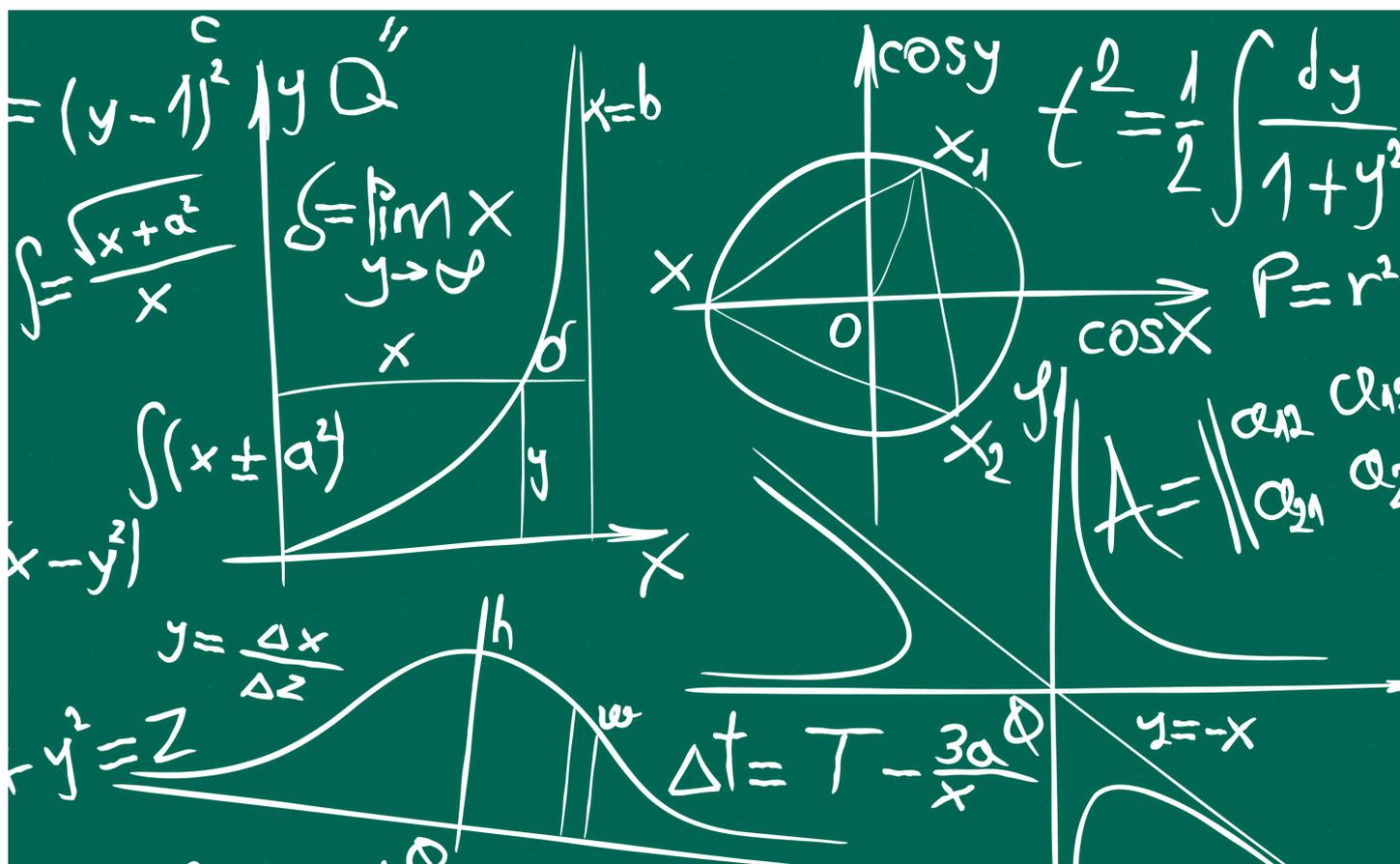


Mathematics fanatics shine at the International Maths Olympiad

Education Today staff



arithmophobia [noun] The irrational fear of numbers or arithmetic (wiktionary, 2011)

A recent review of the state of mathematics education in Australia concluded that, “Australia has gone backwards over the last 20 years in terms of the quality and quantity of students completing Year 12 mathematics” (Brown, 2009). Similarly, a report by the Office of the Chief Scientist (2013) found that there is, “declining interest in the study of STEM [Science, Technology, Engineering and Mathematics] disciplines in senior secondary school,” a view reiterated by an Australian Industry Group report (2013) which asserts that, “Young people in schools and universities are not acquiring the STEM skills we need for our future prosperity.”

