

## Introduction

Recently the whole internet and even the New York Times were busy gossiping about the viral math expression  $8 \div 2(2+2)$ . I say gossiping because nobody seemed to take the question very seriously. There was, on the part of non-mathematicians, a gleefulness in having found something that everyone was “confused” about. Mathematicians who wrote articles in the major papers about this<sup>1</sup>, on the other hand, had little to say. This expression was being paraded around as if it was an actual paradox or something of mathematical interest. From a mathematicians point of view the whole thing is merely about notation, spelling, and mathematically insignificant.

In terms of math education, this viral math discussion is not a paradox, nor is it merely notation. It is a *symptom* of *one* very specific and deep-rooted educational confusion stemming from school-math textbooks and instruction. This is *exactly* the kind of thing the WEHM manual/dictionary has as entries. In fact, I had already finished my chapter about this (WEHM, p...) *before* the whole “controversy” started! It is not a coincidence that the entire world is confused about this simple expression. I can pinpoint the chapter and grade where this fundamental insecurity/confusion comes from. It is *without* a doubt the terrible left-to-right rule from 5-7<sup>th</sup> grade, which quite incredibly (do *you* remember?) disappears *forever* after the end of 7<sup>th</sup> grade. This is the obvious root of the whole confusion! But in all that has been made of this viral expression, no one has bothered to figure that out yet it seems, or even taken note of the staggering educational fact that we teach a math rule that *disappears* again!<sup>2</sup>

My point is that we seem to have developed a particular blind-spot as regards to school-math. Why would the incredible media coverage afforded this expression not lead to a serious article about what exactly the cause of this unnecessary confusion is and what we can do to remedy it?

It’s as if there were no money to be made in teaching math correctly. Where is the will to disrupt education, finally?

## Why my book is different

In a global STEM education market of roughly 40 billion US dollars (of which the largest part is mathematics, and about 50% is in North America) there is always an attempt to differentiate oneself. Everyone (including me) would like to write that one math-help book that changes everything. The approaches are varied, at least superficially, and yet no one book or methodology seems to really make anything noticeably better than the next. They all do the same thing, just in different shades. There are no true standouts. This can be seen in the shocking absence of almost *any* math-help books for grades 9-12 besides from the *For Dummies* series! The few there are don’t sell very well (comparative analysis, p...). For the lower grades (4-8) there are quite a few math-help books, but ask an honest tutor if they can recommend any one that is substantially different than the others. I certainly can’t. I would love to see the actual sales numbers (hard to find, I’m sure you’re aware) instead of just the Amazon rankings, as I suspect that there are no real long-term standouts in this respect either<sup>3</sup>. I have analyzed all the

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<sup>1</sup> NYT, <https://www.nytimes.com/2019/08/02/science/math-equation-pedmas-bemdas-bedmas.html>

<sup>2</sup> To see a detailed discussion of this and who I reached out to and the very disappointing response, see appendix, p...

<sup>3</sup> My guess would be there are momentary fads such as the “big fat math notebook” right now, but nothing that truly differentiates itself over time.

bestsellers (and some not so bestsellers) in this category in terms of content, see comparative analysis (p...). It truly is the nature of the beast that math educators and their cohorts, the school-textbook and math-help authors, thoughtlessly mirror the worst school-math offenses, even as they attempt to be original and revolutionary. They simply *cannot* understand that what is really wrong is the *mathematical* content itself! Even “woke” and “cool” looking books are 100% guilty of this. It seems, to actually criticize the *mathematical* content is the one thing they all agree is impossible, or possibly traitorous?

This precisely what the WEHM manual does....

If you are confused by this statement, I refer you to my go-to example *parallel lines and the transversal* (WEHM, p...)⁴. I cannot find a single math-book that even comments (except to repeat it blindly) on this absurdity as presented in school and in books. It is blatantly obvious, even to the casual observer, that the way students are forced to do this is eminently unnecessary. You really do not need to be an “expert” to see this. An amazing example of the blind repetition of this particular nonsense is *for dummies* (comparative analysis, p...)

The problem, it seems to me, is that the text-book authors and most math help authors are not mathematicians; they are teachers repeating what they have memorized. They simply do not trust their own mathematical fortitude enough to rephrase or clarify what has been handed down from the mount over centuries.

