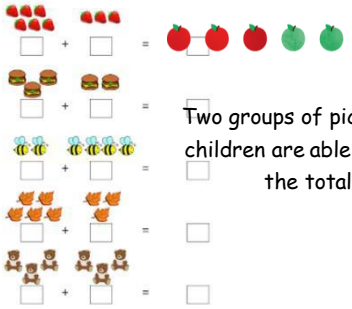
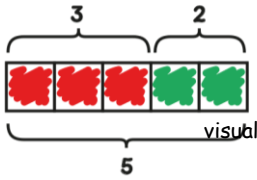
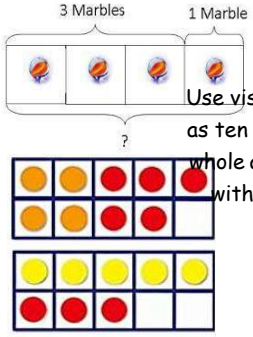
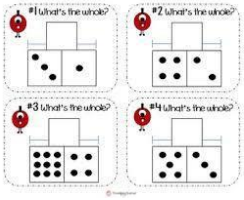
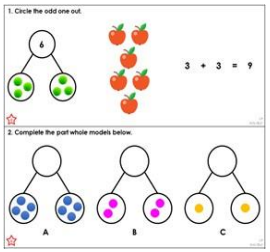
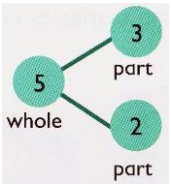
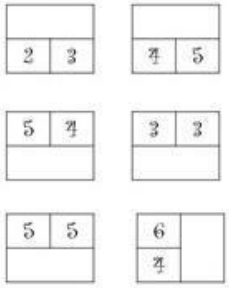
How to use the policy:

This mathematics policy is a guide for all staff in Holmer C of E Academy and has been adapted from work by the NCETM. All teachers have been given the scheme of work from the White Rose Maths Hub and are required to base their planning around their year group's modules and not to move onto a higher year group's scheme work. Teachers can use any teaching resources that they wish to use and the policy does not recommend one set of resources over another, rather that, a variety of resources are used. Staff are, however, expected to support teaching with appropriate resources and manipulatives which will lead to a secure understanding.

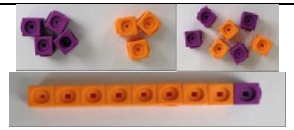
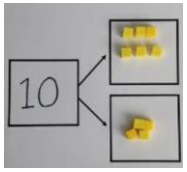
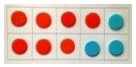
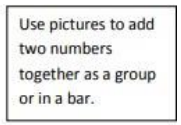
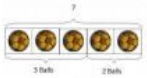
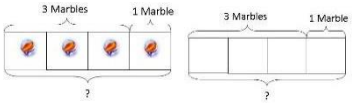
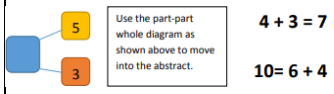
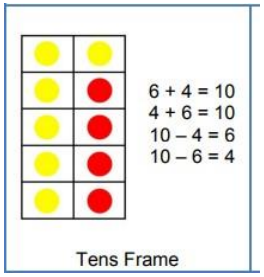
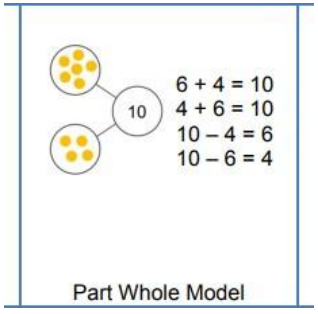
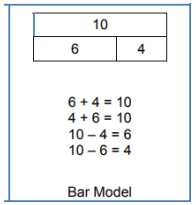
For each of the four rules of number, different strategies are laid out, together with examples of what concrete materials can be used and how, along with suggested pictorial representations. The principle of the concrete-pictorial-abstract (CPA) approach [**Make it, Draw it, Write it**] is for children to have a true understanding of a mathematical concept, they need to master all three phases within a year group's scheme of work.

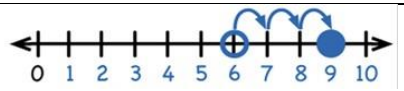
Addition

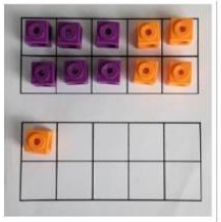
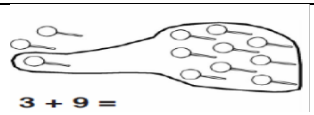
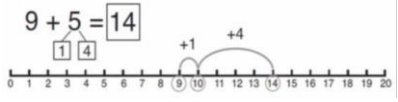
Addition- EYFS

Small Steps	Concrete	Pictorial	Abstract	PS & Reasoning
- Knows that a group of things change in quantity when something is added. - Find the total number of items in two groups by counting all of them. - Says the number that is one more than a given number. - Finds one more from a group of up to five objects, then ten objects. - In practical activities and discussion, beginning to use the vocabulary involved in adding. - Using quantities and objects, they add two single digit numbers and count on to find the answer. - Solve problems including doubling.	   Use toys and general classroom resources for children to physically manipulate, group/regroup.  Use specific maths resources such as counters, snap cubes, Numicon etc.    Use visual supports such as ten Frames, part-part whole & addition mats with the physical objects and resources that can be manipulated.	 Two groups of pictures so children are able to count the total.  Bar model using v visuals, pictures/icons or colours.  Use visual supports such as ten frames, part part whole and addition mats with pictures/icons.  	A focus on symbols and numbers to form a calculation. $5+2=7$   * No expectation for children to be able to record a number sentence/addition calculation.	**Problem Solving** Here are three apples. Here are two more. How many apples are there now? **Reasoning** 3 + 2 = 6 Correct or incorrect?

Addition- Year 1

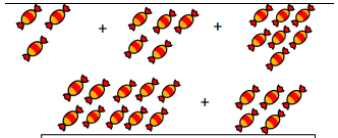
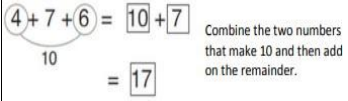
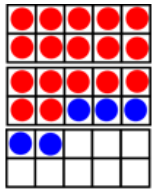
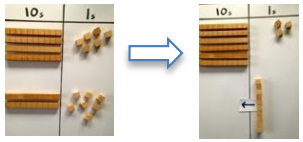
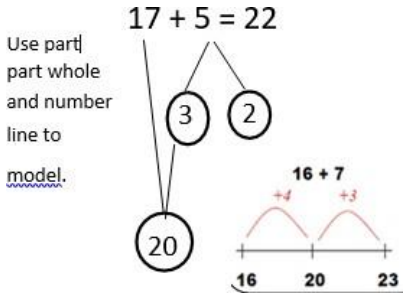
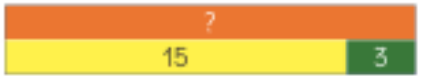
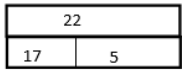
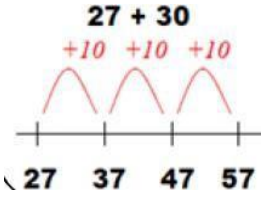
Small Steps	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
Combining two parts to make a whole: part- whole model	 Use cubes to add two numbers together as a group or in a bar. (Some children may still need to use real objects)  Use part-part whole model   (Ten frame) Numicon Use numicon or tens frame	  Use pictures to add two numbers together as a group or in a bar.   <u>The Bar Model</u> will be continued from EYFS as a method to support problem solving involving addition, continuing with the concrete representations and moving onto using pictorial representations of objects. Some children will also move onto the abstract.  Pictorial (concrete) Abstract	 4 + 3 = 7 10= 6 + 4	5 + 3 <, > or = 2 + 7? **Continue the pattern:** 1 + 7 = 8 2 + 6 = 8 3 + … = 8
Represent and use number bonds and related subtraction facts within 20	 (Some children may need to initially use real objects then move onto the representation, egg boxes may also be used to support this)		 Bar model and part-part whole to be used alongside abstract	**Continue the pattern:** 10 + 8 = 18 11 + 7 = 18 Can you make up a similar pattern for the number 17? How would this pattern look if it included subtraction? **Missing numbers:** 9 + ? = 10 10 + ? = 19

Addition and subtraction of one-digit and two-digit numbers to 20 including 0.		6+3=9  Start at the larger number on the number line and count on in ones.	5 + 12 = 17 17= 12 + 5	**Working backwards** Through practical games on number tracks and lines, ask questions such as 'Where have you landed?' and 'What numbers would you need to throw to land on other given numbers?' **What do you notice?** 11+ 9 =20 12 + 8 = 20 13 + 7 = … Can you make up some other number sentences like this involving 3 different numbers?

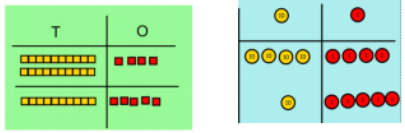
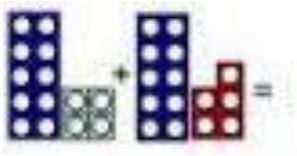
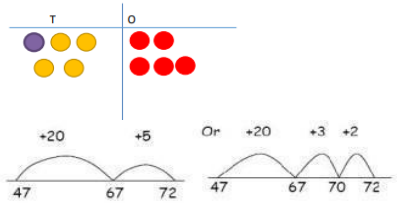
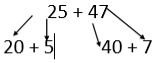
Start at the bigger number and counting on	Start with the larger number on the bead string and then count of to the smaller number 1 by 1 to find the answer.			
Regrouping to make 10 (The 'Make 10' strategy)	 6 + 5 = 11  Start with the bigger number and use the smaller number to make 10. Use ten frames.	 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?	**Pattern spotting:** 2 + 9 =11 3 + 8 = 11 4 + - = 11

Vocabulary	add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, balancing, part, part, whole, group, plus, part-whole model, whole, part, number sentence, altogether, in total, add, count on, missing part, how many are left?, in total, taken away, subtract, subtraction, addition, count backwards, How many more?, How many fewer?, difference.
NC links	• Ma1/2.2a read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs • Ma1/2.2b represent and use number bonds and related subtraction facts within 20 • Ma1/2.2c add and subtract one-digit and two-digit numbers to 20, including 0 • Ma1/2.2d solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? - 9.

Addition- Year 2

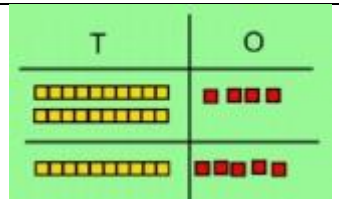
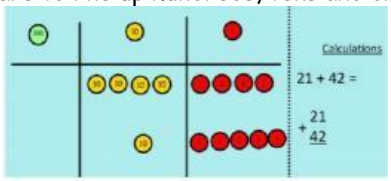
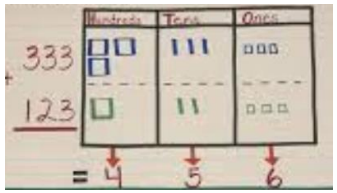
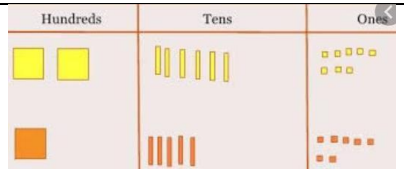
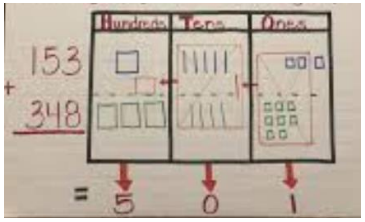
Small Steps	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
Adding 3 1-digit numbers	**4 + 7 + 6= 17** Put 4 and 6 together to make 10. Add on 7.  Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.	 Add together three groups of objects. Draw a picture to recombine the groups to make 10.	 	Tom has 3 conkers, Tim has 5 conkers and Bob has 7 conkers. How many do they have altogether? **Always, sometimes or never true?** Whenever you add 3 1-digit numbers your answer will be less than 10.
Adding a 2-digit number and ones across a 10	 17 + 5 = 22 Use ten frame to make 'magic ten Children explore the pattern. 17 + 5 = 22 27 + 5 = 32 Rounding and adjusting: 46 + 27 = 60 + 13 = 73 	Use part part whole and number line to model.  Bar Model  	17 + 5 = 22 Explore related facts 17 + 5 = 22 5 + 17 = 22 22—17 = 5 22—5 = 17  	If I know that 13 + 5 = 18, then I also know… Continue the pattern: 16 + 4 = 22 26 + 4 = 32 36 + 4 = ___ True or false? 17 + 5 > 18 + 4
Adding and subtracting 10s.		 Base 10 may be used above the number line initially.	27 + 10 = 37 27 + 20 = 47 27 + ? = 57 65 – 10 = 55 65 – 20 = 45 65 - ? = 35	Continue the pattern: 92 = 82 + 10 92 = 72 + 20 Can you make a similar pattern starting with the numbers 74m 26 and 100?

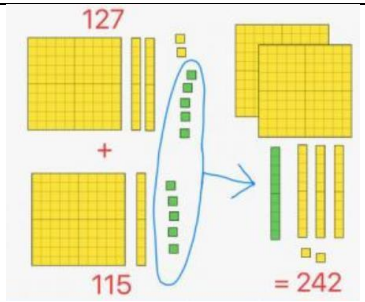
		The calculation will be shown alongside the number line to see the connection		

Adding two 2-digit numbers (Not across a 10)	**24 + 15=** Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.  (Some children may not be ready for place value counters in Y2) Numicon should therefore also be used 	After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.  Use number line and bridge ten using part whole if necessary. Base 10 may be used above the number line. The calculation will be shown alongside the number line to see the connection **Model** | **Calculation** The Bar Model will be used to support problem solving moving onto the generalisation that b+c=a. Children will focus on using the abstract representation with the pictorial to support where necessary.	Partitioning:  20 + 40 = 60 5+ 7 =12 60 + 12 = 72 *Recording addition in columns supports place value and prepares for formal written methods with larger numbers.* Toward the end of the year, children move to more formal recording using partitioning method: 40 + 7 30 + 5 70 + 12	True or false? Are the number sentences true or false? 33 + 40 =53 46 + 32 = 78 Give your reasons Hard and easy questions Which questions are easy/hard? 23 + 10 = 93 + 10 = 54 + 9 = 54 + 1 = Explain why you think the hard questions are hard.
Vocabulary	fact family, number sentence, number bond, 10 more, 10 less, total, tens ones, subtract, difference, bar model, represent, how many are left?, in total, taken away, subtract, count backwards, How many more?, How many fewer?, difference.			
NC Links	• Ma2/2.2a solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures applying their increasing knowledge of mental and written methods • Ma2/2.2b recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100			

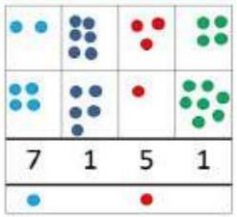
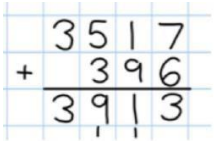
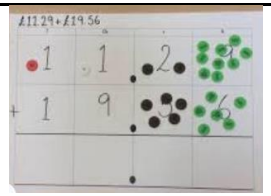
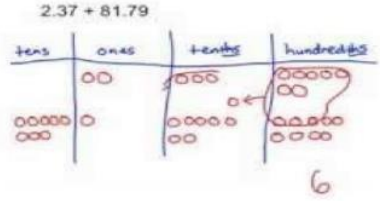
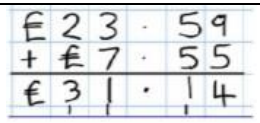
	• Ma2/2.2c add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and 1s a two-digit number and 10s 2 two-digit numbers adding 3 one-digit numbers • Ma2/2.2d show that addition of 2 numbers can be done in any order (commutative) and subtraction of one number from another cannot • Ma2/2.2e recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

Addition- Year 3

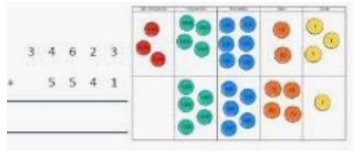
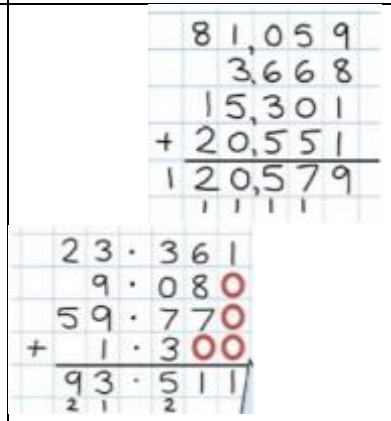
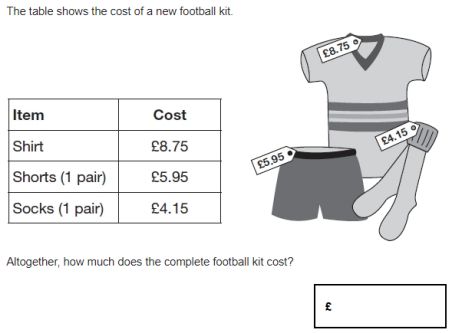
Small Steps	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
Add and subtract numbers with up to 3-digits, using formal written methods of columnar addition Column addition (no regrouping)	 Using manipulatives (dienes, numicon, counters), children are to line up hundreds, tens and ones.  Children should be secure with using PV counters before moving onto pictorial. The calculation will be shown alongside the model used to see the connection **Model** | **Calculation**	 Children are to draw, in a PV frame, the manipulatives, that they are using. Secure knowledge of representation with the PV columns. The calculation will be shown alongside the model to see the connection **Model** | **Calculation**	Children to move onto recording more formally. 2 2 3 + 1 1 4 3 3 7 Some children may need to use the expanded method (see below).	**Problem Solving** Year 1 had 115 pencils. Year 2 had 232 pencils. How many did they have altogether? **Reasoning** Convince me: ◯◯ + ◯◯+ ◯◯ The total is 201. Each missing digit is either a 9 or a 1. Write in the missing digits. Is there only one way of doing this or lots of ways? Convince me.
Column addition (with regrouping)	 	 Children can draw a representation of the grid to further support their understanding, carrying the ten ***underneath*** the line.	20 + 5 40 + 8 60 + 13 = 73 Children are to begin with the abstract: expanded form. For those children, that are confident after AFL, the below method should be used. 536 + 85 621 11	In a school, 232 pupils have blue eyes and 119 have brown eyes. How many pupils are there altogether? 338 + 152 > 153 + 337 How do you know? Is there an easier way of doing this?

	 Exchange ten ones for a ten. Model using Dienes, Numicon and place value counters.			
Vocabulary	Addition, subtraction, mental method, column method, exchange, estimate, approximate/ly, digit.			
NC Links	• Ma3/2.2a add and subtract numbers mentally, including: i. a three-digit number and 1s ii. a three-digit number and 10s iii. a three-digit number and 100s • Ma3/2.2b add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction • Ma3/2.2c estimate the answer to a calculation and use inverse operations to check answers • Ma3/2.2e solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.			

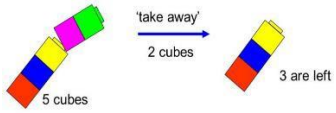
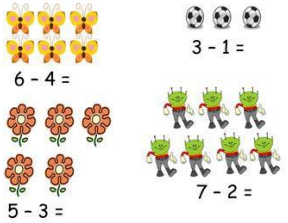
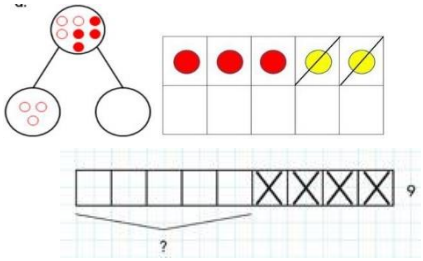
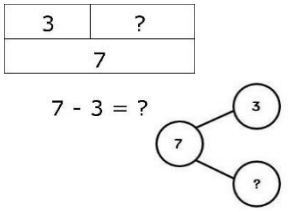
Addition- Year 4

Small Steps	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
Using formal written methods of columnar addition where appropriate add numbers with up to 4 digits (with exchange)	Children continue to use dienes or place value counters to add, exchanging ten ones for a ten and ten tens for a hundred and ten hundreds for a thousand.  **Model** | **Calculation**	 Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.	Continue from previous work to carry hundreds as well as tens.  	**Reasoning** - Convince me: □ + 8◯5 = 1232 What is the largest possible three digit number that can go in the square? What is the smallest? Convince me. **Problem Solving** – In one day, the butchers made £2432. The bakers made £3517. What was the combined total?
Add decimals with 2 decimal places, including money.	 Introduce decimal place value counters and model exchange for addition.	 	 As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.	**Problem Solving** - Year 3 raised £23.52 and Year 4 raised £32.67. How much did they raise altogether? **Reasoning** Always, sometimes or never true. When you add two decimal numbers you never get a whole number.
Vocabulary	Addition, total, more than (>), subtraction, less than (<), column method, estimate, how much, strategy, efficient, accurate, exact, fact.			
NC Links	Ma4/2.2a add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate Ma4/2.2b estimate and use inverse operations to check answers to a calculation Ma4/2.2c solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.			

