



MACQUARIE UNIVERSITY
DIVISION OF ECONOMIC AND FINANCIAL STUDIES
STAT272: PROBABILITY
UNIT OUTLINE

Year and Semester: 2005 Semester 1

Unit convenor: Professor Barry Quinn

Prerequisites: STAT171(P); MATH133(P) or MATH136(P)

Students in this unit should read this unit outline carefully at the start of semester. It contains important information about the unit. If anything in it is unclear, please consult one of the teaching staff in the unit.

ABOUT THIS UNIT

Stat272, Probability, is a 3 credit point unit run by the Statistics Department in the Division of Economic and Financial Studies.

This unit is a mathematically based introduction to probability theory. Emphasis is placed on the theoretical development of the subject matter. Students should be mathematically competent, especially in the areas of integration, differentiation, and the summation of infinite series. Students who are not confident about their ability in these areas should consider enrolling in the more general unit, Risk and Chance. Topics covered include conditional probability, discrete and continuous random variables, transformations, convolutions, moments and moment generating functions, central limit theorem, sampling distributions, order statistics, bivariate and multivariate distributions.

TEACHING STAFF

Convenor: Professor Barry Quinn, Room C5C 466, phone 9850 6475, email bquinn@efs.mq.edu.au

Other teaching staff and times for consultation hours will be finalised at the end of Week 1, and the information posted on the Unit webpage.

CLASSES

The timetable for classes can be found on the University web site at:

<http://www.timetables.mq.edu.au/>

Lectures: You are required to attend 3 x 1 hour lectures each week, beginning in Week 1.

Tutorials: You are required to attend 1 x 1 hour tutorial each week, beginning in Week 2.

REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

The prescribed textbook is “**Mathematical Statistics with Applications**” by W Mendenhall, D Wackerly and R Scheaffer (Sixth Edition) - library call number QA276.M426. Students are expected to have access to a copy of this book throughout the semester. The text is also a textbook for STAT271.

The following books may be useful references:

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| ROSS, S. | A First Course in Probability (QA273.R83) |
| SCHEAFFER, R. L. | Introduction to Probability and Its Applications (QA273.S357) |
| SMITH, P. J. | Into Statistics (QA276.S615) |
| FREUND, J. E. | Mathematical Statistics (QA276.F692) |
| HOEL, P. | Introduction to Mathematical Statistics (QA276.H57) |
| HOGG, R. V. & TANIS, E.A. | Probability and Statistical Inference (QA273.H694) |
| LARSON, H. | Introduction to Probability Theory and Statistical Inference (QA273.L352) |
| SPIEGEL, M.R., SRINIVASAN, J. & SCHILLER, J.J. | Schaum's outline of theory and problems of probability and statistics (QA273.25.S64) |
| WALPOLE, R.E. & MYERS, R.H. | Probability and Statistics for Engineers and Scientists (TA340.W35) |
| HOGG, R. V. & CRAIG, A.T. | Introduction to Mathematical Statistics (QA276.H59) |

At least one copy of each of these is available in the Library, and extra copies may be available on the shelves for borrowing purposes.

It should be understood that there are variations in notation (and even in definition) from one reference book to another, and that *the lecture material alone defines recommended notation*.

Note that all lecture notes will be available in pdf form at the Unit web page.

UNIT WEB PAGE

The web page for this unit can be found at
<http://www.stat.mq.edu.au/units/stat272/index.htm>

Consult the web page frequently. You will find administrative updates, lecture notes, tutorials and assignments posted there.

LEARNING OUTCOMES

The Unit is an introduction to the mathematical foundations of the theory of probability, and thus provides the basic mathematical techniques needed for the theory of statistics. By the end of this Unit, students will be able to compute the moments of various discrete and continuous distributions, obtain the moment generating functions and distributions of sums of independent random variables, obtain the distributions of transformed random variables, and of compound random variables.

In addition to the discipline-based learning objectives, all academic programs at Macquarie seek to develop students' generic skills in a range of areas. One of the aims of this unit is that students develop problem-solving skills.

TEACHING AND LEARNING STRATEGY

Students will attend three one-hour lectures and one one-hour tutorial per week. The slides shown in lectures will be available at the website before the lecture is given, but note that corrections may be made after the lecture. Tutorial exercises will be set weekly and will usually be available on the web the week before the tutorial. Students are expected to have attempted **all** questions **before** the tutorial.

A plan of the topics to be covered is at the end of this document.

RELATIONSHIP BETWEEN ASSESSMENT AND LEARNING OUTCOMES

The marks from assignments will comprise 20% of the final assessment. The remaining 80% will come from the final examination. Satisfactory performance is required in both the assignments and the final examination.

