Unit Title: Analyzing & Collecting Data **Stage 1: Desired Results** Standards & Indicators: S-ID Interpreting Categorical and Quantitative Data: Summarize, represent, and interpret data on a single count or measurement variable: 1. Represent data with plots on the real number line (dot plots, histograms, and box plots). 2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) an spread (interguartile range, standard deviation) of two or more different data sets. 3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). 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. Summarize, represent, and interpret data on two categorical and quantitative variables: 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. 6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data (including with the use of technology); 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 and exponential models. Informally assess the fit of a function by plotting and analyzing residuals, including with the use b. of technology. c. Fit a linear function for a scatter plot that suggests a linear association. Interpret linear models: 7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. Compute (using technology) and interpret the correlation coefficient of a linear fit. 9. Distinguish between correlation and causation.

Career Readiness, Life Literacies and Key Skills		
Standard	Performance Expectations	Core Ideas
9.4.12.Cl.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g.1.1.12prof.CR3a).	With a growth mindset, failure is an important part of success.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3)	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.

9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).		Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
Central Idea/Enduring Unc	lerstanding:	Essential/Guiding Que	estion:
 Chapter 1: Classifying data Displaying Categorical Data Displaying Quantitative Data Measuring Center Measuring Variability Summarizing Quantitative Data Describing Location in a Distribution Chapter 2: Relationships Between 2 Categorical Variables Relationships Between 2 Quantitative Variables Correlations Making Predictions Least-Squares Regression Lines Residual Plots 		Chapter 1: At the end of this chap answer the Essential Why do we study St Answer: We live in a world of c Statistics will help one consumer, make bette able to read, analyze Chapter 2: At the end of this chap	oter, students should be able to Question: <i>tatistics?</i> data. A solid understanding of become a more informed or decisions based on data and be and interpret data.
		answer the Essential	Question: ply causation? Why or why not?
 Chapter 3: Population vs San Observational Stu Sampling Techniq Simple Random S Margin of Error Undercoverage, No other Bias 	nples dies vs Experiments ues amples lonresponse and	Answer: Correlation does not i might have a strong c variable are very unlik variable. Chapter 3: At the end of this chap	mply causation. Two variables orrelation, but changes in one cely to cause changes in the other pter, students should be able to
 Random Assignm Inference for Expension 	ent eriments	<i>What are the variou sample?</i> <u>Answer:</u> Using slips of paper, a a coin, etc.	s ways one can collect a random a random number generator, flipping
Content:		Skills(Objectives):	
Chapter 1: 1.1 The Science and Art of Data		1.1 Classify data. Su table.	Immarize data using a frequency

1.2 Displaying Categorical Data	
1.3 Dotplots	1.2 Create and interpret charts and graphs.
1.4 Stemplots	1 5 1
1.5 Histograms	1.3 Make and interpret dotplots. Describe the shape of a
1.6 Measuring Center	distribution.
1.7 Measuring Variability	
1.8 Boxplots and Outliers	1.4 Make and interpret stemplots.
1.9 Describing Location	
5	1.5 Make and interpret histograms.
Chapter 2:	
2.1 Relationships between 2 Categorical	1.6 Calculate and interpret the mean and median of a
Variables	distribution of guantitative data. Compare the mean and
2.2 Relationships between 2 Quantitative	median.
Variables	
2.3 Correlation	1.7 Calculate and interpret the range, IQR and standard
2.4 Calculating the Correlation	deviation of quantitative data.
2.5 Regression Lines	
2.6 The Least-Squares Regression Line	1.8 Identify boxplots. Make and interpret boxplots.
2.7 Assessing a Regression Model	
	1.9 Find and interpret a percentile in a distribution of
Chapter 3:	quantitative data. Find and interpret a standardized score
3.1 Data Collection	(z-score) in a distribution of quantitative data.
3.2 Bias	
3.3 Simple Random Sample	Chapter 2:
3.4 Margin of Error	2.1 Distinguish between explanatory and response
3.5 Sampling and Surveys	variables for categorical data. Determine if there is an
3.6 Observational Studies and Experiments	association between 2 categorical variables and describe
3.7 Random Assignment	the association if it exists.
3.8 Inference for Experiments	
3.9 Using Studies Wisely	2.2 Make a scatterplot to display the relationship
	between two quantitative variables. Describe the
	direction, form, and strength of a relationship displayed in
	a scatterplot and recognize outliers in a scatterplot.
	2.3 Interpret the correlation. Understand the basic
	properties of correlation. Distinguish correlation from
	causation.
	2.4 Calculate the correlation between 2 quantitative
	variables. Apply the properties of the correlation.
	Describe how outliers influence the correlation.
	2.5 Interpret the slope and y intercept of a least-squares
	regression line. Use the least-squares regression line to
	predict y for a given x. Explain the dangers of
	extrapolation. Calculate and interpret residuals.

