Wyoming Department of Education Required Virtual Education Course Syllabus

BIG HORN COUNTY SCHOOL DISTRICT #1

Program Name	WYCA	Content Area	Mathematics
Course ID	CAMA79719	Grade Level	9, 10, 11, 12
Course Name	Statistics A	# of Credits	0.5
SCED Code	02201G0.5012	Curriculum Type	Connections Academy

COURSE DESCRIPTION

In this first semester course, the student will become familiar with the vocabulary, method, and meaning in the statistics, which exist in the world around them. This is an applied course in which students actively construct their own understanding of the methods, interpretation, communication, and application of statistics. All topics, including univariate and bivariate data, studies and experiments, probability, and distributions, are framed by enduring understandings and essential questions designed to allow the student a deep understanding of the concepts at hand rather than memorization and emulation.

The TI-83+/84 OR 89 calculator and computers will be used to explore the world of data and the patterns which can be found by analyzing this information as well as statistical relationships.

WYOMING CONTENT AND PERFORMANCE STANDARDS

STANDARD#	BENCHMARK
S.ID.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
S.ID.2	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.
S.ID.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
S.ID.4	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.*
S.ID.5	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
S.ID.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
S.ID.6a	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.
S.ID.6b	Informally assess the fit of a function by plotting and analyzing residuals.
S.IC.1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
S.IC.2	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0. 5. Would a result of 5 tails in a row cause you to question the model?
S.IC.3	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
S.IC.4	Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
S.IC.5	Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
S.IC.6	Evaluate reports based on data.

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMES
Unit 1: Univariate Data and Graphical Displays: Part 1 This unit begins with an introduction to univariate data, beginning with a video that covers the basics of statistics using real-world examples. Next, you will learn about different kinds of data, such as qualitative and quantitative. Different ways to display data is introduced, such as bar charts, pie graphs, plots, and histograms. You will begin to learn about data distribution in regards to center, shape, and spread. Then you will have the opportunity to practice displaying data using different methods, including using an interactive histogram. Finally, you will review and use all the information introduced in this unit prior to taking the unit test.	S.ID.1; S.ID.6; S.IC.1; S.IC.3; S.IC.6	Identify variables as either qualitative (categorical) or quantitative; Classify qualitative variables as either ordinal or nominal; Further classify quantitative variables as either discrete or continuous, create and interpret bar charts and pie graphs; Graphically display quantitative univariate data using dot plots and stem plots; Create dot plots and stem plots (often called stem and leaf plots) and describe these plots; Create proper histograms; Graphically display quantitative univariate data using histograms; read, interpret and create cumulative frequency plots

Unit 2: Univariate Data and Graphical Displays: Part 2 In this unit, you will continue the process of describing distributions by using quantities to describe the data set. Specifically, you will learn how to describe the center using the mean or the median and the spread using the range, quartiles, variance, and standard deviation. You will learn how this information contributes to the five-number summary and how to display this information in a boxplot. You will also learn about Tukey's Rule which can be used to determine if a data point is an outlier.	S.ID.1; S.ID.2; S.ID.3; S.ID.4; S.MD.1; S.MD.2; S.MD.3; S.MD.4;	Quantitatively describe the center of a distribution using the mean and median, Quantitatively describe the spread of a distribution, Compute the standard deviation and range of a distribution and data set, Measure the spread of a distribution using the standard deviation and range; Quantitatively describe the center and spread of a distribution; Determine if an extreme value is an outlier or not; Describe the center and spread of a distribution using the five-number summary and its boxplot; Describe distributions using density curves; Calculate probabilities based on simple density curves; Recognize different normal distributions; Understand and apply the empirical rule to determine probabilities and proportions; Understand the necessity of standardization and standardized or z-scores; Compare data points (such as test scores) from different distributions; Compute z-scores in order to make comparisons between data points and distributions; Calculate normal distribution probabilities and scores and z-scores given normal proportions; Use these properties of the normal distribution to answer important questions; Calculate standardized and other scores based upon probabilities in the normal distribution, assess normality through a histogram, the empirical rule, and a special new graph called the normal probability plot
Unit 3: Introduction to Bivariate and Categorical Data This unit provides an introduction to bivariate data beginning with classifying and identifying different types of variables, such as explanatory and response variables. You will then learn how to plot bivariate data using a scatterplot to determine if there is a relationship between the two variables. Interpreting scatterplots involves identifying and describing associations such as direction, form and strength and identifying any data points that do not seem to follow the pattern, called outliers. You will learn about correlation, such as how to calculate and interpret, and the difference between correlation and causation. Using a scatterplot, you will learn how data can be modeled with a least squares regression line and use this model to make predictions. Regressions will be evaluated through the use of residuals, as well as influential points and coefficient of determination.	S.ID.3; S.ID.5; S.ID.6; S.ID.6b; S.ID.8	Identify variables as either explanatory or response; Describe bivariate scatterplots; Graphically display bivariate data; Create scatterplots; Use a calculator to create scatterplots; Interpret scatterplots; Identify and describe scatterplot association (or direction), form, strength; Identify outliers; Calculate correlation, both with and without technology; Properly interpret the correlation; Quantify the strength of an association; Model data with the least squares regression line; Find, use, and interpret the least squares regression line, both with and without technology; Calculate r, the correlation, with technology; Evaluate a regression through residuals and the residual plot; Assess the quality of a linear regression; Recognize the details and cautions and limitations of correlations and regressions; Interpret scatterplots and regression; Recognize outliers (in one or both directions), influential points, and the coefficient of determination (also known as r-squared)
Unit 4: Exploring Bivariate and Non-linear Data In this unit, you will continue working with modeling and interpreting bivariate data. However, the focus will be on data in which linear regression is not the best model. You will learn about exponential data and the power function and how these can be used to model and interpret bivariate data. You will also get an opportunity to analyze bivariate data that is categorical rather than quantitative. Other concepts will include Simpson's Paradox, lurking variables, causation, and extrapolation.	S.ID.5; S.ID.6a; S.ID.9	Understand when and how to move beyond linear regression model exponential data such as populations, bacteria, and money; recognize when and how to model with power functions; analyze bivariate data that is categorical, understand Simpson's Paradox, lurking variables, causation, and extrapolation,

Unit 5: Conducting Studies - Samples and Surveys This unit introduces how reliable data can be obtained for studies, experiments, and simulations. You will learn how a sample can be used to represent a population and how to identify bias, including its affect on any conclusions drawn from the collection of data. Opportunities are provided for you to design samples and surveys, including how randomization should be used in order to obtain reliable data. You will also learn about the different types of good sampling methods that should be used to obtain reliable data as well as sampling cautions that can contribute to sampling error.	S.IC.1; S.IC.2; S.IC.3; S.IC.4; S.IC.5; S.IC.6	Identify the population of interest and an appropriate sample; understand the notion of taking a sample in order to answer questions about the population; Explain the basics of designing a sample and survey; Identify the characteristics of a well-designed and well-conducted survey; Design a sample for a survey; Define the Simple Random Sample and its significance; Select individuals using a Simple Random Sample (SRS); Recognize poor sampling designs; Carefully interpret the data that results recognize stratified, cluster, and systematic sampling; Demonstrate awareness of bias and pitfalls in sampling design and learn how to avoid and account for error; Identify how bias presents itself in sampling; Discover voluntary response bias, response bias, undercoverage, question wording, and sampling error
Unit 6: Semester Review and Exam In this unit, you will have the opportunity to review and pull together all the information introduced in the first semester of the course in order to prepare for the semester exam.		•review the concepts you learned and prepare for the semester exam •completee the semester exam