Key Stage One Calculation Policy

With Faith, Hope and Love we can achieve greater things.

. Addition

. Subtraction

. Multiplication

. Division

St Andrew's C of E Primary School

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Mental and written calculation methods should be taught alongside each other throughout the entirety of this progression. When teaching children to calculate, emphasis should be placed on choosing and using the method that is most efficient.

ADDITION—KS1

Expectations—Year 1

- Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs
- Represent and use number bonds and related subtraction facts within 20
- Add and subtract one-digit and two-digit numbers to 20, including zero
- **Solve one-step problems** that involve addition and subtraction, using **concrete objects and pictorial representations**, and missing number problems such as 7 + ☐ = 9.

Expectations—Year 2

- 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
- Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
- Add numbers using concrete objects, pictorial representations, and mentally, including:

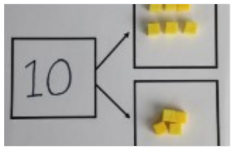
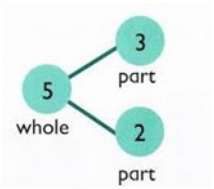
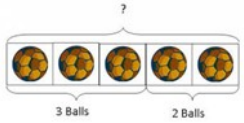
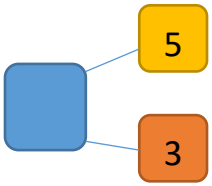
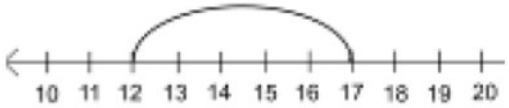
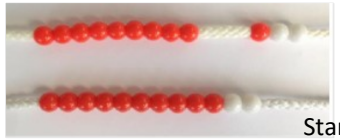
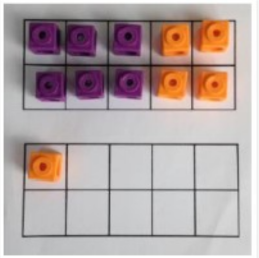
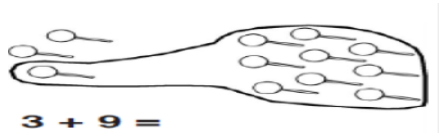
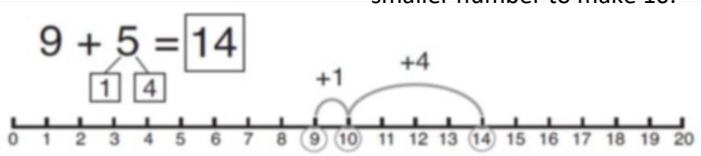
  -a two-digit number and ones

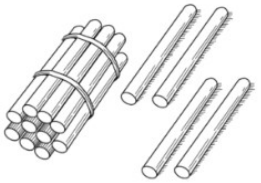
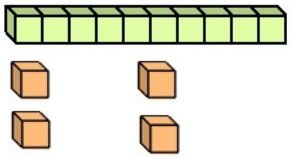
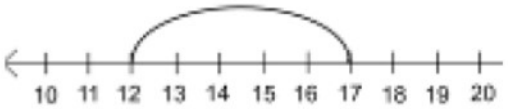
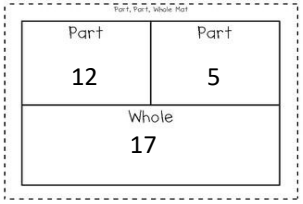
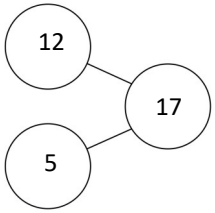
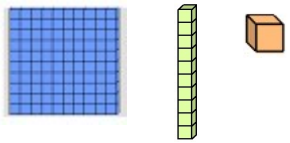
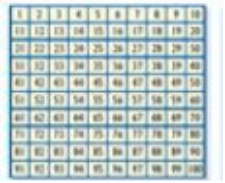
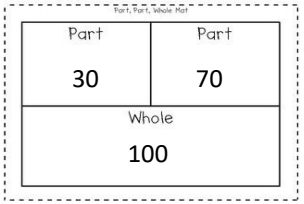
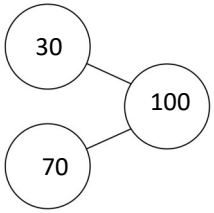
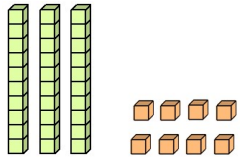
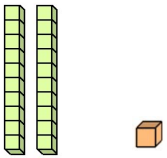
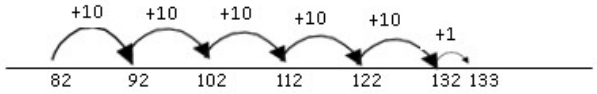
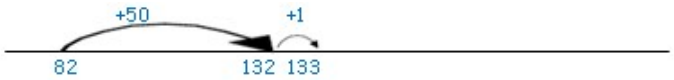
  -a two-digit number and tens

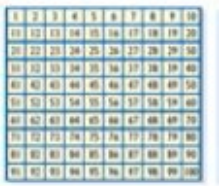
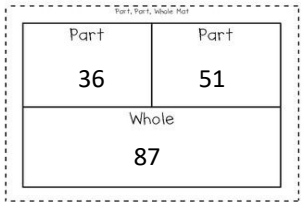
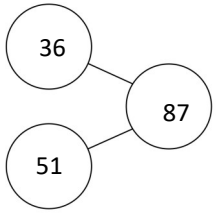
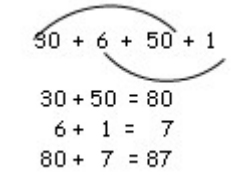
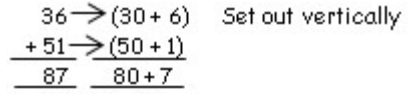
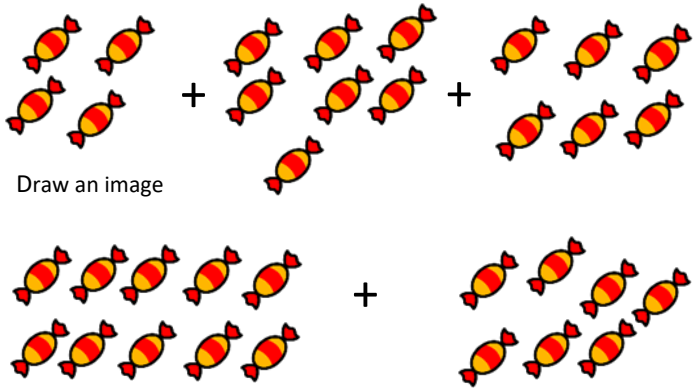
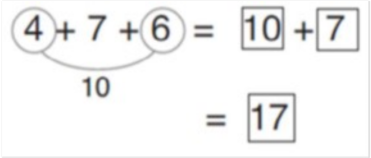
  -two two-digit numbers

  -adding three one-digit numbers
- Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
- Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

Vocabulary: number line, number track, number bonds, add, addition, plus, put together, more, make, count on , sum, total, altogether ,score, double, near double, inverse, equals, one more, two more,...ten more...one hundred more... how many more to make…? ,how many more is… than …?, how much more is …?, *equals, sign,* is the same as, , , part part whole, 10 track, bar model, partition, one,s, tens, units.

Objective and Strategies	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part, part, whole model	    Use cubes to add two numbers together as a group or as a bar. Consider using NUMICON and a number track also.	    Use pictures to add two numbers together as a group or in a bar.	4 + 3 = 7 4 + ? = 7 10= 6 + 4  Use the part, part, whole model to help move into the abstract.
Starting at the bigger number and counting on	 Start with the larger number on the bead string and then count on the smaller number 1 by 1 to find the answer. Consider the use of a number track also.	12 + 5 = 17  Start at the larger number on the number line and jump on in 1's (or one bigger jump) to find the answer.	5 + 12 = 17 Place the larger number in your head and count on the smaller number to find your answer.
Regrouping to make 10	  9 + 3 = 9 + 1 + 2 Start with the bigger Number in a ten frame and use the smaller number to make 10 e.g. 6 + 5 = 6 + 4 + 1 . NUMICON will also work here.	 Use pictures or a number line. Regroup or partition the smaller number to make 10. 	7 + 4 = 11 If I am 7 , how many more do I need to make 10? How many more do I need to add now?

Objective and Strategies	Concrete	Pictorial	Abstract
Adding one and two digit numbers to 20	 Use straws and straw bundles to add two sets together e.g. 12 + 2 = 14  Progress to using dienes equipment once knowledge of 10 is secure.	12 + 5 = 17  Use the number line to show addition from the biggest number.  	12 + 5 = 17 12 + ? = 17 Use the part, part, whole model to help move into the abstract.
Using number bonds to 10 to confirm number bonds to 100	 Cover a 100 block with tens and ones to find out what is remaining.	 A hundred square is a great visual tool.  	3 + 7 = 10 So: 30 + 70 = 100 30 + ? = 100
Adding two 2-digit numbers with a number line.	  Combine dienes equipment (no bridging) to find a total. 38 + 21 = 59	82 + 51 recorded on a blank number line (use this to find a missing number also e.g. 82 + ? = 133  	82 + 51 = 133 82 + ? = 133

Objective and Strategies	Concrete	Pictorial	Abstract
Adding two 2-digit numbers by partitioning	Combine dienes equipment (no bridging) and place value cards to find a total. Straws and PV counters should also be considered for variation. 36 + 51 = 87 	 A hundred square can be used. Draw PV counters and dienes cubes also.  	36 + 51 (Partition both numbers to add)  Move onto a column. 
Adding three single 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.	 Draw an image	 Combine two numbers that make 10, then add on the remainder.

Furthering children's addition understanding through reasoning and mastery:

Reasoning and mastery tasks should have been given to extend and deepen children's understanding throughout the Key Stages. The following are resources and ideas to use to deepen understanding and consider reasoning:

- **Nrich**
- **Testbase online materials**
- **TES SATS questions**
- **Tarsia activities**
- **White Rose Maths Hub assessments and reasoning documents**
- **NCETM Mastery documents**

Children should be able to choose the most efficient methods to use by years 5 and 6 i.e. mental or written

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Mental and written calculation methods should be taught alongside each other throughout the entirety of this progression. When teaching children to calculate, emphasis should be

SUBTRACTION—KS1

Expectations—Year 1

- Read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs
- Represent and use number bonds and related subtraction facts within 20
- Add and subtract one-digit and two-digit numbers to 20, including zero
- **Solve one-step problems** that involve addition and subtraction, using **concrete objects and pictorial representations**, and missing number problems such as

  7 = ☐ – 9.

