

Map: **Prob and Statistics** Grade Level: **12**District: **Island Trees**Created: **11/10/2007** Last Updated: **11/10/2007**

	Essential Questions	Content	Skills	Standards/PIs
Unit 1	<p>What is statistics?</p> <p>How do you distinguish between qualitative data and quantitative data?</p> <p>How do we classify data with respect to the four levels of measurement: nominal, ordinal, interval, and ratio?</p> <p>How do we design a statistical study?</p> <p>How are statistics used in advertising?</p> <p>What makes statistics important to our everyday lives?</p>	<p><b>INTRODUCTION TO STATISTICS</b></p> <p>VOCABULARY: data, statistics, population, sample, parameter, descriptive statistics, inferential statistics</p> <p>-Classifying Data Sets</p> <p>VOCABULARY: qualitative data, quantitative data, nominal level of measurement, ordinal level of measurement, interval level of measurement, ratio level of measurement, inherent zero</p> <p>-Classifying Data by Type</p> <p>-Classifying Data by Level</p> <p>VOCABULARY: observational study, experiment, simulation, survey, census, sampling, simple random sample, stratified sample, cluster sample, systematic sample, convenience sample, biased sample</p> <p>-Deciding on Methods of Data Collection</p> <p>-Using a Simple Random Sample</p> <p>-Identifying Sampling Techniques</p>	<p>-Define vocabulary for unit.</p> <p>-Distinguish between a population and a sample.</p> <p>-Distinguish between a parameter and a statistic.</p> <p>-Distinguish between descriptive statistics and inferential statistics.</p> <p>-Distinguish between qualitative data and quantitative data.</p> <p>-Classify data with respect to the four levels of measurement.</p> <p>-Identify the different ways data is collected.</p> <p>-Create a sample using different types of sampling.</p> <p>-Identify a biased sample.</p>	<p>MST3-A2.S.1</p> <p>MST3-A2.S.2</p> <p>MST3-A.S.1</p> <p>MST3-A.S.3</p>

Unit 2	How do we graph frequency distributions?	<b>DESCRIPTIVE STATISTICS</b>	-Identify and define various symbols for sample and population distributions.	<b>MST3-A.S.5</b>
	How do we graph data in various forms?	VOCABULARY:  frequency distribution, classes, intervals, frequency $f$ , lower class limits, upper class limits, class width, range, midpoints, relative frequency, cumulative frequency, frequency histogram, class boundaries, frequency polygon, relative frequency histogram, ogive	-Construct a Frequency Distribution from a Data Set.	<b>MST3-A.S.9</b> <b>MST3-A.S.10</b>
	How do we distinguish measures of central tendency?		-Compute midpoint, relative and cumulative frequencies.	<b>MST3-A2.S.3</b> <b>MST3-A2.S.4</b>
	How do we describe the shape of various distributions?		-Construct a Frequency Histogram, Frequency Polygon, Cumulative Frequency Histogram and Ogive.	
	How do we find the measures of variation?	-Construct a Frequency Distribution from data set -Compute midpoint, relative and cumulative frequencies	-Interpret and analyze graph results.	
	How do we find the five-number summary?	VOCABULARY:	-Construct stem-and-leaf plot, dot plot, pie chart, pareto chart, scatter plot, paired data sets, time series chart, exploratory data analysis (EDA)	
	How are the various methods of data collection used to influence opinions?	stem-and-leaf plot, outliers, dot plot, pie chart, pareto chart, scatter plot, paired data sets, time series chart, exploratory data analysis (EDA)	-Interpret and analyze various graph results.	
		-Graphing Quantitative, Qualitative and Paired Data Sets	-Distinguish between various displays or descriptions of graphical data.	
		VOCABULARY:	-Calculate mean, median, mode of data set.	
		measure of central tendency, mean, median, mode, bimodal, outlier, weighted mean, mean of a frequency distribution, symmetric, uniform, skewed (positively or negatively)	-Identify outliers for data entries.	
		-Mean, median, mode	-Determine a weighted mean for a data set.	
		-Weighted mean and mean of grouped data	-Determine the mean of a frequency distribution.	
		-Shape of Distributions	- Distinguish characteristics in regard to shape of	

