2025 4-H ROBOTICS ENGINEERING CHALLENGE

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1   Maryland 4-H Robotics Engineering Challenge

The Maryland 4-H Robotics Engineering Challenge (REC) provides an opportunity for 4-H members interested in STEM (Science, Technology, Engineering, Math) to participate in a hands-on, team-based activity where they build robots and program them to complete specific tasks. Successful teams will display technical excellence in robot design, engineering, and programming, as well as a high level of skill on the field in competition. The REC theme changes every year and integrates hot topic issues plus 4-H and University of Maryland priorities to bridge connections between youth, UMD, and industry.

Please direct questions and/or concerns to Willie Lantz, 4-H Robotics Superintendent, at wlantz@umd.edu or Mark DeMorra, 4-H STEM Specialist, at mdemorra@umd.edu.

2   The Essence of the Game

The 2025 Maryland 4-H Robotics Engineering Challenge has youth getting vert! Teams will use their robots to place rings on poles across the field, with the ultimate goal of finishing "on top," as teams who have their rings the highest on the poles will get a big bonus.

Success in this game requires driver precision to navigate tight areas and successfully place rings, excellent planning to determine strategies and sequences of movements, the ability to effectively respond to quickly changing situations, and innovative engineering solutions. Well-thought strategies and pre-game planning for various situations that might occur will be vital to a team's success.

Following is an image of the 2025 REC field with field elements. Each match, a team is assigned to a side of the field, either blue or red. Teams will play as the blue side and red side at least once each on the day of the 4-H Robotics Contests.
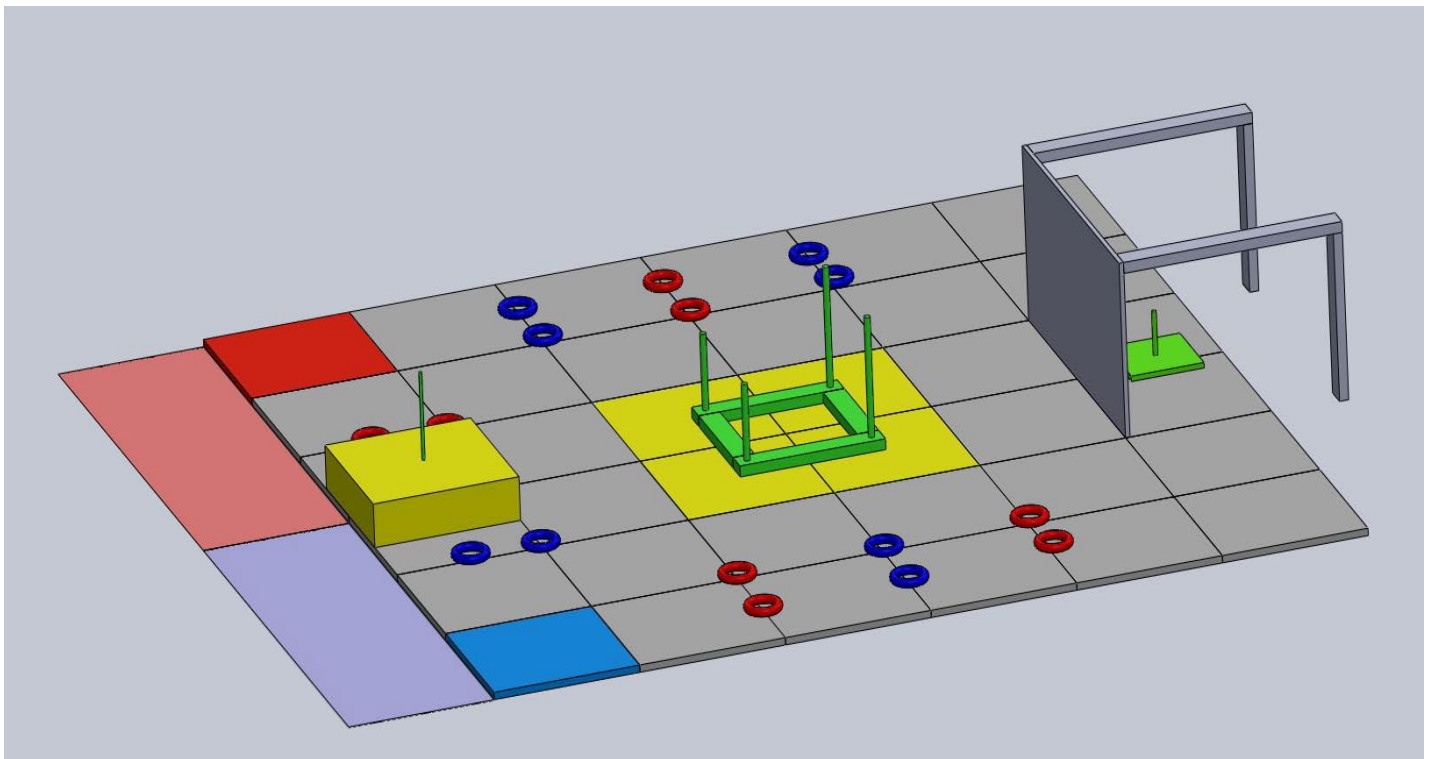

Figure 1: 2025 REC Field

4-H REC matches are played on a 12ft x12ft *Field* surrounded by a 1ft tall *Field Perimeter*. Two teams play on the Field during a match, designated as the "red team" or "blue team," with their *Starting Tile* colored red or blue in accordance. Each team will play at least one match on the red side of the field, and one match on the blue side of the field. The object of the game is for teams to score the most points during each 2.5-minute match they compete in, by performing missions as explained below.

