The faces of students in my high school pre-calculus class looked somber as I returned their chapter 2 tests. The exam itself had not been especially difficult, though many students had performed worse than they had hoped they would. Students saw the red marks on their papers and seemed to take them personally. For some, the return of the exam was demoralizing.

One of the students, Xavier Dixon, slid his test underneath his textbook to hide his failure. Xavier was confident, well spoken, greatly respected by his senior classmates, and involved in many activities and sports, including being a member of the school’s basketball team, which had been a runner-up in a state championship. With a mixture of confusion, disappointment, and embarrassment, he said to a friend, “Man, I remember when I was good at math. I used to get As on everything, but I’ve just gotten slightly worse and worse since I got out of middle school. I got hammered on this test. I’m just not good at math anymore.” Although Xavier had spoken quietly, some classmates heard him and nodded in agreement, thinking of their own declining skills in mathematics.

I felt myself wanting to nod my head in agreement as well. I remembered the many times in high school and college that I had had the same thoughts. I put down my piece of chalk and gave perhaps the most valuable mathematics lesson of the school year.

I told the students that although I teach high school and community college mathematics, I have never considered myself to be a mathematics genius. Mathematics was not always—and still is not—easy for me. I had always seemed to do well in elementary school and early middle school mathematics. I earned good grades with very little effort. As long as I paid attention in class and mentally followed the teacher’s examples, I could complete my homework, almost mindlessly, while I watched The Cosby Show on television. In fact, on more than one occasion, I did my homework at the bus stop in the morning. With this minimal effort, I earned As and Bs.

During middle school and early high school, my work ethic had to change. No longer could I just sit and follow along mentally with what the teacher was saying; I actually had to write the teacher’s notes from the chalkboard and practice working through the assigned problems during class. If I got lost during a lesson, I had to put my pride away, raise my hand, and ask the teacher to clarify a mathematics concept. In addition, homework required a bit more of my attention than before, since it involved longer procedures and deeper thinking. In the end, I knew that I had to take notes in class and do nearly all of my homework in order to earn Bs.

The views expressed in “Sound Off!” reflect the opinions of the author and not necessarily those of the Editorial Panel of the Mathematics Teacher or the National Council of Teachers of Mathematics. Readers are encouraged to respond to this “Sound Off!” by sending letters to mt@nctm.net for possible publication in “Reader Reflections.” “Sound Offs!” from readers are welcomed.
I told the students that although most of them were doing their homework every evening and that many were taking notes in class, expectations increased for a high school level, dual-enrollment (with the community college) class. Many students in this class were putting forth the same effort as students in my first-year algebra class. I told them they needed to “step up their game.”

Although the students had listened attentively and respectfully, I suspected they had not understood my message completely. So I called on Xavier and asked him when he had started playing organized basketball.

“How grade,” he replied.

“How often did your team practice?” I asked.

“About twice a week.”

“When did you play in middle school, did you only practice twice a week with your team?”

“No,” said Xavier. “We practiced every day after school, except game days.”

“And now, as a high school senior, do you only practice after school, or is there additional training?”

“We have summer league that lasts five weeks. Then we have weight training a few days a week during the off-season, and then open gym sessions before the season starts,” Xavier replied.

My final question clarified the point I was trying to make: “Xavier, could you be a successful high school basketball player by practicing twice a week as you did in elementary school, or after school every day as when you were a middle school student?”

He answered as he shook his head: “No.”

Although the students understood the message, many still did not know how to improve their “mathematics game.” So I gave them some tips.

**TAKING NOTES**

We started by discussing the purpose of taking notes. Many students take notes to help them pay attention and to work through problems, but few refer to their notes if they get stuck on a homework problem. I asked, “Do you notice that the problems in the notes resemble the problems in the homework?”

Part of “stepping up your game” in upper-level mathematics is to refer to your notes if you do not understand or do not remember how to do a homework problem. I suggested that students read through the beginning sections of the textbook for further ideas, since concepts and practice problems are written to help students with the lessons. “Sometimes,” I told them, “it isn’t easy to remember all that is taught in a class period. Help yourself by using some of the references provided to you.”

**HOMEWORK**

As students began to understand the broader applications of note taking, we turned our discussion to the importance of homework. Most students will admit that their primary motivation for doing homework is to earn the points toward their overall grade. Few think of homework as practice. Some approach homework carelessly, “getting it done” during lunch hour or on the way to school. Other students assume that putting some effort toward each problem constitutes an honest commitment to the course. But stepping up your game means more than just completing homework for daily points. Homework needs to be done for understanding.

I told the students that for each homework problem they should ask themselves, “Could I repeat what I’ve just done if a similar question were given on a test?” or “Do I understand the directions for what each problem is asking, and am I doing more than just mimicking procedures?” Not enough students think about homework as a method of practice; rather, many consider it busy work, a chore that teachers assign. Students need to consider homework as a tool to advance their learning.

**TEST PREPARATION**

While the practice of correctly doing homework will greatly improve students’ understanding of mathematics material and their future performance on tests, that practice alone may not be enough. Test preparation must go beyond the realm of doing daily homework assignments. Many students believe that if they complete homework assignments, they should not have any trouble doing well on an upcoming test. This is far from always being true.

I offered students a few suggestions for preparation. First, merely skimming through a chapter is not the same as studying. Test preparation requires more effort than looking at problems from the various lessons and thinking. “Um, yeah, I remember how to do that. Yes, I know how to do those. Yes, I remember everything. Done!”

The night before the test, pick a problem or two from each section of the book, and work them through. If, after checking the answer, you find that you have done the problem correctly, move on. If not, look through your old homework and notes and find out where you made your mistakes. I admonished the students, “If you cannot do a review question, then you will not be able to do a
similar problem on the test. Find where you made your mistake and correct the misunderstanding. If you cannot find it, ask someone else—your teacher or a classmate—to look through your work.”

Second, review for your test with classmates. I believe that students understand best when they are taught by their peers. I told the students, “Depend on one another as you study. Individually, you may not be able to answer all the review problems that are practiced. But in a small group, it is much more likely that at least one of you will remember how to perform each review question in a chapter.” Those people who understand the problem can help others who may be temporarily confused. Usually, everyone has a chance to make a contribution.

Suggestions for improving grades can never be exhaustive; indeed, they can be as varied as the classes that you teach. Teachers should remind students periodically to step up their game, especially when students are underperforming. Otherwise, they will continue to believe that their study habits that ensured success in earlier courses will suffice for their current mathematics class. This attitude can be detrimental, however, because students will gradually become less successful, and they will believe, like Xavier, that they are no longer “good at math.”

In addition, teachers should be encouraged to offer suggestions that will help students step up their game. Unless teachers share these suggestions, many students will not know how to improve. Students depend on the teacher’s guidance to perform well not only in mathematics class but also in school and in life. The skills you pass along in your mathematics class can be used in other subjects. In time, when students move on to higher mathematics classes, they will need to learn how to step up their game again to meet the needs of the higher expectations of those courses as well.

THOMAS G. ROTHERY, trothery.mhs@tuhsd.k12.az.us, teaches high school mathematics at McClintock High School in Tempe, AZ 85282, and college mathematics at Mesa Community College–Red Mountain, in Mesa, AZ 85207. His research interests include the use of technology and multiple representations in learning the real number line among English as a Second Language students. Photograph by Louis Olivas; all rights reserved.