

07 - Sampling and Statistics

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **2 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

Pre-Algebra 7A units were created and organized in line with the areas of focus as identified by the New Jersey Student Learning Standards. Each unit consists of standards that are considered major content along with standards that are supporting and/or additional content. The expectation is that students will have many opportunities to develop fluency with rational number arithmetic and solving multi-step problems (including those involving positive and negative rational numbers and word problems leading to one variable equations) throughout the school year. This course prepares students to take Algebra 1 in Grade 8 by addressing a combination of Grade 7 and Grade 8 standards in one school year.

In this unit, students will apply statistics concepts introduced in the Grade 6 and use what they learned in Grade 6 about data analysis to more deeply investigate distributions. Students will draw upon their knowledge of measures of center, measures of variation, and ratios to develop understanding about statistical sampling and making inferences and predictions. The focus is on the use of measures of center and spread to describe and compare samples and populations. Students will come to understand that taking multiple samples can help them gauge the variation in their predictions. Students build fluency in using ratio reasoning to make predictions about a population and in using the measures of center and variation to compare two sample distributions. They apply their understanding of the mean and mean absolute deviation to informally assess the degree of visual overlap between two distributions to infer how close the population means might be.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives:

- Pose questions, collect data, analyze data, and interpret data to answer questions
- Choose appropriate measures of center (mean, median, or mode) and spread (range, IQR, or MAD) to summarize a sample
- Choose appropriate representations to display distributions of samples
- Compare summary statistics of multiple samples drawn from either the same population or from two different populations and explain how the samples vary
- Use the randomly generated frequencies for events to draw conclusions
- Describe the benefits and drawbacks to various sampling plans
- Use random-sampling techniques to select representative samples
- Apply concepts from probability to select random samples from populations

- Explain how sample size influences the reliability of sample statistics and resulting conclusions and predictions
- Explain how different sampling plans influence the reliability of sample statistics and resulting conclusions and predictions
- Use statistics from representative samples to draw conclusions about populations
- Use measures of center, measures of spread, and data displays from more than one random sample to compare and draw conclusions about more than one population
- Use mean and MAD, or median and IQR, from random samples to assess whether the differences in the samples are due to natural variability or due to meaningful differences in the underlying populations

Essential Questions:

- What is the relationship between a sample and a population?
- How can you use a sample to gain information about a population?
- What real-life applications would involve finding the probability of an event?
- What is the purpose of a simulation?
- Why would one need to use a probability model?
- What influences our decision when choosing the best graph for a data set?

Enduring Understanding:

- A survey allows you to gather data using a sample of a population and use that data to represent the population.
- Tables and graphs, as well as measures of center and variability, enable you to compare data from different samples and draw conclusions about the samples and the populations.
- Random samples are without bias, and therefore are useful for drawing conclusions about population characteristics.
- Probability models allow you to select a random sample from a population. Random samples, even of the same size, vary from each other and from the underlying population.
- You can compare two samples with approximately the same measure of variability by using that measure to determine the distance between the centers of the samples.

CONTENT AREA STANDARDS

7.RP

A. Analyze proportional relationships and use them to solve real-world and mathematical problems

7.NS

A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational

numbers

7.EE

A. Use properties of operations to generate equivalent expressions

B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations

7.G

A. Draw, construct, and describe geometrical figures and describe the relationships between them

B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume

7.SP

A. Use random sampling to draw inferences about a population

B. Draw informal comparative inferences about two populations

C. Investigate chance processes and develop, use, & evaluate probability models

MA.7.SP.A.1	Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
MA.7.SP.A.2	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
MA.7.SP.B.3	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.
MA.7.SP.B.4	Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.

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

9.1.8.PB.5: Identify factors that affect one's goals, including peers, culture, location, and past experiences. •

9.1.8.PB.6: Construct a budget to save for short-term, long term, and charitable goals.

WRK.K-12.P.2	Attend to financial well-being.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will:

- Understand that statistics can be used to gain information about a population by examining a sample of the population.
- Understand that taking multiple samples can help gauge the variation in a prediction.

Procedural Knowledge

Students will be able to:

- Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
- Analyze samples and interpret data.
- Identify samples as biased or unbiased
- Determine whether inferences from samples are valid.
- Use ratio reasoning to make predictions based on data gathered using a valid sampling method.
- Use data from a random sample to draw comparative inferences about a population with an unknown characteristic of interest.
- Use measures of center for numerical data from random samples to draw informal comparative inferences about two populations.
- Use measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.
- Assess informally the degree of visual overlap of two numerical data distributions with similar variabilities.

EVIDENCE OF LEARNING

Benchmark Assessments

- BOY Diagnostic Snapshot Assessment
- MP1 Quarterly Assessment
- MP2 Quarterly Assessment
- MP3 Quarterly Assessment
- MP4 Quarterly Assessment
- EOY Diagnostic Snapshot Assessment

Alternate Assessments

- Portfolios
- Verbal Assessment (instead of written)
- Multiple choice
- Modified Rubrics
- Performance Based Assessments

Formative Assessments

- Delta Math Assignments
- Do Now Check ins
- Formative Assessments - exit tickets, student-friendly proficiency scales, skill checklists ([Google Drive Folder](#))

Summative Assessments

- Summative Assessment [Google Drive Folder](#)
- OnCourse Assessments
- Teacher created assessments (both test generator and teacher generated questions)

- Delta Math - Teacher generated assessments

RESOURCES (Instructional, Supplemental, Intervention Materials)

Instructional Materials:

- Reveal Math Accelerated - Sampling & Statistics (Module 10) ([Online link](#) - teacher and student resources)
- Resources for Unit 7 [Google Drive Folder](#)

Supplemental/Intervention Materials:

- Desmos - [Human Stopwatch](#), [What's My Number?](#), [Interpreting Box Plots](#)
- [Delta Math](#)
- [Khan Academy](#)
- [NCTM Illuminations](#)
- [Illustrative Math](#)
- [Illustrative Math Tasks](#)

INTERDISCIPLINARY CONNECTIONS

- Data collection/analysis
- Computations
- Statistics

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.