

**Southern Cayuga Central School District – Curriculum Map**

Subject: **Introduction to Statistics**

School Year: **2022 – 2023**

Title or Topics w/ NYS Standards	Essential Questions & Vocabulary	Content Skills (Activities to cover Essential Questions)	Major Assessments (Tests, Project, etc.)	Time Frame
<p><b>Qualitative Data</b></p>	<ul style="list-style-type: none"> <li>• How can I display data in a way that is easy for others to understand?</li> <li>• Qualitative Data</li> <li>• Frequency</li> <li>• Percent</li> <li>• Pie Chart</li> <li>• Frequency Distribution (Bar Graph)</li> </ul>	<ul style="list-style-type: none"> <li>• Reading Pie Charts</li> <li>• Reading Frequency Distributions</li> <li>• Google Sheets Basics</li> <li>• Creating Pie Charts with Google Sheets</li> <li>• Creating Bar Graphs with Google Sheets</li> <li>• Class Discussion – Article “Pie Charts are the Worst”</li> <li>• Misleading Graphs                             <ul style="list-style-type: none"> <li>• What makes it misleading?</li> <li>• How can it be fixed?</li> <li>• What was the author’s objective in using a misleading graph?</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Warm Ups</li> <li>• Google Sheets Assignments (Exit Tickets)</li> <li>• Homework Assignments</li> <li>• Quiz</li> <li>• Project #1 – Visualizing Qualitative Data</li> </ul>	<p>September</p>
<p><b>Collecting Data</b></p> <ul style="list-style-type: none"> <li>• <b>S-IC.B.3</b> Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.</li> </ul>	<ul style="list-style-type: none"> <li>• Why and when is sampling necessary?</li> <li>• How can I collect random, unbiased data?</li> <li>• Population</li> <li>• Sample</li> <li>• Survey</li> <li>• Random</li> <li>• Sampling</li> <li>• Simple Random Sampling</li> <li>• Systematic Sampling</li> <li>• Stratified Sampling</li> <li>• Cluster Sampling</li> </ul>	<ul style="list-style-type: none"> <li>• The ethics of unbiased and anonymous surveys</li> <li>• Using Google Forms</li> <li>• Evaluating Surveys for Bias</li> <li>• Selecting Random Samples Using:                             <ul style="list-style-type: none"> <li>○ Simple Random Sampling (Random Number Generators)</li> <li>○ Systematic Sampling</li> <li>○ Stratified Sampling</li> <li>○ Cluster Sampling</li> </ul> </li> <li>• Evaluating Samples and Sampling Methods for Bias</li> <li>• Writing Objectives</li> </ul>	<ul style="list-style-type: none"> <li>• Warm Ups</li> <li>• Exit Tickets</li> <li>• Homework Assignments</li> <li>• Project #2 – Sampling Practice</li> </ul>	<p>September</p>

