

AP Statistics Syllabus

2009-2010

Welcome to AP Statistics.

So you are clear what you have signed up for, this is an AP class designed to replace a one semester introductory university course in statistics. This class meets for four (4) periods every seven (7) days. This course requires the completion of Integrated Math 3 with at least a minimum grade of a B and the recommendation of the math teacher. Students should also have a B- or better in their last English class. Be aware that the AP test involves a lot of specific vocabulary and will require regular written analysis. The AP test will require students to explain their work and we will practice this skill throughout the course.

The outline that follows is organized by chapters in the primary text. The timing is approximate and may vary slightly due to many factors. The AP test is offered at the start of May, meaning all material must be covered by that point. There are about 30 weeks of in class instructional time from the start of school till then not including midyear exams or other school activities. This translates to about 83 classes of teaching time.

I can be reached at mrcofer@crc3.net or at www.crc3.net/lsnepal.htm.

Notice the web address above, I would suggest you look through the site at the start of the year and familiarize yourself with what is available on the site. I use this site as a place to put copies of all handouts and to post other material for your class. It is also a location that has links to other websites that will be helpful to you this year.

Before we get into some of the details about the class let's look at some of the expectations and obligations pertaining to this class.

My Expectations of Students

1. You are here to learn. Everything else that we do is secondary to that goal. Behavior that distracts from achieving that goal will not be tolerated. I am in favor of a good time, but not at the expense of the material.
2. You will treat others in the class with respect. This means other students, me or any visitors.
3. You are expected to be in class on time. This means you should be seated and ready to take part in class when the period begins. Your bag's presence at the seat does not count - you must be here in person, there is plenty of time in our schedule for you to take care of everything else. If you have personal concerns, I will leave time at the end of class for conferences.
4. You should participate in class discussions and contribute to the class goal of learning statistics. You should be willing to spend the extra time necessary to meet AP course expectations. Remember, when one person is talking, everyone is listening. Only one discussion can go on at a time. No one puts down another's contributions.
5. You should not create negative externalities (i.e., engage in behavior that negatively affects other people, including me).

6. You should show respect for our shared environment: this room is used by many people. We need to keep it clean, orderly, and the basic arrangement preserved. Everyone shares the responsibility for reordering the furniture, picking up messes, etc.
7. While I consider all school activities important, I firmly believe your main purpose in being here at Lincoln is for academic enrichment. Keep your priorities clear, and manage your time well. This also applies to absences, attendance in class is critical. Students who miss class often (for any reason) are jeopardizing their grade in this course. While I understand that during the year some classes will be missed please try to avoid missing class time. If you are absent, the entire responsibility for obtaining and making up missed work is yours.
8. You should keep track of your cumulative grade. It is important you are aware of how you are doing in class.
9. If you damage or lose your book, you will be held accountable for it and they are not cheap.

My Obligations to Students

1. I will do everything possible to help you learn statistics. You can get extra help after school on almost everyday. If you don't understand something, ask for extra help before the test but don't wait until the last day.
2. I will keep you informed of your grades, and return tests, quizzes, and assignments on a timely basis.
3. I will treat you with respect and grade you fairly.
4. I will conduct evening -- and occasional weekend – review sessions prior to the practice AP tests that I give.

In addition I have a couple of suggestions to help you improve your overall performance. One, save all your papers and keep them in a statistics notebook. I know that you will not go back and look at every assignment, but I guarantee that many of the papers will help you in preparing for examinations, especially graphing problems.

Second, notes are very, very important. But as I am teaching this class as a college course, the responsibility for taking notes is on your shoulders. I personally believe the notes will be extremely beneficial and in fact, I can guarantee that you will be tested on much of the information I write on the board.

Grading

This is the approximate breakdown I will use to compute grades for this class. I grade on a point system and the actual percentage breakdown depends on the total points that term. There will be about 500 – 600 points in each term. Grades will be based on the following activities:

Tests and quizzes (about 3 per term)	≈45%
Case studies / Labs (about 2-3 per term)	≈15%
Project	≈20%
Homework or class work	≈ 5%
Class Participation	≈15%

Tests

The tests will tend to contain problems similar to AP test questions to further prepare you for how the questions will be worded. This means tests will contain multiple choice and short answer questions. You will be required to show your work for an answer to be correct. You will also be expected to explain your answers clearly and concisely, to do this well you will need to study and know the material.

Homework

No I do not pile on the homework; however the homework I do give needs to be done. It will consist of two parts, reading and problem sets. The reading will usually be assigned before we cover a subject so that you will be able to participate in class. The problem sets are to give you experience in solving problems that you will see on projects and tests. Very seldom will homework be graded, however periodically assignments will be checked for completion to make sure you are keeping up. I will not announce ahead of time which assignments will be checked. This will happen a few times a term. It is important that you have the homework on these days as these points can be a deciding factor for your term grade.

