



# FOSX1015

## Statistical Concepts for Science

Session 1, Online-scheduled-weekday 2022

*Science and Engineering Faculty level units*

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#### **Disclaimer**

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## General Information

Unit convenor and teaching staff Karol Binkowski <a href="mailto:karol.binkowski@mq.edu.au">karol.binkowski@mq.edu.au</a>
Credit points 10
Prerequisites
Corequisites
Co-badged status
Unit description This unit provides a broad introduction to statistical concepts and data analysis techniques. You will develop an understanding of statistical practice through a study of those techniques most commonly used in the sciences, social sciences and humanities. Topics covered in this unit include data collection methods, data quality, data summarisation, and statistical models such as the normal distribution, followed by sampling distributions and statistical inferences about means and proportions. Also studied are methods of analysis relating to comparisons, counted data and relationships, including regression and correlation. Statistical computer packages are used for handling and analysing data. However, no prior computing knowledge is assumed. This unit introduces vital skills for tertiary learning and explores their relationship to success in future careers.

## 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:

- ULO2:** Analyse and solve problems about distributions and sampling distributions.
- ULO1:** Organise and summarise data graphically and numerically
- ULO3:** Evaluate and apply statistical strategies to answer a research question.
- ULO4:** Draw conclusions from the results of a statistical analysis.
- ULO5:** Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.

**ULO6:** Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

## General Assessment Information

The data in the above table's "Estimated Time on Task" column is automatically generated, and potentially confusing. The times given for the tests (2 hours each) are just estimates; for each student, this will depend on how many times the test is attempted. The times allocated to activity participation (each 0 hours) should be ignored.

**HURDLES:** All assessment tasks are hurdle requirements to pass this unit. These can be different for internal and external students. Details will be provided on the iLearn page for the unit.

**ATTENDANCE and PARTICIPATION:** There is no participation requirement for Practicals or SGTAs for FOSX1015 students, but you should work through this material to develop your understanding.

**TEST SUBMISSION:** Each statistics module's tests will be online, via the iLearn page. For some of the tests, multiple attempts are allowed; in this case, the highest mark counts toward the student's grade. **For each statistics module, at least 50% of the available marks must be scored in order to pass the unit.**

**LATE SUBMISSION OF WORK:** Online quizzes, in-class activities, or scheduled tests and exams must be undertaken at the time indicated in the unit guide. Should these activities be missed due to illness or misadventure, students may apply for Special Consideration. There is no non-timed assessment in this unit so late submission is not allowed without a successful special consideration request.

A student who does not pass any statistics module by its deadline will fail the unit, unless Special Consideration is granted. If you miss a test deadline due to circumstances out of your control, you may be eligible to apply for Special Consideration via [ask.mq.edu.au](http://ask.mq.edu.au).

**EMPLOYABILITY SKILLS:** This unit has been designed so that 20% of student workload is allocated to employability skills. The employability skills modules are not graded, but the modules are hurdle tasks: you must complete the activities as outlined in order to pass this unit. Some activities will be automatically graded, but all will ask you to apply the modules to your work in this unit, general university studies and your personal goals. You will be informed of any due dates, but most modules can be completed in your own time. See your iLearn unit for detailed information on how to complete the skills modules.

**FINAL EXAM POLICY:** There is no final exam for this unit.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Foundation activities</a>	0%	Yes	Throughout semester

Name	Weighting	Hurdle	Due
<a href="#">Module 1 Test</a>	20%	Yes	Week 4
<a href="#">Module 2 Test</a>	20%	Yes	Week 6
<a href="#">Module 3 Test</a>	20%	Yes	Week 8
<a href="#">Module 4 Test</a>	20%	Yes	Week 10
<a href="#">Module 5 Test</a>	20%	Yes	Week 12

## Foundation activities

Assessment Type <sup>1</sup>: Participatory task

Indicative Time on Task <sup>2</sup>: 0 hours

Due: **Throughout semester**

Weighting: **0%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

Activities related to foundational employability and self-directed learning skills

On successful completion you will be able to:

- Demonstrate foundational employability and self-directed learning skills, including recording academic achievements to link university study to future careers.

## Module 1 Test

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

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

Due: **Week 4**

Weighting: **20%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

This quiz will test the ability of students to summarise a data set numerically and graphically, and to understand and interpret the output of such analyses.

On successful completion you will be able to:

- Organise and summarise data graphically and numerically
- Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.

## Module 2 Test

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

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

Due: **Week 6**

Weighting: **20%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

This quiz will test the ability of students to analyse and solve statistical problems leveraging the properties of distributions and sampling distributions.

On successful completion you will be able to:

- Analyse and solve problems about distributions and sampling distributions.
- Organise and summarise data graphically and numerically
- Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.

