## WAMC Lab Template

Math Concept(s): Geometric Construction Source / Text: Developed by: Tim Dailey E-Ma

Date: Summer Conference 2023

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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):

### <u>Lab Plan</u>

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 threedimensional 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 domainspecific 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

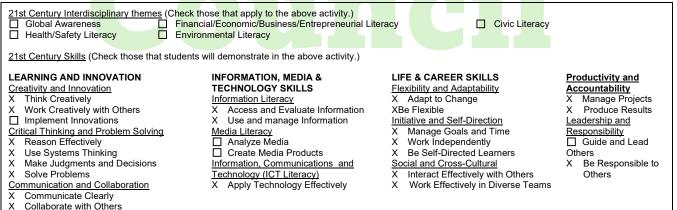
#### Technology

- 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 –
  - o 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:





## 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 21<sup>st</sup> Century Skills selected):

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Cooperative Learning:

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# 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.

