2023 Botball
Fall Game Review
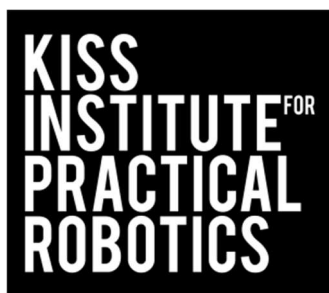
Contents

Revision History

Version 1.0

Contributors

Game Design Chair, Wesley Myers
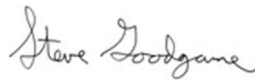
Numerous KIPR staff members and KIPR Community Members

Director's Note

Botball Community,

We are excited to have a more normal Botball season. This fall game should really give teams some great practice for the 2023 Botball game! I hope this fall game is motivating and challenging and that you are as excited as we are here at KIPR about this year's Botball game! Good luck!

Respectfully,

Steve Goodgame

KIPR Executive Director

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The Fall Game

Prepping for the Spring

To help teams start preparing for the spring we have created a fall game that uses some of the game components and articulations that they will see in the spring. There are fewer pieces and scoring areas and teams will have less time to prepare for the tournament. Plus, so as not to give away the spring theme, there will not be a theme to this game.
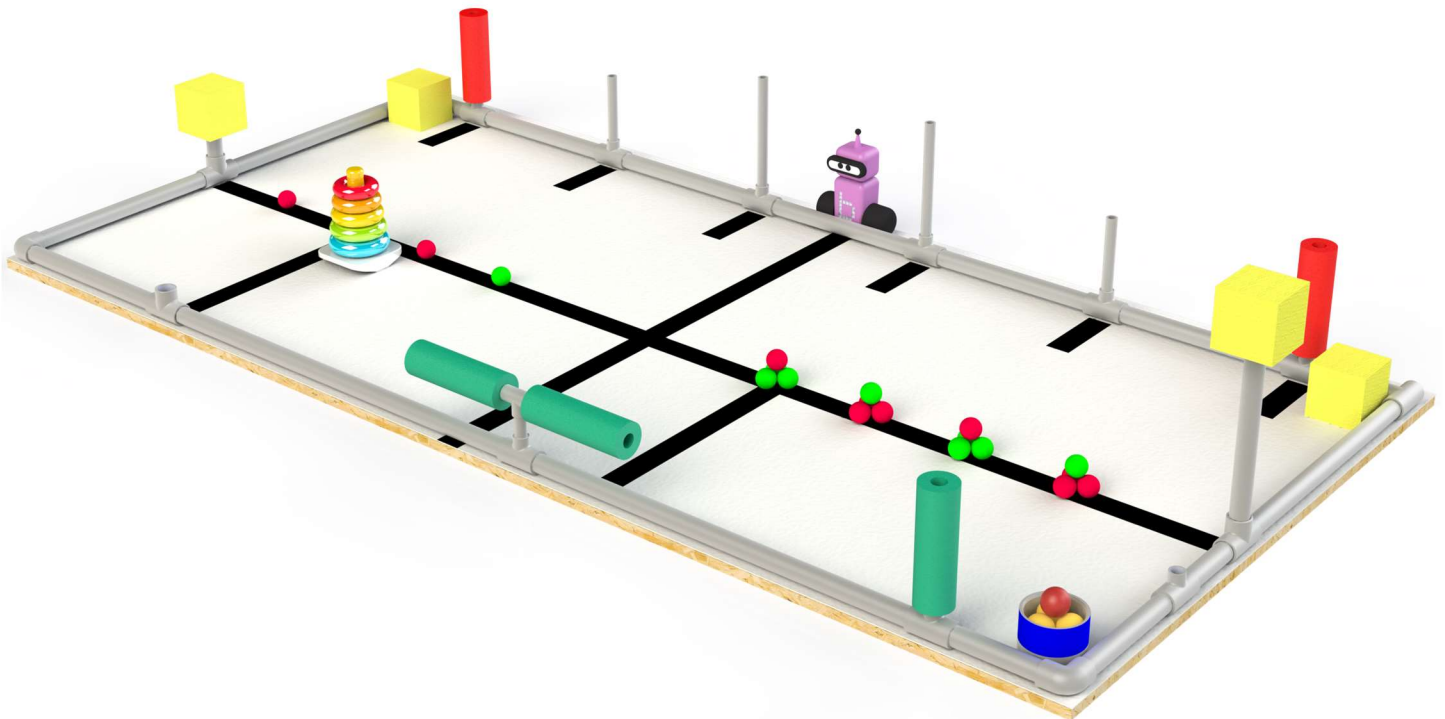
Figure 1 - Game Overview

Game Board Areas

Official game board specifications are on the Team Home Base. All tournament boards and game pieces will fulfill the following specifications within +/- 0.25" or up to 1% of the specification.