2.6 Determine the equation of a least-squares regression line using technology and summary statistics. Describe how outliers affect the least-squares regression line.
2.7 Construct and interpret residual plots to assess if a linear model is appropriate. Interpret the standard deviation of the residuals and coefficient of determination.
Chapter 3: 3.1 Identify the population and sample in a statistical study. Distinguish between an observational study and an experiment.
3.2 Describe how types of sampling can lead to bias.
3.3 Describe how to obtain a simple random sample. Explain the concept of sampling variability and the effect of increasing sample size. Use simulation to test a claim about a population proportion.
3.4 Use simulation to approximate the margin of error for a sample proportion and interpret the margin of error.Use simulation to approximate the margin of error for a sample mean and interpret the margin of error.
3.5 Explain how undercoverage, nonresponse, question wording, and other aspects of a sample survey can lead to bias.
3.6 Explain the concept of confounding and how it limits the ability to make cause-and-effect conclusions.
3.7 Explain the purpose of comparison, random assignment, control, and replication in an experiment.
3.8 Outline an experiment that uses a completely randomized design. Explain the concept of statistical significance in the context of an experiment.
3.9 Evaluate whether a statistical study has been carried out in an ethical manner.

Interdisciplinary Connections:

Interdisciplinary connections are integrated in each unit with connections to the mathematical practices.

- 1. Make sense of problems and persevere in solving them
- 2. Reason abstractly and quantitatively
- 3. Construct viable arguments and critique the reasoning of others

4. Model with mathematics

E lles enventiets tools statts riselly.		
5. Use appropriate tools strategically		
6. Attend to precision		
7. Look for and make use of structure		
o. Look for and express regularity in repeated reason		
Stage 2: A	ssessment Evidence	
Performance Task(s):	Other Evidence:	
<u>Chapter 1:</u>	Classwork	
Lesson App 1.1 - What are my classmates	Written & Online Homework	
like?	Section Quizzes	
Lesson App 1.2 - Which phone speaks to	Chapter Tests	
you?	Online Student Assessments	
Lesson App 1.3 - How can we check the	End of Unit Assessment	
health of a stream?	Graphing Calculators	
Lesson App 1.4 - How many shoes are too	Applets	
many shoes?	Statistical Software	
Lesson App 1.5 - How old are US Presidents?		
Lesson App 1.6 - Is the pace slower in smaller		
cities?		
Lesson App 1.7 - Have we found the beef?		
Lesson App 1.8 - What is best at reducing		
stress?		
Lesson App 1.9 - Which states are rich?		
Chapter 2:		
Lesson App 2 1- Which finger is longer?		
Lesson App 2.2- More sugar more calories?		
Lesson App 2.3- If Leat more chocolate will I		
win a Nobel Prize?		
Lesson App 2.4. Elving dinosaur or early bird?		
Lesson App 2.4- Trying difforent of early bird.		
sugar in the water?		
Lesson Ann 2.6. Did the Broncos buck the		
trend?		
Lesson App 2.7 Do higher priced tablets		
have better better life?		
Chapter 2		
Unapier J. Losson App 3.1. Do you have disposed and		
Lesson App 3.1- Do you have unner plans?		
Lesson App 2.2. Do you tweet?		
Lesson App 2.4. Con you rell your tongue?		
Lesson App 3.4- Can you roll your tongue?		
Lesson App 3.5- Who did you say was		
Lesson App 3.6- What happens when		
physicians study themselves?		

Lesson App 3.7- Multitasking? Or making distractions?	
Lesson App 3.8- Does fish oil affect blood	
pressure?	
Lesson App 3.9- Is foster care better for	
children than an orphanage?	
onnaron than an orphanago.	
Stage	3: Learning Plan
Learning Opportunities/Strategies:	Resources:
Data Collection	eBook-Statistics and Probability with Applications (High
Simulation	School) Daren S. Starnes (The Lawrenceville School),
Rolling Dice	Josh Tabor (Canyon del Oro (AZ) High School) 2016
 Graphing with a Graphing Calculator 	LaunchPad
Graphing with Statistical Software	Google Doc of Extra Examples
Think-Pair-Share	Google Slide Lecture Presentations
 Collaboration 	Prepared Tests and Test Bank
 Matching Graphs with their Data 	Prepared Quizzes
Random Number Generators	Prepared Worksheets
	PD Videos
	Applets
	Statistical Software
	IXI
	LGBT and Disabilities Resources:
	LGBTQ-Inclusive Lesson & Resources by Garden
	State Equality and Make it Better for Youth
	LGBTQ+ Books
	DEI Resources:
	Learning for Justice
	GLSEN Educator Resources
	Bespect Ability: Fighting Stigmas, Advancing
	Opportunities
	 NJDOE Diversity, Equity & Inclusion Educational
	Resources
	<u>Diversity Calendar</u>
Differentiation	
*Please note: Teachers who have students with 504	plans that require curricular accommodations are to refer to