		<p>VOCABULARY:</p> <p>range, deviation, population variance, population standard deviation, sample variance, sample standard deviation</p> <p>-Range</p> <p>-Deviation, Variance and Standard Deviation</p> <p>-Interpreting Standard Deviation</p> <p>-Empirical Rule</p> <p>-Chebychev's Theorem</p> <p>-Standard Deviation for Grouped Data</p> <p>VOCABULARY:</p> <p>fractiles, quartiles (first, second, third), interquartile range, five-number summary, box-and-whisker plot, percentile, standard score (z-score)</p> <p>-Quartiles</p> <p>-Percentiles and Other Fractiles</p> <p>-The Standard Score</p>	<p>frequency distributions.</p> <p>-Compute range, deviation, population variance and population standard deviation.</p> <p>-Compute sample variance and sample standard deviation.</p> <p>-Recognize and apply the Empirical Rule with respect to symmetric distributions.</p> <p>-Recognize and apply Chebychev's Theorem for all distributions.</p> <p>-Determine standard deviation for grouped data samples.</p> <p>-Calculate and identify the three quartiles of a data set.</p> <p>-Determine the interquartile range.</p> <p>-Recognizes the five-number summary of a data set.</p> <p>-Construct a box-and-whisker plot.</p> <p>-Interpret percentiles.</p> <p>-Calculate a z-score.</p>	
How do we distinguish between empirical, classical and subjective probability?	<p><b>PROBABILITY</b></p> <p>VOCABULARY:</p>	<p>-Identify a sample space.</p> <p>-Construct a tree diagram.</p> <p>-Identify simple events.</p>	<p><b>MST3-A.S.19</b></p> <p><b>MST3-A.S.20</b></p> <p><b>MST3-A.S.21</b></p>	

Unit 3	How does conditional probability compare to theoretical or empirical probabilities?	probability experiment, outcome, sample space, simple event, classical (theoretical) probability, empirical (statistical) probability, complement of an event, odds of winning, odds of losing	-Compare and contrast classical probability with empirical probability.	MST3-A.S.22
	How do we find the probabilities of two mutually exclusive events?	-Probability Experiments -Types of Probability	-Identify characteristics of subjective probability. -Calculate different probabilities.	MST3-A2.S.13 MST3-A2.S.14 MST3-A.S.23
How do we apply the Fundamental Counting Principle to find the number of ways two or more events occur?	-Law of Large Numbers -Range of Probabilities -Complementary Events	-Apply Range of Probabilities Rule. -Find the probability of the complement of an event. -Analyze graphs with respect to probability,	MST3-A.S.23 MST3-A2.S.9 MST3-A2.S.10 MST3-A2.S.11 MST3-A2.S.12	
How do advertising companies choose which probability better substantiates their campaign?	VOCABULARY:  conditional probability, independent event, dependent event, multiplication rule, compound event  -Conditional Probability -Independent and Dependent Events -The Multiplication Rule  VOCABULARY:  mutually exclusive, addition rule,  -Mutually Exclusive Events -The Addition Rule  VOCABULARY:	-Recognize the differences between independent and dependent events. -Recognize the use of conditional probability and compute. -Use Multiplication Rule to find probabilities.  -Determine if two events are mutually exclusive. -Determine the probability of two mutually exclusive events. -Apply the Addition Rule for Probability. -Recognize types of probability. -Combine rules of probability to solve one problem.		

		<p>Fundamental Counting Principle, permutation, combination, factorial, distinguishable permutation</p> <p>-The Fundamental Counting Principle</p> <p>-Permutations</p> <p>-Combinations</p> <p>-Applications of the Counting Principle</p>	<p>-Apply the Fundamental Counting Principle for various conditions.</p> <p>-Distinguish between permutation and combination.</p> <p>-Calculate factorials, permutations and combinations.</p>		
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	Essential Questions	Content	Skills	Standards/PIs
Unit 4	<p>How do we construct and interpret probability distributions?</p> <p>Why do we use binomial probability for certain experiments?</p> <p>How do we find probabilities using geometric and poisson distributions?</p> <p>Why are games of chance used as entertainment and what is their appeal?</p> <p>Why do games of chance become successful businesses?</p>	<p><b>DISCRETE PROBABILITY DISTRIBUTIONS</b></p> <p>VOCABULARY:</p> <p>random variable, discrete, continuous, discrete probability distribution, mean, variance, standard variation, expected value, games of chance</p> <p>-Random Variables</p> <p>-Discrete Probability Distributions</p> <p>-Mean, Variance, and Standard Deviation</p> <p>-Expected Value</p> <p>VOCABULARY:</p> <p>binomial experiment, trial, probability of success, probability of failure, binomial probability distribution,</p>	<p>-Identify a random variable.</p> <p>-Distinguish between discrete and continuous random variable.</p> <p>-Construct and graph a discrete probability distribution.</p> <p>-Verify probability distributions.</p> <p>-Calculate the mean, variance and standard deviation.</p> <p>-Find expected value in a game of chance.</p> <p>-Create a game of chance based on expected value of random variables.</p> <p>-Determine if a probability experiment is a binomial experiment.</p> <p>-Identify notation for Binomial Experiments.</p> <p>-Calculate values of notations.</p> <p>-Apply binomial probability formula.</p> <p>-Construct binomial probability distribution graph.</p>	MST3-A2.S.15

