

## Cardboard Boat Competition

**Level:** Middle and High School (6<sup>th</sup> – 12<sup>th</sup> grades)

**Type of Contest:** Team

**Composition of Teams:** 3-5 students per team; 2 people must be on boat and 1 person helps the other team members board the boat.

**Overview:** Students will work as an engineering design team with the goal of building a cardboard boat that travels the length of a high school pool in the least amount of time.

**Materials:** Only the following materials are permissible:

- ANY TYPE of cardboard (Provided by Students)
- Cardboard Tubes may be used
- Water-based polyurethane (Provided by MESA)
- Oars or paddles (Provided by MESA)
- Any kind of tape (Provided by MESA)

### Rules:

1. Tape can only be used to cover joint areas in any direction and any amount; tape cannot be used to fully cover any surface area on the boat (i.e., side, bottom, inside, etc.)
2. Duct tape, masking tape, or other tape adhesives CAN be used to connect cardboard to cardboard and CAN be used to reinforce all seams and stress points. It CANNOT be used to waterproof boats. All shipping labels, decals, or adhered material must be removed from any recycled cardboard.
3. Boats Size: Maximum boat size is 6 feet wide, 8 feet long, and a minimum of 1 foot high. Rafts will automatically be disqualified.
4. Boats submitted the day of competition, must be competition ready (fully dry and constructed). No taping of the boat will be allowed after registration.
5. Teams may use as many coats of polyurethane as deemed appropriate. The MESA center will provide a provision based upon the number of teams from the school participating in this competition.
6. Boats that appear to be wet due to recent polyurethane coatings or flimsy with loose parts will be disqualified.

**NOTE:** It takes water-based polyurethane about 3 days to dry, so apply the last coat of polyurethane at least 3 days before the event.

7. Boats may not be painted or marked with anything that can pollute the pool. Painted or marked boats will lead to disqualification. Cardboard that is already printed on is acceptable.



**Lab Report:**

In addition from constructing a boat that will travel the length of a pool, students are expected to conceptualize their building process.

Specifications:

Lab Report must be from 1- 2 pages in length, Times New Roman font, 12 point font and double spaced with 1 inch margins.

Your lab report should include the following criteria:

1. Identify the Purpose:
  - a. What is the purpose of this competition? What is the overall goal?
2. Design Process:
  - a. Brainstorming Process:
    - i. How did your team come up with the design?
  - b. What STEM Concepts were considered in the building of this project?
    - i. Ex: How did the weight of the passengers factor into your design?
    - ii. Show calculations of the boat’s theoretical displacement. (see Boat Physics attachment)
  - c. Explain the roles each team member have. How many hours were invested in the process of this project?
3. Challenges:
  - a. What were some challenges that you encountered during the building process and how did you overcome them?
4. Hypothesis:
  - a. Although you may not be able to test your final project, do you think your boat will be successful?
5. Conclusion:
  - a. What did you learn from this project?

**Lab Report Rubric**

Criteria	5 Excellent	4 Good	3 Average	2 Below Average	1 Incomplete	0 Missing
<b>Purpose:</b> Team clearly identified the purpose of the competition and overall goal.						
<b>Design Process:</b> Team covered all areas of the design process. Team clearly explained the brainstorming process of project, included STEM concepts, and calculations of the theoretical boat’s displacement.						
<b>Challenges:</b> Team stated challenges they faced while building their boat and provided clarity on the steps they took to resolve each challenge.						
<b>Hypothesis:</b> Based on their design, team came to a final conclusion on the success of their boat.						
<b>Conclusion:</b> Team shared their final thoughts on project and what they learned in the process.						
<b>Neatness:</b> Lab report does not exceed the 2 page maximum, has the correct font, and format.						
<b>Total</b>	_____/30					



### **Judging:**

1. Each boat will have one opportunity to race.
2. 2 team members must be on the boat to participate in the race.
3. Each team will have 1 minute to stabilize their boat in the water.
4. Once the team members of all teams are safely secured in the boats or the stabilization time has elapsed, the race will begin at the judge's announcement.
5. The back of the competing boats will be lined up against the pool wall to ensure a fair start.
6. Timing will cease once the boat touches the finishing side of the pool.
7. The distance between the starting location, where all lead bodies in the boat are lined up, and the finish line will be the same for all teams.
8. Boats that capsized, sink, or fail to travel the entire length of the pool will not have a recorded time.
9. The competition will be judged by the boat's performance in the pool and a Lab Report due prior to competition. (See attachment for specifications)
10. Lab Scoring: For EVERY FIVE points received on the lab report .5 seconds will be taken off the final heat time.
  - a. Ex. lab report score 30 and Heat Time 28 seconds. Total amount of 25 seconds for the final time.

### **Awards:**

#### **Judge's Choice Award** (1 winning team)

Awarded by the judges based on creativity, showmanship and team spirit. Costumes and props are encouraged!

#### **Titanic Award** (1 winning team)

(Most Spectacular Sinking) - Awarded to the crew who, in the opinion of the staff, was the most spectacular in the way the ship and its crew went down.

#### **Overall**

Medals will be given for 1st, 2nd, and 3rd place teams with the best race time (including Lab Report time deduction)

For more Information:

View Cardboard Boat Presentation

[Click Here](#)