Multiplication – Formal Written Multiplication

Key NC Statement

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

Related NC Statements

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables

Key Concepts

This sequence builds upon the previous sequence and continues to ensure that place value language is directly linked to the multiplication of tens and ones. Pupils have already met the idea of the distributive law in 3LS18 where it was linked to pupils' multiplication tables knowledge. Here they meet distribution by regrouping into tens and ones and multiplying both parts by the same number. In 3LS25, pupils rehearsed multiplying multiples of ten in readiness.

Some of the examples in which pupils rehearse short multiplication with no regrouping include multiplying by 2. This is for the purposes of rehearsal to ensure there is no regrouping. However, pupils should be able to use a doubling strategy when asked to multiply by 2 in other contexts.

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

Steps within the Learning Sequence

Step 1: Multiplying two-digit numbers by ones using distributive law (no regrouping)

Step 2: Multiplying two-digit numbers by ones using distributive law (with regrouping)

Step 3: Introducing short multiplication with no regrouping

Step 4: Short multiplication with regrouping of ones into tens only

Step 5: Short multiplication with regrouping of ones and tens

Destination Questions

1

Which calculation will have the greatest product?

62 x 3
8 x 27
34 x 4

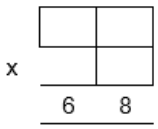
2

Using the digit cards 4, 6, 0, 5 and 2, make two-digit multiplied by one-digit calculations with products that match the following rules:

- largest product
- smallest product.

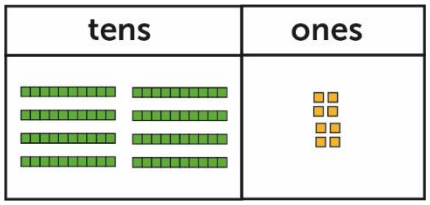
3

Find two ways to arrange the digits 2, 3 and 4 in the calculation to make the correct answer.



4

Which of the calculations match this representation.



44 x 4

42 x 2

22 x 4

5

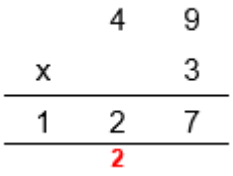
Place <, > or = correctly between the two calculations

6

62 x 3 = ☐

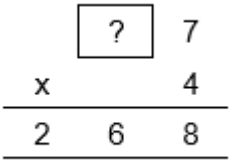
7

Seek and destroy the error.



8

What is the missing digit?



9

Always, sometimes, never true.

