Grade 8 – Mathematics Standards and Guidance

8.NS - Numeric Reasoning: Number Systems

CLUSTER: 8.NS.A - Know that there are numbers that are not rational, and approximate them by rational numbers.

STANDARD: 8.NS.A.1

Standards Statement (JUNE 2021):

Know that real numbers that are not rational are called irrational.

DRAFT Standards Guidance (JUNE 2021):

Terminology

- Rational numbers are numbers that can be represented by a ratio a/b where "a" is an integer, and "b" is a non-zero whole number (e.g. natural number set).
- Rational numbers have decimal expansions that terminate in zeros or eventually repeat.
- Irrational numbers cannot be represented by a ration a/b and would include non-terminating, non- repeating decimals.

Content Boundaries

- This specific example is limited to the tenths place; however, the concept for this grade level extends to the hundredths place.

Teaching Strategies

- Students should be provided with experiences to use numerical reasoning when describing decimal expansions.
- Students should be able to classify real numbers as rational or irrational.
- Students should know that when a square root of a positive integer is not an integer, then it is irrational.
- Students should use prior knowledge about converting fractions to decimals learned in 6th and 7th grade to connect changing decimal expansion of a repeating decimal into a fraction and a fraction into a repeating decimal.
- Emphasis is placed on how all rational numbers can be written as an equivalent decimal. The end behavior of the decimal determines the classification of the number.

Example

- Understand that every number has a decimal expansion.
- For rational numbers show that the decimal expansion terminates or repeats eventually.
- Convert a decimal expansion which terminates or repeats eventually into a rational number expressed as a fraction.

STANDARD: 8.NS.A.2

Standards Statement (JUNE 2021):

Use rational approximations of irrational numbers to compare size and locate on a number line.

DRAFT Standards Guidance (JUNE 2021):

Teaching Strategies

- Students should use visual models and numerical reasoning to approximate irrational numbers.

Boundaries

- Locate them approximate location of irrational numbers on a number line diagram, and estimate the value of expressions.

Example

- Compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of square roots. For example,
    - Start with locating the nearest perfect squares and obtain closer and closer successive decimal approximations.
- Using successive approximations, estimate the decimal expansion of √17 , such as by showing that √17 is between 4 and 5, then closer to 4 (between 4.0 and 4.5) on a number line.
- Estimate the value of √2.
    - By truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

8.AEE - Algebraic Reasoning: Expressions and Equations

CLUSTER: 8.AEE.A - Expressions and Equations Work with radicals and integer exponents.

STANDARD: 8.AEE.A.1

Standards Statement (JUNE 2021):

Apply the properties of integer exponents using powers of 10 to generate equivalent numerical expressions.

DRAFT Standards Guidance (JUNE 2021):

Teaching Strategies

- Students should use numerical reasoning to identify patterns associated with properties of integer exponents.
- The following properties should be addressed: product rule, quotient rule, power rule, power of product rule, power of a quotient rule, zero exponent rule, and negative exponent rule.

Example

- Generate equivalent numerical expressions. For example, 10^2 × 10^(–5) = 10^(–3) = 1/(10^3) = 1/1000.
- $3^2 \times 3^{-5} = 3^{-3} = 1/(3^3) = 1/27$

STANDARD: 8.AEE.A.2

Standards Statement (JUNE 2021):

Represent solutions to equations using square root and cube root symbols.

DRAFT Standards Guidance (JUNE 2021):

Clarifications

- Equations should include rational numbers such as x2 = 14.

Boundaries

- Use square root and cube root symbols to represent solutions to equations of the form $x^2=p$ and $x^3=p$, where p is a positive rational number.
- Evaluate square roots of small perfect squares up to 225 and cube roots of small perfect cubes up to 1000.
- Know irrational numbers include square roots of non-perfect squares, such as √2, and cube roots of non-perfect cubes.

Teaching Strategies

- Students should be able to find patterns within the list of square numbers and then with cube numbers.
- Students should be able to recognize that squaring a number and taking the square root of a number are inverse operations; likewise, cubing a number and taking the cube root are inverse operations.

