Data and Sampling

Content Area: **Math**
Course(s):
Time Period: **MP1**
Length: **45**
Status: **Published**

Unit Overview

Unit Summary	Unit Rationale
In this unit, students reinforce their understanding of a population, and extend the concept to include a subset of data, or a sample, that represents the population accurately. They learn what constitutes a random sample, and how random samples are often the best way to obtain representation. Students also understand that different representative samples from one population will not contain exactly the same individuals. Students understand that representative random samples can be used to make valid inferences about populations, if the samples are sufficiently large. They also understand that by taking the data from the sample (or the part) they can use proportional reasoning to say something about the population (whole). In this unit students understand that they can use data displays and measures of central tendency and variation for two random samples to make informal comparisons. They also understand that qualitative inferences are conclusions made from data while quantitative inferences come from statistical measures as the mean and median. Before students develop an understanding of probability and probability models or single and compound events they must first explore the ideas of likelihood, fairness, and the chance of an event occurring. Once this concept is gained, the concept of probability can be introduced. Being able to analyze the meaning of a probability value and its implications is a crucial step in reasoning with probability. In this unit students compile sample spaces of all possible outcomes of single and compound events by understanding the sample space. Having students make models to represent sample spaces allows them to gain an understanding of how the probabilities are determined. Understanding the	Unit 4b develops procedural skills and fluency related to the topics of data analysis, modeling, and probability. In this unit students also develop conceptual understanding related to these topics. Developing skills related to data and sampling allows students to analyze situations through a mathematical lense and draw informed conclusions based on that data.

meaning of the sample space gives students the background needed to reason in probability situations. Students also need to understand the difference between theoretical and experimental probability. Theoretical probability is the expected or calculated results of an experiment. It is the probability in the perfect simulation. Experimental probability is based on the actual results of an experiment and may not always match the theoretical probability. Students truly understand this when they can state that while the experimental probability may not match theoretical probability for any given trial, as the number of trials increases the experimental probability should approach the theoretical probability.	

NJSLS

7.RP.A.2.c	Represent proportional relationships by equations.
7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
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.
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.
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.
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.
7.SP.C.5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around ½ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
7.SP.C.6	Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.
7.SP.C.7.a	Develop a uniform probability model by assigning equal probability to all outcomes and

	use the model to determine probabilities of events.
7.SP.C.7.b	Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.
7.SP.C.8.a	Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
7.SP.C.8.b	Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.
7.SP.C.8.c	Design and use a simulation to generate frequencies for compound events.

Standards for Mathematical Practice

1	Make sense of problems and persevere in solving them
2	Reason abstractly and quantitatively
3	Construct viable arguments and critique the reasoning of others
4	Model with mathematics
5	Use appropriate tools strategically
6	Attend to precision
7	Look for and make use of structure
8	Look for and express regularity in repeated reasoning

Unit Focus

Enduring Understandings	Essential Questions
• Representative samples must reflect the entire population The best way to determine a representative sample is to make sure the sample is randomly chosen. • Data from random samples can be used to make valid inferences about a population by looking for patterns or trends in the distribution of the data, using measures of center and variation in the data, or by writing a population given the number of items in the entire population. • Data displays, such as box plots, can be used to make informal comparative influences about two populations. One can compare the shapes of the data displays or the measures of center and variability. • You can use dot plots to compare populations or measures of center and variability. You can use statistical measures, such as mean and MAD, to make inferences about populations. • Probability is the likelihood an event will	• How can you determine a representative sample of a population? • How can inferences be drawn about a population from data gathered from samples? • How can data displays be used to compare populations? • How can dot plots and statistical measures be used to compare populations? • What is probability? • How can the probability of an event help make predictions? • How is experimental probability similar to and different from theoretical probability? • How can a model be used to find the probability of an event? • How can all of the possible outcomes, or sample space, of a compound event be represented? • How can a model help find the probability of a compound event? • How can you use simulations to determine

