



Mathematics Statistics

Unit 1: Exploring Data		1 st 6 Weeks			
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	<p>Constructing and interpreting graphical displays of distributions of univariate data.</p> <p>Extensive use of the calculator to input data (into lists) and interpreting and communicating graphical results. Measures of center and spread.</p> <p>Describing distributions with numbers: measures of center and spread.</p>	<p>Histograms and dot plots</p> <p>Stem and leaf plots</p> <p>Plots using TI-83</p> <p>Descriptive interpretation of Distributions</p> <p>Frequency and cumulative distribution</p> <p>Categorical & Quantitative variables</p> <p>Tables</p>	<p>What should a numeric summary include to describe any distribution?</p> <p>What are the different formats to display distributions and when would each one be used?</p> <p>Description of shape, center, spread.</p>	<p>Construct and/or interpret: center and spread outliers and gaps outliers and unusual features shape</p> <p>Enter data and produce graphical displays of data using the TI-83</p> <p>Describe distribution of a quantitative variable in terms of shape, center and spread</p>	<p>District Resources Bock Modeling the World Graphing Calculators Minitab Software</p> <p>Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Bock Modeling the World</p> <p>Campus Resources To be filled in by each campus</p>

Unit 2: Exploring Data		1 st 6 Weeks			
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	Summarizing distributions of univariate data. Measuring center: median, mean Measuring spread: range, interquartile range, standard deviation Compare distributions of univariate data Using boxplots The effect of changing units on summary measures	Histograms and dot plots Stem and leaf plots Plots using TI-83 Measures of Central Tendency Five number summary Variance and standard deviation Outliers Descriptive interpretation of Distributions Frequency and cumulative distribution Tables	What should a numeric summary include to describe any distribution? What are the different formats to display distributions and when would each one be used? What are the different ways to describe center? What is an outlier? How are mean and standard deviation affected by extrema?	Identify an appropriate display for a quantitative variable Describe anomalies or unusual features in a data display. Know basic properties of mean, median, mode Construct a box plot by hand from a five number summary Calculate and interpret standard deviation for a data set. Compare two or more groups of data by comparing box plots, stem plots, etc.	District Resources Book <u>Modeling the World</u> Graphing Calculators Minitab Software Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Book <u>Modeling the World</u> Campus Resources To be filled in by each campus

Unit 3: The Normal Distribution		2 nd 6 Weeks			
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	<p>Distinguish between normal and non-normal distributions, density curves and apply the 68-95-99.7 rule</p> <p>Measuring position with standardized scores (z-scores)</p> <p>Use models for z-scores and standard normal tables; assess normality using normal probability plots.</p>	<p>Density curves</p> <p>Normal distributions</p> <p>Standard-Normal (Z-Score)</p> <p>Z-Table</p> <p>Assessing normality</p> <p>Emperical Rule</p> <p>Skewness</p>	<p>What are the properties of a density curve?</p> <p>What are the properties of a normal distribution?</p> <p>Explain the 68-95-99.7 rule.</p> <p>How do you calculate a Z score?</p> <p>What are standard normal tables?</p> <p>What can a normal probability plot tell us?</p>	<p>Explain how extraordinary a z score may be by using a normal model.</p> <p>Compare values of two variables using z scores.</p> <p>Effects of changing units on summary measures</p>	<p>District Resources Bock Modeling the World Graphing Calculators Minitab Software</p> <p>Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Freeman Practice of Statistics</p> <p>Campus Resources To be filled in by each campus</p>

Unit 4: Experiments and Observational Studies		2nd 6 Weeks			
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	<p>Understanding and applying the concept of two-variable analysis: response and explanatory variables. Using scatterplots to understand/explain relationships. Determine outliers and their meaning/relevance.</p> <p>Testing strength of association (correlation) through the use of "r"</p> <p>Application of the principles of Least-Squares Regression Analysis. Introduction of "correlation of determination" r^2. Applications of residual analysis and understanding/interpreting influential observations</p>	<p>Examining relationships among variables</p> <p>Direction, form and strength</p> <p>Explanatory and Response Variables</p> <p>Extrapolation and Interpolation</p> <p>Lurking variable</p> <p>Residuals</p> <p>Predicted value</p> <p>Slope</p> <p>Regression line</p> <p>Least Squares</p> <p>Scatterplots</p> <p>Correlation</p> <p>Correlation Coefficient (r)</p> <p>Coefficient of Determination</p>	<p>What are four things you need to look for when examining a scatterplot?</p> <p>Distinguish between the "response" and "explanatory" variables.</p> <p>How does the value of r relate to the correlation between two variables?</p> <p>Between what two values must r exist?</p> <p>Define the purpose of a regression?</p> <p>What would be considered an influential observation?</p>	<p>Analyzing patterns in scatterplots</p> <p>Correlation and linearity</p> <p>Least-squares regression line</p> <p>Residual plots, outliers, and influential points.</p> <p>TI-83 calc. Regression analysis</p> <p>Describe direction form and strength of a scatterplot</p> <p>Correlation does not always equal causation.</p>	<p>District Resources Bock Modeling the World Graphing Calculators Minitab Software</p> <p>Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Freeman Practice of Statistics</p> <p>Campus Resources To be filled in by each campus</p>

