



# IV MESA Engineering Exhibition 2.0

## Imperial Valley Robotics Competition

### 2023-2024

**Date: April 27th, 2024**

**Level:** Middle School  
**Type of Contest:** Team  
**Composition of Teams:** 3 – 5 Students per team

**Background:** IV MESA proudly introduces our brand new VEX Robot Engineering Exhibition and we are so happy to invite you! Let's showcase your robot prototypes and show us what they can do!

**Challenge:** Teams will design a robot that has the ability to find two objects of different colors. Once objects are found the teams will have to collect an object from the center. Here is the [Video](#) of the competition.

*The purpose of the competition is to encourage **gracious professionalism** that leaves everyone involved feeling valued with a sense of integrity and teamwork. The goal is not just to win, but also to participate fairly and to extend the gracious professionalism and respect to all teams and students involved.*

*- For Inspiration and Recognition of Science and Technology (FIRST)*

#### **Definitions:**

- Autonomous: Mode in which the robot moves on its own without human control.
- Teleoperation: Mode in which robot moves through human control (ie. remote control)

#### **Robot & Materials:**

1. Teams may only use simple materials such as string/zip ties/balsawood/ rubber bands.
2. IV MESA will only provide the kit/ parts listed below and simple recyclable materials.
3. All teams will receive a VEX IQ kit provided by the Imperial Valley MESA Program. Kits will be provided and assigned by your MESA advisor.
  - a. Robotic kits: VEX IQ Robot SKU#: 228-8899 these are the only robotics kit pieces allowed
4. Robots may incorporate a total of TEN 3D printed parts
  - a. 3D part colors must be different from those already used in the VEX kit.
5. Teams may not do any alteration to any of the VEX Kit Parts provided by the Imperial Valley MESA Program.
  - a. Alterations include: adhesives on kit parts, holes or modifications to kit parts, and or bending kit parts.
  - b. NOTE: Robots with alterations will need to be fixed prior to competition. If alterations cannot be undone, then the team will not be allowed to compete.
6. There are no dimensional restrictions as to the building of the robot.

## Game Rules:

### Exhibition #1 - Autonomous robots have the ability to gain and identify information about their environments

#### Consists of 2 Parts: Autonomous Challenge and 20 Point Challenge

##### Autonomous Challenge

1. Robots may be placed anywhere within the team's designated area.
2. Judges will have 3 different colored disks on hand (green, blue, red)
3. Judges will then place a total of 6 colored disks in the team's field area, disk color and placement will be randomly chosen by the judge.
4. At the Judge's signal, all teams will begin autonomously searching for 2 colored disks.
5. The robot must make a sound and/or remain over each colored disk for at least 3 seconds.
6. After both colors are detected, the robot must search for the brick placed in the corner of the field.
7. Once detected, the robot must touch the brick, make a sound, and come to a complete stop.

##### 20 Point Challenge

1. The goal for this challenge is to collect a total of 20 points in rings.
  - a. If teams don't collect the full 20 points they will be awarded the points they did collect. Ex given: If 3 rings worth 5 points each were retrieved and placed in the ring racker, they earn the team 15 points
2. Robots will then take rings from the center multilevel structure and must deliver them to the ring rackers.
  - a. Rings must be stacked on the ring rack corresponding to their color. For more information go to page 7 for examples of acceptable ring placement.
3. **ONLY THE ROBOT** will be allowed to place the Rings on the ring rackers.
4. The round concludes when teams reach 20 points or time runs out, whichever happens first.

At the end of **Exhibition #1** teams who complete both challenges before or at exactly 5 minutes will receive double the points possible.