Expectations—Year 2

- 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
- Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100
- Subtract numbers using concrete objects, pictorial representations, and mentally, including:

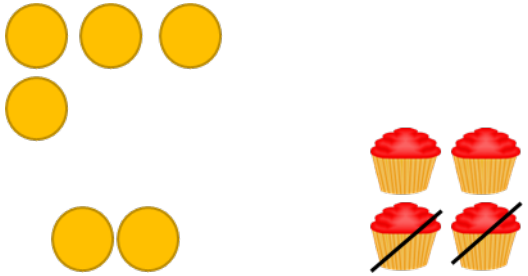
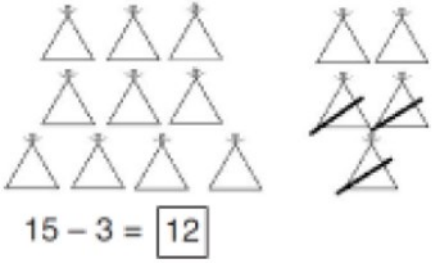
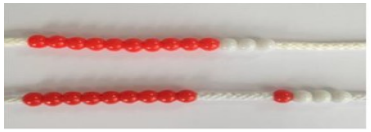
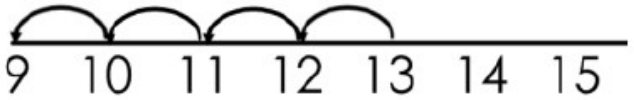
  -a two-digit number and ones

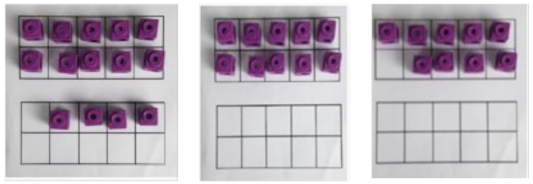
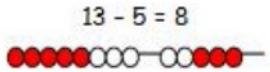
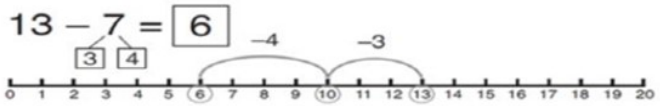
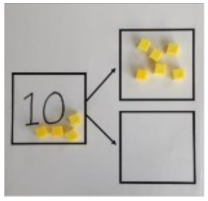
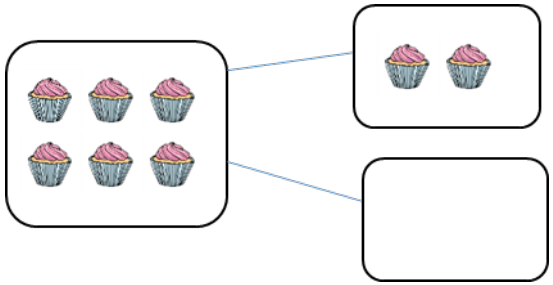
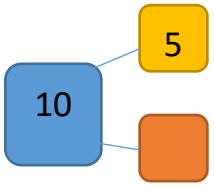
  -a two-digit number and tens

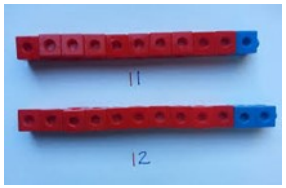
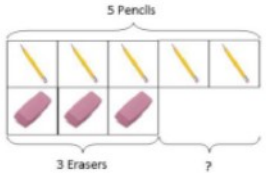
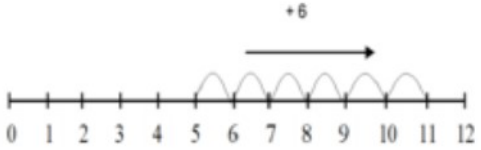
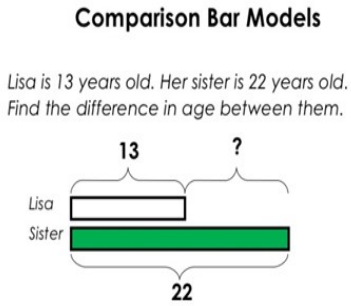
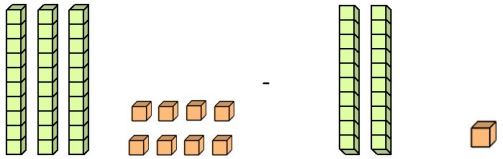
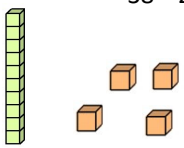
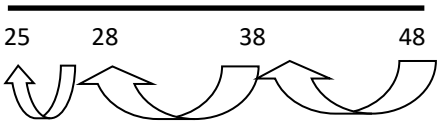
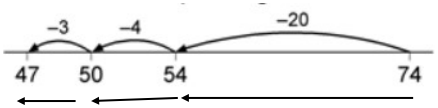
  -two, two-digit numbers

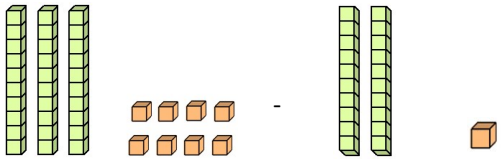
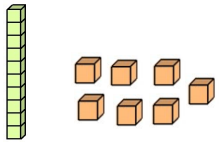
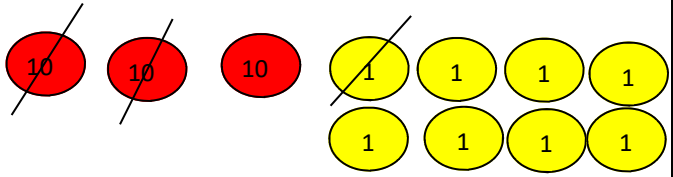
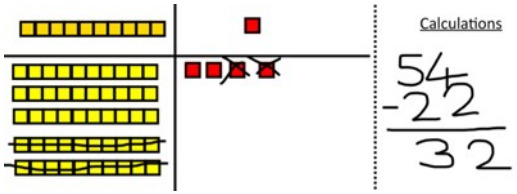
  -adding three one-digit numbers
- Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot
- Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

Vocabulary: number line, number track, number bonds, subtract, take (away), less than, minus, leave, how many are left/left over?, how many are gone?, one less, two less, ten less…, how many fewer is… than…?, how much less is…?, distance between, difference between, equals, sign, is the same as, inverse, partition, recombine, place value, tens, units/ones, part part whole, bar

Objective and Strategies	Concrete	Pictorial	Abstract
Taking away ones	Use physical objects, counters, cubes etc to show how objects can be taken away. 	Cross out drawn objects to show what has been taken away.  15 – 3 = 12	18 -3= 15 8 – 2 = 6
Counting back ones	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 them away counting backwards as you go.  Use a number track with counters or objects e.g. placing counters over the numbers then taking away from the right.	Count back on a number line or number track  9 10 11 12 13 14 15 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. 13—? = 7

Objective and Strategies	Concrete	Pictorial	Abstract
Make 10	14 – 5 = 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.  **The bead string –** this will help to bridge through multiples of ten by partitioning numbers helping with mental strategies. It shows visually that 5 can be partitioned into 2 + 3, 13 – 3 = 10 and 10 – 2 = 8. 	 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.	16 – 8= How many do we take off to reach the next 10? How many do we have left to take off?
Part part whole model	Link to addition- use the part whole model to help explain the inverse between addition and subtraction.  If 10 is the whole and 6 is one of the parts. What is the other part? Links to number bond work. 10 - 6 =	Use a pictorial representation of objects to show the part part whole model. 	Move to using numbers within the part whole model. 

Objective and Strategies	Concrete	Pictorial	Abstract
Find the difference	Compare amounts and objects to find the difference.  Use cubes to build towers or make bars to find the difference Use basic bar models with items to find the difference  	Count on to find the difference.  Draw bars to find the difference between 2 numbers. Clear link to part part whole.  	Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.
Counting back in tens and ones (on a number line)	Use dienes equipment (where no bridging is required)  38—21  Use the bead string (shown above) to highlight bridging through tens.	48—23 Record on a blank number line    	48 -23 = 25 48—? = 25

Objective and Strategies	Concrete	Pictorial	Abstract
Partitioning (without exchanging)	Use dienes and PV cards to support  38 - 21  Use PV cards to help also:  Also use PV counters and physically take away.	Draw PV Counters and cross out to help:  38—21 = 17 Drawing the dienes equipment rods will also help e.g.  54—22 = 32	82 - 51 80 2 50 1 (80 and 2) – (50 and 1) 80 - 50 = 30 2 - 1 = 1 30 + 1 = 31 Set out vertically next: 82 (80 +2) - 51 (50+1) 31 (30+1) Set this question out and use the manipulatives in conjunction with this.

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Mental and written calculation methods should be taught alongside each other throughout the entirety of this progression. When teaching children to calculate, emphasis should be

MULTIPLICATION—KS1

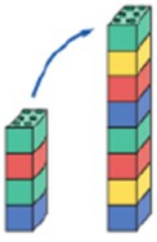
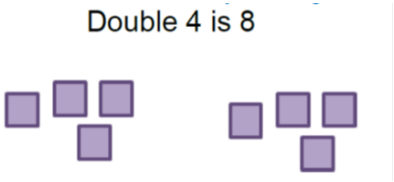
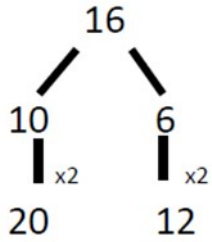
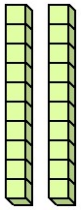
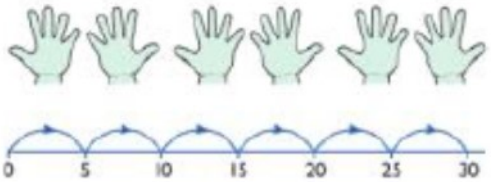
Expectations—Year 1

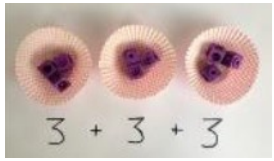
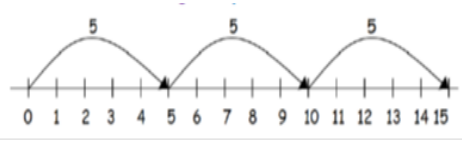
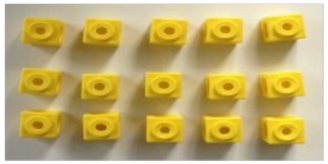
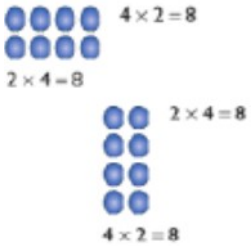
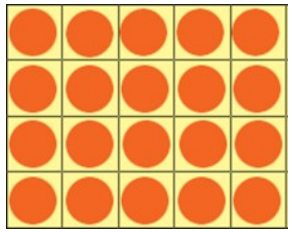
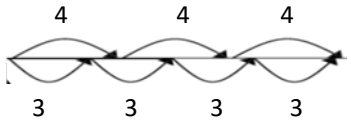
- Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Expectations—Year 2

- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs
- Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
- Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Vocabulary: number line, number track, odd, even, count in twos, threes, fives, count in tens (forwards from/backwards from), how many times? lots of, groups of, once, twice, three times, five times , repeated addition, array, row, column, double, halve , how many groups?, share, share equally, group, group in pairs, threes, etc., equal groups of , divide, divided by, left, left over

Objective and Strategies	Concrete	Pictorial	Abstract
Doubling	Use practical activities to show how to double a number.  	Draw pictures to show how to double a number.  	 Partition a number and then double each part before recombining it back together.
Counting in multiples of 2, 5 and 10	Count in multiples supported by concrete objects in equal groups.      3 groups of 2 = 6	Use a number line or pictures to continue support in counting in multiples.  ITP counting forwards and backwards.  Children should draw images/arrays and group them. Children should use pictorial representations and may use rings to show e.g. 3 groups of	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30  Listen as 10p coins are dropped in a tin one by one, keeping a count and saying how much money is in the tin. There is 20p in the tin, listen as 5p coins are dropped in one by one. How much money is in the tin altogether?

