Data, Probability, and Geometry

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

Unit Overview

Unit Summary	Unit Rationale
In Unit 4A, learners are introduced to probability and statistics. Learners understand that the probability of a chance event is a number between 0 and 1, with larger numbers indicating greater likelihood and probabilities near 0 indicating an unlikely event. They collect data to approximate the probability of a chance event. Learners develop uniform and non-uniform probability models, use them to find probabilities, and compare probabilities from a model to observed frequencies. Learners represent sample spaces and find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. Learners understand that statistics can be used to gain information about a population by examining a sample of the population, and understand the role of random sampling in producing valid inferences. They use data from a random sample to draw inferences about a population and generate multiple samples to gauge the variation in predictions. Building on the work of grade 6, they use measures of center and measures of variability for data from random samples to make informal inferences and compare two populations.	Unit 4A, students will develop procedural skills and fluency related to the topic of probability. Developing skills related to data and sampling allows students to analyze situations through a mathematical sense and draw informed conclusions based on that data. The final part of the unit helps students relate proportional relationships to problems that can be solved using geometry. In this unit students also develop conceptual understanding related to using geometry to solve problems.

NJSLS

MATH.7.SP.A	Use random sampling to draw inferences about a population
MATH.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.
MATH.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.
MATH.7.SP.B	Draw informal comparative inferences about two populations
MATH.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.
MATH.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.
MATH.7.SP.C	Investigate chance processes and develop, use, & evaluate probability models
MATH.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.
MATH.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.
MATH.7.SP.C.7	Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
MATH.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.
MATH.7.SP.C.7.b	Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.
MATH.7.SP.C.8	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
MATH.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.
MATH.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.
MATH.7.SP.C.8.c	Design and use a simulation to generate frequencies for compound events.

Standards for Mathematical Practice

MATH.K-12.1	Make sense of problems and persevere in solving them
MATH.K-12.2	Reason abstractly and quantitatively
MATH.K-12.3	Construct viable arguments and critique the reasoning of others
MATH.K-12.4	Model with mathematics
MATH.K-12.5	Use appropriate tools strategically
MATH.K-12.6	Attend to precision
MATH.K-12.7	Look for and make use of structure
MATH.K-12.8	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 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 experimental probability of an outcome can be	● 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 the probability of events? ● How can you investigate chance processes and develop, use, and evaluate probability models? ● How do scale drawings and actual measurements represent proportional relationships? ● How can a shape that meets given requirements be drawn? ● How can you determine when it is possible to draw a triangle given certain conditions? ● How are angles formed by intersecting lines related? ● How is the circumference of a circle related to the length of its diameter? ● How can the area formula of a circle be used to solve problems? ● How do the faces of a three dimensional figure determine the two-dimensional shapes created by slicing the figure? ● How is finding the area of composite two-dimensional figures similar to finding the surface area of three-dimensional figures? ● How does the formula for volume of a prism help you understand what volume of a prism means? ● How can geometry be used to solve problems?

found by first assigning outcomes to devices such as spinners, coins, and number cubes. These can then be used to model the experimental probability of an event. ● Use a scale drawing to calculate measurements and reproduce proportional scale drawings. ● Understand that drawing a unique quadrilateral needs a combination of side lengths, angle measures, and side angle relationships. ● Understand how to construct triangles given conditions and determine whether it is a unique triangle, more than one triangle, or no triangle. ● The measure of angles that are formed by intersecting lines and rays can be determined when the relationships between different types of angles are known. ● The circumference and diameter of a circle, regardless of size, have a unique constant ratio that is an irrational number symbolized by ● The formula for the area of a circle, can be used to solve problems by substituting the known vales for area (A) and/or radius to solve for the unknown value. ● A cross section is a two-dimensional figure that is exposed when a three-dimensional figure is sliced by a plane. ● The surface area of a composite figure is the sum of the areas of its surfaces. The surface area of a 3-dimensional figure is the combined surface area of all of the faces of the figure. ● To find the volume of a prism, find the area of the base (B) and multiply it by its height.	

Instructional Focus

Learning Targets
● 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
● Model a real-world situation involving a compound even and predict its outcome using a simulation

● Use a scale drawing as a representation of actual lengths and area
● Sketch quadrilaterals with given conditions
● Name and classify quadrilaterals according to their properties

● Construct triangles with given conditions
● Conclude whether or not a triangle is formed and what type of triangle it is
● Calculate the measures of angles by using angle relationships
● Calculate the circumference, radius, or diameter of a circle
● Recognize the relationship between the circumference and the diameter of a circle and
● Find the area of a circle
● Use the area to find the radius and diameter
● Solve problems involving the area of a circle
● Describe cross sections of right rectangular prisms and pyramids
● Solve problems involving cross sections
● Find the surface area of two-dimensional composite shapes
● Find the surface area of three-dimensional composite shapes
● Calculate the volume of various three-dimensional figures
● Solve problems involving the volume of three-dimensional figures

Prerequisite Skills

☐Display, describe, and summarize numerical data.

☐Use equivalent ratios and unit rates to understand precents. Apply equivalent expressions to solve multi-step real-world problems by applying the order of operations.

☐Analyze statistical measures to make predictions.

☐Solve percent problems in real-world applications.

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.

Spiraling For Mastery

Current Unit Content/Skills	Spiral Focus	Activity
• Statistics • Probability • Centers of variability • Scale Drawings • Draw Figures with Given Conditions • Angle Relationships • Word Problems Involving Circumference and Area of Circles • World Problems Involving Surface Area and Volume	• Measure of Center (Grade 6) • Draw Geometric Figures (Grade 6) • Solve Problems Involving Area, Circumference, Surface Area, and Volume (Grade 6)	• 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 Accelerated Math 7 • Pacing Guide	• IXL • Delta Math • Desmos • Khan Academy

Career Readiness, Life Literacies, and Key Skills

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.

Interdisciplinary Connections

ELA.L.KL.7.2.A	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases.
ELA.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.
ELA.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.
ELA.SL.PE.7.1.D	Acknowledge new information expressed by others and, when warranted, modify their own views.
6-8.MS-ETS1-3.4.1	Analyze and interpret data to determine similarities and differences in findings.
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-ETS1-2.ETS1.B.1	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.