Long and Short Division

When dividing a large number it can be daunting but both long and short division are methods that break down this difficult calculation into a series of simple ones. The difference between long and short division is really one of notation, the methods are very similar.

Long Division

These methods are best demonstrated by an example:

Let us consider the example $8,640 \div 15$

We set it up like this:

$$15\overline{)8\ 6\ 4\ 0}$$

First we look at the left number:

$$15\overline{)8\ 6\ 4\ 0}$$

How many 15s go into 8? None so we on to the next digit.

As we didn't divide the 8, we include both digits:

$$15\overline{)8\ 6\ 4\ 0}$$

How many 15s go into 86? $5 \times 15 = 75$

So 5 with a remainder 11.

We add this result like so:

$$\begin{array}{r} 5 \\ 15\overline{)8\ 6\ 4\ 0} \\ -\ 7\ 5 \\ \hline 1\ 1 \end{array}$$

← The number of 15s in 86.

← $5 \times 15 = 75$

← Work out the remainder

Now we carry down the '4' from the top line:

$$\begin{array}{r} 5 \\ 15\overline{)8\ 6\ 4\ 0} \\ -\ 7\ 5 \\ \hline 1\ 1\ 4 \end{array}$$

Next we need to work out how many 15s in 114.

```
   5
15 | 8 6 4 0
   - 7 5
     1 1 4
```

$7 \times 15 = 105$

so 7 lots of 15 go into 114 with a remainder 9.

We add this result like so:

```
   5 7   ← The number of 15s in 114.
15 | 8 6 4 0
   - 7 5
     1 1 4
   - 1 0 5   ← 15x7 = 105
       9     ← the remainder.
```

Now bring down the 0:

```
   5 7
15 | 8 6 4 0
   - 7 5
     1 1 4
   - 1 0 5
       9 0
```

finally, need to find the number of 15s in 90.

```
   5 7
15 | 8 6 4 0
   - 7 5
     1 1 4
   - 1 0 5
       9 0
```

$6 \times 15 = 90$

so 6 lots of 15 in 90 with remainder

Adding this to what we have:

$$
\begin{array}{r|l}
 & 5\ 7\ 6 \\
\hline
15 & 8\ 6\ 4\ 0 \\
 & -\ 7\ 5 \\
\hline
 & \ \ 1\ 1\ 4 \\
 & -\ 1\ 0\ 5 \\
\hline
 & \ \ \ \ 9\ 0 \\
 & -\ 9\ 0 \\
\hline
 & \ \ \ \ 0
\end{array}
$$

← The number of 15s in 90.

← $15 \times 6 = 90$

← The remainder

This may not be zero, if it's not then it's the remainder of the overal calculation.

And we have our answer:

$8640 \div 15 = 576$ with no remainder.

Short division (bus stop)

Let us consider the calculation $2565 \div 5$.

We set up as with long division:

$$5 \overline{)\ 2\ 5\ 6\ 5}$$

First we do how many 5s go into 2?

$$5 \overline{)\ 2\ 5\ 6\ 5}$$

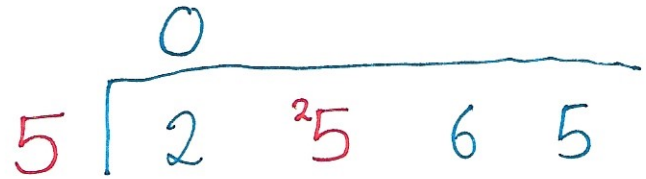
0 ← How many 5s in 2.

$$5 \overline{)\ 2\ {}^{2}5\ 6\ 5}$$

Carry the remainder.

The answer is none so we write zero and carry the remainder, which is 2.

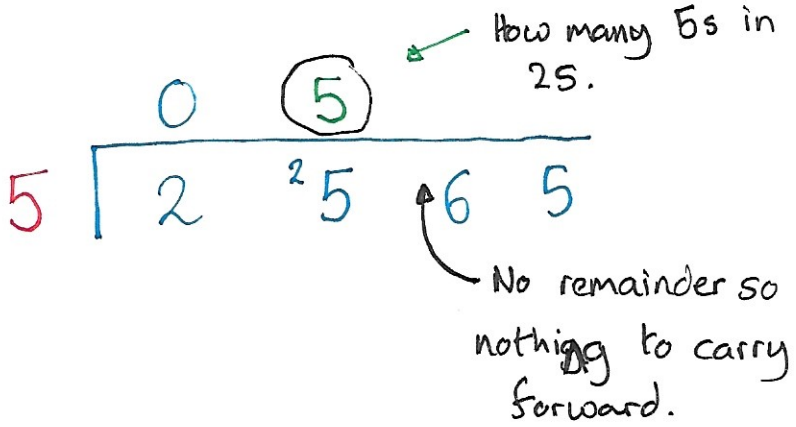
Now we move along, we need to do how many 5s in 25?



