Released December 2017

Year 4

Small Steps Guidance and Examples

Block 1 – Multiplication & Division

White Rose Maths

Year 4 – Yearly Overview

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number – Place Value				Number- Addition and Subtraction			Measurement - Length and Perimeter	Number- Multiplication and Division			Consolidation
Spring	Number- Multiplication and Division			Measurement - Area	Fractions				Decimals			Consolidation
Summer	Decimals		Measurement- Money		Time	Statistics		Geometry- Properties of Shape			Geometry- Position and Direction	Consolidation

Overview

Small Steps

- 11 and 12 times-table
- Multiply 3 numbers
- Factor pairs
- Efficient multiplication
- Written methods
- Multiply 2-digits by 1-digit
- Multiply 3-digits by 1-digit
- Divide 2-digits by 1-digit (1)
- Divide 2-digits by 1-digit (2)
- Correspondence problems

NC Objectives

Recall and use 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.

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.

11 and 12 Times-table

Notes and Guidance

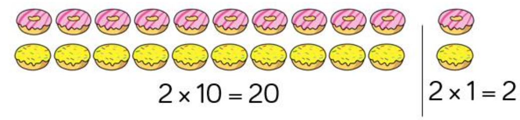
Building on their knowledge of the 1, 10 and 2 times tables, children will explore the 11 and 12 times tables through partitioning.
Encourage children to notice patterns within and between the 11 and 12 times tables.
They will use concrete materials to build representations of the multiplication facts and make links between these and division facts.

Mathematical Talk

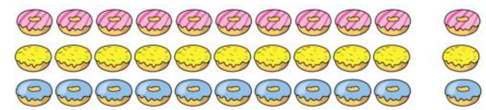
Draw an image for the statement:
$4 \times 10 + 4 \times 1 =$ ______ $\times$ ______
Can you write more of these statements for the 12 times tables?
Can you spot any patterns between the eleven and twelve times tables? Why do you think this happens?
Can you represent $88 \div 8$ using a bar model? What's the same and what's different about this bar model and the one for $88 \div 11$?

Varied Fluency

1. Fill in the blanks:

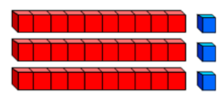
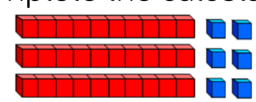


2 lots of 10 add 2 lots 1 is the same as 2 lots of ______ .



3 lots of 10 add 3 lots of 1 = ____ $\times$ 11

2. Using maths equipment, build and record the eleven and twelve times tables, then complete the calculations:

 $3 \times 11 = 33$  $3 \times 12 = 36$

$1 \times 11 = \square$	$55 \div 11 = \square$	$\square \times 12 = 24$	$60 \div 12 = \square$
$22 \div 11 = \square$	$6 \times 11 = \square$	$3 \times 12 = \square$	$\square \times 12 = 72$
$\square \times 11 = 33$	$10 \times 11 = \square$	$12 \div 12 = \square$	$8 \times 12 = \square$
$99 \div 11 = \square$	$121 \div 11 = \square$	$4 \times 12 = \square$	$9 \times 12 = \square$

11 and 12 Times-table

Reasoning and Problem Solving

In each batch of muffins, 3 are strawberry flavoured.
Tim wants 36 strawberry flavoured muffins.
How many batches would he need?
How many muffins would Tim have altogether?
Explain your answer.

Tim would need 12 batches to have 36 strawberry muffins because 3 lots of 12 is 36

Tim would have 144 muffins altogether because 12 x 12 is 144

Sarah used a bar model to show 88 ÷ 11.
Explain Sarah's mistake.

88										
11	11	11	11	11	11	11	11	11	11	11

Can you represent 88 ÷ 11 using a bar model correctly?

Sarah has 11 lots of 11 which would be 121

To divide 88 into 11 equal groups, there would be 8 in each group.

Multiply 3 Numbers

Notes and Guidance

They use their knowledge that multiplication is commutative to find the most efficient order in which to multiply three single digit numbers.
For example, $2 \times 7 \times 5 = 2 \times 5 \times 7$
Children are introduced to the 'Associative Law' where they can group the numbers they would prefer to calculate first and explore the most efficient way to group the calculation.

Mathematical Talk

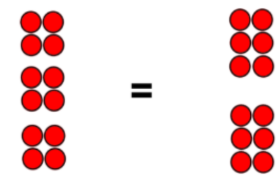
What calculation do the cubes represent? If you rearrange the cubes, what calculation do the cubes represent? What is the same? What is different?
Can you use counters to build your calculation? What do you notice?
What does commutativity mean? Would it work for division? Why?
Which would you prefer to calculate mentally 8×3 or 12×2? Why?