Objective and Strategies	Concrete	Pictorial	Abstract
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 5 x 3 = 15 Bar model 5 5 5	Write addition sentences to describe objects and pictures.  2 x 5 = 10
Arrays showing commutative Multiplication	Create arrays using counters/ cubes to show multiplication sentences.  	Draw arrays in different rotations to find **commutative** multiplication sentences.  tangles.   4 x 3 = 12 3 x 4 = 12	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 Use this to introduce division.

Objective and Strategies	Concrete	Pictorial	Abstract
Multiples of 10	Use straw bundles to introduce multiplying by 10:  10 x 3 = 30 Use dienes equipment to help introduce multiplying by 10. This will build on their understanding of place value and commutative law. 3 lots of 10 10 x 3 10 lots of 3 3 x 10 Also use PV counters to count in 10's. 10 10 10	Children draw pictorial representation to assist counting in 10's. 10 10 10 10 x 3 = 30 Therefore, 3 x 10 = 30	4 x 10 = 40 So: 10 x 4 = 40 ? X 10 = 80

Furthering children's multiplication understanding through reasoning and mastery:

Reasoning and mastery tasks should have been given to extend and deepen children's understanding throughout the Key Stages. The following are resources and ideas to use to deepen understanding and consider reasoning:

- **Nrich**
- **Testbase online materials**
- **TES SATS questions**
- **Tarsia activities**
- **White Rose Maths Hub assessments and reasoning documents**
- **NCETM Mastery documents**

Children should be able to choose the most efficient methods to use by years 5 and 6 i.e. mental or written

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DIVISION—KS1

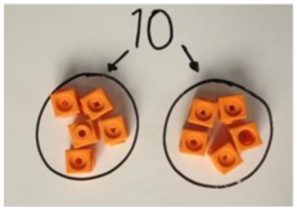
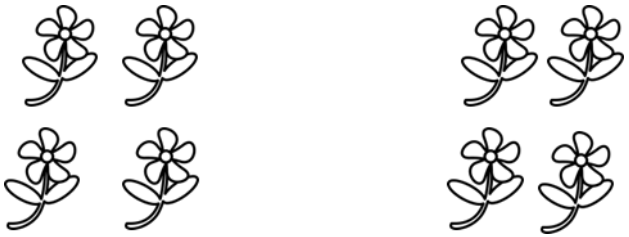
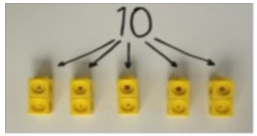
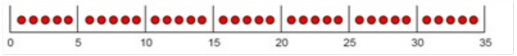
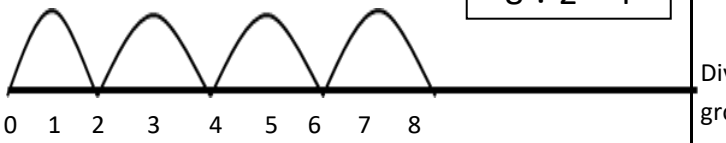
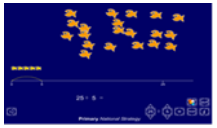
Expectations—Year 1

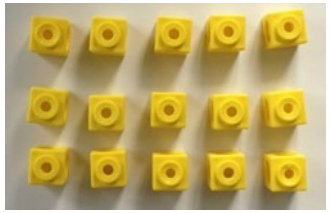
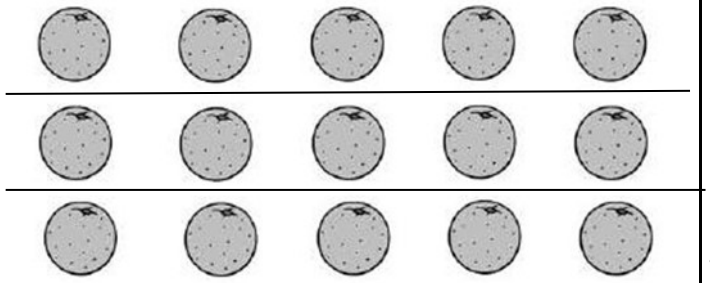
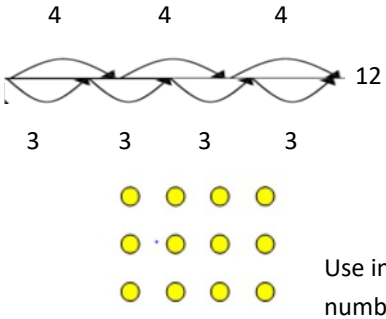
- Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

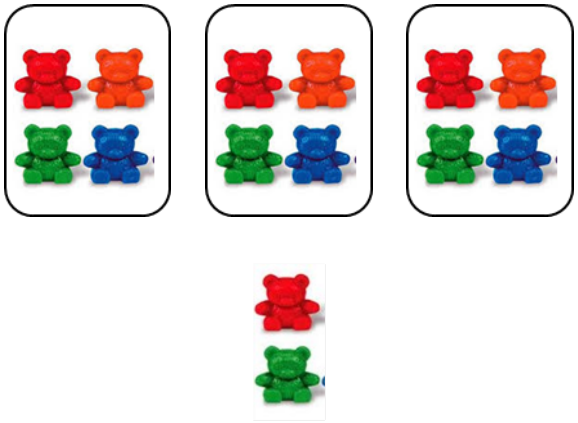
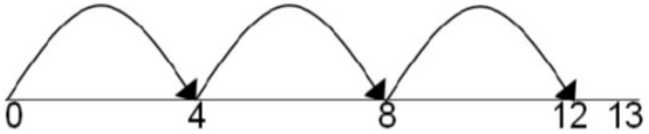
Expectations—Year 2

- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs
- Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot
- Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Vocabulary: number line, number track, odd, even, count in twos, threes, fives, count in tens (forwards from/backwards from), How many groups? lots of, groups of, repeated subtraction, array, row, column, double, halve, share, share equally, group, group in pairs, threes, etc., equal groups of , divide, divided by, left, left over

Objective and Strategies	Concrete	Pictorial	Abstract
Sharing objects equally without remainders	   I have 10 cubes, can you share them equally in 2 groups? This is the Part-Part –Whole model.	Children use pictures or shapes to share quantities.  8 ÷ 2 = 4	Share 9 buns between three people. 9 ÷ 3 = 3
Division as grouping	Divide quantities into equal groups. Use cubes, counters and other objects to aid understanding.    6 eggs put into groups of 3, makes 2 groups 	Use a number line to show jumps in groups. The number of jumps equals the number of groups. 8 ÷ 2 = 4   This is essentially a bar model using grouping.	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?

Objective and Strategies	Concrete	Pictorial	Abstract
Finding fractions (halves and quarters)	Use objects and counters to introduce halving and quartering.  I give my friend half my sweets. How many sweets does he have?	Children draw pictures into 2 equal groups to halve and 4 equal groups to quarter.  1 quarter of 8 is 2. This is can clearly be linked to the Part Part Whole model.	What is half of 8? 8 ÷ 2 = 4 What is a quarter of 8? 8 ÷ 4 = 2
Division within 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.  4 x 3 = 12 3 x 4 = 12 12 ÷ 3 = 4 12 ÷ 4 = 3 Use in conjunction with a number line to see the relationship.	Find the inverse of multiplication and division sentences by creating four linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7

Objective and Strategies	Concrete	Pictorial	Abstract
Introducing remainders	14 ÷ 3 = Divide objects between groups and see how much is left over 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r.  Use in context: Understand the concept of a remainder in context. Eg. How many lengths of 10 cms can you cut from 51 cm of tape? How many will be left? 51 ÷ 10 = 5 lengths of 10cm and 1 cm left over.

Furthering children's division understanding through reasoning and mastery:

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Lower Key Stage Two Calculation Policy

With Faith, Hope and Love we can achieve greater things.

. Addition

. Subtraction

. Multiplication

. Division

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ADDITION—LOWER KS2

Expectations—Year 3

Pupils should be taught to:

- add and subtract numbers mentally, including:
    - a three-digit number and ones
    - a three-digit number and tens
    - a three-digit number and hundreds
- add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

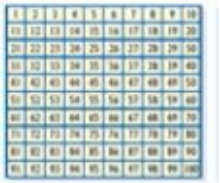
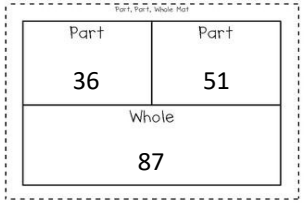
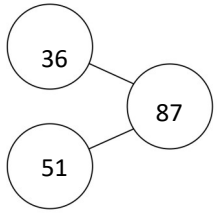
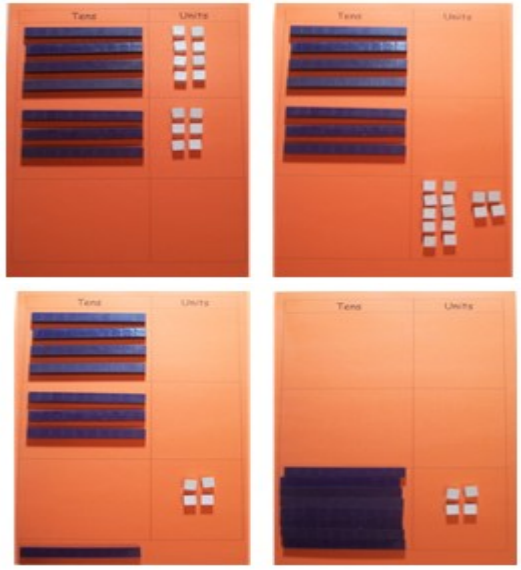
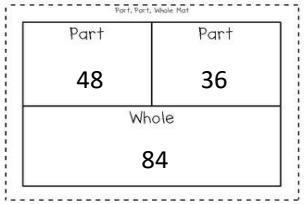
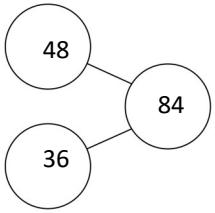
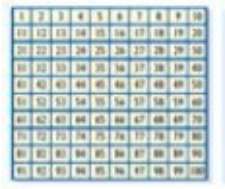
Expectations—Year 4

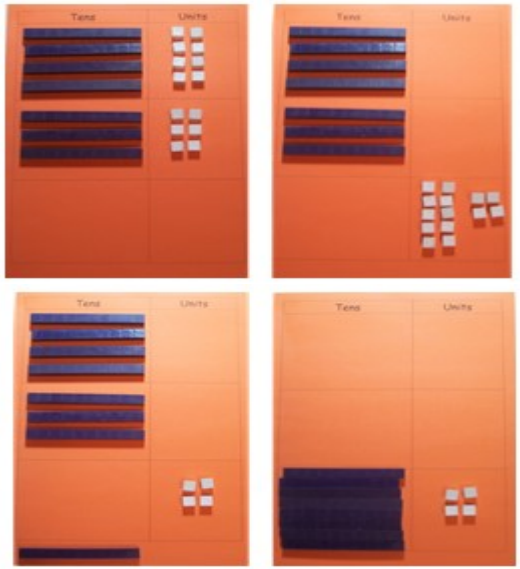
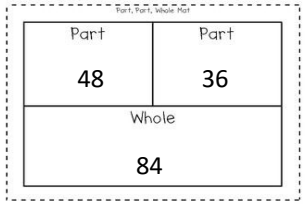
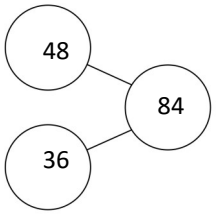
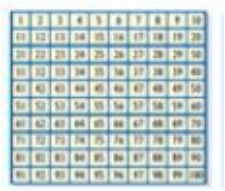
Pupils should be taught to:

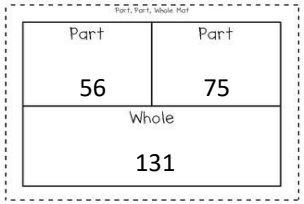
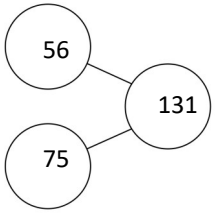
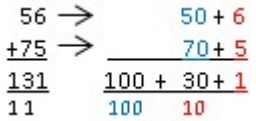
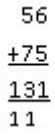
- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.

