Survery of High School Mathematics Syllabus and University Mathematics Units

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1. Australia has a national school curriculum in mathematics.

2. Nonetheless differences between states and territories still exist.

3. The new curriculum has led to some changes in the units offered at university.

4. The university curriculum also depends on the the mathematics taken at high school.

5. We present here a survey of the Year 12 curriculum, and the course requirements and the mathematics units at the G08.

6. We only consider the Year 12 mathematics courses that are accepted as entry to university.

Western Australia

- Math Applications: 3.1 Bivariate data analysis 3.2 Growth and decay in sequences 3.3 Graphs and networks 4.1 Time series analysis 4.2 Loans, investments and annuities 4.3 Networks and decision mathematics
- Methods: 3.1 Further differentiation and applications 3.2 Integration 3.3 Discrete random variables 4.1 The log function 4.1 Continuous RVs 4.3 Interval estimates for proportions
- Specialist: 3.1 Complex Numbers 3.2 Functions and graphs 3.3 3D vectors 4.1 Integration and applications 4.2 Rates of change and differential equations 4.3 Statistical Inference

Queensland - new for Year 11 in 2019 - same as Australian Curriculum

`https://www.qcaa.qld.edu.au/senior/senior-subjects/mathematics`

- Essential Mathematics - not for uni entry
- General Mathematics
- Mathematical Methods. Topics: Introduction to functions, rates of change, periodic functions, exponentials and logs, introduction to integration, **applied statistical analysis**, optimisation.
- Specialist Mathematics. Topics: Real and complex number systems, matrices and applications, vectors and applications, calculus, structures and patterns, **proof, statistical inference**.

https://www.tasc.tas.gov.au/students/courses/mathematics/

- Mathematical Methods: Further differentiation and applications, Discrete random variables, Integral calculus, Log function, Continuous random variables and the normal distribution, Sampling and confidence intervals.

- Specialist: Mathematical induction, Complex numbers, Functions and sketching graphs, 3D vectors, Integration techniques and applications, Rates of change and differential equations.

https://www.tasc.tas.gov.au/students/courses/mathematics/

- General mathematics: Bivariate data analysis, Growth and decay in sequences, Finance, Trigonometry, Networks and decision mathematics.

- Mathematics Methods: Functions, Circular functions, Differential calculus, Integral calculus, Probability and statistics

- Specialist: Sequences and series, Complex numbers, Matrices and linear algebra, Differential calculus, Integral calculus,

http://www.bsss.act.edu.au/curriculum/courses

- Essential mathematics: Probability and relative frequencies, Earth geometry and time zones, Loans and compound interest
- Mathematical applications: Time series analysis, Loans, investement and annuities, Networks and decision mathematics
- Mathematical methods/Specialist Methods : Functions and graphs, Trigonometric functions, Counting and probability, Exponential functions, AP and GP, Differential calculus, Integral calculus, Discrete RVs, Log function, Continuous RVs and normal distribution, Interval estimates for proportions
- Specialist mathematics: Combinatorics, 2D vectors, Geometry, Trigonometry, Matrices, Real and Complex numbers, Functions and graphs, 3D vectors, Integral calculus, Rates of change and DEs, Statistical inference

New South Wales—New in 2019

- Math Standard: Algebra, Measurement, Financial mathematics, Statistical analysis, Networks
- Advanced (Broadly equivalent to WA Methods): Functions, Trigonometric functions, Differential calculus, Applications of differentiation, Integral calculus, Financial mathematics, Descriptive statistics and Bivariate data analysis, Random variables
- Mathematics extension 1: Proof by mathematical induction, Introduction to vectors, Trigonometric equations, Further calculus skills, Applications of calculus, Binomial distribution.
- Mathematics extension 2: The nature of Proof, Further proof by induction, Further work with vectors, Complex numbers, Further integration, Applications of calculus to mechanics.

  The two extension mathematics are broadly equivalent to WA Specialist.

