

Pump Up the Volume

Grades: 6th-8th

Duration: 60 minutes

Program Description

Students will calculate and graph the surface area and the volume of a cube and a sphere. They will analyze their data and relate it to real-life experiences.

Louisiana GLE:

Grades 5th-8th Science as Inquiry

- 1.Generate testable questions about objects, organisms, and events that can be answered through scientific investigation (SI-M-A1)
- 2.Identify problems, factors, and questions that must be considered in a scientific investigation (SI-M-A1)
- 4.Design, predict outcomes, and conduct experiments to answer guiding questions (SI-M-A2)
- 6.Select and use appropriate equipment, technology, tools, and metric system units of measurement to make observations (SI-M-A3)
- 7.Record observations using methods that complement investigations (e.g., journals, tables, charts) (SI-M-A3)
- 8.Use consistency and precision in data collection, analysis, and reporting (SI-M-A3)
- 12.Use data and information gathered to develop an explanation of experimental results (SI-M-A4)
- 13.Identify patterns in data to explain natural events (SI-M-A4)
- 16.Use evidence to make inferences and predict trends (SI-M-A5)
- 19.Communicate ideas in a variety of ways (e.g., symbols, illustrations, graphs, charts, spreadsheets, concept maps, oral and written reports, equations) (SI-M-A7)
- 22.Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)
- 25.Compare and critique scientific investigations (SI-M-B1)
- 37.Critique and analyze their own inquiries and the inquiries of others (SI-M-B5)

Science

Grade 6

- 1.Measure and record the volume and mass of substances in metric system units (PS-M-A1)

Math

Grade 6

- 7.Read and write numerals and words for decimals through ten-thousandths (N-3-M)
- 13.Use models and pictures to explain concepts or solve problems involving ratio, proportion, and percent with whole numbers (N-8-M)
- 18.Measure length and read linear measurements to the nearest sixteenth-inch and mm (M-1-M)
- 23.Identify and select appropriate units to measure area (M-3-M)
- 24.Use mathematical terms to describe the basic properties of 3-dimensional objects (edges, vertices, faces, base, etc.) (G-2-M)

Grade 7

26. Recognize π as the ratio between the circumference and diameter of any circle (i.e., $\pi = C/d$ or $\pi = C/2r$) (G-5-M) .

28. Determine the radius, diameter, circumference, and area of a circle and apply these measures in real-life

32. Describe data in terms of patterns, clustered data, gaps, and outliers (D-2-M) problems (G-5-M) (G-7-M) (M-6-M)

Grade 8

17. Determine the volume and surface area of prisms and cylinders (M-1-M) (G-7-M)

20. Identify and select appropriate units for measuring volume (M-3-M)

32. Model and explain the relationship between the dimensions of a rectangular prism and its volume (i.e., how scale change in linear dimension(s) affects volume) (G-5-M)

33. Graph solutions to real-life problems on the coordinate plane (G-6-M)

Key Terms:

Accuracy: Accurate means "capable of providing a correct reading or measurement." In physical science it means 'correct'. A measurement is accurate if it correctly reflects the size of the thing being measured.

Area – Surface covered by a two-dimensions figure, measured in square ft, square m, etc.

Base – The top and bottom parallel polygonal faces

Center – The point in the middle of the circle or sphere

Circle – A 2-D figure; the set of all points at a given distance from the center

Circumference – The perimeter of a circle

Cube – A rectangular solid with square faces

Diameter – Distance across the circle, passing through the center

Height – The length of an altitude of a polyhedron or solid

Line Graph – A graph used to show change and direction of change over a period of time.

Parallelogram – A convex quadrilateral with two pairs of parallel sides. Altitude (or height) is the segment perpendicular to the base

Perpendicular – Meeting at a 90 degree angle

Pi (π) – Ratio of circumference to diameter of a circle

Polygon – A simple closed two-dimensional shape made of line segments

Polyhedron – A 3-D figure with faces made of polygons

Precision – In a measurement getting the same answer every time; the measurement may not be near the true value

Prism – A 3-D figure with parallel congruent polygon bases and sides made of parallelograms

Radius – The distance from the center to the circle

Rectangle – A parallelogram with a right angle

Sphere – A 3-D figure; the set of all points at a given distance from the center

Square – A quadrilateral with all congruent sides and all congruent angles

Surface – A 3-D geometric figure with polygons or curves for the sides and bases

Volume – Space inside a 3D object, measured in cubic feet, cubic meters , etc

X-axis – Also called **axis of abscissas**; in a plane Cartesian coordinate system) the axis, usually horizontal, along which the abscissa is measured and from which the ordinate is measured.

Y-axis – Also called **axis of ordinates**; (in a plane Cartesian coordinate system) the axis, usually vertical, along which the ordinate is measured and from which the abscissa is measured.

Connections to Permanent Exhibits: These exhibits are found on the second floor in the Measure Up Cluster.

Units of Volume: How many blue squares fit in the front clear box? What is the relationship between the back two boxes?

Volume Table: Calculate the volume of the cube and the cylinder? How do they relate?

Shape Survey: Measure the perimeter of the square? Measure and calculate the area. Is there a relationship between the two?

Web Resources:

Area Explorer-Interactivate CSERD
<http://www.shodor.org/interactivate/activities/AreaExplorer/>

This is an interactive game where students relate area and perimeter. There are also instructions for the students, a help menu to tell them how to play and information for the teacher.

English Verbs Used to Discuss Graphs, Trends, and Changes Eclectic English
<http://www.eclecticenglish.com/applets/Graphs.html>

Use words like stabilize, triple, double, stabilize and match them to the graph they describe.

Algebra>Graph Graph Mole Fun Based Learning
<http://funbasedlearning.com/algebra/graphing/default.htm>

If you are teaching students about how to plot points on an xy coordinate plane, this is a good place to start. There is an easy, medium, and hard version of this interactivity.

Learning about Rate of Change in Linear Functions Using Interactive Graphs: Constant Cost per Minute

National Council of Teachers of Mathematics
<http://standards.nctm.org/document/eexamples/chap6/6.2/index.htm>

This is an interactive graph activity in which students are asked to analyze the cost of using a cell phone.

Learning about Length, Perimeter, Area, and Volume of Similar Objects by Using Interactive Figures: Side Length, Volume, and Surface Area of Similar Solids

National Council of Teachers of Mathematics
<http://standards.nctm.org/document/eexamples/chap6/6.3/part2.htm>

Student can investigate how changing the lengths of the sides of a rectangular prism affects the volume and surface area of the prism with this math interactivity.

Perimeter Explorer-Interactivate
National Council of Teachers of Mathematics
http://www.shodor.org/interactivate/activities/PerimeterExplorer/?version=1.5.0_07&browser=safari&vendor=Apple Computer, Inc.

Interactive game in which students are given a shape on a grid and they must determine the perimeter. There are also instructions for the students, a help menu to tell them how to play and information for the teacher.

Surface Area and Volume Interactivate
National Council of Teachers of Mathematics
<http://www.shodor.org/interactivate/activities/SurfaceAreaAndVolume/>

This activity allows the user to to manipulate three-dimensional polyhedrons to experiment with surface area and volume. There are also instructions for the students, a help menu to tell them how to play and information for the teacher.

Walk Through a 3-D Building
Artifice Design Workshop Lite-Math-Kitecture
<http://www.math-kitecture.com/walk.htm>

After downloading and exploring a building, estimate its volume, surface area, and discover the geometric shapes hidden within! Try to build a model of the building (on or off the computer).

Pre-Visit Activities

Post-Visit Activities