Progression in calculation

Multiplication

Children need to understand the concept of multiplication, that it is:

- **Repeated addition**

- **Can be represented as an array**

They also need to understand and work with certain principles:

- **Inverse of division**

- **Is commutative**
  i.e. 3 x 5 = 5 x 3

- **Is associative**
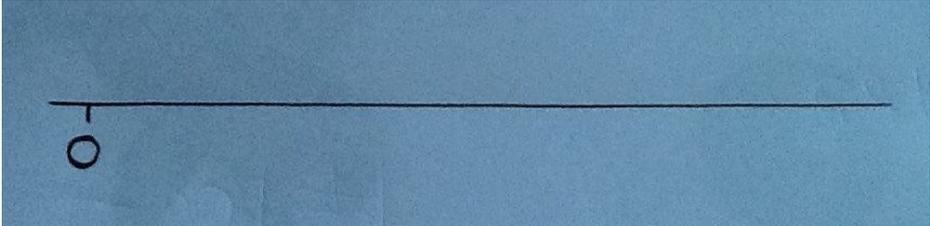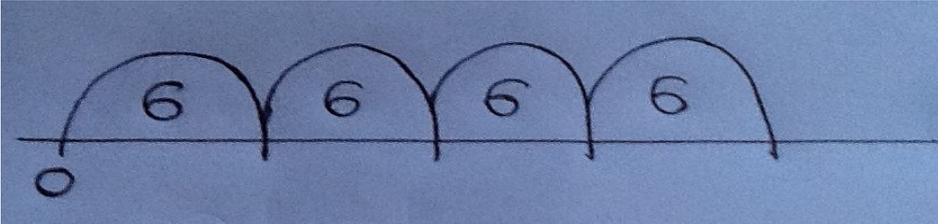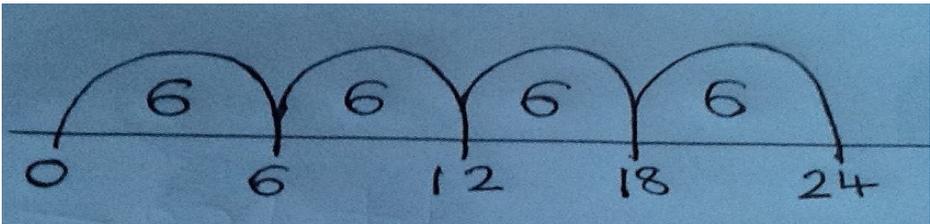 **i.e. 2 x (3 x 5) = (2 x 3) x 5**

Key vocabulary
- lots of, groups of
- times, multiply, multiplied by
- multiple of
- product
- once, twice, three times… ten times… times as (big, long, wide… and so on)
- repeated addition
- array (row, column)
- double

Progression in calculation - multiplication

	Mental strategies	Written strategies
Reception	Practical doubling	
Year 1	Doubling numbers count in steps of 2, 5 and 10	Arrays Pictorial representations
Year 2	2, 5 and 10 x tables 10 x table and place value	Record using x = Arrays Repeated addition
Year 3	3, 4 and 8 x tables x 4 = x 2 x 2	Introduce grid method for TU x U
Year 4	Up to 12 x 12 Multiply by 0, 1, 10 and 100 Use facts to work with two and three digit numbers (multiples of 10) Multiples	Grid method TU x U HTU x U
Year 5	Multiples Square, cube and prime numbers	Introduce Long and short multiplication Up to ThHTU x U Multiply whole numbers and decimals by 10, 100 and 1000
Year 6	Mixed calculations Estimating answers	Long and short multiplication Up to ThHTU x TU BODMAS

