

Psychological Statistics
University of San Francisco
Tuesdays & Thursdays 6:30pm to 8:15pm
Lone Mountain 414A

Instructor: Pi-Ju (Marian) Liu, Ph.D.

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Office location: Psychology Adjunct Office at Kalmanovitz G55

Office hours: Thursdays 5:15 to 6:15 pm, or by appointment

How to reach me: I am most easily reached via the inbox function on Canvas or email at pliu11@usfca.edu; nonetheless, please allow a minimum of 48 hours for a response.

Description and goals of the course: This is a 4-credit statistics course covering fundamental statistical concepts, descriptive statistics, inferential statistics from t-test, analysis of variance, regression, to categorical data analysis techniques. The course will cover both theoretical and applied aspects of statistics. One goal of the course is to gain an understanding of research design using techniques covered in class. In addition, through the class, students should be able to evaluate datasets and apply appropriate data analysis techniques.

Learning Outcomes: This course will introduce students to concepts and application to psychological statistics. Specifically, at the completion of this course, student are expected to:

1. Explain the differences between different levels of measurement, and populations versus samples.
2. Compute the appropriate descriptive statistics, including measures of central tendency and dispersion.
3. Calculate and correctly interpret probabilities, especially those related to hypothesis testing.
4. Use parametric statistics to test hypotheses.
5. Use nonparametric statistics to test hypotheses.
6. Use SPSS to conduct appropriate data analysis.
7. Interpret statistical findings after calculation or on SPSS output.

These outcomes will be measured by performance on the course requirements indicated below.

Course texts: The textbook for this course is “Silverthorne (2010). *Common Sense Statistics* (6th ed). McGraw-Hill”.

Other references: For statistical concepts, read “Cohen (2007). *Explaining Psychological Statistics* (3rd ed). Wiley”, or “Howell (2009). *Statistical Methods for Psychology* (7th ed). Wadsworth Publishing.” For SPSS assistance, read “Field (2009). *Discovering Statistics Using SPSS* (3rd ed). SAGE Publications Ltd.”

Required equipment: A calculator, and SPSS software (available on campus). Remember to bring your calculator to class, especially on exam days. Cell phone calculator is not allowed during exam.

Course requirements and grading: Attendance and completion of assignments are required, whether taking the course for credit or auditing. The course grade will be based on the following:

10%	Attendance
15%	Assignments
15%	Exam 1
20%	Exam 2
20%	Exam 3
20%	Final

Attendance: Attendance is required— The instructor will be taking attendance at the beginning of every class. Please arrive on time. If you miss a class, it is your responsibility to copy notes and handouts from a classmate. You are allowed 2 unexcused absences and 1 sick absence (doctor's note required). Unexcused absences cannot be on exam dates. For every unexcused absence after 2, your final grade will be reduced by 3 percentage points (e.g., if you have 5 unexcused absences, your final grade will likely be reduced by a full letter grade; more than 5 will reduce it even more).

Assignments: There will be around ten assignments during the semester. Assignments will be posted on Canvas throughout the semester. Each assignment is due a week after being posted. These assignments will be tied to lectures and course readings. Students are encouraged to work with study partners. You and your partners should be fully involved with all of the problems, including computer analyses and interpretations. Remember that copying answers from others does not help your learning. Answers to assignments will be posted after the due date. Students are responsible to complete the assignments by due date and bring them to class. If you need to miss class, you can email me a copy before the deadline. No late assignments will be accepted.

Exams: There will be three exams. See the tentative schedule for exam dates. Part of the exams will be closed-book, and part of the exams will be open-book and open-note. However, laptops and other electronic devices are not allowed. You have to be able to attend all exams on the scheduled dates to take this course. Exam 1 will cover all materials up to the exam. Exam 2 and 3 will be cumulative, but it will focus on materials not covered in previous exams. Students are expected to know important topics from previous exams, for example, though normal distribution will be covered at the beginning of the semester, they are the background knowledge students need to possess during Exam 2 and 3. Remember to bring your student ID card for admission to the exams. Students are not allowed to leave the exam room to use the bathroom or get drink during exam hours. [Notice: No make-up examination will be given except for reason of illness or other verified emergencies. The make-up exam will be offered at the instructor's convenience, and is likely to represent a longer and more difficult version of the exam.]

