

Introduction to Statistics for Psychologists: Psychology 109
Section 1: TR 1:15-02:30PM, Kravis Room 165
Section 2: TR 2:45-04:00PM, Kravis Room 165
Spring Semester 2016

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Office: 223 Seaman Hall **Office Hours:** MW 2-3; R 10-11
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Required Materials:

- Readings are listed next to the dates listed in the table of topics and can be found on the shared folder. Although most readings will not change over the course of the semester, there is a small chance I will exchange some readings out for other articles.
- Laptop computer or access to CMC network computer. If you are not a CMC student, you will need a CMC login in order to access the computers in the computer labs. This account should be created for you automatically. Please check your e-mails/spam for account information.
- RStudio (version 0.99.489); R (version 3.2.2 or 3.2.1)
- A calculator for basic operations (e.g., addition, subtraction, multiplication, division, exponents, square roots) unless you use R.

Supplemental Materials:

- Readings, handouts, and data files for this course are available online. Files will be available on Sakai, however, I recommend strongly using your www.box.com/pricing account and syncing files automatically rather than downloading them each week. CMC students already have Box accounts.

Overview. This course is an introduction to quantitative methods in Psychology for undergraduate students. Statistics is meant also as a precursor to understanding the principles of research design that you will learn about in a later semester. I intend to emphasize the *theoretical foundations* of statistics and some selected applications and deemphasize the mathematics involved in the statistical computations. Of course, however, we will work through several computations by hand.

You and I should have several goals for this course. First, we should learn the foundations of both descriptive and inferential statistics because statistics provides a common language for all scientists to communicate and interpret research findings. Second, we should acquire some of the tools to think critically about the research in your area of interest (e.g., Which statistics are appropriate in different circumstances? Why did Dr. Y use 73 *t*-tests without correcting the error rate?). You will find that a skill set in statistics will take you some distance in dealing effectively with real-world issues and will assist you in becoming more critical consumers of information in general. Third, we should attempt to apply the concepts learned in this course to research ideas of your own as you experience the joy of research with a faculty supervisor. Fourth, we should aim to dispel any misgivings you have about computer languages and embrace coding; familiarity with computer programming and R is very valuable to all employment prospects.

To these ends, you will participate in several modes of learning: participating in lectures, lab exercises and homework problems, examinations, and collaboration with peers. The lectures are intended to provide a slightly different organization of the course material (as much as is possible with an introductory statistics class). They also provide me with an opportunity to elaborate upon and illustrate major concepts. Lectures will provide you with an opportunity to ask questions and seek clarification; not all concepts covered in the readings will be covered during lecture. The homework exercises are useful in evaluating your own performance as the course progresses. Exams afford you the opportunity to evaluate your mastery of the material. The examination should

also be viewed as a learning process. Exams will not only measure your knowledge base about the material, but also your ability to: draw analogies, apply what you have learned to novel situations, and make inferences and conclusions about particular problem sets.

Course Specific Learning Goals:

Demonstrate conceptual understanding of major statistical concepts; Think critically about data and analyses; Understand similarities and differences of statistical tests; Understand when to use different statistical tests; Conduct and interpret statistical analyses using computer software.

The following **departmental learning goals** will also be met: 1. Knowledge of major concepts, theories, and empirical findings in psychology; 2. Understanding of research methods in psychology, including research design, data analysis and interpretation; 3. Development of critical-thinking skills and use of the scientific approach to solve problems related to behavior and mental processes

Formal Requirements and Grading:

Exams. Your course grade will be determined by your performance in several different areas so there is ample opportunity to do well. There will be two closed-book closed-note interim examinations and a cumulative final examination. Each exam will have a similar format and will consist of multiple-choice questions, problem sets, interpretation of R output when appropriate, and take-home problems. Please note that good performance on exams will not be achieved by simple memorization of either formula or concepts; recognizing concepts without an understanding them will only take you so far. In order to prepare you for a professional career, for which erroneous information provided to your supervisor will not be treated as partially correct, no partial credit is awarded for incorrect answers.

There will be **no make-up exams** for this course. If there were extenuating circumstances surrounding your absence (e.g., medical reasons, sleeping in, etc.) and you are unable to take an exam, your performance on the **final exam** will replace the missed exam.

Homework. There will be homework for various topics covered in the course. There will be **several homework assignments and learning-based quizzes**, each of which must be submitted for a grade. **Unless you have made special arrangements with me for submitting your homework before class, you must submit each assignment within the first 10 minutes of class on its due date.** Dealing with late assignments is an organizational burden; your responsibility includes completing assignments on time. That said, some homework assignments may be demanding and time consuming for you, so you should plan accordingly.

Conceptual-based assignments. Some questions will focus on conceptual understanding or may require using a calculator. These assignments will be completed and submitted on your own. Asking your peers for help is encouraged, but your work should be your own or your exam performance will likely suffer.

