

Math 121 – Statistics

Lecture 1 Introduction

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Hampden-Sydney College

Wed, Jan 18, 2012

Outline

- 1 Introduction
- 2 Grading
 - Homework
 - Quizzes
 - Tests
 - Final Grades
- 3 Attendance
- 4 Classroom Etiquette
- 5 A Statistical Problem
- 6 Assignment

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Introduction

- Dr. Robb T. Koether
- Office: Bagby 114
- Office phone: 223-6207 (9:00 am - 5:00 pm)
- Home phone: 392-8604 (6:00 pm - 11:00 pm)
- e-mail: rkoether@hsc.edu
- Office hours: 2:30 - 4:00 MTWR; other hours by appointment.

Introduction

- Meeting time: MTWF at 12:30.
- Meeting place: Bagby 022 on MWF and Bagby 111 on T.
- Text: Interactive Statistics, 3rd ed., by Martha Aliaga and Brenda Gunderson.

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Homework

- Daily assignments.
 - Read the section.
 - Read the examples and work through them yourself.
 - Do the “Let’s Do It!” exercises.
 - Do the assigned exercises at the end of the section.
- Do the homework every night; do not put it off.
- The sooner you do the homework, the easier and more beneficial it is.

Homework

- If you are not able to work all the problems, then you need to seek help.
- Departmental tutors will be available Sunday through Thursday nights, 8:00 - 11:00, in Bagby 111, starting next week.

Quizzes

- There will be a quiz every Tuesday during the first 10 minutes of class.
- The quiz questions will be taken verbatim from the previous week's homework.
- No make-up quizzes will be given.
- In exchange for that draconian policy, I will drop the two lowest quiz grades.
- However, you may take a quiz early if you know that you will miss class.

Quizzes

- An industrious student should be able to obtain a nearly perfect quiz average.
- You have in advance all of the questions that might appear on the quizzes and you have their answers.
- You simply need to be sure that you have worked them and then reviewed them before the quiz so that you can reproduce the correct answers.
- A poor quiz average is a clear indication that the student is not doing the homework.

Tests

- There will be three tests

Test	Date	Chapters
#1	Fri, Feb 17	1 - 4
#2	Fri, Mar 23	5 - 8
#3	Fri, Apr 20	9 - 11

Final Exam

- The final exam will be given on Mon, May 7, at 2:00 p.m. in Bagby 022.
- It will be cumulative, covering chapters 1 - 11, 13, 14.
- Everyone must take the final exam.
- It will not be rescheduled.
- Plan now to be there.

Final Grade

- Final grade in the course is a weighted average of the quiz average, the test average, and the final exam grade.

Component	Weight
Quiz avg.	30%
Test avg.	50%
Final exam	20%

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Attendance Policy

- I will check attendance every day.
- If you arrive after the bell, it is your responsibility to tell me after class that you arrived late.
- Two later arrivals count as one absence.
- Based on your attendance, I will take the following actions.

No. of Absences	Action
0 - 3	Raise final grade one part
4 - 6	No action
7 - 9	Lower final grade one part
> 9	Withdraw you with WF

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Classroom Etiquette

- Do not make a habit of leaving the room during the class. If necessary, use the bathroom before coming to class. If you are thirsty, get a drink before class.
- During a lecture, you are free to ask questions. It is polite to raise your hand first and wait to be called on.
- While working assigned problems in class, you are free to talk to other students provided you are talking about the assigned problems.

Classroom Etiquette

- Do not talk to other students while I am talking.
- Do not sleep in class.
- Do not work on assignments from other classes during class.
- Do not read the newspaper during class.
- Do not use a cell phone during class.
- You may use a laptop provided you are using it to follow the lecture. Otherwise, leave the laptop in your room.

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A Statistical Problem

A Statistical Problem

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- I want to determine whether it is fair, i.e., does it land heads 50% of the time.

A Statistical Problem

A Statistical Problem

- I have a coin.
- I want to determine whether it is fair, i.e., does it land heads 50% of the time.
- How do I test it for fairness?

A Statistical Problem

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- Suppose that I believe that the coin is not fair, that it lands heads either too often or not often enough?

A Statistical Problem

A Statistical Problem

- Suppose that I believe that the coin is not fair, that it lands heads either too often or not often enough?
- How could I demonstrate that?

A Statistical Problem

A Statistical Problem

- Suppose that I believe that the coin is not fair, that it lands heads either too often or not often enough?
- How could I demonstrate that?
- In the interest of time, I do not want to toss the coin more than 12 times.

A Statistical Problem

A Naive Approach

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- If I do not get 6 heads (out of 12 tosses), then I will conclude that the coin is not fair.

A Statistical Problem

A Naive Approach

- A naive approach would be to count the number of heads and see whether it is 6.
- If I do not get 6 heads (out of 12 tosses), then I will conclude that the coin is not fair.
- What is wrong with that approach?

A Statistical Problem

How Much Evidence?

- Would exactly 6 heads out of 12 tosses *prove* that the coin is fair?

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- Would 12 heads out of 12 tosses *prove* that the coin is not fair?
- Would 0 heads out of 12 tosses *prove* that the coin is not fair?

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How Much Evidence?

- Would exactly 6 heads out of 12 tosses *prove* that the coin is fair?
- Would 12 heads out of 12 tosses *prove* that the coin is not fair?
- Would 0 heads out of 12 tosses *prove* that the coin is not fair?
- It depends on what we mean by “prove.”

A Statistical Problem

How Much Evidence?

