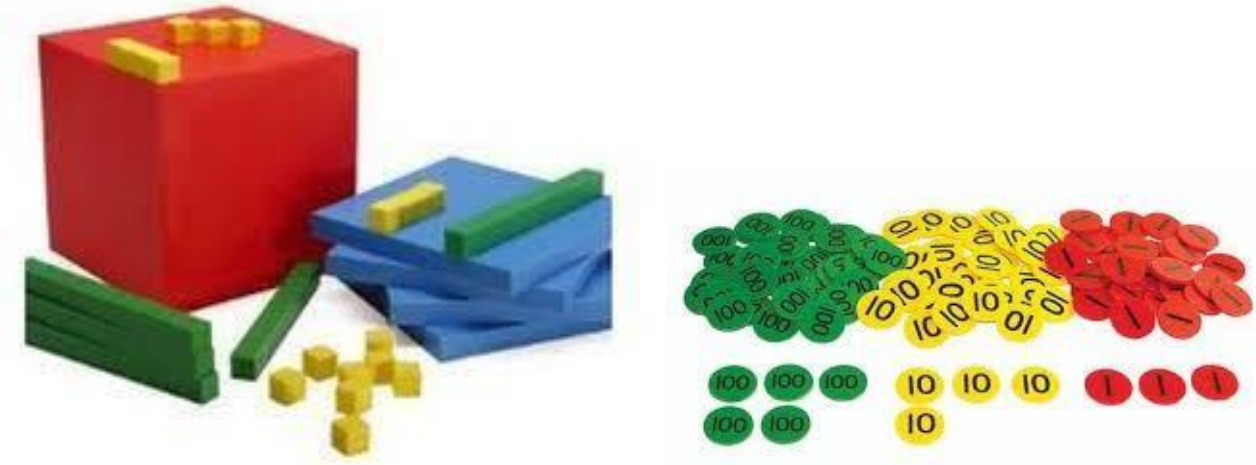
St Stephens Community Academy Calculation Policy

Draft Policy Spring 2020



This policy has been designed to teach children through the use of concrete, pictorial and abstract methods. This calculation policy should be used to support children to develop a deep understanding of number and calculation.

This policy has been developed with an emphasis on Singapore methods to develop number awareness and fluency.

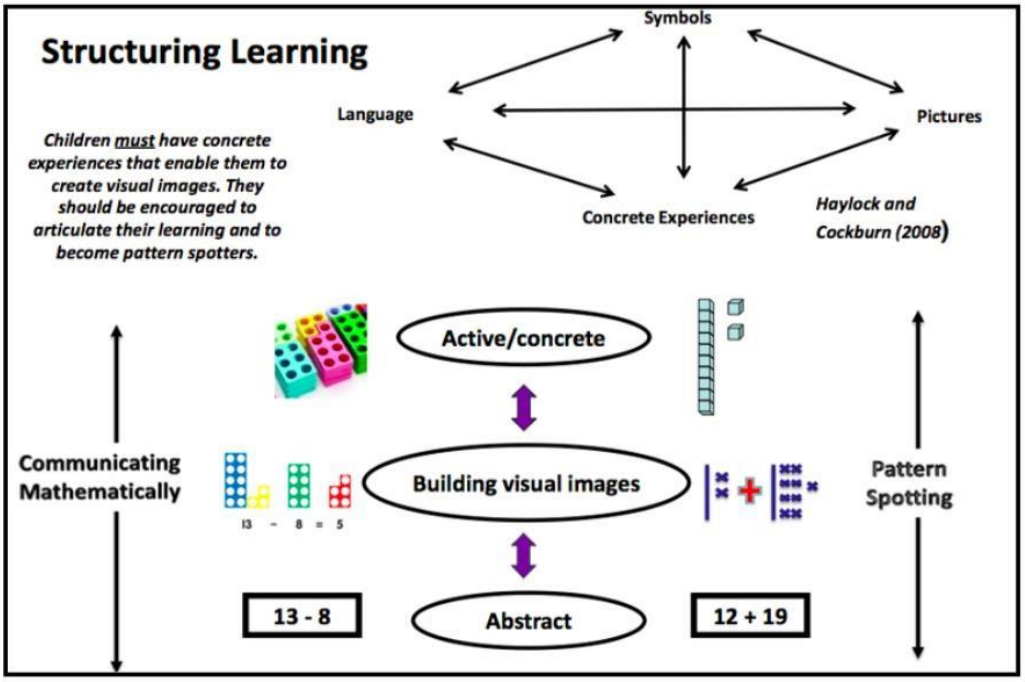
Using the concrete-pictorial-abstract approach:

Children develop an understanding of a mathematical concept through the three steps (or representation) of concrete-pictorial-abstract approach. Reinforcement is achieved by going back and forth between these representations.

Concrete representation The enactive stage - a pupil is first introduced to an idea or a skill by acting it out with real objects. This is a 'hands on' component using real objects and it is the foundation for conceptual understanding.

Pictorial/Iconic representation The iconic stage - a pupil has sufficiently understood the hands-on experiences performed and can now relate them to representations, such as a diagram or picture of the problem.

Abstract representation The symbolic stage - a pupil is now capable of representing problems by using mathematical notation, for example: 12 ÷ 2 = 6 .

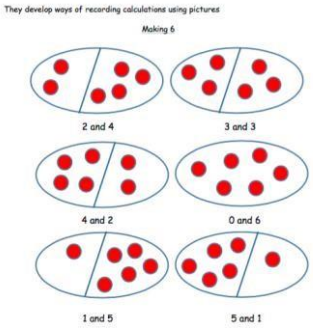


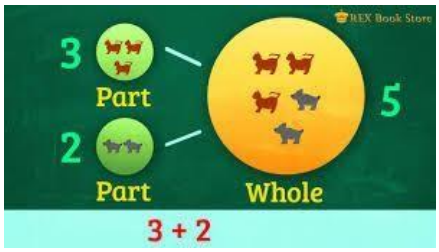
Class F

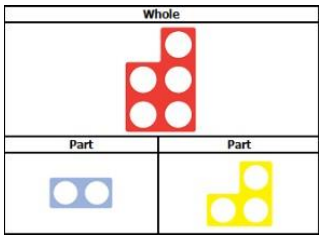
Addition

Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

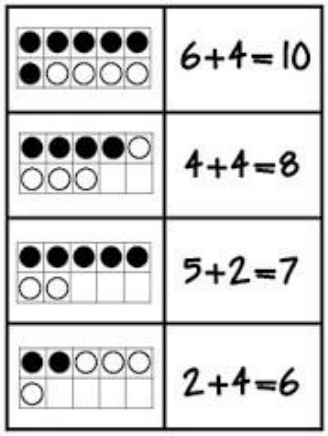
Explore part part whole relationship



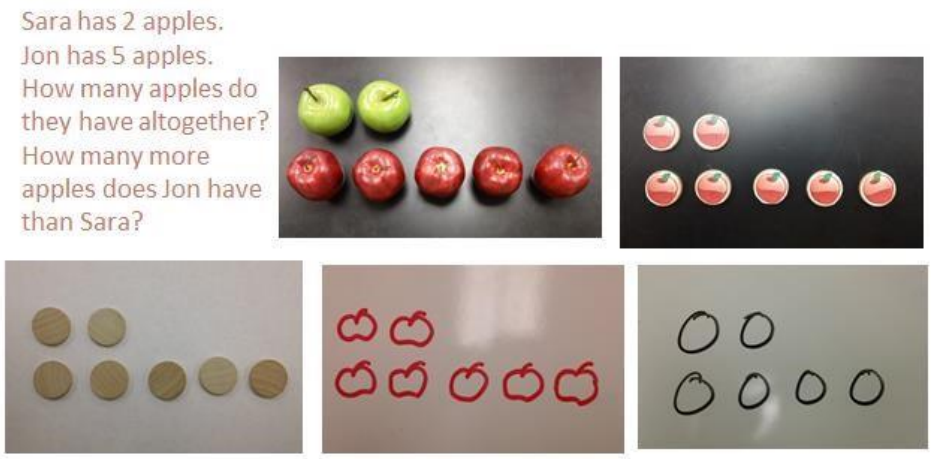




Using the ten frame to support addition of single digits – counting all/combining two groups



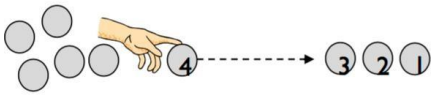
Solving problems using concrete and pictorial images.



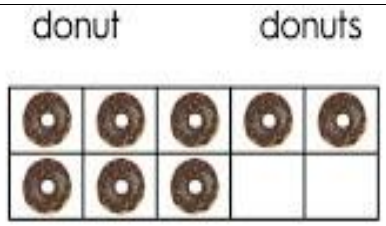
Subtraction

Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.

Taking away after counting out practical equipment. . Children would be encouraged to physically remove these using touch counting.



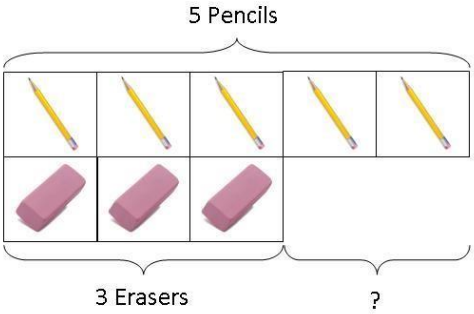
By touch counting and dragging in this way, it allows children to keep track of how many they are removing so they don't have to keep recounting. They will then touch count the amount that are left to find the answer.



$8 - 4 = \_\_$

Those who are ready may record their own calculations

Using the ten frame to support subtraction by taking away

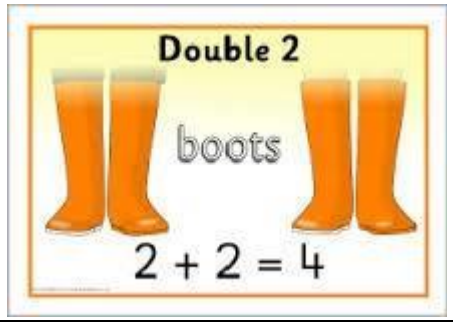


- Peter has 5 pencils and 3 erasers. How many more pencils than erasers does he have?

Solving problems using concrete and pictorial images.

Multiplication

Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.



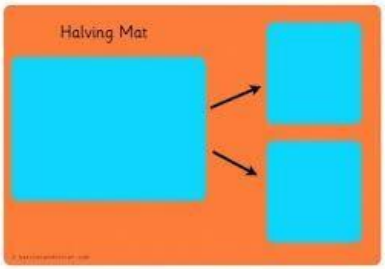
Children will experience equal groups of objects.

They will work on practical problem solving activities involving

There are 6 pairs of socks. How many socks are there altogether?

Division

Children count reliably with numbers from 1 to 20, place them in order and say which number is one more or one less than a given number. Using quantities and objects, they add and subtract two single-digit numbers and count on or back to find the answer. They solve problems, including doubling, halving and sharing.



