

Multiply Two-digit and Three-digit Numbers by a One-digit Number Using a Formal Written Layout

Key NC Statement

Multiply two-digit and three-digit numbers by a one-digit number using formal written layout

Related NC Statements

- 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
- 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

Key Concepts

This sequence revises formal written multiplication from Year 3, ensuring that place value language is directly linked to multiplication of tens and ones so pupils understand the procedure more fully. Pupils will link times table base facts and multiplying multiples of ten and one hundred in readiness for the formal method.

Pupils have already met the idea of distributive law in 4LS6 in which it was linked to multiplication tables knowledge. Here, they meet distribution of the greater factor and multiplying both parts by the same number.

The formal short multiplication method is shown to be distributive and the emphasis is upon the format, understanding what is happening and why at each stage of the procedure.

Steps within the Learning Sequence

Step 1: Multiplying multiples of ten by one-digit numbers

Step 2: Multiplying multiples of one hundred by one-digit numbers

Step 3: Multiplying two and three-digit numbers by one-digit numbers using distributive law (with regrouping)

Step 4: Formal written multiplication with no regrouping

Step 5: Formal written multiplication with regrouping in one column

Step 6: Formal written multiplication with regrouping in one or more columns

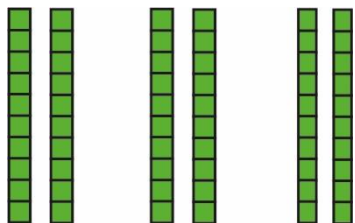
Destination Questions 																																						
1  How many ways can you regroup the following calculation? Which is easiest to use? 82 x 3	2  Find a way to arrange the digits 1, 2, 3 and 4 in the calculation to make the correct answer. <table><tr><td></td><td></td><td></td><td></td></tr><tr><td>x</td><td></td><td></td><td></td></tr><tr><td></td><td>6</td><td>2</td><td>8</td></tr></table>					x					6	2	8	3  Place <, > or = correctly between the two calculations <table><tr><td></td><td>4</td><td>6</td><td>1</td><td></td><td>3</td><td>3</td><td>9</td></tr><tr><td>x</td><td></td><td></td><td>3</td><td></td><td>x</td><td></td><td>4</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>		4	6	1		3	3	9	x			3		x		4								
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	4	6	1		3	3	9																															
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4  162 x 3 =	5  Using the digit cards 6, 5, 8 and 2, make 3-digit multiplied by one-digit calculations with products that match the following rules: • Largest product • Smallest product What did you notice?	6  'Seek and destroy' the error. 3 times greater than 465 is 2095																																				
7  What are the missing digits? <table><tr><td></td><td></td><td>?</td><td>3</td><td>9</td></tr><tr><td>x</td><td></td><td></td><td></td><td>9</td></tr><tr><td></td><td>5</td><td>7</td><td>?</td><td>1</td></tr></table>			?	3	9	x				9		5	7	?	1	8  Always, sometimes, never true. When you multiply a 3-digit by a 1-digit number, if the digit in the hundreds place is more than 4, the product will be greater than 1000.	9  Arrange the following calculations in order of estimated product size from greatest to smallest: • 445 x 6 • 482 x 5 • 768 x 3 Then complete each calculation. Were you correct?																					
		?	3	9																																		
x				9																																		
	5	7	?	1																																		

Step one

Multiplying multiples of ten by one-digit numbers

Show pupils the calculation: $20 \times 3 =$

Explain that we can also think of this as 3 groups of 2 tens. Model building 3 groups of 2 tens.



How many tens are equal to 3 groups of 2 tens?

There are 6 tens. 6 tens is 60.

Model effective language using handout_4LS24_step1_speaking_frame.

Multiplying Multiples of Ten by a One-Digit Number Speaking Frame

is tens. groups of tens is tens.

tens is equal to .

x is ten times greater than x .

20 is 2 tens. 3 groups of 2 tens is 6 tens.
6 tens is equal to 60.

Can you spot a useful base
fact that will help us check?

$2 \times 3 = 6$

Show the related calculations and compare place value.