Each Match starts with a 30-second *Autonomous Period,* where robots can operate only via pre-programmed instructions teams create before the contest. Team members can complete missions on the field to score points but cannot use remote controls during this time. Each team's score at the end of the Autonomous Period will be noted on their score sheets. Once tallying is completed, referees will indicate to teams when they can pick up their remotes for the *TeleOperation* period, which begins after the referees' signal, and lasts for the final two minutes of each match.

During a match, teams can have their robots score points by performing the following:

1. Placing *Rings* of their team's color (red or blue) into various scoring positions across the Field. The two types of scoring positions include:

   - Yellow *Scoring Zones* (one on the field and one elevated).

   - Green *Poles* of various heights (6" up to 18" tall).
     - **NOTE:** Each Pole has a maximum number of Rings that can be placed on it to score, as determined by the height of the Pole. To determine the maximum number of scorable Rings a Pole can hold, take the Pole's height in inches and divide it by two (i.e. 6" = 3 Rings, 12" = 6 Rings, 18" = 9 Rings).

2. Having one of their team's Rings be the topmost Ring on a Pole. This will double the team's overall score for that specific Pole, though this determination for scoring will be made only at the end of the specific period the teams are in (Autonomous or TeleOperation).

Depending on their strategy, robots are also allowed to "*Descore"* opposing team's rings, by removing a ring from a pole or moving a ring out of a yellow scoring zone, but more than one ring can't be Descored at a time. A penalty will be assessed if a robot controls more than one of their opponent's rings at a time.

3   <u>Terms and Definitions</u>

<u>Autonomous Period:</u> The first 30 seconds of a REC match is called the Autonomous Period. As opposed to the *Driver-Controlled Period*, this is when a team's robot must operate on its own without the use of human input through a controller. A team will have to write an autonomous code before competing, and can have multiple autonomous codes created, but can only run one per match.

<u>Blocking:</u> This is defined as inhibiting a robot's access to scoring elements. Temporary blocking while in congested areas is expected, but strategic blocking to limit opponent's ability to score is not allowed.

<u>Control/Controlling:</u> Items are considered to be Controlled by a team's robot if the item(s) is/are following the movement of the team's robot. Examples include but may not be limited to: Pushing an item in any form, holding or carrying an item, grabbing and/or releasing an item.

<u>Descoring:</u> A team may "Descore" an opposing team's ring by either removing it from a pole or moving it out of one of the yellow scoring zones. Teams can only Descore one ring at a time. A minor penalty will be assessed if a team possesses more than one of an opponent's rings at any time.

Driver-Controlled Period: The Driver-Controlled Period follows the 30-second *Autonomous Period* and lasts 2 minutes. Teams control their robots directly using remote controls that communicate with the robot's electronics to operate. The end of the Driver-Controlled Period constitutes the end of a match.

Driver-Station: The area where drivers are required to stand during matches. These areas are represented on the prior REC field image by the colored shadows on the exterior around each team's base and will be marked at the contest with red or blue tape. This area will extend back three feet from the *Field Perimeter*. Drive-teams must remain here for the entirety of a match. If a drive-team member leaves this area during a match, they may forfeit points scored, as determined by the referees.

Drive-Team: Up to three youth team members may be active "at" the field for any one match. This is the active Drive Team. These members must stay in the *Driver Station* area for the duration of the match, and they are the only people able to handle the robot controls or provide any coaching during the match.

Event Official: Any individual who is leading or assisting with the operation and execution of refereeing, judging, scoring, and officiating a REC tournament is considered an Event Official. Decisions made by them are believed to be unbiased and using their best judgment. These individuals have been asked to assist in some manner with a REC tournament by, and report to, the 4-H Robotics Superintendent and 4-H STEM Specialist. Questions about decisions made by robot game referees must be brought to their attention immediately following a match when a referee asks a team to review and sign-off on their score sheet. After a match's scoring has been posted, it is considered final and CANNOT be changed.

Field: The playing area for REC matches, which is based on a standard 12' x 12' VEX EDR or FTC field. It is comprised of a 6 x 6 grid of 24" x 24" foam tiles and all REC game elements located within the *Field Perimeter.* Foam tiles can be acquired from VEX or AndyMark (for FTC's). There are 2 colored starting tiles on opposite sides of the field: one red, one blue. Field tiles are installed with their smooth side up.

Field Perimeter: The 1ft tall black aluminum and clear acrylic border of a REC Field, whose purpose is to keep all *Field* elements contained within its borders throughout the game. The Field Perimeter is 12ft in length on each side and can be a VEX VRC Field Perimeter or FTC Field Perimeter from Andymark.

Item Control Limit: There is no limit to the number of their own *Rings* that a team can control in this year's game. However, for the purposes of *Descoring,* a team's robot can manipulate a maximum of one *Ring* at a time that belongs to their opponents. If a team does not follow the *Item Control Limit,* they will be assessed a *Minor Penalty* of 10 points for each item above the limit their robot controls, with additional *Minor Penalties* every 3 seconds this continues for every item above the limit.