Year 1

Addition

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line

Key skills for addition at Y1: (non-negotiables)

Read and write numbers to 100 in numerals, incl. 1—20 in words

Recall bonds to 5,6,7,8,9, 10 and 20, and addition facts within 20

Count to and across 100

Count in multiples of 1, 2, 5 and 10

Count on in ones from a given 2-digit number

Add two single-digit numbers

Add three single-digit numbers spotting doubles or pairs to 10

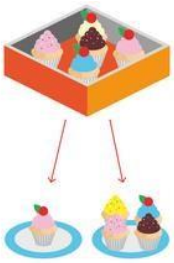
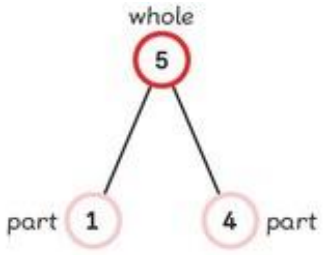
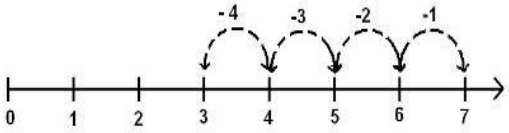
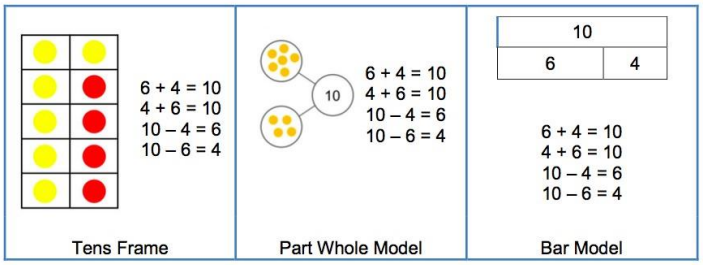
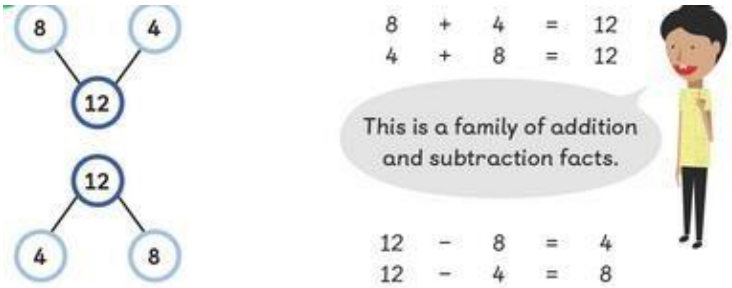
Count on in tens from any given 2-digit number

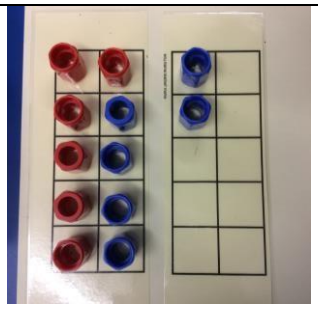
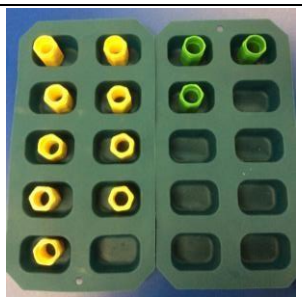
Add 10 to any given 2-digit number

Use number facts to add single-digit numbers to two-digit numbers e.g. use 4 + 3 to work out 24 + 3, 34 + 3…

Add by putting the larger number first

Solve simple 1-step problems involving addition, using objects, number lines and pictorial representations.

Joining two groups and then recounting all objects using one-to-one Correspondence (lots of practice making 10 and numbers to 10 e.g. 6 + 4 = 10 or 3 + 5 = 8)	3 + 4 = 7     
Learn number bonds to 20 and demonstrate related facts *Teach addition and subtraction alongside each other as pupils need to see the relationship between the facts.*	 

Add and subtract one digit numbers and two digit numbers to 20, including zero	8+1=9 
Bridging 10 Use ten frames, Singapore bars, egg boxes and number lines to practice. *Chn should start with the larger number and add the smaller number seeing what makes ten and what is left over.*	  6 + 6 = 12 Make 9 in one and 3 in the other. Take one from the 3 to make the 9 into a ten….10+2 = 12

Subtraction

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_?

Key skills for subtraction at Y1: (non-negotiables)

Recall bonds to 5,6,7,8,9,10 and 20, (number bond 'story')

Given a number, say **one m re or one less.**

Count to and over 100, **for ard and back**, from any number.

Represent and use **subtrac ion facts to 20 and within 20.**

Subtract with **one-digit d two-digit** numbers to 20, including zero.

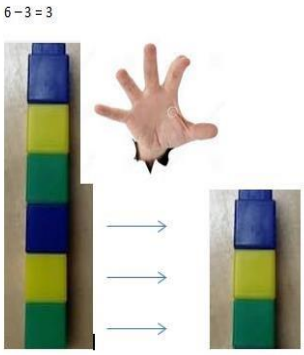
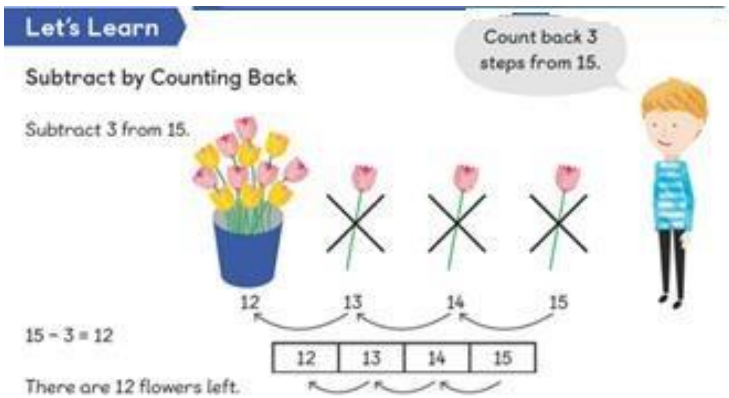
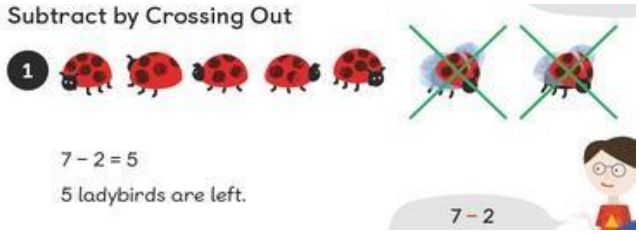
an

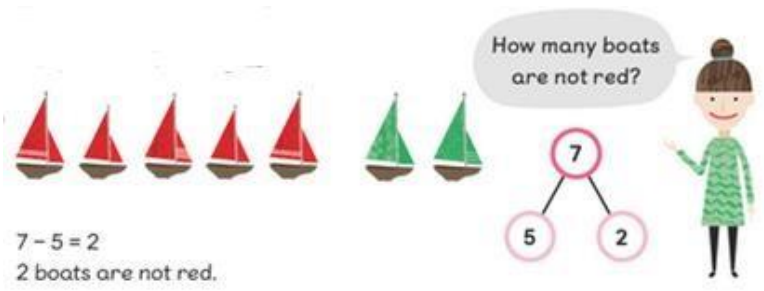
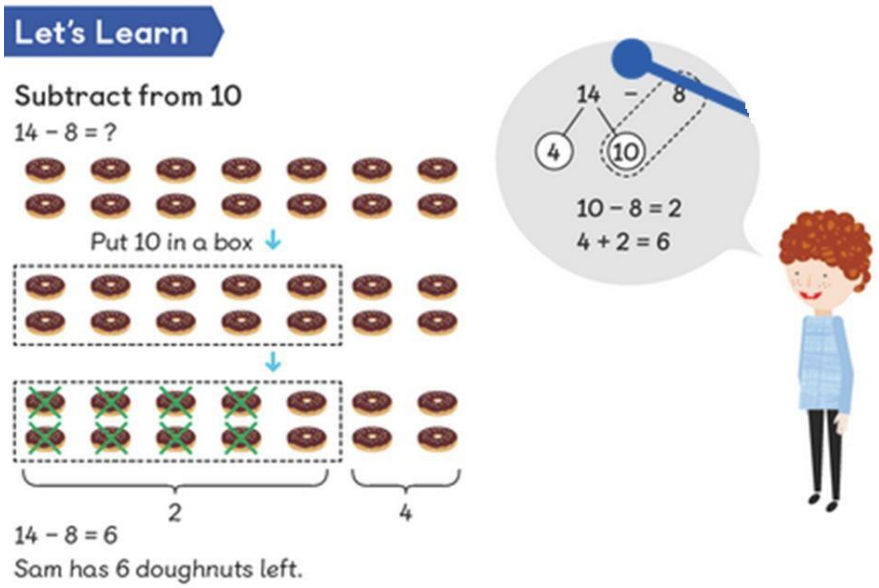
Solve one-step problems at involve addition and subtraction, using concrete objects (ie bead string, th

objects, cubes) and pictures, and missing number problems.

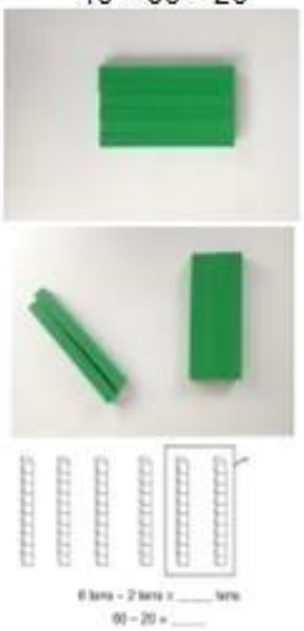
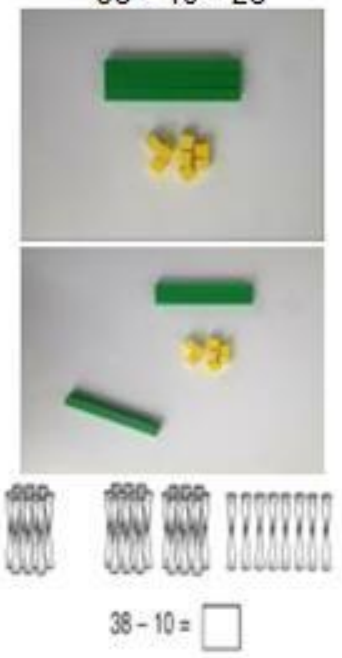
Read and write numbers fr m 0 to 20 in numerals and words.

Use number facts to subtract single-digit numbers from 2-digit numbers, e.g. use 7-2 to work out 27-2, 37-2

Taking away should begin with **physical objects**: objects, cubes, Dienes etc	
Subtraction by counting back	
Subtracting a single digit number from a single digit number and a single digit from a two digit by crossing out pictures	

Subtracting using the part part whole (include problem solving with missing digits). ? - 5 = 2	
Subtraction by subtracting from 10 *Children subtract from 10 and not from ones*	14 – 8 = ? 

When subtracting using Dienes children should be taught to regroup a ten rod for 10 ones and then subtract from those ones	 20 – 4 = 16

Subtracting multiples of 10 *Using the vocabulary of 1 ten, 2 tens etc alongside 10, 20, 30 Is very important here as pupils need to understand that it is a 10 not a 1 that is being taken away*	40 = 60 – 20  38 – 10 = 28  38 – 10 = ☐

Multiplication

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count

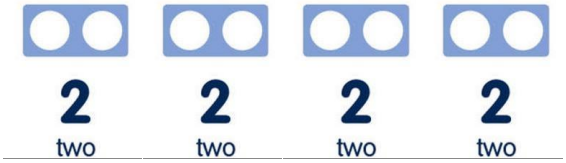
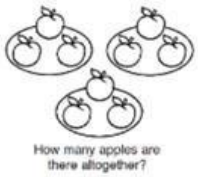
Key skills for multiplication at Y1: (non-negotiables) *Count in multiples of 2, 5 and 10.

*Begin to say what three 5s are by counting in 5s or what four 2s are by counting in 2s, etc.

*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.

*Double numbers to 10 using concrete objects and pictorial representations.

Counting in multiples of 2, 5 and 10 from zero *Children should count the number of groups on their fingers as they are skip counting.*	2 4 6 8 4 groups of 2 = 8  2 × 4 = 8 
When moving to pictorial/written calculations the vocabulary is important	 This image represents two groups of 4 or 4 twice
Solving multiplication problems using repeated addition	  3 + 3 + 3 = 9

Division

Key Vocabulary: share, share equally, one each, two each…, group, groups of, lots of, array

Key number skills needed for division at Y1: (non-negotiables)

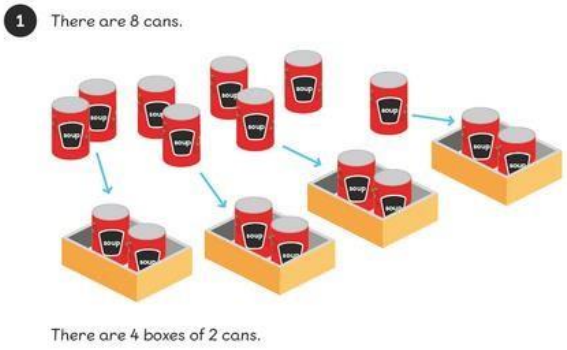
*Begin to count in 2s, 5s and 10s

*Find half of an even numbers to 12 and know it is hard to halve an odd number Find half of even numbers by sharing

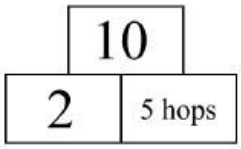
*Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations arrays with the support of the teacher

* Through grouping and sharing small quantities, pupils begin to understand, division, and finding simple fractions of objects, numbers and quantities.

