Marietta City Schools

2024–2025 District Unit Planner

Advanced Algebra: Concepts & Connections

Unit title	Unit 1: Descriptive and Inferential Statistics	**Unit duration (hours)**	*27 hours*

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): ***What will students learn?***

GA DoE Standards

Standards

AA.DSR.2: Communicate descriptive and inferential statistics by collecting, critiquing, analyzing, and interpreting real-world data.

AA.DSR.2.1 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. Distinguish between primary and secondary data and how it affects the types of conclusions that can be drawn.

Strategies and Methods

- Students should be provided opportunities to collect data of their own design (primary) and/or use data that already exists (secondary).
- Students should be able to critique studies of different design types and explain how randomization relates to each style of investigation

Example

- Students might design and carry out a study with a recognition of error in the design of the study.
- Students might evaluate a research study and critique the investigative measures and/or conclusions drawn from the data.

AA.DSR.2.2 When collecting and considering data, critically evaluate ethics, privacy, potential bias, and confounding variables along with their implications for interpretation in answering a statistical investigative question. Implement strategies for organizing and preparing big data sets.

Fundamentals

- Students should be able to question how data were collected, rationale for the study, positionality of the researcher, subjectivity of human decision making, etc.
- Students should be able to recognize bias and describe its potential effects. They do not need to memorize definitions of types of bias.

Examples

- Students might be provided opportunities to search for data on the internet and prepare it by implementing strategies for dealing with messy data.
- Students might be provided opportunities to search for data on the internet and then provide a critical evaluation of the methods used to collect, organize and communicate that data to the public."

Terminology

- Messy data includes missing values, incorrect inputs, lack of representativeness, difficult formatting, etc.

AA.DSR.2.3 Distinguish between population distributions, sample data distributions, and sampling distributions. Use sample statistics to make inferences about population parameters based on a random sample from that population and to communicate conclusions using appropriate statistical language.

Fundamentals

• Students should recognize that it is most often not feasible to study an entire population distribution. Therefore, students should have opportunities to explore representative samples from the population to make inferences concerning the population.

• Students should demonstrate understanding of how sampling distributions developed through simulation are used to describe the sample-to-sample variability of sample statistics.

• Students should summarize results from statistical analyses using appropriate statistical justifications that indicate an understanding of the statistics.

Strategies and Methods

• Students should have many opportunities to communicate quantitative information using statistical language in oral, written, and graphical form to build data fluency.

AA.DSR.2.4 Calculate and interpret z-scores as a measure of relative standing and as a method of standardizing units.

Fundamentals

• Students should understand that z-scores are a statistical tool that allows someone to compare samples with differing units. Students should have opportunities to use z-scores to make decisions when analyzing real-world data.

• Students should understand that z-scores can be used with all distributions, regardless of shape.

• Students should use technology tools to calculate standard deviation when necessary to determine z-scores.

Example

• Students might compare performance on SAT versus ACT despite the different scoring scales by using z-scores.

AA.DSR.2.5 Given a normally distributed population, estimate percentages using the Empirical Rule, z-scores, and technology.

Fundamentals

• Students should understand that there are data sets for which such a procedure is not appropriate because it is not normally distributed.

Strategies and Methods

• Students should be encouraged to use tools such as calculators, spreadsheets, or tables to estimate areas under a normal curve.

AA.DSR.2.6 Model sample-to-sample variability in sampling distributions of a statistic using simulations taken from a given population.

Fundamentals

• Students should be able to use simulations to decide if a specified model accurately reflects real outcomes.

• Students should be able to consider the sample-to-sample variability by using statistics from repeated samples of the same size.

Example

• Students could involve a simulated sampling distribution for a sample mean or a sample population to decide if a specified model accurately reflects real outcomes.

AA.DSR.2.7 Given a margin of error, develop and compare confidence intervals of different models to make conclusions about reliability.

Fundamentals

• Students should be able to apply the margin of error to make conclusions about the reliability of statistical results.

• Students do not have to calculate the margin of error.

Strategies and Methods

• Students might be provided opportunities to develop confidence intervals using simulations and technology, such as statistical applets.

Examples

• Students might compare exit poll data with two different margins of error to determine if the results are conclusive.

• Students might explore questions such as: “In a favorability poll, if a politician has a 52% approval rating ±5 points, can they claim that most people approve?”

AA.DSR.2.8 Summarize and evaluate reports based on data for appropriateness of study design, analysis methods, and statistical measures used.

Fundamentals

• Students should be able to communicate statistical information using written and oral reports.

AA.MM.1: Apply mathematics to real-life situations; model real-life phenomena using mathematics.

AA.MM.1.1 Explain applicable, mathematical problems using a mathematical model.

Fundamentals

• Students should be provided with opportunities to learn mathematics in the context of culturally relevant problems.

