Fishponds

Church of England Academy

'Loving to Learn, Learning to Love'

Calculation Progression

Lower Key Stage Two

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Calculation Progression

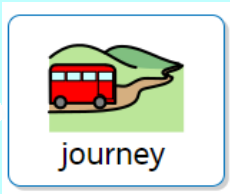
Aims:

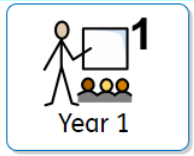
- To share our calculation progression in Maths through LKS2.
- To share the methods that we use for addition, subtraction, multiplication and division.
- To share the practical and visual resources that we use to teach calculation in LKS2.
- To share resources that will help you to support your child/ children at home with calculation.

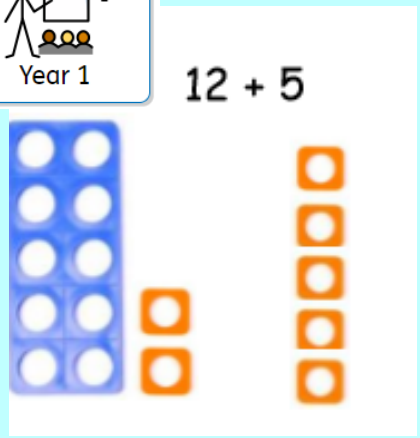
Why is progression in calculation important?

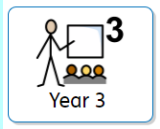
It gives the children the building blocks that they need to be successful in Mathematics and supports them to develop their calculation methods from EYFS to Year 6... and beyond!

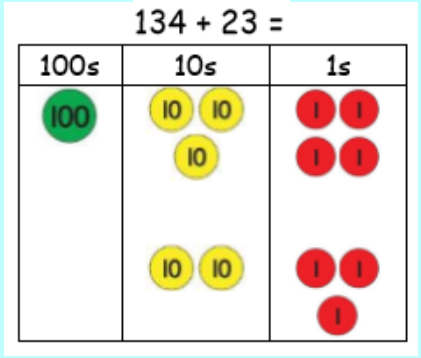
Why is progression in calculation important?

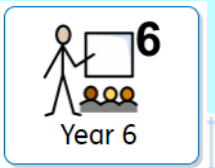


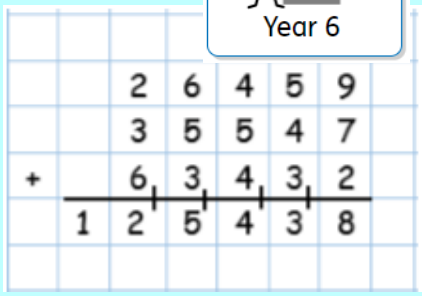












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Calculation Progression

Stage 3	Stage 4
Add and subtract numbers mentally, including: - a three-digit number and ones - a three-digit number and tens - a three-digit number and hundreds Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate

Year 3

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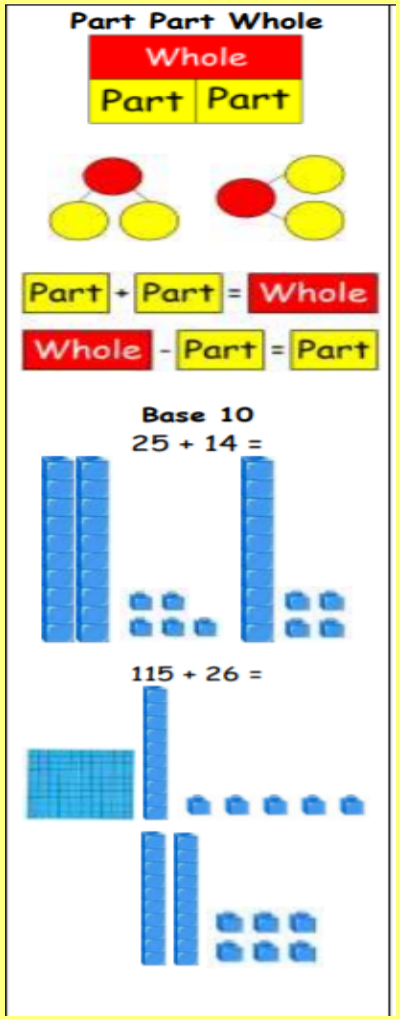
Calculation Progression



Year 3

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Calculation Progression

Place Value Counters

134 + 23 =

100s	10s	1s
100	10 10 10	1 1 1 1
	10 10	1 1 1

145 + 127 =

100s	10s	1s
100	10 10 10 10	1 1 1 1 1
100	10 10	1 1 1 1 1 1 1
	10	

Place value counters also used to add multiples of 10 and 100.

