It's Time for a New "New Math"

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In 1957, the Soviet Union christened the exploration of space by launching Sputnik I. Feeling relative inadequate in science, the U.S. nervously reacted and, by the 1960s, the "new math" was instituted to upgrade mathematics education in the United States. (If you are too young to remember this, do an Internet search!) Parents struggled to help their children with mathematics homework—in elementary school! Fifty years later, it is time for another look into what we teach as the core of high school mathematics.

The inevitable goal of this core is to have all students take Precalculus, with many taking Calculus. Some districts even start algebra in 8th grade to get a head start on this "race to calculus." Recently there has been much discussion in educational circles about the importance of students being versed in statistics before they graduate. Since the news features results of statistical studies every day, citizens need to be able to question, critique, and digest them with sophistication. Data bombards us on a daily basis and numbers are crunched on virtually every page of newspapers. As a result, all students need an education in descriptive and inferential statistics, on some level, and it is probably more relevant to an overwhelming majority of students than the inverse cosecant function.

In addition, it has been documented that today's high school graduates—even valedictorians—are financially ignorant. While well-versed in Latin, European History, derivatives, and Shakespeare, they are not taught how to use their brainpower to tackle the financial decisions they will invariably make. These are not innate skills, they must be formally taught. So perhaps it is time to focus on the mathematics students need in their lives, and how to accommodate that need.

How often does a student encounter the law of cosines after formal high school mathematics? How many students see the value in, or care about finding, the quotient of two complex numbers? Which is more beneficial, figuring out the future value of a periodic $200 monthly deposit over 18 years, or finding the cusps of the graph of an absolute value function? Can we replace rigorous mathematics with relevant rigorous mathematics? The answer is a resounding "yes!"

It is time to offer students a choice after completing Algebra I and Geometry. One path, which I will call the Algebra II/Precalculus path, would have the traditional Algebra II and Pre-calculus courses be the 3rd and 4th year core courses. An alternate path, the Financial Algebra/Statistics path, would have the third year of mathematics be a course in Financial Algebra and the fourth year be a course in statistics. Financial Algebra introduces selected topics from Algebra II and Precalculus to expose students to credit, banking, income taxes, car insurance, mortgages, investing, and retirement. (Note: Financial Algebra is not the old, arithmetic-based consumer math course). The fourth year can be a full-year course in statistics, based on many of the topics found in the AP Statistics curriculum, but adapted for all levels of proficiency. The Financial Algebra and statistics courses provide as much of a platform for advanced mathematics and problem-solving depth as Algebra II and Precalculus do. They also provide students with a mathematical experience they will make use of on a daily basis for the rest of their lives.

Students graduating with Algebra I, Geometry and Right Triangle Trigonometry, Financial Algebra, and Statistics as their four-year mathematics sequence will make more well-informed mathematically-based decisions than students whose sole goal is to get to Precalculus and Calculus.

I am not knocking Algebra II, Precalculus, or Calculus. I always tell my students "Be

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thankful that some people like this material, because without it, you would not have automobiles, iPods, cell phones, airplanes, computers, CD players, etc." But these courses often stir up the battle cry, "When are we ever going to use this?", which is an indicator that students do not appreciate the mathematics they are being presented. (Ironically, and possibly antagonistically, I also question when they use Latin, European History, or Shakespeare in their daily lives!) When was it set in stone that these "traditional" 3rd and 4th year core mathematics courses are necessities? While the mathematics majors will get all of their requisite mathematics courses in college, what percent of high school students become mathematics majors? What skills should every high school student graduate with?

Financial Algebra taps the topics from Algebra II and Precalculus that are useful to students, including exponential functions, present and future value, limits, compound interest, algebraic modeling, piecewise functions, natural logarithms, and more. Statistics includes data explorations and analyses, normal distributions, expected value, regression, logarithmic transformations, hypothesis testing, confidence intervals, etc. Both of these courses provide students with rich mathematical experiences. Anecdotally, I have taught both of these courses for decades, and it is not hard to envision that students' zest for these topics surpasses their enthusiasm for complex numbers in trigonometric form.

Keep in mind that Algebra II, Precalculus, and Calculus will always be a healthy part of a high school's mathematics offerings. But after Geometry, students should be able to choose one of two paths—the Financial Algebra/Statistics path or the Algebra II/Precalculus path. Students starting Algebra in grade 8 would have time to tackle Calculus as seniors. And any student in either path can elect courses from the other path. The Algebra II/Precalculus/Calculus thread has prerequisites at each level; the Financial Algebra and Statistics can be taken in any order.

School administrators are necessarily concerned with enrollment data and what it takes to get into college. But behind the figures there is a parent looking at a child's distraught face every time a student is misplaced into a course that is not an optimal complement to that student's mathematical maturity. Life will place mathematical demands on everyone. High school is our last chance to get students to love and value mathematics. The goal should be to provide students with an education they can embrace. Let us revisit those last two years of high school mathematics, and take a hard look at Financial Algebra and Statistics as alternate capstones to a teenager's mathematics education. The colleges need to be enlightened as well—they need to see the mathematical rigor in the Financial Algebra/Statistics path. However, secondary mathematics educators need to accept the value of this approach first.

If you have attended parties and been introduced to new acquaintances as a mathematics teacher, you undoubtedly have heard people exclaim, with a big smile, "I was never any good at math!" or even "I always hated math!" Why is it that people generally recognize that their disdain for mathematics will be well-received? Could you ever imagine someone who was a poor reader shouting out, with such glee, "I could never read!"? Is it possible that the perception of our subject is something we can change? Can students be the big winners if these changes are made?

By using our own common sense and better judgment, we can inspire a new "new math."

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