

Year 12 Mathematics Participation Report Card

**NUMBERS REMAIN AT RECORD LOWS
AND FEMALE PARTICIPATION DECLINES**

Year 12 participation in calculus-based mathematics subjects continues to decline

KEY FINDINGS

- Participation in higher mathematics fell to 8.4% in 2023, and remained below 10% for the fourth consecutive year.
- Intermediate mathematics participation dropped to a historic low of 16.8% in 2023.
- Only 36.5% of higher mathematics students are female, compared to a peak rate of 38.6% in 2019. This is despite female students making up over half of Year 12 enrolments.
- Gender disparities have widened, with fewer female students and more male students enrolling in both higher and intermediate mathematics in 2023.
- The participation rate in general mathematics has declined from 53% in 2011 to a low of 44% in 2023.

INTRODUCTION

The Australian Mathematical Sciences Institute (AMSI) has collected and reported data on Year 12 participation in mathematics subjects since 2013. Tracking enrolment in specific mathematics subjects to understand the number of students completing high school with mathematics, and at what level they study it in Year 12, is crucial for understanding the pipeline for Australia's future STEM capacity. Students who take calculus-based mathematics, defined here as higher and intermediate mathematics, are better prepared for STEM degrees, which often require strong calculus skills. Despite ecosystem efforts to increase the uptake of these mathematics subjects, national participation rates continue to decline, with serious implications for Australia's future STEM workforce.

Between 2010 and 2023, the total number of Year 12 completers increased steadily, with notable recent fluctuations due to factors such as the introduction of the Vocational Major in Victoria. Despite overall cohort growth, enrolments in higher mathematics declined between 2022 and 2023, driven entirely by a decrease in female students. In contrast, male enrolments increased during this period. A similar trend is evident in intermediate mathematics, where a modest increase in overall enrolments in 2023 was due to rising male participation, while female numbers continue to decline.

Enrolments in general mathematics have also declined for both females and males, with a steeper decline among males. Since 2017, female participation rates in general mathematics have slightly exceeded those of males.

Overall, fewer students are completing Year 12 with any mathematics counted towards their ATAR, raising concerns about general numeracy across the Australian population.

Although female students make up more than half of the Year 12 cohort, they remain significantly underrepresented in higher and intermediate mathematics subjects, contributing to persistent gender imbalances in STEM preparedness.

Between 2010 and 2023, the number of domestic students starting university grew from just over 208,000 to more than 230,000, an increase of approximately 11%.¹ Over the same period, the number of domestic students commencing undergraduate STEM degrees increased by almost 20%, from around 45,000 in 2010 to just over 53,000 in 2023, representing about 23% of the domestic commencing cohort. Almost 33,000 international students began STEM degrees in 2023, making up 38% of the total commencing STEM cohort.

1 <https://www.education.gov.au/higher-education-statistics/student-data>



This sustained growth in student demand for enrolment in STEM degrees underscores the critical need for strong mathematics preparation in school. However, fewer STEM degrees are listing mathematics as a formal prerequisite, a trend that may be contributing to declining student enrolments in higher-level mathematics at Year 12 level. A study of 2019 undergraduate courses found that of the 1,587 undergraduate STEM courses examined across Australian universities, only 19 required higher mathematics for entry.² Additionally, 11 of Australia's 40 universities had no mathematics prerequisites for any of their courses.

While enrolments in STEM degrees clearly continue to grow, there is a risk that students are entering these programs without sufficient preparation for the quantitative rigour of tertiary study and the demands of future careers.

HOW TO INTERPRET THE DATA

This report presents enrolment trends for three levels:³

- **Higher mathematics:** Specialist Mathematics (VIC, QLD, SA, ACT, NT), Mathematics Specialised/Specialist (WA, TAS), Mathematics Extension 1 and Extension 2 (NSW), Mathematics HL (IBO).
- **Intermediate mathematics:** Mathematical Methods (VIC, ACT, WA, QLD, SA, NT), Mathematics Advanced 2 (NSW), Mathematical Methods SL (IBO).
- **General mathematics:** Further Mathematics (VIC), Mathematics Standard 2 plus Standard 1 Exam (NSW), Mathematics Applications (WA), General Mathematics A (QLD), General Mathematics (SA, NT), General Mathematics and Mathematics Methods Foundation (TAS), Mathematical Applications and Further Mathematics (ACT), Mathematical Studies SL (IBO).