Example

- $\sqrt{64} = \left(\sqrt{8}\right)^2 = 8$ and $\sqrt[3]{125} = 5$
    - Since $\sqrt{p}$ is defined to mean the positive solution to the equation $x^2 = p$ (when it exists). It is not mathematically correct to say √64 = ±8 (as is a common misconception).
    - In describing the solutions to $x^2 = 64$, students should write x = ± √64 = ±8.

STANDARD: 8.AEE.A.3

Standards Statement (JUNE 2021):

Estimate very large or very small quantities using scientific notation with a single digit times an integer power of ten.

DRAFT Standards Guidance (JUNE 2021):

Clarifications

- Students should use place value reasoning which supports the understanding of digits shifting to the left or right when multiplied by a power of 10.
- Product and quotient rules for powers is relevant at 8th grade, and only for powers of 10

Teaching Strategies

- Students should use the magnitude of quantities to compare numbers written in scientific notation to determine how many times larger (or smaller) one number written in scientific notation is than another.
- Students should have opportunities to compare numbers written in scientific notation in contextual problems.

Example

- Compare two quantities written in this format. For example, estimate the population of the United States as 3 × 10^8 and the population of the world as 7 × 10^9, and determine that the world population is more than 20 times larger.
- Estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109 and determine that the world population is more than 20 times larger.

STANDARD: 8.AEE.A.4

Standards Statement (JUNE 2021):

Perform operations with numbers expressed in scientific notation.

DRAFT Standards Guidance (JUNE 2021):

Clarifications

- Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.
- Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.
- Interpret scientific notation that has been generated by technology.

Teaching Strategies

- Students should use place value reasoning which supports the understanding of digits shifting to the left or right when multiplied by a power of 10.
- Students combine knowledge of integer exponent rules and scientific notation to perform operations with numbers expressed in scientific notation.
- Students should solve problems involving real-life contexts.

Examples

- Include authentic contexts where both standard and scientific notation are used. Use scientific notation to choose units of appropriate size for measurements of very large or very small quantities.
- Use millimeters per year for seafloor spreading.
- Interpret scientific notation that has been generated by technology such as 1.2E6.

CLUSTER: 8.AEE.B - Understand the connections between proportional relationships, lines, and linear equations.

STANDARD: 8.AEE.B.5

Standards Statement (JUNE 2021):

Graph proportional relationships in authentic contexts. Interpret the unit rate as the slope of the graph, and compare two different proportional relationships represented in different ways.

DRAFT Standards Guidance (JUNE 2021):

Terminology

- Various forms of linear functions include standard and slope-intercept forms.
- Key features include rate of change (slope), intercepts, strictly increasing or strictly decreasing, positive, negative, and end behavior.

Teaching Strategies

- Use verbal descriptions, tables and graphs created by hand and/or using technology.

Examples

- Interpret the unit rate as the slope of the graph. Compare one or more proportional relationships represented in different ways.
- For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

STANDARD: 8.AEE.B.6

Standards Statement (JUNE 2021):

Write the equation for a line in slope intercept form y = mx + b, where m and b are rational numbers, and explain in context why the slope m is the same between any two distinct points.

DRAFT Standards Guidance (JUNE 2021):

Clarification

- Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane
- Derive the equation $y=mx$ for a line through the origin and the equation $y=mx+b$ for a line intercepting the vertical axis at b.

Terminology

- Forms of linear equations: standard and slope-intercept forms.

Teaching Strategies

- Students should be able to rewrite linear equations written in different forms depending on the given context.

Examples

- Know that the slope m is the same between any two distinct points on a non-vertical line and be able to explain or demonstrate why.
- Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.

CLUSTER: 8.AEE.C - Analyze and solve linear equations and pairs of simultaneous linear equations.

STANDARD: 8.AEE.C.7

Standards Statement (JUNE 2021):

Solve linear equations with one variable including equations with rational number coefficients, with the variable on both sides, or whose solutions require using the distributive property and/or combining like terms.