Minor Penalty: A Minor Penalty is assessed when certain infractions of game rules are broken. Minor Penalties issued to a team subtract 10 points from their final score at the end of a match. These penalties are designed so that even though teams may have broken a core rule of the 2025 4-H REC game, they are still able to continue playing.

Multipliers: When scoring occurs, referees will observe each *Pole* at that time to see if teams have successfully placed *Rings* on them. They will tally scores and then see which team's scorable ring is on top of that *Pole*. That team will have their points for their *Rings* on that *Pole* multiplied by two. This will not affect the score of the opposing team for their scorable rings that are on the same pole.

Penalties: Penalties will be assessed for behavior which typically provides an unfair advantage or prevents an opponent from actively attempting to score. Penalties are defined throughout this document, and when applied they will be deducted from a team's score.

Pinning: This is defined as contact with an opposing robot, not allowing it to move. This typically applies to holding an opponent against the *Field Perimeter* or another field element. **It is not allowed.**

Poles (Scoring Poles): There are 6 Poles of different heights on the REC field. Depending on the height and location of these Poles, placing a *Ring* on a Pole will earn a team points when scoring occurs. However, each Pole can only handle a certain number of *Rings. Rings* placed onto a stack that are above the height of each Pole will not be counted for points. The breakdown of the Poles follows:

- In the middle of the center *Scoring Zone*, there is a two-foot square with a Pole at each corner. The front two Poles (closest to the bases) are 12" high and can hold **6** *Rings* maximum. Scorable *Rings* on one of these Poles are worth 3 points when scoring occurs.
- In the middle of the center *Scoring Zone*, there is a two-foot square with a Pole at each corner. The back two Poles (farthest from the bases) are each 18" high and can hold **9** *Rings* maximum. Scorable *Rings* on one of these Poles are worth 4 points when scoring occurs.
- In the middle of the elevated *Scoring Zone*, between the two bases, is a 12" Pole connected to the top of the platform and can hold **6** *Rings* maximum. Scorable *Rings* found on this Pole are worth 5 points when scoring occurs.
- In the back of the *Field*, on the opposite side of the bases, is a 24" x 48" screen supported by beams extending outside of the *Field Perimeter*. Behind this screen is a 6" *Pole* that can hold a maximum of only **3** *Rings* and cannot be seen by teams directly while in their *Driver-Station* area. For this mission, teams will need to make use of imaging devices, such as a camera. Scorable *Rings* found on this Pole are worth 8 points when scoring occurs.

Rings: 16 VEX "High Stakes" Rings will be placed on the field at the start of the match, 8 blue and 8 red. Each team will also be given a Ring of their own color they can preload onto their robot before a match begins. The Rings are used to score points by moving them into *Scoring Zones* or onto *Scoring Poles* across the *Field* (see definitions and scoring table for specifics). Rings are 2" tall with a 7" external diameter and approximate 3" inner diameter. A limited number of Rings can be provided to teams upon request for practice before the contest. They can also be purchased individually here:

https://www.vexrobotics.com/276-8872.html.

Starting Tile (Base): Each team has one designated 24" by 24" foam tile (red or blue) where their robot must be placed completely inside at the beginning of a REC match. This year, Starting Tiles are located in opposite corners along the same wall of the Field Perimeter closest to the elevated Scoring Zone.

Teleoperation (TeleOp): See *Driver-Controlled Period*.

Zones (Scoring Zones): There are two scoring zones on the REC *Field*, both indicated by yellow tape:

- The central Scoring Zone comprises the middle four tiles of the full field. Any *Ring* that is found touching part of this area is worth 1 point.
- The elevated Scoring Zone is a 2' x 2' area found directly in the middle of the red and blue base tiles, up against the *Field Perimeter*, and is 6" high. Any *Ring* resting on this area (but not on the *Pole* in the middle) is worth 2 points.

More information on the materials used to build the REC field components can be found in the REC Build Guide on the MD 4-H STEM Website, including websites where items can be purchased.

