Wilton High School
Statistics 2 Course Outline

WHS offers a course in Statistics, focusing on collecting and analyzing data, drawing inferences through formal procedures, and introductory probability concepts. In a given school year, some topics may be expanded upon and others omitted based on the specific needs of students.

Unit/Topics	Students will know:	Students will able to:
Unit 1 - Introduction to Statistics **An Overview of Statistics, Data Classification, Experimental Design**	• The definition of statistics • The difference between a population and sample • The difference between a parameter and statistics • How to distinguish between descriptive statistics and inferential statistics. • There are two general types of data. • How to design a statistical study • That a well-designed experiment implements randomization, replication, and control. • That variables can have a causal or correlated relationship.	• Identify and/or calculate statistics and parameters • Make a generalization based on the results of a study. • Classify a set of data as quantitative or qualitative. • Collect data by doing an observational study, experiment, simulation, survey, and census. • Select a sample from a population using a variety of methods: simple random sample, stratified sampling, cluster sampling, systematic sampling. • Identify a biased sample. • Identify and revise a biased survey question. • Determine whether a study is an experiment or observational study and what type of conclusion can be drawn from the results.
Unit 2 - Descriptive Statistics **Frequency Distributions and Their Graphs, More Graphs and Displays, Measures of Central Tendency, Measures of**	• That a frequency distribution table an be created for univariate, quantitative data. • Histograms, Ogives, Stem-and-Leaf plots, dot plots can be used to display univariate quantitative data. • A Pareto chart and a Pie chart can	• Calculate class limits, class boundaries, midpoints, frequency, relative frequency, cumulative frequency, cumulative relative frequency • Create and interpret the following graphs: Histogram, Ogives, Stem-and-Leaf plots, Dot Plot, Pareto

Variation, Measures of Position	be used to display qualitative data. ● A Scatter Plot and a Time Series can be used to display bivariate quantitative data. ● The center of a univariate quantitative data set can be stated using the mean, median, or mode. ● Identify the shape of a graph. ● The spread of a univariate quantitative data set can be stated using the standard deviation, variane, or range. ● A quantitative data set can be divided into quartiles and that a boxplot can display this information. ● The z-score can measure the position of a value in a data set.	Chart, Pie Chart, Scatter Plot, Time Series, and Boxplot. ● Calculate measures of central tendency. ● Calculate measures of spread. ● Compare measures of central tendency and spread by looking at graphs. ● Calculate z-scores. ● Make decisions based on the comparison of z-scores. ● Find the 5 number summary for a given quantitative data set.
Unit 3 - Probability **Basic Concepts of Probability and Counting, Conditional Probability and the Multiplication Rule, The Addition Rule, Additional Topics in Probability and Counting**	● A sample space is a list of all possible outcomes of a probability experiment. ● A tree diagram can be used to visually represent the result of the Fundamental Counting Principle. ● A simple event is an event that consists of a single outcome. ● An event and its complement are mutually exclusive and contain all outcomes from the sample space. ● The probability of an event is on the interval [0,1]. ● That the probability of independent and dependent events are calculated differently. ● The Addition Rule is utilized different depending on if events are mutually exclusive or not. ● Permutations involve an ordering while Combinations are choosing objects from a group without regard to order.	● Find the probability of the complement of an event. ● Identify simple events. ● Create a sample space. ● Apply the Fundamental Counting Principle to find probabilities. ● Find the probability of an event given that another event has or has not occurred. ● Identify scenarios that independent or dependent probabilities. ● Use the Multiplication Rule to find probabilities. ● Use the Addition Rule to find probabilities. ● Find the number of ways a group of objects can be arranged by using the permutation formula or technology. ● Find the number of ways a group of objects can be selected using the combination formula or technology.
Unit 4 - Discrete Probability	● A random variable represents a numerical value associated with	● Distinguish between discrete and continuous random variables.

Distributions **Probability Distributions, Binomial Distributions, More Discrete Probability Distributions**	each outcome of a probability experiment. ● A discrete probability distribution satisfies two conditions: each probability is on the interval [0,1] and that the sum of all the probabilities is 1. ● That there are two types of random variables: discrete and continuous. ● Random variables have means, variances, and standard deviations. ● The conditions that qualify a probability experiment to be considered Binomial, Geometric, or Poisson.	● Construct a discrete probability distribution table and its graph. ● Verify a given distribution is a discrete probability distribution. ● Calculate the expected value of a discrete probability distribution. ● Calculate Binomial, Geometric, and Poisson probabilities using technology, formulas, and a probability table.
Unit 5 - Normal Probability Distributions **Introduction to Normal Distributions and the Standard Normal Distribution, Normal Distributions: Finding Probabilities, Normal Distributions: Finding Values, Sampling Distributions and the Central Limit Theorem**	● That the normal distribution is a continuous probability distribution. ● The normal distribution is used to model many natural phenomena. ● The properties that make a continuous probability distribution a normal distribution. ● The standard normal distribution is a normal distribution with a mean of 0 and standard deviation of 1. ● The sampling distribution of sample means is formed by repeatedly taking samples of size n and calculating the mean for each sample. ● The properties of the sampling distribution related to its center, spread, and shape.	● Interpret graphs of normal probability distributions ● Find areas under the standard normal curve. ● Find probabilities for normally distributed variables using a table and technology. ● Find a z-score given the area under the normal curve. ● Transform a z-score to an x-value. ● Find a specific data value of a normal distribution given the probability. ● Apply the Central Limit Theorem to find the probability of a sample mean. ● Understand the Central Limit Theorem through simulation.

Unit 6 - Confidence Intervals **Confidence Intervals for the Mean (Large Samples), Confidence Intervals for the Mean (Small Samples), Confidence Intervals for Population Proportions**	• The difference between making a point estimate and an interval estimate. • The t-distribution is used for small samples of quantitative data when σ is unknown. • The t-distribution is a family of curves based on the degrees of freedom. • A confidence interval estimates with quantitative data and qualitative data in a conceptually similar but mechanically different way. • What distribution to use to obtain the critical values depending on sample size, information given about population, and the standard deviation given when working with quantitative data. • The conditions that need to be met to create an interval estimate from qualitative data.	• Calculate a point estimate given a set of data. • Construct and interpret a confidence interval for a population mean. • Determine the minimum sample size required when estimating a population mean. • Find critical values of t using a t-distribution table and/or technology. • Construct and interpret a confidence interval for a population proportion. • Determine the minimum sample size required when estimating a population proportion.
Unit 7 - Hypothesis Testing with One Sample **Introduction to Hypothesis Testing, Hypothesis Testing for the Mean (Large Samples), Hypothesis Testing for the Mean (Small Samples), Hypothesis Testing for Proportions**	• A sample of data can be used to test a claim about a population parameter. • The amount of evidence required when making a decision is related to the level of significance. • That there is always the potential to make the wrong decision when using a single sample to test a claim about a population parameter.	• Write the null and alternate hypotheses for a test of significance utilizing the appropriate notation. • Make a decision to reject or fail to reject the null hypothesis based on sample data and the level of significance. • Describe the decision made in the context of the problem. • Describe which error could have been made, Type I or Type II • Describe the error in the context of the problem.