SOARING HEIGHTS
CHARTER SCHOOL
DEVELOPING CHARACTER • BUILDING COMMUNITY • GROWING LEADERS

Soaring Heights Charter School 8th Grade Math Curriculum
Revised August 2024

Chapter 1 - Equations

Standards -

8.EE.C.7 - Solve linear equations in one variable

8.EE.C.7a - Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form , , or results (where and are different numbers).

8.EE.C.7b - Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

MP.1: Make sense of problems and persevere in solving them
MP.2: Reason abstractly and quantitatively
MP.3: Construct viable arguments and critique the reasoning of others
MP.4: Model with mathematics
MP.5: Use appropriate tools strategically
MP.6: Attend to precision
MP.7: Look for and make use of structure
MP.8: Look for and express regularity in repeated reasoning

Objectives:

- Apply properties of equality to produce equivalent equations
- Solve equations using addition, subtraction, multiplication and division
- Write and solve multi-step equations.
- Use equations to model and solve real-life equations
- Write and solve equations with variables on both sides.
- Solve literal equations for given variables and convert temperatures.
- Show that a linear equation in one variable has one solution, infinitely many solutions, or no solution by transforming the equation into simpler forms.
- zDetermine whether an equation has one solution, no solution or infinite solutions
- Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
- Use properties of equality to rewrite literal equations
- Use a formula to convert temperatures

Activities:

1. Have students work in small groups and think of patterns in real-life situations. Then they can search together for mathematical patterns that allow them to form rules for multiplying integers. Allow groups to share their findings.

2. Have students work in small groups. Have each group make up a computation problem using 3 numbers, 2 operation signs, and 1 set of parentheses, such as 12-(2+7). Have them write each number and each symbol on separate cards (7 cards total). Have them write the word "Answer = on an eighth card, filing in the computed answer to the problem (in this case, 3). Have groups shuffle their cards and exchange cards with another group. See which group can put the cards in order the fastest. **Gifted and Talented Activities:**

1. Have pairs of students make posters demonstrating how to write a large number in scientific notation. They should show how to move the decimal point to the left (so that the number is greater than or equal to 1 but less than 10) and how to count the places that the decimal was moved to find the exponent. Posters can be displayed in the classroom as reminders of the process.

1

2. Plot (5,2) and (-5, 2) on a coordinate grid. Explain that if you fold the grid on the y-axis,the two points would coincide, that one point is a reflection of the other point, and that the reflection line is the y-axis. Have students graph the triangle with vertices (2,3), (5,0), (5,5) and determine how to change the coordinates, so the resulting triangle is a flip over the x-axis. ((2,-3), (5,0), (5,-5); keep the x-coordinates unchanged and take the opposite of the y-coordinates.

Chapter 2 - Transformations

8.G.A.1, A.2, A.3, A.4 MP1,MP2, MP3, MP4, MP5, MP6, MP7, MP8

Standards -

8.G.A.1 - Verify experimentally the properties of rotations, reflections, and translations:
8.G.A.1a - Lines are transformed to lines, and line segments to line segments of the same length.
8.G.A.1b - Angles are transformed to angles of the same measure.
8.G.A.1c - Parallel lines are transformed to parallel lines.
8.G.A.2 - 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; given two congruent figures, describe a sequence that exhibits the congruence between them.
8.G.A.3 - Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
8.G.A.4 - 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 dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
MP.1: Make sense of problems and persevere in solving them
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Objectives:

- Translate figures in the coordinate plane.
- Find the coordinate of a translation figure
- Use the coordinates to translate a figure
- Reflect figures in the coordinate plane.
- Find the coordinates of a figure reflected in an axis
- Use coordinates to reflect a figure in the x-or y-axis
- Rotate figures in the coordinate plane.
- Find the coordinates of a figure rotated about the origin
- Identify congruent figures
- Describe a sequence of rigid motions between two congruent figures
- Understand the concept of similar figures.
- Use corresponding side lengths to compare perimeters of similar figures
- Use corresponding side lengths to compare areas of similar figures
- Ue corresponding figures to solve real-life problems involving perimeter and area

Activities:

1. Have students work in pairs, one student in a pair graphs a figure on the coordinate plane. The second student in the pair translates this figure to another location. The first student writes a rule that describes the translation. The second student writes a rule that describes the translation from the image back to the original figure. Partners compare the rules.

