



# STAT1371

## Statistical Data Analysis

Session 1, Weekday attendance, North Ryde 2020

*Department of Mathematics and Statistics*

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## General Information

Unit convenor and teaching staff

Unit Convenor/Lecturer

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12WW 626

please refer to iLearn

Frank Schoenig

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Credit points

10

Prerequisites

(HSC Mathematics Extension 1 or 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 is intended for students with a high level of proficiency in mathematics. The unit provides an introduction to modern statistical principles and practice with special emphasis on data analytical techniques. The aim of the unit is to promote an understanding of the principles involved in statistical analysis of simple data sets using elementary techniques. Data analysis will be carried out using an appropriate statistical package. The unit includes topics such as numeric and visual summaries of sample data; data quality; basic probability and random variables, including the binomial, Poisson, negative binomial, hypergeometric, uniform and normal distributions. Sampling distributions and their important properties are used to investigate estimates and their accuracy. Statistical inference techniques are considered such as tests of means, proportions, categorical data as well as regression and correlation.

## 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.

## Assessment Tasks

### Coronavirus (COVID-19) Update

Assessment details are no longer provided here as a result of changes due to the Coronavirus (COVID-19) pandemic.

Students should consult [iLearn](#) for revised unit information.

[Find out more about the Coronavirus \(COVID-19\) and potential impacts on staff and students](#)

## General Assessment Information

**HURDLES:** Attendance at, and reasonable engagement in, Small Group Teaching Activities (SGTA) classes in this unit is **compulsory**. Attendance and reasonable engagement in the class activities in at least 10 out of 12 of the SGTA classes are requirements to pass the unit. This is a hurdle requirement.

**ATTENDANCE and PARTICIPATION:** Please contact the unit convenor as soon as possible if you have difficulty attending and participating in any classes. There may be alternatives available to make up the work. If there are circumstances that mean you will miss a class, you can apply for Special Consideration via [ask.mq.edu.au](http://ask.mq.edu.au)

**ASSIGNMENT SUBMISSION:** Assignment submission will be online through the iLearn page.

Submit assignments online via the appropriate assignment link on the iLearn page. A personalised cover sheet is not required with online submissions. Read the submission statement carefully before accepting it as there are substantial penalties for making a false declaration.

- Assignment submission is via iLearn. You should upload this as a single scanned PDF file.
- Please note the quick guide on how to upload your assignments provided on the iLearn page.
- Please make sure that each page in your uploaded assignment corresponds to only one

A4 page (do not upload an A3 page worth of content as an A4 page in landscape). If you are using an app like Clear Scanner, please make sure that the photos you are using are clear and shadow-free.

- It is your responsibility to make sure your assignment submission is legible.
- If there are technical obstructions to your submitting online, please email us to let us know.

You may submit as often as required prior to the due date/time. Please note that each submission will completely replace any previous submissions. It is in your interests to make frequent submissions of your partially completed work as insurance against technical or other problems near the submission deadline.

**LATE SUBMISSION OF WORK:** All assessment tasks must be submitted by the official due date and time. In the case of a late submission for a non-timed assessment (e.g. an assignment), if special consideration has NOT been granted, 20% of the earned mark will be deducted for each 24-hour period (or part thereof) that the submission is late for the first 2 days (including weekends and/or public holidays). For example, if an assignment is submitted 25 hours late, its mark will attract a penalty equal to 40% of the earned mark. After 2 days (including weekends and public holidays) a mark of 0% will be awarded. Timed assessment tasks (e.g. tests, examinations) do not fall under these rules.

**WEB QUIZZES:** Further information will be made available in due course.

**TESTS:** These will be of 45 minute duration during a lecture time in week 7 and 11. For each test you may take in one A4 page (written on one or both sides) of summary notes into the tests. All statistical tables will be supplied. Further information will be supplied in the week prior to each test.

**FINAL EXAM POLICY:** It is Macquarie University policy not to set early examinations for individuals or groups of students. All students are expected to ensure that they are available until the end of the teaching semester, that is, the final day of the official examination period. The only excuse for not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these special circumstances, you may apply for special consideration via [ask.mq.edu.au](http://ask.mq.edu.au).

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during this supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application.

You can check the supplementary exam information page on FSE101 in iLearn ([bit.ly/FSESupp](http://bit.ly/FSESupp)) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

## Delivery and Resources

### Coronavirus (COVID-19) Update

Any references to on-campus delivery below may no longer be relevant due to COVID-19.

Please check here for updated delivery information: [https://ask.mq.edu.au/account/pub/display/unit\\_status](https://ask.mq.edu.au/account/pub/display/unit_status)

### Lectures

There are three one-hour lectures per week.

### Small Group Teaching Activities (SGTAs)

SGTA classes will start in week 2. Students are required to attend and participate a minimum of ten (10) of the twelve (12) classes that they are registered in to obtain a passing grade. If you are unavailable for your SGTA class in a particular week, you must submit a Special Consideration application (see General Assessment Information for further details).

### 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 or who are in the Bachelor of Mathematical Sciences intake have STAT1371 as a core unit. For all other students, you should do the one of FOSE1015, STAT1170 or STAT1250 based on the requirement of your degree.

### 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 text:

Mendenhall, W. Beaver, R.J. and Beaver, B.M. (2019) *INTRODUCTION TO PROBABILITY AND STATISTICS METRIC EDITION*. CENGAGE LEARNING CUSTOM P.

