

Mathematics for College Statistics (#1210305)

B.E.S.T. Course Description

Course Title:	Mathematics for College Statistics
Course Number:	1210305
Course Information:	<p>In Mathematics for College Statistics, instructional time will emphasize four areas:</p> <ol style="list-style-type: none">(1) analyzing and applying linear and exponential functions within the context of statistics;(2) extending understanding of probability using data and various representations, including two-way tables and Venn Diagrams;(3) representing and interpreting univariate and bivariate categorical and numerical data and(4) determining the appropriateness of different types of statistical studies. <p><i>All clarifications stated, whether general or specific to Mathematics for College Statistics, are expectations for instruction of that benchmark.</i></p> <p>Curricular content for all subjects must integrate critical-thinking, problem-solving, and workforce-literacy skills; communication, reading, and writing skills; mathematics skills; collaboration skills; contextual and applied-learning skills; technology-literacy skills; information and media-literacy skills; and civic-engagement skills.</p>
General Notes:	<p>Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards</p> <p>This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.</p> <p>English Language Development ELD Standards Special Notes Section:</p> <p>Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Mathematics. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaproduct.blob.core.windows.net/uploads/docs/standards/eld/ma.pdf</p>

Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards: 7 Mathematical Thinking and Reasoning Standards, 40 Mathematics Benchmarks, 6 English Language Arts Benchmarks and 1 English Language Development Benchmark

7 Mathematical Thinking and Reasoning Standards	Textbook Section
<p>MA.K12.MTR.1.1: Mathematicians who participate in effortful learning both individually and with others:</p> <ul style="list-style-type: none"> ● Analyze the problem in a way that makes sense given the task. ● Ask questions that will help with solving the task. ● Build perseverance by modifying methods as needed while solving a challenging task. ● Stay engaged and maintain a positive mindset when working to solve tasks. ● Help and support each other when attempting a new method or approach. <p>Clarifications: Teachers who encourage students to participate actively in effortful learning both individually and with others:</p> <ul style="list-style-type: none"> ● Cultivate a community of growth mindset learners. ● Foster perseverance in students by choosing tasks that are challenging. ● Develop students’ ability to analyze and problem solve. ● Recognize students’ effort when solving challenging problems. 	<p>Incorporated Throughout</p>
<p>MA.K12.MTR.2.1: Demonstrate understanding by representing problems in multiple ways.</p> <p>Mathematicians who demonstrate understanding by representing problems in multiple ways:</p> <ul style="list-style-type: none"> ● Build understanding through modeling and using manipulatives. ● Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations. ● Progress from modeling problems with objects and drawings to using algorithms and equations. ● Express connections between concepts and representations. ● Choose a representation based on the given context or purpose. <p>Clarifications: Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:</p> <ul style="list-style-type: none"> ● Help students make connections between concepts and representations. ● Provide opportunities for students to use manipulatives when investigating concepts. ● Guide students from concrete to pictorial to abstract representations as understanding progresses. ● Show students that various representations can have different purposes and can be useful in different situations. 	<p>Incorporated Throughout</p>

<p>MA.K12.MTR.3.1:</p>	<p>Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:</p> <ul style="list-style-type: none"> ● Select efficient and appropriate methods for solving problems within the given context. ● Maintain flexibility and accuracy while performing procedures and mental calculations. ● Complete tasks accurately and with confidence. ● Adapt procedures to apply them to a new context. ● Use feedback to improve efficiency when performing calculations. <p>Clarifications: Teachers who encourage students to complete tasks with mathematical fluency:</p> <ul style="list-style-type: none"> ● Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately. ● Offer multiple opportunities for students to practice efficient and generalizable methods. ● Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used. 	<p>Incorporated Throughout</p>
<p>MA.K12.MTR.4.1:</p>	<p>Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:</p> <ul style="list-style-type: none"> ● Communicate mathematical ideas, vocabulary and methods effectively. ● Analyze the mathematical thinking of others. ● Compare the efficiency of a method to those expressed by others. ● Recognize errors and suggest how to correctly solve the task. ● Justify results by explaining methods and processes. ● Construct possible arguments based on evidence. <p>Clarifications: Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:</p> <ul style="list-style-type: none"> ● Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning. ● Create opportunities for students to discuss their thinking with peers. ● Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods. ● Develop students' ability to justify methods and compare their responses to the responses of their peers. 	<p>Incorporated Throughout</p>

