Math 104: Introduction to Probability, Fall 2014, Section 04

Prerequisites: Intermediate Algebra at the level of Rutgers Math 026 or 027, or equivalent.
A real mastery of elementary algebra and other basic skills is crucial to success in this course.

Math 104 is not intended for majors in STEM fields. Credit will not be granted to those who have already taken, or are concurrently taking, a higher level probability course (including but not limited to 01:640:477, 01:198:206, 01:960:381, 14:332:226, and 14:540:210).

Course description: Math 104 gives a mathematical yet accessible and concrete introduction to probability. Most of the course is devoted to understanding how probability works, and how it is applied in a number of areas, including medical testing and financial decision making. The end of the course introduces some statistics and applications. You will never be left wondering, "What is this good for? What does this have to do with real life?"

Learning Goals: After taking this course, a student will be able to

- understand the difference between theoretical and experimental probability
- understand expected value as it arises in a variety of real-life contexts, and understand its role in decision making
- recognize and avoid the gambler's fallacy
- use Venn diagrams to compute probabilities of events
- understand the relevance of and rationale behind probability simulations, and carry them out
- understand the difference between odds and probability, and convert between them
- understand independent and dependent events, recognize the difference between them, and carry out relevant computations
- understand conditional and unconditional probabilities, recognize the difference between them, and carry out relevant computations
- recognize and avoid the base rate fallacy
- use the binomial probability model to compute probabilities in a range of settings
- have a concrete understanding of the rationale behind Pascal's triangle, the meaning of its entries, and the reasons why they appear throughout this subject
- work with z-scores and probability tables for the standard normal distribution, to compute probabilities of events arising from the normal distribution
- interpret a broad range of real life settings to which probability is relevant
- resist the temptation to go to a casino, or gamble online, or even play the lottery

SAS Core Curriculum learning goals:
Math 104 fulfills both the Quantitative Information (QQ) and Mathematical or Formal Reasoning (QR) learning goals of the SAS Core Curriculum:
QQ: Formulate, evaluate, and communicate conclusions and inferences from quantitative information.
QR: Apply effective and efficient mathematical or other formal processes to reason and to solve problems.

Textbook: *Finite Mathematics: An Applied Approach*, by Michael Sullivan, 11th Edition customized for Rutgers University, available at the bookstores. The customized edition contains only the chapters which are used in the course.
The 10th Edition is no longer used in this course; you really do need the 11th. WileyPlus is no longer used in this course. No solution manual is required.
The custom edition of the textbook can also be bought as an e-book, at https://store.vitalsource.com/show/9781119947172

Meeting times: Monday/Wednesday 5:00pm – 6:20pm in Tillet 105.

Instructor: Prof. Michael Weingart

Teaching Assistant: Michael Weingart. If you have any hesitation about asking the instructor a question, please feel

absolutely free to ask the TA instead.

Course coordinator: Prof. Michael Weingart. Feel free to share any thoughts about the course in general with the coordinator.

Email: weingart@math.rutgers.edu.

Office hours:

- Mondays 11:15am-12:45pm in the SAC on George Street
- Wednesdays 3:20pm-4:40pm in the Livingston Learning Center (in Tillett 111)
- or by appointment in Hill Center 209 (on Busch campus, and don't be shy about asking).
- There are de facto ongoing "virtual office hours" in the Sakai chat room. This means that you can post questions to the chat room at any time, and receive a response within 24 hours.
- There will also be an opportunity to ask questions right after each class meeting, in (or just outside of) the classroom.

Recurring theme: There is ample opportunity for you to ask questions and get help, and you are warmly invited to take advantage of it. Truly.

Calculator: You will need a scientific calculator for the homework. Calculators will not be permitted on exams.

Online resources: This course uses Sakai, accessible at sakai.rutgers.edu; login with your ordinary Rutgers NetID and password. Use Sakai to view announcements, submit homework via the Assignments feature, view solutions to homework problems via Resources, view your grades via the Gradebook, and participate in online discussions about the subject matter of the course in the Chat Room.

Academic Integrity: All Rutgers students are expected to be familiar with and abide by the academic integrity policy (http://academicintegrity.rutgers.edu/policy-on-academic-integrity). Violations of this policy are taken very seriously. During exams, cell phones, tablets, laptops and any other wifi or cellular capable devices must be turned off (not just silenced), and completely put away; **having a cell phone, tablet, or laptop visible during the exam will automatically be reported as an academic integrity violation, with a minimum penalty of receiving a 0 on the exam.** Moreover, during an exam, if you leave the room you must turn in your exam paper, and will not be able to return to continue working on it.