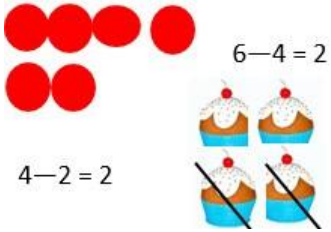
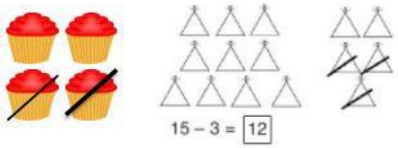
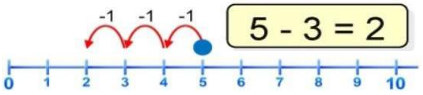
Addition- Year 5/6

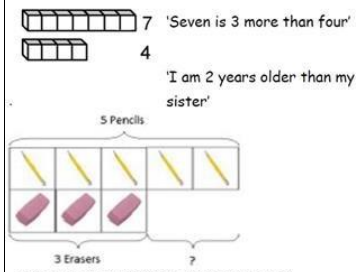
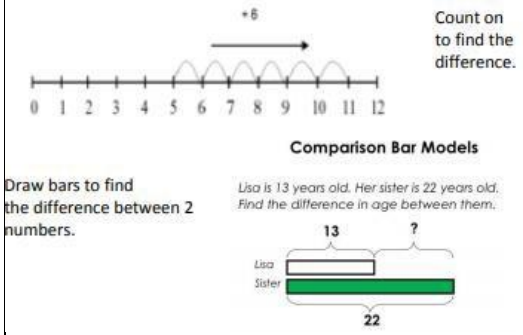
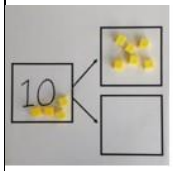
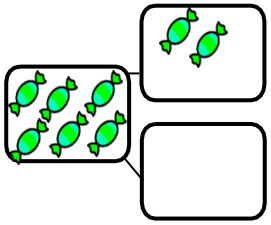
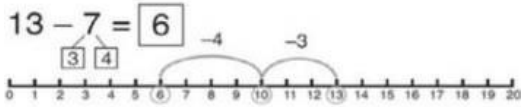
Small Steps	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
Add numbers with more than 4 digits.	See Year 4	See Year 4	 Children should have abstract supported by a pictorial or concrete if needed.	**Problem Solving:** Year 5 collected 6532 football cards. Year 6 collected 3814 football cards. How many did they have altogether? **Reasoning:** True or false? Whenever we add two four digit numbers, our answer will always have 8 digits. Prove it!
Add several numbers of increasing complexity, including adding money, measure and decimals with different numbers of decimal points.	See Year 4	See Year 4	 Insert zeros for place holders. Ensure pupils understand they do not change the value.	**Problem Solving**  **Reasoning:** Robin has these coins: X, X, X, X Tom has these coins: X, X, X, X Who has the most? Explain how you know.
Vocabulary	Add, subtract, ones (1s), tens (10s) hundreds (100s), thousands (1,000s), ten thousands (10,000s), mentally, inverse, round, estimate, sum. Column addition, column subtraction			
NC links	Ma5/2.2a add and subtract whole numbers with more than 4 digits,including using formal written methods (columnar addition and subtraction) Ma5/2.2b add and subtract numbers mentally with increasingly large numbers Ma5/2.2c use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy Ma5/2.2d solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. Ma6/2.1a read, write, order and compare numbers up to 10 000 000 and determine the value of each digit Ma6/2.1b round any whole number to a required degree of accuracy Ma6/2.1c use negative numbers in context, and calculate intervals across 0 Ma6/2.1d solve number and practical problems that involve all of the above.			

Subtraction

Subtraction- EYFS				
Small Steps	**Concrete**	**Pictorial**	**Abstract**	**Reasoning and Problem Solving**
- Knows that a group of things change in quantity when something is taken away - Find one less from a group of five objects, then ten objects. - In practical activities and discussion, beginning to use the vocabulary involved in subtracting. - Using quantities and objects, they subtract two single digit numbers and count back to find the answer.	   Use toys and general classroom resources for children to physically manipulate, group/regroup.    Use specific maths resources such as snap cubes, Numicon, bead strings etc.   Use visual supports such as ten frames, part part whole and subtraction mats, with the physical objects and resources that can be manipulated.	  A group of pictures for children to cross out or cover quantities to support subtraction.  Use visual supports such as ten frames, part part whole and bar model with pictures/icons.	A focus on symbols and numbers to form a calculation.  10 - 6 = 4  * No expectation for children to be able to record a number sentence/addition calculation.	**Problem Solving:** I have 3 cakes. I eat 2 cakes. How many are left? **Reasoning**: There are 8 passengers on the bus. 2 get off. Tom says there are 5 left. Do you agree? Show me how you know!

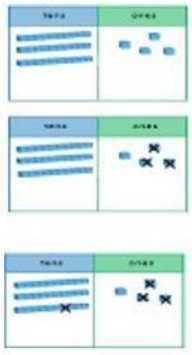
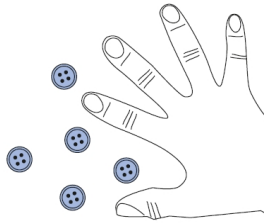
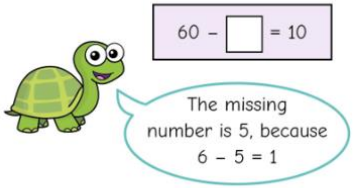
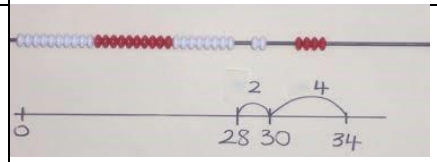
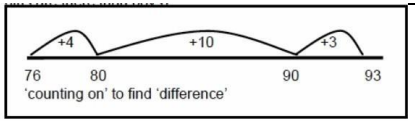
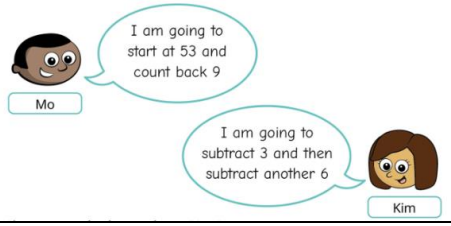
Subtraction- Year 1

Small Steps	Concrete	Pictorial	Abstract	Reasoning and Problem Solving
Subtract one-digit and two-digit numbers to 20, including 0. 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	**Problem Solving:** There are 9 children. 6 of them have scooters. How many do not? **Reasoning:** What do you notice? 11 – 1 = 10 11 – 10 = 1 Can you make up some other number sentences like this involving 3 different numbers?
Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones. **13 – 4**  Use counters and move them away from the group as you take then away counting backwards as you go. 	 Count back on a number line or track Start at the bigger number and count back the smaller number showing the jumps on the number line.	Put 13 in your head, count back 4. What number are you at? (Use your fingers to help you)	Tom had £12. He spent £7. He says he has £4 left. Do you agree? Show me how you know.

Find the difference	Compare objects and amounts  Lay objects to represent bar model.	 	Hannah has12 sweets and her sister has 5. How many more does Hannah have than her sister?	**Problem Solving**: Tom is 6. His brother is 4. What is the difference in age between them? **Reasoning** Two numbers have a difference of 4 The larger number is less than 10 What could the two numbers be?
Represent and use number bonds and related subtraction facts within 20 Part-part whole model	 Link to addition. Use PPW model to model the inverse. If 10 is the whole and 6 is one of the arts, what s the other part? 10—6 = 4	 Use a pictorial representation of objects to show the part-part whole model	 Move to using numbers within the part whole model.	What else do you know? If you know this: 7 – 4 = 3, what other facts do you know?
Make 10	**14 – 9 =**  Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.	 Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.	How many do we take off to reach the next 10? How many do we have left to take off? 16 – 8=	Tim is subtracting 8 from 15. He first counts back five from 15: `15, 14, 13, 12, 11… Then he takes away another 3 to get 8, Can you spot and correct his mistake?
Vocabulary	Group, plus, part-whole model, whole, part, number sentence, altogether, in total, add, count on, missing part, how many are left?, in total, taken away, subtract, subtraction, addition, count backwards, How many more?, How many fewer?, difference.			

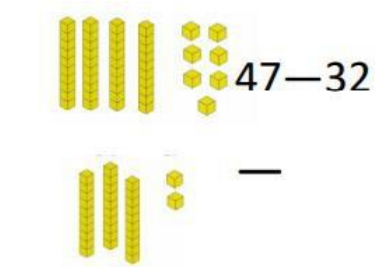
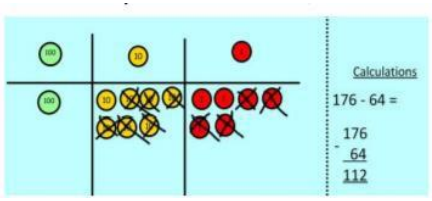
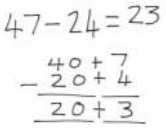
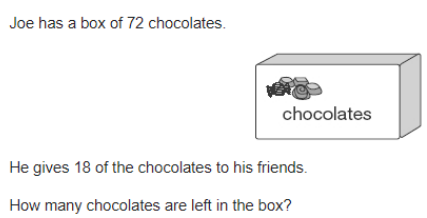
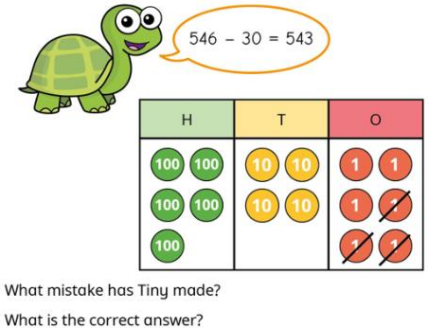
NC Links	• Ma1/2.2a read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs • Ma1/2.2b represent and use number bonds and related subtraction facts within 20 • Ma1/2.2c add and subtract one-digit and two-digit numbers to 20, including 0 • Ma1/2.2d solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? - 9.

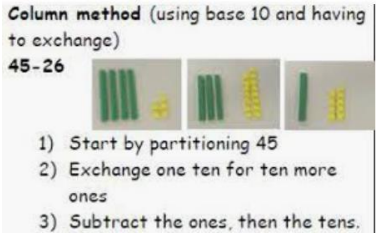
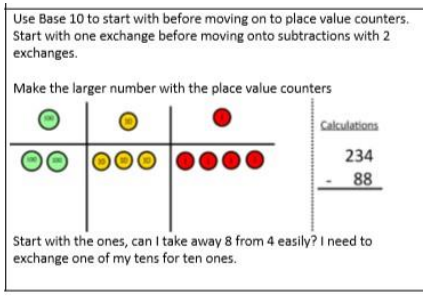
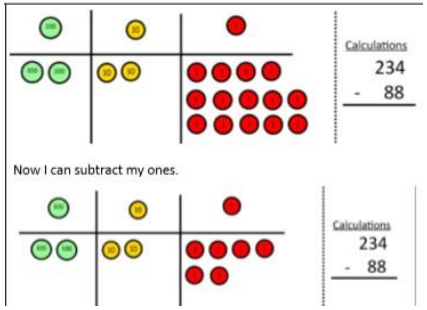
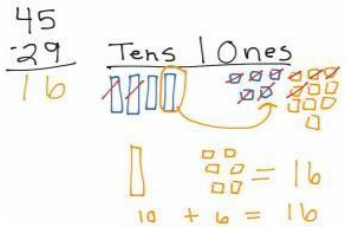
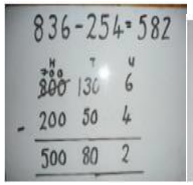
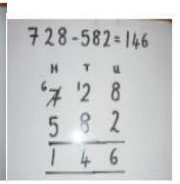
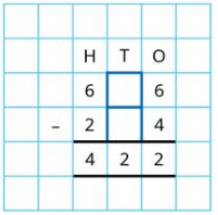
Subtraction- Year 2

