# Unit 10 Data Analysis and Statistics (Chpt 9)

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 4**
Length: **2 weeks (if time permits)**
Status: **Published**

## Brief Summary of Unit

This unit introduces students to probability distributions, different methods for organizing and displaying data, and measures of central tendency. Samples, surveys, experiments and simulations will be used as methods to collect data. Students will study measures of variation to describe how data in a data set are spread out. They will consider samples and the relationship between sample size and margin of error.

**Revised Date:** June 2024

## Standards

Analyzing various sets of data will allow students to explore studies about people from different backgrounds. Statistical studies and analysis provides students an opportunity to read about historical statistics about people's cultures. Embracing the diversity within society incorporates the following:

Amistad Commission

This unit also reflects the goals of the Department of Education and the Amistad Commission including the infusion of the history of Africans and African-Americans into the curriculum in order to provide an accurate, complete, and inclusive history regarding the importance of of African-Americans to the growth and development of American society in a global context.

Asian American and Pacific Islander History Law

This unit includes instructional materials that highlight the history and contributions of Asian Americans and Pacific Islanders in accordance with the New Jersey Student Learning Standards in Social Studies.

New Jersey Diversity and Inclusion Law

In accordance with New Jersey’s Chapter 32 Diversity and Inclusion Law, this unit includes instructional materials that highlight and promote diversity, including:

economic diversity, equity, inclusion, tolerance, and belonging in connection with gender and sexual orientation, race and ethnicity, disabilities, and religious tolerance.

Commission on Holocaust Education

This unit further reflects the goals of the Holocaut Education mandate where students are able to identify and analyze applicable theories concerning human nature and behavior; understand that genocide is a consequence of prejudice and discrimination; understand that issues of moral dilemma and conscience have a profound impact on life; and understand the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

For Geometry topics:

Students will analyze geometric designs which connects to various cultures. Embracing the diversity within society incorporates the following:

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Generic: Diversity and Inclusion: Students will focus on equity, inclusion, and tolerance when analyzing the comparison of various quantities regarding characteristics of people. Equality will also be highlighted which can be associated with both numerical representations and the connection between people. This can be associated with treating people fairly and equally.

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| 1 | Developing Responsibility for Learning: Cultivating independence, self-reflection, and responsibility for one's own learning. |
| 3 | Valuing Evidence in Argumentation: Constructing viable claims and evaluating, defending, challenging, and qualifying the arguments of others. |
| 4 | Building Knowledge: Building strong content knowledge and connecting ideas across disciplines using a variety of text resources and media. |
| 5 | Leveraging Technology: Employing technology and digital media thoughtfully, strategically and capably to enhance reading, writing, speaking, listening, and language use. |
| S.ID.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. |
| 3.a | Identify complex, interdisciplinary, real-world problems that can be solved computationally. |
| 3.b | Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures. |
| S.IC.A.1 | Understand statistics as a process for making inferences about population parameters based on a random sample from that population. |
| S.IC.A.2 | Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. |
| S.IC.B.3 | Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. |
| S.IC.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. |
| S.IC.B.5 | Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. |
| S.IC.B.6 | Evaluate reports based on data (e.g., interrogate study design, data sources, randomization, the way the data are analyzed and displayed, inferences drawn and methods used; identify and explain misleading uses of data; recognize when arguments based on data are flawed). |
| S.CP.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"). |
| S.CP.A.2 | Understand that two events □ and □ are independent if the probability of □ and □ occurring together is the product of their probabilities, and use this characterization to determine if they are independent. |
| S.CP.A.3 | Understand the conditional probability of □ given □ as □(□ and □)/□(□), and interpret |

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| | independence of □ and □ as saying that the conditional probability of □ given □ is the same as the probability of □, and the conditional probability of □ given □ is the same as the probability of □. |
| S.CP.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. |
| 8.1.12.AP.1 | Design algorithms to solve computational problems using a combination of original and existing algorithms. |
| S.CP.B.6 | Find the conditional probability of □ given □ as the fraction of □'s outcomes that also belong to □, and interpret the answer in terms of the model. |
| S.CP.B.7 | Apply the Addition Rule, □(□ or □) = □(□) + □(□) – □(□ and □), and interpret the answer in terms of the model. |
| S.CP.B.9 | Use permutations and combinations to compute probabilities of compound events and solve problems. |
| | Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. |
| TEC.K-12.8.1 | All students will use computer applications to gather and organize information and to solve problems. |
| WORK.K-12.9.1 | All students will develop career awareness and planning, employability skills and foundational knowledge necessary for success in the workplace. |
| WORK.K-12.9.2 | All students will develop career awareness and planning, employability skills and foundational knowledge necessary for success in the workplace. |

## Essential Questions

- How do you decide which method to use when collecting data?
- How is probability used to make informed decisions about uncertain events?
- What does it mean to make an inference?  How can statistics help?

