**3rd Grade Build-a-Barge (45 Minutes - Coach Scheduled Event)**

**Description:** Teams will build a barge on-site to hold the greatest amount of cargo, measured in grams, before sinking. This event has a short knowledge assessment.

**Participants per team:** 2

**Spirit of the Competition:**

- It is a rules violation if coaches, parents, mentors, or spectators enter the competition area. Talking to the team members any time during the competition. Violation of this rule will place the team below all other teams.

**Teams need to bring:**

- Pen or pencil.
- Optional - Teams may also bring rulers, protractors, tape-measures and a non-programmable calculator.

**Safety Requirements:** Indirect-vent Safety Goggles.

- Because this is an event that uses liquids, all competitors must always wear their eye protection when competing.
- If a team does not have the required eye protection, they will have the opportunity to obtain it, time allowing, but will not receive extra time.
- If a team is unable to obtain eye protection, the team will not compete and will receive a no- show score.

**Indirect Vent Goggles**
**ANSI Z87.1-2015 certified and meets CE EN166 & D3 Splash/Droplet standards.**

**Materials provided at event:**

- Each team will receive a set of materials to build a barge. Materials may include items such as aluminum foil, small plastic sheets, clay, cardboard, water-proof tape, straws, Styrofoam, etc. The exact set of materials will not be announced prior to the tournament, but all teams will receive the same materials in the same amounts.
- Cargo items such as coins, washers, marbles, small bags of rice, or similar items will be provided for loading the barges. The mass of each type of cargo will be provided to the teams.
- A container at least 30 cm long by 30cm wide and filled to a depth of at least 20 cm with water.
- Equipment to measure the mass of building materials MAY be provided.

**The Competition:**

**Building Phase**

Teams will receive a set of materials with which to build their barge, and will have 15 minutes to complete a barge meeting the following criteria:

- The barge may have only one, continuous area for cargo (i.e., no separate cargo compartments), and must be open at the top for loading.
- The completed barge must fit completely within a box measuring 10cm x 10cm x 5cm.
- After completing their barge, the team will estimate the amount of cargo (in grams) that their barge will hold and give this estimate to the Event Supervisor (for use in breaking a tie).
- The barge may include components that help it stay afloat, remain stable or otherwise improve its cargo-carrying capacity.

- The Event Supervisor will measure the barge and note on the score sheet whether it meets all criteria (Tier 1) or does not (Tier 2). Teams in Tier 2 may test their barge but will be ranked below all teams in Tier 1.
- The team will then have 2 minutes to place their barge in a test container and load it with cargo.
- Teams load cargo one piece at a time, until the barge sinks, or is holding all the available cargo.
- Mass held will be the total mass held before the barge sinks (i.e., the mass of the last piece of cargo added, that causes the barge to sink, will not be in the total).
- A barge is "sunk" when the top of the cargo area is completely below the water surface. It is not necessary for the barge to settle to the bottom of the container. If a barge takes on water but the top of the cargo area remains above the water surface, the team may continue to add cargo, however the mass of any water in the barge will not count toward the total mass held. (Teams may not attempt to remove water that enters their barge during testing.)
- There may be multiple types of cargo. Teams can load cargo in any order but may not remove or adjust a piece of cargo once it is placed in the barge.
- The cargo is dried before weighing.

**Written Test**

Teams will take a short-written test on paper during the building phase. Topics may include but are not limited to, the principles of buoyancy, Archimedes' principle, types of barges, density, why objects float, parts of the barge etc.

**Scoring:**

Teams will receive two weighted rankings. These rankings will be added to find the final placements. The team with the lowest sum will place first.

- 25% of team score: A ranking based on their written test score.
- 75% of team score: A ranking based on the mass held by their barge.
    - The Event Supervisor ranks the tier 1 teams greatest to least for holding the most mass measured to the nearest gram.
    - The Event Supervisor ranks all Tier 2 teams from most mass held to least.

**Tiebreaker:**

The team whose prediction of the amount of mass their barge would hold is closer to the actual amount will be ranked higher.

**Scoring Example:**

Equation: (written test ranking x 0.25) + (building ranking x 0.75) = final ranking

- Team A ranks 3rd on the written test. This scores 0.75 ranking points. The team also scores 5th on their mass held. This scores 3.75 ranking points. The team's final ranking score is 4.5.
- Team B ranks 2nd on the written test. This scores 0.5 ranking points. The team also scores 7th on their mass held. This scores 5.25 ranking points. The team's final ranking score is 5.75.
- Team A places first in the rankings.

**Possible Resources:**

Division A will not release previous tests, or the exact resources used by the Event Supervisor or test writer for any events. The listed resources are meant as a starting point. It is up to the competitor to research further.

- The Guide to Types of Barges - Archway Marine
- Density Lesson for Kids: Definition & Facts - Video & Lesson Transcript | Study.com.
- In preparing for this event, teams will want to learn about density and how objects float. They will want to practice by building vessels of various materials and shapes to see how these things affect the ability of the barge to hold cargo and will also want to practice loading cargo.