Lesson Title:	Make a Box
Length of Lesson	1 Days
Created By	Michael Andre Hamilton
Subject	Geometry
Grade Level	10^{th}-12^{th} grade
State Standards	Geometry 2a
DOK Level	DOK 2
DOK Application	Graph, Compare, Estimate Infer, Predict, Interpret, Make Observation, Summarize
National Standards	Geometry for 9 – 12^{th} Math Standards
Graduate Research Element	Human Factors and Work Physiology

Student Learning Goal:

National Standards for Geometry for 9-12^{th}

A: analyze properties and determine attributes of two- and three-dimensional objects;
B: explore relationships (including congruence and similarity) among classes of two- and three-dimensional geometric objects, make and test conjectures about them, and solve problems involving them;
C: establish the validity of geometric conjectures using deduction, prove theorems, and critique arguments made by others;
D: use trigonometric relationships to determine lengths and angle measures.

State Standards for 9 – 12^{th} Geometry

A: Apply problem solving skills to solve and verify the solutions for unknown measures in similar polygons.

Materials Needed (supplies, hand-outs, resources):

- a one-quart container (labeled as "1 quart") (this should be a rectangular prism, not cylindrical)
- a bin of Styrofoam "peanuts" (or a similar material, such as a "puffed rice" type of cereal)
- a collection of 30 rectangles for each of the following dimensions (a total of 180 rectangles), made from construction paper:

3 x 5 3 x 4 6 x 2
4 x 5 6 x 5 5 x 2

For each team: a roll of tape

Lesson Performance Task/Assessment:

- Understands the commutative principle
- Can compute the volume of a rectangular prism

Lesson Relevance to Performance Task and Students:

The relevance of this lesson is to get the student to understand volume calculations and the commutative principle

Anticipatory Set/Capture Interest:
At the beginning of class, I will show them different box and ask questions about how can you determine how much can fit in the box.

Guided Practice:

A quart container has just a little more than 60 cubic inches of volume, and there are two box sizes that will work: 3” ´ 4” ´ 5” or 6” ´ 5” ´ 2”. However, in the boxes that they make, students will choose different dimensions to be the lengths, heights and widths of the boxes, and so you should end up with several of the following combinations:

Length	Width	Height	Length	Width	Height
3	4	5	5	6	2
4	3	5	6	5	2
5	3	4	2	5	6
5	4	3	2	6	5
4	5	3	5	2	6
3	5	4	6	2	5

As students study their results table, help them to discover that it is the product of length, width and height that is the same in each case, and this is equal to the volume of their boxes: 60 cubic inches. Point out that the order in which things are multiplied does not affect the answer, and discuss whether or not it makes any difference which measurements are the length, width and height.

Make sure that students understand the concept of cubic inch: a cube with one inch sides. Explain that we use cubic inches to measure volume just like we use inches to measure length, and you could find the volume of something just by counting how many one-inch cubes would fit inside of it. (As an extension, you may wish to have students make a total of 60 one-inch cubes out of index cards using the pattern below, and count how many of them fit in the box.)

Conclude by reviewing the formula for volume of a box: length ´ width ´ height, and explain that this formula is just a quick way of finding the total number of cubic inches in the box.

Independent Practice:
After the instructor show them how to do it the first time. The student will continue step create their own boxes and see can they get the same volume as the instructor

Remediation and/or Enrichment:

Remediation
Individual IEP; partner help throughout lesson; shorten parts of assignment; focus on few process

Enrichment:
None

Check(s) for Understanding:
Day 1:

1. How would I create a box that could hold a basketball?
2. What was the most important concept of box making

Closure:
Have a end of the class discussion about what the learned about box making

Possible Alternate Subject Integrations:
*None.

Teacher Notes: