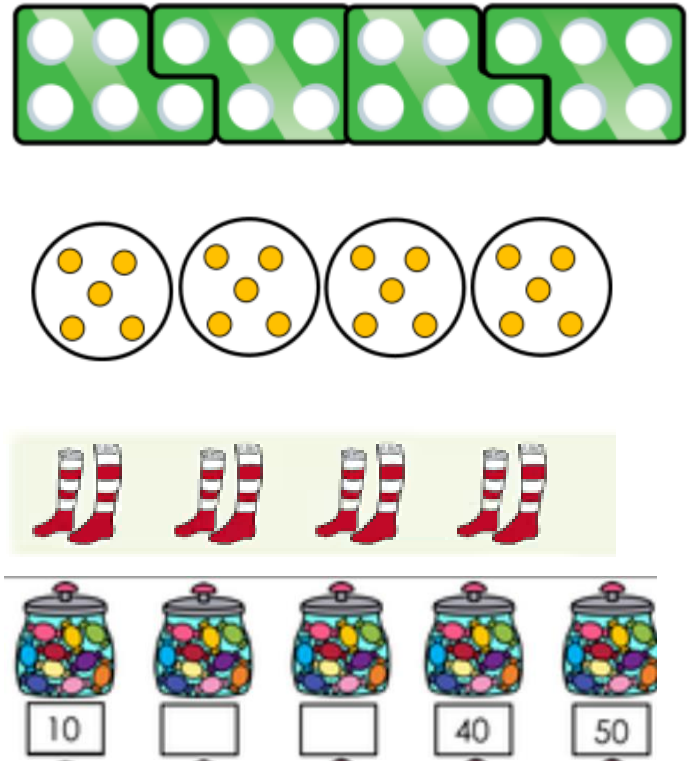
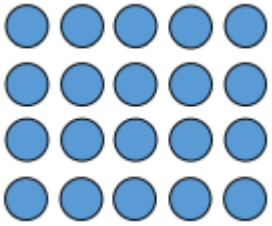
Gentleshaw Primary Academy

Representations and Formal Methods Calculation Policy 2023

Multiplication and Division

KS1 and KS2

Year 1 Multiplication

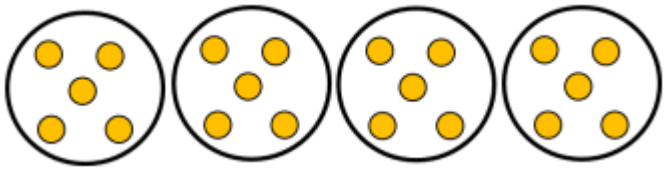
Representations	Formal Method	Skill
	 Year 2 readiness: Children build on their knowledge of describing equal groups to create arrays that represent the equal groups in rows and columns, using objects and counters.	Children represent multiplication as repeated addition in many different ways. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally. In Year 1, children should count forwards and backwards in 2s, 5s and 10s. Children begin by practically grouping objects and circling pictorial representations in groups. Children identify both equal and unequal groups and begin to describe equal groups. Children build on their knowledge of describing equal groups to include representing equal groups with bar models and then addition expressions. They then apply their skill of counting in steps to find the answer to addition expressions. Children build on their knowledge of describing equal groups to create arrays that represent the equal groups in rows and columns, using objects and counters. Children will learn to recall double facts within 20.

Year 2 Multiplication- Solve 1 step problems using multiplication.

Representations

4 groups of 2 or 2 group of 4.

3 groups of 5 or 5 groups of 3.



$5 + 5 + 5 + 5 = 20$

Repeated addition.

Formal Method

Using arrays

4 groups of 2.

4 x 2 =

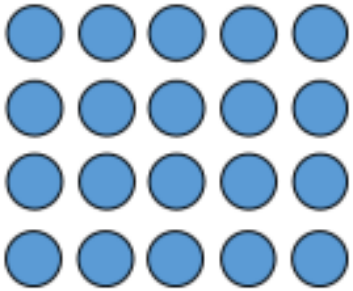
2 groups of 4

2 x 4 =

Problem solving context:

One bag holds 5 apples.
How many apples do 4 bags hold?

