

## Math 130: Introductory Statistics

Spring 2009, MRC 318, MWF 10:00-10:50 p.m.

Professor: Richard J Maresh, Associate Professor of Mathematics

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Office hours: MW 12-2, R 10-11, 1-2, or by appointment

Final Exam: Thursday, 7 May 2009, 9:50-11:50 a.m.

**Course Description:** An introductory course which deals with the organization and processing of various types of data, normal and binomial distributions, estimation theory, hypothesis testing, correlation and regression. Prerequisite: acceptable placement score (MATH 110, 130, 155 are all considered to be the same "level" of readiness) or grade of C or higher in Math 001.

**Text:** *Elementary Statistics (11<sup>th</sup> Edition)*, by Mario Triola (Pearson/Addison-Wesley, 2010)

### Core Abilities

This course qualifies as a general education course (G9) since it addresses the following core abilities:

- 1. Thinking:** Students engage in the process of inquiry and problem solving that involves both critical and creative thinking.
  - A. Reason deductively by learning general principles which are then applied to specific problems.
  - B. Reason inductively by studying examples, seeing the common characteristics, and broadening the solution to the generic case.
  - C. Learn to use the statistical process as one of the means of answering a question or supporting a position.This ability is assessed by evaluating performance on exams and quizzes where students use skills acquired to solve problems.
- 2. Life Value Skills:** Students analyze, evaluate and respond to ethical issues from an informed personal value system.
  - A. Learn of some classic examples of the misuse of statistics and its consequences.
  - B. Acquire an appreciation for the importance of honesty in the presentation of all (not just favorable) outcomes of statistical research.

This ability is assessed by evaluating performance on pertinent exam and quiz questions relating to the chapter covering misuse of statistics, and on the course project where the students will report the outcome of their project, regardless of the favorability of the results based on the data collected.

- 3. Communication Skills:** Students communicate orally and in writing in an appropriate manner both personally and professionally.
  - A. Read text and reference materials outside of class.
  - B. Observe examples and discusses questions and solutions in class.
  - C. Communicate solutions to statistical problems in writing on assignments, quizzes, exams, and course project in appropriate statistical format.

This ability will be assessed using a combination of evaluation of performance on exams, quizzes, oral in-class contributions, and the course project write-up.

### General Course Objectives:

This "consumer-oriented" course is designed to help students learn basic concepts in descriptive and inferential statistics, and introductory probability. Students demonstrate knowledge of these concepts by solving numerous assigned homework problems, and by providing written solutions to exam problems in accepted statistical format.

Introductory Statistics is a support course for a number of disciplines in the health and social science fields. We will look at how to organize and represent data (descriptive statistics) and how to test hypotheses and draw conclusions based on the data (inferential statistics). We will also focus on the theory behind the procedures, admittedly at an introductory level. Most of the actual computations will be performed by a calculator or a computer; the university has a site license for the statistical package SPSS, which is commonly used by researchers in the social sciences and in the health fields.

It is important to understand that there are some "statistics" courses which are basically "research methods" and which do not explore in nearly as much detail the essence of statistical methods. This course, however, carries a MATH prefix and in fact will satisfy your math competency requirement.

### Brief Content Outline:

1. Statistical Data – randomness, sampling
2. Descriptive Statistics – measures of center and variation, graphical representations

3. Probability
4. The Normal Distribution
5. Sampling Distributions, the Central Limit Theorem
6. Confidence Interval Estimates of population parameters
7. Hypothesis Testing
8. Linear Regression
9. Multinomial Experiments, Contingency Tables
10. Analysis of Variance

**Course Procedures:**

**Attendance:** I do not formally use attendance as part of the grading system, but I can assure you that regular attendance is very important to being successful in the course. I include a detailed schedule so that if you do have to miss a class you can keep up with the material, but it's not the same – you simply miss out on a key part of the learning process if you miss a class meeting. It is also important that when you are in class you need to actively engage in what we are doing; this means, for example, not spending class time checking e-mail or looking at facebook.

**Technology:** There are many tools for doing statistical work, but we will mainly use two of them. I prefer the TI-83/84 family of calculators for my own personal work at this introductory level of statistics. The calculator is extremely portable and is very easy to use, once you have learned the statistical procedures. The one drawback is that these calculators cost something like \$120, so unless you already have one or know someone who will lend you one, the cost might be an issue.

