08 Probability and Modeling

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **2-3 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

NJSLS Geometry Overview

While modeling and probability problems should be integrated throughout the course and not reserved for this final unit, this unit can serve as a culmination and review of the critical content of the year and numerous problem solving applications. This unit also serves as an extension to the previous unit as many of applications are based in areas and volume figures including, but not limited to, similar figures.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives:

- Apply concepts of density based on area and volume in modeling situations
- Apply geometric methods to solve design problems
- Use geometric shapes, their measures, and their properties to describe objects
- Analyze area and volume relationships to determine the probability of an event

Essential Questions:

- How are critical ideas from Geometry used to model and solve problems?
- How is Geometry useful in analyzing the probability of an event?

Enduring Understandings:

- Geometric concepts provide powerful tools to model and solve real life situations.
- relationships among area and volume are useful in determining or analyzing the probability of an event.

CONTENT AREA STANDARDS

S.IC

A. Understand and evaluate random processes underlying statistical experiments

B. Make inferences and justify conclusions from sample surveys, experiments, and observational studies

S.CP

A. Understand independence and conditional probability and use them to interpret data

B. Use the rules of probability to compute probabilities of compound events in a uniform probability model

S.MD

A. Calculate expected values and use them to solve problems

B. Use probability to evaluate outcomes of decisions

MA.G-GMD.A.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
MA.G-MG.A.1	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
MA.G-MG.A.2	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
MA.G-MG.A.3	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

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

LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.RH.9-10.4	Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history and the social sciences; analyze the cumulative impact of specific word choices on meaning and tone.
LA.RH.9-10.7	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text, to analyze information presented via different mediums.
LA.RST.9-10.2	Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
LA.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LA.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

LA.RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
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.
WRK.K-12.P.4	Demonstrate creativity and innovation.
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:

- Geometric properties can be used to solve modeling and probability problems

Procedural Knowledge

Students will be able to:

- Apply concepts of density based on area and volume in modeling situations.(★) *Analysis*
- Apply geometric methods to solve design problems.(★) *Analysis*
- Use geometric shapes, their measures, and their properties to describe objects.(★) *Comprehension*

EVIDENCE OF LEARNING

Benchmark Assessments

Benchmark Assessments conducted three times per year, using Pear Assessment (Standards Based

Assessments)

Alternate Assessments

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

Formative Assessments

- Student feedback/questioning/observation
- Exit Ticket
- Error analysis
- Specific skill assessment/questions
- Survey/polling
- Reflection questions
- Scored/evaluated class work or homework
- Task completion

Summative Assessments

Lesson Quizzes
Unit Test or Project
Performance Tasks

RESOURCES (Instructional, Supplemental, Intervention Materials)

Core Instructional Materials

Envisions Geometry

Kuta Software

Supplemental Materials

NJ DOE Model Curriculum unit: Extending to Three Dimensions (contains probability and modeling content)

Illustrative Mathematics unit: Conditional Probability

Khan Academy lessons:

- Solving modeling problems with similar & congruent triangles
- Modeling with right triangles

NJCTL unit: Probability

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.