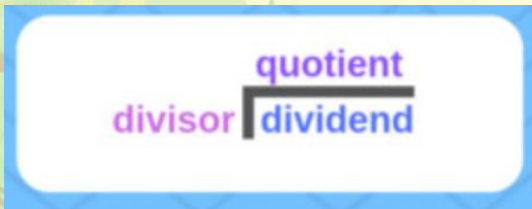# Year 6 - Long Division

Long division is a method used to divide multi-digit numbers into equal groups or parts. It is usually used when the **divisor** is multi-digit (more than one digit).

quotient

divisor │ dividend

It builds upon the formal method of **short division** explored earlier in Key Stage 2 as well as multiplication facts such as **times tables**.

Year 6 - Long Division

In Year 6, the end of year expectation is that children will be able to 'divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division and interpret remainders'.

This means that by the end of the year, all children should be able to complete calculations such as:

$$4730 \div 22 =$$

Children must be proficient with short division before moving onto long division – this will be covered first.

Year 6 -
Long Division

"My Mummy/Daddy/tutor have taught me a division strategy; I'll just use that..."

This is something we hear a lot as teachers. We understand that children may have a preferred method that they have learned outside of school. However, we aim to provide the children with a range of strategies that will provide deeper understanding of a mathematical concept, rather than just teaching to complete a problem procedurally.

We also find that developing understanding of a range of different strategies supports children's reasoning and problem-solving skills leading to more extended explanations.

Year 6 - Long Division (Chunking)

The first method we teach the children is called **chunking.**

Chunking is a method of repeated subtraction of the divisor and **multiples of the divisor** – in other words, working out how many 'chunks' of a number fit into another number.

The aim is to make the 'chunks' as large possible to keep the number of calculations as low as possible.

This method usually requires less times tables knowledge.

Year 6 -
Long Division (Chunking)

When we first begin teaching this skill, children will often be provided with an already prepared **fact box**. Once more confident, children will create their own.

$$22 \overline{)4730}$$

These times table facts are chosen to make the biggest possible 'chunks' from the **dividend**.

Fact Box

1 x 22 = 22
2 x 22 = 44
5 x 22 = 110
10 x 22 = 220
20 x 22 = 440
100 x 22 = 2200
200 x 22 = 4400

Year 6 -
Long Division (Chunking)

The aim of chunking is to create large 'chunks' to subtract from the divisor like those shown in the fact box.
This will reduce the number of steps.

$$22 \overline{)\begin{array}{l} 4730 \\ -\ 4400 \\ \hline 330 \end{array}}$$

(200 x 22)

This 'chunk' is the biggest sensible amount to take away from the **dividend**.

Fact Box

1 x 22 = 22
2 x 22 = 44
5 x 22 = 110
10 x 22 = 220
20 x 22 = 440
100 x 22 = 2200
200 x 22 = 4400

Year 6 -
Long Division (Chunking)

Once you have subtracted the biggest possible chunk, then continue to take away chunks until the remainder is smaller than the divisor.

```
22 | 4730
  -  4400      (200 x 22)
     330
     220       (10 x 22)
  -  110
     110       (5 x 22)
  -    0
```

The aim is to keep taking away 'chunks' until the remaining amount is too small to make another whole group.

Fact Box

1 x 22 = 22
2 x 22 = 44
5 x 22 = 110
10 x 22 = 220
20 x 22 = 440
100 x 22 = 2200
200 x 22 = 4400

Year 6 -
Long Division (Chunking)

When you have created all your 'chunks', add these together to find your **quotient**.

$$215$$

```
        215
22  |  4730
   -  4400    (200 x 22)
        330
   -    220    (10 x 22)
        110
   -    110    (5 x 22)
          0
```

Then, add up the number of groups made to find your **quotient** (answer).

Fact Box

1 x 22 = 22
2 x 22 = 44
5 x 22 = 110
10 x 22 = 220
20 x 22 = 440
100 x 22 = 2200
200 x 22 = 4400

Year 6 -
Long Division (Chunking)

Sometimes, the **dividend** will not be exactly divisible by the **divisor**. This will leave a **remainder**.

$$215\frac{9*}{22}$$

22 | 4739
  -   4400   (200 x 22)
       339
  -    220   (10 x 22)
       119
  -    110   (5 x 22)
         9

*Children will be taught to express remainders in fractions and decimals where appropriate.

If there is a **remainder**, this should be written alongside the **quotient** in an appropriate format.

Fact Box

1 x 22 = 22
2 x 22 = 44
5 x 22 = 110
10 x 22 = 220
20 x 22 = 440
100 x 22 = 2200
200 x 22 = 4400

Year 6 -
Long Division (Formal Method)

The next method we teach the children is called **formal method.**

Unlike chunking, the **long division** method is set out in a similar way to **short division** or bus stop method of division but uses a memorable process to get to the answer.

The aim is to break the dividend down into smaller sections to make it easier to process.

Year 6 -
Long Division (Formal Method)

When we first begin teaching this skill, children will be encouraged to create a **fact box**.

22 | 4730

This is different to the chunking fact box as you only need the **first few multiples**.

Fact Box

1 x 22 = 22
2 x 22 = 44
3 x 22 = 66
4 x 22 = 88
5 x 22 = 110
6 x 22 = 132
7 x 22 = 154
8 x 22 = 176
9 x 22 = 198
10 x 22 = 220

Year 6 -
Long Division (Formal Method)

The aim of formal method is to break down the large number, so we initially focus on the first digits needed to make a group of the divisor.

$$22 \,|\, \overline{4730}$$

2

22 | 4730
- 44
___
3

This is two groups of the divisor so a '2' must be placed on the answer line.

With formal method, we focus on the initial digits, making groups of the divisor.

Fact Box

1 x 22 = 22
2 x 22 = 44
3 x 22 = 66
4 x 22 = 88
5 x 22 = 110
6 x 22 = 132
7 x 22 = 154
8 x 22 = 176
9 x 22 = 198
10 x 22 = 220

Year 6 -
Long Division (Formal Method)

When you have subtracted until the remainder is smaller than your **divisor**, you will have found your **quotient**.

```
        215
  22 | 4730
  -    44 ↓
        33
  -     22
  -     110
        110
          0
```

The aim is to keep making groups of the divisor until the remaining amount is too small to make another whole group.

Fact Box

1 x 22 = 22
2 x 22 = 44
3 x 22 = 66
4 x 22 = 88
5 x 22 = 110
6 x 22 = 132
7 x 22 = 154
8 x 22 = 176
9 x 22 = 198
10 x 22 = 220

Year 6 -
Long Division (Formal Method)

Sometimes, the **dividend** will not be exactly divisible by the **divisor**. This will leave a **remainder**.

```
          215 r 15
    22 | 4745
  -      44 ↓
          34
  -       22
  -      115
         110
          15
```

If there is a **remainder**, this should be written alongside the **quotient** in an appropriate format.

Fact Box

1 x 22 = 22
2 x 22 = 44
3 x 22 = 66
4 x 22 = 88
5 x 22 = 110
6 x 22 = 132
7 x 22 = 154
8 x 22 = 176
9 x 22 = 198
10 x 22 = 220

Your turn

Choose a method to complete the following:

$22 \overline{) 4620}$

$25 \overline{) 4620}$

$25 \overline{) 5235}$