|  |  |
| --- | --- |
| Created on: | July, 2015 |
| Created by: | Kellie Keiser, Central; Juliet Pender, Plumsted; Michele Colon, Vo-Tech; Robin Kelly, Vo-Tech |
| Revised on: |  |
| Revised by: |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM** | | | | | |
| **Content Area:** Mathematics | | | | | |
| **Course Title:** Probability and Statistics | | | | **Grade Level:** High School | |
|  | | | | | | |
|  | **Introduction to Statistics** |  | **3 weeks** | |  | |
|  | | | | | | |
|  | **Summarizing and Graphing Data** |  | **5 weeks** | |  | |
|  | | | | | | |
|  | **Probability** |  | **4 weeks** | |  | |
|  | | | | | | |
|  | **Distributions** |  | **3 weeks** | |  | |
|  | | | | | | |
|  | **Confidence Intervals and**  **Hypothesis Testing** |  | **18 weeks** | |  | |
|  | | | | | | |
|  | **Correlation and Regression** |  | **3 weeks** | |  | |
|  | | | | | | |

|  |  |  |
| --- | --- | --- |
| The following Standards for Mathematical Practice and select Common Core Content Standards should be covered throughout the various units of the curriculum. MP.1 | Make sense of problems and persevere in solving them. | * Find meaning in problems * Look for entry points * Analyze, conjecture and plan solution pathways * Monitor and adjust * Verify answers * Ask themselves the question: “Does this make sense?” |
| MP.2 | Reason abstractly and quantitatively. | * Make sense of quantities and their relationships in problems * Learn to contextualize and decontextualize * Create coherent representations of problems |
| MP.3 | Construct viable arguments and critique the reasoning of others. | * Understand and use information to construct arguments * Make and explore the truth of conjectures * Recognize and use counterexamples * Justify conclusions and respond to arguments of others |
| MP.4 | Model with Mathematics. | * Apply mathematics to problems in everyday life * Make assumptions and approximations * Identify quantities in a practical situation * Interpret results in the context of the situation and reflect on whether the results make sense |
| MP.5 | Use appropriate tools strategically. | * Consider the available tools when solving problems * Are familiar with tools appropriate for their grade or course (pencil and paper, concrete models, ruler, protractor, calculator, spreadsheet, computer programs, digital content located on a website, and other technological tools) * Make sound decisions of which of these tools might be helpful |
| MP.6 | Attend to precision. | * Communicate precisely to others * Use clear definitions, state the meaning of symbols and are careful about specifying units of measure and labeling axes * Calculate accurately and efficiently |
| MP.7 | Look for and make use of structure. | * Discern patterns and structures * Can step back for an overview and shift perspective * See complicated things as single objects or as being composed of several objects |
| MP.8 | Look for and express regularity in repeated reasoning. | * Notice if calculations are repeated and look both for general methods and shortcuts * In solving problems, maintain oversight of the process while attending to detail * Evaluate the reasonableness of their immediate results |
| Technology Goals for Statistics: | | |
| Students will be able to use a graphing calculator or statistical software to calculate measures of center, measures of variation, the correlation coefficient, regression analysis, areas under the normal curve, standard scores, and p-values for hypothesis tests. Students will also be able to use the graphing calculator to simulate random events and to calculate probabilities. | | |

