

Three Units

Grades: 3rd - 6th

Duration: 30 Minutes

Program Description

After exploring three aspects (length, area, and volume) of a prismatic solid, construct a centimeter, a square centimeter, and a cubic centimeter out of appropriate materials.

The goal of this program is to make the notions of a centimeter, square centimeter, and cubic centimeter less abstract by exploring a shape and then creating units in three dimensions out of materials like string, paper, and clay.

Louisiana GLEs:

Science:

3rd Grade

1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
2. Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
3. Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2)
4. Predict and anticipate possible outcomes (SI-E-A2)
5. Use a variety of methods and materials and multiple trials to investigate ideas (observe, measure, accurately record data) (SI-E-A2)
7. Measure and record length, temperature, mass, volume, and area in both metric system and U.S. system units (SI-E-A4)
8. Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)
19. Select the appropriate metric system and U.S. system tools for measuring length, width, temperature, volume, and mass (PS-E-A2)

Math: 3rd Grade

19. Measure length to the nearest yard, meter, and half-inch (M-1-E)
23. Find the area in square units of a given rectangle (including squares) drawn on a grid or by covering the region with square tiles (M-1-E)
25. Select and use the appropriate standard units of measure, abbreviations, and tools to measure length and perimeter (i.e., in., cm, ft., yd., m), area (square inch, square centimeter), capacity (i.e., cup, pint, quart, gallon, liter), and weight/mass (i.e., oz., lb., g, kg, ton) (M-2-E)

English Language Arts: 3rd Grade

Reading and Responding

Standard 7

20. Apply basic reasoning skills
Speaking and Listening

Standard 4

38. Give and follow precise directions and instructions
42. Use active listening strategies
 - asking questions and responding to ideas/opinions
 - giving oral responses, such as explanations of written and/or spoken texts (ELA-4-E5)
44. Assume the role of contributor and active listener

Science: 4th Grade

1. Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
2. Pose questions that can be answered by using students' own observations, scientific knowledge, and testable scientific investigations (SI-E-A1)
3. Use observations to design and conduct simple investigations or experiments to answer testable questions (SI-E-A2)
8. Measure and record length, temperature, mass, volume, and area in both metric system and U.S. system units (SI-E-A4)
9. Select and use developmentally appropriate equipment and tools (e.g., magnifying lenses, microscopes, graduated cylinders) and units of measurement to observe and collect data (SI-E-A4)
23. Determine linear, volume, and weight/mass measurements by using both metric system and U.S. system units to compare the results (PS-E-A2)

Math: 4th Grade

22. Select and use the appropriate standard units of measure, abbreviations, and tools to measure length and perimeter (i.e., in., cm, ft., yd., mile, m, km), area (i.e., square inch, square foot, square centimeter), capacity (i.e., fl. oz., cup, pt., qt., gal., l, ml), weight/mass (i.e., oz., lb., g, kg, ton), and volume (i.e., cubic cm, cubic in.) (M-2-E) (M-1-E)
25. Use estimates and measurements to calculate perimeter and area of rectangular objects (including squares) in U.S. (including square feet) and metric units (M-3-E)

English Language Arts: 4th Grade

Speaking and Listening

Standard 4

34. Adjust pacing to suit purpose, audience, and setting when speaking
35. Interpret, follow, and give multi-step directions
37. Demonstrate active listening strategies, including asking questions, responding to cues, and making eye contact
38. Adjust speaking content according to the needs of the audience

5th-8th Science and Inquiry

6. Select and use appropriate equipment, technology, tools, and metric system units of measurement to make observations (SI-M-A3)

Science: 5th Grade

1. Measure a variety of objects in metric system units (PS-M-A1)

Math: 5th Grade

15. Model, measure, and use the names of all common units in the U.S. and metric systems (M-1-M)
20. Identify appropriate tools and units with which to measure time, mass, weight, temperature, and length (M-3-M)

English Language Arts: 5th Grade

Speaking and Listening

Standard 4

32. Adjust diction and enunciation to suit the purpose for speaking
33. Use complete sentences and standard English grammar, diction, syntax, and pronunciation when speaking
35. Restate or describe oral directions/procedures for tasks
36. Adjust volume and inflection to suit the audience and purpose of presentations
38. Demonstrate active listening strategies
39. Deliver formal and informal presentations for a variety of purposes, including:
41. Participate in group and panel discussions

Science: 6th Grade

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

Math: 6th Grade

23. Identify and select appropriate units to measure area (M-3-M)
21. Demonstrate an intuitive sense of relative sizes of common units for length and area of familiar objects in real-life problems (e.g., estimate the area of a desktop in square feet, the average adult is between 1.5 and 2 meters tall) (M-2-M) (G-1-M)

Key Terms:

Centimeter: A metric unit of length

Square Centimeter: A metric unit of area

Cubic Centimeter: A metric unit of volume

Unit: A division or amount of a quantity that is used as a standard of measurement. Years are the unit of age.

Volume: The amount of three-dimensional space an object takes up

Area: The amount of two-dimensional space an object covers

Length: Distance in a single dimension

Dimension: A single direction in space- (up, down), (back-front) and (side-side). The three dimensions are perpendicular to each other. An extension in a given direction.

Face: Two-dimensional side of a three-dimensional object

Connections to Permanent Exhibits:

Blue Cube: (Math Area) Make a larger cube out of smaller cubic blocks to show that volume (number of small blocks required to make larger cube) increases exponentially (to the third power).

Measurement Cluster (Math Area) Volume exhibit to explore capacity of different shaped containers, Concept Extension sign to measure units of a person; Units exhibits to compare different systems of units. Giant Tape Measure to compare different systems of units.

Web Resources:

<http://www.glc.k12.ga.us/BuilderV03/LPTools/LPShared/lpdisplay.asp?LPID=13281>

GeorgiaStandards.org lesson plan on measuring with nonstandard units

<http://www.rickyspears.com/rulergame/> The Ruler Game

This website only teaches how to use an inch ruler unfortunately; but it is still interesting if you are teaching in inches.

http://www.wisc-online.com/objects/index_tj.asp?objID=MSR3102

Everyone Knows How to Use a Ruler, Right? by Barbara Anderegg

Very interesting website about how to get the most accuracy out of a ruler.

Pre-Visit Activities

- Measure the lengths of object in the classroom using a ruler and record them.
- Introduce language of length, width and height to describe prismatic objects.
- Measure objects using standard and nonstandard units.
- Explain three dimensions: up-down, side-side, and back-forth
- Language Arts: Use at least five key terms to write a story.

Post-Visit Activity

Measurement Lab

Grade Levels: 3 - 5

Objectives

- Students will be able to measure linearly using ruler/meter stick within a quarter of an inch.
- Students will be able to measure liquid capacity.
- Students will be able to measure mass.

Materials

- A worksheet to record measurement;
- Gram scales (balance beam) for each workstation
- Rulers and meter sticks
- Assortment of graduated containers
- An "unknown quantity" workstation could be added as a test.

Procedure

1. Set up lab of different forms of measuring - one at each station.
2. Using overhead, demonstrate measuring with each type.
3. Using graduates, demonstrate reading the mantissa.
4. Divide class into 4 groups.
5. Each student is given 10 minutes/station.
6. Teacher supervises stations (linear stations need most help).
7. Mass measurement station may need instruction as well.
8. Students discuss results within groups, then groups share with class.
9. Have students measure something at home under 1 foot; over 6 feet; capacity of cooking pots;
10. Give students the formula for area, then ask kids: "How big is your yard?"
11. Note, it's fun for kids to estimate measure using a variety of measurement units: the length of a pace, size of a hand, etc.