Year 3

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Calculation Progression

1	2	5	+	2	3	2	=
1	0	0	+	2	0	+	5
+ 2	0	0	+	3	0	+	2
3	0	0	+	5	0	+	7

	2	3	5
+	1	4	3
3	7	8	

	4	7	5
+	2	5	4
7	2	9	

Reasoning and Problem Solving

Find all the possible pairs of numbers that can complete the addition.

$$\begin{array}{r} 1\,\square \\ +\ 2\,\square \\ \hline 4\,2 \\ {\scriptstyle 1} \end{array}$$

How do you know you have found all the pairs?

What is the same about all the pairs of numbers?

13 + 29

19 + 23

14 + 28

18 + 24

15 + 27

17 + 25

16 + 26

All the pairs of ones add up to 12

Can you create a calculation where there will be an exchange in the ones and your answer will have two ones and be less than 100?

There are lots of possible solutions.

E.g. 33 + 29 = 62

S

Year 4

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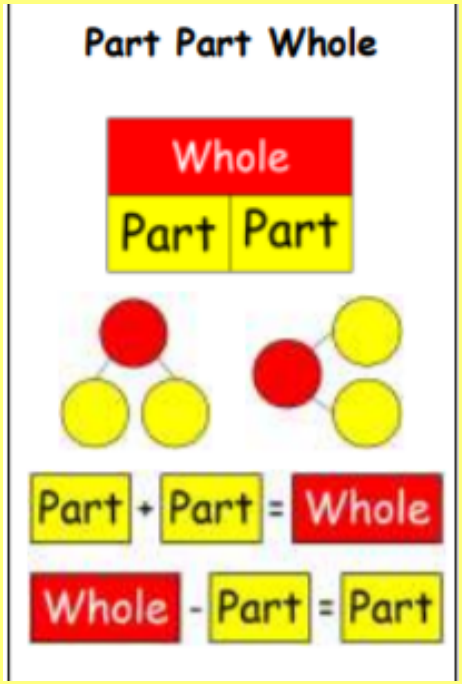
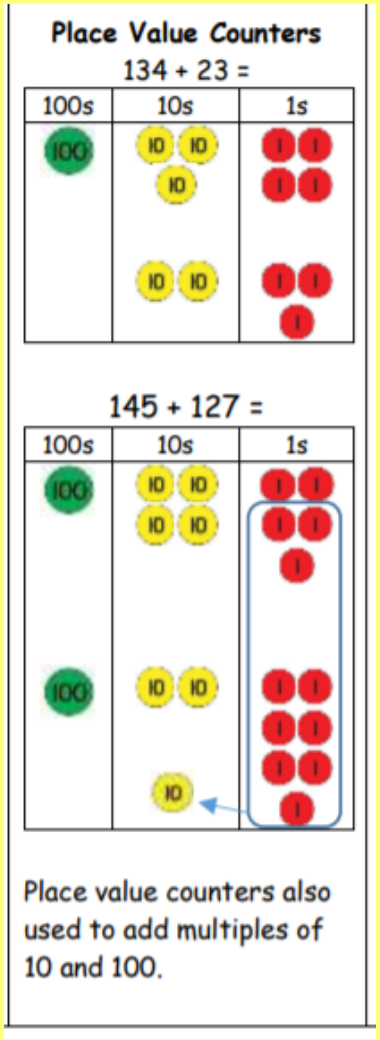
Calculation Progression





	2	5	6	2	
+	3	4	2	1	
	5	9	8	3	

	2	5	6	6	
+	1	3	2	7	
	3	8	9	3	

S

Year 4

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Calculation Progression

Adding More than 2 numbers

		2	3	4	3	
		5	4	1	5	
+		5	6	3	1	
	1	3	7	8	9	

S

Reasoning and Problem Solving

Jack says,

When I add two numbers together I will only ever make up to one exchange in each column.

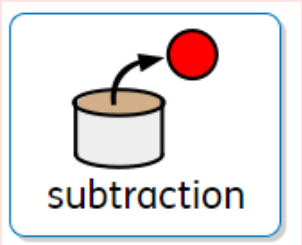
Do you agree?
Explain your reasoning.

Jack is correct. When adding any two numbers together, the maximum value in any given column will be 18 (e.g. 18 ones, 18 tens, 18 hundreds). This means that only one exchange can occur in each place value column. Children may explore what happens when more than two numbers are added together.

What is the missing 4-digit number?