Most states and territories broadly follow the Australian Curriculum, except for NSW. In NSW, students are classified as 'Higher' if they studied Extension 1 (including those who also took Extension 2), and as 'Intermediate' if their highest level was Mathematics Advanced 2 Unit only.

In most states, a student enrolled in a higher-level subject must also enrol in an intermediate level subject. The data below represents the highest level that each student was enrolled in. For example, an intermediate student is one who was enrolled in an intermediate level subject but not in a higher-level subject.

The Australian curriculum includes studies of both General and Essential Mathematics.⁴ This report includes only unadjusted enrolments in General Mathematics or equivalent, as these generally count toward the ATAR.

This report includes data for all Year 12 mathematics students enrolled through secondary boards of studies and the Australian International Baccalaureate (IB) from 2010 to 2023. Where possible, each student is counted only at their most advanced level to avoid double-counting. These figures provide the best indication of students' preparedness for university degrees, especially those with a significant mathematics component such as science and engineering, as well as the many other degrees in areas such as management, commerce and health that also have significant quantitative components.

2 <https://amsi.org.au/?publications=mapping-university-prerequisites-in-australia>

3 Previously, AMSI referred to *advanced*, *intermediate* and *elementary*. Terminology was updated to avoid confusion with the NSW subject *Mathematics Advanced* (classified by AMSI as *intermediate*). Additionally, *elementary* has been replaced with *general mathematics* to better align with Australian Curriculum terminology

4 <https://v8.australiancurriculum.edu.au/senior-secondary-curriculum/mathematics/>



Participation rates are calculated as a proportion of the total Year 12 student cohort completing the secondary school examination in their state or territory.

The sharp increase in Year 12 completions in 2023 is largely due to the introduction of the Victorian Certificate of Education Vocational Major (VCE VM) in Victoria.⁵ Students who are awarded the VCE VM can enrol in any VCE mathematics subjects to fulfill their numeracy requirements.

Students identifying as a gender other than male/female are not presented due to small numbers and risk of identification.

NATIONAL PARTICIPATION RATES

The total number of students enrolled in higher mathematics peaked at just over 22,000 in 2018, before declining to under 19,000 in 2023 (Table 1). Similarly, intermediate mathematics student numbers declined from a peak of almost 46,000 in 2018 to about 38,000 in 2023 (Table 2). A small graduating cohort in one state contributed to the 2019 drop in numbers, but since 2020, the decline in both higher and intermediate mathematics has continued, despite growth in the overall Year 12 cohort.

Table 1. Number and proportion of students enrolled in higher mathematics in Australia (2010–2023)

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Cohort size	195526	198997	202970	206636	202867	213659	214863	219500	217816	201063	212139	215554	210719	225355
# students	21306	20422	20617	21189	21507	21665	21450	21855	22066	20265	19597	19239	18971	18830
% students	10.9%	10.3%	10.2%	10.3%	10.6%	10.1%	10.0%	10.0%	10.1%	10.1%	9.2%	8.9%	9.0%	8.4%

Table 2. Number and proportion of students enrolled in intermediate mathematics in Australia (2010–2023)

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Cohort size	195526	198997	202970	206636	202867	213659	214863	219500	217816	201063	212139	215554	210719	225355
# students	42070	42307	42605	42232	41756	43106	43957	45205	45924	41214	37319	38358	37332	37958
% students	21.5%	21.3%	21.0%	20.4%	20.6%	20.2%	20.5%	20.6%	21.1%	20.5%	17.6%	17.8%	17.7%	16.8%