Assignments Assignments are a major part of the learning process. There will be five assignments, due in weeks 3, 6, 8, 10 and 12. These will be included in the tutorial exercises and clearly specified as assignment questions. They must be completed on separate paper from the tutorial exercises for submission during the tutorial. On-time submission is **compulsory**. Late submission of assignments will not be accepted without a good reason. Failure to submit assignments may result in automatic exclusion from the unit in accordance with Bachelor Degree Rule 11(1).

Final Examination An electronic calculator and **one** A4 sheet of paper (written on one or both sides) may be taken in to the exam room. All material thereon must be in the student's own handwriting. The examination will test your knowledge and understanding of principles, and *not* your ability to substitute into rote-learned formulae. It follows that you need to undertake sufficient practice by doing exercises, in order to grasp the

principles of the subject and to become fluent at *problem solving*; it is *not* sufficient to believe that you will pass simply by quoting and mechanically applying formulae.

The University Examination period in First Half Year 2005 is from 15 June to 29 June. You are expected to present yourself for examination at the time and place designated in the University Examination Timetable. The timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of the examinations.
<http://www.timetables.mq.edu.au/exam>

The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consider applying for Special Consideration. Information about unavoidable disruption and the special consideration process is available at

<http://www.reg.mq.edu.au/Forms/APSCon.pdf>

Note the Division's policy regarding requests for special consideration for examinations and the granting of supplementary examinations on the website:

http://www.efs.mq.edu.au/services/policies_consideration.htm . Please be aware that you will not be contacted to be advised that you have been granted a supplementary examination - you will need to consult the website for this information.

You are advised that 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.

PLAGIARISM

The University defines plagiarism in its rules: "Plagiarism involves using the work of another person and presenting it as one's own." Plagiarism is a serious breach of the University's rules and carries significant penalties. You must read the University's practices and procedures on plagiarism. These can be found in the *Handbook of Undergraduate Studies* or on the web at: <http://www.student.mq.edu.au/plagiarism/>

The policies and procedures explain what plagiarism is, how to avoid it, the procedures that will be taken in cases of suspected plagiarism, and the penalties if you are found guilty. Penalties may include a deduction of marks, failure in the unit, and/or referral to the University Discipline Committee.

UNIVERSITY POLICY ON GRADING

Academic Senate has a set of guidelines on the distribution of grades across the range from fail to high distinction. Your final result will include one of these grades plus a standardised numerical grade (SNG).

On occasion your raw mark for a unit (i.e., the total of your marks for each assessment item) may not be the same as the SNG which you receive. Under the Senate guidelines, results may be scaled to ensure that there is a degree of comparability across the university, so that units with the same past performances of their students should achieve similar results.

It is important that you realise that the policy does not require that a minimum number of students are to be failed in any unit. In fact it does something like the opposite, in requiring examiners to explain their actions if more than 20% of students fail in a unit.

The process of scaling does not change the order of marks among students. A student who receives a higher raw mark than another will also receive a higher final scaled mark.

For an explanation of the policy see

<http://www.mq.edu.au/senate/MQUonly/Issues/Guidelines2003.doc> or

<http://www.mq.edu.au/senate/MQUonly/Issues/detailedguidelines.doc>.

STUDENT SUPPORT SERVICES

Macquarie University provides a range of Academic Student Support Services. Details of these services can accessed at <http://www.student.mq.edu.au>.

STAT272 - PROBABILITY - FIRST SEMESTER 2005**UNIT SYLLABUS**

TOPIC	MATERIAL COVERED
1	Sample space, events. Axioms of probability, conditional probability. Bayes Theorem. Random variables and probability distributions.
2	Discrete Distributions and their applications (Bernoulli, geometric, negative binomial, binomial, hypergeometric, multinomial). The Poisson process and the Poisson distribution.
3	Continuous random variables and distributions with applications (uniform, exponential, triangular, normal, gamma, beta etc.). Discrete and continuous cumulative distribution functions.
4	Expected values (discrete and continuous) and properties of the expectation operator. Measures of variation.
5	Moments: raw and central. Interpretation of moments (skewness, kurtosis etc.).
6	Sums of independent random variables. Discrete and continuous convolutions with applications.
7	Distribution of functions (monotonic and non-monotonic) of continuous random variables. Transformation of a continuous random variable to one with a uniform distribution, with applications to simulation.
8	Probability generating functions and moment generating functions (raw and central) with properties and applications. The moment generating function of a sum of independent random variables. The uniqueness theorem. Characteristic functions.
9	Tchebysheff's inequality. The central limit theorem and applications.
10	Multivariate (particularly bivariate) random variable theory (continuous and discrete). Marginal and conditional distributions and expectations. Covariance and correlation. Compound distributions.
11	Order statistics, specifically the distributions of the minimum, maximum and median.