

**Union County Educational Services Commission  
High School Course Syllabus**

**Title:** Probability and Statistics

**Timeline:** Full Year; 5 Credits

**Course Description:**

This course introduces students to the methods used in the field of applied statistics using mathematical models. Emphasis is given to concepts and techniques for collecting, analyzing, representing data, drawing conclusions, and making predictions. The major focus of this course is to provide students with experience in measures of location and dispersion, correlation, and regression. Students will use multiple representations to present data including written descriptions, numerical statistics, formulas, and graphs. Students will work with independent and dependent events, random variables, conditional probability, binomial and geometric distributions.

**Scope and Sequence:**

- I. Introduction to Statistics and Analyzing Types of Data; Measures of Central Tendency
- II. Measures of Dispersion I; Representations of Data; Measures of Dispersion II
- III. Combinatorics; Probability
- IV. Discrete Random Variables; Normal Distribution

**Curriculum Alignment:**

New Jersey Student Learning Standards - Mathematics

**Grading Procedures:**

Do Now	10%
Participation	20%
Class Assignments	50%
Assessments	20%

**Adoption Date:**

June 2024

**Union County Educational Services Commission**  
**Curriculum Mapping: Probability and Statistics**

	<b>Unit 1</b>	<b>Unit 2</b>	<b>Unit 3</b>	<b>Unit 4</b>
<b>Number of Weeks</b>	approx. 10 weeks	approx. 10 weeks	approx. 10 weeks	approx. 10 weeks
<b>Topics</b>	Introduction to Statistics and Analyzing Types of Data  Measures of Central Tendency	Measures of Dispersion I  Representations of Data  Measures of Dispersion II	Combinatorics  Probability	Discrete Random Variables  Normal Distribution
<b>Standards for Mathematical Content</b>	S-IC.B3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.  S-IC.B6 Evaluate reports based on data (e.g. interrogate study design, data sources, randomization, the way the data are analyzed and displayed, inferences drawn and methods used; identify and explain misleading uses of data; recognize when arguments based on data are flawed).	S-IC.A1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.  S-IC.B6 Evaluate reports based on data (e.g. interrogate study design, data sources, randomization, the way the data are analyzed and displayed, inferences drawn and methods used; identify and explain misleading uses of data; recognize when arguments based on data are flawed).	S-CP.A1 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.A2 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-ID.A4 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-MD.A1 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

	<p>S-IC.A1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.</p> <p>S-ID.A2 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.</p>	<p>S-ID.A1 Represent data with plots on the real number line (dot plots, histograms, and box plots).</p> <p>S-ID.A2 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.</p> <p>S-ID.A3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).</p> <p>S-ID.A4 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</p>	<p>S-CP.B9 Use permutations and combinations to compute probabilities of compound events and solve problems.</p> <p>S-IC.A2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.</p> <p>S-ID.B5 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.</p>	<p>distribution using the same graphical displays as for data distributions.</p> <p>S-MD.A2 Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.</p>
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		<p>procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.</p> <p>S-ID.B6 Represent data on two quantitative variables on a scatter plot and describe how the variables are related.</p> <p>S-ID.C7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.</p>		
<p><b>Standards for Mathematical Practice</b></p>	<p>MP.1 Make sense of problems and persevere in solving them.</p> <p>MP.2 Reason abstractly and quantitatively.</p> <p>MP.3 Construct viable arguments &amp; critique the reasoning of others.</p> <p>MP.4 Model with mathematics.</p> <p>MP.5 Use appropriate tools strategically.</p> <p>MP.6 Attend to precision.</p> <p>MP.7 Look for and make use of structure.</p>			

	MP.8 Look for and express regularity in repeated reasoning.			
<b>Content</b>	variables in a statistical study	interquartile range	counting principle	interquartile range
	quantitative and qualitative variables	percentiles	permutations	percentiles
	population and sample data	deciles	combinations	deciles
	discrete and continuous data	quartiles	odds	quartiles
	descriptive and inferential statistics	outliers		outliers
	mean, median, mode	histogram	compound events	histogram
	frequency tables	box-whiskers plots	dependent	box-whiskers plots
	group data	frequency and cumulative frequency	independent	frequency and cumulative frequency
		stem-leaf	mutually exclusive events	stem-leaf
		dot plot	conditional	dot plot
		scatterplots	tree diagrams	scatterplots
			Pascal's triangle	
		mean absolute deviation	arrangements with multiples	mean absolute deviation
		variance	tree diagrams	variance
		standard deviation		standard deviation

<p><b>Skills</b></p>	<p>calculating mean, and median mode from discrete data</p> <p>frequency tables</p>	<p>Identify outliers</p> <p>Choose the appropriate scale to represent data on a number line</p> <p>construct a dot plot for a set of data; construct a histogram for a set of data</p> <p>calculate the 5-number summary for a set of data</p> <p>construct a box whisker based on the 5-number summary</p> <p>drawing a scatterplot and the line of best fit</p> <p>calculate the variance and standard deviation using formulas and Google Sheets, analyze and interpret the standard deviation</p>	<p>Calculating factorials, permutations, and combinations using formulas and calculator keys</p> <p>apply counting principles to determine the total number of outcomes for an event</p> <p>calculate the theoretical probability of an event. determine the experimental probability and the conditional probability of an event</p> <p>determine probabilities for compound events. using tree diagrams to calculate probabilities</p>	<p>use tables to find probabilities in the standard normal distribution Z</p> <p>transform any normal distribution into Z and use tables</p> <p>use normal tables to find <math>\mu</math> and <math>\sigma</math>, z-score</p> <p>compare and contrast two or more distributions</p>
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