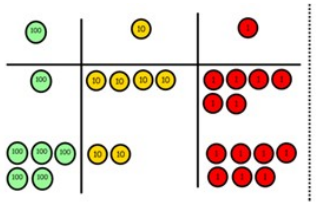
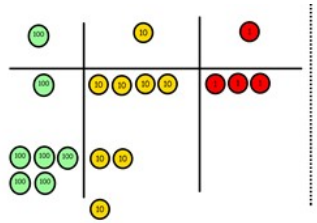
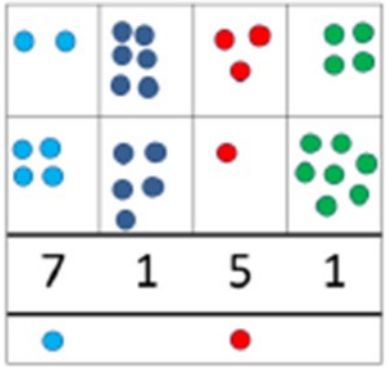
Vocabulary: column addition, extended column addition, exchange, multibase/Dienes, carry

From KS1- add, addition, more, plus, make, sum, total, altogether, score, double, near double, one more, two more… ten more… one hundred more, how many more to make…?, how many more is… than…?, how much more is…? , equals, sign, is the same as, tens boundary, count on in, partition, recombine

Objective and Strategies	Concrete	Pictorial	Abstract
Adding two 2-digit numbers by partitioning and using a column (from KS1)	Combine dienes equipment (no bridging) and place value cards to find a total. 36 + 51 = 87  Nb. Some children may still need to use straws. Consider also the use of PV counters.	 Draw Dienes cubes and PV counters to help.  	36 + 51 36 → (30 + 6) + 51 → (50 + 1) 87 80 + 7 Set out vertically
Adding two 2-digit numbers by partitioning and using a column (bridging tens)	Extended column addition crossing the tens barrier with ones. When this occurs, children should use the term "exchange" to describe converting ten ones into one ten and move this into the tens column.  	   Children should also draw Dienes sticks in their working out to show the exchange of ten ones into one ten.	48 + 36 48 → (40 + 8) + 36 → (30 + 6) 84 80 + 4 1 10 Set out vertically Write this algorithm in conjunction with using the equipment and drawing the pictures.

Objective and Strategies	Concrete	Pictorial	Abstract
Column method of Addition: TU + TU	Us e the same equipment as previously to introduce column addition i.e. without partitioning.   	   Children should also draw Dienes sticks in their working out to show the exchange of ten ones into one ten.	48 + 36 84 1

Objective and Strategies	Concrete	Pictorial	Abstract
Column method of Addition: TU + TU (bridging hundreds)	This will secure crossing the hundreds barrier by Exchanging e.g. 56 + 75 	  Children should also draw Dienes sticks in their working out to show the exchange of ten ones into one ten.	 Children should record this through partitioning first, and then move onto the column method below: 

Objective and Strategies	Concrete	Pictorial	Abstract
Column method of Addition: HTU + HTU	Children should be moved from using the base 10 equipment and now consider the PV counters. This will help children develop an understanding of unitising. Make both numbers on a PV grid:  146 + 527 Add up the units and exchange one ten for ten ones:  146 + 527 Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.	Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.  	146 + 527 673 1

Nb. Order to teach column addition in:

TU + TU (no bridging)

TU + TU (bridging)

HTU + HTU (no bridging)

HTU + HTU (bridging)

ThHTU + ThHTU (no bridging)

ThHTU + ThHTU (bridging)

ThHTU + HTU or ThHTU + TU (vary the amount of digits)

Nb . Return to the **extended method** each time new calculations are introduced e.g. addition of 4 digit numbers or adding money to ensure calculation is grounded in understanding. Then move to the **short formal** written method.

Furthering children's addition understanding through reasoning and mastery:

Reasoning and mastery tasks should have been given to extend and deepen children's understanding throughout the Key Stages. The following are resources and ideas to use to deepen understanding and consider reasoning:

- **Nrich**
- **Testbase online materials**
- **TES SATS questions**
- **Tarsia activities**
- **White Rose Maths Hub assessments and reasoning documents**
- **NCETM Mastery documents**

Children should be able to choose the most efficient methods to use by years 5 and 6 i.e. mental or written

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With Faith, Hope and Love we can achieve greater things.

Mental and written calculation methods should be taught alongside each other throughout the entirety of this progression. When teaching children to calculate, emphasis should be

SUBTRACTION—LKS2

Expectations—Year 3

Pupils should be taught to:

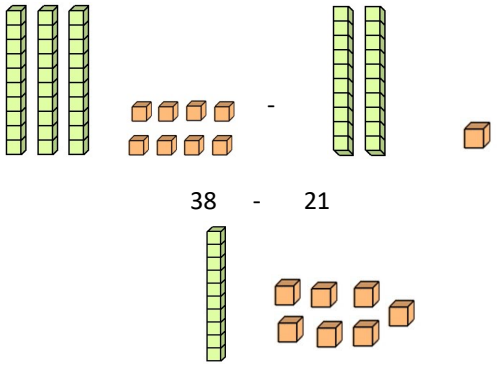
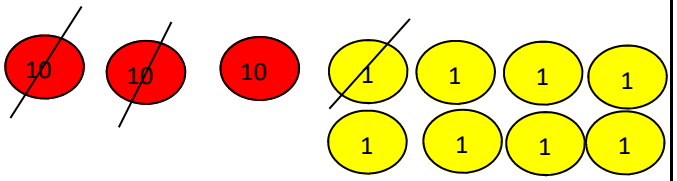
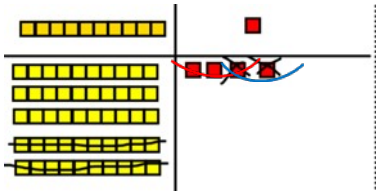
- add and subtract numbers mentally, including:
  - a three-digit number and ones
  - a three-digit number and tens
  - a three-digit number and hundreds
- add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction.

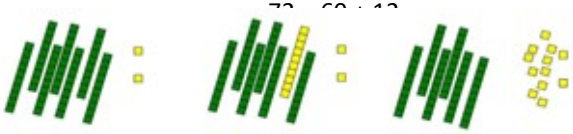
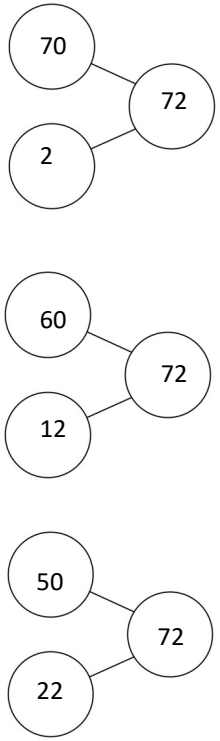
Expectations—Year 4

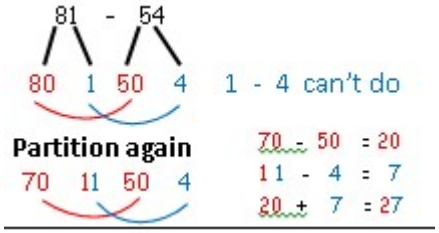
Pupils should be taught to:

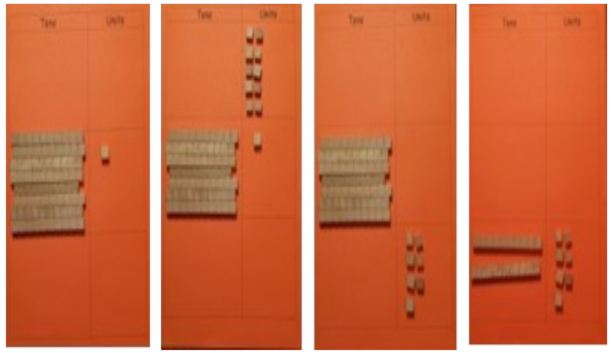
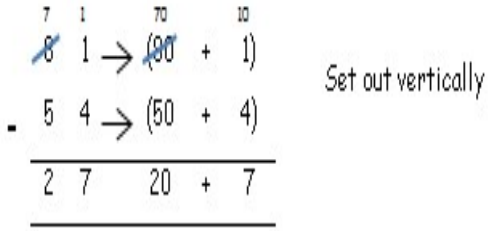
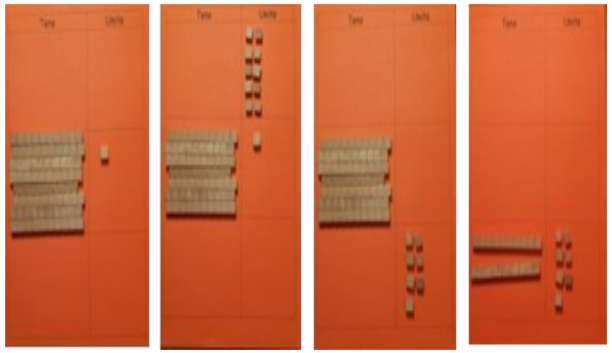
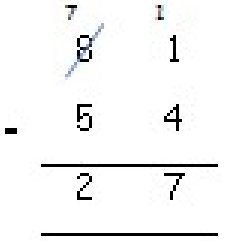
- add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate
- estimate and use inverse operations to check answers to a calculation
- Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.

