White Rose Maths

Spring - Block 1

Multiplication & Division

Overview

Small Steps

- Multiply 4-digits by 1-digit
- Multiply 2-digits (area model)
- Multiply 2-digits by 2-digits
- Multiply 3-digits by 2-digits
- Multiply 4-digits by 2-digits
- Divide 4-digits by 1-digit
- Divide with remainders

NC Objectives

Multiply and divide numbers mentally drawing upon known facts.

Multiply numbers up to 4 digits by a one or two digit number using a formal written method, including long multiplication for 2-digit numbers.

Divide numbers up to 4 digits by a 1-digit number using the formal written method of short division and interpret remainders appropriately for the context.

Solve problems involving addition and subtraction, multiplication and division and a combination of these, including understanding the use of the equals sign.

Multiply 4-digits by 1-digit

Notes and Guidance

Children build on previous steps to represent a 4-digit number multiplied by a 1-digit number using concrete manipulatives.
Teachers should be aware of misconceptions arising from using 0 as a place holder in the hundreds, tens or ones column.
Children then move on to explore multiplication with exchange in one, and then more than one column.

Mathematical Talk

Why is it important to set out multiplication using columns?

Explain the value of each digit in your calculation.

How do we show there is nothing in a place value column?

What do we do if there are ten or more counters in a place value column?

Which part of the multiplication is the product?

Varied Fluency

- Complete the calculation.

Thousands	Hundreds	Tens	Ones
1000		10 10	1 1 1
1000		10 10	1 1 1
1000		10 10	1 1 1

	Th	H	T	O
	1	0	2	3
×				3

- Write the multiplication calculation represented and find the answer.

Thousands	Hundreds	Tens	Ones
1000 1000	100		1 1 1 1 1 1
1000 1000	100		1 1 1 1 1 1

Remember if there are ten or more counters in a column, you need to make an exchange.

- Annie earns £1,325 per week.
How much would he earn in 4 weeks?

Thousands	Hundreds	Tens	Ones
1000	100 100 100	10 10	1 1 1 1 1
1000	100 100 100	10 10	1 1 1 1 1
1000	100 100 100	10 10	1 1 1 1 1
1000	100 100 100	10 10	1 1 1 1 1

	Th	H	T	O
	1	3	2	5
×				4

Multiply 4-digits by 1-digit

Reasoning and Problem Solving

Alex calculated 1,432 × 4

Here is her answer.

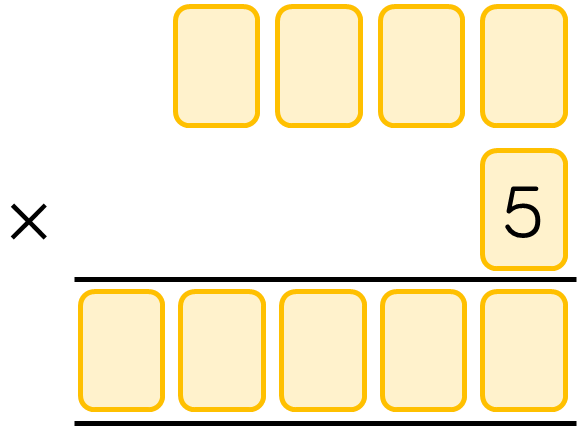
	Th	H	T	O
	1	4	3	2
×				4
	4	16	12	8

1,432 × 4 = 416,128

Can you explain what Alex has done wrong?

Alex has not exchanged when she has got 10 or more in the tens and hundreds columns.

Can you work out the missing numbers using the clues?



- The 4 digits being multiplied by 5 are consecutive numbers.
- The first 2 digits of the product are the same.
- The fourth and fifth digits of the answer add to make the third.

2,345 × 5 = 11,725

Multiply 2-digits (Area Model)

Notes and Guidance

Children use Base 10 to represent the area model of multiplication, which will enable them to see the size and scale linked to multiplying.

Children will then move on to representing multiplication more abstractly with place value counters and then numbers.

Mathematical Talk

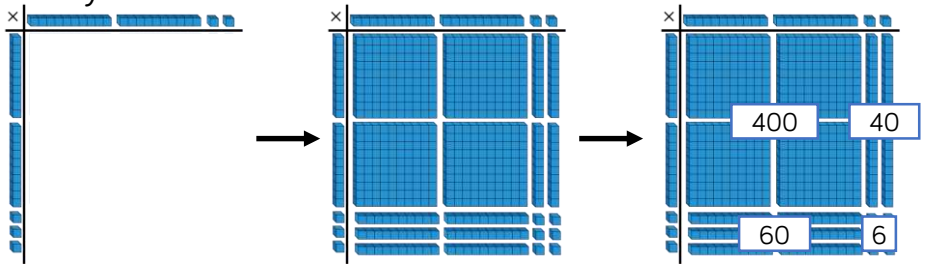
What are we multiplying?
How can we partition these numbers?

