A.P. Statistics: Curriculum

Course Materials:

Primary Materials
Bock, Velleman, De Veaux. *Stats Modeling the World. U.S.A.: Pearson Education , 2004*

Fathom Dynamic Systems Software

Supplemental Materials
AP Statistics Course Description. The College Board

AP Statistics Exam free-response questions from 1997 to present

Erickson, *Fifty Fathoms: Statistics Demonstrations for Deeper Understanding.* CA: eeps media, 2002

Clements, *Exploring Statistics with Fathom.* CA: Key Curriculum Press, 2007

Rossman, Chance, Oehsen. *Workshop Statistics: Discovery with Data and the Graphing Calculator. 2nd ed.* Emeryville CA: Key College Publishing, 2001

Scheaffer, Gnandesikan, Watkins, Witmer. *Activity Based Statistics.* NY: Springer-Verlag, 1996

Watkins, Scheaffer, Cobb. *Statistics in Action: Understanding a World of Data.* CA: Key Curriculum Press , 2004

Erickson, *Data in Depth: Exploring Mathematics with Fathom.* CA: Key Curriculum Press, 2001

NSF/COMAP. Statistics: Decisions through Data series. Lexington, MA: COMAP, 1992. 5 one-hour videotapes, Student Workbook, and User's Guide.

Carroll, Carver, Peters, Ricks. *AP Test Prep Series: AP Statistics.* Ma: Pearson Education, Inc., 2007

Please Note: Computer simulations with Fathom as well as many java applets are used throughout the course. H.W. problems contain many problems where students are asked to analyze computer printout. Calculators are used throughout the course. Instruction is always given. Further, calculators are used to help discover major concepts.

Part I: Exploring ad Understanding Data

Day #	Chapter	Topics	Assignment
1	Intro	**Syllabus**	Read chapter 1 & 2 Page 13: #3, 5, 8, 17, 21
2	1 &2	1. Types of Data *An Unusual Incident Activity* 2. The 5 W's for describing data 3. Basic Vocabulary 4. Segmented Bar Graphs *Work Shop Statistics (WSS)* *Activity 7-2*	Read pp, 15-20 Page 28 # 5, 6, 7 Page 13 #9
3	3	1. Bar & Pie Charts 2. Contingency Tables 3. Conditional & Marginal Distributions 4. Intro to Independence	Read pp.21-26 Page 30-33 # 12,15,23,18
4	3	1. Simpson's Paradox *WSS Activity 7-4* 2. Continue Segmented Bar Graphs	Page 34 # 29 Ditto 3-6 *Teacher's Resource Guide (TRG)*
5	3	*1. Discrimination Lab*	Study for Quiz
6	3-4	1. Quiz 2. Stem plots DVD *Decisions Through Data*	Read pp. 36-43
7	4	1. Quantitative Data 2. Describing with SOCS (Shape, outliers, Center	Page 50-51 # 4,6,7,10,11,12

		Spread) 3. Histograms, dot graphs, Stem & Leaf	
8	4	1. Describing Histograms (bimodal penny example) 2. Bin widths http://www.stat.sc.edu/~west/javahtml/Histogram.html Students work with applet of Old Faithful Data which allows them to see the affects of changing bin-width on the shape of the histogram. 3. Calculator steps for making a histogram	Read pp. 44-48 Page 51-52 # 14, 15, 16, 18, 31
9	4	1. Task Chapter 4 (Discuss) 2. Re-expressing data 3. Worst graphs Ever!	Study for quiz Work on Task
10	4-5	1. Quiz	Numeric Summary Ditto*Calculator steps for 1 Var Stats
11	5	1. Resistant measures 2. Relationship between shape, mean & median 3. Median, Upper & Lower Quartiles 4. Range, IQR 5. Five Number Summary 6. BoxPlots 7. Outlier Test 8. Comparing Boxplots	Read pp. 57-62 Page 73 #3, 4, 6, 11
12	5	1. *TRG* page 5-9 (McTofu Example) 2. *How to make a Box & Whisker on the Calculator*	Matching Plots to Variables Activity Page 74 #13-15
13	5	1. Standard Deviation by hand & development 2. Standard Deviation on calculator	Read pp. 63-70 pp.73-77 # 5, 9a, 9c, 12, 19, 20, 25, 29
14	5	1. A.P. Question 2004 # 1 2. Discuss Task : Auto Safety	Task* Study for Quiz
15	6	1. Quiz 2. Z-Scores (*WSS Activity 5-6)*	Finish Task
16	6	1. Z-Scores	Read pp. 83-73