	Th	H	T	O
	___	___	___	___
+	6	3	9	5
	8	9	4	9

2,554



Year 3 Year 4

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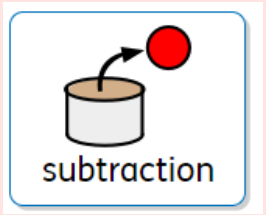
Calculation Progression

Year 3	Year 4
Add and subtract numbers mentally, including: - a three-digit number and ones - a three-digit number and tens - a three-digit number and hundreds Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction	Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate



Year 3

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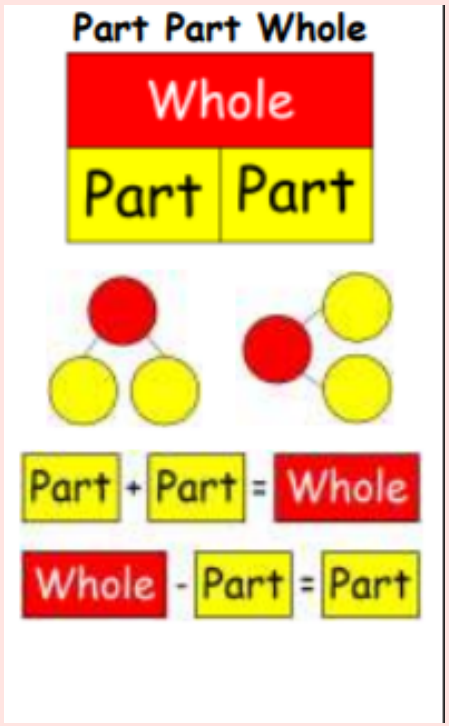
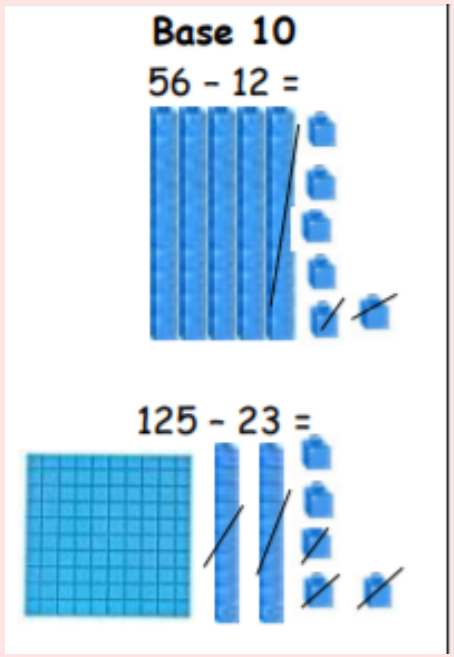
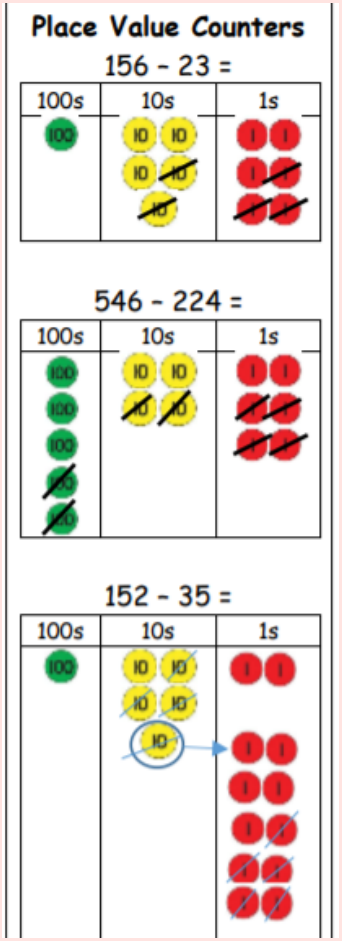
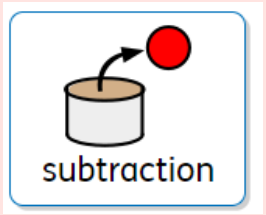
Calculation Progression









Year 3

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Calculation Progression

Column Subtraction with Partitioning

No exchanging

6	8	-	2	5	=	4	3
	6	0	+	8			
-	2	0	+	5			
	4	0	+	3			

	5	6	8	-	2	3	3
	5	0	0	+	6	0	+ 8
-	2	0	0	+	3	0	+ 3
	3	0	0	+	3	0	+ 5

Column Subtraction

No exchange

	4	7	5
-	2	5	4
	2	2	1

One Exchange

		6	
	4	7	12
-	2	5	4
	2	1	8

Two exchanges

	3	16	
	4	7	12
-	2	8	4
	1	8	8

Two exchanges with a 0

		4	9	
		5	10	12
-	1	5	4	
	3	4	8	

Reasoning and Problem Solving

Rosie thinks 352 – 89 = 337

	H	T	O
	3	5	2
–		8	9
	3	3	7

Is she correct?
Explain why.

Rosie is incorrect because she has subtracted the digits in a different order instead of exchanging.

The answer should be 263

Work out the missing digits.