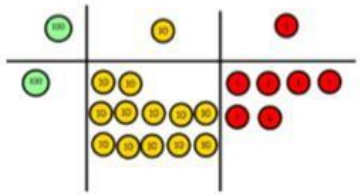
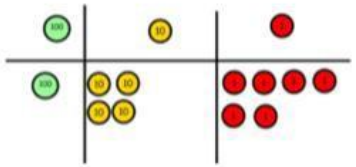
Small Steps	Concrete	Pictorial	Abstract	Reasoning and Problem Solving
Subtract a two-digit number and ones, a two- digit number and tens, two two-digit numbers Partitioning to subtract without re-Grouping: 'Friendly numbers'	34—13 = 21  Use Dienes to show how to partition the number when subtracting without regrouping. The calculation will be shown alongside the manipulative used **Model** | Calculation	Children draw representations of Dienes and cross off.  43—21 = 22	43—21 = 22 *Recording subtraction in columns supports place value and prepares for formal written methods with larger numbers.* Toward the end of the year, children move to more formal recording using partitioning method: e.g. 43-21=22 40 and 3 -20 and 1 20 and 2	Problem Solving Ben puts 35 buttons on the table. He hides some with his hand. How many are hidden?  Reasoning Tiny is working out the missing number.  Do you agree with Tiny? Explain your answer.
Make ten strategy	 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	Reasoning Who is correct? How do you know? Mo and Kim use different methods to work out 53 – 9 
Vocabulary	equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left, how much less is…difference, count on, strategy, partition, tens units			

NC Links	• Ma2/2.2a solve problems with addition and subtraction: using concrete objects and pictorial representations, including those involving numbers, quantities and measures applying their increasing knowledge of mental and written methods • Ma2/2.2b recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 • Ma2/2.2c add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a two-digit number and 1s a two-digit number and 10s 2 two-digit numbers adding 3 one-digit numbers • Ma2/2.2d show that addition of 2 numbers can be done in any order (commutative) and subtraction of one number from another cannot • Ma2/2.2e recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

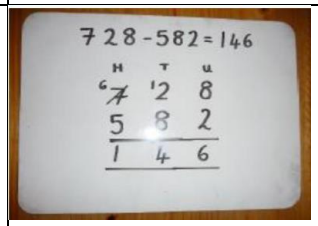
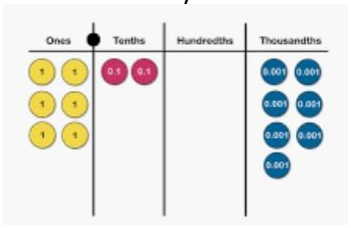
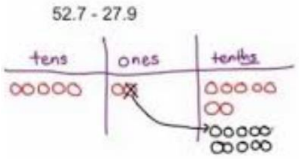
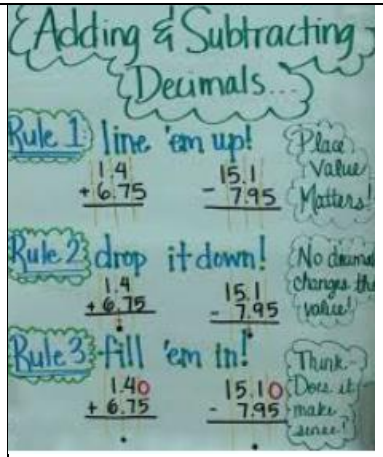
Subtraction- Year 3

Small Steps	Concrete	Pictorial	Abstract	Reasoning and Problem Solving
To subtract numbers with up to three-digits, using formal written methods of columnar subtraction Column subtraction (without exchanging)	 Use base 10 or Numicon to model The calculation will be shown alongside the model chosen to see the connection **Model** | **Calculation**	Children are to be secure with use of PV counters before moving onto abstract. 	Introduce formal method ASAP. Only use expanded method as an intervention for those children who are unable to access formal method.  	**Problem Solving:**  **Reasoning:** 

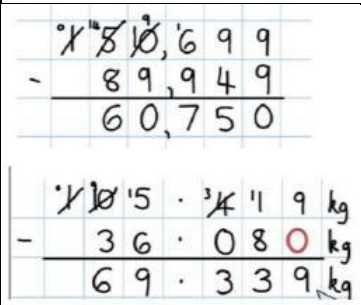
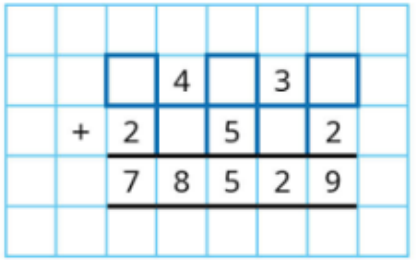
Column Subtraction (with exchanging)	Begin with base 10 or Numicon. Move to pv counters, modelling the exchange of a ten into ten ones. Use the phrase 'take and make' for exchange.  **Column method** (using base 10 and having to exchange) **45-26** 1) Start by partitioning 45 2) Exchange one ten for ten more ones 3) Subtract the ones, then the tens.  Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges. Make the larger number with the place value counters Calculations 234 - 88 Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.  Calculations 234 - 88 Now I can subtract my ones. Calculations 234 - 88	 45 -29 16 Tens | Ones = 16 10 + 6 = 16 When confident, children can find their own way to record the exchange/regrouping	Introduce formal method ASAP. Only use expanded method as an intervention for those children who are unable to access formal method.  836-254=582  728-582=146	What could the missing digits in the subtraction be? Find all the possible answers.  H T O 6 ☐ 6 - 2 ☐ 4 4 2 2 What is the pattern for the two missing digits? Explain your answer.

	Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.  Calculations 234 - 88 Now I can take away eight tens and complete my subtraction  Calculations ~~2~~1~~3~~4 - 88 146 Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.
Vocabulary	equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left, how much less is…difference, count on, strategy, partition, tens units, subtraction, mental method, column method, exchange, estimate, approximate/ly, digit.
NC Links	• Ma3/2.2a add and subtract numbers mentally, including: iv. a three-digit number and 1s v. a three-digit number and 10s vi. a three-digit number and 100s • Ma3/2.2b add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction • Ma3/2.2c estimate the answer to a calculation and use inverse operations to check answers • Ma3/2.2e solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

Subtraction- Year 4

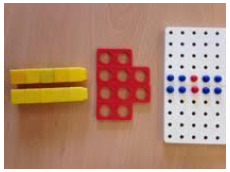
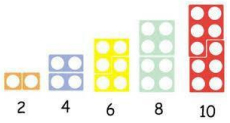
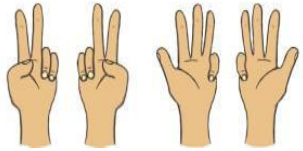
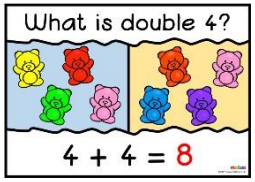
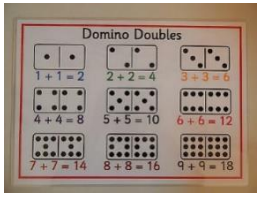
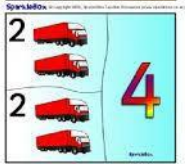
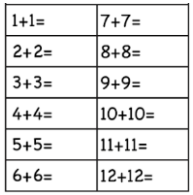
Small Steps	Concrete	Pictorial	Abstract	Reasoning and Problem Solving
Subtract numbers with up to 4 digits using the formal written methods appropriate of columnar subtraction where appropriate Year 4 subtraction with up to 4 digits.	Model process of exchange using Numicon, base ten and then move to PV counters. Use the phrase 'take and make' for exchange- see Y3 The calculation will be shown alongside the model chosen to see the connection **Model** | **Calculation**	Children to draw PV counters and show their exchange—see Y3 The calculation will be shown alongside the model chosen to see the connection	 This will lead to an understanding of subtracting any number including decimals.	**Problem Solving** Dani and Aisha are raising money for charity. Dani raises £2,304 and Aisha raises £1,695 How much money have they raised altogether? **Reasoning** Convince me ☐ - 666 = 8☐5 What is the largest possible number that will go in the rectangular box? What is the smallest? Convince me
Introduce decimal subtraction through context of money	Children to be encouraged to use counters to represent numbers and take counters away to subtract. 	 When confident, children can find their own way to record the exchange/regrouping **Model** | **Calculation**		Problem Solving: The bed cost £254.76. Kasper paid for this with a £400 note. How much change did he get? **Reasoning:** £6.50 - £1.75 <, >,or = £5.75 - £1.20?
Vocabulary	Addition, total, more than (>), subtraction, less than (<), column method, estimate, how much, strategy, efficient, accurate, exact, fact.			
NC Links	Ma4/2.2a add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate Ma4/2.2b estimate and use inverse operations to check answers to a calculation Ma4/2.2c solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.			

Subtraction- Year 5/6

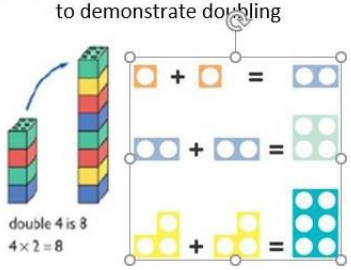
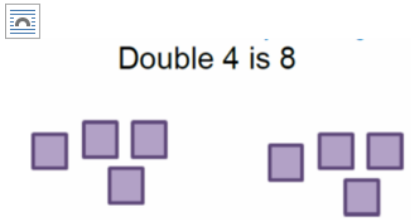
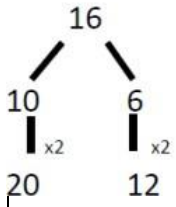
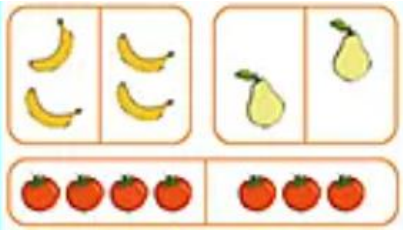
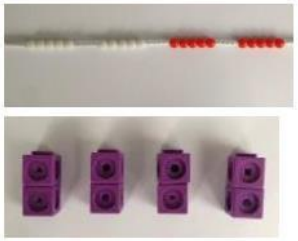
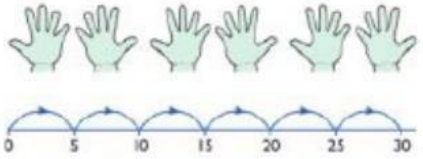
Small Steps	Concrete	Pictorial	Abstract	Reasoning and Problem Solving
Subtract with at least 4 digits, including money and measures. Subtract with increasingly large and more complex numbers and decimal values (up to 3 decimal place).	See Year 4	**See Year 4**		**Problem Solving** Emma has a 5 litre bag of compost.  She uses 2.75 litres. How much compost does Emma have left? Calculate the missing numbers:  **Reasoning**  Tiny is working out a subtraction. 53,209 – 27,452 = 34,257 What mistake has Tiny made?
Vocabulary	equal to, take, take-away, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least count back, how many left, how much less is…difference, count on, strategy, partition, tens units			
NC Links	Ma5/2.2a add and subtract whole numbers with more than 4 digits,including using formal written methods (columnar addition and subtraction) Ma5/2.2b add and subtract numbers mentally with increasingly large numbers Ma5/2.2c use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy Ma5/2.2d solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. Ma6/2.1a read, write, order and compare numbers up to 10 000 000 and determine the value of each digit Ma6/2.1b round any whole number to a required degree of accuracy Ma6/2.1c use negative numbers in context, and calculate intervals across 0 Ma6/2.1d solve number and practical problems that involve all of the above.			

