Honors Statistics Syllabus

Course Materials

Primary Text:

Bock, David; Velleman, Paul; De Veaux, Richard. Stats: Modeling the World, Second Edition. Boston: Pearson Addison Wesley, 2007.

Supporting Texts and Resources:
Peck, Roxy; Olsen, Chris; Devore, Jay. Introduction to Statistics & Data Analysis, Third Edition. Belmont, CA: Thomson, 2008.

Newspaper articles brought to class by teacher or students. These will be presented and analyzed for their statistical significance. Students will be asked to present an article about a study and explain its methods and findings using the vocabulary of statistics.

Technology

Students will have access to a classroom set of TI-84 graphing calculators. They will be used to analyze data in class and outside of class. Students who do not own one may check them out after school for use. There is a demonstration computer in the classroom for students to observe and use for the manipulation of data. Excel and on-line applets will be used. Throughout the course, statistical output from the text will be used to make students accustomed to that style of reporting.

Projects

At the completion of Unit 3, students will prepare a project in which they will plan a survey or experiment, define their strategy, anticipate confounding variables or bias, collect their data, plan and conduct their analysis, interpret and present their results in both written form and a presentation. At the end of the year, a different study or experiment will be planned and students will need to repeat the above mentioned activities and include the concept of inference and/or comparison.

Unit 1 – Exploring and Understanding Data

AP Stats Course Topic Outline
I. Exploring Data
A. Constucting and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram)
1. Center & spread
2. Clusters and gaps
3. Outliers and other unusual features
4. Shape
II. Sampling and Experimentation

C. Planning and conducting experiments
1. Characteristics of a well-designed and well conducted experiment.
2. Treatments, control groups, experimental units, random assignments and replication
3. Sources of bias and confounding, including placebo effect and blinding
4. Completely randomized design

D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys

I. Exploring Data

E. Exploring categorical data
1. Frequency tables and bar charts
2. marginal and joint frequencies for two-way tables
3. Conditional relative frequencies and association
4. Comparing distributions using bar charts

I. Exploring Data
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C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)
1. Comparing center and spread within group, between group variation
2. Comparing clusters and gaps
3. Comparing outliers and other unusual features

4. Comparing shapes
I. Exploring Data
A. Constucting and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram)
1. Center & spread
2. Clusters and gaps
3. Outliers and other unusual features
4. Shape
B. Summarizing distributions of univariate data
1. Measuring center: median, mean
2. Measuring spread: range, interquartile range, standard deviation
3. Measuring position: quartiles, percentiles, standardized scores (z-scores)
4. Using boxplots
5. The effect of changing units on summary measures
C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)
1. Comparing center and spread within group, between group variation
2. Comparing clusters and gaps
3. Comparing outliers and other unusual features
4. Comparing shapes
III. Anticipating Patterns
B. Summarizing distributions of univariate data
1. Measuring center: median, mean
2. Measuring spread: range, interquartile range, standard deviation
3. Measuring position: quartiles, percentiles, standardized scores (z-scores)
5. The effect of changing units on summary measures
C. The normal distribution
1. Properties of the normal distribution
2. Using tables of the normal distribution
3. The normal distribution as a model for measurements

Unit II – Exploring Relationships Between Variables

AP Stats Course Topic Outline
I. Exploring Data D. Exploring bivariate data 1. Analyzing patterns in scatterplots 2. Correlation and linearity 3. Least-squares regression line 4. Outliers
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Unit III – Gathering Data

AP Stats Course Topic Outline
II. Sampling and Experimentation A. Overview of methods of data collection 1. Census 2. Sample survey 3. Experiment 4. Observational study
II. Sampling and Experimentation B. Planning and conducting surveys 1. Characteristics of a well-designed and well-conducted survey 2. Populations, samples, and random selection 3. Sources of bias in sampling and surveys 4. Sampling methods, including simple random

sampling, stratified random sampling, and cluster sampling
D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys
II. Sampling and Experimentation C. Planning and conducting experiments 1. Characteristics of a well-designed and well-conducted experiment 2. Treatments, control groups, experiment units, random assignments, and replication 3. Sources of bias and confounding, including placebo effect and blinding 4. Completely randomized design D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys

Unit IV – Randomness and Probability

AP Stats Course Topic Outline
III. Anticipating Patterns A. Probability 1. Interpreting probability, including long-run relative frequency interpretation 2. "Law of Large Numbers" concept 3. Addition rule, multiplication rule, conditional probability, and independence 4. Discrete random variables and their probability distributions, including binomial and geometric 5. Simulation of random behavior and probability distributions 6. Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable B. Combining independent random variables 1. Notion of independence versus dependence
III. Anticipating Patterns A. Probability

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2. "Law of Large Numbers" concept
3. Addition rule, multiplication rule, conditional probability, and independence
5. Simulation of random behavior and probability distributions
III. Anticipating Patterns B. Combining independent random variables 1. Notion of independence versus dependence 2. Mean and standard deviation for sums and differences of independent random variables

Unit V – Sampling Distributions and Statistical Inference

AP Stats Course Topic Outline
IV. Statistical Inference D. Sampling distributions 1. Sampling distribution of a sample proportion 2. Sampling distribution of a sample mean 3. Central Limit Theorem
IV. Statistical Inference A. Estimation (point estimators and confidence intervals) 1. Estimating population parameters and margins of error 2. Properties of point estimators, including unbiasedness and variability 3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals 4. Large sample confidence interval for a proportion B. Tests of significance 1. Logic of significance testing, null and alternative hypotheses; p-values; one-and two-sided tests; concepts of Type I and Type II errors; concept of power
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3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals
4. Large sample confidence interval for a proportion
5. Large sample confidence interval for a difference between two proportions

IV. Statistical Inference

B. Tests of significance
1. Logic of significance testing, null and alternative hypotheses; p-values; one-and two-sided tests; concepts of Type I and Type II errors; concept of power

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6. Confidence interval for a mean

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Unit VI – Inference When Variables are Related

AP Stats Course Topic Outline
IV. Statistical Inference B. Tests of significance 1. Logic of significance testing, null and alternative hypotheses; p-values 6. Chi-square test for goodness of fit, homogeneity of proportions, and independence (one-and two-way tables)
IV. Statistical Inference B. Tests of significance 1. Logic of significance testing, null and alternative hypotheses; p-values; one-and two-sided tests; concepts of Type I and Type II errors; concept of power