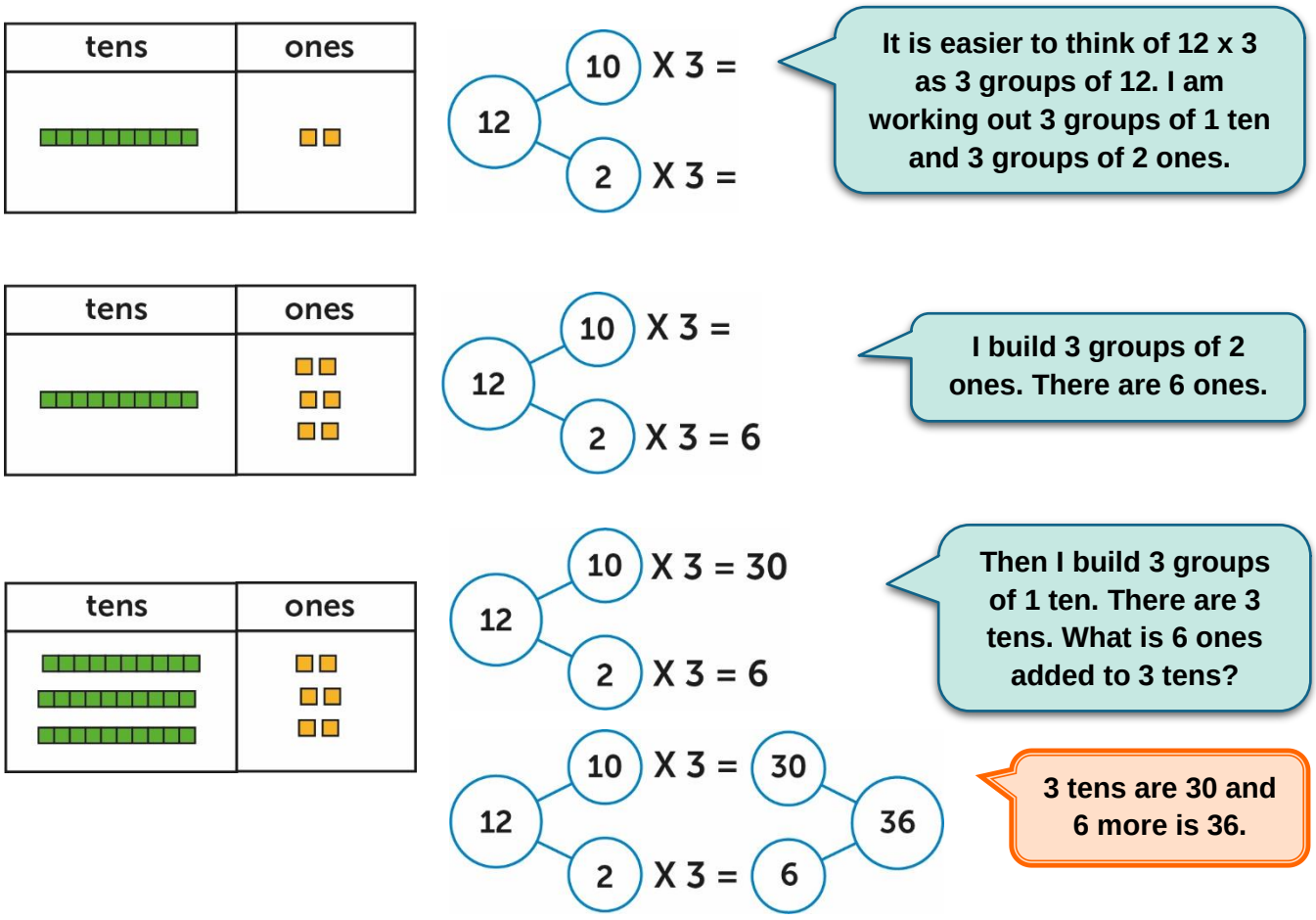
When mutliplying a two-digit number by one-digit, if the digit in the tens place is more than 4, the product will be greater than 100.

Step one

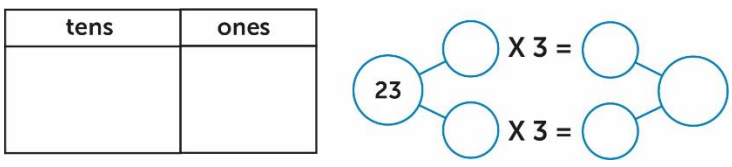
Multiplying two-digit numbers by ones using distributive law (no regrouping)

Show pupils the calculation: 12 x 3. Pupils may be able to tell you the answer to this is 36. Clarify that, if we didn't know the answer, we could use regrouping to find the product.

Model regrouping 12 into 1 ten and 2 ones on the part whole model and with base-10 equipment on a place value chart. Clarify that we must multiply both of the parts by three.
Use handout 3LS26_step1_speaking_frame.



Repeat with 23 x 3 and 3 x 32 using handout_3LS26_step1_recording_frame. Clarify that finding 3 groups of 23 is much easier than 23 groups of 3. Pupils record onto part whole models as demonstrated above, using drawings in place value charts and onto the speaking frame.



