

Nurturing Faith in Math Class

When are we ever gonna use this stuff?" students grumble in math

classes. Though usually little more than a complaint, it sometimes indicates a sincere desire to understand the usefulness of mathematics. It's really a great question—and math teachers should have a great response.

As a university mathematics instructor, one of the courses I teach is Survey of Mathematics. The course:

- reviews basic mathematics concepts that university students need in their various disciplines (e.g., fractions, decimals, percentages, operations with negative and positive integers, the metric system);
- presents concepts most students have not studied before (e.g., history of numeration systems, number bases other than 10, probability, statistics, the normal curve); and
- shows the impact of mathematics on human culture and modern society.

Most students enroll in this course only because they are required to do so. Aware that many have weak math backgrounds and have had negative experiences with math, I use several approaches to help them succeed and have a positive experience.

Respect

First, I try to show respect for each student as a capable learner, valuable person, and fellow Christian.

Upon receiving the Mathematical Association of America's 1994 Award for Distinguished College or University Teaching of Mathematics, Lisa Mantini of Oklahoma State University wrote, "So what has all of this taught me about good teaching? The first thing is to have respect for all those who are trying to learn new things, regardless of their current level of knowledge."¹ Respect and patience mirror the spirit of Christ. Peter and Paul admonished Christians to "show proper respect to everyone" (1 Peter 2:17, NIV)² and to "be completely humble and gentle; be patient, bearing with one another in love" (Ephesians 4:2).

Being in a supportive learning environment helps students be more motivated and successful. Consequently,

they are less likely to ask, "What's this stuff good for?" They focus on the utility of the subject matter rather than the difficulty of learning it.

The Relevance of Mathematics to Life

Another way I try to make the question, "When are we ever gonna use this stuff?" unnecessary is by showing the relevance of mathematics to daily life. The remainder of this article tells how I relate several mathematics topics to my students' lives and values.

1. *Simple Interest, Scholarships, and Philanthropy*

BY ROBERT C. MOORE

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In the 1980s, Southern Adventist University in Collegedale, Tennessee, where I teach, initiated an endowment fund to help with tuition expenses. Today, the principal amount of the fund has greatly exceeded the original goal of \$10 million. Each year, hundreds of our students benefit from the scholarships it generates. I ask my Survey of Mathematics students *who* proposed the idea of this scholarship fund? No one has ever been able to answer the question, so I give them a big hint: What is the name of the Student Center? Answer: Sanford and Martha Ulmer Student Center. Why does it bear the Ulmers' name? Because Mr. Ulmer proposed the idea of having a scholarship endowment fund and contributed generously to its establishment.

This scholarship fund, which helped many of the students pay the tuition for this very math class, is a terrific context in which to study the mathematics of simple interest. Here are two exercises I assign. (The numbers used are approximate and do not reflect exact figures for the fund.)

Exercise 1. In February 1999, the fund had \$14.8 million, due to a gain of \$775,000 during the previous year. How much money did the fund have the previous year?

Exercise 2. To offset inflation, 10 percent of the interest earned is added to the principal, and the rest of the interest is used for student scholarships. If the fund has \$14.8 million and earns 5.5 percent interest per year, how much of the interest will be added to the principal and how much will be available for student scholarships?

The scholarship fund also offers an occasion to discuss Christian values, particularly unselfish giving. Virtually all of my students will eventually be wealthy, compared to most people in the world, and some will even be well-

to-do relative to the U.S. standard of living. Wealth provides opportunities for good. The Apostle Paul advised: "Command those who are rich in this present world not to be arrogant nor to put their hope in wealth, which is so uncertain, but to put their hope in God, who richly provides us with everything for our enjoyment. Command them to do good, to be rich in good deeds, and to be generous and willing to share. In this way they will lay up treasure for themselves as a firm foundation for the coming age, so that they may take hold of the life that is truly life" (1 Timothy 6:17-19). The Ulmers have set a good example!

