



St Gilbert's R.C. Primary School

Policy – Multiplication Methods – September 2016

Progression towards a written method for Multiplication

In developing a written method for multiplication, it is important that children understand the concept of multiplication, in that it is:

- repeated addition

They should also be familiar with the fact that it can be represented as an array

They also need to understand and work with certain principles, i.e. that it is:

- the inverse of division
- commutative i.e. 5×3 is the same as 3×5
- associative i.e. $2 \times 3 \times 5$ is the same as $2 \times (3 \times 5)$

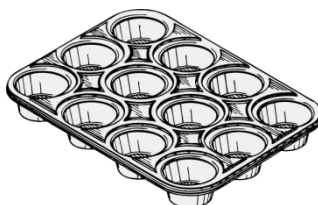
YR

Early Learning Goal:

Children solve problems, including doubling.

Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They should experience practical calculation opportunities using a wide variety of equipment, including small world play, role play, counters, cubes etc.

Children may also investigate putting items into resources such as egg boxes, ice cube trays and baking tins which are arrays.



They may develop ways of recording calculations using pictures, etc.



A child's jotting showing the fingers on each hand as a double.



A child's jotting showing double three as three cookies on each plate.



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Y1

End of Year Objective:

Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the Teacher.

In year one, children will continue to solve multiplication problems using practical equipment and jottings. They may use the equipment to make groups of objects. Children should see everyday versions of arrays, e.g. egg boxes, baking trays, ice cube trays, wrapping paper etc and use this in their learning, answering questions such as 'How many eggs would we need to fill the egg box? How do you know?'

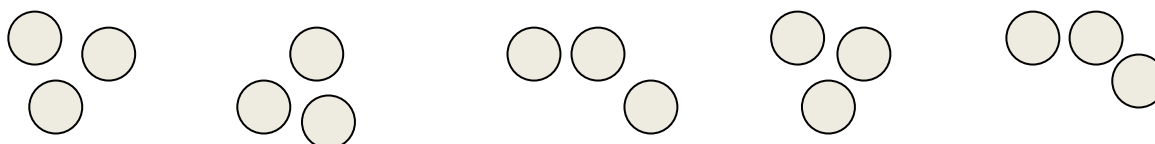
Y2

End of Year Objective:

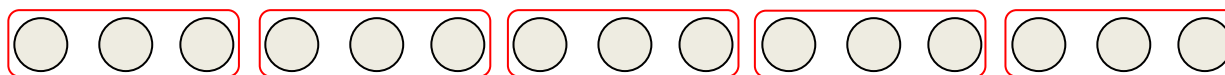
Calculate mathematical statements for multiplication (*using repeated addition*) and write them using the multiplication (x) and equals (=) signs.

Children should understand and be able to calculate multiplication as repeated addition, supported by the use of practical apparatus such as counters or cubes. e.g.

5 x 3 can be shown as five groups of three with counters, either grouped in a random pattern, as below:



or in a more ordered pattern, with the groups of three indicated by the border outline:



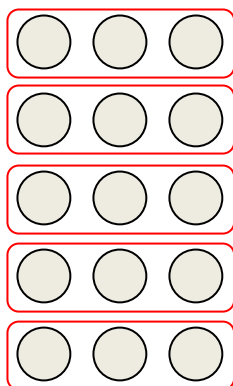
Children should then develop this knowledge to show how multiplication calculations can be represented by an array, (this knowledge will support with the development of the grid method in the future). Again, children should be encouraged to use practical apparatus and jottings to support their understanding, e.g.

5 x 3* can be represented as an array in two forms (as it has commutativity):

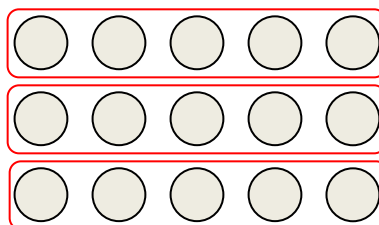


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$$3 + 3 + 3 + 3 + 3 = 15$$



$$5 + 5 + 5 = 15$$

*For mathematical accuracy 5×3 is represented by the second example above, rather than the first as it is five, three times. However, because we use terms such as 'groups of' or 'lots of', children are more familiar with the initial notation. Once children understand the commutative order of multiplication the order is irrelevant).

