



How we teach it.

Written and mental calculation in Reception.

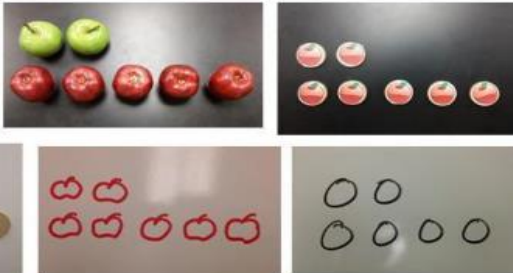


Written Addition in Reception

Method:

The children will begin using concrete and pictorial images to represent information.

Sara has 2 apples.
Jon has 5 apples.
How many apples do they have altogether?
How many more apples does Jon have than Sara?



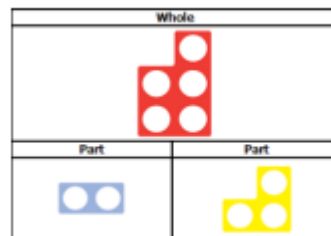
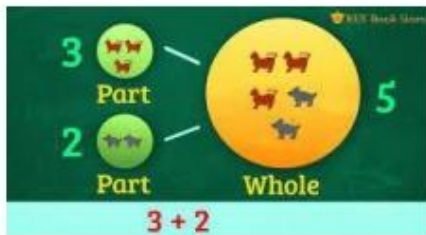
Method:

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

	$6 + 4 = 10$
	$4 + 4 = 8$
	$5 + 2 = 7$
	$2 + 4 = 6$

First Steps:

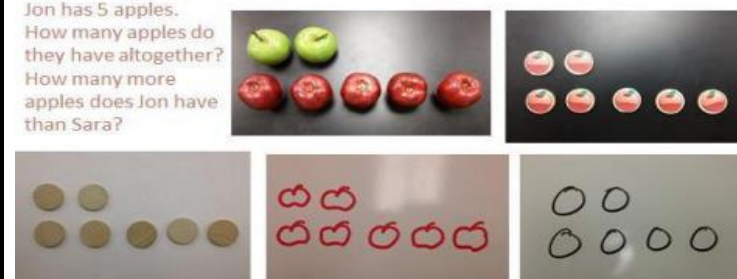
Children will explore the part- part whole relationship - Combining two parts to make a whole



Next Steps:

The Children will then move onto solving problems using concrete and pictorial images.

Sara has 2 apples.
Jon has 5 apples.
How many apples do they have altogether?
How many more apples does Jon have than Sara?

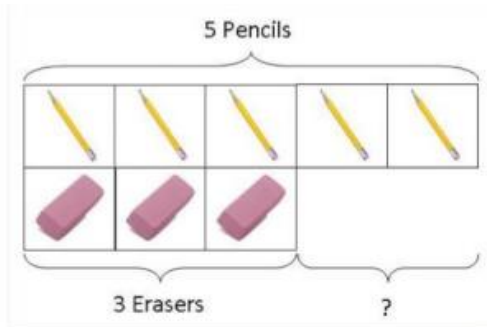




Written Subtraction in Reception

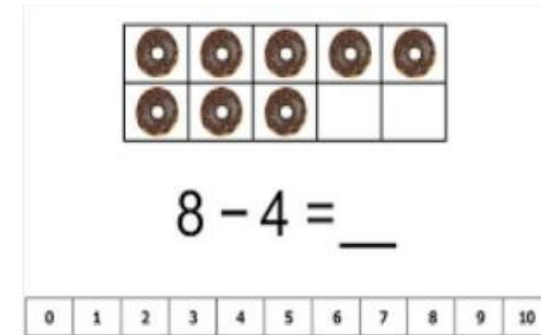
Method:

The children will begin using concrete and pictorial images to represent information.



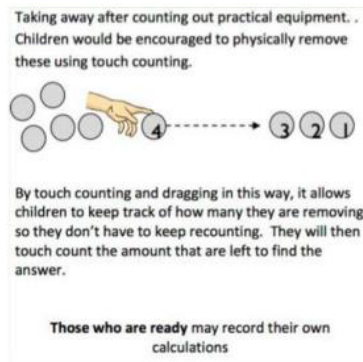
Method:

The children will use the ten frames to support subtraction by taking away.



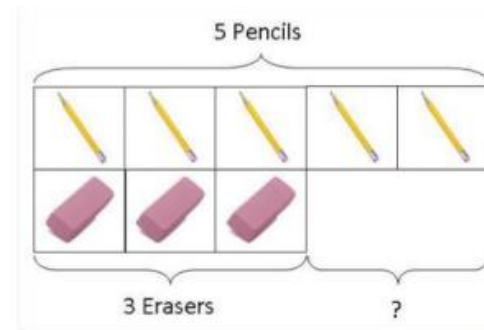
First Steps:

The children will begin using concrete strategies for counting.



Next Steps:

Solving problems using concrete and pictorial images.



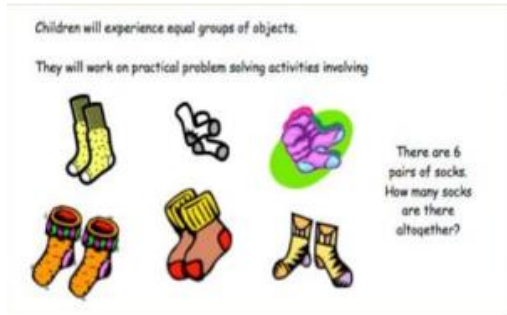
Peter has 5 pencils and 3 erasers. How many more pencils than erasers does he have?



Written Multiplication in Reception

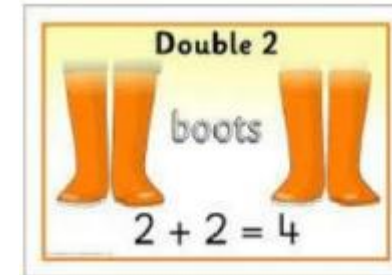
First Steps:

The Children will experience equal groups of objects.



Method:

Children will think about doubling when solving practical problems using manipulatives and real life objects.



Written Division in Reception

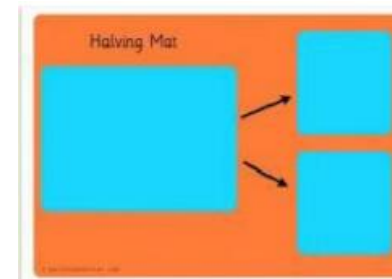
First Steps:

The children will practice sharing practical objects and halving using manipulatives and real life objects



Method:

Hearing and being exposed to language to describe half and double as well as seeing visual representatives.





How we teach it.

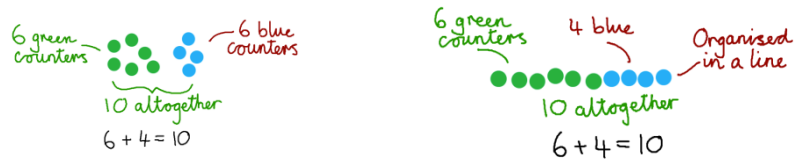
Written and mental calculation in Year 1.



Written Addition in Year 1

Method:

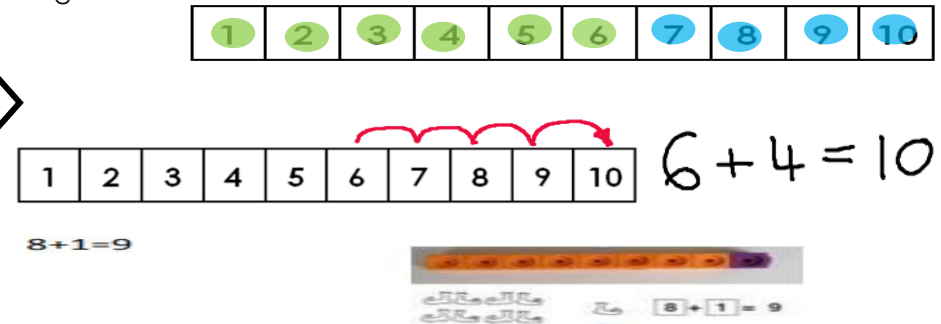
Children will use objects or counters to support their addition. They will count out the appropriate amount of counters, add additional counters and then count how many they have altogether (parts and wholes). They will begin to record their work in number sentences.



They will represent number sentences using counters and will be encouraged to count on from the larger number. They will organise their counters in a line.

Leading to:

Once children are familiar with counting objects, they will then move onto using a number track (with and without counters) as well as bars models to support their addition. They will continue to record their work using number sentences.



First Steps:

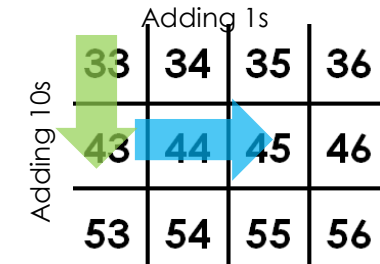
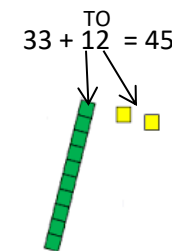
Children will begin learning pictorial methods of addition by counting on from a given number. They will practise thinking of one number and continue counting on in ones. They will also learn the part- whole relationship and that addition is combining parts to make a whole.



Next Steps:

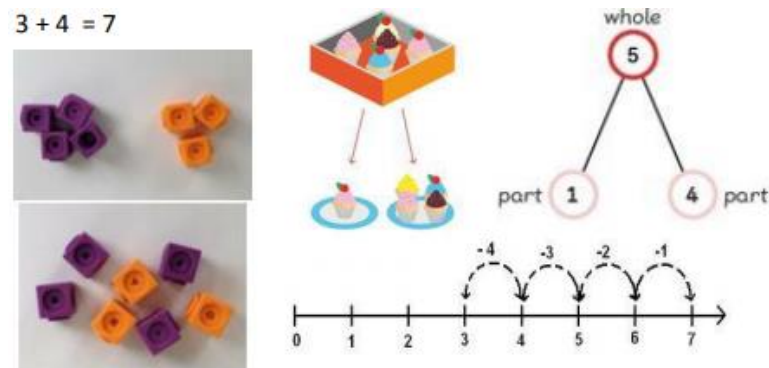
When children are ready to be adding larger numbers, they will first learn to partition numbers into tens and ones using dienes and place value mats. Once they understand numbers can be partitioned into tens and ones, they will use that knowledge to add on a Hundred Square. They will begin to add in tens and ones by moving vertically or horizontally on the Hundred Square.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
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71	72	73	74	75	76	77	78	79	80
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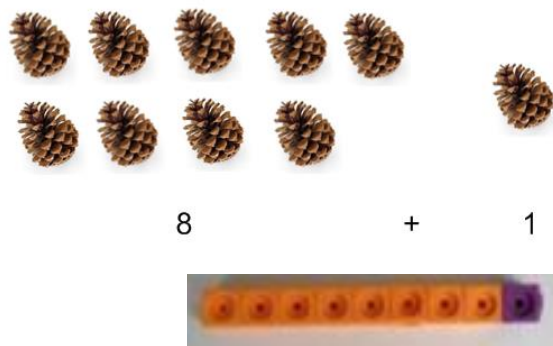
A Deeper Look:

Children will learn to combine two parts to make a whole: part-whole model. They will join groups and then recount all objects. Children will practice making 10 and numbers to 10 ($6 + 4 = 10$ or $3 + 5 = 8$)

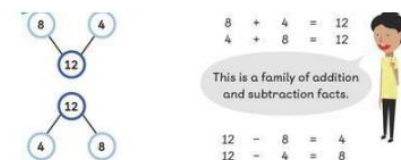
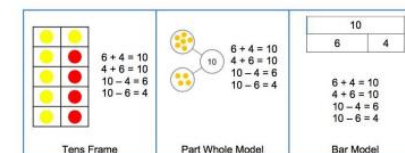
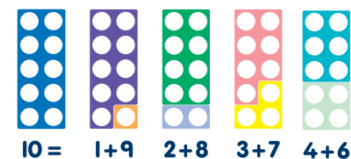


Children are given opportunities to talk about numbers and addition. They learn through real life examples and are encouraged to play with and explore number.

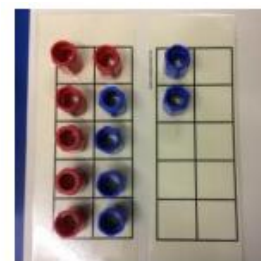
$$8 + 1 = 9$$



Number Bonds: Children will learn number bonds to 10 and 20, and demonstrate the related facts. Addition and subtraction are taught alongside each other as pupils need to see the relationship between the facts.



Bridging 10; Children use ten frames, Numicon and number lines to practice adding numbers. Children start with a larger number and add a smaller number seeing what makes ten.



Make 9 in one and 3 in the other. Take one from the 3 to make the 9 into a ten.... $10 + 2 = 12$

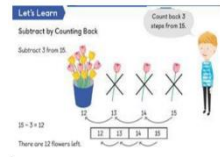


Written Subtraction in Year 1

Method:

Children will use objects or counters to support their subtraction. They will count out the appropriate amount of counters, and separate or take away counters. They will then count how many there are remaining. They will begin to record their work in number sentences.

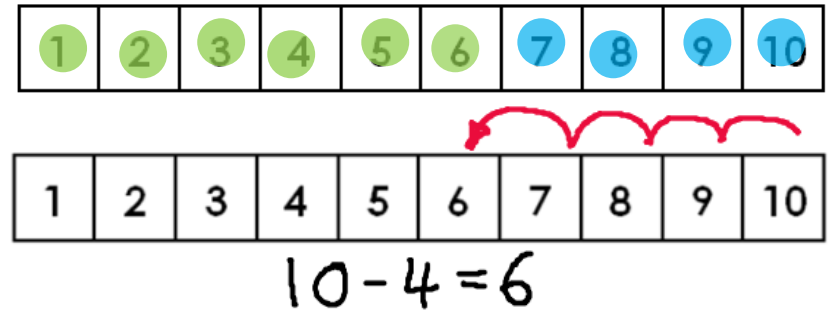
$$8 - 3 = 5$$



They will represent number sentences using counters and will count back while taking away objects. They will organise their counters in a line.

