Mathematisches Forschungsinstitut Oberwolfach

Report No. 34/2007

Explicit Methods in Number Theory

Organised by
Henri Cohen, Talence
Hendrik W. Lenstra, Leiden
Don B. Zagier, Bonn

July 15th – July 21st, 2007

ABSTRACT. These notes contain extended abstracts on the topic of explicit methods in number theory. The range of topics includes asymptotics for field extensions and class numbers, random matrices and L-functions, rational points on curves and higher-dimensional varieties, and aspects of lattice basis reduction.

Mathematics Subject Classification (2000): 11–xx, 12–xx, 13–xx, 14–xx.

Introduction by the Organisers

The workshop *Explicit Methods in Number Theory* was organised by Henri Cohen (Talence), Hendrik W. Lenstra (Leiden), and Don B. Zagier (Bonn), with the assistance of Karim Belabas (Talence), and it took place July 15–21, 2007. Four previous workshops on the topic had been held in 1999, 2001, 2003, and 2005. The goal of the meeting was to present new methods and results on concrete aspects of number theory. In several cases, this included algorithmic and experimental work, but the emphasis was on the implications for number theory.

There were three 'mini-series' highlighting important recent developments: one of three hours, by Jordan Ellenberg and Akshay Venkatesh, on asymptotics for field extensions and class numbers; one of two hours by Mark Watkins, on random matrices and L-functions; and one of three hours by Noam Elkies, on the construction of elliptic curves of high Mordell–Weil rank.

Some of the other themes were:

- Modular forms
- Rational and integral points on curves and higher-dimensional varieties
- Counting points on varieties over finite fields
- Fast multiplication
- Aspects of lattice basis reduction.

As always in Oberwolfach, the atmosphere was lively and active, providing an ideal environment for the exchange of ideas and productive discussions. The meeting was well-attended, with 51 participants from a variety of backgrounds, including a large number of younger researchers. There were 32 talks of various lengths, and ample time was allotted to informal collaboration.