# West Windsor-Plainsboro Regional School District
# Statistics Curriculum

## Unit 1: Exploring and Understanding Data

**Content Area: Mathematics**

**Course & Grade Level: Statistics, Grade 11 and 12**

## Summary and Rationale

Decisions or predictions are often based on data—numbers in context. These decisions or predictions would be easy if the data always sent a clear message, but the message is often obscured by variability. Statistics provides tools for describing variability in data and for making informed decisions that take it into account.

Data are gathered, displayed, summarized, examined, and interpreted to discover patterns and deviations from patterns. Quantitative data can be described in terms of key characteristics: measures of shape, center, and spread. The shape of a data distribution might be described as symmetric, skewed, flat, or bell shaped, and it might be summarized by a statistic measuring center (such as mean or median) and a statistic measuring spread (such as standard deviation or interquartile range). Different distributions can be compared numerically using these statistics or compared visually using plots. Knowledge of center and spread are not enough to describe a distribution. Which statistics to compare, which plots to use, and what the results of a comparison might mean, depend on the question to be investigated and the real-life actions to be taken.

## Recommended Pacing

20 days

## New Jersey Student Learning Standards for Mathematics

**High School Standard ID: Interpreting Categorical and Quantitative Data**

| CPI # | Cumulative Progress Indicator (CPI) |
|---|---|
| A | **Summarize, represent, and interpret data on a single count or measurement variable.** |
| A. 1 | Represent data with plots on the real number line (dot plots, histograms, and box plots). |
| A. 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. |
| A .3 | Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). |
| A. 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. |
| B | **Summarize, represent, and interpret data on two categorical and quantitative variables** |
| B .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. |

| New Jersey Student Learning Standards for English Language Arts Companion Standards | |
|---|---|
| **Standard: Science Key Ideas and Details** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.3. | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.<br>Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. |
| **Standard: Science Craft and Structure** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.4. | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9-10 texts and topics*. |
| **Standard: Science Integration of Knowledge and Ideas** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.7. | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| **New Jersey Student Learning Standards for 21st Century Life and Careers** | |
| **Career Ready Practices** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| CRP2. | Apply appropriate academic and technical skills. |
| CRP4. | Communicate clearly and effectively and with reason |
| CRP8 | Utilize critical thinking to make sense of problems and persevere in solving them. |
| CRP11 | Use technology to enhance productivity. |
| **New Jersey Student Learning Standards for Technology** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| 8.1 | All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. |

## Instructional Focus

**Unit Enduring Understandings**

- The study of Statistics is essential to helping mathematicians analyze, understand and explain real life phenomena.
- Technology is vital to applying statistical techniques
- Statisticians communicate their understanding of concepts both in oral and written form
- Understanding the normal distribution is a key element of analyzing data

**Unit Essential Questions**

- How can I be a critical consumer of statistics, intelligently questioning and analyzing uses and abuses of statistics in the world outside the classroom?

**Objectives**

**Students will know:**

- Techniques to explore sets of data, identifying patterns and departures from patterns, and determining the significance of these departures
- How to recognize possible associations and trends in data.

**Students will be able to:**

- Read Dot Plots, Histograms, box plots and other data displays
- Compute and explain measures of central tendency
- Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages.
- 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).

## Evidence of Learning

**Assessment**

Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of PSAT and NJSLA data.

**Competencies for 21st Century Learners**

| | | | |
|---|---|---|---|
| | Collaborative Team Member | | Effective Communicator |
| | Globally Aware, Active, & Responsible Student/Citizen | | Information Literate Researcher |
| | Innovative & Practical Problem Solver | | Self-Directed Learner |

## Resources

**Core Text:** Stats in Your World, Pearson, 2012

**Suggested Resources:**

## Unit 2: Exploring Relationships Between Variables

**Content Area: Mathematics**

**Course & Grade Level: Statistics, Grade 11 and 12**

## Summary and Rationale

Decisions or predictions are often based on data—numbers in context. These decisions or predictions would be easy if the data always sent a clear message, but the message is often obscured by variability. Statistics provides tools for describing variability in data and for making informed decisions that take it into account.