DRAFT Standards Guidance (JUNE 2021):

Clarifications

- To achieve fluency, students should be able to choose flexibly among methods and strategies to solve mathematical problems accurately and efficiently.
- Students should rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations. Interpret and explain the results.

Terminology

- Parts of an expression include terms, factors, coefficients, and operations.

Boundaries

- This standard also includes solving or giving examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions.
- Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Teaching Strategies

- Students should use algebraic reasoning in their descriptions of the solutions to linear equations.
- Building upon skills from grade 7, students combine like terms on the same side of the equal sign and use the distributive property to simplify the equation when solving. Emphasis in this standard is also on using rational coefficients. Solutions of certain equations may elicit infinitely many or no solutions.Include linear equations and inequalities with rational number coefficients and whose solutions require expanding expressions using the distributive property and collecting like terms.
- Students should use algebraic reasoning to solve linear equations and inequalities in one variable.

Connections

- Problems should be practical and contextual providing a purpose for analyzing equivalent forms of an expression.
- Rewrite a function expressed in standard form to slope-intercept form to make sense of a contextual situation.

Example

- Find the radius given the formula $V=\pi r^2 h$ by rearranging the equation to solve for the radius, r.
- Given $ax + 3 = 7$, solve for x.

STANDARD: 8.AEE.C.8

Standards Statement (JUNE 2021):

Find, analyze, and interpret solutions to pairs of simultaneous linear equations using graphs or tables.

DRAFT Standards Guidance (JUNE 2021):

Clarification

- Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs.
- Estimate solutions by graphing the equations; solve simple cases by inspection, or by using tables.

Connections

- Students should be provided with opportunities to explore systems of equations represented on using technology such as interactive graphs to analyze and interpret the solutions to the systems.
- Students should have the opportunity to explore visual graphs of equations that are parallel, perpendicular or neither parallel nor perpendicular to develop a deep, conceptual understanding.

Teaching Strategies

- Include mathematical problems in authentic contexts leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.
- Students should be able to analyze and solutions to systems of equations presented numerically, algebraically, and graphically.

Example

- Given coordinates for two pairs of points, a student can determine whether the line through the first pair of points intersects the line through the second pair.
- A student can graph two linear equations that represent a culturally relevant problem using digital graphing tools (e.g., Desmos, graphing calculators, or other) and visually make sense of the graphed lines in context. A student can provide a verbal or written explanation of their reasoning.
- A student can recognize that there is no solution to the system of equations formed by $3x + 2y = 5$ and $3x + 2y = 6$ because the lines are parallel and $3x + 2y$ cannot simultaneously be 5 and 6.
- A trampoline park that you frequently go to is $9 per visit. You have the option to purchase a monthly membership for $40 and then pay $4 for each visit. Explain whether you will buy the membership, and why.
    - Option A: y=$9x
    - Option B: y= $30 + $4x
        - Anya is traveling from out of town. This is the only time she will visit this trampoline park. Which option should she choose?
        - Jin plans on going to the trampoline park seven times this month. Which option should he choose?
- What does the point of intersection of the graphs represent?

8.AFN - Algebraic Reasoning: Functions

CLUSTER: 8.AFN.A - Define, evaluate, and compare functions.

STANDARD: 8.AFN.A.1

Standards Statement (JUNE 2021):

Understand in authentic contexts, that the graph of a function is the set of ordered pairs consisting of an input and a corresponding output.

DRAFT Standards Guidance (JUNE 2021):

Clarification

- Understanding that a function is a rule that assigns exactly one output to each input.

Boundaries

- Use of function notation is not required in Grade 8.

Teaching Strategies

- Students should be able to use algebraic reasoning when formulating an explanation or justification regarding whether or not a relationship is a function or not a function.
- Describe the graph of a function as the set of ordered pairs consisting of an input and the corresponding output.

Example

- If a function gives the number of hours it takes a person to assemble n engines in a factory, then the set of positive integers would be an appropriate domain for the function.