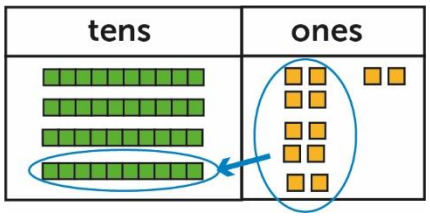
Multiplying Two-Digit Numbers By Ones Using Distributive Law – Speaking Frame

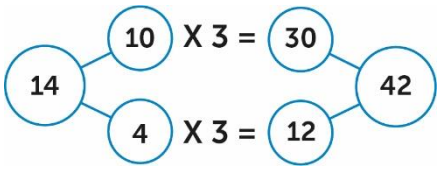
☐ groups of ☐ ones is ☐ ones.
☐ groups of ☐ tens is ☐ tens.
☐ tens is equal to ☐.
☐ added to ☐ is ☐.

Step two

Multiplying two-digit numbers by ones using distributive law (with regrouping)

Show pupils the calculation: 3 x 14. Model as previous step and include using regrouping from ones to tens using base-10 as the final step.



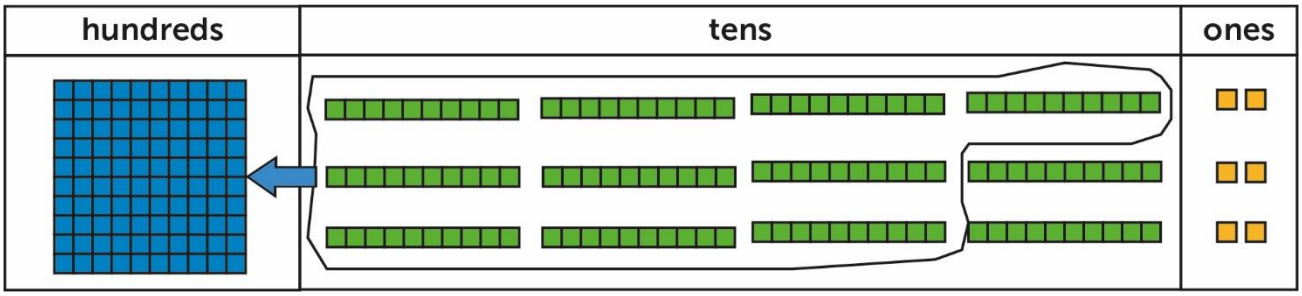


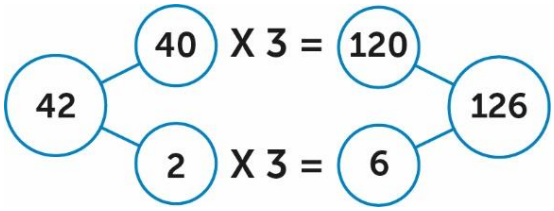
Multiplying Two-Digit Numbers By Ones Using Distributive Law – Speaking Frame

☐ groups of ☐ ones is ☐ ones.
☐ groups of ☐ tens is ☐ tens.
☐ tens is equal to ☐.
☐ added to ☐ is ☐.

Repeat with calculations 34 x 3 and 6 x 15 recording as previously modelled. Use the speaking frame from the step 1 to support effective explanations.

Show pupils 42 x 3 and as the last step model the regrouping of 10 tens for 1 hundred.





Pupils rehearse with 52 x 3, 6 x 15 before moving on to questions in which there are two regroups such as 52 x 6 and then mixed rehearsal with standard examples until secure.
Examples should increase in range and could include the following:

- Comparing products using the equals and inequality symbols: 36 x 5 ☐ 37 x 4

1 2

Activities for exploring ideas at greater depth

Using the digit cards 4, 6, 0, 5 and 2, make two-digit multiplied by one-digit calculations with products that match the following rules:

1. Greatest product with a five in the ones place.
2. Smallest product with a zero in the ones place.

Pupils could explore other ways of distributing the numbers. For example, with 14 x 7, the 14 could be regrouped into 8 and 6.

