

MA 171 Introduction to Statistics

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Office hours:
3:00 (on days that class meets *)
By Appointment:
12:30 (other times may also be possible)

(* Class will meet 4 days a week -- the day off may vary from week to week, but will be announced in advance and posted on the class website.)

PREREQUISITES: MA103, MA104, MA105, or equivalent.

TEXT: *Fundamentals of Statistics*, Michael Sullivan, III, Prentice Hall

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

The NMU Bookstore sells the textbook bundled with a Student Study Pack. The Student Study Pack is included free of charge and contains

- Student Solutions Manual
- Set of 4 Video CD's, covering each section of the book
- CD containing Technology Manuals for 3 types of statistical software: MiniTab, TI-83 calculator, and Excel. These use actual problems and examples from the book, to show how to use the statistical software. (Also available on paper, see below)
- CD containing MiniTab, Student Release 14 (statistical software)

The textbook also has a website, www.prenhall.com/sullivanstats, which includes

- Quick review questions to prepare for each chapter
- "Statlets" -- interactive statistics simulations and demos
- Power Point slides covering the important points for each section of the book, with space for you to add your own notes
- Case studies
- Statistical tables, formulas, summaries
- Practice quizzes to use at the end of each chapter

Optional -- The bookstore also has a printed paper version of the MiniTab Technology Manual (printed versions of the TI-83 and Excel Manuals are available on the Prentice Hall website, www.prenhall.com).

Note -- When you download the MiniTab software, you will also get "Meet MiniTab", an electronic manual explaining some features of MiniTab.

COMPUTER:

A computer is necessary for the MiniTab software that we will be using. 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.

STATISTICAL SOFTWARE:

MiniTab 14 (professional version *and/or* student version)

- **MiniTab 14 (the full professional version)** will be supplied by the university, for university-owned laptops.

This is a “keyed” version, meaning that you have to be connected to the NMU network -- no problem on campus, with “wireless” connection; but off-campus, you would need a modem, and transfer may be slow.

- In addition, the textbooks sold at the NMU Bookstore come with **MiniTab 14 (student version)** on CD. (You install it on your computer, and don’t have to keep using the CD.)

If you want to use MiniTab off-campus, the student version will avoid the “modem” problem mentioned above. Also, the student CD can be installed on non-university-owned computers. Otherwise, you might as well use the full professional version. It is possible to install both versions on your computer.

For our purposes, the student version and the professional version are essentially the same, except that the professional version allows larger data sets. For a few of the simulations we will do, we will want the professional version so we can simulate “many” samples -- for everything else, the student version will be large enough.

LAPTOP FOR IN-CLASS USE:

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-83 calculator could be used instead of a computer. The most basic statistical operations can be done on any graphing calculator.

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

“SEE-THROUGH” RULER (OPTIONAL):

An inexpensive “see-through” ruler (6-inch is good) can be useful for fitting a line through a set of data points.

GENERAL INFORMATION:

This course is an introduction to statistics. We will cover material from most of the chapters of the book, plus some topics that are not in the book (some of them are on the CD that comes with the book). The course will cover descriptive statistics and inferential statistics, with an emphasis on how to use statistics to make decisions.

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. The quizzes, taken all together, will count approximately the same as one exam (or less).

Most of the grade will be based on the exams (probably about 2/3 to 3/4 or possibly more); the rest of the grade will be based on quizzes and assignments (the exact percentages will depend on how many assignments, quizzes, and exams there actually are).

CLASS WEBSITE:

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

LIBERAL STUDIES

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 at 2001 C. B. Hedgcock (227-1700; TTY 227-1543). 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 to make a decision with statistics : 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

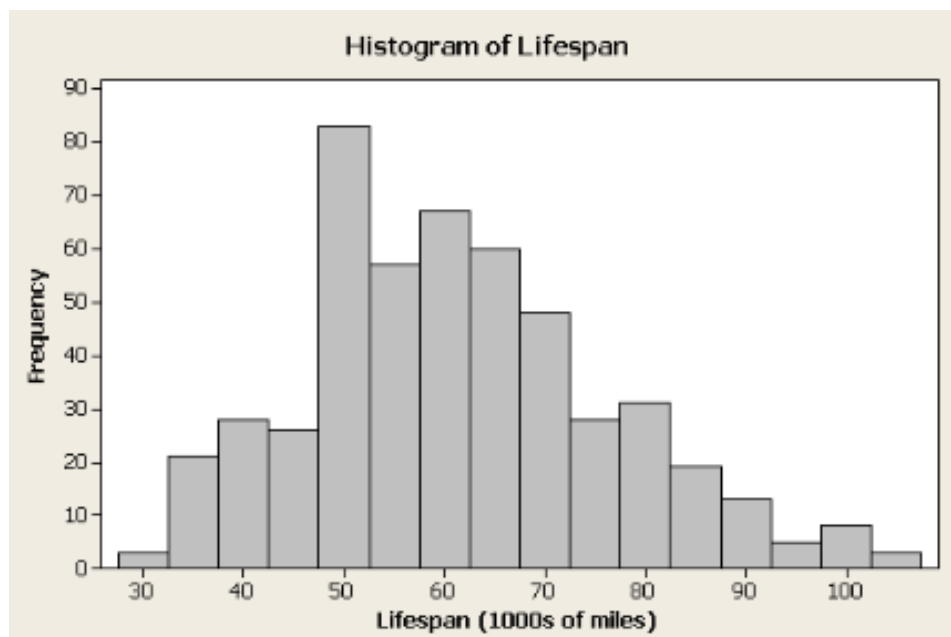
Example: The lifespans for a sample of 500 Brand X tires were:

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,

or *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 theory is true, what are the chances of getting a sample like we got? : Distributions

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

Example: The manufactures 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”).

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?