



MESA DAY RULES 2020-2021 (DRAFT – REVISED 7/16/20)

Prosthetic Arm High School

- LEVEL:** All Grades, Separated per below
- DIVISION(S):** Grades 9th/10th and 11th/12th
- COMPOSITION OF TEAM:** 1-3 students per team
- NUMBER OF STUDENTS:** Preliminary – As determined by your local Center
There will be no regional event for this competition.
- SPONSOR:** University of the Pacific MESA
- OVERVIEW:** Students will design, construct, and operate a simulated prosthetic arm that can grab a 3 oz. standard bathroom cup and use it to scoop beans from a tub on one table to fill a tub on another table that is ten feet away. The weight of the beans will be recorded for points.
- MATERIALS:** For the device, all materials are legal with the exception of hazardous materials. There are no cost limitations; however, awards will be given to the most innovative designs utilizing low-cost materials.
- The Host Center will provide the following:
- 3 oz Bathroom Cups
 - Beans
- GENERAL RULES:**
- 1) The students' full name, grade level, school name, and MESA Center must be clearly labeled on the device. A 10% penalty in the score will be assessed for failing to properly label.
 - 2) The device must have at least two artificial fingers. These fingers:
 - a. MUST open and close. At least two fingers are required to move.
 - b. MUST grab, and release cup. Team member may NOT use any other part of the prosthesis or parts of his/her own hand, wrist or arm to grab and release the cup.
 - 3) The device must NOT be controlled or operated by either of the team member's fingers, hands, or wrists.
 - 4) In order to simulate an amputated arm, participating team member must have his/her wrist, hand, and fingers immobilized during the competition. The team will determine own method for immobilization.
 - 5) The device (i.e., artificial fingers) may only grab **one** cup at a time.
 - 6) Digital media (e.g., photos, video recordings, etc.) will not be accepted for arbitration purposes.

JUDGING:

- 1) Devices will be checked for specifications prior to the start of the competition. Disqualified teams after this initial check will have an opportunity to compete if they meet ALL of the following conditions:
 - a. Accept an automatic “Mistrial” and therefore no score for Trial #1.
 - b. Make repairs/modifications as necessary to bring the device to proper specifications and be ready to compete when called for Trial #2.
 - c. Make repairs/modifications only in the designated area as indicated by the judges.
 - d. Failure to adhere to any of a, b, or c will result in the disqualification being upheld.
- 2) Teams that are not disqualified but wish to make repairs and modifications may do so, but they **MUST** be ready to compete when called for Trial #1.
 - a. Repairs are only allowed with duplicate parts and materials.
- 3) Each device will be allowed two (2) non-consecutive trials.
- 4) At the beginning of each trial, team member must demonstrate immobilization (see Rule 4).
- 5) Each device must be ready when called or team will forfeit that trial.
- 6) Each team will be given up to 60 seconds to prepare, attach, and demonstrate prosthetic arm. If at the end of the 60 seconds the team is not ready, the trial will be declared a mistrial and this process will be repeated for the second trial.
- 7) The judge will give the start order and begin the timer.
- 8) The team member will enter the *Working Area* and will have a maximum of 2 minutes (120 seconds) to grab, fill, and transfer the beans from one tub/table to the other. The judge will notify the team when 1 minute, 30 seconds, 20 seconds, and 10 seconds remain.
 - a. Team member will begin at the starting table
 - b. Team member will grab an empty cup (other team members can be standing by the starting table and may place **one** empty cup at a time on the table for the competing team member to pick up. If you are working individually, the starting table judge can ready your cups for you.)
 - c. Team member will use the empty cup to scoop up beans from the “bean dispensary”
 - d. Team member will transport the beans to the destination table and pour the beans into the “bean bowl” which is sitting atop a scale
 - e. Team member **must** drop the empty cup into the “empty cup container” before heading back to the starting table
 - f. Team member returns to the starting table, grabs a new cup, and repeats the process until time is called
- 9) The judge will call “time” after two minutes has passed.
 - a. The judge will record the weight of the beans in the bowl at the end of each trial.
- 10) Beans that fall out of the cups and bowl during the trial cannot be picked up.