Unit 5: Sampling and Surveying/Gathering Data		3rd 6 Weeks			
Date Taught	AP Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	<p>Methods of data collection</p> <p>Sample survey Experiment Observational study</p> <p>Define and recognize the basic elements of "Sample Design" (SRS). Systematic errors of sampling: bias, voluntary versus nonvoluntary response, poor wording.</p> <p>Utilize the principles of basic "Sample Design" (control, randomization, and replication): (1) comparative experiments; (2) randomized experiments.</p> <p>Accounting for hidden bias and control factors of block and matched pair designs.</p> <p>Simulating Experiments: An imitation of chance behavior. Student designed studies.</p>	<p>Random</p> <p>Simulation</p> <p>Outcome</p> <p>Trial</p> <p>Response variable</p> <p>Population</p> <p>Sample</p> <p>Bias</p> <p>Randomization</p> <p>Sample size</p> <p>Census</p> <p>Parameter</p> <p>Simple Random Sample (SRS)</p> <p>Sampling frame</p>	<p>Be able to recognize : Random outcomes in a real world situation</p> <p>What types of simulations model random behavior in the real world?</p> <p>What is value of sampling to estimate population parameters?</p> <p>What are the characteristics of a well-designed and well-conducted survey?</p> <p>What are sources of bias in sampling and surveys?</p>	<p>Perform a simulation by generating random numbers.</p> <p>Describe a simulation so others can replicate.</p> <p>Draw conclusions about phenomenon being investigated</p> <p>Sample size to understand precision of estimation</p> <p>Bias reporting</p>	<p>District Resources Bock Modeling the World Graphing Calculators Minitab Software</p> <p>Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Freeman Practice of Statistics</p> <p>Campus Resources To be filled in by each campus</p>



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Unit 6: Experiments and Observational Studies			3 rd 6 Weeks		
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	Planning and conducting experiments Characteristics of a well-designed and well-conducted experiment Treatments, control groups, experimental units, random assignments, and replication Sources of bias and confounding, including placebo effect and blinding. Completely randomized design. Randomized block design, including matched pairs design.	Experiment Factor Response Experimental units Level Treatment Control group Blinding Placebo Placebo effect Block Confounding	What are four basic principles of sound experiment design? What is importance of randomization in assigning treatments to experimental units? What is the importance of a control group/placebo?	Recognize factors, treatments, levels and the response variable of a designed experiment. Design a randomized experiment to test the effect of a single factor. Know how to report the results of an observational study.	District Resources Bock Modeling the World Graphing Calculators Minitab Software Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Freeman Practice of Statistics Campus Resources To be filled in by each campus



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Unit 7: Probability: Exploring random phenomena			4th 6 Weeks		
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	Relate the concepts of probability as the study of randomness. Apply probability models to complex random phenomena. Interpreting probability, including frequency interpretation. Law of Large Numbers concept Addition rule, multiplication rule, conditional probability and independence.	Introduction to Probability Randomness Sample space Probability rules Complement Independence Disjoint Venn-diagram Probability models Conditional probability	When/how is the addition rule applied? What is the law of large numbers? Can disjoint events be independent?	Contingency tables Venn diagrams Tree diagrams	District Resources Book Modeling the World Graphing Calculators Minitab Software Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Freeman Practice of Statistics Campus Resources To be filled in by each campus



