Year 4

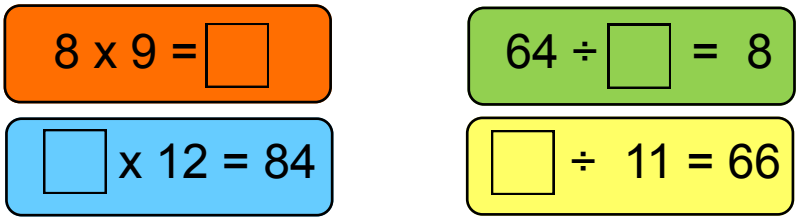
Multiplication and division

Children are expected to:

- **Recall multiplication and division facts for multiplication tables up to 12 x 12.**

From 2020, Year 4 children will complete a statutory times table screening test in June which will assess their fluency and recall of the times table facts up to 12 x 12. Please see the times tables policy for further details of how these facts are taught and assessed throughout school.

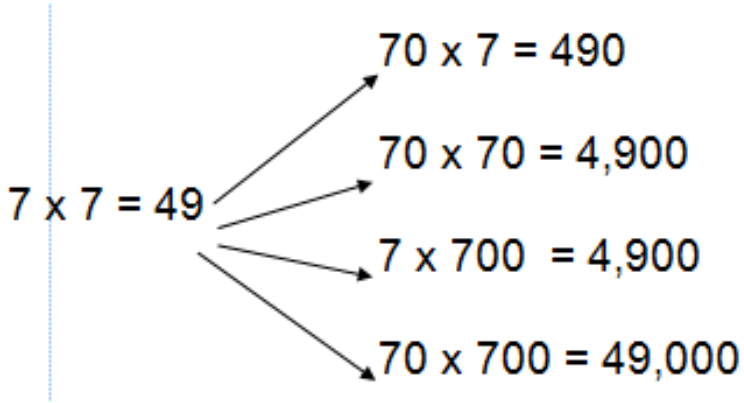
Missing number problems can help assess children's knowledge of multiplication and division facts.



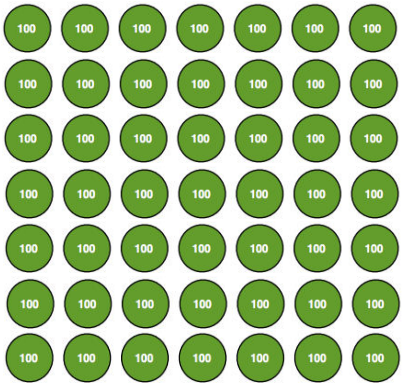
Knowing factor pairs (which two numbers multiply together to make a particular value/multiple) is another skill the children need to acquire.

- **Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.**

Using known multiplication and division facts, children should be able to derive other associated facts for multiples of 10 and 100.



7 x 700 = 4,900



Place value counters can help support the children's understanding of this and enable them to see the relationship between the place value.

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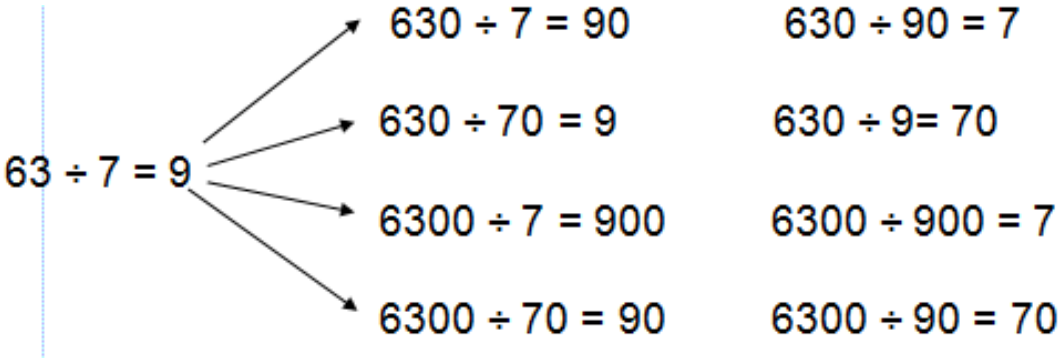


For some calculations, children may be able to mentally partition the numbers and work out the answer out by jotting bits down.