- Would exactly 6 heads out of 12 tosses *prove* that the coin is fair?
- Would 12 heads out of 12 tosses *prove* that the coin is not fair?
- Would 0 heads out of 12 tosses *prove* that the coin is not fair?
- It depends on what we mean by “prove.”
- Why would 12 heads out of 12 tosses (or 1000 heads out of 1000 tosses) *statistically* prove that the coin is not fair?

A Statistical Problem

Allow for Randomness

- We must make a reasonable allowance for the uncertainty, i.e., **randomness**, in the tosses.

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Allow for Randomness

- We must make a reasonable allowance for the uncertainty, i.e., **randomness**, in the tosses.
- We expect the number of heads to be close to 6, but not necessarily equal to 6.

A Statistical Problem

Allow for Randomness

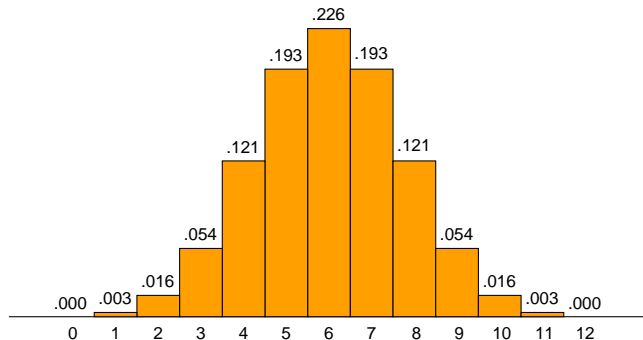
- We must make a reasonable allowance for the uncertainty, i.e., **randomness**, in the tosses.
- We expect the number of heads to be close to 6, but not necessarily equal to 6.
- How close is close enough?

A Statistical Problem

Allow for Randomness

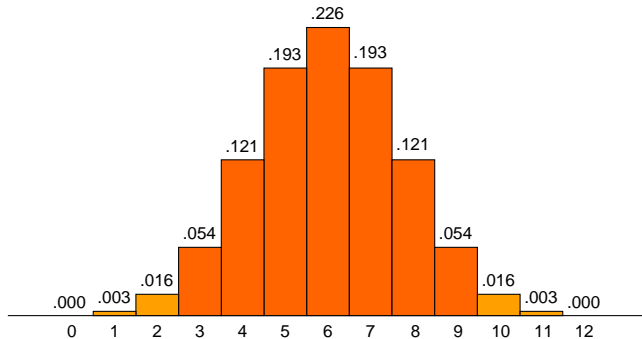
- We must make a reasonable allowance for the uncertainty, i.e., **randomness**, in the tosses.
- We expect the number of heads to be close to 6, but not necessarily equal to 6.
- How close is close enough?
- *That is the most important question in statistics.*

Distribution of Heads for a Fair Coin



The theoretical distribution of the number of heads for a fair coin

The Middle 96%



The middle 96% of the distribution

A Statistical Problem

The Correct Procedure

- The graph indicates that if the coin is fair, then we really do expect to see from 3 to 9 heads.

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- Now I will toss the coin 12 times and see how many heads I get.

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The Correct Procedure

- The graph indicates that if the coin is fair, then we really do expect to see from 3 to 9 heads.
- Now I will toss the coin 12 times and see how many heads I get.
- If I get from 3 to 9 heads, I will conclude that the coin is fair.

A Statistical Problem

The Correct Procedure

- The graph indicates that if the coin is fair, then we really do expect to see from 3 to 9 heads.
- Now I will toss the coin 12 times and see how many heads I get.
- If I get from 3 to 9 heads, I will conclude that the coin is fair.
- Otherwise, I will conclude that it is not fair (or that there was something wrong with the way I tossed it).

A Statistical Problem

The Correct Procedure

- Note that while we can statistically prove that the coin is not fair (if it is not fair), we cannot statistically prove that it is fair (if it is fair).

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- Why not?

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The Correct Procedure

- Note that while we can statistically prove that the coin is not fair (if it is not fair), we cannot statistically prove that it is fair (if it is fair).
- Why not?
- Why would 500,000 heads out of 1,000,000 tosses *not* prove that the coin was fair?

Another Statistical Problem

Another Statistical Problem

- Suppose that you take a true/false quiz with 12 questions.

Another Statistical Problem

Another Statistical Problem

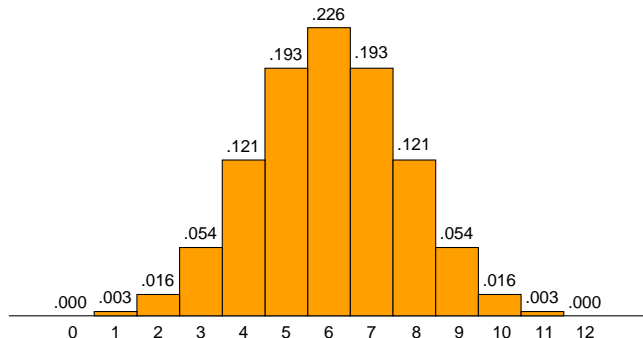
- Suppose that you take a true/false quiz with 12 questions.
- What score(s) would demonstrate that you were not simply guessing at the answers, but that you had knowledge of the material?

Another Statistical Problem

Another Statistical Problem

- Suppose that you take a true/false quiz with 12 questions.
- What score(s) would demonstrate that you were not simply guessing at the answers, but that you had knowledge of the material?
- What would a score of 0 indicate?

Distribution of Correct Answers When Guessing



The theoretical distribution of the number of correct answers when guessing

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Assignment

Homework

- Read the syllabus carefully.
- Read Sections 1.1 - 1.2, pages 1 - 4.