

# Math 111

Elementary Statistics with Applications  
Fall 2018

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Who: Jim Bentley Office: 227 AHN (ext. 8621)  
When: 2:30–3:50 MWF  
Where: LIB 139  
Text: Lock<sup>5</sup>, *Statistics: UnLOCKing the Power of Data*, 2<sup>nd</sup> Ed. (ISBN 978-1-119-30884-3)  
Web: [http://facweb1.redlands.edu/fac/jim\\_bentley](http://facweb1.redlands.edu/fac/jim_bentley)

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GOALS: Math 111, *Elementary Statistics with Applications*, is an introduction to statistical thinking. The emphasis of the course is on general principles involved in the daily use of statistics and on interpretation rather than rigorous mathematical theory. Whenever possible we will use real data. Occasionally we will have to resort to realistic data—real situation but fake data—or simulated data. Again, the emphasis is on a real-world understanding, and thus dealing with real data is helpful.

The course will also help you gain experience using a computer in a problem solving setting. Statkey is available via the internet at <http://www.lock5stat.com/statkey>. The statistics packages R and SPSS will be available in Jones. Limited access to SAS is also available in Jones. A freeware version of R can be found at <http://www.r-project.org>. The companion front end, RStudio, can be downloaded from <http://www.rstudio.com>. Additional documentation for R is available on my web site ([http://facweb1.redlands.edu/fac/jim\\_bentley](http://facweb1.redlands.edu/fac/jim_bentley)). You are free to use any statistical package that you can find. However, as we will see, many packages (particularly free ones) give erroneous results, so choose wisely.

#### PROPOSED TOPICS:

- Collecting Data
  1. The Structure of Data
  2. Sampling
  3. Experimental and Observational Studies
- Describing Data
  1. Categorical Variables
  2. Quantitative Variable: Shape, Center, Spread
  3. Quantitative Variables: Scatterplots, Correlation, Simple Linear Regression
  4. Visualization of Multiple Variables
- Confidence Intervals
  1. Sampling Distributions
  2. Interpretation of Confidence Intervals

- 3. Bootstrap Confidence Intervals
- 4. CIs for Means, Proportions, and Differences
- 5. Normal and t Approximations
- Hypothesis Testing
  - 1. Understanding Hypothesis Tests
  - 2. P-values
  - 3. Statistical Significance
  - 4. Tests for Means, Proportions, and Differences
  - 5. Normal and t Approximations
- Multiple Regression
  - 1. Multiple Explanatory Variables
  - 2. Checking Assumptions
  - 3. Interpretation

The above topics are fundamental to any statistical analysis—descriptive or inferential. However, this course will no more make you a statistician than a course in human anatomy will make you a brain surgeon. It is hoped that at the course’s conclusion you will be better prepared to evaluate articles which appear in newspapers, magazines, and in journals from your own discipline as well as to converse with statisticians during your research.

GRADING:

- 25% Homework, mini-projects, *etc.*: Homework is due at the beginning of class. Work that is turned in late will be given 50% of the earned credit. No homework will be accepted once the graded assignment has been returned. Since answers for some of the problems are given in the back of the book, to gain credit you must support your answers by showing evidence of your thought process—your statistical reasoning. Use one side of the page and write legibly (in pencil unless you are perfect and never need to erase). Please order your answers sequentially and place them in a single column. When submitting multiple pages, please staple the pages together in their proper order. In short, put yourself in the grader’s place and think about how you can make their life easier.

Much of what we will do in this class will take more time than is available during an exam. Since your time is essentially “unlimited” outside of the classroom (yes, I know you have other classes), homework problems are a perfect place to see what you can do. Homework is thus an important part of the learning experience in this course. Please feel free to work with your classmates, but be sure to turn in your own version of the solution (see “Academic Honesty” below). If you choose to get help from others (including faculty), be sure that you fully understand whatever information they have given you. If you choose not to do the homework, or receive failing grades for those assignments you do turn in, the highest overall course score you can achieve is a 75% (or a C). Historically, individuals who did not earn a passing grade on their homework also earned low scores on their exams and thus failed the course. Please take the homework assignments seriously. . . I will.

- 45% Three midterms (Tentatively Mon. Oct. 1, Fri. Oct. 26, and Fri. Nov. 16): Make up exams will only be given if you let the instructor know *in advance* that you will not be able to make the scheduled test. You must provide a reasonable excuse for your absence.