Final: Final paper is due on the final exam date. Students will search for datasets of their interests, form research hypothesis, conduct appropriate analysis, and report findings. The paper has to be written in APA style (see Appendix A from page 7 to 9). SPSS dataset and output need to be saved in separate files and uploaded with the paper for submission. Be sure to upload the paper to Canvas by the beginning of the final. No late paper will be accepted.

Grading:

A+ = 97-100% A = 93-96% A- = 90-92%

B+ = 87-89%	B = 83-86%	B- = 80-82%
C+ = 77-79%	C = 73-76%	C- = 70-72%
D+ = 67-69%	D = 63-66%	D- = 60-62%
F = Below 60%		

Please note, satisfactory performance for any assignment or paper deserves a B. Only work with exceptional performance gets an A.

Extra credit policy: You will be given numerous opportunities to earn up to 10 extra credit points (3% total). For example, you will be given 2 extra points for coming to my office hours for the first time (Come visit me during my office hours! Write a little something about yourself that may help me get to know you ☺. Be sure to put your name and course number on it so that I can give you extra credit points. You can either come individually or in groups.), or for attending a psychology-related or stats-related event that I announce in class and writing a 1-page summary for me. I will announce these approved opportunities as they become available (you are welcome to forward these events news to me, so I can announce it as an extra-credit opportunity).

Accommodating students with disabilities: For students requiring extra time or other accommodations related to disabilities, I am happy to help optimize the learning experience in this course. Please provide me with written documentation prior to the first exam so that we can arrange for a mutually agreeable alternative time for the exam, or other accommodations as needed.

Class policies: I expect students to behave professionally and value other students' right to learn. To limit distractions, please avoid coming late to class, have no food during class sessions, turn off cell phones and smart phones, and leave your iPad or laptop in your bag. All written products should be the student's own work. Students should not submit papers that have been written for prior or concurrent courses. In addition, all students should review university policies on plagiarism. Plagiarism is a serious offense, even if unintentional, and is subject to serious sanctions. It is also assumed that you will:

- Attend all classes and arrange to get what you need from others if absent.
- Raise relevant questions and appropriate observations on the topic.
- Participate through reflection on both your relevant professional experiences, as well as your completion of the reading assignments.
- Depend on each other as well as me, for learning.
- Learn and have fun with statistics!

Class attendance: All students are expected to attend all class sessions. Please be on-time to class. Late students should enter the classroom quietly and take an available empty seat closest to the entrance. If students need to leave the class prematurely, be sure to inform the instructor before class starts, take the seats closest to the exit, and leave quietly during class. Students are responsible for everything that is covered in the lecture, including announcements of assignments, due dates, and changes in the syllabus. You will need to take notes, but you are expected to use something other than a laptop or other electronic device to do so. If you prefer to take notes on any electronic devices, please come see me for permission prior to taking notes on your laptop (or other electronic devices). If you are unable to come to class, please arrange to get

lecture notes from fellow students. If you are a student athlete or have to participate in department or university events (Psi-Chi, march band) and will miss class sessions, please provide written documentations from appropriate authority for each of the class session before that session takes place. Absence of family emergency or sick leave will also need proper documentation submitted right after you are back on campus. Missing classes with no written documentation will affect your grade.

Cell phone and other electronic device use: Cell-phones and smart-phones use are prohibited in the class. Please turn off any ringing or beeping electronic device before class starts. Students are expected to take notes without a laptop. During some class sessions, you might want to operate your laptop to follow instructor's SPSS demonstration. This is the only time when laptops are allowed in class. Nonetheless, if students are found checking emails or browsing websites unrelated to the class, they cannot use laptops during class anymore.

Disruptive behaviors: Please do not carry on a personal conversation during class. Chatting with other students is distracting, and highly disrespectful to fellow students' right to learn. A student responsible for continual disruptive behavior may be required to leave class pending discussion and resolution of the problem. As an instructor, I reserve the right to drop students for inappropriate behaviors.

Appeal to re-grade: If you believe that your paper or exam has been misgraded, please write a paragraph and submit the paragraph as well as your original paper or exam to the instructor in a week. The paragraph should include explanation and arguments on the part that had been misgraded. The instructor will review your assignment again, and assign an appropriate grade. Please note, the new grade can stay the same, go up, or even be lower than the original grade.

