



# STAT1371

## Statistical Data Analysis

Session 1, In person-scheduled-weekday, North Ryde 2024

*School of Mathematical and Physical Sciences*

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## General Information

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Credit points

10

Prerequisites

(HSC Mathematics Extension 1 Band E3 and above or HSC Mathematics Extension 2) or (10cp from MATH1000 or MATH1010-MATH1025 or MATH130-MATH136) or admission to BActStud or BActStudBSc or BAppFinBActStud or BActStudBProfPrac or BActStudProfPrac(Hons) or BMathSc

Corequisites

Co-badged status

Unit description

This unit provides a comprehensive introduction to modern statistical principles and practices, specifically focusing on data analytical techniques. The primary objective is to develop a solid foundational understanding of the fundamental principles underlying statistical analysis. Throughout the unit, students will gain hands-on experience in data analysis using appropriate statistical software. The unit covers a range of essential topics, including the numerical and visual summarization of sample data, the basics of probability theory, and the concepts of discrete and continuous random variables. Furthermore, this unit covers sampling distributions and their fundamental properties. It also includes hypothesis testing for means, proportions, categorical data, and simple linear regression analysis. To fully benefit from this unit, a solid proficiency in mathematics is assumed, and it is specifically designed for students with a strong mathematical background.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

**ULO1:** explain the difference between populations and samples, and apply appropriate statistical techniques to analyse different types of variables

**ULO2:** Understand and apply basic probability concepts to both discrete and continuous variables for solving problems

**ULO3:** evaluate application of the scientific method through estimation and statistical inference for means, proportions, categorical data and linear regression

**ULO4:** Demonstrate foundational learning skills including active engagement in their learning process.

## General Assessment Information

### Requirements to Pass this Unit

To pass this unit you must:

- Attempt all assessments, and
- Achieve a total mark equal to or greater than 50%

### Late Assessment Submission Penalty

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7<sup>th</sup> day (including weekends). After the 7<sup>th</sup> day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is **11:55 pm**. A 1-hour grace period will be provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests and exams, students need to submit an application for [Special Consideration](#).

In this unit, late submissions will be accepted as follows:

- Web Quizzes: NO, unless Special Consideration is granted
- Mid-Semester Test: NO, unless Special Consideration is granted
- Final Examination: NO, unless Special Consideration is granted

### Special Consideration

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the written assessments in this unit on time, please inform the convenor and submit a Special Consideration request through [ask.mq.edu.au](https://ask.mq.edu.au).

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Mid-Semester Test</a>	20%	No	Week 7
<a href="#">Final Exam</a>	50%	No	Exam Period
<a href="#">Web Quizzes</a>	30%	No	Weekly

### Mid-Semester Test

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 1 hours

Due: **Week 7**

Weighting: **20%**

Mid-Semester Test

On successful completion you will be able to:

- explain the difference between populations and samples, and apply appropriate statistical techniques to analyse different types of variables
- Understand and apply basic probability concepts to both discrete and continuous variables for solving problems

### Final Exam

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 3 hours

Due: **Exam Period**

Weighting: **50%**

An invigilated examination held during the University's formal examination period.

On successful completion you will be able to:

- explain the difference between populations and samples, and apply appropriate statistical techniques to analyse different types of variables
- Understand and apply basic probability concepts to both discrete and continuous

variables for solving problems

- evaluate application of the scientific method through estimation and statistical inference for means, proportions, categorical data and linear regression
- Demonstrate foundational learning skills including active engagement in their learning process.

## Web Quizzes

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 11 hours

Due: **Weekly**

Weighting: **30%**

There are eleven quizzes, due at approximately weekly intervals.

On successful completion you will be able to:

- explain the difference between populations and samples, and apply appropriate statistical techniques to analyse different types of variables
- Understand and apply basic probability concepts to both discrete and continuous variables for solving problems
- evaluate application of the scientific method through estimation and statistical inference for means, proportions, categorical data and linear regression

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<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

### Classes

**Lectures** (beginning in Week 1): There are two one-hour lectures each week.

**Small-Group Teaching Activities (SGTAs)** (beginning in Week 2): Students must register for the SGTA class.

**Practicals** (beginning in Week 2): Students must register for the Practical class.

The timetable for classes can be found on the University website at:  
<http://www.timetables.mq.edu.au>.