STANDARD: 8.AFN.A.2

Standards Statement (JUNE 2021):

Compare the properties of two functions represented algebraically, graphically, numerically in tables, or verbally by description.

DRAFT Standards Guidance (JUNE 2021):

Teaching Strategies

- Students should justify their own steps, or if given two or more steps of an equation, explain the progression from one step to the next using properties.

Example

- Given a linear function represented by a table of values and a linear function represented by an algebraic equation, determine which function has the greater rate of change.

STANDARD: 8.AFN.A.3

Standards Statement (JUNE 2021):

Understand and identify linear functions, whose graph is a straight line, and identify examples of functions that are not linear.

DRAFT Standards Guidance (JUNE 2021):

Clarifications

- Students should be given opportunities to explore how an equation in the form y = mx + b is a translation of the equation y = mx.
- In Grade 7, students had multiple opportunities to build a conceptual understanding of slope as they made connections to unit rate and analyzed the constant of proportionality for proportional relationships.
- Students should be given opportunities to explore and generalize that two lines with the same slope but different intercepts, are also translations of each other.
- Students should be encouraged to attend to precision when discussing and defining b (i.e., b is not the intercept; rather, b is the y-coordinate of the y- intercept). Students must understand that the x- coordinate of the y-intercept is always 0.

Teaching Strategies

- Students should be given the opportunity to explore and discover the effects on a graph as the value of the slope and y-intercept changes using technology.
- Students should be able to model contextual situations using graphs and interpret graphs based the contextual situations.
- Students should model functions that are nonlinear and explain, using precise mathematical language, how to tell the difference between linear (functions that graph into a straight line) and nonlinear functions (functions that do not graph into a straight line).
- Students should analyze a graph by determining whether the function is increasing or decreasing, linear or non-linear.
- Students should have the opportunity to explore a variety of graphs including time/distance graphs and time/velocity graphs.
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Example

- For example, A) determine if an equation represents a linear function and give examples of both linear and non-linear functions and B) show that the function A = s^2 is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.
- The business model for a company selling a service with no flat cost charges $3 per hour. What would the equation be as a proportional equation? If the company later decides to charge a flat rate of $10 for each transaction with the same per hour cost, what would be the new equation? How do these two equations compare when analyzed graphically?
    - What is the same? What is different? Why?
- The function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.
- Examples such as this can be used to help students learn that graphs can tell stories.

CLUSTER: 8.AFN.B - Use functions to model relationships between quantities.

STANDARD: 8.AFN.B.4

Standards Statement (JUNE 2021):

Construct a function to model a linear relationship in authentic contexts between two quantities.

DRAFT Standards Guidance (JUNE 2021):

Clarification

- Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) 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.

Teaching Strategies

- This learning objective also includes verbal descriptions and scenarios of equations, tables, and graphs.

STANDARD: 8.AFN.B.5

Standards Statement (JUNE 2021):

Describe qualitatively the functional relationship between two quantities in authentic contexts by analyzing a graph.

DRAFT Standards Guidance (JUNE 2021):

Clarification

- Identify where the function is increasing or decreasing, linear or nonlinear.
- Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Teaching Strategies

- Students should use algebraic reasoning to show and explain that the graph of an equation represents the set of all its solutions.
- Students continue to build upon their understanding of proportional relationships, using the idea that one variable is conditioned on another.
- Students should relate graphical representations to contextual situations.
- Students should use tables to relate solution sets to graphical representations on the coordinate plane.

8.GM - Geometric Reasoning and Measurement

CLUSTER: 8.GM.A - Understand congruence and similarity using physical models, transparencies, or geometry software.

STANDARD: 8.GM.A.1

Standards Statement (JUNE 2021):

Verify experimentally the properties of rotations, reflections, and translations.

DRAFT Standards Guidance (JUNE 2021):

Clarifications

- Understand that:
  - Lines are taken to lines, and line segments to line segments of the same length.
  - Angles are taken to angles of the same measure.
  - Parallel lines are taken to parallel lines.