Data are gathered, displayed, summarized, examined, and interpreted to discover patterns and deviations from patterns. Quantitative data can be described in terms of key characteristics: measures of shape, center, and spread. The shape of a data distribution might be described as symmetric, skewed, flat, or bell shaped, and it might be summarized by a statistic measuring center (such as mean or median) and a statistic measuring spread (such as standard deviation or interquartile range). Different distributions can be compared numerically using these statistics or compared visually using plots. Knowledge of center and spread are not enough to describe a distribution. Which statistics to compare, which plots to use, and what the results of a comparison might mean, depend on the question to be investigated and the real-life actions to be taken.

## Recommended Pacing

22 days

## New Jersey Student Learning Standards for Mathematics

**High School Standard ID: Interpreting Categorical and Quantitative Data**

| CPI # | Cumulative Progress Indicator (CPI) |
|---|---|
| B | **Summarize, represent, and interpret data on two categorical and quantitative variables** |
| B 6 | Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. |
| B 6a | Fit a function to the data; 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, quadratic, and exponential models. |
| B 6b | Informally assess the fit of a function by plotting and analyzing residuals. |
| B 6c | Fit a linear function for a scatter plot that suggests a linear association. |
| C | **Interpret linear models** |
| C 7 | Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. |
| C 8 | Compute (using technology) and interpret the correlation coefficient of a linear fit. |
| C 9 | Distinguish between correlation and causation. |

| New Jersey Student Learning Standards for English Language Arts Companion Standards | |
|---|---|
| **Standard: Science Key Ideas and Details** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.3. | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.<br>Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. |
| **Standard: Science Craft and Structure** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.4. | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9-10 texts and topics*. |
| **Standard: Science Integration of Knowledge and Ideas** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.7. | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| **New Jersey Student Learning Standards for 21st Century Life and Careers** | |
| **Career Ready Practices** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| CRP2. | Apply appropriate academic and technical skills. |
| CRP4. | Communicate clearly and effectively and with reason |
| CRP8 | Utilize critical thinking to make sense of problems and persevere in solving them. |
| CRP11 | Use technology to enhance productivity. |
| **New Jersey Student Learning Standards for Technology** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| 8.1 | All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. |
| **New Jersey Student Learning Standards for Science** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| HS-LS3-3 | Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population |

## Instructional Focus

**Unit Enduring Understandings**

- The study of Statistics is essential to helping mathematicians analyze, understand and explain real life phenomena.
- Technology is vital to applying statistical techniques
- Statisticians communicate their understanding of concepts both in oral and written form

**Unit Essential Questions**

- What is the distinction between correlation and causation?

**Objectives**

**Students will know:**

- How to read and interpret a scatterplot
- The meanings of correlation and causation

**Students will be able to:**

- Represent data on two quantitative variables on a scatter plot
- Assess the fit of a function by plotting and analyzing residuals.
- Fit a linear function for a scatter plot that suggests a linear association.
- 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.

## Evidence of Learning

**Assessment**

Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of PSAT and NJSLA data.

**Competencies for 21st Century Learners**

| | | | |
|---|---|---|---|
| | Collaborative Team Member | | Effective Communicator |
| | Globally Aware, Active, & Responsible Student/Citizen | | Information Literate Researcher |
| | Innovative & Practical Problem Solver | | Self-Directed Learner |

## Resources

**Core Text:** Stats in Your World, Pearson, 2012

**Suggested Resources:**

## Unit 3: Gathering Data

**Content Area: Mathematics**

**Course & Grade Level: Statistics, Grade 11 and 12**

## Summary and Rationale

Decisions or predictions are often based on data—numbers in context. These decisions or predictions would be easy if the data always sent a clear message, but the message is often obscured by variability. Statistics provides tools for describing variability in data and for making informed decisions that take it into account.