Where can we see 20 × 20?
What does the 40 represent?

What's the same and what's different between the three representations (Base 10, place value counters, grid)?

Varied Fluency

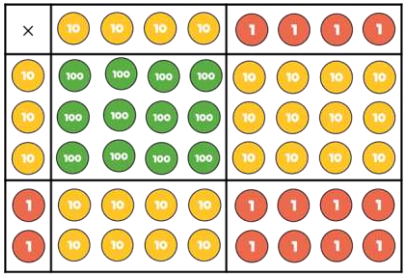
Whitney uses Base 10 to calculate 23 × 22



How could you adapt your Base 10 model to calculate these:

32 × 24 25 × 32 35 × 32

Rosie adapts the Base 10 method to calculate 44 × 32



×	40	4
30	1,200	120
2	80	8

Compare using place value counters and a grid to calculate:

45 × 42 52 × 24 34 × 43

Multiply 2-digits (Area Model)

Reasoning and Problem Solving

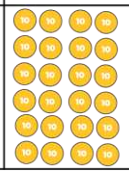
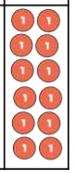
Eva says,

To multiply 23 by 57 I just need to calculate 20 × 50 and 3 × 7 and then add the totals.

What mistake has Eva made?
Explain your answer.

Eva's calculation does not include 20 × 7 and 50 × 3
Children can show this with concrete or pictorial representations.

Amir hasn't finished his calculation.
Complete the missing information and record the calculation with an answer.

×	40	2
40		
6		

Amir needs 8 more hundreds, 40 × 40 = 1,600 and he only has 800

His calculation is 42 × 46 = 1,932

Farmer Ron has a field that measures 53 m long and 25 m wide.

Farmer Annie has a field that measures 52 m long and 26 m wide.

Dora thinks that they will have the same area because the numbers have only changed by one digit each.

Do you agree? Prove it.

Dora is wrong. Children may prove this with concrete or pictorial representations.

Multiply 2-digits by 2-digits

Notes and Guidance

Children will move on from the area model and work towards more formal multiplication methods.

They will start by exploring the role of the zero in the column method and understand its importance.

Children should understand what is happening within each step of the calculation process.

Mathematical Talk

Why is the zero important?

What numbers are being multiplied in the first line and in the second line?

When do we need to make an exchange?

What can we exchange if the product is 42 ones?

If we know what 38 × 12 is equal to, how else could we work out 39 × 12?

Varied Fluency

Complete the calculation to work out 23 × 14

		2	3
×		1	4
		9 (1)	2
	2	3	0

(23 × 4)

(23 × 10)

Use this method to calculate:

34 × 26 58 × 15 72 × 35

Complete to solve the calculation.

		4	6
×		2	7
	3	2 (4)	2
	9 (1)	2	0

(___ × ___)

(___ × ___)

Use this method to calculate:

27 × 39 46 × 55 94 × 49

Calculate:

38 × 12 39 × 12 38 × 11

What's the same? What's different?

Multiply 2-digits by 2-digits

Reasoning and Problem Solving

Tommy says,

It is not possible to make 999 by multiplying two 2-digit numbers.

Do you agree?
Explain your answer.

Children may use a trial and error approach during which they'll further develop their multiplication skills.
They will find that Tommy is wrong because 27 × 37 is equal to 999

Amir has multiplied 47 by 36

		4	7
×		3	6
	2	8 (4)	2
	1	4 (2)	1
	3	2	3

Alex says,

Amir is wrong because the answer should be 1,692 not 323

Who is correct?
What mistake has been made?

Alex is correct.
Amir has forgotten to use zero as a place holder when multiplying by 3 tens.

Multiply 3-digits by 2-digits

Notes and Guidance

Children will extend their multiplication skills to multiplying 3-digit numbers by 2-digit numbers. They will use multiplication to find area and solve multi-step problems.
Methods previously explored are still useful e.g. using an area model.

Mathematical Talk

Why is the zero important?

What numbers are being multiplied in the first line and the second line?

When do we need to make an exchange?

What happens if there is an exchange in the last step of the calculation?

Varied Fluency

- Complete:

		1	3	2
×			1	4
		5	2 (1)	8
	1	3	2	0

(132 × 4)
(132 × 10)

Use this method to calculate:

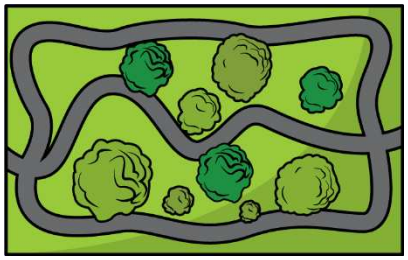
264 × 14 264 × 28

What do you notice about your answers?