	<ul style="list-style-type: none"> <li>• Self-Selecting Sample</li> <li>• Convenience Sample</li> <li>• Bias</li> <li>• Objective</li> </ul>			
<p><b>Quantitative Data (Center and Spread of Data)</b></p> <ul style="list-style-type: none"> <li>• <b>S-ID.A.1</b> - Represent data with plots on the real number line (dot plots, histograms, and box plots).</li> <li>• <b>S-ID.A.2</b> - 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.</li> <li>• <b>S-ID.A.3</b> - Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).</li> <li>• <b>S-IC.B.6</b> - Evaluate reports based on data.</li> </ul>	<ul style="list-style-type: none"> <li>• How can I display data in a way that is easy for others to understand?</li> <li>• How can I summarize a set of data using numeric values?</li> <li>• Quantitative Data</li> <li>• Median</li> <li>• 1<sup>st</sup> / 3<sup>rd</sup> Quartile</li> <li>• Minimum / Maximum</li> <li>• Interquartile Range</li> <li>• 5 Number Summary</li> <li>• Box Plot</li> <li>• Outlier</li> <li>• Mean</li> <li>• Standard Deviation</li> <li>• Histogram</li> <li>• Skewed Left</li> <li>• Skewed Right</li> <li>• Symmetric</li> <li>• Relative Frequency Histogram</li> </ul>	<ul style="list-style-type: none"> <li>• Calculating the Median, Quartiles, and Interquartile Range</li> <li>• Interpreting the Median and IQR</li> <li>• Creating Box Plots</li> <li>• Interpreting Box Plots</li> <li>• Using the IQR to mathematically identify outliers</li> <li>• Calculating the Mean and Standard Deviation</li> <li>• Using the Mean and Standard Deviation to mathematically identify outliers</li> <li>• When to use the median vs. the mean</li> <li>• Reading Histograms and Relative Frequency Histograms</li> <li>• Creating Histograms on Google Sheets</li> <li>• Analyzing and Writing Results</li> </ul>	<ul style="list-style-type: none"> <li>• Warm Ups</li> <li>• Exit Tickets</li> <li>• Google Sheets Assignments</li> <li>• Homework Assignments</li> <li>• Quizzes</li> <li>• Project #3 – Quantitative Data</li> </ul>	October
<p><b>The Normal Distribution</b></p> <ul style="list-style-type: none"> <li>• <b>S-ID.A.4</b> – 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.</li> </ul>	<ul style="list-style-type: none"> <li>• How can I extract information about a population with a sample of data?</li> <li>• Normal Distribution</li> <li>• The Empirical Rule</li> <li>• Percentages</li> <li>• Z-score</li> <li>• Percentile</li> </ul>	<ul style="list-style-type: none"> <li>• What does the Normal Distribution “sound” like? – Using popcorn to visualize and understand a Normal Distribution</li> <li>• Data that is typically Normally Distributed</li> <li>• Using the Empirical Rule to learn information about a population</li> <li>• Calculating z-scores</li> </ul>	<ul style="list-style-type: none"> <li>• Warm Ups</li> <li>• Exit Tickets</li> <li>• Homework Assignments</li> <li>• Quiz</li> <li>• Project #4 – Normally Distributed Data</li> </ul>	November

		<ul style="list-style-type: none"> <li>Using z-scores to learn information about a population</li> <li>Using the normal continuous distribution function on the graphing calculators</li> <li>Calculating percentiles</li> <li>Using the inverse normal function on the graphing calculators</li> <li>Using percentiles to compare individuals from two populations</li> </ul>		
<p><b>Regression</b></p> <ul style="list-style-type: none"> <li><b>S-ID.B.6</b> - Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</li> <li><b>S-ID.B.6.A</b> - 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.</li> <li><b>S-ID.C.7</b> - Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.</li> <li><b>S-ID.C.8</b> - Compute (using technology) and interpret the correlation coefficient of a linear fit.</li> <li><b>S-ID.C.9</b> - Distinguish between correlation and causation.</li> </ul>	<ul style="list-style-type: none"> <li>How can I describe the relationship between two variables mathematically?</li> <li>Correlation</li> <li>Causation</li> <li>Lurking Variable</li> <li>Regression</li> <li>Linear</li> <li>Exponential</li> <li>Correlation Coefficient</li> <li>Scatterplot</li> <li>Trend Line</li> <li>Interpolation</li> <li>Extrapolation</li> <li>Reliable sources</li> </ul>	<ul style="list-style-type: none"> <li>DESMOS – Charge! Activity</li> <li>Comparing two variables using linear regression</li> <li>Using the correlation coefficient to describe the strength and direction of correlation</li> <li>Interpolating and Extrapolating information using the regression equation</li> <li>Interpreting the slope and y-intercept of a regression equation</li> <li>Activity - “Funny Graphs that Show Correlation Between Completely Unrelated Stats”</li> <li>Correlation vs. Causation</li> <li>Identifying possible lurking variables</li> <li>Creating scatterplots on Google Sheets</li> <li>Project #5</li> <li>Comparing two variables that have a correlation that is not linear</li> <li>Comparing two variables using</li> </ul>	<ul style="list-style-type: none"> <li>Warm Ups</li> <li>Exit Tickets</li> <li>Google Sheets Assignments</li> <li>Homework Assignments</li> <li>Quizzes</li> <li>Project #5 – Linear Regression</li> <li>Project #6 - Exponential Regression</li> </ul>	December

