MA 171 Introduction to Statistics Winter 2009

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Office hours: 2:00, on class days

By appointment: 11:30, 4:00 (other times possible)

Class days

Class will meet 4 days a week – Monday, Tuesday, Wednesday, Thursday.

Class website

Assignments, data sets, and other information pertaining to the course will often be posted on the class website, *http://mathlab.nmu.edu/~cpeterso/* or *http://mathlab.nmu.edu* (then select Cheryl Peterson's Page).

Prerequisites

Finite Mathematics (MA103); or College Algebra (MA104 or MA105); or equivalent.

Textbook

Fundamentals of Statistics, second edition, Michael Sullivan, III, Prentice Hall, 2008,
ISBN: 978-0-13-235939-9 (textbook and Minitab software), *or*
ISBN: 0-13-156987-2 or 978-013156987-4 (textbook only).

Minitab CD: The NMU Bookstore has the textbook bundled with Minitab statistical software (release 14 student edition), which we will be using. If you buy a book elsewhere without a Minitab CD, you can rent Minitab for the semester from minitab.com (details on next page).

CD to Accompany Textbook**:** The textbook comes with a CD containing

- Data sets for many of the problems in the book
- Additional chapters / sections, not printed in the book. We will use the Analysis of Variance (ANOVA) section
- Applets -- interactive statistics simulations and demos
- Case studies
- Statistical tables, formulas, summaries

Computer

A computer is necessary for the Minitab software that we will be using. We will frequently be using laptop computers in class. If you don't have a laptop, check with me about what to do.

For many things, a TI-84 or TI-83-Plus calculator could be used instead of a computer. The most basic statistical operations can be done on any graphing calculator. TI-Interactive and Microsoft Excel (which are provided on University-owned laptops) can also be used for some of the things we will be doing.

If you have a calculator , you may sometimes want to use it for basic arithmetic calculations while you are using your computer.

Statistical Software

You will need **Minitab** software.

The NMU Bookstore has Minitab (release 14 student version) bundled with the textbook.

If you buy a textbook alone elsewhere , you can rent Minitab (release 15) for 6 months for $29.99. The URL for renting Minitab is: http://minitab.com/education/semesterrental/.

Goals

Statistics is the science of using data to learn about populations and make decisions (in the face of uncertainty).

By the end of the course, you should be able to use data to make decisions. In particular, you should be able to

- State hypotheses to test
- Know good ways (& poor ways) to set up observational studies & experiments and to collect data by sampling
- Summarize & display data graphically & numerically
- Test a hypothesis using probability
- Estimate a population parameter with a confidence interval
- Understand the probabilities associated with sampling error

General information

There will be approximately three to five ‘major’ exams, including a final exam. There will also be assignments to be handed in. Some of these assignments will be done individually and some will be done in groups. There will be quizzes to provide feedback on how things are going.

Most of the grade will be based on the exams (probably about 80% or possibly more); the rest of the grade will be based on assignments and quizzes.

Final exam:

for 1:00 class: Wednesday, April 29, 12:00 - 1:50
for 3:00 class: Thursday, April 30, 2:00 - 3:50

Liberal studies requirement

This course satisfies the Formal Communication Studies requirement.
These courses are designed to introduce students to the ways in which information and ideas are expressed using a communication system other than English. Such courses should foster the student’s ability to conceptualize and communicate in an orderly, rational manner. Characteristics of a communication system include: 1) possession of a grammar; 2) operation from an established set of rules; 3) reasoning properties such as deduction, inference drawing and problem solving. This includes courses in languages and those in which the central focus of the course is on statistics, computers or formal logic.

Disability services

If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Disability Services Office by: coming into the office at 2001 C. B. Hedgcock; calling 227-1700; or e-mailing disserv@nmu.edu. Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines.

Brief Outline of the Course

A. How can we use statistics to make a decision ? : Preview

Example: A sample of 5 Brand X tires had an average lifespan of 60,000 miles, and a sample of 5 Brand Y tires had an average lifespan of 62,000 miles. Can we conclude that, on average, Brand Y tires last longer? If we took new samples, could the results be different? Perhaps even reversed? What if we had sampled 500 tires of each brand?

B. What is our data telling us? : Summarizing data numerically & graphically

Example: The lifespans for a sample of 500 Brand X tires were:

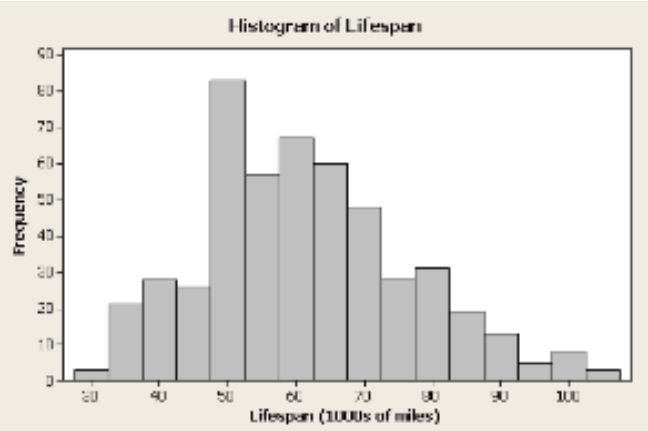
30,000 35,000 . . . 100,000 106,000 miles

We can summarize this data

numerically:

average = 60,000, minimum = 30,000, maximum = 106,000,
range of values = 76,000 miles,

graphically:



C. How do we tell if there a relationship between two things? Can we predict one from the other? : Correlation & regression

Example: The value of a car decreases as the age of the car increases. Does the value decrease in a systematic way, so that we can come up with a formula for predicting the value of a car, given its age?

D. If our "opponent's" theory is true, what are the chances of getting a sample like we got? : Probability distributions

1. Probability distributions
2. Sampling distributions & the Central Limit Theorem

Example: The manufacturers of Brand X tires claim that, on average, their tires last 70,000 miles. If that is true, what is the likelihood that a sample of 5 tires will have an average of only 60,000 miles? What is the likelihood that a sample of 500 tires will have an average of only 60,000 miles?

E. Is our theory really true? How confident can we be that we are right? : Hypothesis tests & Confidence intervals

1. Making decisions about population averages
2. Making decisions about population proportions
3. Comparing two treatments
4. Comparing many treatments --Analysis of variance

Example: If a sample of 5 Brand X tires has an average lifespan of 60,000 miles, can we conclude that the average for all Brand X tires is less than 70,000? Perhaps we can say something like: "we are 95% confident that the average for all Brand X tires is somewhere between 55,000 and 65,000 miles (60,000 miles, give or take 5000 miles"). In this case, we might safely conclude that the average is less than 70,000 miles.

F. How can we tell if two factors are related, or independent? : Chi-square analysis

Examples: Are smoking and heart disease related, or independent?
Are gender (male, female) and political preference (Democrat, Republican) related, or independent?