Algebra,

Been there – Done that

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HANLONMATH

Homework

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

Many people equate completing homework assignments with studying, the most effective teachers know this not to be the case. They know **studying includes reading, thinking, reflecting, organizing, writing, analyzing, visualizing, reviewing, remembering, and recalling.** Too many students think homework is about completion. There are those in education that think it's about completion and recalling, experienced teachers know there is more to it.

Homework that reflects and reinforces the day's instruction and the notes taken from that instruction that encourages study is the best way to check for student understanding, address instruction, and increase student achievement. All too often in schools across America, a homework assignment is nothing more than a page in the book with exercises assigned. The best homework assignments reflect what the teacher values. That is, homework that encourages studying.

A typical secondary math assignment in the United States looks like this:

Page 165, 1 – 33 <u>odd</u>

A more appropriate homework assignment that would encourage studying would look more like this:

Read Sec 4.2 Solving Quadratic Equations
Write the General Form of a Quadratic
List 3 ways of Solving Quadratic Equations
How would you choose which method to use?
Explain the relationship between Completing the Square and the Quadratic Formula
Page 165 - 3, 4, 6, 11, 13, 16, 17, 21, 28, and 30

N.B. - *fewer exercises were assigned and the exercises were chosen specifically because they took into account all the nuances of the concepts and skills taught.*

That homework assignment includes components that encourage and reflect studying. Knowing standard procedures is important in learning math so having it part of the homework assignment will help students complete the exercises assigned as well as being better able to verbalize their knowledge. On subsequent nights' homework, students might be asked to write the procedure using the Zero Product Property. Other questions might also be included in subsequent assignments, such as, why does the coefficient of the quadratic term have to be one when completing the square.

The good news about including these types of questions in the homework is that it increases the probability that students are acquiring the language, read, write & speak, and that it encourages studying. Since teachers typically address these in their instruction, the answers should be contained in student notebooks. Students would have a tough time telling a teacher the reason they did not do their homework was because they did not understand since all they had to do for most of it was revisit their notes.

And, if the students did answer those questions, there would be a much higher probability that they would be able to complete the practice exercises. ***A good homework assignment reflects and supports student notes and instruction***.

Homework assignments vary greatly from school to school. In some algebra classes, students will be routinely assigned 30 to fifty (equations) exercises each night taken directly from the textbook. In another school, students might only be assigned 15 to 20 exercises per night. In the least successful programs, there is a belief that students won't do the homework, so they don't assign any, and the students live up to that low expectation. In the most successful programs, homework appears to be assigned more thoughtfully. Those programs view homework assignments as an extension of their instruction. That suggests the time needed to complete the number of exercises assigned along with the reading, writing, thinking, and memorization that increases understanding are all taken into consideration. Nothing increases proficiency more than practice. When students compute, solve equations or graph, they initially have to think/concentrate on the procedure. As they practice the computing, solving or graphing, those skills should almost become automatic. If they are not, more practice might have to be done in class and/or more exercises might need to be assigned for homework.

The most experienced teachers know that homework assignments that encourage studying and supports their instruction is in the students' best interests.

Rational Numbers

Add/subtract

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.

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

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

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.

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

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

The generalization makes adding/subtracting rational expressions simple

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

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

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

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