On the other hand, the university has purchased a site license for SPSS, a computer-based statistical package for the social sciences. This software is available on virtually every school computer in any of the labs, so there is no cost to you, although you do have to be on campus to use it (the portability issue). SPSS is a more powerful package than the calculator's functions, but this power also makes it more challenging to use. One final factor worth mentioning is that students who are majoring in the social sciences – psychology, sociology, social work – will find it useful to learn how to use SPSS because it is the tool of choice in those fields for doing statistical research. If you envision going to graduate school you might want to try to get comfortable with SPSS.

I do think it is better, from a pedagogical perspective, to use the calculator in first learning statistics because there is less to learn about the tool, but if you have reason to use SPSS then you probably should choose that tool for your work. On the whole, it really doesn't matter what tool you use – people used to learn statistics doing the computations by hand, of course – so I'm not going to insist that you use any specific technology. When we take exams I will allow you to use either of these technological tools, or none at all if that is your preference.

**Blackboard:** Because we meet three times per week I do not make extensive use of *Blackboard*, but I will use it for several things. I will store a copy of the syllabus there, under *Course Documents*. I will store the text publisher's power-point files there as well. I will make occasional announcements through *Blackboard*. I might also use it for old exams or notes on some topic. Finally, I will use it to make available your in-progress grade throughout the semester.

**Homework:** You will note that I have listed for each section about two-thirds of the odd problems (the answers to the odd problems are in the back of the book). It doesn't so much matter that you do exactly these problems, but it is of the utmost importance that you work many problems as we move through the material. Like most mathematics courses, this course is all about solving problems and you just can't learn how to do them unless you do them! If you come to an exam without having worked *LOTS OF* problems, chances are very good that you will not suddenly be able to do them on the exam. This is generally how people who fail this course do so – by not practicing enough.

If you were going to pay money to have someone teach you to play the piano, you would understand that without considerable practice you would not learn to play very well. Learning statistics is the same – I know the material and will do what I can to help you to understand it, but the point of the course is not for me to show you that I know this material – you yourself have to do the actual learning and it is in that time outside the classroom where that learning will take place.

My teaching style includes discussion and question-answering. You will only have questions to ask if you have put in the time trying to work the problems. Only then will you specifically know what you don't yet understand.

As a rule of thumb, university students should expect to put in about TWO HOURS of study outside the classroom for every hour in the classroom. I know many students do not do this, but if you want to be successful here you should try to map out something like 6 hours per week to study statistics.

**Academic Honesty:** Cheating will not be tolerated. Exam questions and problems will be open-ended rather than multiple-choice, so it is harder to get answers from your classmates, and I generally ask you to show your work to receive full credit on a problem, which again makes it harder to lift answers from another. If I detect cheating on an exam you will be given a score of ZERO for that exam – it’s not worth it to cheat, and it is also unethical. Because you sit so close together I will always use two versions of the exams to discourage cheating – the person next to you will have different problems so if you copy you will miss all the problems!

**Exams:** When you take exams you may use your technological tool of choice, either a calculator or SPSS, and you may also construct a 1-page (both sides OK) set of notes. You may also use the card from your text if you would like. For the comprehensive exam you may use the notes from all your previous exams. I usually encourage students to basically outline the material and to write down what you think will be useful to you.

**Getting Help:** The learning center makes tutoring help available, including drop-in math help (M 9-10, 2:30-3:30; T 9-10, 1:30-2:30; W 11-12, 2:30-3:30; R 11-12; F 10-11). If you seek tutoring help, make sure that you do not rely on it to the extent that you aren’t working problems on your own. The tutor won’t be at your side during an exam. Also feel free to come see me if you are having difficulty. Unfortunately, it is often only the strongest students who take advantage of the instructor’s office hours.

**Grading:** I generally use a typical scale: 90% for an A, 80% for a B, 70% for a C and 60% for a D. We will have 550 points of exams (4 unit exams and a final exam) during the semester, and some additional quizzes or problem sets along the way. In my courses, there is not such thing as “extra credit” – I think your grade should reflect how well you have demonstrated your understanding of the material by successfully working problems.

As a general rule your grade for the course will be computed by including the final exam at its face value. However, I will adjust your grade upward if your score on the final exam is higher than your overall average throughout the course – in this case you will receive as a grade what you earned on the final exam.

**Disability Statement:** If you are a person with a disability and require any auxiliary aids, services or other accommodations for this class, please see me and/or Jane Eddy, the campus ADA coordinator (Learning Center, 796-3194), within ten days to discuss your needs. I want to include taking exams in the learning center under this category; you will need a written request from Jane Eddy before I will allow you to take exams there.

