

AP statistics

Overview

Course Design

The scope and detail that statistics covers is quite vast and broad. The subject matters range from physics to psychology. Therefore, a statistics class has the potential to be very engaging and connected. The students in class usually sit in groups of 3 to 4 and work on class work together. The discussions that arise amongst the students are thoughtful and pertinent to the discussion in the day's lecture. This helps them to establish a useful and practical methodology. Projects are assigned to reinforce the learning of material and this is also usually done in groups. C4

Teaching materials for this course include text books, classroom lectures, internet sources, videos, and technology (computer programs). All students have access to a TI-83, Microsoft excel, and Fathom. At the beginning of the year the students are provided with a handout of useful formulas and tables provided within the text book. Students will have access to a computer lab that will assist them with their homework and projects. All these computers will be equipped with excel and Fathom for the purpose of integrating technology and knowledge of the subject into computer labs that occur a few times a year. By the end of this class students will know how to graph data sets, calculate regression lines, define and use density curves and a myriad of statistical charts. They will also be able to conduct valid experiments and surveys, use probability models, create hypothesis tests, and make inferences on the data they are studying.

Projects are also a large part of the learning process students will get a better understanding of the lecture and reinforce their learning with a hands-on approach to the math. Also the class discussions that arise during the projects are engaging and educational.

REMARKS

Throughout this subject there are examples from every field of study, this really fascinates me and is enjoyable for a wide array of students. Although this subject can be challenging and daunting, it leaves you with a sense of understanding at the end that perhaps not everyone enjoys. Many times I can bring my own life experiences into the classroom or current events like political polls or medical research. I have found that statistics is truly different from many other math classes simply for the reason that it is so universal, almost every facet of science uses it, along with business, and sociology. This has been one of the most challenging subjects I've taught but it's been one of the most rewarding.

AP-Statistics Fall 2007

I. Stats: Modeling the World

By David E. Bock, Paul F. Velleman, Richard D. DeVeaux 2nd. Ed.
Pearson – Addison Wesley

II. AP Central (website)

apcentral.collegeboard.com

Use the following steps to get on the Web for AP-Statistics past Free Response Questions.

- 1) Log onto apcentral.collegeboard.com
- 2) Register in the “Other” category
- 3) Click on “login”; followed by “The Exam”; then “Exam Questions”; go to the table and select Statistics; finally “Free Response Questions”

III. Rules: 1) NO FOOD OR SODA

- 2) ONE SPEAKER AT A TIME
- 3) RESPECT ONE ANOTHER
- 4) NO SWEARING
- 5) NO WHINING

IV. Video: Meaning from Data: Statistics made clear. Hosted and lectured by Michael Starbird

V. Grading:

- 1) Homework – counts as 15% of grade. This takes in account all class work passed in and any homework that is corrected.
- 2) Labs/Activity – these will count for 25% of grade and will be given at least once during each quarter. These projects will be graded on neatness and content and completeness of sentences.
- 3) Reading is an essential part of the assignment for your understanding of the concepts and for our class discussion.
- 4) Tests – These will occur usually twice a quarter and count as 30% of your grade.
- 5) Quizzes – will be given twice between tests, and counted as 20% of your grade. Pop-quizzes will occur at any time.
- 6) Class Participation – This will apply to attitude and conduct within the classroom. Also to any activities we have or in-class assignments, this will count for 10% of grade.

AP-Statistics – 2007

HW	Chapter	Content	Writing	Syllabus evaluation guidelines	Video	(Possible) Activity
1	Ch1	Stats Starts Here			Meaning from Data: Statistics Made Clear	
2	Ch2	Data	P 16 - 5,8,20			
3	Ch3	Displaying & Describing Categorical Data	P 36 - 1,3,5,9,11,18	C3		
4			2,11,13,14,17,21			
5			22,25,26,30			
6	Ch4	Displaying Quantitative Data	P 64 -1,10,11,12,13	C2a , C5		
7			14,16,20,23,24			
8			28,29,32,33,34			
Test 1						
9	Ch5	Describing Distributions Numerically	P 90 - 5,7,9,13,16			
10			19,21,22,27,31			
11			33,42,43,44			
12	Ch6	The Standard Deviation as Ruler and the Normal Model	P 123 - 1,4,7,8,9			
13			11,13,14,18,19			
14			23,26,28,30,31			
Test 2						
15	Ch7	Scatterplots, Association, and Correlation	P 160 - 1,4,5	C2a,C2c	9. Correlation	
16			7,8,9,11,14,17			
17			18,19,22,23,25,27			
18	Ch8	Linear Regression (including a test)	P 189 - 2,3,6,7,8			Pass The Buck (microsoft excel)
19			9,10,11,17,19,22			
20			23,24,30			
21			31,32,36			
Test 3						
22	Ch9	Regression Wisdom	P 213 - 1,2,3,4,5,6			
23			8,9,12,15			
24			13,14,16,21			
25	Ch10	Modeling Curved Relationships	P 238 - 1,3,6		7. Models for Growth	Area and distance
26			8,9,14,17			Pendulum Swing
27			19,20,23,24,25			Bouncing Ball
Test 4						
28	Ch11	Understanding Randomness	P 267 - 5,9,10,16,18			Sum to 1, 2, 3 ...