For example:

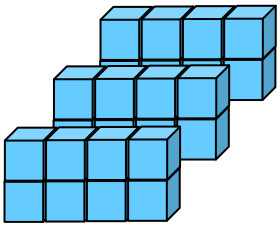
6 x 17 =
6 x 10 and 6 x 7
= 60 and 42
= 102

Children must also be able to tell you what happens when you multiply a number by a 0 or when you multiply and divide a number by 1.

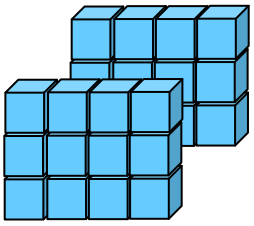
They should also master how to multiply three numbers together. Through practise, they will notice that, no matter how they order the numbers they will always get the same answer.

For example:

2 x 4 x 3 = ?



(2 x 4) x 3
= 8 x 3
= 24



2 x (4 x 3)
= 2 x 12
= 24

This is an essential skill as when they are then presented with a problem which requires multiplying three numbers together, they will be able to choose which order to do it in.
E.g. 6 x 5 x 9 could be completed as (6 x 5) x 9 or as 6 x (5 x 9). Both calculations would give an answer of 270 but children can choose their preferred order based on known facts.

Year 4

Multiplication and division

However, it is important that children recognise that the order of calculations does not make a difference when multiplying (as it doesn't for addition) but the order of the calculation must be completed in the order that it is presented for division (as it does for subtraction).

Children explore this by attempting calculations involving division and establish for themselves that they will arrive at a different answer if they re-arrange the order of the calculation.

- **Recognise and use factor pairs and commutativity in mental calculations.**

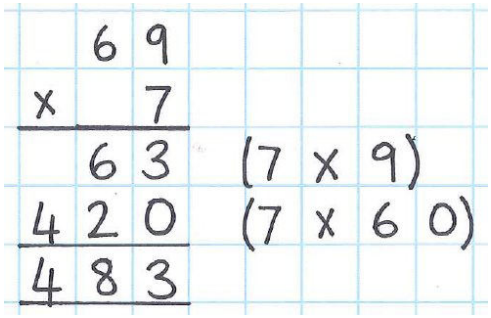
Through explicit teaching of the times tables from KS1, the children have a deep understanding of multiplication and the relationship between multiplication and division.

By Year 4, all children should know the factor pairs up to 12 x 12. They should be able to use commutativity to explain that 7 x 8 and 8 x 7 are the same.
Children are also expected to use and explain their understanding of the inverse. For example knowing that 7 x 8 = 56 means that they also know that 56 ÷ 8 = 7 and 56 ÷ 7 = 8.
See the multiplication and division policy from previous year groups and the times table policy for how this is taught.

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

Progressing from the method learnt in Year 3 whereby the children partition the numbers being multiplied and write a sequence of calculations to arrive at the correct answer, the children now move on to representing this in a more formal way using the **column multiplication method**.

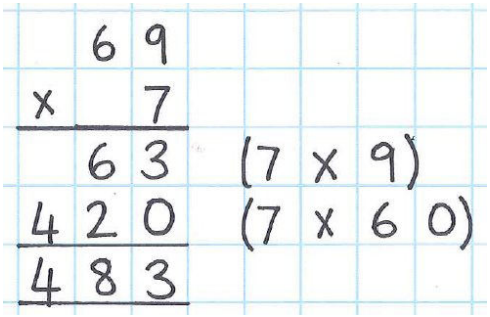
Initially, the children will use the **expanded column method** to ensure that they have a deep understanding of the method and the steps that are followed to arrive at the correct answer.
It is expected by Year 4 that the children will know the multiplication tables to 12 x 12 and the relationship between these facts and multiples of 10 and 100 e.g. if they know 3 x 4 is 12 then they also know that 3 x 40 = 120 and 30 x 4 = 120. They also know that 3 x 400 = 1,200 and 300 x 4 = 1,200. Children who are not secure with these facts and this relationship should continue to consolidate this knowledge using strategies explained in the policy from previous years or the times table policy.