Struggling and/or Special Needs Section for differentiation			
High-Achieving	On Grade Level	Struggling Students	Special Needs/ELL
Students	Students		
Projects	Guided Notes	Guided Notes	Any student requiring further
Problems with higher	Chapter Summaries	Allow use of formula	accommodations and/or modifications
degree difficulty	Formula Sheets	sheets on tests	will have them individually listed in
Higher order thinking	Graphing Calculators	Hands-On Activities	their 504 Plan or IEP. These might
challenges	Think-Pair-Share	Real-life applications	include, but are not limited to:
Use of Statistical Software	Group Work	Require use of	breaking assignments into smaller
	Collaboration	calculators	tasks, giving directions through
	Hands-On activities	Think-Pair-Share	several channels (auditory, visual,

	Real-life application of statistics Chapter Reviews prior to tests	Allow students to work in groups to complete class assignments. Study Sheets Practice Tests Online review of content Pair Student with a High-Achieving student One-on-One Tutoring	kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries
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Unit Title: Exploring Random Variables & Probability

Stage 1: Desired Results

Standards & Indicators:

S-CP Conditional Probability and the Rules of Probability:

A. Understand independence and conditional probability and use them to interpret data:

- 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").
- 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.
- 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*.
- 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.*
- 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.

B. Use the rules of probability to compute probabilities of compound events in a uniform probability model:

- 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.
- 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.
- 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.

9. Use permutations and combinations to compute probabilities of compound events and solve problems.

S-MD Using Probability to Make Decisions:

A. Calculate expected values and use them to solve problems

- 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.
- 2. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
- 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.
- 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?

B. Use probability to evaluate outcomes of decisions :

- 5. Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
 - a. Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast food restaurant.
 - b. Evaluate and compare strategies on the basis of expected values. For example, compare high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.
- 6. Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).
- 7. Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

Career Readiness, Life Literacies and Key Skills		
Standard	Performance Expectations	Core Ideas
9.4.12.Cl.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g.1.1.12prof.CR3a).	With a growth mindset, failure is an important part of success.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3)	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1.,	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.

HS-ETS1-1, HS-ETS1-	2, HS-ETS1-4,
6.3.12.GeoGl.1, 7.1.IH.	IPERS.6,
Control Idea/Enduring Understanding:	Eccential/Guiding Question:
<u>Central luea/Enduring Understanding</u> .	Essential/Guiding Question.
Chapter 4:	
Randomness	Chapter 4:
 Simulation 	At the end of this chapter, students should be able to
 Probability Rules 	answer the Essential Question:
Two-Way Tables	
Venn Diagrams	Why do we use simulations?
Addition Rule	
 Conditional Probability 	Answer:
Independence	Simulation is a way to model random events, such that
Multiplication Rule	simulated outcomes closely match real-world outcomes.
 Tree Diagrams 	By observing simulated outcomes, researchers gain
 Independent Events 	insight on the real world. Some situations do not lend
 Counting Principle 	themselves to precise mathematical treatment. Others
 Permutations 	may be difficult, time-consuming, or expensive to
Combinations	analyze. In these situations, simulation may approximate
	real-world results; yet, require less time, effort, and/or
Chapter 5:	money than other approaches.
Continuous Random Variables	
Discrete Random Variables	<u>Chapter 5:</u>
Binomial Random Variables	At the end of this chapter, students should be able to
 Mean of a Binomial Distribution Other dend Deviation of a Binomial 	answer the Essential Question:
 Standard Deviation of a Binomial Distribution 	
Distribution	How can we find the median of a discrete random
68-05-00 7 Rule	variable?
Normal Distribution Calculations	
	Answer:
Chapter 6	The median of a discrete random variable is the 50th
Parameters	percentile of its probability distribution. We can find the median by adding a sumulative probability row to the
Statistics	probability distribution table, and then locating the
Sampling Distribution	smallest value for which the cumulative probability equals
Unbiased Estimators	or exceeds 0.50
Center	
Variability	Chapter 6:
Large Counts Condition	At the end of this chapter, students should be able to
 Sample Proportion 	answer the Essential Question:
Sample Mean	
Central Limit Theorem	How can we check for bias in a survey?
	Answer
	One way of checking the effect of undercoverage
	nonresponse, and other sources of bias in a sample