I do not know who the professors are that sign off on school-math textbooks. My hunch is they just check that there are no flagrant mathematical violations (and do a mighty bad job at it, it seems, see my twitter feed @madamatix); they do not in fact concern themselves with the educational aspect of what is being said. The actual P.H.Ds involved here content themselves with making general statements about the nature of math without, again, getting into the educational weeds. And why should they? They are busy discovering new things! New Math was an attempt in the 1960's where mathematicians were involved. It turns out they simply had no understanding of the realities of education, whatsoever, and advocated a far to abstract path, in *elementary* arithmetic to boot, that failed dramatically.<sup>5</sup>

So, either the education professionals don't have a mathematicians' deeper understanding, or the mathematicians have little experience (or interest) in teaching high-school math-a real catch 22! To see an amazing yet useless exception to this, please see “the mathematicians lament” comparative analysis, p... To see how the author escapes this trap, please read the bio (p...)

### Why this book won't sell

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<sup>4</sup> It is my experience that if a teacher/book/site can't phrase this in the most obvious manner (because it's so darn obvious, any kid can understand that the school-math approach is nonsense) then there really is no reason to believe they will do any better with more complicated topics such as quadratics, PEMDAS or calculus for that matter.

<sup>5</sup> New math wikipedia: [https://en.m.wikipedia.org/wiki/New\\_Math](https://en.m.wikipedia.org/wiki/New_Math)

I'll start by listing all the best arguments I can think of why this book would not sell, refuting them, and then explaining why it will.

#### Reason #1

Nobody cares or has time for this. Who cares that school-math is exceedingly, clumsy, unnecessarily intimidating, confusing and often simply wrong? I learned it that way and I'm fine, that's just part of education. Sometimes you just have to deal with it. All the people who had a problem with that aren't in science anyway now. If you have what it takes to be a scientist this is no big problem for you, and for everyone else, does it even matter? For them it's just another random hurdle they need to navigate as quickly as possible. They couldn't care less if it makes sense.

This is antiquated thinking. It's like saying who's going to use this thing called Google, I did fine with a dictionary, or, no one will just order everything online people like taking the bus to go shopping. Even the era of the macho nerd must come to an end. Grin and bear it, is so passé.

Also, even if school-math is indeed just another random hurdle to be navigated, this manual makes that navigating so much easier and quicker! This is not (only) for people who care about math, quite the contrary. To quote a great comment I found while writing the comparative analysis (p...): this is math for people who hate math.

#### Reason #2

Even if we admit for a minute that it's true and that school-math is a real problem, understanding how awful it is won't actually help us with school. It will just make everyone angrier and less inclined to do the work. Not helpful. In other words, we have to do what they tell us school anyway. This will just confuse me. A book that largely contradicts the school material is, by definition, a non-starter. It's too complicated. The teachers will get mad at me. People will be afraid to go there and won't buy it. Professionals will decry it. I can't do something different than school.

This is a manual or a dictionary. It does not need to be read at once. You look up the topic or term and that's it. There is a *notes section* for every topic at the beginning of each section that lists only the main points. One of the most important aspects of the WHEM manual is a functioning highly extensive *index* and/or search function (for digital).

The way to use the WHEM manual is as a supplement. Do what you would usually do. Use all the school-textbooks and math-help materials as usual, but when you come across a topic or issue that just does not make any sense (a commonplace occurrence as any student or parent will tell you), look it up in the WHEM manual. An even better approach is to check the WHEM manual first every time a new topic is presented in school.

This manual is exactly that, just a manual, a tool. It is *not* a new way to teach math, as for instance Singapore Math or Exeter Math is. It is *not* a separate system striving to fundamentally alter how we teach and even think about math (as is the *mathematicians lament*, p...). This manual has no ulterior motive or greater goal than to clean up the school-math mess. It is nothing more than the *blueprint* of

the maze the students are in, the view from above. This manual is not saying to do anything different. Just know the labyrinth you're in, how could that hurt? And obviously it *could* help to know what is going on!

This is really quite different than suggesting to actually do things differently. This is *how* to do what they tell you to do in school-math without ending up completely confused. This is how to do things *now*! How to navigate the *present* obstacle course. Some shortcuts (or rather how to avoid roundabout, crazy detours) are offered for sure, but no one is forcing or even suggesting you take them, unless you *want* to because it's so very obvious and easy for you. You will *never* have to choose between some new method and the way you are supposed to do it in school-math. What is being offered here is always supplementary rather than principle.

As to being angry....

Reason #3

Nobody knows the author, and the publishing house might lose its reputation over this.

Educational bad boy lets make math sexy. Danice Mcklarren.

Reason #4

This is not a scalable project

For dummies

Reason #5

Politics. We do not want to be seen as aiding an attack on the institutions of this country. The teachers are good people often selling the shirts off their backs to feed their students and have some of the greatest unions left in this country.