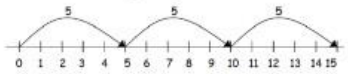
Multiplication

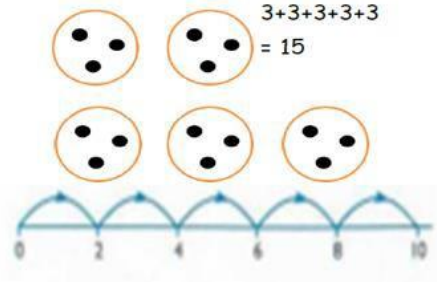
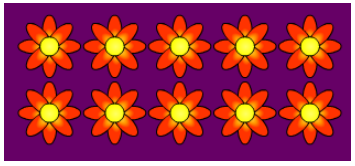
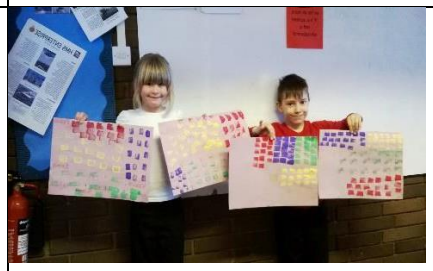
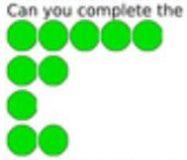
Multiplication-EYFS

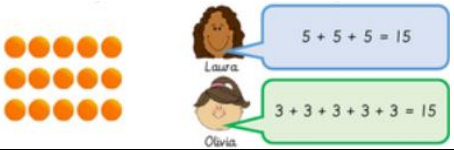
Small Steps	Concrete	Pictorial	Abstract	Reasoning and Problem Solving
- Solve problems including doubling	   Counting and other maths resources for children to make 2 equal groups.   Physical and real life examples that encourage children to see concept of doubling as adding two equal groups.	    Pictures and icons that encourage children to see concept of doubling as adding two equal groups.	 Addition calculations to model adding two equal groups.	Problem Solving Tom has three pairs of socks. How many socks does he have altogether? Reasoning: Which is bigger? Double 2 or double 3? How do you know?

Multiplication- Year 1

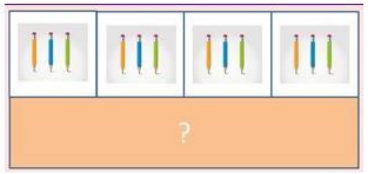
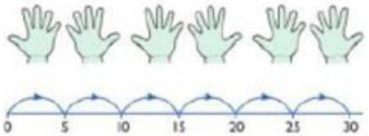
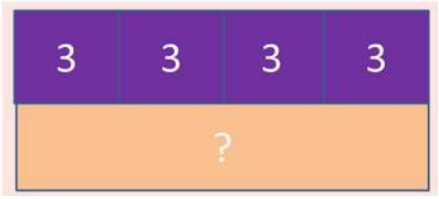
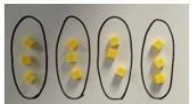
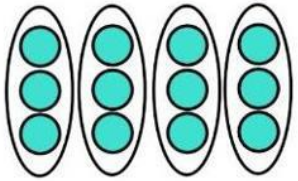
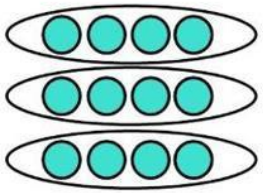
NC Objective & Strategy	Concrete	Pictorial	Abstract	Reasoning and Problem Solving
Doubling	Use practical activities using manip-ultives including cubes and Numicon to demonstrate doubling 	Draw pictures to show how to double numbers 	Partition a number and then double each part before recombining it back together. 	**Problem Solving:** Emma has 5 potatoes but she needs double for her recipe. How many potatoes does Emma need?  **Reasoning:** Which are doubles? 
Counting in multiples	 Count in multiples supported by concrete objects in equal groups.	 Use a number line or pictures to continue support in 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**	**Problem Solving** How many wheels are there? Count in groups of two.  **Reasoning** Complete using < , > or = 3 groups of 5 __ 6 groups of 2

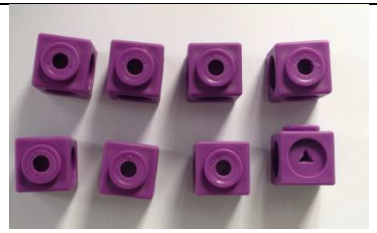
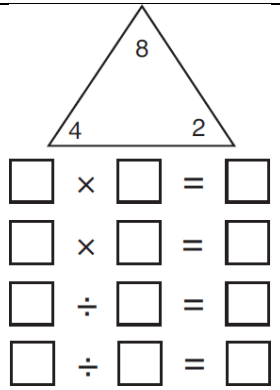
Repeated addition	  Use different objects to add equal groups.	There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?  2 add 2 add 2 equals 6  5 + 5 + 5 = 15	Write addition sentences to describe objects and pictures.  2 + 2 + 2 + 2 + 2 = 10	**Problem Solving** How many legs do 2 pigs have?  How many legs do 3 pigs have?  **Reasoning** Tom says 5 pigs would have 10 legs. Explain the mistake he has made.

		Use pictorial including number lines to solve problems. There are 3 sweets in one bag. How many sweets are in 5 bags altogether?  3+3+3+3+3 = 15		
Understanding arrays	Use objects laid out in arrays to find the answers to 2 lots 5, 3 lots of 2 etc. 		3 x 2 = 6 2 x 5 = 10	**Problem Solving** Sam is making an array using counters. He completes the first row but doesn't finish the rest of his array. Can you complete the array?  What calculations can you make from the array?

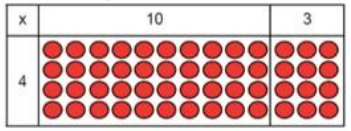
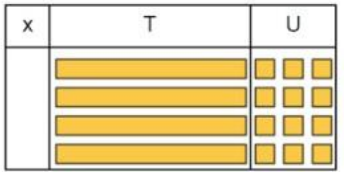
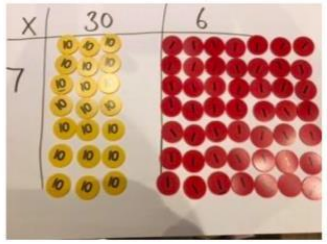
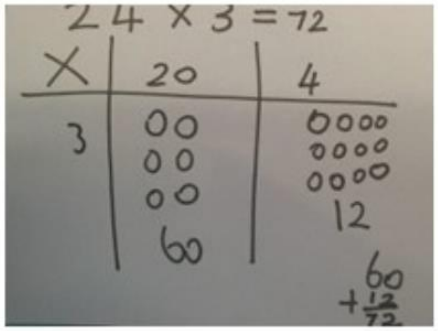
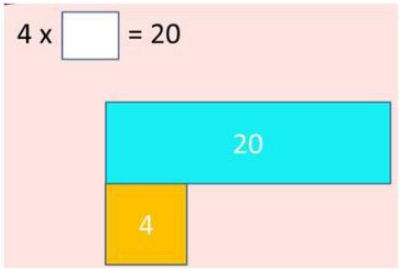
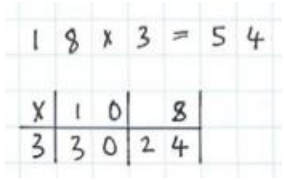
				Reasoning Laura and Olivia are writing the number sentences based on the arrays shown. Who do you agree with and why? 
Vocabulary	Groups of, lots of, times, array, altogether, multiply, fact family, number sentence, number bond, 10 more, 10 less, total, tens ones, subtract, difference, bar model, represent, how many are left?, in total, taken away, subtract, count backwards, How many more?, How many fewer?, difference.			
NC Links	Ma1/2.3a 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.			

Multiplication- Year 2

NC Objective and Strategy	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
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.  5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40   	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 $4 \times 3 = \square$	**Problem Solving:**  This barrel has 5 litres of water in it. How much water would there be in 6 barrels? Can you show how you worked out your answer? **Reasoning** I have 30 counters and I want to put them in equal groups with no leftovers. Can you predict what groups I can make? Use counters to see if you have found them all. 
Multiplication is commutative	Create arrays using counters and 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 × 4 12 = 4 × 3 Use an array to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15	**Problem Solving** Copy and complete: 2 x ____ = 16 16 ÷ 2 = ____ 8 x ____ = 16 16 ÷ 8 + _____ **Reasoning** True or False? a. Multiplication is commutative. _____ b. Division is commutative. _____ c. 5 × 6 has the same value as 6 × 5. _____ d. 12 ÷ 2 has the same value as 2 ÷ 12. _____ Can you prove it?

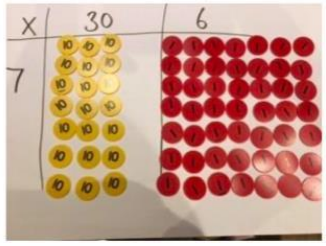
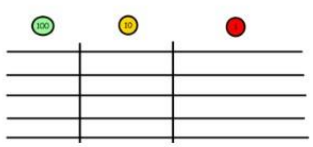
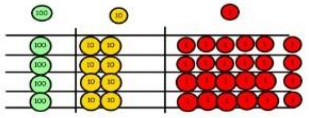
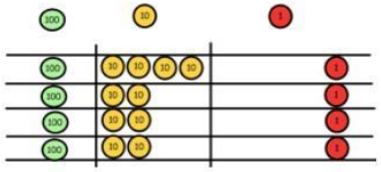
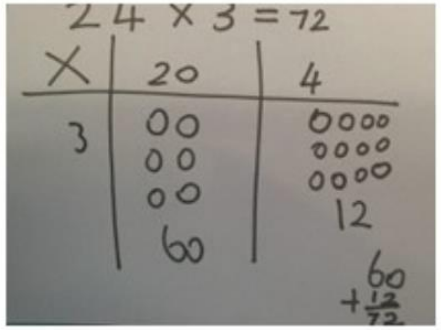
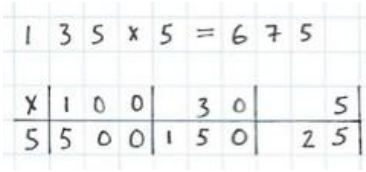
Using the Inverse This should be taught alongside division, so pupils learn how they work alongside each other.			2 x 4 = 8 4 x 2 = 8 8 ÷ 2 = 4 8 ÷ 4 = 2 8 = 2 x 4 8 = 4 x 2 2 = 8 ÷ 4 4 = 8÷ 2 Show all 8 related fact family sentences.	
Vocabulary	Groups of, lots of, times, array, altogether, multiply, multiplied by, repeated addition, sets of, equal groups, times as big as, commutative, multiplication (×), times-table, times, divide (÷), division, share, group, odd, even.			
NC Links	Ma2/2.3a recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers Ma2/2.3b calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs Ma2/2.3c show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot Ma2/2.3d solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.			