Leading to:

Once the children are familiar with taking away objects and finding how many are left they will then move onto using a number line with and without counters to support their subtraction. They will continue to record their work using number sentences.



First Steps:

Children will begin learning written methods of subtraction by counting back from a given number. They will practice thinking of the first number and continue counting back in ones. They will also learn the part-whole relationship and that subtraction happens when you take a part away from a whole.



Next Steps:

When children are ready to be subtracting larger numbers, they will first learn to partition numbers into tens and ones using dienes and place value mats. Once they understand numbers can be partitioned into tens and ones, they will use that knowledge to subtract on a Hundred Square.

1	2	3	4	5	6	7	8	9	10
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71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

$$55 - 12 = 43$$

	Subtracting 1s			
	33	34	35	36
Subtracting 10s	43	44	45	46
	53	54	55	56

A Deeper Look:

Children will subtract using the part- part whole model including problem solving with missing digits. $___ - 5 = 2$



When subtracting using Dienes, children are taught to regroup (rename) a ten rod for 10 ones and then subtract from those ones



$$20 - 4 = 16$$

Children will subtract a single digit number from a single digit number and a single digit from a two digit by crossing out pictures.

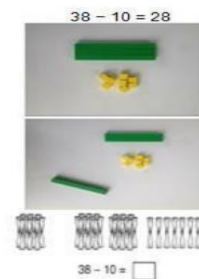
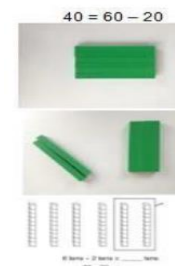
Subtract by Crossing Out



$$7 - 2 = 5$$

5 ladybirds are left.

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 1) being taken away.





Written Multiplication in Year 1

Method:

Children will begin to understand multiplication as 'lots of' or 'groups of'. They will use objects, such as counters and Numicon, to repeatedly add groups of the same size. They will also discuss group size.

6 groups of 5 = 30

2 4 6 8

4 groups of 2 = 8

$4 \times 2 = 8$

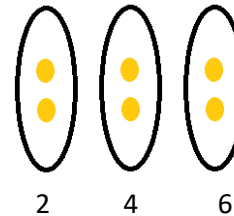


$2 \times 4 = 8$

Leading to:

Children will use an array to support their calculation by repeatedly adding groups of the same size. Children will begin to use their knowledge of the 2, 5 and 10 times tables to count the groups.

3 groups of 2 = 6



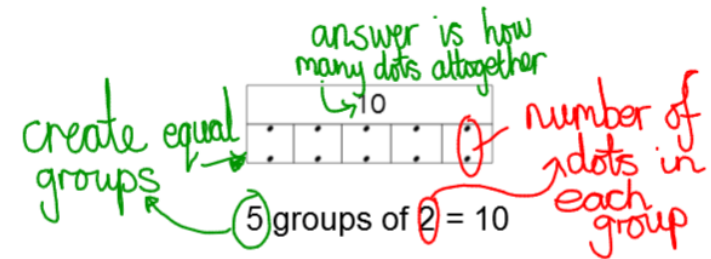
First Steps:

Children will begin learning pictorial methods of multiplication by counting on more than once from a given number. They will practise thinking of one number, count on in ones more than once and say the final answer.



Next Steps:

Once children are confident with using an array they will begin to use a bar model to represent their array. Children will explore the relationship between the whole and the parts.

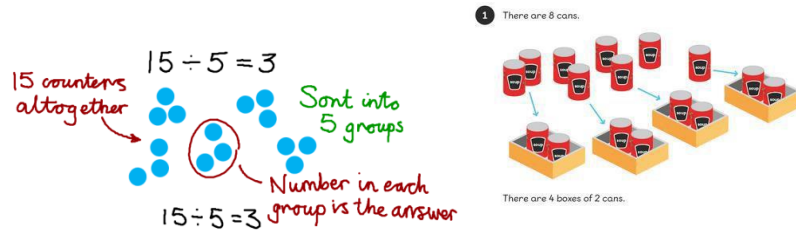




Written Division in Year 1

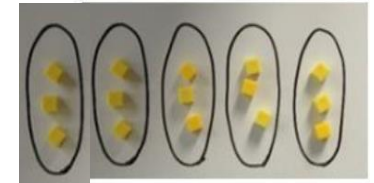
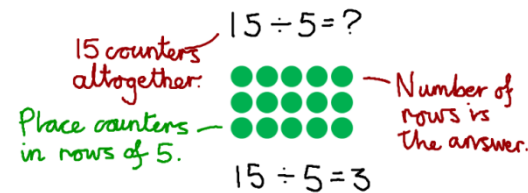
Method:

Sharing is shown below the whole to familiarize children with the concept of a whole. They will begin to explore division using grouping and sharing equally. They will start by sharing counters equally and counting the number of objects in each group. They will begin to record their work using number sentences.



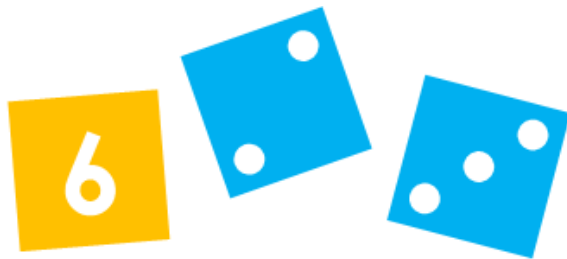
Leading to:

Children continue with grouping and sharing equally, but will now begin to organise objects in rows and columns, and bars. They will use arrays to represent division and will place counters in rows of a specific length and count the number of rows to find their answer.



First Steps:

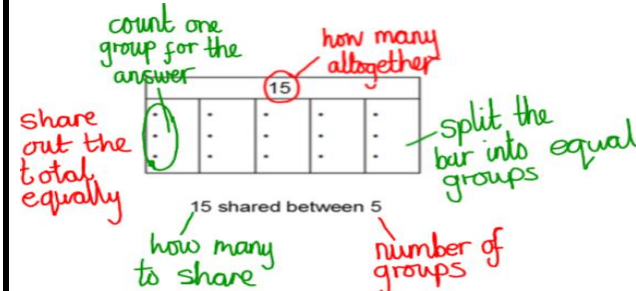
Children will begin learning pictorial methods of division through working practically by sharing objects among a group and grouping.



Next Steps:

When children have a good understanding of division, they will use the bar model to support them when sharing. Children will create groups and share the total amount by drawing dots. This will help children understand the relationship of the whole and parts.

15 shared between 5 = 3





Mental Multiplication and Division in Year 1 and 2

Children should be able to recall:

Year 1

- Doubles of all numbers to 10, e.g. double 6
- Odd and even numbers to 20

Year 2

- Doubles of all numbers to 20 and corresponding halves
- Doubles of multiples of 10 to 50 and corresponding halves

- Multiplication facts for the 2, 3, 5 and 10 times tables, and corresponding division facts
- Odd and even numbers to 100

Working mentally, children should be able to:

Year 1

- Count on from and back to zero in ones, twos, fives or tens

Year 2

- Double any multiple of 5 up to 50, e.g. double 35
- Halve any multiple of 10 up to 100, e.g. halve 90

- Find half of even numbers to 40
- Find the total number of objects when they are organised into groups of, 2, 3, 5 or 10.

Children should know when to:

Year 1

- Use patterns of last digit, e.g. 0 and 5 when counting in 5's.

Year 2

- Partition double the tens and ones separately, then recombine
- Use knowledge that halving is the inverse of doubling and that doubling is equivalent to multiplying by two.

- Use knowledge of multiplication facts from the 2, 3, 5 and 10 times table, e.g. recognise that there are 15 objects altogether because there are three groups of five.



Mental Addition and Subtraction in Year 1

Children should be able to recall:

- Number pairs with a total of 10, e.g. 3 + 7, or what to add to a single digit number to make 10.

- Addition facts for totals to at least 5, e.g. 2 + 3, 4 + 3

- Addition doubles for all numbers to at least 10, e.g. 8 + 8

Working mentally, children should be able to:

- Add and subtract a pair of single digit numbers, e.g. 4 + 5, 8 - 3

- Add or subtract a single digit number to or from a teens number, e.g. 13 + 5, 17 + 3
- Add or subtract a single digit to or from 10, and add a multiple of 10, and add a multiple of 10 to a single digit number, e.g. 10 + 7, 7 + 30

- Add near doubles, e.g. 6 + 7

Children should know when to:

- Reorder numbers when adding, e.g. putting the largest number first
- Count on or back in ones, twos or tens

- Partition small numbers, e.g. $8 + 3 = 8 + 2 + 1$
- Partition and combine tens and ones

- Partition: Double and adjust, e.g. $5 + 6 = 5 + 5 + 1$

Year 1 Problems

- Ebony has 5p and Daniel has 8p. How much do they have altogether?
- A lolly costs 6p. Amrit paid with a 10p coin. How much change does he get?
- Michael says that $16 + 5 = 21$. Is he correct?
- I think of a number. I subtract 5. The answer is 4. What was my number?
- I have 6 pairs of gloves. How many gloves are there altogether?
- Twelve people are split into two groups. How many are in each group?
- Mrs Morton puts five 5p coins into her purse. How much is in her purse altogether?



How we teach it.

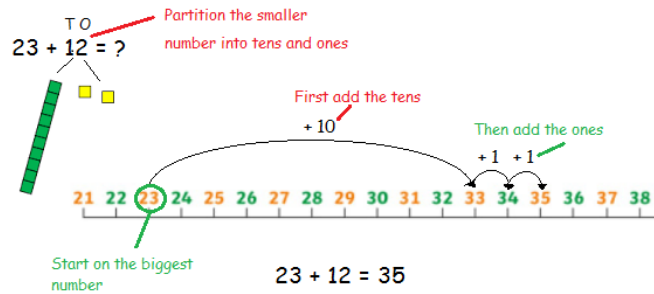
Written and mental calculation in Year 2.



Written Addition in Year 2

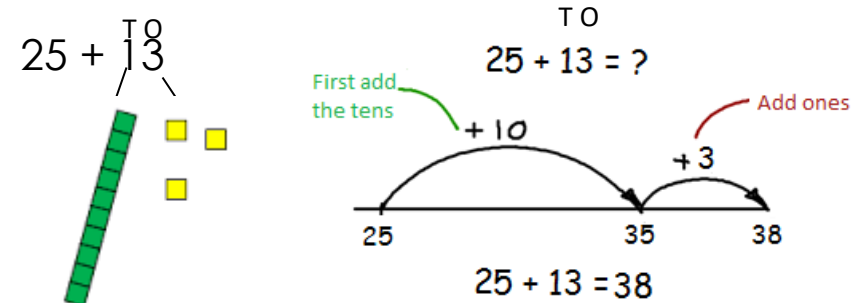
Bridging strategy:

In Year 2, children will continue to develop their understanding of place value and partitioning numbers in to tens and ones. Children will begin to add on number line showing their jumps of tens and ones.



Method:

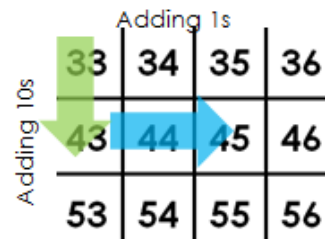
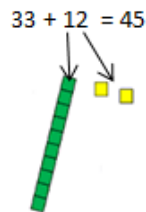
Children begin to use 'blank number lines' where they draw a line starting with the larger number and counting on the number they are adding. First counting on in jumps of tens and then ones. Children will use dienes to support their understanding.



Strategies to support:

Children will add in tens and ones, moving vertically or horizontally on the number square.

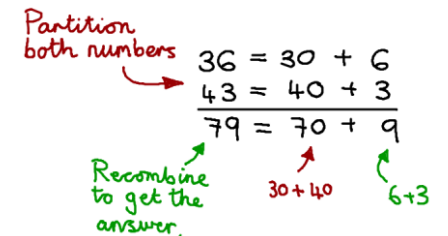
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Leading to:

Children begin to use the expanded method to add two 2-digit numbers. Children to use place value mats and dienes to represent the expanded method. Children do not move onto written methods until they understand addition using manipulatives.

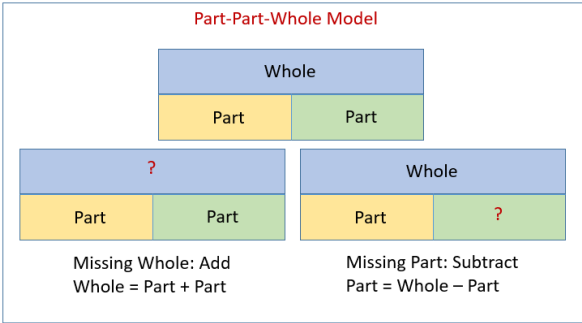
100s	10s	1s
	///	■ ■ ■
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A Deeper Look:

Children use the bar and the whole- part relationship to find missing digits. The bar model is a visual representation of the calculation to find out which part of the whole is missing. The children will then use known methods to work out the answer.

Helen has 14 breadsticks. Her friend has 17. How many do they have altogether?

