

Guide to Understanding the Mathematics Curriculum

Rationale

Why study mathematics and statistics?

Inspire thinking

Mathematics and statistics make sense of information, experience, and ideas by engaging students to think:

- flexibly and creatively
- critically and effectively
- strategically and logically.

'Go down deep enough into anything and you will find mathematics.' - Dean Schlicter

Stimulate creativity and curiosity

Mathematics and statistics open the door to a world of beauty, mystery, and awe. They provide students with the enjoyment of intellectual challenge: opportunities to explore ideas and to wrestle with interesting problems. Mathematics and statistics provide ways of connecting abstract ideas with real world thinking.

'The essence of mathematics is not to make simple things complicated but to make complicated things simple.' - S. Gudder

Equip students for the 21st century

Mathematics and statistics equip students with the knowledge and skills to be global citizens in the 21st century. Effective citizens have the ability and inclination to use mathematics and statistics at home, at work, and in the community by:

- using problem-solving strategies
- using mathematical and statistical models to solve problems
- making sensible estimates
- using and interpreting data
- evaluating mathematical and statistical information
- communicating ideas.
- 'Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write.'

What sorts of careers are there in Mathematics and Statistics?

This is a question many students ask. A quick glance at the 'Situations Vacant' section of Saturday's Press is enough to see that there are few, if any, relevant jobs listed under MATHEMATICS or STATISTICS. A more in-depth look will reveal that Mathematics and Statistics graduates are employed in many different areas. Industry, commerce, government departments and teaching represent some of the more obvious ones. Some jobs require specific mathematical or statistical skills while others, although not directly involving these skills, require the ability to think precisely and reason logically; these are abilities gained from your mathematical studies. For a good idea of the kinds of careers that Mathematics or Statistics can lead to, visit the American Mathematical Society's Early Career Profiles website.

Generally, business, industry and government want people who have a broad background and interest in a variety of mathematical areas, computation and science. Therefore you need to take papers that will expand your knowledge of applications of Mathematics and Statistics. The most directly applicable papers would be in Accounting, Biology, Computer Science, Economics, Engineering, Management, and Physics. In particular, there are very good job opportunities in financial mathematics and in computing combined with Mathematics.

Employers in both private and government sectors are increasingly seeking top graduates from a general field, sometimes not specifying any particular discipline at all. They want bright people whom they will train. Also, the need for people who have a working knowledge of Statistics has burgeoned in recent years.

Over the last few years, the following job vacancies have been advertised locally for graduates in Mathematics or Statistics, or for people with expertise in these areas. Many of these jobs require competence in using software packages such as SAS. Familiarity with spread sheets, such as Excel, and databases are also useful. Most jobs also require strong oral and written communication skills, well developed interpersonal skills, and the ability to work independently as well as in a team.

(Educational institutes, such as secondary schools and universities, advertising for teachers and lecturers have not been included in this list.)

Statistics New Zealand employs many of our Mathematics and Statistics graduates.

Statistics New Zealand

Analyst - Regional & Housing	Degree in statistics, mathematics, economics or a relevant social science.
Analysts - National and Enterprise Accounts	Degree in economics, or accounting, statistics or mathematics with some economics.
Analysts - Payments, Trade	Qualifications or experience in accounting or economics, mathematics or statistics with some economics.

Economic Statistician	Degree and experience in economics, statistics or a similar field is essential.
Mathematical Statisticians	A good university degree with a large component of mathematics or statistics.
Analyst - Maori Statistics Unit	Have research and analytical skills. A relevant tertiary qualification or equivalent experience.
Economic Statistician/Analyst	Have qualifications or experience in economics, accounting or statistics, with some economics.

Government Departments		
ACC	Analysts	Qualifications in mathematics, statistics, operation research or economics.
Defence Technology Agency (DTA)	Scientist/Analyst	A university degree in fields requiring good mathematical and modelling skills, for example, physics, engineering, mathematics, chemistry or operational research.
Defence Technology Agency	Scientist/Analyst	At least a master degree in fields requiring good mathematical and modelling skills, for example, physics, engineering, mathematics, chemistry or operational research.
Government Communications Security Bureau	Communication Systems Analyst	Achieved excellence at tertiary level in computer science, electronic engineering or mathematics. A basic knowledge of cryptography and statistics would be an advantage.
Government Communications Security Bureau	Mathematician	Achieved excellence at tertiary level with a mathematics degree (preferably postgraduate). Knowledge of cryptography , computer networks or digital communications would be an asset.

