SECURING AUSTRALIA'S MATHEMATICAL WORKFORCE

AUSTRALIA NEEDS TO EMBRACE MATHEMATICS

From the classroom to the industry frontline, Australia's mathematics pipeline runs through a number of jurisdictions. By the time it reaches the challenges of employer demand and national adult numeracy aspirations, a lack of oversight and maintenance by its various owners has slowed the flow to a trickle, like a twenty-year drought.

For example, despite a majority of our secondary schools experiencing a severe shortage of properly trained mathematics teachers for over two decades, most state teacher registration boards do not record the discipline qualifications of registered teachers. Nor does the Commonwealth record the discipline profiles of students as they graduate from pre-placement training at faculties of education in our universities. The result of this planning vacuum is a national increase in educational disadvantage, with many schools unable to teach the mathematics subjects that lead to STEM careers. Australia cannot solely rely on its well-resourced public and private schools to supply mathematics graduates, especially to the teaching profession. It is high time our governments moved on from talking about funding models to decisive action on teacher supply.

While a maths culture change is badly overdue in our school system there is a very significant shift occurring in the economy. The critical link between research and innovation has been recognised by the major political parties, due in large part to the end of the resources boom and the efforts of the former Chief Scientist Ian Chubb. As data and its analysis becomes increasingly important in the economy so has the demand for mathematical sciences graduates by our private sector. And increasingly, large companies are looking overseas to fill these new positions while our local mathematical workforce rapidly ages.

Australia must respond now to this mathematical deficit. Our universities must speak with one voice to our schools, telling parents, teachers and students that intermediate Year 12 mathematics is necessary for university study in science, engineering and commerce. The reintroduction of clear maths prerequisites for university study will emphasise the national and personal importance of mathematics and give us some relief from the insidious ATAR gaming that trips up many students. Australia's business community must also do its part by providing an employer perspective on the exciting career paths for mathematics graduates. Only a culture change will turn around our shortage of these graduates, especially women, one of the worst in the OECD.

This policy document identifies key priorities for intervention by Australian governments and for action by peak bodies—commercial, educational, scientific and technological. AMSI believes that these priorities must be addressed as the Commonwealth plans and implements its *National Innovation and Science Agenda* (NISA).

This document should be read in conjunction with AMSI's annual ***Discipline Profile of the Mathematical Sciences*** amsi.org.au/discipline-profile-2016 and the Academy of Sciences' ***Decadal Plan for the Mathematical Sciences (2016-2025)*** science.org.au/support/analysis/decadal-plans-science/decadal-plan-mathematical-sciences-australia-2016-2025

AMSI AUSTRALIAN MATHEMATICAL SCIENCES INSTITUTE

KEY PRIORITIES FOR INTERVENTION

PRIORITY A

Our children

Train the unqualified teachers of school mathematics and secure the future supply of properly trained maths teachers

PRIORITY B

Culture change

Restore university maths prerequisites from their historic low and turn around declining school mathematics enrolments

PRIORITY C

Secure the future

Increase the rates of graduation in the mathematical sciences, especially amongst women, to grow and refresh the quantitative professions

PRIORITY D

World class

Create world quality infrastructure on a national scale in the mathematical sciences and increase our international research engagement

PRIORITY E

Innovation

Boost the engagement of Australian business with mathematical sciences research

THE CASE FOR ACTION

PRIORITY A Fix Out-of-Field Teaching

At least 26 per cent of Year 7 to 10 maths classes don't have a qualified maths teacher, far in advance of any other subject[1]. The comparable international average is around 12 per cent. This statistic must be repaired as part of our STEM planning.

The situation is made worse because regional and low SES communities bear the brunt of the problem. Many secondary schools don't have a single maths graduate on the staff.

Out-of-field teaching is a national issue requiring national leadership

Even if we could magically fill the gap, our schools are fully staffed and displacing current teachers is out of the question. There is only one solution to the immediate problem and that is to provide professional development to the many conscientious and professional educators teaching maths without the requisite content knowledge.

