Syllabus for Math 15, "Introduction to Statistics"

Course Information

Semester & Year: Fall, 2023
Course ID & Section #: MATH-15-D5052
Instructor's name: Levi Gill
Course units: 4

DYARD
Math 15 5:00PM-7:05PM
Math 15S 7:15PM – 8:40PM

Catalog Description

An introduction to basic concepts of descriptive and inferential statistics, with emphasis on the meaning and use of statistical significance. Students will use probability techniques to make decisions via hypothesis testing and will estimate parameters using confidence intervals. The course includes applications from a variety of technical and social science fields.

Course Student Learning Outcomes

1. Accurately communicate statistical ideas using correct statistical notation, graphs, and vocabulary.
2. Use descriptive and inferential statistics to better understand real-world problems.
3. Demonstrate appropriate use of technology in making decisions based upon real-world data.
4. Read and interpret information that contains statistical analysis and be able to communicate these results.
5. Judge the validity of research reported in the mass media and peer reviewed journals.

Accessibility

College of the Redwoods is committed to making reasonable accommodations for qualified students with disabilities. If you have a disability or believe you might benefit from disability-related services and accommodations, please contact your instructor or Disability Services and Programs for Students (DSPS). Students may make requests for alternative media by contacting DSPS based on their campus location:

- Del Norte: 707-465-2324, main building near library

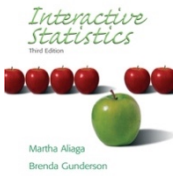
If you are taking online classes DSPS will email approved accommodations for distance education classes to your instructor. In the case of face-to-face instruction, please present your written accommodation request to your instructor at least one week before the needed accommodation so that necessary arrangements can be made. Last minute arrangements or post-test adjustments usually cannot be accommodated.

Welcome to Class!

Statistics is an incredibly relevant topic in our society. It is used in news, business, politics, academic research, and in every field that uses data. Understanding statistics will not only further your educational and career goals, but help you be an informed citizen and consumer.

Textbook

Interactive Statistics by Aliaga and Gunderson



This is a classic and amazing textbook (at least as far as textbooks are concerned). Unfortunately, the authors have passed away and it's now forever immortalized in the 3rd edition, which you will be able to tell is a little dated based on some of the data that you'll be looking at. There are a few things I want you to know up front before you panic looking at the textbook!

- It is written as an *advanced* "beginners" textbook and goes into great depth in many topics. **There are times I'm going to tell you to skim a section**, which is my way of indicating that you need to get the gist of the section but don't get bogged down in the details (unless you want to, then by all means enjoy all it has to offer).
- One advantage of its age is that it still presupposes that you are using a TI-83/84+ calculator, which the Pelican Bay Scholars Program still does. **At the end of every chapter they have TI-calculator instructions**.

- There are **answers to most of the odd questions in the very back of the book**. That's a resource for you to use. There is a difference between *answers* and *solutions*. I want you to submit solutions that works out the problems which get you to the answer.

Additional Readings

In addition, these books will serve as supplemental resources to our textbook. You will find the assigned readings from these books under the *"Additional Readings"* heading in your weekly schedule.

Naked Statistics by Charles Wheelan

Naked Statistics is a New York Times Best Seller and seeks to explain statistics to people who haven't taken a statistics class – so you have an advantage over his target audience. Charles Wheelan uses modern examples and has a quirky sense of humor, and it provides a good overview of statistics and demonstrates its value to our modern context.

Statistics Done Wrong by Alex Reinhart

Statistics Done Wrong is written for those who have been introduced to the basics of statistics, and carefully explains the strengths and limits of the concepts we're learning. The limitations of statistics are something most textbooks rarely spend any time on, and that can be a problem. It's important to know you can only go *this* far and no farther. In my professional estimation, I wish everyone in academic study read this book. Additionally, Alex Reinhart provides oodles of examples of professional academic study from a wide variety of fields which also provides you a window into how statistics is being applied.

Weekly Homework

Lectures

Every week I will be bringing in a packet in addition to my lectures and our class materials. My lectures will be my way of navigating you through our textbook, and should *not* be used to skip reading the textbook. I will give you a ten-thousand-foot view of the material we're covering, work out some examples, and provide you with my personal musing about statistics in general.

Textbook Readings

After you have read my lecture on the topic, you will be assigned portions of the textbook to read. This is going to be your main learning resource. You may have to read the sections a couple times for it to fully sink in. Also, the worked out examples are gold. Make sure you understand them.

There will be times the book may get a little too technical, and I'll let you know when and where you should skim. But by skimming, I still mean that you need to get the main point and the gist of how it works.

Homework

I have two types of homework. **General practice** and **challenge problems**. What's the difference? You'll have answers and solutions to the general practice in the back of the book, and the challenge problems won't have solutions – at least, not for a while.

I expect you to write up and submit full solutions to both types, but I'm going to grade **general practice** mostly for *completeness* (i.e., you did it), and **challenge problems** for completeness and *correctness*. In other words, I'm mostly trusting that you worked out the general practice problems and got the answer that matched the back of the book. In most cases the challenge problems are very similar to the general practice problems, so I'm going to be paying the most attention to those.

Answers and Solutions: How to use them for learning

There are **answer** to odd problems **in the back of the textbook**. There will be **solutions** in the **weekly packets**. These are written by textbook authors and will usually explain things in more detail. **These are tools for learning, so I expect you to use them**! But you want to use them in a way that helps you learn.

Learning is a physiological process, because your brain has to engage, build, and grow as you are learning. You know that feeling of being really tired when you study for a long period of time? That's literally because your brain is physically engaged in the process. Effective learning uses a process we call "productive struggle." If you aren't wrestling through problems, then your brain is probably not highly engaged. Think about it: if all you did was read a textbook and look at problems they worked out, the chances are you aren't actually learning in a deep and meaningful way. But if you read and look at problems, then tried it yourself, your brain engages – that's why it's hard! So to learn, to actually grow physiologically, you need that struggle.