Copying homework is a waste of your time; the true value is in learning the material for the tests and projects.

Projects

Because you almost never take tests outside of the classroom environment, there are 3 major projects. The projects will vary in style and may be individual or in pairs/small groups. At the start of each project you will receive a handout about that project. The sheet will contain various information including project details, grading breakdown and due date. It is important that you keep this sheet to ensure that you are completing the project correctly. Work on the projects will be done both in and out of class, with a majority to be completed outside of class. Each project will consist of design or computational work and a written analysis of your procedures, results and conclusions. Certain projects will also include oral aspects where you will need to explain your results in simple terms to an audience.

Case Studies

This is a major part of your grade in this class so it is important to do well on case studies. There will be about 2-3 case studies a term worth between 24 and 76 points each. In these studies you will be presented with a statistical situation and have to use your knowledge to analyze the situation and come up with an answer. In each case study you will be completing relevant statistical calculations and a written explanation of the procedure, analysis of the results and conclusion. Before the first case study you will get a handout that has further information concerning the grading and we will cover this in detail a few times this year.

Class Participation

This is very important in this class, and not just because it is 15% of your grade. In this class you will be expected to contribute to class discussions, do problems at the board, and voice opinions on topics. This does not mean that you will spend the time talking to your friends, but rather spend time listening to what others are saying and respond with relevant comments. To be able to contribute well you will need to keep up with all assigned readings.

As a reminder, part of your class participation grade is based on you being in class and on time with appropriate materials.

Schedule Sheets

I try to get out schedule sheets to the class on about a two-week basis. These sheets contain information on what we will be doing in class each day and what each night's homework is. These sheets will also contain information about test dates and other important class information. I would like you to keep these sheets even after those weeks are over because they will also help you in studying for major tests. I would like you to remember that since these sheets are produced ahead of time they are subject to change when needed. When this happens I will tell you and I suggest that you notate it on the sheet. I would also remind you that these sheets are posted in class and available on the website.

Calculators and Computers

Either a TI-84 or TI 89 graphing calculator is required for this course. The textbook has sections in each chapter discussing the calculator functions that apply to that sections calculation or test. Understanding how to use your calculator effectively will save you time on the AP test and likely improve your result. In class, you will need a calculator for each test.

All but one lab and all of the projects we do this year will make use of either the calculator, computer programs or both. As you read the scoring matrix for each please note what output you need to supply as part of the write up.

Extra Help

I am available for extra help most days after school. If you need to make up a test be sure to schedule it with me ahead of time so that I have set aside the time and prepared the materials. There may be times when I am unavailable but then alternative arrangements can be made.

If you have any problems in this course, find the time to come talk to me.

Course Materials

Student Text:

Yates, Daniel S., David S. Moore and Daren S. Starnes. *The Practice of Statistics, TI-83/89 Graphing Calculator Enhanced*. 2nd ed. New York: W.H. Freeman, 2003.

Other Resources:

Yates, Daniel S. and Daren S. Starnes. Golden Resource Binder. 1st ed. New York: W.H. Freeman, 2003.

Sternstein, Martin. *Barron's How to Prepare for the AP Statistics*. 3rd ed. New York: Barron's Educational Series, 2004.

Moore, David S. *The Basic Practice of Statistics*. 1st ed. New York: W.H. Freeman, 1995.

Nolz, William and Rebecca L. Busam. *Study Guide for Moore's The Basic Practice of Statistics*. 1st ed. New York: W.H. Freeman, 1995.

Brase, Henry Charles and Corrinne Pellillo Brase. *Understanding Basic Statistics*. 2nd ed. Boston: Houghton Mifflin Company, 2001.

Sellers, Gene R., Stephen B. Vardeman and Adelbert F. Hackert. *A First Course in Statistics*. 3rd ed. New York: Harper Collins Publishers, 1992.

Crawshaw, J. and J. Chambers. *A Concise Course in A-Level Statistics with Worked Examples*. 2nd ed. Leckhampton: Stanley Thornes Publishers, 1992

Blakeslee, David W. and William G Chinn. *Introductory Statistics and Probability, A Basis for Decision Making*. 1st ed. Boston: Houghton Mifflin Company, 1988.

Travers, Kenneth J., William F. Stout, James H. Swift and Joan Sextro. *Using Statistics*. 1st ed. Menlo Park: Addison Wesley Publishing, 1985.

Released AP exams from The College Board

All students are required to have a Texas Instrument TI-84 or TI-89 graphing calculator. This is supplemented with an overhead calculator display I use in class.

