

# **KAP/AP STATISTICS    Syllabus 2007-08    Mr. Jarosz**

## **Course Design**

This course is designed to introduce students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. The students will begin by looking at a variety of data displays. They will display and describe the data from the given information. Students will learn probability rules, then produce their own data, and use probability and models to support inferences about their data. The students will also analyze two-way tables and find inferences for regression.

## **Remarks**

This class is mainly based on making inferences based on surveys, samples, and experiments. Therefore the students will have many hands on activities where they will have to come up with their own judgments based on what occurs. This will be a critical thinking classroom environment where the students will be the leaders in the discussions, as opposed the listeners.

This course is part of the KAP Program at Kenyon College, overseen by Dr. Brad Hartlaub, Mathematics Professor. Students can receive Kenyon College credit.

## **Technology**

The amount of computations we deal with in this class will sometimes be too heavy for only the human mind. We will require the use of the TI-83 and/or TI 83 plus for everyday activities. We will also be using existing applets from websites to complete some of the activities and to enhance understanding. Finally, we will use Minitab for computer technology in the classroom. For Minitab activities, our school's Math lab and library are equipped with Minitab.

## **Primary Textbook**

David S. Moore/George P. McCabe: *Introduction to the Practice of Statistics*, 4<sup>th</sup> edition, Freeman: 2003

## **Supplementary material**

“Against all odds” videos  
Newsweek Articles  
Educational website Activities  
Various old AP Exam Questions

## Standards

C2a: The course provides instruction in each of the four broad conceptual themes outlined in the Course Description with appropriate emphasis on exploring data.

C2b: The course provides instruction in each of the four broad conceptual themes outlined in the Course Description with appropriate emphasis on sampling and experimentation.

C2c: The course provides instruction in each of the four broad conceptual themes outlined in the Course Description with appropriate emphasis on anticipating patterns.

C2d: The course provides instruction in each of the four broad conceptual themes outlined in the Course Description with appropriate emphasis on statistical inferences.

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 exploring and analyzing data, assessing models, and performing simulations.

## Projects

The students will be required to do at least one project per quarter.

- The first project will be collecting and graphing the dates of pennies. This project will be an introduction to types of distribution such as *normal*, *uniform*, and *skewed*. This project will lead into the discussion of the Central Limit Theorem in Chp. 5. (Standard C2a)
- The second project is a collection and display of univariate and bivariate data. Students will be required to collect their own data, present it graphically to the class, and write up an analysis using techniques from Chapters 1 and 2.

### MINITAB - ANALYSIS OF DATA (Standard C5)

#### I. Univariate

1st Variable:

1. Categorical or quantitative?
2. Graphs.
3. Overall pattern and deviation: shape, center, outliers (influential).
4. Mean vs. median-which is better and why.
5. Normal density curve approximate or not. Why?

2nd Variable:

1. Categorical or quantitative?
2. Graphs.
3. Overall pattern and deviation: shape, center, outliers (influential).
4. Mean vs. median-which is better and why.
5. Normal density curve approximate or not. Why?

II. Bivariate

1. Quantitative?
  2. Scatterplot.
  3. Overall pattern and deviations: form, direction, strength, outliers.
  4. Correlation-what it means.
  5. Regression line-good predictor or not. Why?
- The third project is to write an experimental design involving catapulting Gummi Bears. The students are responsible for deciding a treatment that would make the flight of the Gummi Bear change and carry out the experiment. The students' goal is to compare the treatment results with a control group. *Minitab* will be used to produce graphs and normal probability plots. The students will write up the data and a preliminary analysis and conclusion. Hypothesis Testing will be done and written out after Chp. 8. (Standard C5)
  - The fourth project is on sampling. Students will take the claimed percentages given on the Mar's website about the colors of M and M's in a bag of candy. Each student will then take a sample of an actual bag of candy and see if the expected value was correct. Students will use the chi-square test for the goodness-of-fit statistic and write their analysis and conclusion of the Mars company's claim. (Standard C2b and C3)
  - A final project is a choice among a survey, sample, or experiment where the students collect data and draw inferences based on hypothesis testing procedures. Students will write up the design, analysis, and conclusion.

## *COURSE OUTLINE*

Chapter 1: Looking at Data

- |  | <u>Standards</u> |
|--|------------------|
| 1. Displaying Distributions with Graphs  | C2a, C4, C5      |
| 2. Describing Distributions with Graphs<br>using formulas and calculator<br><i>Minitab</i> -prob. #1.26  |                  |
| 3. The Normal Distribution<br><i>Minitab</i> -prob. #1.111-113<br><i>Minitab</i> and calculator - Normal Curve Calculations<br><i>Minitab</i> and calculator – Normal Quantile Plots |                  |

Chapter 2: Looking at Data-Relationships

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|---|-------------|
| 1. Scatterplots – by hand and calculator    | C2a, C4, C5 |
| 2. Correlations - by formula and calculator |             |

3. Least- Squares Regression - by formula and calculator	
4. Cautions about Regression and Correlation	
5. The Question of Causation	
<i>Minitab</i> -prob. 2.73	
Project 2- <i>Minitab</i> , Analysis of Data	
6. Transforming Relationships	
Chapter 3: Producing Data	C2b, C2d, C5
1. First Steps	
2. Design of Experiments	
3. Sampling Design	
4. Toward Statistical Inference	
Chapter 4: Probability – The Study of Randomness	C5
1. Randomness	
2. Probability Models	
3. Random Variables	
4. Means and Variances of Random Variables	
5. General Probability Rules	
Chapter 5: Sampling Distributions	C2a, C2c, C4, C5
1. Sampling Distributions for Counts and Proportions	
<i>Minitab</i> -Bernoulli and Binomial Simulations	
<i>Minitab</i> -Binomial Distribution Calculations	
2. The Sampling Distribution of a Sampling Mean	
<i>Minitab</i> -Class activity to show Central Limit Theory from Project 1	
Chapter 6: Introduction to Inference	C2d, C3, C4, C5
1. Estimating with Confidence – Formulas, <i>Minitab</i> and calculator	
2. Test of Significance –Formulas, <i>Minitab</i> and calculator	
3. Use and Abuse of Tests	
4. Power and Inference as a Decision	
Chapter 7: Inference for Distributions	C2d, C3, C4, C5
Formulas, <i>Minitab</i> and calculator	
1. Inference for the Mean of a Population	
2. Comparing Two Means	
3. Optional Topics in Comparing Distributions	
Chapter 8: Inference for Proportions	C2d, C3, C4, C5
Formulas, <i>Minitab</i> and calculator	
1. Inference for a single Proportion	
2. Comparing Two Proportions	
Chapter 9: Analysis of Two-Way Tables	C2d, C3, C4, C5
Formulas, <i>Minitab</i> and calculator	
1. Data Analysis for Two-Way Tables	

2. Inference for Two-Way Tables
3. Formulas and Models for Two-Way Tables  
Sampling project (M and M's)  
*Minitab*-prob. 9.46

Chapter 10: Inference for Regression

C2d, C3, C4, C5

1. Simple Linear Regression

### **Tests and Exams**

A test will be given at the end of each chapter. Tests will come from your textbook. There will be five major projects built in to the year, and mini “one day” projects given on a weekly basis.

The first week of May is the major AP Exam which everyone will take. There will be two semester exams which I will make up (one in January and one in May).

Most of the homework will come from handouts, with the addition of reading the textbook.