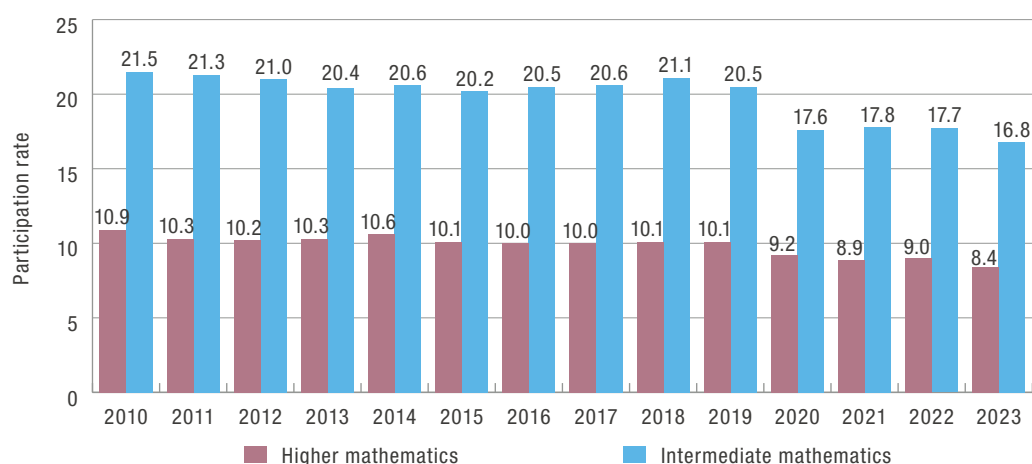
Participation rates have mirrored this trend. The proportion of students taking higher mathematics fell below 10% in 2020 for the first time since AMSI began recording national participation rates and reached a new low of 8.4% in 2023 (Figure 1). Intermediate mathematics participation also fell to a historic low of 16.8% in 2023. The introduction of the VCE VM in Victoria (awarded to up to 6,483 students in 2023),⁵ has increased the cohort size, compared to previous years. If adjustments are made for this effect, then the participation rate rises slightly to 8.6% for higher mathematics and 17.3% for intermediate mathematics.

In total, only 25.2% of students with a Year 12 qualification studied mathematics to at least intermediate level in 2023 (25.9% when adjusted for the VCE VM). This is a decline from 30.6% in 2019 and 32.4% in 2010.

⁵ <https://www.vcaa.vic.edu.au/curriculum/vce-curriculum/about-vce-vocational-major>



Figure 1. Higher and intermediate mathematics participation rates (2010–2023)



PARTICIPATION RATES BY GENDER

HIGHER MATHEMATICS

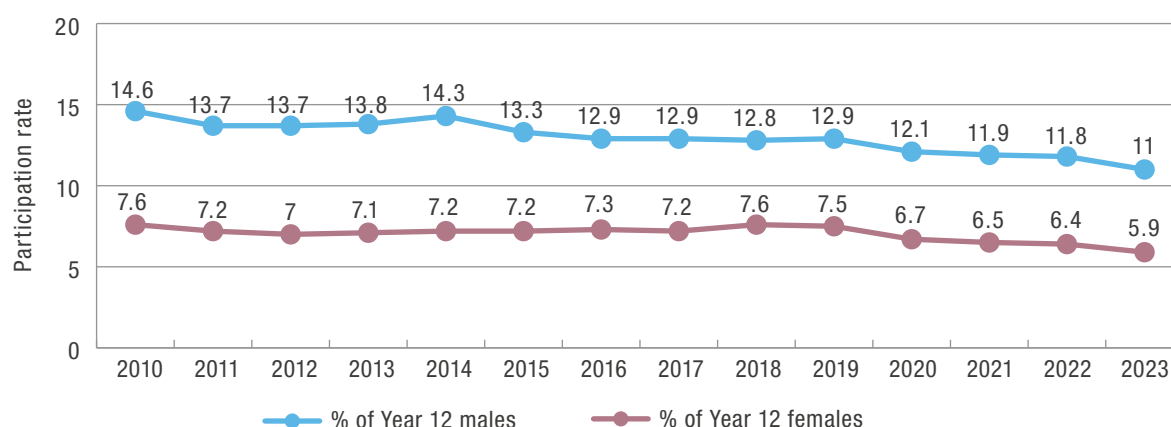
Female participation in higher mathematics remains well below parity. In 2023, only 36.5% of higher mathematics students were female (Table 3), the lowest level since 2014. When looking at student numbers, nearly 250 fewer female students studied higher mathematics in 2023 compared to 2022, while the number of males increased by almost 100.