	survey is to compare the sample with known facts about
Content:	Skills(Objectives): Chapter 4:
Chapter 4:	4.1 Define and Interpret Probability. Use simulation to
4.1 Randomness	model chance behavior
4.2 Probability Rules	
4.3 Addition Rule	4.2 List the sample space of an event. Apply the
4.4 Conditional Probability & Independence	complement rule. Apply the addition rule
4.5 Multiplication Rule & Tree Diagrams	
4.6 Independent Events	4.3 Use a two-way table and a Venn Diagram to find
4.7 Counting Principle and Permutations	probabilities.
4.8 Combinations & Probability	
	4.4 Find and interpret conditional probabilities using
Chapter 5:	two-way tables. Use the conditional probability formula to
5.1 Random Variables	calculate probabilities. Determine whether two events
5.2 Discrete Random Variables	are independent
5.3 Binomial Random Variables	
5.4 Analyzing Binomial Random Variables	4.5 Apply the multiplication rule. Use a tree diagram to
5.5 Continuous Random Variables	model a chance process and to calculate conditional
5.6 Standard Normal Distribution	probabilitios
5.7 Normal Distribution Calculations	probabilities.
	4.6. Apply the multiplication rule for independent events
Chapter 6	4.6 Apply the multiplication fulle for independent events.
6 1 Parameter vs. Statistic	4.7 Apply the counting rule. Lies factorials to count the
6.2 Contor 8 Variability	4.7 Apply the counting rule. Use factorials to count the
6.2 Sempling Distribution	number of permutations of a group of individuals.
6.4 Sample Propertien	
6.4 Sample Proportion	4.8 Use combinations to calculate probabilities.
6.5 Sample Mean	Objected Fr
6.6 Central Limit Theorem	Chapter 5:
	5.1 Verify the validity of a discrete random variable.
	Determine if a random variable is discrete or continuous.
	Calculate probabilities involving a discrete random
	variable.
	E. 2. Create a histogram to display the probability
	5.2 Create a histogram to display the probability
	distribution of a discrete random variable. Calculate and
	interpret the expected value of a discrete random
	variable. Calculate and interpret the standard deviation
	of a discrete random variable.
	5.2 Determine if a given potting is binamial. Calculate
	5.5 Determine il a given setting is pinomial. Calculate
	probabilities involving a single value of a binomial random
	variable. Iviake a histogram to display a binomial
	distribution and describe its snape.
	E.4. Coloulate and interpret the mean and standard
	0.4 Calculate and interpret the mean and standard
	deviation of a binomial distribution. Find probabilities

involving several values of a binomial random variable. Use technology to calculate cumulative binomial probabilities.
5.5 Show that the probability distribution of a continuous random variable is valid and use the distribution to calculate probabilities. Determine the relative locations of the mean and median of a continuous random variable form the shape of its probability distribution. Draw a normal probability distribution with a given mean and standard deviation.
5.6 Use the Empirical Rule to approximate probabilities. You a table to find a z-score and area under the curve.
5.7 Calculate the probability that a value falls within a given interval in a normal distribution. Find the value corresponding to a given probability in a normal distribution.
<u>Chapter 6:</u> 6.1 Distinguish between a parameter and a statistic. Understand the definition of a sampling distribution. Distinguish between population distribution, sampling distribution, and the distribution of sample data.
6.2 Determine whether a statistic is an unbiased estimator of a population parameter. Understand the relationship between sample size and the variability of an estimator.
6.3 Calculate the mean and the standard deviation of the sampling distribution of a sample count and interpret the standard deviation. Determine if the sampling distribution of a sample count is approximately normal. If appropriate, use the normal approximation to the binomial distribution to calculate probabilities involving a sample count.
6.4 Find the mean and standard deviation of the sampling distribution of a sample proportion for an SRS of size n from a population having proportion p of successes. Interpret the standard deviation. Determine if the sampling distribution of p is approximately normal. If appropriate, use a normal distribution to calculate probabilities involving p .

	 6.5 Find the mean and standard deviation of the sampling distribution of a sample mean from an SRS of size <i>n</i>. Interpret the standard deviation. Calculate probabilities involving a sample mean when the population distribution is Normal. 6.6 Explain how the shape of the sampling distribution of is related to the shape of the population distribution. Use the central limit theorem to help find probabilities involving a sample mean .
Interdisciplinary Connections:	
 Interdisciplinary connections are integrated in each unit with connections to the mathematical practices. 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others 4. Model with mathematics 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning 	
Stage 2: A	Assessment Evidence
Performance Task(s):	Other Evidence:
Chapter 4: Lesson App 4.1- Will the train arrive on time? Lesson App 4.2- How prevalent is high cholesterol? Lesson App 4.3- Who owns a home? Lesson App 4.4- Who earns A's in college? Lesson App 4.5- Not milk? Lesson App 4.6- How should we interpret genetic screening? Lesson App 4.7- Do you scream for ice cream? Lesson App 4.8- How many songs can you set up an iPod playlist?	Classwork Written & Online Homework Section Quizzes Chapter Tests Online Student Assessments End of Unit Assessment Graphing Calculators Applets Statistical Software
Chapter 5: Lesson App 5.1- Making the grade? Lesson App 5.2- How much do colleges grades vary? Lesson App 5.3- Is the train binomial? Lesson App 5.4- Free lunch? Lesson App 5.5- Still waiting for the server? Lesson App 5.6- What's a good batting average?	

