Cornhole Catapult
Event Specifications
MESA Day 2024

LEVEL:	Middle School/High School
NUMBER OF TEAMS:	One (1) team per school can participate at the MESA Day state competition. Up to three (3) teams can participate at MESA regional events.
TEAM MEMBERS:	Two (2) to Six (6) Students per Team
OBJECTIVE:	Students will design a device to launch regulation Corn Hole bean bags at a regulation Corn Hole board to score 21 points in the fewest number of throws. Students will also be required to submit their Poster during specification check for review and scoring.
MATERIALS:	Any materials that coincide with the design parameters may be used to build the launcher. Hazardous materials are not allowed. MESA will provide regulation sized targets and bean bags at MESA Day. Teams may bring additional bean bags. Students will submit a Design Poster that provides a brief overview of the project.

DESIGN PARAMETERS:

1. Any launcher design is allowed unless deemed unsafe by the judges. Unsafe designs could include use of compressed gas (other than air) and/or caustic materials.
    a. If compressed gas is used, teams should document at least one successful pressure tests to 150% of maximum launch pressure in their Design Notebook to assist in the judge's safety evaluation. For example, if the launcher is designed to launch at 25 psi, testing data should show that the device successfully held pressure at 38 psi (150% of 25).
    b. Launchers must have a remote trigger that can be operated from at least 1 meter away from either side of the launchers.
        i. Manual or Electronic triggering devices are allowed.
        ii. Remote cannot be triggered from behind the device.
        iii. Triggering device must be "fail safe", so that a loss of power or dropping of triggering device will not cause device to launch.
    c. No student can be within 1 meter of the device once it is ready to launch.
2. Bean Bags used for competition will be regulation size.
    a. Size: 15 cm by 15 cm, +/- 1 cm is acceptable
    b. Weight: 400-480 grams
3. The Corn Hole target used for competition will be regulation size.
    a. Hardwood plywood playing surface measuring 120 cm x 60 cm. +/- 1 cm is acceptable
    b. The playing surface has a minimum thickness of 1 cm with cross-section backing, or 2 cm with or without cross-section backing.
    c. Each hole is 15 cm diameter, centered 23 cm from the top of the board and centered from each side edge.

d. The front of the board can be no higher than 10 cm from the ground to the top of the playing surface.

e. The back of the board is 29 cm to 32 cm from the ground to the top of the playing surface. This should create an angle between 17 and 20 degrees from the ground.

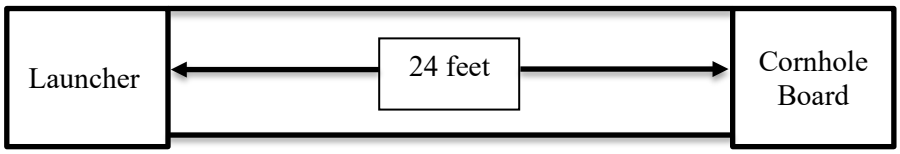
f. The playing surface should be finished -sanded to a very smooth texture. There should be little to no blemishes in the wood surface that may disrupt or distort play.

g. The playing surface can be painted with a high gloss latex paint or varnish. The surface should allow bags to slide when thrown, but not be so slippery that the bags slide back down the platform.

h. At MESA Day, targets will be provided by MESA for testing. Only MESA provided targets will be allowed.

TESTING PARAMETERS:

1. Two (2) team members are required to be present during testing.
2. The throwing lane will be 48 inches wide.
3. The front edge (or closest point) of the Corn Hole target will be placed 24 feet away from the launcher line.
4. The front edge of the launcher can be no further than 2 feet from the launcher line. This creates a maximum distance of 26 feet.
5. No part of the launch device may pass the launcher line.



MINIMUM SAFETY EQUIPMENT:

1. All team members participating in the launch must wear plastic hard hats and goggles.
2. Team members shall remain behind the launch line during testing.
3. Teams should bring their own safety equipment. A set of hard hats and goggles will be available at the event if needed.
4. No student can be within 1 meter of the device once it is ready to launch.
5. No student can stand directly behind the device during launch.

SPECIFICATION CHECK:

1. Teams will submit their design poster a minimum of two (2) weeks before competition for judging. MESA will notify schools when a deadline is set.
2. During specification check, all teams will check in to the competition area and submit their launcher and bean for impounding. Teams not arriving during spec check will receive a score of zero. See event agenda for exact times.
3. Immediately upon submission for competition, each launcher and all bean bags to be used, receives a specification check to determine whether it conforms to dimensions, materials, and construction rules. Any launcher that fails the specification check will be given a performance score of zero. Neither may be modified for competition during or after judging.

4. Judges **<u>may disqualify</u>** any entry if, in their opinion, the testing of the device might create a safety hazard for spectators, team members, or property (i.e. sharp edges).
5. Launcher mechanism (including any power sources) may be tested at the judge's request to confirm the mechanism meets safety requirements.
6. Devices must be in testing condition prior to device inspection. If devices are disqualified during inspection check, design changes will not be allowed. Only devices passing inspection will be allowed to participate in the performance tasks.
7. Repairs are allowed, replacement parts and materials only, and all repairs must be done in the impound area under supervision of a judge. The addition or exchange of parts that, in the opinion of the judge, would alter the design or function of the launcher is NOT allowed. No tools or supplies will be available at the event. Teams should bring needed repair tools and repair materials with them.
8. All repair materials to be used during the competition must be impounded with the device. Tools may be kept by the team and need not be impounded. MESA will not provide tools.
9. After clearing specification check, all launchers will be impounded until testing.