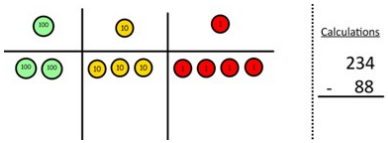
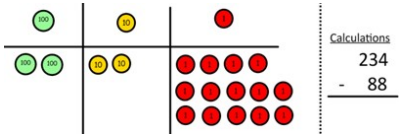
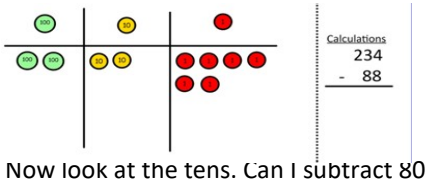
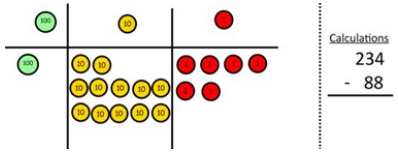
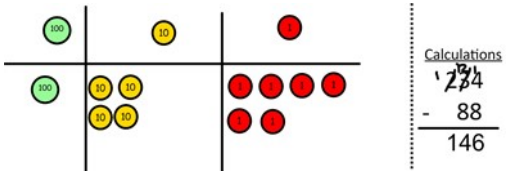
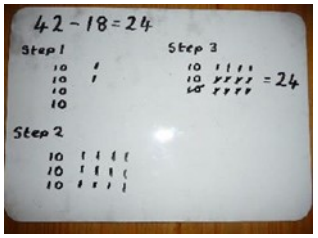
Vocabulary: decomposition, tens /hundreds/thousands/units/tenths boundary, column subtraction, extended column subtraction, exchange, decomposition, multibase/Dienes, From KS1- subtract, take away, less than, minus, leave, how many are left/left over?, how many are gone?, one less, two less, ten less…, how many fewer is… than…?, how much less is…?, distance between, difference between, equals, sign, is the same as, inverse, partition, recombine, place value, tens, units/ones

Objective and Strategies	Concrete	Pictorial	Abstract
Partitioning (without exchanging) - From KS1	Use dienes and PV cards to support  38 - 21 Use PV cards to help also:  Use PV counters alos and physically take away.	Draw PV Counters and cross out to help:  38—21 = 17 Drawing the dienes equipment rods will also help e.g.  54—22 = 32	82 - 51 80 2 50 1 (80 and 2) – (50 and 1) 80 - 50 = 30 2 - 1 = 1 30 + 1 = 31 Set out vertically next: 82 (80 +2) - 51 (50+1) 31 (30+1) Set this question out and use the manipulatives in conjunction with this.

Objective and Strategies	Concrete	Pictorial	Abstract
Decomposition practise (this is needed before children attempt decomposition in subtraction)	Before extended column subtraction ***needing decomposition*** children should be secure in partitioning 2 digit numbers in different ways e.g. 72 = 70 + 2 (using Dienes or PV counters to support)  72 =70 + 2 72 = 60 + 12  When this occurs, children should use the term "exchange" to describe converting one ten into ten ones, moving the ten units to the unit column, leaving one less in the tens column.	Children draw the Dienes blocks to show the exchange. 	72 = 70 + 2 72 = 60 + 12 72 = 50 + 22 ...

Objective and Strategies	Concrete	Pictorial	Abstract
Decomposition through Partitioning **TU—TU**	81—54 	Children may draw the Dienes equipment to help them visualise the fact that 1 subtract 4 can't happen.	

Objective and Strategies	Concrete	Pictorial	Abstract
Decomposition through Extended column method TU—TU	81—54 	Children may draw the Dienes equipment to help them visualise the fact that 1 subtract 4 can't happen.	
Short method of subtraction TU—TU		Children may draw the Dienes equipment to help them visualise the fact that 1 subtract 4 can't happen.	

Objective and Strategies	Concrete	Pictorial	Abstract
Short method of subtraction (using PV counters rather than Dienes equipment)	This is a good step as it introduces unitising. Make the larger number with PV counters:  Start with the ones: Can I subtract 8 from 4? I'll have to exchange one ten for ten ones.  Now I can subtract ones:  Now look at the tens. Can I subtract 80 from 20? I'll have to exchange one hundred for ten tens:  Now take 8 tens to complete the calculation:  	Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.  When confident, children can find their own way to record the exchange/regrouping. Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.  	7 1 8 1 - 5 4 2 7

Using Manipulatives

Subtraction with decomposition should be taught using the manipulatives as shown on the previous pages. To begin, use the PV cards together with the Dienes equipment to show the exchange required. Once children are ready, move them from using the Dienes equipment to the PV counters as shown.

Order to teach subtraction

TU—TU (no exchange)

TU—TU (exchange)

HTU—HTU (no exchange)

HTU—HTU (exchange)

ThHTU—ThHTU (no exchange)

ThHTU—ThHTU (exchange)

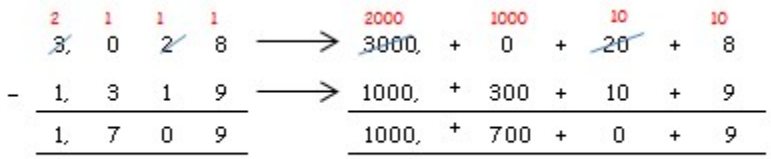
ThHTU—HTU (exchange)

ThHTU—TU (exchange)

Nb. Return to the **extended method** each time new calculations are introduced to ensure calculation is grounded in understanding. Then move to the **short formal** written method.

Column subtraction when there is a zero involved:

This should be explicitly taught to the children and modelled using the Dienes and PV counters.



Furthering children's subtraction understanding through reasoning and mastery:

Reasoning and mastery tasks should have been given to extend and deepen children's understanding throughout the Key Stages. The following are resources and ideas to use to deepen understanding and consider reasoning:

- **Nrich**
- **Testbase online materials**
- **TES SATS questions**
- **Tarsia activities**
- **White Rose Maths Hub assessments and reasoning documents**
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Children should be able to choose the most efficient methods to use by years 5 and 6 i.e. mental or written

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Mental and written calculation methods should be taught alongside each other throughout the entirety of this progression. When teaching children to calculate, emphasis should be

MULTIPLICATION—LKS2

Expectations—Year 3

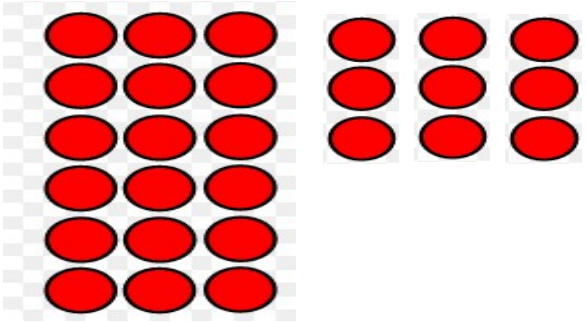
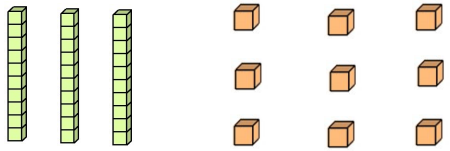
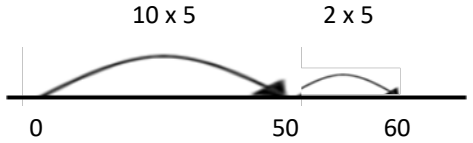
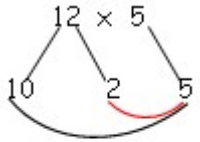
- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division **using the multiplication tables that they know**, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- 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.

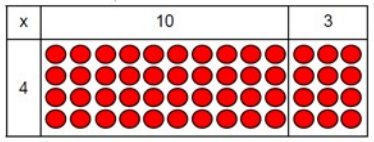
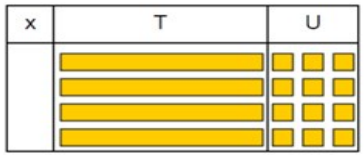
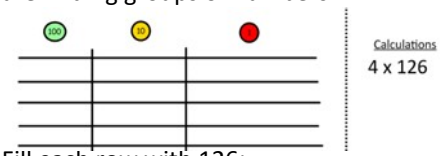
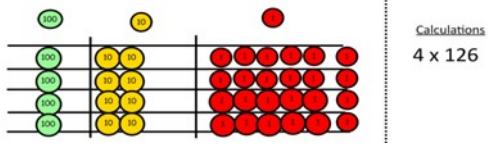
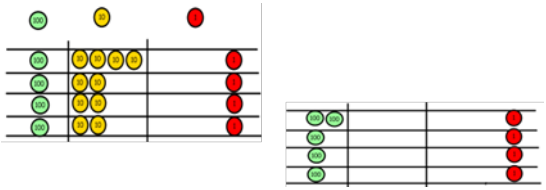
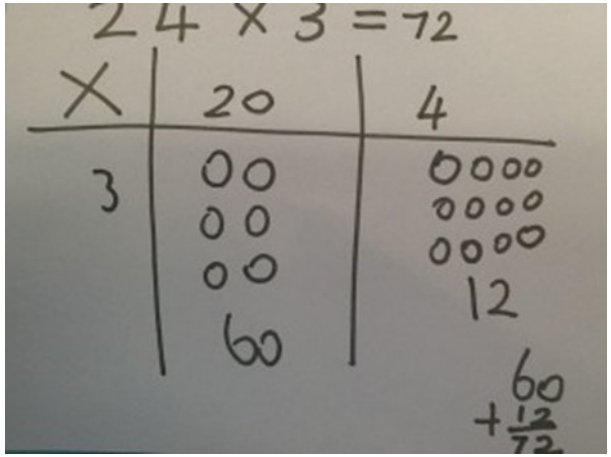
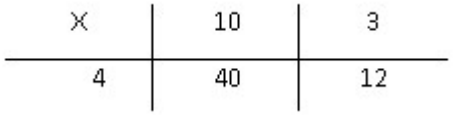
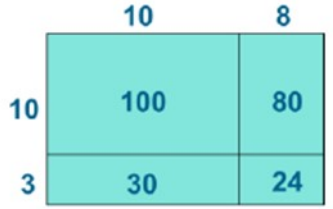
Expectations—Year 4

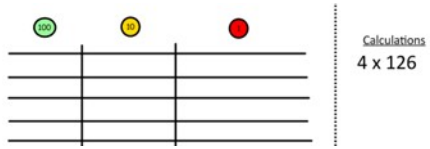
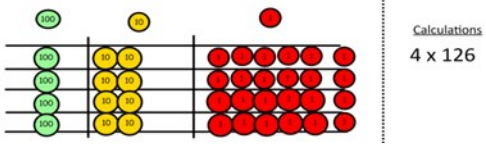
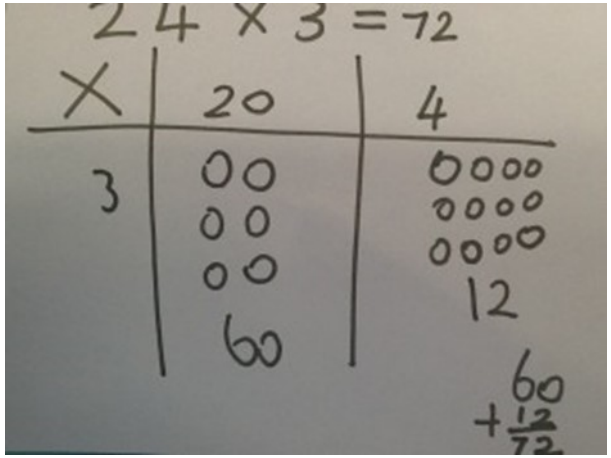
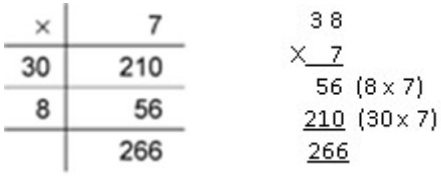
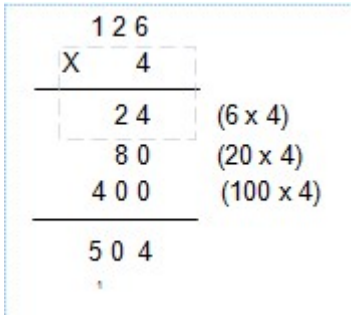
- recall multiplication and division facts for multiplication tables up to 12 × 12
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers
- recognise and use factor pairs and commutativity in mental calculations
- **multiply two-digit and three-digit numbers by a one-digit number using formal written layout**
- solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Vocabulary: odd, even, count in twos, threes, fives, count in tens (forwards from/backwards from)