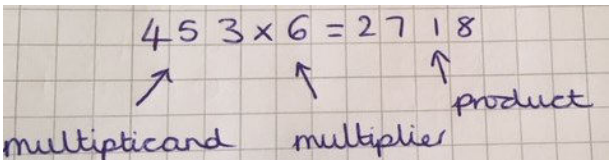
Year 4

Multiplication and division

Example and explanation of expanded column method: 69 x 7



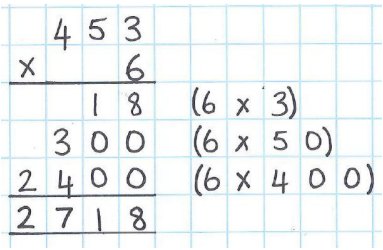
Firstly, children learn to lay out the calculation in this way. They should ensure that the digits are written in their own square and that the multiplication symbol is clear, in its own square on the left side. They should also underline the calculation with a ruler to separate the calculation from the steps taken to solve it.



1. Multiply the ones digit in the multiplicand by the multiplier (the number you are multiplying by, in this case the 7).
2. Record the answer to this calculation underneath the line, ensuring that the digits are written in the correct place value columns and record the calculation that has been completed on the right hand side to keep track of what has been done.
3. Multiply the tens digit in the multiplicand by the multiplier. **It is important that the children see this as a ten and not a one therefore the 6 is representing 60 and not 6.**
4. Record the answer to this calculation underneath the previous one, ensuring that the digits are written in the correct place value column and record the calculation that has been completed on the right hand side.
5. Draw a large equals sign underneath the previous steps.
6. Complete the calculation by using a column addition method to add the answers from the steps taken. **It is important that the children only add the digits from the steps taken to solve the calculation and not from the calculation itself.**

Children can also use this method to solve calculations involving a three-digit number multiplied by a one-digit number.

Example of the expanded column method for a three-digit x one-digit calculation.



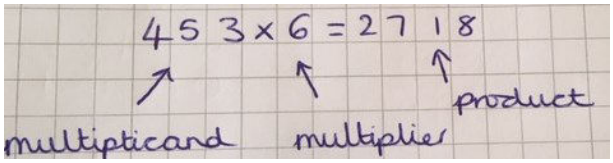
Year 4

Multiplication and division

Once confident with the expanded column method, children can move on to the short method of multiplication. *It is important to remember that if at any stage a child is struggling with the short method or is making repeated mistakes they should go back to the expanded method and consolidate their understanding of the steps taken.*

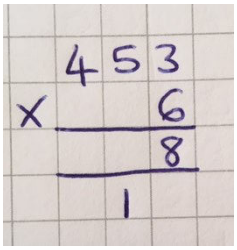
When using the short multiplication method, it is expected that the children have a deep understanding of place value and therefore understand that the digit in the tens column represents a multiple of 10 and the digit in the hundreds column a multiple of 100 e.g in 453 the 5 is really 50 and the 4 is really 400. Without this deep understanding, the children will find this method confusing and will not have a secure understanding of what they are doing or why the method arrives at the correct answer.

Key vocabulary used:

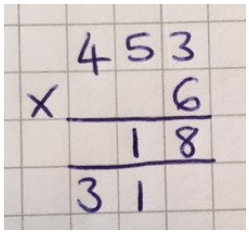


Example and explanation of the short multiplication method for a three-digit x one-digit calculation.

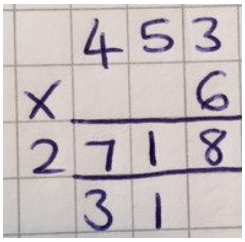
1. Multiply the ones digit in the multiplicand by the multiplier. In this calculation that is 3 x 6 = 18.
2. Record the answer to this accurately in the equals sign ensuring that the digits remain in their correct place value column. In this case, the 8 is recorded in the ones column and the 1 is exchanged underneath the tens column to be added on once the next step of the calculation is completed.