2. Simple Interest, Compound Interest, and Personal Finances

When we study simple and compound interest, I assign exercises that show how finance charges are calculated on credit-card debt and home mortgages. My students are always astounded to learn how much interest they will pay on a 30-year mortgage. In this context, we discuss ways to reduce interest charges, which I hope will pay generous dividends to my students during their college years and afterward.

Perhaps the most important assignment in the course is a paper on personal debt. Each student is required to read a chapter from Edward Reid's book *It's Your Money! Isn't It?*³ or Chapter 8, "Dumping Debt" from Dave Ramsey's book *Financial Peace*⁴ and write a short summary and reaction. As they read, the students learn some principles of Christian stewardship, like "the borrower is servant to the lender" (Proverbs 22:7). They also learn some practical tips for staying out of debt and managing one's personal finances, like how to reduce interest charges for a home mortgage by making "double payments," how to train children to manage money, how to avoid the pitfalls of credit-card debt, and how to use the "debt snowball" to get out of debt.

The first time I assigned the chapter "Dumping Debt," I was amazed that one student reported having cut up his credit cards as a result of read-

ing the chapter! Since that time, other students have done the same. Until then, I had not realized that math class could have such a powerful effect on my students' daily lives.

3. Probability, Lotteries, and Gambling

Notions about probability have the potential to affect human choices. Jurors use probability to assess "reasonable doubt" when deciding to convict or acquit a defendant, citizens use it to decide whether the benefits of nuclear power and air travel outweigh the risks of tragedy, the insurance industry uses it to determine premiums, and people use it to determine how safe "safe sex" really is. I try to convince my students that understanding the principles of probability will help them to function more safely and rationally in modern society.

Two current political and social issues that interest my students are gambling and lotteries. Most of the 50 U.S. states have some form of legalized gambling, and many sponsor lotteries to increase state revenues. When I ask my class how many of them would like to win the lottery and win it big (millions of dollars), virtually every hand goes up. Later, after the class studies the mathematics of probability, I assign a report on gambling and lotteries, allowing them to choose several articles as sources.⁵

At the end of this unit, we discuss the political, social, and spiritual aspects of gambling and lotteries. Some students defend lotteries because their revenues help fund public education. Other students argue that state lotteries are an unfair form of taxation because the people who tend to buy lottery tickets are the ones who can least afford them. We also discuss the high cost of gambling to society due to increased crime rates, family conflicts, and personal financial ruin. I raise the issue of whether gambling is appropriate for Christians. Is it not a selfish attempt to gain something for nothing at the expense of someone else?

Near the end of our discussion, I tell my students there are two reasons I do not buy lottery tickets: First, I would very likely waste my God-given

dollar by losing it, and second, there is a slight chance I would win. Most students are surprised to hear that I do not want to win the lottery. There are many reasons for my position, but the most important one is the deceitfulness of wealth, mentioned by Jesus in the parable of the sower: "Now he who received seed among the thorns is he who hears the word, and the cares of this world and the deceitfulness of riches choke the word, and he becomes unfruitful" (Matthew 13:22, NKJV). In 1 Timothy 6, the Apostle Paul writes that "godliness with contentment is great gain" (vs. 6, NIV). Three times he warns Timothy about the destructive trap of loving money, closing with an ominous warning:

"Some people, eager for money, have wandered from the faith and pierced themselves with many griefs" (vs. 10).

An understanding of probability can reveal why gambling is a losing game, but only our personal values will determine our choices and behaviors.

4. Infinity and Eternity

In one part of the course, I review fractions and decimals. Some fractions have terminating decimal expansions, like $5/16 = 0.3125$, which ends at the 5. Other fractions have repeating decimal expansions that repeat a block of digits infinitely, like $1/3 = 0.33333\dots$, with a one-digit repeating block. The fraction $3/7 = 0.428571428571\dots$ has a six-digit repeating block.

It is easy to convert a terminating decimal to a fraction, but more difficult to do the same with a repeating decimal. To illustrate the process (without getting into too much detail), let's convert $0.22222\dots$ to a fraction.

