Unit 1 - (Data Gatherer)	(About 3 weeks)

You'll be introduced to study design, including the importance of randomization. You'll understand how to interpret the results of well-designed studies to draw appropriate conclusions and generalizations. Discover the first part of Statistics, which is gathering the data. We start by learning the 3 types of data; quantitative, Categorical, and Identifying. We learn 3 types of methods for gathering data; sampling, observation, and experiment. We learn the pros and cons of each method for gathering data, and conclusions that are able to be made. For each type of collecting data there are several variations; experiments (3), sampling (7) and observations (2). We will discuss the pros and cons of each of the variations as well as when to use them. We talk about 3 principles of experimental design, and other tools, in order to validate the findings. We discuss different types of bias in sampling and how to overcome each. We will learn the different components of both experiments and samples.

In this unit, students will …
- Plan a study
- Sample different methods
- Identify sources of bias in sampling methods
- Design an experiment
- Interpret the results of an experiment
- Identify the question to be answered or problem to be solved.
- Describe an appropriate method for gathering and representing data.
- Make an appropriate claim or draw an appropriate conclusion
- Identify key and relevant information to answer a question or solve a problem
- Interpret statistical calculations and findings to assign meaning or assess a claim.

Standards for AP Statistics

S-IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

S-IC.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

S-MD.6 (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

S-IC.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if

differences between parameters are significant.

Unit 2 - (Displaying/Analyzing Categorical and Single Quantitative Data)   (About 3 weeks)

Learn different methods to display single quantitative data as well as the mnemonic "SOCS" to help analyze it. "SOCS" refers to Shape, Outliers, Center, Spread. They will learn the different types of Shape, Outliers, Center, Spread, and which ones to give based on the circumstances. We will learn how to display and analyze qualitative data in both 1 and 2 variables. In 2 variables categorical data we will work with basic, marginal, and conditional probabilities. As well as, whether 2 variables are independent or dependent.

In this unit, students will …
- Identify the questions to be answered or problem to be solved.
- Describe data presented numerically or graphically.
- Construct numerical or graphical representations of distributions.
- Compare distributions or relative positions of points within a distribution
- Calculate summary statistics, relative positions of points within a distribution and predicted response.
- Interpret statistical calculations and finding to assign meaning or assess a claim.
- Determine relative frequencies, proportions, or probabilities using simulations or calculations

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Standards for AP Statistics

N-Q.2 Define appropriate quantities for the purpose of descriptive modeling.

S-ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

S-ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

S-ID.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

S-CP.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.

Unit 3 - (Box Plot, Time plots, Cumulative Graphs)   (About 1 week)

Learn how to display and analyze these 3 more uniques ways of representing single quantitative data. They will learn the pros and cons of each, as well as, how to compare 2 separate distributions to each other. Finally, they will look at what happens to the data if you resize or shift different data points

In this unit, students will …
- Identify the questions to be answered or problem to be solved.
- Describe data presented numerically or graphically.
- Construct numerical or graphical representations of distributions.
- Compare distributions or relative positions of points within a distribution
- Calculate summary statistics, relative positions of points within a distribution and predicted response.
- Interpret statistical calculations and finding to assign meaning or assess a claim.
- Determine relative frequencies, proportions, or probabilities using simulations or calculations

Standards for AP Statistics

S-ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

S-ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

Unit 4- (The Normal Model)   (About 2 weeks)

Learn the Normal model and when, where and why it occurs in life. They will use the normal model to find the percentile of a specific data point, as well as determine which data point is more unique, and finally if a specific data point is an outlier.