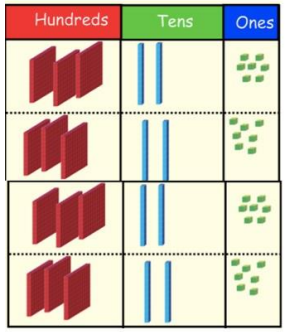
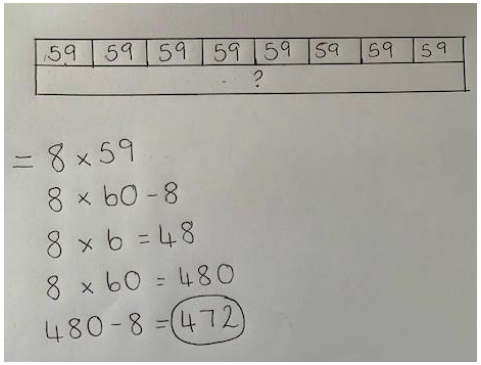
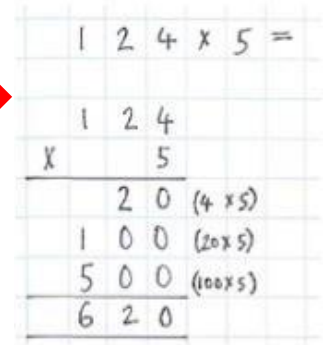
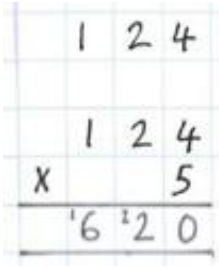
Multiplication- Year 3

NC Objective and Strategy	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
Multiplying two digit number by a one digit number Grid method progressing to the formal method. Solving problems including missing number problems, integer scaling problems.	Show the link with arrays to first introduce the grid method.  Move on to using Base 10 to move towards a more compact method.  Move on to place value counters to show how we are finding groups of a number.  Add up each column, starting with the ones making any exchanges needed. The calculation will be shown alongside the model chosen to see the connection **Model** | **Calculation**	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 shown below.  Bar model are used to explore missing numbers  	Start with multiplying by one digit numbers and showing the clear addition alongside the grid.  Children to add up each column to find the answer. PLEASE NOTE: HOLMER CALCULATION POLICY REQUIRES ALL Y3 PUPILS TO ONLY BE TAUGHT FORMAL MULTIPLICATION METHOD. GRID METHOD SHOULD BE USED AS AN INTERVENTION AND ONLY FOR THOSE PUPILS UNABLE TO ACCESS FORMAL WRITTEN METHOD	**Problem Solving** A teacher asks some children to arrange some chairs into 12 rows of eight chairs. How many chairs will be laid out?  **Reasoning** Missing numbers 24 = ◯ x ◯ Which pairs of numbers could be written in the circles?

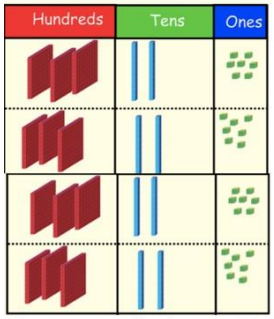
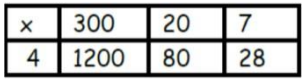
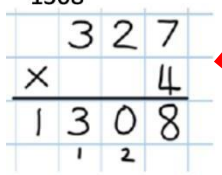
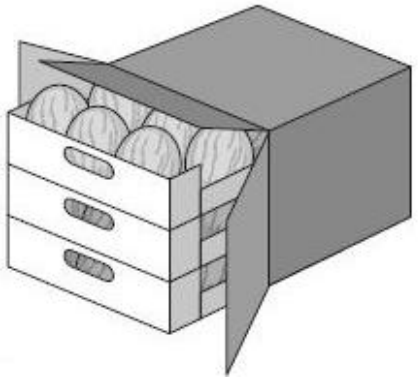
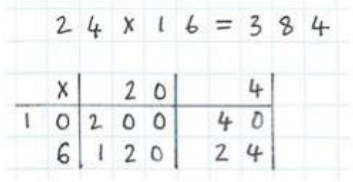
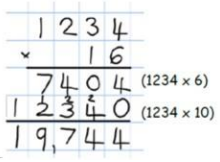
Vocabulary	Groups of, lots of, times, array, altogether, multiply, multiplied by, repeated addition, sets of, equal groups, times as big as, commutative, product, multiples of, scale up, equal, multiply, divide, times-table, sharing, grouping, array, bar model, remainder, repeated addition, multiplication sentence, division statement, division fact, partition.
NC Links	Ma3/2.3a recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables Ma3/2.3b write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods Ma3/2.3c solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Multiplication- Year 4

NC Objective and Strategy	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
Multiply two-digit and three-digit numbers by a one-digit number using formal written layout Grid method recap from year 3 for 2 digits x 1 digit Multiplying numbers by 1 digit (year 4 expectation)	 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 shown below.  PLEASE NOTE: HOLMER CALCULATION POLICY REQUIRES ALL Y4 PUPILS TO ONLY BE TAUGHT FORMAL MULTIPLICATION METHOD. GRID METHOD SHOULD BE USED AS AN INTERVENTION AND ONLY FOR THOSE PUPILS UNABLE TO ACCESS FORMAL WRITTEN METHOD	HTO x O Children to add up each column to find the answer. 	**Problem Solving** If a baker bakes 152 loaves of bread every day. How many loaves will he have baked in a week? **Reasoning** **Missing numbers** 72 = ◯ x ◯ Which pairs of numbers could be written in the circles? **Making links** Eggs are bought in boxes of 12. I need 140 eggs; how many boxes will I need to buy?

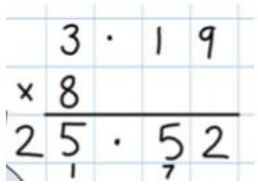
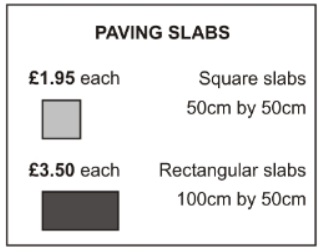
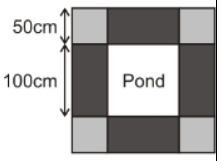
Column multiplication	Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping. 321 x 2 = 642  It is important at this stage that they always multiply the ones first. The corresponding long multiplication is modelled alongside The calculation will be shown alongside the model chosen to see the connection **Model** / **Calculation**	FOR INTERVENTION PURPOSES: This grid method may be used to show how this relates to a formal written method. × | 100 | 20 | 4 5 | 500 | 100 | 20  Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.	  This may lead to a compact method.
Vocabulary	Groups of, lots of, times, array, altogether, multiply, multiplied by, repeated addition, sets of, equal groups, times as big as, commutative, product, multiples of, scale up, inverse, derive multiply (×), divide (÷), multiplication fact, division fact, lots of, groups of, times-table, array, partition, bar model, part-whole model, remainder, commutative.		
NC Links	Ma4/2.3a recall multiplication and division facts for multiplication tables up to 12 × 12 Ma4/2.3b use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers Ma4/2.3c recognise and use factor pairs and commutativity in mental calculations Ma4/2.3d multiply two-digit and three-digit numbers by a one-digit number using formal written layout Ma4/2.3e solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.		

Multiplication Year 5

NC Objective and Strategy	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
Multiply numbers up to 4-digits by a one-digit number using the format written method, including long multiplication for 2-digit numbers Column multiplication for 3 and 4 digits x 1 digit	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  It is important at this stage that they always multiply the ones first. The corresponding long multiplication is modelled alongside	 FOR INTERVENTION PURPOSES ONLY: This grid method may be used to show how this relates to a formal written method.	327 x 4 28 80 1200 1308  This may lead to a compact method 	**Problem Solving** A box contains trays of melons. There are 15 melons in a tray. There are 3 trays in a box.  A supermarket sells 40 boxes of melons. How many melons does the supermarket sell? **Reasoning** **Missing numbers** 6 x 0.9 = ◯ x 0.03 6 x 0.04 = 0.008 x ◯ Which numbers could be written in the circles? **Making links** Apples weigh about 170 g each. How many apples would you expect to get in a 2 kg bag?
Column multiplication (long multiplication)	Manipulatives may still be used with the corresponding long multiplication modelled alongside **Model** | **Calculation**	Moving forward, multiply by a 2 digit number showing the different rows within the grid method.  	24 x 6 on the first row. 24 x 10 on the second row. Show multiplying by 10 by putting zero in the units first  (6 x 4 = 24, carrying the 2 for the 20, then 6 x 2)	

Vocabulary	Groups of, lots of, times, array, altogether, multiply, multiplied by, repeated addition, sets of, equal groups, times as big as, commutative, product, multiples of, scale up, inverse, derive, factor pairs, composite numbers, prime number, factors, squared, cubed, Equal, multiply, divide, times-table, sharing, grouping, array, bar model, remainder, repeated addition, multiplication sentence, division statement, division fact, partition, place holder.
NC Links	Ma5/2.3a identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. Ma5/2.3b know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers Ma5/2.3c establish whether a number up to 100 is prime and recall prime numbers up to 19 Ma5/2.3d multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers Ma5/2.3e multiply and divide numbers mentally drawing upon known facts Ma5/2.3f 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 Ma5/2.3g multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000 Ma5/2.3h recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}) Ma5/2.3i solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes Ma5/2.3j solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign Ma5/2.3k solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

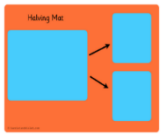
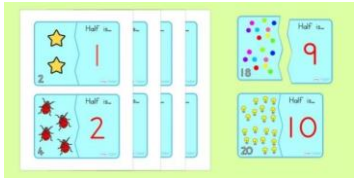
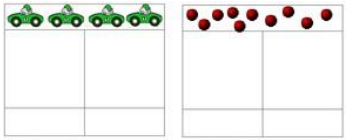
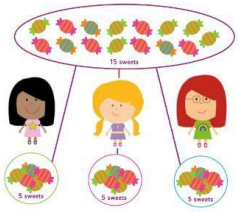
Multiplication- Year 6

NC Objective and Strategy	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
Multiply decimal up to 2 decimal place by a single digit.			Remind children that the single digit belongs in the units column. Line up the decimal points in the question and the answer.  	Problem Solving Mr Singh buys paving slabs to go around his pond.   He buys 4 rectangular slabs and 4 square slabs. What is the total cost of the slabs he buys? Reasoning **6a. Mr Smith shares the calculation below with Class 6:** **5.47 x 6 =** **Fay says,**  **The product is 30.47** **What mistake has Fay made?** **What is the correct answer?**
vocabulary	Groups of, lots of, times, array, altogether, multiply, multiplied by, repeated addition, sets of, equal groups, times as big as, commutative, product, multiples of, scale up, inverse, derive, factor pairs, composite numbers, prime number, factors, squared, cubed multiplication, short division, long division, remainder, factor, estimate, common factor, common multiple, prime, composite, squared (2), cubed (3), order of operations, brackets, inverse operation.			

