

AP Statistics

Text: Yates, Daniel, David Moore and Darren Starnes, The Practice of Statistics 2nd ed., W.H. Freeman and Company, New York **aligned with College Board Indicators**
AP Questions are available from the College Board website
<http://apcentral.collegeboard.com>

Other Resources Used:

- 1) David E. Bock, Velleman, DeVaux, Stats Modeling the World, Pearson Addison Wesley, New York, 2004.
- 2) Ron Millard, Turner, Activities and Projects for Introductory Statistics Courses, 2nd edition, W.H. Freeman and Company, New York 2008.
- 3) Daniel Yates, Starnes, Moore, Statistics through Applications, W.H. Freeman and Company, New York, 2005.
- 4) Martin Sternstein, Ph.D., Barron's AP Statistics, 4th edition, Barron's Educational Series, New York, 2008.

Course: *AP Statistics*

Description:

This is a year long class meant to be taught at the introductory college level. The course moves through four basic units including data gathering, data analysis, probability and inference. More specific skill breakdown is provided in the above pacing and standards alignment guide.

Materials:

Students will need a TI-83+ or TI-84+ calculator and internet access.

Goals:

- 1) Students will learn to gather data in using appropriate methods and display that method in multiple ways.
- 2) Students will use technology to organize, display, simulate and perform appropriate calculations and tests within statistical problems.
- 3) Students will learn to look at numbers with a new understanding of where those numbers came from and be more aware of both proper and improper production and use of statistical information.
- 4) Students will learn the essential elements of experimental design and survey methods.
- 5) Students will understand the idea of randomness with respect to discrete and continuous data sets.
- 6) Students will learn to draw conclusions about what the data tell them through various types of hypothesis testing.

College Board/ Indicator Ref. #	Text Section	Days (Time)	Resources AP Questions; Vocabulary
1.0 Exploring Data	<p><i>Chapters 1-4</i></p> <p><i>Objectives: 1) Students will become familiar with all major types of data display including bar charts, pie charts, dot plots, line plots, stem and leaf plot, boxplots and histograms.</i></p> <p><i>2) Students will be able to construct data displays for quantitative variables and will use TI-84 calculators to construct histograms, boxplots and scatter plots.</i></p> <p><i>3) Students will be able to choose and justify appropriate summary statistics for a data set after commenting on the shape, center and spread of a distribution based on the raw data and its display.</i></p> <p><i>4) Characteristics of density curves with an emphasis on Normal Distributions will be explored including standardizing data and the empirical rule.</i></p> <p><i>5) Students will use normal probability plots to help justify the use of a normal model.</i></p> <p><i>6) Students will assess linearity of bivariate data by looking at a scatter plot, residual plot and calculating the correlation coefficient.</i></p> <p><i>7) Students will use technology to generate models for data</i></p>	44	<p>In addition to the text demonstrations will be made using <i>Fathom</i> software in class.</p> <p>Essential Vocabulary:</p> <p><i>Individuals</i></p> <p><i>Variable (categorical and quantitative)</i></p> <p><i>Distribution</i></p> <p><i>Shape</i></p> <p><i>Center</i></p> <p><i>Spread</i></p> <p><i>Outlier (know all types and how to test for them)</i></p> <p><i>5 number summary</i></p> <p><i>Mean</i></p> <p><i>Standard deviation</i></p> <p><i>Normal curve</i></p> <p><i>LSRL</i></p> <p><i>Residual</i></p> <p><i>Correlation</i></p> <p><i>Influential point</i></p> <p><i>Conditional Distribution</i></p> <p><i>Simpsons's paradox</i></p>

	<p><i>including LSRL and comment on those models using the coefficient of determination and other analysis.</i></p> <p>8) <i>Students will use models to make predictions about the data.</i></p> <p>9) <i>Students will use basic functions to transform data in order to improve analytical potential.</i></p>		
1.1 a, b, c, d	Introduction pp. 4-10 <i>Displaying data-charts</i>	3	
	1.1 pp. 11-30 <i>dotplots/stemplots/histograms</i>	3	<p>AP: 2001 #6a; 2002B #5; 2003 #1a,b; 2006 #1; 2008B #1</p> <p>HW 1: p. 34-36 #1.23-1.29 odd</p>
1.2 a, b, c, d, e	1.2 pp. 37-46 <i>mean/5 number summary</i>	3	<p>AP: 2005 #1a (choice of measure of center)</p>
1.3 a, b, c, d	1.2 pp. 49-61 <i>spread-Standard Deviation comparative distributions</i>	3	<p>AP: 2000 #3; 2001 #1; 2004B #5a; 2004 #1; 2006 #1</p> <p>HW 2: p.66-70 #1.59-1.68 all</p>
3.3 a, b, c	2.1 pp. 76-91 <i>density curves-normal dist. 68-95-99.7 Rule</i>	3	<p>AP: 2007 #1a</p> <p>HW 3: p.90-93 all</p>
	2.2 p. 93-109 <i>standardizing data/standard normal curve</i>	3	<p>AP: 1998 #6a; 1999 #4a,c; 2002 #3a; 2004B #3a,b</p> <p>HW 4: p.113-116 odd</p>
1.4 a, b, c	3.1 pp. 120-134 <i>scatterplots-construction of</i>	3	<p>HW 5: p.135-139 select problems</p>
	3.2 pp. 140-147 <i>correlation</i>	3	<p>AP: 1998 #2; 2000 #1; 2002B #1</p> <p>HW 6: p.146-149 select problems.</p>
	3.3 pp. 149-156 <i>LSRL</i>	3	<p>AP: 2006 #2 (regression line from</p>