29			23,27,29			Within the square
						Buffon's needle
30	Ch12	Sample Surveys	P 289 - 1,4,6, 9,11,12			Random Rectangle
31			18,20,23			Hospital Stay
End Fall						
	Ch13	Experiments	P 313 - 2,5,6			2002 B #3
			13,15,16,17,19,22			2003 B #4
TEST			24,25,28,29,33,36			2000 #5
	Ch14	From Randomness to Probability	P 339 - 1,2,4	C2c		
			6,9,11,12,13,15			
			17,18,20,23,24,25			
	Ch15	Probability Rules!	P 362 - 1,5			Christmas Lights
			7,9,12,15			Pick a Die
			17,18,21,22,23			Ropes and Loops
			25,27,30,32,35			Monty Hall
	Ch16	Random Variables	P 381 - 1,4,5			Soda
			8,9,12,13,19,22,26			
			27,31,33,35,37,38, 40			
	Ch17	Probability Models	P 398 - 2,4,6	C2c C5	15. What Is Probability	Russian Roulette
			8,10,13,15,17			Rumor
TEST			20,23,26,28,30,32			Seven game series
	Ch18	Sampling Distribution Models	P 428 - 1,3,5,8			Dice (8-4-2-1)
			9,12,14,16,20,21			
			23,26,29,31,33,34			
	Ch19	Confidence Intervals for Proportions	P 446 - 1,3,6	C2d	19. Confidence Interval	Beads and Jars
			7,9,12,13,15,17,19			
Test			22,24,25,27,29,30, 31			
	Ch20	Testing Hypotheses about Proportions	P 469 - 1,3		20. Significance Tests	
			5,8,11,13			Male vs. Female inc.
			16,19,20,23,24			
	Ch21	More About Tests	P 491 - 1,3,5			
			8,10,11,13			
			15,18,19,21			
	Ch22	Comparing Two Proportions	P 508 - 2,3,4,5,8			Sensitive Questions
Test			10,12,15,19,21,22			
End Winter						
	Ch23	Inferences about Means	P 541 - 2,3,4,5	C2b C3		Heart beats
			8,9,11,13,15			Quality Control
			18,20,26,29,30			Matching length

	Ch24	Comparing Means	P 567 - 2,6,7,8,9,11 14,19,21,23,27,28	C2d		Reflexes
	Ch25	Paired Samples and Blocks	P 586 - 1,4,6 8,10,11,15,18,21			
Test	Ch26	Comparing Counts	P 629 - 1,4,7,8 9,10,13,14 21,23,26,28			Sex Bias
	Ch27	Inferences for Regression	P 658 - 1,2 3,4,5,6,7,9	C2d,C5	25. Inference for Relationships	
		AP Exam - May 8, 2008 (afternoon)				
		AP Final Project – Choice of student statistics related		C4		

C2a – The course provides instruction with appropriate emphasis on exploring data.

C2b – The course provides instruction with appropriate emphasis on sampling and experimentation.

C2c – The course provides instruction with appropriate emphasis on anticipating patterns.

C2d – The course provides instruction with appropriate emphasis on statistical inference.

C3 – The course draws connections between all aspects of the statistical process, including design, analysis, and conclusions.

C4 – The course teaches students how to communicate methods, results, and interpretations using the vocabulary of statistics.

C5 – The course teaches students how to use graphing calculators and demonstrates the use of computers and/or computer output to enhance the development of statistical understanding through exploration and analysis of data, assessment of models, and simulations.

COURSE OUTLINE

Exploring Data – Ch.1,Ch.2,Ch3,Ch4,Ch5,Ch6

Graphical displays of distributions of univariate data: boxplots, stemplots, dotplots, histograms, frequency charts, cumulative frequency charts, and bar charts. tree center, spread, and shape. Summarizing distributions of univariate data. Mean, median, mode, range, interquartile range, quartiles, standard deviation, percentiles, standardized scores (z-scores). Comparing distributions of univariate data. Compare center, spread, clusters, gaps, outliers and shapes within groups and between dotplots, stemplots and boxplots. Several days are spent in instruction with the TI-83 calculator, this will continue throughout the class. Students use data generated in the class for classroom exercises.

Scatter Plots and Correlations – Ch.7,Ch.8

Explanatory and response variables. Analyzing patterns in scatterplots, time series, correlation and linearity. Use of excel and Fathom for interpreting data.

