2006 SUMSRI Journal
Introduction

The Summer Undergraduate Mathematical Sciences Research Institute (SUMSRI) is a program designed to prepare participants for the rigor and pace of graduate school. Because of the small number of African Americans, Latinos and Native Americans with doctoral degrees in the mathematical sciences, we are particularly interested in these undergraduate students. In order to prepare these students, the Institute offers short courses, research seminars and colloquia for seven weeks. It is an intense program in which the undergraduate participants learn what it means to focus entirely on mathematics and statistics as one would do during a graduate program. Each course, seminar and colloquia is designed to fulfill the following goals:

- Address the shortage of underrepresented minorities and women mathematicians by producing minority and women research mathematicians.
- Provide the participants with a research environment and improve their research abilities.
- Improve the participants' ability to work in groups and give them a long term support group.
- Provide role models.
- Improve the participants' technical writing skills.
- Give the participants an opportunity to give a talk and to write a technical research paper.
- Familiarize the participants about graduate school and inform them about available financial aid for graduate school.
- Make the participants an awareness of career opportunities in the mathematical sciences.
- Prepare the participants for the GRE.

This preparation will, hopefully, permit the SUMSRI participants to successfully compete and complete graduate school.

In the summer of 2006, the Institute offered research seminars in number theory, abstract algebra and multivariate statistics. Participants also attended workshops in mathematical writing, GRE preparation, two short courses in algebraic topology and real analysis as well as eleven colloquium talks.

Applications for participation in the institute came from across the nation. In order to be chosen, each applicant had to be a U.S. citizen or permanent resident and must have completed college level introductory mathematics and/or statistics courses and at least one proof-based mathematics course. Each applicant wrote a brief essay on why they wished to participate in the Institute. Two recommendation letters from faculty members from the applicant's home institution were received for each applicant. In 2006, fifteen participants were accepted. The average GPA in the mathematical sciences for this summer's participants was 3.72. Eight of the participants were African American and seven were Caucasian. Eleven of the 15 participants were female.

Research seminar instructors suggested topics that would challenge students to work in teams, draw on their critical thinking and research skills, familiarize them with current literature on the topic, set parameters of the research and utilize computer modeling programs.

In Multivariate Statistics, Emilola Abayomi, Erin Esp and Shannon Grant looked at variables that influenced spending habits, entitling their paper "Reckless or Responsible, A Multivariate Statistical Analysis of Consumer Spending". Using Principal Components analysis, Factor Analysis and Discriminant Analysis, they devised a rule for classifying individual consumers as either reckless or responsible spenders.

Ashley Brooks, Amber Shoecraft and Anthony Franklin formed a second Multivariate Statistics research group, choosing to focus on educational statistics in 64 countries to classify countries into two populations, one where the educational system of the country is exceptional and the other where the educational system is only fair.

The Algebra research group, including Chatelle Bickett, Samantha Graffeo, Whitney Ross and Edward Washington, looked into the structure of zero-divisor sum graphs including vertex degree, connectivity and cycles. Further investigation was made into planar graphs and automorphisms of these kinds of graphs.

The Number Theory group, including Terris Brooks, Elizabeth Fowler, Katherine Hastings, Danielle Hiance and Matthew Zimmerman, looked elliptic curves and their torsion subgroup of $Z_2 \times Z_8$ to search for curves of rank 4.

Final presentations of the research projects were given using overhead projector illustrations and/or Power Point slides. Members of the Miami University Mathematics and Statistics Department attended these presentations. It is hoped that many of these students will attend regional and national mathematics and statistics meetings in order to present the results of their work.

By providing this intensive research program, we endeavored to encourage those who attend SUMSRI to pursue advanced degrees.

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