Academic Statistics						
Scope and Sequence	**Unit Title**	**Competency**	**Vocabulary**	**Strategy**	**PA Core State Standards**	**Statistics and Probability with Applications(Starnes and Tabor)**
Big Idea	**Analyzing one-variable data and understanding the differences between quantitative and qualitative data.**					
Essential Question	***How do you analyze univariate data using graphical and numerical methods?***					
5 weeks (Aug-Sept)	**Analyzing One-Variable Data**	Understanding statistics and data	Statistics, variabke, categorical, quantitative, distribution	Activity: "1 in 6 wins" page 4 Lesson APP: "What are my classmates like?", page 8		1.1
		Displaying Categorical Data	Bar chart, pie chart,	Tech Corner: Making bar and pie charts, page 16 Lesson APP 1.2: "Which cell phone speaks to you?", page 16	CC.2.1.HS.F.2; CC.2.4.HS.B.4	1.2
		Displaying Quantitative Data: Dotplots	Dotplot, symmetric, skewed, shape, center, variability, outlier	Tech Corner: Making a Dotplot, page 26 Lesson APP 1.3: "How can we check the health of a stream?", page 26	CC.2.1.HS.F2; CC.2.4.HS.B.4	1.3
		Displaying Quantitative Data: Stemplots	Stemplot, leaves, key	Tech Corner: Making a Stemplot, page 34 Lesson APP 1.4: "How many shoes are too many shoes?", page 34	CC.2.4.HS.B.4	1.4

		Displaying Quantitative Data: Histograms	Histogram	Tech Corner: Making a Histogram, page 43 Lesson APP 1.5: "How old are U.S. presidents?", page 42	CC.2.1.HS.F.2;CC.2.4.HS.B.4	1.5
		Measuring Center	Median,Mean,Mode	Activity: Mean as a "balance point", page 53 Lesson APP 1.6: "Is the pace of life slower in smaller cities?", page 55	CC.2.4.HS.B.4	1.6
		Measuring Variability	Range, quartiles, IQR, standard deviation	Tech Corner: Computing Numerical Summaries with Technology, page 64 Lesson APP 1.7: "Have we found the beef?", page 64	CC.2.4.HS.B.4	1.7
		Summarizing Quantitative Data: Boxplots and Outliers	Fve-number summary, boxplot, outliers	Tech Corner: Making Boxplots with Technology, page 73 Lesson APP 1.8: "Which is best at reducing stress?", page 73	CC.2.4.HS.B.4	1.8
		Describing Location in a Distribution	Percentile, Cumulative relative frequency graph, z-score	Lesson APP 1.9 "Which states are rich?", page 82	CC.2.4.HS.B.4	1.9
Big Idea	**Modeling Linear and Nonlinear Associations**					
Essential Question	***How do you analyze bivariate data using graphical and numerical methods?***					
5 weeks (Oct-Nov)	**Analyzing Two-Variable Data**	Relationships Between Two Categorical Variables	response variable, explanatory variable, association	Construct a segmented bar chart, Two Categorical Variables applet	CC.2.4.HS.B.2	2.1

		Relationships Between Two Quantitative Variables	Positive and negative association	Construct a scatterplot, Two Quantitative Variables Applet	CC.2.4.HS.B.2	2.2
		Correlation	correlation (r)	Guess the Correlation Applet at www.rossmanchance.com	CC.2.4.HS.B.2	2.3
		Calculating the Correlation		Correlation and Regression Applet	CC.2.4.HS.B.2; CC.2.4.HS.B.3	2.4
		Regression Lines	y-hat (predicted y), extrapolation, residual		CC.2.4.HS.B.2; CC.2.4.HS.B.3	2.5
		The Least-Squares Regression Line	LSRL	Calculating LSRL using technology vs summary statistics	CC.2.4.HS.B.2	2.6
		Assessing a Regression Model (Optional)	residual plot, standard deviation of the residuals, coefficient of determination (r-squared)	Two Quantiative Variables applet	CC.2.4.HS.B.2	2.7
		Fitting Models to Curved Relationships (Optional)	quadratic model, exponential model	Two Quantiative Variables applet	CC.2.4.HS.B.2	2.8
Big Idea	**Collecting and Analyzing Data**					
Essential Question	***How do you collect and correctly interpret data?***					
5 weeks (Nov-Dec)	**Collecting Data**	Identify the statistical problem-solving process	variable, data, datum, discrete, continuous, levels of measurement	Lesson App 3.1 (Pg 185)	CC.2.1.HS.F.2;CC.2.4.HS.B.4; CC.2.4.HS.B.5	3.1
		Distinguish between sampling techniques	suspect samples, detached statistics, implied connections, margin of error, random assignment,	Whole class activity collecting a sample using all 5 methods; Lesson App 3.3 (Pg 199); One Categorical Variable applet: Lesson App 3.5 (pg 217); Lesson App 3.7 (Pg 232)	CC.2.1.HS.F2; CC.2.4.HS.B.4; CC.2.4.HS.B.5	3.3, 3.5, 3.7

