MULTIPLICATION

Stage 1 Multiply with concrete objects, arrays and pictorial representations

How many legs will 3 teddies have?

2 + 2 + 2 = 6

There are 3 sweets in one bag. How many sweets are in 5 bags altogether?

3 + 3 + 3 + 3 + 3 =15

Give children experience of counting equal group of objects in 2s, 5s and 10s.

Present practical problem solving activities involving counting equal sets or groups, as above.

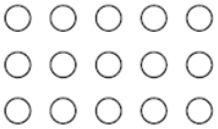
Key vocabulary: groups of, lots of, times, array, altogether, multiply, count
Key skills for multiplication at Stage 1:
Count in multiples of 2, 5 and 10.
Solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.
Make connections between arrays, number patterns, and counting in twos, fives and tens.
Begin to understand doubling using concrete objects and pictorial representations.

Stage 2 Multiply using arrays and repeated addition (using at least 2s, 5s and 10s)

Use repeated addition on a number line - starting from zero, make equal jumps up on a number line to work out multiplication facts and write multiplication statements using x and = signs.

4 X 5 = 20

Use arrays to help teach children to understand the commutative law of multiplication, and give examples such as **3 x __ = 15**:



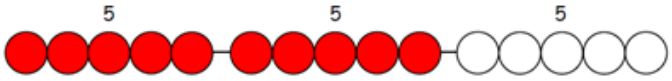
5 x 3 = 15

3 x 5 = 15

5 x 3 = 3 + 3 + 3 + 3 = **15**
3 x 5 = 5 + 5 + 5 = **15**

Use practical apparatus:

5 x 3 = 5 + 5 + 5



Use mental recall:
Children should begin to **recall multiplication facts for 2, 5 and 10** times tables through practice in counting and understanding of the operation.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, **multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times...**
Key skills for multiplication at Stage 2:

- Count in steps of 2, 3 and 5 from zero, and in 10s from any number.
- Recall and use multiplication facts from the **2, 5 and 10** multiplication tables, including recognising odds and evens.
- Write and calculate number statements **using the x and = signs**.
- Show that multiplication can be done in any order (commutative).
- Solve a range of problems involving multiplication, using concrete objects, arrays, repeated addition, mental methods, and multiplication facts.
- Pupils use a variety of language to discuss and describe multiplication.

Stage 3 Multiply 2-digits by a single digit number

Introduce the grid method for multiplying 2-digit by single-digits:

e.g. 23 x 8 = 184

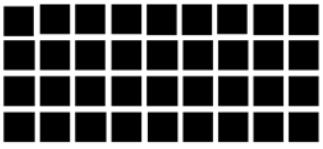
X	20	3
8	160	24

160 + 24 = 184

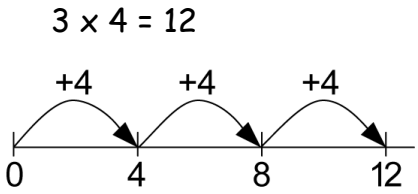
Introduce the grid method with children physically making an array to represent the calculation (e.g. make 8 lots of 23 with 10s and 1s place value counters), then translate this to grid method format.

To do this, children must be able to:

- Partition numbers into tens and units
- Multiply multiples of ten by a single digit (e.g. 20 x 4) using their knowledge of multiplication facts and place value
- Recall and work out multiplication facts in the 2, 3, 4, 5, 8 and 10 times tables.
- Work out multiplication facts not known by repeated addition or other taught mental strategies (e.g. by commutative law, working out near multiples and adjusting, using doubling etc.) Strategies to support this are repeated addition using a number line, bead bars and arrays:



9 x 4 = 36



Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated ad-dition, column, row, commutative, sets of, equal groups, times, _times as big as, once, twice, three times..., **partition, grid method, multiple, product, tens, units, value**

Key skills for multiplication at Stage 3:

- Recall and use multiplication facts for the **2, 3, 4, 5, 8 and 10** multiplication tables, and multiply multiples of 10.
- Write and calculate number statements using the multiplication tables they know, including **2-digit x single digit**, drawing upon mental methods, and progressing to reliable written methods.
- Solve multiplication problems, including missing number problems.
- Develop mental strategies using commutativity (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240)
- Solve simple problems in contexts, deciding which operations and methods to use.
- Develop efficient mental methods to solve a range of problems e.g using commutativity (**4 × 12 × 5** = 4 × 5 × 12 = **20 × 12** = 240) and for missing number problems x 5 = 20, 3 x = 18, x = 32

Stage 4 Multiply 2 and 3-digits by a single digit, using all multiplication tables up to 12 x 12

Developing the grid method:

e.g. 135 x 5 = 680

X	100	30	6
5	500	150	30

500
150 ← Encourage column addition to add accurately.
+ 30
680

Move onto **short multiplication** (see Stage 5) if and when children are confident and accurate multiplying 2 and 3-digit numbers by a single digit this way, **and** are already confident in "carrying" for written addition.