How many times? Lots of, groups of, once, twice, three times, five times , repeated addition, array, row, column, double, halve, product, multiples of four, eight, fifty and one hundred , scale up, multiplication facts (up to 12x12), inverse, derive

Objective and Strategies	Concrete	Pictorial	Abstract
Using partitioning on a number line	This is the first exposure to the distributive law of multiplication e.g. 12x 5 = (10+2)x5= 10x5 + 2 x5 Children will they need lots of practice of this E.g. 13 x 3 using arrays: 10 x 3 + 3 x3  30 3 3 3 =39 Move to Dienes:  30 3 3 3 =39	Use a number line e.g. 12 x 5  Moving on to: 	 10 × 5 = 50 2 × 5 = 10 50 + 10 = 60

Objective and Strategies	Concrete	Pictorial	Abstract
Grid Method	Show the link with arrays to first introduce the grid method:  4 rows of 10 4 rows of 3 Move on to Dienes for a more compacted method:  4 rows of 13 Then progress to using PV counters. This shows that we are finding groups of numbers:  Fill each row with 126:  Add up each column from the units, exchanging as needed.  = 504	Children can represent any of the practical work they have done through drawings of arrays, dienes equipment and PV counters. With regard to PV counters, they can draw them, using colours to show different amounts, or just use circles in the different columns to show their thinking.  	 40 + 12 = 52 Moving forward, progress to grid showing TU x TU:   Nb: Children should be encouraged to estimate their answers before carrying out calculations e.g. 47 x 3 is approximately:

Objective and Strategies	Concrete	Pictorial	Abstract
Expanded short method of Multiplication	This should be applied in conjunction with the grid method as this is simply the same method, just written in a different format. Continue to use PV counters in the concrete working:  Fill each row with 126:  400 80 24 400 + 80 + 24 = your answer!	 	When writing the expanded short method, write it alongside the grid method to see the clear similarities.   Children should be encouraged to estimate their answer before doing any calculation. E.g. 126 x 4 is approximately: 125 x 4 = 500

Guidance for multiplication teaching:

Manipulatives: Children should use the manipulatives alongside the written approach to develop a deep understanding of the multiplication methods. Teachers should teach the grid method and then move on to the expanded short method, using the grid method alongside it.

It is advised to use Dienes equipment and arrays before moving on to place value counters for the concrete stage. Teachers should make a judgement as to when the children are ready to move to the next concrete apparatus.

Order to teach multiplication (using grid and expanded method)

TU x U

HTU x U

TU x TU

HTU x U (with money—introduce decimals)

Teachers should make a judgement on when to move to the next style of calculation. Since the calculations are all fairly similar, it is hoped that the methods can be shown alongside each other to highlight these similarities.

Teachers should seek to "master" each calculation type before moving on. Also, children should have consolidation and "mastery" time on each question type e.g. TU x U before moving to the next calculation (HTU x U)

Furthering children's multiplication understanding through reasoning and mastery:

Reasoning and mastery tasks should have been given to extend and deepen children's understanding throughout the Key Stages. The following are resources and ideas to use to deepen understanding and consider reasoning:

- **Nrich**
- **Testbase online materials**
- **TES SATS questions**
- **Tarsia activities**
- **White Rose Maths Hub assessments and reasoning documents**
- **NCETM Mastery documents**

Children should be able to choose the most efficient methods to use by years 5 and 6 i.e. mental or written

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Mental and written calculation methods should be taught alongside each other throughout the entirety of this progression. When teaching children to calculate, emphasis should be

DIVISION—LKS2

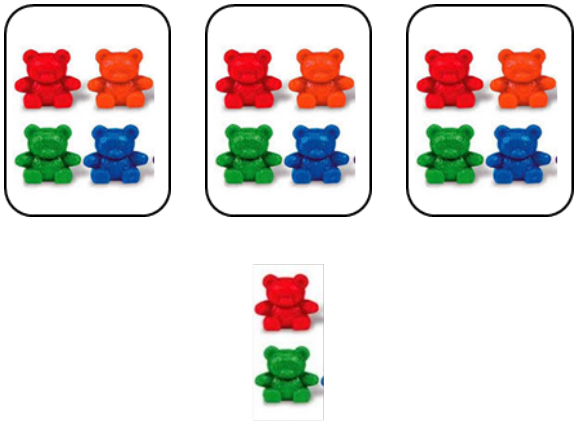
Expectations—Year 3

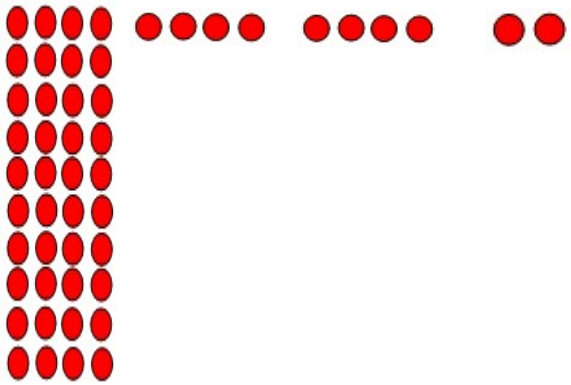
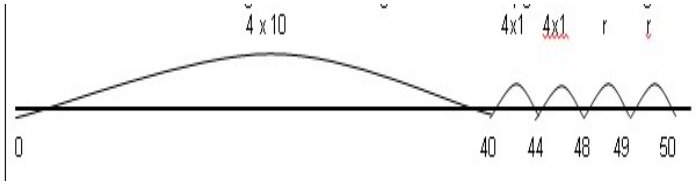
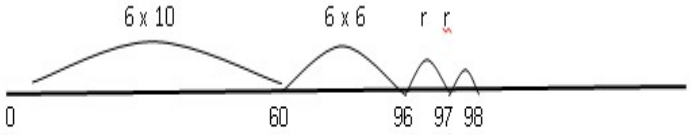
- Recall and use multiplication and division facts for the 3, 4 and 8 times tables.
- Write and calculate mathematical statements for multiplication and division using multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.
- 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.

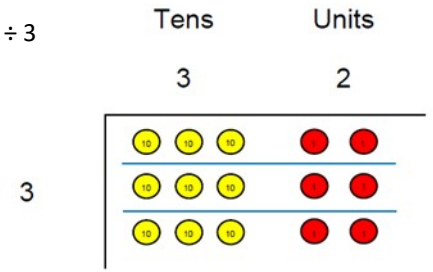
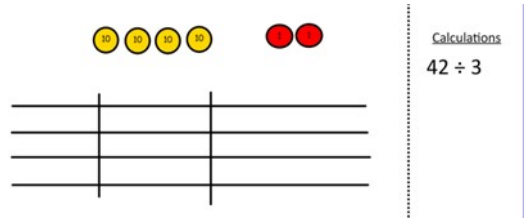
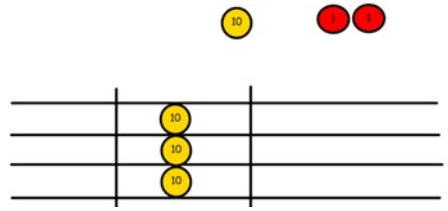
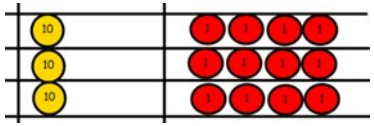
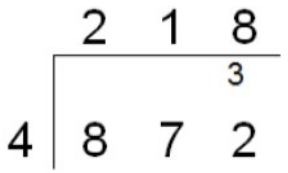
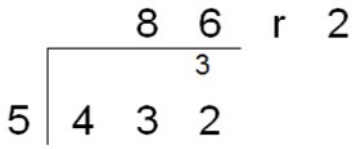
Expectations—Year 4

- Recall multiplication and division facts for multiplication tables up to 12 x 12.
- Use place value, known and derived facts to multiply and divide mentally, including; multiplying by 0 and 1; dividing by 1; multiplying together three numbers.
- Recognise and use factor pairs and commutativity in mental calculations.
- Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.
- Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by one-digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Vocabulary: number line, number track, odd, even, count in twos, threes, fives, count in tens (forwards from/backwards from) How many groups? lots of, groups of, repeated subtraction, array, row, column, double, halve, share, share equally, group, group in pairs, threes, etc., equal groups of , divide, divided by, left, left over, ***division facts, inverse, derive***

Objective and Strategies	Concrete	Pictorial	Abstract
Introducing remainders	14 ÷ 3 = Divide objects between groups and see how much is left over 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r.  Use in context: Understand the concept of a remainder in context. Eg. How many lengths of 10 cms can you cut from 51 cm of tape? How many will be left? 51 ÷ 10 = 5 lengths of 10cm and 1 cm left over.

Objective and Strategies	Concrete	Pictorial	Abstract
Chunking on a number line— TU ÷ U	Use practical equipment to help solve simple TU ÷ U questions e.g. 50 ÷ 4.  40 44 48 50 4 x 10 4 x 1 4 x 1 r 2 4 x 12 r 2 = 12 r 2 Dienes equipment can also be used for the multiples of 10.	Use a number line to record the chunking.  Begin to group in different groups other than multiples of 10, encouraging children to use known multiplication facts.  98 ÷ 6 = 16 r 2	Chunking – without remainders 96 ÷ 6 = 16 16 6 ⟌ 96 - 60 (6 × 10) 36 - 36 (6 × 6) 0 Chunking – with remainders 98 ÷ 6 = 16 r 2 16 6 ⟌ 98 - 60 (6 × 10) 38 - 36 (6 × 6) 2

Objective and Strategies	Concrete	Pictorial	Abstract
Short division **(for TU ÷ U, then HTU ÷ U)**	96 ÷ 3  Use place value counters to divide using the bus stop method alongside  42 ÷ 3= Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.  We exchange this ten for ten ones and then share the ones equally among the groups. 	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. Children can draw PV counters (using different colours if needed) to help them understand.	Begin with divisions that divide equally with no remainder.  Move onto divisions with a remainder.  Finally move into decimal places to divide the total accurately.

