Beech Grove Primary School

How we teach calculations:

Calculation Policy for Mathematics

Updated Spring 2022

CALCULATION POLICY RATIONALE

The following calculation policy has been devised to meet the requirements of the National Curriculum 2016 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of **procedural knowledge** across the school.

Mathematical curriculum content is defined as:
Declarative knowledge: consists of facts, formulae, concepts, principles and rules.
I know that…
Procedural knowledge: as a sequence of steps, includes methods, algorithms and procedures: everything from long division, ways of setting out calculations in workbooks
I know how…
Conditional knowledge: gives pupils the ability to reason and solve problems. Useful combinations of declarative and procedural knowledge are transformed into strategies when pupils learn to match the problem types that they can be used for.
I know when…

This Calculation Policy ensures consistency in teaching methods and presentation across the school. It has been designed as a CPD tool for teachers of all levels of expertise to track procedural knowledge both through prior learning, where procedures are revisited at the start of a sequence of learning, and through future learning by understanding the next stage in a child's mathematical learning journey. It has also been designed for use by TA's in interventions and for parents to help their children at home.

The use of two key representations (part whole models and bar models) are a golden thread through the maths curriculum. They provide children with additional tools to aid conditional knowledge and enable them to draw connections across different mathematical ideas. Bar modelling is a powerful tool used to bridge concrete learning to abstract learning in KS1. In KS2, it enables children to have a deeper understanding of fractions and is used as a bridge from arithmetic to early algebra. It is a useful interim method for abstracting arithmetic and algebraic expressions from word problems and prepares children for the secondary maths curriculum.

Please note that early learning in number and calculation in Reception follows the NCETM Mastering Number approach to meet the Early learning goals set out in the reformed Early years framework (September 2021) and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage. As children progress through the curriculum, there is a planned obsolescence of early methods. Ideally, pupils gradually cease to depend on some methods of counting and calculating, and associated resources, that they were taught earlier on.

The Beech Grove Calculation Policy addresses the following statements from *OFSTED's School Inspection Handbook:*

- The school's curriculum planning for mathematics carefully sequences knowledge, concepts and procedures to build mathematical knowledge and skills systematically and, over time, the curriculum draws connections across different ways of looking at mathematical ideas.
- The school's curriculum identifies opportunities when mathematical reasoning and solving problems will allow pupils to make useful connections between identified mathematical ideas.
- Teaching models new procedures and uses resources and approaches that enable pupils to understand the mathematics they are learning.
- All teachers of mathematics, including non-specialist teachers of mathematics, have sufficient mathematical and teaching content knowledge to deliver topics effectively.
- Teachers plan to teach older pupils efficient, systematic and accurate mathematical methods that they can use for more complex calculations and in their next stage of learning.
- Within the curriculum, there are sufficient opportunities planned to revisit previously learned knowledge, concepts and procedures; this is to ensure that, once learned, mathematical knowledge becomes deeply embedded in pupils' memories. This then allows rapid and accurate recall and frees pupils' attention so they can work with increasing independence, apply their mathematical knowledge to more complex concepts and procedures, and gain enjoyment through a growing self-confidence in their ability.

The following calculation policy has been devised to meet requirements of the National Curriculum 2016 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Please note that early learning of mathematics in Reception covers the fundamental skills of subitising, cardinality, ordinality and counting, composition and comparison. This meets the Early learning goals set out in the reformed Early years framework (September 2021).

Composition forms the building blocks of all subsequent calculation and is therefore included in this calculation policy as our curriculum is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

Composition

Composition is a key area of early mathematics. Children must learn that a number is a 'whole' made up of smaller parts so the whole is therefore bigger than its parts.

A sound understanding of numerosity and cardinality is crucial in children's knowledge of composition. Having a deeper understanding of the number system will support the child's continued exploration and understanding of number fact work in Key Stage 1. Being able to compose and decompose numbers mentally will mean children are more fluent in their knowledge of number bonds which they will use to calculate efficiently in Key Stage 1 and Key Stage 2.

In Reception children will :

- learn that all numbers can be made up of 1s
- compose their own 'collections' within 4.
- explore the concept of 'wholes' and 'parts' by looking at a range of objects that are composed of parts, some of which can be taken apart and some of which cannot
- explore the composition of numbers within 5.
- practise recalling 'missing' or 'hidden' parts for 5
- explore the composition of 6, linking this to familiar patterns, including symmetrical patterns
- begin to see that numbers within 10 can be composed of '5 and a bit'
- explore the composition of odd and even numbers, looking at the 'shape' of these numbers
- begin to link even numbers to doubles
- begin to explore the composition of numbers within 10.
- explore the composition of 10.
- Use a range of gestures and stem sentences to support their understanding of composition and their ability to communicate their understanding by using the correct mathematical vocabulary.

Composition

Key Vocabulary: part, whole, double, 'stopping' number, made of, altogether, greater, fewer

Stem sentences

____ and ____ make _____ altogether

I can see ___ and ____ that makes _____ altogether

____ is made of ____ and ____. Double ____ is _____

___ is made of _____ and ____

(Generalised statement)

5 is made of ____ and ____

10 is made of ____ and ____

Early Learning Goals

Number:

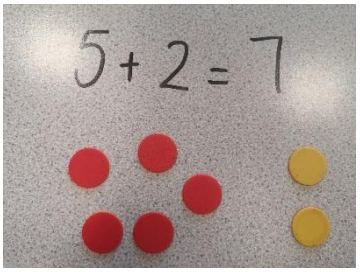
- Have a deep understanding of number to 10, including the composition of each number.
- Subitise (recognise quantities without counting) up to 5.
- Automatically recall (without reference to rhymes, counting or other aids) number bonds up to 5 (including subtraction facts) and some number bonds to 10, including double facts.

Numerical Pattern

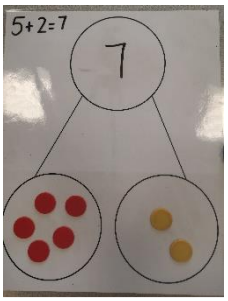
- Verbally count beyond 20, recognising the pattern of the counting system.
- Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity.
- Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally

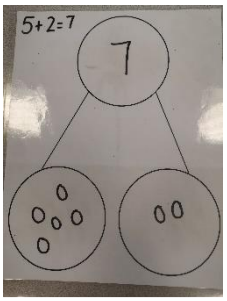
Addition

Year 1 Add with numbers up to 20



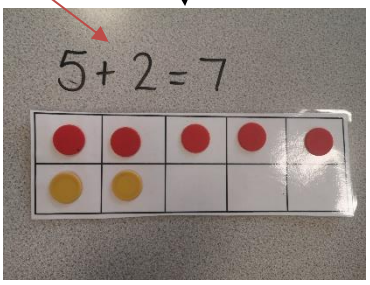
Introduce the calculation alongside concrete resources (prior learning would include objects such as fruit and even children)



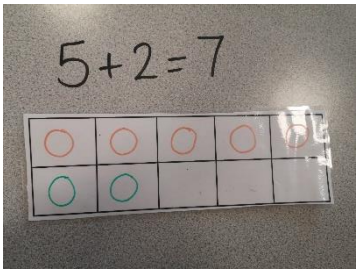


Use part-whole models. Use language: these are the parts that make the whole. Move from abstract to pictorial by drawing counters / dots / crosses.

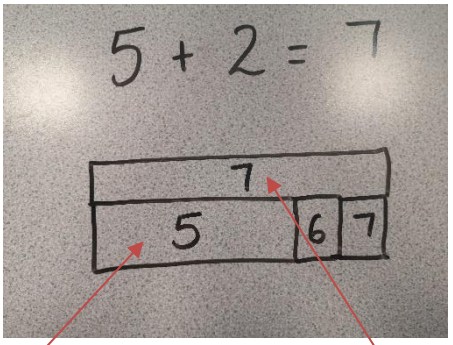
Always refer to parts and wholes.



Move to tens frames, starting with the abstract. Link back to previous learning steps.



Move to pictorial by asking children to draw counters. Encourage children to 1:1 count by drawing dots on each counter.



N.B. Throughout, use the language increase.

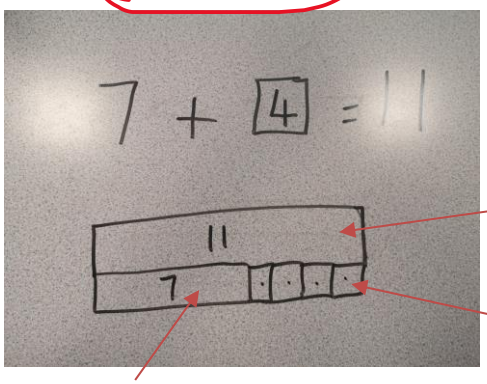
Start with the biggest part and then add on ones to find the whole.

Once you know the whole, 'put on the lid'.

Missing numbers

7 + ___ = 11

1) We know a part.
2) We know the whole.
3) We need to find the other part.



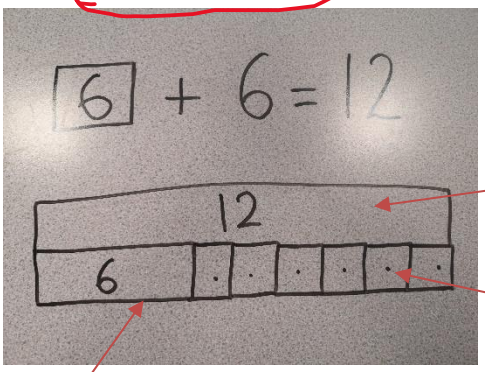
Put the whole number on top.

Count on to the whole number.

Start with the known part.

___ + 6 = 12

1) We know a part.
2) We know the whole.
3) We need to find the other part.



Put the whole number on top.

Count on to the whole number.

Start with the known part.

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, most, count on, part, whole, ones, tens.

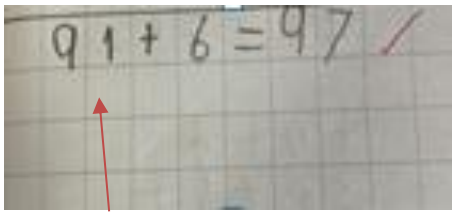
Key skills for addition at Y1:

- Read and write numbers to 100 in numerals, incl. 1—20 in words
- Recall bonds to 10 and 20, and addition facts within 20
- Count to and across 100
- Count in multiples of 1 2, 5 and 10
- Solve simple 1-step problems involving addition, using objects, number lines and pictorial representations.