Use an array to represent:



Skill

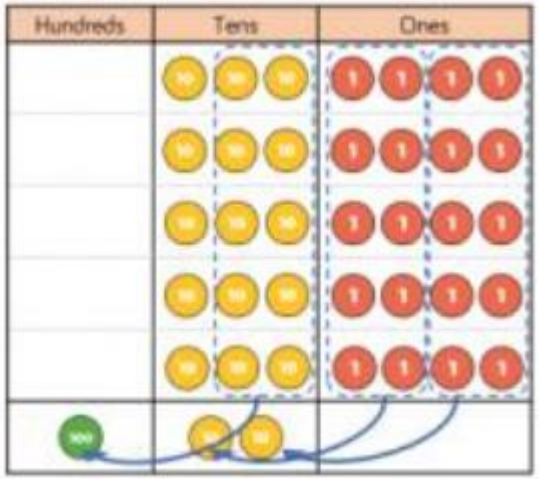
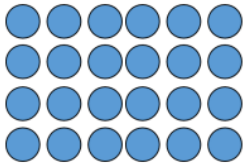
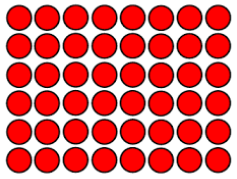
Children should confidently recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.

Children should be able to calculate mathematical statements within the multiplication tables and write them using the multiplication (×),and equals (=) signs.

Children should show that multiplication of 2 numbers can be done in any order (commutative).

Children should solve problems involving multiplication using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

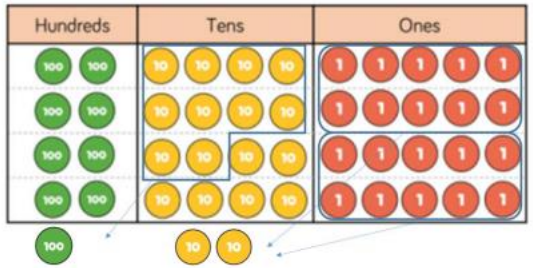
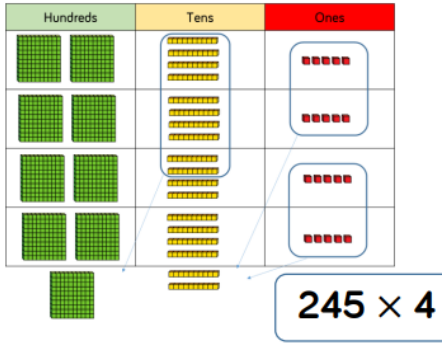
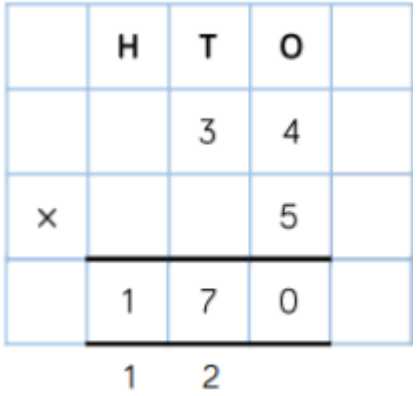
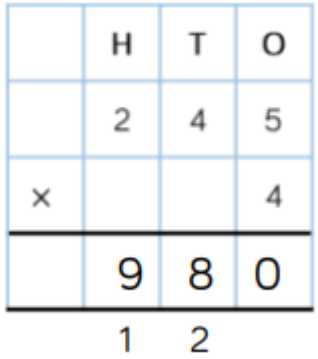
Year 3 Multiplication- Recall 3,4,6, and 8 times tables
Multiply 2 digit by 1 digit numbers

Representations	Formal Method	Skill
 34 x 5 = 5 groups of 35.	Use arrays and times tables recall to calculate 3s, 4s, 6s and 8s times tables.  6 x 4 or 4 x 6  8 x 6 or 6 x 8 Year 4 readiness: Informal methods and the expanded method are used in Year 3 before moving on to the short multiplication method in Year 4.	Children should 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.

