# Unit 4 - Statistics and Measurement Geometry

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

## Unit Overview

In this unit, students will continue to work on the following concepts: square roots, cube roots, and integer exponents. They will use these concepts in order to explain a proof of the Pythagorean Theorem and its converse, problem solving with the Pythagorean Theorem, and using the Pythagorean Theorem to determine the distance between two points in the coordinate plane. Students will also be able to solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

## Enduring Understandings

Calculating square roots of perfect squares and identifying them as rational.
Estimating square roots of non-perfect squares and identifying them as irrational.
The Pythagorean Theorem is a formula that can determine a missing side of a right triangle if the other two side measurements are known.
Volume formulas calculate the amount of space enclosed by three-dimensional figures, and can be applied to many real life situations.

## Essential Questions

How do square/cube roots relate to rational and irrational numbers?
Where and when can the Pythagorean Theorem be applied?
Why is it important to know and be able to apply formulas for the volume of a cone, cylinder, and sphere?

## Learning Objectives

Be able to evaluate square roots and cubic roots of small perfect squares and cubes respectively and use square and cube root symbols to represent solutions to equations.
Be able to identify $\sqrt{2}$ as irrational.
Be able to explain a proof of the Pythagorean Theorem and its converse.
Be able to utilize the Pythagorean Theorem to determine unknown side lengths of right triangles.
Be able to use the Pythagorean Theorem to determine the distance between two points in the coordinate plane.
Be able to identify and apply the appropriate formula for the volume of a cone, a cylinder, or a sphere to solve real-world and mathematical problems.
Career Exploration – Explore the course catalog of the local high schools, specifically examining the courses in math and possible careers requiring upper levels of math.
Explain a proof of the Pythagorean Theorem and its converse.

Utilize the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensions to solve real-world and mathematical problems.
Use the Pythagorean Theorem to determine the distance between two points in the coordinate plane.
Using a linear equation to model real life problems then solve it by interpreting the meaning of the slope and the intercept.
Construct and interpret scatter plots for bivariate measurement data and identify and interpret data patterns (clustering, outliers, positive or negative association, possible lines of best fit, and nonlinear association).
Construct frequency/relative frequency tables to analyze and describe possible associations between two variables.
Distinguish between valid and invalid samples from a population by determining if the sample is representative of the subgroups within the population
Use random sampling to produce a representative sample, develop valid inferences about a population with an unknown characteristic of interest, and compare the variation in estimates using multiple samples of the same and different size.
Visually and numerically compare the means and variations of two distinct populations (such as the mean height of different sports teams) to draw informal comparative inferences about measures of center and variability using graphical representations and statistical calculations.
Interpret and express the likelihood of a chance event as a number between 0 and 1, relating that the probability of an unlikely event happening is near 0, a likely event is near 1, and 1/2 is neither likely nor unlikely.
Conduct experimental probability events that are both uniform (rolling a number cube multiple times) and non-uniform (tossing a paper cup to see if it lands up or down) to collect and analyze data to make predictions for the approximate relative frequency of chance events.
Develop uniform and non-uniform theoretical probability models by listing the probabilities of all possible outcomes in an event, for instance, the probability of the number cube landing on each number being 1/6. Then, conduct an experiment of the event using frequencies to determine the probabilities of each outcome and use the results to explain possible sources of discrepancies in theoretical and experimental probabilities.
Design a simulation of a compound probability event and determine the sample space using organized lists, tables, and tree diagrams, calculate the fractional probabilities for each outcome in the sample space, and conduct the simulation using the data collected to determine the frequencies of the outcomes in the sample space.

## Standards: Content

| | |
|---|---|
| MATH.8.G.B | Understand and apply the Pythagorean Theorem |
| MATH.8.G.B.6 | Explain a proof of the Pythagorean Theorem and its converse. |
| MATH.8.G.B.7 | Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. |
| MATH.8.G.B.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. |
| MATH.8.G.C | Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres |
| MATH.8.G.C.9 | Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. |
| MATH.8.SP.A | Investigate patterns of association in bivariate data |
| MATH.8.SP.A.1 | Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, |

| | |
|---|---|
| | outliers, positive or negative association, linear association, and nonlinear association. |
| MATH.8.SP.A.2 | Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g., line of best fit) by judging the closeness of the data points to the line. |
| MATH.8.SP.A.3 | Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. |
| MATH.8.SP.A.4 | Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. |

## Standards: Interdisciplinary

| | |
|---|---|
| PFL.9.1.8.CDM.4 | Evaluate the application process for different types of loans (e.g., credit card, mortgage, student loans). |
| PFL.9.1.8.CP.1 | Compare prices for the same goods or services. |
| CS.6-8.8.1.8.AP.1 | Design and illustrate algorithms that solve complex problems using flowcharts and/or pseudocode. |
| CS.6-8.8.1.8.AP.2 | Create clearly named variables that represent different data types and perform operations on their values. |
| CS.6-8.8.1.8.DA.1 | Organize and transform data collected using computational tools to make it usable for a specific purpose. |
| CS.6-8.8.1.8.DA.4 | Transform data to remove errors and improve the accuracy of the data for analysis. |
| CS.6-8.8.1.8.DA.5 | Test, analyze, and refine computational models. |

## Assessment Evidence

| | |
|---|---|
| Formative | Collaborative Activities, Homework, Classwork, Discussion, Independent Class Assignment, Informal Observations of Students, Games, Exit Slips, Pre-Assessments, Math Message – Warm up, Questioning, Teacher Made Pages, Learning Centers, LinkIt, Problem of the Day, Problem of the Week, Entrance Slips, Pre-Assessments |
| Summative | LinkIt Benchmark Assessments, Tests, Pre-Assessments, Quizzes, Written Responses |
| Alternative & Benchmark | Alternative – Reteaching, One on One Conferencing, Learning Centers, Levels Homework, Higher Order Thinking Problems, Additional leveled practice<br>Benchmark - LinkIt Benchmark Assessments, Totowa TPA |
| Assessment Evidence Resource | |

## Instructional Resources

Smartboard, Computers, iPads, websites and digital interactives/models, multi-media presentations, video streaming, Brain Pop, Microsoft 365, Primary and Secondary Source Documents, Assorted Manipulatives, Khan Academy, Crosswalk Coach for the Common Core Standards, Ready Common Core Mathematics Instruction and Practice, Common Core Coach, Calculators, Reveal Math Resources.

Instructional Resource List

## Curricular Mandates

*Below are the curricular requirements as defined in NJ Administrative Code and Statute*

| | | | |
|---|---|---|---|
| | Amistad | | Diversity, Equity, and Inclusion |
| | Holocaust | | LGBT and Disabilities (Grades 6-12) |
| | Climate Change | | Asian American & Pacific Islander |

## Social Emotional Learning (SEL) Competencies

*NJ Social and Emotional Learning Competencies & Sub-Competencies*

| | | | |
|---|---|---|---|
| | Self-Awareness | X | Relationship Skills |
| X | Responsible Decision-Making | | Social Awareness |
| X | Self-Management | | |

## 21st Century Skills & Themes

| | | | | | |
|---|---|---|---|---|---|
| | Global and Cultural Awareness | X | Technology Literacy | | Planning and Budgeting |
| X | Creativity and Innovation | | Financial Institutions | | Risk Management and Insurance |
| X | Information and Media Literacy | | Digital Citizenship | | Economic and Government Influences |
| | Critical Thinking and Problem Solving | | Credit Profile | | Career Awareness and Planning |

| | | | | | |
|---|---|---|---|---|---|
| | Civic Financial Responsibility | | Financial Psychology | | |