

# Mathematics 101, Section 1 – Spring 2011

## Reasoning with Data: Elementary Applied Statistics

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**Office Hrs:** Mon, Wed, Thurs 12:30pm – 1:30pm  
and at other times to be determined

**Course web site:** <http://math.rwinters.com/101>      **TA/grader:** Marguerite Sulmont

**Text:** David S. Moore and George P. McCabe, *Introduction to the Practice of Statistics, 5th ed.*, Freeman, 2006. The ISBN is 0-7167-6400-8. There are earlier editions and a newer edition that present similar information, but they will not have the same homework exercises and examples. All assigned homework will be made available as printable PDF documents on the course website. The text comes with a CD containing data for all the examples and homework exercises, but all data relevant to the assigned homework will also be available at the course website. A limited number of copies of the text will be on reserve at the Science Library.

**Description:** This course focuses on understanding how statistics are used and misused in a variety of fields, including the social sciences, medicine, and the physical sciences. It is intended to be accessible to students who have not yet had calculus and to satisfy the Quantitative Reasoning Overlay Requirement. **If you have taken Math 205 or the equivalent, then you may not take 101 except by permission of the instructor. Math 220 is the more appropriate choice in this case and also satisfies this requirement.** You may not take Math 101 if you have also taken or are taking Math 101Z, POL 199, QR 180, ECON 103/SOC 190, or PSYC 205.

Statistical concepts and questions are all around us. For example:

- The news media regularly conduct polls on national and local issues, and on political candidates. Often only a few hundred people are polled. How reliable are the results of these polls?
- A drug manufacturer has been testing a new product to combat the effects of stroke. The company reports that 52% of the subjects fared better after taking the drug. Is this enough evidence to conclude that the drug is effective, or is more information needed to analyze the drug's effectiveness?
- Some SAT and GRE prep courses advertise that they guarantee to improve your score. But scores tend to improve if you take the test even without a prep course. How can you determine if it is worthwhile to take a prep course?
- Women who are HIV-positive may give birth to HIV-positive babies. Would giving HIV tests to all men and women who apply for marriage licenses be an effective way of reducing the rate at which babies are born with HIV?

After taking this course, you should be able to answer questions like these and follow and analyze statistical arguments about data that you find in courses or in the media (i.e., be “statistically literate”). You should be able to understand where the fundamental formulas and tests of statistics come from and what they mean. You should be able to apply basic statistical tests that are common to several disciplines, and be prepared to learn any additional statistical methods you will need for specific courses in the future.

You will carry out simple computations in the course by hand or with a calculator, and more involved ones with computer software. There will be ample opportunities to help you learn to use the software for calculations and to visualize the basic ideas of statistics and probability. There will also be a Final Project in which you will be collecting and interpreting your own data.

**Homework assignments**, solutions, data files, and course supplements will be distributed electronically and not on paper. All course materials will be posted or linked on the course website, so it's a good idea to bookmark it. A Sakai conference may also be made available, if desired, for the purpose of discussion and collaboration among students in the course.

As in any math course, the best way to learn the material is to participate in class and to do the assignments regularly. I encourage you to work together, but what you hand in should be your own calculations and in your own words. **If you're not sure what collaboration is permissible, please check with me.**

Another resource for you is the **Math Help Room** (SCI 362). If you need help with the concepts or techniques of the course, if you're stuck on the homework, etc., you can go to the Help Room and the teaching assistants (TA's) there. The Help Room is open Sunday through Thursday evening from 7pm to 9pm. Our Math 101 TA (Marguerite Sulmont) is there on Monday evenings and will know the most about your assignment. The other TA's may also be able to help you depending on the courses they've taken.

**If you need additional help**, please be sure to see me during office hours, or else talk to me after class to make an appointment. The best way to contact me is by email.

One key to doing well is to read the textbook; don't just use it for finding examples that are similar to the homework questions. If you read the text, it will give you another way to look at the concepts of the course as well help you do the homework and prepare for the exams. You can also borrow other books that explain statistics in different ways. Some are on the shelves just outside the Help Room and others are in the Science Library. You may also find the *ActivStats* CD to be a helpful guide to many topics in the course.

**Required Software:** *Microsoft Excel* or equivalent spreadsheet software, preferably with the Data Analysis Toolpak. Different versions of Excel may require more effort in getting the software to do what we'll need for this course. Some "Tips & Tricks" will be provided on the course website as needed. You should familiarize yourself with some of the statistical functions built into Excel (which is widely available on college computers if you don't have it).

You will occasionally need a calculator that can compute square roots in addition to all of the basic algebraic operations.

**Optional Software:** *ActivStats*, Pearson/Addison-Wesley. The main tool we'll use from *ActivStats* is the **DDXL add-in for Excel** which can be installed and used even if you choose not to use the rest of *ActivStats*. (Note: *ActivStats* may not work on the most recent versions of Excel. Older versions are preferable.) Use of the *ActivStats* software is not required, but it provides a guided walk through much of what you'll need to know for this course and does so in a very accessible way. If you are familiar with other statistical tools, by all means use them.

**Course requirements** (this may be adjusted slightly):

**60% 3 hour exams** – Your lowest exam grade will only count half as much as the others.

**20% Final project** – Project to be done working in small groups. You will choose a question to investigate, gather the necessary data, analyze the data using computer software, and write a paper describing your conclusions. The groups will present their work in oral reports to the whole class. There is no Final Exam.

**20% Homework** – This will include exercises from the text and the use of Excel spreadsheets, data analysis tools, and data files either posted on the course website or downloaded from public sites. It is essential that you do all the homework assignments and turn them in even if your work is imperfect.

**A word of advice:** The material for the first exam is less technical than what comes later, and students are often lulled into a false sense of security by it. You should be aware that starting at around Chapter 4 or 5 of the text, the course may require more effort.

Statistics is a cumulative subject, and it is difficult to absorb lots of math in a short period. If you fall behind it will be difficult to catch up and do well. I try to set up rules that will encourage learning, and that means being somewhat strict about deadlines.

**You will be expected to hand in your work on time.** Late homework will not generally be accepted, except in unusual circumstances and always with advance notice. Extensions for the project or exams may be given only if permission is requested before the due date, or for unusual circumstances beyond your control. However, please don't hesitate to talk to me if you believe your circumstances merit an extension. Please let me know if you need special arrangements with any aspect of the course because of religious observances or disabilities.

The course will be based on the following chapters in the text. Specific reading and homework assignments will be posted in the **Calendar** on the course website.

<b>Chapter Title</b>	<b>Topics discussed</b>	<b>Chapter</b>
Looking at Data: Distributions	visualizing data, summarizing data numerically, normal curve	Chapter 1
Looking at Data: Relationships	comparing data visually, correlation, regression, causation	Chapter 2
Producing Data	experimental design, sampling	Chapter 3
Probability: The Study of Randomness	probability models, random variables	Chapter 4
Sampling Distributions	counts, proportions, binomial distribution, central limit theorem	Chapter 5
Introduction to Inference	confidence intervals, significance testing, abuse of tests	Chapter 6
Inference for Distributions	inference for the mean, comparing two means	Chapter 7
Inference for Proportions	inference for a single proportion, comparing two proportions	Chapter 8
Other topics as time permits		