CURRICULUM MAP TEMPLATE

Priority Standards = Approximately 70% Supporting Standards = Approximately 20% Additional Standards = Approximately 10%

HONORS PROBABILITY AND STATISTICS

	Essential Questions & Content	Framework Standard	Skills	Assessment & Learner Expectations
Sept	**Essential Questions:** **How is attention to units and quantities meaningful in data analysis and problem solving?** **How do various representations of data lead to different interpretations of the data?** **When and how can extreme data points impact interpretation of data?** **Why are multiple sets of data used?** **How are center and spread of data sets described and compared?** **How is a data set represented in a two-way frequency table summarized?** Prerequisite Concepts: *Students should already be able to:* • Graph a histogram • Find mean, median and mode Unit 1 Concepts: • Interpret Histograms • Represent distributions with box plots • Parallel boxplots • Centers of Spread • Standard Deviation • Geometric Mean	N.Q.1 S.ID.1 S.ID.2 S.ID.3 S.ID.4 S.ID.5 S.IC.1 S.IC.4 MP.2 MP.3 MP.4	UNIT 1: GRAPICAL AND NUMERIC REPRESENTATIONS OF DATA Display and describe univariate data with activities: • Interpret different types of histograms: Frequency histograms, relative frequency histograms, and density histograms • Examine sample ages from three countries displayed in a spreadsheet and in relative frequency histograms that highlight the distinctive features of the distribution of the ages from each sample • Represent distributions of data using boxplots. • Analyze three parallel boxplots • Recognize that the mean and standard deviation (SD) and the median and interquartile range (IQR) are two ways to measure center and spread • Identify and interpret the mean geometrically as the location of the coins on the ruler such that the sum of the distances on either side of the mean is the same. • Be introduced to the concept of standard deviation. • Gain a basic understanding of what standard deviation is measuring by examining the location of data around the mean	**TI Nspire Labs:** • How to make histograms • Analyzing Country Data • Boxplots Introduction • Multiple Boxplots • Center and Spread • Center of Mass • SD: Measure of Spread • SD: How Far is Typical? **Fathom Lab**: • Distributions and Best Methods of Display

	Vocabulary: • class alignment/bin alignment • class width/bin width • density • frequency • histogram • relative frequency • skew (right or left) • boxplot • dot plot • median • population • quartiles • sample • outlier • interval • range • symmetry • distribution • five-number • interquartile range • maximum • mean • minimum • Q1 (lower quartile) • Q3 (upper quartile) • Bimodal or unimodal • Resistant • Akewed or symmetric • centroid • center of balance • fulcrum • weighted mean • deviation • dot plot			
Oct	**Essential Questions:** **How is statistics used?** **When is it appropriate to question the results from a model compared to a real-life simulation?** Prerequisite Concepts: *Students should already be able to:* • Create visual displays of data sets. • Determine probabilities. • Analyze data using statistical measures Unit 2 Concepts: • Three defining characteristics of a normal curve related to shape, center, spread, and area. • Characteristics of normal curves • Axis of symmetry/ Mean of Curve	S.ID.1 S.ID.4 S.IC.1 S.IC.4 S.IC.5 S.MD.1 S.MD.2 S.MD.3 S.MD.4 G.CO.3 MP.1 MP.2 MP.3 MP.4 MP.6	UNIT 2: NORMAL DISTRIBUTIONS • Investigate the relationship of the equation of a normal curve to its graph. • Use a slider to change the values of two parameters, μ and σ, to investigate their effects on the normal curve, noting in particular that μ represents the location of the mean and that σ represents the distance from the mean to the curve at the point of inflection. • Find the area under the standard normal curve with mean 0 and standard deviation 1 for a given distance from the mean and compare this to the area under the curve for another member of the family of normal curves. • Learn four characteristics of a normal curve: the distribution is symmetric and mound-shaped; the mean and median are approximately equal; the distribution meets the 68-95.5-99.7 rule; and the normal	**TI Nspire Labs:** • Exploring the Normal Curve Family • Z Scores • Assessing Normality • Normal Probability Plot • Looking Normal • Percentiles • Transforming Univariate Data **Fathom Lab**: Standard Deviation **Graphing Calculator**: Calculation of SD and Z