|  |  |  |
| --- | --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Unit Overview - Introduction to Statistics** | | |
| **Content Area:** Mathematics  **Grade:** High School | | |
| **Unit:** Introduction to Statistics | | |
| **Domain:** Interpretating Categorical and Quantitative Data | | |
| **Unit Summary:** Summarize, represent, and interpret data on a single count or measurement variable. Calculate and interpret measures of central tendency, variation and position. Construct and interpret histograms, box plots, dot plots, stem and leaf plots, bar charts, pie charts. | | |
| **Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology. | | |
| **21st century themes:** The unit will integrate the 21st Century Life and Career standards:  CRP2. Apply appropriate academic and technical skills.  CRP4. Communicate clearly and effectively and with reason  CRP6. Demonstrate creativity and innovation.  CRP7. Employ valid and reliable research strategies.  CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.  CRP11. Use technology to enhance productivity. | | |
| **Learning Targets** | | |
| **Content Standards** | | |
| **Number** | **Common Core Standard for Mastery** | |
| S-ID.1. | Represent data with plots on the real number line (dot plots, histograms, and box plots). | |
| S-ID.2. | Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. | |
| S-ID.3. | Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). | |
| **Unit Essential Questions**  How can we describe data?  To what extent can statistics help us make predictions and inferences about our world?  How can we determine the validity of our interpretation of the statistics? | | **Unit Enduring Understandings**  *Students will understand that…*  Data collection can be utilized to make summative statements or inferences about a population.  Observational studies can be used to demonstrate correlation or association.  Designed experiments can be used to prove  causation.  Data can be organized in a variety of useful  ways. |
| **Unit Objectives**  *Students will know…*  Methods of survey  Types of statistics  Designing  Experiments  Organizing Data  *Vocabulary:*  Population  Sample  Descriptive statistics  Inferential statistics  Discrete data  Continuous data  Univariate  Bivariate  Stratified sample  Cluster sample  Treatment  Placebo  Control  Blocking  Blind | | **Unit Objectives**  *Students will be able to…*  Identify types of statistics and data.  Establish a process for planning and conducting a study.  Calculate relative frequency.  Construct bar graphs and dot plots.  Distinguish between an experiment and an observational  study.  Determine the processes of sampling.  Create a procedure for conducting a designed  experiment using proper terminology.  Identify key concepts of a designed experiment and then  to block an experiment.  Understand the need to blind or double blind an  experiment. |

|  |  |
| --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Evidence of Learning** | |
| **Formative Assessments** | |
| * Observation * Homework * Class participation * Whiteboards/communicators * Think-Pair-Share | * DO-NOW * Notebook * Writing prompts * Exit passes * Self-assessment |
| **Summative Assessments**   * Chapter/Unit Test * Quizzes * Presentations * Unit Projects * Mid-Term and Final Exams | |
| **Modifications (ELLs, Special Education, Gifted and Talented)**   * Teacher tutoring * Peer tutoring * Cooperative learning groups * Modified assignments * Alternative assessments * Group investigation * Differentiated instruction * Native language texts and native language to English dictionary * **Follow all IEP modifications/504 plan** | |
| **Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:**  For further clarification refer to NJ Class Standard Introductions at [**www.njcccs.org**](http://www.njcccs.org).   * Graphing Calculator * Microsoft Excel/PowerPoint * Teacher-made tests, worksheets, warm-ups, and quizzes * Computer software to support unit * Smart board * Document camera * [www.ixl.com](http://www.ixl.com) * [www.purplemath.com](http://www.purplemath.com) * [www.Kutasoftware.com](http://www.Kutasoftware.com) * [www.Khanacademy.com](http://www.Khanacademy.com) * [www.brightstorm.com](http://www.brightstorm.com) * [www.coolmath.com](http://www.coolmath.com) * [www.desmos.com](http://www.desmos.com) | |
| **Teacher Notes:** | |

|  |  |  |
| --- | --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Unit Overview - Summarizing and Graphing Data** | | |
| **Content Area:** Mathematics  **Grade:** High School | | |
| **Unit:** Summarizing and Graphing Data | | |
| **Domain:** Independently use their learning to display and analyze data | | |
| **Unit Summary:** Analyze and interpret a normal distribution. To use various ways to interpret and analyze statistical data.  **Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.  **21st century themes:** The unit will integrate the 21st Century Life and Career standards:  CRP2. Apply appropriate academic and technical skills.  CRP4. Communicate clearly and effectively and with reason  CRP6. Demonstrate creativity and innovation.  CRP7. Employ valid and reliable research strategies.  CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.  CRP11. Use technology to enhance productivity. | | |
| **Learning Targets** | | |
| **Content Standards** | | |
| **Number** | **Common Core Standard for Mastery** | |
| S-ID.1. | Represent data with plots on the real number line (dot plots, histograms, and box plots). | |
| S-ID.2. | Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. | |
| S-ID.3. | Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). | |
| S-ID.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. | |
| S-ID.5. | Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal and conditional relative frequencies). Recognize possible associations and trends in the data. | |
| S-ID.6. | Represent data on two quantitative variables on a scatter plot and describe how the variables are related. | |
| **Unit Essential Questions**  What method of displaying data would best represent my purpose?  Why can technology support but  not replace our mathematics skills  and understanding?  What conclusions can be made and supported and what can not be supported?  When is data reliable to use? | | **Unit Enduring Understandings**  *Students will understand that…*  Data can be organized and displayed in a variety of ways  Understanding the distribution of data is important to determine how to analyze the data  Describing the variation of data is as important as defining the center of a data set  Standard deviation is essential to every statistically analysis |
| **Unit Objectives**  *Students will know…*  Frequency table and histogram  Stem and leaf plots  Normal vs. skewed  Scatterplots  Mean, Median,  Mode, Midrange  Standard Deviation  *Vocabulary:*  Histogram  Comparative Bar Graph  Stem and Leaf  Cumulative frequency  Scatter plot  Sample/Pop Mean and Deviations  Empirical Rule | | **Unit Objectives**  *Students will be able to…*  Use comparative bar graphs and pie graphs to display  data.  Construct and analyze stem and leaf plots for tendencies  and distribution.  Create frequency, relative frequency and cumulative  frequency histograms.  Identify distribution of data based on histograms.  Display bivariate data using scatter plots.  Calculate the mean, median, mode, midrange, range and  standard deviation of data.  Create and interpret boxplots.  Understand and use the Empirical Rule. |

