2022 - 2023, HS, Statistics

The following Practice Standards and Literacy Skills will be used throughout the course:

Standards for Mathematical Practice
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Literacy Skills for Mathematical Proficiency
1. Use multiple reading strategies.
2. Understand and use correct mathematical vocabulary.
3. Discuss and articulate mathematical ideas.
4. Write mathematical arguments.

Quarter 1

Standards	Student Friendly "I Can" Statements
S.ID.A.1 Understand the term 'variable' and differentiate between the data types: measurement, categorical univariate and bivariate.	I can identify the individuals and variables in a set of data. I can distinguish between a population and a sample. I can classify variables as categorical or quantitative.
S.ID.B.10 Represent and analyze categorical data.	I can analyze categorical data. I can graph and interpret categorical data sets using pie charts and Pareto charts.
S.ID.A.2 Understand histograms, parallel box plots, dot plots and scatter plots and use them to display and compare data.	I can graph and interpret quantitative data sets using stem-and-leaf and dot plots. I can find the first, second, and third quartiles of a data set and the interquartile range (IQR). I can represent a data set graphically using a box-and-whisker plot. I can find the outliers of a data set. I can compare two sets of data graphically and numerically.

Standards	Student Friendly "I Can" Statements
	I can graph and interpret paired data sets using scatter plots and time series charts.
S.ID.A.4 Compute basic statistics and understand the distinction between a statistic and a parameter.	I can distinguish between a parameter and a statistic.
S.ID.A.8 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. (2nd Quarter – Chap. 5)	I can construct and analyze frequency tables and bar charts. I can construct a frequency distribution including relative frequencies and cumulative frequencies. I can construct frequency histograms, cumulative relative frequency histograms, and boxplots.
S.ID.A.5 For univariate measurement data, be able to display the distribution and describe its shape; select and calculate summary statistics.	I can find the mean, median, mode, and five number summary of a population and a sample. I can find the weighted mean of a data set and the mean of a frequency distribution. I can describe the shape of a distribution as symmetric, uniform, or skewed and how to compare the mean and median for each.
S.ID.A.9 Describe individual performances in terms of percentiles, z-scores, and t-scores.	I can find and interpret the percentile of an individual value within a distribution of data. I can find and interpret the standardized (z-score) score of an individual value within a distribution. I can estimate percentiles and individual values using a cumulative relative frequency graph.
S.ID.A.7 Analyze the effect of changing units on summary measures.	I can analyze the effect of changing units on summary measures.
S.ID.A.3 Summarize distributions of univariate data.	I can find the range of a data set. I can find the variance and standard deviation of a population and of a sample.

Standards	Student Friendly "I Can" Statements
	I can use the Empirical Rule to interpret standard deviation. I can approximate the sample standard deviation for grouped data. I can interpret quartiles and percentiles.
S.ID.A.6 Recognize how linear transformations of univariate data affect shape, center and spread.	I can describe how transformations of univariate data affect shape, center and spread.
S.MD.B.10 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.	I can use a statistics table or technology to find the proportion of values in a specified interval or the value that corresponds to a given percentile in any normal distribution. I can determine whether a distribution of data is approximately normal from graphical and numerical evidence.
S.ID.B.12 For bivariate measurement data, be able to display a scatter plot and describe its shape, use technological tools to determine regression lines and correlation coefficients.	I can identify Explanatory and Response variables. I can find a correlation coefficient with technology. I can create and interpret a scatter plot. I can interpret a regression line including its slope and y intercept. I can use a residual plot to determine if the linear model is appropriate. I can identify the strength and direction of a linear relationship. I can distinguish between correlation and causation. I can find the equation of a regression line using technology, summary statistics or a computer printout. I can predict y-values using a regression equation.

Standards	Student Friendly "I Can" Statements
	I can find and interpret the coefficient of determination.
S.ID.B.13 Identify trends in bivariate data; find functions that model the data and that transform the data so that they can be modeled.	I can identify trends in data and construct functions that represent and model the data.
S.ID.B.11 Display and discuss bivariate data where at least one variable is categorical.	I can evaluate a graph of bivariate data where at least one variable is categorical.