Furthering children's division understanding through reasoning and mastery:

Reasoning and mastery tasks should have been given to extend and deepen children's understanding throughout the Key Stages. The following are resources and ideas to use to deepen understanding and consider reasoning:

- **Nrich**
- **Testbase online materials**
- **TES SATS questions**
- **Tarsia activities**
- **White Rose Maths Hub assessments and reasoning documents**
- **NCETM Mastery documents**

Children should be able to choose the most efficient methods to use by years 5 and 6 i.e. mental or written

Upper Key Stage Two Calculation Policy

With Faith, Hope and Love we can achieve greater things.

. Addition

. Subtraction

. Multiplication

. Division

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With Faith, Hope and Love we can achieve greater things.

Mental and written calculation methods should be taught alongside each other throughout the entirety of this progression. When teaching children to calculate, emphasis should be

ADDITION—UPPER KS2

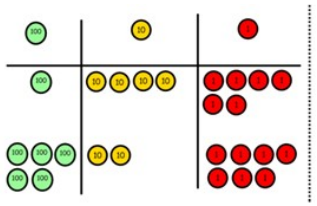
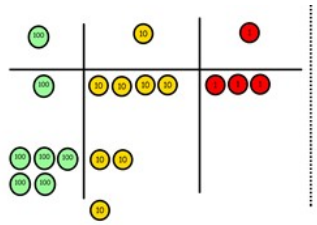
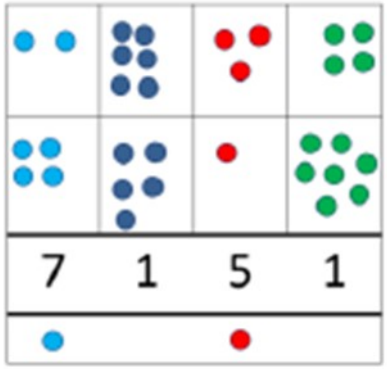
Expectations—Year 5 and Year 6

Pupils should be taught to:

- add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)
- add and subtract numbers mentally with increasingly large numbers
- use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Vocabulary: column addition, extended column addition, exchange, multibase, carry

From KS1- add, addition, more, plus, make, sum, total, altogether, score, double, near double, one more, two more… ten more… one hundred more, how many more to make…?, how many more is… than…?, how much more is…? , equals, sign, is the same as, tens boundary, count on in, partition, recombine

Objective and Strategies	Concrete	Pictorial	Abstract
Column method of Addition	Children should be moved from using the base 10 equipment and now consider the PV counters. This will help children develop an understanding of unitising. Make both numbers on a PV grid:  146 + 527 Add up the units and exchange one ten for ten ones:  146 + 527 Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.	Children can draw a pictorial representation of the columns and place value counters to further support their learning and understanding.  	146 + 527 673 1 536 + 85 621 1 1 72.8 + 54.6 127.4 1 1 £ 2 3 . 5 9 + £ 7 . 5 5 £ 3 1 . 1 4 1 1 1 2 3 . 3 6 1 9 . 0 8 0 5 9 . 7 7 0 + 1 . 3 0 0 9 3 . 5 1 1 2 1 2

Suggested order to tackle addition problems:

ThHTU + ThHTU

TeThHTU + TeThHTU

ThHTU + HTU

TeThHTU + HTU

Vary the amount of digits in questions so as to test children's

Understanding of place value.

Move onto decimal notations also:

U.te + U.te

U.tehu + U.tehu

Again, consider decimals with different amounts of digits to probe children's understanding of place value.

Furthering children's addition understanding through reasoning and mastery:

Reasoning and mastery tasks should have been given to extend and deepen children's understanding throughout the Key Stages. The following are resources and ideas to use to deepen understanding and

consider reasoning:

- **Nrich**
- **Testbase online materials**
- **TES SATS questions**
- **Tarsia activities**
- **White Rose Maths Hub assessments and reasoning documents**
- **NCETM Mastery documents**

Children should be able to choose the most efficient methods to use by years 5 and 6 i.e. mental or written

Part of a sample 2016 Y6 SATs problem involving different operations:

Sticks	£	1	2.	5	0
Sugar	£		9.	9	9
Apples	£	2	2.	5	0
Total	£	4	4.	9	9

Sample 2016 Y6 SATs

Write the missing digits to make the addition correct.

$$\begin{array}{r} 1\ \square\ 1 \\ +\ \square\ 1\ \square \\ \hline 9\ 0\ 0 \end{array}$$

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Mental and written calculation methods should be taught alongside each other throughout the entirety of this progression. When teaching children to calculate, emphasis should be

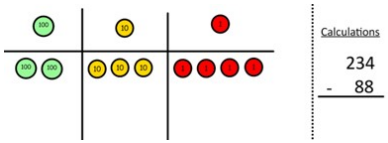
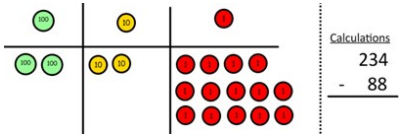
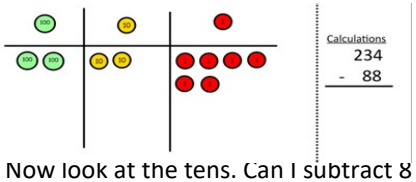
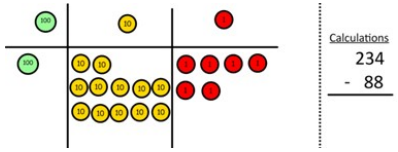
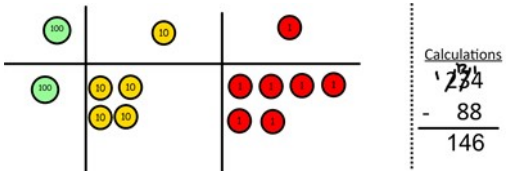
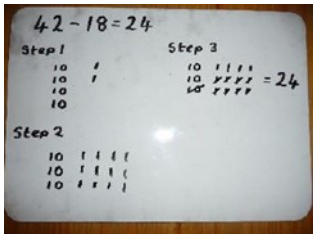
SUBTRACTION—Upper KS2

Expectations—Year 5 and Year 6

Pupils should be taught to:

- add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)
- add and subtract numbers mentally with increasingly large numbers
- use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy
- Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Vocabulary: decomposition, tens /hundreds/thousands/units/tenths boundary, column subtraction, extended column subtraction, exchange, decomposition, multibase/Dienes, From KS1- subtract, take away, less than, minus, leave, how many are left/left over?, how many are gone?, one less, two less, ten less…, how many fewer is… than…?, how much less is…?, distance between, difference between, equals, sign, is the same as, inverse, partition, recombine, place value, tens, units/ones

Objective and Strategies	Concrete	Pictorial	Abstract
Short method of subtraction	This is a good step as it introduces unitising. Make the larger number with PV counters:  Start with the ones: Can I subtract 8 from 4? I'll have to exchange one ten for ten ones.  Now I can subtract ones:  Now look at the tens. Can I subtract 8 from 2? I'll have to exchange one hundred for ten tens:  Now take 8 tens to complete the calculation:  	Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.  When confident, children can find their own way to record the exchange/regrouping. Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.  	7 1 8 1 - 5 4 2 7 5 12 1 2 6 3 . 0 - 2 6 . 5 2 3 6 . 5

Suggested order to tackle subtraction problems:

ThHTU - ThHTU

TeThHTU - TeThHTU

ThHTU - HTU

TeThHTU - HTU

Vary the amount of digits in questions so as to test children's

Understanding of place value.

Move onto decimal notations also:

U.te - U.te

U.tehu - U.tehu

Again, consider decimals with different amounts of digits to probe children's understanding of place value.

Furthering children's subtraction understanding through reasoning and mastery:

Reasoning and mastery tasks should have been given to extend and deepen children's understanding throughout the Key Stages. The following are resources and ideas to use to deepen understanding and

consider reasoning:

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Children should be able to choose the most efficient methods to use by years 5 and 6 i.e. mental or written

Part of a sample 2016 Y6 SATs problem involving different operations:

Prices:

Sticks	£	1	2.	5	0
Sugar	£		9.	9	9
Apples	£	2	2.	5	0

Children buy just enough sticks, sugar and apples to make **100** toffee apples. They sell all 100 toffee apples for **£1 each**. The profit goes to charity.

Work out how much money goes to charity.

St Andrew's C of E Primary School

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Mental and written calculation methods should be taught alongside each other throughout the entirety of this progression. When teaching children to calculate, emphasis should be

MULTIPLICATION—UPPER KS2

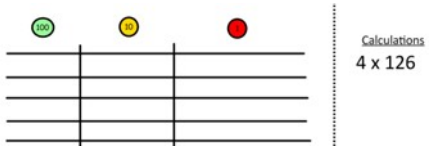
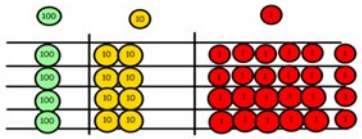
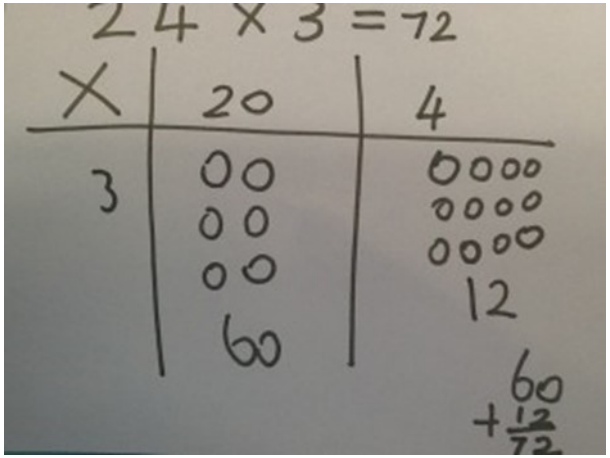
Expectations—Year 5 and Year 6

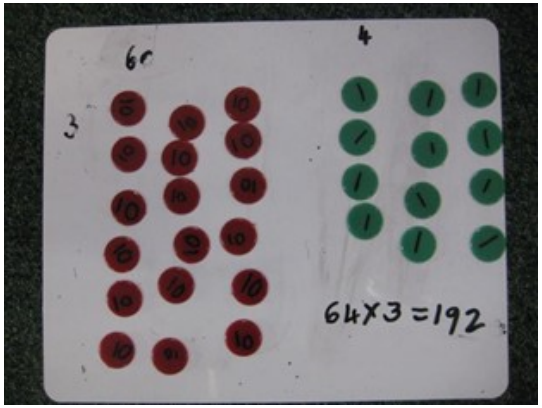
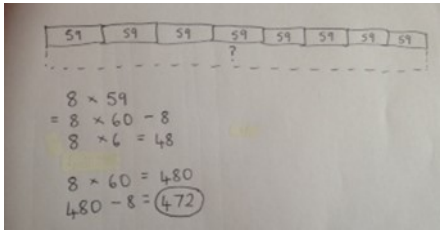
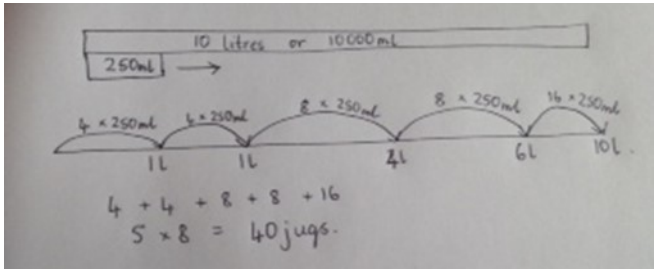
- identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
- know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- establish whether a number up to 100 is prime and recall prime numbers up to 19
- **multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers**
- multiply and divide numbers mentally drawing upon known facts
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})
- solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
- solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign

Vocabulary: odd, even, count in twos, threes, fives, count in tens (forwards from/backwards from)

How many times? Lots of, groups of, once, twice, three times, five times , repeated addition, array, row, column, double, halve, product, multiples of four, eight, fifty and one hundred , scale up, multiplication facts (up to 12x12), inverse, derive, factor pairs

composite numbers, prime number, prime factors, square number, cubed number, formal written method

Objective and Strategies	Concrete	Pictorial	Abstract
Expanded short method of Multiplication	This should be applied in conjunction with the grid method as this is simply the same method, just written in a different format. Continue to use PV counters in the concrete working:  Calculations 4 x 126 Fill each row with 126:  Calculations 4 x 126 400 80 24 400 + 80 + 24 = your answer!	 	When writing the expanded short method, write it alongside the grid method to see the clear similarities. × | 7 30 | 210 8 | 56 266 38 x 7 56 (8 x 7) 210 (30 x 7) 266 126 X 4 24 (6 x 4) 80 (20 x 4) 400 (100 x 4) 504 Children should be encouraged to estimate their answer before doing any calculation. E.g. 126 x 4 is approximately: 125 x 4 = 500

Objective and Strategies	Concrete	Pictorial	Abstract
Column Multiplication	Children can continue to be supported by place value counters at this stage of multiplication.  It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.	Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.   	Start with long multiplication, reminding the children about lining up their numbers clearly in columns. If it helps, children can write out what they are solving next to their answer in brackets: 32 x 24 8 (4 x 2) 120 (4 x 30) 40 (20 x 2) 600 (20 x 30) 768 7 4 x 6 3 1 2 2 1 0 2 4 0 + 4 2 0 0 4 6 6 2 Move to no brackets This moves to the more compact method. 2 3 1 1342 x 18 13420 10736 24156 1

Suggested order to tackle multiplication problems:

HTU x U

ThHTU x U

TU x TU

HTU x TU

ThHTU x TU

Children should be taught the expanded method for each type before moving onto the short column method.

Move onto decimal notations also:

U.te x U

U.tehu x U

Furthering children's mutliplication understanding through reasoning and mastery:

Reasoning and mastery tasks should have been given to extend and deepen children's understanding throughout the Key Stages. The following are resources and ideas to use to deepen understanding and consider reasoning:

- **Nrich**
- **Testbase online materials**
- **TES SATS questions**
- **Tarsia activities**
- **White Rose Maths Hub assessments and reasoning documents**
- **NCETM Mastery documents**

Children should be able to choose the most efficient methods to use by years 5 and 6 i.e. mental or written

Other Guidance

- Children apply all the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations.
- Children use and understand the terms factor, multiple and prime, square and cube numbers.
- Pupils use multiplication and division as inverses to support the introduction of ratio in year 6, for example, by multiplying and dividing by powers of 10 in scale drawings or by multiplying and dividing by powers of a 1000 in converting between units such as kilometres and metres.
- Distributivity can be expressed as a(b + c) = ab + ac.
- They understand the terms factor, multiple and prime, square and cube numbers and use them to construct equivalence statements (for example, 4 x 35 = 2 x 2 x 35; 3 x 270 = 3 x 3 x 9 x 10 = 92 x 10).
- Pupils use and explain the equals sign to indicate equivalence, including in missing number problems (for example, 13 + 24 = 12 + 25; 33 = 5 x).

Examples from NC 2014:

342 × 7 becomes

$$\begin{array}{r} 3\ 4\ 2 \\ \times\quad\ 7 \\ \hline 2\ 3\ 9\ 4 \\ \ \ 2\ 1 \end{array}$$

Answer: 2394

2741 × 6 becomes

$$\begin{array}{r} 2\ 7\ 4\ 1 \\ \times\quad\ 6 \\ \hline 1\ 6\ 4\ 4\ 6 \\ \ \ 4\ 2 \end{array}$$

Answer: 16 446

124 × 26 becomes

$$\begin{array}{r} \ \ 1\ 2 \\ \ \ 1\ 2\ 4 \\ \times\quad 2\ 6 \\ \hline \ \ 7\ 4\ 4 \\ 2\ 4\ 8\ 0 \\ \hline 3\ 2\ 2\ 4 \\ 1\ 1 \end{array}$$

Answer: 3224

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Mental and written calculation methods should be taught alongside each other throughout the entirety of this progression. When teaching children to calculate, emphasis should be

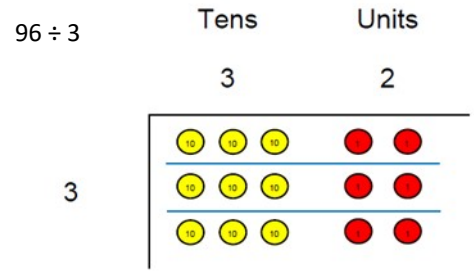
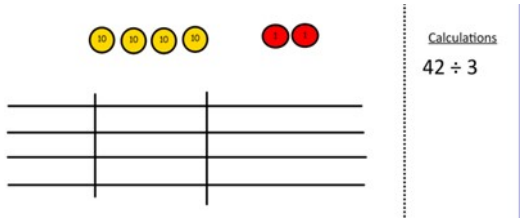
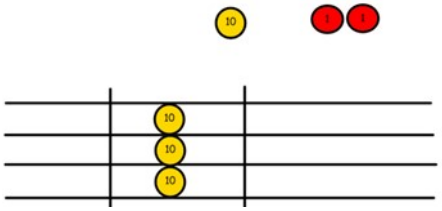
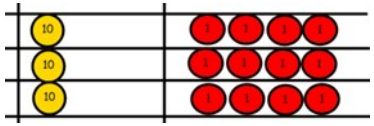
DIVISION—UPPER KS2

Expectations—Year 5 and Year 6

- identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers
- know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers
- establish whether a number up to 100 is prime and recall prime numbers up to 19
- 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
- multiply and divide numbers mentally drawing upon known facts
- 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
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})
- solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes
- solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign

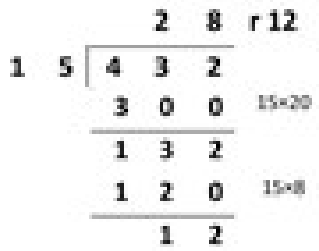
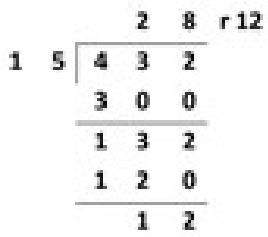
Vocabulary: number line, number track, odd, even, count in twos, threes, fives, count in tens (forwards from/backwards from)

How many groups? lots of, groups of, repeated subtraction, array, row, column, double, halve, share, share equally, group, group in pairs, threes, etc., equal groups of , divide, divided by, left, left over, division facts, inverse, derive, factor pairs composite numbers, prime number, prime factors, square number, cubed number, formal written method

Objective and Strategies	Concrete	Pictorial	Abstract
Short division (Writing re-mainder in a number of different ways)	96 ÷ 3  Use place value counters to divide using the bus stop method alongside  42 ÷ 3= Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.  We exchange this ten for ten ones and then share the ones equally among the groups. 	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. Children can draw PV counters (using different colours if needed) to help them understand.	98 ÷ 7 becomes 1 4 7 | 9 8 2 Answer: 14 432 ÷ 5 becomes 8 6 r 2 5 | 4 3 2 3 Answer: 86 remainder 2 496 ÷ 11 becomes 4 5 r 1 1 1 | 4 9 6 5 Answer: $45\frac{1}{11}$ Also consider diving decimals.

Objective and Strategies	Abstract
Extended Long Division (Chunking)	432 ÷ 15 becomes 2 8 r 12 1 5 | 4 3 2 3 0 0 15×20 1 3 2 1 2 0 15×8 1 2 Answer: 28 remainder 12 432 ÷ 15 becomes 2 8 1 5 | 4 3 2 3 0 0 15×20 1 3 2 1 2 0 15×8 1 2 $\frac{12}{15} = \frac{4}{5}$ Answer: $28\frac{4}{5}$ 432 ÷ 15 becomes 2 8 · 8 1 5 | 4 3 2 · 0 3 0 15×20 1 3 2 1 2 0 15×8 1 2 0 1 2 0 0 Answer: 28·8

Move straight to the abstract stage at this point as this method is a consolidation of many skills such as multiplying by multiples of 10 and subtraction. These skills are assumed at this stage and given the relative size of the numbers, concrete materials at this stage would be a hindrance.

Objective and Strategies	Abstract
Long division	432 ÷ 15  2 8 r 12 1 5 | 4 3 2 3 0 0 15×20 1 3 2 1 2 0 15×8 1 2 Becomes: 432 ÷ 15  2 8 r 12 1 5 | 4 3 2 3 0 0 1 3 2 1 2 0 1 2

Move straight to the abstract stage at this point as this method is a consolidation of many skills such as multiplying by multiples of 10 and subtraction. These skills are assumed at this stage and given the relative size of the numbers, concrete materials at this stage would be a hindrance.

Suggested order to tackle division problems:

HTU ÷ U

ThHTU ÷ U

HTU.te ÷ U

ThHTU.te ÷ U

Ensure remainders are taught in a variety of ways.

Children should then consider long methods:

HTU ÷ TU

ThHTU ÷ TU

Furthering children's division understanding through reasoning and mastery:

Reasoning and mastery tasks should have been given to extend and deepen children's understanding throughout the Key Stages. The following are resources and ideas to use to deepen understanding and consider reasoning:

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- **Testbase online materials**
- **TES SATS questions**
- **Tarsia activities**
- **White Rose Maths Hub assessments and reasoning documents**
- **NCETM Mastery documents**

Children should be able to choose the most efficient methods to use by years 5 and 6 i.e. mental or written

Other Guidance

- Children apply all the multiplication tables and related division facts frequently, commit them to memory and use them confidently to make larger calculations.
- Children use and understand the terms factor, multiple and prime, square and cube numbers.
- Pupils interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding (for example, 98 ÷ 4 = = 24 r 2 = 24 and a half = 24.5 ≈ 25).
- Pupils use multiplication and division as inverses to support the introduction of ratio in year 6, for example, by multiplying and dividing by powers of 10 in scale drawings or by multiplying and dividing by powers of a 1000 in converting between units such as kilometres and metres.
- Distributivity can be expressed as a(b + c) = ab + ac.
- They understand the terms factor, multiple and prime, square and cube numbers and use them to construct equivalence statements (for example, 4 x 35 = 2 x 2 x 35; 3 x 270 = 3 x 3 x 9 x 10 = 92 x 10).
- Pupils use and explain the equals sign to indicate equivalence, including in missing number problems (for example, 13 + 24 = 12 + 25; 33 = 5 x $\square$).