Varied Fluency

1. Complete the table.

	
I have ____ lots of ____ 3 times.	I have ____ lots of ____ twice.
____ × ____ × ____	____ × ____ × ____
8 × 3	12 × ____

2. Complete the calculations.
Using counters, create your own examples and record the calculations.



___ × ___ × ___ = ___ × ___ × ___

___ × ___ = ___ × ___

3. Choose 3 single digit cards. Arrange them to create a multiplication calculation and work out the answer.

$\boxed{} \times \boxed{} \times \boxed{} =$

Rearrange the cards to create 2 different calculations.
What do you notice about the three answers?

Multiply 3 Numbers

Reasoning and Problem Solving

Tom records this in his maths book:

$6 \times 3 \times 5 > 3 \times 5 \times 6$

He says,

6 × 3 × 5 is larger because the first calculation starts with a 6 which is larger than the first number in the second calculation.

Do you agree with Tom?
Prove why.

Tom is wrong because both answers are equal. Children could prove it using commutative law.
$6 \times 3 \times 5 = 90$
$3 \times 5 \times 6 = 90$

Make the target number of 84 using three of the digits below.

7	5	3	4	6	2

____ × ____ × ____ = 84

Multiply the remaining three digits together, what is the product of the three numbers?

Is the product smaller or larger than 84?
Can you complete this problem in more than one way?

Possible answers:

$7 \times 2 \times 6 = 84$

$4 \times 3 \times 5 = 60$

60 is smaller than 84

$7 \times 3 \times 4 = 84$

$2 \times 6 \times 5 = 60$

60 is smaller than 84

Children may also show the numbers in different orders.

Factor Pairs

Notes and Guidance

Children use counters initially to create arrays as a way of exploring factor pairs.
They develop their understanding of factor pairs alongside systematic recording of factors.
E.g. Factor pairs for 12 - begin with 1×12, 2×6, 3×4.
At this stage, children should recognise that they have already used 4 in the previous calculation and therefore all factor pairs have been identified.

Mathematical Talk

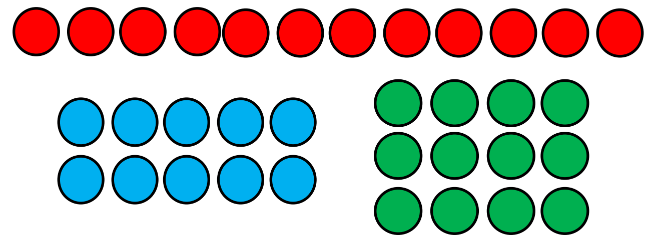
Are there any other factor pairs for 12?

Can you prove this using arrays?

Do you notice a number that always appears when finding factor pairs?

Varied Fluency

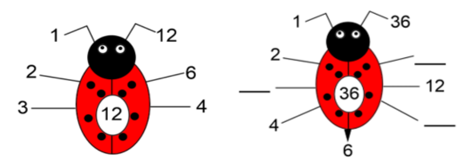
1. What factor pairs for 12 do these arrays show?



Use counters to create arrays for 24. How many factor pairs can you find?

2. Here is an example of a factor bug.
Complete the factor bug for 36.

Draw your own factor bugs for 16, 48, 56 and 35.

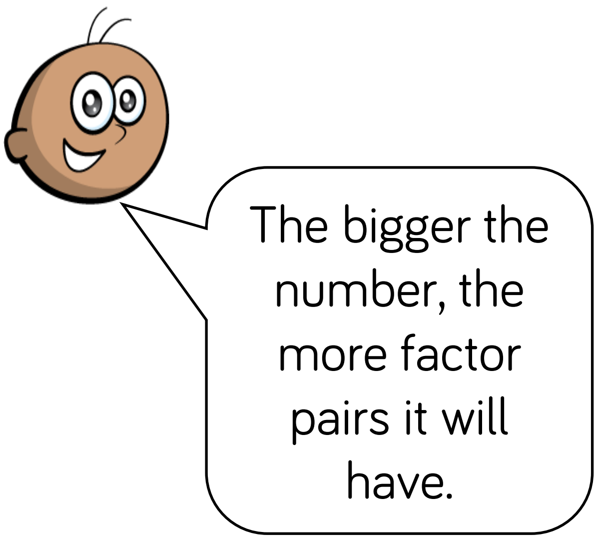


3. Complete the sentences.

42 has ____ factors.
The factors of 42 are ____________________.