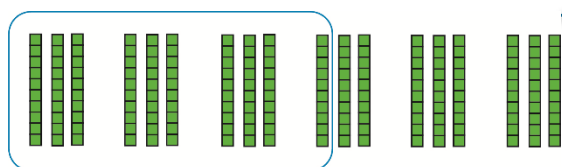
- $2 \times 3 = 6$
- $20 \times 3 = 60$

20 is ten times bigger than 2 so 20×3 is ten times bigger than 2×3 . The product will be ten times greater too.

Show pupils the calculation 30×6

What does 30×6 mean?

Model building 6 groups of 3 tens.



How many tens do I have?

18 tens is 180.

There are more than 10 tens which is 1 hundred. I can regroup my tens into 1 hundred and 8 tens.

Can you spot a useful base
fact that will help us check?

$3 \times 6 = 18$

Show the related calculations and compare place value.

- $3 \times 6 = 18$
- $30 \times 6 = 180$

30 is ten times greater than 3 so 30×6 is ten times greater than 3×6 . The product will be ten times greater too.

Pupils rehearse with calculations such as 50×5 , 40×5 , 30×6 and 40×7 using base-10 equipment and recording to show the regrouping of 10 tens for 1 hundred.

They continue to rehearse calculations without resources. For example, 60×9 ; 80×7 ; 8×70 ; 9×40 .

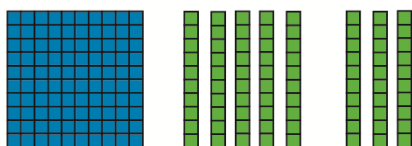
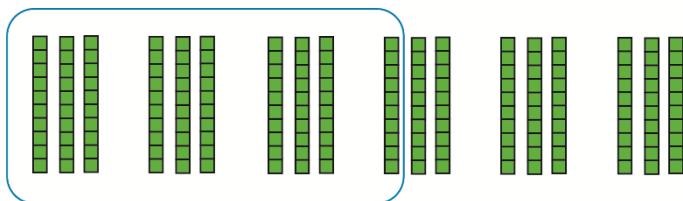
Step two

Multiplying multiples of one hundred by one-digit numbers

Pupils count in multiples of 40, 70, 300 and 600, for example, on the counting stick linking facts to times table base facts.

Model linking multiplying by hundreds to multiplying by tens.

30×6 and 300×6

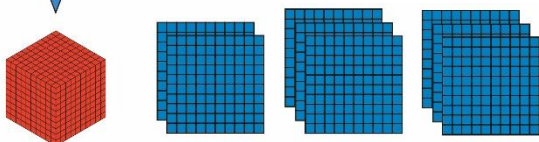
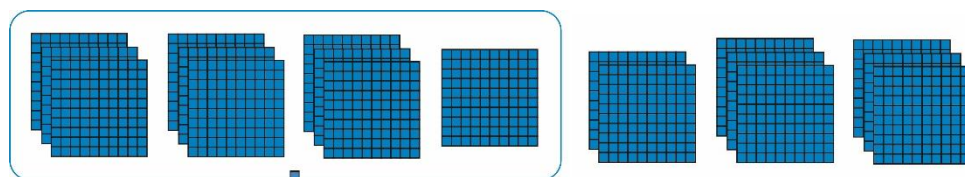


What is the base fact we are using?

$3 \times 6 = 18$

Show the related calculations and compare place value.

- $3 \times 6 = 18$
- $30 \times 6 = 180$
- $300 \times 6 = 1800$



300 is ten times bigger than 30 so 300×6 is ten times bigger than 30×6 . The product will be ten times greater too.

Pupils to then rehearse examples, such as 200×4 , using base-10 equipment, to show that the product will be 100 times greater than 2×4 because 200 is 100 times greater than 2. To support effective explanations, use handout_4LS24_step2_speaking_frame.



Multiplying Multiples of One Hundred by a One-Digit Number Speaking Frame

is hundreds. groups of hundreds is hundreds.

hundreds is equal to .

$\times$ is one hundred times greater than $\times$.