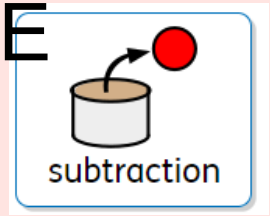
	H	T	O
	5	?	3
–	2	1	8
	3	1	5

	H	T	O
	?	0	?
–	2	?	8
	2	4	6

533 – 218 = 315

504 – 258 = 246

E



Year 4

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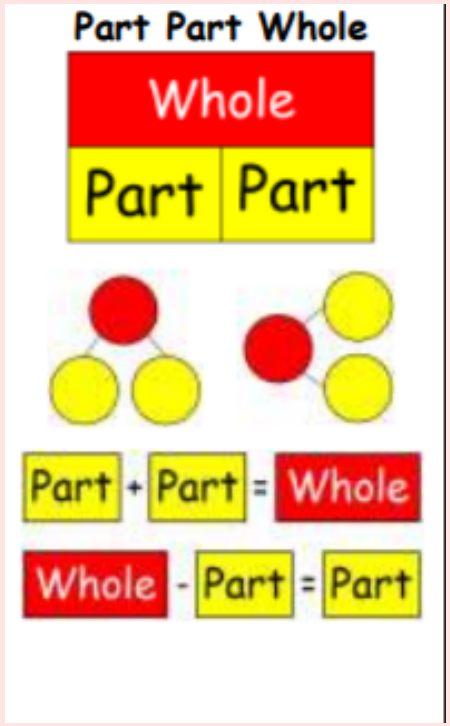
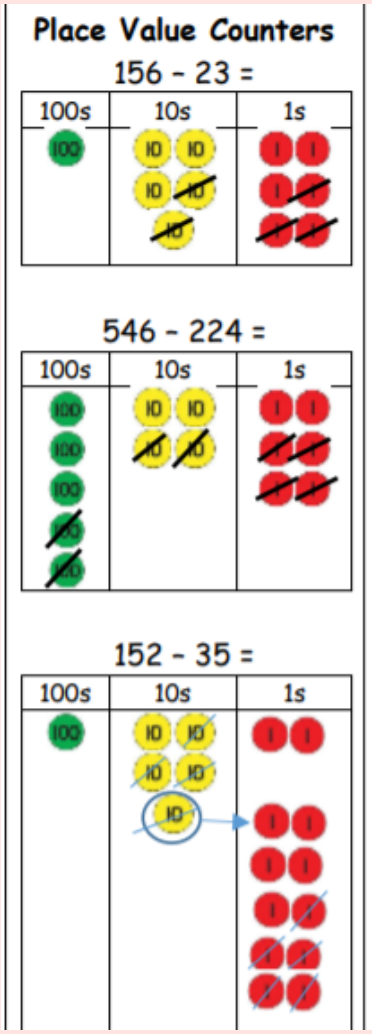
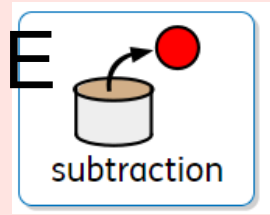
Calculation Progression







Year 4

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Four digit 1 exchange

			5	
	6	7	6	15
-	3	5	2	7
	3	2	3	8

		6		
	6	7	15	9
-	3	5	8	7
	3	1	7	2

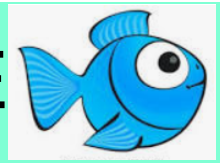
Four digit 2 or more exchanges

		7	15	
	6	8	6	15
-	3	5	7	7
	3	2	8	8

		5	9	
	7	6	10	13
-	1	2	3	5
	6	3	6	8

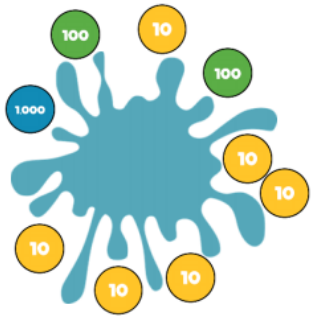
Subtracting Decimals

		4				
	£	5	16	8	9	
-	£	2	7	3	2	
	£	2	9	5	7	

E 

Reasoning and Problem Solving

There are counters to the value of 3,470 on the table but some have been covered by the splat.



What is the total of the counters covered?
How many different ways can you make the missing total?

3470 – 1260 = 2210

Possible answers include:

- two 1000s, two 100s and one 10
- twenty-two 100s and one 10
- twenty-two 100s and ten 1s

1,235 people go on a school trip.

There are 1,179 children and 27 teachers. The rest are parents.

How many parents are there?

Explain your method to a friend.

Add children and teachers together first.

1,179 + 27 = 1,206

Subtract this from total number of people.

1,235 – 1,206 = 29

29 parents.