Quarter 2

Standards	Student Friendly "I Can" Statements
S.IC.A.1 Understand the differences among various kinds of studies and which types of inferences can be legitimately drawn from each.	I can describe the scope of inference that is appropriate within a statistical study.
S.IC.A.2 Compare census sample survey, experiments, and observational study.	I can compare and use census, sample survey, experiment, and observational study to determine which method should be used in each situation. I can collect data using an observational study, survey, performing an experiment, or simulation
S.IC.B.9 Compare and use sampling methods, including simple random sampling, stratified random sampling, and cluster sampling.	I can select an appropriate sampling method. I can select a sample from a given population using random sampling, simple random sampling, stratified sampling, cluster sampling and systematic sampling. I can identify a biased sample and demonstrate understanding of how it affects a statistical study.
S.IC.A.5 Identify bias in sampling and determine ways to reduce it to improve results.	I can recognize and explain instances of bias in sampling.
S.IC.A.3 Describe the role of randomization in surveys and experiments.	I can describe how to obtain a random sample using slips of paper, technology, or a table of random digits.
S.IC.B.8 Select a method to collect data and plan and conduct surveys and experiments.	I can determine an appropriate method to collect data. I can design and conduct a statistical experiment to study a problem, then interpret and communicate the outcomes. I can explain what blind and double-blind studies do and how they are used in an experiment. I can use a survey and experiment to collect and analyze data.
S.IC.B.11 Analyze results and make conclusions from observational studies, experiments, and surveys.	I can analyze results and make conclusions from observational studies, experiments, and surveys.

Standards	Student Friendly "I Can" Statements
S.IC.A.4 Describe the role of experimental control and its effect on confounding.	I can explain the concept of confounding and how it limits the ability to make cause and effect conclusions. I can identify confounding variables.
S.CP.A.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").	I can identify the sample space of a probability experiment. I can identify simple events using probability notation. Example: $P(A \cap B)$
S.MD.A.3 Design a simulation of random variables and probability distributions (e.g., drawing by lots, using a random number generator, and using the results to make fair decisions.)	I can use simulation to model chance behavior and use the results to draw a conclusion.
S.CP.A.2 Use permutations and combinations to compute probabilities of compound events and solve problems.	I can use permutations and combinations to compute probabilities using the formula and using technology. I can find the number of ways a group of objects can be arranged in order. I can find the number of ways to choose several objects from a group without regard to order.
S.CP.A.3 Demonstrate an understanding of the Law of Large Numbers (strong and weak).	I can demonstrate an understanding of the Law of Large Numbers.
S.CP.B.4 Demonstrate an understanding of the addition rule, the multiplication rule, conditional probability, and independence.	I can find the probability of an event or the complement of the event using a tree diagram or basic probability rules. I can find the probability of an event given another event has occurred. I can distinguish between independent and dependent events. I can determine if two events are mutually exclusive. I can apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.

Standards	Student Friendly "I Can" Statements
	I can use the Fundamental Counting Principle to find the number of ways two or more events can occur.
S.CP.B.5 Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A)=P(B)P(A|B), and interpret the answer in terms of the model.	I can use the Multiplication Rule to find the probability of two events occurring in sequence.
S.MD.A.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.	I can define a random variable, create a sample space and graph the probability distribution. I can distinguish between discrete random variables and continuous random variables. I can construct a discrete probability distribution and its graph. I can determine if a distribution is a valid probability distribution.
S.MD.A.2 Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.	I can calculate the expected value (mean) of a given random variable. I can find the expected value of a given data distribution.
S.MD.B.9 Calculate the mean (expected value) and standard deviation of both a random variable and a linear transformation of a random variable.	I can calculate the mean and standard deviation of both a random variable and a linear transformation of a random variable.
S.IC.E.19 Apply the properties of the normal distribution in appropriate situations in order to make inferences about a data set.	I can use a normal distribution to approximate binomial probabilities.
S.MD.A.4 Analyze discrete random variables and their probability distributions, including binomial and geometric.	I can find the mean, variance, and standard deviation of a discrete probability distribution. I can find the expected payoff for a game of chance. I can determine if a probability experiment is a binomial experiment. I can find binomial probabilities using the binomial probability formula or technology. I can make a histogram of a binomial distribution.

Standards	Student Friendly "I Can" Statements
	I can find the mean, variance, and standard deviation of a binomial probability distribution. I can find probabilities using the geometric distribution.
S.MD.A.6 Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. *For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?*	I can run a simulation by using a random digit table or random integer function in a calculator to make predictions. I can take the results of a simulation or experiment, create a probability distribution, and find the expected value.
S.MD.A.5 Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated, find the expected value. *For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions on a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.*	I can find a theoretical probability distribution and find the expected value under various situations.
S.MD.A.8 Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	I can use probability to analyze decisions and strategies.
S.MD.A.7 Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. For example **a.** Find the expected payoff for a game of chance. *For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.*	I can weigh possible outcomes by assigning probabilities to payoff values and finding expected values. I can find the expected payoff for a game of chance.

