CIJE-Tech High School

Robotics Competition 2024-2025

High Stakes

CENTER FOR INITIATIVES IN JEWISH EDUCATION

Revision A, 08/01/2024

The Center for Initiatives in Jewish Education (CIJE)

The Center for Initiatives in Jewish Education (CIJE) strengthens and enriches the quality of education in Jewish schools throughout the United States. CIJE is investing in our nation's future by providing beneficiary schools with cutting-edge technology, engaging curricula, and vital support so that students can acquire the skills they need to excel in our global society. Currently, CIJE has more than 245 beneficiary schools across the United States and programs which span grades K-12. CIJE's innovative programs are paving the way for the achievement and success of tomorrow's leaders and thinkers.

CIJE-TECH STEM PROGRAM: AN OVERVIEW

More than ten years ago, the Center for Initiatives in Jewish Education began the implementation of various STEM programs in elementary Jewish schools. The success of these programs brought about the initiation of the CIJE-Tech Principles in Engineering and Applied Engineering programs.

Goals:

The CIJE STEM education programs:

- Provides a challenging and rigorous program of study focusing on the application of STEM subjects.
- Offers courses and pathways for preparation in STEM fields and occupations.
- Bridges and connects in-school and out-of-school learning opportunities.
- Provides opportunities for student exploration of STEM related fields and careers.
- Prepares students for successful college and university STEM education.

To increase STEM learning, the CIJE-Tech programs include activities that improve student and teacher content knowledge and teacher pedagogical skills. Innovative strategies are used, including small group collaborative work and the use of hands-on activities and experiments to promote inquiry and curiosity. Learning is connected to the real world through an emphasis on the application of STEM subjects to everyday life, employment, and the surrounding environment.

The CIJE high school programs were approved as "d" Laboratory Science Courses by the University of California in 2015. The second-year course is approved at the more challenging honors *Level*.

Center for Initiatives in Jewish Education

President	Jason Cury
Vice President, Professional Development	Faigy Ravitz
Director, Curriculum Development	Adam Jerozolim, M.E.
Coordinator, Innovative Programs	Orly Nadler, M.A.

CIJE STEM Specialists:

Christopher Auger-Dominguez
Dewain Clark, M.A.
Robert Jones
Yafa Lamm
Aryeh Laufer
Katherine Owuor, Ph,D.
Joseph Saltzman
David Seay, M.A.
Barbara Sehgal, M.A.

Summary provided by:
Center for Initiatives in Jewish Education
148 39th Street, Suite A311, Brooklyn, NY, 11232
info@theCIJE.org
212-757-1500 Phone
212-757-1565 Fax

This program was produced with the generous support of the Center for Initiatives in Jewish Education (CIJE) as part of its ongoing quest to achieve excellence in education.

Robotics Competition

Game Rules

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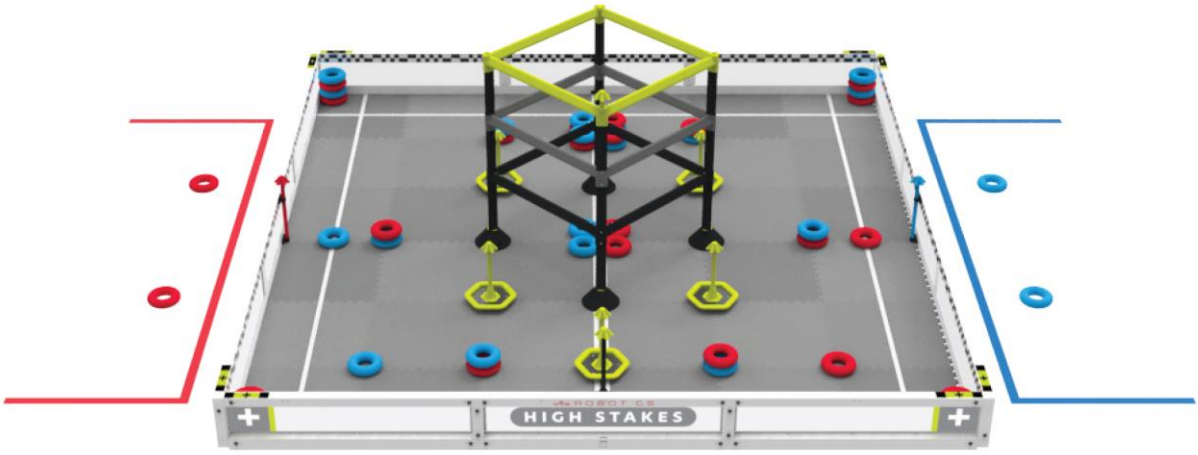
Summary

VEX V5 Robotics Competition *High Stakes* is played on a 12'x12' square *Field*, set up as illustrated in the figures throughout.