Table 3. Number and proportion of higher mathematics students by gender (2010–2023)

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Female	7894	7562	7422	7683	7663	7966	8174	8262	8550	7816	7402	7226	7106	6858
	37.1%	37.0%	36.0%	36.3%	35.6%	36.8%	38.1%	37.8%	38.7%	38.6%	37.8%	37.6%	37.5%	36.5%
Male	13412	12860	13195	13506	13844	13699	13276	13593	13514	12449	12192	12008	11852	11948
	62.9%	63.0%	64.0%	63.7%	64.4%	63.2%	61.9%	62.2%	61.2%	61.4%	62.2%	62.4%	62.5%	63.5%
Total	21306	20422	20617	21189	21507	21665	21450	21855	22066	20265	19597	19239	18971	18830

The overall female participation rate in higher mathematics declined to 5.9% in 2023, compared with 11.0% for male students (Figure 2). Little progress has been made on narrowing this gender gap in recent years.

Figure 2. Higher mathematics participation rate by gender (2010–2023)



INTERMEDIATE MATHEMATICS

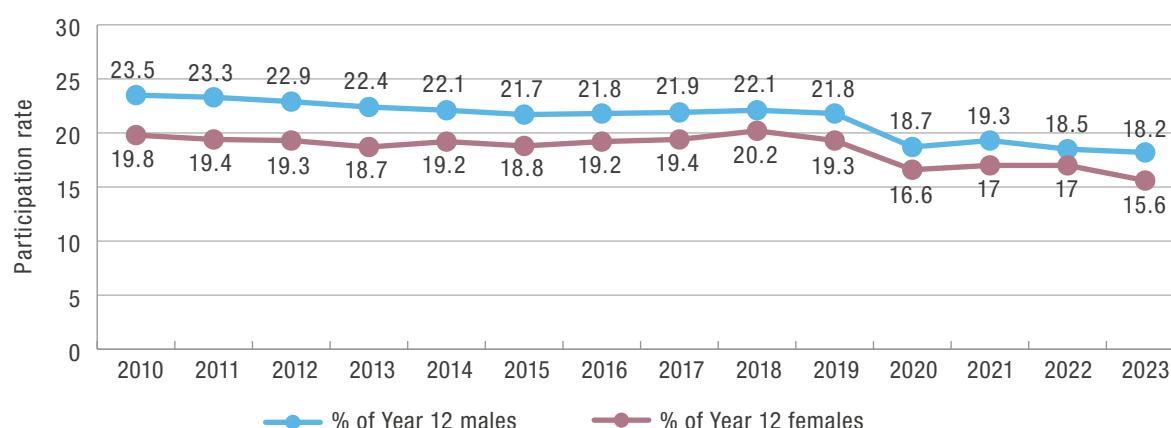
Female and male intermediate mathematics student numbers have declined since 2019. The gender balance has been nearly even for over a decade, with around 50% of students being female; however, this fell to 47.9% in 2023, the lowest level since 2013 (Table 4). Between 2022 and 2023, the number of female intermediate mathematics students declined by over 500, while male enrolments increased by more than 1000.

Table 4. Number and proportion of intermediate mathematics students by gender (2010–2023)

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Female	20570 48.9%	20489 48.4%	20580 48.3%	20231 47.9%	20412 48.9%	20856 48.4%	21438 48.8%	22122 48.9%	22645 49.3%	20257 49.2%	18420 49.4%	18802 49.0%	18725 50.2%	18172 47.9%
Male	21500 51.1%	21818 51.6%	22025 51.7%	22001 52.1%	21344 51.1%	22250 51.6%	22519 51.2%	23081 51.1%	23272 50.7%	20954 50.8%	18889 50.6%	19537 50.9%	18569 49.7%	19737 52.0%
Total	42070	42307	42605	42232	41756	43106	43957	45205	45924	41214	37335	38358	37332	37958

The female participation rate in intermediate mathematics declined to 15.6% in 2023, compared to rates of 18–20% prior to 2020 (Figure 3). The male participation rate also fell to 18.2%, down from 21–23% before 2020. The large drop in the female participation rate from 2022 to 2023 is particularly concerning.