2. Have students reflect a letter such as S or B in a mirror. Elicit the fact that the image is reversed.

Gifted and Talented Activities:

1. Students draw figures that have 0, 1, 2, 3, 4, and 5 lines of symmetry. Label them for display in the classroom.

2. Students use protractors to review measuring angles in degrees. Students draw and label angles on the coordinate plane, and represent counterclockwise by following the direction with their fingers.

Chapter 3 - Angles and Triangles

8.G.A.5 MP1,MP2, MP3, MP4, MP5, MP6, MP7, MP8

Standards-

8.G.A.1 - Verify experimentally the properties of rotations, reflections, and translations:
8.G.A.1a - Lines are transformed to lines, and line segments to line segments of the same length.
8.G.A.1b - Angles are transformed to angles of the same measure.
8.G.A.1c - Parallel lines are transformed to parallel lines.

8.G.A.5 - Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

MP.1: Make sense of problems and persevere in solving them

MP.2: Reason abstractly and quantitatively

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MP.4: Model with mathematics

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Objectives:

- Identify congruent angles when a transversal intersects parallel lines
- Find missing angle measures created by the intersections of lines.
- Use equations to find missing angle measures of triangles
- Understand properties of interior and exterior angles of triangles.
- Explain how to find the sum of the interior angle measure of a polygon
- Use an equation to find an interior angles measure of a polygon
- Use similar triangles to find missing measures.
- Use angle measures to determine whether triangles are similar
- Use similar triangles to solve real-life problems

Activities

1. Students sit in groups of four and suppose they are angles. One pair of adjacent angles. One pair of adjacent angles stand up and then sit down. One pair of vertical angles stand up and sit down. One pair of vertical angles stand up and sit down. Ask students to explain why they think they are each angle.

2. To help students better understand arcs and tic marks, have students cut out polygons of the same and different sizes. Then have them place one on top of another to "prove" or "disprove" the congruence of these two polygons. They should mark corresponding sides and angles using tic marks and arcs.

Gifted and Talented Activities:

1. Students explore to find the angles formed by the diagonals of a square or any parallelogram with four equal sides (rhombus). (right angles) have students explain and determine vertical angles, congruent angles, complementary angles and supplementary angles. 2. Draw two perpendicular lines intersected by a transversal. The transversal should not be drawn through the point where the two perpendicular lines intersect. Describe how the corresponding angles are related. (In each corresponding pair, one angle is 90 degree larger than the other)

Chapter 4 - Graphing and Writing Linear Equations

Standards -

8.EE.B.5 - Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different 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.

8.EE.B.6 - Use similar triangles to explain why the slope is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation for a line through the origin and the equation for a line intercepting the vertical axis at .

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 (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.
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Objectives:

- Create a table of values and write ordered pairs given a linear equations
- Plot ordered pairs to create a graph of a linear equations
- Use a graph of a linear equation to solve real-life problems
- Explain the meaning of slope
- FInd the slope of a line
- Interpret the slope of a line in a real-life problem
- Graph proportional relationships.
- Write an equation that represents a proportional relationship
- Use a graph to compare proportional relationships
- Identify the slope and y-intercept
- Rewrite a linear equation in slope-intercept form
- Graph linear equations in slope-intercept form.
- Rewrite the standard form of a linear equation
- Find intercepts of linear equations written in standard form
- Graph linear equations in standard form.
- Write equations of lines in slope-intercept form.
- Write equations of lines in point-slope form.
- Graph and compare proportional relationships, interpreting the unit rate as the slope.
- Use similar triangles to explain why the slope is the same between any two points on a line. Derive y=mx and y=mx+b.
- Interpret the rate of change and the initial value of a function.
- Use a point on a line and the slope to write an equation of the line
- Use any two points to write an equation of a line
- Write equation in point-slope form to solve real-life problems
- Write equations in slope-intercept form to solve real-life problems