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Unit 8: Probability: Models		4 th 6 Weeks			
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	Discrete random variables and their probability distributions, binomial and geometric Understanding and calculate complex probabilities.	Randomness Sample space Probability models Binomial Geometric Independence Expected value Venn-diagram Conditional probability	What are appropriate conditions for using a geometric, binomial, or normal model? What is the data called that is produced from a binomial distribution? Define a binomial coefficient. Write out the general factorial expression. What conditions must be satisfied to meet the definition of a geometric distribution? What is the expected value of a geometric count?	Find probability model for a discrete random variable. Find mean and variance of a random variable. Interpret meaning of the expected value and standard deviation of the random variable.	District Resources Book Modeling the World Graphing Calculators Minitab Software Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Freeman Practice of Statistics Campus Resources To be filled in by each campus

Unit 9: Sampling Distributions			5 th 6 Weeks		
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	Sampling Distributions of a sample proportion Sampling distribution of a sample mean Central Limit Theorem Sampling distribution of a difference between two independent sample proportions Sampling distribution of a difference between two independent sample means Simulation of sampling distributions t- distribution	Sampling distribution model Central Limit Theorem Standard error	Distinguish between “sample” and “population”. What is a parameter? What lends strength to a statistic? How is a sampling distribution validated? A statistic is said to be unbiased if what condition holds? Describe the concept of “variability of a statistic”. What does the CLT tell us about the sampling distribution versus the normal distribution? Why do we use the CLT?	Demonstrate a sampling distribution by simulation Interpret a sampling distribution model Understand purpose of Central Limit Theorem Describe the concept of “variability of a statistic”.	District Resources Book Modeling the World Graphing Calculators Minitab Software Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Freeman Practice of Statistics Campus Resources To be filled in by each campus



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Unit 10: Introduction to Inference			5 th 6 Weeks		
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	Estimating with confidence. Tests of Significance (Ho: & Ha:); p-value. Using Significance Tests (z-stats).	Inference: Confidence Estimating with confidence Tests of significance Using significance tests Inference as a decision	Define statistical inference. What does the confidence interval estimate? What does the confidence level tell you? List the three events necessary to reduce a margin of error. What is the goal of tests of significance? How does the p-value influence whether you reject or fail to reject a null hypothesis? What does it mean to be statistically significant? When do we use z-scores?	Estimate population parameters and margins of error Construct and interpret confidence intervals for the population means. Properties of point Estimators Be able to interpret a one proportion z interval Be able to state null and alternate hypotheses. Interpret meaning of p value Choose between and one-sided and two-sided hypothesis	District Resources Bock Modeling the World Graphing Calculators Minitab Software Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Freeman Practice of Statistics Campus Resources To be filled in by each campus



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Unit 10: Introduction to Inference			5 th 6 Weeks		
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
				Relationship between hypothesis tests and confidence intervals Relate critical value to specified alpha value Compute z-interval on calculator.	District Resources Bock Modeling the World Graphing Calculators Minitab Software Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Freeman Practice of Statistics Campus Resources To be filled in by each campus

Unit 11: The Sampling Distributions			6 th 6 Weeks		
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	Comparing two means Mean of a Population: t tests	Inference: Distributions Means of a population Comparing two means Degrees of Freedom	What procedure is useful for non-normal data when the sample size is ≥ 15 ? What is the goal of inference? What conditions must be met for comparing two means?	State null and alternative hypotheses for testing the difference between two population proportions Examine data for violations of conditions of inference Perform significance tests on two populations Assumptions for t-tests and confidence intervals Compute and determine a t test for a population mean Compute z-test, z-interval, and t-test using calculator.	District Resources Graphing Calculators Minitab Software Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Freeman Practice of Statistics Campus Resources To be filled in by each campus

Unit 12: Introduction to Inference			6 th 6 Weeks		
Date Taught	Required Elements	Content/Vocabulary	Guiding Questions	Activities	Resources
	Test for Goodness of Fit: χ^2 Test for Homogeneity Test for Independence	Inference: Tables: Chi-Square Test for goodness of fit Inference for two-way tables Homogeneity	What is “formal inference”? What are the components of χ^2 ? What distinguishes the a) χ^2 test for homogeneity from the b) χ^2 test of association and independence?	Recognize different chi-square test types (GOF, Homogeneity, Independence) Know how to use tables to perform chi-square test Compute chi-square test on calculator	District Resources Bock Modeling the World Graphing Calculators Minitab Software Internet Resources MISD Mathematics Web Site Mathematics Tool Kit Math Dictionary WebCCAT Freeman Practice of Statistics Campus Resources To be filled in by each campus