STAT 190 Basic Statistics
Syllabus

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Requirements for all sections are included on the common syllabus. This syllabus is more detailed, highlighting topics and including elements specific to my course.

Chapter 1 Data Collection

1.1   Introduction to the Practice of Statistics
1.2   Observational Studies versus Designed Experiments
1.3   Simple Random Sampling
      What makes a random sample random? What does a "representative" sample look like?
1.5   Bias in Sampling
2.3   Graphical Misrepresentation of Data
      "Lying With Statistics" presentation and discussion
      Lying With Statistics paper analyzing a graphic from a newspaper, magazine, or web site

Chapter 2 Organizing and Summarizing Data

2.1   Organizing Qualitative Data
2.2   Organizing Quantitative Data
      Minitab: Introduction to graphical displays: pie charts, histograms, stem and leaf plots

Chapter 3 Numerically Summarizing Data

3.1   Measures of Central Tendency (Mean and median)
      What happens to average family income if Bill Gates moves to a very small town?
3.2   Measures of Dispersion (The ith deviation, variance, standard deviation, q-spread)
      Show that the deviations sum to 0.
3.4   Measures of Position and Outliers
      Using z-scores: Who was a "better" batter, Ty Cobb or Ted Williams?
3.5   The Five-Number Summary and Boxplots
      Minitab: Introduction to basic statistical quantities and boxplots

Chapter 4 Describing the Relationship between Two Variables

4.1   Scatter Diagrams and Correlation
      Is 0.5 a large value for correlation? It depends!
4.2   Least-Squares Regression
4.3   The Coefficient of Determination
      Minitab: Introduction to basic regression techniques
      Class Data: Height versus Shoe Size, ACT versus College GPA, others
      Correlation versus Causation: Does smoking cause cancer? Do more fire trucks cause more damage?

Chapter 5 Probability

Introduction: What is probability? What does it mean? Why is it between 0 and 1? Discuss the relationship between relative frequency and probability. Discuss the long-run interpretation of probability (the old man on the street corner).

5.1 Probability Rules
The Birthday Problem

5.2 The Addition Rule and Complements

5.3 Independence and the Multiplication Rule

5.4 Conditional Probability and the General Multiplication Rule
Monty Hall problem, Incidence of a Rare Disease

Chapter 6 Discrete Probability Distributions

6.1 Discrete Random Variables

6.2 The Binomial Probability Distribution
Show how the binomial distribution works using a tree diagram.

Chapter 7 The Normal Probability Distribution

7.1 Properties of the Normal Distribution

7.2 The Standard Normal Distribution

7.3 Applications of the Normal Distribution

7.5 The Normal Approximation to the Binomial Probability Distribution

7.4 Assessing Normality
Minitab: A second look at graphical displays, introduction to normal probability plots

Chapter 8 Sampling Distributions

8.1 Distribution of the Sample Mean (General, normal, Central Limit Theorem)
Using random numbers to illustrate the CLT for the sample mean.

8.2 Distribution of the Sample Proportion
A second look at the Monty Hall problem as an example: What is the probability of observing at least as many wins as were observed by the class?

Chapter 9 Estimating the Value of a Parameter using Confidence Intervals

Introduction: A confidence interval as a set of plausible values; confidence versus probability. How much sleep do students average getting each night? Make the notion of an unknown population parameter less abstract – considering the true mean sleep gotten by all students.

9.1 The Logic in Constructing Confidence Intervals for a Population Mean, Population Standard Deviation Known ← *Depends on the actual textbook.*

9.2 Confidence Intervals for a Population Mean, Population Standard Deviation Unknown
Class data: Interval estimate for heights of males and/or females in class, compared to national averages

9.3 Confidence Intervals for a Population Proportion

Chapter 10 Hypothesis Tests Regarding a Parameter

10.1   The Language of Hypothesis Testing
10.2   Hypothesis Tests for a Population Mean, Population Standard Deviation Known
        ← *Depends on the actual textbook.*
10.3   Hypothesis Tests for a Population Mean, Population Standard Deviation Unknown
        Minitab: Application of graphical displays and basic statistical quantities, verifying assumptions,
        introduction to basic hypothesis testing and confidence intervals
10.4   Hypothesis Tests for a Population Proportion
10.5   What is a p-value? How is it interpreted?
        A third look at the Monty Hall problem: The probability of observing at least as many wins as were
        observed by the class, as done before, is actually a p-value!

Chapter 11 Inferences on Two Samples

11.2   Inference about Two Means, Independent Samples
        Class data: Comparing the mean heights of males and females
        Minitab: Application of graphical displays and basic statistical quantities, verifying assumptions.
11.1   Inference about Two Means, Dependent Samples
        Class data: Comparing the mean amount of sleep students get from early and late in the semester
        Minitab: Application of graphical displays and basic statistical quantities, verifying assumptions.
        Minitab: Two sample hypothesis tests (if time allows)

Chapter 12 Additional Topics (as time allows)

12.1   Chi-Square Goodness of Fit Test
        Counting M&M's
12.2   Chi-Square Test for Independence and Homogeneity of Proportions
12.3   Testing the Significance of the Least-Squares Regression Model