occur. Probability can be described using a ratio such as 1 out of 2. The close the ratio is to 0 the less likely it is to occur. The closer the value is to 1 the more likely the event will occur. • Theoretical probability of an event is the number of favorable outcomes divided by the number of possible outcomes, when all outcomes are equally likely. • Theoretical probability is calculated based on an equation. Experimental probability consists of the results of an actual experiment. These probabilities are often very close, but are usually not identical. • A probability model can be used to evaluate a chance process and its outcomes to develop theoretical or experimental probability. The model has a sample space, a list of events, and the probability of each event. • The possible outcomes of a compound event (a combination of two or more events) can be represented using a tree diagram, a table, or an organized list. • A model, such as a table, organized list, or tree diagram can represent the sample space of a compound event. The sample space can be used to determine the probability of a favorable outcome.	the probability of events?

Instructional Focus

Learning Targets

Learners will...

- Distinguish between a population and a sample
- Establish whether a sample is representative of a population
- Generate random samples
- Make qualitative inferences from a sample data set
- Make quantitative inferences from a sample data set
- Make estimates about a population based on a sample data set, and assess whether the inferences are valid
- Use box plots to compare and make inferences about populations
- Use the median and IQR of datasets to informally compare and make inferences about two populations.
- Use the mode, range, mean, and mean absolute deviation (MAD) to compare populations
- Use probability to describe the likelihood that an event will occur
- Relate probability to mathematical fairness
- Understand theoretical probability and how it can be used
- Use theoretical probability to predict an outcome
- Compare theoretical and experimental probability
- Use experimental probability to make predictions
- Explain differences between theoretical and experimental probability
- Develop a probability model
- Use a probability model to evaluate a situation
- Use a probability model to make an estimate
- Use a tree diagram, a table, or an organized list to represent a sample space for a compound event
- Organize information about a compound event in a table, a tree diagram, or an organized list
- Find the probability of a compound event
- Use different tools to simulate a compound event

Prerequisite Skills

- Displaying one variable data using dot plots, histograms, and box plots
- Recalling mean, median, mode, and range and how to calculate each of them
- Recognize statistical questions
- Data is distributed by center (median and/or mean), spread or overall shape.

Common Misconceptions

- Vocabulary related to probability is frequently used in the “real-world” but not necessarily in the true mathematical meanings, for example probability and odds are often used interchangeably
- Students often confuse the vocabulary base, length, height, “B” (base area), when moving between 2- and 3- dimensional figures whatever face the prism is sitting on is the base of the figure
- Confuse the terms circumference and area with what they represent in a circle.

Spiraling For Mastery

Current Unit Content/Skills	Spiral Focus	Activity
• Scale Drawings • Draw Figures with Given Conditions • Angle Relationships • Word Problems Involving Circumference and Area of Circles • Cross Sections • World Problems Involving Surface Area and Volume	• Draw Geometric Figures (Grade 6) • Solve Problems Involving Area, Circumference, Surface Area, and Volume (Grade 6) • Percent and Proportional Relationships (Grade 7)	• Math Diagnostic and Intervention System Activities

Assessment

Formative Assessment	Summative Assessment
• Homework • Lesson Checks • MathXL • Quizzes • Exit Tickets • Lesson Reflections • Performance Tasks	• Topic Tests (Common Assessments) • Unit 4 Benchmark (Link-It)

Resources

Key Resources	Supplemental Resources
• Savvas EnVision Math 7 • Pacing Guide	• IXL • Delta Math • Desmos • Khan Academy

Career Readiness, Life Literacies, and Key Skills

9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
9.4.8.GCA.1	Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful visualizations.
9.4.8.IML.5	Analyze and interpret local or public data sets to summarize and effectively communicate the data.

Interdisciplinary Connections

L.KL.7.2.A	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases.
SL.PE.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
SL.PE.7.1.C	Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
SL.PE.7.1.D	Acknowledge new information expressed by others and, when warranted, modify their own views.
6-8.MS-ETS1-3.4	Analyzing and Interpreting Data
6-8.MS-ETS1-3.ETS1.B.1	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
6-8.MS-ETS1-3.ETS1.B.2	Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.