		2.Adding & Subtracting A constant to Data 3.Rescaling Data (2, 3 accomplished with a discovery ditto utilizing calculator)	P. 100 # 1, 3, 5, 7, 8
17	6	1. Normal Probability Model 2. Model vs. Distribution	Read pp. 83-87 Page 100 #1, 3, 5,7,8
18	6	1. Normal Probability Calculations using Technology NormalCdf, InvNorm	Read pp. 90-93 p. 101-102 # 12, 14, 19, 21, 23ac, 25
19	6	1. Activity: Normal Distribution & Length of Pregnancy 2. Normal Probability Calculations Cont.	Read pp. 93-98 # 22, 24ac, 27, 29, 32
20	6	1. Normal Probability Plot: Simulation	Take Home Quiz
21	1-6	Review of Part I: Start In Class Due on Day #25	Page 105 # 3,5,6,7,9,15,18,24,31,32 Page 103 #29 Page 78 #30

Part II: Exploring Relationships Between Variables

22	7	1. Describing Scatterplots: Direction, Form ,Scatter, Outliers Calculator utilized with various data sets for context 2. Association Doesn't Mean Causation! Lurking Variables	Read pp. 115-119 Page 131 # 2, 3, 5, 6, 7
23	7	1. Estimating Correlation http://www.stat.uiuc.edu/courses/stat100/java/guess/GCApplet.html http://www.ruf.rice.edu/~lane/stat_sim/reg_by_eye/index.html 2. Calculating Correlation: Fathom Development to develop formula for r using data	Read pp. 119-125 Page 133 # 11, 12, 13, 15, 16, 23
24	7	1. More on Estimating Correlation: Scatsim program on Calculator for estimating r 2. Straightening Data- A first look 3. Start Test Review	Finish Test Review Problems

25	7	**TEST REVIEW**	STUDY
26	1-6	TEST Part I	
27	8	1. Least Square Regression Line: Fathom Activity Fathom allows students to try to find the line of best fit manually. Then students try to minimize the squared residuals. Leads to definition of least squares regression line and idea of a residual.	Read pp. 137-144 Page 155 # 5
28	8	1. Collect Data: Paper Pinching 2. Manually Calculating LSRL from data 3. Interpreting slope and y-intercept in context 4. Define Residuals 5. Appropriateness of linear model using residuals 6. Graphing Residuals on Calculator	Page 155 # 2, 3, 4, 9
29	8	1. Understanding R-Squared : Use TI program: Simulation to understand what R-squared means 2. Interpreting R-Squared	Read pp. 145-150 Page 156-157 # 17, 22
30	8	1. Summary Activity: *TRG page 8-7* 2. Discuss Task: Smoking	Page 157-158 # 23, 25, 32
31	8	1. Analyzing Computer Printouts: A.P. Examles	Page 160-161 # 31, 33, 35, 37
32	8	1. A.P. Questions: 1999 #1, 1998 #4, 2002 #4 (computer output included)	Study
33	7/8	Test : Linear Regression	
34	9	1. Graduation Activity- Dangers of Extrapolation	Read pp. 162-167 Page 175-176 # 1, 2, 3, 5, 6
35	9	1. Influential Points class Activity http://www.calpoly.edu/~srein/StatDemo/All.html http://www.stat.uiuc.edu/courses/stat100/java/guess/PPApplet.html	Read pp, 167-173 Page 176-177 # 1, 9, 10, 11
36	9	1. Influential Points Continued 2. Lurking Variables & Causation 3. Working with Summary Values	Page 178-180 # 12, 13, 15, 20
37	10	1. Re-expressing Data (Demonstrated on Calculator) 2. The Ladder of Powers	Read pp, 181-191

			Page 198 # 1, 4, 5
38	10	1. Shrinking Paragraphs Data Collection Activity 2. Chapter 10 Modeling Class work Ditto	Finish for H.W.
39	10	1. Attack of the Logarithms- Exponential, Logarithmic & Power Models 2. Class Activity: Television & Life Expectancy	Read pp. 191-197 Page 199-201 # 7, 8, 9, 24
40	10	1. Non Linear Data Collection Activities: Toss Em! & Cheerios	Page 204-213 # 3, 11, 39, 37, 41,42 Due Day # 42
41	10	1. Finish Data Collection Activities 2. Discuss Task: Save Fluffy 3. Work in groups on Review Assignment	
42	10	1. Go Over Review Assignment	Study For Test
43	10	1. Test	