|  |  |
| --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Evidence of Learning** | |
| **Formative Assessments** | |
| * Observation * Homework * Class participation * Whiteboards/communicators * Think-Pair-Share | * DO-NOW * Notebook * Writing prompts * Exit passes * Self-assessment |
| **Summative Assessments**   * Chapter/Unit Test * Quizzes * Presentations * Unit Projects * Mid-Term and Final Exams | |
| **Modifications (ELLs, Special Education, Gifted and Talented)**   * Teacher tutoring * Peer tutoring * Cooperative learning groups * Modified assignments * Alternative assessments * Group investigation * Differentiated instruction * Native language texts and native language to English dictionary * **Follow all IEP modifications/504 plan** | |
| **Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:**  For further clarification refer to NJ Class Standard Introductions at [**www.njcccs.org**](http://www.njcccs.org).   * Graphing Calculator * Microsoft Excel/PowerPoint * Teacher-made tests, worksheets, warm-ups, and quizzes * Computer software to support unit * Smart board * Document camera * [www.ixl.com](http://www.ixl.com) * [www.purplemath.com](http://www.purplemath.com) * [www.Kutasoftware.com](http://www.Kutasoftware.com) * [www.Khanacademy.com](http://www.Khanacademy.com) * [www.brightstorm.com](http://www.brightstorm.com) * [www.coolmath.com](http://www.coolmath.com) * [www.desmos.com](http://www.desmos.com) | |
| **Teacher Notes:** | |

|  |  |  |
| --- | --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Unit Overview - Probability** | | |
| **Content Area:**  Mathematics **Grade:** High School | | |
| **Unit**: Probability | | |
| **Domain:** To calculate probabilities and make inferences about the data. | | |
| **Unit Summary:** Use probabilities to interpret data. Calculate and interpret a variety of probabilities utilizing the addition, multiplication and conditional probability rules.  **Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.  **21st century themes:** The unit will integrate the 21st Century Life and Career standards:  CRP2. Apply appropriate academic and technical skills.  CRP4. Communicate clearly and effectively and with reason  CRP6. Demonstrate creativity and innovation.  CRP7. Employ valid and reliable research strategies.  CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.  CRP11. Use technology to enhance productivity. | | |
| **Learning Targets** | | |
| **Content Standards** | | |
| **Number** | **Common Core Standard for Mastery** | |
| S-CP.1. | Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”). | |
| S-CP.2. | Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. | |
| S-CP.3. | Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. | |
| S-CP.4. | Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. | |
| S-CP.5. | Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. | |
| S-CP.6. | Find the conditional 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. | |
| S-CP.7. | Apply the Addition Rule, P (A or B) = P (A) + P (B) – P (A and B), and interpret the answer in terms of the model. | |
| S-CP.8. | (+) Apply the general Multiplication Rule in a uniform probability model, P (A and B) = P (A) P (B|A) = P (B) P (A|B), and interpret the answer in terms of the model. | |
| S-CP.9. | (+) Use permutations and combinations to compute probabilities of compound events and solve problems. | |
| S-MD.1. | Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. | |
| S-MD.2. | Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. | |
| S-MD.3. | Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated;  find the expected value. | |
| S-MD.4. | Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. | |
| S-MD.5. | * Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. * Find the expected payoff for a game of chance. * Evaluate and compare strategies on the basis of expected values. | |
| S-MD.6. | Use probabilities to make fair decisions | |
| S-MD.7. | Analyze decisions and strategies using probability concepts | |
| **Unit Essential Questions**  Can probability be an accurate tool for making predictions?    What are differences between  games of chance and skill and can  probability is used for each?    When is simulation a useful tool in  calculating probability?    When data is considered normally  distributed and when can z-scores  be used? | | **Unit Enduring Understandings**  *Students will understand that…*  Relative frequency of occurrence is probability  The Law of Large Numbers allows for accurate estimations when sample size is large enough  Tree diagrams are an excellent method of displaying sample space and calculating probability  Probability distribution of a discrete variable becomes more normal as sample size increases |
| **Unit Objectives**  *Students will know…*  Compound Probability  Conditional Probability  Law of Large Numbers  Expected Value  Probability Distribution  Binomial Probability  Central Limit Theory    *Vocabulary:*  Sample Space  Simple/Compound Probability  Mutually Exclusive or Disjoint  Independence  Binomial Distribution  z-score  critical value  Discrete random variable | | **Unit Objectives**  *Students will be able to…*  Create sample space of a chance experiment.  Use Venn Diagrams to represent outcomes.  Identify mutually exclusive events.  Distinguish between experimental and theoretical  probabilities.  Calculate probabilities for compound events and  conditional events.  Establish rules for Independence of events.  Calculate means of discrete random variables.  Identify properties of a z-curve.  Use z-scores to find probabilities and percentiles. |