Two (2) *Alliances*—one (1) "red" and one (1) "blue"—composed of two (2) *Teams* each, compete in *Matches* consisting of a one minute and forty-five second (1:45) *Driver Controlled Period*.

The object of the game is to attain a higher score than the opposing *Alliance* by (1) *Scoring Rings* on *Stakes*, (2) *Placing Mobile Goals in Corners*, and (3) *Climbing* at the end of the *Match*.



All disputes are to be decided at the head referee's discretion.

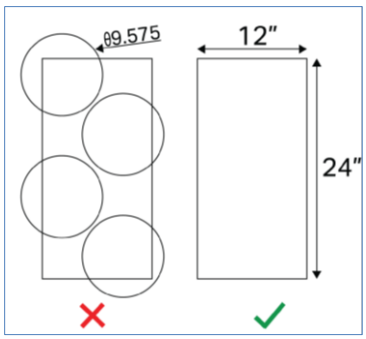
Robots Rules

1. At the tournament, before any matches begin, a competing robot must be qualified by the tournament referee before it can compete.
2. Robots must fit in a 18"x18"x18" box when the competition begins. Robots may not use power when being measured. See expansion rules below regarding once the match begins.

   Each team will undergo an official measurement before they can compete. Teams that do not meet the dimensional requirements will not be allowed to compete until the size is corrected.

3. Robots may be built ONLY using official VEX V5 components, unless otherwise specifically noted within these rules. Product pages on the VEX Robotics website should be used as the official definitive source for determining if a product is a "V5 component."
4. Products from the VEXpro, VEX EXP, VEX IQ, VEX GO, VEX 123, or VEX Robotics by HEXBUG* product lines cannot be used for Robot construction, unless specifically allowed by a clause below, or "cross-listed" as part of the VEX V5 Product lines.
5. Robots must have a colored indicator (e.g. – plaque, flag, clip, etc.) indicating if they are on the blue or red *Alliance*. CIJE will provide indicators at the tournament for those teams that need.
6. The colored *Alliance* indicators are considered decorative and can thus be made from any materials. They may not add functionality in any way regarding game play.

7. An unlimited amount of rope/string may be used, no thicker than 1/4" (6.35 mm).
8. Any zip ties may be used.
9. Any rubber bands may be used, up to a ½ inch wide.
10. Any screws, nuts, bolts, washers, and mechanical fasteners, up to size #8 (M4), and up to 2.5" (63.5 mm) in length, may be used. Fender washers (very large washers) are prohibited.
11. Mechanical fasteners may be secured using Loctite or a similar thread-locking product.
12. Small amounts of grease or lubricating compound may be used. Grease or lubricant may not be in excess to leak or drip onto the floor or game pieces at any time of the competition.
13. Hot glue for securing cable connections may be used.
14. There is no weight limit on the robot.
15. The robot must be wireless and may not have any connections (e.g. - wired, mechanical, string) to the drivers or competitors.
16. Robots may not intentionally detach parts during the match or leave mechanisms on the field.
17. Robots may only use one (1) VEX V5 Robot Brain.
18. Robots may be controlled by up to two (2) V5 Controllers.
19. Robots may use up to eight (8) standard VEX V5 smart motors (276-4840).
    a) Smaller 5.5W smart motors (276-4842), may be substituted at a 2:1 ratio (for a potential total of 16 smaller motors).
20. The V5 Radio should be mounted such that no metal surrounds the radio symbol on the V5 Radio. This will ensure constant communication with the robot.
21. Robots may use only one (1) V5 Robot Battery (276-4811), or vex approved equivalent, and no other power sources.
22. V5 Wireless Controllers may only be powered by their internal rechargeable battery.
23. Custom V5 Smart Cables using non-VEX 4P4C connectors and 4P4C crimping tools are permissible. This includes soldering and repairing VEX brand cabling. Teams who create custom cables acknowledge that incorrect wiring may have undesired results and cause permanent damage to V5 electronics.
24. Robots may use custom-made plastic parts (Polycarbonate, Polypropylene, ABS, etc.) cut from a single 12" x 24" sheet, up to 0.070" thick. They do not have to be cut from the same 12" x 24" sheet, but rather must be able to "nest" or be rearranged into a 12" x 24" area. Using thinner plastic does not allot you additional in^2 of plastic. Plastic sheets purchased from VEX would fall under this same allotment.

