

Beeston Primary: Progression in Multiplication

These notes show the stages in building up to a compact, efficient method for multiplication. Our aim is that children use mental methods when appropriate but for calculations that they cannot do in their heads they choose an appropriate written method which they can use accurately and with confidence. Time must be taken building up to the formal written method to ensure complete understanding at each stage. Multiplication should be taught alongside its inverse, division.

Stage 1

Repeated Addition: Practical Multiplication

Children need plenty of experience of multiplying using repeated addition with concrete objects and pictorial representations.

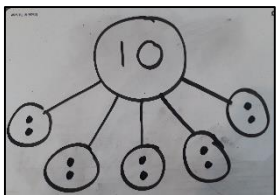
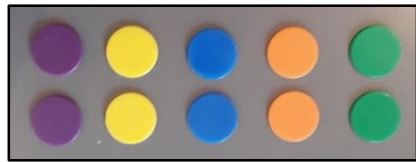
Give children plenty of opportunities to count in equal groups.

Give children plenty of problem solving activities involving counting equal sets or groups.

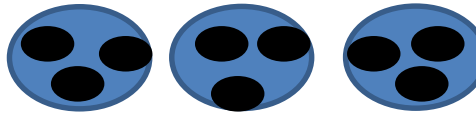
e.g. How many legs on 5 teddies?



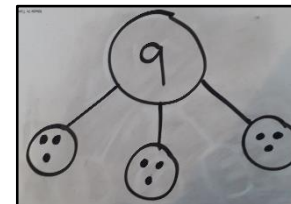
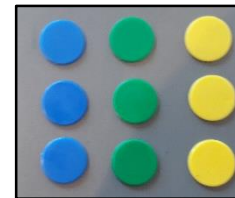
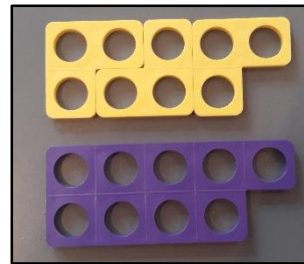
$$2 + 2 + 2 + 2 + 2 = 10$$



There are 3 sweets in a bag. How many sweets in 3 bags?



$$3 + 3 + 3 = 9$$



Children need to be able to:

Foundation

- Count in 2s, 5s and 10s.
- Recognise equal sets.

Key Vocabulary:

Groups of, lots of, altogether, equals, count, repeated addition, double

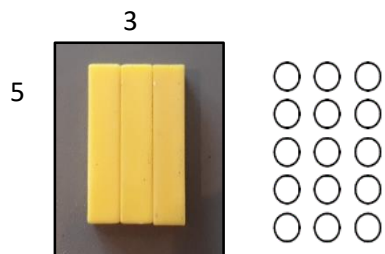
Think: Can I do this in my head? Can I use a jotting? Do I need a formal strategy?

Stage 2

Repeated Addition: Arrays

Children will recognise multiplication as repeated addition and picture this as arrays.

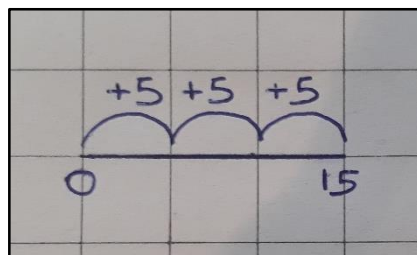
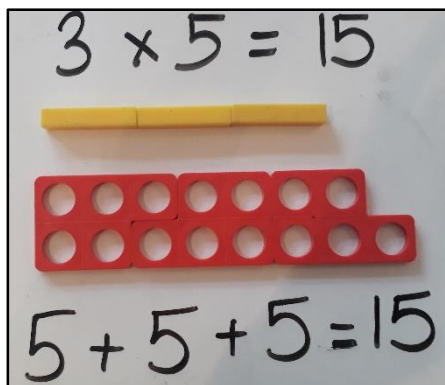
e.g. Children can represent 3×5 pictorially as (this can also be done using the 5 and 3 Cuisenaire rods):



Children can then work this out using repeated addition.

Repeated Addition: Number lines

To work out 3×5 children can use numicon or Cuisenaire to create a number line:



Children need to be able to:

Key Stage 1: Year 1/2

- Count in steps accurately
- Understand multiplication as repeated addition
- Be familiar with 2, 5, 10, 3, 4 multiplication tables.
- Understand that multiplication is commutative (multiplication can be done in any order).
- Solve one step multiplication problems.
- Understand multiplication as the inverse of division.

Key Vocabulary:

Groups of, lots of, altogether, equals, count, repeated addition, sets of, row, column, multiply, times, ___ times as big as, array, bar model, number line

Think: Can I do this in my head? Can I use a jotting? Do I need a formal strategy?

Stage 3

Grid Method

The grid method should be introduced alongside children physically making an array to represent the calculation.

Multiply and Divide Integers by 10s, 100s, 1000s

Students should be familiar with using place value to multiply and divide whole numbers by powers of 10. They should begin by focusing on multiplication before looking at division.

