Notices

of the American Mathematical Society

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ABOUT THE COVER

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From the Editor

As mathematicians we are accustomed to using our analytical skills many times a day, whether we are pondering abstractions or deciding which route home will be best. But while the world knows that mathematical skills are part and parcel of performing complex calculations and proving theorems, most nonscientists are unaware of how often mathematical analysis intersects our daily lives. This point was brought home to me last summer when I was visiting friends in England. Their ten-year-old wanted to know if she and her three good friends were likely to be in the same class the following fall; there would be three sixth-year classes.

"Two of you certainly will be," said her father, "That's the Pigeonhole Principle. Three classes, four girls, at least two girls will be in the same class."

His wife looked at both of us and sighed. 'That's just common sense," she said "Anybody could figure that out. One doesn't need mathematics." We could not persuade her that there was indeed a mathematical principle behind four girls, three classes, at least one class with two girls.

My friend's attitude is not uncommon. The divorce between mathematics and common sense works both ways. Software for mathematics education is arithmetic drill problems, discrete math algorithms. Yet the software I like best for teaching math—and I have not done an extensive survey—is one that doesn't purport to be a math program at all. It is "Oregon Trail"; it simulates traveling the trail in a covered wagon. The user has to make a number of decisions along the way: Will you be a banker (you start with lots of money, but few skills), a carpenter (less money, but you can quickly repair a broken axle), a farmer? Do you raft down the Hood River (dangerous) or use the Barlow Toll Road ($5 tariff)?

My nine-year-old doesn't know he is learning probability; neither do some of his teachers. All my mathematician friends realize it instantly.

This artificial separation between mathematics and common sense is costly. A particularly trenchant example is the standard medical advice given to pregnant women over age thirty-four. After that age the probability of a Down's syndrome baby is higher than the probability that amniocentesis will induce a miscarriage; many doctors standardly recommend amniocentesis.

But each woman evaluates the costs of having a miscarriage and of having a Down's syndrome child differently. Factoring in these concerns changes the set point considerably; some women will avoid amniocentecis completely, others will choose to have it at a much earlier age, when the probabilities of a Down's syndrome child are significantly less than the chance that amniocentesis will induce a miscarriage. Yet many obstetricians offer the simple model that doesn't capture all the available information. That's no surprise. They're presenting "common sense". We know it is mathematics. But we don't present mathematical reasoning as if it had anything to do with the logic of everyday life.

As mathematicians we frequently experience a difficult idea becoming clear; we call that understanding the concept. Nonmathematicians experience the same phenonmenon. But when understanding hits, the nonmathematicians characterize the argument as "common sense". (If they understand the argument, it couldn't be mathematics.) This is not a healthy split for mathematicians or for society. There are things we could do about it.

We could stop viewing mathematics as the abstraction that plays with the rules but has nothing to do with the application. We could think about teaching mathematics as part of an integrated whole—the Oregon Trail—instead of probability problems in the probability section of the text. This is hard work of course. But having mathematically literate students would be worth a lot.

Easier steps are that we could give homework questions and exam problems that employ common sense and analytical reasoning. In our regular teaching we could emphasize analytical reasoning as it arises in our daily lives. We could institute undergraduate mathematics modeling courses, where the stress is on modeling, not mathematics. In doing so, the beauty of Galois Theory, the clarity of Hilbert spaces remain undiminished. But the value of mathematics—and mathematicians—to society is much more apparent. And we might even see more sense in "common sense".

Susan Landau