	H	T	O		
		3	4		
×			5		
		2	0	(5 × 4)	
+	1	5	0	(5 × 30)	
	1	7	0		

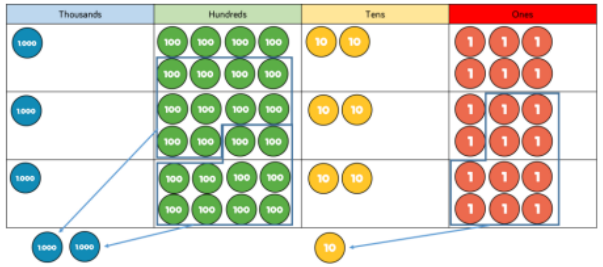
$34 \times 5 = 170$

Year 4 Multiplication
Multiply 2-digit numbers by 1-digit numbers
Multiply 3-digit numbers by 1-digit numbers

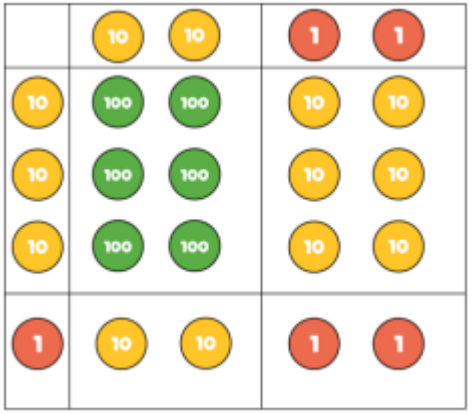
Representations	Formal Method	Skill
 	 2 digit x 1 digit  3- digit x 1 digit	By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work When moving to 3- digit by 1-digit multiplication, encourage children to move towards the short, formal written method. Base 10 and place value counters continue to support the understanding of the written method. Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.

Year 5 Multiplication- Multiply a 4 digit by a 1 digit number
Multiply 2- digit numbers by 2-digit numbers
Multiply 3-digit numbers by 2-digit numbers

Represenations



Multiply 2-digit numbers by 2-digit numbers



Formal Method

Multiply a 4 digit by a 1 digit number:

	Th	H	T	O
	1	8	2	6
×				3
	5	4	7	8
	2		1	

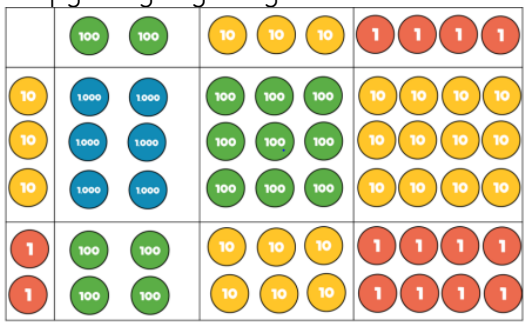
	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

Multiply 2-digit numbers by 2-digit numbers.

Skill

When multiplying 4- digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method. If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.

Multiply 3 digit by 2 digit numbers:



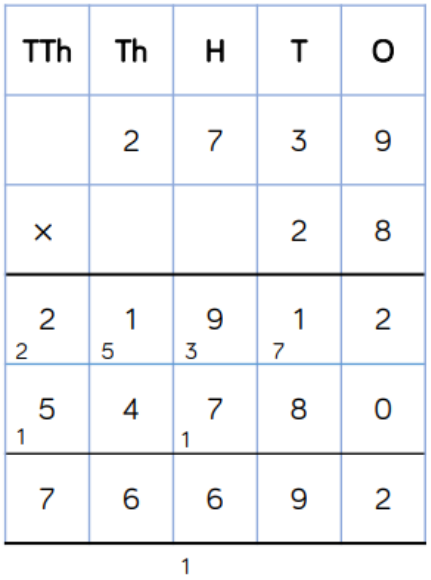
Multiply 3 digit by 2 digit numbers:

Th	H	T	O
	2	3	4
×		3	2
	4	6	8
$^{1}7$	$^{1}0$	2	0
7	4	8	8

Multiply 4-digit numbers by 2-digit numbers.

TTh	Th	H	T	O
	2	7	3	9
×			2	8
2 (2)	1 (5)	9 (3)	1 (7)	2
5 (1)	4	7 (1)	8	0
7	6	6	9	2
		(1)		

Year 6 Multiplication- Multiply 4 digit by 2 digit numbers
Multiply one-digit numbers with up to two decimal places by whole numbers.

	Formal Method	Skill
		When multiplying 4- digits by 2-digits, children should be confident in using the formal written method. If they are still struggling with times tables, provide multiplication grids to support when they are focusing on the use of the method. Consider where exchanged digits are placed and make sure this is consistent.

Multiply one-digit numbers with up to two decimal places by whole numbers.