The fall game board is played on an 8' X 4' field, which is half of an official Botball game table. The game board is composed of two 4' x 4', reusable modules whose surfaces are pebble grain white fiberglass reinforced plastic panel (FRP). A fully assembled fall game board will be ~4' x 8'. A panel channel or black or white duct tape is used to close exposed seams where modules abut.

The game board is separated into defined areas for each team. Teams competing in the virtual tournament can run on the same 4" x 8' board or they can build two half boards and butt them together

- Large Starting Box
- Small Starting Box
- Zone A
- Zone B
- Zone C
- Zone D
- Zone E
- Zone F
- Rings
- Blue Coupler

Figure 2 - Game Areas

Starting Boxes – The boundary of the *Starting Boxes* are defined by the **inside edges** of the tape lines and inside edge of the PVC.

Zones A,B,C,D – The boundary of *Zones A,B,C,D are* defined by the **inside edges** of the tape lines and inside edge of the PVC.

Zone E – Encompasses the 6 PVC uprights and the matching black tape lines beneath them.

Zone F – Encompasses the two horizontal 0.5" PVC pipes on the upright bordering the *Small Starting Box* and the 0.5" vertical PVC pipe that sits on the border of *Zone D*.
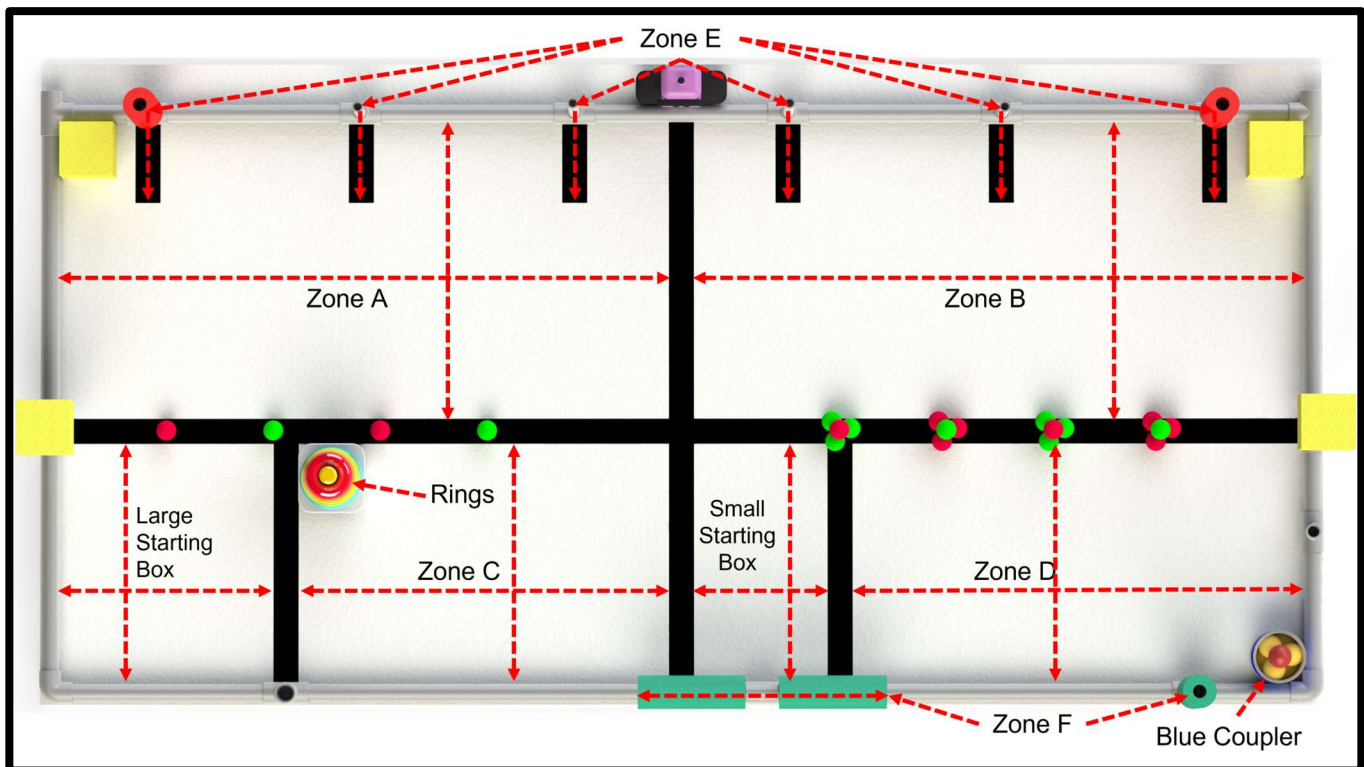
Rings and Blue Coupler – The coupler or rings are scoring areas so long as the scoring game piece is inside or at least some portion breaks the plane on either open end of the coupler or ring.