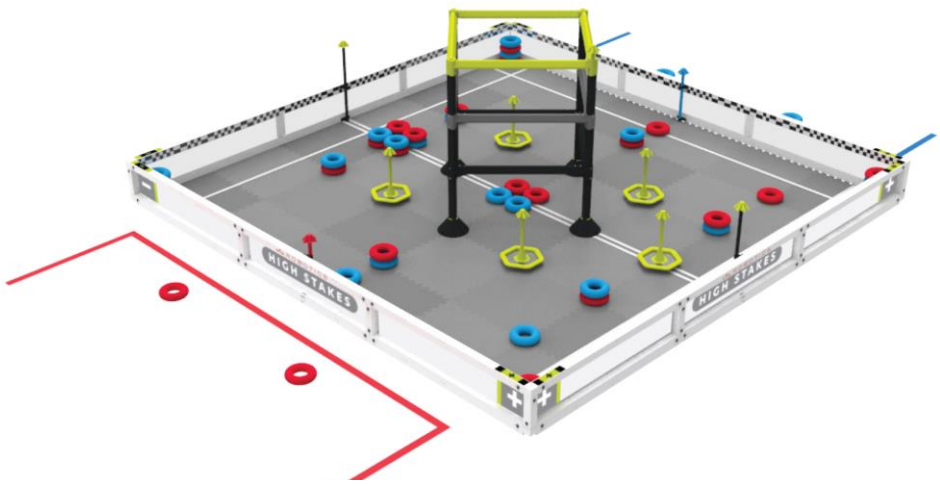


25. Shattering plastic, such as PMMA, is prohibited.

26. 3D printing may not be used, except to replace or replicate an already approved VEX component.
27. The V5 pneumatic kit (SKU 276-8750) may be used. A maximum of two (2) legal VEX pneumatic air reservoirs may be used on a Robot, charged to a maximum of 100 psi.
28. The compressed air contained inside a pneumatic subsystem can only be used to actuate legal pneumatic devices (e.g., cylinders)
29. No modifications to electronic (other than wires) or pneumatic components are allowed.
30. Mechanisms and components that could (1) potentially damage playing field objects, (2) potentially damage other competing robots, or (3) pose an unnecessary risk of entanglement are not allowed.
31. Teams may add non-functional decorations, 3D prints, or lights made of any materials, provided they do not affect the robot's performance in any way or affect the outcome of the match.

Game Rules

32. The VEX V5 Robotics Competition *High Stakes* field consists of the following:
    a) Five (5) *Mobile Goals*, each with one (1) *Stake*
    b) Four (4) *Wall Stakes*, one (1) per *Alliance* and two (2) neutral
    c) One (1) *Ladder*, with three (3) *Levels* and one (1) *High Stake*
    d) Forty-eight (48) *Rings*, twenty-four (24) of each color
    e) Four (4) *Corners*, two (2) Positive and two (2) Negative



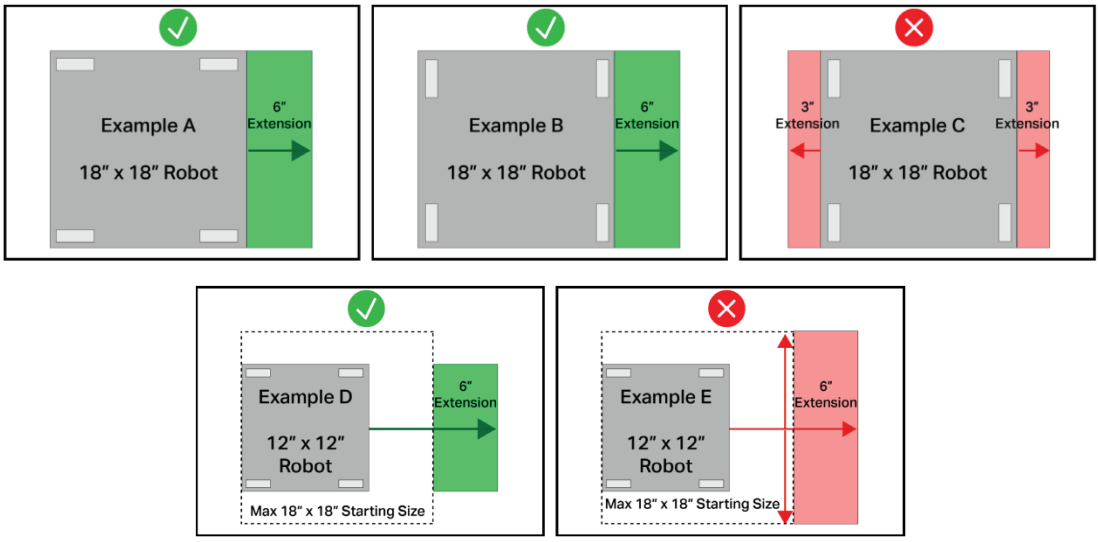
33. Prior to the start of each Match, the Robot must be placed such that it is:
    a) Contacting their *Alliance*'s wall.
    b) Not contacting any *Rings* other than a maximum of one (1) preload.
    c) Not contacting any other Robots.
    d) Completely stationary (i.e., no motors or other mechanisms in motion).

34. Horizontal expansion is limited within the following criteria:

    a) Robots may never exceed an overall footprint of 24” x 18”.