Computer-based assignments. Some questions will require using the R programming language and RStudio. Both of these are free for download from the Internet for your personal computer for ease of access for athletes and when labs are busy. They are also installed on CMC Computer Lab computers (WARNING: other campuses might not have the same versions installed). RStudio and R programming language assignments will serve to supplement your understanding of statistical principles and output; you may be asked to compute specified analyses from the R printout itself. A tentative outline for homework assignments is provided at the end of this syllabus. Because detecting errors and troubleshooting with code is improved with two sets of eyes, homework problems involving R will be completed with a partner. I will often ask you to demonstrate your understanding in class or may call you into my office to ensure both of you are working together weekly rather than alternating. If you choose to work alone, you must let me know before completing the assignment. If I cannot understand what you did on a homework problem, I will assume that you do not understand what you did.

For obvious reasons, collaboration with fellow students when taking exams is not permissible. I do, however, very much encourage you to seek assistance from your classmates when working on the assigned homework. I offer the following caveat: If you cannot do the homework on your own, you will probably be unable to perform well on the exams. If you find yourself “dependent” on one or more of your classmates, I urge you strongly to practice additional exercises from the readings. This is good advice to all students because much of statistics is skill-based, and the only way to acquire skills is through a lot of practice.

Quizzes. My goal for this course is to improve your mastery and long-term, rather than short-term, learning of statistical concepts. As such, topic quizzes will be assigned for each topic and due by the day we start that new topic. In order to complete the quiz, you will need to read for class. These quizzes are designed to help you answer questions in class, to help you raise questions of clarification in class, and to improve your performance on exams by guiding your study habits and by strengthening your understanding of concepts. If interested, I can direct you to several research studies that demonstrate the effectiveness of quizzing on long-term retention of information. In order to incentivize keeping up with the materials, quiz scores of 70% or higher will be converted into 100%, otherwise your quiz grade will reflect your raw quiz grade.

Professionalism (class participation, conduct, non-flakiness, etc.). In-class problem sets and activities will require you to read each chapter before attending class. For many problem sets, I will assume that you have read and understood the basic concepts so that I can assist with more challenging concepts in class. If you have questions about the material, please meet me during office hours or schedule a meeting prior to class so that you are prepared to complete problem sets in-class. Attendance to and participation in lectures will play a large part in determining your overall grade as lecture topics are designed to complement material in your text. Lecture and textbook materials will overlap, but some material discussed in lecture will not appear in your text; the same is true for textbook topics.

Your professional behavior will also determine part of your grade. Professionalism includes: being punctual for class and appointments, preparing for and participating in class, having respect for others, having personal responsibility and accountability, being courteous, collaborating responsibly with your peers on small-scale (e.g., problem sets, computer assignments, etc.), and paying attention to all speaking members of the classroom. Engaging in disruptive activities (e.g., talking, monopolizing discussions, interrupting others, sleeping, web surfing, texting, using your phone, tardiness, etc.) will likely result in an automatic, and substantial, reduction in professionalism points which will translate into a letter grade or more reduction. Finally, helping your fellow classmates and building strong intellectual networks is mutually beneficial as one's mastery of course material is illustrated through teaching others.

A few final notes about grading and assignments. As with any college course, you should expect a challenge. As do other faculty teaching statistics, I make a distinction between “*getting an A*” and “*earning an A*” in this course. You should expect to spend **about 7 hours of work a week** outside of class session if you want to earn an A. If reading a chapter and answering homework takes you 2 hours, you should spend the remaining time (e.g., 5 hours) reviewing the material in your text and in your notes, completing practice assignments, and testing your knowledge either on your own or using online questionnaires. Kirk (in readings) offers the same advice. The exams will be challenging, but as expected for a course of this ilk. Consequently, performing well by cramming 6 hours the night (or two) before the exam is rare. By spending 7 hours per week on the materials, the concepts will build upon one another and your understanding of the material will be facilitated by previous learning.

I believe my expectations are reasonable and if you take my suggestions to heart, you will do just fine in the course. I do, however, understand that students' and professor's expectations are not always monotonic, especially for mastery of entry-level statistics course. If a couple

students do not earn As in this course, I may adjust the grading distribution based on the grades obtained by you peers.

Grading:

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|-----------------|-------------|
| Exam 1 | 25% |
| Exam 2 | 25% |
| Final Exam | 30% |
| Professionalism | 5% |
| Homework | 10% |
| Quizzes | 5% |
| <i>Total</i> | <i>100%</i> |

Typically speaking, grading will result in:

| | | |
|------|-------|-----------|
| A | = 10% | A's = 25% |
| A- | = 15% | |
| B+ | = 15% | B's = 45% |
| B | = 15% | |
| B- | = 15% | |
| C+ | = 15% | C's = 25% |
| C | = 10% | |
| C- | = 5% | |
| <C's | = 5% | |

Academic Integrity: Although you may find yourself working on assignments with a partner, all assignments should be your one original work. You are not to share materials with other students if that material has the potential of being copied, even if your intention is not to allow a classmate to copy your work. Any signs of academic dishonesty will be submitted to the Academic Standards Committee for review. Although I do not anticipate any events of academic dishonesty, any form of dishonesty of any form will *not* be tolerated.