|  |  |
| --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Evidence of Learning** | |
| **Formative Assessments** | |
| * Observation * Homework * Class participation * Whiteboards/communicators * Think-Pair-Share | * DO-NOW * Notebook * Writing prompts * Exit passes * Self-assessment |
| **Summative Assessments**   * Chapter/Unit Test * Quizzes * Presentations * Unit Projects * Mid-Term and Final Exams | |
| **Modifications (ELLs, Special Education, Gifted and Talented)**   * Teacher tutoring * Peer tutoring * Cooperative learning groups * Modified assignments * Alternative assessments * Group investigation * Differentiated instruction * Native language texts and native language to English dictionary * **Follow all IEP modifications/504 plan** | |
| **Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:**  For further clarification refer to NJ Class Standard Introductions at [**www.njcccs.org**](http://www.njcccs.org).   * Graphing Calculator * Microsoft Excel/PowerPoint * Teacher-made tests, worksheets, warm-ups, and quizzes * Computer software to support unit * Smart board * Document camera * [www.ixl.com](http://www.ixl.com) * [www.purplemath.com](http://www.purplemath.com) * [www.Kutasoftware.com](http://www.Kutasoftware.com) * [www.Khanacademy.com](http://www.Khanacademy.com) * [www.brightstorm.com](http://www.brightstorm.com) * [www.coolmath.com](http://www.coolmath.com) * [www.desmos.com](http://www.desmos.com) | |
| **Teacher Notes:** | |

|  |  |  |
| --- | --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Unit Overview - Distributions** | | |
| **Content Area:**  Mathematics **Grade:** High School | | |
| **Unit:** Distributions | | |
| **Domain:** Calculate the probabilities of binomial and normal distributions | | |
| **Unit Summary:** Analyze and interpret binomial and normal distributions. Determine whether an event satisfies the conditions for a binomial distribution and whether that event can be approximated by a normal distribution. Then use the area under the normal curve to explain the probability of that event occurring by chance**.**  **Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.  **21st century themes:** The unit will integrate the 21st Century Life and Career standards:  CRP2. Apply appropriate academic and technical skills.  CRP4. Communicate clearly and effectively and with reason  CRP6. Demonstrate creativity and innovation.  CRP7. Employ valid and reliable research strategies.  CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.  CRP11. Use technology to enhance productivity. | | |
| **Learning Targets** | | |
| **Content Standards** | | |
| **Number** | **Common Core Standard for Mastery** | |
| S-MD, 1. | Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. | |
| S-MD, 2. | Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. | |
| S-MD 3 | Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated;  find the expected value. | |
| S-MD - 4 | Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. | |
| S-MD- 5 | Use probabilities to make fair decisions | |
| S-MD -6 | Analyze decisions and strategies using probability concepts | |
| **Unit Essential Questions**  When data is considered normally distributed and when can z-scores be used?  Is the data from a simple random sample?  Are there only 2 possible outcomes?  Are the trials independent?  Does the probability stay the same between trials? | | **Unit Enduring Understandings**  *Students will understand that…*  Probability distribution of a discrete variable becomes more normal as sample size increases.  A binomial distribution can be approximated by a normal distribution when certain conditions are met |
| **Unit Objectives**  *Students will know…*  The meaning of the expected value  and standard deviation of a binomial  distribution  The results of the calculated values for  both a binomial and normal  distribution  Identify an unusual z-score  The area under the curve being the  probability that event can occur  *Vocabulary:*  Expected Value  Probability Distribution  Binomial Probability  Central Limit Theory  Sample Space  Binomial Distribution  z-score  Critical value  Discrete/Continuous random variable | | **Unit Objectives**  *Students will be able to…*  Calculate means of discrete random variables.  Identify properties of a z-curve.  Use z-scores to find probabilities and percentiles  Calculate the expected value and standard deviation for  a binomial distribution  Calculate the value of a binomial distribution  Correctly use a normal distribution as an approximation  of a binomial distribution  Calculate the area under a normal curve |