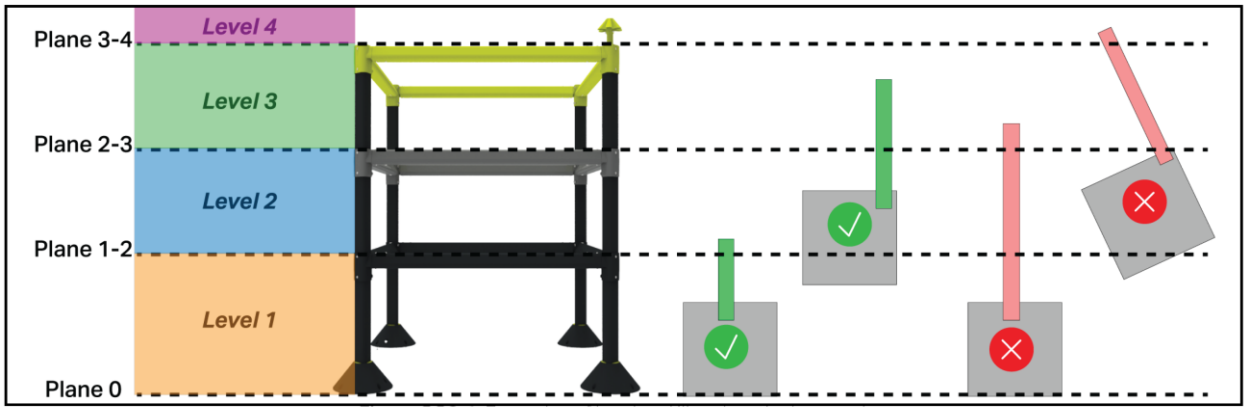
    b) From the Robot’s perspective, they may only expand in one “X/Y” direction (i.e., from a single “side” of the Robot). This “side” must be identified and measured during Robot inspection. See the figures below.

    c) The top of the Robot is not considered a “side” in the context of this rule.



35. Vertical expansion is limited so that robots may never contact and/or “break the plane” of more than two *Levels* of the *Ladder* at any given time.

The intent of this rule is to prohibit Teams from “skipping a *Level*”. It is impossible to contact or “break the Plane” of three *Levels*, or two non-sequential *Levels*, without violating this rule.



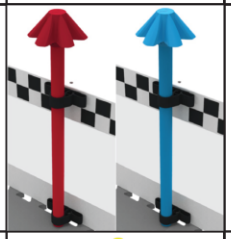
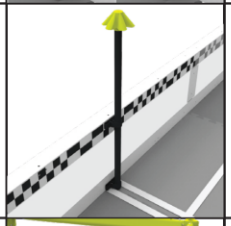
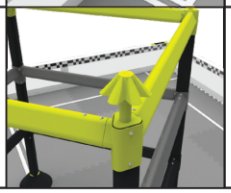
Scoring

36. Points can be scored by (1) Scoring *Rings* on *Stakes*, (1) Placing *Mobile Goals* in *Corners*, and (3) Climbing at the end of the Match.

Task	Points
Each *Ring* Scored on a *Stake*	1 Point
Each Top *Ring* on a *Stake*	3 Points
Ring Scored on *High Stake*	+2 to a non-zero climb score for each *Alliance* member
Climb – *Level* 1	3 Points
Climb – *Level* 2	6 Points
Climb – *Level* 3	12 Points

Rings

37. There are ten (10) vertical *Stakes* in the game:
    a) Five (5) neutral *Stakes* in *Mobile Goals*, which fit six (6) *Rings* each
    b) Two (2) *Alliance Wall Stakes*, one per *Alliance*, which fit two (2) *Rings* each
    c) Two (2) neutral *Wall Stakes*, which fit six (6) *Rings* each
    d) One (1) neutral *High Stake*, which fits one (1) *Ring*

Stake	Image	Color	Location	Max # of Rings
Neutral *Mobile Goal Stake*		Yellow	*Mobile Goals*	6
Alliance Wall *Stake*		Red / Blue	*Field* walls parallel to *Alliance Stations*	2
Neutral Wall *Stake*		Grey / Yellow	*Field* walls perpendicular to *Alliance Stations*	6
High *Stake*		Yellow	Top of *Ladder*	1

38. *Mobile Goals* are hexagonal, with a maximal diameter of 10” and an overall height of 14.5”. The *Stake* is considered part of the *Mobile Goal*.

39. A *Ring* is a hollow red or blue torus-shaped plastic object with an outer diameter of 7” (177.8 mm), an inner “hole” diameter of 3” (76.2 mm), and a thickness (or “tube diameter”) of 2” (50.8 mm).