Factor Pairs

Reasoning and Problem Solving

Ismail says,  Do you agree? Draw or make arrays to prove your answer.	No. For example, $12 = 1 \times 12$, 2×6, 3×4 $19 = 1 \times 19$

Some very special numbers are equal to the sum of all of their factors (but not including the number itself). 6 is a special number. The sum of its factors: $1 + 2 + 3$ equal 6 Can you work systematically to find the next number that this works for?	28
An even number always has an even number of factor pairs and an odd number always has an odd number of factor pairs. Is this true or false? Prove it.	False. 15 is an odd number, it has two factor pairs- 1×15 and 3×5 12 has three pairs of factors- 1×12, 2×6 and 3×4.

Efficient Multiplication

Notes and Guidance

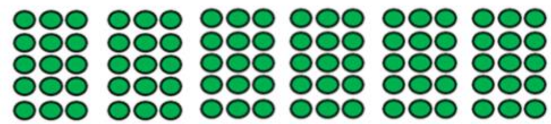
Children build on their understanding of factor pairs to expand calculations. They then apply their understanding of commutative and associative law to find the most efficient way to solve a problem.
Children also partition 2 digit numbers and combine multiplication with addition and subtraction to solve calculations.

Mathematical Talk

Which is easier to do? $5 \times 6 \times 3$? $3 \times 6 \times 8$?
Why is $3 \times 5 \times 6$ not the most efficient?
If we know what 2×4 is, how do we know what 20×4 is?
What's the same and what's different about the images?
How else could we solve 99×9? E.g. $100 \times 9 - 9$
$30 \times 9 + 60 \times 9 + 9$

Varied Fluency

1. We can use our knowledge of factors to help us solve 15×6

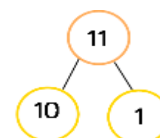


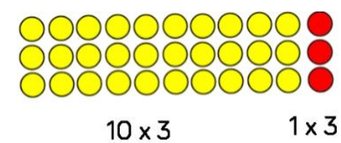
15×6

$3 \times 5 \times 6$

We have ____ lots of ____ × _____
The question becomes $3 \times 5 \times 6$
How could you use this to help you work out the answer?

2. 11×3

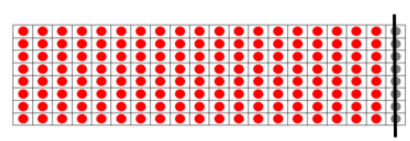




Ten lots of 3 = _______ One lot of 3 = _______
Eleven lots of 3 = __________
11×3 = _____ × 3 + 3
____ × 3 + _____ × 3 = 11×3

Use this method to solve:
21×5 31×6 7×22

3. $19 \times 8 = 20 \times 8 - 1 \times 8$



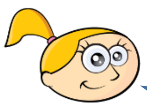
How could we use this method to solve 29×8?
Use this method to solve 19×4, 39×7, 48×4

Efficient Multiplication

Reasoning and Problem Solving

Three children worked out 28 × 5

Molly says,



I did 28 × 10, then halved it to get 140

Nisha says,

I halved 28 to get 14 and doubled 5 to get 10. Then I did 14 × 10, which is the same as 28 × 5

Harry says,

I did 30 × 5 which equals 150, then subtracted 2 × 5 to get 140

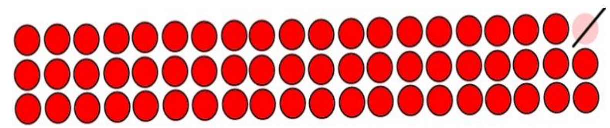
Which method would you use and why?
Can you think of another method?
Use your preferred method to calculate 42 × 5

Children's responses will vary, encourage all children to justify why the prefer their method and discuss its efficiency.

Other possible method could be partitioning the two-digit number:
20 × 5 = 100
8 × 5 = 40
100 + 40 = 140

42 × 5 = 210

Daisy has calculated 19 × 3



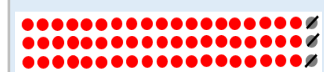
20 × 3 = 60
60 – 1 = 59
19 × 3 = 59

Can you explain her mistake and correct the diagram?

Daisy has subtracted one, rather than one lot of 3. She should have done

20 × 3 = 60

60 – 1 × 3 = 57



Written Methods

Notes and Guidance

Children use their understanding of repeated addition to represent a two-digit number multiplied by a one-digit number with concrete manipulatives.

They also apply their understanding of partitioning to represent and solve calculations.
Children then move on to explore multiplication with exchange.