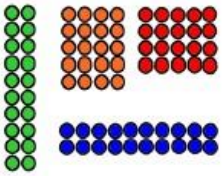
* They make connections between arrays, number patterns, and counting in twos, fives and tens.

Pupils should be taught to divide through working practically and the sharing should be shown below the whole to familiarize children with the concept of the whole. *The language of whole and part part should be used.*	8 ÷ 4 = 2 

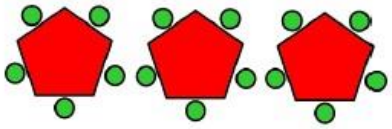
Children will experience equal groups of objects and will count in 2s, 5s and 10s. They will work on practical problem solving activities involving equal sets or groups,



e.g. If the frog hops in 2s, how many hops will there be before he lands on 10?



Here are 20 counters. Arrange them in equal rows. Is there a different way to arrange them in equal rows?



Year 2

Addition

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, addition, column, tens boundary **Calculation skills for addition at Y2:**

Add a 2-digit number and ones, using number facts and bridging 10 (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)

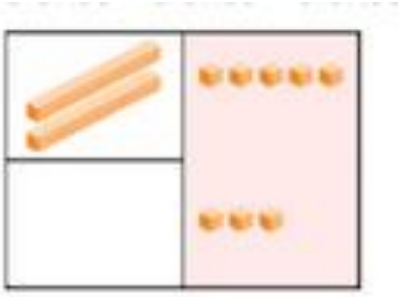
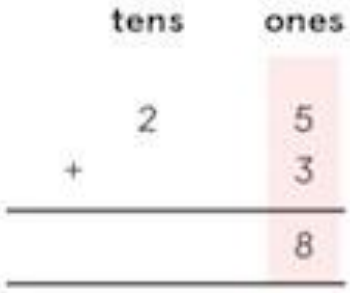
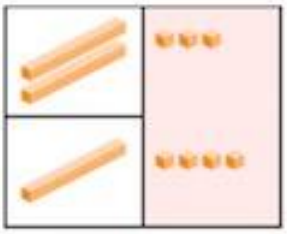
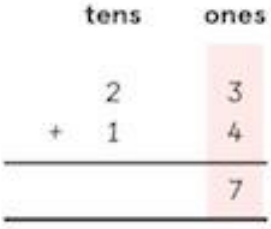
Add three single-digit numbers (e.g. 5 + 9 + 7)

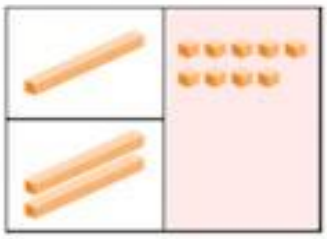
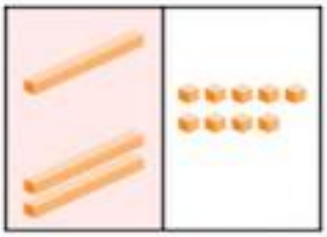
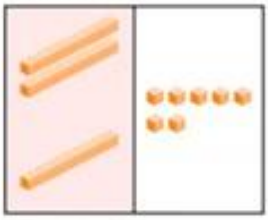
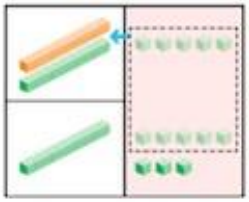
12, 20 and bonds of tens to 100 (30 + 70 etc.)

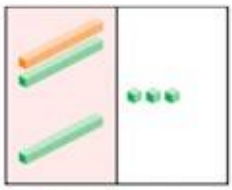
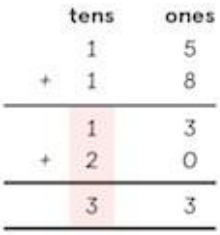
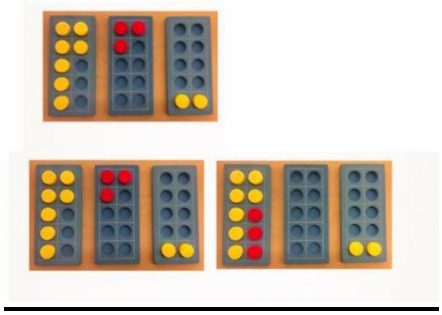
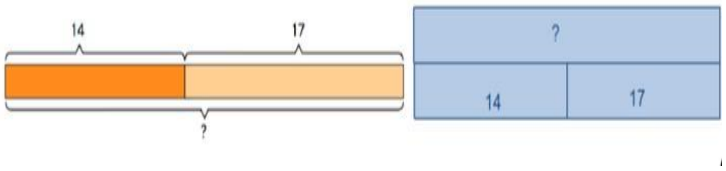
-digit numbers (tens and ones)

Show that adding can be done in any order (the commutative law).

ng concrete objects, pictorial representations, involving numbers, quantities and measures, and applying mental and written methods.

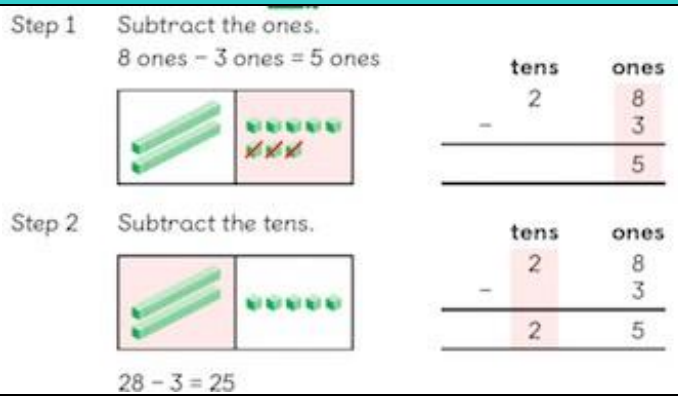
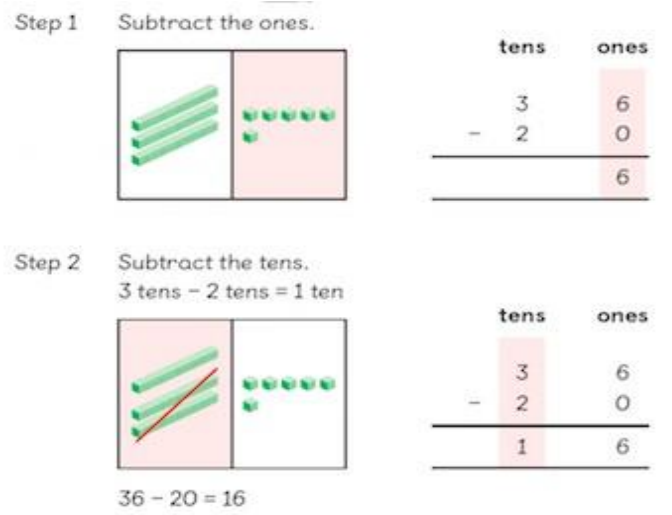
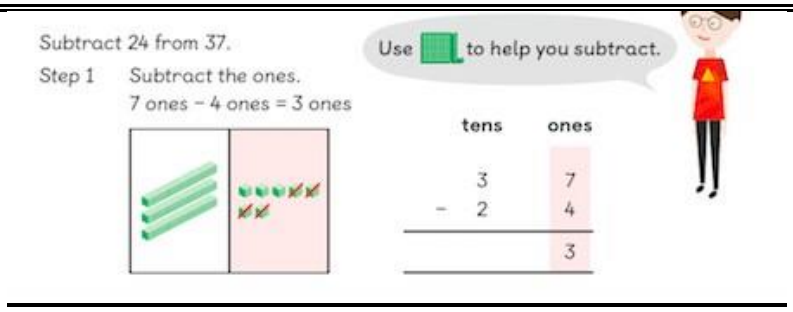
Using concrete objects and pictorial representations to add a 2 digit number with a 1 digit number.	 
Using concrete objects and pictorial representations to add a 2 digit number and 10s number.	Step 1 Add the ones. 3 ones + 4 ones = 7 ones  

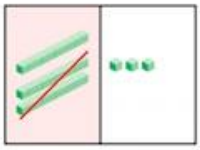
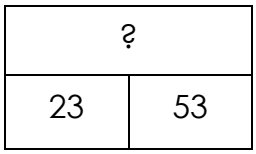
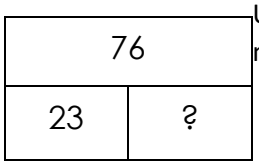
	Step 1 Add the ones.  tens ones 1 9 + 2 0 9 Step 2 Add the tens. 1 ten + 2 tens = 3 tens  tens ones 1 9 + 2 0 3 9 19 + 20 = 39
Using concrete objects and pictorial representations to add a 2 2 digit numbers.	Step 2 Add the tens. 2 tens + 1 ten = 3 tens  tens ones 2 3 + 1 4 3 7 23 + 14 = 37 Adding with renaming Add 15 and 18. Use to help you add.  Step 1 Add the ones. 5 ones + 8 ones = 13 ones Regroup the ones. 13 ones = 1 ten and 3 ones  tens ones 1 5 + 1 8 1 3

	Step 2 Add the tens. 1 ten + 1 ten + 1 ten = 3 tens  15 + 18 = 33 
Using concrete objects and pictorial representations to add a 3 single digit numbers.	7+3+2 = 2 = leads to 10 + 
Using the bar to find missing digits. *It is important for children to use the bar in this way to encourage the use of it to aid with problem solving.*	Helen has 14 bread-sticks. Her friend has 17. How many do they have altogether? 

Subtraction

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, units Key skills for subtraction at Y2:
Recognise the place value of each digit in a two-digit number.
Recall and use subtraction facts to 12, 20 fluently, and derive and use related facts up to 100 (number bonds story).
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.

Using concrete objects and pictorial representations to subtract a 1 digit number from 2 digit number.	
Using concrete objects and pictorial representations to subtract a 10s number from 2 digit number.	
Using concrete objects and pictorial representations to subtract a 2 digit number from 2 digit number.	

	Step 2 Subtract the tens. 3 tens − 2 tens = 1 ten   37 − 24 = 13
Recognise and use the inverse relationship between addition and subtraction	  Use this to check calculations and solve missing number problems.

Multiplication

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, 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, seeing these as 'lots of', e.g. 5 lots of 2

*Recognising odds and evens.

*Double numbers up to 20

*Begin to double multiples of 5 to 100

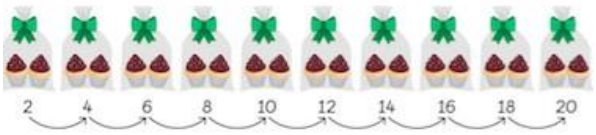
*Begin to understand that multiplication is repeated addition and to use arrays (E.g) 3x4 is three rows of four dots.

