

MATH 104: PROBABILITY

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www.maths.lancs.ac.uk/departments/study/years/first/modules/math104

Aims

Probability is the language in which to study chance phenomena, and whose concepts are fundamental to many diverse fields including physics, economics and statistics. This course gives an elementary introduction to probability theory. The course introduces the ideas associated with the axioms of probability, conditional probability, independence, discrete and continuous random variables, distributions, expectation and probability models.

Measurable objectives

At the end of the module students should be able to

- understand sample space, outcomes, events and independence and relate the ideas to real situations;
- use combinatorial arguments for permutations and combinations;
- interpret and use the axioms and laws of probability;
- understand conditional probability and use Bayes' theorem
- interpret and manipulate probability mass functions;
- be able to model random variables using the Bernoulli, binomial, geometric and Poisson distributions;
- obtain the mean and variance of these distributions;
- interpret and manipulate probability density functions for continuous distributions;
- have seen the uniform, normal and exponential distributions and their mean and variances

Organisation and Assessment

- **Timetable:** The module runs for five weeks, weeks 16-20, with four lectures a week, and a weekly workshop/tutorial.

	mon	tues	wed	thur	fri
9-10				104 Cavendish LT	
10-11		104 Cavendish LT	office		WS Man School LT7
11-12			104 Cavendish LT		104 Frankland LT
12-1					
1-2				WS Biology LT	
2-3					
3-4					
4-5				WS Furness LT1	
5-6					

- **Office hour:** Fylde B4b at Wed 10.00.
- **Workshops:** begin in **Week 16**. A register is taken. Marked course work is returned, with solutions. Solutions to workshop questions are available at the end of the workshop.
- **Exercise questions:** All questions for the workshop (WS) and for assessed course work (CW) are contained in the booklet.
- **Lecture Notes:** This booklet is in the style of notes with gaps which are only filled in in the lectures. Course work solutions are only distributed at a lecture. Attendance is strongly advised. [Copies of the lecture transparencies are available at the web site a week later.]
- **Assessment:** The assessment for this course is the same as the other MATH 100 modules: 10% course work, 30% test (in the last week of lectures), and 60% final exam.
- **Coursework submission:** Coursework is to be handed in to your tutor's pigeonhole by **Wednesday 2.00pm**. Work handed in after this point is not marked as we aim to return the marked scripts within 24 hours.
- **Course work marking:** Please hand in fair copy that makes it easy to read and mark. We give out detailed solutions, so marked scripts only provide a mark total, indicate where a solution first goes wrong, and may add a little encouragement. We expect you to collect the marked work **in person** at the Workshop.
- **Test:** The test will take place on **Friday, week 20**.
- Your participation in the course, in class experiments, in contributing to workshops and responses to feedback questionnaires, is gratefully received.

Lab100 experiments for Part I students

This module is supported by computer laboratory sessions from Lab100. We use the software package **R**.

Experiments are time consuming and it is easier to repeat experiments a computer. Critical to these experiments is the concept of **random numbers**. The computer generates **pseudo random numbers** between 0 and 1, with each having the same chance of occurrence. We use these in a range of experiments.

The primary role of Lab100 for this course is: to gain a feeling for random variables how they are generated, and how they vary. To clarify and illustrate theoretical concepts of probability.

Lab100 for Math104 students: There are 5 lab sessions, each with a sheet to work through and a quiz, which forms part of the assessment of the course.

Use **google** to find the Lab100 Home Page. Details of free software useful for courses in the Maths and Stats Department are given on the Lab100 Home Page. You need to download **R**.

Additional Reading:

Apart from these notes students might look at

Ross, S. (2000) **A First Course in Probability**. 5th Edition. Macmillan: New York.

Grimmett, G., and Welsh, D. (1986) *Probability: An Introduction*. Oxford University Press.

Ghahramani, S. (2000) *Fundamentals of Probability*. Prentice-Hall.

Isaac, R. (1995) *The Pleasures of Probability*. Springer.

Any basic book on probability should be helpful. Try the section AYD in the library. Surf the net.