Very few undergraduate students in the mathematical sciences aspire to be school teachers. This was not the case when undergraduate numbers in maths were higher.

State and Federal governments must act together to solve the teacher supply problem

Why aren't prospective teachers choosing to be maths teachers? Without an answer to this question we will not be able to secure the future supply of mathematically well-prepared teachers. It's not hard to join the dots: is it the quality of maths teaching that is the turn-off? There is no shortage of quality biology teachers and a steady supply of potential biology teachers exists for the foreseeable future. The socio-economic and gender demographics that supply prospective teachers are unlikely to be well served by school mathematics, with well-resourced schools being less likely to produce future school teachers. This downward spiral must be arrested.

PRIORITY B Restore Prerequisites

"Most universities have sacrificed their prerequisites to make it easier to enrol students. It has nothing to do with the goals of education, and everything to do with the incentives built into the funding and school-leaver assessment systems. If we corrected that market failure, schools would respond by improving mathematics teaching into early primary years."
Dr Alan Finkel, Australian Chief Scientist

The 20 year free fall in the enrolment share of the Year 12 calculus-based mathematics subjects, often referred to as intermediate or advanced, continues[2]. This is one of the greatest challenges to the health of the STEM disciplines and professions in Australia and will bedevil plans for Australia to be an innovative, science-based economy.

In response to this decline in enrolment share the majority of Australia's universities have dropped these subjects as formal prerequisites for science and engineering degrees[3] while continuing to assume the subject content. Only 14 per cent of science degrees have Intermediate Mathematics, as a prerequisite, and then only in Victoria and Queensland. This reactive policy has sent a negative and misleading message to schools about the value of these subjects.

Universities must phase in restoration of maths prerequisites

It is pleasing to see that the University of Sydney has joined some major interstate universities by announcing mathematics prerequisites from 2019 and we urge the other NSW universities to follow suit.

1 Pages 15-17 of the *2016 Discipline Profile of the Mathematical Sciences*
2 Page 12, *2016 Discipline Profile*
3 Table 1.16 on page 15, *2016 Discipline Profile*

Our future as a high technology, research driven economy depends on reversing this 20 year-trend

Fixing this problem will repair some of the imbalance in maths, physics and chemistry enrolments at Year 12, limit ATAR gaming by both schools and students and give some measure of protection to the future supply of STEM graduates by ensuring adequate preparation of incoming students. Prerequisites send an unequivocal message to school communities that universities value these subjects. Their phased re-introduction will, however, take some time and has to be matched to schools' access to trained teachers and community culture change.

Over more than 20 years we have seen:

- Widespread removal of prerequisites and their replacement by dubious "assumed knowledge" advice
- Widespread university course realignments to cope with increasing numbers of less mathematically literate students
- Reduced graduation rates in the mathematical sciences[4], which is all the more apparent when viewed in an international context[5]
- Stagnating interest in engineering and science courses
- A concentration of university based research to a small number of institutions dangerously narrowing the support base for research training[6]
- Reduced intake of mathematically qualified graduates into teacher training programs, reduced numbers of qualified secondary school teachers, especially in regional and low SES areas, leading to fewer students in calculus-based mathematics subjects at Year 12[7]
- The unavailability of these school subjects in many regional and low SES areas

This situation creates a structural impediment to meeting Australia's galloping demand for highly skilled mathematics and statistics graduates. This puts a brake on the national productivity growth enjoyed by other OECD countries where mathematics and statistics graduation levels are, on average, twice as high as those in Australia.

PRIORITY C Increase the Rates of Graduation

The mathematical sciences, government and employers must partner to improve community awareness of the value and demand for our graduates

Australia has one of the lowest rates of mathematical sciences graduations in the OECD, and a correspondingly small workforce. Bachelor degree completions in the mathematical sciences have been falling with the 2014 figure at a 14-year low and 40 per cent lower than in 2003[8].