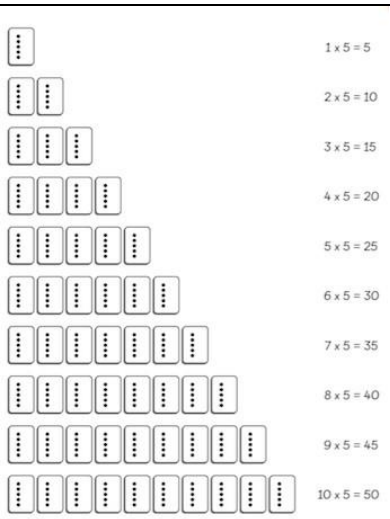
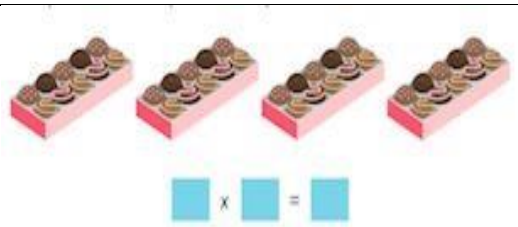
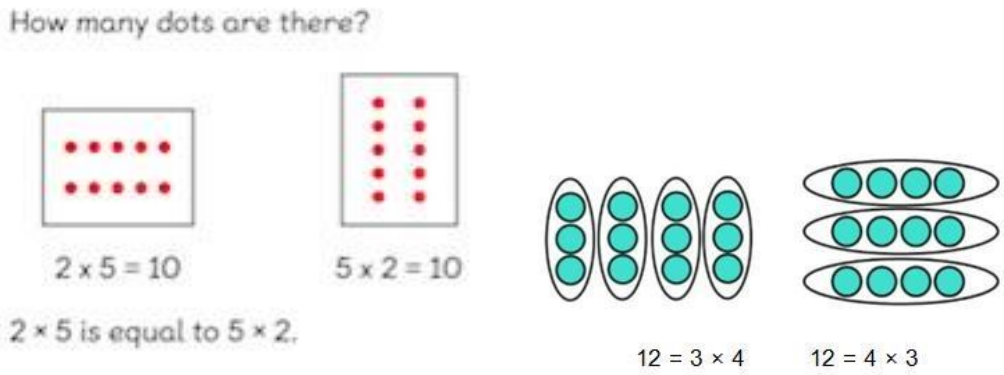
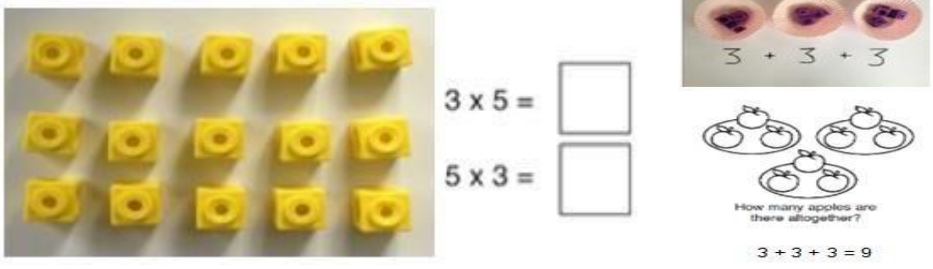
* Write and calculate number statements **using the x and = signs**.

* 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.

Skip counting in multiples of 2, 3, 5, 10 from 0	 

Recall and use multiplication facts for the multiplication tables 2, 5 and 10.	
I can use multiplication (x) and equal (=) sign when writing out my times tables.	
Multiplication is commutative *Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer.*	
Solve multiplication problems in context using arrays and repeated addition	

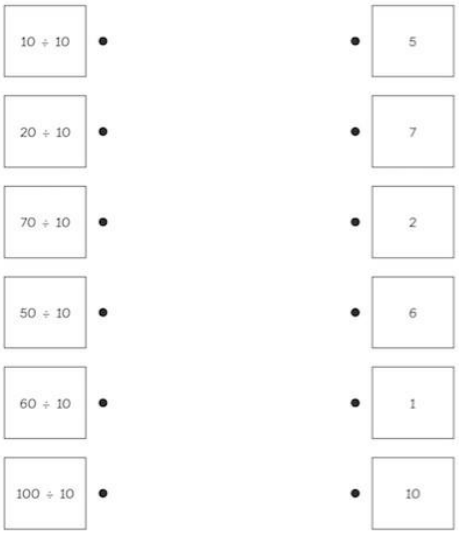
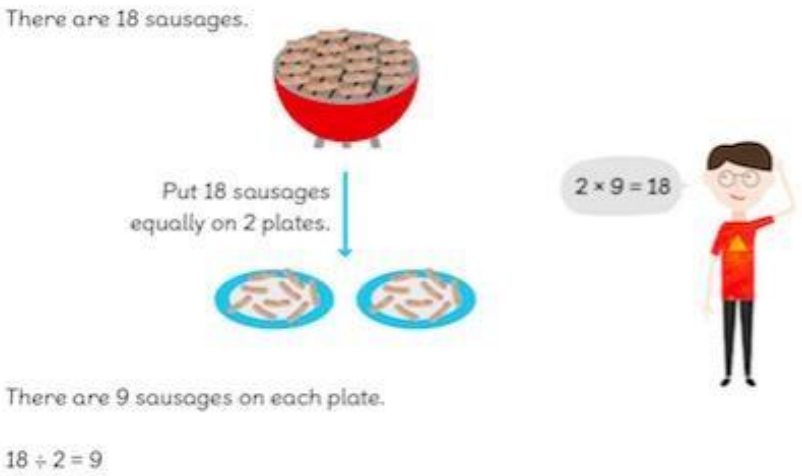
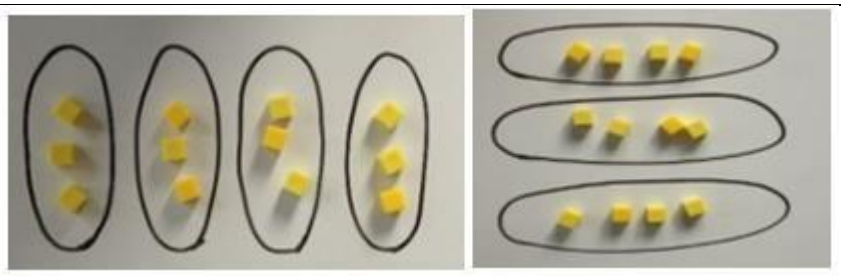
Division

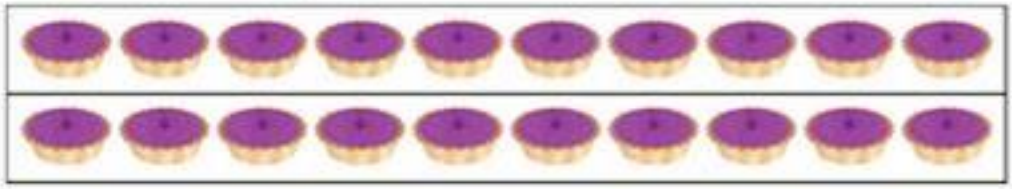
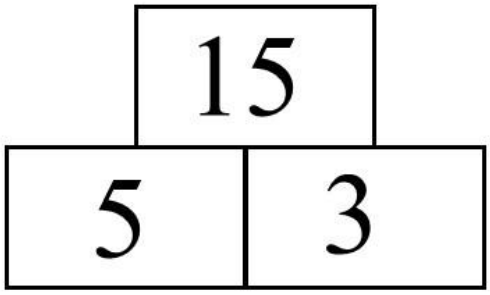
Key Vocabulary: share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over Key number skills needed for division at Y2:

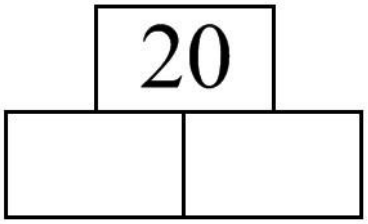
*Count in steps of 2, 3, and 5 from 0

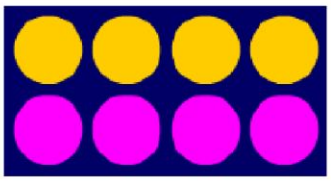
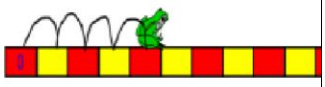
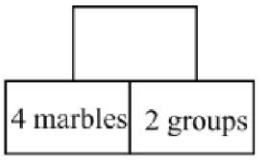
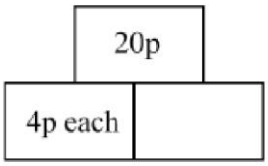
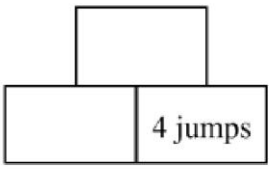
*Using fingers, say where a number is in the 2s,5s or 10s. (E.g> 8 is the fourth number when I count)

*Relate division to grouping,

* 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 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, include problems in contexts.	
Recall and use division facts for the multiplication tables 2, 5 and 10.	
Solve division problems in context using concrete objects by sharing	
Solve division problems in context using arrays	

I can solve division as grouping.	Put 10 buns in groups of 2. How many plates are there?   Put into groups of 5. There are ☐ groups.
I can use the inverse. This should be taught alongside both multiplication and division.	Make a family of multiplication and division facts.  2 x 10 = 20 ——— 20 ÷ 10 = ☐ 10 x 2 = 20 ——— 20 ÷ 2 = ☐  15 5 3 What could the missing numbers be?



□ ÷ 2 = 4	20 ÷ △ = 4	□ ÷ △ = 4
A number of marbles divided between 2 groups gives each group 4 each	20p is divided between some children. Each child gets 4p. How many children are there?	On a number line, I do four equal jumps. What numbers could I land on?
		
		

Year 3

Addition

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, **hundreds boundary, increase, vertical, _carry', expanded, compact Key skills for addition at Y3:**

Read and write numbers to 1000 in numerals and words.

-digit numbers mentally, incl. those exceeding 100.

Add a three-digit number and ones mentally (175 + 8)

Add a three-digit number and tens mentally (249 + 50)

Add a three-digit number and hundreds mentally (381 + 400)

Add pairs of 'friendly' 3-digit numbers, e.g. 320 + 450 Begin to add amounts of money using partitioning.

Solve problems, including missing number problems, using number facts, place value, and more complex addition.

Recognise the place value of digits in 3-digit numbers (hundreds, tens, ones.)

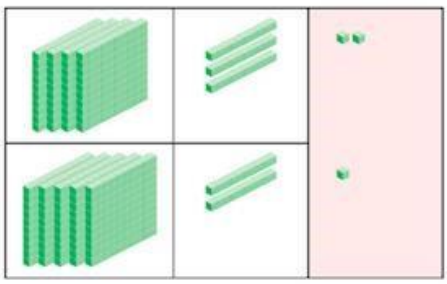
Continue to practise a wide range of mental calculations, ie. number bonds, adding the nearest multiple of 10, 100, 100 and adjusting, using near doubles, partitioning and recombining

Use expanded column addition to add two or three 3-digit numbers or three 2-digit numbers

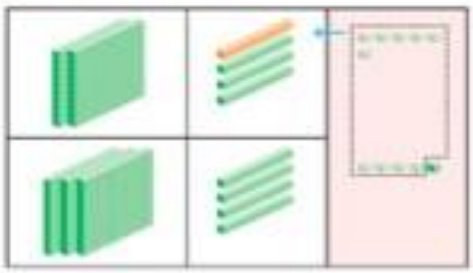
Begin to use compact column addition to add numbers with three digits.

Begin to add like fractions. (E.g. 3/8 + 1/8 + 1/8)

Recognise fractions that add to 1. (E.g. $\frac{1}{4} + \frac{3}{4}$ or 3/5 + 2/5)

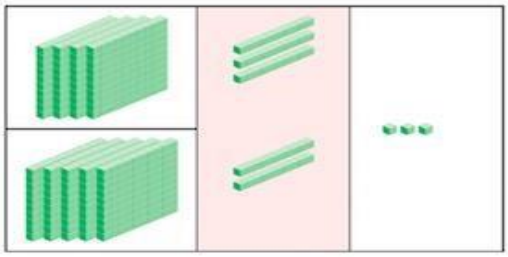
Add two three digit numbers. *Children need to use equipment first to support their understanding of place value.* *Children to word gradually to three digit + three digit starting without carrying and gradually moving towards carrying.*	432 + Step 1 Add the ones. 2 ones + 1 one = 3 ones  h t o 4 3 2 + 5 2 1 3 521 =

236 + 345 =



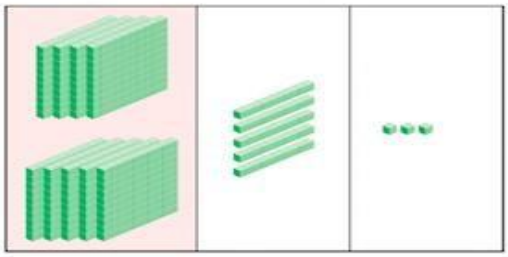
	h	t	o
	2	3	6
+	3	4	5
			1

Step 2 Add the tens.
3 tens + 2 tens = 5 tens



	h	t	o
	4	3	2
+	5	2	1
		5	3

Step 3 Add the hundreds.
4 hundreds + 5 hundreds = 9 hundreds

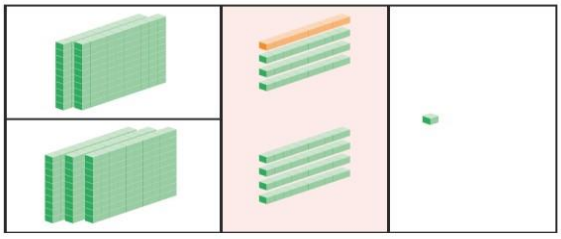


	h	t	o
	4	3	2
+	5	2	1
	9	5	3

432 + 521 = 953

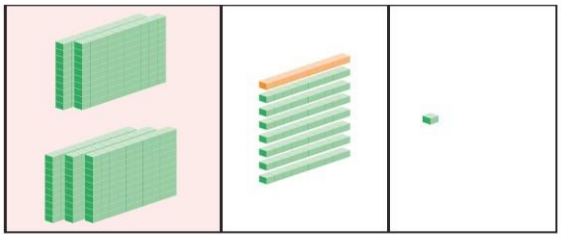
There are 953 flowers altogether.