			software)
	pp. 157-165 <i>the role of r^2</i>	3	AP: 2005 #3
	pp. 167-176 <i>residuals</i>	3	AP: 1998 #4 (residual plots); 1999 #6c; 2002 #4; 2003B #1(influential points) HW 7: p.176-190 select problems
1.4 e	4.1 pp. 194-211 <i>transforming relationships log/ exponential models</i>	3	
	pp. 214-222 <i>power models</i>	3	HW 8: p.222-225 select problems
1.4 d	4.2 pp. 225-237 <i>extrapolation/lurking variables</i>	3	HW 9: p.238-240 select problems
1.5 a, b, c, d	4.3 PP. 241-253 <i>two way tables/conditional distributions</i> TEST 1	2	AP: 1997 #6; 2004B #1 HW 10: p.257-261 even
2.0 Sampling and Experimentation	Chapter 5 Objectives: 1) <i>Students will understand how to gather data effectively by asking the key question: What do we want to discover?</i> 2) <i>Students will learn to construct appropriate survey questions to answer questions about a target population.</i> 3) <i>Students will learn to model situations through simulation techniques using TI-84 calculators and Fathom software.</i> 4) <i>Students will understand the difference between observational studies and experiments.</i> 5) <i>Students will learn how to determine the effects of treatments on a response variable through experimental</i>	16	Essential Vocabulary: <i>Observational Study Experiment Population Sample Sampling Census Voluntary Response Sample Biased SRS Probability Sample Stratified Random Sample Undercoverage Nonresponse Systematic Random Sample Convenience Sample Factor Level</i>

	<i>design.</i>		Placebo Randomize Control Replicate Block Blinding (double) Probability Model Simulation
2.1 a, b, c, d 2.2 a, b, c, d	5.1 pp. 268-285 <i>observation v. experiment</i> <i>sampling design: population, census, voluntary response, convenience, bias, SRS, PRB</i> <i>sampling and stratifying</i>	4	AP: 2005 #5b,c; 2007 #5a HW 11: p.285-289 all
2.3 a, b, c, d, e	5.2 pp. 290-298 <i>designing experiments:</i> <i>Units, subjects, treatments, factors, levels, placebo, controls, randomization, replication, significance</i>	6	AP: 2003B #3a; 2007 #2 HW 12: p.303-305 all
	pp. 299-306 <i>Blinding, matched pairs, block designs</i>	4	AP: 1998 #3; 1999 #3; 2000 #5; 2001 #4 (blocking); 2002 #2 (match pairs design); 2002B #3; 2003 #4 (randomization); 2004 #2 (blocking); 2004B #2; 2006 #5
3.1 e, 2.4	5.3 pp. 309-316 <i>Simulating experiments: random digit assignment</i> QUIZ Chapter 5	3	AP: 2003 #4a,b,d; 2007 #2b HW 13: p.319-323 Part I of Project Due
3.0 Anticipating Patterns	Chapters 6-9 Objectives: 1) Students will explore random behavior and become familiar with the Law of Large Numbers. 2) <i>Students will learn basic probability rules through simulation and formal methods.</i> 3) <i>Students will move from</i>	45	Essential Vocabulary: General Probability Rules Disjoint Complimentary Independent Event Outcome

	<i>discrete probability calculation to theoretical distribution models including the normal model, geometric model and binomial model.</i>		<i>Without replacement Discrete Continuous Expected Value Binomial Probability Geometric Probability</i>
3.1 a	6.1 pp. 330-333 <i>The idea of probability</i>	2	HW 14: p. 356-359 all
3.1 c	6.2 pp. 335-348 <i>sample space, event, prb model, Multiplication, Addition, and Complement Rules</i>	3	
3.1 c	6.3 pp. 359-379 <i>Conditional Probability-General Rules</i>	5	AP: 1997 #3; 1999 #5; 2003B #2; 2004 #4a HW 15: p.379-386 select problems
3.1 d	7.1 pp. 390-403 <i>discrete/continuous random variables, normal distributions as PRB distributions</i>	5	HW 16: p.403-405 all
3.1 b, f	7.2 pp. 407-426 <i>means and variances of random variables, Law of Large Numbers</i> QUIZ Chapters 6-7	5	AP: 1999 #5b; 2000 #6b,c; 2001 #2; 2002 #3; 2002B #2; 2003B #5; 2003 #6a; 2004B #3c,d (normal curve); 2004 #4b,c; 2005 #2 (expected values); 2006 #3a HW 17: p. 427-430 select problems
3.1 d	8.1 pp.439- 461 <i>binomial distributions</i>	5	AP: 1998 #6b,c,d,e; 1999 #4b; 2001 #3; 2004 #3 (conditions for binomial setting); 2006 #3b,c HW 18: p.461-464 all
3.1d	8.2 pp.464-475 <i>geometric distributions</i>	5	HW 19: p. 475-482 odd
2.2 a, b, c	9.1 pp. 488- 502		