<p>MA.K12.MTR.5.1:</p>	<p>Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:</p> <ul style="list-style-type: none"> ● Focus on relevant details within a problem. ● Create plans and procedures to logically order events, steps or ideas to solve problems. ● Decompose a complex problem into manageable parts. ● Relate previously learned concepts to new concepts. ● Look for similarities among problems. ● Connect solutions of problems to more complicated large-scale situations. <p>Clarifications: Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:</p> <ul style="list-style-type: none"> ● Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts. ● Support students to develop generalizations based on the similarities found among problems. ● Provide opportunities for students to create plans and procedures to solve problems. ● Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking. 	<p>Incorporated Throughout</p>
<p>MA.K12.MTR.6.1:</p>	<p>Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:</p> <ul style="list-style-type: none"> ● Estimate to discover possible solutions. ● Use benchmark quantities to determine if a solution makes sense. ● Check calculations when solving problems. ● Verify possible solutions by explaining the methods used. ● Evaluate results based on the given context. <p>Clarifications: Teachers who encourage students to assess the reasonableness of solutions:</p> <ul style="list-style-type: none"> ● Have students estimate or predict solutions prior to solving. ● Prompt students to continually ask, “Does this solution make sense? How do you know?” ● Reinforce that students check their work as they progress within and after a task. ● Strengthen students’ ability to verify solutions through justifications. 	<p>Incorporated Throughout</p>
<p>MA.K12.MTR.7.1:</p>	<p>Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:</p> <ul style="list-style-type: none"> ● Connect mathematical concepts to everyday experiences. ● Use models and methods to understand, represent and solve problems. ● Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency. 	<p>Incorporated Throughout</p>

	<p>Clarifications:</p> <p>Teachers who encourage students to apply mathematics to real-world contexts:</p> <ul style="list-style-type: none"> ● Provide opportunities for students to create models, both concrete and abstract, and perform investigations. ● Challenge students to question the accuracy of their models and methods. ● Support students as they validate conclusions by comparing them to the given situation. ● Indicate how various concepts can be applied to other disciplines. 	
40 B.E.S.T. Mathematics Benchmarks		Textbook Section
MA.912.AR.1.1:	<p>Identify and interpret parts of an equation or expression that represent a quantity in terms of a mathematical or real-world context, including viewing one or more of its parts as a single entity.</p> <p>Clarifications:</p> <p><i>Clarification 1:</i> Parts of an expression include factors, terms, constants, coefficients and variables.</p> <p><i>Clarification 2:</i> Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.</p>	3.1, 3.2, 3.3, 5.1, 5.2, 5.3, 6.3, 7.1, 7.2, 10.5
MA.912.AR.1.2:	<p>Rearrange equations or formulas to isolate a quantity of interest.</p> <p>Clarifications:</p> <p><i>Clarification 1:</i> Instruction includes using formulas for temperature, perimeter, area and volume; using equations for linear (standard, slope-intercept and point-slope forms) and quadratic (standard, factored and vertex forms) functions.</p> <p><i>Clarification 2:</i> Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.</p>	4.2, 5.1, 10.2
MA.912.AR.2.5:	<p>Solve and graph mathematical and real-world problems that are modeled with linear functions. Interpret key features and determine constraints in terms of the context.</p> <p>Clarifications:</p> <p><i>Clarification 1:</i> Key features are limited to domain, range, intercepts and rate of change.</p> <p><i>Clarification 2:</i> Instruction includes the use of standard form, slope-intercept form and point-slope form.</p> <p><i>Clarification 3:</i> Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.</p> <p><i>Clarification 4:</i> Within the Algebra 1 course, notations for domain, range and constraints are limited to inequality and set-builder.</p> <p><i>Clarification 5:</i> Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.</p>	2.4, 10.2, 10.3
MA.912.AR.5.7:	<p>Solve and graph mathematical and real-world problems that are modeled with exponential functions. Interpret key features and determine constraints in terms of the context.</p> <p>Clarifications:</p> <p><i>Clarification 1:</i> Key features are limited to domain; range; intercepts; intervals where the function is</p>	10.5