40. A *Ring* is considered Scored on a *Stake*, and receives one (1) point, if it meets the following criteria:

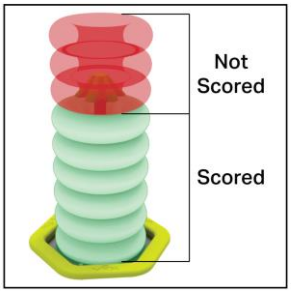
    a) The *Ring* is “encircling” a *Stake*. In this context, “encircling” means that any part of the *Stake* is at least partially within the volume defined by the inner edges of the *Ring*.

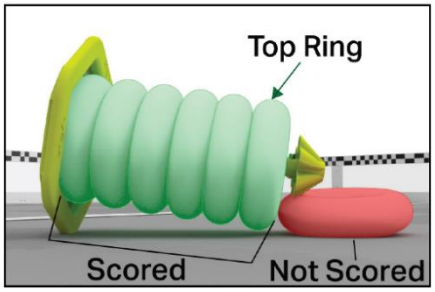
    b) The *Ring* is not contacting a Robot from the same color *Alliance* as the *Ring*.

    c) The *Ring* is not contacting a gray foam tile.

    d) The *Stake* does not exceed its total permitted number of *Rings*. In the event of too many *Rings* on a *Stake*, the “highest” *Rings* will be removed.

41. There is no requirement for a *Mobile Goal* to be upright in order for its *Rings* to be considered Scored.





42. A *Ring* is considered a Top *Ring*, and receives three (3) points, if it meets the following criteria:

    a) The *Ring* is Scored on a *Stake*.

    b) The *Ring* is the furthest Scored *Ring* from a given *Stake*’s base (i.e., *Mobile Goal* base or Field Perimeter wall).

    c) There is no minimum number of *Rings* required; if only one *Ring* is Scored on a *Stake*, then it is still considered that *Stake*’s Top *Ring*.

    d) A *Ring* that is considered a Top *Ring* does not also receive points for being Scored on a *Stake*; i.e., that *Ring* is worth 3 points, not a total of “3 + 1” points.

43. *Alliance Wall Stakes* are protected. Robots may not directly or indirectly interact with the opponent’s *Alliance Wall Stake*. This includes both Scoring and/or removing *Rings* of either color.

44. Apart from Alliance Wall *Stakes*, *Rings* may be removed from *Stakes* (i.e. - Neutral Wall *Stakes*, Mobile *Stakes*, and High *Stakes*)

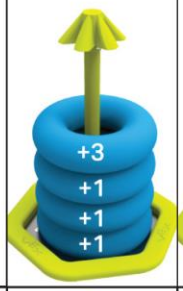
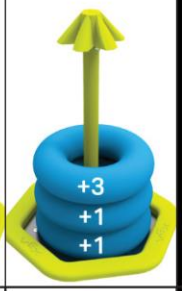
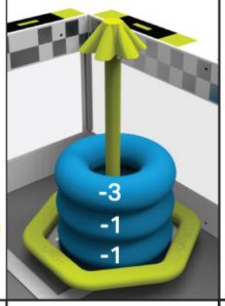
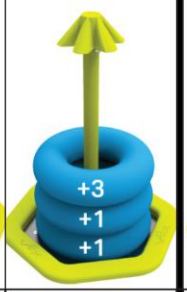
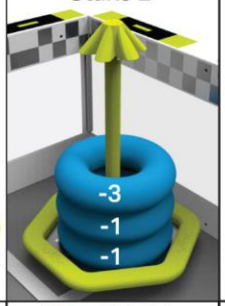
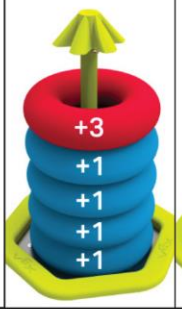
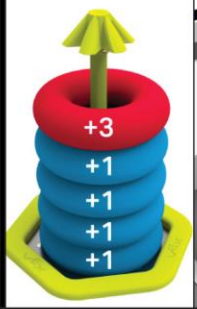
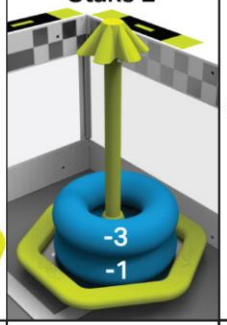
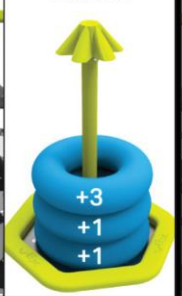
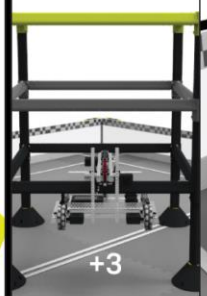
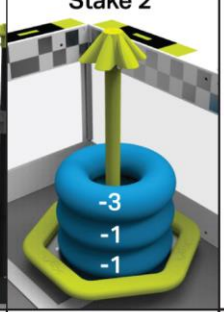
45. A *High Stake* bonus is available to an *Alliance* that ends the Match with a *Ring* Scored on the *High Stake*. Each Robot from that *Alliance* which has earned points for a Climb will receive an additional two (2) points for that Climb.