JUDGING:

1. Teams must be ready for competition when called or forfeit that launch.
2. Launch set-up is limited to two (2) minutes.
3. All team members participating in the launch shall wear at least the minimum safety equipment prior to starting launch set-up until launching is complete. If any team member fails to wear the minimum safety equipment, the team will receive a zero score for that launch.
4. Teams may use their own bean bags. MESA will have additional bean bags available for use on the day of the event.
5. Teams must launch, at minimum, three (3) bean bags before adjusting their launcher and/or collecting bean bags.
6. Teams may launch, at maximum, ten (10) bean bags before adjusting their launcher and/or collecting bean bags.
7. Teams must stop launching when bean bags are being collected. All launched bean bags must be returned to the launch area before launching can begin again.
8. The team member responsible for operation of the device will indicate to the judge that the devices are in the "ready-to-operate" condition.
9. Judges will give the launch order and students may launch their bean bag. Judges will begin the timer.
10. Teams must launch until they score 21 points, 40 launches have been taken, or time runs out. Testing ends when a team reaches 21 points. Judge will stop the timer when the team reaches 21 points, has launched 40 times, or 10 minutes has elapsed.
11. Team will be allowed, at maximum, 40 launches or 10 minutes, whichever comes first. Time spent adjusting or repairing launcher is included in the 10 minute maximum.
12. A misfire happens when a bean bag falls out of position prior to triggering the launching device. Once the launching device starts moving or the triggering device is actuated, it is considered a launch and will be scored regardless of the final bean bag location. For example, if the bean bag falls off the launching device because of pulling on the triggering device and lands on the ground next to the launcher, this is considered a valid launch and will count toward scoring.
13. Teams are allowed to leave some bean bags on the playing surface but must collect a minimum of 3 bean bags when pausing to collect bags for additional launches.

SCORING CRITERIA:

1. Point system for bean bags:
   - Misses the target – 0 points
   - Any part of bean bag on target – 1 point
   - Any part of bean bag over hole without going through – 2 points
   - Entire bean bag falls through hole – 3 points
2. Bean bags can be pushed over or through the hole by other beans bags. If that happens, the points for that bean bag will be changed to match the final position of the bean bag. For example, launch 1 bean bag ends up over the hole and was scored 2 points. Launch 2 bean bag hits bean bag 1 and pushes it through the hole. The score for bean bag 1 will be changed from 2 points to 3.
3. Bean bags pushed away from the hole or off the playing surface will have their score changed to match the final position of the bean bag. For example, launch 1 bean bag ends up over the hole and was scored 2 points. Launch 2 bean bag hits bean bag 1 and pushes it off the playing surface. The score for bean bag 1 will be changed from 2 points to 0.
4. Points for launch (L_n) are assigned when the team collects the bean bags.
5. The Launch score is the sum of all points received. L_{Total} ($L_{Total}=L_1+L_2+\ldots+L_{n-1}+L_n$)
6. The Performance score is found by dividing the launch score (L_{Total}) by the number of shots taken and multiplying the total by 10. L_{Total} /Shots*10
   For example, if a team needed 15 shots to score 21 points their launch score would be (21/15)*10 = 14
7. If a team fails to reach 21 points, the difference to 21 points will be added to their number of shots. For example, if a team score 12 points on 10 shots, 9 (21-12 = 9) will be added to the number of shots in the score calculation.
   (12/(10+9))*10 = (12/19)*10 = 6.3
8. The maximum score is 30. 21 points in 7 shots. (21/7)*10 = 30
9. The Final Score is the Performance Score + Poster Score
10. In the event of a tie, the team with the shortest time to reach 21 points will be the winner.

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School: _____

Student Names: _____

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Specification Check	**Pass**	**Fail**
1. Team arrived on time for spec check and impounding	Yes	No
2. Launcher is safe for competition?	Yes	No
3. Bean bags are regulation size?	Yes	No

If the answer is No for any of the above checks, the team is disqualified

Time	
Launch Score (L_S) - Total points from shots, max 21	
Point Difference If score is less than 21, Difference from 21. (21- L_S)	
Number of shots	
Performance Score (Launch Score/(Shots+Point Difference))*10	
Poster Score	
Total Score	

Judge's signature: _____

Student signature: _____

Comments:

Score Tracker Sheet
L = Launch, S = Scoring, F = Final Score
Use to tally score during competition

L	S	F	L	S	F	L	S	F
1			15			29		
2			16			30		
3			17			31		
4			18			32		
5			19			33		
6			20			34		
7			21			35		
8			22			36		
9			23			37		
10			24			38		
11			25			39		
12			26			40		
13			27					
14			28					

Time to complete:

Point system for bean bags:

- Misses the target – 0 points
- Any part of bean bag on target – 1 point
- Any part of bean bag over hole without going through – 2 points
- Entire bean bag falls through hole – 3 points

Poster Rubric

Category	Excellent (3 points)	Met Criteria (2 points)	Poor (1 point)	Not Present (0 points)
Project Overview - Using 50 words or less, team summarizes the project, including team objective(s), successes, challenges, and performance expectation				
Launcher Graphic – Team has a graphic or two that shows their launcher				
Launcher Details – Team describes their launcher with callouts to graphic				
Trigger Graphic – A graphic of the mechanism used to fire their launcher				
Testing Data 1 – Team has a graphic of testing data that helped determine their design decisions				
Testing Data 2 – Team has a 2nd graphic of testing data that helped determine their design decisions				
Launcher Name			Yes	No
School & Team Member Names			Yes	No
School Logo			Yes	No
MESA Logo			Yes	No
Column Totals				
			Total Score:	