|  |  |
| --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Evidence of Learning** | |
| **Formative Assessments** | |
| * Observation * Homework * Class participation * Whiteboards/communicators * Think-Pair-Share | * DO-NOW * Notebook * Writing prompts * Exit passes * Self-assessment |
| **Summative Assessments**   * Chapter/Unit Test * Quizzes * Presentations * Unit Projects * Mid-Term and Final Exams | |
| **Modifications (ELLs, Special Education, Gifted and Talented)**   * Teacher tutoring * Peer tutoring * Cooperative learning groups * Modified assignments * Alternative assessments * Group investigation * Differentiated instruction * Native language texts and native language to English dictionary * **Follow all IEP modifications/504 plan** | |
| **Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:**  For further clarification refer to NJ Class Standard Introductions at [**www.njcccs.org**](http://www.njcccs.org).   * Graphing Calculator * Microsoft Excel/PowerPoint * Teacher-made tests, worksheets, warm-ups, and quizzes * Computer software to support unit * Smart board * Document camera * [www.ixl.com](http://www.ixl.com) * [www.purplemath.com](http://www.purplemath.com) * [www.Kutasoftware.com](http://www.Kutasoftware.com) * [www.Khanacademy.com](http://www.Khanacademy.com) * [www.brightstorm.com](http://www.brightstorm.com) * [www.coolmath.com](http://www.coolmath.com) * [www.desmos.com](http://www.desmos.com) | |
| **Teacher Notes:** | |