		Observational & experimental studies used in statistics	suspect samples, detached statistics, implied connections, margin of error, confounding, treatment, experimental units, subjects, control group, placebo effect, placebo, double-blind, single-blind	Students outline their own observational & experimental study; One Categorical Variable applet; Lesson App 3.4 (Pg 209); Lesson App 3.6	CC.2.1.HS.F.5; CC.2.4.HS.B.4; CC.2.4.HS.B.5	3.4, 3.6
		Recognizing statistical misuse in articles, ads, and graphs	suspect samples, detached statistics, implied connections, inference, data ethics, convenience sample, bias, voluntary response sample, random sampling, completely randomized design, statistically significant	Lesson App 3.2 (Page 191); Lesson App 3.8 (Pg 240); Lesson App 3.9 (Pg 249)	CC.2.1.HS.F.2; CC.2.4.HS.B.4; CC.2.4.HS.B.5	3.2, 3.8, 3.9
Big Idea	**Determining probabilities using probability and counting rules**					
Essential Question	***How do you calculate probabilities?***					
8 weeks (Dec-Feb)	**Probability**	Randomness, Probability, and Simulation	Probability, law of large numbers, simulation	Activity: "What is Probability?", page 262 Lesson APP 4.1: "Will the train arrive on time?", page 266	CC.2.4.HS.B.1; CC.2.4.HS.B.6	4.1
		Basic Probability Rules	Probability model, sample space, event,complement rule, mutually exclusivem, addition rule	Lesson APP 4.2: "How prevalent is high cholesterol?", page 274	CC.2.4.HS.B.1; CC.2.4.HS.B.6; CC.2.4.HS.B.7	4.2
		Two-way Tables and Venn Diagrams	general addition rule, venn diagram, intersection, union	Lesson APP 4.3: "Who owns a home?", page 282	CC.2.4.HS.B.6; CC.2.4.HS.B.7	4.3

		Conditional Probability and Independence	Conditional Probability, independent events	Lesson APP 4.4: "Who earns A's in college?", page 291	CC.2.4.HS.B.6; CC.2.4.HS.B.7	4.4
		The General Multiplication Rule and Tree Diagrams	General multiplication rule, tree diagram	Lesson APP 4.5: "Not Milk?", page 299	CC.2.4.HS.B.6; CC.2.4.HS.B.7	4.5
		The Multiplication Rule for Independent Events	Multiplication rule for independent events,	Lesson APP 4.6: "How should we interpret genetic screening?", page 306	CC.2.4.HS.B.6; CC.2.4.HS.B.7	4.6
		The Multiplication Counting Principle and Permutations	Multiplication counting principle, permutation, factorial	Lesson APP 4.7: "Do you scream for ice cream?", page 313 Tech Corner: Calculating Factorials and Permutations, 314	CC.2.4.HS.B.1; CC.2.4.HS.B.6; CC.2.4.HS.B.7	4.7
		Combinations and Probability	Combination	Lesson APP 4.8: "How many ways can you set up an iPod play list?", page 321 Tech Corner: Calculating Combinations, page 321	CC.2.4.HS.B.1	4.8
Big Idea	**Analyzing discrete and continuous distributions**					
Essential Question	***How do you calculate probabilities for a discrete versus a continuous distribution?***					
5 weeks (Feb-Mar)	**Random Variables**	Two Types of Random Variables	discrete, continuous, random variable, probability distribution	Probability distributions in the form of a table	CC.2.4.HS.B.4	5.1
		Analyzing Discrete Random Variables	mean (expected value) and standard deviation of a discrete random variable	Perform calculations using formula and graphing calculator	CC.2.4.HS.B.4	5.2

