Algebra,

Been there – Done that

Rational Numbers

Add/subtract

Mathematical Systems

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Algebra, Been there –Done that is a newsletter that links algebra to previously learned concepts and skills or outside experiences

The procedure used to add and subtract rational expressions in algebra is the same used in adding and subtracting fractions in 5th and 6th grades. That is;

1. Find a common denominator
2. Make equivalent fractions
3. Add/subtract the numerators
4. Bring down the denominator
5. Reduce

Add/Sub Fractions
1. Find C.D.
2. Make = frac
3. +/- num.
4. Bring down den.
5. Reduce

If we looked at enough problems, we would be able to find patterns that would allow us to add/subtract fractions in our heads. Look at the following addition problems and their respective answers, see if you can identify a pattern.

$$\frac{1}{5}+\frac{1}{2}=\frac{7}{10} \qquad \frac{1}{2}+\frac{1}{3}=\frac{5}{6} \qquad \frac{1}{3}+\frac{1}{5}=\frac{8}{15}$$

Look at the numbers in the problems, look at the answers. See anything interesting?

Use that pattern to add $\frac{1}{3}+\frac{1}{4}$ in your head.

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

All those fractions had a numerator of 1, what happens if the numerators are not 1.

$$\frac{1}{5}+\frac{2}{7}=\frac{17}{35} \qquad \frac{2}{9}+\frac{1}{2}=\frac{13}{18} \qquad \frac{2}{5}+\frac{4}{7}=\frac{34}{35}$$

From these examples, its easy to see where the denominator comes from, can you manipulate the numbers in the problem that would suggest where the numerator is coming from? It doesn't just jump out at you, you have to play with the numbers.

$$\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$$

Well, if you played long enough you would see you get the common denominator by just multiplying the denominators. The numerator is obtained by multiplying the addends diagonally, then adding those products.

Also works for subtraction

$$\frac{3}{4}-\frac{1}{5}=\frac{11}{20}$$

For example $\frac{3}{5}+\frac{2}{7}\rightarrow\frac{3\times7+5\times2}{5\times7}=\frac{31}{35}$

The generalization makes adding/subtracting rational expressions simple

Generalizing that, we have $\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$

That pattern or formula would allow me to simplify expressions mentally.

$$\frac{2}{x}+\frac{3}{y}=\frac{2y+3x}{xy} \qquad \text{or} \qquad \frac{2}{x-1}+\frac{3}{x+2}=\frac{2(x-2)+3(x-1)}{(x-1)(x+2)}$$

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It would also allow me to add and subtract fractions very quickly in my head