Game Piece

Scoring Pieces
- 1 - Rock-a-Stack
  - 5 - Rings
  - 1 - Ring Stand
- 4 - 4" Yellow Cubes
- 1 - Botgal
- 10 - Green poms
- 10 - Red Poms
- 6 - orange ping pong balls
- 1 - red ping pong ball
- 2 - 8" long red pool noodles
- 3 - 8" long green pool noodles

Starting Positions
- *Rock-a-Stack* – Will start in *Zone C* with one side coincident to the long center black tape of *Zone C* and the other side coincident to the outside of the Large Starting Box black tape line (refer to figure 3).

- *Single Red and Green Poms* – Will be placed along the half of the long center black line composing one edge of the *Starting Box* and *Zone C* in the order (Red, Green, Red, Green). Starting 8" from the PVC and spaced 8" apart.

- *Pom Stacks* – Stacks of three poms with one pom on top (refer to figure 3) will be placed with the first stack 10.75" from the PVC in the order 3 red - green top, 3 green - red top, 3 red - green top, 3 green - red top 8" apart.

- 4" Yellow Cubes – Two will be placed on top of the 1" PVC post at each end of the long center black tape. The other 2 cubes will be placed in opposite corners along the length of the board opposite the *Start Box* in *Zone A* and *Zone B*.

- *Botgal* – Will start aligned on the short center black tape but will sit behind and touching the PVC.

- *Red Pool Noodles* – Will start inserted onto the short posts in *Zone E* (refer to Figure 2 & 3)

- *Green Pool Noodles* – Two will start inserted onto each end of the post in *Zone F* on the outside PVC of the *Small Starting Box*. One green noodle will start inserted on the remaining PVC post in *Zone F* that sits on the border of *Zone D* (refer to Figure 2 & 3)

- *Blue Coupler* – Will start touching both sides of the PVC in the corner of *Zone D*