Correlated with the 20 year decline in Year 12 Intermediate and Advanced maths is the increasing age of Australia's mathematical sciences workforce[9]. To make matters worse the mathematics workforce is not attracting younger females in anywhere near the same way as other STEM fields[10]. The twin culprits are the shrinking participation rates in Year 12 Intermediate and Advanced Mathematics and the low and declining participation rate by female students in Advanced Maths at Year 12 (less than 7 per cent of Year 12 girls versus more than 13 per cent of boys)[11].

We have lived with low female participation rates in mathematics for too long. As a consequence female adult numeracy is below that of males, by around 30 per cent in some age groups[12]. While we often think of mathematics as an enabling discipline the flip side is more important: mathematical illiteracy is disabling. An egalitarian society like ours can't tolerate this endemic disadvantage to women.

4 Pages 25-30, *2016 Discipline Profile*
5 Pages 30-31, *2016 Discipline Profile*
6 Pages 43-44, *2016 Discipline Profile*
7 Sections 1.3 and 1.4, *2016 Discipline Profile*
8 Figure 2.17, page 25, *2016 Discipline Profile*
9 Figures 3.7 and 3.8, page 37, *2016 Discipline Profile*
10 Figure 3.9, page 38, *2016 Discipline Profile*
11 Figure 1.12, page 13, *2016 Discipline Profile*
12 Figure 3.3, page 34, *2016 Discipline Profile*

Direct intervention is the only way to reverse this individual and collective disadvantage to Australia's women

In terms of the national economy, it is widely recognised that weak participation by women in many of the STEM professions is handicapping Australia's productivity and competitive advantage.

AMSI supports the Science in Australia Gender Equity (SAGE) initiative of the Australian Academy of Science and the Australian Academy for Technological Sciences and Engineering. This project aims to increase the participation of women in science, technology, engineering and medicine. The low participation of women in senior roles in the mathematical sciences continues to be a serious concern for Australian universities.

AMSI is proud to be working with the BHP Billiton Foundation to increase the participation of girls and women in study and career pathways that involve mathematics and statistics. We encourage the private and public sectors to double their efforts to include women in Australia's STEM future. Mathematical sciences educators in schools and universities must face the problem squarely.

PRIORITY D National Research Infrastructure

AMSI believes Australia needs dedicated national research infrastructure in the mathematical sciences in the form of a distributed national research facility. We also contend that the National Collaborative Research Infrastructure Strategy (NCRIS) must support the technical mathematical sciences requirements of the Australian innovation system.

National Research Centre

The Academy of Science's *Decadal Plan for the Mathematical Sciences (2016-2025)* recommends:

> *"Australian universities should collaborate with the discipline to source seed funding for a new national research centre in mathematical sciences with the objective of enhancing connectivity with industry and strengthening the international collaboration and visibility of Australian research in mathematics and statistics."*[13]

Australia needs a national research program in the mathematical sciences

From page 25 of the *Decadal Plan*

International research centres in the mathematical sciences

Mathematical sciences institutes and centres have become internationally recognised as an effective means of providing the infrastructure for both discipline-based and cross-disciplinary research essential for innovation and training across many areas. While AMSI itself delivers high quality research training programs our national research programs are not as extensive as those of our OECD comparators.

Many of Australia's competitors have realised that advancement in the mathematical sciences requires the creation of a new type of research centre that is not often seen in other disciplines. These centres are characterised by the following attributes:

- They are nationally coordinated to support the research capabilities of the nation as a whole rather than just a few institutions.
- They are broad in their discipline focus, offering opportunities in a wide-ranging spectrum of fields at the leading edge.
- They are agile and responsive to the needs of fast developing research and collaboration.
- They are a cost-effective way of supporting individuals and institutions.
- They facilitate linkages across the innovation system in the mathematical sciences — among universities, government agencies and industry.
- They are tailored to national geography and discipline demographics.

Australia currently has no funding mechanism to support a centre along these lines. (The ARC Centre of Excellence scheme and the Cooperative Research Centres scheme are both designed to concentrate capability in a restricted range of fields.)