46. Points can be added or subtracted from your score if a *Mobile Goal* is placed into one of two (2) positive, or two (2) negative, corners of the arena.
47. The *Corner* is defined as the foam tile and tape line. The tape is considered part of the *Corner*. It is not a 3-dimensional volume. There are two (2) "Negative *Corners*", and two (2) "Positive *Corners*".

48. A *Mobile Goal* is considered Placed in a *Corner* if it meets the following criteria:
    a) The *Mobile Goal*'s base is contacting the *Corner* (i.e., the Floor and/or white tape line).
    b) It is "upright." A *Mobile Goal* is considered "upright" if no contact is being made between its *Stake* (and/or any *Rings* on this *Stake*) and the Floor or Field Perimeter.
    c) Contact with a Robot is irrelevant, as long as all other criteria are met.
49. Only one *Mobile Goal* may be considered Placed in each *Corner*.
50. If two *Mobile Goals* meet the above requirements in the same *Corner*, the following criteria will be used as a series of "tiebreakers" to determine which *Mobile Goal* is Placed:
    a) Compare the number of Field Perimeter segments contacted by the *Mobile Goal* (1 or 2). A higher number is better.
    b) A *Mobile Goal* that is contacting a white tape line ranks lower than one which is not.
    c) A *Stake* that is roughly perpendicular to the Floor ranks higher than a *Stake* that is not as "vertical."
    d) If criteria 1-3 are still tied, then neither *Mobile Goal* is considered Placed.
51. A *Mobile Goal* that has been Placed in a *Corner* will result in the following *Corner* modifiers to its Scored *Rings*:
    a) Placed in a Positive *Corner*: Values of all Scored *Rings* on the *Mobile Goal* will be doubled. Scored *Rings* will receive two (2) points and Scored Top *Rings* will receive six (6) points.
    b) Placed in a Negative *Corner*: *Rings* on the *Mobile Goal* will be worth zero (0) points, and an equivalent amount of points will be removed from that *Alliance*'s other Scored *Rings*. Scored *Rings* will remove (1) point, and Scored Top *Rings* will remove three (3) points.
        - This negator only applies to an *Alliance*'s "*Ring* points." Points received for Climbing cannot be removed.

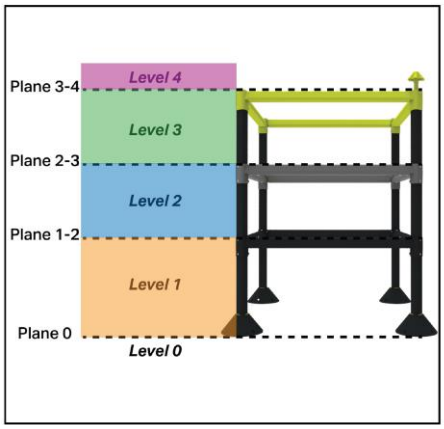
52. Positive *Corners* are "safe" during the endgame. During the last ten (10) seconds of a Match, Robots may not contact *Mobile Goals* in the Positive *Corners* of the Field, and may not add or remove *Mobile Goals* or *Rings* to or from the Positive *Corners* of the Field.

53. As indicated by VEX®, the impact of *Corner* modifiers is subject to change as the season progresses. CIJE tournaments will follow along with any VEX® updates.

Example	Before Negative Corner		After Negative Corner		Notes
	Stake 1	Stake 2	Stake 1	Stake 2	
1					*Stake* 2 was initially worth 5 points for the Blue *Alliance*, but is now worth negative 5 points after being moved into the *Negative Corner*.
	Blue: +6 Points	Blue: +5 Points	Blue: +6 Points	Blue:-5 Points	Blue: **+1 Point**
2	Stake 1	Stake 2	Stake 1	Stake 2	Even though the net total is -1, you cannot have negative total points.
					
	Blue: +4 Points	Blue: +5 Points	Blue: +4 Points	Blue:-5 Points	Blue: **0 Points**
3	Stake 1	Stake 2	Stake 1	Stake 2	Even though the Blue *Alliance* has no *Top Rings*, the negative *Top Ring* still removes three points. Because none of the red *Alliance's Rings* are *Scored* in the *Negative Corner*, their points are not affected.
					
	Red: +3 Points Blue: +4 Points	Blue: +4 Points	Red: +3 Points Blue: +4 Points	Blue: -4 Points	Red: **+3 Points** Blue: **0 Points**
4		Stake 2		Stake 2	*Corners* do not affect *Climb* or *Autonomous Bonus* Points.
					