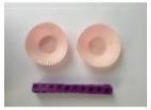
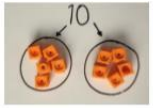
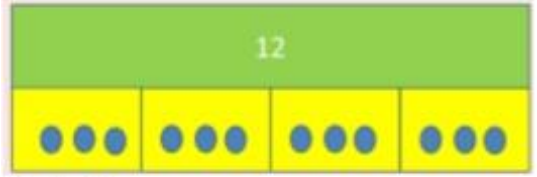
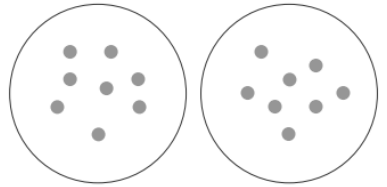
NC Links	Ma6/2.2a multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication Ma6/2.2b divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context Ma6/2.2c divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context Ma6/2.2d perform mental calculations, including with mixed operations and large numbers. Ma6/2.2e identify common factors, common multiples and prime numbers Ma6/2.2f use their knowledge of the order of operations to carry out calculations involving the 4 operations Ma6/2.2g solve multi-step problems in contexts, deciding which operations and methods to use and why Ma6/2.2h solve problems involving addition, subtraction, multiplication and division Ma6/2.2i use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.

Division

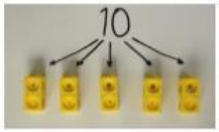
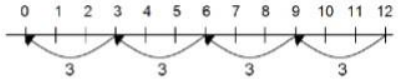
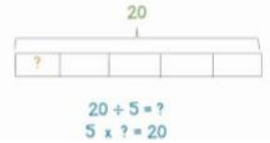
Division- EYFS

Small Steps	Concrete	Pictorial	Abstract	Reasoning and Problem Solving
Solve problems including halving and sharing. Halving a whole, halving a quantity of objects. Sharing a quantity of objects.	   Children have the opportunity to physically cut objects, food or shapes in half  Counting and other maths resources for children to share into two equal groups. Use visual supports such as halving mats and part part whole, with the physical objects and resources that can be manipulated.    Counting and other maths resources for children to explore sharing between 3 or more.	 Pictures and icons that encourage children to see concept of halving in relation to subitising, addition and subtraction knowledge. i.e. Knowing 4 is made of 2 groups of 2, so half of 4 is 2.  Bar model with pictures or icons to support understanding of finding 2 equal parts of a number, to further understand how two halves make a whole.  Pictures for children to create and visualise 3 or more equal groups.	Half these beads between you and your friend.	**Problem Solving:** Can you make sure the ladybird has an equal number of dots on each wing? How many does it dots does it have altogether? How many on each wing? **Reasoning:** Which of these pictures show one half? How do you know?

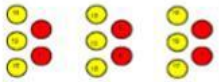
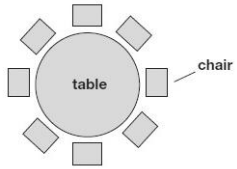
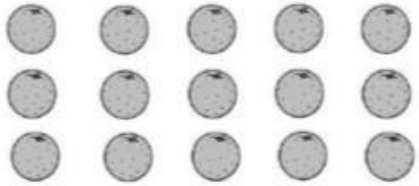
Division- Year 1

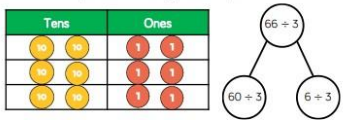
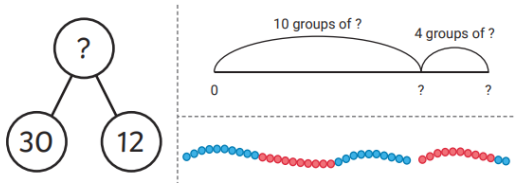
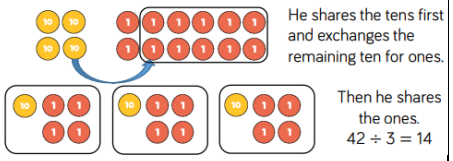
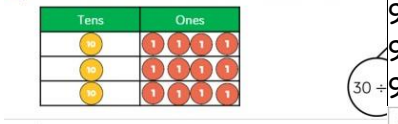
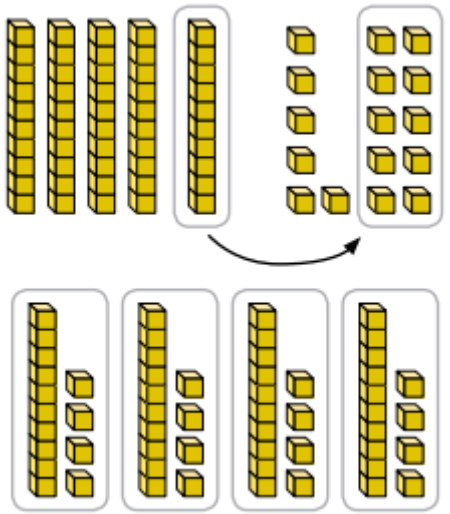
NC objective and Strategy	Concrete	Pictorial	Abstract	Reasoning and Problem Solving
Division as sharing (sharing objects into groups)	   I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.  8 ÷ 2 = 4 Children use bar modelling to show and support understanding.  12 ÷ 4 = 3	**Share 9 buns between three people.** 9 ÷ 3 = 3	**Problem Solving** Jordan has a bag of 16 sweets. If he shares them equally with his brother, how many sweets will they get each?  **Reasoning** Rosie has 16 sweets. Can she make 3 equal groups of 5?  Explain your answer.
Vocabulary	share, share equally, one each, two each…, group, groups of, lots of, array Equal groups, array, row, column, double, half, halve, twice, share.			
NC Links	Ma1/2.3a 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.			

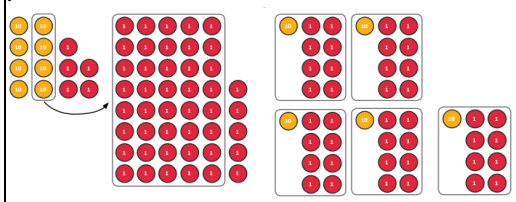
Division- Year 2

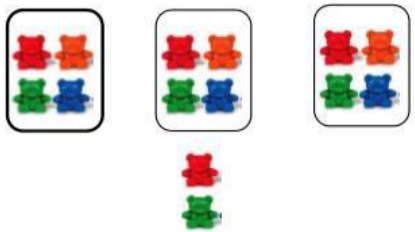
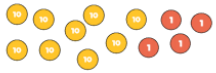
Objective and Strategy	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.    	Use a number line to show jumps in groups. The number of jumps equals the number of groups.  Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.  	**28 ÷ 7 = 4** **Divide 28 into 7 groups. How many are in each group?**	**Problem Solving**  Ben has **40** cards. He shares them equally between **4** party bags. How many cards does he put in each bag? **Reasoning** Ella and Wes have 36 counters.   **36 in equal groups of 6 makes 7 groups.** **Ella** **36 in equal groups of 4 makes 9 groups.**  **Wes** **Who is correct? Explain why.**
Vocabulary	share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, equal groups, multiplication (×), times-table, times, divide (÷), division, share, group, odd, even			
NC Links	Ma2/2.3a recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers Ma2/2.3b calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs Ma2/2.3c show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot Ma2/2.3d solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.			

Division- Year 3

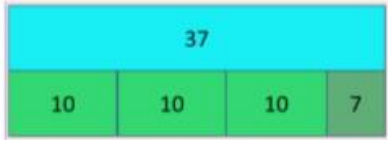
Objective and Strategy	Concrete	Pictorial	Abstract	Problem Solving and Reasoning
Division as grouping	Use cubes, counters, objects or place value counters to aid understanding.  24 divided into groups of 6 = 4 96 ÷ 3 = 32 	Continue to use bar modelling to aid solving division problems.  20 ÷ 5 = ? 5 x ? = 20	How many groups of 6 in 24? 24 ÷ 6 = 4	**Problem Solving** One table can seat 8 people.  How many tables are needed to seat 40 people? **Reasoning** There are **6 triangles** and **0 matchsticks are left over.**  ***Rearrange the same number of matchsticks.*** There are ☐ squares and ☐ matchsticks are left over. There are **3** ☐ and **0** matchsticks are left over.
Division with arrays	 Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	Draw an array and use lines to split the 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	**Problem Solving** There are 36 children in Mrs, Smith's class. She puts them into groups of three, How many groups does she make? **Reasoning** Ben and Anna have a pack of cards each. In each pack there are 60 cards. Ben splits his pack into groups of 6. Anna splits hers into groups of 5. Ben says he will have the most groups because he has made his groups with the biggest number. Do you agree? Prove it!

Divide 2-digit numbers by a 1-digit number by partitioning into tens and ones using a pv grid	Eva uses a place value grid and part-whole model to solve 66÷ 3 	See part- whole model		**Problem Solving** 42 ÷ 3  **Reasoning** Sue and Joe are dividing 56 by 8. Sue says she will partition 56 into 40 + 16 then divide both those numbers by 8. Joe says he will divide 50 by 8, then 6 by 8. Which method is best? Can you explain why?
Divide numbers that involve exchanging between the tens and ones. The answers do not have remainders.	Ron uses place value counters to divide 42 into three equal groups  He shares the tens first and exchanges the remaining ten for ones. Then he shares the ones. 42 ÷ 3 = 14	Annie uses a similar method to divide 42 by 3  Children may use pictorial representation for the pv counters, alongside the part-whole model Children use their times-tables to partition the number into multiples of the divisor.	96 ÷ 8 96 ÷ 4 96 ÷ 3 96 ÷ 6 Compare the statements using <, > or = 48 ÷ 4 ◯ 36 ÷ 3 52 ÷ 4 ◯ 42 ÷ 3 60 ÷ 3 ◯ 60 ÷ 4	**Problem Solving** Tom has 56 pencils to share between four classes. Use the model below to help you to work out how many pencils each class would get. 

				Reasoning Lee has used place value counters to calculate 85 ÷ 5. He says the answer is 18 .  Do you agree with Lee's calculation? Explain your reasons.

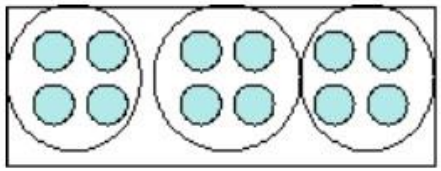
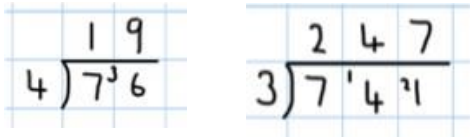
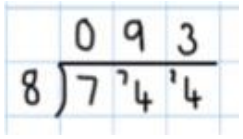
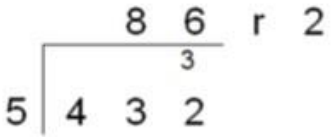
<table>
<tr>
<td>Division with a remainder</td>
<td>
14 ÷ 3 =
Divide objects between groups and see how much is left over

Moving on to:
Use place value counters to work out 94 ÷ 4
Did you need to exchange any tens for ones?
Is there a remainder?