Children should be able to:

- **Approximate before they calculate**, and make this a regular part of their calculating, going back to the approximation to check the reasonableness of their answer e.g: 346 x 9 is approximately 350 x 10 = 3500. Record an approximation to check the final answer against.
- Multiply multiples of ten and one hundred by a single-digit, using their multiplication table knowledge.
- **Recall all times tables up to 12 x 12**

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Key skills for multiplication at Stage 4:

- Count in multiples of 6, 7, 9, 25 and 1000
- Recall multiplication facts for **all multiplication tables up to 12 x 12.**
- Recognise place value of digits in up to 4-digit numbers
- Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multiply 3 numbers.
- Use commutativity and other strategies mentally 3 x 6 = 6 x 3 , 2 x 6 x 5 = 10 x 6 , 39x7 = 30 x 7 + 9 x 7.
- Solve problems with increasingly complex multiplication in a range of contexts.
- Count in multiples of 6, 7, 9, 25 and 1000
- Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and units)

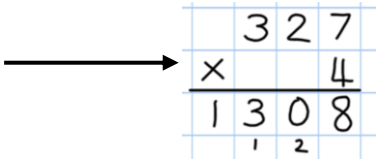
Stage 5 Multiply up to 4-digits by 1 or 2 digits.

Introducing column multiplication:

- Introduce by comparing a grid method calculation to a short multiplication method, to see how the steps are related, but notice how there are less steps involved in the column method.
- Children need to be taught to approximate first, e.g. for **72 x 38, they will use rounding: 72 x 38** is approximately 70 x 40 = **2800**, and use the approximation to check the reasonableness of their answer against.

Short multiplication for multiplying by a single digit:

X	300	20	7
4	1200	80	28

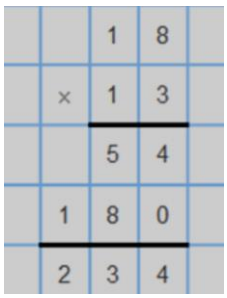


Pupils could be asked to work out a given calculation using the grid, and then compare it to "your" column method. What are the similarities and differences? Unpick the steps and show how it reduces the steps.

Introduce **long multiplication for multiplying by 2 digits:**

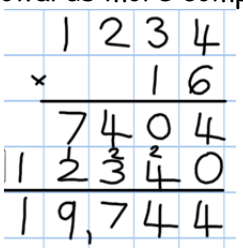
X	10	8
10	100	80
3	30	24

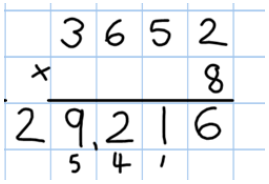
100 + 80 + 30 + 24 = 234



18 x 3 on the 1st row
(8 x 3 = 24, carrying the 2 for twenty, then "1" x 3).
18 x 10 on the 2nd row. Put a zero in units first, then say 8 x 1, and 1 x 1.

Moving towards more complex numbers:





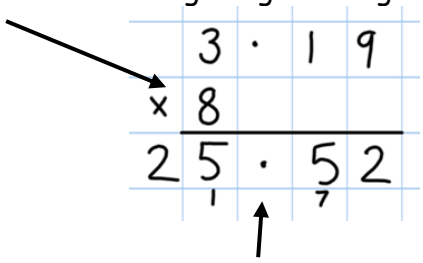
Key vocabulary groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times..., partition, grid method, total, multiple, product, inverse, **square, factor, integer, decimal, short/long multiplication, "carry"**

Key skills for multiplication at Stage 5:

Identify multiples and factors, using knowledge of **multiplication tables to 12x12.**
Solve problems where larger numbers are decomposed into their factors
Multiply and divide integers and decimals by 10, 100 and 1000
Recognise and use square and cube numbers and their notation
Solve problems involving combinations of operations, choosing and using calculations and methods appropriately.

Stage 6 Short and long multiplication as in Stage 5, and multiply decimals with up to 2 decimal places by a single digit.

Remind children that the single digit belongs in the units column.



Line up the decimal points in the question and the answer. This works well for multiplying money (£.p) and other measures.

Children will be able to:

- Use rounding and place value to make approximations before calculating and use these to check answers against.

- Use short multiplication (see Y5) to multiply numbers with more than 4-digits by a single digit; to multiply money and measures, and to multiply decimals with up to 2 decimal places by a single digit.
- Use long multiplication (see Y5) to multiply numbers with at least 4 digits by a 2-digit number.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times... partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short / long
multiplication, "carry", **tenths, hundredths, decimal**

Key skills for multiplication at Stage 6:

- Recall multiplication facts for all times tables up to **12 x 12 (as Y4 and Y5)**.
- Multiply multi-digit numbers, up to 4-digit x 2-digit using long multiplication.
- Perform mental calculations with mixed operations and large numbers.
- Solve multi-step problems in a range of contexts, choosing appropriate combinations of operations and methods.
- Estimate answers using round and approximation and determine levels of accuracy.
- Round any integer to a required degree of accuracy.