

NCSU Society for Undergraduate Mathematics

SUM Series

Thursday, October 2, 2008

3:00–3:50 p.m.

Harrelson 330

Mathematics and pizza!

How the Talmud Divides an Estate Among Creditors

Steve Schechter

A man dies leaving an estate of size e and debts to creditors $1, \dots, n$ of d_1, \dots, d_n , with $e < d_1 + \dots + d_n$. How much should each creditor get?

The Babylonian Talmud, a compendium of Jewish law that dates back 1800 years, discusses this issue and gives the following examples. Assume $d_1 = 100$, $d_2 = 200$, $d_3 = 300$.

If $e = 100$, each creditor gets $33 \frac{1}{3}$.

If $e = 200$, creditor 1 gets 50, creditors 2 and 3 get 75 each.

If $e = 300$, creditor 1 gets 50, creditor 2 gets 100, creditor 3 gets 150.

A literature stretching across 1500 years deals with the question: what algorithm is the Talmud using? Of course, as in any legal system, the answer must be based on other Talmudic principles.

The problem was convincingly solved by Robert Aumann (PhD in Mathematics 1955, Nobel Prize in Economics 2005, also a religious Jew) and Michael Maschler in the 1980's. Later Marek Kaminski showed how, given d_1, \dots, d_n , one can construct special-purpose glassware so that when an amount of liquid e is poured in, it will divide itself in the correct way.

I will explain the Aumann-Maschler-Kaminski solution, as well as its relation to game theory.