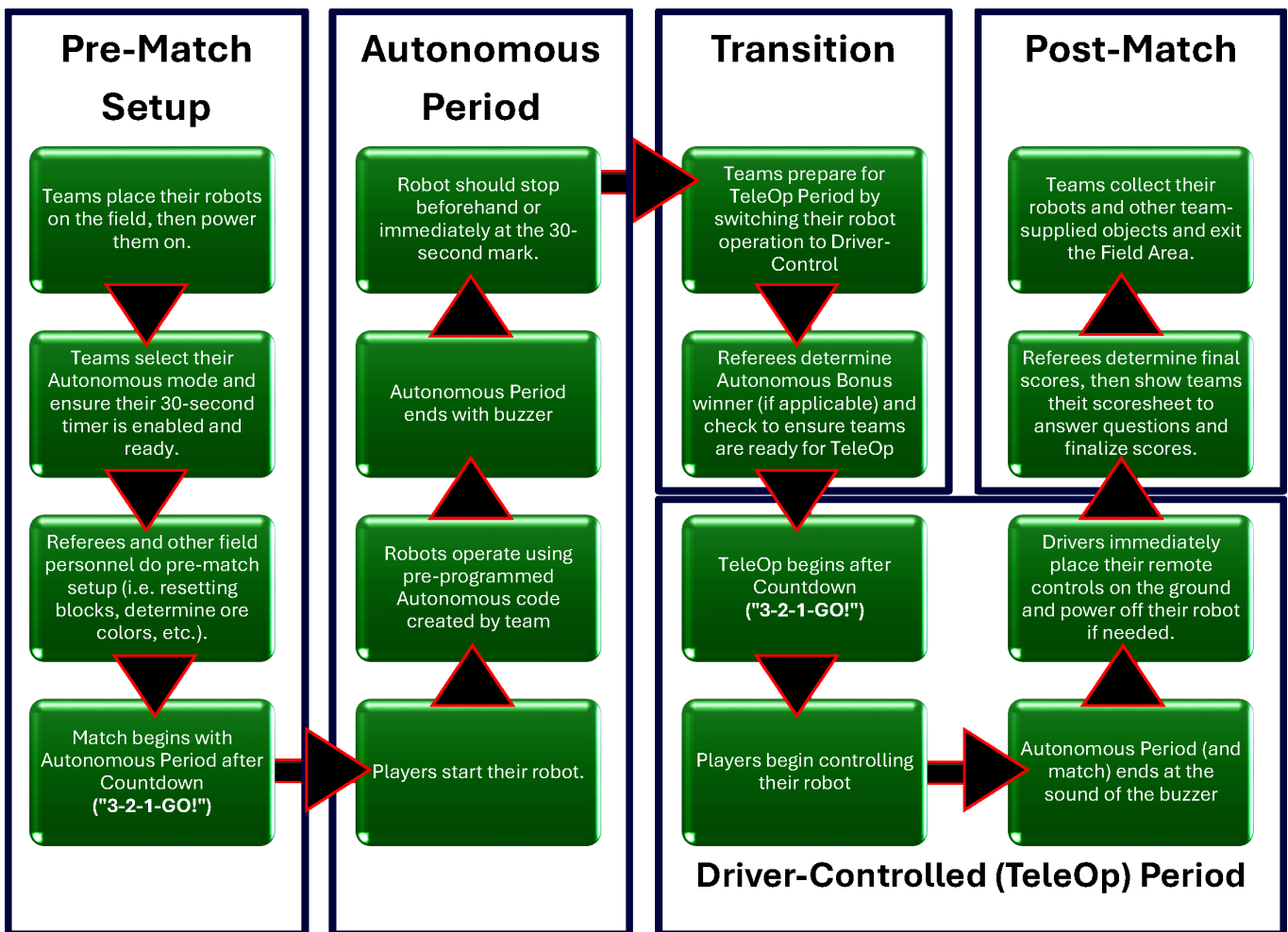# 4   Challenge Overview

4.1   Robot Game Structure

During each match, two teams will compete head-to-head, and teams will be competing in multiple matches throughout the day. The objective is for a team to score the most points by completing game

tasks. Points are primarily scored by placing rings on poles and in scoring zones and trying to have the topmost ring on a scoring pole to earn a multiplier bonus. Missions have a range in their difficulty, intended to challenge veteran teams while also allowing for new teams to have a chance to compete.

Each match lasts a total of 2 minutes 30 seconds, divided into two separate time periods, as follows.

1. *Autonomous Period:* Teams will have 30 seconds to score points using only code previously installed on their robot, without any direct operator control. Remote controls must be out of the drivers' hands during this period. The robot must remain in its final resting position at the end of the Autonomous period and cannot be moved until the start of the Driver Control period.

2. *Driver Control (Teleoperation) Period:* Shortly after the conclusion of the Autonomous period, Teams will have 2 minutes to operate their robot by remote control.

Scores will be tallied by referees and other event officials at the end of the Driver Control period. Scores may not immediately be revealed to teams, but will be posted shortly after a match's conclusion, after scoring officials have verified and entered them into the system. Following is a flowchart that may be helpful for teams to review to understand the processes and flow of 4-H REC games.

Pre-Match Setup

- Teams place their robots on the field, then power them on.
- Teams select their Autonomous mode and ensure their 30-second timer is enabled and ready.
- Referees and other field personnel do pre-match setup (i.e. resetting blocks, determine ore colors, etc.).
- Match begins with Autonomous Period after Countdown ("3-2-1-GO!")

Autonomous Period

- Robot should stop beforehand or immediately at the 30-second mark.
- Autonomous Period ends with buzzer
- Robots operate using pre-programmed Autonomous code created by team
- Players start their robot.

Transition

- Teams prepare for TeleOp Period by switching their robot operation to Driver-Control
- Referees determine Autonomous Bonus winner (if applicable) and check to ensure teams are ready for TeleOp
- TeleOp begins after Countdown ("3-2-1-GO!")
- Players begin controlling their robot

Post-Match

- Teams collect their robots and other team-supplied objects and exit the Field Area.
- Referees determine final scores, then show teams theit scoresheet to answer questions and finalize scores.
- Drivers immediately place their remote controls on the ground and power off their robot if needed.
- Autonomous Period (and match) ends at the sound of the buzzer

Driver-Controlled (TeleOp) Period

4.2   Judging and Engineering Notebook

During the season, teams should document their work in an Engineering Notebook, which should summarize the team's entire process of designing, building, programming, and testing their robot. It is

expected that teams will update their Engineering Notebook *every meeting*. At State Fair, on the morning of the REC Tournament, each team must submit their Engineering Notebook when they check-in that morning. The judges will *not* review Engineering Notebooks before judging rounds begin.

