Before I start to teach algebraic fractions to young secondary school students, I often find that they have very limited understanding of basic addition of numerical fractions.

My first comment is PLEASE do not write fractions like this...

$$
2 / 3+7 / 5
$$

Secondly, it is evident that many students are still being taught old "rote" methods that do not promote "understanding" at all.

The "mantra" goes like this...multiply the $\mathbf{3}$ and $\mathbf{5}$ and get 15


Students who follow rote methods like this, only "know a routine" which, the teacher says, gives "the correct answer"!

Students could be taught this similar routine just as easily under the misapprehension that "understanding" is being taught!

This false mantra goes like this...multiply $\mathbf{2}$ and 7 and get 14


If students are "taught" that this is how to add fractions they will think that they "know" how to add fractions but they clearly have no "understanding"!

There is a big difference between "knowing" and "understanding"

I often need to re-teach the following...

## ADDITION OF FRACTIONS.

## This diagram clearly shows that: $\frac{2}{7}+\frac{3}{7}=\frac{5}{7}$



The diagram also shows that we can ONLY add fractions with the same denominators.

Clearly, we can add ANY fractions directly, as long as they have the SAME DENOMINATORS.

Consider these examples:
1.
$\frac{5}{17}+\frac{6}{17}$
$=\frac{11}{17}$
2.

$$
\begin{aligned}
& \frac{a}{c}+\frac{b}{c} \\
= & \frac{(a+b)}{c}
\end{aligned}
$$

3. 

$$
\frac{x+5}{x+7}+\frac{x+3}{x+7}
$$

$$
=\frac{2 x+8}{x+7}
$$

4. 

$$
\frac{3 x+4}{x-6}+\frac{5 x-7}{x-6}
$$

$$
=\frac{8 x-3}{x-6}
$$



We can only tell what the sum is when we divide the number line into $\mathbf{1 2}^{\text {ths }}$ :


NOTE: $\frac{1}{3}+\frac{1}{4}=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$

## ADDING FRACTIONS WITH DIFFERENT DENOMINATORS!

 (Clearly, we must make the denominators EQUAL)Consider these examples:
1.

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

$$
=\frac{1}{3} \times\left[\frac{4}{4}\right]+\frac{1}{4} \times\left[\frac{3}{3}\right] \quad \text { multiplying by } 1 \text { in the form } \frac{4}{4} \text { or } \frac{3}{3}
$$ means that the fraction is the same!

$=\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$
2.

$$
\begin{aligned}
& \frac{1}{b}+\frac{1}{c} \\
= & \frac{1}{b} \times \frac{c}{c}+\frac{1}{c} \times \frac{b}{b} \\
= & \frac{c+b}{b c}
\end{aligned}
$$

3. 

$$
\begin{aligned}
& \frac{a}{b}+\frac{d}{c} \\
= & \frac{a}{b} \times \frac{c}{c}+\frac{d}{c} \times \frac{b}{b} \\
= & \frac{a c+d b}{b c}
\end{aligned}
$$

4. 

$$
\begin{aligned}
& \frac{4}{(x+2)}+\frac{3}{(x-5)} \\
= & \frac{4}{(x+2)} \times \frac{(x-5)}{(x-5)}+\frac{3}{(x-5)} \times \frac{(x+2)}{(x+2)} \\
= & \frac{4 x-20}{(x+2)(x-5)}+\frac{3 x+6}{(x-5)(x+2)} \\
= & \frac{7 x-14}{(x+2)(x-5)}
\end{aligned}
$$

5. 


$=\frac{(x+3)}{(x-5)} \frac{(x-2)}{(x-2)}+\frac{(x+4)}{(x-2)} \frac{(x-5)}{(x-5)}$
$=\frac{\left(x^{2}+x-6\right)}{(x-5)(x-2)}+\frac{\left(x^{2}-x-20\right)}{(x-2)(x-5)}$
$=\frac{\left(2 x^{2}-26\right)}{(x-5)(x-2)}$

The concept that just "knowing a thing" is not the same as "understanding $i t$ " has been the focus of my teaching for many years.
I have devoted a whole website to this concept and I encourage educators to see my ideas...
www.knowingisnotunderstanding.weebly.com

