

A FUTURE IN  
**APPLIED  
MATHEMATICS**



## WHAT IS APPLIED MATHEMATICS?

Whether or not we are good at mathematics, most of us would agree that maths is important. It underpins so many aspects of our existence – the computer that produced this document, the calculations that make a bridge safe to cross, and the computation of numbers for the weekly lottery draw.

Applied mathematics focuses particularly on modelling research and analysis of situations. It explores the links between mathematics, industries and financial institutions, and the practical applications of problem modelling in the fields of engineering, science and business. Examples include structural analysis in buildings, global warming analysis and economic modelling. For more examples, visit: [www.mathscareers.org.uk/article/maths-matters](http://www.mathscareers.org.uk/article/maths-matters)

If you have a great head for maths and would love to use your skills and knowledge to solve problems for industry, the environment and for humankind, applied mathematics could be an ideal career choice for you.

## OUTLOOK AND TRENDS

The outlook is very bright for those embarking on careers in the mathematical sciences.

Technological innovation accounted for almost half of global economic growth over the past 50 years, and almost all of the 30 fastest-growing occupations in the next decade will require at least some background in science, technology, engineering or mathematics.

Source: Sergiy Klymchuk, Associate Professor, AUT University

Businesses and industry draw on more quantitative than qualitative abilities in solving complex and diverse problems. For example, at Fonterra the Advanced Process Control team has a new initiative using online mathematical tools to actively manage product quality during processing. This is as an alternative to traditional approaches of relying on post-manufacture testing.

Some career options, such as the role of actuary, are highly specialised and quite limited in numbers in New Zealand. Other roles, such as market/financial analyst or research analyst, are broader roles that can be found in many different sectors. There is also a continuing high demand for teachers of maths in secondary schools.

The number of statistician jobs in New Zealand rose by 6% between 2011 and 2012, according to Ministry of Business, Innovation and Employment. However, although demand is strong for experienced statisticians, opportunities for new graduates may be harder to find.

Mathematician was ranked as the best job in the US for 2014, statistician was ranked third and actuary fourth, according to CareerCast's 2014 Job Rated report. A study by PayScale shows that the top 15 highest-earning college degrees have a common element: mathematics.

Sources: careercast.com / Mathematical Association of America [www.maa.org/careers](http://www.maa.org/careers)

## WORK SETTINGS

Applied mathematics can be found at work in any environment where analysis or modelling is required in order to make business, operational and industrial decisions. Typical applications include quality control, modelling of various physical processes, research, and financial modelling.

Large organisations in particular offer opportunities for considerable advancement. In the past, progression usually involved starting with a technical role and working to advance to management. Recently there has been a trend to enter into graduate programmes and advance more directly to management and senior management positions that way.

Work opportunities may be found in a wide array of sectors and industries in New Zealand, such as financial and business management, engineering and industrial, building and construction, research and education. Employing organisations range from private commercial enterprises, through government departments to charities or not-for-profit organisations.

For some roles there are groupings of typical employers:

- Actuaries mainly work in insurance companies, though other possibilities include specialist consulting firms, crown entities and government agencies (e.g. ACC, Reserve Bank), and large financial services and accountancy firms.
- Statisticians often work for government departments (in particular Statistics New Zealand), banks, finance companies, insurance companies or survey companies.
- Researchers with applied mathematics skills and knowledge are in demand with crown and private research institutes and research centres within educational institutions.

## CAREER ROLE EXAMPLES

### Actuary

Collects and analyses data about past events using mathematical and statistical modelling to predict and assess the financial risks and impacts of future events. Analyses and solves business problems and advises businesses and government on managing financial and other business risks. Prepares reports and advises on insurance, investment, superannuation and management of funds. Calculates the assets and liabilities of companies, and determines their financial strength.

### Analyst – Data Quality

Works to increase the effectiveness, efficiency and standardisation of business processes by monitoring data quality performance using quantitative metrics. Makes recommendations and works with the business to improve problem areas. Operates across multiple areas of the organisation, analysing data, developing and using monitoring reports to confirm compliance to key targets. Works with the business to refine processes around data entry to improve data quality at the source.



## Marketing Business Analyst

Generates detailed analysis, modelling, reports and recommendations on how to grow and optimise performance. Analyses sales by product and market channel. Prepares monthly management reports of price/volume variance, sales and store performance.

Carries out budget modelling, including long-range forecasting and maintains analytical databases and business intelligence reports.

## Statistician

Applies statistical techniques and models to forecast results, trends and needs, designing data collection methods such as surveys, experiments and questionnaires. Identifies data trends, and the differences and relationships between different sets of data and uses computers to produce graphs, tables and charts of data and writes reports and presents findings to clients. Provides data to inform policy and business decisions.

## SKILLS AND KNOWLEDGE

Analysis, problem solving and experimental design

- Able to analyse complex situations and information, identifying the problem and determining a range of possible solutions.
- Skilled in interpreting results, drawing conclusions and reporting on these.
- Ability to understand, develop and implement effective models and algorithmic solutions to problems.
- Competent in selection of appropriate statistical, mathematical and computational techniques to perform industrial and business data acquisition and analysis.
- Confident in utilising statistical, modelling and business intelligence software.