Mathematical Talk

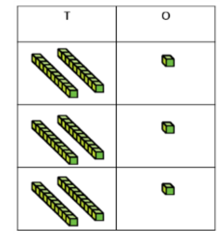
What is the value of each digit in my calculation?

Will this calculation involve an exchange?

In which column will the exchange take place?

Varied Fluency

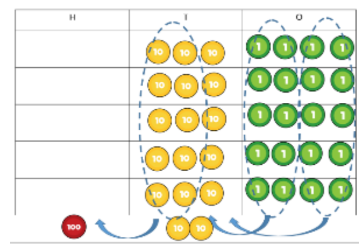
1. There are 21 chocolate bars in each vending machine.
How many chocolate bars are there in 3 vending machines?



	T	O	
	2	1	
×		3	
		3	(3 × 1)
+	6	0	(3 × 20)
	6	3	

Use this method to solve
22×3 $\quad 12 \times 4$ $\quad 33 \times 3$

2. Tamsin uses place value counters to calculate 5×34



	3	4	
	x	5	
	2	0	(5 × 4)
1	5	0	(5 × 30)

Use Tamsin's method to complete:
5×42 $\quad 23 \times 6$ $\quad 48 \times 3$

3. There are 76 sweets in a bag.
I buy 3 bags.
How many sweets do I have in total?

Written Methods

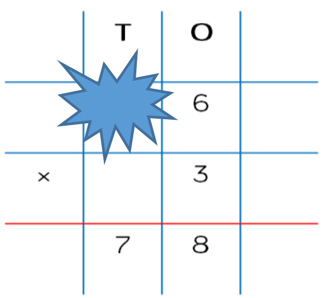
Reasoning and Problem Solving

Grace answered the question 35 × 3, her answer is 9015

Can you explain the mistake she may have made?

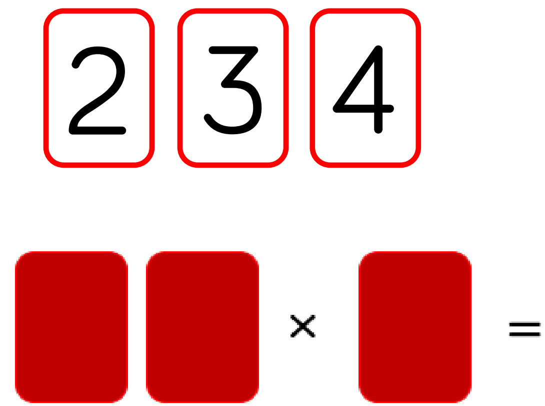
Grace has multiplied 3 by 5 giving an answer of 15. She has then multiplied 30 by 3 giving an answer of 90. She has then put the two numbers together to make 9015, rather than adding 15 and 90 to get the answer 105

Nicky thinks the value of the digit under the splat is 2.
Do you agree?



Nicky is incorrect because the value of the digit is 20, the 2 represents 2 tens.

Using the digit cards in the multiplication below how close can you get to 100?



23 × 4 = 92 this is the closest answer.

24 ;× 3 = 72

32 × 4 = 128

34 × 2 = 68

Children may also use estimation as part of their reasoning. For example, 23 is near 25 and there are 4 lots of 25 in 100

Multiply 2-digits by 1-digit

Notes and Guidance

Children move from expanded multiplication to the short multiplication method.

They begin with no exchange and then use their knowledge of place value and exchange in addition to show what happens when there are 10 ones or tens in a column.

Mathematical Talk

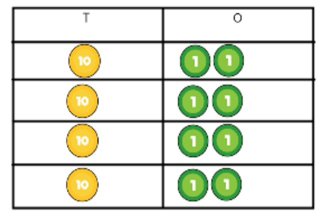
Which digit should we start with; the ones or the tens? Does it matter?

Which calculations need an exchange? How can you tell?

Where do we write the number that we are exchanging?

Varied Fluency

1. Calculate 12×4
   Use place value counters and the formal method.



	1	2
x		4

2. Calculate:

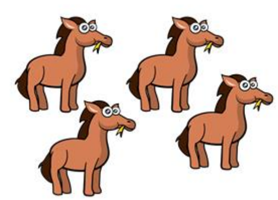
	4	3
x		3

	3	6
x		4

	7	4
x		5

	3	9
x		$\square$
1	$\square$	6

3. Each horse eats 37 carrots a day. How many do they eat altogether?



Multiply 2-digits by 1-digit

Reasoning and Problem Solving

Here are three multiplications.