	<p>increasing, decreasing, positive or negative; constant percent rate of change; end behavior and asymptotes.</p> <p><i>Clarification 2:</i> Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation.</p> <p><i>Clarification 3:</i> Instruction includes understanding that when the logarithm of the dependent variable is taken and graphed, the exponential function will be transformed into a linear function.</p> <p><i>Clarification 4:</i> Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.</p>	
MA.912.DP.1.1:	<p>Given a set of data, select an appropriate method to represent the data, depending on whether it is numerical or categorical data and on whether it is univariate or bivariate.</p> <p>Clarifications:</p> <p><i>Clarification 1:</i> Instruction includes discussions regarding the strengths and weaknesses of each data display.</p> <p><i>Clarification 2:</i> Numerical univariate includes histograms, stem-and-leaf plots, box plots and line plots; numerical bivariate includes scatter plots and line graphs; categorical univariate includes bar charts, circle graphs, line plots, frequency tables and relative frequency tables; and categorical bivariate includes segmented bar charts, joint frequency tables and joint relative frequency tables.</p> <p><i>Clarification 3:</i> Instruction includes the use of appropriate units and labels and, where appropriate, using technology to create data displays.</p>	2.1, 2.2, 2.3, 2.4, 3.3, supplement segmented bar chart and joint frequency table
MA.912.DP.1.2:	<p>Interpret data distributions represented in various ways. State whether the data is numerical or categorical, whether it is univariate or bivariate and interpret the different components and quantities in the display.</p> <p>Clarifications:</p> <p><i>Clarification 1:</i> Within the Probability and Statistics course, instruction includes the use of spreadsheets and technology.</p>	2.1, 2.2, 2.3, 2.4, 3.3, 6.1, 6.2, 6.3
MA.912.DP.1.3:	<p>Explain the difference between correlation and causation in the contexts of both numerical and categorical data.</p>	2.4
MA.912.DP.2.1:	<p>For two or more sets of numerical univariate data, calculate and compare the appropriate measures of center and measures of variability, accounting for possible effects of outliers. Interpret any notable features of the shape of the data distribution.</p> <p>Clarifications:</p> <p><i>Clarification 1:</i> The measure of center is limited to mean and median. The measure of variation is limited to range, interquartile range, and standard deviation.</p> <p><i>Clarification 2:</i> Shape features include symmetry or skewness and clustering.</p> <p><i>Clarification 3:</i> Within the Probability and Statistics course, instruction includes the use of spreadsheets and technology.</p>	3.1, 3.2, 3.3