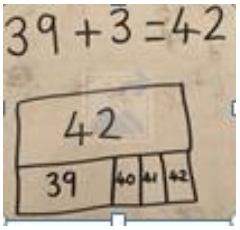
Addition

Year 2 Add with 2-digit numbers

2 digit + 1 digit

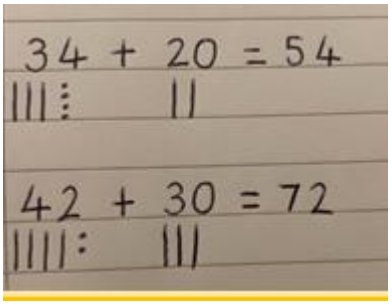


Children put the biggest number in their heads and count on with fingers



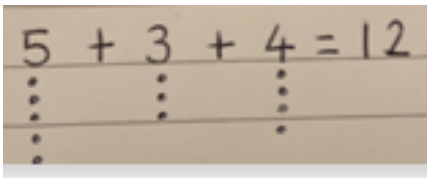
Use bar models to display the calculation. Put the biggest number in the box and then count on, writing each number in each box.

Adding a multiple of 10 to any number

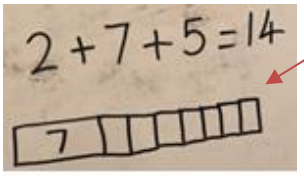


Children partition the number and count how many tens and how many ones it has. Then draw the tens and ones and count them altogether.

Adding 3 single digits



Children encouraged to count on in head but can draw dots underneath each number and then add them altogether.



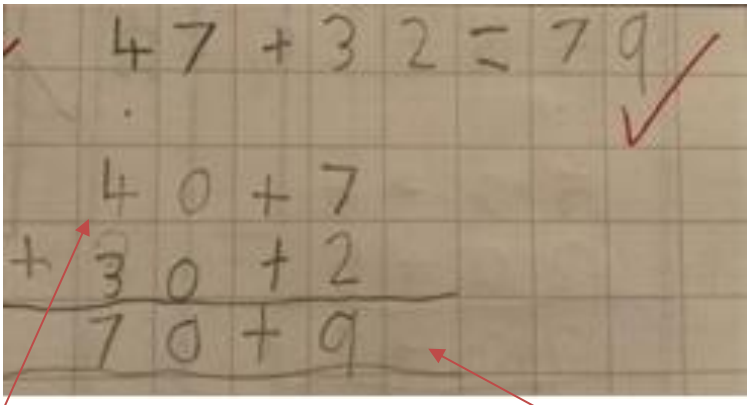
Progress to using bar models.

Addition with carrying

Use the written method. Children add down the columns and add the tens and ones together to find the answer.

2 digit + 2 digit

Introduce the written method for adding two 2-digit numbers together.



Children partition the numbers. E.g. 40 and 7.

Children then add down the columns and then put the numbers together to find the answer.

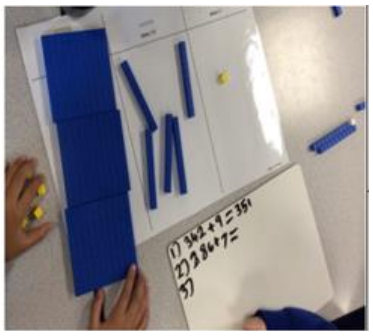
Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, most, count on, part, whole, ones, tens, partition, addition, column, tens boundary, sum, carry.

Key skills for addition at Y2:

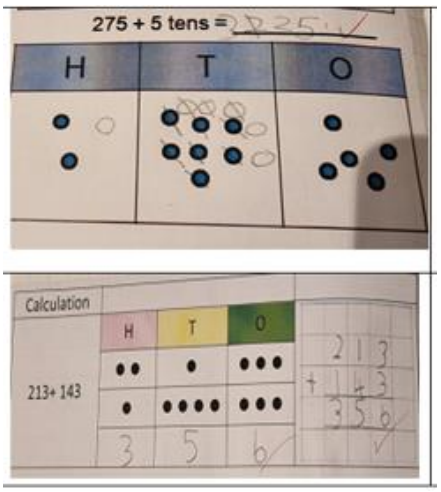
- Add a 2-digit number and ones (e.g. 27 + 6)
- Add a 2-digit number and tens (e.g. 23 + 40)
- Add pairs of 2-digit numbers (e.g. 35 + 47)
- Add three single-digit numbers (e.g. 5 + 9 + 7)
- Show that adding can be done in any order (the commutative law).
- Recall bonds to 20 and bonds of tens to 100 (30 + 70 etc.)
- Count in steps of 2, 3 and 5 and count in tens from any number.
- Understand the place value of 2-digit numbers (tens and ones)
- Compare and order numbers to 100 using < > and = signs.
- Read and write numbers to at least 100 in numerals and words.
- Solve problems with addition, using concrete objects, pictorial representations, involving numbers,
- quantities and measures, and applying mental and written methods.

Addition

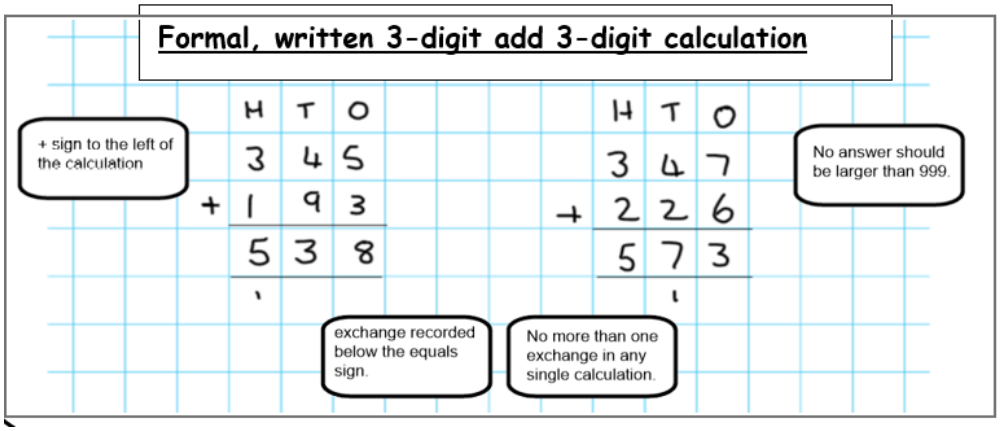
Year 3 Add numbers with up to 3-digits



Use concrete base 10 to introduce children to adding 3-digt numbers. This allows children to understand the value of each digit.



Pictorial representation allows children to gain a visual understanding of exchanging.



Children are now ready to use the formal written method. **N.B. concrete and visual representations should still be available throughout.**

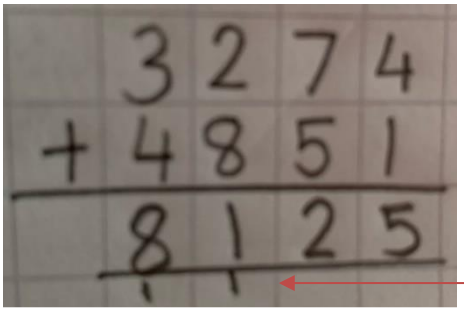
Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, part, whole, sum, tens, partition, addition, column, tens boundary, carry. increase, vertical.

Key skills for addition at Y3:

- Add multiples of 100
- Add 3 digit and 1 digit numbers not crossing 10
- Add 3 digit and 1 digit numbers crossing 10.
- Add and 3 digit and 3 digit numbers not crossing 100
- Add 3 digt and 2 digt numbers crossing 100
- Add and subtract 100s.
- Spot the pattern – making it explicit
- Add a 2 digit and 3 digit numbers not corssing 10 or 100
- Add a 2 digit and 3 digit numbers crossing 10 or 100
- Add two 3 digit numbers not crossing 10 or 100
- Add two 3 digit number crossing 10 or 100

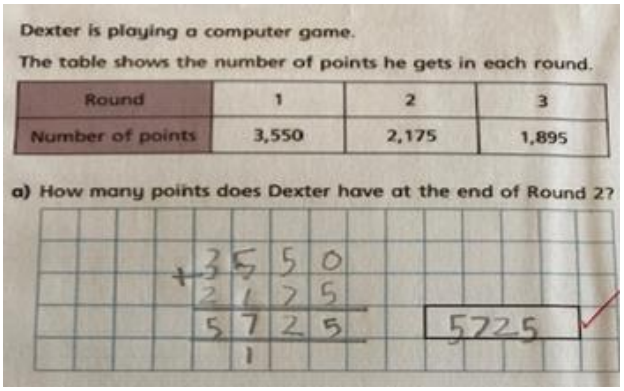
Addition

Year 4 Add numbers with up to 4 digits



Encourage children to now solve calculations with more than one carry.

Children build on what they've learned in Year 3 when using the formal written method to now add numbers up to 4 digits.



Children encouraged to now use the formal written method to help solve real life problems and calculations.

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, ones, tens, partition, plus, addition, column, tens boundary, hundreds boundary, increase, vertical, carry, thousands, hundreds, digits.

Key skills for addition at Y4:

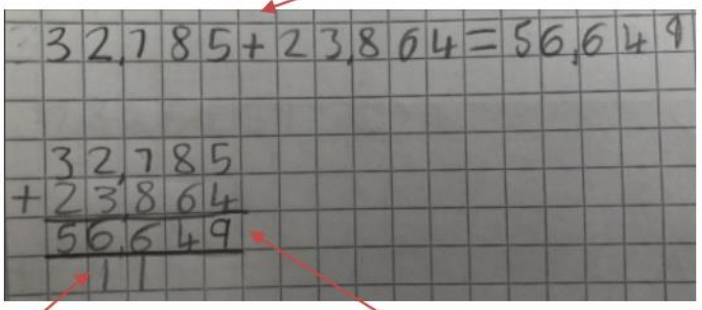
- Select most appropriate method: mental, jottings or written and explain why.
- Recognise the place value of each digit in a four-digit number.
- Round any number to the nearest 10, 100 or 1000.
- Estimate and use inverse operations to check answers.
- Solve 2-step problems in context, deciding which operations and methods to use and why.
- Find 1000 more or less than a given number.
- Continue to practise a wide range of mental addition strategies, ie. number bonds, add the nearest multiple of 10, 100, 1000 and adjust, use near doubles, partitioning and recombining.
- Add numbers with up to 4 digits using the formal written method of column addition
- Solve 2-step problems in contexts, deciding which operations and methods to use and why.
- Estimate and use inverse operations to check answers to a calculation.

Addition

Year 5 Add numbers with more than 4 digits

including money, measures and decimals with different numbers of decimal places.