Lesson App 5.7- What cholesterol levels are	
unhealthy for teen boys?	
, ,	
Chapter 6:	
<u>Unapter 0.</u>	
cabin?	
Lesson App 6.2- How many tanks does that	
emeny have?	
Lesson App 6.3- How can we check for bias in	
a survey?	
Lesson Ann 6.4. What's that shot on my	
retate chin?	
Lesson App 6.5- Are college women taller?	
Lesson App 6.6- Keeping things cooler with	
statistics?	
Stage	3: Learning Plan
Learning Opportunities/Strategies:	Resources:
Dice Games	
 Simulation 	eBook-Statistics and Probability with Applications (High
 Probability Games 	School) Daren S. Starnes (The Lawrenceville School)
Random Number Generator	losh Tabor (Canvon del Oro ($\Delta 7$) High School) 2016
Data Collection	Loungh Dod
Applets	Google Doc of Extra Examples
Card Games	Google Slide Lecture Presentations
 Venn Diagrams 	Prepared Tests and Test Bank
 Two-Way Tables 	Prepared Quizzes
Graphing Calculators	Prepared Worksheets
Statistical Software	PD Videos
Think Dair Share	Applete
 Small Group Discussion 	Statistical Software
	IXL
	LGBT and Disabilities Resources:
	 LGBTQ-Inclusive Lesson & Resources by Garden
	State Equality and Make it Better for Youth
	<u>LGBTQ+ Books</u>
	DEI Resources:
	Learning for Justice
	GLSEN Educator Resources
	 <u>Supporting LGBTQIA Youth Resource List</u>
	 Respect Ability: Fighting Stigmas, Advancing
	Opportunities
	 NJDOE Diversity, Equity & Inclusion Educational
	Resources
	<u>Diversity Calendar</u>

Differentiation

*Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving	On Grade Level	Struggling Students	Special Needs/ELL
Students	Students		
Projects Problems with higher degree difficulty Higher order thinking challenges Use of Statistical Software	Guided Notes Chapter Summaries Formula Sheets Graphing Calculators Think-Pair-Share Group Work Collaboration Hands-On activities Real-life application of statistics Chapter Reviews prior to tests	Guided Notes Allow use of formula sheets on tests Hands-On Activities Real-life applications Require use of calculators Think-Pair-Share Allow students to work in groups to complete class assignments. Study Sheets Practice Tests Online review of content Pair Student with a High-Achieving student One-on-One Tutoring	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

Unit Title: Estimating a Parameter & Testing a Claim

Stage 1: Desired Results

Standards & Indicators:

S-IC Making Inferences and Justifying Conclusions:

A. Understand and evaluate random processes underlying statistical experiments

- 1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
- 2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?

B. Make inferences and justify conclusions from sample surveys, experiments, and observational studies

- 3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
- 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.

StandardPerformance ExpectationsCore Ideas9.4.12.CI.1Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g.1.1.12prof.CR3a).With a growth mindset, failure important part of success.9.4.12.CT.1Identify problem-solving strategies used in the development of an innovative product orCollaboration with individuals diverse experiences can aid
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9.4.12.CT.1 Identify problem-solving strategies used in the development of an innovative product or diverse experiences can aid
practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3) problem-solving process, par for global issues where diver solutions are needed.
9.4.12.GCA.1 Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
Central Idea/Enduring Understanding: Essential/Guiding Question:
Chapter 7:• Confidence Levels• Confidence Interval Interpretation• Margin of Error• Critical Values• Reading Tables• Area under the Curve• 4-Step Process• Finding t-Values• Standard Error• ConditionsChapter 8:• Significance Test• Significance Level• Making Conclusions• Making Conclusions• Significance Level• Type I & Type I I Errors• Conditions of a Significance Test• Significance Tests• Significance Tests• Significance Test• Significance Test• Significance Test• Significance Test• Type I & Type I I Errors• Conditions of a Significance Test• Type I & Stating A Claim about a Mean• Significance Tests for a Mean• Significance Tests for a Mean

Content:

Chapter 7:

- 7.1 Confidence Intervals
- 7.2 Interpreting Confidence Intervals
- 7.3 Estimating a Proportion
- 7.4 Confidence Intervals for a Proportion
- 7.5 Estimating a Mean
- 7.6 Confidence Intervals for a Mean

Chapter 8:

- 8.1 Interpreting P-values
- 8.2 Type I & Type II Errors
- 8.3 Conditions of a Significance Test
- 8.4 Significance Tests for Proportion
- 8.5 Testing a Claim about a Mean
- 8.6 Significance Tests for a Mean

Skills(Objectives):

Chapter 7:

7.1 Interpret a confidence interval in context. Determine the point estimate and margin of error from a confidence interval. Use confidence intervals to make decisions.