But at the same time we want a *productive* struggle. It does no good to struggle in the dark, not knowing the goals or having help. So there's necessary balance between too hard and too easy. Having answers and solutions help maintain that balance – **but for this process to work, it takes a commitment from you**.

Here's how to approach the practice problems:

1) **Try it without looking at solutions or answers**, but make sure that you are fresh and familiar with the portions of the textbook that the question comes from. Look at examples.
2) Once you've tried it, check the answer in the back of the book. See how you did. If something is wrong, don't automatically jump to the solutions, but try to think about how your answer is different and see if you can fix it yourself.
3) If you can't figure out why you got a different answer, then look at the solutions in the homework packet.

After you've completed the problem, give yourself a moment to reflect on the process from the 10,000 foot view. What was the sticking point? Do you understand it now? This "post-game" analysis is almost as vital as the original productive struggle.

Reading Report

For the additional readings from *Naked Statistics* and *Statistics Done Wrong*, I'm going to provide a writing prompt in each week's packet that will ask you to respond to the ideas presented. The reading reports will be graded separately from homework problems. These are short essay questions, meaning they require more than just a one sentence answer.

Exams

I've broken up the class into Units. Roughly for every three to four chapters there will be an exam. This keeps the material from piling up into massive exams. The Final Exam will be cumulative, but emphasize material covered in the last unit. I am giving you two weeks for each exam, but you can submit them earlier if they are complete. Exams are open notes and open book(s), but you need to work on the problems individually.

Grading

Exams	**50%**
Homework	**30%**
Reading Reports	**20%**

A	$92 \leq Grade$
A-	$90 \leq Grade < 92$
B+	$87 \leq Grade < 90$
B	$82 < Grade < 87$
B-	$80 \leq Grade \leq 82$
C+	$78 \leq Grade < 80$
C	$70 \leq Grade < 78$
D	$60 \leq Grade < 70$
F	$Grade < 60$

Rubrics

I will use the following rubric to grade your **homework problem set**.

Completeness	**5 pts** **Complete** All problems are complete and have full solutions.	**4 pts** **Missing Parts** Problems are missing full solutions (e.g. missing graphs, missing parts).	**3 pts** **Missing Work** Some problems are missing.	**2 pts** **Needs Help** Some problems are missing, and/or *most* submitted problems are missing full solutions.	**1 pt** **Missing a Lot** I mostly see answers without solutions.
Correctness	**5pts** **Excellent** Your solutions are correct, or any mistakes are small mistakes.	**4pts** **Technical Mistakes** Your problems have some errors, but they are mostly small technical mistakes or basic miscalculations.	**3 pts** **Small Conceptual** The mistakes you are making are driven by small conceptual misunderstandings of new material.	**2 pts** **Serious Conceptual** The mistakes you are making are driven by large conceptual mistakes of new material, or conceptual mistakes of material that has been well-covered.	**1 pt** **Point for Trying** You made a good-faith attempt on the problem, but there is a lot wrong.

Total Points: ___ /10

I will use the following rubric to grade your **reading responses**.

Completeness	**5 pts** **Excellent** All questions are completely answered (this includes self-reflection questions!)	**3 pts** **Mostly** You didn't completely answer question(s)	**1 pt** **Not Quite** Question(s) were left blank.

Total Points: ____ / 5

What Constitutes Cheating

I've had a reoccurring problem with students either copying each other's work *or* using materials from previous semesters. So please read this section carefully to make sure that we have clear expectations.

Study groups. If you are fortunate enough to have someone to study with, that is great! I'm completely supportive of it. However, there is a difference between studying together and one person copying the other's work. Copying is really obvious in math classes. If I feel things are too similar, I'll send a note advising you of that.

Exams. You absolutely cannot work together on the exams. These need to be completely independent work. Any copying will automatically result in a 0 on the exam for both those who copied and those who allowed their work to be copied.

Using Old Solutions. Our textbook is actually a bit limited in the number of similar problems. There are three levels of problems: easy, medium, and hard. I only assign easy and medium problems. (The medium problems will feel hard, but imagine what the *hard* problems would feel like!) The downside to all of this is that most solutions are available from students from previous classes. However, using solutions from previous semesters is not acceptable for your work in a college class and will result in a 0 on the homework.

In each of these situations, I err on the side of caution. I'm not going to act on a mild suspicion, and you will always have an opportunity to reply. The program Dean has made himself available to double check any decisions I make on this issue.

About Your Instructor

I am a College of the Redwoods alumni! I have been teaching for College of the Redwoods since 2009, and I joined the Pelican Bay Scholars Program in 2017. I like teaching *a lot*. In my estimation, there's really nothing quite as rewarding than helping people grow and achieve their goals.

I have Bachelor's degree (B.A.) in Mathematics, a Masters of Science (M.S.) in Mathematical Modeling, and a Masters of Divinity (I'm also a pastor). Basically, I've spent a lot of time in higher education. I have academic experience in what are considered "pure" and "applied" mathematics. In applied mathematics, my research was in using advanced statistical models to forecast the spread and damage of forest fires, but I ultimately left a very short tenure in research to teach. Since then, that field of study has become a really hot topic (yes, pun intended!) because of the increase of wildfires due to local policy practices, naturally occurring global weather patterns, and the effect of pollution on our environmental systems.

Alongside teaching, I am a regular speaker and workshop presenter for the California Acceleration Project (CAP), a non-profit organization seeking to remove structural barriers in the community college system that have negatively impacted student success.