During the day of the REC tournament, each team will have a scheduled time to give a presentation about their work during the season, both technical and non-technical, to a panel of judges. These sessions will last approximately 10 minutes, **but teams must leave time for judges to ask questions at the end**. It is recommended teams aim to have their presentations last approximately 5 minutes with 5 minutes left for questions. If the judges feel a team's presentation is running too long, they reserve the right to stop the team at whatever point deemed necessary, and the judges will score the team on what they heard and what questions they're able to ask with the time left. The team's Engineering Notebook and their presentation will determine their final judging score. The rubric used by judges to score notebooks and presentations can be found in the appendix of this document.

A team should use their Engineering Notebook to document the team's design process in building the robot from its initial design concepts to the product. Team members should document their work in the journal each time they meet to work on the robot. Items that can be included are, but not limited to: prototype & CAD drawings, obstacles encountered, lessons learned, coding used and development process, failures & successes of designs, testing procedures and results, and any relevant community outreach or club efforts. Any format may be used for the journal.

4.3   State Fair Competition Structure

There are two components that combine equally to form a team's overall tournament score and subsequent ranking: Robot Performance and the Engineering Presentation/Notebook. The percentage score for these two components is added and the resulting sum is used to rank the teams.

During the State REC Tournament, REC teams will compete in at least 3 matches. A team's overall Robot Performance is the average score of all their scheduled matches. If a team does not participate in a scheduled match, or if it is disqualified from a match, it will receive zero points for that match, which will reduce their average score. A team's average score will then be turned into a percentage of the competition's highest top score.

5   <u>Challenge & Game Rules</u>

5.1   Robot Rules

1. Robots can weigh a maximum of 20 lbs. (including batteries). A scale may be used at inspection to ensure the robot meets this requirement.
2. Robots may be constructed using a wide variety of materials. Creativity is encouraged! Legos, VEX robotics parts, FIRST components, plastic, cardboard, duct tape, fasteners of various types, etc. are all permitted.
3. Components that pose risk of harm to an opponent's robot are not permitted, even if the risk is unintentional or rare. This includes, but is not limited to, sharp, explosive, radioactive, or liquid components. Robot inspectors, judges, and referees will be monitoring for these potential risks and have the authority to disqualify a robot from competing until identified issues are fixed.
4. At the beginning of a match, robots must fit inside an 18"x18"x18" sizing box. Robots identified as being too large will be required to reduce their size before being able to compete.
5. Once a match begins, a robot may expand in size. Teams are urged to use common sense when designing their robot expansions.
6. No component of a robot may be intentionally detached during a match. This can present a safety hazard.
7. The robot's power source CANNOT exceed a total of 12 nominal volts.

8. The total capacity of the robot's power source CANNOT exceed 6000 mAh.
9. During matches, robots MUST be controlled wirelessly. No tethered/wired connections are allowed.
10. A robot's Autonomous program, if it has one, MUST be able to be started remotely by a team. After being placed in its starting position on the field, touching the robot or its components in any way to start it, change its programming or operation, or otherwise physically control it by hand in some manner, is not allowed until after event officials signal it is clear for robots to be removed. Starting and/or controlling robots by hand in this manner could present safety hazards.
11. Any microprocessor may be used in the robot's design.
12. Any wireless controller may be used, as long as the setup allows for the robot's operation in Autonomous and Driver Control to be done remotely, in accordance with Robot Rule 10 above.
13. A robot can have a MAXIMUM of 10 motors and/or servos total.
14. On Challenge Day, all robots must be inspected before they will be permitted to compete in any match. Any issues the inspection judges find with a robot design or setup must be rectified first before it is allowed to compete.

5.2   Participation Requirements

1. 4-H REC Teams may consist of between 3-8 4-H youth members.
2. All team members MUST be enrolled in 4-H Online by July 15, 2025 in order to participate in REC at State Fair. Failure to be an enrolled 4-H member, paid in full, and in good standing will result in those individuals not being able to participate in the challenge in any form.
3. Each group of youth must have two certified 4-H volunteers established to compete and remain in compliance with established 4-H program rules and protocols.
4. Coaches and Mentors **are** allowed to run, assist, and/or oversee more than one 4-H REC team.
5. The 4-H division a REC team competes in is determined by the oldest member of the team. The 4-H age divisions are as follows (Note: 4-H age is determined by a child's age as of 1/1/2025)
    • Senior Division 14+ years
    • Intermediate Division 11 through 13 years
    • Junior Division 8 through 10 years

5.3   Safety Rules

1. Each team in the pit areas and/or at the field during a match **must wear safety glasses**. NO EXCEPTIONS!
2. If a robot becomes disabled or behaves erratically, an event official may authorize a team member to enter the field of play and shut off the robot. This is the ONLY time a team member may be allowed to enter the field while play is ongoing. Penalties may be applied if team members enter the field without permission by an event official, while a match is ongoing.
3. Robots that repeatedly or purposefully damage other robots and/or the field or field elements may be removed from the tournament by an event official.