7.2 Interpret a confidence level in context. Describe how the confidence level and sample size affect the margin of error. Explain how practical issues like nonresponse, undercoverage, and response bias can affect the interpretation of a confidence interval.

7.3 Carry out the steps in constructing a confidence interval for a population proportion: define the parameter, check conditions, perform calculations and interpret results in context.

7.4 Use the 4-Step Process to construct and interpret a confidence interval for a population proportion.Determine the sample size required to obtain a level *C* confidence interval for a population proportion with a specified margin of error.

7.5 Construct and interpret a confidence interval for a population mean. Carry out the steps in constructing a confidence interval for a population mean: define the parameter, check conditions, perform calculations and interpret results in context.

7.6 Use sample data to check the Normal/Large Sample Condition. Use the 4-Step Process to construct and interpret a confidence interval for a population mean.

Chapter 8:

8.1 State appropriate hypothesis for a significance test about a population parameter. Interpret P-value in context. Make an appropriate conclusion for a significance test based on P-value.

8.2 Determine if the results of a study are statistically significant and make an appropriate conclusion using a significance level. Interpret a Type I and Type II error in context. Give a consequence of a Type I and Type II error in a given setting.

8.3 Check the Random and Large Counts conditions for performing a significance test about a population

	proportion. Calculate the standardized test statistic for a significance test about a population proportion. Find the P-value for a one-sided significance test about a population proportion using a table or technology.
	8.4 Use the 4-Step process to perform a one-sided test about a population proportion. Calculate the P-value for a 2-sided significance test about a population proportion using a table or technology. Use the 4-Step process to perform a 2-sided significance test about a population proportion.
	8.5 Check the Random and Large Counts conditions for performing a significance test about a population mean. Calculate the standardized test statistic for a significance test about a population mean. Find the P-value for a significance test about a population mean using a table.
	8.6 Use the 4-Step process to perform a significance test about a population mean. Use a confidence interval to draw a conclusion about a 2-sided test for a population mean.
Interdisciplinary Connections:	

Interdisciplinary connections are integrated in each unit with connections to the mathematical practices.

- 1. Make sense of problems and persevere in solving them
- 2. Reason abstractly and quantitatively
- 3. Construct viable arguments and critique the reasoning of others
- 4. Model with mathematics
- 5. Use appropriate tools strategically
- 6. Attend to precision
- 7. Look for and make use of structure
- 8. Look for and express regularity in repeated reasoning

Stage 2: Assessment Evidence

Performance Task(s):	Other Evidence:
Chapter 7: Lesson App 7.1- Do you approve of the president's job performance? Lesson App 7.2- Do you like my picture? Lesson App 7.3-Do you know your government? Lesson App 7.4- TV in bed? Lesson App 7.5- What does an Oreo weigh? Lesson App 7.6- How tense are the video screens?	Classwork Written & Online Homework Section Quizzes Chapter Tests Online Student Assessments End of Unit Assessment Graphing Calculators Applets Statistical Software
Chapter 8:	

Lesson App 8.1- Do you kiss people the "right" way? Lesson App 8.2- Are these potatoes keepers? Lesson App 8.3- Is it better to be last? Lesson App 8.4- Who feels job stress? Lesson App 8.5- Who needs an aspirin? Lesson App 8.6- Do our employees have high blood pressure?	
Stage	3: Learning Plan
 Learning Opportunities/Strategies: Mystery Mean Activity Simulation Data Collection Collaboration Survey Polling Applets Statistical Software Graphing Calculators Think-Pair Share Reading Tables and Charts Small Group Discussion 	Resources:eBook-Statistics and Probability with Applications (High School) Daren S. Starnes (The Lawrenceville School) , Josh Tabor (Canyon del Oro (AZ) High School) 2016 LaunchPad Google Doc of Extra Examples Google Slide Lecture Presentations Prepared Tests and Test Bank Prepared Quizzes Prepared Worksheets PD Videos Applets Statistical Software IXL
	LGBT and Disabilities Resources: LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth LGBTQ+ Books
	 DEI Resources: Learning for Justice GLSEN Educator Resources Supporting LGBTQIA Youth Resource List Respect Ability: Fighting Stigmas, Advancing Opportunities NJDOE Diversity, Equity & Inclusion Educational Resources Diversity Calendar
Differentiation *Please note: Teachers who have students with 504	plans that require curricular accommodations are to refer to

Struggling and/or Special Needs Section for differentiation

High-Achieving	On Grade Level	Struggling Students	Special Needs/ELL
Students	Students		