		<ul style="list-style-type: none"> <li>exponential regression</li> <li>Using the correlation coefficient to determine the validity of the equation</li> <li>Interpolating and Extrapolating information using the regression equation</li> <li>Interpreting the percent growth or percent decay</li> <li>Finding reliable information on the Internet</li> <li>Project #6</li> </ul>			
<b>Midterm Project</b>	<ul style="list-style-type: none"> <li>How can I display and share information in a way that will make others want to learn about my topic?</li> <li>Infographic</li> </ul>	<ul style="list-style-type: none"> <li>Analyze and describe example infographics</li> <li>How to use piktochart.com</li> <li>Select topic and collect information</li> <li>Informal meeting</li> <li>Continue collecting information</li> <li>Work on infographic</li> <li>Presentations</li> </ul>	<ul style="list-style-type: none"> <li>Midterm – Infographic</li> <li>Midterm - Presentation</li> </ul>	January	
<b>Probability</b>	<ul style="list-style-type: none"> <li><b>S-CP.A.1</b> - 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").</li> <li><b>S-CP.A.2</b> - Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.</li> <li><b>S-CP.A.3</b> - Understand the conditional</li> </ul>	<ul style="list-style-type: none"> <li>How can I determine how likely an event is?</li> <li>How can I determine how likely multiple events are?</li> <li>Probability</li> <li>Experiment</li> <li>Outcome</li> <li>Event</li> <li>Tree Diagram</li> <li>Sample Space</li> <li>Sets</li> <li>Venn Diagram</li> <li>Union</li> <li>Intersection</li> <li>Probability Addition</li> </ul>	<ul style="list-style-type: none"> <li>Monty Hall Activity</li> <li>Intro to Probability with equally likely outcomes</li> <li>Probabilities with M&amp;M's <ul style="list-style-type: none"> <li>Single event</li> <li>Union</li> <li>Intersection</li> <li>Conditional</li> </ul> </li> <li>Union and Intersection with Venn Diagrams</li> <li>Adding probabilities</li> <li>Tree Diagrams with outcomes of different likeliness</li> <li>Calculating Expected Value</li> <li>Conditional Probabilities</li> <li>Determining independence</li> </ul>	<ul style="list-style-type: none"> <li>Warm Ups</li> <li>Exit Tickets</li> <li>Homework Assignments</li> <li>Quiz</li> <li>Project #7 – Create a Probability Based Game</li> </ul>	February - March