Children build on prior year's knowledge, now applying this to bigger numbers up to 1,000,000.

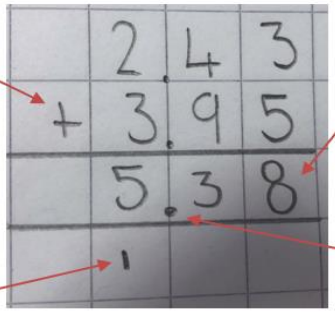


Add sign to go at left hand side.

Start adding from the one's column.

Carry numbers underneath the bottom line.

Children begin to add decimals with



Add sign to go at left hand side.

Start adding from the one's column.

Decimal point to sit on line.

Carry numbers underneath the bottom line.

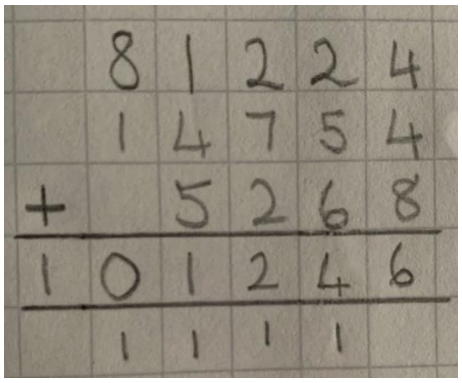
Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, ones, tens, partition, plus, addition, column, tens boundary, hundreds boundary, increase, expanded, carry, compact, vertical, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths ten thousand, hundred thousand, million.

Key skills for addition at Y5:

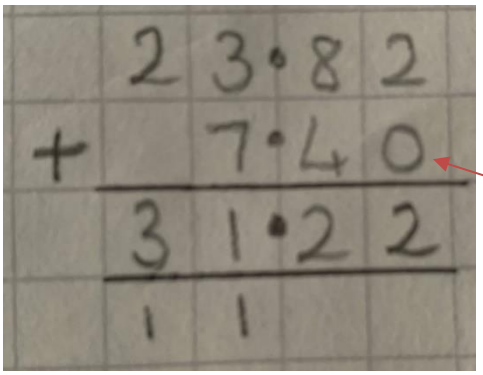
- Add numbers mentally with increasingly large numbers, using and practising a range of mental strategies ie. add the nearest multiple of 10, 100, 100 and adjust; use near doubles, inverse, partitioning and
- re-combining; using number bonds.
- Use rounding to check answers and accuracy.
- Solve multi-step problems in contexts, deciding which operations and methods to use and why.
- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.
- Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000.
- Add numbers with more than 4 digits using formal written method of columnar addition.

Addition

Year 6 Add several numbers of increasing complexity



Introduce children to adding more than two numbers. Encourage children to "hold" the number in their head from the first calculation before then moving on to number bonds e.g 3 + 5 + 7 = add the 3 and the 7 to make 10 and then add the 5 for 15.



Recap adding decimals from Year 5 but now move onto decimals with a different number of places.

Encourage children to use place holders to fill in any 'gaps'.

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, ones, tens, partition, plus, addition, column, tens boundary, hundreds boundary, increase, carry, expanded, compact, vertical, thousands, hundreds, digits, inverse, decimal places, decimal point, tenths, hundredths, thousandths, ten thousand, hundred thousand, million.

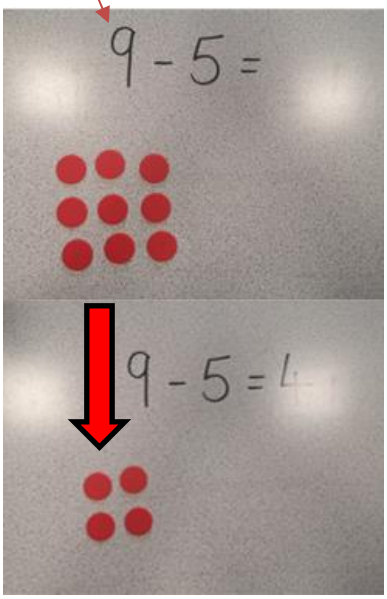
Key skills for addition at Y6:

- Perform mental calculations, including with mixed operations and large numbers, using and practising a range of mental strategies.
- Solve multi-step problems in context, deciding which operations and methods to use and why.
- Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.
- Read, write, order and compare numbers up to 10 million and determine the value of each digit.
- Round any whole number to a required degree of accuracy.
- Pupils understand how to add mentally with larger numbers and calculations of increasing complexity.

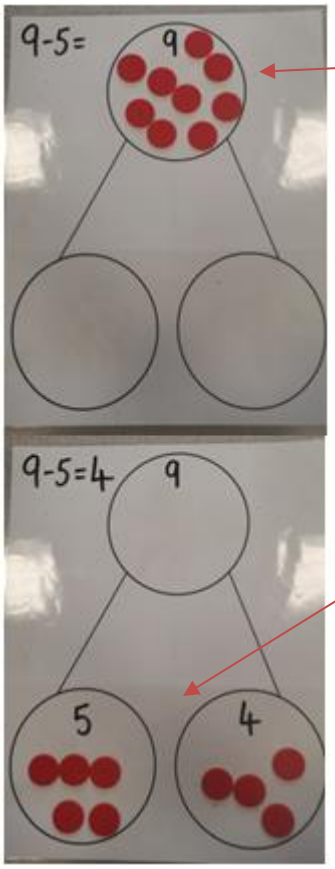
Subtraction

Year 1

Use language we know this is the whole.



Practically take away the counters and then count how many are left. Alongside counters, use lots of other objects: fruit, toys, children etc.

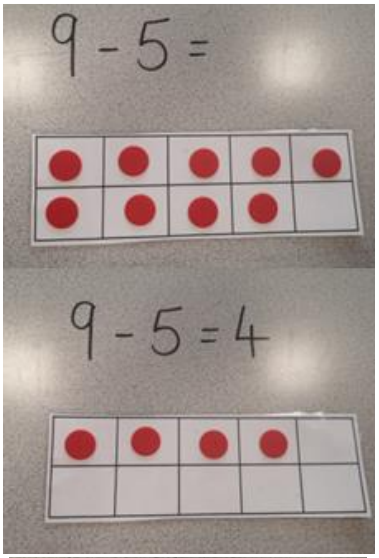


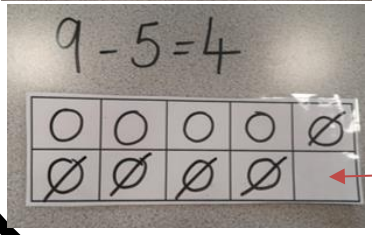
Remind children we are taking from the whole.

Physically move the parts by taking away five. Use the language 5 is a part, 4 is a part, the whole is 9. 9-5=4

Move to pictoral, drawing counters.

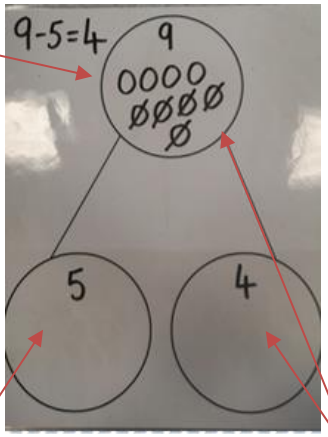
Move to setting the calculation out in a ten frame. Repeat taking away 5 and counting how many are left.





Move from the practical counters to the concrete of drawing counters and crossing out to take away.

First, draw counters.

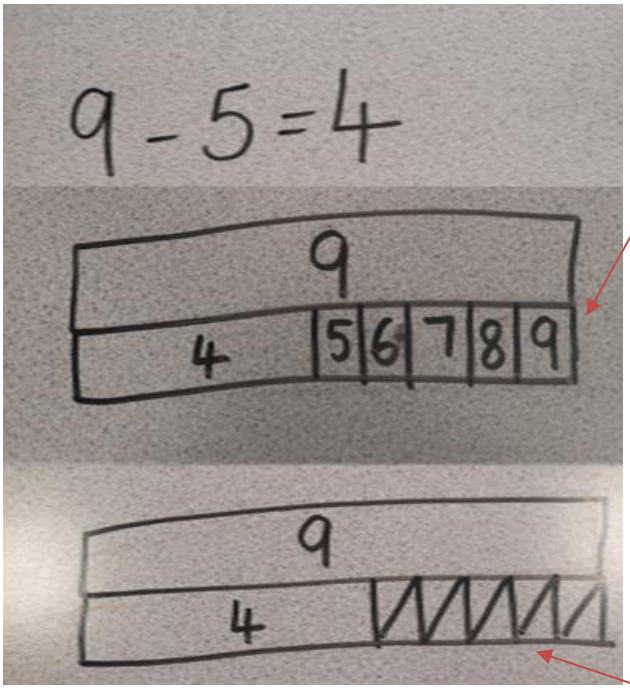


Then, write known part.

Finally, work part out by crossing out.

Subtraction

Final step is to use a bar model.



Count back from the whole and write the numbers in.

Rapid graspers can move to this method. It is the same as above but uses crossing out to make it both speedier and more challenging.

Key vocabulary: equal to, take, take away, less, minus, subtract, how many more, how many fewer / less than, most, least, count back, how many left, how much less is_? tens, ones, difference.

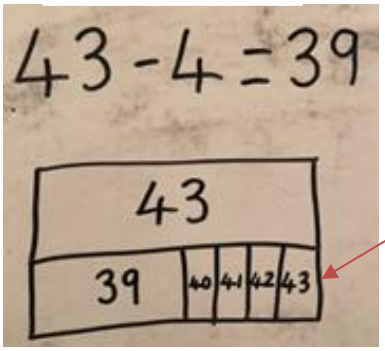
Key skills for subtraction at Y1:

- Given a number, say **one more or one less.**
- Count to and over 100, **forward and back**, from any number.
- Represent and use **subtraction facts to 20 and within 20**.
- Subtract with **one-digit and two-digit** numbers to 20, including zero.
- Solve one-step problems that involve addition and subtraction, using concrete objects (ie bead string, objects, cubes) and pictures, and missing number problems.
- Read and write numbers from 0 to 20 in numerals and words.

Subtraction

Year 2 Subtract with 2-digit numbers

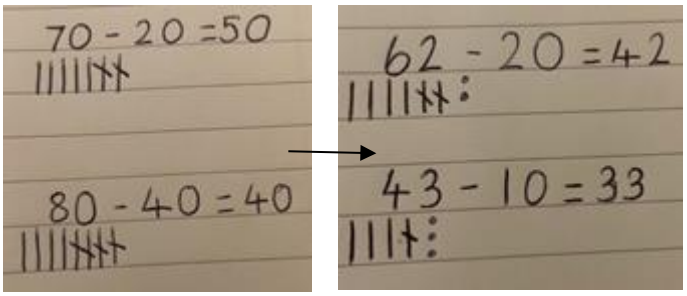
2 digit – 1 digit



Children put the biggest number in the end box (on the right) and count backwards, writing the number in each box until they get to the final box.