### Exhibition #2 -In a teleoperated robot, a human operator controls the movement

1. Robots will compete in this round in teleoperation mode.
2. Objective is to obtain as many rings as possible on the ring rackers in 5 minutes.
3. Center barriers will **NOT** be present on the field throughout the duration of the round.
4. Robots are not limited to their field area during this round and may move freely throughout the field
5. At judge's signal, robots will take rings from the center multilevel structure and deliver them to the 3 different colored ring rackers
  - a. Rings must be completely placed on the ring racker corresponding to their color. For more information go to page 7 for examples of acceptable ring placement
6. **ONLY THE ROBOT** will be allowed to place the Rings on the ring rackers.
7. Teams have the full allotted time to place as many rings as they can onto the ring rackers
8. Rings that are on the floor or around the ring rackers are free game for any robot
9. The center multilevel structure must remain in place at all times.
10. The ring rackers must remain in place at all times.
11. Rings that are on the ring rackers cannot be removed.
12. Robots may not steal rings from other competing robots when a ring is in a robot's possession
13. The round concludes when the time runs out.

## Competition Logistic Rules:

1. Teams should assign roles to each teammate. (example: lead engineer, teleoperator, computer scientist, etc. )
2. The Lead Engineer is responsible for checking in their robot during the Competition.
  - a. Robots will be impounded after registration and no alteration will be allowed.
3. Each team will have the opportunity to compete in two rounds. **Exhibition #1** is 7 minutes long and **Exhibition #2** is 5 minutes.
4. **Exhibition #1** has two challenges:
  - a. Robots will compete in the first challenge in **autonomous** mode.
    - i. Teams may start anywhere in their field area at the beginning of the round
      - Teams must stay within their field area. Failure to do so will result in automatic disqualification
    - ii. Disks will be placed AFTER the robot is on the field
    - iii. Brick will be placed beforehand
    - iv. Robots must stay in their assigned field area during round 1
    - v. Teams must attempt to complete this portion of the competition in autonomous mode or in remote control after the allotted time.
      - Full points will be awarded to teams who complete it in autonomous mode.
      - Teams must attempt the autonomous portion for the FULL 1 minute. Failure to do so, will result in an automatic 0 for the entire Exhibition #1. For example, a robot that purposely just spins or stays still for the 1 minute will receive 0 points for Exhibition #1.
      - No points will be awarded for a robot that completes the autonomous task in teleoperation mode but the robot may continue to the 20 Point Challenge.
      - Anytime during the autonomous portion, teams may ask for robot resets but time will continue.
  - b. Robots will complete the second challenge in teleoperation mode.
    - i. Robots may NOT block or interfere with the other competing robots
    - i. If something should happen to the robot during teleoperation mode, the team can ask to reset the robot and fix the issue. Time, however, will continue.
5. **Exhibition #2** is fully in teleoperation mode.
  - a. Robots must start in front of the ring rackers on their corner of the field (see picture on page 9)
  - b. Robots may NOT block or interfere with the other competing robots
  - c. If something should happen to the robot during teleoperation mode, the team can ask to reset the robot and fix the issue. Time, however, will continue.
6. During competition, all team members **MUST** stay in their assigned field area at all times.
7. Teams will begin at Judge's signal. Any robot that fails to do so will be considered a false start. A false start will be considered as the following:
  - a. A robot is released or their program starts before the Judge's signal.
  - b. If a false start happens, then all robots will reset and the match will restart.
  - c. Once the vehicle exits the starting zone, the run is considered legitimate.
8. Teams will be randomly assigned a field and lane which will be provided the day of competition.
  - a. Teams should assign roles to each teammate. (example: lead engineer, teleoperator, computer scientist, etc. )
  - b. Only one teleoperator per round.

### Day of Competition Rules and Procedure:

1. Teams must be registered **prior** to competition. MESA Advisors will be responsible for registering each team by **Friday, April 5th**.
2. Team leaders must register/check-in their team and robot on the day of competition.
  - a. The robot will be then taken into the **impound zone**.
3. Teams will wait for their round number to be called. When called, teams will wait at the standby pit ready to go into the competition field area.
4. After the first round is done, teams are to return robots into the **impound zone**. **Robots will be returned for robot modification in between Exhibition 1 and 2.**

### Application Video Presentation: (Rubric on page 5)

The team will be responsible for developing and producing their own video on the educational topic of the competition and their robot. The video must include the following specifications:

1. Videos will be submitted to the link provided: <https://forms.gle/sE2ksCFSAQAaAsm86>
  - a. The **due date is Saturday, April 20th, 2024 by 11:59pm**..... No late submissions will be accepted.

Format of the video:

2. The video must be between 3 to 5 minutes long and must be in MP4 video format or a Youtube link. If using Youtube please set the video to public.

The content of the video:

3. The video must contain the following:
  - a. An introductory 5 second segment that displays the team's name, names of members, school, school logo and [IVMESA logo](#) (all together at the same time).
  - b. The video **must** explain your team's Engineering Design Process pertaining to this competition through an audio recording **and** visual textual display
  - c. Theoretical information: Research information on robotics, see page 6 for more information.
4. Include a "time-lapse" video demonstration of your robot while completing its tasks on the playing field.
5. Artwork or images that are not original or for public use are prohibited unless permission has been granted by the author/s. If permission is granted, it must be stated directly under the image/artwork.
6. The last 5 seconds of the video must **MUST** include proper bibliography for information used in the video presentation. Plagiarism will **NOT** be tolerated and students will receive a "zero" if information is copy pasted.

### Scoring:

Overall score will consist of the total for the following components:

1. Video Presentation Score
  - a. Maximum score possible for Video Presentation is **20 points**.
2. Exhibition #1 Points
  - a. The Autonomous Challenge is worth a total of **30 points**
  - b. The 20 Point Challenge has a maximum of **20 points** possible
  - c. **50 Total Points** possible for both challenges
    - i. Teams have the opportunity to double their total **Exhibition #1** points to 100 points only if the team finishes both challenges before or at exactly 4.5 minutes
  - d. For specific information on ring values see page 8
3. Exhibition #2 Points
  - a. For specific information on ring values see page 8



**Awards:**

Awards will be given for the best score for each of the following categories:

- Video
- Competition
- Engineering design

Medals will be awarded for 1st, 2nd, and 3rd place based on the best overall score.

**In case of a tie, the robot with the least weight wins.**

**Ribbons will be awarded for Video and Engineering design.**

***Continue to the next page  
Important information***

Team Name:	School:
<p>Introduction: (Maximum ½ point each)</p> <ul style="list-style-type: none"> <li>• The video must be between 3 to 5 minutes long and must be in MP4 video format or a Youtube link. If using Youtube please set the video to public.</li> <li>• An introductory 5 second segment must include every team member speaking to the camera</li> <li>• Include the team's name, names of members, school, school logo and <a href="#">IVMESA</a> logo (all together at the same time).</li> <li>• The order of the video should follow the video rubric order. For example: First the introduction, then the robot information and so on.</li> </ul> <p>___/2 points</p>	
<p>Robot information: (Maximum 1 Point each)</p> <ul style="list-style-type: none"> <li>• Identify the challenge for this competition</li> <li>• Does the team demonstrate/ explain how they explored the task?</li> <li>• What were some of the design options shared?</li> <li>• Explain some issues you ran into with your first design when you tried it out.</li> <li>• How did you make your final design better?</li> </ul> <p>___/5 points</p>	
<p>Theoretical information:</p> <ul style="list-style-type: none"> <li>• In the real world, robotics is everywhere. Research different areas in which robots are used in real life and give a brief description of two areas</li> <li>• Research different engineering majors and explain which types can lead to a career in robotics</li> <li>• Give a brief presentation of the features and capabilities of your robot</li> <li>• Convert your block code to either C++ or Python. Then, include a portion of your code as a graphic and <u>have every team member explain 2 to 3 lines</u> (worth 4pts)</li> </ul> <p>___/10 points</p>	
<p>Visual Creativity: (Maximum ½ Point each)</p> <ul style="list-style-type: none"> <li>• Does the video capture and hold the attention of the observer effectively?</li> <li>• Is the layout of text and images well organized? Is the use of space neat, uncluttered, and very easy to follow?</li> <li>• Does the video have the use of creative visual material? Is the information displayed in a creative way?</li> <li>• Does the team use a variety of methods to display/communicate information ex. Pictures, charts, tables, graphics, recordings, etc.?</li> <li>• Do all team members participate equally?</li> <li>• Is the bibliography included in the video?</li> </ul> <p>___/3 points</p>	
<p>Total: _____/20 points</p>	