Step 2 Add the tens.
1 ten + 3 tens + 4 tens = 8 tens



	h	t	o
		1	
	2	3	6
+	3	4	5
		8	1

Step 3 Add the hundreds.
2 hundreds + 3 hundreds = 5 hundreds



	h	t	o
		1	
	2	3	6
+	3	4	5
	5	8	1

236 + 345 = 581

Using the bar to find missing digits. *It is important for children to use the bar in this way to encourage the use of it to aid with problem solving.*

Bar Model to support understanding of problem solving:

A man sold 230 balloons at a carnival in the morning. He sold another 86 balloons in the evening . How many balloons did he sell in all?

Subtraction

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_? lifference, count on, strategy, partition, tens, units **exchange, decrease, hundreds, valu :, 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 answe s and use inverse operations to check

Find 10 more or 10 less of a given number.

Counting up dif erences as a mental strategy when numbers are close together or near multiples of 10 (see examples above)

Practice 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.

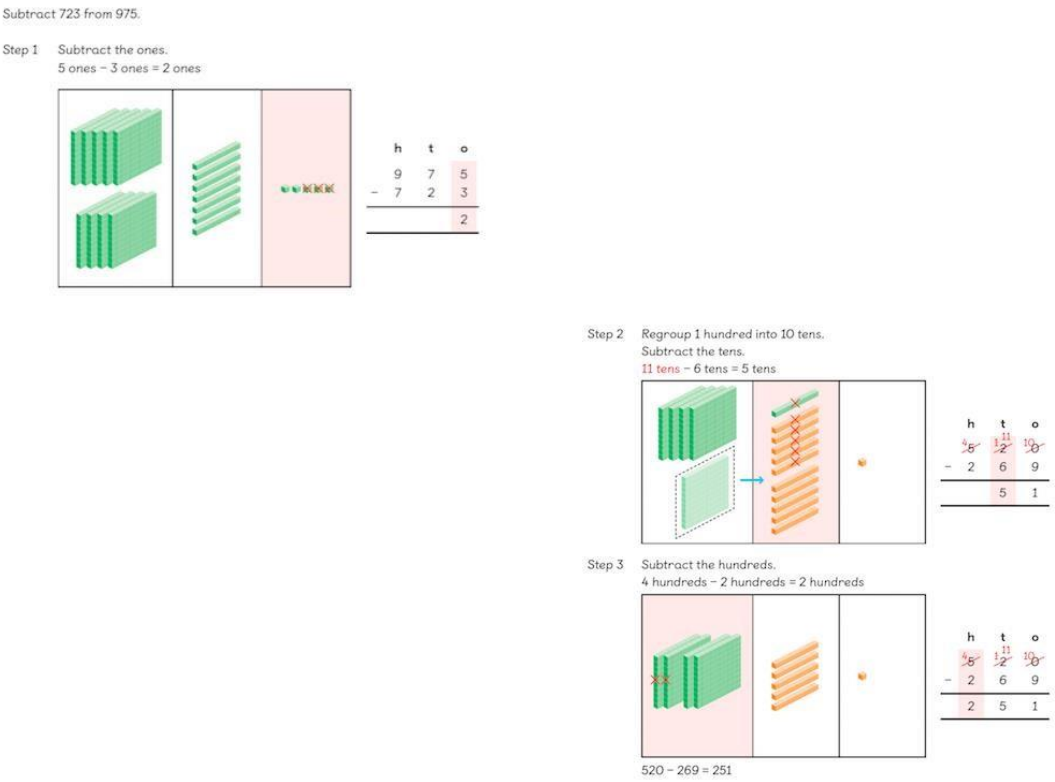
Use counting up as an informal written strategy for subtracting pairs of three-digit numbers,

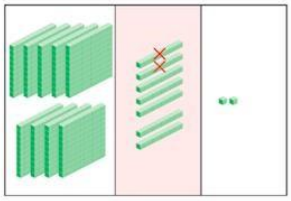
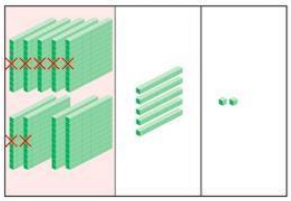
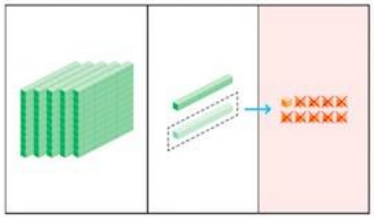
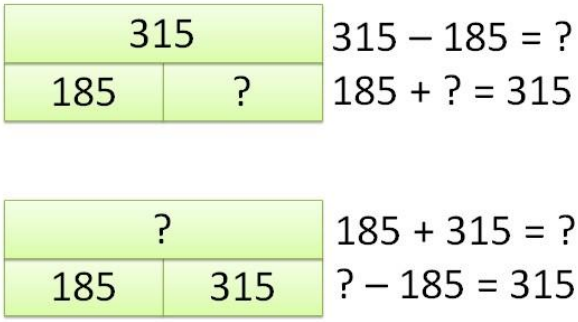
Begin to use partitioning for expanded columnar addition,

Subtract up to 3 digits from 3 digits.

Very important for children to use dienes equipment along with a place value chart to support.

Only when secure with the method should exchanging be introduced.



	Step 2 Subtract the tens. 7 tens − 2 tens = 5 tens  h t o 9 7 5 − 7 2 3 5 2 Step 3 Subtract the hundreds. 9 hundreds − 7 hundreds = 2 hundreds  h t o 9 7 5 − 7 2 3 2 5 2 975 − 723 = 252 Subtract 269 from 520. Step 1 Regroup 1 ten into 10 ones. Subtract the ones. 10 ones − 9 ones = 1 one   h t o 5 ~~1 2~~ ~~10 0~~ − 2 6 9 1
Using the bar to find missing digits. *It is important for children to use the bar in this way to encourage the use of it to aid with problem solving.*	

Multiplication

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times, _times as big as, once, twice, three times…, **partition, grid method, multiple, product, tens, units, value**

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.

* Multiply whole numbers by 10 and 100.

* Use place value and number facts in mental multiplication. E.g 3x14 as 3x10 and 3x4.

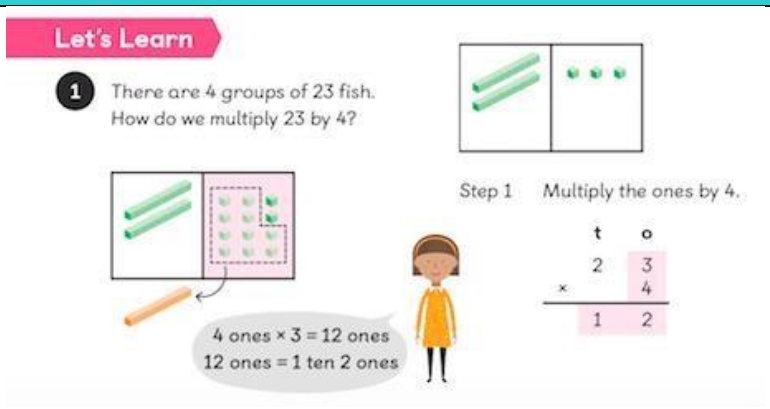
*Write and calculate number statements using the multiplication tables they know, including **2-digit × single-digit**, drawing upon mental methods, and progressing to reliable written methods.

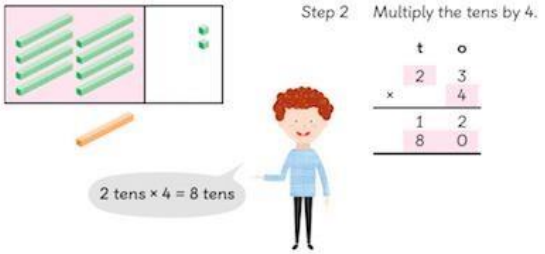
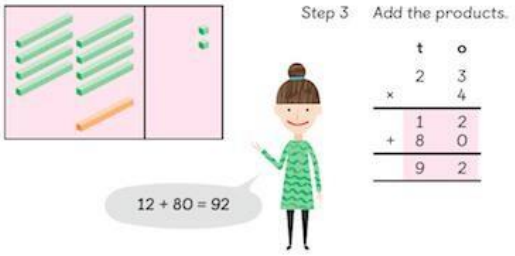
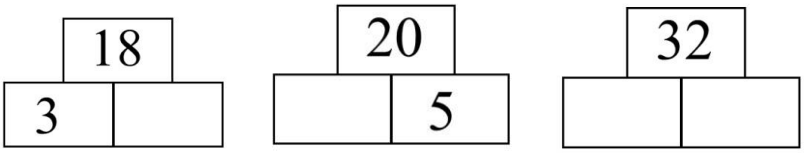
* Solve multiplication problems, including missing number problems.

*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 (**4 × 12 × 5** = 4 × 5 × 12 = **20 × 12** = 240) and for missing number problems x 5 = 20, 3 x = 18, x = 32 and partitioning to partition teen numbers to multiply by a single digit number. *Double numbers up to 50 Written

Use partitioning (grid multiplication) to multiply 2-digit and 3-digit numbers by 'friendly' single digit numbers.

Children should be able to recall the 2, 5, 10, 3, 4 and 8 times tables. Multiple a two digit number by a one digit.	

	 Step 2 Multiply the tens by 4. 2 tens × 4 = 8 tens  Step 3 Add the products. 12 + 80 = 92 23 × 4 = 92 There are 92 fish in 4 tanks.
Using the bar to solve multiplication problems.	4 children go to the cinema. They each pay £15. How much do they spend altogether? Whole unknown 
Solve problems with missing numbers.	 □ x 5 = 20 3 x △ = 18 □ x □ = 32

Division

Key Vocabulary: share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, **inverse, short division, _carry', remainder, 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 doubling, connect the 2, 4 and 8s).

*Divide whole numbers by 10 or 100 to give whole number answers

*Recognise that division is not commutative.

*Use place value and number facts in mental division. (E.g. 84 ÷ 4 is half of 42)

*Divide larger numbers mentally by subtracting the tenth multiple, including those with remainders. (E.g. 57 ÷ 3 is 10 + 9 as 10x3=30 and 9x3=27)

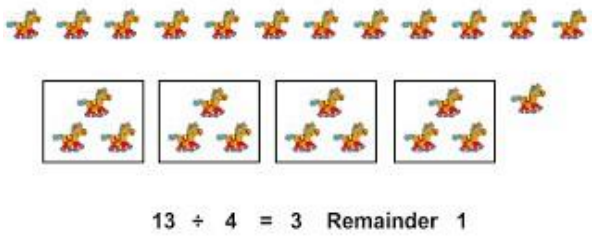
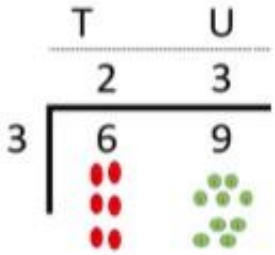
*Halve even numbers to 100, halve odd numbers to 20

*Solve problems, in contexts, and including missing number problems, involving multiplication and division.