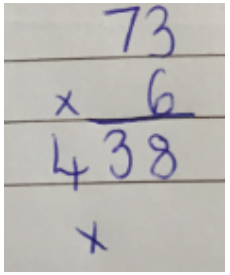
<u>For multiplying decimals: Example 1</u>

7.3 x 6

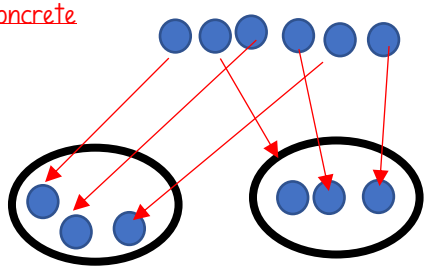
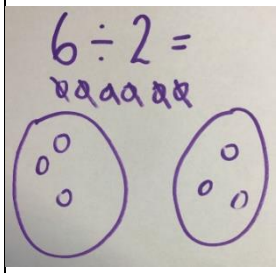
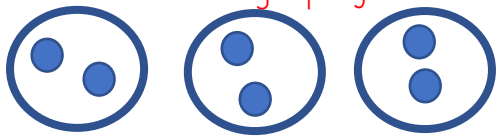
1) Round and estimate

7.3 rounds to 7

7 x 6 = 42

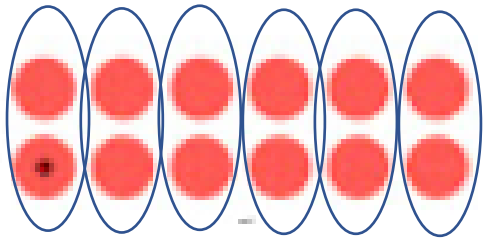
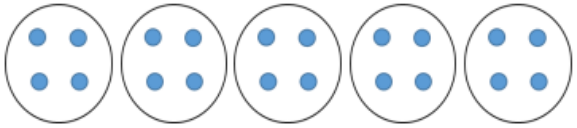
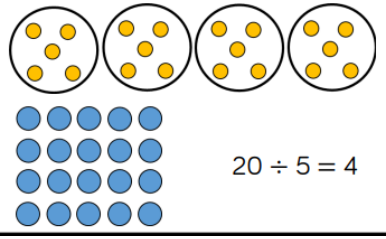
	2) Remove the decimal point and multiply 7.3 x 6 becomes 73 x 6  3) Decimal needs to be put back. How many numbers are there to right of the decimal point the original question? 7.3 x 6 So there needs to be one after the decimal in the answer. 438 = 43.8 4) Look back at your estimate. 42, is 43.8 a reasonable answer.	

Year 1 Division
Solve 1-step problems using multiplication (sharing)

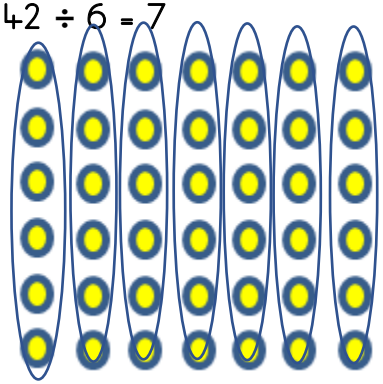
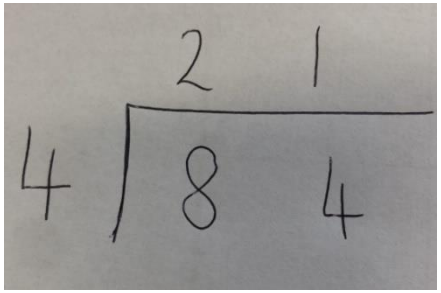
Representations	Formal Method	Skill
Children to use a range of concrete resources to to practically share.	Sharing- Share 6 biscuits between 2 children. Pictorial Concrete  Pictorial  Year 2 readiness Grouping- introduce when ready 6 ÷ 2 = 3 How many children will receive 2 biscuits each. How many groups of 2 are there in 6? There are 3 groups of 2 in 6. 	Children solve problems by sharing amounts into equal groups. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally

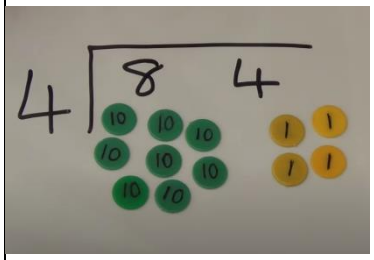
Year 2 Division

Solve 1-step problems using division (sharing and grouping)