Data are gathered, displayed, summarized, examined, and interpreted to discover patterns and deviations from patterns. Quantitative data can be described in terms of key characteristics: measures of shape, center, and spread. The shape of a data distribution might be described as symmetric, skewed, flat, or bell shaped, and it might be summarized by a statistic measuring center (such as mean or median) and a statistic measuring spread (such as standard deviation or interquartile range). Different distributions can be compared numerically using these statistics or compared visually using plots. Knowledge of center and spread are not enough to describe a distribution. Which statistics to compare, which plots to use, and what the results of a comparison might mean, depend on the question to be investigated and the real-life actions to be taken.

## Recommended Pacing

22 days

## New Jersey Student Learning Standards for Mathematics

**Standard 4.S-IC Making Inferences & Justifying Conclusions**

| CPI # | Cumulative Progress Indicator (CPI) |
|---|---|
| A | **Understand and evaluate random processes underlying statistical experiments** |
| A 1 | Understand statistics as a process for making inferences about population parameters based on a random sample from that population. |
| A 2 | Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. |

## New Jersey Student Learning Standards for English Language Arts Companion Standards

**Standard: Science Key Ideas and Details**

| CPI # | Cumulative Progress Indicator (CPI) |
|---|---|
| RST.9-10.3. | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.<br>Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. |

**Standard: Science Craft and Structure**

| CPI # | Cumulative Progress Indicator (CPI) |
|---|---|
| RST.9-10.4. | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9-10* |

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|---|---|
| | *texts and topics*. |
| **Standard: Science Integration of Knowledge and Ideas** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.7. | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| **New Jersey Student Learning Standards for 21st Century Life and Careers** | |
| **Career Ready Practices** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| CRP2. | Apply appropriate academic and technical skills. |
| CRP4. | Communicate clearly and effectively and with reason |
| CRP8 | Utilize critical thinking to make sense of problems and persevere in solving them. |
| CRP11 | Use technology to enhance productivity. |
| **New Jersey Student Learning Standards for Technology** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| 8.1 | All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. |

## Instructional Focus

**Unit Enduring Understandings**

- A statistician must understand the importance of experiment design to judge the validity of an experiment
- There are specific mathematical techniques to explore sets of data, to identify departures from established patterns, and to determine the significance of these departures.

**Unit Essential Questions**

- How does a statistician decide what variables and how to measure them when planning a study?
- How important is the design of an experiment?

**Objectives**

**Students will be able to:**

- Look for possible problems in sample surveys including sampling bias, under-coverage, nonresponse, response bias and wording of questions
- Learn the value, as well as the limitations, of anecdotal evidence
- Distinguish between observational studies and experiments, and recognize the inherent qualities of each
- Design experiments, taking into consideration the importance of randomization, replication, and control in their design
- Look for possible problems in experiment designs including bias and lack of realism
- Use simulations (using random number tables, as well as the TI-83-84) to begin to understand the nature of sampling distribution
- Consider the effects of both bias and variability on sampling distributions and any attempt to estimate a population parameter with a sample statistic

| Evidence of Learning | | | |
|---|---|---|---|
| **Assessment** | | | |
| Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of PSAT and NJSLA data. | | | |
| **Competencies for 21st Century Learners** | | | |
| | Collaborative Team Member | | Effective Communicator |
| | Globally Aware, Active, & Responsible Student/Citizen | | Information Literate Researcher |
| | Innovative & Practical Problem Solver | | Self-Directed Learner |
| **Resources** | | | |
| **Core Text:** Stats in Your World, Pearson, 2012<br>**Suggested Resources:** | | | |

## Unit 4: Randomness and Probability

**Content Area: Mathematics**

**Course & Grade Level: Statistics, Grade 11 and 12**

## Summary and Rationale

Randomization has two important uses in drawing statistical conclusions. First, collecting data from a random sample of a population makes it possible to draw valid conclusions about the whole population, taking variability into account. Second, randomly assigning individuals to different treatments allows a fair comparison of the effectiveness of those treatments. A statistically significant outcome is one that is unlikely to be due to chance alone, and this can be evaluated only under the condition of randomness. The conditions under which data are collected are important in drawing conclusions from the data; in critically reviewing uses of statistics in public media and other reports, it is important to consider the study design, how the data were gathered, and the analyses employed as well as the data summaries and the conclusions drawn.