Bivariate Data - Ch.9, Ch.10

Least squares regression line, residual plots, outliers, influential points, and transformations to achieve linearity. Students use calculators and computers to write equations of the curves that best model their data. Project: Will include computer use to interpret data and organize it. Also to find LSRL and correlation, and to create a residual plot.

Gathering Data (Samples, Observations, and Experiments) – Ch.11, Ch.12, Ch.13

Learn how to simulate trials and model procedures and the importance of Randomness. Representing population and sample parameters with SRS, stratified, cluster, multi-stage, and systematic sampling. Blindness, and biases will be discussed along with confounding factors.

Probability and Categorical Data - Ch.14, Ch.15, Ch.16, Ch.17

Analyzing two-way tables, Simpson's Paradox, conditional, and marginal relative frequency and their association with probability. Venn Diagrams with a emphasis on mutually exclusive, disjoint, and independence. Pictures of data like venn, contingency tables, and tree diagrams. Geometric and Binomial models to explain probabilities.

Confidence Intervals, Hypothesis testing, standard error, and one-two sample z– Ch.18, Ch.19, Ch. 20, Ch. 21

Central Limit Theorem, along with Standard error and it's definition. Confidence Intervals with z. P-value along with null hypothesis and alternative hypothesis. Statistical significance and critical values with Type I and Type II error.

Inferences of Means and Sample Blocks – Ch.23, Ch.24, Ch.25

Degrees of freedom and Student's t distribution. Testing hypothesis, one and two sample t test. Paired t-interval

Comparing Counts and Inference for regression – Ch.26, Ch. 27

Chi-Squared with two way tables for a goodness of fit. Simple linear regression model, estimating regression parameters, confidence intervals and inference for the slope, prediction, point estimators, and confidence interval for a future observation.

AP Statistics Project (Hypotheses Testing) [[C2a,b,c,d]] [[C3]] [[C4]] [[C5]]

Project: Is There Statistically Significant Evidence to Demonstrate Gender Discrimination in the Paycheck?

Scenario:

Several major corporations have had to pay millions of dollars to settle "gender discrimination" lawsuits. As a result of these rulings, companies are very concerned with the parity of pay of their employees.

Gender Discrimination Class Action Against Morgan Stanley (June 22, 2006)
Boeing to Pay \$72.5 Million for Gender Discrimination, (November 14, 2005)
A New Black Eye for Boeing? Internal Documents Suggest Years of Serious Compensation Gaps for Women (Business Week, April 26, 2004)
EEOC announces \$47 million agreement in principle to settle claims of class-wide sex bias against Rent-A-Center (March 9, 2002)
Employees in three states file sex-discrimination lawsuits against Boeing (January 16, 2002)
Wal-Mart female workers demand respect and fair treatment (July 16, 2001)
Lawsuits charge CBS with sex discrimination (February 25, 2000)
AT&T settles sex-bias lawsuit for \$3.3 million (June 6, 1994)

Project:

Write a report (word processor preferred) testing the following claim:

"The mean pay of the female managers is less than their male counterparts."

I. At the 0.05 level of significance, test whether the following corporation is guilty of "gender discrimination" in the manner they pay their employees. The following table displays the annual salary of 40 managers (20 male and 20 female). No effort was made in pairing the data. Perform the hypothesis tests using the Female and Male data as Independent Data

Note: Remember to hypothesis test $\sigma^2(\text{male}) = \sigma^2(\text{female})$ to determine if the variances should be pooled or not when testing the means.

II. At the 0.05 level of significance, test whether the following corporation is guilty of "gender discrimination" in the manner they pay their employees. The following table displays the annual salary of 40 managers (20 male and 20 female). Every effort was made in pairing the data (same amount of experience, same responsibilities, etc.).

Perform the hypothesis tests using the Female and Male data as Dependent Data

Female	Male
\$43,800	\$44,000
\$35,500	\$36,000
\$39,700	\$38,000
\$38,000	\$42,000
\$36,500	\$37,000
\$33,000	\$35,000
\$54,000	\$56,000
\$36,000	\$36,000
\$54,000	\$53,000
\$35,500	\$36,000
\$34,900	\$41,000

\$36,900	\$38,000
\$47,800	\$50,000
\$42,000	\$45,500
\$30,000	\$31,000
\$42,000	\$41,500
\$39,000	\$38,500
\$42,500	\$42,000
\$31,000	\$31,000
\$38,000	\$39,500

III. Based on your hypothesis tests

A. Are there grounds for a gender discrimination lawsuit in behalf of the female managers?

B. If you represented management, which approach, independent or dependent, would be the basis of your defense?

C. If you represented labor, which approach, independent or dependent, would be the basis of your prosecution?

D. Which approach should the jury believe? Explain your decision.

IV. (Oral Presentation) - Be prepared to defend either position for in-class debate and mock trial.