	Blue: +3 Points	Blue: +5 Points	Blue: +3 Points	Blue:-5 Points	**+3 Points**

Climbing

54. A Robot is considered to have Climbed to a *Level*, and awarded the associated points, if it meets the following criteria:
    a) The Robot is contacting the *Ladder*.
    b) The Robot is not contacting any other Field Elements, including the gray foam tiles.
    c) The Robot is not contacting any *Mobile Goals*.
    d) The Robot's lowest point is past that *Level*'s minimum height. A *Level* 1 Climb represents a Robot whose lowest point is above the foam floor tiles.



Climb – *Level* 1	3 Points
Climb – *Level* 2	6 Points
Climb – *Level* 3	12 Points

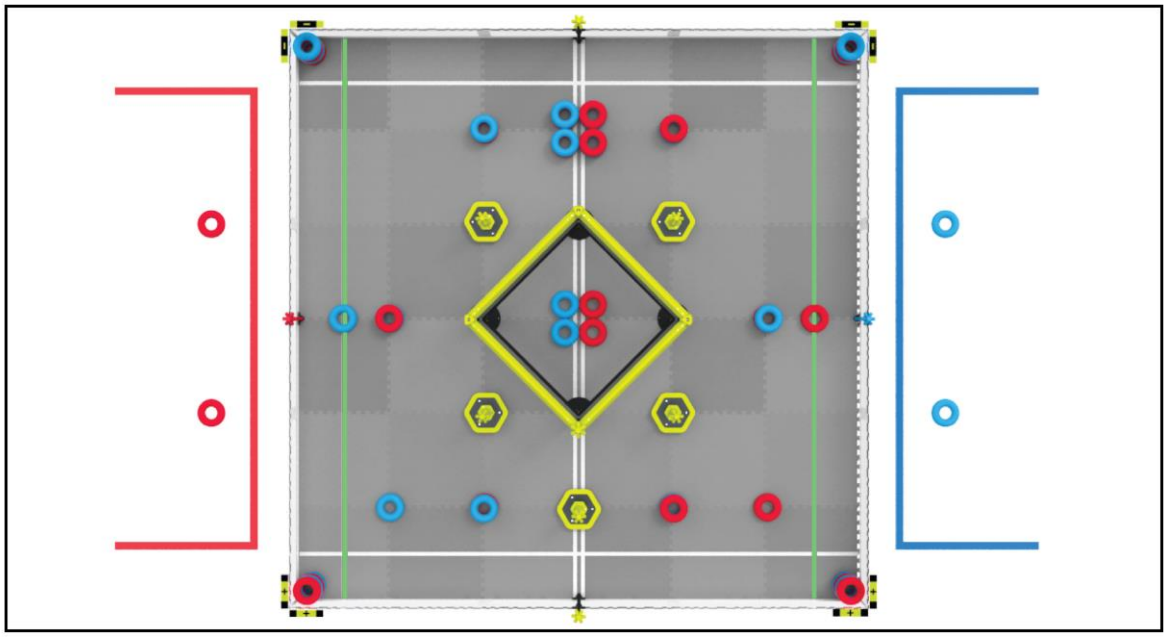
55. All Scoring statuses are evaluated after the Match ends.

Possession

56. Each Robot gets one *Ring* as a preload. A preload must be placed such that it is in contact with only one robot and nothing else, including the floor.
57. Possession is limited to two *Rings* and/or one *Mobile Goal*.
    a) *Rings* on a *Stake* are not included in a Robot's Possession count. For the purposes of this rule, "on a *Stake*" means that the *Ring* meets the criteria for a Scored *Ring*, even if it is being contacted by a Robot.
58. Possession – A Scoring Object is considered Possessed by a Robot if a Robot's change in direction would result in controlled movement of the Scoring Object. This typically requires at least one of the following to be true:
    a) The Scoring Object is fully supported by the Robot.
    b) The Robot is moving the Scoring Object in a preferred direction with a **concave** face of the Robot (or inside of a **concave** angle formed by multiple mechanisms/faces of the Robot).
    c) The Robot is holding the Scoring Object against the Floor or a Field Element.

59. Robots in Violation of this rule must immediately stop all actions except for attempting to remove the excess Scoring Objects.
60. If they are unable to remove the excess Scoring Objects, then they must return to a legal starting position. They will not be eligible to receive points for Climbing.
61. Plowing multiple *Mobile Goals* is permitted.
62. Plowing – A Robot is considered to be Plowing a Scoring Object if the Robot is intentionally moving it in a preferred direction with a flat or **convex** face of the Robot.

    The difference between Possession and Plowing is analogous to the difference between the terms “controlling” and “moving.”