Written calculation methods for multiplication
Repeated addition on a number line

|	
1. For this method, replace the 'x' with the phrase 'jumps of.'	4 × 6 4 jumps of 6
2. Draw a horizontal line using a ruler.	
3. Start with 0 on the left.	0
4. Draw the number of jumps you need to make and label how much each one is worth.	0 6 6 6 6
5. Add on each jump and label the running total under the line.	0 6 6 6 6 6 12 18 24
6. Complete the number sentence.	4 × 6 = 24
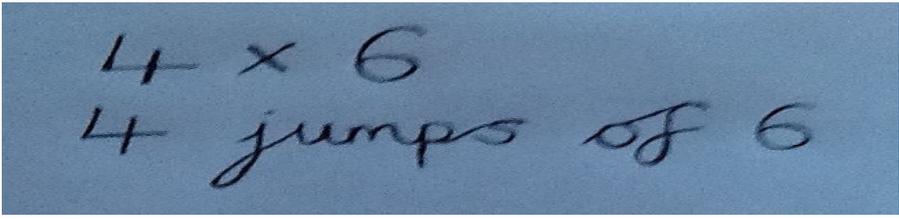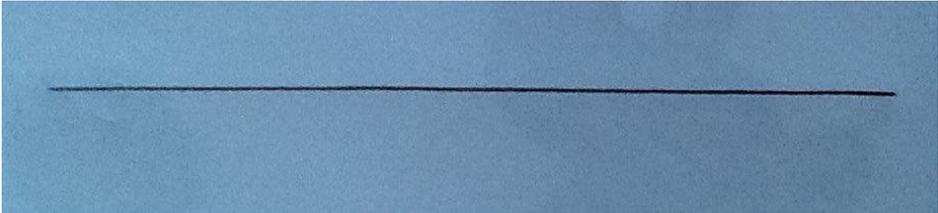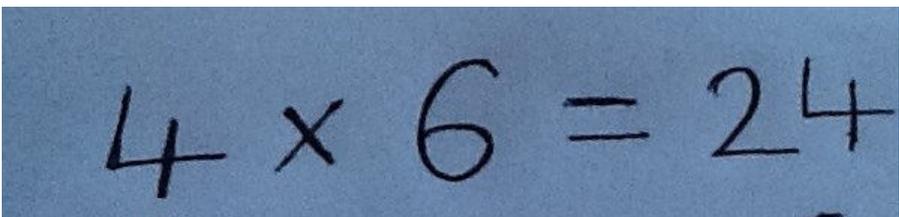
Prior learning/skills and concepts that they need to understand:
- using a number line to add
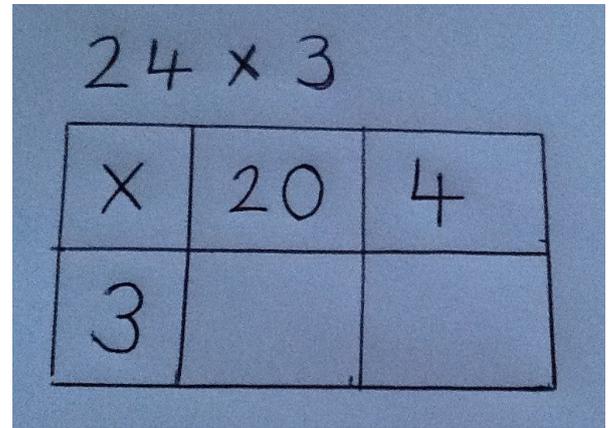- arrays and groups
- mental addition of single digits

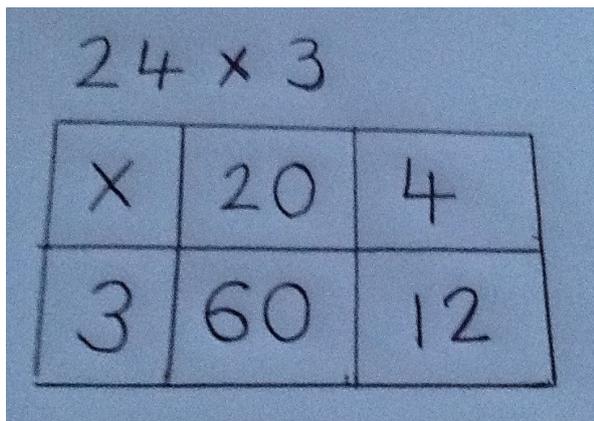# Written calculation methods for multiplication
Grid method

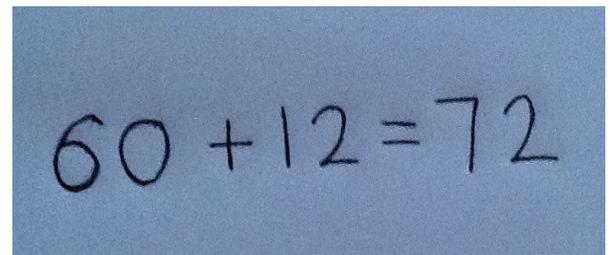**1. Draw your grid. (For TU x U you will need a 2 x 3 grid).**