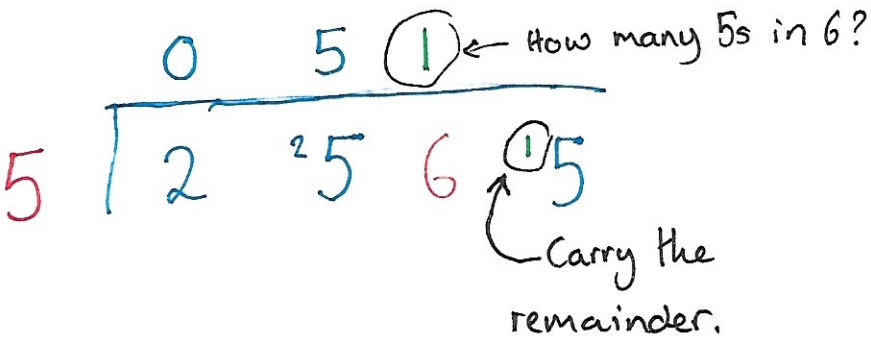
There are 5 lots of 5 in 25:

$5 \times 5 = 25$

So add this:

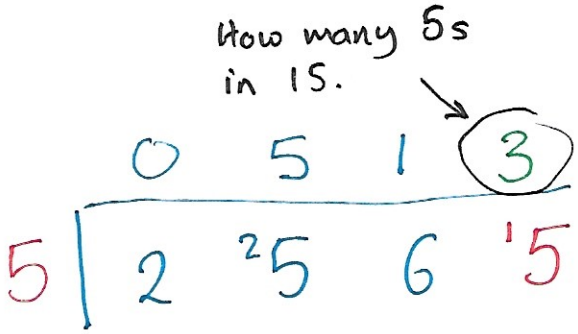


Next is how many 5s go into 6? The answer is clearly 1 with remainder 1.

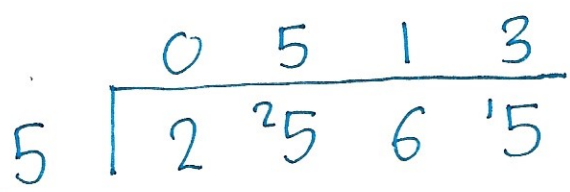


So finally how many 5s in 15?

$3 \times 5 = 15$ so 3 with no remainder.



And so we've finished



So $2565 \div 5 = 513$.

What to do with remainders

Let us consider a similar example to the previous with $2568 \div 5$. This will not divide exactly.

Let's skip through the first few steps as they are the same as the above:

$$\begin{array}{r} 0\ 1\ 5 \\ \hline 5 \,|\, 2\ {}^{2}5\ 6\ {}^{1}8 \end{array}$$

So we do, how many 5s are in 18.

$5 \times 3 = 18$ so it is 3 remainder 3.

So we add that in

$$\begin{array}{r} 0\ 1\ 5\ 3 \text{ r } 3 \\ \hline 5 \,|\, 2\ {}^{2}5\ 6\ {}^{1}8 \end{array}$$

So $2568 \div 5 = 153$ r 3

However, we could be more accurate and carry the remainder by adding a decimal place.

$$\begin{array}{r} 0\ 1\ 5\ 3. \\ \hline 5 \,|\, 2\ {}^{2}5\ 6\ {}^{1}8.{}^{3}0 \end{array}$$

How many 5s in 30? $6 \times 5 = 30$ so 6 with no remainder.

$$\begin{array}{r} 0\ 1\ 5\ 3.6 \\ \hline 5 \,|\, 2\ {}^{2}5\ 6\ 8.{}^{3}0 \end{array}$$

So $2568 \div 5 = 153.6$