		6	1
x			5
		3	5

		7	4
x			7
	4	9	8

		2	6
x			4
	8	2	4

Correct the multiplications.

		6	1
x			5
	3	0	5

		7	4
x			7
	5	1 [2]	8

		2	6
x			4
		8	4

Tom baked muffins in a tray like this.

Tom wasn't sure how many he baked, but he used 27, 28 or 29 tins!

When he counted them there were 174 muffins. How many tins did he use?

Tom used 29 tins.

		2	9
x			6
	1	7	4

Always, sometimes, never

- When multiplying a two-digit number by a one-digit number, the answer has 3 digits.
- When multiplying a two-digit number by 8 the answer is odd.
- When multiplying a two-digit number by 7 you need to exchange.

Prove it!

Sometimes: 12 × 2 has only two digits; 23 × 5 has three digits.

Never: all multiplications by 8 are even.

Sometimes: most two-digit numbers need exchanging, but not 10 or 11

Multiply 3-digits by 1-digit

Notes and Guidance

Children build on previous steps to represent a three-digit number multiplied by a one-digit number with concrete manipulatives.
Teachers should be aware of misconceptions arising from 0 in the tens or ones column.
Children then move on to explore multiplication with exchange in first one column and then more than one column.

Mathematical Talk

Why is it important to set out using columns?

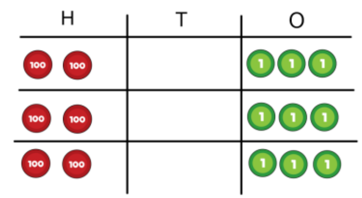
What happens when there is a 0 in the ones column, tens column or hundreds column?

Explain the value of each digit in your calculation.

What do we do if there are ten counters in a column?

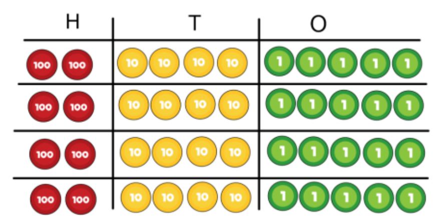
Varied Fluency

1. Complete the calculation



H	T	O
2	0	3
×		3

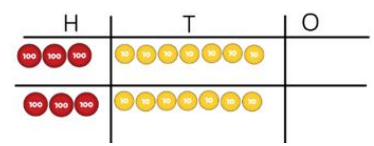
2. A school has 245 packets of sweets.
Each packet contains 4 sweets.
How many sweets are there altogether?



H	T	O
2	4	5
×		4

Use the place value counters to solve the problem.
Remember, if there are ten or more counters in a column, to make an exchange.

3. Write the multiplication calculation represented and find the answer.



Multiply 3-digits by 1-digit

Reasoning and Problem Solving

Spot the mistake

Beth and Natasha have both completed the same multiplication. Who has the correct answer?
What was the misconception that caused the error?

Beth

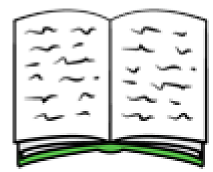
	2	3	4
	x		6
1,	2	0	4

Natasha

	2	3	4
	x		6
1,	4	0	4

Beth didn't exchange 20 tens for 2 hundreds.

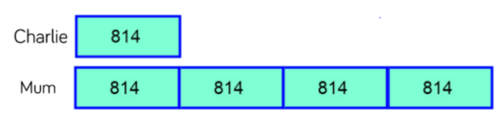
Charlie and his mum were having a reading competition.
In one month, Charlie read 814 pages.



His mum read 4 times as many pages as Charlie.

- How many pages did they read altogether?
- How many less pages than his Mum did Charlie read?

Use a bar model to help.



814 × 5 = 4,070

814 x 3 = 2,442

Divide 2-digits by 1-digit (1)

Notes and Guidance

Children build on their knowledge of dividing a two-digit number by a one-digit number from Year 3 by sharing into equal groups.

Children use examples where the tens and the ones are divisible by the divisor. For example, 96 divided by 3, 84 divided by 4 and 85 divided by 5

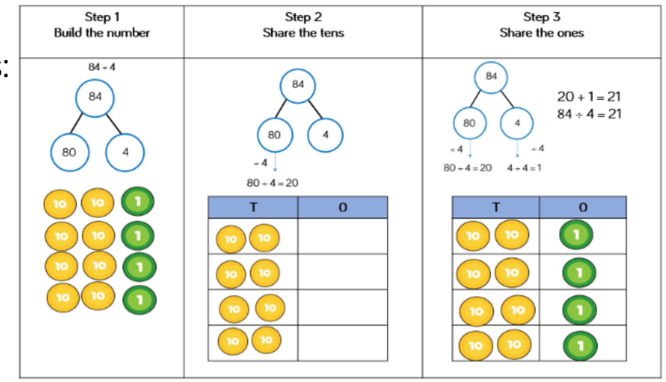
Mathematical Talk

How can we partition 84? What are we sharing it by? What is the divisor?
If I cannot share the tens equally, what do I need to do?
How many ones will I have after exchanging the tens?