SCORING:

- 1) 1 point will be awarded per gram of beans
 - i. Examples:
 1. 9.98 grams = 9.98 points
 2. 11.2 grams = 11.2 points
 3. 109.5 grams = 109.5 points
 - b. Time needed to complete trial is 120 seconds
- 2) Final Score = highest number of points
 - a. The highest number of points of the two trials will be used
- 3) In the case of a tie, the tied prosthetic arms will be weighed and the lightest arm will win.

AWARDS:

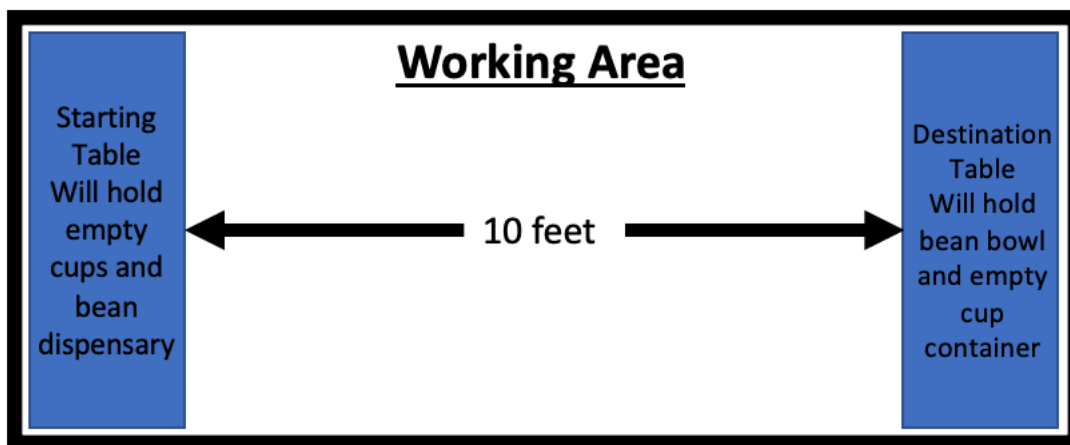
- Awards will be given per division: Grades 9th/10th and Grades 11th/12th
- Medals will be awarded for 1st, 2nd and 3rd place based on the highest Grand Total Score.
- Ribbons will be awarded for Innovative Engineering Design utilizing low-cost materials.

ATTACHMENTS/APPENDIX:

- Competition Area Specifications
- Equipment
- Inspection & Score Sheet for Prosthetic Arm

Competition Area Specifications

- Two tables, 10 feet apart will be provided.



- The *Working Area* will be either tape on the ground or rope, around the tables as shown in the diagram above. Only the team member actively participating during the trial will be permitted in this *Working Area*.

Equipment

- Two tables – standard 6 or 8 ft tables are permissible
- Standard 3 ounce bathroom cups (<https://tinyurl.com/competitioncups>)
- Measuring tape
- Masking tape, painters tape, caution tape, or rope to outline the *Working Area*
- 1 stopwatch to record trial time, but have extras on hand

INSPECTION AND SCORE SHEET FOR PROSTHETIC ARM

High School – Grades 9/10 and 11/12

Copies of this inspection and score sheet will be provided by the MESA Day Host Center.

Student Names: _____

Grade: **9/10** or **11/12** (circle one)

School: _____ MESA Center: _____

Section below to be completed by Judges

INSPECTION LIST:	YES	NO
Device includes at least two artificial fingers that open and close (at least 2 fingers are required to move) ..	<input type="checkbox"/>	<input type="checkbox"/>
Fingers grab and release cups	<input type="checkbox"/>	<input type="checkbox"/>
Device not controlled by fingers, hands, or wrists of either hand	<input type="checkbox"/>	<input type="checkbox"/>
Team has demonstrated immobilization of the fingers, hand, and wrist	<input type="checkbox"/>	<input type="checkbox"/>
Device labeled properly (students' full name, school name, grade and MESA Center)	<input type="checkbox"/>	<input type="checkbox"/>

Innovative Engineering Design (ranking – 1, 2, 3, etc.): _____

TRIAL 1

Total weight of beans in grams:
(1 gram = 1 point)

Trial Time = 120 seconds Points: _____

Mistrial (reason): _____

TRIAL 2

Total weight of beans in grams:
(1 gram = 1 point)

Trial Time = 120 seconds Points: _____

Mistrial (reason): _____

Final Score (best of two trials) _____

Device Labeling Penalty (10% of Final Score) - _____

GRAND TOTAL SCORE _____