People and self-management skills

- Ability to communicate with clients and colleagues using a client-focused approach
- Capable of presenting fundamental ideas and arguments to people outside the profession
- Strong planning, organisational, decision-making and problem-solving skills
- Ability to work collaboratively in a team

## PERSONAL QUALITIES

- Logical, analytical and methodical
- Quick to learn new tasks
- Highly accurate with an intuition for drilling down to detail
- Motivated, proactive and able to manage time to meet deadlines

## SALARY GUIDE

	Salary (per year)
Actuary (trainees)	\$35,000 – \$90,000
Actuary (fully qualified with 5 to 8 years' experience)	\$90,000 – \$120,000+
Statistician (1 to 5 years' experience)	\$45,000 – \$65,000
Statistician (senior roles with more than 5 years' experience or specialised in a particular field)	\$65,000 – \$100,000
Mathematical modellers	\$50,000 – \$55,000
Research mathematicians with a Master's degree or PhD	\$60,000 – \$95,000

Sources: New Zealand Society of Actuaries, Statistics NZ, [www.futureintech.org.nz](http://www.futureintech.org.nz)

Salary range is indicative of the New Zealand job market at the time of publication and should only be used as a guideline.

## PROFESSIONAL REGISTRATION

Australia and the UK have certification for statisticians but New Zealand currently doesn't.

The NZ Statistical Association and Anzstat (a mailing list for people in Australia, New Zealand and internationally with an interest in statistics) are professional organisations/resources that help with professional development and career networking.

## THE AUT ADVANTAGE

AUT applied maths graduates benefit from a strong emphasis on practical skills during their studies, with the experience of working on a real project in relevant industries like Statistics NZ, Mercury Energy or Fonterra. This develops their ability to:

- work independently on a project
- solve a wide variety of problems that occur in business and industry
- communicate effectively, linking theory to practical applications of solutions

## FURTHER STUDY OPTIONS

Further study in the Mathematical Sciences is available at postgraduate level, including the Bachelor of Science (Honours), Postgraduate Certificate in Science, Postgraduate Diploma in Science, Master of Analytics, Master of Health Informatics, Master of Science, Master of Philosophy, and Doctor of Philosophy.



## SHARLENE DOHRMAN

Statistical Analyst, Statistics New Zealand

Bachelor of Mathematical Science in Applied Mathematics and Analytics

"I work as part of a large statistical methodology team providing advice and support for the estimates that Statistics NZ publishes. Initially I worked on supporting subject areas such as business performance surveys and the quarterly employment survey. As part of rotation, I have moved into a different team and I now support Census 2018.

The core skills required in this role involve the ability to investigate different methods, including survey design methods and making trade-offs to provide fit-for-purpose solutions. The tasks involved with supporting Census 2018 are focused on areas that are not well defined, allowing more testing and development work.

I have found it very rewarding to be able to educate others, challenge their thinking, or provide them with efficient ways of completing tasks. I also enjoy creating proposals for new ideas, and being able to be part of implementing them... making a difference."

## EMPLOYER COMMENT

"Sharlene's qualification makes her perfect for her role in ensuring the quality, robustness and accuracy of the statistics and economic indicators that Statistics New Zealand produces. Her analytical thinking and ability to learn new tasks quickly means she works very efficiently, and proactively.

The amount of data becoming available is growing exponentially, and what's becoming really important in the world of statistics is not just the statistical knowledge you bring, but also your ability to explain this knowledge and your work to people who are not all comfortable with the field."

**Lee-Kurt Kupferman**

Statistical Methods Subject Matter Project Manager, Statistics New Zealand

## USEFUL WEBSITES

### **NZ Mathematical Society**

[www.nzmathsoc.org.nz](http://www.nzmathsoc.org.nz)

### **NZ Statistical Association**

[www.stats.org.nz](http://www.stats.org.nz)

### **Statistics New Zealand**

[www.stats.govt.nz](http://www.stats.govt.nz)

### **Society for Industrial and Applied Mathematics**

[www.siam.org/careers](http://www.siam.org/careers)

### **New Zealand Society of Actuaries**

[www.actuaries.org.nz](http://www.actuaries.org.nz)

### **American Society of Quality – Statistics Division**

[www.asq.org/statistics](http://www.asq.org/statistics)

## FURTHER INFORMATION

For the most up to date information on the study of applied mathematics, visit our website

[www.aut.ac.nz/applied-math](http://www.aut.ac.nz/applied-math)

### **FUTURE STUDENTS**

Contact the Future Student Advisory team for more information: [www.aut.ac.nz/enquire](http://www.aut.ac.nz/enquire)

[futurestudents@aut.ac.nz](mailto:futurestudents@aut.ac.nz)

 @AUTFutureStudents

### **CURRENT AUT STUDENTS**

Contact the Student Hub Advisors team for more information: 0800 AUT UNI (0800 288 864)

[www.aut.ac.nz/enquire](http://www.aut.ac.nz/enquire)

[studenthub@aut.ac.nz](mailto:studenthub@aut.ac.nz)

 @AUTEmployabilityandCareers

### **EMPLOYABILITY & CAREERS**

For other Future Career Sheets visit:

[www.aut.ac.nz/careersheets](http://www.aut.ac.nz/careersheets)

For employability and career support, AUT students can book an appointment through

<https://elab.aut.ac.nz/>

### **CITY CAMPUS**

55 Wellesley Street East, Auckland Central

### **SOUTH CAMPUS**

640 Great South Road, Manukau, Auckland

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The information contained in this career sheet is correct at time of printing, August 2019.