|  |  |  |
| --- | --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Unit Overview – Confidence Intervals and Hypothesis Testing** | | |
| **Content Area:** Mathematics  **Grade:** High School | | |
| **Domain:** Creating and Analyzing Inferential statistics | | |
| **Unit Summary:** Administrating Hypothesis testing. Calculate and interpret confidence intervals, Perform hypothesis testing for proportions, averages, (sigma known and unknown), and difference between two samples by comparing p-values to alpha and test statistic to critical values.  **Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.  **21st century themes:** The unit will integrate the 21st Century Life and Career standards:  CRP2. Apply appropriate academic and technical skills.  CRP4. Communicate clearly and effectively and with reason  CRP6. Demonstrate creativity and innovation.  CRP7. Employ valid and reliable research strategies.  CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.  CRP11. Use technology to enhance productivity. | | |
| **Learning Targets** | | |
| **Content Standards** | | |
| **Number** | **Common Core Standard for Mastery** | |
| S-IC 1 | Understand that statistics is a process for making inferences about population parameters based on a random sample from that population. | |
| S-IC 2 | Decide if a specified model is consistent with results from a given data-generating process, e.g. using simulation. | |
| S – IC 3 | Recognize the purposes of and differences among sample surveys, experiments and observational studies; explain how randomization relates to each. | |
| S – IC 4 | Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. | |
| S-IC 5 | Use data from a randomized experiment to compare two treatments; justify significant differences between parameters through the use of simulation models for random assignment. | |
| S – IC 6 | Evaluate reports based on data. | |
| S – ID 1 | Represent data with plots on the real number line (dot plots, histograms, and box plots). | |
| S – ID 2 | Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. | |
| S – ID 3 | Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). | |
| S – ID 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. | |
| S ID 5 | Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal and conditional relative frequencies). Recognize possible associations and trends in the data. | |
| **Unit Essential Questions**  How can a confidence interval be interpreted in context of the problem?  How is the width of the interval affected by changes in sample size or confidence level?  How can a sample size be determined for a study that would place your results within a specified error?  Can confidence intervals be used to draw conclusions about a claim?  Which hypothesis test is appropriate for a particular data set?  What makes results “statistically significant” and how are they determined so?  When is interpreting results inconclusive and potentially dangerous?  How can one data set be used to draw opposing conclusions?  How can hypothesis testing be used to find out if a difference between two samples is greater than a given value?   What are differences between pooled and non-pooled and does it matter which is used to test data?  When is it appropriate to use a matched pair t-test instead of a two sample t-test?  Can the probability value be utilized to determine the strength of the test? | | **Unit Enduring Understandings**  *Students will understand that…*  A point estimate is used to establish a value for a population parameter  A confidence interval is a range of plausible values for a characteristic of a population  Confidence intervals are always two tailed and the confidence level relates to the area under the curve between the interval  Standard error is the estimated standard deviation of the statistic  Hypothesis testing uses sample data to decide between two competing claims about a population characteristic  There is a possibility of making a Type I or Type II error when conducting a hypothesis test  Tests can be performed using the critical value approach or the p-value approach  The level of significance is the total area in the rejection region  Hypothesis testing for two samples involves the difference between the means or proportions  Identifying and labeling each population allows for more accurate and less confusing conclusions   Procedures vary for samples that are dependent as opposed to independent   Matched pair tests are an important analysis tool when analyzing results of an experiment |
| **Unit Objectives**  *Students will know…*  Interval for one mean  Interval for sample proportion  Confidence level  Sample size  Interval for difference of 2 means or  proportions  Null and alternate hypotheses  Words/context of hypothesis testing  Errors in Hypothesis testing  *Vocabulary*  Point estimate  Confidence level  Critical values  Standard error  Margin of error  critical value  Null hypothesis  Alternate Hypothesis  Type I Type II Error  Test statistic  Critical value  Level of significance  p-value  Rejection region  Power of the test  Degrees of freedom  Independent samples  Paired samples  Paired test statistic  Pooled Non-pooled | | **Unit Objectives**  *Students will be able to…*  Calculate a point estimate from a sample.  Use formula to create a confidence interval for a sample  mean.  Understand the relationship between the interval and a  normal curve.  Interpret the interval in words in context of the problem.  Find confidence interval for one sample proportion.  Understand the relationship between sample size and  width of confidence interval.  Work backwards to find sample size needed for a given  study.  Calculate and interpret intervals for the difference of t  two sample means or proportions.  Determine the null and alternate hypotheses for a given  scenario.  Understand difference between one tailed and two tailed  test and draw curve.  Identify and interpret Type I and Type II errors in  context of problem.  Follow procedure and conduct hypothesis test on one  sample mean.  Understand and use p-value approach as well as critical  value approach.  Analyze results of test in context of the problem.  Perform hypothesis tests on one sample proportion.  Establish and interpret the power of the test  Identify and label two groups to be tested.  Create appropriate null and alternate hypotheses.  Conduct two sample t-tests for pooled or non-pooled  data.  Distinguish between independent and dependent  samples.    Perform matched pair t-test and interpret results.  Construct confidence interval for matched pair results.  Understand the cautions and limitations of hypothesis t  testing.  Use paragraph method of conducting hypothesis tests. |

|  |  |
| --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Evidence of Learning** | |
| **Formative Assessments** | |
| * Observation * Homework * Class participation * Whiteboards/communicators * Think-Pair-Share | * DO-NOW * Notebook * Writing prompts * Exit passes * Self-assessment |
| **Summative Assessments**   * Chapter/Unit Test * Quizzes * Presentations * Unit Projects * Mid-Term and Final Exams | |
| **Modifications (ELLs, Special Education, Gifted and Talented)**   * Teacher tutoring * Peer tutoring * Cooperative learning groups * Modified assignments * Alternative assessments * Group investigation * Differentiated instruction * Native language texts and native language to English dictionary * **Follow all IEP modifications/504 plan** | |
| **Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:**  For further clarification refer to NJ Class Standard Introductions at [**www.njcccs.org**](http://www.njcccs.org).   * Graphing Calculator * Microsoft Excel/PowerPoint * Teacher-made tests, worksheets, warm-ups, and quizzes * Computer software to support unit * Smart board * Document camera * [www.ixl.com](http://www.ixl.com) * [www.purplemath.com](http://www.purplemath.com) * [www.Kutasoftware.com](http://www.Kutasoftware.com) * [www.Khanacademy.com](http://www.Khanacademy.com) * [www.brightstorm.com](http://www.brightstorm.com) * [www.coolmath.com](http://www.coolmath.com) * [www.desmos.com](http://www.desmos.com) | |
| **Teacher Notes:** | |