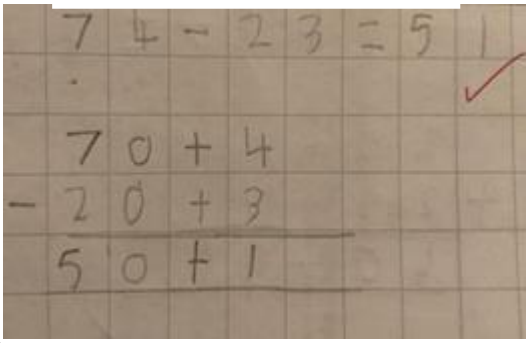
Children draw a large bar model. Children look at calculation and draw the amount of lines that they need to subtract
e.g. 43 - 4 the children would draw 4 lines inside the bar model.

Subtracting multiples of 10s



Draw base 10 and then physically cross out the tens to subtract.

2 digit – 2 digit



Introduce the written method. Children partition the numbers. Children then subtract down the columns and put the numbers together to find the answer.

Key vocabulary: equal to, take, take away, less, minus, subtract, how many more, how many fewer / less than, most, least, count back, how many left, how much less is_? tens, ones, difference, count on, strategy, partition.

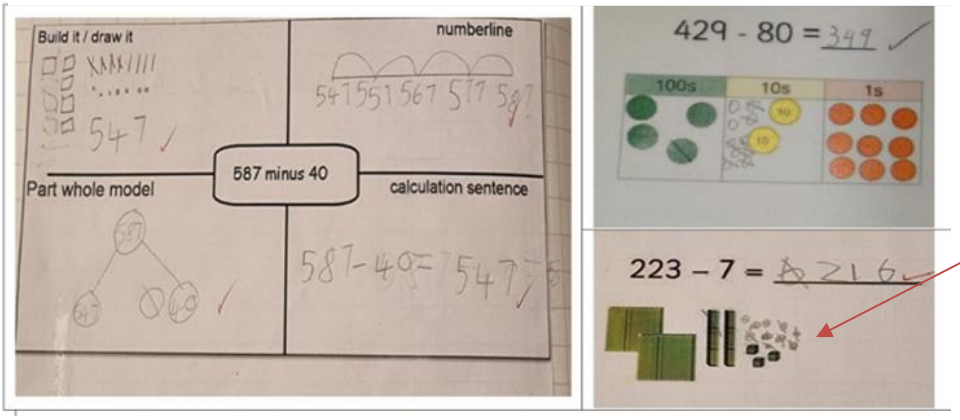
Key skills for subtraction at Y2:

- Recognise the place value of each digit in a two-digit number.
- Recall and use subtraction facts to 20 fluently, and derive and use related facts up to 100.
- Subtract using concrete objects, pictorial representations, 100 squares and mentally, including: a two- digit number and ones, a two-digit number and tens, and two two-digit numbers.
- Show that subtraction of one number from another cannot be done in any order.
- Recognise and use inverse relationship between addition and subtraction, using this to check
- calculations and missing number problems.
- Solve simple addition and subtraction problems including measures, using concrete objects, pictorial representation, and also applying their increasing knowledge of mental and written methods.
- Read and write numbers to at least 100 in numerals and in words.

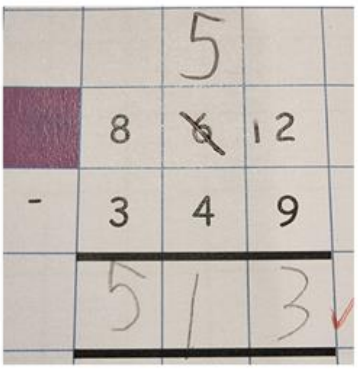
Subtraction

Year 3 Subtracting with 2 and 3-digit numbers.

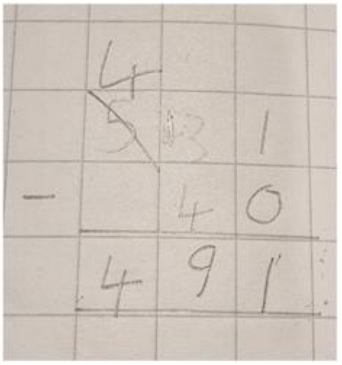
Use a range of concrete and pictorial representations to allow children to understand the value of each digit and gain a visual understanding of exchanging.



Exchange a ten for ten ones before carrying out the subtraction



- No more than 3 digits
- Column method
- Only one exchange from either 100s or 10s column
- Operation sign positioned to the left of the calculation



Move to the formal method of subtracting 2 and 3 digit numbers.

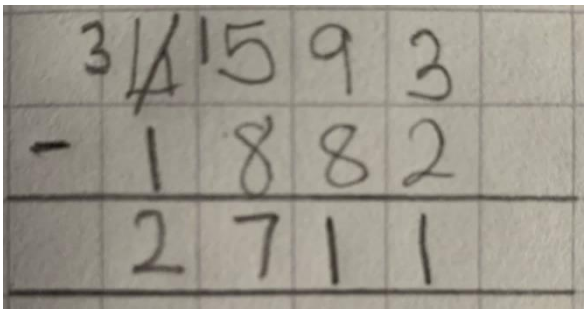
Key vocabulary: equal to, take, take away, less, minus, subtract, how many more, how many fewer / less than, most, least, count back, how many left, how much less is_? difference, count on, strategy, partition, tens, ones, exchange, decrease, hundreds, value, digit.

Key skills for subtraction at Y3:

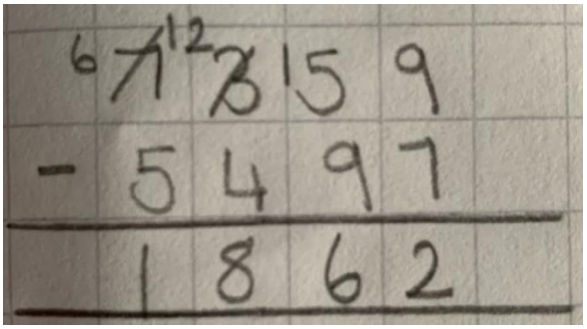
- Subtract mentally a: **3-digit number and ones, 3-digit number and tens, 3-digit number and hundreds**
- Estimate answers and use inverse operations to check.
- Solve problems, including missing number problems.
- Find 10 or 100 more or less than a given number.
- Recognise the place value of each digit in a 3-digit number .
- Counting up differences as a mental strategy when numbers are close together or near multi-
- ples of 10 (see examples above)
- Read and write numbers up to 1000 in numerals and words.
- Practise mental subtraction strategies, such as subtracting near multiples of 10 and adjusting (e.g. subtracting 19 or 21), and select most appropriate methods to subtract, explaining why.

Subtraction

Year 4 Subtract with up to 4-digit numbers



Children build on prior year's knowledge – now applying this to 4-digit numbers. Begin with a mixture of no exchange and one exchange.



Next, move onto multiple exchanges. Always sticking with numbers no more than 4-digits.

N.B. begin to apply method to real life problems including measure.

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_? difference, count on, strategy, partition, tens, ones, exchange, decrease, hundreds, value, digit, thousands, inverse, estimate.

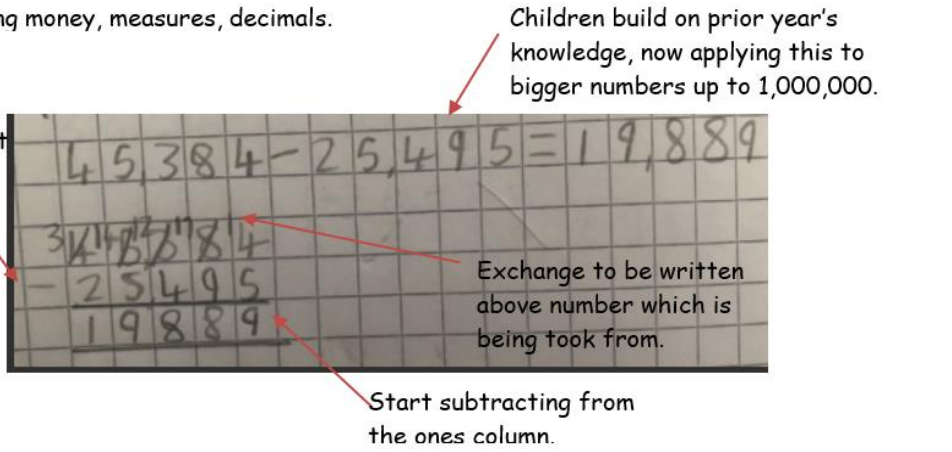
Key skills for subtraction at Y4:

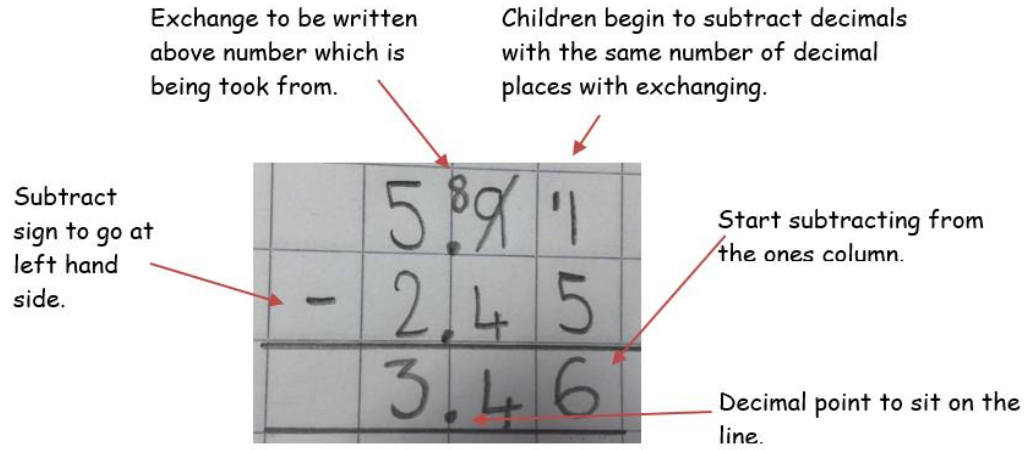
- Subtract by counting on where numbers are close together or they are near to multiples of 10, 100 etc.
- Children select the most appropriate and efficient methods for given subtraction calculations.
- Estimate and use inverse operations to check answers.
- Solve addition and subtraction 2-step problems, choosing which operations and methods to use and why.
- Solve simple measure and money problems involving fractions and decimals to two decimal places.
- Find 1000 more or less than a given number.
- Count backwards through zero, including negative numbers.
- Recognise place value of each digit in a 4-digit number Round any number to the nearest 10, 100 or 1000
- Solve number and practical problems that involve the above, with increasingly large positive numbers.