3. Multiply the tens digit in the multiplicand by the multiplier. In this case 5 x 6 (which is really 50 x 6 or 5 x 6 lots of 10). 5 x 6 = 30 lots of 10 or 300.
4. Add on any exchanges for this column. In this case, we exchanged 1 ten from the previous calculation so now have 31 lots of 10 or 310.
5. Record the answer to this accurately in the equals sign ensuring that the digits remain in their correct column. In this case, the 1 in the tens column and the 3 is exchanged underneath the hundreds column to be added on once the next step of the calculation is completed.



6. Multiply the hundreds digit in the multiplicand by the multiplier. In this case 4 x 6 (which is really 400 x 6 or 4 x 6 lots of 100). 2400 or 4 x 6 = 24 lots of 100.
7. Add on any exchanges for this column. In this case, we exchanged 3 hundreds from the previous calculation so now have 27 lots of 100 or 2700.
8. Record the answer to this accurately in the equals sign ensuring that the digits remain in their correct column. In this case, the 7 in the hundreds column and the 2 in the newly created thousands column as this was the final step and there are no further steps left to complete.



Year 4

Multiplication and division

If children have a secure understanding of place value and the multiplication facts up to 12 x 12 including related facts of multiples of 10 and 100, this method is fairly straight forward once they understand how to lay out the calculation and the order that the calculations must take place in.

Common errors include:

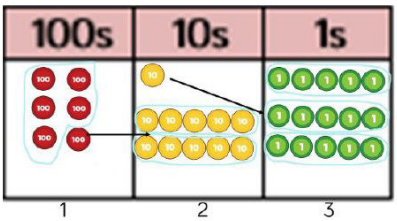
- Writing the digits in the wrong place value column
- Forgetting to exchange
- Forgetting to add on any digits that have been exchanged
- Multiplying the exchange as part of the calculation (this is not necessary as it has already been multiplied and therefore just needs adding on to the answer for the step)
- Calculation errors within the method

These errors are addressed and explicitly pointed out to the children through teacher modelling. The children engage in discussions about these errors and, in doing so, develop a deep understanding of how to complete the method accurately in order to arrive at the correct answer and strategies to be able to identify where they may have made a mistake.

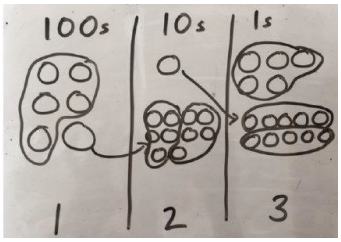
Children are also taught a formal written method for division known as short division or 'the bus stop' method. However, it is important to recognise that in order to have a secure understanding of how this method works and why it arrives at the correct answer, children must have a secure knowledge of place value, division as sharing and grouping and the relationship between multiplication and division. Until children are secure with these concepts, they should continue to explore division problems using a number line method. Children who are struggling with the short method for division can always revert back to the number line method if necessary.

In order to develop a deep understanding of this method, children begin by solving it using a concrete method using place value counters followed by a pictorial method. The abstract version will be modelled by the teacher alongside this until the children have a secure understanding of the method and are able to use the abstract method independently and explain what they are doing at each stage.

concrete



pictorial



abstract

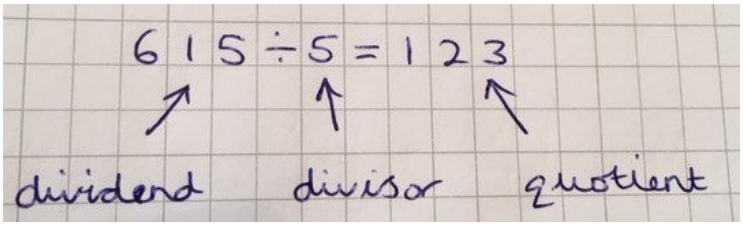
$$5\overline{)615}\quad 123$$

Year 4

Multiplication and division

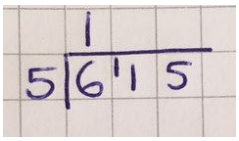
Example and explanation of short multiplication (the bus stop method):

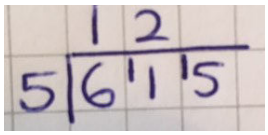
Key vocabulary:

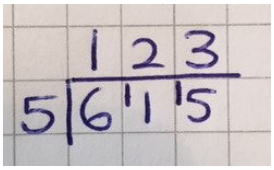


Children learn to represent the calculation with the dividend (the number being divided) underneath the 'bus stop' and the number that they are dividing by on the left hand side. The answer to each step sits in the correct place value column above the bus stop.
In this method, it is important that the children begin by dividing the largest value digit which is different to all other formal methods where we must always start with the ones.