If we solve 96 ÷ 8 = , 96 ÷ 4 = , 96 ÷ 6, what's the same, what's different? Can we notice a pattern? Which one is the odd one out? Why?

Varied Fluency

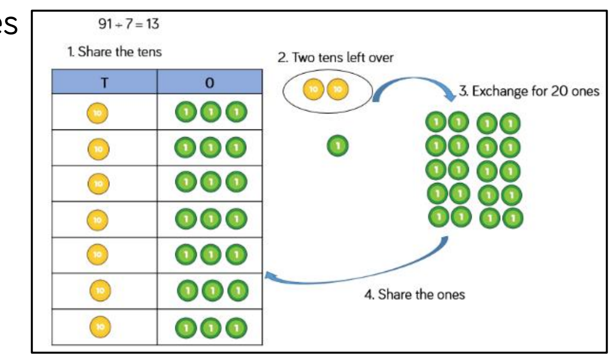
1. Charlie solves 84 ÷ 4 like this:



Use this approach to solve:

69 ÷ 3   88 ÷ 4   96 ÷ 3

2. Charlie now solves 91 ÷ 7 like this:



Use this approach to solve:

75 ÷ 5   84 ÷ 6   68 ÷ 4   98 ÷ 7

Divide 2-digits by 1-digit (1)

Reasoning and Problem Solving

Macey is working out 72 ÷ 3.
Before she starts, she says the calculation will involve an exchange.

Do you agree?
Explain why.

Macey is correct because 70 is not a multiple of 3 and if you try to share 7 tens between three you cannot do it equally. This is when she will need an exchange.

True or false?

The calculations below all have the same divisor.

57 ÷ ____ = 19
72 ÷ ____ = 18
85 ÷ ____ = 17

False because…
57 ÷ 3 = 19
72 ÷ 4 = 18
85 ÷ 5 = 17

72 can also be divided equally by 3 and children may investigate this.

The children in Year 4 are checking their friend's method.
Who do you agree with and why?

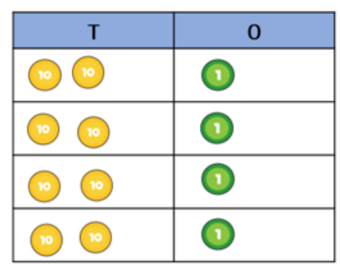
This is correct because there are three columns of counters.
Nathan

This is correct because there are three counters in each row.
Adil

This is incorrect because 84 is shared by 4, not 3.
Jakob

This is incorrect because the answer is not 21.
Nelly

84 ÷ 3



Possible response:
I agree with Jakob because the counters have been shared between four groups when they should have been shared between three. Nelly is also correct but hasn't explained why.

Divide 2-digits by 1-digit (2)

Notes and Guidance

Children explore dividing two-digit numbers by one-digit numbers involving remainders.

They use the sharing method used in the previous steps to explore what happens when there are remainders.

Children will also understand that remainders are a part of the whole divisor left over.

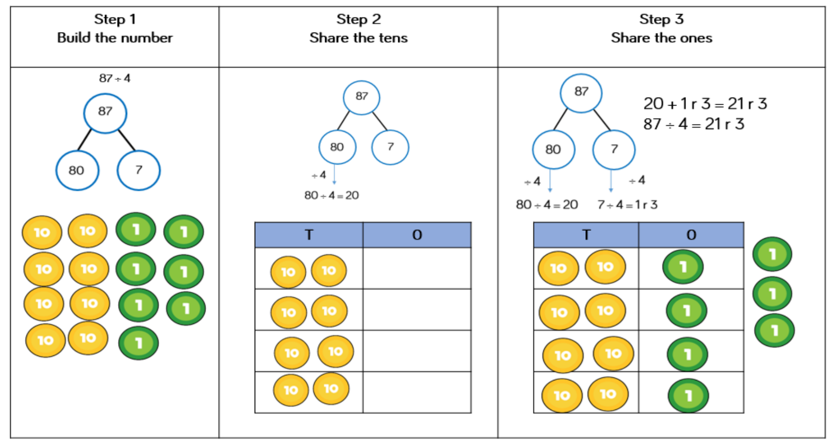
Mathematical Talk

In the calculation 87 ÷ 4, what is the divisor (4) and what is the dividend (87)? How do these help us with our method?

