

# MA/SC 381 Fall 2023

## Probability

MWF 11:00-11:50AM (Lovejoy 303)

**Professor:** Evan Randles  
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**Office:** Davis Science Center 209  
**Office Hours:** Monday 2:00-3:00PM, Tuesday 2:00-4:00PM,  
Friday 1:00-2:00PM, & by appointment  
**Course Website:** <http://personal.colby.edu/~erandles/M381.html>  
**Personal Website:** <http://personal.colby.edu/~erandles/>

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(TA Office Hours: Monday 6-8PM and Tuesday 5-6PM)

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*“Probability is expectation founded upon partial knowledge. A perfect acquaintance with all the circumstances affecting the occurrence of an event would change expectation into certainty, and leave neither room nor demand for a theory of probabilities.”* – George Boole

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**Course Description:** This course is a mathematical introduction to probability theory, the foundation for commonly used inferential statistical techniques (covered in Statistics 482). Students will learn the basic theorems of probability and computational techniques for finding probabilities associated with stochastic processes. Topics include axiomatic foundations, combinatorics, random variables, discrete and continuous probability distributions, special probability distributions, independence, conditional and marginal probability distributions, properties of expectations, moment generating functions, sampling distributions, weak and strong laws of large numbers, and the central limit theorem.

**Prerequisites:** Mathematics 160 (formerly, 122); or Mathematics 135 and 165 (formerly, 161 and 162). Mathematics 274 is recommended.

**Textbook:** [My Course Notes](#)

You are expected to read the course materials, including the course notes, carefully, thoroughly and – ideally – before you come to class. As you know from your previous mathematics courses, reading a mathematics textbook means to read with a pencil/pen in hand and work out all details carefully. When creating material for this course (the course notes, homework, exams, etc.), I like to draw from many different sources. In particular, I often consult the texts *Elementary Probability Theory*

by K. L. Chung, *Probability and Random Processes* by G. Grimmett and D. Stirzaker; *Introduction to Probability and Its Applications* by R. Scheaffer; *Introduction to Probability* by D. Bertsekas and J. Tsitsiklis; and *Reasoning About Luck* by V. Ambegaokar. While you are not required to obtain these texts, you may want to take a look at them, especially if you plan to continue your studies of probability after this course.

**Grading:** Your grade will be calculated as follows:

Class participation:	5%
Weekly homework assignments:	25%
Minimum of Midterms 1 & 2:	20%
Maximum if Midterms 1 & 2:	25%
Final Exam:	25%

**Exams:** This course will have two midterms and one final exam. The exams will be at the following dates, times, and locations:

<b>Midterm 1</b>	<b>Wednesday, October 4th 7:00-9:00PM</b>	Miller 008
<b>Midterm 2</b>	<b>Wednesday, November 15th, 7:00-9:00PM</b>	Olin 001
<b>Final Exam</b>	<b>(TBA)</b>	

It is crucial that you reserve these time slots for these exams. In the event that you are unable to attend a midterm exam, you must let me know at least **two weeks** prior to the exam date.

**Homework:** Homework is the most important part of this course. It is where you will grapple with new ideas, come up with creative solutions and communicate your thoughts and understanding to others. Consequently, it is crucial that you take homework very seriously. You should start homework early and work diligently. If you are having substantial difficulty with a particular exercise, please come talk to me during office hours. I am here to help! You are permitted and encouraged to discuss homework with your classmates, however, when it comes time to write up your solutions, you are required to do so independently and away from your peers (in another room, preferably). You are also permitted to consult other textbooks and, in this case, please give full details (beyond what's in our course notes). If you work with peers or consult material outside the textbook, you are required to cite your sources (including naming the peers with whom you worked); failure to do so is a matter of academic dishonesty and will result in grade penalties and/or reports of academic negligence/dishonesty. Your solutions should communicate your individual process and understanding of the material. What you turn in must be your own.

For your homework write-ups, I expect your solutions to be written out correctly and presented in good mathematical prose. Your grade will depend on the correctness of your solutions and the quality of your writing. This means that your writing should follow a coherent logical structure which makes use of complete sentences (whenever possible) and follows standard rules of grammar. Please do not submit solutions containing incoherent and unstructured calculations. You should be proud of the material you turn in!

*Homework Structure and Schedule:* Assignments will be posted to the course website and are due at 10:00AM on Wednesdays in the appropriate box outside my office door (Davis209A) It is crucial to keep up with the homework in this course. Therefore, short of the circumstances discussed in the attendance policy above, late homework will not be accepted. I will drop your lowest homework

score on the condition that you attend one Mathematics/Statistics department colloquium and write a short (one paragraph) summary.