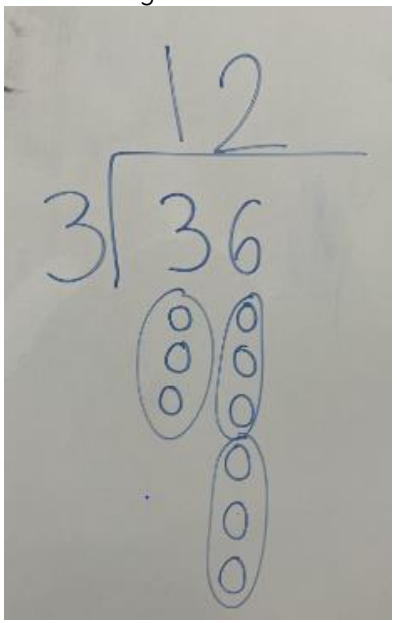
Representations	Formal Method	Skill
Concrete- Grouping 12 ÷ 2 = How many groups of 2 go into 12?  1 2 3 4 5 6	Sharing: There are 20 apples altogether. They are shared equally between 5 bags. How many apples are in each bag?  20 ÷ 5 = 4 Grouping: There are 20 apples altogether They are put in bags of 5. How many bags are there?  20 ÷ 5 = 4	Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.

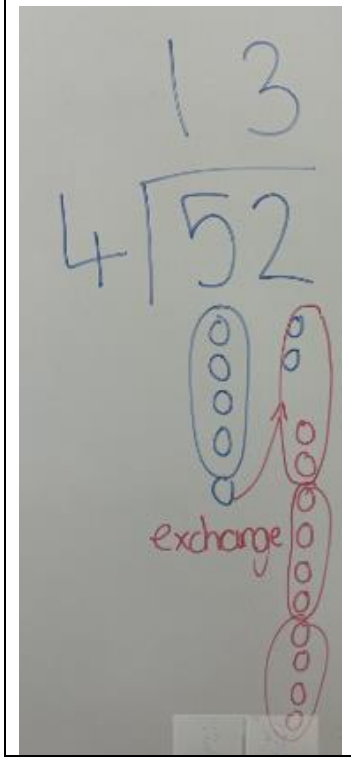
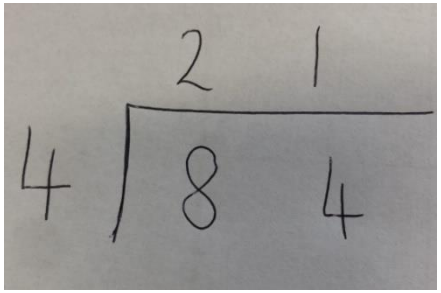
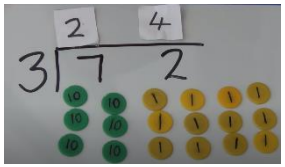
Year 3 Division
Recall division facts for 3,4,6,8x tables.
2-digits by 1-digit (grouping without remainders)

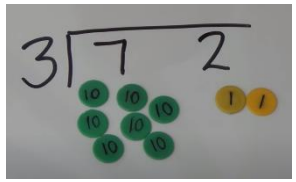
Representations	Formal Method	Skill
Concrete- 2 digit ÷ 1 digit when reliant on knowledge of multiplication facts. This method is to be used when using multiplication facts of up to 12 x 12. 42 ÷ 6 = 7  1 2 3 4 5 6 7 There are 7 groups of 6 in 42. Concrete- 2 digit ÷ 1 digit division using PV counters(without remainders). 84 ÷ 4 = 21	<u>Abstract- Recall of division facts at speed.</u> Year 4 readiness Abstract 2 digit ÷ 1 digit division using PV counters (without remainders) 84 ÷ 4 = 21 	**By the end of year 3, children need to be secure with the recall of 3,6,4,8 times tables.** By the end of year 3, children should be exposed to division of 2 digit ÷ 1 digit. This will be revisited in year 4 and therefore children do not need to be secure in this skill by the end of year 3. Exposure to this method concretely will support learning.

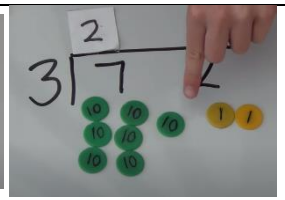


Encourage children to group to support understanding.