Gameplay Rules

63. Teams may not intentionally or strategically remove Scoring Objects from the field.
64. *Rings* that leave the Field will be given to Drive Team Members from the same color *Alliance* as the *Ring*. They may place them into the field such that they are contacting the floor and a wall, and nothing else (including the *Corner* spot).
65. If a *Mobile Goal* leaves the Field, it should be returned to the field in a neutral space. Any *Rings* which were scored on this *Mobile Goal* will remain on the *Mobile Goal* (note this differs from VEX®).
66. You cannot intentionally remove opponents from the *Ladder*. Teams cannot negate an opponent’s Climb by contacting their Robot with a *Mobile Goal*, and an affected Climb will still be Scored.
67. Teams should expect possible interaction between Robots when engaging with the *Ladder*. These interactions will be treated similarly as two Robots engaging on the playing field; other than repeated/egregious cases, this contact/damage is likely to be ruled incidental.

68. Guidance for interpreting questionable/incidental interactions on the ladder is as follows:
    a) If the two Robots are not at the same *Level*, the higher Robot has the "right of way". Therefore, a Robot not Climbing, i.e., is still in contact with the Floor, cannot come in contact with a robot already off the floor.
    b) If a Robot is contacting the horizontal rungs of the *Ladder* facing their *Alliance* Station, they should generally be considered in a more "offensive" or "safe" position.
69. You cannot voluntarily remain in the same square for more than 5 seconds if it affects game play.
70. A Robot may not Hold an opposing Robot for more than a "5-count" (approximately 5 seconds) as counted out and approximated by the referee. A Robot is considered to be Holding if it meets any of the following criteria during a Match:
    a) Trapping - Limiting the movement of an opponent Robot to a small or confined area of the field, approximately the size of one foam field tile or less, without an avenue for escape. Note that if a Robot is not attempting to escape, it is not considered Trapped.
    b) Pinning - Preventing the movement of an opponent Robot through contact with the Field Perimeter, a Field or Game Element, or another Robot.
    c) Lifting - Controlling an opponent's movements by raising or tilting the opponent's Robot off of the foam tiles.
71. It's the referees discretion to determine when a Hold is Released.
72. No human competitor may touch anything within the arena, including their own robot, during a match. Even a minor infraction will lead to full disqualification for that match for that robot. If part of the robot inadvertently extends outside the arena it may not be touched as well.
73. Strategies aimed solely at the destruction, damage, tipping over, or entanglement of opposing robots are not allowed. If deemed to be intentional the offending robot may be disqualified from that match.
74. If a robot is completely out-of-bounds (outside the playing field), it is up to the referee's discretion to return the robot to the field. Team drivers may not touch the robot.
75. A competitor may only "drive" for one robot throughout the day. Even if other robots belong to the same school as the competitor, he/she may only drive for one of them.
76. A team (a specific group of students) may not switch robots during a competition. This includes adding or amending to their robot so that it behaves in a significantly different manner or capability. The competition referee will decide all matters pertaining to changing robots during a competition.
77. **Code of conduct:** Treat everyone with respect. All students, teachers, mentors and adults associated with a school are expected to conduct themselves in a respectful and positive manner while participating in the CIJE-Tech Robotics Tournament. If person(s)

are deemed to be disrespectful or uncivil to staff, volunteers, or fellow teams at an event, the team can be disqualified from their current or upcoming match.

78. If the adult team leader feels there has been an error regarding tournament play, he/she may bring it exclusively to the attention of the head referee without involving students. Their decision will be final say in the matter.

Tournament Style

79. Multiple robots from the same school do not behave as a team or affect each other's scores. For the purposes of the competition each robot is judged independently. There is no school average, combined school score, or school team.
80. Robots, and Alliances, will be chosen at random. Multiple robots in the arena may be from the same school. Alliances will be changed after each match.
81. The 16 robots with the top personal scores after all qualifying rounds have been played will advance to the semi-finals.
82. Robot ranking is determined using Win Points (WP on the scoreboard)
    a) Two (2) WP's are awarded for winning a Qualification Match.
    b) One (1) WP is awarded for tying a Qualification Match.
    c) Zero (0) WP's are awarded for losing a Qualification Match.
83. A tie in Win Points is then decided using Strength of Schedule Points (SP on the scoreboard). SP Points are the sum of the scores of the losing *Alliances* in your Matches. A higher SP score indicates that you played tougher opponents than someone with equal Win Points as you.
84. A seven (7) match bracket style playoff, as indicated in the bracket below, will be used to determine the winning *Alliance.*

85. At any given event, the number of Robots and Matches may be changed due to limiting factors such as time or available Robots (e.g. A four (4) *Alliance*, three (3) Match playoff)
86. Playoff *Alliances* will be determined as follows:

    Alliance 1: Robot #1 and Robot #9 *Alliance* 2: Robot #2 and Robot #10

    Alliance 3: Robot #3 and Robot #11 *Alliance* 4: Robot #4 and Robot #12 *Etc.*

87. The hosting school will be required to have their robot in the designated tournament area throughout the competition, beginning from the official start time, and may not bring it back to another part of the building for the duration of the tournament. They may bring tools and supplies to the tournament area.