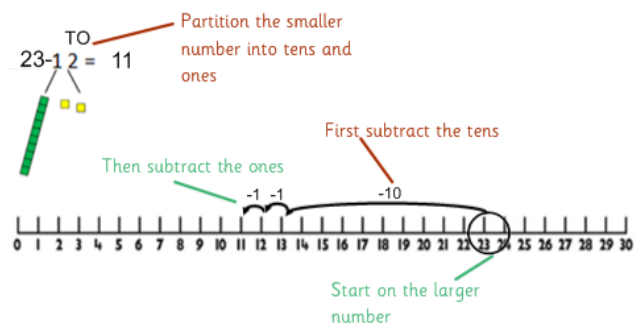


?	
14	17

Written Subtraction in Year 2

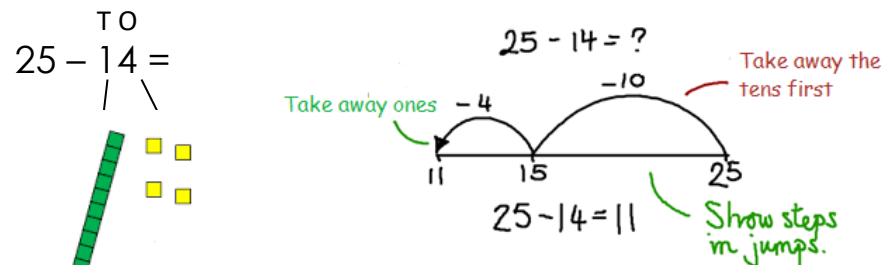
Bridging Strategy:

In Year 2, children will continue to develop their understanding of place value and partitioning numbers in to tens and ones. Children will begin to subtract on number line showing their jumps of tens and ones.



Method:

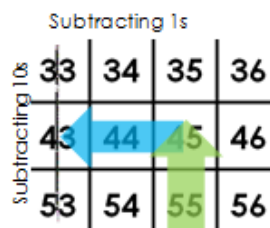
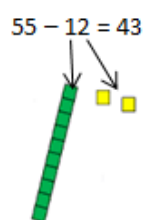
Children will begin to use 'blank number lines' where they draw a line starting with the larger number and counting back from the number they are subtracting. First counting back in jumps of tens and then ones. Children will use dienes to support their understanding.



Strategies to support:

Children will subtract in tens and ones, moving vertically or horizontally on the number square.

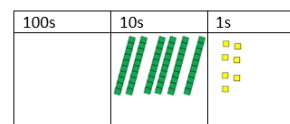
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71	72	73	74	75	76	77	78	79	80
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91	92	93	94	95	96	97	98	99	100



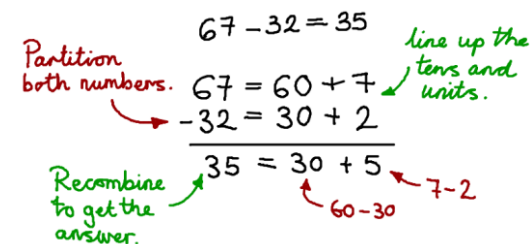
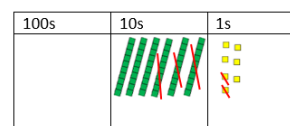
Leading to:

Children begin to use the expanded method to subtract two 2 digit numbers. Children to use place value mats and dienes to represent the expanded method. Only if children are ready they should move onto the written representation.

Step 1



Step 2



A Deeper Look:

Bar Model:

It is important for children to use a bar to aid with problem solving. Children recognise and use the part-whole relationship to understand that subtraction is the inverse of addition. Children use the bar model to solve missing number problems.

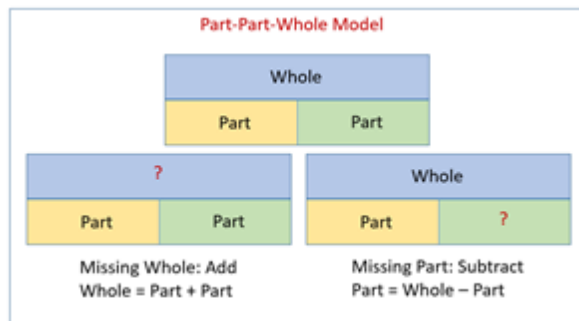
$23 + 53 = 76$ becomes $76 - 23 =$

?	
23	53

76	
23	?

Use this to check
calculations and solve missing
number problems.

The bar model is a visual representation of the calculation to find out which part of the whole is missing. The children will then use known methods to work out the answer.

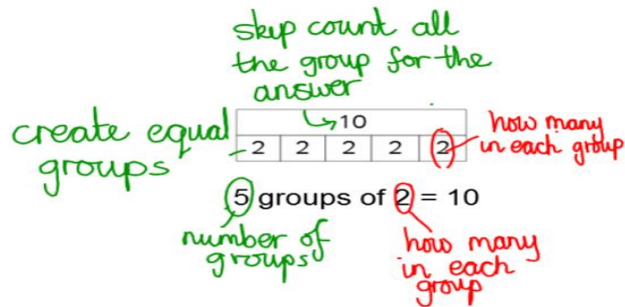




Written Multiplication in Year 2

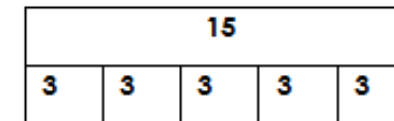
Method:

When children are secure in their understanding of multiplication using arrays, the children will move onto numerical bar model representations.



Leading to:

Children should continue to use the bar model as a visual representation for solving multiplication problems. Now that the children are more confident, they children should use the language number of groups, size of groups and product. Children to continue to develop their recall of the 2, 3, 5 and 10 times tables.

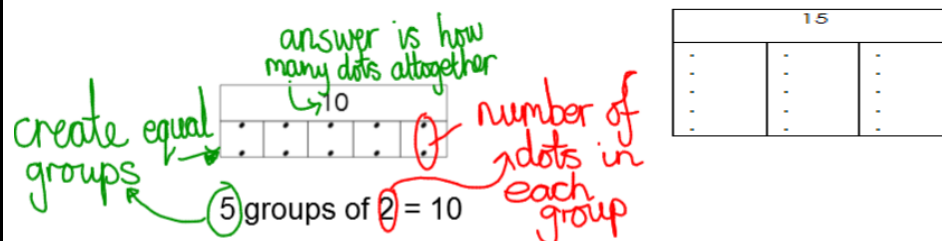


$$5 \times 3 = 15$$

$$5 \text{ multiplied by } 3 = 15$$

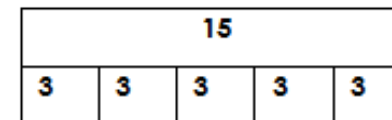
First Steps:

The children will use a bar model to represent their array. Children will explore the relationship between the whole and the parts.



Next Steps:

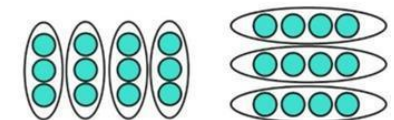
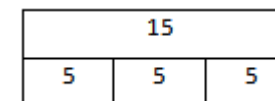
When children are secure in their understanding of the numerical bar model representation. They will begin to understand that the order of multiplication does not matter and the relationship between multiplication and division. Children gain an understanding that multiplication is commutative.



$$3 \times 5 = 15$$

or

$$5 \times 3 = 15$$



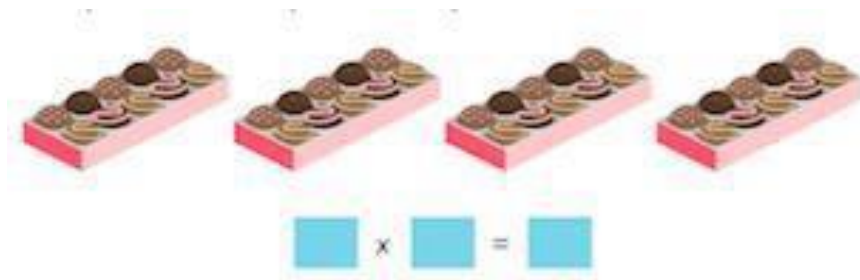
$$12 = 3 \times 4$$

$$12 = 4 \times 3$$

A Deeper Look:

Children will use multiplication (x) and equal (=) sign when writing out times tables. They will be taught that multiplication results in a product that we get by multiplying the numbers of groups by the size of group.

Ex) 10 (size of group) X 4 (number of groups) = product



Children solve multiplication problems in context using arrays and a bar model.



$$3 \times 5 = \square$$
$$5 \times 3 = \square$$

Beth has 6 packets of biscuits with 10 biscuits in them each. How many does she have altogether?

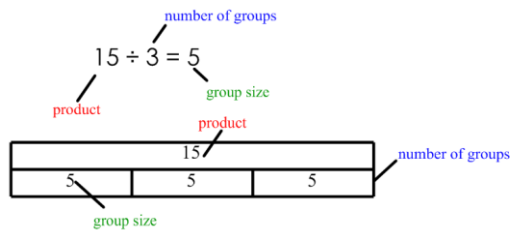
?					
10	10	10	10	10	10



Written Division in Year 2

Method:

Children will begin to use the language of product, number of groups and group size. When they know the product and the number of groups, they will show this in bar model. They use their multiplication facts to determine the size of each group.



To work out the group size, children will use their multiplication facts. Children will understand that multiplication is the inverse of division.

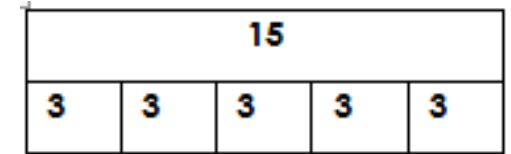
$$3 \times \underline{\quad} = 15$$



Leading to:

Children will continue to use the language of product, number of groups and group size. They will begin to explore the relationship between multiplication and division, and use this knowledge to help them solve division problems.

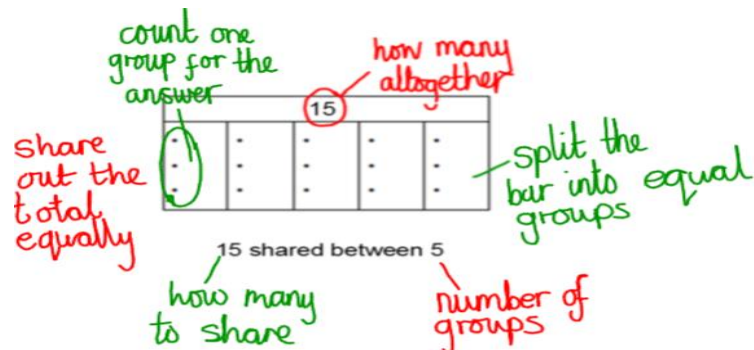
If $5 \times 3 = 15$
Then $15 \div 5$ must be 3



First Steps:

Children will continue with grouping and sharing equally in a bar model.

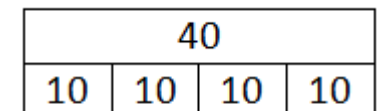
$$15 \div 5 = 3 \quad 15 \text{ shared between } 5$$



Next Steps:

Children will continue to consolidate their knowledge of division using real problems and fractions.

Sam has 40 chocolates that she is sharing between 4 friends. How many do they each get?



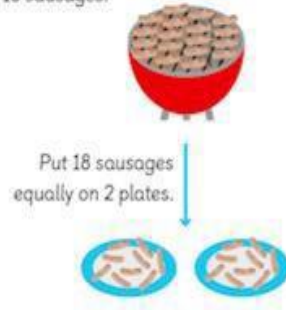
What fraction do they each get of the 40 chocolates?

$$\frac{1}{4} \text{ of } 40 = 10$$

A Deeper Look:

Children learn to solve division problems in context. They will begin to understand that division happens when a product is divided into groups. When solving problems, children use the information given in the question (product, number of groups or group size) to determine which operation to use (multiplication or division).

There are 18 sausages.



$$2 \times 9 = 18$$



In this question, Product= 18

Number of groups= 2

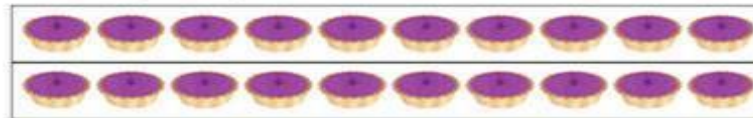
To solve this question, you must do 18 divided by 2

There are 9 sausages on each plate.

$$18 \div 2 = 9$$

Multiplication and division are taught alongside as a whole part relationship (product, number of groups or group size).

Make a family of multiplication and division facts.



$$2 \times 10 = 20 \quad \text{---} \quad 20 \div 10 = \square$$

$$10 \times 2 = 20 \quad \text{---} \quad 20 \div 2 = \square$$



Mental Addition and Subtraction in Year 2

Children should be able to recall:

- Addition and subtraction facts for all numbers up to at least 10, e.g. $3 + 4$, $8 - 5$
- Number pairs with totals to 20

- All pairs of multiples of 10 with totals up to 100, e.g. $30 + 70$
- What must be added to any two – digit number to make the next multiple of 10.

- Addition doubles for all numbers to 20, e.g. $17 + 17$ and multiples of 10 to 50, e.g. $40 + 40$

Working mentally, children should be able to:

- Add and subtract a pair of single-digit numbers, including crossing 10, e.g. $5 + 8$, $12 - 7$
- Add any single digit number to or from a multiple of 10, e.g. $60 + 5$

- Subtract any single digit number from a multiple of 10, e.g. $80 - 7$
- Add and subtract a single digit number to or from a two digit number, including crossing the tens boundary, e.g. $23 + 5$, $57 + 3$, then $28 + 5$, $52 - 7$.

