



# STAT271

## Statistics I

S2 Day 2016

*Dept of Statistics*

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### Disclaimer

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## General Information

Unit convenor and teaching staff

Associate Lecturer

Suzanne Curtis

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AHH, Level 2, Workstation 35

To be determined

Credit points

3

Prerequisites

STAT272(P)

Corequisites

Co-badged status

Unit description

This is a unit in statistical methods for the analysis of data in which attention is given to the theoretical structure underlying the techniques. It aims to equip students with a wide understanding of statistics such that they are able to employ appropriate methods of analysis in various circumstances. The techniques learned are widely used in the sciences, social sciences, business and many other fields of study. This unit is designed for students majoring in statistics and/or actuarial studies.

Topics include: inference about one and two sample problems using normal theory and non-parametric methods; analysis of variance; multiple comparisons; and regression.

## 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:

Point estimation methods, including the method of moments and maximum likelihood.

Properties of estimators. Asymptotic (large sample) properties.

Sampling distributions and properties of sample statistics. Definition and derivation of t, F and chi-squared distributions etc.

Interval estimation: pivotal quantities and confidence intervals.

Principles of hypothesis testing. Type I and Type II errors. Power. Comparison of competing tests. Relationship between confidence intervals and hypothesis testing. Confidence intervals and hypothesis testing for the probability parameter in the binomial distribution.

Single population inference: confidence intervals and hypothesis testing (for location and scale), including related samples (paired comparisons). Classical (normal theory) and nonparametric procedures are considered.

Two populations inference: confidence intervals and hypothesis testing (for location and scale). Classical (normal theory) and nonparametric procedures are considered.

Inference for categorical data (chi-squared tests): goodness of fit tests; tests of association; and tests of homogeneity.

Correlation and linear regression. Model fitting and inference for simple and multiple linear regression.

Inference for k populations. One-way analysis of variance and nonparametric techniques. Multiple comparisons and contrasts.

Inference for two factor designs (two-way analysis of variance) - normal theory and nonparametric techniques. Multiple comparisons and contrasts.

## General Assessment Information

For the two in-class tests, students are permitted to take into the test room one (1) A4 page of personal summary of formulae or notes, written on one or both sides of the page. These notes may be handwritten or typed. You will be permitted to take this sheet with you at the completion of the tests. Some formulae will be provided (as per statistical tables available on iLearn); all necessary statistical tables will be provided.

## Assessment Tasks

Name	Weighting	Due
<u>Exam</u>	60%	University Examination Period
<u>Test One</u>	10%	Week 7
<u>Test Two</u>	10%	Week 11
<u>Assignments</u>	20%	Weeks 3, 5, 9, 13

### Exam

Due: **University Examination Period**

Weighting: **60%**

The final examination will be of 3 hours duration with 10 minutes reading time. All material covered in the unit is examinable. Relevant statistical tables will be provided at the final examination. These will be the same as the ones made available during the teaching of the unit. For the final examination you will be permitted to take into the exam room a nonprogrammable calculator and two (2) A4 pages of formulae or notes, written on one or both sides of the page. These notes may be hand-written or typed. Students will not be permitted to take these with them at the completion of the exam, and it is recommended that a photocopy be made if a student has a desire to retain them.

On successful completion you will be able to:

- Point estimation methods, including the method of moments and maximum likelihood. Properties of estimators. Asymptotic (large sample) properties.
- Sampling distributions and properties of sample statistics. Definition and derivation of t, F and chi-squared distributions etc.
- Interval estimation: pivotal quantities and confidence intervals.
- Principles of hypothesis testing. Type I and Type II errors. Power. Comparison of competing tests. Relationship between confidence intervals and hypothesis testing.
- Confidence intervals and hypothesis testing for the probability parameter in the binomial distribution.
- Single population inference: confidence intervals and hypothesis testing (for location and scale), including related samples (paired comparisons). Classical (normal theory) and nonparametric procedures are considered.
- Two populations inference: confidence intervals and hypothesis testing (for location and scale). Classical (normal theory) and nonparametric procedures are considered.
- Inference for categorical data (chi-squared tests): goodness of fit tests; tests of association; and tests of homogeneity.
- Correlation and linear regression. Model fitting and inference for simple and multiple linear regression.
- Inference for k populations. One-way analysis of variance and nonparametric techniques. Multiple comparisons and contrasts.
- Inference for two factor designs (two-way analysis of variance) - normal theory and nonparametric techniques. Multiple comparisons and contrasts.

## Test One

Due: **Week 7**

Weighting: **10%**

This test (of 45 minutes duration) will be held during a lecture hour in Week 7. The specific date is yet to be determined.

On successful completion you will be able to:

- Point estimation methods, including the method of moments and maximum likelihood. Properties of estimators. Asymptotic (large sample) properties.
- Sampling distributions and properties of sample statistics. Definition and derivation of t, F and chi-squared distributions etc.
- Interval estimation: pivotal quantities and confidence intervals.
- Principles of hypothesis testing. Type I and Type II errors. Power. Comparison of competing tests. Relationship between confidence intervals and hypothesis testing.

## Test Two

Due: **Week 11**

Weighting: **10%**

This test (of 45 minutes duration) will be held during a lecture hour in Week 11. The specific date is yet to be determined.