Activities:

1.. Students will use algebra tiles to transform each equation. Then solve the equations. Have

students list words that have specific meanings in math, but different meanings outside of math. Provide the words terms, expression, and product as examples to get them started. Students may find it helpful to use the glossary to find additional examples. Have them give the mathematical and nonmathematical meaning of each word.

2. Students use the same terms and numbers, but different orders of terms and numbers and different operations, to write equations. They gains points based on the solution of the equation. The player with the most points at the end of 4 rounds wins.

Gifted and Talented Activities:

1. Carlos buys 6 tubes of paint and 3 pieces of fabric to make an art project. Shauna buys 8 tubes of paint and 1 piece of fabric. Define and use variables to represent the total cost.

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2. Students use the same terms and numbers, but different orders of terms and numbers and different operations, to write equations. They gains points based on the solution of the equation. The player with the most points at the end of 4 rounds wins.

Chapter 5 - Systems of Linear Equations

8.55.C.8, F.B.4, MP1,MP2, MP3, MP4, MP5, MP6, MP7, MP8

Standards -

8.EE.C.8 - Analyze and solve pairs of simultaneous linear equations.
8.EE.C.8a - Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
8.EE.C.8b - Solve systems of two linear equations in two variables using the substitution method and estimate solutions by graphing the equations. Solve simple cases by inspection. For example: by inspection, conclude that 3x 2y=5 and 3x +2y=6 have no solution because 3x+2y cannot simultaneously be 5 and 6. Solve 3x + y=20 and y=2 using the substitution method; Solve y=-2x + 7 and y=3x +1 using the substitution method.
8.EE.C.8c - Solve real-world and mathematical problems 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.
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 (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.
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Objectives:

- Graph a linear equation
- Find the point where two lines intersect
- Solve a system of linear equations by graphing
- Solve a linear equation in two variables for either variable
- Solve a system of linear equation by substitution
- Add or subtract equations in a system
- Use the Multiplication Property of Equality to produce equivalent equations
- Solve a system of linear equations by elimination
- Determine the number of solutions of a system
- Solve a system of linear equations with any number of solutions

Activities:

1. For a system of equations representing a real-world situation, have students write the word form of each equation. Have them look for similar phrases in both equations. Use these phrases to help students understand that the solution of a system must satisfy both equations. 2. Have students draw a colored box around the equation that has an isolated variable with a coefficient of 1. Have them draw **the** same color box around that variable in the second equation.

2, As they rewrite the second equation, have them substitute the boxed expression for the boxed variable. Have students work in pairs. Have them take turns explaining which equation has or can have an isolated variable with a coefficient of 1, as well as what substitution they can make.

Gifted and Talented Activities:

1. One adult and two children paid $28 for admission to a science museum. Two adults and 5 children paid $64 to the same museum. What are the prices of one adult admission and one child admission? (adult $12 and child $8)

2. Jon's phone plan charges a monthly rate of $25.00 plus $1.00 per text. Marla's plan charges a monthly rate of $35.00 plus $0.50 per text. At what number of text messages will the monthly charges be the same for both plans? What will the monthly charge be then? (The monthly charge will be the same ($45) for 20 text messages.

Chapter 6 - Data Analysis and Displays

Standards -

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. For 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.

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. For example, 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?

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Objectives:

- Make a scatter plot
- Identify outlier, gaps, and cluster s in a scatter plot
- Use scatter plots to describe relationships between data
- Write and interpret an equation of a line of fit
- Find an equation of a line of best fit
- Use a line of fit to make predictions
- Read a two-way table
- Make a two-way table
- Choose appropriate data displays for situations
- Identify misleading data displays
- Analyze a variety of data displays

Activities

1. Have students use manipulative as data points to model clustering and outliers. They can also brainstorm the types of data that the manipulative might represent.
2. Have students find and present examples of scatter plots that appear to be chaotic but which actually allow them to make predictions once they draw a trend line.