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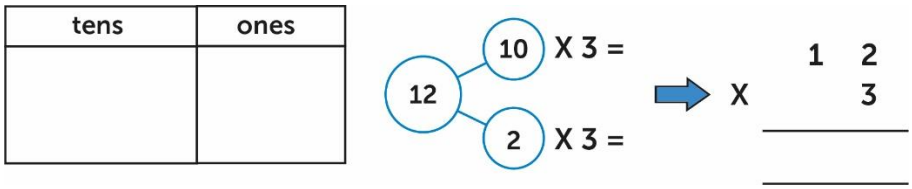
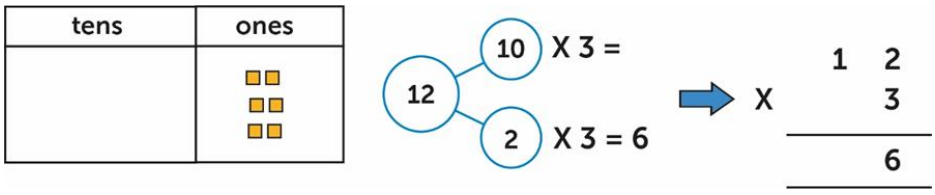
Step three

Introducing short multiplication with no regrouping

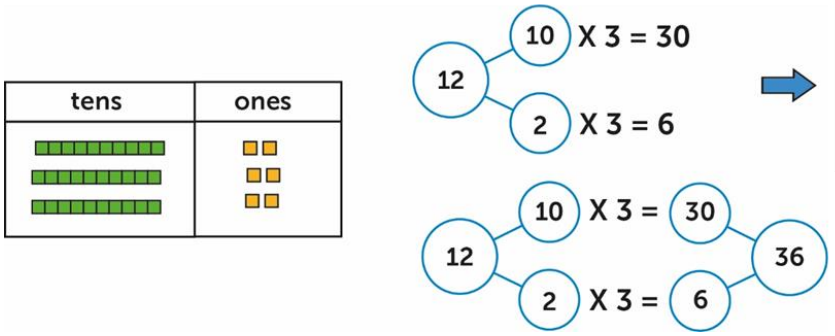
The focus in this step is in making links between the informal distributive approach in the previous steps and the formal layout. Use the speaking frame from previous steps alongside the representations below. Model the following:

Begin with: 12 x 3 = 36.





Start with the ones. I build 3 groups of 2 ones. There are 6 ones.



Then I build 3 groups of 1 ten. There are 3 tens. 6 ones added to 3 tens is 36.

Model again with 34 x 4 as needed.
Pupils rehearse using the following standard examples.

- 24 x 2
- 40 x 2
- 32 x 3
- 22 x 4

3 4

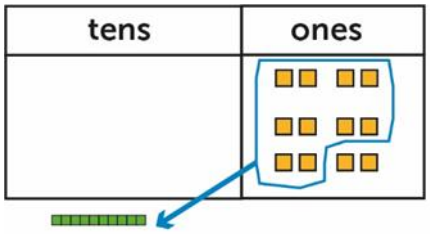
Activities for exploring ideas at greater depth

Pupils suggest alternative strategies that they could use to solve the calculations above and decide which are more efficient for each calculation.

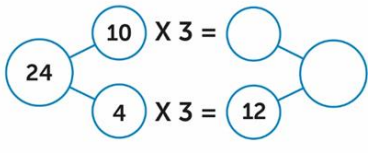
Step four

Short multiplication with regrouping of ones into tens only

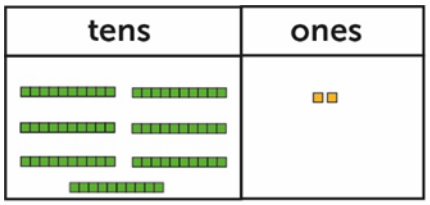
Show pupils the calculation: 24 x 3. Model as below:



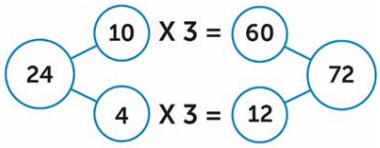
$$\begin{array}{r} 2\ 4 \\ \times\quad 3 \\ \hline 2 \\ \hline 1 \end{array}$$



Find 3 groups of 4 ones. Regroup 12 ones for 1 ten and 2 ones.