Standards	Student Friendly "I Can" Statements
b. Evaluate and compare strategies based on expected values. *For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.*	I can evaluate and compare strategies based on expected values.

Quarter 3

Standards	Student Friendly "I Can" Statements
S.IC.A.6 Describe the sampling distribution of a statistic and define the standard error of a statistic.	I can describe the characteristics of a sampling distribution. I can describe the relationship between the variability of a statistic and the sample size. I can distinguish between a parameter and a statistic. I can distinguish between the population distribution, the distribution of a sample and the sampling distribution. I can verify the conditions of sampling distributions of sample proportions and means. I can use a Normal distribution, if appropriate, to calculate probabilities involving sampling distributions of sample proportions or means.
S.IC.A.7 Demonstrate an understanding of the Central Limit Theorem.	I can interpret the Central Limit Theorem I can use the Central Limit Theorem to verify that the sampling distribution of a sample mean is approximately normal.
S.IC.D.15 Understand the meaning of confidence level, of confidence intervals, and the properties of confidence intervals.	I can interpret confidence intervals for a population mean or a population proportion. I can interpret the confidence level of a given confidence interval. I can find the point estimate and margin of error for a given confidence interval.
S.IC.C.13 Develop and evaluate inferences and predictions that are based on data.	I can use a confidence interval to make predictions about a population parameter.
S.IC.D.16 Construct and interpret a large sample confidence interval for a proportion and for a difference between two proportions.	I can construct a confidence interval for a population proportion and for a difference between two proportions.

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	I can find the z* critical value for a population proportion. I can determine the minimum sample size required when estimating a population proportion.
S.IC.D.17 Construct the confidence interval for a mean and for a difference between two means.	I can construct a confidence interval for a population mean and for a difference between two means. I can find the t* critical value from a t distribution for a specific confidence level and given sample size. I can find the standard error of the mean. I can determine the minimum sample size required for estimating mu.
S.IC.C.14 Use properties of point estimators, including biased/unbiased, and variability.	I can relate the variability of the statistic to the margin of error of the confidence interval.
S.IC.E.20 Interpret the t-distribution and determine the appropriate degrees of freedom.	I can find critical values in a t-distribution. I can identify the similarities and differences of the t-distribution and the z-distribution.
S.IC.B.10 Test hypotheses using appropriate statistics.	I can use hypothesis testing to evaluate a claim. I can verify the required conditions to run a hypothesis test for proportions or means. I can use technology to find p-values for hypothesis tests. I can identify the null and alternative hypothesis for a given scenario. I can identify the significance level for a hypothesis test. I can identify type 1 and type 2 errors in context and state consequences of each.

Standards	Student Friendly "I Can" Statements
	I can evaluate the appropriate test to use based on the situation. (t-test or 1-prop z-test) I can interpret the level of significance. I can determine if a test is one-tailed or two tailed and if it is right or left tailed. I can find and interpret the p-value. I can make and interpret a decision in context based on the results of a statistical test (p-value).

Quarter 4

Standards	Student Friendly "I Can" Statements
S.IC.D.16 Construct and interpret a large sample confidence interval for a proportion and for a difference between two proportions.	I can construct a confidence interval for the difference between two proportions. I can verify the required conditions for constructing a confidence interval between two proportions.
S.IC.D.17 Construct the confidence interval for a mean and for a difference between two means.	I can construct a confidence interval for the difference of two means. I can verify the required conditions for constructing a confidence interval for the difference of two means.
S.IC.B.10 Test hypotheses using appropriate statistics.	I can verify the required conditions for a hypothesis test of the difference between two samples. I can perform a t-test for the difference between two populations μ1 and μ2 using small independent samples. I can perform a z-test for the difference between two population proportions. I can perform a t-test to test the mean of the differences for a population of paired data.
S.IC.B.12 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	I can use data from an experiment to run a two-sample t test to determine if the differences between the parameters are significant.
S.IC.E.18 Apply the properties of a Chi-square distribution in appropriate situations in order to make inferences about a data set.	I can use the chi-square distribution to test whether a frequency distribution fits a claimed distribution. I can use population proportions to calculate expected counts. I can state the appropriate hypotheses for a chi-square goodness of fit test. I can verify the appropriate conditions to run a chi-square test.