

Dear Mr. :

At your request, I have examined the books *Contemporary Mathematics in Context*, Course 1 Part A, and Course Part B. I understand that you are considering this text for students at the middle level (not the upper quartile, nor the lower quartile) of the ninth grade. I will now offer some impressions with that audience in mind.

This is not a textbook of the traditional sort. Texts from thirty years ago or more concentrated on just the mathematics: they presented the key ideas, then they presented examples, then they presented drill, and finally they provided exercises to establish student proficiency with the material. More recently (fifteen to twenty years ago), texts began to make an effort to offer applications. They still retained the essence of the four steps just described, but they added material from the real world in order to show students just what mathematics means in everyday life.

Truly modern texts depart rather radically from the paradigm just described. In particular, they do not feel bound to introduce the ideas in any formal way, nor do they feel bound to offer examples or drill or exercises. The text being discussed here is of this type. i

As you read my analysis, please bear in mind what mathematics really is. The whole point of mathematics is to learn to think analytically. It is to see that we need not be hampered by merely intuitive or conversational analysis. In mathematics, we learn that words have precise meanings, and we learn that the formalism and precision of mathematics can lead to deeper insights. It is of course appropriate, and often (intellectually) exciting, to have these notions confirmed with applications. But it is wrong to discard the discourse of mathematics in order to concentrate on “real life applications.” Unfortunately, I am afraid that that is exactly what this book does.

One of the themes of this text is that students should work in groups. Such interaction among students can be useful (although there

is always the question of whether this is an efficient and productive use of time). But some special management skills are required of any teacher who is going to endeavor to teach by way of group work.

The book takes a decisive role in telling students how a group ought to operate. There is extensive discussion on page 3, and even more discursive palaver on page 7, concerning how the members of the group ought to interact with each other. These sociological disquisitions are repeated throughout the text. For my taste, the book contains far too much of this social engineering text, and it does so at the expense of mathematical substance.

As an illustration, page 4 asks students “What one height would be most typical or representative of your group?” and “How much variation is there in the armspans of your group?” and “... does there seem to be a relationship between height and armspan?”

Someone who was serious about learning mathematical thought would ask “What does ‘typical’ mean in this context?” and “What does ‘variation’ mean in this context?” and “What does ‘relationship’ mean in this context?” In fact all of these terms have precise analytical meanings, and one would have hoped that this text would have used its Investigations (Investigations are the *lingua franca* of the text) to motivate an explanation of their meaning. Unfortunately, we are to be disappointed in this expectation.

The entire two-volume text is littered with important ideas and terminology that are hinted at but never defined. As an instance, page 9 suggests that the authors might have begun to discuss variance and standard deviation. But they do not. Page 72 does in fact finally give a definition of standard deviation; but it is in words, rather than with the standard, concise, and important formula that is usually used—and there are no illustrative examples or calculations. Page 16 introduces the important statistical idea of an outlier, but never says precisely what one is. Page 19 discusses the absolutely fundamental concept of (Gaussian) normal distribution, but never says (except in the most vague, heuristic

terms) what one is.

Page 437 presents an exercise that asks students to create a “fanciful fractal.” This would be difficult for the student to do, because the text has never said just what a fractal is. The exercise goes on to ask the student to analyze the fanciful fractal mathematically. Such a request has no meaning, for the authors have offered no paradigm; the student trained with this text will have no idea what is being requested.

One of the strange anomalies of this text is the frequent references to certain formulas or expressions called *NOW* and *NEXT*. As far as I can tell, in Volume 2 these are first introduced on page 422. The precise passage is “Use the words *NOW* and *NEXT* to write equations showing the two patterns.” I have been doing mathematics professionally for thirty years, and I do not have any idea what is being said here.¹ That is too bad, for *NOW* and *NEXT* are used repeatedly and consistently for the next 55 pages or more. The consistent use of *NOW* and *NEXT* is bound up with a detailed consideration of curve fitting. Curve fitting is fundamental to practical applications of mathematics in business, economics, and many other disciplines: How do you take your data and find a function that describes the rule that will produce that data? Unfortunately, the authors never really tell us how to *do* curve fitting. They give a number of Investigations and problems which might lead students to think about the task. But there is a well-developed theory (regression and so forth) connected with curve-fitting. If this book wanted to have substance, it would have developed such theory.

To summarize: Instead of textual substance, instead of explanation, instead of examples, instead of drill on basic skills, this text concentrates on “Investigations” conducted by group work. It seems to be more concerned with social questions than with substantive math-

¹Going back to Volume 1, I can begin to get an idea of what is intended. The authors meant to say, “Using *NOW* and *NEXT* as the names of your variables, formulate an equation that expresses a relationship between *NOW* and *NEXT*.” This is just another example of the sloppy, indeed careless, use of language that plagues the entire text.

ematics. It sets a poor example for students because it uses language imprecisely, often not even defining important terms. I am very concerned about what students will *retain*, and what skills they will take on to later classes. I am concerned by what the student trained with this book will genuinely *understand*. Such a student will have seen some informal analyses of a variety of different problems. He or she may have developed a taste for quantitative reasoning. But there will have been minimal exposure to genuine mathematics that will travel well.

It is common wisdom these days that students who want to get into a reasonably good college should have some exposure to calculus—if only so that they can demonstrate an ability to grapple with college-level material. What makes calculus challenging for students is not so much its intrinsic difficulty but rather that it builds on so many earlier ideas (algebra, geometry, trigonometry, Cartesian coordinates, the theory of functions). What students should be doing in the three or four years before calculus is mastering those fundamental mathematical ideas. It is fine to offer applications—very much like the ones in this text—to remind students why mathematics is part of our lives. But it does not work to concentrate on the examples, to treat them in an anecdotal and phenomenological manner, and to only casually (and imprecisely) introduce the mathematical ideas along the way.

My view is that you would be doing your students, and your school district, a great disservice to adopt this book as your primary text. It may be fashionable to teach from such a book, but it is not effective.

I can imagine teaching the substantive parts of ninth-grade mathematics from a more traditional text, and supplementing that material with examples from the text under review. In so doing, the teacher would have to exercise great care and skill so as to provide sufficient context and detail for the examples. But the examples are in fact modern and engaging and would probably speak to the students in interesting ways. I repeat, however, that this book should *not* be used as a primary text.

I hope that my comments have been of some use to you. I would be happy to answer further questions, or to meet with a group of your people, if you should so desire. My phone and FAX numbers and my e-mail address appear below.

Sincerely,

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