Extraordinary care must be taken here. We must position ourselves as the savior of students and good teachers who are suffering from lack of funding and inferior *materials*. The real scourge of the Common Core is in fact not the core itself, it is the *material* written for the Common Core. We must make this almost universally prevalent misconception the hook to hang the whole concept from. *Materials* not teachers need to be overhauled. Alas, there are also a few bad apples amongst the teachers, suffering themselves from insecurity because of the material, no doubt. Unfortunately they often become as illogical as the material they are *forced* to execute. We want to help everyone out of this terrible situation by correcting the *material*.

## Reason #6

The intersection between the group who care enough about math to buy this book and the group that doesn't understand math enough to need it is too small.

STEM failure (when students sign up for a STEM path and then drop out) is 60% *especially* at Ivy League schools!<sup>6</sup> This is a result of rote memorization rather than understanding, exactly what this book addresses.

Of course, the main reason this is not an argument to forego using the WEHM manual is that the WEHM manual is indeed a *help*-manual even */especially* for the disinterested student. This book makes school-math easier for *everybody* not just gifted students.

## Who will buy it

### Parents

The importance of investing in education needs not be explained to any parents who have given their child's future a second thought. Or, as the saying goes: You think education is expensive? Try not being educated!

In 20 years of tutoring math I have never found a math book to actually *recommend* to parents of children dealing with some aspect school-math. When I need school-math *exercises*<sup>7</sup> any of the major companies<sup>8</sup> will do (they have the most consistent material p...) But when it comes to *explaining* a topic, the parts of the text books *between* the exercise sets are useless and worse. The math-help books are more of the same, without a doubt written by the same group of people. These help-books just repeat the school-math mantra in various shades and they all have the same penchant for ambiguous phrasing and mathematical catastrophes that school-math does, see comparative analysis. This leaves a trail of devastated students and parents beginning to crack and give up on the idea of ever really getting the better of this stuff, bowing their heads to the tyranny of non-sense that, they have learned, must simply be endured. Or, they could buy the *WEHM manual* and be freed from this forever! Something doesn't make sense? Feel like everyone (student, teachers, textbook) is saying slightly (or completely) different things? Just look up the *topic* or *detail* in the manual! You will find a *full* explanation of the topic and all the non-sense surrounding it that I have seen in *20 years* and also what to do about it. There is a short *note-version* and an *in-depth* version of each chapter. Freedom!

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<sup>6</sup> <https://www.greatschools.org/gk/articles/why-americas-smartest-students-fail-math/>

<sup>7</sup> School-math exercises must be exactly that. For this reason using *only* my own exercises isn't helpful.

<sup>8</sup> Pearson, Barrons etc

Even tutors have no overarching original insights in my experience. It takes a long time to figure out and actually *believe* what is going on in school-math. I am the only tutor I know who, when meeting a troubled math student, starts from the assumption that the student is basically a victim of what I call *math trauma*<sup>9</sup>. Quite a few teachers and tutors will acknowledge that school-math is absurd in specific cases, but (similar to Khan Academy, p...) they always end up pulling their punches and never explicitly take the side of the student or “victim” and tell them: “You poor thing, this stuff is really awful, it really does not make any sense, it’s downright mean, it is absolutely *not* your *fault* that you *hate* math.” This is because the reality is, in the true sense of the word, quite *unbelievable*. But even if parents are lucky enough to stumble on a tutor who understands and *believes* this whole picture (I have yet to meet another), tutoring of this caliber is simply prohibitively expensive!

### Students

This book could actually be quite a riot. Imagine always being one step ahead of your math teacher! What if you could, on a regular basis, point out mistakes in the math materials to your teacher and fellow students. Or, just having an edge and never being confused about what is really going on in a math topic again would be nice. Simply spending less time piecing all the nonsense together from notes and worksheets and just getting on with what you need to pass would no doubt be the biggest selling point for kids.

### Adults

Judging by the prevalence of math “interest” books for general consumption dominating the Amazon math bestseller list (p...), this might be quite a formidable market in itself. There really are a lot of adults who really want to know what went wrong. They know math is important and fascinating, they think of themselves as of relatively high intelligence and yet they have always hated math. Why? Are they actually not as smart as they like to think they are? This book could be quite a revelation to a whole class of people.

### Teachers

Younger teachers might indeed be very open to something that if embraced early on could make their whole teaching experience one of comradeship rather than of painful, protracted defense of nonsense.

Then, of course, when students start coming to class with this book in tow, making every math class a potential embarrassment for the teachers. Teachers might start reading up themselves just to be protected!

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<sup>9</sup> The inability to focus.....

