Data and Volume

Content Area: **Math**
Course(s): **Math Grade 8**
Time Period: **MP4**
Length: **45**
Status: **Published**

Unit Overview

Unit Summary	Unit Rationale
Unit 4 allows students to explore the idea that two sets of data may show a relationship to each other. Students create scatter plots for numerous sets of paired measurement data and examine the plots for evidence of association. Students categorize the associations between the paired data as positive, negative, linear, nonlinear, or no association at all. Students will then extend the examination of bivariate data that show a linear association. Students sketch and find equations for trend lines and use these lines as models to make predictions for the data. Students will also work with paired sets of categorical data, using frequency tables to compare two sets of data. Students use the two-way frequency and two-way relative frequency tables to make evidence based conjectures about the data. In this unit students will also understand that volume is a measure of capacity. They relate volumes of cones, cylinders, and spheres to the volume of three-dimensional figures they know. They use these relationships to generalize volume formulas for cones, cylinders, and spheres.	Unit 4 allows students to develop procedural skills and fluency related to the topic of bivariate data and volume. In this unit students also develop conceptual understanding related to these topics. The ability to analyze data and recognize patterns and trends is a vital component of being able to make informed decisions.

NJSLS

8.F.A.3	Interpret the equation □ = □□ + □ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
8.F.B.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (□, □) values, including reading these from a table or from a graph. Interpret the rate

	of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
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.
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.
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.
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.
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 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
• A scatter plot is a graph on a coordinate plane that uses points to show the relationship between paired data. These points visually display any clusters, gaps, or outliers. • A trend line on a scatter plot approximates the linear association between the paired data. Scatter plots can show a linear or nonlinear association or no association. • Trend lines in linear models can help with making predictions about a set of data. By determining the equation of a linear model, predictions of an outcome can be made. • Data can be displayed in a two-way	• How does a scatter plot show the relationship between paired data? • How can you describe the association of two data sets? • How do linear models help you to make a prediction? • How does a two-way frequency table show the relationship between sets of ordered pairs? • What is the advantage of a two-way relative frequency table for showing relationships between sets of paired data?

frequency table, making it easier to analyze. Individual data categories can be compared to all the data. Individual data can also be compared to sub-categories to make evidence-based conjectures. • Data can be organized in a two-way frequency table and then used to create a two-way relative frequency table. Relative frequency can be determined for the rows and columns as well as for the whole table. • Finding the volume of a cylinder is an extension of finding the volume of a rectangular prism. The volume of a rectangular prism is the product of the area of its base and its height. Similarly, the volume of a cylinder is equal to the product of the area of its circular base and its height. • The volume of a cone is 1/3 the volume of a cylinder given that the bases have the same radius and the heights are the same. The formula for the volume of a cone is V = 1/3Bh, where B is the area of its circular base and h is the height of the cone. • The volumes of a sphere and cone are proportionally related. The volume of a sphere is twice the volume of a cone that has the same circular base and height. The formula for the volume of a sphere is V= $4/3\pi r^3$	

Instructional Focus

Learning Targets
• Construct a scatter plot graph to model paired data • Utilize a scatter plot to identify and interpret the relationship between paired data • Recognize whether the paired data has a linear association, or no association • Draw a trend line to determine whether a linear association is positive or negative and strong or weak • Use the slope and y-intercept of a trend line to make a prediction • Make a prediction when no equation is given by drawing trend lines and writing the equation of the linear model • Organize paired categorical data into a two-way frequency table • Compare and make conjectures about data displayed in a two-way frequency table

- Construct two-way frequency tables and two-way relative frequency tables
- Compare and make conjectures about data displayed in a two-way relative frequency table
- Recognize the relationship between the volume of a rectangular prism and the volume of a cylinder.
- Solve real-world problems involving the volume of a cylinder.
- Use the formula for the volume of a cylinder to find an unknown measure.
- Recognize the relationship between the volume of a cylinder and the volume of a cone
- Use the Pythagorean Theorem when solving volume problems.
- Find the volume of a cone. Given the circumference of the base, find the volume of a cone
- Recognize the relationship between the volume of a cone and the volume of a sphere.
- Find the volume of a sphere. Given the surface area, find the volume of a sphere.
- Find the volume of a composite figure.

Prerequisite Skills

- Graphing
- Solving equations in one variable
- Evaluating equations and expressions using substitution
- Making inferences from bi-variate data
- Collecting and displaying data
- Properties of right triangles
- Solving problems using equations

Common Misconceptions

- Students believe that volume is a number that results from substituting other numbers into a formula rather than a measure related to the amount of space occupied.
- Students often mislabel graphs and mis-identify types of statistical displays
- Students confuse surface area and volume
- Students confuse shapes, especially those in three dimensions

Spiraling For Mastery

Current Unit Content/Skills	Spiral Focus	Activity
• Paired Data • Linear Associations and Models • Frequency Tables • Volume of Cones, Cylinders, and Spheres	• Collecting and Displaying Data (Grade7) • Making Inferences from Data (Grade 7) • Linear Equations (Grade 8) • 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 • Unit 4 Benchmark (Link-It)

Resources

Key Resources	Supplemental Resources
• Savvas EnVision Grade 8 • Pacing Guide	• IXL • Delta Math • Desmos • Khan Academy • Manuevering the Middle

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.2	Identify specific examples of distortion, exaggeration, or misrepresentation of information.
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.8.2	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
L.KL.8.2.A	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases.
L.VL.8.3	Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, including technical meanings, choosing flexibly from a range of strategies.
SL.PE.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
SL.PE.8.1.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.8.1.B	Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
SL.PE.8.1.C	Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
SL.PE.8.1.D	Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
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-ETS1-3.ETS1.B.2	Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.