PBL - Build a Container

Middle

Texas Essential Knowledge & Skills

ELA 7-8.1B - Developing and sustaining foundational language skills: listening, speaking, discussion, and thinking--oral language. (2017)

The student develops oral language through listening, speaking, and discussion. The student is expected to:

(B) follow and give complex oral instructions to perform specific tasks, answer questions, or solve problems;

ELA 6.28 - Listening and Speaking/Teamwork.

Students work productively with others in teams. Students will continue to apply earlier standards with greater complexity. Students are expected to participate in student-led discussions by eliciting and considering suggestions from other group members and by identifying points of agreement and disagreement.

ELA 6.27 - Listening and Speaking/Speaking.

Students speak clearly and to the point, using the conventions of language. Students will continue to apply earlier standards with greater complexity. Students are expected to give an organized presentation with a specific point of view, employing eye contact, speaking rate, volume, enunciation, natural gestures, and conventions of language to communicate ideas effectively.

Math 6.4C 6.5A - Proportionality.

The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to:

(A) represent mathematical and real-world problems involving ratios and rates using scale factors, tables, graphs, and proportions;

(C) give examples of ratios as multiplicative comparisons of two quantities describing the same attribute;

Math 6.2D Number and operations.

The student applies mathematical process standards to represent and use rational numbers in a variety of forms. The student is expected to:

(D) order a set of rational numbers arising from mathematical and real-world contexts;

Materials

- Cardboard
- String
- Foam
- Paper
- Tape
- Glue
- Cloth
- Rubber Bands
- Measuring tape or ruler
- Rubik's Cubes

Objective

1. Students will review and apply math skills: area, perimeter, and nets
2. Students will review and apply physics skills (force=mass x acceleration)
3. Work cooperatively in groups
4. Organize thoughts and create "talking points" for presentation, focusing on proper communication skills

Scenario

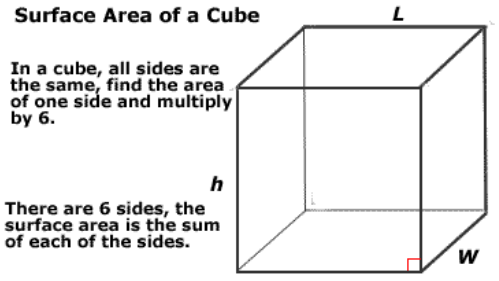
You are the design engineers at a packaging company and you have been contacted to design a container to hold a new kind of Rubik's Cube. The product is the same size as the original Rubik's Cube, but it's made of beautiful glass cubes instead of the traditional plastic cubes with stickers that can be peeled off. The container must hold 20 cubes and prevent them from being broken during the shipping process. The company also asks that you use as little materials as possible due to cost efficiency. Size of the container is a concern as well due to high shipping costs. You present to the company in just two weeks!

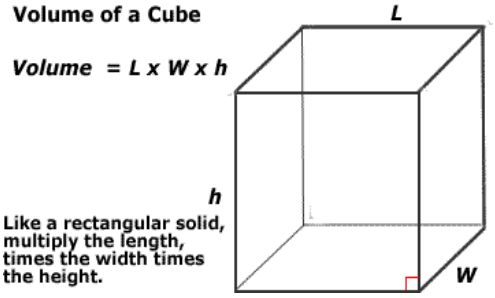
Task

1. Create a blueprint for your container prior to building. This will ensure that your group will:
   - Visualize the end result
   - Have something to reference
   - Plan on everything fitting together
   - Know things will look right
   - Eliminate building by trial and error
2. Build your container based on your blueprint. The container must:
   - Allow consumers to easily remove cubes from packaging
   - Have dimensions no greater than 36”x36”x18”
   - Weigh no more than 8lbs (including 20 Rubik’s Cubes, assuming they are the same weight as the plastic cubes)
3. Design a presentation for the company that includes:
   - Proof your container will prevent glass Rubik’s Cubes from breaking
   - Proof your container is inexpensive to produce
   - Proof your container is inexpensive to ship

Notes to Teacher

- *Students will need to measure the Rubik’s Cube so they may need a brief review the geometry of a cube.*
- *Students may need to be introduced to force (F=Mass x Acceleration) to take into consideration for the glass cubes breaking if dropped.*





Evaluation:

RUBRIC	4	3	2	1
ORGANIZATION 15%	We present our data and plan in a clear and logical sequence that is complete and easy to follow.	We present our data and plan in a logical sequence that is complete and relatively easy to follow.	We present our data in a manner that is complete, but its disorganization often makes it difficult to follow.	Our presentation is incomplete and/or disorganized.
SUBJECT KNOWLEDGE 30%	We demonstrate our understanding of the mathematical concepts related to the project (area, perimeter, & force) with explanations that are clear, thorough, and mathematically correct.	We demonstrate our understanding of the mathematical concepts related to the project (area, perimeter, & force) with explanations that are mathematically correct.	We demonstrate our understanding of the mathematical concepts related to the project (area, perimeter, & force) with explanations that are primarily mathematically correct.	We are unable to adequately answer questions related to the mathematical concepts of the project (area, perimeter, & force)
PUBLIC SPEAKING 15%	We speak so that our presentation can clearly be heard; we use proper grammar and correct pronunciation; we appropriately use mathematical vocabulary to demonstrate an understanding of the terms.	We speak so that our presentation can generally be heard; we generally use proper grammar and correct pronunciation; we use mathematical terms properly.	We speak softly so that our presentation is difficult to hear; at times, our use of grammar and pronunciation detracts from the presentation; we use mathematical terms appropriately, but infrequently.	We speak softly so that our presentation is difficult to hear; our use of grammar and pronunciation detracts from the presentation; we seldom use mathematical terms, or use them inappropriately.
GROUP PARTICIPATION 15%	Each member of our group participated with relatively equivalent roles.	Each member of our group participated, but our roles were not equivalent.	Each member of our group participated, but not all spoke.	Not all members of our group participated in the presentation.
Presentation 25%	Our presentation is designed to explain and support our product (container).	Our presentation is related to our product (container).	Our presentation often distracts from our product (container).	Our presentation is unrelated to our product (container).
Total Score	_____/20			