What is a remainder? What does this tell us?

Varied Fluency

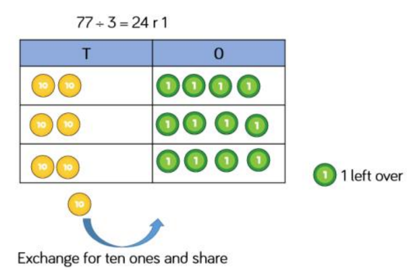
1. Phoebe solves 87 ÷ 4 using this approach



Solve the following in the same way:

95 ÷ 3 =   67 ÷ 3 =   81 ÷ 4 =

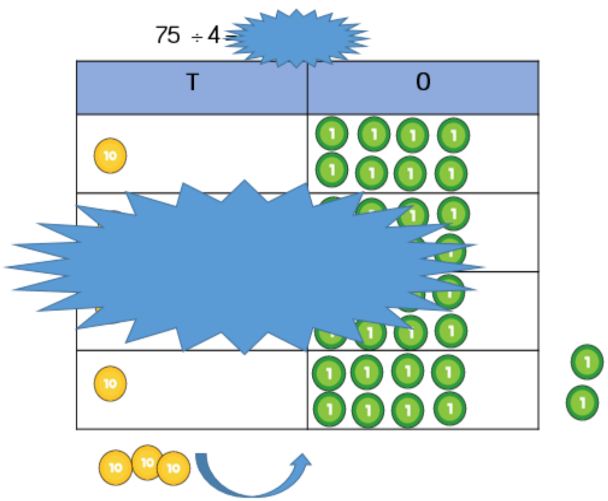
2. Phoebe uses the same approach but this time her calculations involve an exchange.
Solve these in the same way:
- 97 ÷ 7 =
- 85 ÷ 3 =
- 97 ÷ 4 =



Divide 2-digits by 1-digit (2)

Reasoning and Problem Solving

Sian has the calculation 85 ÷ 3 = 28 r 1 She says 85 must be 1 away from a multiple of 3 Do you agree?	I agree, remainder 1 means there was 1 left over. There are 3 groups of 28 but 1 is left over. The multiple of 3 must be 84
76 sweets are shared between 4 friends. How many sweets will be left over? Four children attempt to solve this question. • Alex says it's 1 • Ben says it's 9 • Charlotte says it's 9 r 1 • Damien says it's 10 Can you explain who is correct and the mistakes other people have made?	Possible response: Alex is correct as there will be one remainder and the question asks how many sweets will be left over.

Jasmine thinks she can't use the image below to work out the calculation. Do you agree?  	Possible response: I disagree. You can see there are 18 in each group or row. There are also two left over which must mean 75 ÷ 4 = 18 r 2

Divide 3-digits by 1-digit

Notes and Guidance

Children apply their previous knowledge of division to divide a 3 digit number by a 1 digit number.

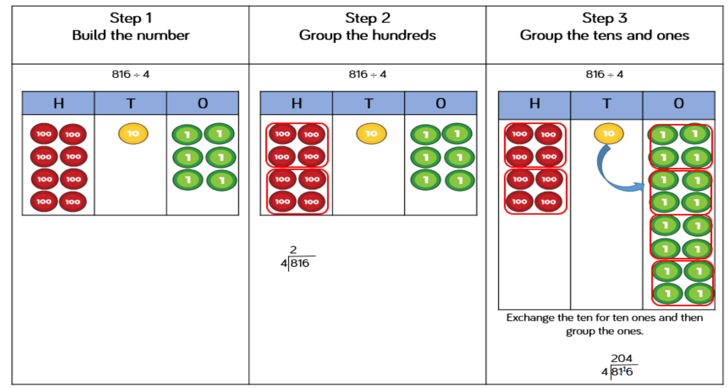
They will be using a variety of manipulatives and approaches to find the most efficient method.

Mathematical Talk

What is the same and what's different when we are dividing 3 digit number by a one digit number and a two digit number by a one digit number?
How does our written calculation show what we are doing?
If I cannot make a group in a column, what should I do?
How can we partition a number to help us divide?
If we do the same calculation with place value counters, is it the same? What is different?