13 Page 33, *Decadal Plan for the Mathematical Sciences (2016-2025)*

NCRIS Capability

There is a wide and deep mathematical sciences capability gap in the NCRIS. It is the "at scale", flexible engagement of mathematical sciences researchers with our innovation system in the age of data and computation. Reliance on the mathematical and statistical capacity of end users in the Science and Research Priority areas, government agencies and in Australian businesses is inadequate to the task of dealing with the major mathematical challenges of disruptive technologies and those that come with new and emerging areas of science.

In particular, this direct engagement with the mathematical sciences needs to be an explicit capability in NCRIS. AMSI recommends the establishment of an NCRIS centre which will provide technical support for the collaborations of mathematical scientists with end users from government agencies, universities and private sector on topics such as climate change to advanced manufacturing and national security[14].

PRIORITY E Boost Business Engagement

Universities and businesses must improve engagement to maximise the economic benefits of mathematics and statistics

Released in 2015, the Australian Academy of Science's report on the importance of advanced physical and mathematical sciences to the Australian economy illustrated the enormous and pervasive impact of mathematical sciences research on the Australian economy[15].

Unfortunately, this stellar performance hides an alarming trend. At a time when our governments are trying to drive up the number of commercially employed research trained STEM professionals, domestic PhD numbers in the mathematical sciences have stagnated. As a proportion of PhD degrees in all fields of education, PhDs in mathematical sciences are losing ground as they do not attract the same interest as other fields of education[16]. As a result, Australian companies are increasingly sourcing skilled staff offshore or outsourcing their research capacity to offshore providers.

We must increase graduate pathways into the business sector. This is essential to build a vibrant private mathematical sciences research sector with capability across industry priority areas such as data science, optimisation and computational mathematics. While it remains a priority, the discipline's interest in the ARC's Linkage Grant scheme indicates little appetite for collaboration with industry. In turn, the business sector only invests a minuscule fraction (0.2 per cent) of its R&D expenditure in the mathematical sciences. Engagement will require a significant change to the work readiness of our graduates and willingness of the commercial world to invest in homegrown research and development in the mathematical sciences, the proven contributor to Australia's economy.

The pre-election commitment of the Australian government to fund 1400 PhD research internships delivered by AMSI Intern is a welcome call to action for universities, companies and government agencies. AMSI Intern, along with the ATN universities' Industrial Doctoral Training Centre in the Mathematical Sciences, are evidence of our discipline's willingness to engage with NISA.

14 See AMSI's response amsi.org.au/2016-national-research-infrastructure-roadmap-capability-issues-paper-response/
15 Tables 4.2 and 4.3, page 42, *2016 Discipline Profile*
16 Pages 29-30, *2016 Discipline Profile*

EMBRACING MATHEMATICS
POLICY MEASURES

The policy and action measures outlined here need to be undertaken in concert by the various stakeholders: it is our strong view that isolated measures will not be successful.

OVERALL MEASURES

1. State and Federal governments to establish a mathematics pipeline taskforce charged with strategic planning to overcome the endemic problems of mathematics teaching in our schools and the severe and chronic shortage of mathematical sciences graduates. **Action:** *Education Council, Science Council, DoET, DoIIS, State governments, OCS, UA, AEU, AAMT, AMSI, AIG, BCA, AustMS, SSA, AAS, ATSE, STA*

2. A five-year national awareness campaign for mathematics and statistics targeted at both the school and higher education sectors. This campaign will highlight the importance of school mathematics studies for a wide variety of careers and trades and encourage the provision of effective advice on subject choice at secondary and post-secondary levels. It will include a strong gender equity component. Include professional development for both mathematics and careers teachers. It will also highlight government incentives to study mathematics and statistics. **Action:** *DoET, DoIIS, ESA, State governments, research agencies, UA, AEU, AAMT and state teacher associations, AMSI, AIG, BCA, AustMS, SSA, AAS, ATSE, STA*

PRIORITY A Fix Out-of-Field Teaching

Immediate measures to relieve the urgent shortages:

1. Upgrade out-of-field teachers, starting in low SES and regional areas and with those teachers needing the least discipline content (e.g. biology graduates with some maths/stats). Identify qualification/content providers from amongst the universities. Utilise Commonwealth-State agreements. Make the subjects HECS free. Utilise NBN for online provision. Involve ESA. Set 5-year targets. Provide a "Golden Hello" for teachers completing their upgrade qualification. **Action:** *Education Council, DoET, State governments, DoC*

2. Implement key strategies to increase the number of suitably prepared undergraduates proceeding to school mathematics teaching, including provision of effective advice on subject choice. For example, students undertaking a biology/biological sciences degree and intending to become secondary teachers could be encouraged through concrete Commonwealth incentives to complete sufficient tertiary mathematics and statistics subjects enabling them to teach secondary school mathematics as well as biology. Include incentives to encourage early undergraduate commitment to pre-placement training. HECS-free honours year for those subsequently completing teacher training. **Action:** *DoET, Deans of Science, Deans of Education, UA*

NOTE: Year 11 and 12 mathematics subjects should in general be taught by those with a major in mathematics and/or statistics (see measure 6).

Structural measures for long term improvement:

3. "Golden Hellos" for new, qualified maths teachers working in "difficult to fill" positions. **Action:** *DoET, State governments*

4. Jurisdictions to return to offering salary increments/incentives to encourage honours graduates and postgraduates to enter teaching within the public school systems. **Action:** *State governments.*

5. Every secondary school to appoint a maths/stats graduate in the role of discipline leader within five years starting with the most "in need" schools. Introduction of teacher and school incentive programs (e.g. the UK's "Golden Hello" scheme). **Action:** *Education Council, DoET, State governments*

6. To qualify as a Year 11 or 12 teacher, mathematics graduates of pre-service programs must have a three-year undergraduate sequence leading to a mathematics or statistics major (50 per cent of total third year enrolment). Both mathematics and statistics must be represented in this sequence. All of these subjects must be taught by the provider's mathematics and statistics discipline. In addition, graduates must take at least one subject of mathematical pedagogical content knowledge as part of a full year's study in education. This may be part of an integrated four-year program or as part of a three + one-year degree plus graduate diploma- type combination. **Action:** *AITSL, Deans of Education, State governments*

7. To qualify to teach secondary mathematics at Year 10 level, graduates of pre-service programs must have at least two first year and two second year mathematics and statistics subjects, including least one statistics and at least one second year mathematics subject. The education year requirements are as for Year 11 and 12 already outlined above. **Action:** *AITSL, Deans of Education, State governments*

8. University mathematical sciences schools to share resources to offer third year subjects specifically targeted at prospective teachers. Such subjects would present senior school mathematics from an advanced viewpoint. **Action:** *AMSI member schools, faculties of education*

9. Every primary school is to have an embedded maths specialist (an individual with appropriate tertiary content qualifications) within five years, by appointment or training, with "Golden Hello" or incentives upon completion of training. Incentives to schools. **Action:** *Education Council, DoET, State governments*

10. Undergraduate degrees identified as including mathematical sciences content to be weighted in the calculation of GPAs for entry into postgraduate Diplomas of Primary Education. **Action:** *Deans of Education, AITSL, UA*

11. Primary teacher pre-placement training mathematics content improved and standardised within five years. **Action:** *Deans of Education, AITSL, UA*

12. Primary Bachelor of Education programs. Conventional entry from Year 12 must require a 70th percentile score in any Year 12 mathematics subject in the Australian Curriculum: Mathematics except Essential Mathematics or current equivalent. **Action:** *AITSL, DoET, Deans of Education, UA*

13. The program itself must contain two mathematics subjects, identifiably tailored to primary teaching knowledge requirements, at least one of which must be taught in the first year. These subjects should be delivered in conjunction with the provider's mathematics and statistics discipline centre and are the subjects referred to in

measure 12. In addition, the program should contain three mathematics subjects with pedagogical content knowledge. **Action:** *AITSL, Education Council, DoET, State governments, Deans of Education*