- Add or subtract a multiple of 10 to or from any two digit number, e.g. $27 + 60$, $72 - 50$
- Add 9, 19, 29, ... or 11. 21. 31, ...
- Add near doubles, e.g. $13 + 14$, $39 + 40$

Children should know when to:

- Reorder numbers when adding
- Partition: bridge through 10 and multiples of 10 when adding and subtracting

- Partition and combine multiples of tens and ones
- Use knowledge of pairs making 10
- Partition: Count on in tens and ones to find the difference

- Partition: add a multiple of 10 and adjust by 1
- Partition: double and adjust



Mental Multiplication and Division in Year 2

Children should be able to recall:

- Doubles of all numbers to 10, e.g. double 6
- Odd and even numbers to 20

- Doubles of all numbers to 20 and corresponding halves
- Doubles of multiples of 10 to 50 and corresponding halves

- Multiplication facts for the 2, 5 and 10 times tables, and corresponding division facts
- Odd and even numbers to 100

Working mentally, children should be able to:

- Count on from and back to zero in ones, twos, fives or tens

- Double any multiple of 5 up to 50, e.g. double 35
- Halve any multiple of 10 up to 100, e.g. halve 90

- Find half of even numbers to 40
- Find the total number of objects when they are organised into groups of, 2, 5 or 10.

Children should know when to:

- Use patterns of last digit, e.g. 0 and 5 when counting in 5's.

- Partition double the tens and ones separately, then recombine
- Use knowledge that halving is the inverse of doubling and that doubling is equivalent to multiplying by two.

- Use knowledge of multiplication facts from the 2, 5 and 10 times table, e.g. recognise that there are 15 objects altogether because there are three groups of five.

Year 2 Problems

- Dylan has 37 coloured pencils and he buys 30 more. How many does he have now?
- Janie has 40 beads. She loses 25 of them. How many does she have left?
- What is the difference between seventy six and thirty five?
- I think of a number. I subtract 5. The answer is 4. What was my number?
- Last week Ellie got £1.00 pocket money. She spent half of it. How much has she got left?
- A tub contains 24 coins. Saj takes 5 coins. Joss takes 10 coins. How many coins are left in the tub?
- Amelia writes the calculation below as a multiplication calculation? What might she write?
 $3 + 3 + 3 + 3 + 3 = 15$
- Mr Siddique shares £18 equally between his three sons. How much does each son get?
- Charlotte-May had to find a 14 of a number. Her answer was 4. What number did she start with?
- Danny cuts his pizza into 8 equal slices. He eats $\frac{3}{4}$ of the pizza and gives the rest to his dog, Gruff. How many pieces does Danny eat?



How we teach it.

Written and mental calculation in Year 3.



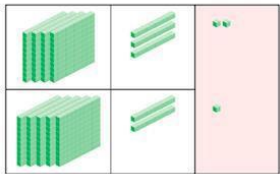
Written Addition in Year 3

Method:

Column addition with dienes and mats alongside the expanded method.

In Year 3, the children add two and three digit numbers. The Children use dienes to support their understanding of place value. Children start adding without regrouping and gradually moving towards regrouping questions. Dienes are used alongside the expanded method.

Step 1 Add the ones.
2 ones + 1 one = 3 ones



Partition both numbers

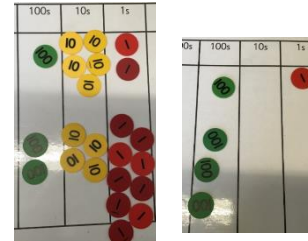
$$\begin{array}{r} 36 = 30 + 6 \\ 43 = 40 + 3 \\ \hline 79 = 70 + 9 \end{array}$$

Recombine to get the answer.

30 + 40 6 + 3

Leading to:

The Expanded Method of Addition.

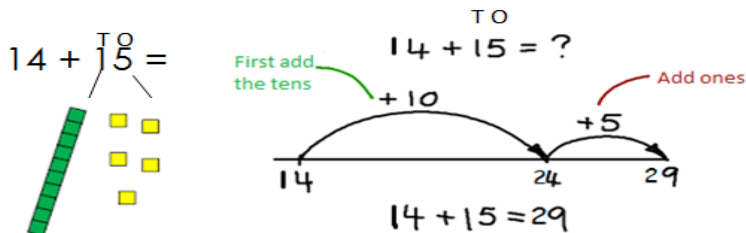


$$\begin{array}{r} 100 \quad 10 \\ 152 = 100 + 50 + 2 \\ 249 = 200 + 40 + 9 \\ \hline 400 + 0 + 1 \end{array}$$

An emphasis will be placed on carrying tens to the next column using dienes or place value counters so that children gain an understanding of the concept.

Strategy to support:

Children will use 'blank number lines' to add numbers. First counting on in jumps of tens and then ones. Children will use dienes to support their understanding.



Next Steps:

The children add **3 digit numbers** using the column method. They begin to use place value counters and mats for support.

$$\begin{array}{r} 123 = 100 + 20 + 3 \\ + 45 = \quad 40 + 5 \\ \hline 168 = 100 + 60 + 8 \end{array}$$

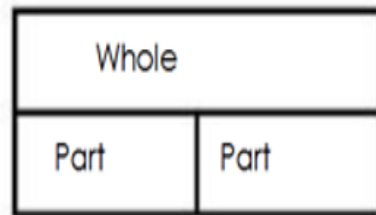
Is the same as: + 45

$$\begin{array}{r} 123 \\ + 45 \\ \hline 168 \end{array}$$

A Deeper Look:

Bar modelling:

It is important for children to use a bar to aid in problem solving. When reading questions, children look for the part- whole relationship to determine if they need to add or subtract.



Children understand that addition and subtraction are a whole part relationship. They look for wholes and parts in the question and use the information they have to determine what operation to use.

Ex) $\text{Whole} - \text{Part} = \text{Part}$

$\text{Part} + \text{Part} = \text{Whole}$

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?





Mental Addition in Year 3

Children should be able to recall:

- Addition facts for all numbers to 20 drawing on knowledge of inverse relationship.
E.g. $9 + 8$, $13 + 6$

- Sums of multiples of 10.
E.g. $50 + 80$
- Pairs of two-digit numbers with a total of 100.
E.g. $32 + 68$

- Addition doubles for multiples of 10 to 100.
E.g. $90 + 90$

Working mentally, children should be able to:

- Add and subtract groups of small numbers.
E.g. $6 + 3 - 2$

- Add two-digit numbers.
E.g. $34 + 65$
- Add a two-digit number from a multiple of 10.
E.g. $50 + 38$

- Add near doubles.
E.g. $16 + 18 = 16 + 16 + 2$

Children should know when to:

- Reorder numbers when adding.
- Identify pairs totalling 10 or multiples of 10.

- Partition: Add tens and ones separately then recombine.
- Partition: Count on in tens and ones to find the total.
- Partition: Add 10 or 20 and adjust.

- Partition: Double and adjust when adding near doubles.
- Count on in minutes and hours bridging through 60.



Written Subtraction in Year 3

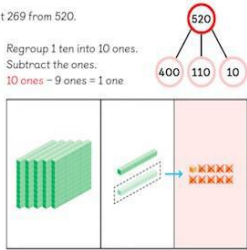
Method:

Column subtraction with dienes or place value counters and mats, alongside the Expanded Method of Subtraction.

Children will subtract up to 3 digits, from a 3 digit number. The children use dienes along with place value charts to support their learning. When secure with the method, exchanging is introduced. The children then partition numbers and use the expanded method.

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	2	0
-	2	6
		9
		1

$$67 - 32 = 35$$

Partition both numbers. $67 = 60 + 7$ *line up the tens and units.*

$$- 32 = 30 + 2$$

$$35 = 30 + 5$$

Recombine to get the answer. $60 - 30 = 30$ $7 - 2 = 5$

Leading to:

The Expanded Method of Subtraction with exchanging.

Children partitioning both numbers and use the expanded method of subtraction. This is supported with dienes or place value counters and place value mats.

$$62 = 50 + 12$$

$$62 = \cancel{60} + \cancel{2}$$

We exchange 1 ten for 10 units.

$$- 35 = 30 + 5$$

$$27 = 20 + 7$$

Write these numbers above.

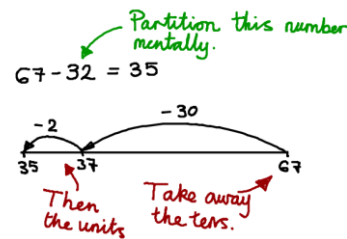


Strategies to support:

Counting back using a number line.

Children subtract using a number line and partitioning.

Note: Counting back is not always the most efficient method when the numbers are closer together.



Next Steps:

The Expanded method is taught alongside column subtraction.

Exchange with the next digit.

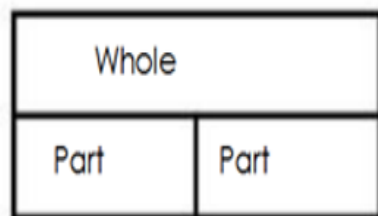
$$\begin{array}{r} 512 \\ - 245 \\ \hline 117 \end{array}$$

$50 - 40 = 10$ $12 - 5 = 7$

A Deeper Look:

Bar modelling:

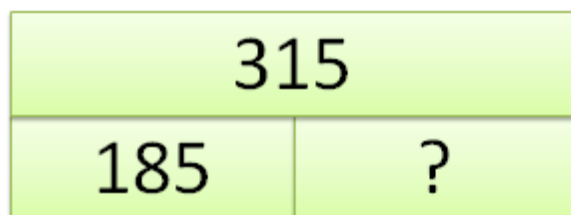
It is important for children to use a bar to aid with problem solving. When reading questions, children look for the part- whole relationship to determine if they need to add or subtract. Children use the bar model to solve missing number problems.



Children understand that addition and subtraction are a whole- part relationship. They look for wholes and parts in the question and use the information they have to determine what operation to use.

Ex) $\text{Whole} - \text{Part} = \text{Part}$

$\text{Part} + \text{Part} = \text{Whole}$



$$315 - 185 = ?$$

$$185 + ? = 315$$



Mental Subtraction in Year 3

Children should be able to recall:

- Subtraction facts for all numbers to 20 drawing on knowledge of inverse relationship.
E.g. $17 - 9$

- Differences of multiples of 10.
E.g. $120 - 90$

- Pairs of two-digit numbers with a total of 100.
E.g. $32 + n = 100$

Working mentally, children should be able to:

- Add and subtract groups of small numbers.
E.g. $5 - 3 + 2$

- Subtract a two-digit number from a multiple of 10.
E.g. $90 - 27$

- Subtract two-digit numbers.
E.g. $68 - 35$

Children should know when to:

- Partition: Count back in tens and ones to find the difference.

- Partition: Subtract 10 or 20 and adjust.

- Count back in minutes and hours bridging through 60.



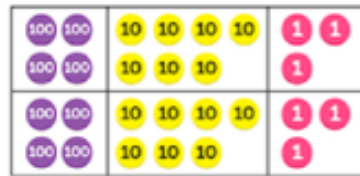
Written Multiplication in Year 3

Method:

Partitioning

Children should be supported using real life examples and manipulatives (dienes, place value counters, place value mats).

$$\begin{array}{r} 473 \times 2 = \\ 400 \times 2 = 800 \\ 70 \times 2 = 140 \\ 3 \times 2 = 6 \\ \hline 946 \end{array}$$

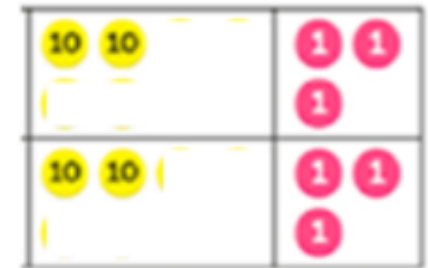


Leading to:

Grid Method and Partitioning with Place Value counters

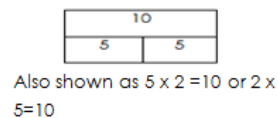
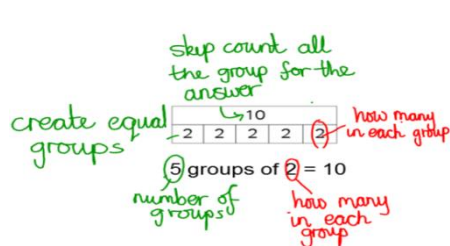
The Grid method resembles column multiplication. Children use place value counters and real life to support their learning.

$$\begin{array}{r|l} \times & 2 \\ \hline 20 & 40 \\ 3 & 6 \\ \hline & 46 \end{array}$$



Strategies to support:

Children will use a bar model to support their calculations. This will allow them to understand that the order of multiplication does not matter and the relationship between multiplication and division.



$$\begin{array}{r|l} \times & 4 \\ \hline 100 & 400 \\ 20 & 80 \\ 3 & 12 \\ \hline & 492 \end{array}$$

Next Steps:

Grid Method with 3 digit numbers

The Grid method should be set up to resemble column multiplication. Children will discuss their calculations using appropriate vocabulary.

A Deeper Look:

Bar modelling:

In Year 3, children use a bar to solve multiplication problems.

Product	
Group Size	Number of Groups

Children look for the information given (Product, Number of Groups and Size of Groups Model). They use the information provided to determine what operation to use.

Ex)

Product divided by Group Size = Number of Groups

Group Size X Number of Groups = Product

4 children go to the cinema.
They each pay £15. How much
do they spend altogether?

Whole unknown

?			
15	15	15	15



Mental Multiplication in Year 3

Children should be able to recall:

- Multiplication facts for the 2, 5 and 10 times table

- Multiplication facts for the 3, 4 and 6 times tables

- Doubles of multiples of 10 to 100.
E.g. Double 90

Working mentally, children should be able to:

- Double any multiple of 5 up to 100.

- Multiply one-digit or two-digit numbers by 10
E.g. 7×10 , 46×10

- Multiply one-digit or two-digit numbers by 100
E.g. 7×100 46×100

Children should know when to:

- Partition: when doubling, double the tens and units separately then recombine.

- Use knowledge that halving and doubling are inverse operations.

- Recognise that when multiplying by 10 or 100 the digits move one or two places to the left and zero can be used as a place holder.

