10 Data Analysis and Probability

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **ongoing**
Status: **Published**

General Overview, Course Description or Course Philosophy

This unit will focus on strengthening the prerequisite skills and conceptual understanding needed to analyze data and calculate probability Lesson activities will reinforce new content and address common misconceptions and errors to support students' progress towards using data appropriately and displaying it in a meaningful way.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives/Enduring Understandings:

- Data Analysis allows us to make a decision or prediction based on the numbers in context
- Data are gathered, displayed, summarized, examined and interpreted to discover patterns and deviations from patterns.
- Probability assigns a numerical value for the likelihood of an event or events to occur.

Essential Questions:

- What does it mean when the standard deviation of a data set is zero?
- In what situations is it desirable to have a small or larger standard deviation?
- What types of data do not approximate well to a normal distribution?

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- There are different types of data sets
- The definition of dependent, independent and conditional probability

- The definitions of random sampling and sample space
- The definition of AND, OR, NOT
- There are rules of probability
- There is a limited validity of a sample population depending upon its size
- The definition of the margin of error

Procedural Knowledge

Students will be able to:

- Calculate the measure of central tendency with data (mean, mode median)
- Display information obtained from data with one variable
- Summarize, represent, and interpret data with one variable.
- Construct and interpret two way frequency charts
- Make inferences and justify conclusions from sample surveys, experiments and observational studies.
- Interpret data using understanding of independence and conditional probability
- Evaluate outcomes of decisions using probability
- Compute probabilities of compound events in a uniform probability model using the rules of probability
- Develop a margin of error through the use of simulation models for random sampling

CONTENT AREA STANDARDS

MA.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").
MA.S-CP.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.
MA.S-CP.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.
MA.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.
MA.S-CP.A.5	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
MA.S-CP.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.
MA.S-CP.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.
MA.S-CP.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.
MA.S-CP.B.9	Use permutations and combinations to compute probabilities of compound events and solve problems.
MA.S-IC.A.1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
MA.S-IC.A.2	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).
TECH.9.4.12.IML.4	Assess and critique the appropriateness and impact of existing data visualizations for an intended audience (e.g., S-ID.B.6b, HS-LS2-4).
TECH.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
TECH.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

EVIDENCE OF LEARNING

Formative Assessments

- Student feedback/questioning/observation
- Error analysis
- Specific skill assessment/questions
- Survey/polling
- Task completion and review of quizzes and material presented in the Algebra II class

Summative Assessments

There will be no formal assessments in this course.

RESOURCES (Instructional, Supplemental, Intervention Materials)

Desmos Activities:Review Measures of Center, Shape, center and spread of data, Two Way Frequency Table Practice, Probability set of 30 activities, Introduction to confidence intervals
DeltaMath Resources
Kuta Software worksheets,

Approved course textbook

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary connections are frequently addressed through modeling and application problems whereby students solve and analyze situations taken from business, physics, engineering, biology, statistics, geography, and numerous other fields. Examples can be found in topic specific textbook problems and digital resources.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.