In this unit, students will …
- Identify the questions to be answered or problem to be solved.
- Describe data presented numerically or graphically.
- Construct numerical or graphical representations of distributions.
- Compare distributions or relative positions of points within a distribution
- Calculate summary statistics, relative positions of points within a distribution and predicted response.
- Interpret statistical calculations and finding to assign meaning or assess a claim.
- Determine relative frequencies, proportions, or probabilities using simulations or calculations

Standards for AP Statistics
S-ID.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Unit 5- (Quantitative Data in 2 Variables)   (About 3 weeks)

You'll build on what you've learned by representing two-variable data, comparing distributions, describing relationships between variables, and using models to make predictions. Examine scatter points. They will analyze them using the mnemonic "FODS" which stands for Form, Outliers, Direction and Strength. For strength they will use the Correlation Coefficient which has several requirements to be used and 6 main properties. One of the big takeaways for students in this unit is that correlation does not imply causation. After examining the scatterplot, we will create a line of best fit. Line of best fit can help us interpolate, extrapolate as well as find residuals of the line.

In this unit, students will …
- Compare representations of 2 categorical variables
- Calculate statistics for 2 categorical variables
- Represent bivariate quantitative data using scatter plots
- Describe associations in bivariate data and interpreting correlation
- Develop linear regression models
- Generate residuals and residual plots
- Show departures from linearity
- Identify the question to be answered or problem to be solved.
- Calculate summary statistics, relative positions of points within a distribution, correlation, and predicted response.
- Compare distributions or relative positions of points within a distribution.
- Construct numerical or graphical representations of distributions.
- Describe Data Presented Numerically Or Graphically.
- Interpret statistical calculations and findings to assign meaning or assess a claim.

Standards for AP Statistics
S-ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.
S-ID.9 Distinguish between correlation and causation.
S-ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
S-ID.6a Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
S-ID.6b Informally assess the fit of a function by plotting and analyzing residuals.
S-ID.6c Fit a linear function for a scatter plot that suggests a linear association.
F-LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.
F-LE.1b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

Unit 6 - (Basic Probability)   (About 3 weeks)
Learn the 3 different types of probability; Empirical, Personal, Theoretical. They will understand the basic rules, definitions and notations of probability and randomness. We will compute probability using Venn Diagrams, tree Diagrams, the addition rule and the multiplication rule. We will have to know when each is appropriate to use.One of the main takeaways is the Law of Averages (which is not a real thing) and the Law of Large Numbers.
In this unit, students will …   ● Identify the question to be answered or problem to be solved *(not assessed)*.   ● Determine relative frequencies, proportions, or probabilities using simulation or calculations.   ● Interpret statistical calculations and findings to assign meaning or assess a claim.   ● Construct numerical or graphical representations of distributions.   ● Determine Parameters For Probability Distributions.   ● Describe probability distributions.

Standards for AP Statistics

Unit 7 - (Probability Models)   (About 3 weeks)

You'll learn the fundamentals of probability and be introduced to the probability distributions that are the basis for statistical inference. Students will start with generic probability tables. They will calculate and understand the meaning of expected value, standard deviation, and variance. They will then look at specific probability models; geometric and binomial. The will once again calculate expected value, standard deviation, and variance. The will then be able to compare different samples and generate conclusions using the normal model.

In this unit, students will …
- Use simulation to estimate probabilities
- Calculate the probability of a random event
- Randomize variables and probability distributions
- Work with the binomial distribution
- Work with the geometric distribution
- Identify the question to be answered or problem to be solved *(not assessed)*.
- Determine relative frequencies, proportions, or probabilities using simulation or calculations.
- Interpret statistical calculations and findings to assign meaning or assess a claim.
- Construct numerical or graphical representations of distributions.
- Determine Parameters For Probability Distributions.
- Describe probability distributions.

Standards for AP Statistics
S-MD.1 (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. **S-MD.2 (+)** Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. **S-MD.3 (+)** Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. **S-MD.4 (+)** Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. **S-MD.5 (+)** Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. **S-MD.5a** Find the expected payoff for a game of chance.