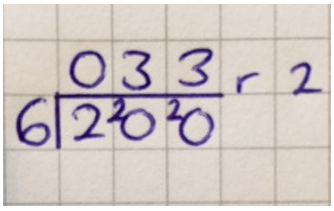
1. Think "How many groups of the divisor can I make from the hundreds digit in the dividend?" In this case: "How many groups of 5 hundreds can I make from 6 hundreds?" or "How many times can I take 5 from 6?"
2. Record the answer on the top of the bus stop. In this case the answer is 1 with 1 remaining.
3. Exchange any remainders into the tens column.
4. Think "How many groups of the divisor can I make from the tens digit in the dividend?" In this case: "How many groups of 5 tens can I make from 11 tens?" or "How many times can I take 5 from 11?"
5. Record the answer on top of the bus stop. In this case the answer is 2 with 1 remaining.
6. Exchange any remainders into the ones column.
7. Think "How many groups of the divisor can I make from the ones digit in the dividend?" In this case: "How many groups of 5 ones can I make from 15 ones?" or "How many times can I take 5 from 15?"
8. Record the answer on top of the bus stop. In this case the answer is 3 with 0 remaining.







If after completing the step for the ones column there are any remaining, these are recorded as remainders in the answer using a small **r** to represent the word remainder.
For example:



Year 4

Multiplication and division

Common errors of the short division method are:

- Not exchanging the correct amount
- Not including the exchange when dividing
- Calculation errors within the method

These errors are addressed and explicitly pointed out to the children through teacher modelling. The children engage in discussions about these errors and, in doing so, develop a deep understanding of how to complete the method accurately in order to arrive at the correct answer and strategies to be able to identify where they may have made a mistake.

- **Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.**

distributive law = partitioning so 39 x 7 = (30 x 7) + (9 x 7)

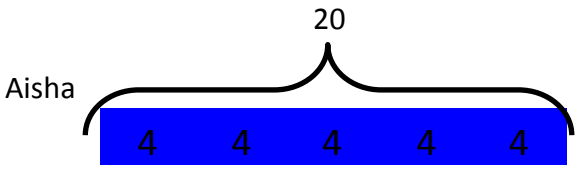
Children should explore a range of problems involving multiplication and division, some of which can be completed mentally and some which will require a formal written method.

Aisha cycles 5 laps of a track.

The total distance Aisha cycles is 20 km.

Ben cycles 7 laps of the same track.

How far does Ben cycle in total?



Each lap = 4km. 4 x 7 = 28km.

Headphones £27.50

Lyra wants to buy some headphones.

She saves £3 each week.

How many weeks does Lyra need to save for?

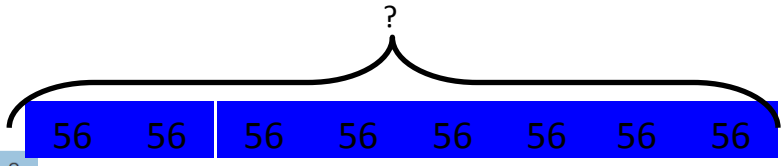
Children could choose to do this as a division problem e.g 27.50 ÷ 3 or as a missing number multiplication problem e.g 3 x ? = >£27.50

A secure knowledge of the 3 x table is essential here as the introduction of money including a decimal point may cause difficulty for some children, as could the understanding of what to do with the remainder if the division method is chosen.

A train has 8 carriages.

Each carriage has 56 seats.

How many seats are there on the train altogether?



56 x 8 = ?

Children should select the multiplication method to solve this problem.

Year 4

Multiplication and division

Key vocabulary

See Year 1-3

Divide, divisor, divided by, divisible by, divided into, share between, groups of, factor, factor pair, multiple, times, equals, remainder, inverse, integer.