PRIORITY B Restore Prerequisites

Immediate measures:

1. Set national three, five and ten-year targets for increased enrolments in Year 12 advanced mathematics subjects. **Action:** *Education Council, DoET, State governments*

2. Identify regions with low or no enrolments in advanced mathematics subjects in Year 12 and coordinate and fund shared provision of these subjects. Use NBN. **Action:** *Education Council, DoET, State governments, DoC*

3. Reinstate universal Year 12 mathematics prerequisites for science degrees commencing 5 years after the introduction of the senior Australian mathematics curriculum. DoET incentives to do so. **Action:** *Deans of Science, UA, DoET, OCS*

4. Reinstate Year 12 advanced mathematics prerequisites for engineering degrees where appropriate, commencing five years after the introduction of the senior Australian mathematics curriculum. DoET incentives to do so. **Action:** *Deans of Engineering, Engineers Australia, UA, DoET, OCS*

Structural measures for long term improvement:

5. Introduce an undergraduate scholarship scheme for students studying mathematics or statistics. This scheme should contain a component intended for students who wish to study the discipline but have been unable to access advanced Year 12 mathematics subjects. The scholarships should be extendable into a postgraduate teaching qualification. **Action:** *DoET, State governments, UA*

PRIORITY C Increase the Rates of Graduation

1. Set three, five, and ten-year targets to increase female participation in advanced secondary school mathematics subjects, and university mathematics subjects. **Action:** *DoET, State governments, UA*

2. Review the Year 11 and 12 Australian Curriculum in mathematics and biology to strengthen linkages highlighting the importance of mathematics in biological applications. **Action:** *ACARA*

3. Implement a nationwide careers awareness campaign targeting female students, parents, teachers and industry and the general community promoting the value of mathematics as a personal career choice and pathway to national prosperity. The key messaging should focus on participation equity, innovation, national prosperity (increased GDP) and accessing an untapped pool of graduates. **Action:** *AMSI-BHP Billiton Foundation, DoET, DoIIS, ESA, State governments, research agencies, UA, AAMT and state teacher associations, AIG, BCA, AAS, ATSE, OCS, AustMS, SSA*

4. Take direct action to reverse the secondary school teacher shortage by enticing the oversupply of biology graduates into university mathematics subjects, to equip them with the mathematics required to teach. Since these graduates are predominantly women, some understanding of strategies for increasing participation of women will be necessary at university/lecturer level. A second strategy is to entice existing

biology teachers to up their skills with a mathematics qualification.
Action: *DoET, Deans of Science, Deans of Education, UA.*

5. Develop a national strategy on the retention and promotion of women in STEM academia through the SAGE initiative and WiMSIG. This will include the identification of specific structural barriers to female career progression. Undertake a national audit of AMSI departments measured against key statistics. Use the best performers as exemplars. Expect university STEM departments to achieve minimum standards, setting one, three, five and ten-year targets.
Action: *SAGE, UA, STA, WiMSIG, AMSI, SSA, ARC*

6. Introduce targeted measures aimed at increasing retention of female mathematical sciences students and supporting their progression from undergraduate study to honours, masters and PhD. Build national networks through established events and WiMSIG. Introduce initiatives to specifically engage and support female students in the mathematical sciences - PhD scholarships, travel scholarships, access to childcare.
Action: *DoET, DoIIS, AAS, AustMS (WiMSIG), AMSI, SSA*

PRIORITY D National Research Infrastructure

1. "Australian universities should collaborate with the discipline to source seed funding to support establishment of a national research centre in the mathematical sciences. This will enhance connectivity with industry and strengthen international collaboration and visibility of Australian research in mathematics and statistics." (AAS Decadal Plan recommendation). **Action:** *AMSI, universities, ARC, DoET, DoIIS, AAS, ATSE*

2. NCRIS should explicitly include mathematics and statistics as a "capability" and resource it through the establishment of a collaborative facility to provide technical support for the engagement of expert mathematical scientists with end users in the government agencies and private sector in key areas of data science, optimisation and computational science. **Action:** *NCRIS, OCS, AMSI, government agencies*