Activities for exploring ideas at greater depth

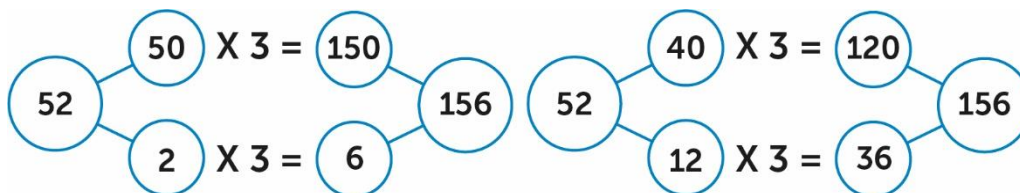
If I know that $5 \times 7 = 35$, what else do I know? Pupils use language, drawings and symbols to make a poster for a known base fact.

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Step three

Multiplying two and three-digit numbers by one-digit numbers using distributive law (with regrouping)

Show pupils the calculation 52×3 . Model two ways to solve this using regrouping of the number 52 and multiplying each part by 3 before combining the products. Use base-10 representation and discuss 'what is the same and what is different?' about each method of regrouping.



What are the base facts we are using in each case?

$5 \times 3 = 15$ and $2 \times 3 = 6$

$4 \times 3 = 12$ and $12 \times 3 = 36$

tens	ones

tens	ones

Where is the 50 and where is the 2?
Where are the three groups?

Where is the 40 and where is the 12?
Where are the three groups?

$3 \times 50 + 3 \times 2 = 156$

$3 \times 40 + 3 \times 12 = 156$

Pupils rehearse with 72×6 finding two different ways of regrouping 72. Some pupils may like to regroup 72 into three parts. For example, 30, 30 and 12.

Repeat regrouping two and three-digit numbers. For example, 128×8 , 56×4 , 3×520 and 244×5 . Suggest multiple ways of regrouping the two or three-digit number. Pupils rehearse comparing products using the equals and inequality symbols. For example, $236 \times 5 \square 287 \times 4$



Activities for exploring ideas at greater depth

Find a unique way of regrouping that no one else has thought of.

Represent your strategy for regrouping efficiently.

Are there any other strategies that you could use to calculate the examples provided?

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Step four



Formal written multiplication with no regrouping

The focus in this step is making links between the informal distributive approach in the previous steps, the formal layout and moving into three-digit by one-digit multiplication. Use handout_4LS24_step4_speaking_frame alongside the representations below.

Using Distributive Law – Speaking Frame

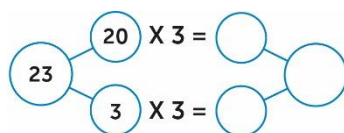
□ multiplied by □ is □

□ multiplied by □ is □

□ added to □ is □ .

- Begin with $23 \times 3 = 69$

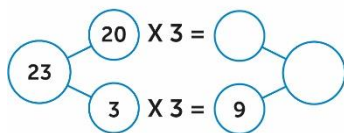
tens	ones
	■ ■ ■ ■ ■ ■



$$\begin{array}{r} 23 \\ \times 3 \\ \hline \end{array}$$

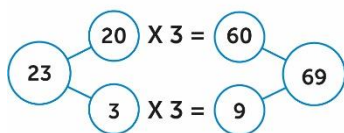
Start with the ones. I build 3 groups of 3 ones. There are 9 ones.

tens	ones
■■■■ ■■■■ ■■■■	■ ■ ■ ■ ■ ■



$$\begin{array}{r} 23 \\ \times 3 \\ \hline 9 \end{array}$$

Then I build 3 groups of 2 tens. There are 6 tens. What is 9 ones added to 6 tens?



$$\begin{array}{r} 23 \\ \times 3 \\ \hline 69 \end{array}$$

Model again with 234×2 ensuring place value language is stressed. Pupils rehearse using the following standard examples. **Please note** that we would not expect pupils to use a formal written method to multiply by 2 and that these examples are only for the purposes of learning / revising the layout. Pupils can be asked to suggest other methods for solving the calculations and discuss which is more efficient.

- 231×3
- 34×2
- 322×3

Show pupils $322 + 322 + 322$ and make the link between the multiplication and repeated addition. Ensure pupils are clear that as the number of groups increase, it is inefficient to use repeated addition.

Further rehearsal is available on handout_4LS24_step4_planet_hunt.