Part III: Gathering Data

44	11	1. Is if Really Random Activity 2. Steps for creating a Simulation	Read pp. 216-222 Page 224 # 5, 7, 9, 10, 11
45	11	1. Random Babies Activity http://www.rossmanchance.com/applets/randomBabies/Babies.html Simulation utilized to enhance simulation example completed in class	Page 224 # 6, 12, 13, 14
46	11	1. Finish Random Babies Activity 2. Start A.P. Questions 2001 #3, 1998 #6	Page 224 #16, 18, A.P. 2001 #3, 1998 #6
47	11	1. Go over H.W. 2. Discuss Task : ESP	Study for Quiz
48	12	1. Quiz of Simulations 2. Census &Sampling DVD *Decisions Through Data*	Finish Task

49	12	1. Define Census, Population Parameter, Sample Statistic 2. Counting Rectangles Activity 3. Bias Versus Error 4. Define Simple Random Sample	Read pp. 226-232 Page 243 # 1, 2, 3, 4
50	12	1. Length Bias Experiment 2. Types of Bias	Read pp. 232-240 Page 243-245 # 5, 6, 8, 14, 15, 23
51	12	1. Diseased Tree Activity 2. Stratified Sampling 3. Cluster Sampling 4. Systematic Sampling 5. Multistage Sampling	Page 243-245 # 11, 12, 19, 20, 21
52	12/13	1. Observational Studies: Retrospective & Prospective Studies 2. 3 Principles of Experimental Design 3. Blinding 4. Model Completely Randomized experiment	Read pp. 252-261 Page 263-264 # 1, 3, 4, 8, 21, 22 Start Review for chapter 11-13 Test
53	13	1. Experimental Design: Gummy Bear Experiment	Page 263-264 # 2,9,14.30,31
54	13	1. Blocked Experiments 2. Matched Pair versus Repeated Measure: Pulse Activity	A.P.: 2001 # 4, 2002 #2, 2003#4, 2002 Form B # 3 & Shampoo question
55	13	1. Over H.W. 2. Review pp. 267-272 # 19, 23, 24, 25, 28, 31, 41	Finish Review problems Read "Tuskegee Syphilis "
56	11-13	1. Discuss Ethics of Experiments 2. Over H.W.	Study for Test
57	11-	Test	

Part IV: Randomness and Probability

58	14	1. Law of Large Numbers (calculator simulation: Penny toss) 2. Basic Probability Rules for Independent events 3. Define: Disjoint Events	Read pp. 274-283 Page 285-286 # 3, 4, 5, 8, 9. 11
59	14	1. Using Probability Rules 2. Disjoint Events vs. Independent Events	Page 286 # 6, 13, 14, 15, 16, 19, 21
60	15	1. Venn Diagrams 2. Conditional Probability 3. Definition of Independent Events	Read pp. 289-298 Page 305-306 # 3, 5, 8, 9, 11, 15
61	15	1. H.W. Discussion 2. Tree Diagrams	Read pp. 298-300 Page 306-307 # 16, 17, 19, 25, 29, 30
62	15	1. Reversing Probability Smart Board Lesson	Read pp. 300-305 Page 307 # 27, 31, 32, 33 Study for Quiz
63	14-15	1. Discuss H.W. 2. Quiz chapters 14 & 15	
64	16	1. Define Random Variables 2. Expected Value of Random Variables (Show on Calculator) 3. Standard Deviation of Random Variables (Show on Calculator)	Read pp. 309-315 Page 321# 1, 9, 3, 11, 4, 12, 7
65	16	1. Rules for Random Variables- Discovery Ditto with Calculator. Calculator used to discover rules for combining random variables	Read pp. 315-320 Page321-322

			# 16, 19, 21, 23, 24, 25
66	16	1. Combining Random Variables	Page 322-323 # 26, 27, 28, 33, 34
67	16	1. H.W. Discussion 2. Intro to Roulette Game	Study for quiz
69	16	1. Quiz 2. Group Work on Roulette Expected Winnings	Finish for H.W.
70	17	1. Define Bernoulli Trials 2. Geometric vs. Binomial Distributions 3. Expected Value & S.D. of Geometric Distribution	Read pp. 325-332 Page 336 # 1, 7, 9, 13, 19 Page 323 # 37
71	17	1. Expected Value & S.D. of Binomial Distribution 2. Examples of both Geometric & Binomial problems 3. Calculator Steps: Binomialpdf/cdf Geompdf/cdf	Page 337-338 # 8, 10, 11, 14, 16, 20
72	17	1. Over H.W. 2. Start Basketball Lab	Review Dittos for Probability Assigned :Due Day # 75
73	17	1. Finish Basketball Lab	Read pp. 333-336 Work on Probability Review
74	17	1. Approximating Binomial Model with Normal Model 2. Develop np>10 & n1>10 condition (success/failure condition) 3. Examples: using Normal Model to approximate Binomial mod.	Page 338 # 25, 26, 27, 28
75	14-17	1. Over H.W. and Probability Review	Study for Test
76	14-17	Test	