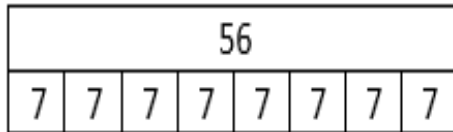


Written Division in Year 3

Method:

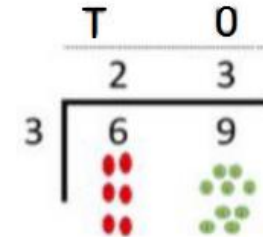
The Bar Model

Children will use a bar model to divide with and without remainders.



Leading to:

Dividing using short division. This is supported using place value counters.



Remind children of correct place value, that 69 is equal to 60 and 9 but in short division, pose:

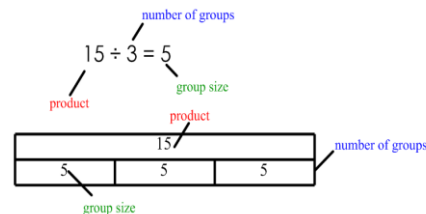
How many 3s in 6? 2, and record it above the 6 tens

How many 3s in 9? 3 and record it above the 9 ones

Strategies to support:

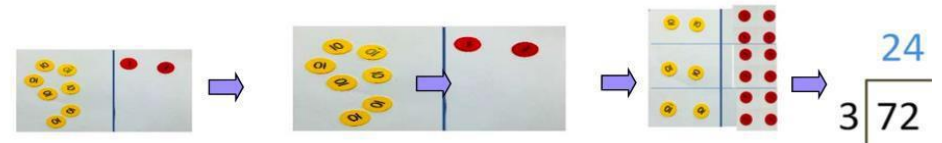
Children will use the language of product, number of groups and group size. They will use a numerical bar model when they know the product and the number of groups.

To work out the group size children will use their multiplication facts.



Next Steps:

Once the children demonstrate a full understanding of remainders, and short division, they can be taught how to use the method when remainders occur within the calculation (e.g. $72 \div 3$), and be taught to 'carry' the remainder onto the next digit.



A Deeper Look:

Bar modelling:

In Year 3, children use a bar to solve division problems.

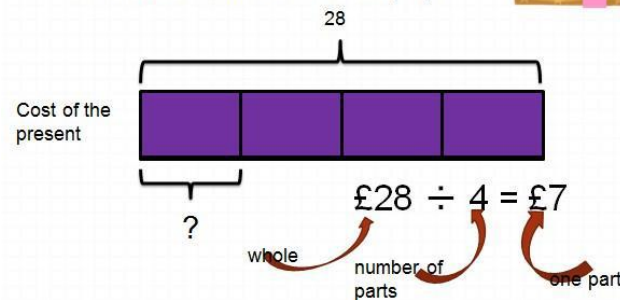
Product	
Group Size	Number of Groups

4 children go to the cinema.
They each pay £15. How much
do they spend altogether?

Whole unknown

?			
15	15	15	15

Four children bought a present for
£28. They shared the costs equally.
How much did each child pay?





Mental Division in Year 3

Children should be able to recall:

- Corresponding division facts for the 2, 5 and 10 times tables.
- Corresponding division facts for the 3, 4 and 6 times tables.
- Halves of multiples of 10 and 100.
E.g. Half of 90

Working mentally, children should be able to:

- Halve any multiple of 10 up to 200.
E.g. Halve 170
- Find unit fractions of numbers and quantities involving halves, thirds, quarters, fifths and tenths,

Children should know when to:

- Partition: when halving, halve the tens and units separately, then recombine.
- Use knowledge that halving and doubling are inverse operations.
- Recognise that finding a unit fraction is equivalent to dividing by the denominator and use of division facts.

Year 3 Problems

- 1. There are 334 children at Springfield School and 75 at Holy Trinity Nursery. How many children are there altogether?
- 2. Gemma collected 293 badges but she gave 45 of them to her friend, Rebecca. How many badges did she have left?
- 3. Aiden has seven marbles and Harvey has fifteen. They decide to share them equally between them. How many do they get each?
- 4. Seven people each put five pens into a pot. Carmen then takes out fifteen pens. How many pens are left?
- 5. If you spend 61p at the corner shop, how much change do you get from £1.00?
- 6. If five apples cost fifty pence, how much would two apples cost?
- 7. Emma buys seven markers for 30p each. How much change does she get from £3.00?
- 8. A bookcase in the library holds 5 shelves with 46 books on each shelf. How many books are there in the bookcase altogether?
- 9. How many 5p stickers can Alexis buy with his 55p pocket money?
- 10. Which is the larger amount, one third of £60 or one quarter of £88?
- 11. A computer game is £24 in the sale. This is one quarter of its original price. How much did it cost before the sale?



How we teach it.

Written and mental calculations in Year 4.

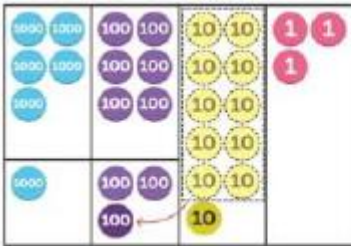


Written Addition in Year 4

Method:

Column Addition

In Year 4, Column Addition is taught referencing place value counters and mats. Children are encouraged to see how the two relate and why carrying takes place.



$$\begin{array}{r} 5678 \\ + 1235 \\ \hline 13 \end{array}$$

Column Addition with carrying

Leading to:

Column Addition

Children will be expected to become familiar with using formal methods of addition with and without carrying. This is supported with place value counters.

500 + 400 + 100 = 1000.
Carry the 1000 into the thousands column.

As 80 + 70 + 10 = 160, carry the 100 into the hundreds column.

As 7 + 5 = 12, carry the ten into the next column.

line up the H, T & U

Start adding at the units!

$$\begin{array}{r} \text{Th H T U} \\ 587 \\ + 475 \\ \hline 1062 \end{array}$$

Strategies for Support:

Column Addition will be taught referencing the Expanded Method. This understanding is supported with place value counters.

$$\begin{array}{r} 123 = 100 + 20 + 3 \\ + 45 = \quad \quad 40 + 5 \\ \hline 168 = 100 + 60 + 8 \end{array}$$

Is the same as: +

$$\begin{array}{r} 123 \\ + 45 \\ \hline 168 \end{array}$$

Next Steps:

Children will begin to add more than one number using column methods of addition. This understanding is supported with place value counters.

Ensure that the digits are lined up correctly.

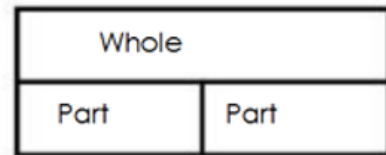
Carry below the line.

$$\begin{array}{r} \text{Th H T U} \\ 5678 \\ \quad 468 \\ + \quad 72 \\ \hline 6218 \\ \hline 121 \end{array}$$

A Deeper Look:

Bar Model Strategy to support:

Children will use a bar model to find missing digits. It is important for them to use the bar model in this way to encourage the use of it when problem solving.

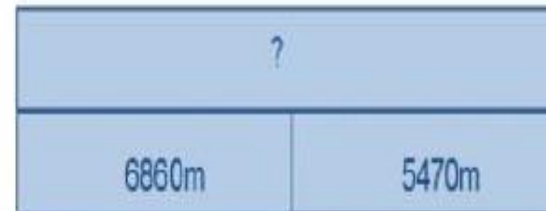


Alison jogs 6,860 metres and Calvin jogs 5,470 metres. How far do they jog altogether?

Children understand that addition and subtraction are a whole part relationship. They look for wholes and parts in the question and use the information they have to determine what operation to use.

Ex) $\text{Whole} - \text{Part} = \text{Part}$

$\text{Part} + \text{Part} = \text{Whole}$





Mental Addition in Year 4

Children should be able to recall:

- Sums of pairs of multiples of 10, 100 or 1000.
- Pairs of fractions that total one.

- Addition doubles of numbers 1 to 100.
E.g. $38 + 38$

- What must be added to any three digit number to make the next multiple of 100.
E.g. $521 + n = 600$

Working mentally, children should be able to:

- Add any pair of two-digit numbers including crossing the 10 and 100 boundary.
E.g. $47 + 58$

- Add a near multiple of 10.
E.g. $56 + 29 = 56 + 30 - 1$
- Add near doubles of two-digit numbers.
E.g. $38 + 37$

- Add two-digit or three-digit multiples of 10
E.g. $120 + 140$

Children should know when to:

- Count on in hundreds tens or ones.
- Partition: add tens and units separately then recombine.

- Partition: Add a multiple of 10 and adjust.
E.g. $56 + 29 = 56 + 30 - 1$
- Partition: Double and adjust.
E.g. $38 + 37 = 38 + 38 - 1$

- Use knowledge of place value and related calculations.
E.g. Work out $140 + 150$ using $14 + 15 = 29$
- Partition: Count on in minutes and house, bridging through 60.



Column Subtraction with Dienes

Base ten blocks representing the number 1000. The blocks are arranged in a grid. The top row has 1000 units (10 groups of 100) and 100 tens (10 groups of 10). The bottom row has 1000 units (10 groups of 100) and 100 tens (10 groups of 10). A red arrow points from the 100 tens to the 1000 units.

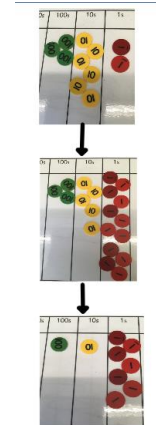
$$\begin{array}{r} 52\overset{7}{\cancel{8}}\overset{10}{\cancel{0}} \\ - 3169 \\ \hline \end{array}$$

Column Subtraction

Exchange with the next digit.

$$\begin{array}{r} 512 \\ 362 \\ -245 \\ \hline 117 \end{array}$$

50 - 40 12 - 5



Column Subtractions will be taught referencing the Expanded Method and dienes to encourage children to see how they relate.

Because you can't 'do' 2-5, exchange a ten for ten units.

$$\begin{array}{r} 362 = 300 + \cancel{50} + \cancel{12} \\ 245 = 200 + 40 + 5 \\ \hline 117 = 100 + 10 + 7 \end{array}$$

Recombine to get the answer.

Exchange with the next digit.

$$\begin{array}{r} 512 \\ 362 \\ -245 \\ \hline 117 \end{array}$$

50-40 12-5

Children will move on to using Column Subtraction on its own and with decimals(supported with place value counters where necessary). $3000 - 1000$

Exchange with the next digit.

th place

3000 - 0

4 15

~~35~~7

363

3194

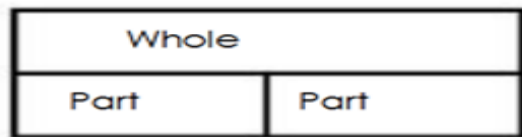
Start subtracting from the units

150 - 60 = 90

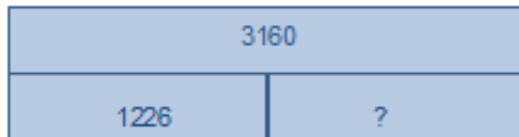
A Deeper Look:

Bar Model Strategy to support:

Using the bar to find missing digits. It is important for children to use the bar to aid with problem solving.



There are 3,160 books in a shop. 1,226 are in English and the rest are in French. How many French books are there?



Children understand that addition and subtraction are a whole part relationship. They look for wholes and parts in the question and use the information they have to determine what operation to use.

Ex) $\text{Whole} - \text{Part} = \text{Part}$

$\text{Part} + \text{Part} = \text{Whole}$

Year 4: solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.



e.g. one-step problem

Sally has 40 football cards. She gives 25 of them away. How many does she give away?



Mental Subtraction in Year 4

Children should be able to recall:

- Differences of pairs of multiples of 10, 100 or 1000.

- Halves of numbers 1 to 100.
E.g. Halve 56

- What must be added to any three digit number to make the next multiple of 100.
E.g. $521 + n = 600$

Working mentally, children should be able to:

- Subtract any pair of two-digit numbers including crossing the 10 and 100 boundary.
E.g. $91 - 35$

- Subtract a near multiple of 10.
E.g. $36 - 19 = 36 - 20 + 1$

- Subtract two-digit or three-digit multiples of 10
E.g. $370 - 180$

Children should know when to:

- Count back in hundreds tens or ones.
- Subtract by counting up from the smaller number.

- Partition: subtract tens and units.
E.g. Subtracting 27 by subtracting 20 then 7.
- Partition: Subtract a multiple of ten then adjust.

- Use knowledge of place value and related calculations.
E.g. $290 - 150$ using $29 - 15 = 14$
- Partition: Count back in minutes and hours, bridging through 60.

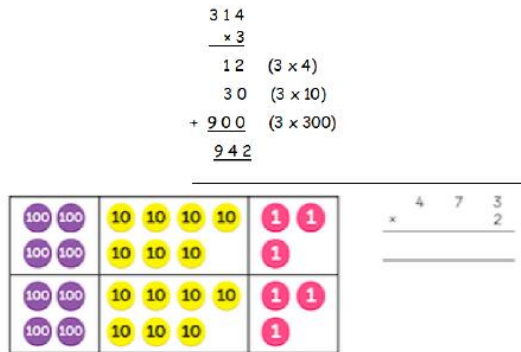


Written Multiplication in Year 4

Method:

The Ladder Method of Multiplication supported by place value counters.

The Ladder method is used when children multiplying both two and three digit numbers by a one digit number. Place value counters are used alongside to promote understanding of what is occurring.



Leading to:

The Compact Method of Multiplication.

Children use the compact method of multiplication and carry tens to the next column (supported with place value counters where necessary).

Strategies to support:

Grid Method

The Grid Method is set up vertically to resemble column multiplication as closely as possible (supported with place value counters where necessary).