Eg. $46 \times 10 = 460$

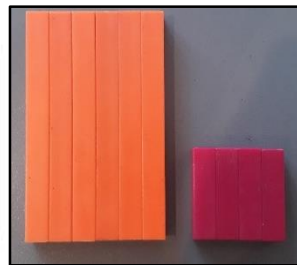
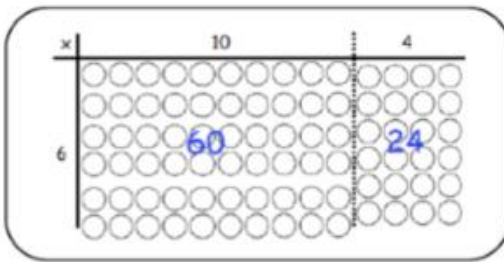
H	T	Ones
4	6	0
	4	6

Two digit teen number multiplied by a single digit:

This should first be introduced using an array.

Children should be encouraged to explore commutative properties e.g 6×10 followed by 6×4 OR 6×4 followed by 6×10

$14 \times 6 = 84$



	6	0
+	2	4
	8	4

Students should then use column addition to arrive at their final answer

$6 \times 14 = 84$

x	10	4
6	60	24

Children need to be able to:

Lower Key Stage 2: Year 3/4

- Partition numbers
- Recall multiplication facts up to 12×12
- Have a secure understanding of related multiplication facts e.g. from 5×7 and place value knowledge, know 50×7 , 50×70 , 50×700 .
- Have a secure understanding of place value.
- Add combinations of numbers mentally or using column addition.
- Solve two step problems involving multiplication.
- Understand multiplication to be the inverse of division.

Key Vocabulary:

Groups of, lots of, altogether, equals, count, repeated addition, sets of, row, column, multiply, times, ___ times as big as, array, bar model, number line, ten times bigger, 100 times bigger, multiple, product, inverse.

Think: Can I do this in my head? Can I use a jotting? Do I need a formal strategy?

Multiplying a 2 digit by a 2 digit number:

Children should partition both numbers and multiply each part. Children can then add the parts together, using column addition:
e.g. $56 \times 27 = 1512$

X	20	7
50	1000	350
6	120	42

	1	0	0	0	
		1	2	0	
			3	5	0
+				4	2
	1	5	1	2	

Progression

1. Multiply a 2-digit number by a 1-digit number.
2. Multiply a 3-digit number by a 1-digit number.
3. Multiply a 2-digit number by a 2-digit number.

Children need to be able to: Lower Key Stage 2: Year 3/4

- Have a secure understanding of decimal place value.
- Understand the relationship between facts such as 7×8 and 0.7×8 .
- Have a secure knowledge of times tables facts up to 12×12 .
- Use column addition to add decimal numbers.
- Solve two step problems involving multiplication.
- Understand multiplication to be the inverse of division.

Key Vocabulary:

Groups of, lots of, altogether, equals, count, repeated addition, sets of, row, column, multiply, times, ___ times as big as, array, bar model, number line, ten times bigger, 100 times bigger, 10 times smaller, 100 times smaller, multiple, product, inverse.

Think: Can I do this in my head? Can I use a jotting? Do I need a formal strategy?

Stage 4

Short Multiplication

Once children have a *secure* understanding of the grid method, they can move on to short multiplication.

e.g. 56×7

x	50	6	
7	350	42	392



$$\begin{array}{r} 56 \\ \times 7 \\ \hline 392 \end{array}$$

$7 \times 6 = 42$
 $7 \times 50 = 350$

NB: cross out exchange once used.

Introduce short multiplication alongside the grid method. Ask children to compare similarities and differences between the two methods. Unpick the steps to show how they are reduced from grid method.

Long Multiplication

Children can multiply two digit numbers by two or three digit numbers as follows:

e.g. $56 \times 27 = 1512$

x	50	6	
20	1000	120	
7	350	42	1512



$$\begin{array}{r} 56 \\ \times 27 \\ \hline 392 \\ 1120 \\ \hline 1512 \end{array}$$

(56×7)
 (56×20)

NB: cross out exchange once used.

These calculations do not need to be written down

Introduce long multiplication alongside grid method. Unpick the steps to show how they are reduced from grid method.

Eventually children will be able to do this without writing out what they are multiplying at the side.

Children need to be able to: Upper Key Stage 2: Year 5/6

- Have secure knowledge of times tables up to 12×12 .
- Have secure knowledge of place value, including decimal place value.
- Be able to multiply and divide decimals to 2dp by 10, 100 and 1000.
- Have a secure understanding of the grid method.
- Solve complex multistep problems involving multiplication.
- Understand multiplication to be the inverse of division.

Key Vocabulary:

Groups of, lots of, altogether, equals, count, repeated addition, sets of, row, column, multiply, times, ___ times as big as, array, bar model, number line, ten times bigger, 100 times bigger, 10 times smaller, 100 times smaller, multiple, product, inverse.

Think: Can I do this in my head? Can I use a jotting? Do I need a formal strategy?

Multiplying with decimals

As children progress, they will be able to use the short multiplication method to multiply decimal numbers.

$$\begin{array}{r} 3.19 \\ \times 8 \\ \hline 25.52 \end{array}$$

e.g. 3.19×8

$$\begin{array}{r} 319 \times 8 \\ \hline 2552 \end{array} \quad (\times 100)$$

$3.19 \times 8 = 25.52$

$(\div 100)$

Progression

1. Multiply a 2-digit number by a 1-digit number
2. Multiply a 2-digit number by a 2-digit number
3. Multiply a 3-digit number by a 2-digit number
4. Multiply a 2-digit number by a decimal
5. Multiply 10/100 in decimals