Part V: From the Data at Hand to the World at Large

78	18	1. Modeling the Sampling Distribution of Samples Proportions 2. Activity: Reese's Pieces Activity	Read pp. 357-352

		http://www.rossmanchance.com/applets/ Applet used to introduce the idea of a sampling distribution of proportions: Applet is a simulation	Page 362 # 1, 3,5, 7
79	18	1. Problems utilizing Sampling Distribution of Sample Proportions	Page 363 # 8, 9, 10, 12, 15
80	18	1. Sampling Distribution of Means Activity: http://www.ruf.rice.edu/~lane/stat_sim/sampling_dist/ Applet used to explore the Central Limit Theorem before it is formally introduced.	Finish Activity for H.W.
81	18	1. Central Limit Theorem 2. Model CLT with Examples	Read pp. 352-360 Page 363 # 16, 17, 18, 21, 23, 28
82	18	1. Standard Error versus Standard Deviation 2. Diminishing Returns of using larger n	Page 363 # 14, 22, 27, 29, 33
83	18	1. Discuss Test mistakes 2. Over H.W.	Study for Quiz
84	18	1. Quiz	
85	19	1. Confidence Intervals for Proportions: Class Discovery Activity (Human Confidence Intervals)	Read ch. 19 Check Right Eye Dominance
86	19	1. Model the construction of a Conf. Interval & Checking Conditions 2. Interpreting Confidence Intervals 3. Define Critical Values	Page 378 # 1, 3, 5, 9, 13, 15
87	19	1. What do we mean when we say that we are 95% Confident? 2. Orange M&M Class Activity to see our confidence is in the"method". 3. Fathom Demonstration of Confidence Intervals: Students learn the affects of changing sample size and Confidence level on the Confidence Interval. Used to understand what	Page 378 # 7, 8, 14, 18, 20

		Confidence actually means.	
88	19	1. Creating Confidence Intervals on TI-83 2. Calculating Sample Size given a level of Confidence	P378 # 25, 28, Take Home Quiz A.P. Packet Due in 1 week
89	20	1. Hypothesis Testing about Proportions : One Tail versus Two Tailed 2. Model with Court Analogy	Read pp. 382-391 Page 398 # 1, 7, 10, 15
90	20	1. Discuss H.W. 2. Do #11 together as a Two-Tailed Test: Tie to C.I. 3. Using Calculator to perform a hypothesis test	Read pp,. 391-397 Page 398 # 2, 12, 17, 19
91	21	1. P-Value as a conditional probability 2. Define Statistically Significant 3. The connection between confidence intervals and hypothesis tests	Read pp. 401-409 Page 418 # 1, 3, 19, 21
92	21	1. Type I and Type II Errors: Smart Board Lesson with Applet: Students see the affects of changing alpha level on Type I and II errors as well as power. 2. Define Type I &Type II Errors, Power 3. Relationship between Type I & Type II Errors	Read pp. 409-415 Page 418 # 7, 9, 12, 14, 16
93	21	1. Discuss H.W. 2. Give out Task: Life After High School 3. Model Computer printout and analysis	Study For Quiz
94	20/21	1. Quiz chapter 20/21	Read Lab
95	21	1. Taste the Difference Lab: With Partner	
96	21	1. Finish Lab 2. Discuss solutions A.P. Packet	
97	22	1. Comparing 2 Proportions: Two Prop Z Interval & Test 2. When to Pool and when not to Pool!	Read pp. 421-431 Page 433 # 9, 11, 13

98	22	1. More examples of 2 Proportions 2. How to calculate test and interval on calculator	Page 434 # 10, 12, 18 Start Review of Chapter 18-22
99	18-22	1. Group work: Page 437-441 # 11, 17, 18, 21, 27, 29, 33	Finish for H.W.
100	18-22	1. Discuss H.W. 2. Q& A for Test	Study
101	18-22	1. Test	