**Disclaimer:** I reserve the right to make adjustments to the schedule and the syllabus in general as we move through the course. This is a new edition of the text and it may turn out that some changes may be necessary.

### Math 130: Spring 2009 Schedule

Jan 12	[1-2] Introduction, Statistical Thinking	p 9 # 1-12, 19-22, 23, 25
Jan 14	[1-3], [1-4] Types of Data, Critical Thinking	p 16 # 1-27 odd; p 23 # 1-25 odd
Jan 16	[1-5] Sample Data	p 34 # 1-25 odd
Jan 19	[2-2], [2-3] Frequency Distributions, Histograms	p 52 # 1-23 odd
Jan 21	[2-4], [2-5] Statistical Graphics, Bad Graphs	p 67 # 1-15 odd, 21; p 73 # 1-9 odd
Jan 23	[3-2] Measures of Center (Mean, Median, Mode)	p 94 # 1-21 odd
Jan 26	[3-3] Measures of Variation (Standard deviation)	p 109 # 1-21 odd
Jan 28	[3-4] Measures of Relative Standing (z-score, percentile)	p 126 # 1-27 odd
Jan 30	Review ...	
Feb 2	<b>EXAM #1</b> (Chapters 1-3)	
Feb 4	[4-2], [4.4] Basic Concepts of Probability	p 147 # 1-15 odd; p 167 # 1-17 odd
Feb 6	[5-2], [5.3] Random Variables, Binomial Probability	p 214 # 1-17 odd; p 225 # 1-31 odd
Feb 9	[5-4] Mean, Variance, Std Dev for Binomial Dist.	p 231 # 1-15 odd
Feb 11	[6-2] Normal Distribution	p 261 # 1-31 odd
Feb 13	[6-3] Applications of the Normal Distribution	p 271 # 1-21 odd

Feb 16	[6-5] Central Limit theorem	p 295 # 1-15 odd
Feb 18	[7-2] Confidence Interval for a Population Proportion	p 339 # 1-35 odd
Feb 20	[7-3], [7-4] Estimating a Population Mean	p 351 # 1-23 odd; p 365 # 1-19 odd

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Feb 23	[7-5] Estimating a Population Variance	p 377 # 1-19 odd
Feb 25	Review ...	
Feb 27	<b>EXAM #2</b> (Chapters 4-7)	

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***SPRING BREAK***

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Mar 9	[8-2] Basics of Hypothesis Testing	p 409 # 1-27 odd
Mar 11	[8-2], [8-3] Testing a Claim about a Proportion	p 420 # 1-19 odd
Mar 13	[8-3], [8-4] Testing a Claim about a Proportion	p 429 # 1-15 odd

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Mar 16	[8-4] Testing a Claim about a Mean ( $\sigma$ known)	p 423 # 25-31 odd; p 431 # 17-19 odd
Mar 18	[8-5] Testing a Claim about a Mean ( $\sigma$ unknown)	p 438 # 1-19 odd
Mar 20	[8-6] Testing a Claim about a Variance	p 447 # 1-13 odd

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Mar 23	[9-2] Inferences about Two Proportions	p 468 # 1-21 odd
Mar 25	[9-3] Inferences about Two Means – Independent Samples	p 482 # 1-13 odd
Mar 27	[9-4] Inferences from Matched Pairs (Dependent Samples)	p 493 # 1-15 odd

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Mar 30	[9-5] Comparing Variation in Two Samples	p 502 # 1-15 odd
Apr 1	Review ...	
Apr 3	<b>EXAM #3</b> (Chapters 8-9)	

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Apr 6	[10-2] Correlation	p 530 # 1-15 odd
Apr 8	[10-3] Regression	p 547 # 1-21 odd

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***EASTER BREAK***

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Apr 15	[10-4] Prediction Intervals	p 557 # 2,5,7
Apr 17	[11-2] Multinomial Experiments: Goodness-of-Fit	p 593 # 1-11 odd

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Apr 20	[11-3] Contingency Tables	p 606 # 1-13 odd
Apr 22	[12-2] One-way Analysis of Variance	p 639 # 1-13 odd
Apr 24	[12-3] Two-way Analysis of Variance	p 649 # 1-13 odd

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Apr 27	Review ...	
Apr 29	<b>EXAM #4</b> (Chapters 10-12)	
May 1	Review ...	

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**Comprehensive Final Exam, Thursday, 7 May 2009, 9:50 – 11:50 p.m. [150 points]**