|  |  |  |
| --- | --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Unit Overview – Correlation and Regression** | | |
| **Content Area:** Mathematics  **Grade:** High School | | |
| **Domain:** Correlation and Regression | | |
| **Unit:** Correlation and Regression | | |
| **Unit Summary:** To interpret scatter plots and regression lines. To determine a relationship between two quantitative variables by using a scatter plot and regression line.  **Primary interdisciplinary connections:** Infused within the unit are connections to the 2014 NJCCCS for Mathematics, Language Arts Literacy, Science and Technology.  **21st century themes:** The unit will integrate the 21st Century Life and Career standards:  CRP2. Apply appropriate academic and technical skills.  CRP4. Communicate clearly and effectively and with reason  CRP6. Demonstrate creativity and innovation.  CRP7. Employ valid and reliable research strategies.  CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.  CRP11. Use technology to enhance productivity. | | |
| **Learning Targets** | | |
| **Content Standards** | | |
| **Number** | **Common Core Standard for Mastery** | |
| S-ID.6. | * Represent data on two quantitative variables on a scatter plot and describe how the variables are related. * Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or chooses a function suggested by the context. Emphasize linear, quadratic, and exponential models. * Informally assess the fit of a model function by plotting and analyzing residuals. * Fit a linear function for scatter plots that suggest a linear association. | |
| S-ID.7. | Interpret the slope (rate of change) and the intercept (constant term) of a linear fit in the context of the data. | |
| S-ID.8. | Compute (using technology) and interpret the correlation coefficient of a linear fit. | |
| S-ID.9. | Distinguish between correlation and causation. | |
| **Unit Essential Questions**  How can qualitative data be tested to draw inferential conclusions that are supported numerically?   What are differences between correlation and association when drawing conclusions about data?  When is data usable for linear regression hypothesis testing? | | **Unit Enduring Understandings**  *Students will understand that…*  Bivariate quantitative data can be tested using linear regression hypothesis testing procedures |
| **Unit Objectives**  *Students will know…*  Test for association  Expected versus observed  Chi Square test statistic  Linear Regression Test  *Vocabulary:*  Association  Residual  Correlation coefficient  Coefficient of Determination  Variance | | **Unit Objectives**  *Students will be able to…*  Calculate residuals for linear data.    Find and interpret the correlation coefficient and coefficient of determination.    Conduct a linear regression hypothesis test on the slope of a regression line and interpret results in context. |

|  |  |
| --- | --- |
| **OCEAN COUNTY MATHEMATICS CURRICULUM**  **Evidence of Learning** | |
| **Formative Assessments** | |
| * Observation * Homework * Class participation * Whiteboards/communicators * Think-Pair-Share | * DO-NOW * Notebook * Writing prompts * Exit passes * Self-assessment |
| **Summative Assessments**   * Chapter/Unit Test * Quizzes * Presentations * Unit Projects * Mid-Term and Final Exams | |
| **Modifications (ELLs, Special Education, Gifted and Talented)**   * Teacher tutoring * Peer tutoring * Cooperative learning groups * Modified assignments * Alternative assessments * Group investigation * Differentiated instruction * Native language texts and native language to English dictionary * **Follow all IEP modifications/504 plan** | |
| **Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:**  For further clarification refer to NJ Class Standard Introductions at [**www.njcccs.org**](http://www.njcccs.org).   * Graphing Calculator * Microsoft Excel/PowerPoint * Teacher-made tests, worksheets, warm-ups, and quizzes * Computer software to support unit * Smart board * Document camera * [www.ixl.com](http://www.ixl.com) * [www.purplemath.com](http://www.purplemath.com) * [www.Kutasoftware.com](http://www.Kutasoftware.com) * [www.Khanacademy.com](http://www.Khanacademy.com) * [www.brightstorm.com](http://www.brightstorm.com) * [www.coolmath.com](http://www.coolmath.com) * [www.desmos.com](http://www.desmos.com) | |
| **Teacher Notes:** | |