	• Estimate the area • Normal probability plot • Transformations involving other functions Vocabulary: • normal curve • mean • standard deviation • point of inflection • density functions • z-score • probability density function • symmetry • standard normal curve • normal distributions • histograms • measures of central tendency • percentile • normal probability plot • 68-95-99.7 rule • outlier • skew • exponentiation • logarithm • univariate data		probability plot is linear. Use these to determine if a data set it normal. • Create a normal probability plot for several data sets involving height to examine the appearance of such plots when the distribution is approximately normal • Examine multiple samples taken from a single approximately normal population • Use the area to the left of a value in a normal distribution to find its percentile and then reverse the process to find the value for a given • Involve square root, logarithmic, square, and exponentiation transformations of skewed univariate data using a given data set.	
Nov/ Dec	**Essential Questions:** **From a scatterplot, how are two quantitative variables related?** **How is a data set fit to a normal curve?** Prerequsite Concepts: *Students should already be able to:* • Formulate the equation of a line graphed • Graph a scatterplot and find the best fit line • Graph a dot plot • Find percent decrease Unit 3 Concepts: • Create a Scatterplot • Identify large residuals and analyze residual plots • Calculate least squares regression line and interpret coefficients • Examine displays of data to	S.ID.1 S.ID.6 S.ID.7 S.ID.8 F.IF.4 F.IF.7 F.IF.8 A.CED.2 A.REI.10 A.SSE.3 F.BF.4 F.LE.1 MP.1 MP.2 MP.3 MP.4 MP.6	UNIT 3: DESCRIBING BIVARIATE DATA-REGRESSIONS • Create a scatterplot and fitting a line to student pulse rates collected before and after exercise. • Analyze the association between the number of spaces from Go and the cost of the property on a standard Monopoly board.to fit a certain situation or set of data. • Collect data, find the linear regression model of the data, and address aspects of the data that affect regression • Investigate the connection between the scatterplot of bivariate data and the numerical value of the correlation coefficient • Predict values of a particular variable. • Find a least-squares regression line fit to a set of nine values. • Identify outliers that are influential with respect to the least-squares regression line.	**TI Nspire Labs:** • Scatterplot Pulse Rates • Monopoly and Regression • Tootsie Pops & Hand Span • Investigating Correlation • Interpreting R^2 • Influencing Regression • Influence and Outliers • Transforming Bivariate Data

	visualize error and make predictions • Identify outliers • Manipulate points to alter least squares line • Make correlation coefficient closer to zero • Squared residuals • Observe scatterplots, residual plots, and correlation coefficients of bivariate data. • Transform data using transformations. • Determine which transformation is more effective • Use the least-squares regression line to make predictions. Vocabulary: • explanatory variable • least-squares regression line • residual • response variable • scatter plot •slope • coefficient of determination • correlation coefficient • explanatory variable • influential point • outlier • response variable • y-intercept • linear • centroid • dot plot • linear correlation coefficient • linear regression • mean • variance • influence • bivariate data • exponential function • log transformation • log-log transformation • power function • quadratic function • residual plot • square root transformation		Describe the role of the location of a point relative to the other data in determining whether that point has influence on the least-squares regression line. • Transform square root, semi-log, and log-log of curved bivariate data using given data sets	