Subtraction

Year 5 Subtract with at least 4-digit numbers

including money, measures, decimals.





Key vocabulary: equal to, take, take away, less, minus, subtract, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_? difference, count on, strategy, partition, tens, ones, exchange, decrease, hundreds, value, digit, inverse, thousands, estimate tenths, hundredths, thousandths, decimal point, decimal, million.

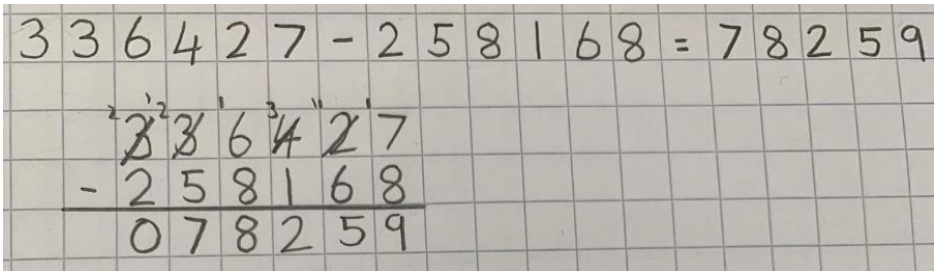
Key skills for subtraction at Y5:

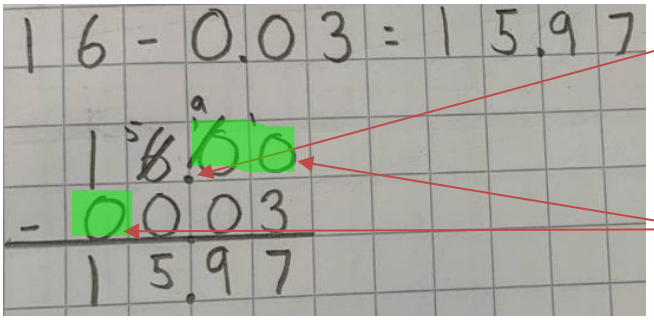
- Subtract numbers mentally with increasingly large numbers .
- Use rounding and estimation to check answers to calculations and determine, in a range of contexts, levels of accuracy .
- Solve addition and subtraction multi-step problems in context, deciding which operations and methods
- to use and why.
- Read, write, order and compare numbers to at least 1 million and determine the value of each digit.
- Count forwards or backwards in steps of powers of 10 for any given number up to 1 million.
- Interpret negative numbers in context, counting forwards and backwards with positive and negative integers through 0.
- Round any number up to 1 million to the nearest 10, 100, 1000, 10 000 and 100 000.

Subtraction

Year 6 Subtracting with increasingly large and more complex numbers and decimal values.

Children build on prior year's knowledge, now applying this to bigger numbers up to 10,000,000.





Ensure the decimal points are lined up. This requires the children to have strong place value knowledge.

Use place value holders to set the calculation up as a compact column subtraction.

Key vocabulary: equal to, take, take away, less, minus, subtract, how many more, how many fewer / less than, most, least, count back, how many left, how much less is_? difference, count on, strategy, partition, tens, ones, exchange, decrease, hundreds, value, digit, inverse, estimate, thousands, tenths, hundredths, thousandths, decimal point, decimal, million, tens of millions.

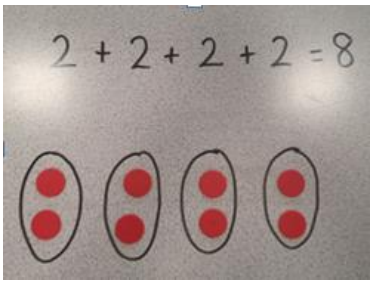
Key skills for subtraction at Y6:

- Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why.
- Read, write, order and compare numbers up to 10 million and determine the value of each digit
- Round any whole number to a required degree of accuracy
- Use negative numbers in context, and calculate intervals
- across zero.
- Children need to utilise and consider a range of mental subtraction strategies, jottings and written methods before choosing how to calculate.
- See previous videos for introducing the compact column method

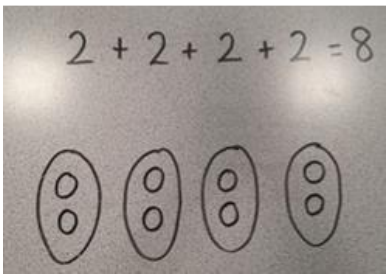
Multiplication

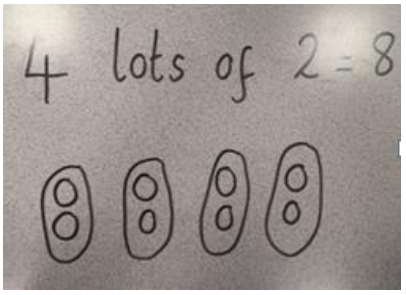
Year 1 Multiply with concrete objects, arrays and pictorial representations.
Multiplying by 2 and 5.

Begin with repeated addition. Lots of counting in 2s and 5s to practice. Use lots of pictures, e.g we have 6 bikes so how many wheels? 2 + 2 + 2 + 2 + 2 + 2 = 12.



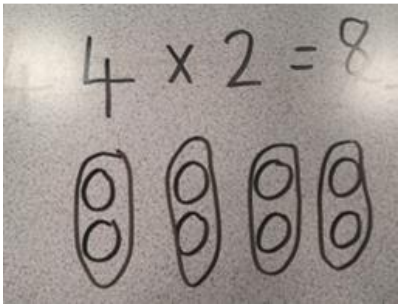
Move from concrete to pictorial by drawing groups of 2 to solve the repeated addition.

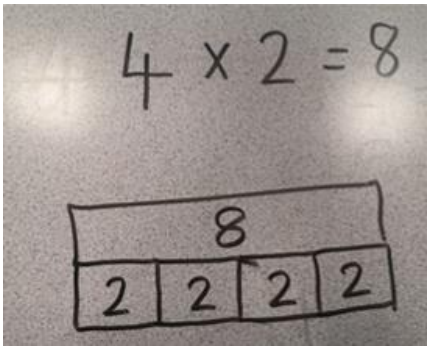




Move onto 'lots of'. Draw 'lots of' 2 and refer to it being the same as 2+2+2+2.

Introduce the 'x' symbol as meaning 'lots of'. 4 lots of 2 is 4 x 2 = 8.

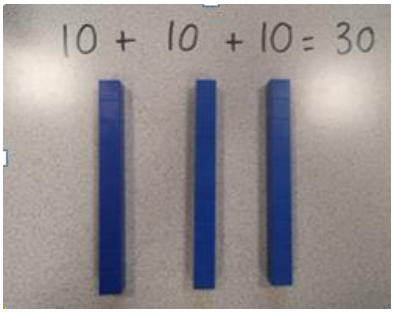




Move to bar models. Repeat the language 4 x 2, 4 lots of 2. Count in 2's to find the total and then put the number on the top.

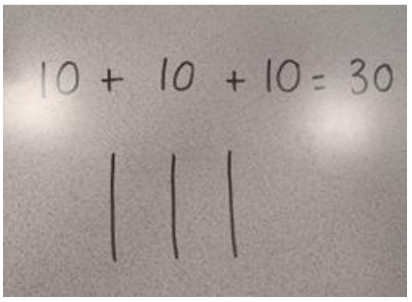
Multiplication

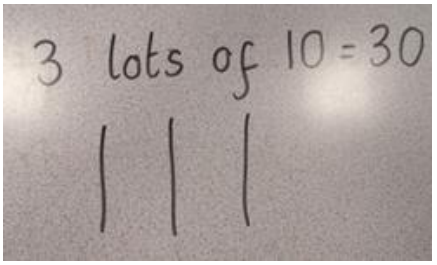
Multiplying by 10.



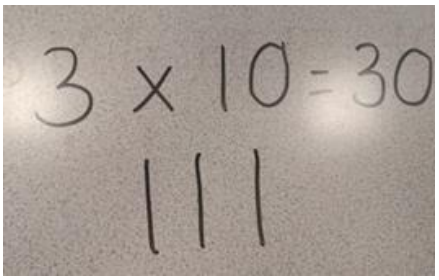
Begin with repeated addition, using base 10 to solve and count in 10's.

Move from concrete to pictorial by drawing 'sticks'. Count in multiples of 10 to solve.

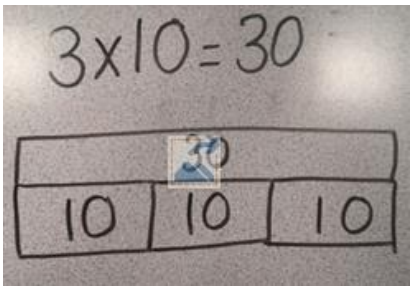




Introduce the term 'lots of' to the children. Draw sticks to help solve and count in multiples.



Introduce the 'x' symbol as times by / lots of / groups of. Use sticks as visual representation and count in 10's to solve.



Finish with the bar model. Teach in same steps as 2 and 5 x.

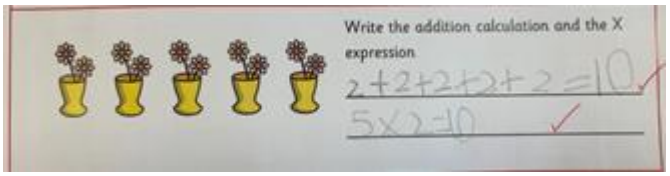
Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, repeated addition, double.

Key skills for multiplication at Y1:

- Count in multiples of 2, 5 and 10.
- Solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.
- Make connections between arrays, number patterns, and counting in twos, fives and tens. Begin to understand doubling using concrete objects and pictorial representations.

