

WAMC Lab Template

Math Concept(s): Geometric Construction

Source / Text:

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Attach the following documents:

- Lab Instructions: Design a package to hold a 1" round bouncy ball, whose volume is 8 in cubed. Develop and draw a two dimensional rectangular pattern with lines and tabs. Cut out and assemble package with either double sided tape or glue.
- Student Handout(s)
- Rubric and/or Assessment Tool: Package interior volume is a minimum of 8 cu. In. and a maximum of 12 cu. In. Package should include product name, logo, and tagline. Five colors minimum must be used in the design of the product packaging.

Short Description (Be sure to include where in your instruction this lab takes place):

Lab Plan

Lab Title: Package Volume Pattern Development

Prerequisite skills: Know the formulas for volume and area, measurement, isometric drawing,

Lab objective: The objective of the lab is to help students understand the concept of volume and area within pattern development and package design

Standards: (Note SPECIFIC relationship to Science, Technology, and/or Engineering)

Mathematics K–12 Learning Standards:

- Geometry 7.G

Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Standards for Mathematical Practice:

- 1. Make sense of problems and persevere in solving them
- 4. Model with mathematics
- 5. Use appropriate tools strategically
- 6. Attend to precision
- 7. Look for and make use of structure

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- Reading Standards for Literacy in Science and Technical Subjects 6–12
 - Craft & Structure: RST —6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6–8 texts and topics*.

- Integration of Knowledge & Ideas: RST — 6-8.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

K-12 Science Standards

Technology

- **2: Digital Citizen - Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.**
 - **2.c. Students demonstrate and advocate for an understanding of intellectual property with both print and digital media- including copyright, permission and fair use-by creating a variety of media products that include appropriate citation and attribution elements.**

Engineering

- **HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.**
 - Mathematics –
 - **MP.2** Reason abstractly and quantitatively. (HS-ETS1-1),(HS-ETS1-3),(HS-ETS1-4)
 - **MP.4**) Model with mathematics. (HS-ETS1-1),(HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4)

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

- Global Awareness Financial/Economic/Business/Entrepreneurial Literacy Civic Literacy
 Health/Safety Literacy Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION

Creativity and Innovation

- X Think Creatively
 X Work Creatively with Others
 Implement Innovations

Critical Thinking and Problem Solving

- X Reason Effectively
 X Use Systems Thinking
 X Make Judgments and Decisions
 X Solve Problems

Communication and Collaboration

- X Communicate Clearly
 X Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy

- X Access and Evaluate Information
 X Use and manage Information

Media Literacy

- Analyze Media
 Create Media Products
Information, Communications and Technology (ICT Literacy)
 X Apply Technology Effectively

LIFE & CAREER SKILLS

Flexibility and Adaptability

- X Adapt to Change
 XBe Flexible

Initiative and Self-Direction

- X Manage Goals and Time
 X Work Independently
 X Be Self-Directed Learners

Social and Cross-Cultural

- X Interact Effectively with Others
 X Work Effectively in Diverse Teams

Productivity and Accountability

- X Manage Projects
 X Produce Results

Leadership and Responsibility

- Guide and Lead Others
 X Be Responsible to Others

<https://wa-appliedmath.org/>

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Scissors, card stock, pencil, ruler, colored pencils

Set-Up Required:

- Examples of various package designs from previous years

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

-

Cooperative Learning:

-

Expectations:

- It is expected that students will grasp an understanding of the determining volume and why it is a necessary consideration and how it can be applied in woodworking and construction

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Timeline:

- 150 min.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Scavenger hunt to find different examples of pattern development and how they vary from one another and what the various applications are for different volumes of material. What are the considerations that need to be made when developing patterns dealing with volume

Career Applications

- Package design, Industrial design, sheet metal worker, manufacturing

Optional or Extension Activities

- Add additional geometric shapes into the design of the package.