Part IV: Learning About the World

102	23	1. One Sample T-Test 2. Gosset's T : Calculator simulation (Awesome) Students will see the affect of using s instead of Sigma . Used to create need for Student's T - distribution 3. Nearly Normal Condition	Read pp. 443-448 & 452-455 Page 462 # 3, 21, 29
103	23	1. One Sample T-Interval 2. Connection T-Interval to Hypothesis test 3. Calculator Steps	Read. pp. 449-452& 455-460 Page 462 # 5, 17, 22, 23, 28
104	23	1. Calculating Sample size for a given Margin of error 2. Discuss Task: SAT Performance 3. Computer printout analysis	Study for quiz
105	23	1. Quiz 2. Start Chips Ahoy Lab	Work on Task
106	23	1. Finish Lab	Finish Task
107	24	1. Two Sample T Test and Interval 2. Calculator Steps	Read pp. 466-477 & 481-482 Page 486 # 7, 19, 26

108	25	1. Paired Data T- Test and Interval 2. Calculator Steps	Read pp. 491-500 Page 503 # 7, 9, 11, 12, 18
109	24/25	1. Over H.W. 2. Discuss Task: SAT Performance Part II 3. Computer Printout Analysis	Study for Quiz
110	24/25	1. Quiz 2. Start Go Fish Lab	Work on Task
111	24/25	1. Finish Lab 2. Over Quiz	
112	19-25	1. Group Project: Problems on all Inference	Work on for H.W.
113	19-25	1. Finish Group Project; Edit Phase	Study for Test
114	19-25	1. Test	

Part VII: Inference When Variables are Related:

115	26	1. Chi Square Test for Goodness of Fit 2. Chi Square Model 3. Calculator program modeled	Read pp. 518-524 Page 538# 3, 4, 6, 7
116	26	1. Chi Square Test of Homogeneity 2. Calculating Expected Values and Degrees of Freedom 3. Standard Cell Residual and what it tells you 4. Matrix Feature of Calculator discussed/model test	Read pp. 525-530 Page 538 # 8, 11, 12
117	26	1. Chi Square Test of Independence 2. Differentiating between Homogeneity & Independence 3. Combining Categories 4. Computer Printout Analysis	Read pp. 530-537 Page 538 # 5, 10, 13, 16, 17
118	26	1. H.W. Discussion 2. Assign Task: '97 AP Stat Scores 3. Start Correlation & Regression Review Ditto	Study for quiz Finish Ditto

119	26/27	1. Quiz Chapter 26 2. Discuss Correlation & Regression Review 3. Fathom Demo: Could Association be due to Random Sampling? 4. Rossman Chance Applet: Students see simulation of sampling distribution for slopes. Excellent visual.	Task
120	27	1. Inference for Regression: Assumptions & Conditions 2. Linear Regression T-Test	Read pp. 550-556 & 560 Page 563 # 1, 2, 4, 7, 23
121	27	1. Linear Regression T- Interval 2. Calculating Standard Error of Slope	Read pp. 559-561 Page 563 # 5, 6, 15, 21, 23
122	19-27	1. Group Work: Pages 574-582 # 1, 3, 4, 23a	Finish HW
123	19-27	1. Group Work: Pages 574-582 # 6, 9, 10, 19, 23b	Finish HW
124	19-27	1. Group Work: Pages 574-582 # 5, 7, 11, 55	Finish HW
125	19-27	1. Go over H.W. 2. Question Forum	Study for Test
126	19-27	1. Test	

Review Activities:

Over the Review Period students will:

- Discuss Format of Test
- Complete Practice Exams 1-4 in ***Pearson Education AP Statistics Review Book***
- Complete Acorn Book sample Multiple Choice Questions
- Complete 2002 Released Multiple Choice questions
- Complete Free Response questions from as many exams as time will allow
- Review all Inference Procedures and Conditions
- Complete Inference Review Work sheets.
- Attend a Practice A.P. Exam session after school.

Post Exam Activities;

Students will complete several labs that utilize the methods learned in class. Here is a sample of labs students have completed in the past:

- Helicopter Project: http://courses.ncssm.edu/math/Stat_inst01/intro.htm
- Statistics Olympics http://statweb.calpoly.edu/mcarlton/olympics/StatisticsOlympics.doc
- Movie Analysis: Civil Action http://www.castilleja.org/faculty/josh_zucker/statistics/CivilAction/
- Final Project: Students complete a project that demonstrates their understanding of the major topics of the course. They choose a meaningful subject and question, design an experiment/ survey, collect data and summarize the data visually, numerically and verbally. They use the data to make appropriate inferences to answer their original question. Students present their project to the class.