Next Steps:

Children will be comfortable using compact multiplication and will be able to explain the method using appropriate vocabulary (supported with place value counters where necessary).

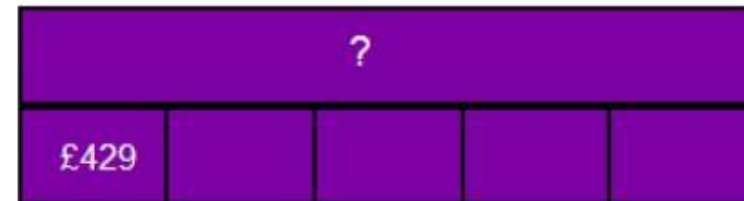
A Deeper Look:

Bar Model Strategy to support:

Multiply using a bar to support in problem solving.

A computer costs 5 times as much as a television. The television costs £429.

Cost of the computer



How much does the computer cost?

Children will solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

$$\begin{array}{l} 8 \times 59 \\ = 8 \times 60 - 8 \\ 8 \times 6 = 48 \\ 8 \times 60 = 480 \\ 480 - 8 = 472 \end{array}$$

e.g. 8 children each download 59 songs to play on their iPod. How many songs do they have altogether?



Mental Multiplication in Year 4

Children should be able to recall:

- Multiplication facts to 10×10 .
- Doubles of numbers 1 to 100.
E.g. Double 58.

- Doubles of multiples of 10 and 100.
E.g. Double 50, Double 200.

- Factor pairs for known multiplication facts.

Working mentally, children should be able to:

- Double any two-digit number.
E.g. Double 39
- Double any multiple of 10 or 100.
E.g. Double 340, Double 800.

- Multiply numbers to 1000 by 10 and then 100.
- Multiply a multiple of 10 by a single-digit number.
E.g. 40×3

- Multiply numbers to 20 by a single-digit number.
E.g. 17×3
- Give the factor pair associated with a multiplication fact.
E.g. 6 has the factor pair 2 and 3

Children should know when to:

- Partition: Double the tens and ones separately then recombine.

- Use understanding that when a number is multiplied by 10 or 100, its digits move one or two places to the left.
- Use knowledge of multiplication facts and place value.
E.g. $7 \times 8 = 56$, $70 \times 8 = 560$

- Use partitioning and the distributive law to multiply.
E.g. $13 \times 4 = (10 \times 4) + (3 \times 4)$
 $= 40 + 12$



Written Division in Year 4

Method:

Short division with the support of place value counters

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	O	
	0	2	5	r1
5	1	2	6	
				



Leading to:

Short Division

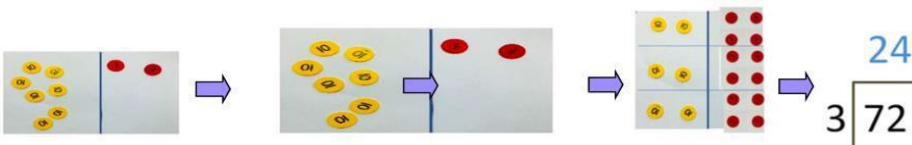
Dividing up to three digit numbers by a one digit number using short division. Only when the children are secure with dividing a two-digit number should they move onto a 3-digit number (supported with place value counters where necessary).

$$\begin{array}{r} 025 \\ 5 \overline{) 125} \\ \underline{10} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

Combine
 $1 \div 5 = 0$
 $12 \div 5 = 2 \text{ r} 2$
 $25 \div 5 = 5$
Carry the remainder

Strategy to Support: Division with partitioning and manipulatives

Children look at short division with the support of dienes and manipulatives. Children are taught how to use the method when remainders occur within the calculation (e.g. $72 \div 3$), and be taught to 'carry' the remainder onto the next digit.



Next Steps:

Children will be comfortable using short division and will be able to explain the method using appropriate vocabulary (supported with place value counters where necessary).

$$\begin{array}{r} 025 \\ 5 \overline{) 125} \\ \underline{10} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

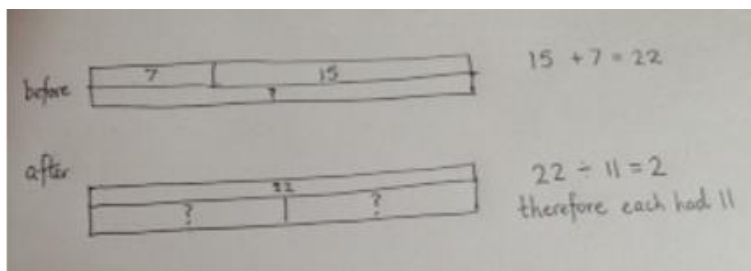
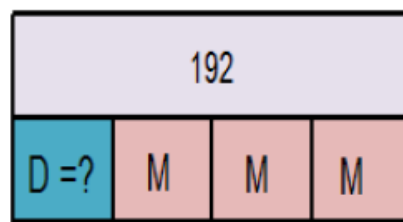
Combine
 $1 \div 5 = 0$
 $12 \div 5 = 2 \text{ r} 2$
 $25 \div 5 = 5$
Carry the remainder

A Deeper Look:

Bar Model Strategy to support:

Children solve division problems using a bar model.

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?



e.g.
Aiden has seven marbles and Harvey has fifteen.
They decide to share them equally between
them. How many do they get each?



Mental Division in Year 4

Children should be able to recall:

- Corresponding division facts of times tables up to 10 x 10.
- Halves of numbers to 100.

- Halves of multiples of 10 and 100.

- Fraction and decimal equivalents of one-half, quarters, tenths and hundredths.
E.g. $\frac{3}{10}$ is 0.3 and $\frac{3}{100}$ is 0.03

Working mentally, children should be able to:

- Halve multiples of 10 and 100.
- Halve any even number to 200.

- Find unit fractions and simple non-unit fractions of numbers and quantities.
E.g. $\frac{3}{8}$ of 24

- Divide numbers to 1000 by 10 and then 100.
E.g. $600 \div 100$, $850 \div 10$
- Identify the remainder when dividing by 2, 5 or 10.

Children should know when to:

- Partition: halve the tens and units separately then recombine.

- Use understanding that when a number is divided by 10 or 100, its digits move one or two places to the right.

- Use knowledge of multiplication facts and place value.
E.g. $56 \div 7 = 8$, $560 \div 70 = 8$

Year 4 Problems

- 1. Martin has saved £6.78 and spends £4.69. How much does he have left?
- 2. Sally has 40 football cards. She gives $\frac{2}{5}$ of them away. How many does she give away?
- 3. Sally has 30 football cards. She gives $\frac{2}{5}$ of them to her friend. How many does she have left?
- 4. 8 children each download 59 songs to play on their iPod. How many songs do they have altogether?
- 5. Calculate how many fives there are in 85?
- 6. At the dressmakers, Debbie buys buttons weighing 3 grams each. If she has 81 grams of buttons, how many buttons does she buy?
- 7. Kelly buys $\frac{4}{5}$ of the shop's oranges. If the shop had 20 oranges, how many does she have?



How we teach it.

Written and mental calculations in Year 5.



Written Addition in Year 5

Method:

Column Addition.

At the beginning of Year 5, children will continue using column addition to add 4 digit numbers and several numbers with different numbers of digits at the same time. Place value counters and mats will be used for support where necessary.

$$\begin{array}{r}
 \text{Th H T O} \\
 5678 \\
 + \quad 468 \\
 + \quad \quad 72 \\
 \hline
 6218 \\
 \hline
 121
 \end{array}$$

Ensure that the digits are lined up correctly.

Carry below the line.

Leading to:

Column Addition with decimals

By the end of Year 5, children will be comfortable using column addition to add large and small numbers and will be able to add **decimals** using column addition. Place value counters and mats will be used for support where necessary.

$$\begin{array}{r}
 \text{TO} \cdot \frac{1}{10} \\
 35.2 \\
 + 16.0 \\
 \hline
 51.2
 \end{array}$$

Carry below the line.

Add '0' as a place holder

Strategies to support:

$$\begin{array}{r}
 123 = 100 + 20 + 3 \\
 + 45 = \quad \quad 40 + 5 \\
 \hline
 168 = 100 + 60 + 8
 \end{array}$$

Is the same as:

$$\begin{array}{r}
 \text{HTO} \\
 123 \\
 + 45 \\
 \hline
 168
 \end{array}$$

Next Steps:

Children will be comfortable using column addition with numbers of all sizes and will be able to explain their method using appropriate mathematical vocabulary.

$$\begin{array}{r}
 500 + 400 + 100 = 1000. \\
 \text{Carry the 1000 into the Thousands column.} \\
 \text{Th H T O} \\
 587 \\
 + 475 \\
 \hline
 1062
 \end{array}$$

line up the H, T & U

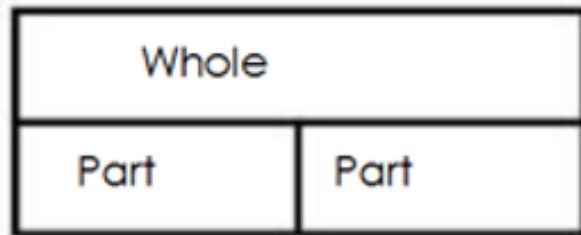
Start adding at the units.

As $80 + 70 + 10 = 160$, carry the 100 into the hundreds column.

As $7 + 5 = 12$, carry the ten into the next column.

A Deeper Look:

Children use a bar to find missing digits. It is important for children to use the bar in this way to aid with problem solving.

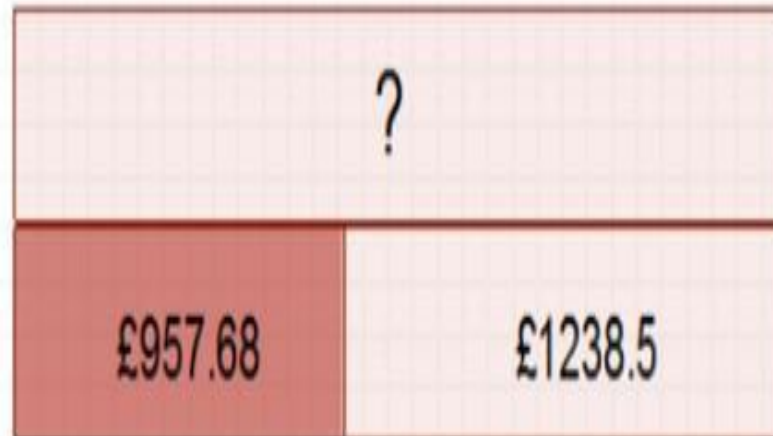


Children understand that addition and subtraction are a whole part relationship. They look for wholes and parts in the question and use the information they have to determine what operation to use.

Ex) $\text{Whole} - \text{Part} = \text{Part}$

$\text{Part} + \text{Part} = \text{Whole}$

MacDonalds sold £9957.68 worth of hamburgers and £1238.5 worth of chicken nuggets. How much money did they take altogether?





Mental Addition in Year 5

Children should be able to recall:

- Sums of decimals.
E.g. $6.5 + 2.7$
- Doubles of decimals.
E.g. Double 3.4

- What must be added to any four digit number to make the next multiple of 1000.
E.g. $4087 + n = 5000$

- What must be added to a decimal with units and tenths to make the next whole number.
E.g. $7.2 + n = 8$

Working mentally, children should be able to:

- Add a pair of two digit numbers or three-digit multiples of 10.
E.g. $38 + 86$, $620 + 380$

- Add a near multiple of 10 or 100 to any two-digit or three digit number.
E.g. $235 + 198$

- Add any pair of decimal fractions each with units and tenths.
E.g. $5.7 + 2.5$

Children should know when to:

- Count on in hundreds tens, ones and tenths.
- Partition: Add hundreds, tens or ones separately, then recombine.

- Add a multiple of 10 or 100 and adjust.
E.g. $235 + 198 = 235 + 200 - 2$
- Partition: Double and adjust.

- Use knowledge of place value and related calculations.
E.g. $6.3 + 4.8$ using $63 + 48$
- Partition: Count on in minutes and hours, bridging through 60.



Written Subtraction in Year 5

Method:

Column Subtraction.

Children will move on to using column subtraction on its own and with larger numbers. Place value counters and mats will be used for support where necessary.

Exchange with the next digit.

$$\begin{array}{r} 415 \\ 357 \\ \hline 363 \\ 3194 \end{array}$$

3000 - 0

150 - 60 = 90

Start subtracting from the units

Leading to:

Column Subtraction.

Subtracting **decimals** using column subtraction. Place value counters and mats will be used for support where necessary.

Exchange with the next digit.

$$\begin{array}{r} 2 \\ 316.5 \\ - 17.0 \\ \hline 19.5 \end{array}$$

Line up the H, T & $\frac{1}{10}$

Add '0' as a place holder.

2 - 1

16 - 9

Strategies to support:

The Expanded Method of Subtraction and Column Subtraction.

The expanded method of subtraction will continue to be taught alongside the column method to ensure children see their relationship.

Because you can't 'do' 2-5, exchange a ten for ten units.

Exchange with the next digit.

$$\begin{array}{r} 50 + 12 \\ 362 = 300 + 50 + 12 \\ 245 = 200 + 40 + 5 \\ \hline 117 = 100 + 10 + 7 \end{array}$$

Recombine to get the answer.

50 - 40 12 - 5

Next Steps:

Children will be comfortable using column subtraction with numbers of all sizes and will be able to explain their method using appropriate mathematical vocabulary.