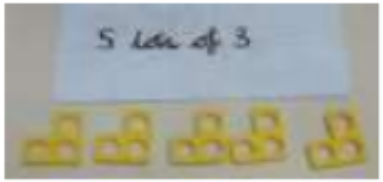
Year 3	Year 4
Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods	recall multiplication and division facts for multiplication tables up to 12 × 12 use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers recognise and use factor pairs and commutativity in mental calculations multiply two-digit and three-digit numbers by a one-digit number using formal written layout

Multiplication

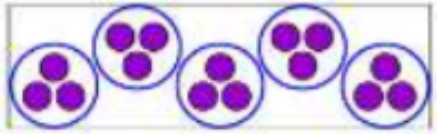
Year 3

All Using 2s, 3s, 5s and 10 times tables

Numicon



Models and Images

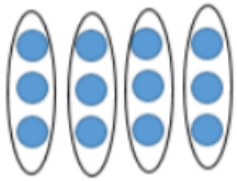


There are ___ equal groups with ___ in each group. I have five ___.

Drawing Pictures

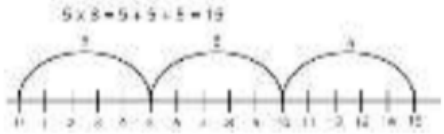
Arrays

4 x 3 = 12



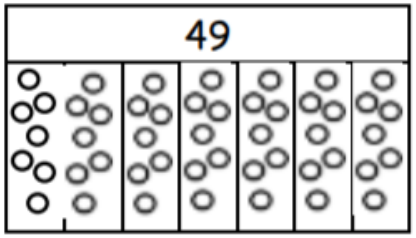
3 + 3 + 3 + 3 = 12

Repeated addition



Bar Model

7 x 7 =49



Year 3

Place Value Counters

23 x 5 =

10s	1s
10 10	1 1 1
10 10	1 1 1
10 10	1 1 1
10 10	1 1 1
10 10	1 1 1

100 + 15 = 115

Partitioning

24 x 3 =

20 4

20 x 3 = 60

4 x 3 = 12

72

56 x 5 =

50 6

50 x 5 = 250

6 x 5 = 30

280

Reasoning and Problem Solving

Always, Sometimes, Never?

A two-digit number multiplied by a one-digit number has a two-digit product.

Sometimes.

e.g.

$13 \times 5 = 65$

$31 \times 5 = 155$

Explain the mistake.

H	T	O
	2	7
×		3
6	2	1

They have not performed the exchange correctly.
6 tens and 2 tens should be added together to make 8 tens so the correct answer is 81

How close can you get to 100?
Use each digit card once in the multiplication.

2 3 4

□□ × □ =

You can get within 8 of 100

$23 \times 4 = 92$ this is the closest answer.

$24 \times 3 = 72$

$32 \times 4 = 128$

$34 \times 2 = 68$

S

Multiplication

Year 4

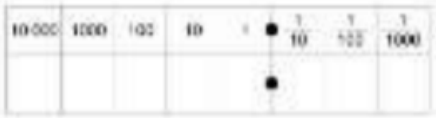
TH	H	T	U	t	h
Thousands	Hundreds	Tens	Units	Tenths	Hundredths
		8	0		

8 x 10 = 80

Placeholder

Multiply by 10, 100 and 1000

Use a place value grid to multiply by 10, 100 and 1000. Children should understand that the numbers move places – they don't add zeros.



E

Multiplication

Year 4

132 x 3 =

100s	10s	1s
100	10 10 10	1 1
100	10 10 10	1 1
100	10 10 10	1 1

300 + 90 + 6 = 396

Partitioning

24 x 3 =

20 4

20 x 3 = 60

4 x 3 = 12

72

56 x 5 =

50 6

50 x 5 = 250

6 x 5 = 30

280

E

Multiplication

Year 4

Expanded Column Multiplication

		4	7	
x			5	
		3	5	
	2	0	0	
	2	3	5	

		2	3	4	
x				3	
			1	2	
			9	0	
		6	0	0	
		7	0	2	

Compact Column Multiplication

		8	7	
x			3	
		2	6	1

7 x 3 = 21 - place the 1 in the ones column and place the 2 in the tens column.
3 x 8 = 24 - add the 2 that had been brought up to 24 to make this 26 and place this in the columns.

Reasoning and Problem Solving

Always, Sometimes, Never

If you write a whole number in a place value grid and multiply it by 10, all the digits move one column to the left.

Always.

Discuss the need for a placeholder after the new rightmost digit.

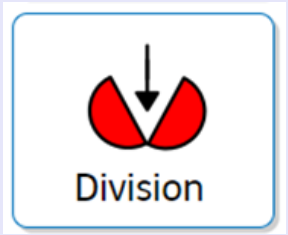
Alex completes the calculation:

$$43 \times 2$$

Can you spot her mistake?