Gifted and Talented
Activities:

1. Have students discuss examples of two events which may occur simultaneously, but one does not cause the other.

2.Have students use scatter plots to distinguish correlation from causation. They explain the difference between data that shows a correlation (negative or positive association) and data that shows a causal relationship.

Chapter 7 Functions
Standards -

8.F.A.1 - Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
(Clarification: Function notation is not required in Grade 8)

8.F.A.2 - Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each

represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.

8.F.A.3 - Interpret the equation $y=mx+b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, 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.

8.F.B.5 - Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., 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.

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Objectives:

- Represent a relation as a set of ordered pairs
- Determine whether a relation is a function
- Use functions to solve real-life problems
- Write a function rule that describes a relationship
- Evaluate functions for given inputs
- Represent functions using tables and graphs
- Write linear functions to model relationships
- Recognize linear function represented as tables, equations, and graphs
- Compare linear and nonlinear functions
- Interpret linear functions in real-life situations
- Describe relationships between quantities in graphs
- Sketch graphs given verbal descriptions of relationships

Activities:

1. Have students use manipulatives as data points to model clustering and outliers. They can also brainstorm the types of data that the manipulative might represents.

2. Have students find and present examples of scatter plots that appear to be chaotic but which actually allow them to make predictions once they draw a trend line.

Gifted and Talented
Activities:

1. Have students discuss examples of two events which may occur simultaneously, but one does not cause the other.

2. Have students use scatter plots to distinguish correlation from causation. They explain the difference between data that shows a correlation (negative or positive association) and data that shows a causal relationship.

Chapter 8 Exponents and Scientific Notation
8 EE.A.1,A.3,A.4 ,MP1,MP2, MP3, MP4, MP5, MP6, MP7, MP8

Standards -

8.EE.A.1 - Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example,3^2 x 3^-5= 3^-3 = ⅓^3 = 1/27 .

8.EE.A.3 - Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3x10^8 and the population of the world as 7x10^9 and determine that the world population is more than 20 times larger.

8.EE.A.4 - 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 (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

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Objectives:

- Write products using exponents
- Evaluate expressions involving powers
- Use exponents to solve real-life problems
- Find products of powers that have the same base

- Find powers of powers
- Find powers of products
- FInd quotients of powers that have the same base
- Simplify expressions using the Quotient of Powers Property
- Solve real-life problems involving quotients of powers
- Explain the meanings of zero and negative exponents
- Evaluate numerical expressions involving zero and negative exponents
- Simplify algebraic expressions involving zero and negative exponents
- Round very large and very small numbers
- Write multiples of 10 as a power
- Compare very large or very small quantities
- Convert between scientific notation and standard form
- Choose appropriate units to represent quantities
- Use scientific notation to solve real-life problems
- Explain how to add and subtract numbers in scientific notation
- Use operations in scientific notation to solve real-life problems

Activities:

1. Explain to students that the word times usually indicates multiplication, whereas the phrase how many times greater indicates division. For example, you use multiplication to find 3 times a number, 5 times more, and 8 times as much. You use division to find how many times greater or how many times smaller.

2. Have students multiply 7.9 by 10, by 100, by 1,000, and by 10,000 and describe what happens to the location of the decimals point. (79, 790, 7,900 and 79,000: the decimal moves as many places to the right as the number of zeros in the multiple of 10)

Gifted and Talented Activities:

1. A light-year is 5.9 x 10^12 miles. A mile is 1.609 x 10^3, meters. In scientific notation, how many meters are in a light year? (9,431 x 10^15) A light year is 5.9 x 10^12 miles. A mile is approximately 6.34 x 10^4 inches. About how many inches are in a light-year? (3.74 x 10^4 m)

2. If you divide 2 by a very small number, such as 10^-3, will the quotient be greater than or less than 2? Explain. (greater than) If you divide 2 by a very large number, such as 10^4, will the quotient be greater than or less than 2? Explain. (less than)

Chapter 9 - Real Numbers and the Pythagorean Theorem

Standards -

8.NS.A.1 - Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually and convert a decimal expansion which repeats eventually into a rational number.