`https://www.vcaa.vic.edu.au/Documents/vce/mathematics/MathematicsSD-2016.pdf`

- **Further Mathematics: Units 3 and 4**
  Unit 3 Data analysis—Exploratory data analysis, linear regression, time series analysis; Recursion and financial modelling—Depreciation, compound interest, loans, annuities and perpetuaties.
  Unit 4 Matrices—Matrices and their applications, transition matrices, networks and decision mathematics, geometry and measurement, graphs and relations, linear programming.
- **Mathematical Methods: Units 3 and 4 (Equivalent to WA Mathematics Methods)**
  Functions and Rraphs, Algebra, Calculus, Probability and Statistics
- **Specialist Mathematics: Units 3 and 4 (Broadly equivalent to WA Mathematics Specialist)**
  Functions and graphs, Algebra (Complex numbers), Calculus, Vectors, Mechanics, Probability and Statistics (more on random variables, hypothesis tests for means)

https://www.futureschool.com/australian-curriculum/northern-territory/

- Applied 1: Applied Geometry Mathematics, Applied 2: Investment and loans Mathematics, Applied 3: Small business, Applied 4: Matrices, Applied 5: Optimisation, Applied 6: Probability and simulation, Applied 8: Statistics and working with data.
- Methods: Probability and statistics, Co-ordinate geometry, Log and exponential functions, Sequences and series, Arithmetic and Geometric progression,Functions, Differential calculus, Simultaneous equations, Matrices, Linear equation systems.
- Specialist:Trigonometry, Complex numbers, Logic, Graphs of polynomials, Circle geometry, Differential calculus, Integral calculus, Area, Volume of revolution, Functions.

- Three levels of courses.

- Lowest level is financial mathematics, statistics, networks, geometry

- Methods: functions, introductory calculus, statistics

- Specialist: Functions, further calculus, complex numbers, 3D vectors, matrices, statistics

- Methods can be taken alone, and Specialist students also take Methods.

While unit names and topics may look the same, there are differences. Compare the WA and Victorian Specialist.

- Specification of syllabi is very different.

- Some topics are very different–mechanics, inverse trig functions, integration by partial fractions, arc length, probability, statistical inference (hypothesis tests), Euler's method for approximating solution to DE.

- The types of questions asked are very different. That is, student expectations are very different.

- This means that students completing Specialist in one state are not necessarily prepared for the first year mathematics units at a university in another state.

Minimum requirement for entry into engineering

Institution	Math requirement
Adelaide	Methods, with bridging unit
ANU	Methods (needs a bridging unit)
Monash	Methods
Melbourne	Methods, with bridging unit
UNSW	Maths Extension 1 and 2, or lower with bridging unit
Sydney	Maths Advanced or lower with bridging units
Uni of Qld	Math C, or Math B with bridging unit
UWA	Applications, with 3 bridging units

What we teach in First year: UWA

Unit	Details
MATH1720 Math Funds	For lowest level entry. Algebra, polynomial, exponential and log functions.
MATH1721 Methods	Equivalent to Yr 12 Methods. Trig functions, Vectors, Complex numbers, polar co-ordinates, exp and log functions, intro calc.
MATH1722 Specialist	Equivalent ot Yr 12 Specialist. Differentiation and applications, integration and applications, 3D vectors, motion, matrices.
MATH1011 Multivar calc	Calculus of vector functions, ODEs.
MATH1012 Math theory n Meth	Lin alg, Eigenspaces, sequences and series, Laplace trans, basic probability
STAT1400 Stats for Science	Univariate statistical method
STAT1520 Bus Stats	

Loss of content in Mathematics

- Up to 1986, at UWA, three terms of 10 weeks each. First year mathematics unit had four lectures a week, so 120 hours of content.
- From 1987 onward, two semesters of 13 weeks each, four lectures a week, so 104 hours of content.
- From 2000 onward, three lecture a week, so 78 hours of content.
- From S2, 2018, two semesters of 12 weeks each, three hours of lectures per week, so 72 hours of content.

Over a year the loss of content is 40%!