Step 1. Give the number a name:
Let $n = 0.22222\dots$

Step 2. Multiply the number n by 10 to move the decimal point one place: $10n = 2.22222\dots$

Step 3. Subtract the original number n from the result of step 2.

$$\begin{array}{r} 10n = 2.22222\dots \\ -n = 0.22222\dots \\ \hline 9n = 2.0 \end{array}$$

Step 4. Solve for n : $n = 2/9$.

Now we have the original number written in fraction form—one whole number, 2, divided by another whole number, 9. How did we end up with the whole number 2? We canceled all of the 2s to the right of the decimal point when we subtracted the two numbers in Step 3. But, you say, in Step 2 we moved the decimal point one place to the right, and that left one fewer 2 to the right of the decimal. Yes, but because the original number has an *infinite number of 2's*, moving the decimal point leaves just as many 2's to the right of the decimal point as before. Therefore, the decimal portions of the two numbers in Step 3 canceled out when we subtracted.

Here is a similar one for you to try on your own: Convert $0.99999\dots$ to a fraction. You might be surprised!

Infinity is strange. How can we take something away and still have just as much as we had at the start? Finite collections of things certainly do not work this way. I ask my students to recall or sing the last stanza of the hymn "Amazing Grace." It says that after 10,000 years in heaven, we will have "no less days to sing God's praise than when we'd first begun." Amazing—eternity less 10,000 years is still eternity! That's the same idea we used in converting $0.22222\dots$ to a fraction.

Thanks to Georg Cantor (1845-1918), we understand the mathematics of infinite sets much better. He developed theories for dealing with infinite sets that are very different from those that deal with finite sets. Many of Cantor's contemporaries were critical, and even hostile, to his ideas, but now the mathematical community acknowledges his brilliant contributions.

Just as the mathematics of the infinite must be approached differently from that of the finite, spiritual things must be spiritually understood. "The man without the Spirit does not accept the things that come from the Spirit of God, for they are foolishness to him, and he cannot understand them because they are spiritually discerned" (1 Corinthians 2:14). As

Christians, we study God's Word in order to understand divine wisdom. We should not be surprised when we are criticized for our beliefs. We pray that our critics will eventually change their minds.

So what's this stuff good for? Lots! It prepares us for daily living and rewarding careers. And more important, it teaches us to respect one another, encourages us to give unselfishly, cautions us against debt, reveals the deceitfulness of wealth, and points us to God's wisdom. It supports our faith and guides our lives in today's challenging society. ✍

REFERENCES

1. Lisa A. Mantini, "To Challenge With Compassion: Goals for Mathematics Education," *Focus* 15:7 (October 1995), p. 10.
2. Unless otherwise indicated, Bible texts in this article are quoted from the *Holy Bible, New International Version*, copyright © 1973, 1978, International Bible Society. Used by permission of Zondervan Bible Publishers.
3. G. Edward Reid, *It's Your Money! Isn't It?* (Hagerstown, Md.: Review and Herald Publ. Assn., 1993).
4. Dave Ramsey, *Financial Peace* (New York: Viking, 1995).
5. James Popkin, "Tricks of the Trade: The Many Modern Ways Casinos Try to Part Bettors From Their Cash," *U.S. News and World Report* (March 14, 1994), pp. 48-52; Chris Ison and Dennis J. McGrath, "Gambling's Toll in Minnesota," *Reader's Digest* 148:888 (April 1996), pp. 101-105; James Dobson, untitled (Focus on the Family), *Family News From Dr. James Dobson* (January 1999; April 1999). The newsletters are on gambling (January and April) and lotteries (April); Jonathan Gallagher, "Seven Reasons for Not Rolling Sevens," *Adventist Review* 177:14 (April 2000), pp. 8-12; and Terry Crites, "Using Lotteries to Improve Students' Number Sense and Understanding of Probability," *School Science and Mathematics* 94:4 (April 1994), pp. 203-207.

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