		<p>binomial probability formula</p> <p>-Binomial Experiments</p> <p>-Notations for Binomial Experiments</p> <p>-Binomial Probability Formula</p> <p>-Finding Binomial Probabilities</p> <p>-Graphing Binomial Distributions</p> <p>-Population Parameters of Binomial Distribution</p> <p>VOCABULARY:</p> <p>geometric distribution, first success, poisson distribution</p> <p>-The Geometric Distribution</p> <p>-The Poisson Distribution</p>	<p>-Find and interpret mean, variance and standard deviation.</p> <p>-Classify a distribution as binomial, geometric and poisson.</p> <p>-Apply rules of geometric and poisson distributions.</p> <p>Supplement:</p> <p>-Find the mean and variance of geometric distribution.</p> <p>-Find the variance of a poisson distribution.</p>		
	How do we apply and	<b>NORMAL PROBABILITY</b>	-Identify the properties of a		MST3-A2.S.16

Unit 5	<p>interpret normal probability distribution graphs?</p> <p>How do we find probabilities for normally distributed variables?</p> <p>How do we work with z-scores?</p> <p>Why do we use the Central Limit Theorem?</p> <p>How do we approximate Binomial Probabilities?</p> <p>How is statistics used to project future needs or potential problems?</p>	<p><b>DISTRIBUTIONS</b></p> <p>VOCABULARY:</p> <p>continuous probability distribution, normal distribution, normal (bell-shaped) curve, standard normal distribution, uniform distribution</p> <p>-Properties of a Normal Distribution</p> <p>-Interpreting Graphs of Normal Distribution</p> <p>-Standard Normal Distribution</p> <p>-Finding Areas under the Standard Normal Curve</p> <p>-Uniform Distributions</p> <p>VOCABULARY:</p> <p>left-tail probability, right-tail probability, between probability, cumulative distribution</p>	<p>Normal Distribution.</p> <p>-Interpret the graphs of Normal Distribution.</p> <p>-Identify the properties of a Standard Normal Distribution.</p> <p>-Calculate the z-score of a Standard Normal Distribution.</p> <p>-Find the areas under a Standard Normal Curve.</p> <p>-Find the mean and variance of the Uniform Distribution.</p> <p>-Find the probability of the Uniform Distribution.</p> <p>-Analyze graphic display of Normal Probability Distribution.</p> <p>-Compute probability for normal distributions (left-tail, right-tail, and between).</p> <p>-Analyze and interpret specified information.</p> <p>-Compute z-Score given an area or a percentile.</p>			
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probability (CDF)	-Transform z-Score to an x-value.
-Probability and Normal Distributions	-Calculate a specific data value for a given probability.
VOCABULARY:	-Analyze and interpret results of specified data values.
percentile, x-value	-Find mean of the sample means.
-Finding z-Scores given an area	-Find standard deviation of the sample means.
-Finding z-Scores given a Percentile	-Understand the uses of the Central Limit Theorem.
-Transforming a z-Score to an x-value	-Interpret and apply the Central Limit Theorem
-Finding a Specific Data Value for a Given Probability	-Find the probability for sampling distributions.
VOCABULARY:	-Find probability for the mean of both samples and populations.
sampling distribution, sampling distribution of sample means, standard error of the mean, central limit theorem	-Interpret results of the probabilities of the means.
-Sampling Distributions	-Find the mean and standard deviation for a normal approximation to a binomial distribution.
-The Central Limit	-Approximate a