Figure 3. Intermediate mathematics participation rate by gender (2010–2023)



GENERAL MATHEMATICS

The number of students enrolled in general mathematics declined from a peak of almost 110,000 in 2017 to just under 99,000 in 2023 (Table 5). Changes to courses and assessment practices between 2016 and 2020, along with other factors not captured in the data, likely contributed to this decline.

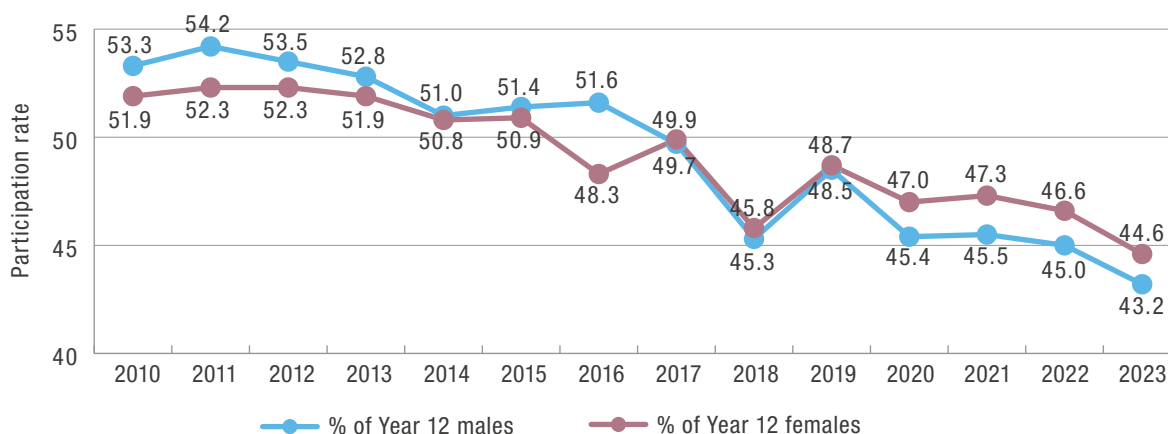
Female enrolments in general mathematics have historically been slightly higher than male enrolments, with females making up 50-53% of students since 2010 (Table 5). However, female enrolments declined from nearly 56,000 in 2017 to below 52,000 in 2023. Male enrolments have also declined, from over 53,000 in 2016 to less than 47,000 in 2023, with the proportion of male students remaining between 46-49%.

Table 5. The number and proportion of Australian general mathematics students by gender (2010–2023)

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Female	54025 52.5%	55162 52.1%	55823 52.0%	56266 52.0%	53944 52.2%	56412 51.6%	53949 50.3%	56992 52.1%	51495 51.9%	51058 52.2%	52282 53.3%	52348 53.2%	51306 53.2%	51982 52.6%
Male	48858 47.5%	50708 47.9%	51509 48.0%	51888 48.0%	49300 47.8%	52813 48.4%	53333 49.7%	52319 47.9%	47780 48.1%	46672 47.7%	45798 46.7%	46036 46.8%	45110 46.7%	46739 47.3%
Total	102883	105870	107332	108154	103244	109225	107282	109330	99292	97752	98108	98431	96527	98867

Participation rates in general mathematics have also declined since 2010. Prior to 2016, more than half of all Year 12 students studied a general mathematics-level subject; by 2023, this had declined to 44.6% of females and 43.2% of males (Figure 4). While rates for both genders have fallen over time, female participation has remained slightly higher than male participation since 2017.