- 30% Final (Sat. Dec. 15 at 3:00 PM. Note that this is **not** the “Most Sections of Mathematics” time.): The final will be 50% cumulative and 50% material from the last quarter of the class.

OFFICE HOURS: MWF 9:30–10:50, MW 3:50–4:15, or by appointment. These are times when I will be in, or near (*e.g.* in the student study area or computer lab), my office. I’ll be around at other times (like lunch when there isn’t a Denominator’s meeting), so if my door is open and nobody else is getting help, *turn your cell phone off*, knock and then come on in. If I’m busy I’ll ask you to come back at another time. Don’t be offended, just come back later.

ATTENDANCE: You are encouraged to attend all class sessions. Statistics, like many sciences, is cumulative in nature. Missing material affects your ability to understand later topics. If you must miss a class, have someone turn in your homework for you and be sure to get notes and assignments from a classmate. This course makes use of in-class activities. If you are not attending class you will not be able to participate in the learning experiences they provide and your absence will have an adverse effect on the experiences of your classmates. In particular, lack of attendance does not support the cooperative nature of the group projects. Should outside circumstances make it difficult for you to continue your work in the class, please see me immediately.

The last day to drop is Wed., October 10. Fall Break is Sat., October 6 through Tues., October 9. Thanksgiving Break is Wed., November 21 through Sun., November 25. The last day of classes is Mon., December 10.

CELL PHONE AND COMPUTER USAGE: In consideration of your classmates, please turn your cell phone off before entering our classroom. You may not be able to hear the vibration when your phone rings or the clicking as you send text messages, but many of your classmates and I can. Similarly, we can hear you typing on the computer keyboard and clicking the mouse, so please refrain from using the computer for activities other than those associated with the class. By distracting me you are detracting from the quality of the experience that I can provide for everyone else in the room. Past students who have used cell phones and computers for non-class related activities have been disappointed by the grades that they earned.

ACADEMIC HONESTY: Please familiarize yourself with the University’s policy on academic honesty (see the Catalog). You are encouraged, and sometimes required, to work together. However, it is expected that the work you turn in on individual assignments and exams will be yours alone. If there is evidence that you have copied any part of your work, you will be subject to University disciplinary action for plagiarism (see the Catalog).

LEARNING OUTCOMES: At the end of this class you should:

1. become a critical consumer of statistically-based results reported in popular media, recognizing whether reported results reasonably follow from the study and analysis conducted.
2. be able to recognize questions for which the investigative process in statistics would be useful and should be able to answer questions using the investigative process.
3. be able to produce graphical displays and numerical summaries and interpret what graphs do and do not reveal.
4. recognize and be able to explain the central role of variability in the field of statistics.
5. be able to recognize and be able to explain the central role of randomness in designing studies and drawing conclusions.
6. have gained experience with how statistical models, including multivariable models, are used.
7. be able to demonstrate an understanding of, and ability to use, basic ideas of statistical inference, both hypothesis tests and interval estimation, in a variety of settings.

8. be able to interpret and draw conclusions from standard output from statistical software packages.
9. be able to demonstrate an awareness of ethical issues associated with sound statistical practice.

GRADING SCALE: Major components of this course will be graded on a percentage scale. The individual grades will be combined using the given weights. I reserve the right to modify the percentage scale using a variance stabilizing transformation or other means if I feel that the distribution for the class is too low.

Percentage	12 point	U of R	Grade	Percentage	12 point	U of R	Grade
$96.7 \leq X \leq 100$	12	4.0	A+	$76.7 \leq X < 80.0$	6	2.3	C+
$93.3 \leq X < 96.7$	11	4.0	A	$73.3 \leq X < 76.7$	5	2.0	C
$90.0 \leq X < 93.3$	10	3.7	A-	$70.0 \leq X < 73.3$	4	1.7	C-
$86.7 \leq X < 90.0$	9	3.3	B+	$67.7 \leq X < 70.0$	3	1.3	D+
$83.3 \leq X < 86.7$	8	3.0	B	$63.3 \leq X < 67.7$	2	1.0	D
$80.0 \leq X < 83.3$	7	2.7	B-	$60.0 \leq X < 63.3$	1	0.7	D-
				$X < 60.0$	0	0.0	F