Wyoming Department of Education Required Virtual Education Course Syllabus

BIG HORN COUNTY SCHOOL DISTRICT #1

Program Name	WYCA	Content Area	Mathematics
Course ID	CAMA77882	Grade Level	9, 10, 11, 12
Course Name	AP Statistics A	# of Credits	0.5
SCED Code	02203E0.5012	Curriculum Type	Connections Academy

COURSE DESCRIPTION

In the first half of AP Statistics, students will become familiar with the vocabulary, methods, and meaning in the statistics that exist in the world. This is an applied course in which the student will actively construct his or her own understanding of the methods, interpretation, communication, and application of statistics. Each unit is framed by enduring understandings and essential questions designed to allow the student a deep understanding of the concepts at hand rather than by memorization and emulation. The student will also complete several performance tasks throughout the year consisting of relevant, open-ended tasks requiring the student to connect multiple statistical topics together. The TI-83+/84 OR 89 calculator and computers will be used to explore the world of data and the patterns that can be found by analyzing this information as well as statistical relationships. General topics of study include exploring data, planning and design of a study, anticipating patterns, and statistical inference.

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.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.ID.6c	Fit a linear function for a scatter plot that suggests a linear association.
S.ID.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
S.ID.8	Compute (using technology) and interpret the correlation coefficient of a linear fit.
S.ID.9	Distinguish between correlation and causation.
S.IC.1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
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.
S.CP.1	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or compliments of other events ("or," "and," "not").
S.CP.2	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.
S.CP.3	Understand the conditional probability of A given B as P(A and B)/P(B), 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.
S.CP.4	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. For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.
S.CP.5	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.
S.CP.6	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.
S.CP.7	Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.
S.CP.8	(+)Apply the general Multiplication Rule in a uniform probability model, P(A and B) = [P(A)]x[P(B|A)] =[P(B)]x[P(A|B)], and interpret the answer in terms of the model.
S.MD.1	(+)Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
S.MD.2	(+)Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
S.MD.3	(+)Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.
S.MD.4	(+)Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMES
Unit 1: Welcome Unit 1 is an introduction to the AP Statistics course, including course navigation, expectations, and a quiz.		•note taking skills •calculator philosophy and policy

Unit 2: Exploring Univariate Data In this unit, you will learn how to graph a dataset in a variety of ways, describe essential aspects of that data, and make comparisons between two or more datasets. Some of the methods of visually displaying numerical data will be a review, while other methods will be new skills you can learn.	S.ID.1; S.ID.2; S.ID.3; S.ID.4; S.ID.5; S.ID.6; S.IC.1; S.IC.3; S.IC.6; S.MD.1; S.MD.2; S.MD.3; S.MD.4	•learn to create and interpret bar charts and pie graphs •Graphically display quantitative univariate data using dotplots and stemplots •Create dotplots and stemplots (often called stem and leaf plots) and describe these plots •Create proper histograms and time plots •Graphically display quantitative univariate data using histograms and time plots •read, interpret and create cumulative frequency plots •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 •Recognize different normal distributions •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
Unit 3: Exploring Bivariate and Categorical Data In Unit 3, you will learn that, despite the shortcomings and bias and abuse, statistical modeling does indeed help you understand and even predict the world around you. You will learn how bivariate modeling works (and how it doesn't work).	S.ID.5; S.ID.6; S.ID.6a; S.ID.6b; S.ID.6c; S.ID.7; S.ID.8; S.ID.9	•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) •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 4: Conducting Studies and Experiments This unit will teach you the difference between an observational study, an experiment, and a simulation. You will investigate to what extent data can be purposefully biased, and learn about good and bad samples.	S.IC.1; S.IC.2; S.IC.3; S.IC.4; S.IC.5; S.IC.6	•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 •Identify the basic terminology of experiments •Discern the purpose and feasibility of conducting an experiment •Discover the basic structure of experimental design and what role randomization plays •Design a completely randomized experiment •Identify the placebo effect and decide how to account for it •Design more complicated experiments using the concepts of matching and blocking •recognize confounding variables, bias, and blinding •Conduct a simulation using probabilities and either a random digit table or calculator to obtain your data •Describe the conditions for and details of conducting a simulation •understand when and how to generalize results

Unit 5: Probability and Random Variables This unit focuses on probability. You will learn about collection (sample size, disjunct, and independence) and display (Venn and tree diagrams) of probability.	S.CP.1; S.CP.2; S.CP.3; S.CP.4; S.CP.5; S.CP.6; S.CP.7; S.CP.8; S.IC.4	•Identify the sample space for a probability setting •Recognize replacement •Demonstrate how to count using the multiplication principle and see its connection to a tree diagram •Recognize the basic rules of probability •Define Venn diagrams •Demonstrate Benford's law •Identify probability and the multiplication rule •Explain independence and how it affects probability models •Illustrate how probability can model more realistic settings •Understand Union notation •Use Venn diagrams to understand overlapping events •Recognize how the concept of independence and conditional probability are related •Calculate conditional probabilities •Organize data into a tree diagram •Use a tree diagram to find probability •Define and notate random variables •Recognize discrete random variables •Identify and use discrete probability distributions •Distinguish between discrete and continuous random variables •Construct and use continuous probability distributions and review the normal distribution •Correctly make normal distribution calculations •Determine the mean, or expected value, of a random variable •Identify if a game is fair using statistics •Calculate the variance and standard deviation of a random variable •Recognize and understand the applicability of the Law of Large Numbers •Use and apply the rules for means and variances when combining random variables
Unit 6: Binomial, Geometric, and Sampling Distributions In this unit, you will learn to recognize and apply the binomial distribution, and find the mean and standard deviation of a binomial distribution. You will also learn to recognize and apply the geometric distribution and find the geometric mean.	S.ID.2; S.ID.3; S.ID.4; S.ID.6a; S.MD.1; S.MD.2	•recognize binomial probabilities •Use and apply the binomial formula and the mean and standard deviation of binomial distributions •Interpret and manipulate the binomial formula •Calculate and understand the binomial mean and standard deviation •Recognize geometric settings and distinguish them from binomial settings •Understand the four conditions necessary for a geometric setting •Distinguish between binomial and geometric setting •Calculate probabilities within geometric settings as well as apply the geometric mean and standard deviation •Use geometric probabilities to model this and other geometric distributions •Understand what a sampling distribution is as well as how it is affected by sampling variabilty •Understand the characteristics of bias and variability •Define the characteristics of a sampling distribution based upon proportions and categorical data •Determine the conditions under which we may estimate the standard deviation of the distribution and assume normality in order to make calculations and decisions •Determine the characteristics of a sampling distribution based on means and quantitative data •Select the details of sampling distributions of quantitative data •Discover the conditions under which you may assume normality in order to make calculations and decisions •Determine the significance and necessity of the Central Limit Theorem to the study of statistics •Understand how it is that nearly every sampling distribution approaches a normal distribution