**\*The video must not contain only a slide deck. Team members must speak for the duration of the video. Videos without team members speaking will automatically receive a zero.**

**\*Please follow the order of the rubric in your video timeline. For example, Introduction followed by Robot Information, Theoretical Information and so on.**

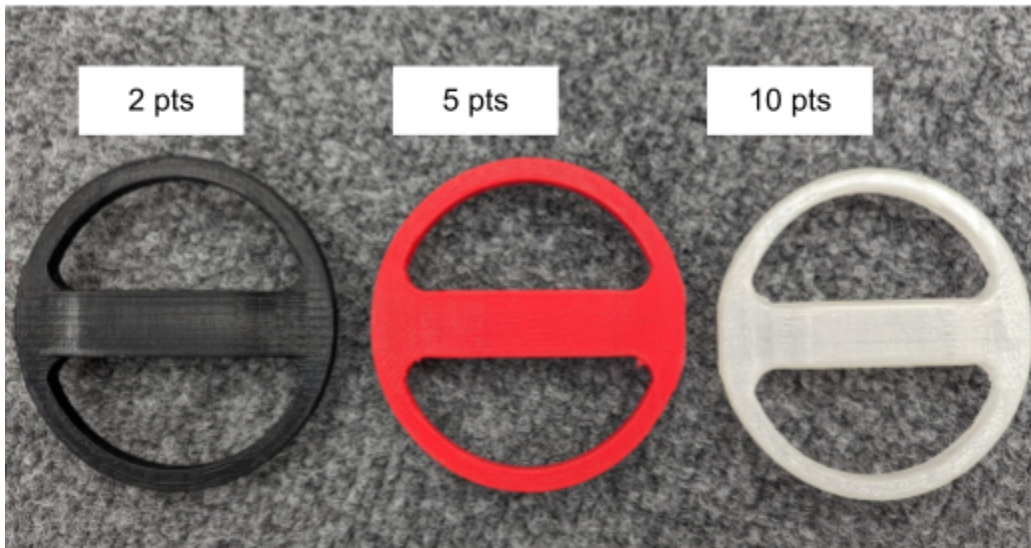
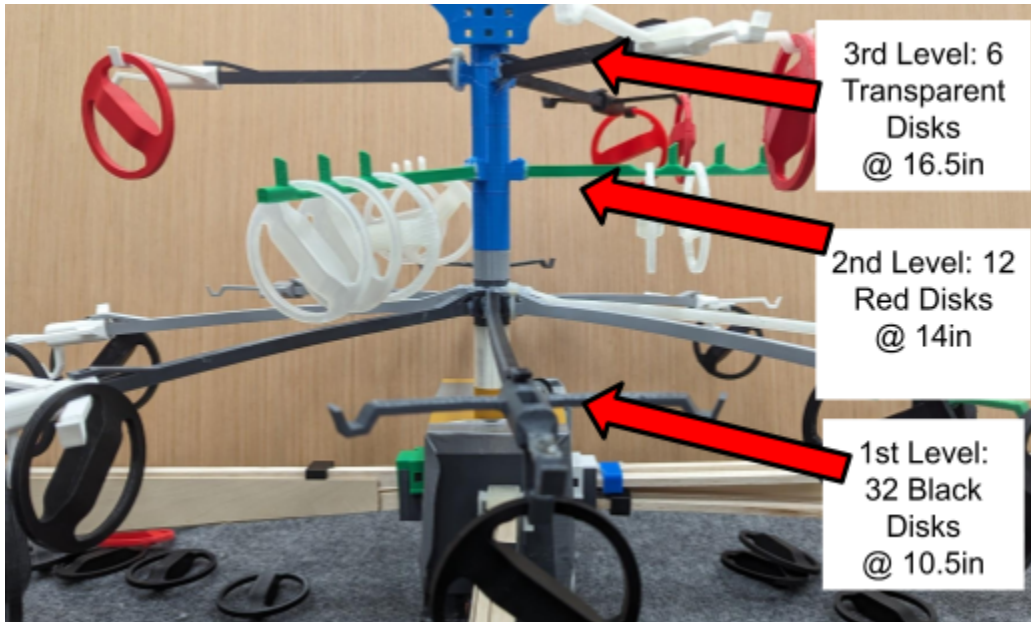
Acceptable Ring Placement: Ring should be fully inside the Ring Racker



