It All Adds Up

A math professor
and the most gifted student
he has ever taught.

By Matt Jennings, *Photograph by Brett Simison*

Nearly 60 seconds of silence had elapsed since I mentioned to John Schmitt that he must be inordinately proud of the young man sitting to my left. The awkwardness for me began around the, oh, 20-second mark, so my discomfort surely must have been palpable at this point. Schmitt had seemed ready to answer a few times, but each time he stopped. Finally, he said, "Aden's intellect isn't my doing. His work ethic isn't my doing. His thoughtful approach to problem solving isn't my doing. I'm delighted that he has these opportunities [after graduation], but pride is not something I can claim. Delighted. That's what I feel." I exhaled. My fear that I had misspoken was replaced by the revelation that this mathematician wanted to make sure he was *precisely* understood.

Let's back up a moment. I was in Schmitt's Warner Hall office, chatting with him and the aforementioned Aden, full name being Aden Forrow '13, an exceedingly quiet, very pleasant young man from the Boston area. In a recent talk, Schmitt had referred to Aden as likely "the most mathematically gifted student I have ever taught." For the past year or so, the two have been investigating a problem within the area of mathematics known as combinatorics. Schmitt explained that in combinatorics "we are given a finite set of objects and a set of rules placed upon the objects, and our two most basic questions are 1) does there exist an arrangement of the objects that satisfies the rules, and 2) if so, how many?" A Sudoku puzzle is a trivial combinatorial problem, Schmitt said. "But what is more interesting," he added "is discerning the minimum number of clues that can be given while still providing for a valid puzzle." The conjecture is 17, and recently an Irish mathematician designed a procedure to prove that no 16-clue puzzle could exist. Tricky thing is, it would take a standard desktop computer 300,000 years to complete the computation.

So Schmitt and Aden are trying to solve the problem using a tool known as the Combinatorial Nullstellensatz . . . and that's pretty much all I will say about this tool. I asked Schmitt to explain it to me, and another silence arose. Aden quietly chuckled. Then, as polite as he could be, Schmitt attempted to tell me about the Combinatorial Nullstellensatz. Let's just say that we subsequently both agreed that C. N. is not meant to be understood by a general audience. And, frankly, it's beside the point.

The point, really, of our discussion was not how Aden and Schmitt were attempting to solve this problem, nor was it about whether they would actually solve it at all. ("One never knows how long it will take to solve a math problem, if you can solve it in the first place," Schmitt would later say.) No, the reason we were talking that afternoon was because it was so unlikely to be having this discussion in the first place.

Before he met Aden, Schmitt had never found the need to provide a student in an enrolled course with his or her own set of problems, problems that were not a part of the course syllabus. But just one or two days into Aden's participation in Math 247, Graph Theory, Schmitt knew he had to do something different. "He wasn't challenged by the class. He picked up on subtleties, special cases that I've never seen an undergraduate recognize. There have been times when I've noticed disparities between talented students and the whole of a class, but this generally happens in introductory courses. Aden was on an entirely different level."

So Schmitt decided he would seek out a problem for which he and Aden could apply the Combinatorial Nullstellensatz technique. (Using Sudoku came to him at breakfast one morning while he was having his granola.) "And we have been having an ongoing mathematical conversation that each of us has wanted to have. These conversations have been entirely outside of any syllabus; Aden receives no course credit."

I asked Aden if this matched his recollection.

He thought for about five seconds and then said, "More or less."

"Aden is very understated," Schmitt added.

Aden smiled. "One of the things I like about Middlebury is the amount of attention professors give to their teaching and to their students," he said. Schmitt mentioned that I could very easily be writing a story about Aden's collaboration with Noah Graham, in the physics department, "but then you would have missed out on capturing my good looks."

At this, Aden let out a loud, sustained laugh. It was startling, given how quiet he had been. It was a laugh one shares with a peer. M

Aden Forrow '13 will enroll in the mathematics graduate program at MIT next year. If he has an idea for the Sudoku project, he knows who he will call first.