Computer programs including internet access, Microsoft Excel, and others

Use of the class website and online discussion board

Other material and data comes from various sources such as articles in newspapers, journals, and different websites.

Worksheets from various sources for reinforcement, introduction of concepts, or review

The case studies and term projects come from various sources and are usually completed out of class.

The homework problems listed below are assigned from the student textbook. Some of the problems listed are worked in class as discussion problems.

Course Outline:

I. Data Comprehension and Use (about 10 weeks)

A. Exploring Data (3 classes and summer work)

1. Displaying Distributions with Graphs
 - a) Variable types
 - b) Graph types – histograms, box plots, stemplots, frequency plots, etc
 - c) Interpreting graphs
 - (i) Shape
 - (ii) Center
 - (iii) Spread
 - (iv) Outliers
 - (v) Symmetry or skewed
2. Describing Distributions with Numbers
 - a) Measuring center – mean, median
 - b) Resistance
 - c) Measuring spread – range IQR
 - d) Standard deviation

Chapter 1 HW: 8, 14, 16, 18, 21, 22, 24-26, 28, 31, 33, 38, 40, 41, 43
Various Worksheets and Handouts

B. The Normal Distributions (3 classes and summer work)

1. Density Curves and the Normal Distributions
 - a) Mean vs. median
 - b) Inflection points
 - c) 68-95-99.7 rule
 - d) Percentiles
2. Standard Normal Curve
 - a) Standardizing – the z score
 - b) Finding proportions
 - c) Assessing normality

Chapter 2 HW: 3-8, 11, 13, 15, 16, 26-33, 40-46
Various Worksheets and Handouts
Exploring Normal Distributions Lab
Chapter 1 and 2 Test

C. Examining Relationships (6 classes)

1. Scatterplots
 - a) Variable types
 - b) Direction
 - c) Form
 - d) Strength
 - e) Outliers
2. Correlation
3. Least-Squares Regression
 - a) Models - equation
 - b) Predictions
 - c) Coefficient of determination
 - d) Residuals
 - e) Influential observations

Chapter 3 HW: 1, 2, 5, 6, 19, 23-26, 28, 30-41, 45, 49-52, 56, 57
Various Worksheets and Handouts
Linear Models Lab
Chapter 3 Quiz

- D. 2-Variable Data (5 classes)
 - 1. Modeling non-linear relationships
 - a) Exponential function
 - (i) Log work
 - (ii) Examples
 - (iii) Residuals
 - b) Power function
 - 2. Interpreting Correlation and Regression
 - a) Extrapolation
 - b) Lurking variables
 - c) Association vs. causation
 - 3. Relations in Categorical Data
 - a) Two way tables
 - b) Marginal distributions
 - c) Conditional distribution
 - d) Simpson's Paradox

Chapter 4 HW: 1, 3, 4, 6-17, 27, 28, 32-36, 40, 44, 49, 51-55, 59, 62-66
Various Worksheets and Handouts
Exploring Least Squares Regression Lab
Standardized Testing Data Interpretation Project
Chapter 4 Quiz

- E. Producing Data (7 classes)
 - 1. Designing Samples
 - a) Sample design
 - b) Sample types
 - (i) When to use
 - (ii) How to use – describe
 - c) Bias
 - d) Inference
 - 2. Designing Experiments
 - a) Factors
 - b) Bias
 - (i) Placebo effect
 - (ii) Control group
 - (iii) Randomization
 - c) Design types
 - d) Statistical significance
 - 3. Simulating Experiments
 - a) Design steps
 - b) Methods of simulation

Chapter 5 HW: 3, 6, 8-15, 17, 20, 21, 25, 26, 35-37, 39, 41, 44, 45, 51-53, 56, 59-64, 66-68, 70-73
Various Worksheets and Handouts
The Rumor Mill Lab
The Desert Island Lab
Experimental Design Project
Chapter 5 Test

II. Inference (about 14 weeks)

A. Probability (7 classes)

1. Randomness
2. Probability Models
 - a) Sample space
 - b) Multiplication principle
 - c) Probability rules
 - d) Finite space
 - e) Independence
3. Additional Probability topics
 - a) Union of events
 - b) Conditional probability

Chapter 6 HW: 3-6, 10, 12, 14, 15, 17, 19, 20, 22, 23, 29, 30, 33, 36, 37, 41, 50-53, 55-58, 61, 62, 64-67, 69, 74, 77-81, 86

Various Worksheets and Handouts
Lincoln Airways Lab
Chapter 6 Test

B. Random Variables (5 classes)

1. Discrete and Continuous Random Variables
 - a) Discrete
 - b) Continuous
 - (i) Probability distribution
 - (ii) Normal curve
2. Means and Variance of Random Variables
 - a) Mean – expected value
 - b) Law of Large Numbers
 - c) Rules for means
 - d) Rules for variances