Unacceptable Ring Placement: Ring won't count as scored

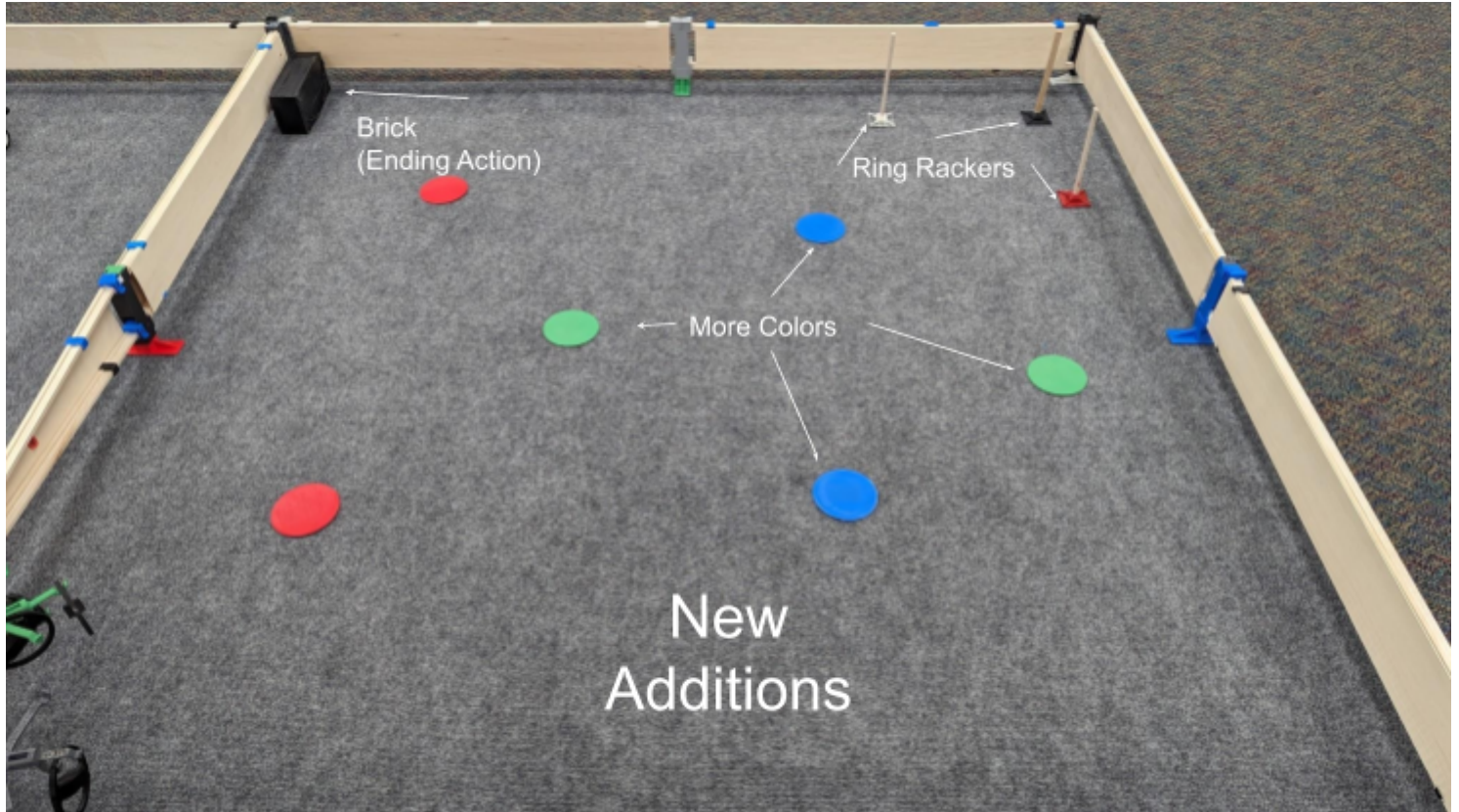


## Scoring and Measurements