Varied Fluency

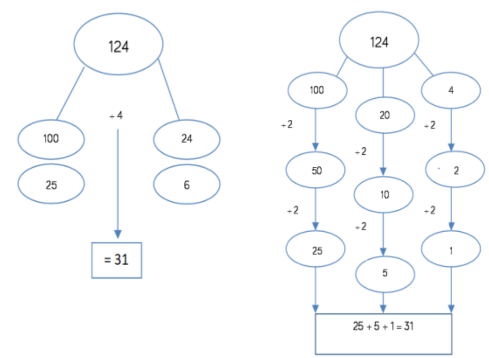
1. Karen solves this calculation 816 ÷ 4 and represents it like this:



Use this method to solve:

678 ÷ 3 =   791 ÷ 7 =   216 ÷ 4 =

2. Erin uses partitioning and the part whole model to help her calculate 124 ÷ 4



Use this method to solve:

- 235 ÷ 5
- 147 ÷ 7
- 432 ÷ 8

Divide 3-digits by 1-digit

Reasoning and Problem Solving

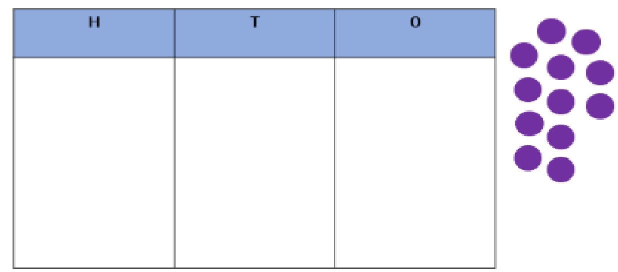
Place < , > or = to make these number sentences correct.

738 ÷ 6		868 ÷ 7
976 ÷ 8		625 ÷ 5
584 ÷ 4		438 ÷ 3

Children will need to complete the short divisions before comparing them.

Answers:
123 > 124
122 < 125
146 = 146

You have 12 counters and the place value grid.



- Create a 3 digit number divisible by 2
- Create a 3 digit number divisible by 3
- Create a 3 digit number divisible by 4
- Create a 3 digit number divisible by 5
- Create a 3 digit number divisible by 6
- Can you find a 3 digit number divisible by 7, 8 or 9?

Divisible by 2: Any even number created.

Divisible by 3: 336, 624, 921

Divisible by 4: 228, 408, 624

Divisible by 5: 165

Divisible by 6: 534

Divisible by 7: 714

Divisible by 8: 840

There is no 3 digit number divisible by 9 however there is a pattern worth investigating!

Correspondence Problems

Notes and Guidance

Children solve more complex problems building on their understanding from Year 3 of when *n* objects relate to *m* objects.

They find all solutions and notice how to use multiplication facts to solve problems.

Mathematical Talk

How can we represent this using multiplication?

What could you do to help you? Could you draw the shapes?

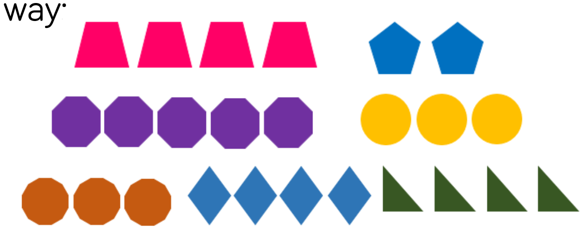
Can we represent this in a number sentence? Is there more than one possibility?
How many different solutions can you find?

Varied Fluency

1. Johnny says he can represent the total number of vertices of his shapes like this:

$$4 \times 7 + 3 \times 3 = 37$$

Find the total number of vertices for these sets of shapes in the same way:



2. Use circles, squares and pentagons to represent the following total of vertices:

21 22 23

3. Using the 6 and 4 times tables how many different ways can you make a total of 40?
Represent this with manipulatives.

Correspondence Problems

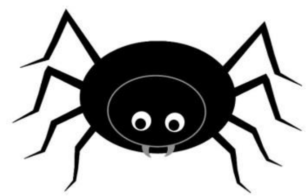
Reasoning and Problem Solving

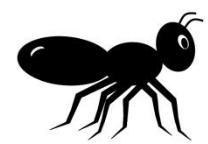
Using the vertices of squares and triangles, how many ways can you balance the equation?

 = ____

Possible solution:
Children may use their knowledge of times tables to help them or they may use trial and error with the shapes to solve it. They may choose to use a table to organise their thoughts.

Spiders have 8 legs and ants have 6 legs.





There are 288 legs in a vegetable patch.

How many spiders and ants could there be?

Possible answers:

24 spiders

16 ants

9 spiders

36 ants