

# The South African Mathematical Talent Search

John Webb

In April 1991 South Africa received its first invitation to take part in the 32nd International Mathematical Olympiad (IMO) in Sweden, which I attended as an Observer. This opened the way to South Africa's full participation in the IMO, and since 1992 I, as Team Leader, along with Graeme West (University of the Witwatersrand) as Deputy Leader, have taken a team of six students to each IMO.

For many years South Africa had the infrastructure for running a successful IMO program. The quarterly mathematics magazine for high schools, *Mathematical Digest*, features regular problem-solving competitions and has a free circulation to all high schools in South Africa and neighboring countries. With a circulation of about 4,000, *Mathematical Digest* has just celebrated its 25th birthday.

The South African Mathematics Olympiad celebrated its 30th birthday in 1995. For many years it had fewer than 5,000 contestants in its first round, with 100 writing the second round. It is at present expanding its first round participation, with Junior and Senior Rounds, and total participation is now over 20,000.

In addition, there are regional mathematical competitions in some parts of the country. The University of Cape Town Mathematics Competition began in 1977, and today attracts over 4,000 participants who come to the UCT campus one evening in April to write competition papers at five different levels. While it is not a big competition in international terms, it claims (with confidence, but no real justification) to be the largest mathematics competition in the world written in one place at one time.

Despite this background, the identification and preparation of IMO teams presented difficulties which the South African Mathematics Olympiad was not in a position to solve adequately. One problem was the very low participation by black students. Another was the timing of the Olympiad: with its final round written in September, it cannot be used as a final selection test for a team to go to an IMO in July.

When South Africa was admitted to the IMO, the South African Mathematics Society took on the task of selecting and training the teams. A nationwide Talent Search was launched in the form of a correspondence course in problem-solving.

The Talent Search is publicized through teachers' and pupils' magazines such as *Mathematical Digest*. Posters are sent to schools, and personal invitations to take part are sent to students who have distinguished themselves in a regional competition or the national Olympiad. Entry is open to all, and is free.

The structure of the Talent Search is simple. Students are sent a round of problems to solve. They mail in their solutions which are marked and returned with model solutions, suggestions for further reading, a short article on some aspect of problem-solving, and the next round of problems. The Talent Search is self-paced. However, normally the top students get through ten rounds of problems in a year.

The Talent Search enrollment builds up during the year to about 200 students. However, many of the participants soon find the problems too difficult; they are then diverted into a more accessible series of problems appropriate to their abilities.

The Talent Search follows the Southern hemisphere academic year which runs from January to December. At the end of the year, certificates of achievement are sent to all participants and the top students are invited to attend a "Mathematical Camp", held at the University of Stellenbosch at the beginning of the summer vacation. During the six days of the camp the students write a series of tests and attend lectures on solving Olympiad problems. There is also time for sightseeing excursions.

In January the new Talent Search begins, but the survivors of the Stellenbosch Camp continue with a program of problem-solving by correspondence, culminating in an IMO Selection Camp held at Rhodes University in April. The team of six, with a reserve, is selected and goes into heavy training, once again by correspondence.

## *Mathematics for Gifted Students II*

A small but useful series of publications has been built up. After the IMO in Hong Kong, a book entitled *South Africa and the 35th IMO* was published. This 136-page book, which I co-wrote with Graeme West, contains the problems used in the 1993/94 Talent Search and the camps, plus all 144 problems from the 1994 IMO problems. Full solutions of all the problems are also included.

In addition, five titles have been published in the series *South African Mathematical Society Olympiad Training Notes*:

- *The Pigeon-hole Principle*, by Valentin Goranko;
- *Topics in Number Theory*, by Valentin Goranko;
- *Inequalities for the Olympiad Enthusiast*, by Graeme West;

- *Graph Theory for the Olympiad Enthusiast*, by Graeme West;

- *Functional Equations for the Olympiad Enthusiast*, by Graeme West.

For the first two years, South Africa's performance at the IMO was not impressive, but in Hong Kong the team won three Bronze Medals and an Honorable Mention. The next year, at the IMO in Canada, every member of the team won an award: two Bronze Medals and four Honorable Mentions.

The opportunity to compete in an International Mathematical Olympiad has turned out to be an important incentive in encouraging promising young mathematicians in South Africa to develop their talents. South Africa may not be in the First League of the IMO, but we are challenging for a position at the top of the Second.