	T	O
	4	3
×		2
		6
+		8
	1	4

Alex has multiplied 4 by 2 rather than 40 by 2



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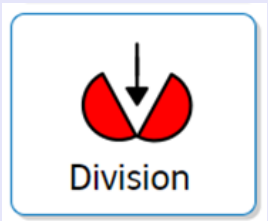
Year 3

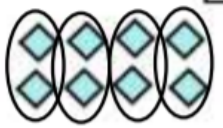


Sharing Objects

15 ÷ 3 = 5

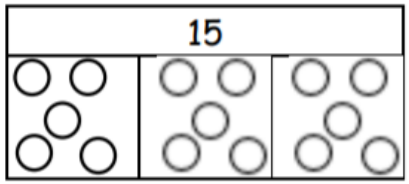
Grouping Objects

8 ÷ 2 = □



Bar Model

15 ÷ 3 =

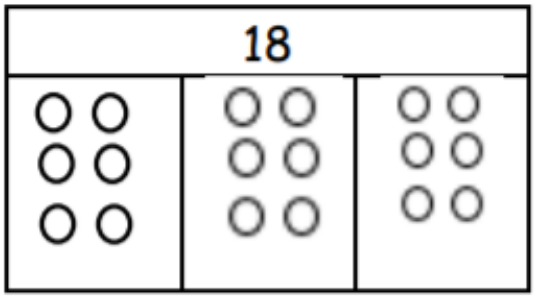


Inverse

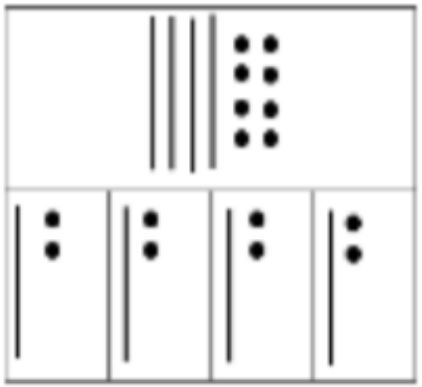
Use of times table knowledge and the inverse.
Eg. 5 x 4 = 20 so 20 ÷ 4 = 5
20 ÷ 5 = 4

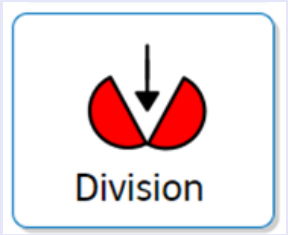
Sharing (Bar Model)

18÷3 =



48 ÷ 4 = 12

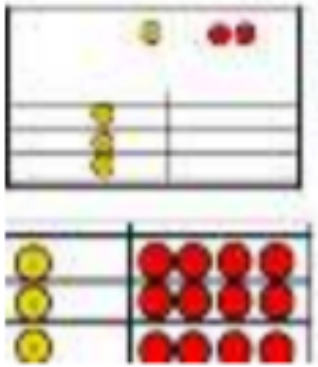




Year 3

Place Value Counters

42 ÷ 3= 14



1. Make 42. Share the 4 tens between 3. Can we make an exchange with the extra 10?

Exchange the ten for 10 ones and share out 12 ones

Reasoning and Problem Solving

Teddy answers the question 44 ÷ 4 using place value counters.

Tens	Ones
10 10	1 1
10 10	1 1

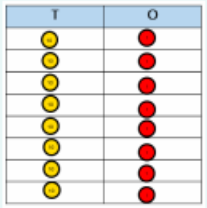
Is he correct?
Explain your reasoning.

Teddy is incorrect. He has divided 44 by 2 instead of by 4

Dora thinks that 88 sweets can be shared equally between eight people.

Is she correct?

Dora is correct because 88 divided by 8 is equal to 11



Alex uses place value counters to help her calculate 63 ÷ 3

Tens	Ones
10	10 1
10	10 1
10	10 1

She gets an answer of 12
Is she correct?

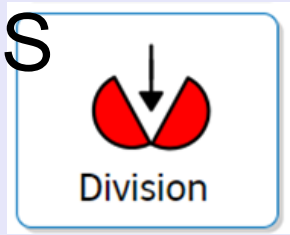
Alex is incorrect because she has not placed counters in the correct columns.