Hadley Wickham (2017) *R for data science : import, tidy, transform, visualize, and model data* / Hadley Wickham & Garrett Grolemund. First edition. Garrett Grolemund & ProQuest (Firm) (eds.). Sebastopol, CA : O'Reilly Media.

Diez, D.M., Barr, C.D. & Çetinkaya-Rundel, M. (2012) *OpenIntro statistics*. Open Textbook Library (Corporate Author) (ed.). [Online]. OpenIntro. Available from: <https://open.umn.edu/opentextbooks/BookDetail.aspx?bookId=60>.

Lisa DeBruine & Dale Barr. (n.d.) *Data Skills for Reproducible Science (Version 1.0.0)*.

**Other References** (Note that many of the older editions of the listed books are also useful references).

Previous editions of the text book QA276.M425/2009

Johnson, Richard A. and Bhattacharyya Gouri K. (Ed 7, 2014) 'Statistics: Principles and Methods'

McClave, J. and Sincich, T. 'Statistics' (Ed12).

Devore, Jay L. 'Statistics: the exploration and analysis of data' (Ed 5)

Moore D.S. & McCabe G.P., 'Introduction to the Practice of Statistics' (Ed 5)

Griffiths D. et al, (1998) 'Understanding Data - Principles and Practice of Statistics'

Mendenhall, W. & Ott, L., 'Understanding Statistics' (Ed 3)

Hamilton, Lawrence C. 'Modern Data Analysis: a first course in applied statistics'

Phipps, M.C. & Quine, M.P. 'A Primer of Statistis' (Ed 4).

Clarke, G.M. & Cooke D. 'A Basic Course in Statistics' (Ed 5)

Koopmans L.H., 'Introduction to Contemporary Statistical Methods', (Ed 2)

Chatfield, C., 'Statistics for technology: a course in applied statistics' (Ed 3)

Huntsberger D.V. & Billingsley, P., 'Elements of Statistical Inference', (Ed 6)

Agresti, A. & Franklin, C. 'Statistics: the art and science of learning from data'

## Computing and Software

**R and RStudio:** These are freely available to download from the Web and they will be used for data analysis in this unit. See Topics 1 for more info.

Students will regularly need access to a computer with internet access. There are 160 computers available in rooms 17 Wally's Walk (C5C) Rooms 218 and 219 on the ground floor. The Help Desk is close by at 17 WW 244 for assistance with any IT problems. There are some student computers available also in the Student Connect area of MUSE. You can also access any of the 200 computers in the Library, Levels 1 and 2. Please see the website below for further information such as opening hours and conditions of use: [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/)

## Unit Schedule

### Coronavirus (COVID-19) Update

The unit schedule/topics and any references to on-campus delivery below may no longer be relevant due to COVID-19. Please consult [iLearn](#) for latest details, and check here for updated delivery information: [https://ask.mq.edu.au/account/pub/display/unit\\_status](https://ask.mq.edu.au/account/pub/display/unit_status)

## Topics covered:

1.	<p><b>Sample Descriptives</b></p> <p>Visual and numerical summaries for both categorical and measured variables</p>
2.	<p><b>Probability</b></p> <p>Basic probability concepts and applications: events, sets, joint probability, conditional probability, independence and Bayes' Theorem.</p>
3.	<p><b>Discrete random variables</b></p> <p>Evaluation of general expectation and variance. Properties of sums of random variables. Specific distributions covered: Bernoulli, Binomial, Poisson, Geometric, Negative Binomial and Hypergeometric. Poisson approximation to the binomial distribution.</p>
4.	<p><b>Continuous random variables</b></p> <p>Evaluation of general expectation and variance (using calculus). Specific distributions covered: uniform, polynomial based probability distributions and the normal distribution .</p>
5.	<p><b>Sampling distributions</b></p> <p>Distributions of sample statistics: the sample mean and total. Mean and variance of linear transforms of a random variable. The Central Limit Theorem, including normal approximation for continuous and discrete random variables, with particular applications to the Binomial, Poisson and Negative Binomial distributions (with continuity correction).</p>
6.	<p><b>Introduction to inference</b></p> <p>The scientific method, with particular application to hypothesis testing for a single population mean (one-sample z-test). Type I and Type II errors. Confidence interval, sample size and power.</p>
7.	<p><b>Inference for one population mean</b></p> <p>Application of the one-sample t-test and confidence interval. Investigating normality, particularly normal scores plots.</p>
8.	<p><b>Inference for two population means</b></p> <p>The two-sample t-test (and evaluate confidence intervals) for the difference in two population means. The "modified" two-sample t-test. Basics of experimental design, with particular application to the paired t-test.</p>
9.	<p><b>Inference for proportions</b></p> <p>Large-sample inference procedures regarding proportions (for one and two populations). Hypothesis testing, confidence intervals and sample size requirements.</p>
10.	<p><b>Correlation and Regression</b></p> <p>Correlation for two measured variables. The difference between correlation and causation. Simple linear regression, including estimation and inference for the coefficients, the mean function and prediction intervals. Assumption diagnostics.</p>
11.	<p><b>Categorical Data Analysis</b></p> <p>Inference for categorical data, including goodness of fit tests, independence tests for contingency tables, pooling of variable levels.</p>

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-centr](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-centr)

al). 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](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

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

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/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](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Student Support

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

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [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

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## 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 since First Published

Date	Description
18/02/2020	Amendments in the CMS were updated re assessment tasks/learning activities