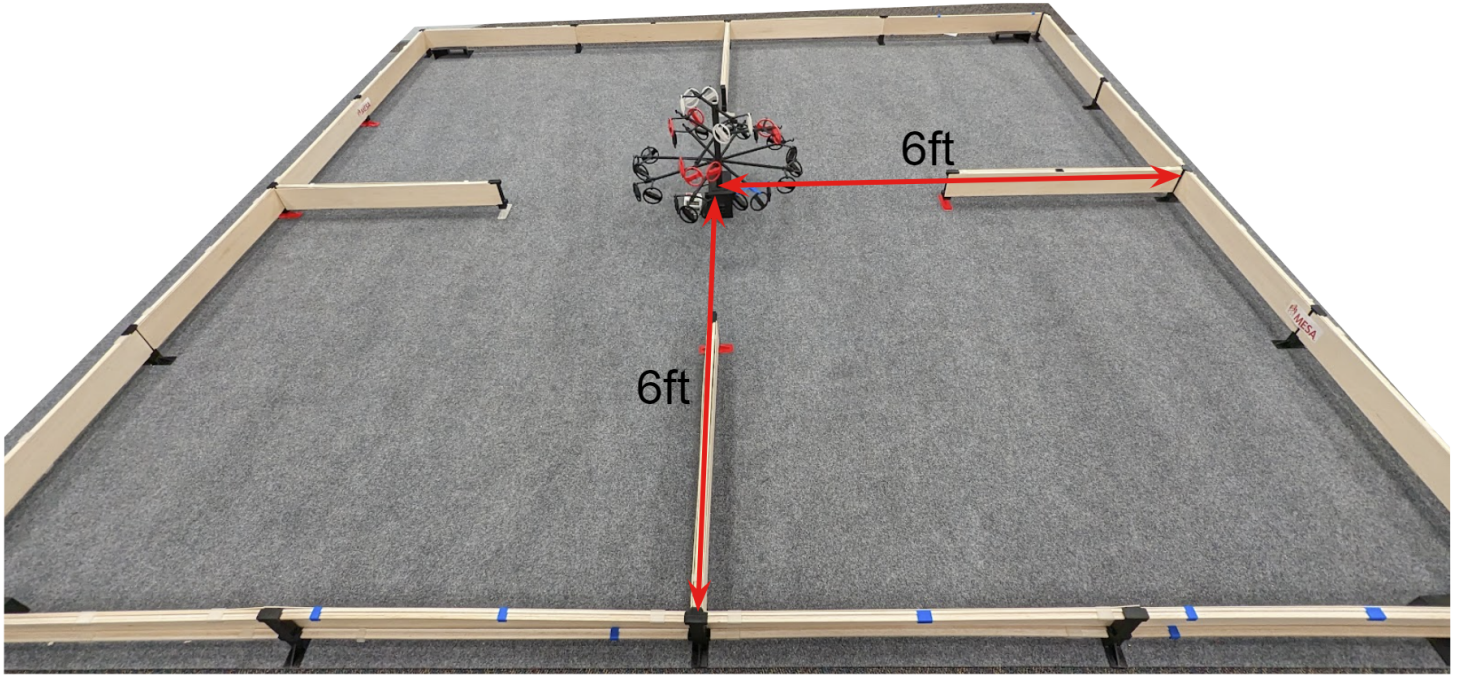




**Field Layout: Exhibition 1- Autonomous & 20 Point Challenge**



**Field Layout Exhibition 2:**



**Starting Location:**