Many students are unclear of the definition of plagiarism and for that reason I have posted some CMC links to information that I believe will clarify the issue. In addition, any work completed for another course, past or present, may not be submitted for a grade for this course.

<http://registrar.academic.claremontmckenna.edu/acpolicy/default.asp>

Physical and Learning Differences: If you have a learning difference that requires special accommodations, please remember to contact the Dean of Students Office 909-621-8114. Please do so as soon as possible so that you can be appropriately accommodated.

| Week | Date | Topics | Readings Due ‡ |
|-----------|------|--|--|
| 1 1/19 | T | Statistics: An Introduction | Syllabus ¥ |
| | R | (T1) Measurement, Frequency, & Probability Distributions | ACA 1 Kirk (pp. 3-6; 6-21) |
| 2 1/26 | T | Continued | ACA W1 (thru Representativeness of the Sample) |
| | R | (T2) Descriptive Statistics: Central Tendency & Variance Quiz #1 (T1-2); Homework #1 Due | ACA 2 (not Z-scores); Kirk (pp. 75-76) |
| | | | |
| 3 2/2 | T | (T3) Properties & Assumptions of Inferential Statistics & Models Quiz #2 (T3); Homework #2 Due | ACA: 2 (Z-scores); ACA 4 (all) |
| | R | (T4) Using R and RStudio | TBA |
| | | | |
| 4 2/9 | T | (T5) Linear Models, Sampling Distributions, and NHST: Part 1 Quiz #3 (T5) | ACA: 5 (all) |
| | R | (T6) Linear Models, Sampling Distributions, and NHST: Part 2 Quiz #4 (T6); Homework #3 Due | ACA: 6 (all) |
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| 5 2/16 | T | (T7) Linear Relationships between Variables: Correlation Quiz #5 (T7) | ACA: 3 (thru p. 97) |
| | R | Continued | |
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| 6 2/23 | T | EXAM 1 Homework #4 Due | |
| | R | (T8) Prediction: Bivariate Linear Regression | ACA: 3 (98 thru p. 106) |
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| 7 3/1 | T | Continued | |
| | R | (T9) Prediction: Multiple Linear Regression | ACA: 3 (106 thru end) |
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| 8 3/8 | T | Continued Quiz #6 (T8-9) | |
| | R | (T10) Comparing Samples to Populations and Samples with Repeated Measures (Related Samples) Quiz #7 (T10); Homework #5 Due | ACA: 8 (all) |
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| 9 3/15 | T | SPRING | |
| | R | BREAK | |
| | | | |
| 10 3/22 | T | (T11) Examining p values and Effect Size | ACA: 7 (all) |
| | R | Continued Homework #6 Due | |
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| 11 3/29 | T | (T12) Comparing Two Independent Samples http://daniellakens.blogspot.com/2015/01/always-use-welchs-t-test-instead-of.html Quiz #8 (T12); Homework #7 is Due | ACA: 9 (all) |
| | R | Continued | |
| | | | |
| 12 4/5 | T | (T13) Comparing More Than Two Samples + Multiple Comparisons among Means, & A Priori & Post-Hoc Tests Quiz #9 (T13) | ACA: 10 (thru p. 370) |
| | R | Continued | |
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| 13 4/12 | T | Catch-up/Review Day Homework #8 Due | No reading |
| | R | EXAM 2 | |
| | | | |
| 14 4/19 | T | (T14) Comparing Multiple Factors with Two or More Groups Quiz #10 (T14) | ACA: 10 (p. 370 thru end) |
| | R | Continued | |
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| 15 4/26 | T | (T15) Qualitative-Nominal-Categorical Data: Chi-Squared Tests Homework #9 is Due | ACA: 11 |
| | R | Continued | |
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| 16 5/3 | T | Catch-up Day | |
| | R | Homework #10 is Due Last Day of Class/Review for exam | |
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| 5/11 | | 7pm Davidson Hall (Adams Building) Common Final period not yet assigned Link: http://www.claremontmckenna.edu/registrar/finals.php | |

No make-up exams will be granted unless you petition to receive an incomplete in the class and that petition is approved by the Academic Standards Committee by the time the final exam is administered. You are also responsible for handing in materials by their due dates at the beginning of class.

‡ Please complete the readings before attending class. Your ability to contribute in class, take quizzes, etc. will influence your professionalism grade.

¥ Bring your laptop and calculator to each class. Although calculators will be used on exams, I may have you perform calculations during class. If I ask you to perform calculations and you do not have your calculator with you, your class participation will reflect this.

Disclaimer: I tried to make the schedule as accurate as possible. However, it may be necessary to make adjustments to it as the semester progresses, so do not consider these dates to be set in stone. I will advise you of changes to this schedule if such changes are necessary.