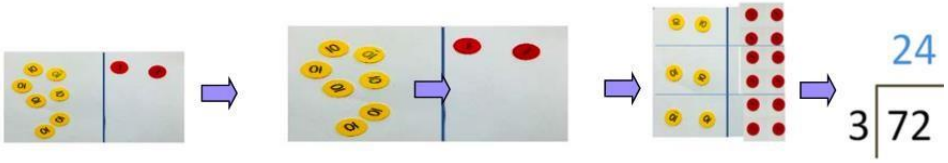
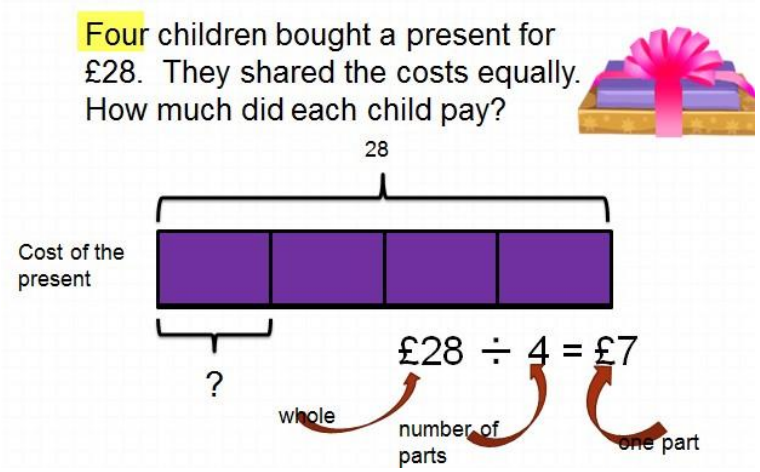
*Pupils develop efficient mental methods, for example, using multiplication and division facts (e.g. using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, so 60 ÷ 3 = 20 and 20 = 60 ÷ 3).

*Perform divisions just above the 10th multiple using the written layout and understanding how to give a remainder as a whole number.

*Find unit fractions of quantities and begin to find non-unit fractions of quantities

Dividing by grouping understanding the concept of remainders.	Start with using the real objects- or objects that represent the calculation.  13 ÷ 4 = 3 Remainder 1
Dividing using short division. *Once children are secure with division as grouping and demonstrate this using number lines, arrays etc., **short division** for larger 2-digit numbers should be introduced, initially with carefully selected examples requiring no calculating of remainders at all.*	 **Remind children of correct place value, that 69 is equal to 60 and 9, but in short division, pose:** · *How many 3's in 6? = 2, and record it above the **6 tens**.* · *How many 3's in 9? = 3, and record it above the **9 ones**.* Once children demonstrate a full understanding of remainders, and also the short division method taught, they can be taught how to use the method when remainders occur within the calculation (e.g. 72÷3), and be taught to 'carry' the remainder onto the next digit.

Start by introducing the	

layout of short division by comparing it to an array.	
Using the bar to aid the solving of division problems.	

Year 4

Addition

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, vertical, „carry", expanded, compact, **thousands, hundreds, digits, inverse**

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.

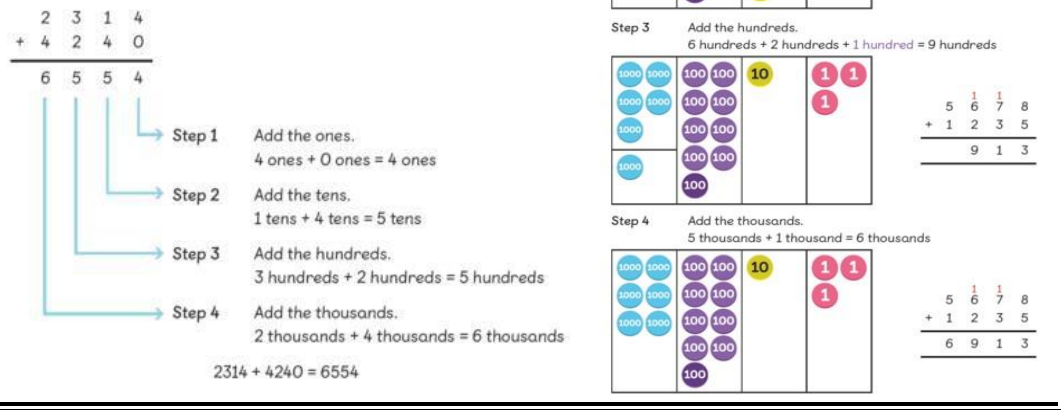
Estimate and use inverse operations to check answers to a calculation.

Add like fractions, e.g. $^3/_5 + {}^4/_5 = {}^7/_5 = 1\,{}^2/_5$.

Be confident with fractions that add to 1 and fraction complements to 1. (E.g. $^2/_3 + ? = 1$)

Adding numbers with up to 4 digits.

Again this should start with the children using dienes to support them with lots of discussion about the value of each digit.



Using the bar to find missing digits. *It is important for children to use the bar in this way to encourage the use of it to aid with problem solving.*	This is not a form of getting the correct answer but helping to guide children to the correct operation. Alison jogs 6,860 metres and Calvin jogs 5,470 metres. How far do they jog altogether? 

Subtraction

Key vocabulary: equal to, take, take away, less, minus, subtract, leaves, distance be-tween, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_? difference, count on, strategy, partition, tens, units exchange, decrease, hundreds, value, digit, **inverse**

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.

Use expanded column subtraction for 3-digit and 4-digit numbers

Use complementary addition to subtract amounts of money, and for subtractions where the larger number is a near multiple of 1000 or 100

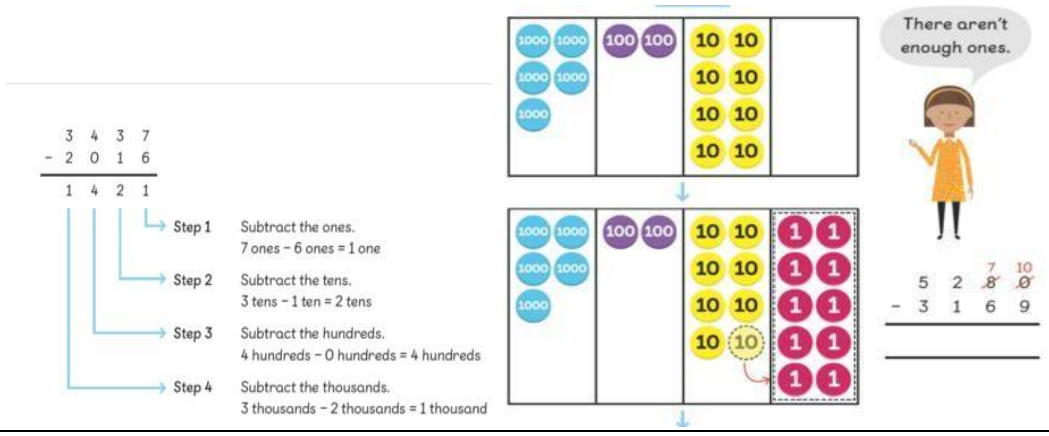
E.g. 2002 – 1865 is

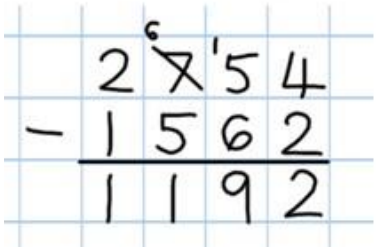
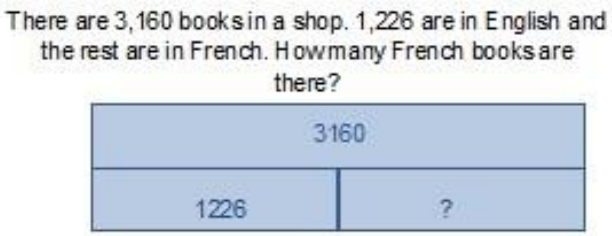
Subtract like fractions, e.g. $\frac{1}{4} + {}^{1}/_{8} = {}^{3}/_{8}$

Use fractions that add to 1 to find fraction complements to 1, e.g. $1 - {}^{2}/_{3} = {}^{1}/_{3}$

To subtract with numbers up to four digits including exchanging when children are secure.

Again children need to use dienes to support their learning.



	
Using the bar to find missing digits. *It is important for children to use the bar in this way to encourage the use of it to aid with problem solving.*	

Multiplication

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, groups of, sets of, lots of, equal groups, times, multiply, times as big as, once, twice, three times… partition, grid method, total, multiple, product, sets of, **inverse**

Key skills for multiplication at Y4:

* Count in multiples of 6, 7, 9, 25 and 1000
* Recall multiplication facts for **all multiplication tables up to 12 x 12.**
* Multiply whole numbers and one-place decimals by 10, 100, 1000

*Multiply multiples of 10, 100, 1000 by single digit numbers. (E.g. 300 x 6 or 4000 x 8)

*Use understanding of place value and number facts in mental multiplication. (E.g. 36 x 5 is half of 36 x 10 and 50 x 60 = 3000)

*Partition 2-digit numbers to multiply by a single-digit number mentally. (E.g. 4 x 24 as 4 x 20 and 4 x 4)

*Multiply near multiples using rounding. (E.g. 33 x 19 as 33 x 20 – 33)

*Find doubles to double 100 and beyond using partitioning

*Begin to double amounts of money. (E.g. £35.60 doubled = £71.20.)

* 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.

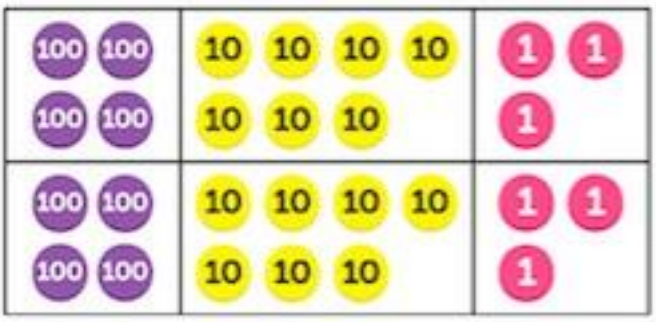
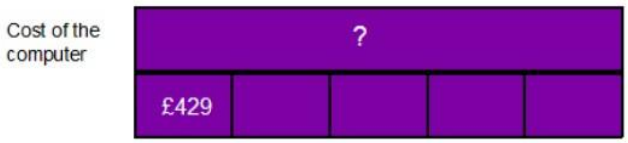
*Solve problems with increasingly complex multiplication in a range of contexts.

*Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)

Written

*Use a vertical written method to multiply a one-digit by a 3-digit number (ladder)

*Use an efficient written method to multiply a 2-digit number by a number between 10 and 20 by partitioning (grid

method)	
Children to know all times tables to 12 x 12. Ladder method to be used with children multiplying both two and three digits by a one digit number.	314 × 3 12 (3 x 4) 30 (3 x 10) + 900 (3 x 300) 942  4 7 3 × 2
Multiplying using the bar.	A computer costs 5 times as much as a television. The television costs £429. How much does the computer cost? 

Division

Key Vocabulary: share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, „carry", remainder, multiple, **divisible by, factor Key number skills needed for division at Y4:**

*Know by heart all the division facts up to 144 ÷ 12.

*Divide whole numbers by 10, 100 to give whole number answers or answers with one decimal place

*Divide multiples of 100 by 1-digit numbers using division facts. (E.g. 3200 ÷ 8 = 400)

*Use place value and number facts in mental division. (E.g. 245 ÷ 20 is double 245 ÷ 10)

*Divide larger numbers mentally by subtracting the 10th or 20th multiple as appropriate. (E.g. 156 ÷ 6 is 20 + 6 as 20x6=120 and 6x6=36)

*Find halves of even numbers to 200 and beyond using partitioning

*Begin to halve amounts of money. (E.g. Half of £52.40 = £26.20)

*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.

*Pupils practise to become fluent in the formal written method of short division with exact

answers when dividing by a one-digit number (2 or 3-digit by a single digit)

*Give remainders as whole numbers.