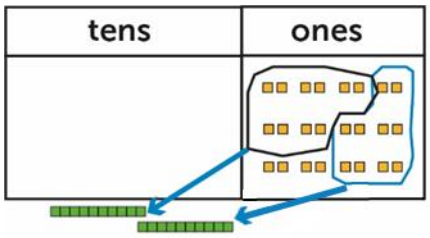


$$\begin{array}{r} 2\ 4 \\ \times\quad 3 \\ \hline 7\ 2 \\ \hline \cancel{1} \end{array}$$

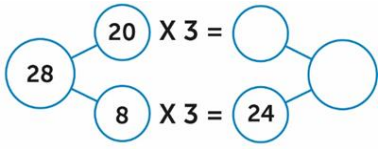


Find 3 groups of 2 tens. Add the ten from the regrouped ones.

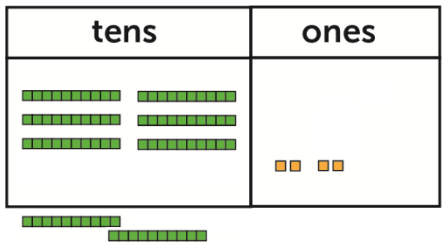
Repeat with 28 x 3 in which 2 groups of 10 ones are regrouped. Pupils may not have experienced regrouping more than 1 group of ten before.



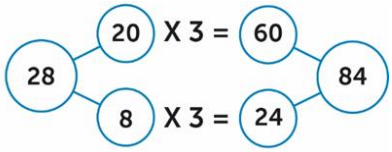
$$\begin{array}{r} 2\ 8 \\ \times\quad 3 \\ \hline 4 \\ \hline 2 \end{array}$$



Find 3 groups of 8 ones. Regroup 24 ones for 2 tens and 4 ones.



$$\begin{array}{r} 2\ 8 \\ \times\quad 3 \\ \hline 8\ 4 \\ \hline \cancel{2} \end{array}$$



Find 3 groups of 2 tens. Add the 2 tens from the regrouped ones.

Pupils rehearse using the resources and record as a formal method with examples such as: 37 x 2; 39 x 3 and 28 x 4.

5

Activities for exploring ideas at greater depth

Find as many calculations as possible that will result in regrouping of 20 ones for 2 tens or 80 ones for 8 tens.

Step five

Short multiplication with regrouping of ones and tens

As in step 4, pupils rehearse and secure examples such as: 64 x 2; 73 x 3; 92 x 4, 53 x 2. There is no regrouping of the ones into tens. Clarify that a calculation that regroups tens into hundreds will have hundreds in the product.

Pupils then move immediately into rehearsing calculations in which there is regrouping in both places. Base-10 equipment or place value counters may still be necessary for *some* pupils throughout.

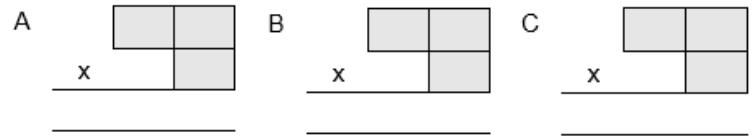
When ready show pupils examples of calculations with errors. Pupils seek and destroy the errors noting what went wrong in each case.
For example:

	2	7
x		5
1	7	3
	5	

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 a dice and 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 five times.
- The player with the most points wins.



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

Pupils solve missing number multiplication calculations such as the calculation below explaining how they know what the missing digit is.

	2	☐
x		4
1	1	2

6 7 8 9

Activities for exploring ideas at greater depth

Pupils decide whether having a high digit as the multiplier (number of groups) or as the tens digit in the multiplicand (size of group) is more impactful. They reason why. They then reason how they could use this knowledge to help them win at the Crooked Multiplication game.

Play the 'Crooked Multiplication' game but instead of largest product players want to be the player closest to a product of 100.

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