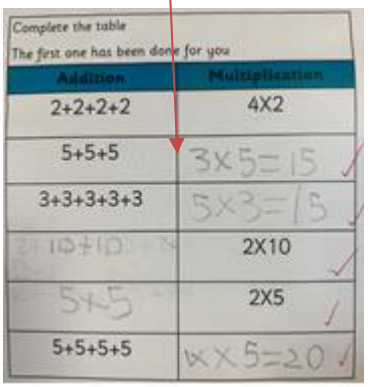
Multiplication

Year 2 Multiply using arrays and repeated addition (using at least 2s, 5s and 10s)

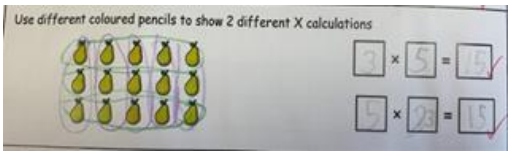


Begin with repeated addition, using pictorial representations. 5 x 2 becomes 2 + 2 + 2 +2 + 2 = 10.

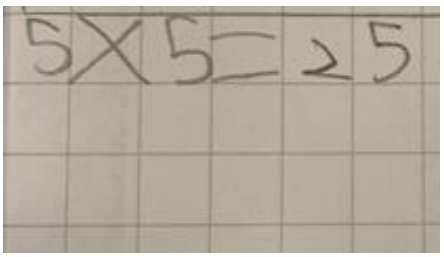
Move to the abstract of writing and matching multiplication calculations with the repeated addition.



Introduce arrays. Children draw rows and columns to match the multiplication number sentence. Children can use objects before moving onto the pictorial.



Use arrays to show that multiplication is commutative and can be done in any order. 3 x 5 = 15 and 5 x 3 = 15.



Children use their knowledge of counting on in 2s, 3s, 5s and 10s to solve their multiplication calculations. Children will use their fingers to count on.

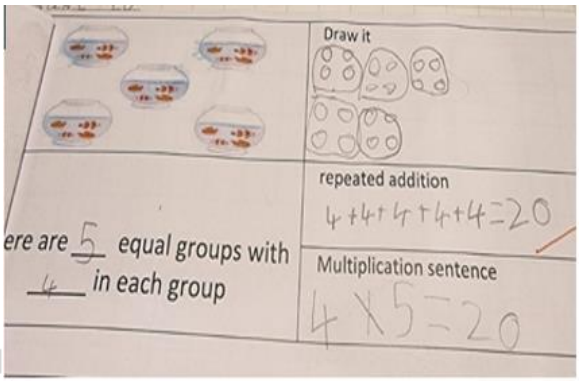
Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, repeated addition, double, multiplied by, column, row, commutative, sets of, equal groups, once, twice, three times...

Key skills for multiplication at Y2:

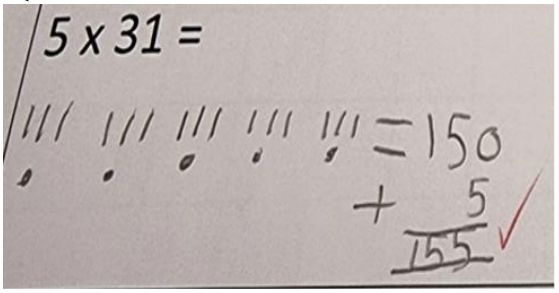
- Count in steps of 2, 3 and 5 from zero, and in 10s from any number.
- Recall and use multiplication facts from the **2,3, 5 and 10** multiplication tables, including recognising odds and evens.
- Write and calculate number statements **using the x and = signs**.
- Show that multiplication can be done in any order (commutative).
- Solve a range of problems involving multiplication, using concrete objects, arrays, repeated addition, mental methods, and multiplication facts.
- Pupils use a variety of language to discuss and describe multiplication.

Multiplication

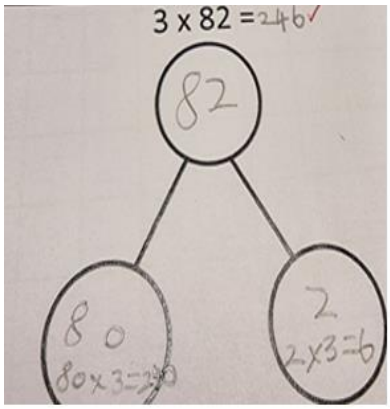
Year 3 Multiply 2-digits by a single digit number



Children have an opportunity to secure understanding of 2, 3, 4 and 8 times tables.



Use concrete and then pictorial base 10 to allow children to gain an understanding of the value of each digit.



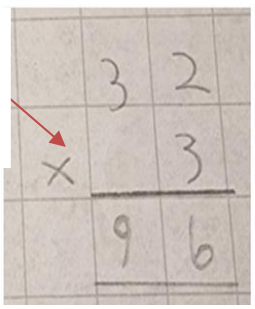
Use concrete and then pictorial base 10 to allow children to gain an understanding of the value of each digit.

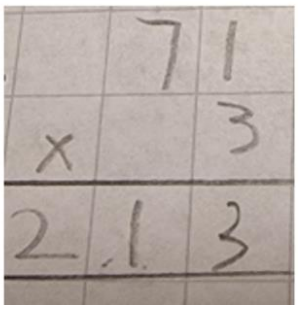
Step 1 – no exchange

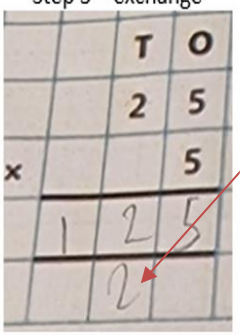
Step 2 – answers to 1,000

Step 3 – exchange

Operation to the left of calculation







Carry, if any, written underneath.

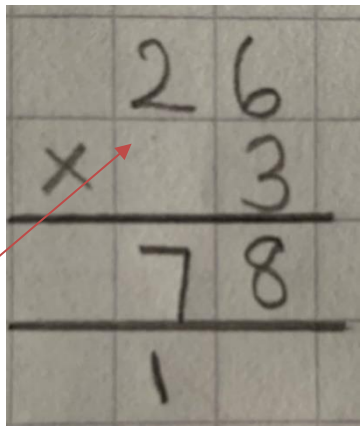
Key vocabulary: groups of, lots of, times, array, altogether, multiply, count multiplied by, repeated addition, double, column, row, commutative, sets of, equal groups, once, twice, three times, partition, multiple, product, tens, ones, value, carry.

Key skills for multiplication:

- Recall and use multiplication facts for the **2, 3, 4, 5, 8 and 10** multiplication tables, and multiply multiples of 10.
- Write and calculate number statements using the multiplication tables they know, including **2-digit x single-digit**, drawing upon mental methods, and progressing to reliable written methods.
- Solve multiplication problems, including missing number problems.
- Develop mental strategies using commutativity (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240)
- Solve simple problems in contexts, deciding which operations and methods to use.
- Develop efficient mental methods to solve a range of problems e.g using commutativity

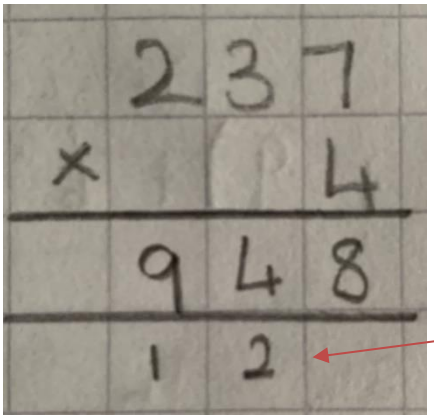
Multiplication

Year 4 Multiply 2 and 3-digits by a single digit, using all multiplication tables up to 12 x 12



Recap method learned at Year 3. Begin with multiplying 2-digit numbers by 1 digit.

When multiplying the tens column, ensure children understand it is 2 tens (twenty) x 3 and not 2 x 3.



Move onto multiplying 3-digit numbers by 1-digit.

Progress to multiple exchanges.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count multiplied by, repeated addition, column, row, commutative, sets of, equal groups, double, once, twice, three times, partition, grid method, multiple, product, tens, ones, value, carry, inverse, hundreds, thousands.

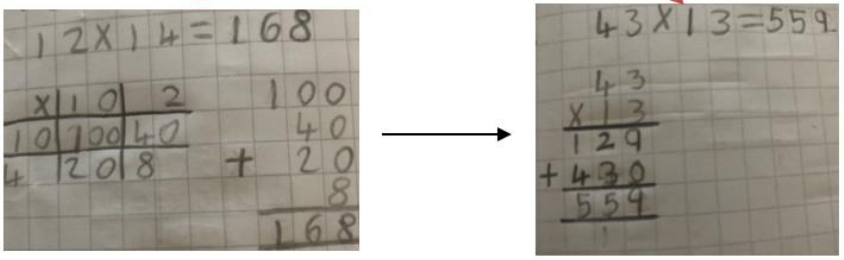
Key skills for multiplication at Y4:

- Count in multiples of 6, 9, 11, 25 and 1000
- Recall multiplication facts for **2, 3, 4, 5, 6, 8, 9, 10 and 11 multiplication tables up to 12 x**
- Recognise place value of digits, in up to 4-digit numbers
- Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multiply 3 numbers.
- Use commutativity and other strategies mentally 3 x 6 = 6 x 3 , 2 x 6 x 5 = 10 x 6 , 39x7 = 30 x 7 + 9 x 7.
- Solve problems with increasingly complex multiplication in a range of contexts.
- Count in multiples of 6, 9, 11, 25 and 1000
- Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)

Multiplication

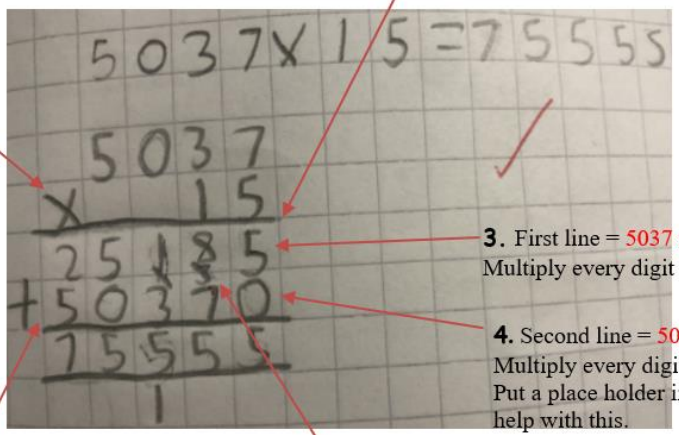
Year 5 Short multiplication as in Y4 and multiply up to 4 digits by 2 digits (long multiplication).

Introduce multiplying 2-digit by 2-digit as an area model before moving onto column method.



1. Line the numbers up in the correct place value columns and miss 2 lines before your answer line.

2. Multiplication sign goes on the left.



3. First line = 5037 x 5
Multiply every digit by the ones column.

4. Second line = 5037 x 10
Multiply every digit by the tens column. Put a place holder in the ones column to help with this.