It should look like this:

Tens	Ones
10 10	1
10 10	1
10 10	1

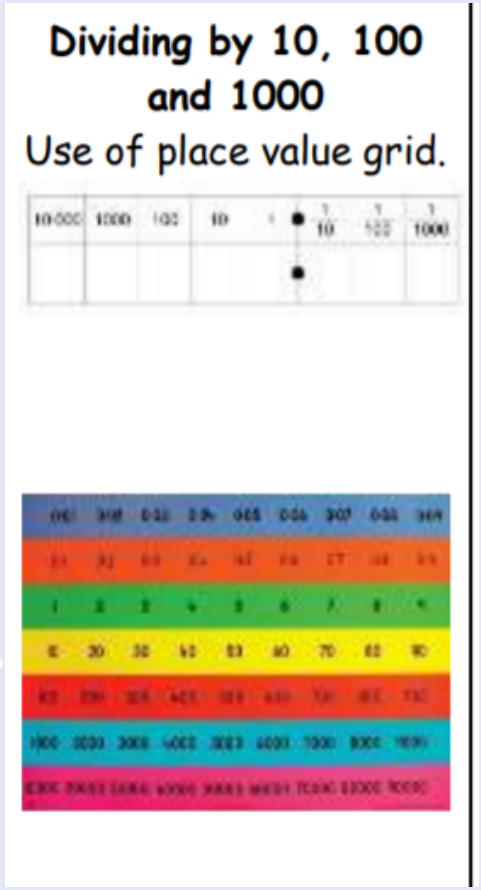
The correct answer is 21

S


Division

Year 4

TH
H
T
U
t
h
Thousands
Hundreds
Tens
Units
Tenths
Hundredths
8 0
8
80 ÷ 10 = 8


Dividing by 10, 100 and 1000
Use of place value grid.

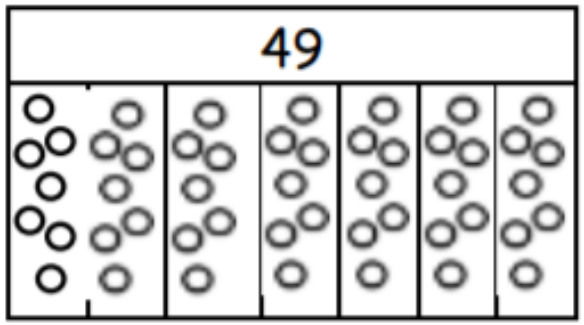
E

Division

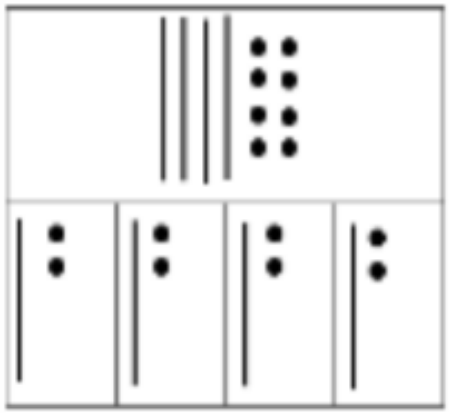
Year 4

Sharing (Bar Model)

49 ÷ 7 =

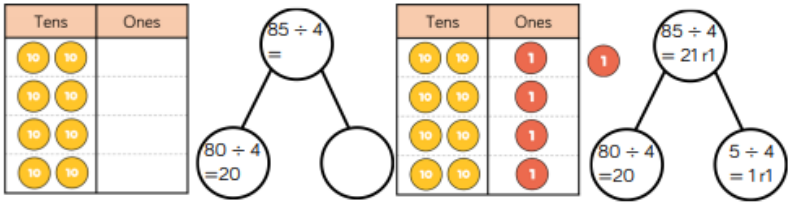


48 ÷ 4 = 12

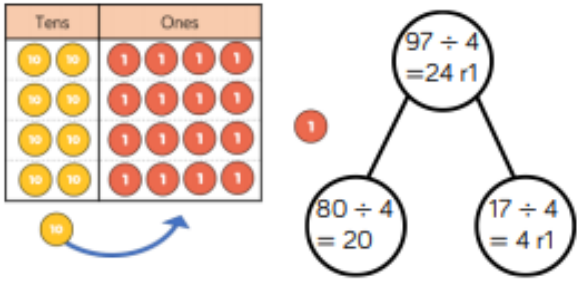


Teddy is dividing 85 by 4 using place value counters.

First, he divides the tens. Then, he divides the ones.



Exchange example:



E

Year 4

Related Division Facts

45 ÷ 5 = 9

450 ÷ 5 = 90

4500 ÷ 5 = 900

Expanded Method – Clear Multiple

5	4	5	3	0	
-	4	5	0	0	(900 x 5)
			3	0	
		-	3	0	(6 x 5)
				0	

Expanded Method – Unclear Multiple

			7	7	5
5	3	8	7	5	
-	3	5	0	0	(700 x 5)
		3	7	5	
-		3	5	0	(70 x 5)
			2	5	
-			2	5	(5 x 5)
				0	