- Calculate:

637 × 24 573 × 28 573 × 82

- A playground is 128 yards by 73 yards.



Calculate the area of the playground.

Multiply 3-digits by 2-digits

Reasoning and Problem Solving

$22 \times 111 = 2442$

$23 \times 111 = 2553$

$24 \times 111 = 2664$

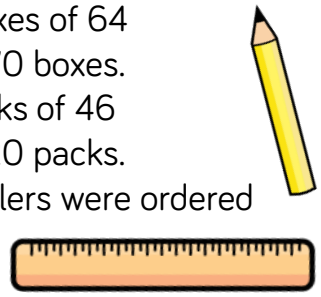
What do you think the answer to 25×111 will be?

What do you notice?

Does this always work?

The pattern stops at up to 28×111 because exchanges need to take place in the addition step.

Pencils come in boxes of 64
A school bought 270 boxes.
Rulers come in packs of 46
A school bought 720 packs.
How many more rulers were ordered than pencils?



15,840

Here are examples of Dexter's maths work.

			9	8	7
×				7	6
		5	5 9	4 2	2
		6	6 9	4 0	9
	1	1 2	8	1 3	1

			3	2	4
×				7	8
		2	1 5	3 9	2
	2	1 2	2 6	8	0
		3	2	7	2

He has made a mistake in each question.

Can you spot it and explain why it's wrong?

Correct each calculation.

In his first calculation, Dexter has forgotten to use a zero when multiplying by 7 tens.
It should have been
$987 \times 76 = 75{,}012$

In the second calculation, Dexter has not included his final exchanges.
$324 \times 8 = \underline{2},592$
$324 \times 70 = \underline{2}2{,}680$
The final answer should have been 25,272

Multiply 4-digits by 2-digits

Notes and Guidance

Children will build on their understanding of multiplying a 3-digit number by a 2-digit number and apply this to multiplying 4-digit numbers by 2-digit numbers.

It is important that children understand the steps taken when using this multiplication method.

Methods previously explored are still useful e.g. grid.

Mathematical Talk

Explain the steps followed when using this multiplication method.

Look at the numbers in each question, can they help you estimate which answer will be the largest?

Explain why there is a 9 in the thousands column.

Why do we write the larger number above the smaller number?

What links can you see between these questions? How can you use these to support your answers?

Varied Fluency

- Use the method shown to calculate 2,456 × 34

		3	2	5	0	
×				2	6	
	1	9_{1}	5_{3}	0	0	(3,250 × 6)
	6	5_{1}	0	0	0	(3,250 × 20)
	8	4	5	0	0	

- Calculate

3,282 × 32 | 7,132 × 21 | 9,708 × 38

- Use <, > or = to make the statements correct.

4,458 × 56 ◯ 4,523 × 54

4,458 × 55 ◯ 4,523 × 54

4,458 × 55 ◯ 4,522 × 54

Multiply 4-digits by 2-digits

Reasoning and Problem Solving

Spot the Mistakes

Can you spot and correct the errors in the calculation?

		2	5	3	4
×				2	3
		$^{1}7$	5	$^{1}9$	2
		$^{1}5$	0	6	8
	1	2	$^{1}6$	$^{1}6$	0

There are 2 errors.
In the first line of working, the exchanged ten has not been added.
In the second line of working, the place holder is missing.
The correct answer should be 58,282

Teddy has spilt some paint on his calculation.

		2	[paint]	6	9
×				2	[paint]
	2	$^{6}2$	$^{5}9$	$^{7}5$	2
	$^{1}5$	$^{1}7$	$^{1}3$	[paint]	0
	[paint]	$^{1}0$	$^{1}3$	3	2

What are the missing digits?

What do you notice?

The missing digits are all 8

Divide 4-digits by 1-digit

Notes and Guidance

Children use their knowledge from Year 4 of dividing 3-digits numbers by a 1-digit number to divide up to 4-digit numbers by a 1-digit number.

They use place value counters to partition their number and then group to develop their understanding of the short division method.