Boundaries

- Rotations can be limited to 90, 180, ~~and~~ 270 and 360 degrees around the origin
- Reflections can be limited to reflection over horizontal and vertical lines

Examples

- Show these properties using physical models, transparencies, and/or geometry software.
- Include here--other technology

STANDARD: 8.GM.A.2

Standards Statement (JUNE 2021):

Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations.

DRAFT Standards Guidance (JUNE 2021):

Clarification

- Students describe a series of rigid transformations that map a two dimensional figure onto its image.

Terminology

- Rigid transformations include translations (slides), reflections (flips), rotations (turns), or glide reflections.

Example

- Given two congruent figures, describe a sequence of transformations that demonstrates the congruence between them.

STANDARD: 8.GM.A.3

Standards Statement (JUNE 2021):

Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.

DRAFT Standards Guidance (JUNE 2021):

Examples

- Given a triangle with given coordinates, give the new coordinates after a prescribed transformation.
- The image of Triangle ABC with A=(−3,0), B=(−3,−2) and C=(4,−2) would have coordinates A'=(−3−3,0+2)=(−6,2), B'=(−3−3,−2+2)=(−6,0), and C'=(4−3,−2+2)=(1,0) following a translation 3 units to the left and 2 units up.
- The center of dilation should be limited to a) the origin on the coordinate plane or b) one vertex of a figure such as a triangle.

STANDARD: 8.GM.A.4

Standards Statement (JUNE 2021):

Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and/or dilations.

DRAFT Standards Guidance (JUNE 2021):

Example

- Given two similar two-dimensional figures, describe a sequence of transformations that demonstrates the similarity between them.

STANDARD: 8.GM.A.5

Standards Statement (JUNE 2021):

Use informal arguments to establish facts about interior and exterior angles of triangles and angles formed by parallel lines cut with a transversal.

DRAFT Standards Guidance (JUNE 2021):

Terminology

- Including identify alternate exterior angles, alternate interior angles, linear pairs, same side interior angles, same side exterior angles, and corresponding angles.

Boundaries

- This standard includes using the properties of the angle sum of the interior angles of a triangle, exterior angle of triangles, the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles to find missing angle measures.

Teaching Strategies

- Use informal (visual) construction with tools (patty paper, protractor, etc.) to discover the angle relationships between angles formed when two lines are cut by a transversal.
- When using more than one transversal, tie into similar triangles and to set up problems using triangle sum relationships (angle sum).

Example

- Arrange three copies of the same triangle so that the three angles appear to form a line, and give an argument in terms of transversals why this is so.

CLUSTER: 8.GM.B - Understand and apply the Pythagorean Theorem.

STANDARD: 8.GM.B.6

Standards Statement (JUNE 2021):

Distinguish between applications of the Pythagorean Theorem and its Converse in authentic contexts.

DRAFT Standards Guidance (JUNE 2021):

Clarification

- Analyze and justification can be done using a variety of representation including use of pictures, diagrams, narratives, or models.

Terminology

- The Pythagorean Theorem states that the area of the square whose side is the hypotenuse is equal to the sum of the areas of the squares on the other two sides.
- The converse of the Pythagorean Theorem states that if a triangle has sides of length a, b, and c and if $a^2+b^2=c^2$ then the angle opposite the side of length c is a right angle.

Teaching Strategies

- Students should have the opportunity to explore one or more proofs of the Pythagorean Theorem, but are not required to prove the Theorem.
- Geometric and spatial reasoning should be used when explaining the Pythagorean Theorem.

Example

- Many ancient cultures used simple Pythagorean triples such as (3,4,5) in order to accurately construct right angles: if a triangle has sides of lengths 3, 4, and 5 units, respectively, then the angle opposite the side of length 5 units is a right angle.
    - The Pythagorean Theorem tells us that a certain relation holds amongst the side lengths of a right triangle. These ancient architects, however, do not have a right triangle but rather want to *produce* a right triangle. The converse of the Pythagorean Theorem enables them to do just this: they can conclude that an angle is a right angle provided a certain relationship holds between side lengths of a triangle.