Expanded Method – Unclear Multiple with Remainder

		1	0	5	8 r 2	
4	4	2	3	4		
-	4	0	0	0		(1000 x 4)
		2	3	4		
-		2	0	0		(50 x 4)
			3	4		
-			3	2		(8 x 4)
				2		

E

Division

Year 4

Bus Stop

54 ÷ 3 =

$$\begin{array}{r} 18 \\ 3\overline{)5^{2}4} \end{array}$$

85 ÷ 5 =

$$\begin{array}{r} 17 \\ 5\overline{)8^{3}5} \end{array}$$

74 ÷ 5 =

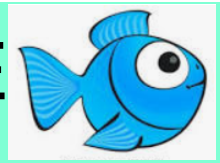
$$\begin{array}{r} 14\ r\ 4 \\ 5\overline{)7^{2}4} \end{array}$$

235 ÷ 5 =

$$\begin{array}{r} 47 \\ 5\overline{)2^{2}3^{3}5} \end{array}$$

267 ÷ 8 =

$$\begin{array}{r} 33\ r\ 3 \\ 8\overline{)2^{2}6^{2}7} \end{array}$$

E 

Reasoning and Problem Solving

While in Wonderland, Alice drank a potion and everything shrank. All the items around her became ten times smaller! Are these measurements correct?

Item	Original measurement	After shrinking
Height of a door	220 cm	2,200 cm
Her height	160 cm	16 cm
Length of a book	340 mm	43 mm
Height of a mug	220 mm	?

Can you fill in the missing measurement?

Can you explain what Alice did wrong?

Write a calculation to help you explain each item.

Height of a door
Incorrect – Alice has multiplied by 10.

Her height
Correct

Length of a book
Incorrect – Alice has swapped the order of the digits. When dividing by 10 the order of the digits never changes.

Height of a mug
22 mm.

37 sweets are shared between 4 friends. How many sweets are left over?

Four children attempt to solve this problem.

- Alex says it's 1
- Mo says it's 9
- Eva says it's 9 r 1
- Jack says it's 8 r 5

Can you explain who is correct and the mistakes other people have made?

Alex is correct as there will be one remaining sweet.
Mo has found how many sweets each friend will receive.
Eva has written the answer to the calculation.
Jack has found a remainder that is larger than the divisor so is incorrect.

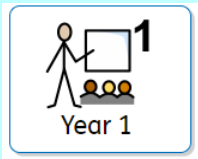
Recap!

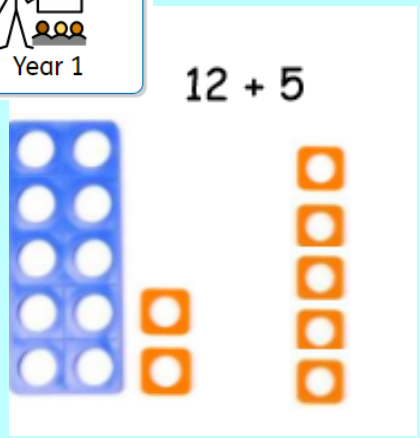
Why is progression in calculation important?

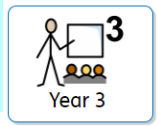
It gives the children the building blocks that they need to be successful in Mathematics and supports them to develop their calculation methods from EYFS to Year 6... and beyond!

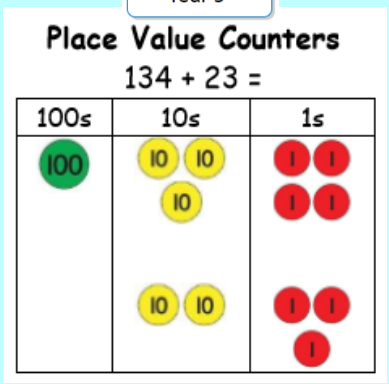
Recap!

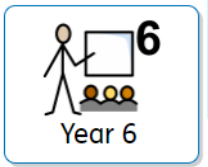
Why is progression in calculation important?

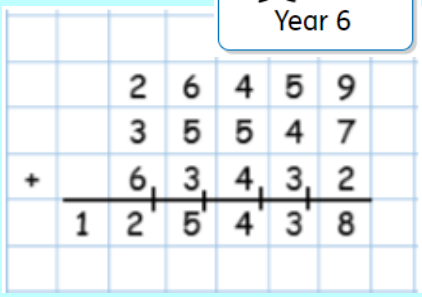












How can I continue to support my child/children with Maths calculation?

- Firstly, thank you - you are doing amazing job with supporting the children with their online/home learning!
- You can use the calculation progression document and follow the methods when supporting your children with Maths calculation.
- You can use the vocabulary on the calculation progression document when supporting your children.
- You can join our Maths lesson zooms to see the calculation methods that the children are learning that day!
- You can use the websites provided, that link to our calculation methods, if you want to do anymore Maths activities at home with your children!