Yet within the context of this predicted mathematical Armageddon, our International

Mathematical Olympiad (IMO) representatives have managed to achieve some remarkable results on a global scale. The six-person team, consisting of students from Years 9 to 12, finished 15th out of the 97 countries competing this year, a creditable improvement on last year’s 27th place finish. What is most noteworthy is that all six team members brought home individual medals, ranging from bronze to gold.

The path to compete in the IMO is a long and challenging one. Executive Director of the Australian Mathematics Trust (AMT) Mike Clapper explains that potential competitors are usually first identified during the annual Australian Maths Competition, an event administered by AMT involving more than 300,000 students from Years 3 to 12. The competition gives students limited time to solve 30 problems of increasing difficulty.

Gifted maths students are also recognised

through AMT’s Mathematics Challenge for Young Australians. The initial stage, known as the Challenge Stage, is conducted over a three-week period by schools with students in Years 5 to 10, and involves solving a number of problems individually, with the discussion of two of the problems with a partner also allowed.

The Enrichment Stage is a six-month commitment that challenges students from Years 5 to 10 to solve a series of mathematical problems, supported by systematic structured course materials. Students can also choose to sit the Australian Intermediate Mathematics Olympiad (AIMO) paper, a four-hour examination that draws on skills and knowledge developed during the Challenge and Enrichment stages.

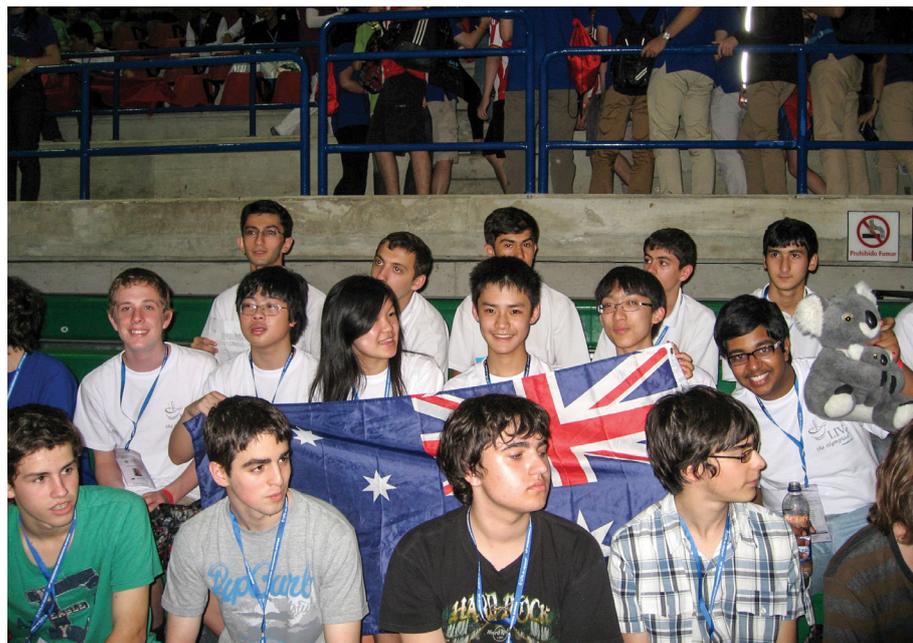
Students who excel in these events are invited to attend a selective School of Excellence program. Only 25 students make it through to



Clockwise from bottom: The Opening Ceremony photo (with the flag) has the students in the following order:

R to L: Alexander Gunning, Rachel Wong, Jason Kwong, Jonathan Zheng, Alexander Chua and Seyoon Ragavan

The 'official photo' has: L to R: Seyoon Ragavan, Jonathan Zheng, Alexander Chua, Jason Kwong, Rachel Wong and Alexander Gunning.



this stage, which Clapper says provides “tuition in advanced problem solving and exams to check progress.” The first of these is conducted in December, with a follow-up exam early in the next year that is used to identify the final 25 students for a Team Selection School from whom the final International Mathematics Olympiad team is chosen.