STANDARD: 8.GM.B.7

Standards Statement (JUNE 2021):

Apply the Pythagorean Theorem in authentic contexts to determine unknown side lengths in right triangles.

DRAFT Standards Guidance (JUNE 2021):

Teaching Strategies

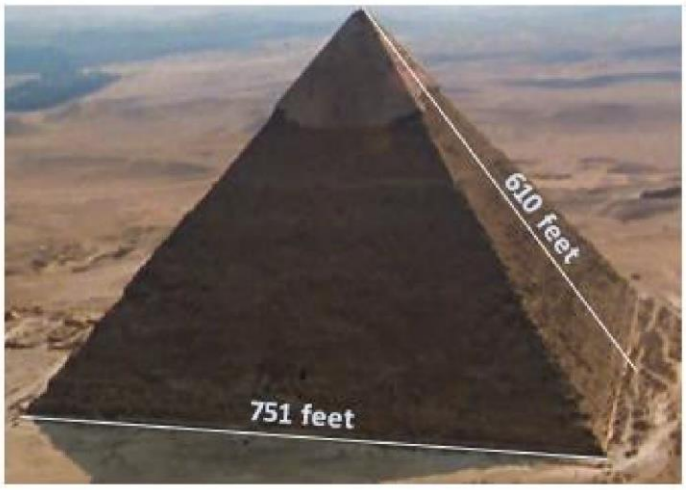
- Geometric and spatial reasoning should be used to solve problems involving the Pythagorean theorem.
- Models and drawings may be useful as students solve contextual problems in two- and three-dimensions.

Boundaries

- Include authentic mathematical problems in two and three dimensions.

Example

- How tall is the Great Pyramid of Giza?



STANDARD: 8.GM.B.8

Standards Statement (JUNE 2021):

Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

DRAFT Standards Guidance (JUNE 2021):

Boundaries

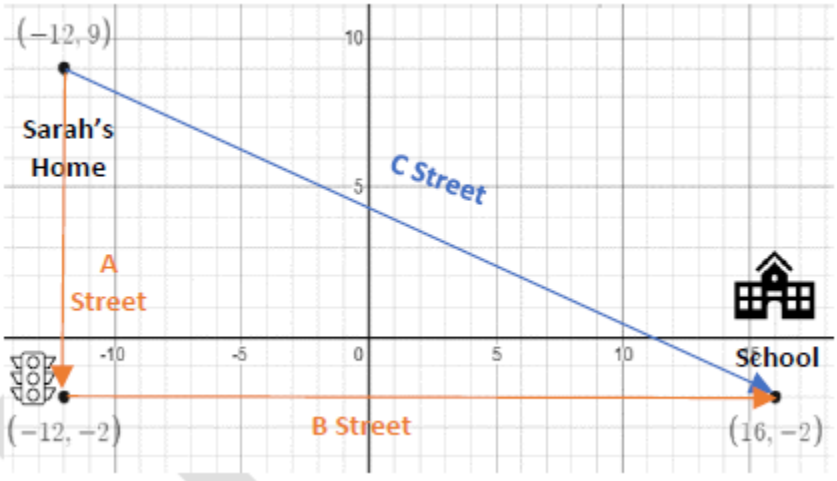
- The Distance Formula is NOT included in the 8th grade standard.
- Students should apply their understanding of the Pythagorean Theorem to find the distance. Use of the distance formula is not an expectation for this grade level.

Teaching Strategies

- Students should be provided opportunities to solve problems using a variety of strategies.

Example

- There are two paths that Sarah can take when walking to school. One path is to take is to take A Street from home to the traffic light and then walk on B street from the traffic light to the school, and the other way is for her to take C street directly to the school. How much shorter is the direct path along C Street?
    - To answer this question, students may use what they learned in 6th grade to find the distance between (-12,9) and (-12, -2) representing A street and the distance between (-12, -2) and (16, -9) representing B street. Then, students could use those two distances to find the sum of the distances for the first path. Then, students can apply the Pythagorean theorem to determine the distance between the final two points, (-12,9) and (16,-2) to determine the answer to the question.