		<p>Theorem</p> <p>-Probability and the Central Limit Theorem</p> <p>VOCABULARY:</p> <p>correction for continuity</p> <p>-Normal Approximation to a Binomial Distribution</p> <p>-Correction for Continuity</p> <p>-Approximating Binomial Probability</p>	<p>Binomial Distribution.</p> <p>-Determine the correction for continuity.</p> <p>-Interpret the results of approximating Binomial Probability.</p>			
Unit 6	<p>How do we construct and interpret confidence intervals for the population mean?</p> <p>How do we know when to use the t-Distribution?</p> <p>How do we ensure that statistical results are meaningful and important?</p>	<p><b>CONFIDENCE INTERVALS</b></p> <p>VOCABULARY:</p> <p>margin of error, confidence interval</p> <p>-Finding the Margin of Error</p> <p>-Confidence Intervals for Population Mean</p>	<p>-Find the margin of error.</p> <p>-Find the confidence interval for a population mean.</p> <p>-Construct the confidence interval using the calculator.</p> <p>-Construct the confidence interval when population standard deviation is known.</p>			

		<p>VOCABULARY:</p> <p>t-Distribution, degrees of freedom</p> <p>-The t-Distribution</p> <p>-Constructing Confidence Intervals using t- Distributions</p>	<p>-Identify the properties t- Distributions.</p> <p>-Find the critical values of t.</p> <p>-Construct confidence intervals for the mean using t-Distributions.</p> <p>-Construct the confidence interval when the population standard deviation is NOT known.</p> <p>-Distinguish whether to use the normal or t- Distribution.</p>			
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	Essential Questions	Content	Skills		Standards/PIs
Unit 7	<p>Why do we conduct Hypothesis Testing?</p> <p>How do we apply Hypothesis Testing for large samples?</p> <p>How do we apply Hypothesis Testing for small samples (<math>n &lt; 30</math>)?</p> <p>What conclusions are drawn based on analysis of hypothesis testing?</p> <p>How are future decisions made based on these conclusions?</p>	<p><b>HYPOTHESIS TESTING WITH ONE SAMPLE</b></p> <p>VOCABULARY:</p> <p>hypothesis test, statistical hypothesis, null hypothesis, alternative hypothesis, type I error, type II error, level of significance, test statistic, P-value, left-tailed test, right-tailed test, two-tailed test</p> <p>-Introduction to Hypothesis Testing</p> <p>-Writing Null and Alternative Hypothesis</p> <p>-Types of Errors and Level of Significance</p> <p>-Statistical Tests and P-values</p> <p>-Making a Decision and Interpreting the Decision</p> <p>-Steps for Hypothesis Testing</p> <p>-Strategies for Hypothesis Testing</p>	<p>-State a null and alternative hypothesis.</p> <p>-Determine which hypothesis is the claim.</p> <p>-Identify type I and type II errors based on the hypothesis.</p> <p>-Calculate the level of significance.</p> <p>-Compare and contrast various levels of significance and interpret the results.</p> <p>-Identify the test statistic.</p> <p>-Determine whether the hypothesis is a left-tailed, right-tailed, or two-tailed test.</p> <p>-Determine the P-value (probability value).</p> <p>-Identify the Nature of the Hypothesis Test.</p> <p>-Conclude the hypothesis test by making and interpreting a decision.</p> <p>-Understand and apply the 7 steps for hypothesis testing.</p>		

		VOCABULARY:				
		z-test for a mean, standardized test statistic, rejection region (critical region), critical values				
		-Using P-values to Make Decisions				
		-Using P-values for a z-Test				
		-Hypothesis Testing Using P-values				
		-Rejection Regions and Critical Values				
		-Using Rejection Regions for z-Test				
		VOCABULARY:				
		t-Test for a mean				
		-Critical Values in a t-Distribution				
		-The t-Test for a small sample.				
		-Using P-values with t-Tests				

