MEDFORD HIGH SCHOOL
COURSE SYLLABUS

Department: Mathematics
Course Title: Advanced Placement Statistics
Level and/or Grade: Advanced Placement
Prerequisite: B- or better in Honors Algebra 2 or B+ or better in Standard Algebra 2

Course Description:
This course provides students with the equivalent of a first semester college level course in statistics. Students are exposed to four broad conceptual themes: exploring data by describing patterns and departures from patterns; sampling and experimentation whereby students plan and conduct studies; anticipating patterns using probability and simulation to explore random phenomena; statistical inference through estimation of population parameters and testing hypotheses. Processes used include problem solving, reasoning, communication, representation, connections, and technology integration. Students electing this course are expected to take the Advanced Placement Examination in May and, depending of the results, may be granted credit and/or appropriate placement by a participating school of higher education.

Course Overview
AP Statistics is a course that allows for an activity based approach to learning where students learn to explore data, anticipate patterns, sample populations, and make statistical inferences based on their results. This comes about through the use of notes, problem sets, graphing calculators, readings, articles, class discussions, classroom activities, homework assignments, projects, and research. The aim of this course is for students to integrate statistical terms and vocabulary into their discussions. Throughout this course, students will be asked to effectively communicate the methods used, the results found, and the reasoning behind it all. This will be demonstrated through class discussions, activities, assignments, projects, and presentations. All of these aspects together allow students to expand their more traditional mathematical knowledge into the statistical word of interpretations and inferences.

Course Alignment with High School 21st Century Student Learning Expectations:
Students will...
1. Become self-directed learners as they
   - Set goals and responsibility for learning.
   - Select strategies for problem solving.
   - Monitor one’s own learning through reflection.
2. Communicate effectively as they
   - Express ideas precisely and with coherence.
   - Use a variety of representations to express mathematics to multiple audiences.
   - Use appropriate vocabulary and symbolic notation effectively.
3. Apply problem-solving skills and critical and creative thinking as they
   - Apply mathematical knowledge to new, non-routine situations.
   - Evaluate and test different routes to solving a problem.
   - Demonstrate persistence.
4. Use technology appropriately as a tool for learning, collaboration, presentation, research, and design as they
   - Demonstrate proficiency with the graphing calculator as a tool for learning.
   - Communicate and collaborate with educators and peers using online systems.
   - Use technology strategically for independent learning, calculation and representation.
5. Act with integrity, respect and responsibility toward themselves, others, and the environment as they
   - Actively participate in class and demonstrates respectful behavior.
   - Respond to new and diverse perspectives.
   - Critique the work of others and accept the critique of others.
6. Exhibit flexibility and adaptability as they
   - Recognize mistakes as an essential part of learning.
   - Revise thinking to apply in context.
   - Approach new experiences with confidence.
7. Collaborate in diverse groups to share knowledge, build consensus, and achieve goals as they
   - Work in pairs and small groups to discuss and problem solve.
   - Construct team positive interactions.
   - Discuss a variety of viewpoints and demonstrate logical reasoning to make decisions.
8. Practice leadership in and service to their community as they
   - Support their peers in learning mathematics.
   - Participate in departmental activities that promote the understanding mathematics.
   - Use mathematical models to solve community problems.
9. Become contributing citizens in a global society as they
   - Understand the role of mathematics in shaping the world.
   - Exchange ideas and resources beyond the classroom.
   - Make career choices that positively impact future of the mathematical learning.

**Texts and Additional Resources**


Various News Papers, Journals, Magazines, and Current Event Sources

TI-83/TI-83+/TI-84 Graphing Calculator

Additional Technology: Microsoft Excel and Internet Resources

**Course Outline**

This course is organized into six general unit categories, which are then broken down into more specific and in-depth chapters. Each unit includes various types of activities the incorporate graphing calculators, spreadsheet software and additional technology into the lessons. Tests and quizzes take place throughout the year to ensure that students are learning, understanding, and retaining the information from class. Each unit also has a project attached to it that enhances students’ knowledge of the topic covered as well as links each chapter into a coherent course. These projects allow the topics to build on themselves and grow in complexity so that students can come to learn what is involved with, and how to conduct, a valid and reliable statistical study.