5. Children to add their two answers like a normal column addition.

N.B. Children to carry any carry overs (e.g. The 3 tens from 35) under the next column. Encourage children to cross out carry overs when they have used them to avoid errors.

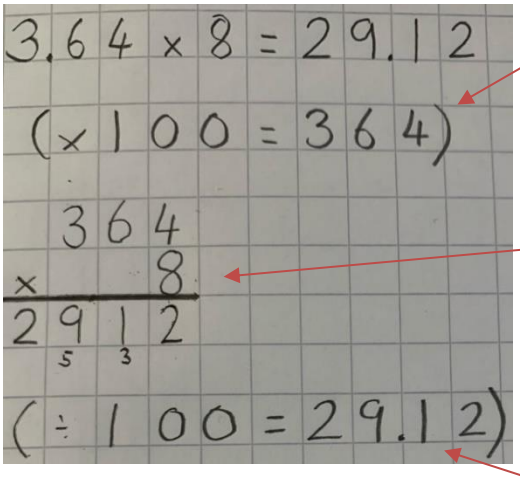
Key vocabulary: groups of, lots of, times, array, altogether, multiply, count multiplied by, repeated addition, column, row, commutative, sets of, equal groups, double, once, twice, three times, partition, grid method, multiple, product, tens, ones, value, inverse, hundreds, thousands, square, cube, factor, integer, decimal, short/long multiplication.

Key skills for multiplication at Y5:

- Identify multiples and factors, using knowledge of **multiplication tables to 12x12.**
- Solve problems where larger numbers are decomposed into their factors
- Multiply and divide integers and decimals by 10, 100 and 1000
- Recognise and use square and cube numbers and their notation
- Solve problems involving combinations of operations, choosing and using calculations and methods appropriately.

Multiplication

Year 6 Short and long multiplication as in Y5, and multiply decimals with up to 2d.p by a single digit.



Multiply the decimal by 10, 100 or 1000 to 'remove' the decimal point

Use short or long multiplication (whichever is appropriate) to solve the calculation.

Then divide the answer from the calculation by 10, 100 or 1000 to give the final answer.

N.B. The number of decimal places for the number being multiplied will be the same as the number of decimal places in the answer.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count multiplied by, repeated addition, column, row, commutative, sets of, equal groups, double, once, twice, three times, partition, grid method, multiple, product, tens, ones, value, inverse, hundreds, thousands, square, cube, factor, integer, decimal, short/long multiplication.

Key skills for multiplication at Y6:

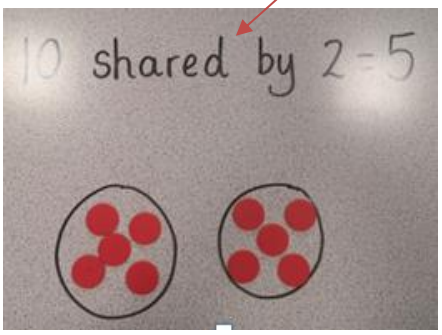
- Recall multiplication facts for all times tables up to **12 x 12 (consolidate).**
- Multiply multi-digit numbers, up to 4-digit x 2-digit using long multiplication.
- Perform mental calculations with mixed operations and large numbers.
- Solve multi-step problems in a range of contexts, choosing appropriate combinations of operations and methods.
- Estimate answers using round and approximation and determine levels of accuracy.
- Round any integer to a required degree of accuracy.
- Multiplying Fractions

Division

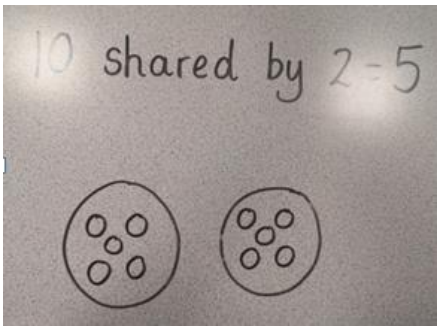
Year 1 Group and share small quantities

Sharing (by 2 and 5)

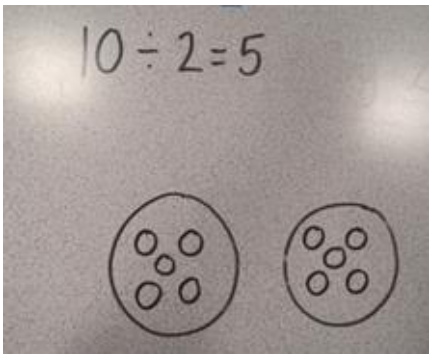
Introduce language ‘shared by’



Begin with lots of concrete opportunities of practically sharing cakes, fruit, sweets and PE equipment. Move onto sharing large counters into hoops and then small counters.

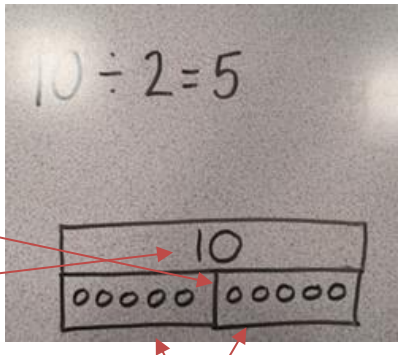


Move to pictorial representation by drawing counters to share by 2 or 5.



Introduce the ÷ symbol. Use the vocabulary divide alongside shared by. Continue to share practically into circled groups.

Once confident with previous step, move onto sharing with a bar model.

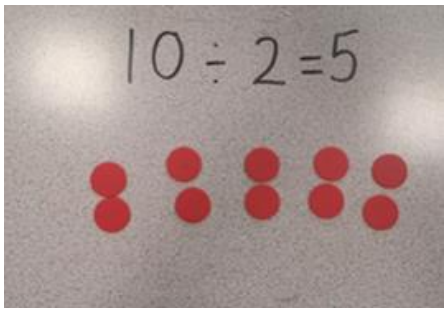


First, draw the number of groups sharing by.

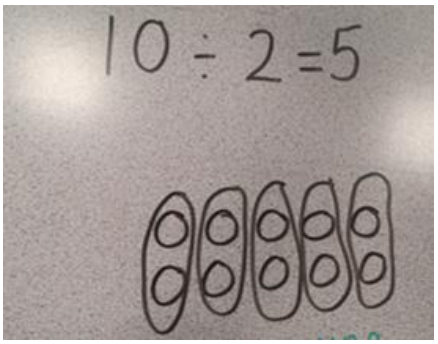
Put the dividend on the top.

Draw the counters to share.

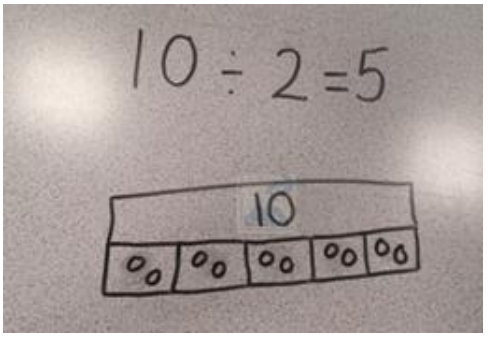
Grouping (by 2,5 and 10)



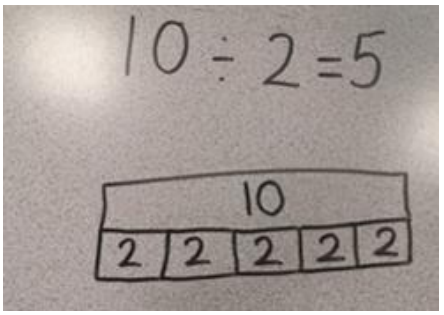
Introduce children to grouping (specifically for 10's). Give the children 10 counters to put into groups of 2. How many groups do we have? Link back to sharing – we get the same answer!



Move from the concrete to the pictorial by drawing groups. Start with regular arrangements, before moving to irregular arrangements.



Introduce bar models for grouping. Draw groups of 2 (using circles / dots / etc) until you reach the dividend. Put the dividend in the lid. Count the number of groups.



Finally, move to the abstract of groups of 2 – still using bar models. Count in groups of 2 until you reach the dividend.

Vocabulary: share, share equally, one each, group, groups of, lots of, array, divided by, half.

Key number skills needed for division at Y1:

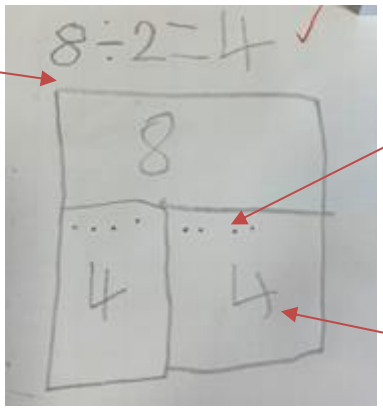
- Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations arrays with the support of the teacher
- Through grouping and sharing small quantities, pupils begin to understand, division, and finding
- simple fractions of objects, numbers and quantities.
- They make connections between arrays, number patterns, and counting in twos, fives and tens.

Division

Year 2 Use the grouping and sharing method for division.

Sharing

Children look at the amount they are sharing and the amount they are sharing by. Then draw the correct amount of boxes for their bar model. The number they are dividing goes in the top of the model.

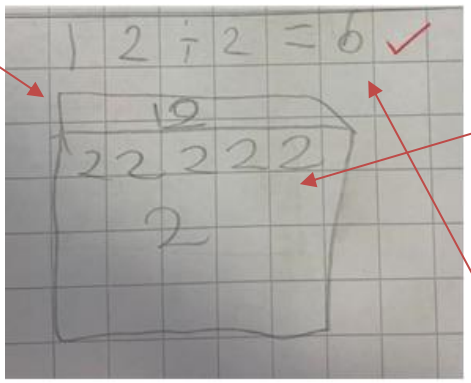


Children use dots to equally share the amount they are dividing into the boxes.

Finally, children count the number of dots in the box. If they've shared equally, they will have the same number in each box.

Grouping

Children draw a big bar model and put the number they are dividing at the top.



Children count in the number they are dividing by until they reach their target number (in this case 12).

Finally, children count the number of groups and this is then recorded as their answer.

Vocabulary: share, share equally, one each, group, groups of, lots of, array, divided by, half, divide, divided into, division, grouping.