- *Ping Pong Balls* – Both orange and red balls will be randomly placed inside the *Blue Coupler*
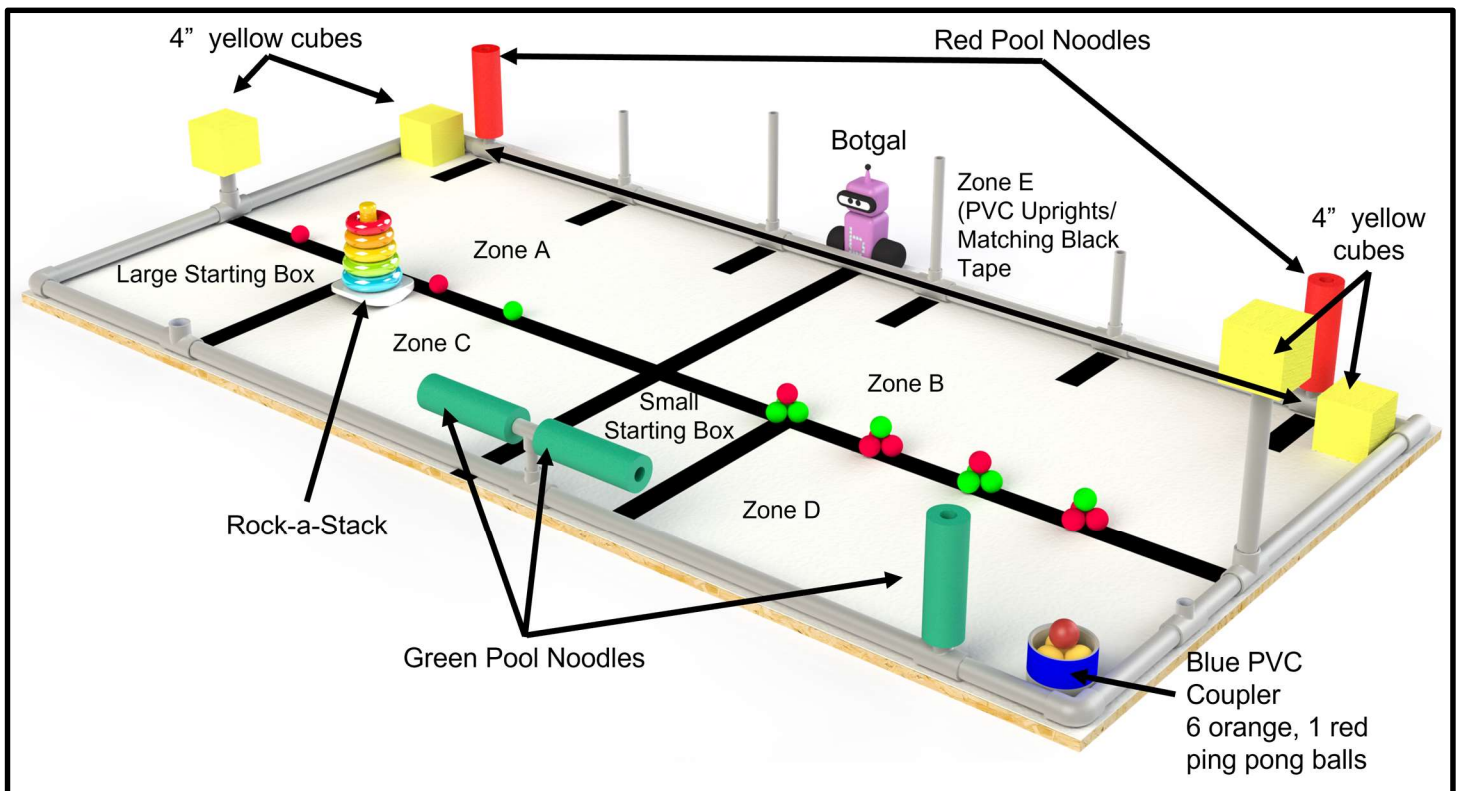

Figure 3- Game Pieces

Scoring

2022 Botball Fall Tournament

Seeding Scoring Sheet

Team Name:_____

Team Number:_____

Areas	Itemized Points		Totals
1. Large Starting Box Poms Rings/ Ping Pong Balls Cubes/ Noodles	#_____ X 5 = _____ #_____ X 10 = _____ #_____ X 20 = _____ Subtotal = _____	Botgal X 4	
2. Small Starting Box Cubes All Other Objects	#_____ X 25 = _____ #_____ X 1 = _____ Subtotal = _____	Stack Height (Ring Stand on Top = 2) X _____	
3. Zone A Poms/ Ping Pong Balls Rings Noodles	#_____ X 1 = _____ #_____ X 5 = _____ #_____ X 20 = _____ Subtotal = _____	Botgal X 2	
3. Zone B Poms/ Ping Pong Balls Rings Noodles	#_____ X 1 = _____ #_____ X 5 = _____ #_____ X 20 = _____ Subtotal = _____	Botgal X 2	
5. Zone C Red Poms Green Poms Noodles	#_____ X 5 = _____ #_____ X 20 = _____ #_____ X 10 = _____ Subtotal = _____	Sorted X 3	
5. Zone D Green Poms Red Poms Noodles	#_____ X 5 = _____ #_____ X 20 = _____ #_____ X 10 = _____ Subtotal = _____	Sorted X 3	
7. Zone E Cubes/ Poms Rings Green Noodles	#_____ X 10 = _____ #_____ X 30 = _____ #_____ X 50 = _____ Subtotal = _____	# of Uprights with Rings/ Green Noodles X _____	
8. Zone F Red Noodles	#_____ X 50 = _____	Uprights w/ Noodles X _____	
9. Rings Poms Ping Pong Balls	#_____ X 15 = _____ #_____ X 40 = _____ Subtotal = _____	# of Filled Rings X _____	
10. Blue Coupler Poms	#_____ X 15 = _____	Red Ping Pong Ball X 3	
	Team Initial		**Total** --->

Scoring Rules

1. **Black Tape Rule:** Any game piece with the exception of those scoring on the black tape lines of *Zone E* do not score.
2. **General Scoring Rule:** A game piece must touch the surface of the scoring area to score.
3. **Volume Rule:** To score the *Noodles* or *Rings* on any of the PVC uprights in *Zones E or F* or to score *Ping Pong Balls* or *Poms* in the *Rings* or the *Blue Coupler*, volume is defined as breaking the volume of the *Rings*, *Noodles*, or *Blue Coupler*.
4. **Stacking Rule:** *Yellow Cubes* in a stack score if the bottommost item in the stack is touching the surface of the game table. Each level must touch the topmost surface of the cube below it. A *Ring Stand* may only count as the topmost game piece in a stack.