Exchange with the next digit.

$$\begin{array}{r} 415 \\ 357 \\ \hline 363 \\ 3194 \end{array}$$

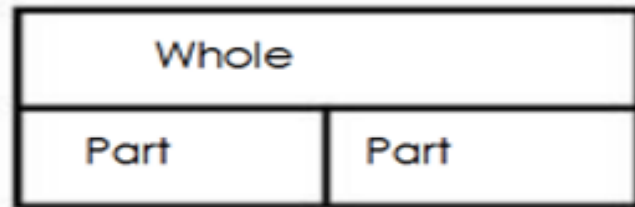
3000 - 0

150 - 60 = 90

Start subtracting from the units

A Deeper Look:

Children use a bar to find missing digits. It is important for children to use the bar in this way 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?



Children understand that addition and subtraction are a whole part relationship. They look for wholes and parts in the question and use the information they have to determine what operation to use.

Ex) $\text{Whole} - \text{Part} = \text{Part}$

$\text{Part} + \text{Part} = \text{Whole}$



Mental Subtraction in Year 5

Children should be able to recall:

- Differences of decimals.
E.g. $7.8 - 1.3$
- Halves of decimals.
E.g. Half of 5.6

- What must be added to any four digit number to make the next multiple of 1000.
E.g. $5000 - 4087 = n$

- What must be added to a decimal with units and tenths to make the next whole number.
E.g. $8 - 7.2 = n$

Working mentally, children should be able to:

- Subtract pair of two digit numbers or three-digit multiples of 10.
E.g. $620 - 380$, $62 - 38$

- Subtract a near multiple of 10 or 100 to any two-digit or three digit number.
E.g. $235 - 198$
- Find the difference between near multiples of 100 or 1000.
E.g. $607 - 588$, $6070 - 4087$

- Subtract any pair of decimal fractions each with units and tenths.
E.g. $5.7 - 2.5$

Children should know when to:

- Count back in hundreds tens, ones and tenths.
- Subtract by counting up from the smaller to the larger number.

- Subtract a multiple of 10 or 100 and adjust.
E.g. $280 - 98 = 280 - 100 + 2$

- Use knowledge of place value and related calculations.
E.g. $6.3 - 4.8$ using $63 - 48$
- Partition: Count back in minutes and hours, bridging through 60.



Written Multiplication in Year 5

Method:

Multiplying numbers using Column Multiplication.

Children will be introduced to column multiplication. They will multiply numbers in the same way as in grid method but record it in columns according to place value. Place value counters and mats will be used for support where necessary.

Th H T O

$$\begin{array}{r} 324 \\ \times 23 \\ \hline 972 \\ 6480 \\ \hline 7452 \end{array}$$

Multiply the top number by the units of the bottom. $(3 \times 4) + (3 \times 20) + (3 \times 300)$

Multiply the top number by the tens of the second number. $(20 \times 4) + (20 \times 20) + (20 \times 300)$

Add to get the answer.

Leading to:

The Column Method of Multiplication.

Children will continue to use column multiplication, adding each multiplication in the same row as they multiply the digits of the numbers. Children will solve missing number problems to develop mastery.

Th H T O

$$\begin{array}{r} 324 \\ \times 23 \\ \hline 972 \\ 6480 \\ \hline 7452 \end{array}$$

Multiply the top number by the units of the bottom. $(3 \times 4) + (3 \times 20) + (3 \times 300)$

Multiply the top number by the tens of the second number. $(20 \times 4) + (20 \times 20) + (20 \times 300)$

Add to get the answer.

Strategies to support:

The Ladder Method of Multiplication.

Ladder method to be used with children multiplying both two and three digits by a one digit number. Dienes are used alongside to promote mastery of what is occurring at a place value level.

$$\begin{array}{r} 43 \\ \times 56 \\ \hline 258 \\ 2580 \\ \hline 2408 \end{array}$$

Use column addition to find answer

6×3

6×40

50×3

50×40

Next Steps:

Multiplying **decimal numbers** using the grid method and/or estimation.

$$\begin{array}{r|l} \times & 5 + 0.2 \\ \hline 6 & 30 + 1.2 = 31.20 \\ 0.3 & 1.5 + 0.06 = 1.56 \\ & \hline & 32.76 \end{array}$$

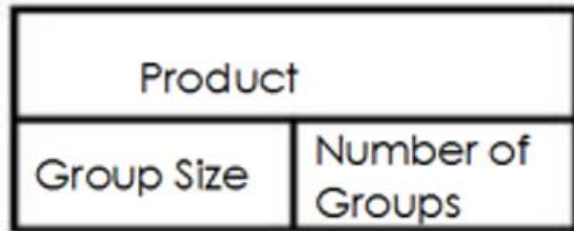
0.3×0.2

Take care to line up the digits. Adding a place holder will help.

Ex) $6.3 \times 5.2 = n$. Estimates to 6×5 (the answer should be close to 20). Multiply without decimals and add them in at the end.

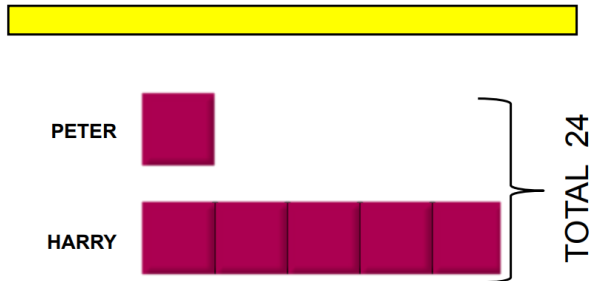
A Deeper Look:

Children use a bar model to support multiplication.



Peter has 4 books.

Harry has five times as many books as Peter.



Children should determine if they are working with a comparison model or Product, Number of Groups and Size of Groups Model.

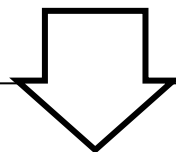
In a comparison model, they must find the total number of groups and solve for one group.

In a Product, Number of Groups and Size of Groups Model, they use the information provided to determine what operation to use.

Ex)

Product divided by Group Size = Number of Groups

Group Size X Number of Groups = Product





Mental Multiplication in Year 5

Children should be able to recall:

- Squares to 10×10 .

- Factor Pairs to 100.
E.g. 30 has the factor pairs 1×30 , 2×15 , 3×10 and 5×6

Working mentally, children should be able to:

- Multiply two-digit numbers by 4 or 8.
E.g. 26×4
- Multiply two-digit numbers by 5 or 20.
- Multiply by 25 or 50.

- Double three-digit multiples of 10 to 500.
- Multiply whole numbers and decimals by 10, 100 or 1000.
E.g. 4.3×10 , 0.75×100

- Multiply pairs of multiples of 10 and a multiple of 100 by a single-digit number.
E.g. 60×30 , 900×8

Children should know when to:

- Multiply by 4 or 8 by repeated doubling.
- Form an equivalent calculation.
E.g. To multiply by 5, multiply by 10 then halve. To multiply by 20, double and then multiply by 10.

- Use knowledge of doubles and halves and understanding of place value.
E.g. When multiplying by 50, multiply by 100 then divide by 2.
- Use knowledge of multiplication and place value when calculating with multiples of 10.
E.g. 60×7 using 6×7

- Use understanding that when a number is multiplied by 10 or 100 its digits move one or two places relative to the decimal point and zero is used as a place holder.



Written Division in Year 5

Long Division

Children will use their understanding of short division to learn long division. Short division will initially be taught alongside long division to enable an understanding of the process to be gained. Place value counters and mats will be used for support where necessary.

$$\begin{array}{r} 025 \\ 5 \overline{) 125} \\ \underline{10} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

Handwritten notes:
Combine
 $1 \div 5 = 0$
 $12 \div 5 = 2 \text{ r } 2$
 $25 \div 5 = 5$
Carry the remainder

Leading to:

Long Division.

Children will gain fluency in long division.

$$\begin{array}{r} 626 \text{ r } 8 \\ 11 \overline{) 6894} \\ \underline{66} \\ 29 \\ \underline{22} \\ 74 \\ \underline{66} \\ 8 \end{array}$$

Strategy to Support:

Short Division with and without remainders.

Children will continue to explore short division. They will use their increasing knowledge of times tables to solve. Dines are used to support understanding.

$$\begin{array}{r} 025 \\ 5 \overline{) 125} \\ \underline{10} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

Handwritten notes:
Combine
 $1 \div 5 = 0$
 $12 \div 5 = 2 \text{ r } 2$
 $25 \div 5 = 5$
Carry the remainder

Next Steps:

Children will use estimation to solve division problems involving decimals numbers. They round to estimate their answers.

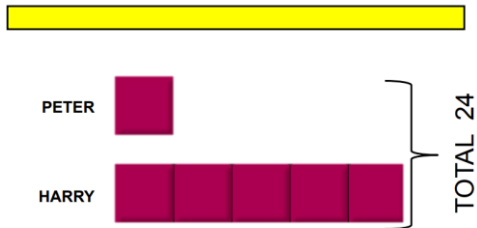
$$\begin{array}{r} 3. \\ 2 \overline{) 73.59} \\ \underline{-6} \\ 1 \end{array} \quad \begin{array}{r} 36. \\ 2 \overline{) 73.59} \\ \underline{-6} \\ 13 \\ \underline{-12} \\ 1 \end{array} \quad \begin{array}{r} 36.7 \\ 2 \overline{) 73.59} \\ \underline{-6} \\ 13 \\ \underline{-12} \\ 15 \\ \underline{-14} \\ 1 \end{array}$$

A Deeper Look:

Children use a bar to support division problems.

Peter has 4 books.

Harry has five times as many books as Peter.



Product	
Group Size	Number of Groups

Children should determine if they are working with a comparison model or Product, Number of Groups and Size of Groups Model.

In a comparison model they must find the total number of groups and solve for one group.

In a Product, Number of Groups and Size of Groups Model, they use the information provided to determine what operation to use.

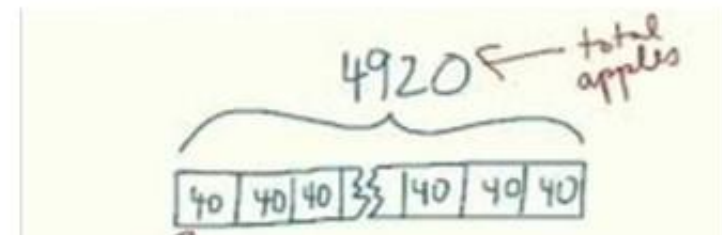
Ex)

Product divided by Group Size = Number of Groups

Group Size X Number of Groups = Product

Bar Model to support understanding of problem solving:

Frank has 4920 apples. He needs to put them into baskets of 40. How many baskets does he need?





Mental Division in Year 5

Children should be able to recall:

- Division facts corresponding to tables up to 10×10 and the related unit fractions.
E.g. $7 \times 9 = 63$ so one-ninth of 63 is 7 and one-seventh of 63 is 9.

- Percentage equivalents of one-half, one-quarter, three quarters, tenths and hundredths.

- Factor Pairs to 100 and corresponding division facts.
E.g. $30 \div 5 = 6$, $30 \div 6 = 5$ using $5 \times 6 = 30$

Working mentally, children should be able to:

- Divide two-digit numbers by 4 or 8.
- Halve three-digit multiples of 10 to 1000.
E.g. $760 \div 2$

- Find the remainder after dividing a two-digit number by a single-digit number.
E.g. $27 \div 4 = 6 \text{ r } 3$
- Divide whole numbers and decimals by 10, 100 or 1000.
- Divide a multiple of 10 by a single-digit number (whole number answers)
E.g. $270 \div 3$

- Find fractions of whole numbers or quantities.
E.g. $\frac{2}{3}$ of 27, $\frac{4}{5}$ of 70 kg
- Find 50%, 25% or 10% of whole numbers of quantities.
E.g. 25% of 20 kg, 10% of £10

Children should know when to:

- Divide by 4 or 8 by repeated halving.
- Use knowledge of division facts.
E.g. when carrying out a division to find a remainder.

- Use understanding that when a number is divided by 10 or 100, its digits move one or two places to the right relative to the decimal point and zero is used as a place holder.

- Use knowledge of equivalence between fractions and percentages.
E.g. To find 50%, 25% and 10%
- Use knowledge of division facts and understanding of place value.
E.g. When calculating with multiples of 10.

Year 5 Problems

- 1. Every day for 4 days Helen scored 7.5 in a test. On the fifth day she scored 8. What was her total score?
- 2. I cut 60 cm from 3.3m of string and shared the rest between 3 friends. How much string did they get each?
- 3. How many jugs with a capacity of 250ml could you fill with 10 litres of water?
- 4. All the children in the school are going on a residential trip to the outdoor activity centre. They will be divided into 6 equal groups. If there are 246 children in the school how many will be in each group?
- 5. Robert calculated 25% of 600. What answer does he get?
- 6. Sam calculated 40% of 120. What answer does he get?
- 7. Rita worked out that one sixth of a number was 12. What was the number she started with?



How we teach it.

Written and mental calculations in Year 6.



Written Addition in Year 6

Method:

Column Addition.

Children will practise using column addition to add numbers of all sizes. Secure knowledge of place value is essential.

$500 + 400 + 100 = 1000$.
Carry the 1000 into the Thousands column.

Th H T O
 $\begin{array}{r} 587 \\ + 475 \\ \hline 1062 \end{array}$

line up the H, T & U
 Start adding at the units.
 As $80 + 70 + 10 = 160$, carry the 100 into the hundreds column.
 As $7 + 5 = 12$ carry the ten into the next column.

Common Mistakes to look out for:

- Make sure that the digits are lined up correctly in columns of thousands, hundreds, tens and units.
- Check that carrying is done correctly. The digit that needs to be carried must be placed in the correct column and then added in the next step.

Alternative Methods:

By the end of Year 6 children will need to be secure in their knowledge of an efficient method of addition. The following methods may be of help along with place value counters and mats.

The Expanded Method of Addition.

Partition both numbers. line up the H, T & U

$123 = 100 + 20 + 3$
 $45 = 40 + 5$

$168 = 100 + 60 + 8$

Recombine to get the answer.
 $100 + 0$ $20 + 40$ $3 + 5$

Adding several decimals.