		Binomial Random Variables	binomial random variable, success, failure, independent, number of trials	BINS, Perform calculations using formula and graphing calculator, Probability applet	CC.2.4.HS.B.4	5.3
		Analyzing Binomial Random Variables	mean and standard deviation of a binomial distribution, cumulative binomial probabilities	Mean & Std. Deviation shortcut formulas for ONLY a binomial, using graphing calculator to calculate cumulative binomial probabilities, Probability applet	CC.2.4.HS.B.4	5.4
		Continuous Random Variables	density curve, normal distribution, bell-shaped		CC.2.4.HS.B.4	5.5
		The Standard Normal Distribution	Empirical Rule (68-95-99.7), z-score, standard normal distribution	Finding probabilities using tables and graphing calculator, Probability applet	CC.2.4.HS.B.4	5.6
		Normal Distribution Calculations	z-score, mean, standard deviation, area, probability, percentile, standard normal distribution	Drawing a normal curve & shading area, standardizing/not standardizing to solve, calculate probability OR find an x-value given a probability (area), Probability applet	CC.2.4.HS.B.4	5.7
Big Idea	**Understanding sampling distributions**					
Essential Question	***What are the different sampling techniques and when are each used?***					
5 weeks (Mar-Apr)	**Sampling Distributions**	What is a Sampling Distribution?	Statistic, parameter, sampling distribution	Activity: "A penny for your thoughts?", page 400 Lesson APP 6.1: "How cold is it inside the cabin?", page 404	CC.2.4.HS.B.4	6.1

Sampling Distributions: Center and Variability	Unbiased estimator sampling variability	Activity: "How many craft sticks are in the bag?", page 409 Lesson APP 6.2: "How many tanks does the enemy have?", page 413	CC.2.4.HS.B.4	6.2
The Sampling Distribution of a Sample Count (The Normal Approximation to the Binomial)	Sampling distribution of the sample count X, mean, standard deviation,large counts condition	Activity: "Simulating with the Normal Approximation to Binomial Distributions applet", page 419 Lesson APP 6.3: "How can we check for bias in a survey?", page 422	CC.2.4.HS.B.4	6.3
The Sampling Distribution of a sample Proportion	Sampling distribution of the sample proportion p-hat	Activity: "Sampling from the candy machine", page 427 Lesson APP 6.4" "What's that spot on my potatoe chip?", page 429	CC.2.4.HS.B.4	6.4
The Sampling Distribution of a Sample Mean	Sampling distribution of the sample proportion x-bar	Activity: "Sampling from a normal population", page 434 Lesson APP 6.5: "Are college women taller?", page 436	CC.2.4.HS.B.4	6.5

		The Cental Limit Theorem	central limit theorem, normal/large sample condition	Activity: "Sampling from a non-normal population", page 439 Lesson APP 6.6: "Keeping things cool with statistics", page 442	CC.2.4.HS.B.4	6.6
Big Idea	**Culminating Research Project**					
Essential Question	***Can students incorporate statistical ideas they have learned to complete a final research project involving the collection and analysis of data?***					
4 weeks (May)	**Statistics Final Project**	Project Planning and Data Collection	Statistical analysis, research question, random variable(s), observational or experimental study, sampling method, sample size, population, sample		CC.2.4.HS.B.1-7	
		Data Analysis	Measures of center and variability, normality, outliers, LSRL, correlation coefficient		CC.2.4.HS.B.1-7	
		Project Report and Project Presentation	Research question, data collection methods, data analysis results, conclusions and interpretations		CC.2.4.HS.B.1-7	