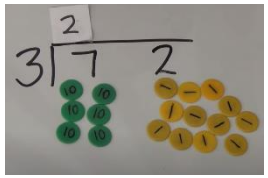


Year 4 Division Recall division facts for all times tables. 2 digit by 1 digit (with and without remainders) 3 digit by 1 digit (with and without remainders)		
Representations	Formal Method	Skill
	2 digit ÷ 1 digit division (without remainders) 84 ÷ 4 = 21  2 digit ÷ 1 digit division using PV counters (with exchanging without remainders) 72 ÷ 3 	By the end of Year 4 children are to recall all division facts for multiplication tables up to 12 x 12. Children should use concrete resources to solve 2 and 3 digit by 1 digit division (Year 5 readiness).



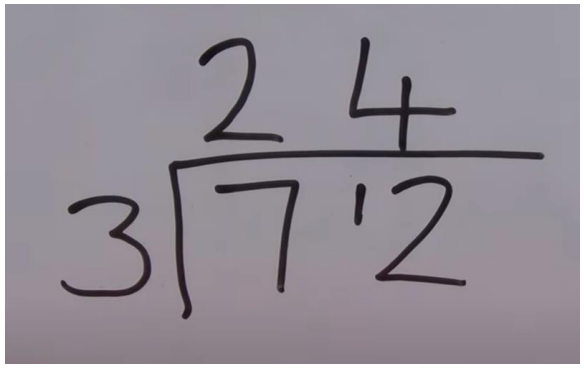


Repeat this with remainders.



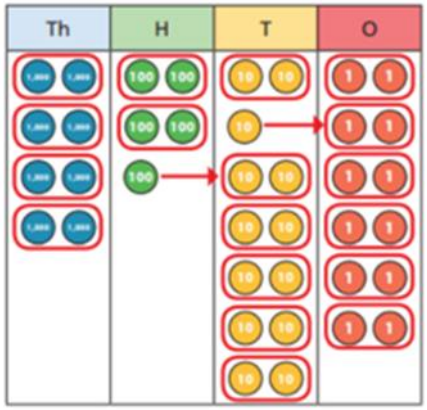
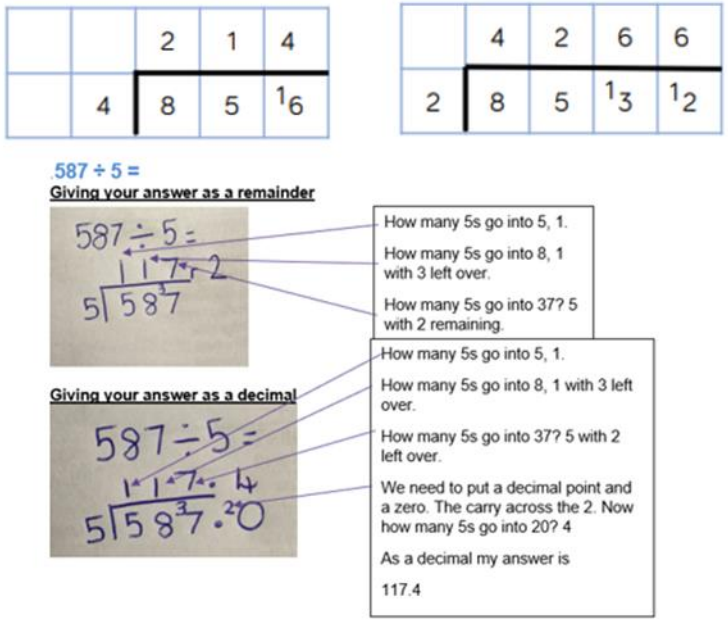
Abstract- 2 digit ÷ 1 digit division (with exchanging without remainders)

72 ÷ 3



Repeat this with remainders.

Year 5 Division- Divide 3 and 4 digit by 1-digit grouping. (Short division)

Represenations	Formal Method	Skill
		Children can continue to use grouping to support their understanding of short division when dividing a 3-digit number by a 1-digit number. Place value counters or plain counters can be used on a place value grid to support this understanding. Children can also draw their own counters and group them through a more pictorial method.