PRIORITY E Boost Business Engagement

1. Embed commercialisation programs into existing university research training along with STEM research internships. **Action:** *Deans of Science & Engineering, UA, AMSI Intern*

2. Establish broad impact of research measures that reward outcomes of commercial engagement while continuing to reward success for research excellence.
Action: *ARC, UA, DoET, DoIIS, Science Council, OCS, STA*

3. Engage in sustained dialogue with private sector mathematical sciences graduate employers to improve work–readiness of graduates and establish research collaboration pathways. **Action:** *AMSI, BCA, AIG, Deans of Science, DoIIS, OCS, DoET*

4. AMSI, its membership and the ARC to identify mechanisms to boost Linkage grant applications. **Action:** *AMSI member universities*

5. Provide dedicated allocation of Australian Postgraduate Awards (APAs) in mathematics and statistics to the universities to improve retention of domestic students from Honours and Masters programs. Incentives for universities which provide such a dedicated allocation from their own award program. Especially important in smaller and regional universities. **Action:** *DoET, UA, Deans of Science, AMSI*

6. Provision of targeted HECS-free places for mathematics and statistics Honours or equivalent to improve retention of domestic students into PhD programs. Only effective for those continuing to higher study. **Action:** *DoET, UA*

7. Provision of stipend top-up on APAs to improve retention from Honours and Masters programs. This is particularly important in statistics where employment demand is severely reducing retention. **Action:** *DoET, UA*

8. Re-weighting of PhD funding in mathematics and statistics to match those in the physical sciences because of the heavy supervision burden. **Action:** *DoET, UA, Deans of Science*

Professor Geoff Prince
AMSI DIRECTOR
November 2016

Abbreviations

AAMT	Australian Association of mathematics Teachers
AAS	Australian Academy of Science
ACARA	Australian Curriculum, Assessment and Reporting Authority
AEU	Australian Education Union
ATN	Australian Technology Network
AITSL	Australian Institute of Teaching and School Leadership
AMSI	Australian Mathematical Sciences Institute
APA	Australian Postgraduate Award
AIG	Australian Industry Group
ATSE	Academy of Technological Sciences and Engineering
AustMS	Australian Mathematical Society
BCA	Business Council of Australia
DoCA	Dept. of Communications & the Arts
DoET	Dept. of Education & Training
DoIIS	Dept. of Industry, Innovation & Science
ESA	Education Services Australia
GPA	Grade Point Average
HECS	Higher Education Contributions Scheme
IDTC	Industrial Doctoral training Centre (ATN)
NCRIS	National Collaborative Research Infrastructure Strategy
OECD	Organisation for Economic Co-operation and Development
OCS	Office of the Chief Scientist
SAGE	Science in Australia Gender Equity (AAS & ATSE)
SES	Socioeconomic status
SSA	Statistical Society of Australia
STA	Science & Technology Australia
STEM	Science, Technology, Engineering and Mathematics
UA	Universities Australia
WiMSIG	Women in Mathematics Special Interest Group

AMSI Mission Statement

THE RADICAL IMPROVEMENT OF MATHEMATICAL SCIENCES CAPACITY AND CAPABILITY IN THE AUSTRALIAN COMMUNITY THROUGH:

The support of high quality mathematics education for all young Australians.

Improving the supply of mathematically well-prepared students entering tertiary education by direct involvement with schools.

The support of mathematical sciences research and its applications including cross-disciplinary areas and public and private sectors.

The enhancement of the undergraduate and postgraduate experience of students in the mathematical sciences and related disciplines.

AMSI Members

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GOVERNMENT AGENCIES

Australian Bureau of Statistics
CSIRO
Bureau of Meteorology
The Defence Science & Technology Group
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SOCIETIES

Australian & New Zealand Industrial & Applied Mathematics (ANZIAM)
Australian Mathematical Society
Australian Mathematics Trust
Mathematics Education Research Group of Australasia (MERGA)
Statistical Society of Australia

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