Homework: There will be frequent homework assignments posted in the Assignments area of Sakai. Due dates will be indicated on Sakai, but homework will typically be due on Wednesday evenings. Since the solutions to each homework assignment will be posted in the Resources section of Sakai shortly after the assignment is due, **late homework will not be accepted**. The lowest two homework scores will be dropped from the course grade computation.

All written work must be submitted online via the Assignments area of Sakai; it may not under any circumstances be submitted on paper, nor by email. To access Sakai, be sure that you have an active email account and know your NetID and password. If you upload a file, it must be in one of the formats .doc, .docx, .pdf, or .jpg. It is entirely your responsibility to make certain that the file you upload has the appearance you intend; please check this by opening the file after you have uploaded it, and see that it does open, that the image is right side up and generally readable, etc. If you ever have technical difficulties with Sakai, especially in uploading homework, please contact the excellent and very responsive Sakai help desk at sakai@rutgers.edu.

Doing the homework is crucial to learning the subject thoroughly, and the system of electronic submission makes it possible for you to get feedback quickly on whether you have done the homework correctly.
You are permitted, and in fact encouraged, to work together on homework problems, but **all written work which you submit must ultimately be your own.** Submitting someone else's work as if it were your own violates the academic integrity policy.

Quizzes: There will be frequent unannounced quizzes. At least one, but at most two quiz scores will be dropped from the course grade computation.

Exams: There will be two midterm exams and a comprehensive, cumulative final exam.
Missing an exam is a serious matter, and should only occur as a result of a genuine, verifiable emergency situation. "Verifiable" means that there should be a doctor's note, notice of court appearance, etc. indicating that you were unable to

attend at the time of the exam. If circumstances beyond your control prevent you from attending an exam, it is important that you contact the instructor as quickly as possible.

Date and time of the final exam: Tuesday December 16, from 8am-11am.

Grading: The overall course grade will be based on the results of the exams, written homework, and quizzes given in class, according to the following scheme:

Homework and quizzes	20%
2 Midterms, in total	40%
Final Exam	40%

Attendance, and the classroom setting: You are expected to attend all class meetings, whose content will go far beyond a mere rehashing of the textbook. If you entertain the notion that you can succeed in the course by learning the material on your own, please think again.
All students are expected to bring a positive attitude to the classroom, and to respect the learning environment. This means, at a minimum, that no student will disrupt the learning environment, even in small ways, which includes sending or receiving text messages, or surfing the internet, or tweeting, or talking to other students about anything unrelated to the subject matter at hand.

Caution: The information in this syllabus is subject to change, as announced in class or via email/Sakai. No major changes are anticipated, but you are expected to attend class and check email regularly.

Extra help: If you are having difficulty, please take advantage of the opportunity to visit office hours. Do not hesitate to ask questions by email, or in the Sakai Chat Room. The Rutgers Learning Centers also provide drop-in, free tutoring for Math 104, according to a schedule accessible at lrc.rutgers.edu/tutoring.shtml.

A few friendly words of advice:

- Never fall behind in a math course!!!!! The ideas we will discuss need time to sink in, and are very difficult to learn quickly right before an exam, so it is important to clear up your confusions sooner rather than later.
- An excellent way to improve your understanding of the subject is to study and work on homework together with classmates. Explaining mathematical ideas to others is often the most effective way to sort out your own confusions and clarify your understanding; you don't know just what it is that you don't know until you try explaining it to someone else.
- You are also warmly invited to ask questions in class, which students are far too hesitant to do in math courses, or in office hours, or by email, or in the Sakai Chat Room. **I very much want you to succeed in this course.**

Schedule of topics:

week 1	Course introduction and overview; intuitions and definition of probability; experiments, outcomes and events; events as sets of outcomes; equally likely outcomes; experimental vs. theoretical probability; properties of probability
week 2	Unions and intersections of events; using Venn diagrams to compute probabilities; addition rule of probability
week 3	Using tree diagrams to enumerate sample spaces; multiplication principle of counting; Pascal's triangle and histograms
week 4	Expected value, with many examples; notion of a fair game; decision making
week 5	catch-up, review, and midterm exam #1
week 6	More examples of expected value; odds versus probability; Monty Hall problem; introduction to conditional probability
week 7	Applications of conditional probability; false positives; the prosecutor's fallacy

week 8	Tree diagrams and Bayes' theorem; independent events
week 9	The binomial probability model; new examples of expected value
week 10	Applications of the binomial probability model
week 11	catch-up, review, and midterm exam #2
week 12	Simpson's paradox; transition from the binomial model to the normal distribution; mean and standard deviation
week 13	Normal distribution, with many examples and applications
week 14	catch-up and course review
	cumulative final exam