8.NS.A.2 - Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g.π^2,). For example, by truncating the decimal expansion of √2, show thatv√2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

8.NS.A.3 - Understand that the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

8.EE.A.2 - 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.

8.EE.A.2a - Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that radical √2 is irrational.

8.EE.A.2b - Simplify numerical radicals, limiting to square roots (i.e. non perfect squares).

8.G.B.6 - Explain a proof of the Pythagorean Theorem and its converse.

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.

8.G.B.8 - Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

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Objectives:

- Find square roots of numbers
- Evaluate expressions involving square roots
- Use square roots to solve equations
- Explain the Pythagorean Theorem
- Use the Pythagorean Theorem to find unknown side lengths of triangles
- Use the Pythagorean Theorem to find distances between points in a coordinate plane
- FInd cube roots of numbers
- Evaluate expressions involving cube roots
- Use cube roots to solve equations
- Explain the meaning of rational numbers
- Write fractions and mixed numbers as decimals
- Write repeating decimals as fractions or mixed numbers
- Classify real numbers as rational or irrational
- Approximate irrational numbers
- Solve real-life problems involving irrational numbers
- Explain the converse of the Pythagorean Theorem
- Identify right triangles given three side lengths
- Identify right triangles in a coordinate plane

Activities:

1**.** Have students make a table showing the cubes of integers from 2 through 15. Elicit the cube of an even number will always be even and the cube of an odd number will always be odd. Then have them make similar statements about positive and negative cubes.

2. Use centimeter grid paper to draw a right triangle. The right angle should be included between sides that are 3 cm and 4cm. Draw a 3-by3 square along the side that is 3 cm long. Label the square A. Draw a 4-by-4 square. Label the square B. Cut out another piece of grid paper to make a square on the side opposite the right angle and label square C.

Gifted and Talented Activities:

1. A rectangle has opposite vertices at points with coordinates (4,3) and are the coordinates of **the** other vertices? Answer (-4,3**)**, (4,-3) (-4,-3).

2. A book is leaning with one end at the top edge of a bookend. The bookend is 6 in high. The distance along the shelf from the edge of the book to the bottom of the bookend is 4 in. How long is the book? Round to the nearest inch? Answer - 7in

Chapter 10 - Volume and Similar Solids

8.EE.A.2,, G.C.9, ,MP1,MP2, MP3, MP4, MP5, MP6, MP7, MP8

Standards -

8.EE.A.2 - 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.

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.

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Objectives:

- Use a formula to find the volume of a cylinder
- Use the formula for the volume of a cylinder to find a missing dimension
- Use a formula for the volume of a cone
- Use the formula for the volume of a cone to find a missing dimension
- Use a formula to find the volume of a sphere
- Use the formula to find the volume of a sphere to find the radius
- Find volumes of composite solids
- Use corresponding dimensions to determine whether solids are similar
- Use corresponding dimensions to finding measures in similar solids
- Use linear measures to find surface areas and volumes of similar solids

Activities:

1. Students identify and describe as geometric solids a soup can, a cereal or tissue box, a cone-shape paper cup, and other examples in the classroom..

2. Students are given hollow models of rectangular pyramids and prisms with the same base area and height. Using rice or beans, or foam pieces, they show which has the greater volume.

Gifted and Talented Activities:

1. Students draw a plane intersecting a cone and discuss what plane figures the intersection might form.

2. Students cut a spherical object, such as a foam ball, in half. Students point to and measure the radius with a ruler. They find the surface area and volume of these objects using the formulas.