24 x 3

X		

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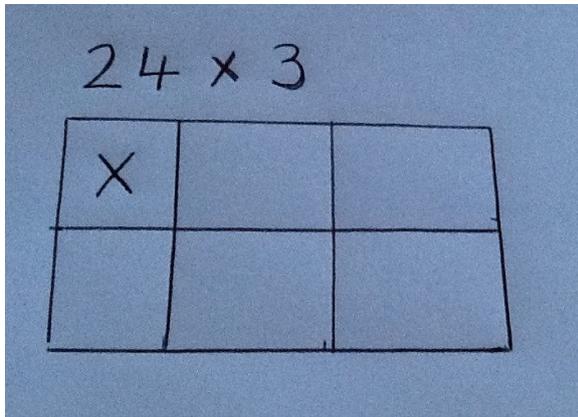
2. Partition the numbers and put them in the grid.

24 x 3

X	20	4
3		

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3. Multiply each number along the top by the number(s) in the first column.

24 x 3

X	20	4
3	60	12

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4. Add the results together.

60 + 12 = 72

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5. Complete the number sentence.

24 x 3 = 72
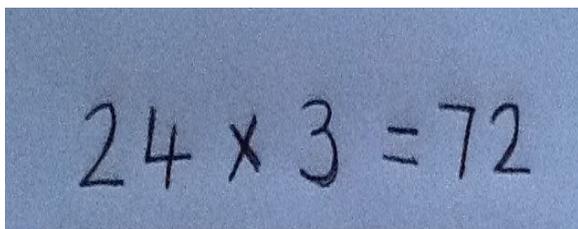
Prior learning/skills and concepts that they need to understand:
- multiplication tables
- partitioning
- place value
- addition strategies

Written calculation methods for multiplication
Long multiplication

1. Set out the calculation using place value columns. $$37 \times 4$$ $$\begin{array}{r} 37 \\ \times \quad 4 \\ \hline \end{array}$$	2. Multiply the units by the number you are multiplying by. $$\begin{array}{r} 37 \\ \times \quad 4 \\ \hline 28 \ (7 \times 4) \end{array}$$
3. Repeat for tens number (and so on). $$\begin{array}{r} 37 \\ \times \quad 4 \\ \hline 28 \ (7 \times 4) \\ 120 \ (30 \times 4) \end{array}$$	4. Add the results together. $$\begin{array}{r} 37 \\ \times \quad 4 \\ \hline 28 \ (7 \times 4) \\ 120 \ (30 \times 4) \\ \hline 148 \\ \hline \end{array}$$
5. Complete your number sentence. $$37 \times 4 = 148$$	If you are multiplying by a two digit number, partition it and multiply everything by the units and then by the tens. $$27 \times 13 = 351$$ $$\begin{array}{r} 27 \\ \times \quad 13 \\ \hline 21 \ (7 \times 3) \\ 60 \ (20 \times 3) \\ 70 \ (7 \times 10) \\ 200 \ (20 \times 10) \\ \hline 351 \\ \hline 1 \end{array}$$

Prior learning/skills and concepts
that they need to understand:
- place value
- multiplication tables
- column addition

Written calculation methods for multiplication
Short multiplication

Multiply the units first. If you need to carry put the number underneath the line in the next column. Then multiply the tens, don't forget to add any numbers that you have carried.

```
  12
x  6
────
  72
  1
```

```
  2 4
x 1 3
─────
3 1 2
  5
```

What is BODMAS? It stands for 'brackets', 'other', division', 'multiplication', 'addition' and 'subtraction'. The order in which we carry out a calculation is important.

Order of operation

What is 2 + 3 x 4 ?

If we calculate the '2 + 3' part first, we get:

(2 + 3) x 4 = 5 x 4
= 20

If we calculate the '3 x 4' part first, we get:

2 + (3 x 4) = 2 + 12
=14

These are obviously two different answers — but which one is correct?

BODMAS tells us that 'multiplication' comes before 'addition', so the **second** answer is correct:

2 + 3 x 4 = 2 + 12 = 14