	<i>sampling distributions, variability, parameters, bias</i>	5	HW 20: p.499-504 select problems
3.4 a	9.2 pp. 504 – 512 <i>sample proportions</i>	5	HW 21: p.513-514 all
3.4 b, c	9.3 pp.514 – 525 <i>sample means, central limit theorem</i> TEST 2	5	AP: 1998 #1 (CLT); 2004 #3c,d (CLT); 2007 #3 HW22: p.525-530 all
4.0 Statistical Inference	Chapters 10 – 14 Objectives: 1) <i>Students will use sample statistics to estimate a range of possible values for population parameters (confidence intervals).</i> 2) <i>Students will propose models for situations and examine observed statistics to see if the model makes sense.</i> 3) <i>Students will learn to appropriately identify and use inference procedures to test hypothesis based on the central limit theorem including tests about proportions and means.</i> 4) <i>Students will learn to check underlying assumptions for all tests.</i> 5) <i>Students will know when to use t models, matched-pairs t models and how to perform tests on counted data.</i> 6) <i>Students will identify understand and perform inferences for regression.</i>	60	Essential Vocabulary: <i>Hypothesis</i> <i>Null</i> <i>Type I Error</i> <i>Type II Error</i> <i>Power</i> <i>Significance Level</i> <i>Standard Error</i> <i>Pooled Data</i> <i>Confidence Level</i> <i>Inference</i> <i>Margin of Error</i> <i>P-Value</i>
4.1 c, f	10.1 pp. 537 – 556 <i>estimating with confidence, confidence intervals for a population mean, margin of error</i>	6	AP: 2007 #1c HW 23: p.556-558 all

4.2 a, d	10.2 pp. 559 – 582 <i>tests of significance, alternative and null hypotheses, p-value, statistical significance, one-sample z statistic</i>	5	AP: 2005 #5a HW 24: p.583-586 select problems
4.2a	10.3 pp. 586 – 592 <i>statistical significance</i>	5	AP: 2002 #1; 2002 #6a,b; 2003B #6; 2003 #6b,c,d
4.2a	10.4 pp. 593 – 605 <i>inference as decision, type I and type II errors, power</i> QUIZ Chapters 8-10 Project Part II Due	6	HW 25: p.602-612 select problems
3.4 g, 4.1 f, 4.2 a, d	11.1 pp. 616 – 642 <i>inference for the mean of a population, one-sample t-statistic, t confidence intervals and tests of significance, matched pairs t procedures, robustness</i>	6	AP: 2000 #2 (t-test); 2003 #1c; 2004 #6 (confidence interval only); 2004B #5b,c; 2007 #4 HW 26: p.642-646 select problems
4.1 g, 4.2 e	11.2 pp. 648 – 668 <i>comparing two means, two-sample problems, difference between means</i>	5	AP: 1999 #6a,b; 2000 #4; 2001 #5 (paired t-test or two sample z test); 2002B #6a; 2003B #4c; 2004B #4 (confidence interval only); 2005 #6; 2006 #4 HW 27: p. 668-680 select problems
4.1 d, 4.2 b	12.1 pp. 685 – 697 <i>inference for a population proportion, confidence intervals for p</i>	5	AP: 1998 #5; 2002B #4; 2003 32 (Type I and Type II Error) HW 28: p.698-701 odd
4.1 e, 4.2 c	12.2 pp. 702 – 713 <i>comparing two proportions, confidence intervals for differences of proportions, significance tests for differences of proportions</i> Projects Due	3 3	AP: 2000 #6; 2002 #5, #6c,d; 2003B #3b; 2004B #6; 2007 #5 HW 29: p. 719-722 all
3.4 h, 4.2 f	13.1 pp. 728 – 743		HW 30: p.742-744

	<i>Chi square test for goodness of fit</i>	6	all
4.2 f	13.2 pp. 744 – 766 <i>inference for two-way tables, chi-square statistic, chi-square test for homogeneity of populations</i> TEST 3+ (Sample AP Exam)	6	AP: 1999 #2 (independence); 2002 #6; 2002B #6b (homogeneity); 2003 #5 (independence); 2003B #5c (independence) HW 31: p.766-775 select problems
4.1 h, 4.2 g	14.1 pp. 780 – 794 <i>regression inference, confidence intervals for the regression slope</i>	4	AP: 2001 #6b HW 32: p.806-811 select problems

- Pacing based on 52 minute periods 5 days per week with approximately 165 prep days before AP Exam.