Academic honesty: Written work you submit must reflect your own work and completely indicate with citations material that came from another source. Any paper that fails to do so will receive a failing grade. "Plagiarism is a most serious offense in academia, subject to severe sanctions, including expulsion from school. Ignorance is no excuse, so it is important that you know what plagiarism is & how to avoid it. Plagiarism is presenting words or ideas of another without giving appropriate credit. Even if plagiarism is unintentional, it is still a serious breach of ethical standards in academia, and the plagiarist is subject to sanctions. The most obvious form of plagiarism is when exact words are taken from someone else's work and presented without a proper citation. Less obvious, but still plagiarism, is when ideas are taken and used without proper citation. Even if the work of another is paraphrased into your own words, you must cite the original source. Exact words must be enclosed in quotation marks and a citation given. If you draw material from a secondary source, you must cite both the original writer and the author of the secondary source. See the *APA Publication Manual* for detailed examples of proper citation format." (abstract from <http://www.cgu.edu/pages/903.asp>)

Tentative Schedule of Topics and Readings

1. August 25 & 27 (Chapter 1 & 2)

- Introduction
- Data: Levels of Measurement

Self-introduction on August 25 (Tuesday).

2. September 1 & 3 (Chapter 3 & 4 & 5)

- Populations and Samples
- Frequency distribution
- Measures of Central Tendency

Personal Information Sheet due by September 1 (Tuesday). See Appendix B on page 10

3. September 8 & 10 (Chapter 6 & 7 & 8)

- Variation of Measures of Dispersion
- Normal Distribution
- Probability

4. September 15 & 17 (Chapter 9 & 10)

- Hypothesis testing
- Independent T-Test

5. September 22 & 24 (Chapter 11)

- Paired T-Test
- Exam 1

Exam 1 on September 24 (Thursday).

6. September 29 & October 1 (Chapter 12)

- One Way Analysis of Variance

7. October 6 & 8 (Chapter 12 & 13)

- One Way Analysis of Variance (continued)
- Repeated Measures

8. October 13 & 15 (Chapter 14)

- Two Way Analysis of Variance

9. October 20 & 22

- Exam 2

Class does not meet on October 20 (Tuesday). Fall break.

Exam 2 on October 22 (Thursday).

10. October 27 & 29

- SPSS Application

11. November 3 & 5 (Chapter 17)
– Correlation

12. November 10 & 12 (Chapter 18)
– Linear Regression

13. November 17 & 19

Class does not meet on this week. Gerontological Society of America Annual Scientific Meeting.

14. November 24 & 26

Open-lab on November 24 (Tuesday). Though encouraged, you are not required to attend this session. Make sure you use your time wisely and work on your final paper.

Class does not meet on November 26 (Thursday). Thanksgiving.

15. December 1 & 3 (Chapter 15 & 16)
– Nonparametric Tests

16. December 8
– Exam 3

Exam 3 on December 8 (Tuesday).

17. December 15
– Final

Final paper due on Canvas by 8pm on December 15 (Tuesday).

The above schedule is subject to change in case of unforeseen events (e.g., natural disasters) or topic shifts (e.g., we decided to spend additional time on certain topics). Readings and due date for assignments may also vary given progress in the course. The instructor and the department reserve the right to revise this syllabus, verbally or in writing. Students are responsible for materials indicated above, whether explicitly discussed in class or not.

Appendix A. Reporting Experimental Results

In most scientific fields, experimental reports are written in a specific format. There are two very good reasons for this. First, the format makes it easier for the reader to know where to look for information on a particular point. It is not necessary to read the entire article to find it. Secondly, the standard format makes the report easier to write. The author is spared all problems dealing with the literary structure of the report. The format specifies in which section of the report one should place particular types of information about the experiment. Thus, while writing the report, the author can focus on each section without having to make decisions about what information does or does not belong there.

Here are the headings for the different sections that make up the experimental report given in their order of appearance. **The paper is double-spaced throughout.** Do not move to a new page at the end of a section to start the next section. The only exception is the abstract which appears on its own page and the reference section which starts on a new page.