<p>probability of A given B as <math>P(A \text{ and } B)/P(B)</math>, and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.</p> <ul style="list-style-type: none"> <li>• <b>S-CP.A.4</b> - 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.</li> <li>• <b>S-CP.A.5</b> - Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.</li> <li>• <b>S-CP.B.6</b> - Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.</li> <li>• <b>S-CP.B.7</b> - Apply the Addition Rule, <math>P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)</math>, and interpret the answer in terms of the model.</li> <li>• <b>S-CP.B.8</b> - Apply the general Multiplication Rule in a uniform probability model, <math>P(A \text{ and } B) = P(A)P(B A) = P(B)P(A B)</math>, and interpret the answer in terms of the model.</li> <li>• <b>S-CP.B.9</b> - Use permutations and combinations to compute probabilities of compound events and solve problems.</li> </ul>	<p>Rule</p> <ul style="list-style-type: none"> <li>• Expected Value</li> <li>• Conditional Probability</li> <li>• Independent</li> <li>• Dependent</li> <li>• Two-way frequency table</li> <li>• Multiplication property of probability</li> <li>• Combinations</li> <li>• Permutations</li> </ul>	<p>mathematically</p> <ul style="list-style-type: none"> <li>• Are these two events dependent on one another? Activity</li> <li>• Using Two-Way Frequency tables</li> <li>• Combinations vs. Permutations – Lock Box Challenge</li> <li>• Calculating Combinations and Permutations</li> <li>• Using combinations and permutations in probability</li> <li>• Revisit the Monty Hall Activity</li> <li>• Project #7</li> </ul>		
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<b>Binomial Probability Distributions</b>	<ul style="list-style-type: none"> <li>• How can we use probabilities to make decisions?</li> <li>• Binomial Probability</li> <li>• Probability Distribution</li> <li>• Probability Histogram</li> <li>• Binomial Experiment</li> <li>• Binomial Probability Distribution</li> <li>• Expected Value</li> <li>• Confidence Interval</li> <li>• 95% Confidence Interval</li> </ul>	<ul style="list-style-type: none"> <li>• Is this a fair die? – Group Activity</li> <li>• Mathematically proving whether or not the die is fair</li> <li>• Calculating a 95% C.I.</li> <li>• Comparing M&amp;M samples using a binomial probability</li> <li>• Do these probabilities make sense? Activity</li> <li>• Project #8</li> </ul>	<ul style="list-style-type: none"> <li>• Warm Ups</li> <li>• Exit Tickets</li> <li>• Homework Assignments</li> <li>• Quiz</li> <li>• Project #8 – Is the representation accurate?</li> </ul>	March - April
<b>Conducting Experiments</b>	<ul style="list-style-type: none"> <li>• How can I accurately, effectively, and ethically collect data where I need to use test subjects?</li> <li>• Experiment</li> <li>• Experimental Design</li> <li>• Factors</li> <li>• Treatment</li> <li>• Subject</li> <li>• Control Group</li> <li>• Placebo</li> <li>• Blinding</li> <li>• Single-blind</li> <li>• Double-blind</li> </ul>	<ul style="list-style-type: none"> <li>• Tuskegee Experiments – Article &amp; Group Discussion</li> <li>• APA’s Code of Ethics</li> <li>• How would you show whether or not mint helps students on exams? Activity</li> <li>• The steps of the experimental design process</li> <li>• Project #9</li> </ul>	<ul style="list-style-type: none"> <li>• Warm Ups</li> <li>• Exit Tickets</li> <li>• Homework Assignments</li> <li>• Quiz</li> <li>• Project #9 – Design an Experiment (Do not run it at this point!)</li> </ul>	April
<b>Hypothesis Testing</b>	<ul style="list-style-type: none"> <li>• How to I analyze data after I conduct an experiment?</li> <li>• What can information from an experiment actually tell me?</li> <li>• Hypothesis</li> <li>• Null Hypothesis</li> </ul>	<ul style="list-style-type: none"> <li>• What do I need for this experiment? – Group Activity</li> <li>• Types of Hypothesis</li> <li>• Can we prove something is true? – Group Activity</li> <li>• Calculating p-values for two-tailed test</li> <li>• Calculating p-values for one-</li> </ul>	<ul style="list-style-type: none"> <li>• Warm Ups</li> <li>• Exit Tickets</li> <li>• Homework Assignments</li> <li>• Quiz</li> <li>• Project #10 – Conduct an Experiment</li> </ul>	May

	<ul style="list-style-type: none"> <li>• Alternative Hypothesis</li> <li>• Two-tailed test</li> <li>• Left-tailed test</li> <li>• Right-tailed test</li> <li>• Type 1 Error</li> <li>• Type 2 Error</li> <li>• P-value</li> </ul>	<ul style="list-style-type: none"> <li>tailed test</li> <li>• What if we are wrong? – Types of Errors – Group Discussion</li> <li>• Project #10</li> </ul>		
<b>Final Project</b>				June