Chapter 7 HW: 6, 8, 11, 13, 14, 18, 22, 24, 25-28, 34, 35, 38, 39, 40-44
Various Worksheets and Handouts
Chapter 7 Quiz

C. The Binomial and Geometric Distributions (6 classes)

1. The Binomial Distribution
 - a) Binomial setting
 - b) Binomial random variable
 - c) Binomial probability
 - (i) Pdf
 - (ii) Cdf
 - d) Binomial formulas
 - e) Mean and standard deviation
2. The Geometric Distribution
 - a) Geometric setting
 - b) Geometric formulas
 - c) Mean

Chapter 8 HW: 5-7, 10, 12, 13, 17-23, 30-33

Various Worksheets and Handouts

Chapter 8 Quiz

D. Sampling Distributions (5 classes)

1. Sampling Distributions
 - a) Parameters and statistics
 - b) Variability
 - c) Descriptions
 - d) Bias
2. Sample Proportions
 - a) Population proportion
 - b) Sample proportion
 - c) Rules of thumb
 - d) Standard deviation
 - e) Normal approximation
3. Sample Means
 - a) Central Limit Theorem
 - b) Sampling distributions
 - c) Law of Large Numbers

Chapter 9 HW: 8-13, 20, 22-25, 36-47

Various Worksheets and Handouts

Central Limit Theorem Lab

Chapter 9 Quiz

E. Introduction to Inference (8 classes)

1. Estimating with Confidence
 - a) Confidence interval
 - b) Margin of error
 - c) Confidence level
 - d) Relationships between variables
 - e) Sample size

2. Test of Significance
 - a) Significance test
 - b) Null hypothesis
 - c) Alternative hypothesis
 - d) P-value – significance level
 - e) Statistically significant?
3. Using Significance Tests
 - a) Test for a population mean – z test
 - b) Fixed significance levels
 - c) Two sided tests
 - d) Hawthorne effect
4. Inference as a Decision
 - a) Acceptance sampling
 - b) Type 1 and Type 2 errors
 - c) Power

Chapter 10 HW: 2, 3, 5-7, 19-24, 26, 27, 29-31, 35-37, 39-40, 45, 48, 50, 53-57, 60-65, 67, 68, 70, 73-75, 81, 82

Various Worksheets and Handouts

A Crowd Study Lab

Chapter 10 Test

- F. Inference for Distributions (6 classes)
 1. Inference for the Mean of a Population
 - a) Assumptions
 - b) Standard error
 - c) T-distribution
 - (i) 1 sample test
 - (ii) Matched pairs test
 - d) Degrees of freedom
 - e) Power
 2. Comparing Two Means
 - a) Assumptions
 - b) Two sample t-tests
 - c) Pooling

Chapter 11 HW: 3-5, 7-9, 13, 16-18, 20, 23-26, 33-35, 37-39, 41-44, 47-49, 51, 53

Various Worksheets and Handouts

- G. Inference for Proportions (5 classes)
 1. Inference for a Population Proportion
 - a) Assumptions
 - b) Sample proportions
 - c) Standard error
 - d) Desired sample sizes
 2. Comparing Two Proportions
 - a) Difference of means
 - b) Sampling distributions
 - c) Confidence intervals

Chapter 12 HW: 4, 5, 7-9, 11-13, 17-22, 25-31, 35-37
Various Worksheets and Handouts
The Airport Problem Lab
Chapter 11 and 12 Test

III. Topics in Inference (about 3 weeks)

A. Inference for Tables: Chi-Square Procedures (5 classes)

1. Test for Goodness of Fit
 - a) Chi-square statistic
 - b) Degrees of freedom
 - c) Distributions
 - d) Assumptions
 - e) Simulations
2. Inference for Two-way Tables
 - a) Table design
 - b) Expected counts
 - c) Chi-square statistic

Chapter 13 HW: 1-3, 6-8, 10-12, 15-22, 23, 24, 26, 31-33
M&M Lab
Various Worksheets and Handouts

B. Inference for Regression (3 classes)

1. Linear regression
 - a) Assumptions
 - b) Standard error
 - c) Testing hypothesis

Chapter 14 HW: 1-9
Various Worksheets and Handouts
Chapter 13 and 14 Test

IV. AP Test Preparation (about 2 weeks)

A. Topical review – about 5-6 classes

1. Basic Concepts
 - a) Relationships
 - b) Distributions
 - c) Numerical descriptions
 - d) Graphical descriptions
2. Probability
3. Experiments and observational studies
4. Inference tests

B. Mock tests

1. one in class over two days
2. one as a single sitting on the weekend

Post AP project on various topics looking at particularly inference for linear regression.