1. **Cover sheet:** with title and author's name and affiliation. Include the names of any collaborators on the experiment, but underline your name so we know who wrote the report. The title should refer to the major variables or theoretical issues you have investigated.
2. **Abstract:** The abstract appears on the second page of the manuscript and is the only section on this page. It is typed as a single paragraph and should be between 100 and 175 words. The abstract is a brief summary of the content and purpose of the report. It should be self contained and fully intelligible without reference to the body of the paper. It should include succinct information about the experimental problem, method, results and conclusions. Variables or techniques which are important in the experiment should be specifically mentioned. One way to write an abstract is to write one or two sentences for each section of the report.
3. **Introduction:** The purpose of the introduction is to state the specific research problem under study and to explain its importance in a broader context. In other words, you should explain what you are doing in the experiment and why. The introduction should include: a brief review of previous work in the area with a clear explanation of the relationship between this work and the problem under study; a brief discussion of relevant theories and how they are related to the problem; a preview of the particular methods used in the experiment with perhaps a statement of the independent and dependent variables; finally a statement of the experimental hypothesis.
4. **Method:** The purpose of the method is to describe exactly what was done in the experiment. The information should be specific enough that the reader could perform precisely the same experiment and thus independently verify the results. The method is usually divided into the following subsections, which begin with their headings. **Participants.** This subsection gives information about how many people participated in the study and demographic information that is relevant, e.g., sex, age, and educational level. Other information should be included when it is relevant to the problem under study; for example, in experiments involving auditory perception it would be important to report whether participants had normal hearing. You should always state how participants were selected, e.g., through local schools, in dormitories, by answering an

advertisement, etc. **Apparatus and materials.** This subsection describes the equipment and stimuli used in the experiment. There are experiments which use no equipment, for example a study of memory span for words in which words are presented on a card and the subject writes the response on a sheet of paper. In this case the subsection would be titled just "Materials," and would describe the words, i.e., how many syllables, parts of speech, and how they were selected. **Procedure.** This subsection would summarize each step in the execution of the experiment, as experienced by the participant, from beginning to end in chronological order. One way to organize the procedure subsection is to think about what was done to a subject from the beginning of the experiment to the end. It should also include information about the experimental design, e.g., were variables manipulated between or within participants; what was the order of presentation of the variable, e.g., were the different variables presented in "blocked" or "random" order? Instructions should be summarized.

5. **Results:** The results section presents a summary of the data collected in the experiment, usually by reporting mean number or percent. First, state the main finding of the experiment. You should be very careful to state only what the data show, not an interpretation of the data. There is usually data to be presented in tables and figures. You must verbally describe in the results section any tables or figures you wish to include. You should refer to data concerning the effects of all independent variables, even if they are counter to your hypothesis. If you know the proper statistical tests to perform on your data, by all means perform the tests and report the results. However, it is of no use to anyone for you to find a statistical test that you do not understand and apply it blindly in a "cookbook" fashion. The descriptive statistics (means, percentages) are what the reader wants to know, and they should be presented clearly and completely.

6. **Discussion:** In the discussion, you should first evaluate your results with respect to your original hypothesis. You might also give attention to the implications of the results for the theoretical issues raised in the introduction. You should note any differences between your results and the previous research reviewed in the introduction. You should state clearly and directly what conclusions can be drawn from the study.

7. **References:** The reference section begins on a separate page. In it you must list all references cited in the experimental report. It is assumed you have read all references cited. The references must be listed in the references section according to a specific format, the rules of which are given below. The rules are all exemplified in the illustration that follows. In the text, refer to an article by citing the last name of the author or authors, and put the date of the article in parentheses: "According to Burke (1990)" If there are two authors, cite thusly: "Hackl and Burke (2004) showed that ...". If there are three or more, name them all in the first citation, but thereafter refer to the paper by mentioning only the first author, followed by "et al." and the date if appropriate.

In the references. For articles, the format is

Last name, I., Last name, J., & Last name, K. (Year), Title. Journal Name, vol. #, page to page.

For books the format is

Last name, I., Last name, J., & Last name, K. (year). Title. City: Publisher.

Examples of the reference section looks like this.

References

Beatty, W. R., Gray, T. J., & Nemo, C. (1990). Ingestion of flies by Venus' flytraps (*Dionaea muscipula*): A failure to replicate. *Journal of Plant Behavior*, *16*, 269- 275.

Bump, V. R. Y. Sand, grit, and other dirt. (2000). *Bulletin of the Atomic Botanist*, *82*, 596-604.

Ison, K. B., & Gray, T. J. Forgetting in plants and elephants. In T. M., Mason & J. K. Jarr (Eds.) (2004). *Learning is where you find it*. New York: Mediocre Press.