Figure 4. General mathematics participation rate (2010–2023)

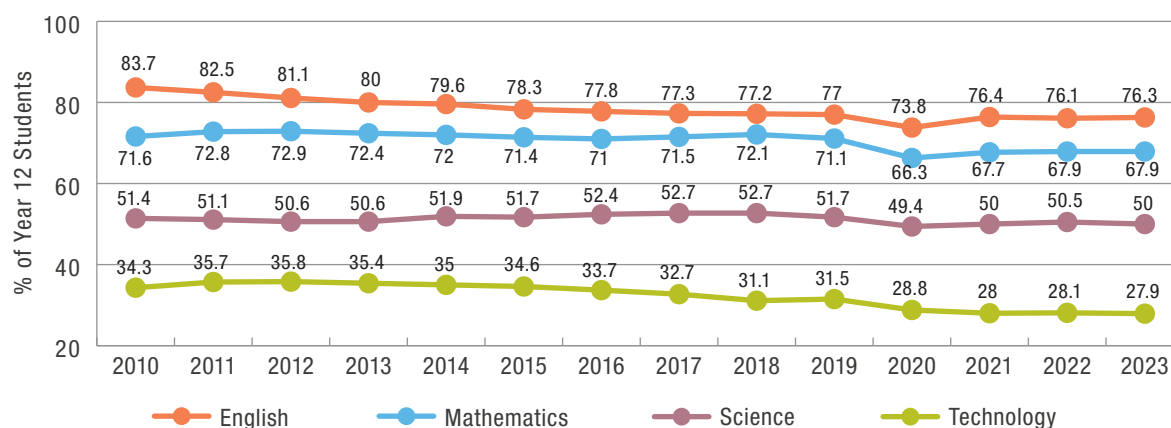


These declines in general mathematics enrolments reflect a broader trend across all mathematics subjects in senior secondary schooling. Over the past decade, approximately 71-73% of Year 12 students typically enrolled in at least one mathematics subject contributing to the ATAR. This declined to a low of 66.3% in 2020, before rising slightly to around 68%, where it has remained through to 2023 (Figure 5).⁶

⁶ ACARA calculates the percentage of Year 12 students enrolled as a percentage of total full-time Year 12 students (including part-time equivalents), whereas AMSI calculates this percentage based on Year 12 students who have successfully completed the secondary school examination in their state or territory. AMSI's figures also include International Baccalaureate (IB) data.



Figure 5. Percentage of Year 12 enrollments in a tertiary-recognised subject in English, Mathematics, Science, and Technology⁷



Source: <https://www.acara.edu.au/reporting/national-report-on-schooling-in-australia/year-12-subject-enrolments>

KEY TAKEAWAYS

- Advanced mathematics participation remains too low. Fewer than one in ten Year 12 students take the highest-level calculus-based mathematics subject, limiting preparedness for STEM degrees and careers.
- The gender gap persists at the top level. Females remain underrepresented in higher-level mathematics despite making up more than half of Year 12 enrolments.
- Gender disparities are worsening in advanced-level mathematics. In 2023, female enrolments declined while male enrolments increased in both higher and intermediate mathematics.
- Participation rates in general mathematics are also declining. Fewer students are finishing school with any mathematics counted towards their ATAR, raising concerns about general numeracy.
- Action is needed. Improving participation requires coordinated efforts to strengthen student and teacher support, build confidence in the curriculum, and raise awareness of the importance of mathematics for further study and career opportunities.

CONCLUSION

National participation in advanced mathematics continues to decline, with persistent gender gaps and falling enrolments even at the general mathematics level. These trends highlight the urgent need for coordinated action to ensure students leave school with the mathematical skills required for general numeracy, future study and careers. Supporting students and teachers and raising community awareness will be vital to reverse this decline and secure Australia's future STEM capability.

Acknowledgements

AMSI would like to thank Dr Maaïke Wienk, Michael O'Connor, Frank Barrington, Michael Evans, and Susan James for their invaluable contributions to driving and maintaining this annual data collection.

⁷ This graph represents students enrolled in at least one subject in the learning areas of English, Mathematics, Science and Technology. It does not specify enrolments in individual subjects in each learning area.