Unit 8 - (Confidence Intervals and Hypothesis Tests with Quantitative Data)   (About 8 weeks)
As you build understanding of sampling distributions, you'll lay the foundation for estimating characteristics of a population and quantifying confidence. You'll learn inference procedures for proportions of a categorical variable, building a foundation of understanding of statistical inference, a concept you'll continue to explore throughout the course. Building on lessons learned about inference in Unit 6, you'll learn to analyze quantitative data to make inferences about population means. Use the Central Limit Theorem to create confidence intervals and run hypothesis tests. There are several different types of intervals/tests based upon the information that you have. Students will have to choose the appropriate test/interval and be sure that all the conditions are met. Students will have to explain the meaning of their confidence interval as well as the conclusion of their tests. They will also interpret type 1 and type 2 errors in context and give a consequence from making those errors. Students will compare means, proportions, 1 sample, 2 sample, 1 tail, 2 tail.
In this unit, students will … ● Variation in statistics for samples collected from the same population ● The central limit theorem ● Biased and unbiased point estimates ● Sampling distributions for sample proportions ● Sampling distributions for sample means ● Constructing and interpreting a confidence interval for a population proportion ● Setting up and carrying out a test for a population proportion ● Interpreting a p-value and justifying a claim about a population proportion

- Type I and Type II errors in significance testing
- Confidence intervals and tests for the difference of 2 proportions
- Constructing and interpreting a confidence interval for a population mean
- Setting up and carrying out a test for a population mean
- Interpreting a p-value and justifying a claim about a population mean
- Confidence intervals and tests for the difference of 2 population means
- Identify the question to be answered or problem to be solved *(not assessed)*.
- Determine relative frequencies, proportions, or probabilities using simulation or calculations.
- Describe probability distributions.
- Determine Parameters For Probability Distributions.
- Identify an appropriate inference method for confidence intervals.
- Verify that inference procedures apply in a given situation.
- Interpret statistical calculations and findings to assign meaning or assess a claim.
- Justify a claim based on a confidence interval.
- Make an appropriate claim or draw an appropriate conclusion.Identify null and alternative hypotheses.
- Identify an appropriate inference method for significance tests.
- Identify key and relevant information to answer a question or solve a problem.
- **4.A** Make an appropriate claim or draw an appropriate conclusion.
- **4.C** Verify that inference procedures apply in a given situation.
- Construct a confidence interval, provided conditions for inference are met.
- **4.D** Justify a claim based on a confidence interval.
- Calculate a test statistic and find a *p*-value, provided conditions for inference are met.
- **4.E** Justify a claim using a decision based on significance tests.
- Identify null and alternative hypotheses.

Standards for AP Statistics
S-IC.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

Unit 9 - (Inference for Categorical Data and Scatter Plots)   (About 4 weeks)

You'll learn about chi-square tests, which can be used when there are two or more categorical variables. You'll understand that the slope of a regression model is not necessarily the true slope but is based on a single sample from a sampling distribution, and you'll learn how to construct confidence intervals and perform significance tests for this slope.Students will perform hypothesis tests for categorical data. The 3 types are goodness of fit test, homogeneity test, and test for independence. Students will need to correctly choose and administer the test. Confidence intervals and hypothesis tests will be run on scatterplots. They will also identify which cell or data point is the most influential.

In this unit, students will …
- Confidence intervals for the slope of a regression model
- Setting up and carrying out a test for the slope of a regression model
- Selecting an appropriate inference procedure
- The chi-square test for goodness of fit
- The chi-square test for homogeneity
- The chi-square test for independence
- Selecting an appropriate inference procedure for categorical data
- Identify the question to be answered or problem to be solved *(not assessed)*.
- Describe probability distributions.
- Identify null and alternative hypotheses.
- Identify an appropriate inference method for significance tests.
- Determine relative frequencies, proportions, or probabilities using simulation or calculations.
- Calculate a test statistic and find a *p*-value, provided conditions for inference are met.
- Identify an appropriate inference method for confidence intervals.
- Construct a confidence interval, provided conditions for inference are met.
- **4.D** Justify a claim based on a confidence interval.
- **4.A** Make an appropriate claim or draw an appropriate conclusion.
- **4.C** Verify that inference procedures apply in a given situation.
- **4.B** Interpret statistical calculations and findings to assign meaning or assess a claim.
- **4.E** Justify a claim using a decision based on significance tests.

All additional time will be spent reviewing for the AP exam.