Ubiquity Symposium

The Science In Computer Science

Why You Should Choose Math in High School

by Espen Andersen

Editor's Introduction

It has been more than six years since Espen Andersen originally published his reflections on the importance of studying math during the formative years of high school, and his message is still relevant today: Mathematics is not only the foundation for computer science, but also a global language.

Peter J. Denning
Editor

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This little article (slightly revised from 2006) was written very quickly as an op-ed for Norway's largest newspaper, *Aftenposten*. I was concerned about the decline in applications for technical educations and the steadily falling math scores of beginning students—a problem almost all rich societies experience, whether it is because the students don't want math or the teachers cannot teach it. I wanted to reach teenagers in a form they could understand, and even took the precaution of running it by my teenage daughters to vet it for the inevitable middle-aged dad-isms.

It caused lots of debate, was one of the most forwarded articles for three weeks running (probably parents forcing it on their children) and I kept getting thank you emails from math teachers. One even inquired whether I was married—a reaction I can safely say none of my other publications have induced. After I translated it for ACM Ubiquity, it was featured on boingboing.net, from where it was quoted and reprinted many places, including the New York Times and in Tom Friedman's The World is Flat.

So, it seems, you can take math in high school and have your 15 minutes.

But why would this piece be of interest in a symposium on the science in computer science?

Since math—or, at least, mathematical understanding—is a prerequisite for understanding computing, it behooves us as a profession to try to influence young people not to miss an important brick in their intellectual foundation. From all the evidence I have seen, the prosperity of a nation is, if not a function of, at least influenced by the proportion of young people going into STEM education 10-15 years before. Since many computer scientists came

from math and all of them need it, here is a list of arguments for choosing math early. It is formulated in a language tested to appeal to that age group—and just might work with that reluctant teenager who for some reason does not believe that math is rewarding.

So, here goes.

"Why You Should Choose Math in High School"

Choose math because it makes you smarter. Math is to learning what endurance and strength training is to sports: The basis that enables you to excel in the specialty of your choice. You cannot become a major sports star without being strong and have good cardiovascular ability. You cannot become a star within your job or excel in your knowledge‐based profession unless you can think smart and critically–and math will help you do that.

Choose math because you will make more money. Many hopefuls flock to talent shows because they want to be a "celebrity" and make money, but fail to see that very few actually make it—and most of them get stale after a few years. Then it is back to school, or to less rewarding careers ("Would you like fries with that?"). If you skip auditions and the sports channels and instead do your homework—especially math—you can go on to get an education that will get you a well-paid job. Much more than what pop singers and sports stars make—perhaps not right away, but certainly if you look at averages and calculate it over a lifetime.

Choose math because you will lose less money. When hordes of idiots throw their money at pyramid schemes, it is partially because they don't know enough math. Specifically, if you can "do the math"—with a little bit statistics and interest calculations, for instance, you can expose economic lies and wishful thinking through quick sanity checks. With some knowledge of hard sciences you will probably live better, too, because you will avoid spending your money and your hopes on alternative medicine, crystals, magnets, and other swindles—simply because you know they don't work.

Choose math to get an easier time at college and university. Yes, it is hard work to learn math properly while in high school. But when it is time for college or university, you can skip reading pages and pages of boring, over‐explaining textbooks. Instead, you can look at a chart or a formula, and instantly understand how things relate to each other. Math is a language—more terse and effective than any other. Math allows you to find equations that predict useful things, such as the future. If you know math, you can work smarter, not harder. Besides, you won't have to take remedial math classes, and you can understand right away what the professors are talking about.

Choose math because you will live in a global world. In a global world, you will compete for the interesting jobs with people from the whole world—and the smart kids in Eastern Europe, India, and China see math and other "hard" subjects as a ticket out of poverty and social degradation. Why not do as they do—get knowledge that makes you viable all over the world, not just in your home country?

Choose math because you will live in a world of constant change. New technology and new ways of doing things change daily life and work more and more. If you have learned math, you can learn how and why things work. Math specializes in identifying and exploiting recurring patterns. With math, you can do calculations that appear to the uninformed as miraculous feats. And you can avoid stumbling through your career, supported by Post‐It Notes and help files, scared to death of accidentally pressing the wrong key and getting into unfamiliar territory.

Choose math because it doesn't close any doors. If you don't choose math in high school, you close the door to interesting studies and careers. You might not think those options interesting now, but what if you change your mind? Besides, math is most easily learned as a young person, whereas social sciences, history, art and philosophy benefits from a little maturing—and some math.

Choose math because it is interesting in itself. Too many people—including, unfortunately, quite a few teachers—will tell you that math is hard and boring. But what do they know? You don't ask your grandmother what kind of smartphone you should get; you don't ask your parents for help sending a text message. Why ask a teacher—who perhaps got a C in basic math and still made it through to their teaching certificate—whether math is hard? They might be bored. So what? That does not mean YOU will be bored. The scientists who got the Curiosity Rover to Mars clearly were not bored with their math. The ones who build Photoshop, Google, and Wolfram Alpha are not bored. If you do the work and stick to it, you will find that math is fun, exciting, and intellectually elegant.

Choose math because you will meet it more and more in the future. Math is increasingly important in all areas of work and scholarship. Future journalists and politicians will talk less and analyze more. Future police officers and military personnel will use more and more complicated technology. Future nurses and teachers will have to relate to numbers and technology every day. Future car mechanics and carpenters will use chip‐optimization and stress analysis as much as monkey wrenches and hammers. There will be more math at work, so you will need more math at school.

Choose math because you want to change the world. Many people—young and old— are concerned about pollution, global warming, alternative energy and other environmental issues. That is all well and good, but if we are to do something about it, it will take new technology and new ways of thinking. Choosing math in high school will give you a chance to put your money where your mouth is—to do something about the environment by building theories and technologies, rather than doing nothing more than carry a sign and press "Like" on Facebook.

Choose math because it is creative. Many think math only has to do with logical deduction—using only a part of the brain—and somehow is antithetical to creativity. The truth is that math can be a supremely creative force if only the knowledge is used right, not least as a tool for problem solving during your career. A good knowledge of math in combination with other knowledge makes you more creative than others. (Incidentally, all those beautiful trees and mountains you see in computer games—many of them are fractals, i.e., mathematical functions. There's a lot of math in Photoshop and if you know math, you can make the most of it.)

Choose math because it is cool. You have permission to be smart; you have permission to do what your peers do not. The payoff for learning math may not occur right away. It comes later when you get the cool job while others are flipping burgers. It comes when you discover people come to you to solve technology problems that baffle them. Choose math, so you don't have to, for the rest of your life, talk about how math is "hard" or "cold." Choose math, so you don't have to joke away your inability to do simple calculations or lack of understanding of what you are doing. Choose math to you have the survival skills for a digital world.

Choosing math in high school doesn't force you to become a mathematician (or an engineer). But math is a sharp knife for cutting through thorny problems.

If you want a sharp knife in you mental tool chest—choose math!

About the Author
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