Year 6 Division
4 digit divided by a 2 digit number

Representations	Formal Method	Skill

1105 ÷ 13

$$13 \overline{)1105}$$

10	3	13
20	6	26
30	9	39
40	12	52
50	15	65
60	18	78
70	21	91
80	24	104
90	27	117
100	30	130

Step 1-

Partition the number 13 into 10 and 3, write the times tables out so that you have the 13 times table ready.

$$\begin{array}{r} 0 \\ 13 \overline{)1105} \end{array}$$

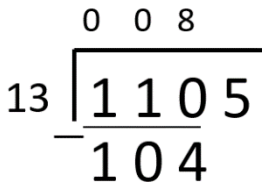
$$\begin{array}{r} 0\ 0 \\ 13 \overline{)1105} \end{array}$$

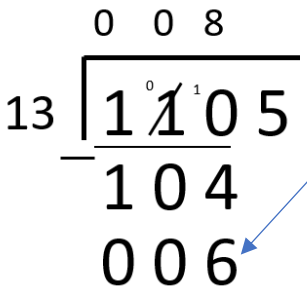
$$\begin{array}{r} 0\ 0\ 8 \\ 13 \overline{)1105} \end{array}$$

Step 2- How many 13s go into 1? 0 so extend your line, you are now looking at 11. How many 13s go into 11? 0 so the line continues.

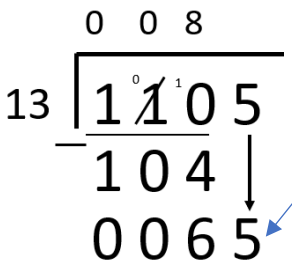
How many 13s go into 110? Look back at your 13 times tables. 8. To see what we have left over we are going to subtract carefully.

Subtract 104 from 110, to see what you have left over.





There is 6 left over

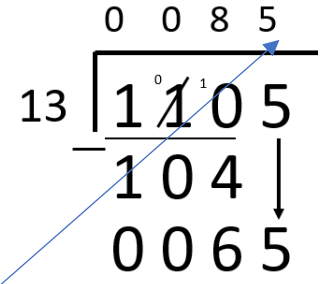


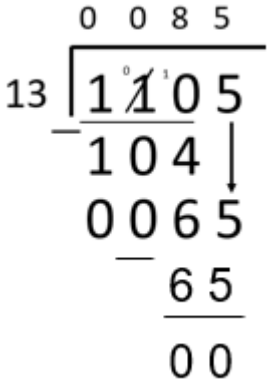
Drag the 5 down, you now need to work out how many 13s go into 65. Look back at your 13 times tables.

13 goes into 65 perfectly.

There are 5 13s in 65

Put your 5 above the bus stop.





The answer is 85. 1105 ÷ 13 = 85

Use the inverse to check.

Example 2

6864 ÷ 52

$$52\overline{)6864}$$

1) Put your calculation into the bus stop. Write your 52 times table as shown here, partitioning the tens and ones into 50 and 2.

50	2	52
100	4	104
150	6	156
200	8	208
250	10	260
300	12	312
350	14	364
400	16	416
450	18	468
500	20	520

$$\begin{array}{r} 0 \\ 52\overline{)6864} \end{array}$$

2) How many times can 52 go into 6? 0 extend your line. You are now working out how many times 52 can go into 68.

One group of 52 can go into 68, to calculate what is left over, subtract carefully. There is 16 left over.

$$\begin{array}{r} 01 \\ 52\overline{)6864} \\ -52 \\ \hline 16 \end{array}$$

$$\begin{array}{r} 01 \\ 52\overline{)6864} \\ -52\downarrow \\ \hline 166 \end{array}$$

3) Drag down your 6, you are now looking at how many times 52 goes into 166?

4) Look back at your 52 times table. 2 groups of 52 go into 166, so carefully subtract 156 to see what you have left over. You have 10 left over.

$$\begin{array}{r} 013 \\ 52\overline{)6864} \\ -52\downarrow \\ \hline 166 \\ -156 \\ \hline 10 \end{array}$$

5) Drag down the 4, how many times does 52 go into 104? It goes in exactly twice. Put your 2 above your bus stop.

6864 ÷ 52 = 132

Us the inverse to check.

$$\begin{array}{r} 0132 \\ 52\overline{)6864} \\ -52\downarrow \\ \hline 166\downarrow \\ -156 \\ \hline 104 \\ -104 \\ \hline 000 \end{array}$$