MA.912.DP.2.4:	<p>Fit a linear function to bivariate numerical data that suggests a linear association and interpret the slope and y-intercept of the model. Use the model to solve real-world problems in terms of the context of the data.</p> <p>Clarifications: <i>Clarification 1:</i> Instruction includes fitting a linear function both informally and formally with the use of technology. <i>Clarification 2:</i> Problems include making a prediction or extrapolation, inside and outside the range of the data, based on the equation of the line of fit.</p>	2.4, 10.2, 10.3
MA.912.DP.2.5:	<p>Given a scatter plot that represents bivariate numerical data, assess the fit of a given linear function by plotting and analyzing residuals.</p> <p>Clarifications: <i>Clarification 1:</i> Within the Algebra 1 course, instruction includes determining the number of positive and negative residuals; the largest and smallest residuals; and the connection between outliers in the data set and the corresponding residuals.</p>	10.2, 10.3
MA.912.DP.2.6:	<p>Given a scatter plot with a line of fit and residuals, determine the strength and direction of the correlation. Interpret strength and direction within a real-world context.</p> <p>Clarifications: <i>Clarification 1:</i> Instruction focuses on determining the direction by analyzing the slope and informally determining the strength by analyzing the residuals.</p>	10.1, 10.2, 10.3
MA.912.DP.2.7:	<p>Compute the correlation coefficient of a linear model using technology. Interpret the strength and direction of the correlation coefficient.</p>	10.1, 10.3
MA.912.DP.2.9:	<p>Fit an exponential function to bivariate numerical data that suggests an exponential association. Use the model to solve real-world problems in terms of the context of the data.</p> <p>Clarifications: <i>Clarification 1:</i> Instruction focuses on determining whether an exponential model is appropriate by taking the logarithm of the dependent variable using spreadsheets and other technology. <i>Clarification 2:</i> Instruction includes determining whether the transformed scatterplot has an appropriate line of best fit, and interpreting the y-intercept and slope of the line of best fit. <i>Clarification 3:</i> Problems include making a prediction or extrapolation, inside and outside the range of the data, based on the equation of the line of fit.</p>	10.5
MA.912.DP.3.1:	<p>Construct a two-way frequency table summarizing bivariate categorical data. Interpret joint and marginal frequencies and determine possible associations in terms of a real-world context.</p>	4.2, 4.3 and supplement
MA.912.DP.3.2:	<p>Given marginal and conditional relative frequencies, construct a two-way relative frequency table summarizing categorical bivariate data.</p>	4.2, 4.3 and supplement

	<p>Clarifications: <i>Clarification 1:</i> Construction includes cases where not all frequencies are given but enough are provided to be able to construct a two-way relative frequency table. <i>Clarification 2:</i> Instruction includes the use of a tree diagram when calculating relative frequencies to construct tables.</p>	
MA.912.DP.3.5:	<p>Solve real-world problems involving univariate and bivariate categorical data.</p> <p>Clarifications: <i>Clarification 1:</i> Instruction focuses on the connection to probability. <i>Clarification 2:</i> Instruction includes calculating joint relative frequencies or conditional relative frequencies using tree diagrams. <i>Clarification 3:</i> Graphical representations include frequency tables, relative frequency tables, circle graphs and segmented bar graphs.</p>	supplement
MA.912.DP.4.1:	Describe events as subsets of a sample space using characteristics, or categories, of the outcomes, or as unions, intersections or complements of other events.	4.1, 4.2, 4.3
MA.912.DP.4.2:	Determine if events A and B are independent by calculating the product of their probabilities.	4.2
MA.912.DP.4.3:	Calculate the conditional probability of two events and interpret the result in terms of its context.	4.3
MA.912.DP.4.4:	Interpret the independence of two events using conditional probability.	4.2, 4.3, supplement
MA.912.DP.4.5:	<p>Given a two-way table containing data from a population, interpret the joint and marginal relative frequencies as empirical probabilities and the conditional relative frequencies as empirical conditional probabilities. Use those probabilities to determine whether characteristics in the population are approximately independent.</p> <p>Clarifications: <i>Clarification 1:</i> Instruction includes the connection between mathematical probability and applied statistics.</p>	supplement
MA.912.DP.4.6:	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.	supplement
MA.912.DP.4.7:	Apply the addition rule for probability, taking into consideration whether the events are mutually exclusive, and interpret the result in terms of the model and its context.	4.2
MA.912.DP.4.8:	Apply the general multiplication rule for probability, taking into consideration whether the events are independent, and interpret the result in terms of the context.	4.2
MA.912.DP.4.9:	Apply the addition and multiplication rules for counting to solve mathematical and real-world problems, including problems involving probability.	4.4
MA.912.DP.4.10:	Given a mathematical or real-world situation, calculate the appropriate permutation or combination.	4.4
MA.912.DP.5.1:	Distinguish between a population parameter and a sample statistic.	1.2, 7.1, 7.2
MA.912.DP.5.2:	Explain how random sampling produces data that is representative of a population.	1.3, 7.1, 7.2