Projects Problems with higher degree difficulty Higher order thinking challenges Use of Statistical Software	Guided Notes Chapter Summaries Formula Sheets Graphing Calculators Think-Pair-Share Group Work Collaboration Hands-On activities Real-life application of statistics Chapter Reviews prior to tests	Guided Notes Allow use of formula sheets on tests Hands-On Activities Real-life applications Require use of calculators Think-Pair-Share Allow students to work in groups to complete class assignments. Study Sheets Practice Tests Online review of content Pair Student with a High-Achieving student One-on-One Tutoring	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries
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Unit Title: Comparing Populations & Inference

Stage 1: Desired Results

Standards & Indicators:

S-IC Making Inferences and Justifying Conclusions:

B. Make inferences and justify conclusions from sample surveys, experiments, and observational studies

- 1. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
- 2. 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.
- 3. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
- 4. Evaluate reports based on data.

Career Readiness, Life Literacies and Key Skills		
Standard	Performance Expectations	Core Ideas
9.4.12.Cl.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g.1.1.12prof.CR3a).	With a growth mindset, failure is an important part of success.
9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3)	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.

9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).		Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
Central Idea/Enduring Und	lerstanding:	Essential/Guiding Que	estion:
 Chapter 9: Describing Sampli Checking Condition Calculating Difference Proportions Testing a Claim at Between 2 Proportion Estimating Difference Means Testing a Claim at Between 2 Means Analyzing Paired I Testing a Claim at Between 2 Means Analyzing Paired I Testing a Claim at Between 2 Means 	ing Distributions ons ence Between 2 pout a Difference tions nce Between 2 pout a Difference Data pout Mean Difference Charts & Tables	Chapter 9: At the end of this chap answer the Essential What's the relations and the difference of Answer: The mean difference in means. Chapter 10: At the end of this chap answer the Essential	pter, students should be able to Question: <i>Thip between the mean difference</i> of the means? is equal to the difference of the pter, students should be able to Question:
 Chapter 10: Stating Hypothesis Calculating Expect Chi-Square Tests Testing the Distrib Categorical Variate Goodness of Fit Testing a Relation Categorical Variate Chi-Square Test for 	s ited Counts ution of a ble ship Between 2 bles or Association	When is a chi-squar Answer: The Goodness of Fit t categorical variable fr determine whether sa hypothesized distribut	re test for goodness of fit used? test is applied when you have one om a single population. It is used to imple data are consistent with a tion.
<u>Content</u> :		<u>Skills(Objectives)</u> :	
Chapter 9: 9.1 Difference Between 2 9.2 Testing a Claim about Between 2 Proportions 9.3 Estimating Difference 9.4 Testing a Claim about Between 2 Means 9.5 Analyzing Paired Data 9.6 Testing a Claim about	Proportions a Difference Between 2 Means a Difference Mean Difference	 <u>Chapter 9:</u> 9.1 Describe the chardistribution of the difference betwee whether the condition Construct and interpret two proportions. 9.2 State the hypothere 	aracteristics of the sampling erence between 2 proportions. Is using the sampling distribution of In 2 proportions. Determine Is for performing inference are met. Let a confidence interval to compare esis and check the conditions for
		2 proportions. Calcul	ate the standardized test statistic

Chapter 10:	and P-value for a significance test about a difference
10.1 Testing the Distribution of a Categorical	between 2 proportions. Perform a significance test to
	compare two proportions. Interpret the results of
10.2 Goodness of Fit	inference procedures in a randomized experiment.
10.3 Testing a Relationship Between 2	
Categorical Variables	9.3 Describe the snape, center and variability of the
10.4 Chi-Square Test for Association	sampling distribution of a difference between 2 sample
	conditions for constructing a confidence interval for a
	difference between 2 means. Use the 4 Step process to
	construct and interpret a confidence interval for the
	difference between 2 means
	9.4 State hypotheses and check conditions for
	performing a significance test about a difference between
	2 means. Calculate the standardized test statistic and
	P-value for a significance test about a difference between
	2 means. Use the 4-Step process to perform a
	significance test about a difference between 2 means.
	9.5. Use a graph to analyze the distribution of differences
	in a naired data set. Calculate the mean and standard
	deviation of the differences in a paired data set, and
	interpret the mean difference in context. Use the 4-Step
	process to construct and interpret a confidence interval
	for the true mean difference.
	9.6 Use the 4-Step process to construct and interpret a
	confidence interval for the true mean difference.
	Determine whether you should use 2-sample t
	procedures for inference in a given setting.
	Chapter 10:
	10.1 State hypothesis for a test about the distribution of a
	categorical variable. Calculate expected counts for a test
	about the distribution of a categorical variable. Calculate
	expected counts for a test about the distribution of a
	categorical variable. Calculate test statistic for a test
	about the distribution of a categorical variable.
	10.2. Toot conditions for a toot shout the distribution of a
	10.2 lest conditions for a test about the distribution of a
	about the distribution of a categorical variable. Use the
	4-Step process to perform a chi-squared test for
	acodness of fit