<table>
<tr><th>Tens</th><th>Ones</th></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table>
29
</td>
<td>
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.

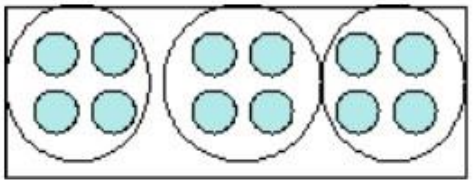
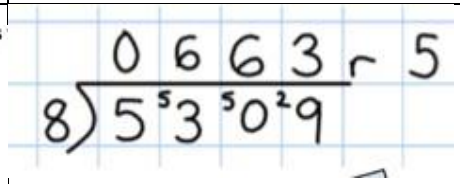
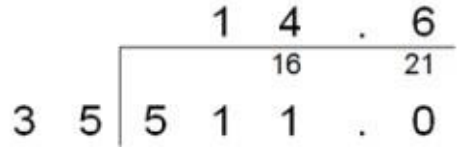
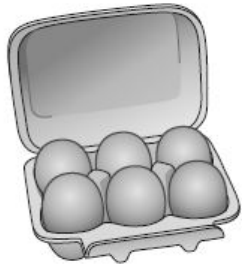
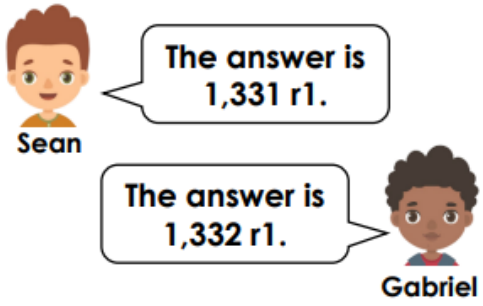
Use bar models to show division with remainders.

</td>
<td>
Complete written divisions and show the remainder using r.

</td>
<td>
Problem Solving
Write the missing number in each calculation.
25 ÷ ☐ = 3 remainder 4
35 ÷ ☐ = 4 remainder 3
Reasoning
Tom bakes 37 cakes which he shares equally between 4 people. He says each person will get exactly 9 cakes and there won't be any left over. Do you agree? Convince me!
</td>
</tr>
<tr>
<td>Vocabulary</td>
<td colspan="4">share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, product</td>
</tr>
<tr>
<td>NC Links</td>
<td colspan="4">Ma3/2.3a recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
Ma3/2.3b write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
Ma3/2.3c solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.</td>
</tr>
</table>

Division- Year 4

Objective and Strategy	Pictorial	Abstract	Problem Solving and Reasoning
Divide up to 3 digit numbers by 1 digit. Short Division	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.	Begin with divisions that divide equally with no remainder  Children should be aware that a 0 is used to keep place value, if the number is not divisible.  Move onto divisions with a remainder. 	Problem Solving: Tom has 76 cakes which he shares equally between 4 tins. How makes cakes will each tin contain? Reasoning: Ben has 741 marbles. He says that he can't possibly share them equally between him and his two friends as there will be a remainder. Explain why Ben is wrong. Prove it!
Vocabulary	share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, product, division facts, inverse, derive		
NC Links	Ma4/2.3a recall multiplication and division facts for multiplication tables up to 12 × 12 Ma4/2.3b use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers Ma4/2.3c recognise and use factor pairs and commutativity in mental calculations Ma4/2.3d multiply two-digit and three-digit numbers by a one-digit number using formal written layout Ma4/2.3e solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.		

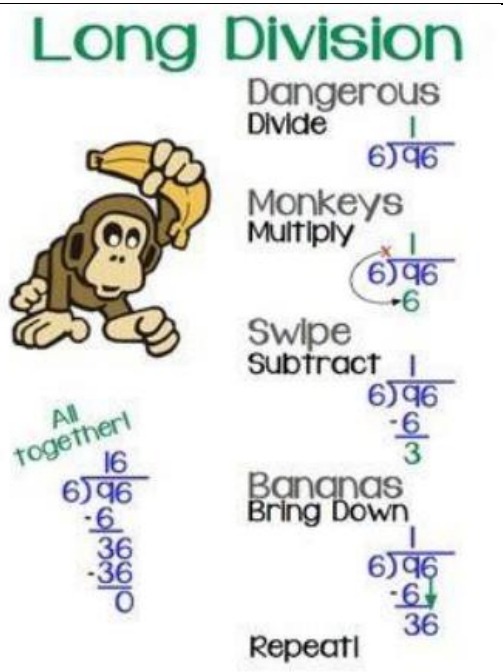
Division- Year 5

NC Objective and Strategy	Pictorial	Abstract	Problem Solving and Reasoning
Divide at least 4 digit numbers by 1 digit. Interpret remainders appropriately for the context Short Division	Students can continue to use drawn diagrams with dots or circles help them divide numbers into equal groups.  Encourage them to move towards counting in multiples to divide more efficiently.	 Finally move into decimal places to divide the total accurately. 	**Problem Solving** A farmer is packing eggs. Each box holds **six** eggs.  The farmer has 980 eggs to pack. How many boxes can the farmer **fill** using 980 eggs? **Reasoning** Sean and Gabriel are calculating 7,987 ÷ 6.  **Who is correct? Explain your reasoning.**
Vocabulary	share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, product, division facts, inverse, derive, formal written method. Equal, multiply, divide, times-table, sharing, grouping, array, bar model, remainder, repeated addition, multiplication sentence, division statement, division fact, partition, place holder.		
NC Links	Ma5/2.3a identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. Ma5/2.3b know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers Ma5/2.3c establish whether a number up to 100 is prime and recall prime numbers up to 19 Ma5/2.3d multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers Ma5/2.3e multiply and divide numbers mentally drawing upon known facts Ma5/2.3f 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		

	Ma5/2.3g multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000 Ma5/2.3h recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3) Ma5/2.3i solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes Ma5/2.3j solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign Ma5/2.3k solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

Division-Year 6

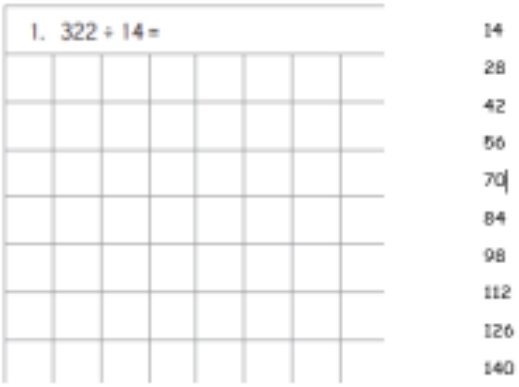
Objective and Strategy	Abstract
Long Division	



LONG DIVISION PRACTISE – No remainders

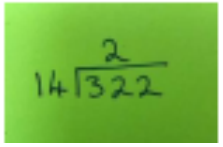
Let's look at this example together:

1. Begin by listing multiple of 14 up to 10 x 14 (this helps children to realise whether their answers are correct).

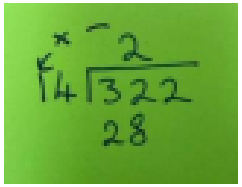


If children do not know multiples, encourage strategies such as repeat addition – add 10, then add 4.

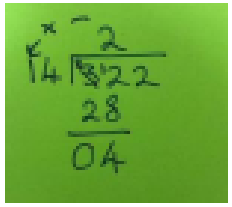
2. Now refer to our dangerous monkeys! DIVIDE 32 by 14. The answer is 2. Put this answer above the 2 under the 'bus-stop.'



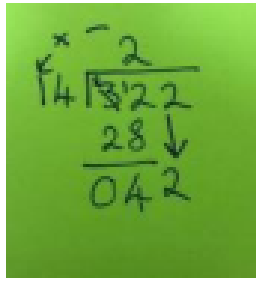
3. The next step in our dangerous monkeys is to MULTIPLY. You need to multiply your answer of 2 by 14. You can use your multiples to help you here. It equals 28 which you write underneath the 32.



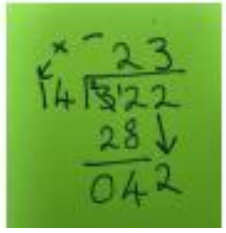
4. We've done divide and multiply, now we need to SUBTRACT. We will subtract the 28 from the 32 and record the answer underneath.



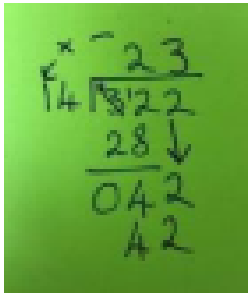
5. The final step in the process is to BRING DOWN. We bring down the next number in line – the 2.



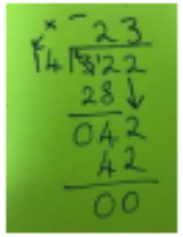
6. Now we repeat the whole process. So if we go back to the beginning, our first step is to DIVIDE. This time we divide 42 by 14. If we look at our multiples, we can see the answer is 3. We put the number 3 above the 'bus-stop' line, next to the 2.



7. After divide, we MULTIPLY. So if we look at our multiples we can see that 3 x 14 = 42. We record this answer under the other 42.



8. Remember what comes next? SUBTRACT. 42 - 42 = 0.



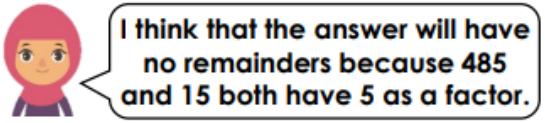
Once you get to zero, you can be confident you have your final answer.

Problem Solving:

498 apples have been harvested from the orchard. They all need to be packed away in boxes. If each box can hold 15 apples, how many boxes will the farmer need?

Reasoning: Saher is calculating 485 ÷ 15.

She says,



Is she correct? Explain how you know.

Vocabulary	share, share equally, one each, two each…, group, groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, product, division facts, inverse, derive, formal written method. short division, long division, remainder, factor, estimate, common factor, common multiple, prime, composite, squared (2), cubed (3), order of operations, brackets, inverse operation.

NC links	Ma6/2.2a multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication Ma6/2.2b 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 Ma6/2.2c divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context Ma6/2.2d perform mental calculations, including with mixed operations and large numbers. Ma6/2.2e identify common factors, common multiples and prime numbers Ma6/2.2f use their knowledge of the order of operations to carry out calculations involving the 4 operations Ma6/2.2g solve multi-step problems in contexts, deciding which operations and methods to use and why Ma6/2.2h solve problems involving addition, subtraction, multiplication and division Ma6/2.2i use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.

Minimal Resources required to support the CPA approach (depending on year group):

- 10 frames (including egg boxes)
- Straws/pipe cleaners
- Bead strings (to 20 and 100)
- Rekenrek frames
- Base 10/Dienes (including magnetic to model on flip chart)
- Place value grids
- Double-sided counters
- Part-part whole templates
- Place value counters (KS2)
- Multi-link cubes