HENRY COUNTY SCHOOLS

Better Together.

STATISTICAL REASONING

| MATH |

HENRY
Teaching & Learning Standards

Math

Statistical Reasoning

Collaboration, Communication, Creativity, and Critical Thinking skills are embedded within the language of the Henry Teaching and Learning Standards

HCS Graduate Learner Outcome	***As a Henry County graduate, I will be able to use mathematical practices to help make sense of the real world.***
GA Standard Code	
MP.1	**Make sense of problems and persevere in solving them.**
MP.2	**Reason abstractly and quantitatively.**
MP.3	**Construct viable arguments and critique the reasoning of others.**
MP.4	**Model with mathematics.**
MP.5	**Use appropriate tools strategically.**
MP.6	**Attend to precision.**
MP.7	**Look for and make use of structure.**
MP.8	**Look for and express regularity in repeated reasoning.**

HCS Graduate Learner Outcome	***As a Henry County graduate, I will be able to use a variety of data analysis and statistics strategies to analyze, develop, and evaluate inferences based on data.***
GA Standard Code	
MSR.FQ	**Formulate questions to clarify the problem at hand and formulate one (or more) questions that can be answered with data.**
MSR.FQ.1	Apply the statistical method to real-world situations.
MSR.FQ.1a	Formulate questions to clarify the problem at hand and formulate one (or more) questions that can be answered with data.
MSR.FQ.1b	Collect data by designing a plan to collect appropriate data and employ the plan to collect the data.
MSR.FQ.1c	Analyze data by selecting appropriate graphical and numerical methods and using these methods to analyze the data.
MSR.FQ.1d	Interpret results by interpreting the analysis and relating the interpretation to the original question.
MSR.FQ.2	Identify whether the data are categorical or quantitative (numerical). Students will be able to identify the difference between categorical and quantitative (numerical) data.
MSR.FQ.2a	Determine the appropriate graphical display for each type of data.
MSR.FQ.2b	Determine the type of data used to produce a given graphical display.

MSR.CD Design and implement a plan to collect the appropriate data to answer the statistical question.

MSR.CD.1 Distinguish between a population distribution, a sample data distribution, and a sampling distribution.

MSR.CD.1a Identify the three types of distributions.
i. Recognize a population distribution has fixed values of its parameters that are usually unknown.
ii. Recognize a sample data distribution is taken from a population distribution and the data distribution is what is seen in practice hoping it approximates the population distribution.
iii. Recognize a sampling distribution is the distribution of a sample statistic (such as a sample mean or a sample proportion) obtained from repeated samples. The sampling distribution provides the key for determining how close to expect a sample statistic approximates the population parameter.

MSR.CD.1b Create sample data distributions and a sampling distribution.
i. Create a sample data distribution by taking a sample from a defined population and summarizing the data in a distribution.
ii. Create a sampling distribution of a statistic by taking repeated samples from a population (either hands-on or by simulation with technology).

MSR.CD.2 Understand that randomness should be incorporated into a sampling or experimental procedure. Students will be able to implement a reasonable random method for selecting a sample or for assigning treatments in an experiment.

MSR.CD.2a Implement a simple random sample.

MSR.CD.2b Randomly assign treatments to experimental subjects or objects.

MSR.CD.3 Distinguish between the three types of study designs for collecting data (sample survey, experiment, and observational study) and will know the scope of the interpretation for each design type. Students will be able to distinguish between the three types of study designs for collecting data (sample survey, experiment, and observational study) and know the scope of the interpretation for each design type.

MSR.CD.3a Determine the type of study design appropriate for answering a statistical question.

MSR.CD.3b Determine the appropriate scope of inference for the study design used.

MSR.CD.4 Distinguish between the role of randomness and the role of sample size with respect to using a statistic from a sample to estimate a population parameter. Students will be able to distinguish the roles of randomization and sample size with designing studies.

MSR.CD.4a Recognize that randomization reduces bias where bias occurs when certain outcomes are systematically more likely to appear.

MSR.CD.4b Recognize that random selection from a population plays a different role than random assignment in an experiment.

MSR.CD.4c Recognize that sample size impacts the precision with which estimates of the population parameters can be made (larger the sample size the more precision).

MSR.AD Select appropriate graphical and numerical methods and use these methods to analyze the data.

MSR.AD.1 Use distributions to identify the key features of the data collected. Students will describe the distribution for quantitative and categorical data.

MSR.AD.1a Describe the distribution for quantitative data.
i. Describe and interpret the shape of the distribution.
ii. Describe and interpret the measures of center for the distribution.
iii. Describe and interpret the patterns in variability for the distribution.
iv. Describe and interpret any outliers or gaps in the distribution.

MSR.AD.1b Describe the distribution for categorical data.
i. Describe and interpret the modal category for the distribution.
ii. Describe and interpret patterns that exist for the distribution.

MSR.AD.2 Use distributions to compare two or more groups. Students will compare two or more groups by analyzing distributions.

MSR.AD.2a Construct appropriate graphical displays of distributions.

MSR.AD.2b Use graphical and numerical attributes of distributions to make comparisons between distributions.

MSR.AD.3 Determine if an association exists between two variables (pattern or trend in bivariate data) and use values of one variable to predict values of another variable. Students will analyze associations between variables and make predictions from one variable to another.

MSR.AD.3a Analyze associations between two variables.
i. Create scatter plots for two-variable numerical data.
ii. Create two-way tables for two-variable categorical data.
iii. Analyze patterns and trends in data displays.

MSR.AD.3b Make predictions and draw conclusions from two-variable data based on data displays.

MSR.AD.3c Distinguish between association and causation.

MSR.IR Interpret results and make connections to the original question.

MSR.IR.1 Ask if the difference between two sample proportions or two sample means is due to random variation or if the difference is significant. Students will be able to determine if there are differences between two population parameters or treatment effects.

MSR.IR.1a Using simulation, determine the appropriate model to decide if there is a difference between two population parameters.

MSR.IR.1b Using simulation, determine the appropriate model to decide if there is a difference between two treatment effects.

MSR.IR.2 Understand that when randomness is incorporated into a sampling or experimental procedure, probability provides a way to describe the 'long-run' behavior of a statistic as described by its sampling distribution. Students will be able to create simulated sampling distributions and understand how to use the sampling distribution to make predictions about a population parameter(s) or the difference in treatment effects.

MSR.IR.2 Create an appropriate simulated sampling distribution (using technology) and develop a margin of error.

MSR.IR.2 Create an appropriate simulated sampling distribution (using technology) and develop a p-value.