Land Transport Safety Authority of New Zealand	Economic Analyst	Postgraduate degree in economics with a strong background in at least one of the areas of econometrics, statistics and mathematics.
Ministry of Education	Research Analysts	Experience in statistical analysis, investigation and trend reporting activities.
Ministry of Fisheries	Regional Intelligence Analyst	Tertiary qualification, preferably with a statistical and/or information analysis focus.
Ministry of Health	Intelligence Analyst	Have a flair for analytical, research, and statistical type activities.
Ministry of Social Development	Analyst - (several) Forecasting and Modelling Unit	Relevant tertiary qualification, preferably at the postgraduate level. Experience in time series analysis and economic, statistical or mathematical modelling.
New Zealand Treasury	Analyst/Senior Analyst - Macro Forecasting and Analysis	Strong tertiary qualification in one or more of: economics, applied mathematics, econometrics, or a closely related discipline.
Industry and Commerce		
Meteorological Service of NZ	Trainee Meteorologists	BSc, BSc(Hons) or MSc in mathematics or physics.
Orion	Network Investment Analyst	A university degree that includes economics, maths and physics.
Pacific Edge Biotechnology Ltd	Bioinformatician/Computational Biologist	A recent degree with relevant biological, mathematical or information and computer science focus.
Rodgers & Partners Consultants Ltd	Business Analyst	Appropriate qualification in mathematics, finance, engineering or science.
Tower Managed Funds Ltd	Actuarial Analyst	Exceptional analytical skills, strong mathematical ability. Relevant degree with good grades in mathematics, statistics or economics and finance.

Weyerhaeuser NZ	Logistics Co-ordinator	Proven analytical and mathematical skills with attention to detail.
Zespri International Ltd	Innovation Analyst	Relevant tertiary qualification and experience in the area of statistical analysis and/or computer science.

Pedagogy

Key principles underpinning effective mathematics (and statistics) teaching

Teachers who enhance positive social and academic outcomes for their diverse students are committed to teaching that takes students' mathematical thinking seriously. Their commitment to students' thinking is underpinned by the following principles:

- an acknowledgement that all students, irrespective of age, have the capacity to become powerful mathematical learners;
- a commitment to maximise access to mathematics;
- empowerment of all to develop mathematical identities and knowledge;
- holistic development for productive citizenship through mathematics;
- relationships and the connectedness of both people and ideas;
- interpersonal respect and sensitivity;
- fairness and consistency.

Effective Pedagogy in Mathematics/Pangarau Best Evidence Synthesis Iteration. Anthony, G., and Walshaw, M. (2007) p. 1

Making a difference for all

Irrespective of their differences, the various perspectives agree that mathematics teaching should make a positive difference to the life chances of students and should enhance their participation as citizens in an information- and data-driven age (Watson, 2006). Precisely because of the "gatekeeping role that mathematics plays in students' access to educational and economic opportunities" (Cobb & Hodge, 2002, p. 249), it should assist students to develop:

- the ability to think creatively, critically, and logically;
- the ability to structure and organise;
- the ability to process information;
- an enjoyment of intellectual challenge;
- the skills to interpret and critically evaluate statistical information in a variety of contexts;
- the skills to solve problems that help them to investigate and understand the world.

Achievement Objectives

Objectives delivered in mathematics come from the NZC document across curriculum levels 3 – 8. A mathematics course delivers achievement objectives covering the five strands of mathematics from years 9 – 11 and then in years 12 – 13 the objectives for each course comes from either a statistics or mathematics (calculus) strand.

Programme Design

The course at each year level is designed to build a progression of both knowledge and skills that allows students to move from one curriculum level to the next. Each year will have different key concepts that are important as a foundation in knowledge and skills. The courses are developed as student centred courses where each teacher is able to respond to the group of students in front of them to determine how best to deliver the key concepts for that year. Students assume responsibility to know where they are at in their learning and to discuss what their next steps will be in order to make progress. The nature of each mathematics strand is the key to student success in the senior mathematics courses and there is a particular emphasis on algebra in our junior mathematics programme planning.