5.4   General Robot Round Rules

1. All decisions regarding scoring and rules violations are made by event officials. Every effort will be made to ensure matches are fairly and evenly officiated. Concerns about match scoring, penalties, and violations must be brought to the attention of event officials at the end of the match in question, and before the robots are removed from the playing field.
2. Unless given explicit permission by an event official, team members must remain in the designated driver station area for the duration of a match.
3. At no point during a match may anyone other than an active drive-team member give coaching or instruction.
4. Each match will last a total of 2 minutes and 30 seconds: 30 seconds for Autonomous and 2 minutes for Driver Control.
5. After robots have been set up on the field and event officials have given the "ready" signal, team

members CANNOT enter the field or change the position of their robots without explicit permission from the officials.

6. During each match, a countdown timer will be clearly visible to all teams competing in the current match.
7. Event officials may be encouraged, but are not required, to give a countdown in the closing seconds of each match.
8. A buzzer sound plus a signal from an event official will indicate time has expired for each match. At this point, teams must IMMEDIATELY set down their controller to make it obvious they are no longer operating their robot. Any missions completed after the 2.5-minute period will not count towards the scoring.
9. If a robot malfunctions at the conclusion of a match such that the robot continues to operate, teams must receive an "OK" from the event official before manually disabling their robot
10. If a team continues to operate their robot after time has expired, an event official will give a **Warning** for the first violation. Additional violations may result in a team being disqualified from the current match and subsequent matches.
11. If and only if extreme circumstances arise that compromise the integrity of the game, as decided by event officials, the decision to replay a match or a portion of it may be made.
12. Egregious and Unsportsmanlike Conduct: If the referee determines that a team's behavior or actions, on or off the field, is meant to damage another team's robot or is unsportsmanlike conduct, the team will be issued a warning. The referee will explain the warning to the team. If the behaviors or actions continue, the referee may disqualify the team from the competition.

5.5 Autonomous Period

1. The Autonomous period will last for the first 30 seconds of the match.
2. Teams are recommended to use a VEXNET match controller or the FTC Robot Controller app to stop their Autonomous program or must have another pre-approved method to stop their robot's Autonomous function immediately upon expiration of the 30-second Autonomous period.
3. **Incidental** contact between robots will be excused during the Autonomous period. **Intentional** contact is not permitted in any form and may result in penalties being applied.
4. During the *Autonomous* period, a team must not handle their remote control.
5. Once the *Autonomous* period has begun, teams may not touch their robot for any reason unless they have received explicit approval from an event official.
6. If a robot continues operation past the end of the *Autonomous* period, any missions it completes after the 30-second time will NOT be counted for points. The first time a team's robot does this, they will be given a Warning. At the 2nd instance, their robot will be disqualified from scoring in the Autonomous portion of matches for the rest of the competition.
7. At the conclusion of the Autonomous period, event officials will calculate the score of each team.
   • During this time, teams may ask permission to enter the field if manual switching from Autonomous to Driver Control modes, if required. **Teams must declare this requirement to the event official prior to the start of the match.** After Autonomous has concluded, those teams may not enter the field to perform this switch until permission is granted. The teams may not reposition the robot or touch any other game piece.

5.6 Driver Control (Teleoperation) Period

1. The Driver Control period will last for 2 minutes.
2. During Driver Control, each team must control their robot exclusively through wireless controllers.
3. Controlling the robot using wired or tethered means is not permitted.
4. During the Driver Control period, teams may not touch their robot for any reason unless the team has received explicit permission from an event official to do so.
5. During Driver Control, incidental contact between robots is expected, but this is not *Battle-Bots*, so behavior which causes damage to another robot (intentional or accidental) will be penalized.

6. On the first violation of rules regarding robot contact and/or damage, the referee will issue the offending team a **Warning**. Subsequent infractions by the same team will result in disqualification from a match.
7. At the conclusion of Driver Control, teams may not touch, move, or otherwise handle their robot until granted permission from an event official. This is to ensure final scoring is done accurately.
8. Once the signal is given for robots to be removed from the field, all scoring decisions are **<u>final.</u>**
9. Teams may ask for scoring or rules clarification before removing their robot from the field of play.

5.7 Penalties

1. A robot may NOT exceed the Item Control Limit for the opponents' Rings. Attempting to control more than the allowed number of opponent Rings will result in a Minor Penalty (10 points). A Minor Penalty will be issued for every opponent Ring over the Item Control Limit, with additional Minor Penalties issued every 3 seconds this continues for every item above the limit.
2. Penalties will be applied for attempts to block or disrupt the motion of their opponents' robot, as well as damage to either the team's robot, components, or field elements.

Appendix A   TENTATIVE Referee Scoring Sheet

TEAM NAME_____   MATCH NUMBER_____   **RED** or **BLUE**?