$14.5 + 0.71 + 26.85$

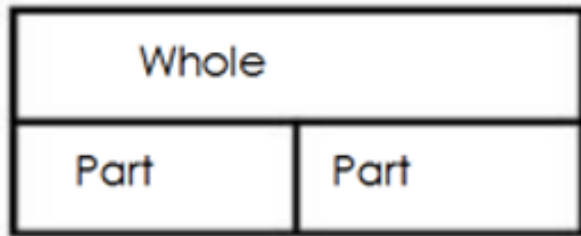
Line up the digits with the longest number first.

T O $\frac{1}{10}$ $\frac{1}{100}$
 $\begin{array}{r} 26.85 \\ 14.50 \\ + 0.71 \\ \hline 42.06 \end{array}$

Add zero as a place holder.
 Carry below the line.
 Start adding from the right

A Deeper Look:

Children use a bar to find missing digits and to assist with problem solving.



Children understand that addition and subtraction are a whole part relationship. They look for wholes and parts in the question and use the information they have to determine what operation to use.

Ex) $\text{Whole} - \text{Part} = \text{Part}$

$\text{Part} + \text{Part} = \text{Whole}$

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?

?		
£70.50	£427.89	£1295



Mental Addition in Year 6

Children should be able to recall:

- Addition facts for multiples of 10 to 1000.
E.g. $650 + n = 930$

- Addition facts for decimal numbers with one decimal place.
E.g. $1.4 + n = 2.5$

- What must be added to a decimal with units, tenths and hundredths to make the next whole number,
E.g. $7.26 + n = 8$

Working mentally, children should be able to:

- Add pairs of decimals with units, tenths or hundredths.
E.g. $0.7 + 3.38$

- Find doubles of decimals each with units and tenths.
E.g. $1.6 + 1.6$
- Add near doubles of decimals.
E.g. $2.5 + 2.6 = 2.5 + 2.5 + 0.1$

- Add a decimal with units and tenths that is nearly a whole number.
E.g. $4.3 + 2.9$

Children should know when to:

- Count on in hundreds tens, ones and tenths and hundredths.
- Use knowledge of place value and related calculations.
E.g. $6.8 + 4.3$ using $68 + 43$

- Use knowledge of place value and of doubles of two-digit numbers.
- Partition: Double and adjust.
E.g. $1.6 + 1.7 = 1.6 + 1.6 + 0.1$

- Partition: add a whole number and adjust.
E.g. $4.3 + 2.9 = 4.3 + 3 - 0.1$
- Partition: Count on in minutes and hours, bridging through 60 (analogue and digital times, 12-hour and 24-hour clock)



Written Subtraction in Year 6

Method:

Column Subtraction.

Children will practise using the column method to subtract numbers of increasing size. Secure knowledge of place value is essential.

$$\begin{array}{r} 3607 - 489 \\ \hline 3118 \end{array}$$

Exchange 1 hundred for 10 tens then 1 ten for 10 units.

Start subtracting from the right.

Common Mistakes to look out for.

- Children must ensure that the bottom number is subtracted from the top. If the top digit is smaller than the top digit children must exchange with the next digit.
- In some calculations, e.g. $305 - 58$, children will need to exchange more than once to subtract successfully.

Alternative Methods.

By the end of Year 6 children will need to be secure in their knowledge of an efficient method of subtraction. The following methods may be of help along with place value counters and mats.

The Expanded Method of Subtraction.

$$\begin{array}{r} 263 = 200 + 50 + 3 \\ 46 = 40 + 6 \\ \hline 217 = 200 + 10 + 7 \end{array}$$

We exchange 1 ten for 10 units.

Recombine to get the answer.

$50 - 40 = 10$
 $13 - 6 = 7$

Subtraction decimals with a different number of digits.

$$\begin{array}{r} 324.9 - 7.25 \\ \hline 317.65 \end{array}$$

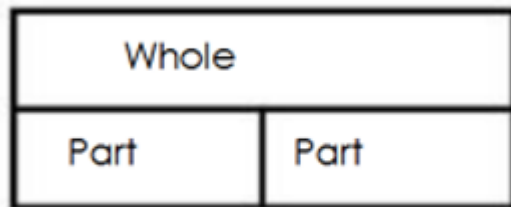
Line up the digits.

Exchange with the next digit

Add zero as a place holder.

A Deeper Look:

Children use a bar model to find missing digits. It is important for children to use a bar in this way to aid with problem solving.



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	?

Children understand that addition and subtraction are a whole part relationship. They look for wholes and parts in the question and use the information they have to determine what operation to use.

Ex) $\text{Whole} - \text{Part} = \text{Part}$

$\text{Part} + \text{Part} = \text{Whole}$



Mental Subtraction in Year 6

Children should be able to recall:

- Subtraction facts for multiples of 10 to 1000.
E.g. $n - 250 = 540$

- Subtraction facts for decimal numbers with one decimal place.
E.g. $n - 1.4 = 2.5$

- What must be subtracted from a decimal with units, tenths and hundredths to make the previous whole number,
E.g. $7.26 - n = 7$

Working mentally, children should be able to:

- Subtract pairs of decimals with units, tenths or hundredths.
E.g. $4.54 - 0.84$

- Subtract a decimal with units and tenths, that is nearly a whole number.
E.g. $6.5 - 3.8 = 6.5 - 4 + 0.2$

Children should know when to:

- Count back in hundreds tens, ones and tenths and hundredths.
- Use knowledge of place value and related calculations.
E.g. $6.8 - 4.3$ using $68 - 43$

- Partition: subtract a whole number and adjust.
 $6.5 - 3.8 = 6.5 - 4 + 0.2$

- Partition: Count back in minutes and hours, bridging through 60 (analogue and digital times, 12-hour and 24-hour clock)



Written Multiplication in Year 6

Method:

The Column Method of Multiplication.

Children will begin to use column multiplication, adding each multiplication in the same row as they multiply the digits of the numbers.

Th H T O

Multiply the top number by the units of the bottom.

Multiply the top number by the tens of the second number.

Add to get the answer.

$$\begin{array}{r} 324 \\ \times 23 \\ \hline 972 \\ 6480 \\ \hline 7452 \end{array}$$

$(3 \times 4) + (3 \times 20) + (3 \times 300)$

$(20 \times 4) + (20 \times 20) + (20 \times 300)$

Common Mistakes to look out for.

- Check multiplication of multiples of 10 and 100 as calculations are often wrong by a factor of 10.
- Ensure that after recombining, the digits are lined up to enable column addition to proceed effectively.
- Children may need to carry when adding.

Alternative Methods.

By the end of Year 6, children will need to be secure in their knowledge of an efficient method of multiplication. The following methods may be of help along with place value counters and mats.

Grid method of multiplication.

$$\begin{array}{r|l} \times & 4 \\ \hline 100 & 400 \\ 20 & 80 \\ 3 & 12 \\ \hline & 492 \end{array}$$

Ladder Multiplication.

Children can use an expanded method of column multiplication if there are difficulties in multiplying and adding in the same step.

Use column addition to find answer

$$\begin{array}{r} 43 \\ \times 56 \\ \hline 18 \\ 240 \\ 150 \\ 2000 \\ \hline 2408 \end{array}$$

6×3

6×40

50×3

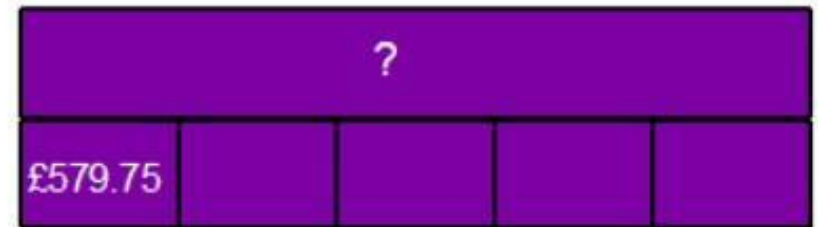
50×40

A Deeper Look:

Children use a bar to support multiplication.

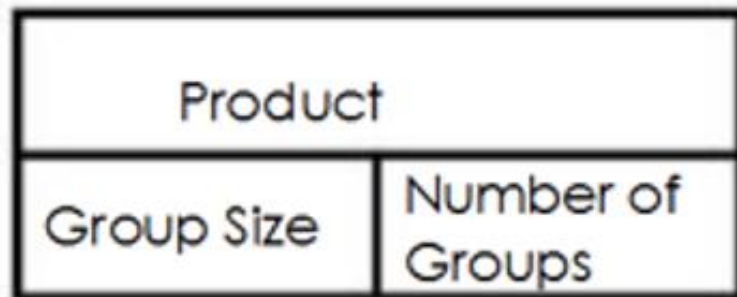
If 5 friends went on holiday and each paid £579.75 what was the total cost of the holiday?

Cost of the holiday



Peter has 4 books.

Harry has five times as many books as Peter.



Children should determine if they are working with a comparison model or the Product, Number of Groups and Size of Groups Model.

In a comparison model they must find the total number of groups and solve for one group.

In a Product, Number of Groups and Size of Groups Model, they use the information provided to determine what operation to use.

Ex)

Product divided by Group Size = Number of Groups

Group Size X Number of Groups = Product



Mental Multiplication in Year 6

Children should be able to recall:

- Squares to 12×12

- Squares of the corresponding multiples of 10

- Prime numbers less than 100.

Working mentally, children should be able to:

- Multiply pairs of two-digit and single-digit numbers.
E.g. 28×3
- Double decimals with units and tenths.

- Multiply pairs of multiples of 10 and 100.
E.g. 50×30 , 600×20
- Multiply two-digit decimals
E.g. 0.8×7

- Identify numbers with odd and even numbers of factors and no factor pairs other than 1 and themselves.

Children should know when to:

- Partition: Double the units and tenths separately and recombine.

- Use knowledge of multiplication and place value when calculating with multiples of 10 and 100.
E.g. 60×70 using 6×7

- Use knowledge of multiplication facts to identify factor pairs and numbers with only two factors.



Written Division in Year 6

Method:

Long Division

Children will consolidate their knowledge of long division to solve problems. They should use dienes and manipulatives to consolidate their understanding.

$$\begin{array}{r} 626r8 \\ 11 \overline{) 6894} \\ \underline{66} \\ 294 \\ \underline{22} \\ 74 \\ \underline{66} \\ 8 \end{array}$$

long division

Common Mistakes to look out for.

- When subtracting children will need to ensure they have lined up the digits to allow accurate subtraction.
- Children may need to exchange when subtracting and can forget to do this.

Alternative Methods.

By the end of Year 6 the children will need to be secure in their knowledge of an efficient method of division. The following methods may be used to help along with use of place value counters and mats.

Short division.

Children can use short division to divide by a digit less than 13.

$$\begin{array}{r} 17r7 \\ 14 \overline{) 245} \end{array}$$

$$\begin{array}{r} 025 \\ 5 \overline{) 125} \\ \underline{10} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

Combine
 $1 \div 5 = 0$
 $12 \div 5 = 2r2$
 $25 \div 5 = 5$
Carry the remainder

$$\begin{array}{r} 025 \\ 5 \overline{) 125} \\ \underline{10} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

A Deeper Look:

Children use a bar to support division problems.

Peter has 4 books.
Harry has five times as many books as Peter.



Product	
Group Size	Number of Groups

Children should determine if they are working with a comparison model or Product, Number of Groups and Size of Groups Model.

In a comparison model they must find the total number of groups and solve for one group.

In a Product, Number of Groups and Size of Groups Model, they use the information provided to determine what operation to use.

Ex)

Product divided by Group Size = Number of Groups

Group Size X Number of Groups = Product



Mental Division in Year 6

Children should be able to recall:

- Prime numbers less than 100.

- Equivalent fractions, decimals and percentages for hundredths.
E.g. 35% is equivalent to 0.35 or $\frac{35}{100}$

Working mentally, children should be able to:

- Divide a two-digit number by a single-digit number.
E.g. $68 \div 4$
- Divide by 25 or 50.
E.g. $480 \div 25$

- Halve decimals with units and tenths.
E.g. Half of 15.2
- Divide multiples of 100 by a multiple of 10 or 100 (Whole number answers).
E.g. $600 \div 20$, $800 \div 400$
- Divide two-digit decimals.
E.g. $4.8 \div 6$

- Find 10% or multiples of 10% of whole numbers and quantities.
E.g. 30% of 50 ml
- Simplify fractions by cancelling.
- Scale up and down using known facts.
E.g. Given that three oranges cost 24p, find the cost of four oranges.

Children should know when to:

- Partition: Use partitioning and the distributive law to divide tens and ones separately.
 $92 \div 4 = (80 + 12) \div 4$
- Form an equivalent calculation.
E.g. To divide by 25 divide by 100 then 4.

- Use knowledge of equivalence between fractions and percentages and the relationship between fractions and division.

- Recognise how to scale up or down using multiplication and division.
E.g. If three oranges cost 24p, one orange costs $24 \div 3 = 8p$

Year 6 Problems

- 1. Three quarters of a number is 54. What is the number?
- 2. Which is more; five ninths of 252 or four sevenths of 238?
- 3. There are 36 packets of biscuits. One half are chocolate, a ninth are digestive and a third are wafer biscuits. The rest are ginger nuts. How many biscuits are ginger nuts?
- 4. There is 20% off in a sale. How much would a track suit cost, if the normal price was £44.50?
- 5. There is 20% off in a sale. The reduced price of the jeans is £36. What was the original price?
- 6. At a dance there are 4 girls to every 3 boys. There are 63 children altogether? How many girls are there?
- 7. Seven in every nine packets of crisps in a box are salt and vinegar. The rest are plain. There are 63 packets of salt and vinegar crisps. How many packets of plain crisps are there?