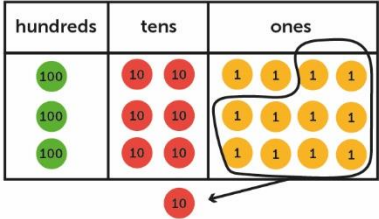
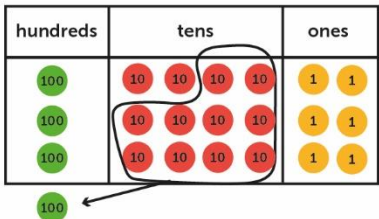
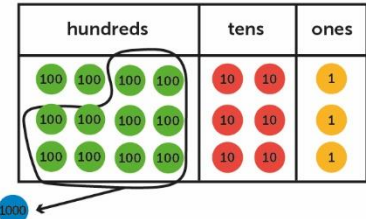
Ensure pupils can use the layout correctly.



Step five

Formal written multiplication with regrouping in one column

Model the following three calculations using base-10 equipment or place value counters demonstrating regrouping in each case. Use place value language throughout.

124 x 3	142 x 3	421 x 3
 $\begin{array}{r} 124 \\ \times 3 \\ \hline 72 \\ \hline 1 \end{array}$	 $\begin{array}{r} 142 \\ \times 3 \\ \hline 426 \\ \hline 1 \end{array}$	 $\begin{array}{r} 421 \\ \times 3 \\ \hline 1263 \\ \hline 1 \end{array}$

I regrouped 10 ones for 1 ten.

What did we regroup? Why?

Is the regrouped '1' in the correct place? How do you know?

Pupils repeat with 127×3 , 172×3 and 721×3 . What do pupils notice about the regrouping?

Using the digits 1, 2 and 5 pupils make 3 calculations that fulfil the rules when multiplied by 4.

- One of the calculations must regroup ones into tens.
- One calculation must regroup tens into hundreds.
- One calculation must result in a four-digit product.

If needed, pupils practise a range of standard calculations with one regroup.

Step six

Formal written multiplication with regrouping in one or more columns

Pupils continue onto rehearsing calculations in which there is regrouping in more than one place. Base-10 equipment or place value counters may still be necessary for *some* pupils throughout. Pupils are encouraged to round to estimate.

For example, $675 \times 6 \approx 700 \times 6$. 700×6 is 100 times greater than 7×6 . 42 hundreds is 4,200.

Examples could include;

- 63×4
- 146×5 (resulting in zeroes)
- 675×6
- 7 times greater than 329

Handout_4LS24_step6_regroup provides further rehearsal.

Show pupils examples of calculations with errors. Pupils 'seek and destroy' the errors noting what went wrong in each case. For example:

$$\begin{array}{r} 4 \ 5 \ 1 \\ \times \quad \quad 3 \\ \hline 1 \ 7 \ 1 \ 3 \\ \text{5} \end{array}$$

$$\begin{array}{r} 4 \ 5 \ 1 \\ \times \quad \quad 3 \\ \hline 1 \ 2 \ 5 \ 3 \\ \text{1} \end{array}$$

Pupils can then play the 'Crooked Multiplication' game.

- Version 1: Pupils play in 3s or 4s. They need a 0-9 dice.
- Players take turns to roll the dice and then place digits into their three grey squares until they are full.
- Players calculate their products and check others.
- The player with the greatest product wins a point.
- Play 5 times.
- The player with the most points wins.

A

x		

B

x		

C

x		

- Version 2: As version 1, but players can sabotage each other by placing numbers thrown into any one of their opponent's empty grey squares.

Pupils solve missing number multiplication calculations such as those below and explain how they worked out the missing digit.

$$\begin{array}{r} 4 \ \square \ 4 \\ \times \quad \quad \square \\ \hline 1 \ 3 \ 6 \ 2 \end{array}$$

3

5

6

7

9

Activities for exploring ideas at greater depth

Using the digit cards 4, 6, 8, 5 and 2, make 3-digit multiplied by one-digit number calculations with products that match the following rules.

- Greatest product with a two in the hundreds place.
- Smallest product with a zero in the tens place.
- Product nearest to 5,000.

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