**Unit 1**

Chapter 1: **Exploring What is Statistics** (1 week)
- Inferential vs. descriptive statistics
- Sampling methods
- Simple Random Sampling
- Stratified Random Sampling
- Variable classifications
- Advantages of mean, median, and mode
- Using samples vs. experiments to collect data
- Project: Important Moments with Statistics
Unit 2

Chapter 2: **Displaying Data – One Sample** (1 week)
- Activity: Does size matter?
  - Categorical vs. quantitative data
  - Pie charts
  - Bar graphs
- One day spent focusing solely on graphing calculator use for this chapter (graphing data and interpreting information from the graphical displays)
- Spreadsheet software will be used to create graphical representation of data

Chapter 3: **Displaying Data – Multiple Samples** (3 week)
- Histograms
- Frequency graphs
- Stem and leaf plots
- Box and whisker plots
- Five number summary
- Outliers
- Percentiles
- Interpreting and explaining the best representation of data: mean vs. median
- Two days spent focusing solely on graphing calculator use for this chapter (to obtain statistical summaries such as the five-number summary, stem and leaf plots, histograms, etc. and interpret the information from both the numerical and graphical representations)
- One day spent in the computer lab using spreadsheet software to create graphical representation of data
- Article: Vietnam Draft
- Activity: Do Students Really Cheat?
- Activity: Battery Life
- Project: The Great Class Debate

Chapter 4: **Displaying Data – Regressions** (2 week)
- Scatter plots
- Interpreting and explaining scatter plots in context
- Least Squares Regression Line
- Residual Plots
- Linear vs. non-linear relationships
- Two days spent focusing on graphing calculator use for this chapter (to write, graph, and analyze equations of the lines and curves that best model their data)
- Activity: Who Stole My Taffy?
- Activity: Barbie Bungee
- Activity: Tootsie Roll

Unit 3

Chapter 5: **Normal Distribution** (1 week)
- Frequency
- Skew
- The normal curve (visually)
- Mean, median, mode
- Variance
- Standard Deviation
- One day spent in the computer lab using statistical application web resources to alter curves and analyze the effect that the shape has on the mean, median, mode, quartiles, standard deviation, and variance
- Activity: Playing with Normal (computer needed)
- Activity: Presidents’ Ages and the Normal Curve

Chapter 6: **Standard Deviation** (2 week)
- The empirical rule
- z-scores
-Percentiles
-Two days spent focusing on graphing calculator use for this chapter
-Article: The Role of the SAT
-Activity: Playing with Percentiles
-Project: My Rank at College

Unit 4
Chapter 7: **Probability** (3 week)
-Definitions (outcomes and events)
-Sample Space
-Experimental vs. theoretical
-Random number tables
-Independent vs. dependent
-Conditional probability
-Multiplication and addition rules
-Binomial probability
-Tree diagrams
-Two days spent focusing on graphing calculator use for this chapter (to help generate and analyze random data as well as binomial situations)
-Activity: Stations
-Activity: Which Door?
-Activity: Who Want to be a Millionaire?
-Activity: Genetics
-Project: Understanding the Game

Midyear Review/ Exam (1 week)

Unit 5
Chapter 8: **Collecting Data** (1 week)
-Sampling methods
-Pros and cons of sampling methods (depending on situation)
-Central Limit Theorem
-Bias in data
-Types of errors (sampling vs. non-sampling)
-Computer lab activity focusing on sampling and understanding the central limit theorem and its applications
-Graphing calculator used to simulate large sets of data and analyze them

Chapter 9: **Confidence** (2 weeks)
-Confidence intervals (proportions)
-Confidence intervals (averages)
-Confidence levels
-Interpreting a confidence statement
-Use graphing calculators to calculate confidence intervals
-Activity: Age of a Penny
-Activity: History Knowledge Survey
-Activity: Survey to Improve School
-Project: What Do Your Peers Think? (computer/graphing calculator needed)

Unit 6
Chapter 10: **Testing** (3 week)
-Sampling vs. experiments
-Confounding vs. lurking variables
-Experimental design
-Single-blind vs. double-blind
-Null and alternative hypothesis
-Significance level
-P-values
-T-tests
-Determining outcome (reject or fail to reject the null hypothesis)
-One sample and two sample tests
- Type I vs. type II error
- One day spent focusing on graphing calculator use for this chapter (to analyze data and conduct hypothesis tests)
- Activity: Can You Taste the Difference?
- Activity: Hula Hoops

Chapter 11: Experiments (1 week)
- Confidentiality
- Informed consent
- Institutional review board
- Article: Past Medical Testing on Humans Revealed
- Project: Past Experiments (computer needed)

Chapter 12: Inferences (3 week)
- Tests with population proportions vs. population averages
- Degrees of freedom
- Observed vs. expected
- Chi square test
- One day spent focusing on graphing calculator use for this chapter (to analyze data and conduct chi square tests)
- One days spent focusing on computer applications and simulations for this chapter
- Activity: Paper Airplane Flight
- Activity: Changes with M&M’s

Preparing for the AP Exam (2 week)
- Practice Multiple Choice
- Practice Open Response

Final Project (post AP exam) (2 week)
- Design
- Collect data
- Display Data
- Analyze and Interpret Data
- Reach a Conclusion
- Explain Process, Results, and Findings to Others