Kamano, M. *The neurophysiology of American plants*. (2001). Outlandish, N. J: Bench Press.

8. Tables and figures: Tables are placed after the reference section and they are followed by figures. Number all tables with Arabic numerals in the order in which they are first mentioned in text. Give every table a brief but clear explanatory title. All graphs, charts, and illustrations are called figures when mentioned in text. Number all figures consecutively with Arabic numerals. Each figure should have a caption that describes the contents of the figure in a brief sentence or phrase.

Appendix B. Personal Information Sheet

Please fill out the following information about yourself. All information will be used within the context of the course and will remain confidential.

First Name _____

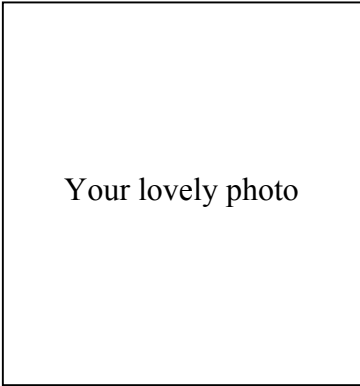
Last Name _____

I prefer to be called _____

Major & Minor _____

Year in the program _____

Intended Career _____
(if related to education or counseling, please specify age – e.g., elementary school, adolescence, college, older adults)



Imagine I called on you to give your thoughts/opinions on a topic in class, and circle/highlight the number on the scale below that best represented your likely reaction.

- | | | | | |
|-------------------------------------|---|---|-----------------------|------------------------------------|
| 5 | 4 | 3 | 2 | 1 |
| Good luck
shutting me up | I usually enjoy
sharing my opinion | A bit uncomfortable,
but I can handle it | Pretty nervous | I may actually
throw up |

What do you hope to learn from this class? (Be as specific or general as you like.)

What techniques/activities/strategies have other instructors used before that helped you learn?

Anything else you would like me to know about your background, recreational interests, research interests, current work, future goals, learning style, or expectations?

I would like to have the alternative grading policy for attendance. (Highlight or check if you would like to have the alternative grading policy for attendance. If no, just leave it blank.)

Appendix C. 10 Things This Instructor Loves

I did not create this list, but the list resonates well with my love for teaching, especially statistics! See the original post here (http://m.chronicle.com/article/10-Things-This-Instructor/232483/?cid=at&utm_source=at&utm_medium=en), and maybe learn a few things about what professors hate ;)

1. Students. I love you! OK, not "you" in any sort of personal way (though I'm sure you're very lovable), but I love college students. I love talking with you, mentoring you, teaching you, learning from you, and watching you interact and learn from one another. College is an amazing time in anyone's life. You're a grown adult, but still young, often idealistic, and not yet set in your ways. I love that about you. I love the enthusiasm and energy you bring to my life. You remind me of my 20-year-old self — when I was figuring out my place in the world and how much I had to learn, but also all the ways I could contribute, all the things in front of me. College is exciting (but also scary). I love to be able to guide you through this time.
2. Students who come to class with an open mind. I love the first day of class, and it's made even better by students who arrive ready to make the course their own, and not what they heard it would be like. I love when we all come in with a clean slate. We're not yet bogged down by grading or studying. We haven't yet realized just how much work the semester is going to be, but are instead focused on how much we will learn, how much we will grow, how much fun we'll have.
3. Students who come to my class to fulfill a requirement but decide to make the most of the experience. I had an economics major once in my "Oceanography" course who confessed he was dreading taking the class and didn't see how it related to anything he was interested in. Nonetheless, he tried to approach the course as an opportunity to learn things that he wouldn't have time to study later in life. Along the way, he later told me, he discovered all sorts of things that turned out to be relevant to his life — learning the nature of the tides in his home town, and understanding the connections between oceans and things he read about in the newspaper like ocean acidification, global climate change, and renewable energy.
4. Students who give eye contact during a lecture. There is nothing worse than standing in front of students, whether it's only 10 or 300, and feeling alone. It is a lot of work to teach, but seeing just one set of eyes engaging with me rather than with a screen makes it so much easier. Thank you to those who listen and engage with your professors.

5. Students who come to me when they need help. To help someone learn a difficult concept is incredibly rewarding. It is a relief when students recognize that they need help and come to me early enough to get it.