Random processes can be described mathematically by using a probability model: a list or description of the possible outcomes (the sample space), each of which is assigned a probability. In situations such as flipping a coin, rolling a number cube, or drawing a card, it might be reasonable to assume various outcomes are equally likely. In a probability model, sample points represent outcomes and combine to make up events; probabilities of events can be computed by applying the Addition and Multiplication Rules. Interpreting these probabilities relies on an understanding of independence and conditional probability, which can be approached through the analysis of two-way tables.

## Recommended Pacing

30 days

## New Jersey Student Learning Standards for Mathematics

**High School Standard CP: Conditional Probability and the Rules of Probability**

| CPI # | Cumulative Progress Indicator (CPI) |
|---|---|
| **A** | **Understand independence and conditional probability and use them to interpret data** |
| A 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”). |
| A 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. |
| A 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*. |
| A 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. |
| A 5 | Recognize and explain the concepts of conditional probability and independence in |

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|---|---|
| | everyday language and everyday situations. |
| **B** | **Use the rules of probability to compute probabilities of compound events.** |
| B 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. |
| B 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. |
| B 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. |
| B 9 | (+) Use permutations and combinations to compute probabilities of compound events and solve problems. |
| **High School Standard MD: Using Probability to Make Decisions** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| **A** | **Calculate expected values and use them to solve problems** |
| A 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. |
| A 2 | (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. |
| A 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. |
| A 4 | (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. |
| **B** | **Use probability to evaluate outcomes of decisions** |
| B 5 | (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. |
| B 5a | Find the expected payoff for a game of chance. |
| B 5b | Evaluate and compare strategies on the basis of expected values. |
| B 6 | (+) Use probabilities to make fair decisions. |
| B 7 | (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game). |

| **New Jersey Student Learning Standards for English Language Arts Companion Standards** | |
|---|---|
| **Standard: Science Key Ideas and Details** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.3. | Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.<br>Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. |

| Standard: Science Craft and Structure | |
|---|---|
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.4. | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9-10 texts and topics*. |
| **Standard: Science Integration of Knowledge and Ideas** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.7. | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |

| New Jersey Student Learning Standards for 21st Century Life and Careers | |
|---|---|
| **Career Ready Practices** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| CRP2. | Apply appropriate academic and technical skills. |
| CRP4. | Communicate clearly and effectively and with reason |
| CRP8 | Utilize critical thinking to make sense of problems and persevere in solving them. |
| CRP11 | Use technology to enhance productivity. |

| New Jersey Student Learning Standards for Technology | |
|---|---|
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| 8.1 | All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. |

## Instructional Focus

**Unit Enduring Understandings**

- There are patterns of chance numerical outcomes that statisticians use to predict the future

**Unit Essential Questions**

- What are the limitations of using probability to predict future outcomes?

**Objectives**

**Students will know:**

- The basic definition of probability and underlying concept of how probability works

**Students will be able to:**

- Construct a valid sample space for a given experiment
- Calculate simple probabilities using sample spaces
- Calculate probabilities for disjoint events using the addition rule
- Calculate probabilities for independent events using the multiplication rule
- Use the complement to calculate probabilities
- Calculate probabilities for events that are not disjoint using the general addition rule
- Calculate conditional probabilities

- Calculate probabilities for events that are dependent using the general multiplication rule
- Use tree diagrams to organize probability problems with multiple stages

## Evidence of Learning

**Assessment**

Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of PSAT and NJSLA data.