MA.912.DP.5.3:	Compare and contrast sampling methods. Clarifications: <i>Clarification 1:</i> Instruction includes understanding the connection between probability and sampling methods. <i>Clarification 2:</i> Sampling methods include simple random, stratified, cluster, systematic, judgement, quota and convenience.	1.3 and supplement (judgement and quota)
MA.912.DP.5.4:	Generate multiple samples or simulated samples of the same size to measure the variation in estimates or predictions.	4.5, 6.3
MA.912.DP.5.5:	Determine if a specific model is consistent within a given process by analyzing the data distribution from a data-generating process.	4.5, 5.1, 5.2, 6.1, 6.2, 7.2
MA.912.DP.5.6:	Determine the appropriate design, survey, experiment or observational study, based on the purpose. Articulate the types of questions appropriate for each type of design.	1.1, 1.3
MA.912.DP.5.7:	Compare and contrast surveys, experiments and observational studies. Clarifications: <i>Clarification 1:</i> Instruction includes understanding how randomization relates to sample surveys, experiments and observational studies.	1.1, 1.3
MA.912.DP.5.11:	Evaluate reports based on data from diverse media, print and digital resources by interpreting graphs and tables; evaluating data-based arguments; determining whether a valid sampling method was used; or interpreting provided statistics. Clarifications: <i>Clarification 1:</i> Instruction includes determining whether or not data displays could be misleading.	1.1, 2.4, 4.1, 4.5, 5.2, 7.1
MA.912.F.1.2:	Given a function represented in function notation, evaluate the function for an input in its domain. For a real-world context, interpret the output. Clarifications: <i>Clarification 1:</i> Problems include simple functions in two-variables, such as $f(x,y)=3x-2y$. <i>Clarification 2:</i> Within the Algebra 1 course, functions are limited to one-variable such as $f(x)=3x$.	2.4, 10.2, 10.5
MA.912.F.1.8:	Determine whether a linear, quadratic or exponential function best models a given real-world situation. Clarifications: <i>Clarification 1:</i> Instruction includes recognizing that linear functions model situations in which a quantity changes by a constant amount per unit interval; that quadratic functions model situations in which a quantity increases to a maximum, then begins to decrease or a quantity decreases to a minimum, then begins to increase; and that exponential functions model situations in which a quantity grows or decays by a constant percent per unit interval. <i>Clarification 2:</i> Within this benchmark, the expectation is to identify the type of function from a written description or table.	2.4, 10.1, 10.2, 10.5

MA.912.FL.1.1:	Extend previous knowledge of operations of fractions, percentages and decimals to solve real-world problems involving money and business. Clarifications: <i>Clarification 1:</i> Problems include discounts, markups, simple interest, tax, tips, fees, percent increase, percent decrease and percent error.	1.2, 4.2, 4.3, 6.5, 7.2
MA.912.FL.1.3:	Solve real-world problems involving weighted averages using spreadsheets and other technology.	3.1, 3.3
MA.912.LT.5.4:	Perform the set operations of taking the complement of a set and the union, intersection, difference and product of two sets. Clarifications: <i>Clarification 1:</i> Instruction includes the connection to probability and the words AND, OR and NOT.	4.1, 4.2, 4.3
MA.912.LT.5.5:	Explore relationships and patterns and make arguments about relationships between sets using Venn Diagrams.	supplement

6 English Language Arts Benchmarks and 1 English Language Development Benchmark		Textbook Section
ELA.K12.EE.1.1:	Cite evidence to explain and justify reasoning. Clarifications: 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.	Incorporated Throughout
ELA.K12.EE.2.1:	Read and comprehend grade-level complex texts proficiently. Clarifications: See Text Complexity for grade-level complexity bands and a text complexity rubric.	Incorporated Throughout
ELA.K12.EE.3.1:	Make inferences to support comprehension. Clarifications: Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.	Incorporated Throughout
ELA.K12.EE.4.1:	Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations. Clarifications: In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.	Incorporated Throughout
ELA.K12.EE.5.1:	Use the accepted rules governing a specific format to create quality work. Clarifications: Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.	Incorporated Throughout

ELA.K12.EE.6.1:	Use appropriate voice and tone when speaking or writing. Clarifications: In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.	Incorporated Throughout
ELD.K12.ELL.MA.1:	English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.	Incorporated Throughout