6. Students who aren't afraid to ask questions. If one student doesn't understand something, it is very likely others don't either. Stopping the professor to clarify a point gives us the opportunity to really teach and stay in touch with our students. I am always grateful to students who risk looking "dumb" to ask a question.

7. Students who tell me not just that they enjoyed my course, but why. I have had students give me poems they wrote about rocks, tell me stories of discussing our case study on the Salton Sea in a job interview, and send me vacation pictures with vignettes of how they taught their family all about the volcanoes they visited in Hawaii. I've had graduates, on campus for a visit, drop by my office just to tell me they put their knowledge gained from one of my courses into practice in graduate school. Whether I receive those poems, letters, and visits weeks, months, or years after the course ends, they never get old. They re-energize me and remind me of how lucky I am to have the opportunity to affect people's lives.

8. Students who have their own ideas. Few things are more fun in teaching than seeing students so engaged in the course material that they begin to have new ideas, rather than just regurgitating what I say. I know how I would describe the ocean gyres or why Earth has seasons, but often students find new and better ways to describe those things. I love that. Some show me articles they've found on something we've discussed in class, or help a struggling fellow student do a problem that I hadn't clarified in the best way. It makes me smile when students challenge the conventional way of understanding. Keep it up.

9. Students who give me unique and powerful things to say in a letter of recommendation. Writing a letter for an excellent student is so satisfying. When I applied to graduate school, my strongest letter came from a professor who gave me one of my worst grades in college. Despite the message that grade conveyed to some, I knew I had worked incredibly hard in his course, and went on to do research with him. I never found out exactly what he said in my recommendation, but I do know I got into every graduate school I applied to. I have had the privilege of writing similar letters, both for A students and for C-plus students who worked so hard and showed such curiosity and creativity that it was a pleasure to write them a glowing recommendation. There are other students who may have earned an A from me, but that is about all I could say of them in a letter. It's better when students give me something to say about them.

10. Students who are fully engaged in the learning process. My heart skips a little when I see students bent over their desks, arms moving rapidly, trying to get everything down on paper for an exam, or when I see their hands in the air figuring out which way the ocean currents are deflected in the Southern Hemisphere. The energy of new knowledge put in motion is a beautiful thing.

Move on and learn a few study tips before we start the semester!

Appendix D. Study Tips for Student of Psychological Statistics

1. Use distributive practice rather than massed practice. That is, set aside one to two hours at the same time each day for five days out of the week (take the weekend off) for studying statistics. Do not cram your study for four or five hours into one or two sittings each week. This is a cardinal principle.
2. A word of warning: Statistics is very cumulative – each topic builds on the previous topics throughout the quarter. You must keep up with the instructor: attend class, read the text and do homework every day. Falling a day behind puts you at a disadvantage. Falling a week behind puts you in deep trouble.
3. A word of encouragement: Statistics is very cumulative – each topic builds on the previous topics throughout the quarter. You are constantly reviewing previous material as you work on new concepts. Identifying and learning the key concepts means you don't have to memorize as much.
4. That being said, don't try to memorize formulas. (A good instructor will never ask you to do this.) Study CONCEPTS CONCEPTS CONCEPTS. Remember, later in life when you need to use a statistical technique you can always look the formula up in a textbook.
5. Work as many and varied problems and exercises as you possibly can. You cannot learn statistics by just reading about it. You must push the pencil and practice your skills repeatedly. Studying statistics is different from studying other subjects – it is learned primarily by doing problems, so do the homework contentiously. The problems will help you learn the formulas and techniques you do need to know, as well as improve your problem-solving prowess.
6. Consider forming a study group of three or four students from your class. Meet once or twice a week (also use the phone) to review problems and concepts that have given you difficulty. You may learn more from your study group than you will from your instructor or the textbook! Verbal interchange and interpretation of concepts and skills with other students really cements a greater depth of understanding. And if everyone in your study group is stuck on the same problems, you know it is time to get help from your instructor!
7. Look for reoccurring themes in statistics. There are probably only a handful of important skills that keep popping up over and over again. Ask your instructor to emphasize these if need be.
8. Be a Gestalt Psychologist! In other words, recognize that the whole of statistics is greater than the sum of its parts. It is very easy to get hung up on nit-picking details and fail to see the forest because of the trees.
9. If you are a victim of math or stat anxiety (probably 70% of the general population are), do something about it! Do yourself a favor and get help. This may very well be the best decision you make in undergraduate school.