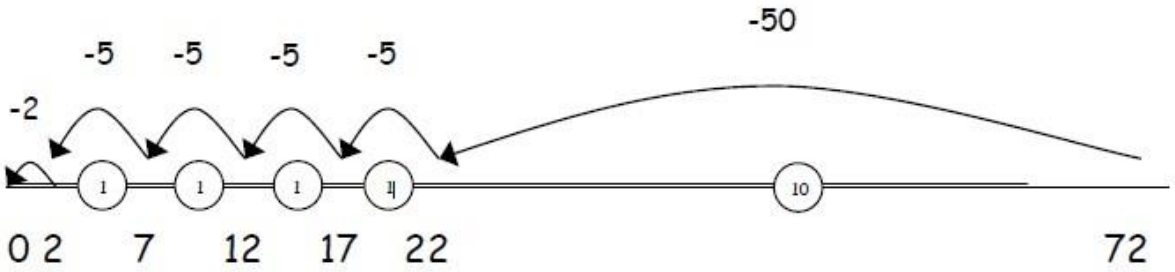
*Begin to reduce fractions to their simplest forms.

*Find unit and non-unit fractions of larger amounts.

Divide up to 3-digit numbers by a 1- digit (without remainders initially)

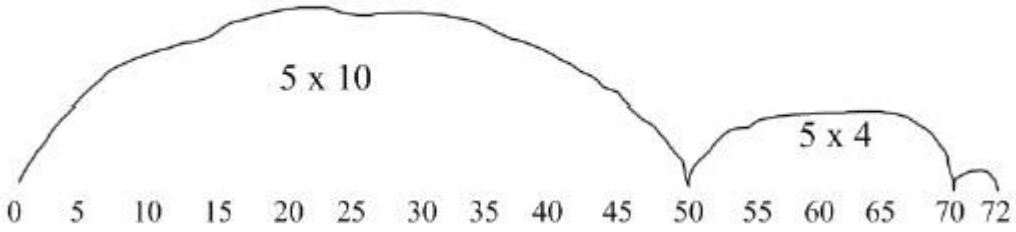
They will continue to develop their use of repeated subtraction to be able to subtract multiples of the divisor

72 ÷ 5



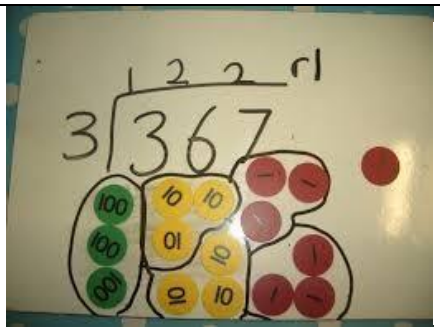
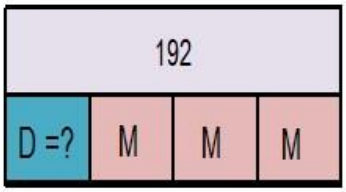
or counting forward(linked to multiplication)

or



This then leads to the chunking method once the pupils are secure with grouping.

		10	+	5	=	1	5r2
	5	7	2				
	-	5	0				
		2	2				
	-	2	0				
		r	2				

Dividing up to three digit numbers by a one digit number using short division. Only when the children are secure with dividing a two digit number should they move onto a 3 digit number.	 H T U 0 2 5 r1 5 1 12 6
Dividing using the bar.	Desmond and Melissa collect cards. They have 192 cards in all. Melissa has three times as many cards as Desmond. How many cards does Desmond have? 

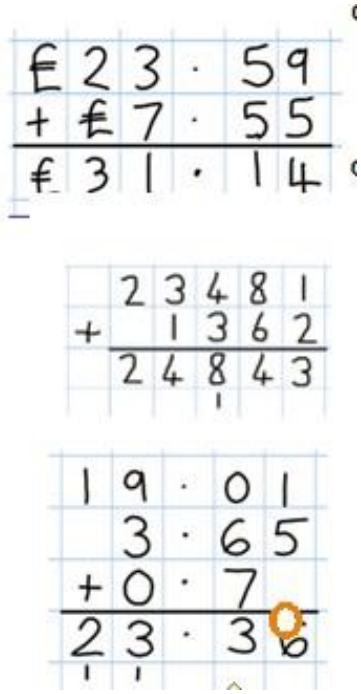
Year 5

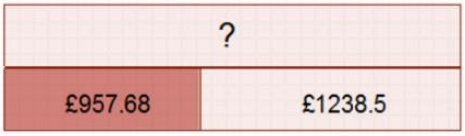
Addition

Key vocabulary: add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary, hundreds boundary, increase, „carry", expanded, compact, vertical, thousands, hundreds, digits, inverse & **decimal places, decimal point, tenths, hundredths, thousandths**

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.
- Use column addition to add two or three whole numbers with up to 5 digits
- Use column addition to add any pair of two-place decimal numbers including amounts of money.
- Begin to add related fractions using equivalences. (E.g. $\frac{1}{2} + {}^{1}/_{6} = {}^{3}/_{6} + {}^{1}/_{6}$)
- Choose the most efficient method in any given situation

Adding numbers with more than 4 digits including decimals *Using place value charts are key to this as well as place value counters to help with the decimals.*	
Using the bar to find missing digits.	This is not a form of getting the correct answer but helping to guide children to the correct operation.

It is important for children to use the bar in this way to encourage the use of it to aid with problem solving.	MacDonalds sold £9957.68 worth of hamburgers and £1238.5 worth of chicken nuggets. How much money did they take altogether? 

Subtraction

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, units exchange, decrease, hundreds, value, digit, inverse, **tenths, hundredths, decimal point, decimal**

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 in-tegers through 0.
- Round any number up to 1 million to the nearest 10, 100, 1000, 10 000 and 100 000.

Use compact or expanded column subtraction to subtract numbers with up to 5 digits.

Use complementary addition for subtractions where the larger number is a multiple or near multiple of 1000.

Use complementary addition for subtractions of decimals with up to two places incl. amounts of money

Begin to subtract related fractions using equivalences. (E.g. $\frac{1}{2} - \frac{1}{6} = \frac{2}{6}$)

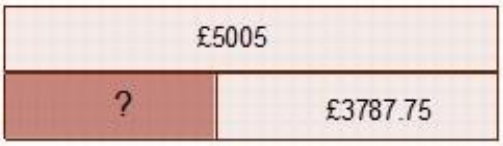
Choose the most efficient method in any given situation

Subtract with at least four digit numbers including two decimal places. Include money, measures and decimals ensuring that children do this practically before the abstract.	Subtract with decimal values, including mixtures of integers and decimals, aligning the decimal point. $\begin{array}{r} 3\,10\,0\,5\,6 \\ -\quad 2\,1\,2\,8 \\ \hline 2\,8\,9\,2\,8 \end{array}$ Approximate, Calculate, Check . $\begin{array}{r} 7\,10\,6\,8\,.\,0 \\ -\quad 3\,7\,2\,.\,5 \\ \hline 6\,7\,9\,6\,.\,5 \end{array}$

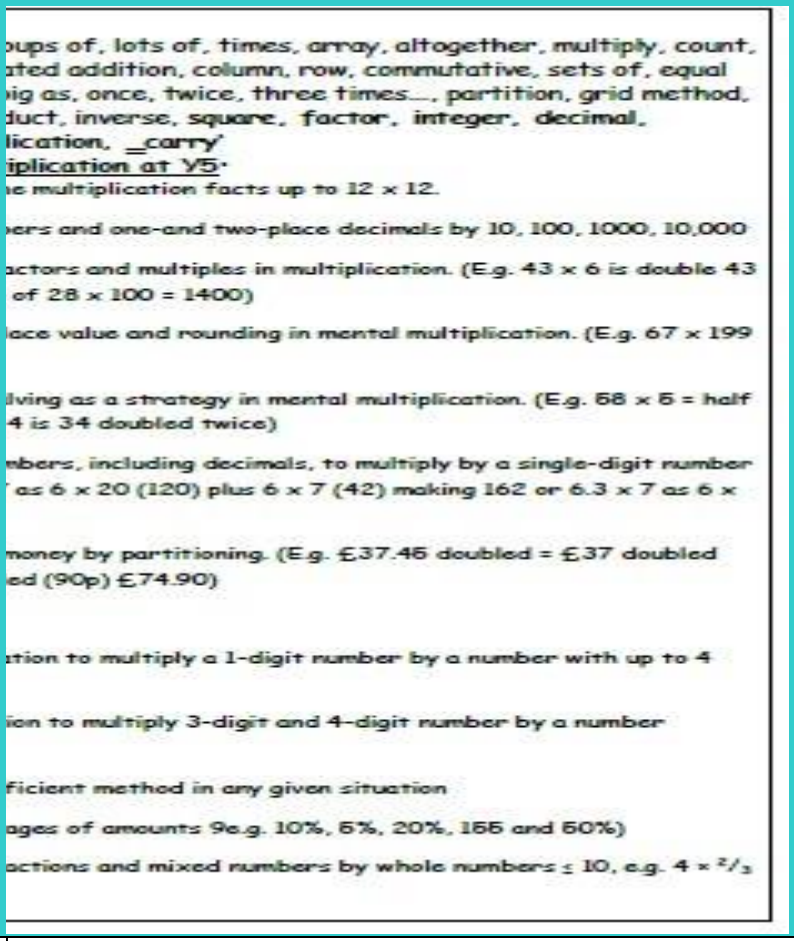
Using the bar to find missing digits.

It is important for children to use the bar in this way to encourage the use of it to aid with problem solving.

A whole to Lapland costs £5005 for a family of four, the Smith's have only saved £3787.75, how much money do they still need to find?



Multiplication



…oups of, lots of, times, array, altogether, multiply, count, …ated addition, column, row, commutative, sets of, equal …ig as, once, twice, three times…, partition, grid method, …duct, inverse, square, factor, integer, decimal, …lication, _carry'
…iplication at Y5·
…e multiplication facts up to 12 x 12.

…ers and one-and two-place decimals by 10, 100, 1000, 10,000

…actors and multiples in multiplication. (E.g. 43 x 6 is double 43 … of 28 x 100 = 1400)

…lace value and rounding in mental multiplication. (E.g. 67 x 199

…lving as a strategy in mental multiplication. (E.g. 68 x 6 = half …4 is 34 doubled twice)

…mbers, including decimals, to multiply by a single-digit number …as 6 x 20 (120) plus 6 x 7 (42) making 162 or 6.3 x 7 as 6 x

…money by partitioning. (E.g. £37.46 doubled = £37 doubled …ed (90p) £74.90)

…tion to multiply a 1-digit number by a number with up to 4

…ion to multiply 3-digit and 4-digit number by a number

…ficient method in any given situation

…ages of amounts 9e.g. 10%, 5%, 20%, 15% and 60%)

…actions and mixed numbers by whole numbers ≤ 10, e.g. 4 × ²/₃

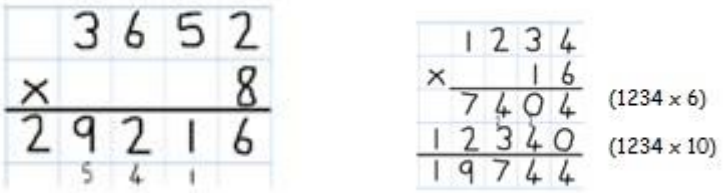
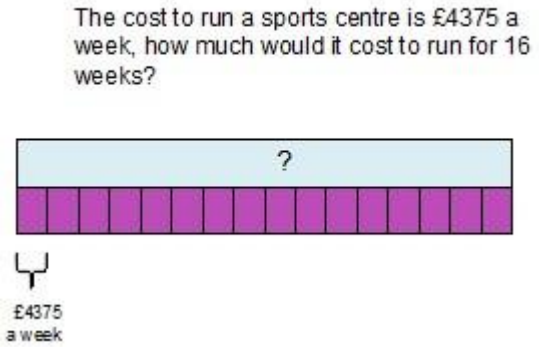
Multiplying up to four digit numbers by two digits using long multiplication.