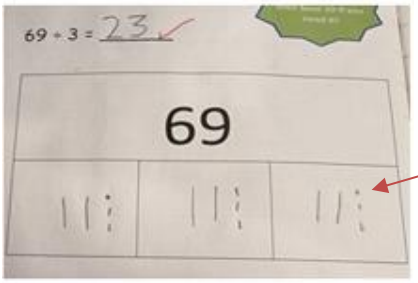
Key number skills needed for division at Y2:

- Count in steps of 2, 3, 5 and 10 from 0
- Recall and use multiplication and division facts for the **2, 3, 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 x, ÷ and = 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

Division

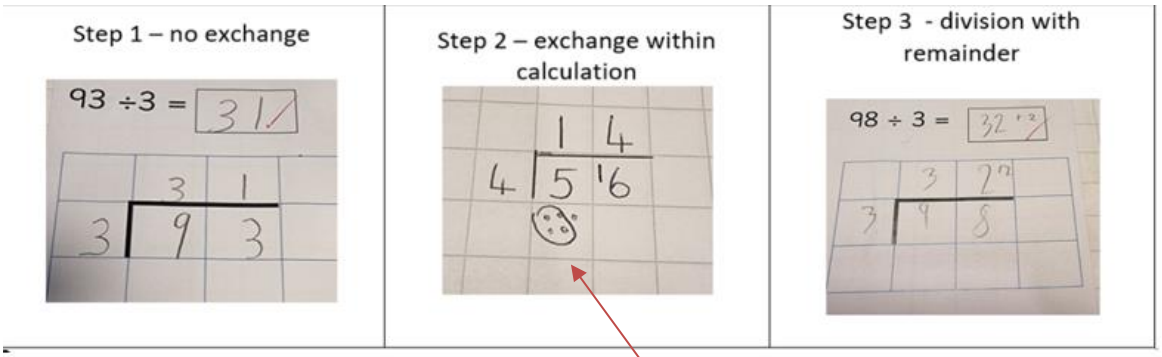
Year 3 Divide 2-digit numbers by a single digit

Children recap using the bar model method for dividing – progressing now to much more complexed 2-digit numbers. No exchanging will happen at this stage.



Children to use pictorial representations of base 10. Children will have access to concrete resources before and alongside to aid their understanding of what each digit is worth.

Move onto the formal method of short division.



Children encouraged to use visual representations to aid their understanding.

Vocabulary: share, share equally, one each, group, groups of, lots of, array, half, divide, divided by, divided into, division, grouping, inverse, short division, carry, remainder, left over, multiple.

Key number skills needed for division at Y3:

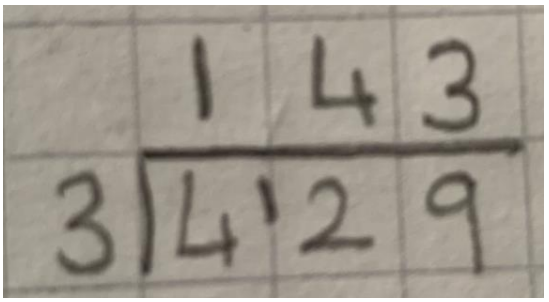
- Recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables (through dou-
- bling, connect the 2, 4 and 8s).
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to for-
- mal written methods.
- Solve problems, in contexts, and including missing number problems, involving multiplication and division.
- Pupils develop efficient mental methods, for example, using multiplication and division facts (e.g. using 3 × 2 =
- 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, so 60 ÷ 3 = 20 and 20 = 60 ÷ 3).
- Pupils develop reliable written methods for division, starting with calculations of 2-digit numbers by 1-digit numbers and progressing to the formal written method of short division.

Division

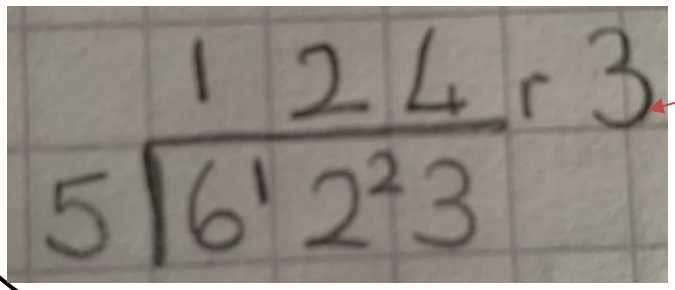
Year 4 Divide up to 3-digit numbers by a single digit

(without remainders initially)

Recap bus stop method from Year 3 – applying it to dividing 3-digit numbers by 1-digit.



Progress to short division where children will encounter a remainder.



For the last part of the calculation the question is how many 5's are in 23? Encourage children to recognize the answer is 4 but with 3 left over. They then record this as r 3.

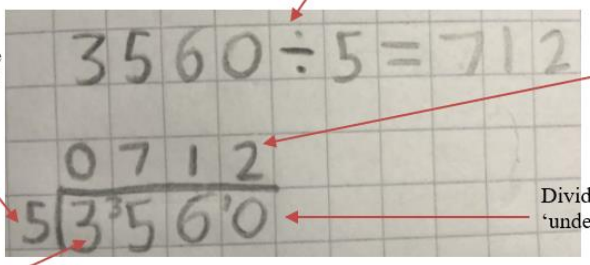
Vocabulary: share, share equally, one each, group, groups of, lots of, array, divide, half, divided by, divided into, division, grouping, number line, left over, inverse, short division, carry, remainder, multiple, divisible by, factor.

Key number skills needed for division at Y4:

- **Recall multiplication and division facts for 2, 3, 4, 5, 6, 8, 9, 10 & 11 up to 12 x.**
- Use place value, known and derived facts to multiply and divide mentally, including: multiplying and dividing by 10 and 100 and 1.
- Pupils practise to become fluent in the formal written method of short division with exact answers when dividing by a one-digit number
- Pupils practise mental methods and extend this to three-digit numbers to derive facts, for example 200 × 3 = 600 so 600 ÷ 3 = 200
- Pupils solve two-step problems in contexts, choosing the appropriate operation, working with increasingly harder numbers. This should include correspondence questions such as three cakes shared equally between 10 children.

Division

Year 5 Divide up to 4 digits by a single digit, including those with remainders.



Children to use same bus stop method as in Y4 but with a 4-digit number.

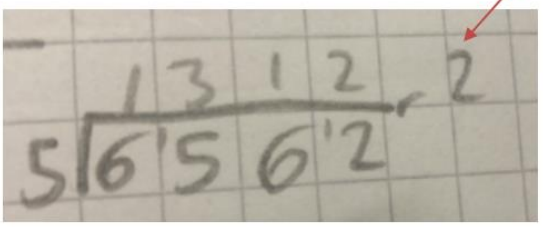
Divisor to go on the 'outside' of the bus stop.

Answer to go on 'top' of the bus stop.

Dividend to go on the 'under' the bus stop.

Children to start at largest place value column and any remainders (left overs) should be carried to the next column to the right.

Children introduced to bus stop method with remainders. The remainder will be written as 'r' followed by how much is left over.



Vocabulary: share, share equally, one each, group, groups of, lots of, array, half, divide, divided by, divided into, division, grouping, left over, inverse, short division, carry, remainder, left over, multiple, divisible by, factor, prime number, prime factors, composite number (non-prime).

Key number skills needed for division at Y5:

- Recall multiplication and division facts for all numbers up to 12 x 12 (7 & 12 new to year group).
- Multiply and divide numbers mentally, drawing upon known facts.
- Identify multiples and factors, including finding all factor pairs of a number, and common factors of two number.
- Solve problems involving multiplication and division where larger numbers are decomposed into their factors.
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.
- Use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.
- Work out whether a number up to 100 is prime, and recall prime numbers to 19.
- 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
- Use multiplication and division as inverses.
- 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
- Solve problems involving combinations of all four operations, including understanding of the equals sign, and including division for scaling by different fractions and problems involving simple rates.

Division

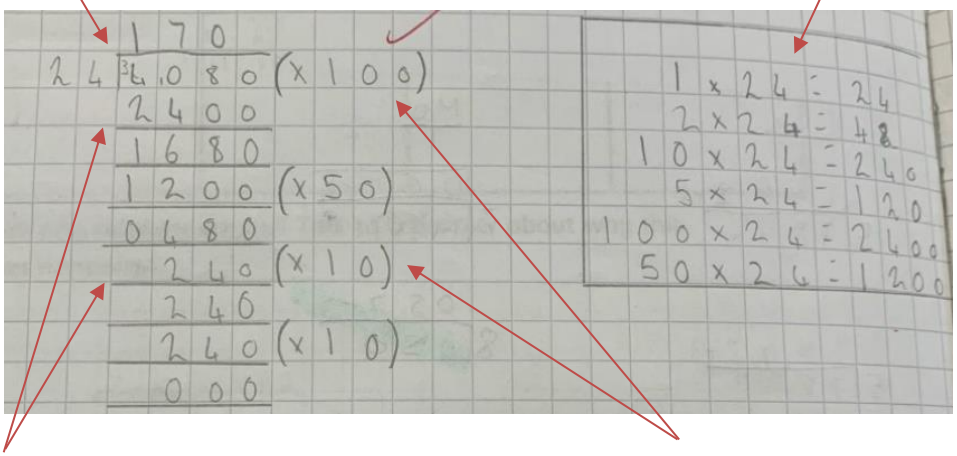
Year 6 Divide at least 4 digits by both single-digit and 2-digit numbers (including decimal numbers and quantities)

For short division – see Y5.

For the question below, children use the chunking method for solving 4080 ÷ 24.

First, write out the calculation using the same layout from short division.

Next, create a useful list. Start with 1 times and then use knowledge of double and ten times. From there, half for 5 times and then supersize for 100 and 50 times. N.B some children may want to extend their useful list to make 20, 40 times etc.



Then, use useful list to help 'chunk'. Use column subtraction to take out chunks from useful list until get to zero.

Record the 'chunks' to the side of the calculation and then once you get to zero, add all the chunks together to find the answer. Therefore, **4080 ÷ 24 =170**

Vocabulary: share, share equally, one each, group, groups of, lots of, array, divide, half, divided by, divided into, division, grouping, left over, inverse, short division, carry, remainder, multiple, divisible by, factor, prime number, prime factors, composite number (non-prime), common factor.

Key number skills needed for division at Y6:

- Recall and use multiplication and division facts for all numbers to 12 x 12 for more complex calculations
- Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context. Use short division where appropriate.
- Perform mental calculations, including with mixed operations and large numbers.
- Identify common factors, common multiples and prime numbers.
- Solve problems involving all 4 operations.
- Use estimation to check answers to calculations and determine accuracy, in the context of a problem.
- Use written division methods in cases where the answer has up to 3 decimal places.
- Solve problems which require answers to be rounded to specified degrees of accuracy.