Enrolment can be managed using eStudent at: <https://students.mq.edu.au/support/technology/systems/estudent>.

### **Maths Background Quiz**

This is a set of questions (pdf format) to allow students to assess whether they have sufficient mathematics in their background for STAT1371. Students are to attempt the quiz in their own time and mark it using the supplied solutions. Only students intending to do an Actuarial Studies degree have STAT1371 as a core unit. For all other students, you should do one of FOSE1015, STAT1170 or STAT1250 based on your degree requirement.

### **Calculators**

Each student will need a small calculator, preferably one that does simple statistical calculations (it should have at least mean and standard deviation capability). You should bring it to all SGTA classes. A calculator will also be needed for the mid-session tests and the final examination. You will **not** be permitted to use a programmable calculator or one with a full alpha character set in any examination.

### **Recommended Textbooks:**

- Diez, D.M., Barr, C.D. & Çetinkaya-Rundel, M. (2012). *OpenIntro Statistics*. Open Textbook Library (Corporate Author) (ed.). [Online]. OpenIntro. Available at <https://www.openintro.org/book/os/>.
- Hadley Wickham (2017). *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data*. First Edition. Hadley Wickham & Garrett Golemund.
- Mendenhall, W. Beaver, R.J. and Beaver, B.M. (2019). *Introduction to Probability and Statistics*. Metric Edition. Cengage Learning Custom P.
- Richard J. Larsen and Morris L. Marx (2021). *Introduction to Mathematical Statistics and Its Applications*. 6th edition. Published by Pearson.

### **Computing and Software**

**R and RStudio:** These are freely available to download from the web and will be used for data analysis in this unit. See Topic 1 for more information.

### **Methods of Communication**

We will communicate with you via your university email or through announcements on iLearn. Queries to convenors should be placed on the iLearn discussion forums.

### **COVID Information**

For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: <https://www.mq.edu.au/about/coronavirus->

**faqs.** Remember to check this page regularly in case the information and requirements change during the semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

## Unit Schedule

The following topics will be covered in this unit.

1.	<b>Sample descriptives</b> Visual and numerical summaries for both categorical and measured variables.
2.	<b>Probability</b> Basic probability concepts and applications: events, sets, joint probability, conditional probability, independence and Bayes' Theorem.
3.	<b>Discrete random variables</b> Evaluation of general expectation and variance. Properties of sums of random variables and classic discrete distributions.
4.	<b>Continuous random variables</b> Evaluation of general expectation and variance (using calculus). Specific distributions covered: uniform, polynomial-based probability distributions and the normal distribution.
5.	<b>Sampling distributions</b> Distributions of sample statistics, mean and variance of linear transforms of a random variable, and the Central Limit Theorem.
6.	<b>Introduction to inference</b> The scientific method, with particular application to hypothesis testing for a single population mean, one-sample z test, Type I and Type II errors and confidence interval.
7.	<b>Inference for one population mean</b> Application of the one-sample t-test and confidence interval. Investigating normality, particularly normal score plots.
8.	<b>Inference for two population means</b> The two-sample t-test (and evaluate confidence intervals) for the difference in two population means, and paired t-test.
9.	<b>Correlation and regression</b> Correlation for two measured variables. Simple linear regression, including estimation and inference for the coefficients, the mean function and prediction intervals, and assumption diagnostics.
10.	<b>Categorical data analysis</b> Large-sample inference procedures regarding proportions. Hypothesis testing, confidence intervals and inference for categorical data.

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies](https://students.mq.edu.au/support/study/policies) (<https://students.mq.edu.au/support/study/policies>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central](https://policies.mq.edu.au) (<https://policies.mq.edu.au>) and use the [search tool](#).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](https://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)



- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

## Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

## Changes from Previous Offering

We value student feedback to be able to continually improve the way we offer our units. As such we encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link on the iLearn page.

Student feedback from the previous offering of this unit was positive overall, with students pleased with the clarity around assessment requirements and the level of support from teaching staff. However, there was a strong preference for two one-hour lectures instead of a two-hour lecture. As such, the delivery of the unit has changed to two one-hour lectures each week in this offering, and we will continue to strive to improve the level of support and the level of student engagement.

Unit information based on version 2024.03 of the [Handbook](#)