*Homework Policies:*

1. All write-ups are to be submitted in hard copy. They should be single-sided with no more than one problem per page, i.e., if a homework assignment has 5 problems, you should turn in at least 5 pieces of paper.
2. Each paper you turn in should have your name and the due date printed clearly at the top.
3. Your write-ups should be paper-clipped. You should staple all papers corresponding to a single exercise together, but please paper-clip (not staple) the group of exercises together. It is your responsibility to make sure that your homework is complete and all pages are accounted for.

**Attendance and Class Participation:** You are required to attend each class session. This means that you need to be on time to class, seated, and ready to learn (take notes, participate, discuss, and engage). To learn mathematics, it is essential to discuss it with others and ask questions. Thus, you will be required to participate in class discussion and you will frequently be called on during lecture. It is for this reason that your on-time attendance is required.

With this being said, I also know that things come up that are outside of your control. To accommodate this, you are allowed 4 ‘free passes’ this semester that can be used for missing class, arriving late, or leaving early. Absence for religious reasons or for official Colby activities does not count as using a free pass as long as you communicate with me clearly beforehand. Using more than your 4 free passes will result in a reduction of final course grade.

**Office Hours:** You are strongly encouraged to attend office hours and do so regularly. Office hours are the perfect venue for asking questions, getting help, and having real one-on-one time with me. For my office hours to be most beneficial to you and fair to your peers, my office-hour policies are as follows:

- If you are attending office hours to get help with a homework problem, you must first have spent a considerable amount of time ( $\geq 30$  minutes) thinking about/attempting to solve the problem. In particular, you must have parsed through the definitions (e.g., know the vocabulary), compared the problem against what we’ve done in class and similar examples from the course notes, and made an earnest attempt at solving the problem and be prepared to show me your attempt.
- To be most effective in helping students with homework problems, I will help students individually and so please be prepared to wait your turn. If we’re talking about homework problems, you are not permitted to take notes (or pictures) of any kind.
- For all other questions about the course (including general questions on the material), I’m very happy to talk to groups of students and students should feel free to take notes at these times.

*Open Door Policy:* I maintain an “open door policy.” This means that, if you find my (inner) office door open and I’m inside, I am likely available to chat and help. In that case, please knock on my door and ask if I am available.

**My Email Policy:** I love talking about mathematics and I always prefer to do it in person. For this reason, I like to, whenever possible, reserve email for logistical things. However, when you are stuck and cannot come see me in person, please feel free to email me. I am here to help!

As my life is busy and I have many responsibilities, I usually only check and respond to email once per day and sometimes not at all on weekends. For this reason, I try to uphold the following 24-48 hour rule: If you send an email Sunday through Thursday, I will do my best to respond within 24 hours. If you send an email on Friday or Saturday, I will do my best to respond within 48 hours. If I do not respond within these windows, feel free to email me again as I may have missed it.

**Academic Integrity:** Honesty, integrity, and personal responsibility are cornerstones of a Colby education and provide the foundation for scholarly inquiry, intellectual discourse, and an open and welcoming campus community. These values are articulated in the Colby Affirmation and are central to this course. You are expected to demonstrate academic honesty in all aspects of this course. If you are clear about course expectations, give credit to those whose work you rely on, and submit your best work, you are highly unlikely to commit an act of academic dishonesty.

Academic dishonesty includes, but is not limited to: violating clearly stated rules for taking an exam or completing homework; plagiarism (including material from sources without a citation and quotation marks around any borrowed words); claiming another’s work or a modification of another’s work as one’s own; buying or attempting to buy papers or projects for a course; fabricating information or citations; knowingly assisting others in acts of academic dishonesty; misrepresentations to faculty within the context of a course; and submitting the same work, including an essay that you wrote, in more than one course without the permission of the instructors.

Academic dishonesty is a serious offense against the college. Sanctions for academic dishonesty are assigned by an academic review board and may include failure on the assignment, failure in the course, or suspension or expulsion from the College.

For more on recognizing and avoiding plagiarism, see the library guide at the following website: [libguides.colby.edu/avoidingplagiarism](http://libguides.colby.edu/avoidingplagiarism)

### *The Colby Affirmation*

Colby College is a community dedicated to learning and committed to the growth and well-being of all its members.

As a community devoted to intellectual growth, we value academic integrity. We agree to take ownership of our academic work, to submit only work that is our own, to fully acknowledge the research and ideas of others in our work, and to abide by the instructions and regulations governing academic work established by the faculty.

As a community built on respect for ourselves, each other, and our physical environment, we recognize the diversity of people that have gathered here and that genuine inclusivity requires active,

honest, and compassionate engagement with one another. We agree to respect each other, to honor community expectations, and to comply with college policies.

As a member of this community, I pledge to hold myself and others accountable to these values.