## Module 3 Test

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

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

Due: **Week 8**

Weighting: **20%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

This quiz will test the ability of students to answer research questions about population means.

On successful completion you will be able to:

- Analyse and solve problems about distributions and sampling distributions.
- Organise and summarise data graphically and numerically
- Evaluate and apply statistical strategies to answer a research question.
- Draw conclusions from the results of a statistical analysis.

- Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.

## Module 4 Test

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

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

Due: **Week 10**

Weighting: **20%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

This quiz will test the ability of students to answer research questions about the linear relationship between two numerical random variables.

On successful completion you will be able to:

- Analyse and solve problems about distributions and sampling distributions.
- Organise and summarise data graphically and numerically
- Evaluate and apply statistical strategies to answer a research question.
- Draw conclusions from the results of a statistical analysis.
- Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.

## Module 5 Test

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

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

Due: **Week 12**

Weighting: **20%**

**This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)**

This quiz will test the ability of students to answer research questions about the appropriateness of models for a categorical random variable, and the independence of two categorical random variables.

On successful completion you will be able to:

- Analyse and solve problems about distributions and sampling distributions.

- Organise and summarise data graphically and numerically
- Evaluate and apply statistical strategies to answer a research question.
- Draw conclusions from the results of a statistical analysis.
- Evaluate the appropriateness of statistical methodologies when analysing a variety of problems arising from other fields of research.

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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

Off-shore students must email [stat1170.admin@mq.edu.au](mailto:stat1170.admin@mq.edu.au) as soon as possible to discuss study options.

## Classes

The statistics content will be delivered in classes from Week 1 to Week 11. Specifically, students should work through the following material on a weekly basis:

- A 1-hour lecture – recorded **Weeks 1–10**.
- A 1-hour SGTA on the topics of the previous lecture – **Weeks 1–11**. (Week 1 will introduce the employability module.)
- A 1-hour practical on the topics of the previous one or two lectures – **Weeks 1–11**. (Week 1 will introduce the employability module.)

Some activities will be available in connection to the employability modules, especially near the end of semester. Details will be announced via iLearn.

## Assistance

For help with any matters related to this unit, students should contact the appropriate department staff, by emailing [stat1170.admin@mq.edu.au](mailto:stat1170.admin@mq.edu.au).

## Required and Recommended Texts and/or Materials

- A calculator with statistics mode may be useful during lectures.
- Software:
  - The software used in this unit is *Excel*, the spreadsheet application from Microsoft's *Office* suite. For students with Mac or Windows computers, this

application can be downloaded from the student portal. This can be accessed from the web page for Student IT services: [http://students.mq.edu.au/it\\_service/s/](http://students.mq.edu.au/it_service/s/). Students using other operating systems might find *Google Sheets* or *OpenOffice Calc* to be a workable alternative.

Recommended textbook for this unit:

- *Modern Statistics: An introduction*, Don McNeil and Jenny Middledorp (ISBN 9781486007011). This can be purchased in hard copy from [www.booktopia.com.au/coolshop/](http://www.booktopia.com.au/coolshop/) or in e-format (ISBN 9781486022120).

Other recommended reading:

- *Introduction to the Practice of Statistics*, Moore, D.S. and McCabe, G. P (W.H. Freeman)
- *Statistics without Tears* by Rowntree (Penguin)
- *Mind on Statistics* by Utts & Heckard (Thomson, 2004)
- *Elementary Statistics* by Johnson & Kuby (Thomson, 2007)
- *Statistics: The Art & Science of Learning from Data* by Agresti & Franklin (Prentice Hall, 2007)
- *The Statistical Sleuth* by Ramsey and Schafer (Duxbury, 2002).

## Technology Used and Required

iLearn (a version of Moodle) is used for delivery of course material and can be accessed at: <http://ilearn.mq.edu.au>.

## Prizes

The Don McNeil Prize for Introductory Statistics is named in honour of the foundation Professor of Statistics at Macquarie University. The prize is awarded twice per year to the student with the best overall performance in a first-year statistics unit.

## Unit Schedule

In Weeks 1–10, the lectures will introduce the following topics. Each topic will be developed in SGTAs and Practicals in the following week.

Week 1	Data, research questions, graphics
Week 2	Numerical data
Week 3	Introduction to distributions
Week 4	Sampling distributions
Week 5	Hypothesis tests for a population mean
Week 6	Comparing population means



Week 7	Simple linear regression
Week 8	Simple linear regression
Week 9	Categorical data analysis
Week 10	Categorical data analysis

Employability activities and assessment will occur throughout the semester, including Weeks 11–13.

## 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 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.