Times Tables and Fractions (1)

The most important idea in fractions is **Equivalent Fractions**. Many people think that equivalent fractions are just one of the topics in fraction work that have to be covered, but they pop up every time we do a calculation using fractions, so it is very important to really understand what they are all about and we need a good grasp of times tables.

Let's begin with a definition:

<u>Equivalent fractions</u> are fractions that look different, but are actually the same value.

Take the fraction $\frac{1}{2}$, for example. I am sure you know it is the same as $\frac{2}{4}$.

It just looks different.

The numerator (the number in the top line) and the denominator (the number in the bottom line) have changed, but the two fractions are the same.

If you had $\frac{1}{2}$ a cake and I had $\frac{2}{4}$, we would both have the same amount of cake.

Sometimes we wish to make the numerator and the denominator in a fraction smaller to simplify the fraction and sometimes we want to increase them, when adding, for instance.

When the numerator and the denominator are made smaller, we call the process '**cancelling'**.

To **cancel** a fraction, we look for a number that is a factor of **both** the numerator and denominator.

Take the fraction $\frac{20}{24}$, for instance. Can we find a number that is both a factor of **20** and a factor of **24**? You may have said '**2**' or you may have said '**4**'. Normally we like to go for the largest number we can find – it saves work in the long run.

Using the '**4**', we divide **4** into **20** and **4** into **24** to get the fraction $\frac{5}{6}$.

We say that we have '**cancelled'** by **4**. If we had cancelled by **2** instead, we would have the answer $\frac{10}{12}$, which we could then cancel by two again to get $\frac{5}{6}$ as before.

The fractions $\mathbf{\frac{20}{24}}$, $\mathbf{\frac{10}{12}}$ and $\mathbf{\frac{5}{6}}$ are equivalent fractions. They look different, but actually have the same value.

When the numerator and the denominator are as small as possible as in $\mathbf{\frac{5}{6}}$, we say the fraction is in its '**lowest terms**'.

You can see how important it is to know your multiplication tables for this work. If you know them well, you will quickly see that both **20** and **24** are in the **4** times table, so **4** must be a factor of **20** and **24** and we can use this to **cancel** the fraction. This would be very difficult to do if you did not know the tables, especially as the numbers get bigger.

Let's try a more difficult fraction.

We will cancel the fraction $\mathbf{\frac{225}{360}}$.

There are different ways you can approach this fraction, but it is unlikely you will be able to cancel in one go, so let's start with a small number.

We can see that **225** ends with a **5** and **360** ends with a **0**, so **5** must be a factor of **225** and **360** and we can start by cancelling by that. **5** divides into **225** exactly **45** times and **5** divides into **360** exactly **72** times, so that gives us $\mathbf{\frac{45}{72}}$.

Now, here is where a good knowledge of multiplication tables is useful. If you know them really well, you will see that both **45** and **72** are in the **9** times table, which means we can cancel both numbers by **9**.

This gives us $\mathbf{\frac{5}{8}}$ and a moment's thought will convince you that this fraction will not cancel any more.

So the fractions $\mathbf{\frac{225}{360}}$, $\mathbf{\frac{45}{72}}$ and $\mathbf{\frac{5}{8}}$ are all equivalent fractions and the last one is in its lowest terms.

We will see in a moment how useful all this can be, but first…..

Sometimes we want to make the numerator and the denominator bigger and for this we use the word '**lecnacing'**. You will notice that the word '**lecnac'** is the word '**cancel'** spelt backwards. That is to emphasise that they are opposite processes.

To **lecnac** a fraction, we multiply both the numerator and the denominator by the same number (times tables again!).

Let us take the fraction $\frac{5}{8}$ as an example.

We can multiply the numerator and the denominator by **2** to get $\frac{10}{16}$.

Or we could have multiplied them by **3** to get $\frac{15}{24}$.

Or by **4** to get $\frac{20}{32}$.

We can keep doing this to get a whole chain of fractions that are all equivalent to each other, like this:

$\frac{5}{8}$ $\frac{10}{16}$ $\frac{15}{24}$ $\frac{20}{32}$ $\frac{25}{40}$ $\frac{30}{48}$ $\frac{35}{56}$ ………

It is important to remember that all these fractions have the same value, so if we do something to one of them (like add another fraction to it) it is the same as doing that to any of the other equivalent fractions.

Try continuing these chains of fractions:

$\frac{1}{2}$ $\frac{2}{4}$ $\frac{3}{6}$

$\frac{2}{3}$ $\frac{4}{6}$ $\frac{6}{9}$

$\frac{3}{5}$ $\frac{6}{10}$ $\frac{9}{15}$

So, now let's see why equivalent fractions are so useful.

Suppose we want to add two fractions, say $\frac{3}{7} + \frac{2}{9}$.

We cannot add them as they are because **7ths** are not the same size pieces as **9ths**.

What we need to do is to make the pieces the same size by **lecnacing** until the denominators are the same.

The first question is therefore, 'What number will **7** and **9** both divide into?'

There are many numbers they will both divide into, but we normally go for the smallest one we can find, which is **63**. We want to write both fractions with a denominator of **63**. Let's do them one at a time.

To get $\frac{3}{7}$ into $\frac{}{63}$, we can see we need to lecnac by **9**, because the denominator has already been multiplied by **9**.
So we must multiply the **3** by **9** too. This gives us $\frac{27}{63}$.

To get $\frac{2}{9}$ into $\frac{}{63}$, we need to lecnac by **7**. This gives us $\frac{14}{63}$.

The sum $\frac{3}{7} + \frac{2}{9}$ has now become $\frac{27}{63} + \frac{14}{63}$

Because the denominators are both **63**, we can add the numerators to get $\frac{41}{63}$,

which is the answer to the original sum.

To be able to do this, you need a good knowledge of:

multiplication tables
equivalent fractions
lecnacing and
numerator and denominator of fractions.

Let's try another question and this time we will write it out as you would at school.

Find $\frac{4}{5} + \frac{7}{8}$

Here is the working: $\frac{4}{5} + \frac{7}{8} = \frac{32}{40} + \frac{35}{40} = \frac{67}{40}$

Can you see what we have done? First we found a number that **5** and **8** will divide into and, because we know our tables really well, it was easy to see that the number is **40**.

We made **40** the new denominator of both fractions.

Looking at the first fraction, we see we have to lecnac by **8**, which we did.

Looking at the second fraction, we see we have to lecnac by **5**, which we also did.

Then we added them together. Easy, yes?!

With this answer, there is just one extra step to take. You may have noticed that the answer is a top heavy fraction (or ‘improper’ fraction as we sometimes say). This is because **67** is greater than **40**.

We only need $\frac{40}{40}$ to make a whole one (equivalent fractions again!) so we can make a whole one and still have $\frac{27}{40}$ left. The full answer is therefore $1\frac{27}{40}$

Now, why don’t you try a few using this method of lecnacing?
(What do you mean, your brain’s full!?)

1. $\frac{1}{9} + \frac{1}{5}$

2. $\frac{3}{5} + \frac{1}{7}$

3. $\frac{1}{2} + \frac{1}{6}$

4. $\frac{3}{4} + \frac{1}{3}$

5. $\frac{3}{7} + \frac{3}{8}$