**Competencies for 21st Century Learners**

| | | | |
|---|---|---|---|
| | Collaborative Team Member | | Effective Communicator |
| | Globally Aware, Active, & Responsible Student/Citizen | | Information Literate Researcher |
| | Innovative & Practical Problem Solver | | Self-Directed Learner |

## Resources

**Core Text:** Stats in Your World, Pearson, 2012

**Suggested Resources:**

## Unit 5: From the Data at Hand to the World at Large

**Content Area: Mathematics**

**Course & Grade Level: Statistics, Grade 11 and 12**

## Summary and Rationale

Randomization has two important uses in drawing statistical conclusions. First, collecting data from a random sample of a population makes it possible to draw valid conclusions about the whole population, taking variability into account. Second, randomly assigning individuals to different treatments allows a fair comparison of the effectiveness of those treatments. A statistically significant outcome is one that is unlikely to be due to chance alone, and this can be evaluated only under the condition of randomness. The conditions under which data are collected are important in drawing conclusions from the data; in critically reviewing uses of statistics in public media and other reports, it is important to consider the study design, how the data were gathered, and the analyses employed as well as the data summaries and the conclusions drawn.

Random processes can be described mathematically by using a probability model: a list or description of the possible outcomes (the sample space), each of which is assigned a probability. In situations such as flipping a coin, rolling a number cube, or drawing a card, it might be reasonable to assume various outcomes are equally likely. In a probability model, sample points represent outcomes and combine to make up events; probabilities of events can be computed by applying the Addition and Multiplication Rules. Interpreting these probabilities relies on an understanding of independence and conditional probability, which can be approached through the analysis of two-way tables.

## Recommended Pacing

25 days

## New Jersey Student Learning Standards for Mathematics

**High School Standard IC: Making Inferences & Justifying Conclusions**

| CPI # | Cumulative Progress Indicator (CPI) |
|---|---|
| B | **Make inferences and justify conclusions from sample surveys, experiments, and observational studies** |
| B 3 | Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. |
| B 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. |
| B 5 | Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. |
| B 6 | Evaluate reports based on data. |

## New Jersey Student Learning Standards for English Language Arts Companion Standards

**Standard: Science Key Ideas and Details**

| CPI # | Cumulative Progress Indicator (CPI) |
|---|---|
| RST.9-10.3. | Follow precisely a complex multistep procedure when carrying out experiments, taking |

| | |
|---|---|
| | measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.<br>Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. |
| **Standard: Science Craft and Structure** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.4. | Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9-10 texts and topics*. |
| **Standard: Science Integration of Knowledge and Ideas** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| RST.9-10.7. | Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. |
| **New Jersey Student Learning Standards for 21st Century Life and Careers** | |
| **Career Ready Practices** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| CRP2. | Apply appropriate academic and technical skills. |
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| CRP8 | Utilize critical thinking to make sense of problems and persevere in solving them. |
| CRP11 | Use technology to enhance productivity. |
| **New Jersey Student Learning Standards for Technology** | |
| **CPI #** | **Cumulative Progress Indicator (CPI)** |
| 8.1 | All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. |
| **Instructional Focus** | |
| **Unit Enduring Understandings** | |
| • Statisticians use surveys, experiments and observational studies to gather data.<br>• There are advantages and disadvantages to each data gathering technique.<br>• Choosing an inappropriate technique for gathering data can undermine the validity of your results. | |
| **Unit Essential Questions** | |
| • What are the differences between surveys, experiments and observational studies?<br>• How does a statistician decide whether a survey, experiment or observational study is appropriate?<br>• What are the ethics involved in performing experiments? | |

**Objectives**

**Students will know:**

- The definition and limitations of an observational study
- The definition and limitations of an experiment
- How to judge the validity of a survey

**Students will be able to:**

- 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.
- 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.
- Use data from a randomized experiment to compare two treatments;
- Use simulations to decide if differences between parameters are significant.

## Evidence of Learning

**Assessment**

Assessment plan may include teacher designed formative and summative assessments, a district common assessment, analysis of PSAT and NJSLA data.

**Competencies for 21st Century Learners**

| | | | |
|---|---|---|---|
| | Collaborative Team Member | | Effective Communicator |
| | Globally Aware, Active, & Responsible Student/Citizen | | Information Literate Researcher |
| | Innovative & Practical Problem Solver | | Self-Directed Learner |

## Resources

**Core Text:** Stats in Your World, Pearson, 2012

**Suggested Resources:**