MISSION	QUANTITY	POINTS FOR EACH	TOP RING? x2 if YES	TOTAL	MAX SCORE POSSIBLE
AUTONOMOUS PERIOD					
Rings on field in lower yellow scoring zone		X 1			/9
Rings resting on elevated yellow platform		X 2			/18
Rings on 12" green pole left of center (red side)		X 3	**YES or NO**		/54
Rings on 12" green pole right of center (blue side)		X 3	**YES or NO**		/54
Rings on 18" green pole left of center (red side)		X 4	**YES or NO**		/72
Rings on 18" green pole right of center (blue side)		X 4	**YES or NO**		/72
Rings on 12" green poles on elevated yellow platform		X 5	**YES or NO**		/90
Rings on 6" high green pole behind screen		X 8	**YES or NO**		/144
Minor Penalties		X 10			-
AUTONOMOUS TOTAL					
TELEOPERATION PERIOD					
Rings on field in lower yellow scoring zone		X 1			/9
Rings resting on elevated yellow platform		X 2			/18
Rings on 12" green pole left of center (red side)		X 3	**YES or NO**		/54
Rings on 12" green pole right of center (blue side)		X 3	**YES or NO**		/54
Rings on 18" green pole left of center (red side)		X 4	**YES or NO**		/72
Rings on 18" green pole right of center (blue side)		X 4	**YES or NO**		/72
Rings on 12" green poles on elevated yellow platform		X 5	**YES or NO**		/90
Rings on 6" high green pole behind screen		X 8	**YES or NO**		/144
Minor Penalties		X 10			-
TELEOPERATION TOTAL					

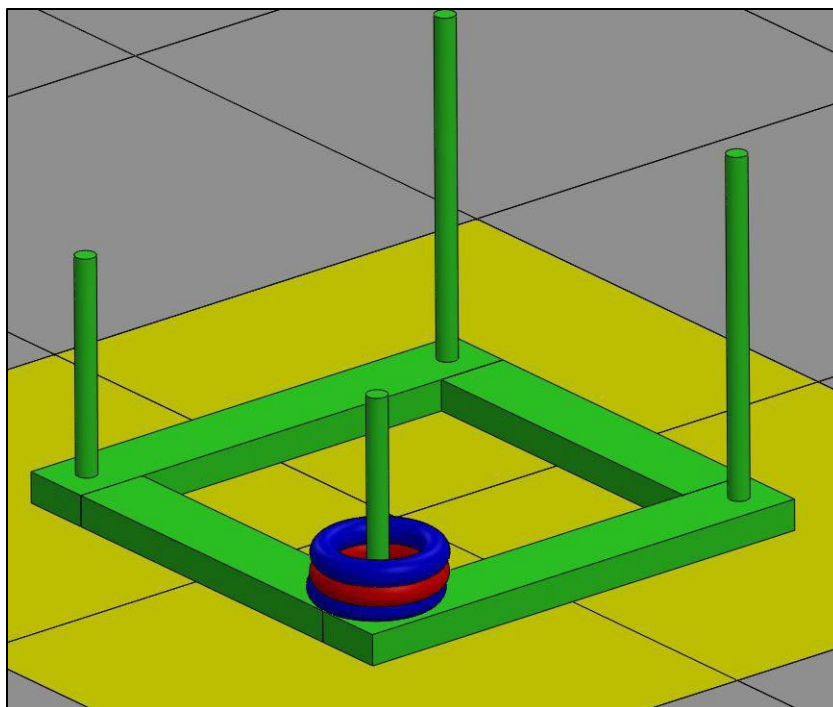| **AUTONOMOUS SCORE:**	**+**	**TELEOPERATION SCORE:**	**=**	**FINAL SCORE:**
TEAM MEMBER INITIALS				

