HUDSONVILLE HIGH SCHOOL COURSE FRAMEWORK

COURSE / SUBJECT **Advanced Placement Statistics** (full course)

KEY COURSE OBJECTIVES/ENDURING UNDERSTANDINGS	OVERARCHING/ESSENTIAL SKILLS OR QUESTIONS
BE ABLE TO DISPLAY CATEGORICAL AND QUANTITATIVE DATA IN VARIOUS GRAPHS; SUMMARIZE DATA NUMERICALLY; UNDERSTAND STANDARD DEVIATION **UNDERSTAND WHAT NORMAL DISTRIBUTIONS ARE; HOW TO COMPUTE PROBABILITIES FROM THEM; KNOW WHAT Z-SCORES ARE** **UNDERSTAND CORRELATION, FINDING LINEAR EQUATIONS FOR APPROPRIATE DATA; INTERPRETING THE SLOPE AND Y-INTERCEPT IN CONTEXT; KNOWING WHAT RESIDUALS SHOW** **BE ABLE TO COMPUTE BINOMIAL PROBABILITIES, JOINT AND CONDITIONAL PROBABILITIES; P(A AND B) AS WELL AS P(A OR B); UNDERSTAND "INDEPENDENCE" BETWEEN EVENTS** **UNDERSTAND BASIC ELEMENTS OF SAMPLING METHODS AND EXPERIMENTAL DESIGN. KNOW THE DIFFERENCE BETWEEN OBSERVATIONAL STUDIES AND EXPERIMENTS AND WHY IT MATTERS.** **LEARN INFERENCE METHODS FOR PROPORTIONS, MEANS, AND CATEGORICAL DATA, AND LINEAR REGRESSION.**	Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Construct viable arguments and critique the reasoning of others. Model with mathematics. Use appropriate tools strategically. Attend to precision. Look for and make use of structure. Look for and express regularity in repeated reasoning.

Unit/Chapter	*Standards Taught*	*Lessons/Activities*	*Key Concepts/ Vocabulary*	*Assessments FOR Learning (formative)*	*Assessments OF Learning (summative)*	*Common Core Standard*
Unit 1 – Exploratory Data Analysis: Graphs and numerical summaries for exploring data sets	Making and interpreting graphical displays such as dotplots, stemplots, boxplots, and histograms; describing shapes of distributions. Summarizing distributions with numbers: Mean, Median, range, interquartile range, standard deviation. Comparing Distributions graphical and numerically, looking for unusual features/ outliers	Using many real-life data sets to incorporate various graphing techniques and ways to numerically summarize data	Graphs: Stemplot, boxplot, histogram, ogive, dotplot Numerical measures: Mean, Median, IQR, standard deviation, outliers	Quiz, Several investigative assignments, textbook problems	Chapter 1 Test and the Trimester Final Exam	S-ID.5 S-ID.1 S-ID.3
Unit 2 – The Normal Distribution	Understanding the properties of a normal distribution, computing z-scores, the relationship between z-scores and the percentile in a normal distribution	Chapter 2 in Textbook	Normal distribution, z-score, density curve, standardized value	Quiz, textbook homework, in-class small group problems	Chapter 2 Test and the Trimester Final Exam	S-ID.4
Unit 3 – Examining Bivariate Data: Scatterplots	Concept of linear correlation, correlation coefficients, r-squared, least squares regression line	Chapter 3 in Textbook	Least Squares line, correlation coefficient, “explained variation”, extrapolation, correlation vs. causation	Quiz, textbook homework, in-class small group problems, old AP Exam questions for review of Chapter 1/2	Chapter 3 Test and the Trimester Final Exam.	S-ID.6 S-ID.6a S-ID.6b S-ID.6c S-ID.7 S-ID.8 S-ID.9
Unit 4 – More on Bivariate Data	Transforming data to achieve linearity (logs); cautions about correlation, relationships between categorical data and two-way tables	Chapter 4 in Textbook	How to make non-linear data become linear; riskiness of extrapolation; differentiating between exponential and power equations; marginal and conditional distributions from 2-way tables	Quiz, textbook homework, in-class small group problems	Chapter 4 Test and the Trimester Final Exam.	