Alexander Gunning knows this process intimately. The Year 10 student from Melbourne’s Glen Waverley Secondary College competed in his second IMO in 2013, finishing with a Gold Medal and ranking an impressive 8th overall. Gunning’s performance is rendered even more exceptional when you consider that he is still at the younger end of the age range of

the competition.

AMT’s Clapper suggests that students who are attracted to the IMO tend to enjoy interacting with other students who like maths. The School of Excellence programs often have an atmosphere akin to any student camp, with the only difference being that participants indulge in a shared passion for maths, rather than sport or drama, for example.

Gunning admits in the lead up to this year’s IMO in Colombia, he appreciated the opportunity to train with the UK team and he has also benefitted from regular contact with a tutor from Monash University.

The tutors at the Selection School are often themselves recent IMO participants,

and although there is certainly an element of competition in the preparation, Clapper says that there is also a lot of collaboration. He believes that Australia’s Olympiad program is as strong as any given the talent pool size. “The Director of Programming works hard to develop programs to bring people on board. Other countries don’t have the same structures,” he explains.

The support available seems to have served Gunning well. Although he says that he felt some pressure this year after winning a bronze medal in his first IMO outing in 2012, there was nothing he felt unprepared for, an assertion that is certainly backed up by his results. As part of his preparation, he sat one exam a week with one question from each topic area, focusing on attacking the ones he felt weakest in. His Monash University tutor also exposed him to tertiary level mathematics work. The strategy stood him in good stead during the competition. “The problems were a lot nicer this year, more doable” he smiles, “maybe because I’ve improved.”

Both Clapper and Gunning are optimistic about Australia’s future prospects in the IMO, with the youngest member of this year’s team being in Year 9. “We will have a fairly strong team in coming years,” Gunning says. “Some members have been in the IMO multiple times and you therefore get better each time.” Clapper also regards the achievements of the younger students in 2013 as promising, but stresses that it is important that the net to find talented mathematicians is cast as widely as possible.

“For example, we need to find a way to support talent in any schools where they may not have teachers able to support the capacity. Problems are very challenging, even for teachers!”

The benefits of participating in the AMT’s lead-up events as well as in the IMO itself are

numerous. Clapper describes how having the opportunity to demonstrate advanced skills gives students personal confidence. "It's almost impossible to recognise the level of student talent within a school environment. It's not always obvious that they can be internationally competitive," he says. In addition to preparing students for competitions, AMT's programs, "develop kids with natural talent so that they are employable across many fields."

One only has to look at the journeys of Australia's IMO team alumni to see that this is true. David Chalmers, a member of the 1982 team, became a Professor of Philosophy and Director of the Centre for Consciousness at the Australian National University, for instance, while Zhao Yiyang (Sally), who competed in 2001 and 2002 went on to study Medicine/Arts (AMT, 2007).

Of course, many IMO competitors go on to study in traditional STEM fields. Alex Gunning is aiming to pursue a career in maths/science, possibly physics, but is not yet sure exactly what course he will follow. In his spare time, he is currently interested in computer programming, especially in terms of finding ways to test maths conjectures, but like many in the IMO team, he is also an accomplished musician and hopes to play in a university band while he is studying.

Although Clapper acknowledges that Australia's results in the OECD's Programme

for International Student Assessment (PISA) tests show a slight slip, he is quick to point out that we are still well above the mean. "A reduction in students taking maths and science to higher levels is a common problem in most high performing countries," he explains.

The AMT's programs remain a vital part of engaging capable maths students, as although only six students represent the country at the IMO, many other students have the opportunity for development.

In a recent National Press Club address, Australia's Chief Scientist Prof Ian Chubb outlined his vision for a strategic approach to lifting the nation's achievement in STEM fields. "The education system will provide all Australians with the capacity and confidence to make informed choices on complex matters where STEM offers options that have ethical, economic or environmental dimensions." (Chubb, 2013). The way forward, Clapper suggests, is to reconceptualise what teaching maths is about. "The balance on 'skill and drill' is wrong," he says. "We need to keep students engaged with problems."

For exceptional students like Alex Gunning, "There are few places where maths isn't applicable." The challenge for teachers remains in ensuring that the relevance of the discipline becomes more obvious to a broader range of

students. The AMT is starting to develop new programs to support teachers in recognition of the fact that even primary teachers are sometimes not confident with maths; small steps, perhaps, but a logical strategy to ensure that the spread of arithmophobia is slowly arrested.

Further reading

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