## Enduring Understandings

- Random phenomena are unpredictable in the short term, but show long run regularity.
- Statistical inference is a tool for validating a claim about a population parameter and judging the reliability of statistical relationships, typically on the basis of random sampling.
- The probability of an event is the proportion of times the event will occur over many trials.

## Students Will Know

- Students will know basic combinatorial principles.
- Students will know how to design and conduct an experiment.
- Students will know how to develop a margin of error through the use of simulation models for random sampling.
- Students will know how to estimate population parameters.

- Students will know how to find a sample space of an experiment.
- Students will know how to find the probability of either of two events: P(AorB) = P(A)+P(B)– P(A and B).
- Students will know how to randomly assign groups.
- Students will know how to use data from a randomized experiement to compare two treatments and evaluate reports based on data.
- Students will know how to use Venn Diagrams to display the sample space for an event.
- Students will know sampling methods (simple random, stratified, cluster).
- Students will know that distributions can be summarized in frequency tables and characterized by their shape, center, spread, and outliers.
- Students will know that probability = #successful outcomes / # total outcomes.
- Students will know that probability is the study of chance and random processes.
- Students will know that the probability of events occurring together P(B|A)= P(A and B)/ P(A ).
- Students will know the effects of taking large samples.
- Students will know the set notation of union and intersection.

## Students Will Be Skilled At

- Students will be skilled at calculating and interpreting probabilities and conditional probabilities.
- Students will be skilled at calculating probabilities of compoud events using the multiplication rule (and).
- Students will be skilled at calculating probabilities of compound events using the addition rule (or).
- Students will be skilled at constructing and interpreting two way frequency tables.
- Students will be skilled at designing experiments that are well planned, well designed, and well conducted.
- Students will be skilled at determing margins of error.
- Students will be skilled at determining methods of data collection.
- Students will be skilled at Identifing and calculating Sample Space.
- Students will be skilled at Identifing and calculating the probability of a simple event.
- Students will be skilled at identifing independent or mutually exclusive events.
- Students will be skilled at identifying differences in sampling methods.
- Students will be skilled at Interpreting and calculating conditional probabilites using formulas and tree diagrams.
- Students will be skilled at using permutations and combinations to compute the probability of compound events and solve real-world problems.

## Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, NJSLA test bank problems, and/or

Albert/AP Classroom assessments

- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Albert/AP Classroom and/or Big Ideas Math unit assessments
- Benchmark: IXL or teacher created diagnostic assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and differentiated learning tasks in Khan Academy, DeltaMath, and IXL

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

## Learning Plan

Unit 10 Probability and Statistics (Chapter 8 and 9, 3 weeks)

** As time permits**

- Basic theoretical/experimental probability (1 day)
- Independent/dependent rules (1 day)
- Mutually exclusive and overlapping rules (1 day)
- Deciding if a specified model is consistent with the results from a given data-generating process (½ day)
- Recognizing the purposes of and differences among sample surveys, experiments, and observational studies (½ day)
- Using the mean and standard deviation of a data set to fit to a normal distribution (1 day)
- Estimating population percentages (½ day)
- Recognizing when data sets are not appropriate for the use of a normal distribution (½ day)
- Using calculators spreadsheets (1 day)
- Tables to estimate areas under the normal curve (1 day)

## Materials

Core instructional materials:Core Book List including Big Ideas Math Algebra 2 2022

Supplemental materials: Khan Academy, Edia, and DeltaMath

- District approved textbook and ancillary materials
- Graphing Calculator
- Online materials such as Desmos, Delta Math, Edia, Ed Puzzle, Khan Academy
- Teacher created activiites
- Teacher created notes

## Suggested Strategies for Modification

Suggested Strategies for Modification for Algebra 2/Intro to Trig CP