Appendix B   Scoring Examples
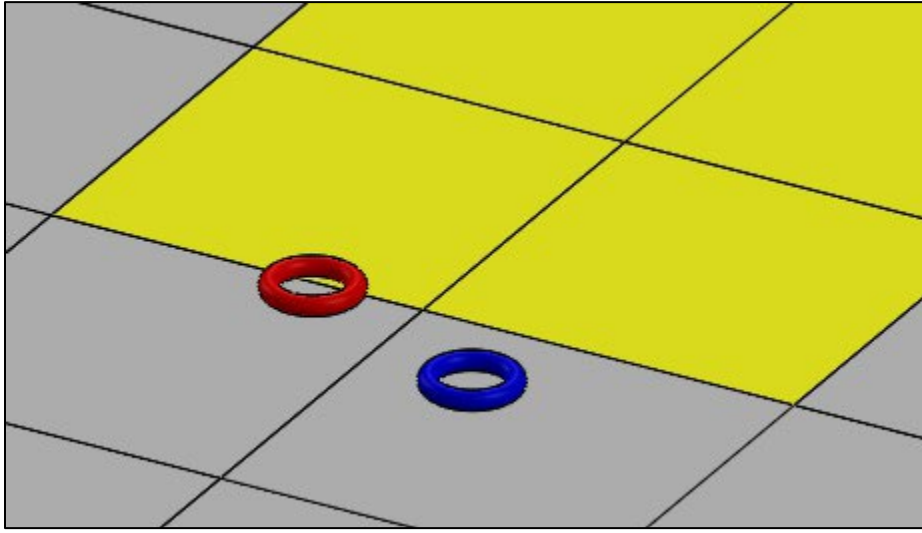
Red Score = 1 Ring touching Floor Level Scoring Zone = **1 point**
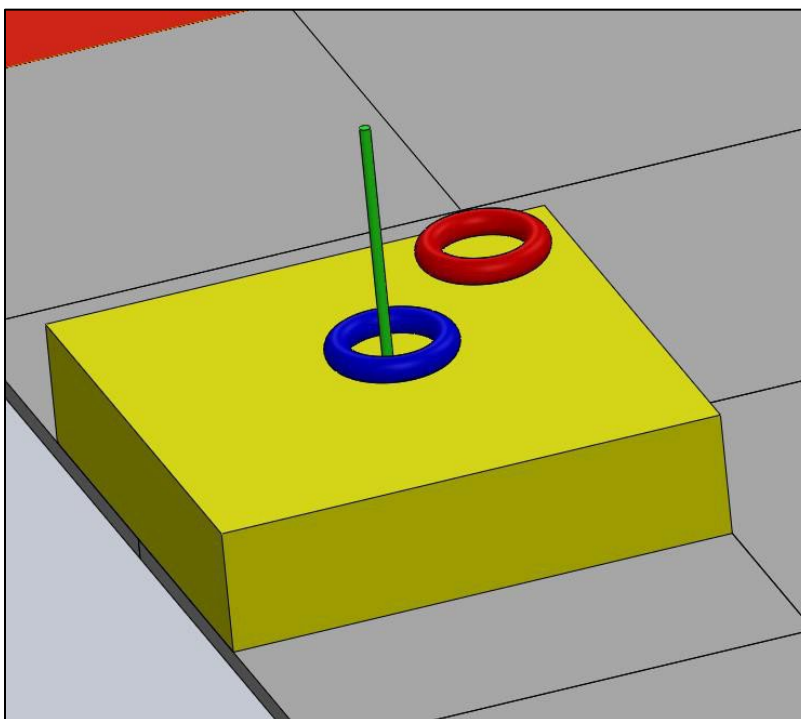
Blue Score = **0 points**
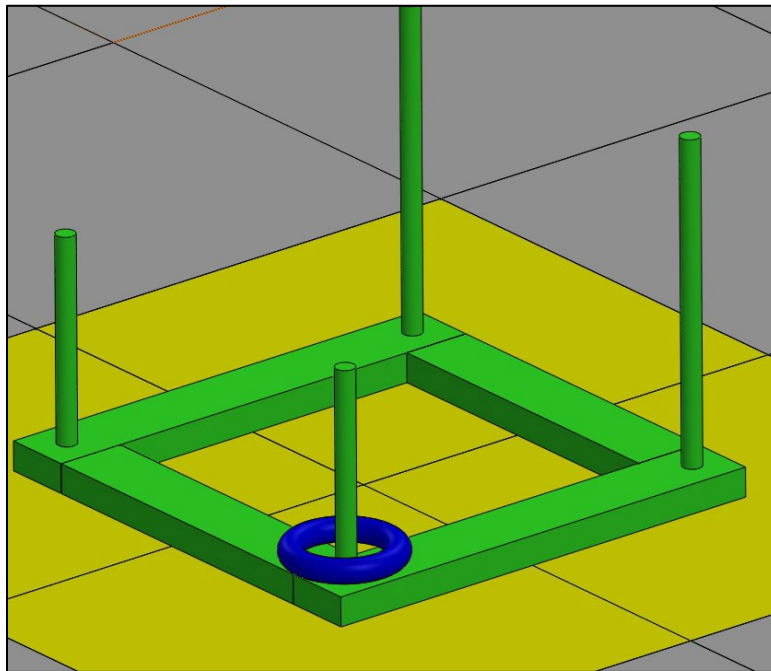
Blue Score = 1 Ring on 12" pole + Top Ring Bonus = 1 x 3 x 2 = **6 points**

Red Score = 1 Ring on 12" pole = 1 x 3 = **3 points**

Blue Score = 2 Rings on 12" pole + Top Ring Bonus = 2 x 3 x 2 = **12 points**

Red Score = 1 Ring on elevated scoring zone = **2 points**

Blue Score = 1 Ring on Elevated Platform Pole + Top Ring Bonus = 5 x 2 = **10 point**

Appendix C   Presentation & Notebook Judging Rubric

	Awarded Points	Possible Points
Quality of Display Elements		
Visual elements were well organized.		5
Visual elements were helpful (i.e. not just "eye candy").		5
SECTION TOTAL:		/ 10
Quality of Presentation		
Each team member spoke, and information presented matches what is recorded in Engineering Notebook.		5
Team clearly presented overview and technical information on major subsystems of robot (scoring mechanisms, drivetrain, battery/power supply, choice of materials, gear ratios, etc.).		10
Team provided clear and detailed explanation of code and programming.		10
Team provided an explanation of design process and problem solving process.		10
Clearly demonstrated understanding of game, rules, and strategy.		5
SECTION TOTAL:		/ 40
Quality of Engineering Notebook		
Each team member has a brief biography in notebook.		5
The team includes information, matching what is in their presentation, about their service projects throughout the year that align with the goals & priorities of 4-H and REC.		10
The team clearly demonstrates & records their process of robot design, building, programming, and testing, including goals, important milestones, significant changes, evaluation and testing methods, etc.		20
The team clearly demonstrates the problems they identified, the work they did to solve each particular problem, the testing methods used to verify the solutions, and adequately explained the resolutions.		15
SECTION TOTAL:		/ 50
GRAND TOTAL		/ 100