WDHS Curriculum Map
Probability and Statistics

Time Interval/ Content	*Standards/ Strands*	*Essential Questions*	*Skills*	*Assessment*
Unit 1: Introduction to Statistics *Larson Sections:* 1.1-1.3 2 weeks	• 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-6: Evaluate reports based on data.	• What is Statistics and how does it relate to you?	*Students will understand that…* • Statistics is a science of collecting, organizing, analyzing, and interpreting data in order to make decisions. *Students will know…* • Statistics • Data • Population • Sample • Parameter • Descriptive Statistics • Inferential Statistics • Qualitative Data • Quantitative Data • Levels of Measurement • Observational Study • Experiment • Simulation • Survey • Census • Sampling • Bias • Error *Students will be able to…* • Distinguish between a population and a sample • Distinguish between a parameter and statistic	• Classwork • Homework • Quizzes • Test • Performance Task: Analyzing a Statistical Study

			• Distinguish between descriptive statistics and inferential statistics • Distinguish between qualitative data and quantitative data • Classify data with respect to the four levels of measurement • How to design a statistical study • How to collect data by doing an observational study, performing an experiment, using a simulation, or a survey • How to design an experiment • How to create a sample using random sampling, simple random sampling, stratified sampling, cluster sampling, and systematic sampling and how to identify a biased sample	

Time Interval/ Content	*Standards/ Strands*	*Essential Questions*	*Skills*	*Assessment*
Unit 2: Descriptive Statistics *Larson Sections*: 2.1-2.5 3 weeks	• 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-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-IC-6: Evaluate reports based on data.	• What is descriptive statistics and how is it useful when studying data? • How does descriptive statistics affect inferential statistics?	*Students will understand that…* • Descriptive statistics is the branch of statistics that involves the organization, summarization, and display of data. • Descriptive statistics is useful when making inferences about the population. *Students will know…* • Frequency Distribution • Histogram • Frequency Polygon • Ogive • Stem-and-Leaf Plot • Dot Plot • Time Series Plot • Pie Chart • Pareto Chart • Mean • Median • Mode • Distribution Shapes • Range • Standard Deviation • Variance • Empirical Rule • 5 Number Summary • Box Plot • Percentile • Z-Score *Students will be able to…* • Construct a frequency distribution including limits, midpoints, relative frequencies, cumulative frequencies, and boundaries	• Classwork • Homework • Quizzes • Test • Performance Task: What's the Cost of Lunch?

			• Construct frequency histograms, frequency polygons, relative frequency histograms, and ogives • How to graph quantitative data sets using exploratory data analysis tools of stem-and-leaf plots and dot plots • How to graph and interpret paired data sets using scatter plots and time series charts • How to graph qualitative data sets using pie charts and Pareto charts • How to find the mea, median, and mode of a population and a sample • How to describe the shape of a distribution as symmetric, uniform, or skewed and how to compare the mean and median for each • How to find the range of a data set • How to find the variance and standard deviation of a population and a sample • How to use the Empirical Rule to interpret standard deviation • How to approximate the sample standard deviation for grouped data • How to find the quartiles and interquartile range of a data set • How to draw a box plot • How to interpret other fractiles such as percentiles • How to find and interpret the standard score (z-score)	

Time Interval/ Content	*Standards/ Strands*	*Essential Questions*	*Skills*	*Assessment*
Unit 3: Correlation and Regression *Larson Sections:* 9.1-9.3 2 weeks	• 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. • 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.	• What can we use to determine the relationship between two variables? • How can we make predictions using ordered pair data and scatter plots?	*Students will understand that…* • Correlation is the relationship between two variables. • A regression line is the line of best. • A regression line can be used to make predictions. • An error will occur when using a regression line to make predictions. *Students will know…* • Scatter plot • Correlation • Independent Variable • Dependent Variable • Correlation Coefficient • Residuals • Regression Line • Total Deviation • Explained Deviation • Unexplained Deviation • Coefficient of Determination • Standard Error of Estimate *Students will be able to…* • Construct a Scatter Plot • Find the Correlation Coefficient • Find the Equation of a Regression Line • Find and Interpret the Coefficient of Determination • Find and Interpret the Standard Error of Estimate	• Classwork • Homework • Quizzes • Test • Perforamce Task: Comparing Flight Distances vs Cost

