



Background:

Buoyancy and surface tension are important factors to consider when designing products intended to float. Complexity is also introduced when considering load distribution and how to counteract an unbalanced system. The objective of this challenge is to design and construct a vessel that will support an unbalanced load.



Specifications: *(Any project not meeting specifications will not be allowed to compete.)*

1. Each school may have up to five teams (max 3 per team) or individuals participating. Each design must be unique and must clearly be labeled with the names of each team member and school. A student may only participate once.
2. The competitors may only use household aluminum foil in the construction of their design. The foil can be marked as premium, heavy duty, etc. but must not be for industrial use (you should be able to find it at most typical grocery stores). If asked, a team member must be able to easily demonstrate the project material composition for judges' inspection.
3. The vessel must not have an area contacting the water that measures more than 4" x 4", must not exceed 2" in height, and must be capable of floating once placed in water without intervention. No part of the vessel may be affixed to the container holding the water.
4. Pennies (United-States one-cent coins) will be used as the weight added to each design. The vessel must be large enough to accommodate multiple pennies to be placed at a distance furthest away from the geometric center of the vessel. The load supported by the vessel will be dictated once the vessel touches the bottom of the container holding the water.
5. The winning team will have a vessel, which maximizes weight supported and minimizes dimensions. Note, a vessel that supports less pennies may score higher than a vessel that supports more pennies due to minimizing dimensions.
6. At least one team member must be present for their team's evaluation.

The Competition:

1. Vessels must be brought to the competition fully assembled. Materials for testing will be provided on the day of the event.
2. Dimensions, in inches, of the area of the vessel contacting the water as well as the largest height will be measured prior to the competition. The formula below will dictate the score, rounded to the nearest whole number, assigned to each team:

$$Score = 50 * (\# pennies) / (length_{max} * width_{max} * height_{max})$$

3. Once the vessel is placed in the water, the vessel must be free floating, and students will not be able to interact with the vessel in any way other than to place pennies on it. The judge will place the first penny on the vessel, at the furthest distance away from the geometric center of the vessel, determined at their discretion. The student will then place all additional pennies, one by one, on top of the first penny until the vessel sinks to the bottom of the basin. In the event the pennies provided by the teacher are not enough to sink the vessel, the teacher will place additional objects, chosen at their discretion, on the vessel until the vessel sinks. The mass of each object will be measured and converted to number of pennies to be factored in scoring.
4. In the event of a tie, a first tie break of most pennies will be used. If a tie still stands, the second tie break will be a coin toss.