Y3

End of Year Objective:

Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, progressing to formal written methods.*

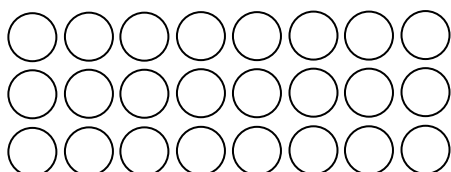
**Although the objective suggests that children should be using formal written methods, the National Curriculum document states "The programmes of study for mathematics are set out year-by-year for key stages 1 and 2. Schools are, however, only required to teach the relevant programme of study by the end of the key stage. Within each key stage, schools therefore have the flexibility to introduce content earlier or later than set out in the programme of study." p4*

It is more beneficial for children's understanding to go through the expanded methods of calculation as steps of development towards a formal written method.

Initially, children will continue to use arrays where appropriate linked to the multiplication tables that they know (2, 3, 4, 5, 8 and 10), e.g.

$$3 \times 8$$

They may show this using practical equipment:

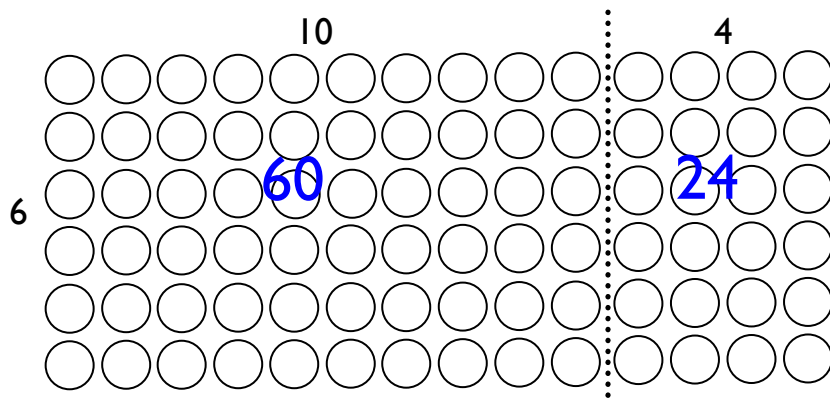


$$3 \times 8 = 8 + 8 + 8 = 24$$

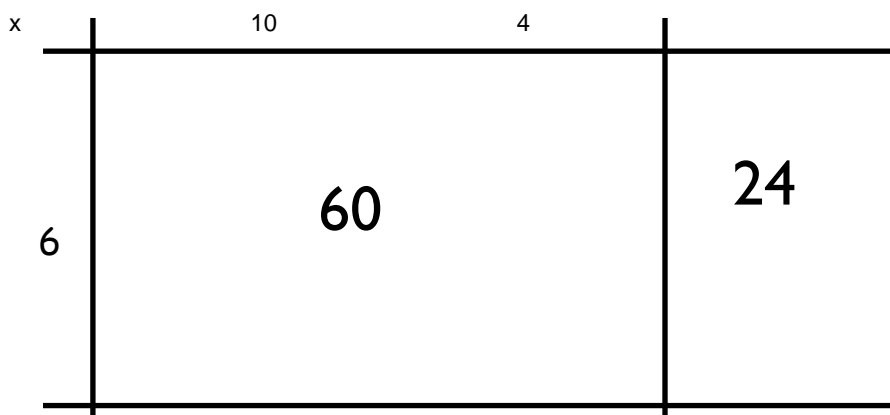
or by jottings using squared paper:



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By placing a box around the array, as in the example below, and by removing the array, the grid method can be seen.



It is really important that children are confident with representing multiplication statements as arrays and understand the rows and columns structure before they develop the written method of recording.