Time Interval/ Content	*Standards/ Strands*	*Essential Questions*	*Skills*	*Assessment*
Unit 4: Probability *Larson Sections:* 3.1-3.4 3 weeks	• 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 complements 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. • S-CP-5: Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. • S-CP-6: Find the conditional	• How can we determine the probability of an event occurring?	*Students will understand that…* • Probability is the chance an event occurs. • The differences between the Counting Principal, Multiplication Rule, and Addition Rule. *Students will know…* • Probability Experiment • Outcome • Sample Space • Event • Simple Event • Fundamental Counting Principal • Classical Probability • Empirical Probability • Subjective Probability • Complement of Event • Conditional Probability • Independent • Dependent • Multiplication Rule • Mutually Exclusive • Addition Rule • Permutation • Distinguishable Permutation • Factorial • Combination *Students will be able to…* • Identify the Sample Space of a probability experiment and to identify simple events	• Classwork • Homework • Quizzes • Test • Performance Task: Casino Day

	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)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. • S-CP-9: Use permutations and combinations to compute probabilities of compound events and solve problems.		• Use the Fundamental Counting Principle to find the number of ways two or more events can occur • Distinguish among classical probability, empirical probability, and subjective probability • Find the probability of the complement of an event and how to find other probabilities using tree diagrams and the Fundamental Counting Principal • Find conditional probabilities • Distinguish between independent and dependent events • Use the Multiplication Rule to find the probability of two events occurring in sequence • Determine if two events are mutually exclusive • Use the Additional Rule to find the probability of two events • Find the number of ways a group of objects can be arranged in order and the number of ways to choose several objects from a group without regard to order • Use the counting principal to find probabilities	

Time Interval/ Content	*Standards/ Strands*	*Essential Questions*	*Skills*	*Assessment*
Unit 5: Probability Distributions *Larson Sections:* 4.1, 5.1-5.4 3 weeks	• 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. • 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. • S-MD-5: Weight the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. • S-MD-5A: Find the expected payoff for a game of chance. • S-MD-5B: Evaluate and compare strategies on the basis of expected values. • S-ID-6: Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize	• How can we interpret a probability distribution? • When should we use a discrete distribution versus a continuous distribution?	*Students will understand that…* • A probability distribution is every possible value the random variable can assume, together with its probability. • Discrete probability distributions are for finite or countable possible outcomes. • Continuous probability distributions are for infinite or uncountable possible outcomes, represented by the normal curve. *Students will know…* • Random Variable • Discrete • Continuous • Probability Distribution • Mean of a Random Variable • Standard Deviation of a Random Variable • Expected Value • Normal Distribution (Curve) • Standard Normal Curve • Z-Score • Sampling Distribution *Students will be able to…* • How to distinguish between discrete random variables and continuous random variables • How to determine if a distribution is a probability distribution	• Classwork • Homework • Quizzes • Test • Performance Task: Birth Weights in America

	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.		• How to construct a discrete probability distribution and its graph and find the mean, variance, and standard deviation • How to find the expected value • How to interpret graphs of normal probability distributions • How to interpret z-scores • How to find areas under the standard normal curve • How to find probabilities for normally distributed variables • How to find a z-score given the area under the normal curve • How to transform a z-score to an x-value • How to find a specific data value of a normal distribution given the probability	

Time Interval/ Content	*Standards/ Strands*	*Essential Questions*	*Skills*	*Assessment*
Unit 6: Sampling Distributions *Larson Sections:* 5.4, 6.1, 6.3, 7.1, 7.2, 7.4, 8.4 *CP:* 3 weeks	• S-IC-2: Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. • 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-MD-6: Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator). • S-MD-7: Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).	• Why are sampling distributions important? • What is the purpose of hypothesis testing?	*Students will understand that…* • A sampling distribution can be used to approximate characteristics of a population. • Hypothesis testing is a process that uses a sampling distribution to test a claim about a population characteristic. *Students will know…* • Sampling Distribution • Standard Error of the Mean • Central Limit Theorem • Point Estimate • Interval Estimate • Level of Confidence • Critical Values • Sampling Error • Margin of Error • Confidence Interval • Hypothesis Test • Null Hypothesis • Alternative Hypothesis • Level of Significance • Test Statistic • P-Value • Z-Test *Students will be able to…* • Find sampling distributions and verify their properties. • Interpret the Central Limit Theorem.	• Classwork • Homework • Quizzes • Test • Performance Task: Ahoy Mates

			• Apply the Central Limit Theorem to find the probability of a sample mean. • Find a point estimate and a margin of error. • Construct and interpret confidence intervals for the population mean and proportion. • State a null hypothesis and an alternative hypothesis. • Know whether to use a one-tailed or a two-tailed statistical test. • Interpret a decision based on the results of a statistical test. • Find critical values for a *z*-test. • Use rejection regions for a *z*-test. • Find *P*-values and use them to test a mean and a population proportion. • How to perform a *z*-test for the difference between two population proportions.	