<b>Key to Standards used in this Map</b>			
<p><b>MST3-A.S.1</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will collect, organize, display, and analyze data. [Organization and Display of Data] - Performance Indicator A.S.1 - categorize data as qualitative or quantitative [Algebra]</p> <p><b>MST3-A.S.3</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will collect, organize, display, and analyze data. [Organization and Display of Data] - Performance Indicator A.S.3 - determine when collected data or display of data may be biased [Algebra]</p> <p><b>MST3-A.S.5</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will collect, organize, display, and analyze data. [Organization and Display of Data] - Performance Indicator A.S.5 - construct a histogram, cumulative frequency histogram, and a box-and-whisker plot, given a set of data [Algebra]</p> <p><b>MST3-A.S.9</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will collect, organize, display, and analyze data. [Analysis of Data] - Performance Indicator A.S.9 - analyze and interpret a frequency distribution table or histogram, a cumulative frequency distribution table or histogram, or a box-and-whisker plot [Algebra]</p> <p><b>MST3-A.S.10</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will collect, organize, display, and analyze data. [Analysis of Data] - Performance Indicator A.S.10 - evaluate published reports and graphs that are based on data by considering: experimental design, appropriateness of the data analysis, and the soundness of the conclusions [Algebra]</p> <p><b>MST3-A.S.19</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance Indicator A.S.19 - determine the number of elements in a sample space and the number of favorable events [Algebra]</p> <p><b>MST3-A.S.20</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance Indicator A.S.20 - calculate the probability of an event and its complement [Algebra]</p> <p><b>MST3-A.S.21</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance Indicator A.S.21 - determine empirical probabilities based on specific sample data [Algebra]</p> <p><b>MST3-A.S.22</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance Indicator A.S.22 - determine, based on calculated probability of a set of events, if: some or all are equally likely to occur - one is more likely to occur than another - whether or not an event is certain to happen or not to happen [Algebra]</p> <p><b>MST3-A.S.23</b> [2 occurrences] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance Indicator A.S.23 - calculate the probability of: a series of independent events - two mutually exclusive events - two events that are not mutually exclusive [Algebra]</p> <p><b>MST3-A2.S.1</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will collect, organize, display, and analyze data. [Collection of Data] - Performance Indicator A2.S.1 - understand the differences among various kinds of studies [Algebra 2 and Trigonometry]</p> <p><b>MST3-A2.S.2</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will collect, organize, display, and analyze data. [Collection of Data] - Performance Indicator A2.S.2 - determine factors which may affect the outcome of a survey [Algebra 2 and Trigonometry]</p> <p><b>MST3-A2.S.3</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will collect, organize, display, and analyze data. [Organization and Display of Data] - Performance Indicator A2.S.3 - calculate measures of central tendency with group frequency distributions [Algebra 2 and Trigonometry]</p> <p><b>MST3-A2.S.4</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will collect, organize, display, and analyze data. [Organization and Display of Data] - Performance Indicator A2.S.4 - calculate measures of dispersion (range, quartiles, interquartile range, standard deviation, variance) for both samples and populations [Algebra 2 and Trigonometry]</p> <p><b>MST3-A2.S.9</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance Indicator A2.S.9 - differentiate between situations requiring permutations and those requiring combinations [Algebra 2 and Trigonometry]</p> <p><b>MST3-A2.S.10</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance Indicator A2.S.10 - calculate the number of possible permutations (<math>nPr</math>) of <math>n</math> items taken <math>r</math> at a time [Algebra 2 and Trigonometry]</p> <p><b>MST3-A2.S.11</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance Indicator A2.S.11 - calculate the number of possible combinations (<math>nCr</math>) of <math>n</math> items taken <math>r</math> at a time [Algebra 2 and Trigonometry]</p> <p><b>MST3-A2.S.12</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance Indicator A2.S.12 - use permutations, combinations, and the fundamental principle of counting to determine the number of elements in a sample space and a specific subset (event) [Algebra 2 and Trigonometry]</p> <p><b>MST3-A2.S.13</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance Indicator A2.S.13 - calculate theoretical probabilities, including geometric applications [Algebra 2 and Trigonometry]</p> <p><b>MST3-A2.S.14</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance Indicator A2.S.14 - calculate empirical probabilities [Algebra 2 and Trigonometry]</p> <p><b>MST3-A2.S.15</b> [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance</p>			

Indicator A2.S.15 - know and apply the binomial probability formula to events involving the terms exactly, at least, and at most [Algebra 2 and Trigonometry]  
**MST3-A2.S.16** [1 occurrence] - MST Standard 3 - Statistics and Probability Strand - Students will understand and apply concepts of probability. [Probability] - Performance  
Indicator A2.S.16 - use the normal distribution as an approximation for binomial probabilities [Algebra 2 and Trigonometry]