CLUSTER: 8.GM.C - Solve mathematical problems in authentic contexts involving volume of cylinders, cones, and spheres.

STANDARD: 8.GM.C.9

Standards Statement (JUNE 2021):

Choose and use the appropriate formula for the volume of cones, cylinders, and spheres to solve problems in authentic contexts.

DRAFT Standards Guidance (JUNE 2021):

Teaching Strategies

- Given the volume, solve for an unknown dimension of the figure. Students will need to be able to express the answer in terms of pi and as a decimal approximation.

Boundaries

- Memorizing the formulas is NOT included in this standard.

8.DR – Data Reasoning

CLUSTER: 8.DR.A. - Formulate Statistical Investigative Questions

STANDARD: 8.DR.A.1

Standards Statement (JUNE 2021):

Formulate statistical investigative questions to articulate research topics and uncover patterns of association seen in bivariate categorical data.

DRAFT Standards Guidance (JUNE 2021):

Clarifications

- Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table.
- Students can generate questions about things they notice and wonder from a real-life situation.

Terminology

- A statistical investigative question is one that requires data that will vary.

Teaching Strategies

- Students should be able to use statistical reasoning to anticipate patterns of association, such as clustering, outliers, positive or negative association, linear association, and nonlinear association

Examples

- Collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

CLUSTER: 8.DR.B - Collect and Consider Data

STANDARD: 8.DR.B.2

Standards Statement (JUNE 2021):

Collect or consider data using surveys and measurements to capture patterns of association, and critically analyze data collection methods.

DRAFT Standards Guidance (JUNE 2021):

Clarification

- Know that straight lines are widely used to model relationships between two quantitative variables.

Terminology

- The line of best fit shows the linear relationship between two variables in a data set.
- It is important to indicate 'predicted' to indicate this is a probabilistic interpretation in context, and not deterministic.

Teaching Strategies

- Students should be able to use statistical reasoning to consider patterns of association, such as clustering, outliers, positive or negative association, linear association, and nonlinear association through the analysis of data presented in multiple ways.
- 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.
- Students should discover the line of best fit as the one that comes closest to most of the data points.

CLUSTER: 8.DR.C - Analyze, summarize, and describe data

STANDARD: 8.DR.C.3

Standards Statement (JUNE 2021):

Analyze patterns of association between two quantitative or categorical variables and reason about distributions to compare groups.

DRAFT Standards Guidance (JUNE 2021):

Clarification

- Construct and interpret scatter plots for bivariate data to investigate patterns of association between two quantities.
- Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
- Students should be given opportunities to analyze the data distribution displayed graphically to answer the statistical investigative question generated from a real-life situation.

Terminology

- Bivariate data are data for two variables (usually two types of related data), such as height and weight.

Teaching Strategies

- Students should be able to use statistical reasoning to describe patterns of association, such as clustering, outliers, positive or negative association, linear association, and nonlinear association through the analysis of data presented in multiple ways.
- Create a scatter plot for bivariate data and, if appropriate, informally fit a straight line and use the line to predict values. Informally assess the model fit by judging the closeness of the data points to the line.

Example

- Given a set of data points, a student creates a scatter plot (see below), approximates a line of best fit, and writes the equation for the approximated line.

CLUSTER: 8.DR.D - Interpret data and answer investigative questions

STANDARD: 8.DR.D.4

Standards Statement (JUNE 2021):

Interpret scatter plots for bivariate quantitative data to investigate patterns of association between two quantities to answer investigative questions.

DRAFT Standards Guidance (JUNE 2021):

Clarification

- Interpret the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

Terminology

- A linear model shows the relationship between two variables in a data set, such as lines of best fit.
- Bivariate data are data for two variables (usually two types of related data), such as height and weight.
- It is important to indicate 'predicted' to indicate this is a probabilistic interpretation in context, and not deterministic.

Teaching Strategies

- Students should interpret contextual linear problems involving situations using bivariate quantitative data.

Example

- In a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.