Unit 5 – Producing Data through Samples and Experiments; Simulations	Sampling methodology: SRS, stratified, systematic, cluster; Experimental design concepts: Randomization, blocking, matched-pairs; how to use randomness to simulate probabilities	Chapter 5 in Textbook	SRS, stratified, systematic, cluster samples, sources of bias in sampling; Role of randomization in experiments, and different types of experimental designs; use of random number table and/or calculator to simulate probabilities and expected values.	Quiz, textbook homework, in-class small group problems, old AP Exam questions for review of Chapters 3 and 4	Chapter 5 Test and the Trimester Final Exam.	S-IC.3 S-MD.6 S-IC.5
Unit 6 – Basic Probability Concepts *Done through this Unit by Thanksgiving*	Probability Models and general probability rules	Chapter 6 in textbook	The general principles behind probabilities, independent vs. dependent events; P(A and B) compared to P(A or B); conditional probabilities	Quiz, textbook homework, in-class small group problems	Chapter 6 Test and the Trimester Final Exam.	S-ID.5 S-CP.1 S-CP.2 S-CP.4 S-CP.5 S-CP.6 S-CP.7 S-CP.8
END OF TRIMESTER A					**Trimester A Final Exam**	
Unit 7 – Random Variables	Discrete vs. continuous variables, means and variances (SD's) of random variables, how to combine variables and find the new mean and SD; how linear transformations affect variables	Chapter 7 in textbook	Discrete, continuous, adding variables, multiplying variables, finding means and standard deviations of variables	Quiz, textbook homework, in-class small group problems	Chapter 7 Test and the Trimester Final Exam	
Unit 8 – Binomial and Geometric Distributions	Understanding what makes something binomial or geometric, computing binomial and geometric probabilities and their distributions	Chapter 8 in textbook	Definition of binomial, calculating binomial probabilities and their graphs, means and standard deviations; same for geometric distributions	Quiz, textbook homework, in-class small group problems, old AP Exam questions for review of Chapters 5/6	Chapter 8 Test and the Trimester Final Exam	
Christmas Break						

Unit 9 – Sampling Distributions	Understanding sampling distributions for means and proportions; the Central Limit Theorem	Chapter 9 in textbook	Learning what a "sampling distribution" for a statistic is; finding their shape, mean, and SD; the Central Limit Theorem (CLT)	Quiz, textbook homework, in-class small group problems, old AP Exam questions to review Chapters 5/6/7/8	Chapter 9 Test and the Trimester Final Exam	S-IC.1
Unit 10 – Introduction to Inference	Understanding the concept of a confidence interval and significance test, types of errors, and the concept of the "power" of a test	Chapter 10 in textbook	Learning how to compute confidence intervals for estimating a population mean; the concept of a p-value as a measure of statistical significance in testing a mean, seeing how these ideas are tied to the sampling distribution concepts of the previous unit (9); contextual meanings of Type I and II errors in significance testing; learning what the "power" of a test is and the factors that influence it.	Quiz, textbook homework, in-class small group problems; extra credit session to further explore the power of a test	Chapter 10 Test and the Trimester Final Exam	S-IC.1 S-IC.2 S-IC.4 S-IC.5
Unit 11 – Inference for Means	Learning the details of t-methods of inference: 1 sample, matched pairs, and 2-sample t tests and confidence intervals	Chapter 11 in textbook	Understanding the role of t-values and degrees of freedom for tests in which only the sample SD is known. Formulas and calculator methods for computing intervals and p-values of tests.	Quiz, textbook homework, in-class small group problems;	Chapter 11 Test and the Trimester Final Exam	S-IC.1 S-IC.2 S-IC.4 S-IC.5
End of Trimester B					**Trimester B Final Exam**	
Unit 12 – Inference for Proportions	Continuing work with inference (intervals and tests) for 1 or 2 proportions	Chapter 12 in textbook	Learning how to integrate what was learned in Chapter 9 to compute confidence intervals to estimate a population proportion (or the difference between 2 proportions) and significance tests for 1 or 2 proportions	Quiz, textbook homework, in-class small group problems; old AP Exam questions for review of Chapters 9/10/11 Student-generated sampling investigation	Chapter 12 Test and the Trimester Final Exam	S-IC.1 S-IC.2 S-IC.4 S-IC.5

Unit 13 – Inference for Categorical Data	Learning the chi-squared significance test procedures for categorical data in tables	Chapter 13 in textbook	Learning the computation, and logic behind, the chi-squared statistic for a goodness-of-fit test and test of independence; sub-topics are the computation of expected values, degrees of freedom.	Quiz, textbook homework, in-class small group problems; Student-generated sampling investigation	Chapter 13 Test and the Trimester Final Exam	S-IC.1 S-IC.2 S-IC.4 S-IC.5
Unit 14 – Inference for Bivariate Data	Learning the basic idea of a t-test or t-interval for inference on the slope for bivariate data (scatterplot data).	Chapter 14 in textbook	How to compute a confidence interval for estimating a population slope; significance test for a slope being different from 0.	Quiz, textbook homework, in-class small group problems, old AP Exam questions for review of Chapters 12/13	Textbook homework, small group problems, begin reviewing for the AP Exam; AP Exam is given in early May	S-IC.1 S-IC.2 S-IC.4 S-IC.5