Jan/ Feb	**Essential Questions:** **How are probabilities of independent events compared to their joint probability?** **How does conditional probability apply to real-life events?** **How are two-way frequency tables used to model real-life data?** **How are conditional probabilities and independence interpreted in relation to a situation?** Prerequisite Concepts: *Students should already be able to:* • Represent sample spaces. • Apply basic properties of probability. • Use two-way frequency tables. • Create visual displays of data sets. • Analyze data using statistical measures Unit 4 Concepts: • Frequency table and conditional probability table. • Graph of relationship between two items from the survey to report conditional probabilities. • Simulated sampling distribution and how likely a given outcome is expected to occur. • Large variability of small number of observations • Visualize the law of large numbers. • Probability of a specific outcome stabilizes as the number of	S.CP.1 S.CP.3 S.CP.4 S.CP.5 S.CP.6 S.ID.1 S.ID.4 S.ID.5 S.MD.1 S.MD.2 S.MD.3 S.MD.4 S.MD.5 S.MD.7 S.CI.1 S.CI.2 N.Q.1 MP.1 MP.2 MP.3 MP.4 MP.6	UNIT 4: PROBABILITY AND RANDOM VARIABLES • Analyze the results of a survey using a two-way frequency table. • Describe how the distribution of a random sample of outcomes provides information about the actual distribution of outcomes in a discrete sample space. • Simulate tossing two fair dice, recording the sum of the faces, and creating a dotplot of the sums. • Use a simulation to find the experimental probability of independent events, tossing two coins. Find the sample space and then compare the experimental and theoretical probabilities • Create binomial trials, distributions, and probabilities. Students can create the tns file following the steps in Binomial_Pdf_Create_Eye_Color, or they can use the premade file Binomial_Pdf_Eye_Color.tns • Examine the general shape of binomial distributions for a variety of values of *n* and *p* • Think about probability when additional information is given. Vocabulary: • association • conditional probability • table • random sample • survey • two-way frequency table • distribution • variability • sample space • outcome • relative frequency • faces of a die • probability of an outcome • simulated sampling distribution	**TI Nspire Labs:** • Two-way Tables and Association • Probability Distributions • Tossing Dice • Tossing Coins • Binomial PDF- Eye Color • Why np Min? • Conditional Probability

	observations increases • Size of simulated sampling distribution • How the distributions are alike and how they differ. • Probability questions based on a dotplot • Experimental distribution vs. the theoretical distribution • Binomial distribution with a given sample size and probability of success: Probability of specific outcomes from a spreadsheet of values, from graph, and probability of mutually exclusive events from a graph or spreadsheet. • Change, find and analyze the sample size and the probability of a success and the probability of specific outcomes. • Shapes of binomial distributions to those of related normal distributions • Discrete vs continuous random variables • Accuracy of normal approximations of binomial probabilities • Probability questions using tabular and graphical information, and bar graphs • Bar graph information of the form P(A|B). • Probability of A given B and the probability of B given A (A|B and B|A)		• theoretical distribution • binomial distribution • expected value • probability • binomial random variable • mean • normal random variable • number of trials, *n* • probability distribution function • probability of success, *p* • standard deviation	
March	**Essential Question:** **What is the difference between experimental and theoretical**	S.CP.1 S.CP.2 S.MD.1 S.MD.2	UNIT 5: THEORETICAL PROBABILITY • Explore permutations and combinations by arranging letters when order does and does	**TI Nspire Labs:** • Permutations and Combinations • Probability of Repeated

	probabilities? Prerequisite Concepts: *Students should already be able to:* • Find simple probabilities Unit 5 Concepts: • Permutations and combinations when order does and does not make a difference • Probability of specific outcomes of repeated independent trials. • Probability tree diagram • *n* objects taken *n* at a time and then *n* objects taken *r* at a time basic probability theory, sampling distributions and infinite series approximations.	S.MD.3 S.MD.4 S.IC.2 G.CO.12 MP.1 MP.2 MP.3 MP.4 MP.6	not make a difference. • Investigate probability by simulating tossing a coin three times. • Develop the formula for finding *n* objects taken *n* at a time and then *n* objects taken *r* at a time. • Investigate the probability of two people having the same birthday in a crowd of a given size Vocabulary: • experiment • outcomes • sample space • event • independent event •dependent event • probability tree diagram • permutation • combination • series	Independent Events • Permutations • Birthday Problem
April/ May	**Essential Questions:** **Which data collection method is best used for a specific context?** **How does randomization relate to a data collection method?** **How is a population mean estimated from data from a sample survey?** Prerequisite Concepts: *Students should already be able to:* • Draw a boxplot and interpret data Unit 6 Concepts: • Informal estimate of their mean area. • Mean of a convenience sample as an estimate of the mean area of the entire collection. • Mean of a random sample as an estimate of the mean area of the	S.ID.1 S.IC.1 S.IC.3 S.IC.4 MP.2 MP.3 MP.5	UNIT 6: SAMPLING AND EXPERIMENTATION • Compare the results of the three estimation methods to show that random samples of rectangles provide estimates that, on average, are closer to the true population mean than the other two methods. • Investigate aspects of statistical information reported in the media or other venues, aspects that are often misunderstood by those unfamiliar with sampling. • Investigate the effectiveness of two mosquito sprays in a large tract of land by using two different experimental designs - one randomized design and one randomized block designs. • Investigate the effectiveness of two mosquito sprays in a large tract of land by using three different experimental designs - one randomized design and two randomized block designs	**TI Nspire Labs:** • Random Samples • Trend or Noise? • Blocking Introduction • Effective Blocking • Stratified Sampling