• Mathematically applicable problems are problems presented in context where the context makes sense, realistically and mathematically, and allows for students to make decisions about how to solve the problem (i.e., model with mathematics).

AA.MM.1.3 Using abstract and quantitative reasoning, make decisions about information and data from a mathematical, applicable situation.

Fundamentals

• Students should be able to:

analyze functions, graphs, tables, and equations and make decisions about the real-life situations they describe based upon their understanding of mathematical functions.

analyze statistical results to decide the best course of action or approach to a problem.

Example

• Given a rectangle with length = (x – 2) and width = (2x + 3), a student could discover and articulate that the area = (x – 2)(2x + 3) = 2x2 – x – 6. From the student's understanding of parabolas, a student would know that the parabola that represents all possible areas of this rectangle opens upwards and that there is no maximum area possible for this rectangle.

AA.MM.1.4 Use various mathematical representations and structures to represent and solve real-life problems.

Fundamentals

• Students should be able to generate models, graphs, charts, and equations, to represent real-world phenomena in order to solve problems.

• Students should be provided opportunities to generate representations of real-world phenomena utilizing technology to show these phenomena and to solve problems.

Concepts/Skills to support mastery of standards

- Surveys and Studies
- Population and Sample Distributions
- The Normal Curve
- Empirical Rule
- Margin of Error and Confidence Intervals
- Sampling Methods
- Centers and Spread
- Conceptual understanding of standard deviation

Vocabulary

Z-score	Confidence Interval	Simulation	Descriptive Statistics	Error	Ethics
Experimental Study	Generalizable	Inferential Statistics	Potential Bias	Margin of Error	Sample
Normal Distribution	Observational Study	Percentile	Population	Population Distribution	
Primary Data	Privacy	Probability	Randomization	Reliability	

Sample Survey	Sample Data Distribution	Sampling Distribution	Sampling Variability	Secondary Data
Standard Deviation	Standard Unit	Trial	Validity	Variability

Notation

Standard deviation (σ)

Z score $Z = \frac{x - \mu}{\sigma}$

Margin of error: $z^* \sqrt{\frac{p(1-p)}{n}}$,

Essential Questions

- What is the purpose and difference among sample surveys, experiments, and observational studies?
- How does randomization relate to sample surveys, experiments, and observational studies?
- What factors lead to bias in contextual situations?
- What is the difference between population distributions and sampling distributions?
- What inferences can be made about population parameters based on a random sample?
- How can z scores be used to compare data?
- When is the empirical rule utilized?
- How can sample-to-sample variability be modeled?
- How do you compare confidence intervals using margin of error?
- What is the appropriate study design, analysis method, and statistical measure used when evaluating reports?

Assessment Tasks

Formative Assessment(s):

Unit Quiz/CFA

Summative Assessment(s):

Unit Test

Learning Experiences

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
AA.DSR.2.4 Calculate and interpret z-scores as a measure of relative standing and as a method of standardizing units. **AA.DSR.2.5** Given a normally distributed population, estimate percentages using the Empirical Rule, z-scores, and technology. **AA.MM.1.1** Explain applicable, mathematical problems using a mathematical model. **AA.MM.1.2** Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts. **AA.MM.1.3** Using abstract and quantitative reasoning, make decisions about information and data from a mathematically applicable situation. **AA.MM.1.4** Use various mathematical representations and structures to represent and solve real-life problems	**Normal Distributions** In this learning plan, students will analyze the standard normal curve to make sense of population distributions. Students will also learn how to use the empirical rule and z-scores to extrapolate from a sample to a population and use statistical methodologies to make predictions regarding the full population. **Learning Goals:** ● I can use the mean and standard deviation to fit data to a normal distribution ● I can use calculators or tables to estimate areas under the normal curve. ● I can interpret areas under a normal curve in context ● I can calculate and interpret z-scores. ● I understand z-scores as a measure of relative standing and as a method of standardizing units. ● I can determine the percentile a data point falls into. ● I can conduct a sampling operation to gather data about a population. ● I can develop statistical parameters of the data that was gathered. ● I can make predictions about the total population, based on the sample.	Students will be able to work at their own pace in collaborative groups where additional scaffolding is available as needed. Graphic organizers and visual supports are provided in Schoology Unit Resources.

Content Resources

Textbook Correlation: enVision A|G|A - Algebra 2

AA.DSR.2.1 - Lessons 11-2, Topic 11-Mathematical Modeling in 3 Acts
AA.DSR.2.2 - Lessons 11-2
AA.DSR.2.3 - N/A
AA.DSR.2.4 - Lesson 11-4
AA.DSR.2.5 - Lesson 11-4
AA.DSR.2.6 - Lessons 11-5, Topic 11-Mathematical Modeling in 3 Acts
AA.DSR.2.7 - Lesson 11-5
AA.DSR.2.8 - Lesson 11-6