

Statistics and Probability

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Office hours: By appointment. I am available after school on most days.

Course Description: This class is an exploration of several practical mathematical applications. It is intended to provide students with an understanding and appreciation for the many areas of life that can be analyzed mathematically. We should be able to get through all 10 chapters of the book:

Part I: Producing data

Chapter 1: Getting good data (measuring; do the numbers make sense?)

Chapter 2: Sampling and surveys (what makes a sample/survey reliable; bias)

Chapter 3: Designing experiments (what makes an experiment reliable; ethics)

Part II: Organizing data

Chapter 4: Describing distributions (graphs; descriptive statistics)

Chapter 5: The normal distribution (shape; mean and standard deviation)

Chapter 6: Describing relationships (scatterplots; regression; correlation)

Part III: Chance

Chapter 7: Chance and probability (probability models; probability rules)

Chapter 8: Simulation and expected values (using trials to find average values)

Part IV: Inference

Chapter 9: Introduction to inference (confidence intervals; significance tests)

Chapter 10: Inference for tables and means (Chi-square; Central Limit Theorem)

Textbook & Required Material: The book for this class is Statistics through Applications (Yates, Starnes, and Moore). We will be using the TI-83 calculator extensively in this class, so make sure that you have it with you for every class period.

Course Goals & Benchmarks:

- **Intro to Probability and Statistics**
 - **Benchmarks & Performance Standards**

- Students completing course work in Intro to Statistics and Probability will:
- Understand how sampling methods affect the reliability of data collected as a sample of a population. (Department Standards 6)
- Know the difference between survey and census. (Department Standards 2, 9)
- Understand the sampling methods that are used –simple random, stratified, capture –recapture. (Department Standards 6, 9)
- Understand how clinical studies can be set up to determine casual relationships. (Department Standards 2, 9)
- Understand why different clinical studies can appear to be conflicting. (Department Standards 2,9)
- Understand and identify treatment and control groups, confounding variables and placebos. (Department Standards 2, 9)
- Distinguish between blind, double blind, and randomized controlled and controlled placebo studies. (Department Standards 2, 9)
- Be familiar with the major case studies that illustrate the problems in sampling. (Department Standards 4, 6, 9)
- Be able to represent data in frequency charts, bar charts, pictograms, histograms, pie charts and box and whisker plots. (Department Standards 4, 7)
- Distinguish between categorical and numerical variables and distinguish between continuous and discrete numerical data. (Department Standards 1, 6)
- Compute measures of location and measures of spread such as mean, median and mode, range and standard deviation. (Department Standards 1, 7)
- Find and use the Quartiles and Five–Number Summary to compare 2 or more sets of data. (Department Standards 1, 4, 7)

- Understand and correctly use the vocabulary of probability –random experiment, sample space, random variable, outcome, and event. (Department Standards 5, 6)
- Use the fundamental counting principle, permutation and combination rules to determine the size of a sample space and the number of outcomes in an event. (Department Standards 1)
- Compute theoretical probability as the ratio of number of outcomes in an event to the number of outcomes in the sample space, including the certain and impossible events. (Department Standards 5)
- Be able to complete a probability space for a random experiment. (Department Standards 5)
- Compute odds in favor of, or against, an event from the probability and vice versa. (Department Standards 5)
- Understand the Normal Distribution and use it to describe distributions that are approximately normal. (Department Standards 1, 9)
- Find the mean and standard deviation of a Normal or approximately Normal Distribution. (Department Standards 1, 6)
- Understand the Binomial Distribution and use it to find probabilities for binomial situations. (Department Standards 1, 5)
- Understand the relationship between combinations and Pascal’s triangle. (Department Standards 8)
- Understand the relationship between the Normal and Binomial Distribution. (Department Standards 4, 8)
- Be able to standardize values of a Normal random variable and use Z-tables to find associated probabilities. (Department Standards 1, 4, 5)
- Perform one and two sided hypothesis tests using a) confidence intervals and b) t-tests. (Department Standards 1, 4, 5, 6, 9)
- Perform Chi-squared tests for goodness of fit. (Department Standards 1, 5, 9)

Grading policy: Your grade for the class will be (approximately) 40% chapter tests, 25% final, 20% quizzes, and 15% homework. The grading scale is the standard 90-80-70-60 scale. Homework will be assigned on a regular basis, and checked periodically.

Homework should be organized, legible, and should demonstrate that some time and effort was put into it. I will occasionally collect a homework assignment and grade it for credit; I will let you know when I want to do this. If you are absent on the day that I collect an assignment, it is your responsibility to turn it in when you return.

We will have a quiz and a test over every chapter and a final at the end of the semester. Ordinarily, if you miss a quiz or a test due to absence, you will make it up on the day that you return (I strongly prefer that tests and quizzes NOT be made up during class time, so if you miss a test or quiz, plan on coming in early or staying after school to take it the next day). However, if you are absent for several days, we can make arrangements when you get back. If you know in advance that you will be absent on the day of a quiz or a test, talk to me and we will try to work something out.

General Classroom Expectations: The school policy on absences and tardies can be found in the student handbook. If you are absent from class, it is your responsibility to get the notes and any homework assignments from that day. When you are absent, please check the website for any homework assignments and upcoming quizzes/tests. When in class, you will conduct yourself with the honor and dignity that is expected of an Immaculate Heart student. This means that, among other things, you will pay attention, not create distractions for yourself or others, and always adhere to the academic integrity code of this school.