	entire collection. • True population mean vs other methods. • Randomly-generated distribution of data • Analyze boxplots of data and observe the variation • Analyze the distribution of the mean scores and relate it to the distribution • Look for trends or seemingly large changes. • Select a random sample to be used in an experiment. • Randomly allocate and observe the mean number • Examine a sampling from a population and observe a pattern in a measured variable • Compare the variability in a completely randomized design • Compare mean differences and variability for experimental designs to determine the most effective design for context. • Simple random sample (SRS) to select survey participants. • Stratified random sampling designs to select survey participants.		• Determine which of three different sampling methods - a simple random selection design and two stratified selection designs - would be most beneficial in selecting a survey sample within a given context. Vocabulary: • bias • convenience sample • mean •random sample distribution • boxplots • experimental units • random allocation • randomized block design • simple random sample treatments • random selection • simple random sample (SRS) • stratified random sample • stratum(a) • survey	
May/ June	**Essential Question:** **When is the difference between parameters significant?** Prerequisite Concepts: *Students should already be able to:* • Find Standard Deviations • Collect data and record • Find area of rectangles	S.ID.1 S.ID.4 S.IC.1 S.IC.4 S.IC.5 S.MD.1 S.MD.2 S.MD.3 S.MD.4	UNIT 7: SAMPLING DISTRIBUTIONS • Examine the variability of individual elements and their related standardized test statistics when those elements are drawn randomly from a given normally-distributed population. • Investigate the differences between the standard deviations of sampling distributions of means for samples taken from finite populations with and without replacement	**TI Nspire Labs:** • Why t? • 10% Rule • Family of t Curves • German Tanks: Exploring Sample Distributions • Sampling Distributions • Why Divide by n – 1? • Central Limit Theorem • Standard Error and

	Unit 7 Concepts: • Z-score and population mean • Z-scores' direct association with sample • Calculate the standardized test statistic for samples taken from a population whose standard deviation is not known (*t*-score) • Sample standard deviation. • t-scores in normal distributions • Conclusions about normal distributions and t-scores • Accuracy of Standard Deviation Formula • Standard deviation for sampling distributions of sample means • Standard deviation with and without replacement • *t*-distribution to the standard normal distribution and note that the area in the tails is larger for the *t*-distribution with one degree of freedom. • Probability of an outcome occurring for a *t*-distribution with one degree of freedom • Compare this probability to that of the same outcome when the distribution is normal. • The degrees of freedom and graph of the *t*-distribution and the standard normaldistribution. • Create and analyze rules to estimate largest values of a population • Sample mean variation • Descriptive measures for the sampling distribution • Sampling distribution of the variances • Divisors both *n* and *n*-1	MP.1 MP.2 MP.3 MP.4 MP.5 MP.6	• Investigate how a *t*-distribution compares to a normal distribution. • Estimate the largest number of a population based on random samples from the population, as statisticians did in WWII. • Examine samples from a normal population and observing the distribution of the means of those samples. • Investigate calculating a sample variance using both n and n-1 as the divisor for samples drawn with and without replacement • Examine distributions of sample means of random samples of size *n* from four different populations. • investigate the relationship between the standard deviation of a population, the area of a set of rectangles, and the standard deviation of the sampling distribution of sample mean areas of the rectangles. Vocabulary: • hypothesis test • mean • median • maximum • minimum • population • sample • sampling distribution • standard deviation • standardized test statistic • *t*-score • *z*-score • Confidence interval • Hypothesis test • Finite Population Correction Factor • Normal distribution • Degrees of freedom • Empirical rule • Normal probability distribution • Point of inflection • *t*-distribution • parameter • statistic • variability dot plot • sample mean • bias • parameter • sample size • variance • Central Limit Theorem	Sampling Means

	• Impact of sample size on the variance using divisors • Uniform distribution • Skewed distribution • Simulate a sampling distribution of sample mean areas for different sample sizes and compare • Model relationships with functions		(CLT) • proportion • quantitative data •skewed right distribution • spread • uniform distribution • standard error	