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Supporting talented maths students

Simon Marshall, New Zealand's only gold medallist at the International Mathematical Olympiad (IMO), was introduced to the Olympiad in third form in 1998. Jenny Rankine talked with him.

A teacher gave Marshall the questions distributed each September by the New Zealand Mathematical Olympiad Committee (NZMOC). The top 24 respondents are invited to a week-long live-in Mathematical Training Camp each January.

He didn't get into the camp that year, but he took the NZMOC Certificate course through the University of Auckland, along with his Onslow College subjects, and was chosen for the 2000 camp.

"It was an amazing experience; I'd never had so much maths put through me. It was good socialising with quick-witted people who really loved maths. I didn't get selected for the IMO team; but that year I did IMO-level maths problems almost constantly and finally started to get somewhere."

At the 2001 camp he was chosen for the IMO team competing in Washington DC in July, his first overseas trip. He and the other Wellington team member met weekly with a Victoria University lecturer.

The 2004 New Zealand IMO team after the closing ceremony in Athens. Left to right: Eve Waddington, Jethro van Ekeren (bronze), Simon Marshall, Heather Macbeth (bronze), Eric Kang, James Liley, James McKaskill. Absent: Team leader Arkadii Slinko.

The annual IMO competition started in 1959 and involves the top high school maths students from 90 countries. They send teams of up to six people who compete as individuals. New Zealand has the best female representation and the last three teams have all included Maori members. Competitors answer six problems, each worth seven points, in two four-hour exams. Of the 500 or so students, about half get a medal - 40 gold, 80 silver and over 100 bronze.

"I got 24 out of 42, a silver medal. It's one thing to be measured against everyone in the country, but to be measured against everyone else in the world and come out pretty favourably - I thought maybe I've got some talent." Team member Stephen Merriman also won a bronze.

"Camp was quite different the next year. There was an assumption that I was going to go back and get a gold medal, and that's what I wanted."

The pressure was on at his second Olympiad in Glasgow in 2002; the stress still resonates in his voice. "When we compared notes after the first day I realised I'd misinterpreted a question and would get no points for it. I was so despondent I said I'd eat a whole jar of jam if I got the medal - and I did."

Marshall scored 29 and the New Zealand team gained its second-highest score and highest ever ranking of 35.

The University of Auckland and the NZIMA created a scholarship especially for Marshall in recognition of his achievement. "The gold medal made me take my mathematical abilities a lot more seriously and push myself harder at university."

In 2004 and 2005 he was IMO deputy team leader. "I travelled with them to Athens and Mexico, making them feel confident, answering their questions. I was like an expectant father waiting for the results - you share their nervousness and you feel really happy when they've done well."

Marshall's straight A+ results in his BSc and the papers he'd submitted to journals as an undergraduate gained him entry to all of the 11 universities he applied to for postgraduate study. He is intrigued by the problems about equations and integers he is studying in number theory at Princeton. "You might want to find the solutions where integers are prime numbers. Some questions are so simple to ask but very difficult to solve." He looks forward to contributing to maths in New Zealand after his PhD.

The NZIMA has supported the NZMOC directly since 2003. NZIMA Co-director Marston Conder describes it as "an impressive organisation, with a pyramid of training, mentoring and selection involving hundreds of students and teachers before the chosen team competes at the IMO itself."

2002 IMO questions

Question A3

Find all pairs of integers $m > 2$, $n > 2$ such that there are infinitely many positive integers k for which $(k^n + k^2 - 1)$ divides $(k^m + k - 1)$.

Question B2

Find all real-valued functions f on the reals such that $(f(x) + f(y))\,(f(u) + f(v)) = f(xu - yv) + f(xv + yu)$ for all x, y, u, v.

Question B3

$n > 2$ circles of radius 1 are drawn in the plane so that no line meets more than two of the circles. Their centres are $O_1, O_2, \ldots, O_n$. Show that $\sum_{i<j} 1/O_iO_j \le (n-1)\pi/4$.