On successful completion you will be able to:

- Confidence intervals and hypothesis testing for the probability parameter in the binomial distribution.
- Single population inference: confidence intervals and hypothesis testing (for location and scale), including related samples (paired comparisons). Classical (normal theory) and nonparametric procedures are considered.
- Two populations inference: confidence intervals and hypothesis testing (for location and scale). Classical (normal theory) and nonparametric procedures are considered.
- Inference for categorical data (chi-squared tests): goodness of fit tests; tests of association; and tests of homogeneity.

## Assignments

Due: **Weeks 3, 5, 9, 13**

Weighting: **20%**

There will be four assignments due at approximately fortnightly intervals. Due dates/times and submission details will be specified separately for each assignment. The assignments will be made available at least one week prior to when they are due. Some marks will be allocated for clarity of reasoning and presentation in each assignment.

Late submissions will not be marked (and given a zero mark). Late submissions will only be granted based on an approved "Disruption to Studies" application.

On successful completion you will be able to:

- Point estimation methods, including the method of moments and maximum likelihood. Properties of estimators. Asymptotic (large sample) properties.
- Sampling distributions and properties of sample statistics. Definition and derivation of t, F and chi-squared distributions etc.
- Interval estimation: pivotal quantities and confidence intervals.
- Principles of hypothesis testing. Type I and Type II errors. Power. Comparison of competing tests. Relationship between confidence intervals and hypothesis testing.
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- Two populations inference: confidence intervals and hypothesis testing (for location and scale). Classical (normal theory) and nonparametric procedures are considered.
- Inference for categorical data (chi-squared tests): goodness of fit tests; tests of association; and tests of homogeneity.
- Correlation and linear regression. Model fitting and inference for simple and multiple linear regression.
- Inference for k populations. One-way analysis of variance and nonparametric techniques. Multiple comparisons and contrasts.
- Inference for two factor designs (two-way analysis of variance) - normal theory and nonparametric techniques. Multiple comparisons and contrasts.

## Delivery and Resources

**Classes** STAT271 is delivered by lectures (3 per week) and tutorials (1 per week, commencing in week 2). All teaching material will be available on iLearn.

**Required and Recommended Texts and/or Materials** Recommended: Mendenhall W, Wackerly D and Scheaffer R. "Mathematical Statistics with Applications", Seventh Edition QA276 .M426 2008 Copies of this book are held in Special Reserve in the University Library. The Library also holds copies of the sixth and previous editions as well as the Student solutions manual. The following books are useful references for this unit:

Authors	Title	Library Call No.
Bain, L.J. & Engelhardt, M	Introduction to Probability and Mathematical Statistics	QA273.B2546/1992
Conover, W.J.	Practical Nonparametric Statistics	QA278.8.C65/1999

Authors	Title	Library Call No.
Hogg, R.V. & Craig, A.T.	Introduction to Mathematical Statistics	QA276.H59 / 1995
Larson, H.J.	Introduction to Probability Theory and Statistical Inference	QA273.L352/1982
Walpole, R.E. & Myers, R.H.	Probability and Statistics for Engineers and Scientists	TA340.W35/1993

## Learning and Teaching Activities

### Lectures

Lecture notes will be made available in advance from iLearn.

### Tutorials

Tutorial Exercises and solutions will be available from iLearn at least five days prior to the tutorial. Tutorials will be run as "drop-in" clinics in which students can ask for assistance or further explanation on the tutorial exercises or lecture material. Students may attend as many tutorials as desired.

## Policies and Procedures

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

Academic Honesty Policy [http://mq.edu.au/policy/docs/academic\\_honesty/policy.html](http://mq.edu.au/policy/docs/academic_honesty/policy.html)

**New Assessment Policy in effect from Session 2 2016** [http://mq.edu.au/policy/docs/assessment/policy\\_2016.html](http://mq.edu.au/policy/docs/assessment/policy_2016.html). For more information visit [http://students.mq.edu.au/events/2016/07/19/new\\_assessment\\_policy\\_in\\_place\\_from\\_session\\_2/](http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/)

Assessment Policy prior to Session 2 2016 <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy prior to Session 2 2016 <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Complaint Management Procedure for Students and Members of the Public [http://www.mq.edu.au/policy/docs/complaint\\_management/procedure.html](http://www.mq.edu.au/policy/docs/complaint_management/procedure.html)

Disruption to Studies Policy [http://www.mq.edu.au/policy/docs/disruption\\_studies/policy.html](http://www.mq.edu.au/policy/docs/disruption_studies/policy.html) *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of 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/support/student\\_conduct/](https://students.mq.edu.au/support/student_conduct/)

## Results

Results shown in *iLearn*, 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>.

## 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>) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## 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>

## 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.

## Graduate Capabilities

### Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary



solutions to problems.

This graduate capability is supported by:

## **Learning outcomes**

- Point estimation methods, including the method of moments and maximum likelihood. Properties of estimators. Asymptotic (large sample) properties.
- Sampling distributions and properties of sample statistics. Definition and derivation of t, F and chi-squared distributions etc.
- Interval estimation: pivotal quantities and confidence intervals.
- Principles of hypothesis testing. Type I and Type II errors. Power. Comparison of competing tests. Relationship between confidence intervals and hypothesis testing.
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- Inference for two factor designs (two-way analysis of variance) - normal theory and nonparametric techniques. Multiple comparisons and contrasts.

## **Assessment tasks**

- Exam
- Test One
- Test Two
- Assignments

## **Effective Communication**

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication

technologies as appropriate.

This graduate capability is supported by:

## **Assessment tasks**

- Exam
- Test One
- Test Two
- Assignments