	 10.3 State hypotheses for a test about the relationship between 2 categorical variables. Calculate expected counts for a test about the relationship between 2 categorical variables. Calculate the test statistic for a test about the relationship between 2 categorical variables. 10.4 Check conditions for a test about the relationship between 2 categorical variables. Use the 4-Step process to perform a chi-square for association. 			
Interdisciplinary Connections: Interdisciplinary connections are integrated in each unit with connections to the mathematical practices. 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others 4. Model with mathematics 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure				
Stage 2: A	Assessment Evidence			
Performance Task(s):	Other Evidence:			
Chapter 9: Lesson App 9.1- Who likes rap music more? Lesson App 9.2- Does taking aspirin help prevent heart attacks? Lesson App 9.3- Do bigger apartments cost more money? Lesson App 9.4- Is name-brand popcorn better than store-brand? Lesson App 9.5- Is caffeine dependence real? Lesson App 9.6- Does generic ice cream melt faster?	Classwork Written & Online Homework Section Quizzes Chapter Tests Online Student Assessments End of Unit Assessment Graphing Calculators Applets Statistical Software			
<u>Chapter 10:</u> Lesson App 10.1- Are fruit flies predictable? Lesson App 10.2 - Is the die fair? Lesson App 10.3- Is there an association between gender and superpower preference? Lesson App 10.4- Should angry people go to the sauna?				
Stage 3: Learning Plan				

Learning Opportunities/Strategies:	Resources:		
 Mystery Mean Activity 			
Simulation	eBook-Statistics and Probability with Applications (High		
Data Collection	School) Daren S. Starnes (The Lawrenceville School),		
Collaboration	Josh Tabor (Canyon del Oro (AZ) High School) 2016		
Survey	LaunchPad		
Polling	Google Doc of Extra Examples		
Applets	Google Slide Lecture Presentations		
 Statistical Software 	Prepared Tests and Test Bank		
 Graphing Calculators 	Prepared Quizzes		
 Think-Pair Share 	Prepared Worksheets		
 Reading Tables and Charts 	PD Videos		
 Small Group Discussion 	Applets		
	Statistical Software		
	IXL		
	LGBT and Disabilities Resources: LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth LGBTQ+ Books 		
	DEI Resources:		
	Learning for Justice		
	GLSEN Educator Resources		
	Supporting LGBTQIA Youth Resource List		
	<u>Respect Ability: Fighting Stigmas, Advancing</u> Opportunities		
	NIDOE Diversity Equity & Inclusion Educational		
	Resources		
	Diversity Calendar		

Differentiation *Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving	On Grade Level	Struggling Students	Special Needs/ELL
Students	Students		
Projects	Guided Notes	Guided Notes	Any student requiring further
Problems with higher	Chapter Summaries	Allow use of formula	accommodations and/or modifications
degree difficulty	Formula Sheets	sheets on tests	will have them individually listed in
Higher order thinking	Graphing Calculators	Hands-On Activities	their 504 Plan or IEP. These might
challenges	Think-Pair-Share	Real-life applications	include, but are not limited to:
Use of Statistical Software	Group Work	Require use of	breaking assignments into smaller
	Collaboration	calculators	tasks, giving directions through
	Hands-On activities	Think-Pair-Share	several channels (auditory, visual,
	Real-life application	Allow students to	kinesthetic, model), and/or small
	of statistics	work in groups to	group instruction for reading/writing
	Chapter Reviews	complete class	
	prior to tests	assignments.	ELL supports should include, but are
		Study Sheets	not limited to, the following::
		Practice Tests	Extended time
			Provide visual aids

Online review of content Pair Student with a High-Achieving student	Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries
One-on-One Tutoring	

Pacing Guide

Probability & Statistics	TextBook: Statistics and Probability with Applications	NJSLS-Mathematics
UNIT 1	CHAPTERS	S.ID 1 - 9
Analyzing and Collecting	1: (7 Days)	
Data(21 Days)	2: (7 Days)	
	3: (7 Days)	
MID MP		
UNIT 2	CHAPTERS	S.CP 1 - 9
Exploring Random Variables	4: (7 Days)	S.MD 1- 7
and Probability	5: (7 Days)	
(21 Days)	6: (7 Days)	
END OF MP		
UNIT 3	CHAPTERS	S.IC 1-4
Estimating a Parameter &	7: (10 Days)	
Testing a Claim (21 Days)	8: (11 Days)	
MID MP		
UNIT 4	CHAPTERS	S.IC 3-5
Comparing Population &	9: (11 Days)	
Inference (21 Days)	10: (10 Days)	
END OF MP		