

To whom it may concern,

Indiana education officials recently judged me to be one of a small group of people with the qualifications to evaluate proposed new academic standards in mathematics. I was, in fact, commissioned to analyze them. Contrary to feedback I have heard from some people in Indiana, I am not “on board with this current draft.” The only thing that I could say in my review that was even mildly positive was that “it has good bones.” That’s all. No flesh, just the POSSIBILITY of developing into something halfway decent.

I tried to make it as clear as I possibly could that even this would require an inordinate amount of work on the part of highly qualified people. Moreover, I made it as clear as I could in conversations with the apparent leader of the project **that these highly qualified people were not the members of the committee that the Indiana Department of Education had selected to make those revisions.**

In my view this was a committee of people, perhaps qualified in other areas not related to mathematics, but not qualified in any sense to handle fixing the mathematical monstrosities inhabiting the current document.

No! What was required was a small group of actual research mathematicians who had published research papers in internationally respected mathematics journals. All this came with the provision, of course, that you could find any who would actually be willing to spend the considerable time necessary for such a project. Moreover, I had twisted the arm of one such Indiana mathematician, and obtained his agreement to do this if asked. Needless to say, my understanding is that he was not asked.

Let’s take just one example from first grade to see just a few of the issues I found. In the document you will find the following standard, 1.CA.1:

Demonstrate fluency with addition facts and the corresponding subtraction facts within 20. Use strategies such as counting on; making ten (e.g., $8 + 6 = 8 + 2 + 4 = 10 + 4 = 14$); decomposing a number leading to a ten (e.g., $13 - 4 = 13 - 3 - 1 = 10 - 1 = 9$); using the relationship between addition and subtraction (e.g., knowing that $8 + 4 = 12$, one knows $12 - 8 = 4$); and creating equivalent but easier or known sums (e.g., adding $6 + 7$ by creating the known equivalent $6 + 6 + 1 = 12 + 1 = 13$). Understand the role of 0 in addition and subtraction.

In my view, this is a monstrosity. To begin with, it is given as just three sentences, and I doubt very much that even a knowledgeable parent or teacher could parse it to see what is really being asked. So my first objection is that one needs to write these standards in good, readable, English. But let us, in fact, parse it to see what it is actually asking students to do.

Demonstrate fluency with

- addition facts
- and the corresponding subtraction facts
- within 20.

Use strategies such as

- counting on;
- making ten
- (e.g., $8 + 6 = 8 + 2 + 4 = 10 + 4 = 14$);
- decomposing a number leading to a ten(e.g., $13 - 4 = 13 - 3 - 1 = 10 - 1 = 9$);
- using the relationship between addition and subtraction
- (e.g., knowing that $8 + 4 = 12$, one knows $12 - 8 = 4$);
- and creating equivalent but easier or known sums
- (e.g., adding $6 + 7$ by creating the known equivalent $6 + 6 + 1 = 12 + 1 = 13$).
- Understand the role of 0 in addition and subtraction.

The first part, when parsed, tells what students are expected to do – the kinds of questions they should be expected to answer correctly. Of course, even these statements need to be expanded into English from the Educationese in which they are written. So allow me to translate to the degree that I even can:

- (1) add two whole numbers presumably each between 1 and 20, and presumably with sum also between 1 and 20.
- (2) subtract two whole numbers between 1 and 20 presumably with non-negative difference between 1 and 20 as well.

Of course, to be honest, I am only guessing, since the first three statements are not clear enough to make the assumptions I made in (1), (2) above. What I am relying on is my knowledge of somewhat similar first grade standards from other documents. For all I know, what 1.CA.1 is asking is to add two single digit numbers. But maybe it is asking for the sum of a whole number less than twenty with a single digit number, but with sum between one and 20. I really have no way of knowing. **PRECISION IS ABSOLUTELY NECESSARY IN SUCH STANDARDS, ESPECIALLY IN THE LOWER GRADES.**

But now let's look at the next part "Use strategies such as." Please keep in mind that standards are usually understood to be specifications for the kinds of questions to appear on tests. Do you think it would be good form for students to be asked questions about the listed "strategies?" How would you even ask them to use the strategy "making 10," unless you expected first graders to write short essays?

And, to properly satisfy this standard you would have to require similar questions for each of the remaining two strategies. Is this really what you want first graders to come away with? I would have thought that what you really would desire is that first grade students are able to add one digit numbers, subtract a one digit number from a larger one digit number, and maybe subtract a one digit number from a two digit number no bigger than 20.

Finally, there is “Understand the role of 0 in addition and subtraction.” What does this mean, and how are students expected to be tested on it? Perhaps what is meant is that they should find the answers to questions of the form $5 - 0$, $6 + 0$, $0 + 3$, $0 + 5$, $7 - 0$, $5 - 0$, and $0 - 7$. Oops! This last example would result in a negative number, and first grade students are not expected to deal with negative numbers, not in this country nor any other country in the world. But a more honest question would probably be “Explain what 0 does when adding or subtracting it.” So once more it seems that the standard really expects first graders to write at least one essay.

Now do you see why I begged that actual mathematicians be asked to make the changes I felt were necessary? They would never willingly accept standards like 1.CA.1. It is simply too vague, too imprecise, and involves far too many things, most of them highly inappropriate, aside from the fact that it is entirely incomprehensible as written.

In the lower grades, standards like 1.CA.1 are the norm in the document, rather than the exception. Being bribed by the promise of lots of money from the federal government might have been reason enough to accept such standards originally. People would understand, whatever they might think of your intelligence. But doing it on purpose? What could they possibly think then? Oddly enough, as truly terrible as standards like 1.CA.1 are, those were not my major objection to the document.

Instead, my view had been that one of the few strengths of the March 14th draft was that it also included standards for mathematics courses more advanced than just the weak algebra 1, geometry and algebra 2 standards in Indiana's current Common Core Standards. There are standards for trigonometry, pre-calculus and even calculus. So, at first glance, it would seem that Indiana students were to be given the chance to actually prepare for higher end jobs and STEM type college majors than Core Standards provided. But this requires that the standards for these courses be

- (1) correct
- (2) coherent, and
- (3) actually cover the desired content.

In fact, **there are even more errors in the current document than were present in the March 14th document for all six of these courses.** The standards for these courses are completely disorganized, and, mathematically speaking, can only be described as bizarre.

Maybe this is a good thing. The same kinds of issues will doubtlessly come up in other states, and being able to show people actual examples of the kinds of nonsensical things states can come up with would be helpful. So perhaps for the greater good you should vote to make the current draft your new mathematics standards, and to be on the safe side include a statement to the effect that you have done this to provide the rest of the country with a dramatic example of what not to do.

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