*Children need to be taught to approximate first, e.g. for **72 x 38, they will use rounding: 72 x 38** is approximately 70 x 40 = **2800**, and use the approximation to check the reasonableness of their answer.*

```
   56
X  27
-----
  392    (56x7)
 1120    (56x20)
-----
 1512
```

Approximate, Calculate, Check .

· Explain that first we are multiplying the top number by 7 s
(any carrying needs to be done underneath the numbers). ·
explain that we need to put a 0 underneа
are multiplying the number by 20.. (2 tens) which is the san
explain that this is because we

	2. · Now add the 2 numbers together to give you the answer. · This will need lots of modeling to show the children. 
Using the bar to support multiplication.	

Division

Key Vocabulary: share, share equally, one each, two each…, group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over, inverse, short division, „carry", remainder, multiple, divisible by, factor, inverse, **quotient, 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 (as in Y4).

* 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 and 10,000 to give whole number answers or answers to to 1,2 or 3 decimal places.

* 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.

* Use multiplication and division as inverses.

*Halve amounts of money by partitioning. (E.g. Half of £75.40 = half of £75 (37.50) plus half of 40p (20p) which is £37.70)

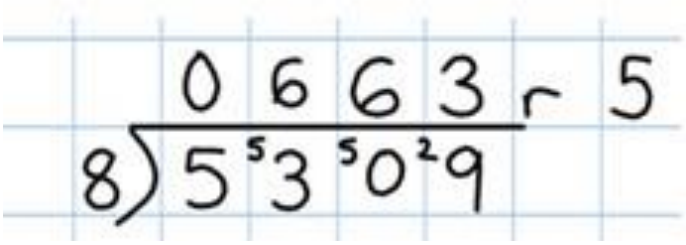
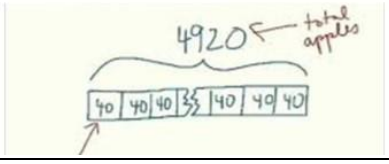
*Divide larger numbers mentally by subtracting the 10th or 100th multiple as appropriate. (E.g. 96 ÷ 6 is 10 + 6, as 10 × 6 = 60 and 6 × 6 = 36; 312 ÷ 3 is 100 + 4 as 100 x 3 = 300 and 4 x 3 = 12) *Reduce fractions to their simplest form.

* 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 (e.g. 98 ÷ 4 = 24 r 2 = 241/2 = 24.5 ≈ 25).

Written

*Use short division to divide a number with up to 4 digits by a number ≤12.

*Give remainders as whole numbers, fractions or appropriate context.

*Find non-unit fractions of large amounts. *Turn improper fractions into mixed numbers and vice versa. *Choose the most efficient method in any given situation	
Diving with up to four digit numbers by one digit including numbers where remainders are left.	 **Short division with remainders:** Now that pupils are introduced to examples that give rise to remainder answers, division needs to have a real life problem solving context, where **pupils consider the meaning of the remainder and <u>how</u> to express it,** ie. as a fraction, a decimal, or as a rounded number or value , depending upon the context of the problem.
Using the bar to support division problems.	**<u>Bar Model to support understanding of problem solving:</u>** Frank has 4920 apples. He needs to put them into baskets of 40. How many baskets does he need? 

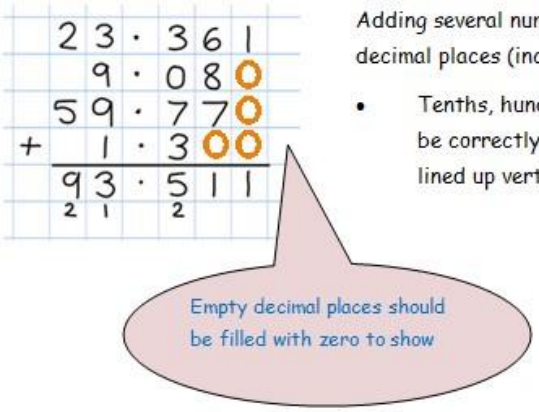
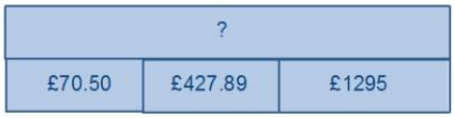
<u>Year 6</u>

Addition

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

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.
- Use column addition to add numbers with up to 5 digits.
- Use column addition to add decimal numbers with up to 3-digits
- Add mixed numbers and fractions with different denominators.

Adding several numbers with up to three decimal places.	 Adding several numbers with different numbers of decimal places (including money and measures): • Tenths, hundredths and thousandths should be correctly aligned, with the decimal point lined up vertically including in the answer row.
Adding using the bar.	Jack went on holiday. His flight cost £70.50, the hotel £1295 and spending money £427.89. How much did Jack spend on his holiday? 

Subtraction

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, units exchange, decrease, hundreds, value, digit, inverse, **tenths, hundredths, decimal point, decimal**

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 in-tegers through 0.
- Round any number up to 1 million to the nearest 10, 100, 1000, 10 000 and 100 000.

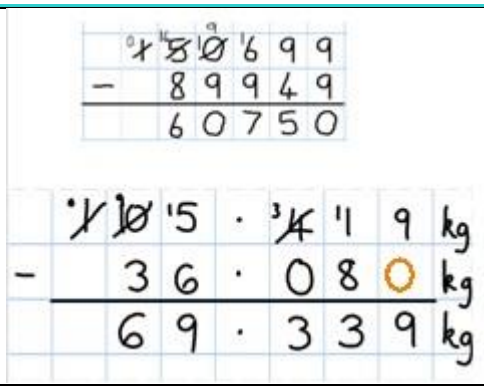
Use compact or expanded column subtraction to subtract numbers with up to 5 digits.

Use complementary addition for subtractions where the larger number is a multiple or near multiple of 1000.

Use complementary addition for subtractions of decimals with up to two places incl. amounts of money

Begin to subtract related fractions using equivalences. (E.g. $\frac{1}{2} - {}^{1}/_{6} = {}^{2}/_{6}$)

Choose the most efficient method in any given situation

Subtracting with increasingly large and more complex numbers and decimal values.		Very important to use in a range of contexts- measures and money.
Using the bar for subtraction.	Chloe wants to buy a new car for £6450. She has £4885.87 in her savings account. Her Dad gives her £150 for her birthday. How much more money does she need to save? £6450 £4885.87 | £150 | ?	

Multiplication

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times... partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short / long multiplication, „carry", **tenths, hundredths, decimal**

Key skills for multiplication at Y6:

*Know by heart all the multiplication facts up to 12 x 12.

*Multiply whole numbers and decimals with up to three places by 10, 100 or 1000, e.g. 234 x 1000 = 234,000 and 0.23 x 1000 = 230)

*Identify common factors, common multiples and prime numbers and use factors in mental multiplication. (E.g. 326 x 6 is 652 x 3 which is 1956)

*Use place value and number facts in mental multiplication. (E.g. 40,000 x 6 = 24,000 and 0.03 x 6 = 0.18)

*Use doubling and halving as mental multiplication strategies, including to multiply by 2, 4, 8, 5, 20, 50 and 25 (E.g. 28 x 25 is $\frac{1}{4}$ of 28 x 100 = 700)

*Use rounding in mental multiplication. (34 x 19 as (20 x 34) – 34)

*Multiply one and two-place decimals by numbers up to and including 10 using place value and partitioning. (E.g. 3.6 x 4 is 12 + 2.4 or 2.53 x 3 is 6 + 1.5 + 0.09)

*Double decimal numbers with up to 2 places using partitioning

e.g. 36·73 doubled is double 36 (72) plus double 0·73 (1·46)

Written

*Use short multiplication to multiply a 1-digit number by a number with up to 4 digits

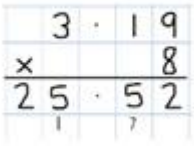
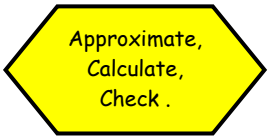
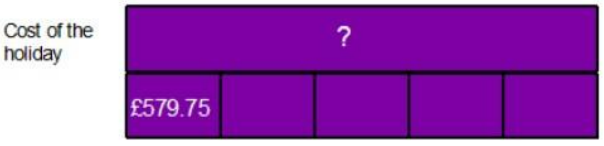
*Use long multiplication to multiply a 2-digit by a number with up to 4 digits

*Use short multiplication to multiply a 1-digit number by a number with one or two decimal places, including amounts of money.

*Multiply fractions and mixed numbers by whole numbers.

*Multiply fractions by proper fractions.

*Use percentages for comparison and calculate simple percentages.

Short and long multiplication with up to two decimal places.	 
Using the bar to help with multiplication.	If 5 friends went on holiday and each paid £579.75 what was the total cost of the holiday? 

Division

Key Vocabulary: As previously, & common factor Key number skills needed for division at Y6:

*Know by heart all the division facts up to 144 ÷ 12.

*Divide whole numbers by powers of 10 to give whole number answers or answers with up to three decimal places.

*Identify common factors, common multiples and prime numbers and use factors in mental division. (E.g. 438 ÷ 6 is 219 ÷ 3 which is 73)

*Use tests for divisibility to aid mental calculation.

*Use doubling and halving as mental division strategies, e.g. to divide by 2, 4, 8, 5, 20 and 25. (E.g. 628 ÷ 8 is halved three times: 314, 157, 78.5)

*Divide one and two place decimals by numbers up to and including 10 using place value. (E.g. 2.4 ÷ 6 = 0.4 or 0.65 ÷ 5 = 0.13, £6.33 ÷ 3 = £2.11)

*Halve decimal numbers with up to 2 places using partitioning e.g.
Half of 36·86 is half of 36 (18) plus half of 0·86 (0·43)

*Know and use equivalence between simple fractions, decimals and percentages, including in different contexts.

*Recognise a given ratio and reduce a given ratio to its lowest terms.

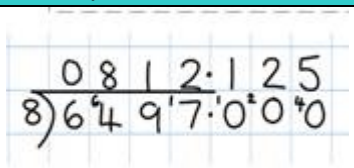
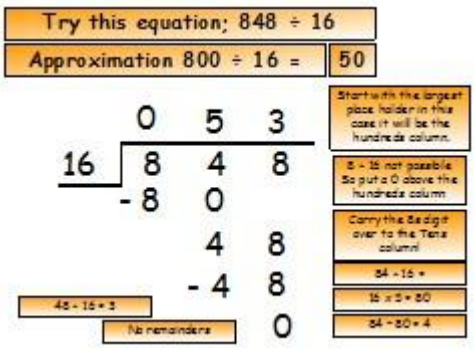
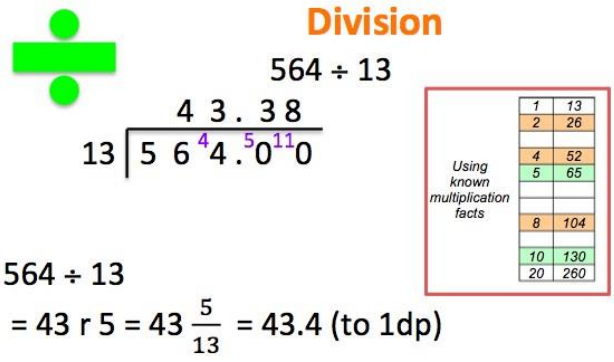
Written

*Use short division to divide a number with up to 4 digits by a 1-digit or a 2-digit number *Use long division to divide 3-digit and 4-digit numbers by 'friendly' 2-digit numbers.

*Give remainders as whole numbers or as fractions, decimals or the appropriate context

*Divide a one-place or a two-place decimal number by a number ≤ 12 using multiples of the divisors.

*Divide proper fractions by whole numbers.

Divide at least 4 digits by both single-digit and 2-digit numbers (including decimal numbers and quantities)	 **Short division with remainders:** Pupils should continue to use this method, but with numbers to at least 4 digits, and understand how to express remainders as fractions, decimals, whole number remainders, or rounded numbers. Real life problem solving contexts need to be the starting point, where pupils have to consider the most appropriate way to express the remainder.
Long division this is for when dividing by two digit numbers.	 

Using the bar to help divide.	Paul and David hire a car together at a cost of £297.50. Paul pays 6 times more than David. How much does David pay?