From this, children can use the grid method to calculate two-digit by one-digit multiplication calculations, initially with two digit numbers less than 20. Children should be encouraged to set out their addition in a column at the side to ensure the place value is maintained. When children are working with numbers where they can confidently and correctly calculate the addition mentally, they may do so.

13 x 8

x	10	3
8	80	24

$$\begin{array}{r} 80 \\ + 24 \\ \hline 104 \end{array}$$

When children are ready, they can then progress to using this method with other two-digit numbers.



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37 x 6

x	30	7	
6	180	42	

	180	
+	42	
	<u>222</u>	

Children should also be using this method to solve problems and multiply numbers in the context of money or measures.

Y4

End of Year Objective:

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

Children will move to Y4 using whichever method they were using as they transitioned from Y3. They will further develop their knowledge of the grid method to multiply any two-digit by any single-digit number, e.g.

79 x 8

x	70	9	
8	560	72	

	560	
+	72	
	<u>632</u>	

To support the grid method, children should develop their understanding of place value and facts that are linked to their knowledge of tables. For example, in the calculation above, children should use their knowledge that $7 \times 8 = 56$ to know that $70 \times 8 = 560$.

By the end of the year, they will extend their use of the grid method to be able to multiply three-digit numbers by a single digit number e.g.

346 x 8

x	300	40	6	
8	2400	320	48	

	2400		
+	320		
+	48		
	<u>2768</u>		

When children are working with numbers where they can confidently and correctly calculate the addition (or parts of the addition) mentally, they may do so.



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Children should also be using this method to solve problems and multiply numbers in the context of money or measures.

Y5

End of Year Objective:

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

Children should continue to use the grid method and extend it to multiplying numbers with up to four digits by a single digit number, e.g.

4346 x 8

x	4 000	300	40	6	
8	32 000	2400	320	48	
					32000
					+ 2400
					+ 320
					+ 48
					<hr/> 34768

and numbers with up to four digits by a two-digit number, e.g.

2693 x 24

x	2000	600	90	3	
20	40000	12000	1800	60	
4	8000	2400	360	12	
					40000
					+ 8000
					+ 12000
					+ 2400
					+ 1800
					+ 360
					+ 60
					+ 12
					<hr/> 64632

When children are working with numbers where they can confidently and correctly calculate the addition (or parts of the addition) mentally, they may do so.

Children should also be using this method to solve problems and multiply numbers in the context of money or measures.

Children, once confident with the grid method, should begin using the column method to multiply as it provides a quicker way of finding an answer. They should begin using the expanded column method .e.g,



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42 x 6 =

$$\begin{array}{r} 42 \\ \times 6 \\ \hline 12 \\ \hline 240 \\ \hline + 252 \\ \hline \end{array} \quad \begin{array}{l} \\ \\ (2 \times 6) \\ \\ (40 \times 6) \end{array}$$

They should then move onto the compact method of multiplication. For short division;

$$\begin{array}{r} 42 \\ \times 6 \\ \hline 252 \\ \hline 1 \end{array}$$

For long division;

52 x 38 =

$$\begin{array}{r} 52 \\ \times 38 \\ \hline 416 \\ \hline 1560 \\ \hline + 1976 \\ \hline \end{array} \quad \begin{array}{l} \\ \\ \text{Multiply } 52 \times 8 \\ \text{Multiply } 52 \times 30 \\ \text{Add the products} \end{array}$$



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Y6

End of Year Objective:

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

By the end of Y6, children should be competent in using all of the above methods to multiply whole and decimal numbers, however they should be selecting the most efficient method for a question.

To use the grid method to multiply decimal numbers with up to two decimal places, e.g.

4.92 x 3

x	4	0.9	0.02	
3	12	2.7	0.06	12 + 2.7 + 0.06 <hr/> 14.76

When children are working with numbers where they can confidently and correctly calculate the addition (or parts of the addition) mentally, they may do so.

Children should also be using this method to solve problems and multiply numbers, including those with decimals, in the context of money or measures, e.g. to calculate the cost of 7 items at £8.63 each, or the total length of six pieces of ribbon of 2.28m each.