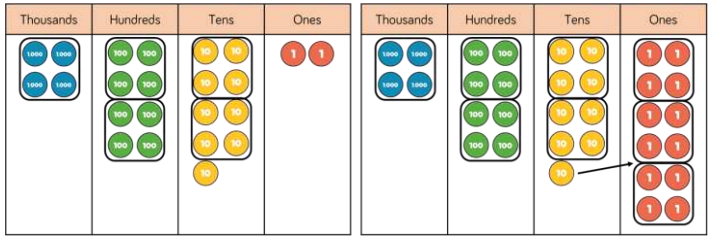
Mathematical Talk

How many groups of 4 thousands are there in 4 thousands?
How many groups of 4 hundreds are there in 8 hundreds?
How many groups of 4 tens are there in 9 tens?
What can we do with the remaining ten?
How many groups of 4 ones are there in 12 ones?

Do I need to solve both calculations to compare the divisions?

Varied Fluency

- Here is a method to calculate 4,892 divided by 4 using place value counters and short division.



	1	2	2	3
4	4	8	9	$^{1}2$

Use this method to calculate:

6,610 ÷ 5 2,472 ÷ 3 9,360 ÷ 4

- Mr Porter has saved £8,934
He shares it equally between his three grandchildren.
How much do they each receive?

- Use <, > or = to make the statements correct.

3,495 ÷ 5 ◯ 3,495 ÷ 3

8,064 ÷ 7 ◯ 9,198 ÷ 7

7,428 ÷ 4 ◯ 5,685 ÷ 5

Divide 4-digits by 1-digit

Reasoning and Problem Solving

Jack is calculating 2,240 ÷ 7

He says you can't do it because 7 is larger than all of the digits in the number.

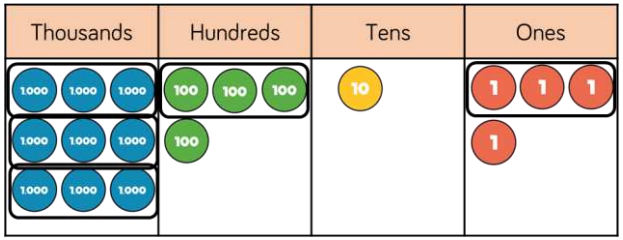
Do you agree with Jack?
Explain your answer.

Jack is incorrect.
You can exchange between columns.
You can't make a group of 7 thousands out of 2 thousand, but you can make groups of 7 hundreds out of 22 hundreds.

The answer is 320

Spot the Mistake

Explain and correct the working.



	3	1	0	1
3	9	4	1	4

There is no exchanging between columns within the calculation.
The final answer should have been 3,138

Divide with Remainders

Notes and Guidance

Children continue to use place value counters to partition and then group their number to further develop their understanding of the short division method.

They start to focus on remainders and build on their learning from Year 4 to understand remainders in context. They do not represent their remainder as a fraction at this point.

Mathematical Talk

If we can't make a group in this column, what do we do?

What happens if we can't group the ones equally?

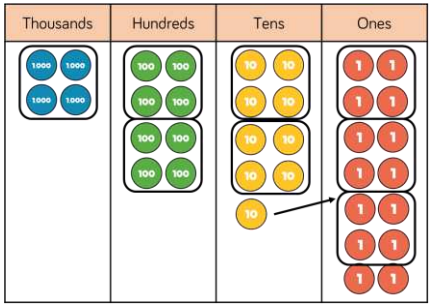
In this number story, what does the remainder mean?

When would we round the remainder up or down?

In which context would we just focus on the remainder?

Varied Fluency

- Here is a method to solve 4,894 divided by 4 using place value counters and short division.



	1	2	2	3		
4	4	8	9	1 4		r2

Use this method to calculate:

6,613 ÷ 5 2,471 ÷ 3 9,363 ÷ 4

- Muffins are packed in trays of 6 in a factory.
In one day, the factory makes 5,623 muffins.
How many trays do they need?
How many trays will be full?
Why are your answers different?

- For the calculation 8,035 ÷ 4
  - Write a number story where you round the remainder up.
  - Write a number story where you round the remainder down.
  - Write a number story where you have to find the remainder.

Divide with Remainders

Reasoning and Problem Solving

I am thinking of a 3-digit number.

When it is divided by 9, the remainder is 3

When it is divided by 2, the remainder is 1

When it is divided by 5, the remainder is 4

What is my number?

Possible answers:

129	219
309	399
489	579
669	759
849	939

Encourage children to think about the properties of numbers that work for each individual statement.
This will help decide the best starting point.

Always, Sometimes, Never?

A three-digit number made of consecutive descending digits divided by the next descending digit always has a remainder of 1

$765 \div 4 = 191$ remainder 1

How many possible examples can you find?

Sometimes

Possible answers:

$432 \div 1 = 432$ r 0
$543 \div 2 = 271$ r 1
$654 \div 3 = 218$ r 0
$765 \div 4 = 191$ r 1
$876 \div 5 = 175$ r 1
$987 \div 6 = 164$ r 3