    Note: Judges must be able to visibly determine the stack *height* and *integrity* (all items in stack touching other items in the stack) **without moving any items** otherwise all cubes in the stack score as "flat in the scoring zone of the base item of the stack".

5. **Highest Scoring Rule:** A game piece can only score in one scoring area and will be scored as if it is in the highest scoring area, as determined by base score without multipliers.
6. **Robot Rule:** For the purposes of scoring, a robot is defined minimally as a KIPR Robot Controller with at least two motors or a Create connected to it. A robot with 2 controllers counts as a single robot.
7. **Final Scoring Rule:** The score is determined by final object location, not by how it got there. Judges will wait until any scoring objects still in motion have come to rest before scoring a game.

Tie Breakers & Special Scoring Conditions

If one team never breaks any border of the *Starting Box*, including the 12" ceiling, then they lose the round. If both teams break the boundary of their *Starting Box* and one team's robot does not shut down their motors or does not stop commanding their servos to move at the end, then they lose the round. In the case of a tie score, a team wins if none of the above conditions apply and they are the:

1. Teams with the most points in *Zone E*
2. Teams with the most points in *Zone F*
3. Teams with the tallest stack
4. Team with the most points in *Zone A*
5. Team with the most points in *Zone B*
6. Team with the most points in *Starting Box*
7. Team with the most robots in any zone
8. Team with the robot (defined by the KIPR Robot Controller power switch) closest to the *Ring Stand*
9. Team with the robot (defined by the KIPR Robot Controller power switch) closest to the *Botgal*

Game Play

Virtual Tournament

We will host a Virtual Fall Game and participating schools should have one game table constructed and two cameras; one to show the overview of the game table and one mobile (phone or iPad) that can be moved if virtual judges have scoring questions. Adult mentor is required during tournament to attest to board set-up and any scoring questions.

Fair Play and Spirit of Botball

Botball is about the development of **student** skills. All adults mentoring a team should understand that responsible Botball mentorship **does not include** working on the robot entries or programming the robot entries for the students but **does** allow for appropriate mentor guidance of the team.

Spirit of Botball: This is a 100% student-driven experience.

Students know this, and adults know better!

Practice

Teams should practice until they are asked to go to whichever virtual room they will be competing in.

On-Deck

Entry to the On-Deck

The virtual tournament moderator will assign you to on-deck areas and competition rooms.

Inspections

Virtual tournaments will have a robot inspection prior to teams competing and the adult mentor must attest to the construction rules being followed.

Setup – Before Hands-Off

- Starting lights must be attached to the outside edge of the game table alongside the *Starting Box(s)*. Starting lights must either be aimed at the team's light sensors or at the floor and cannot be aimed so as to disrupt an opponent (judges' ruling).
- You can use handheld flashlights or cell phone lights as long as you can trigger the robot to start when the judge gives the command.
- Starting lights may **not** break the vertical projection of the board inside its PVC boundary. This is for safety as robots do occasionally break the bulbs if they make contact.
- There are two starting lights for each team, so each KIPR Robot Controller can have its own starting light. Both lights will turn on and off at the same time and cannot be controlled individually.
- Teams cannot touch starting lights after Hands-Off.

If judges determine a team is taking too long to calibrate, then they will issue a 30-second warning. At the end of the 30 seconds, a team that is not ready for "Hands-Off" will be assigned a fault, and the setup clock will be reset. If a team receives a 2nd fault in a round, then they forfeit the round. The maximum setup time, which may be extended at judges' discretion, is 90 seconds.

Before the Game Begins – After Hands-Off

Once "Hands-Off" has been declared, the team members will position themselves so as not to block the view of the table by the cameras. No part of a team's robot(s) may leave the *Starting Box* until the round has begun. Movement is okay so long as the *Starting Box* boundary isn't violated. If a moving violation happens, then the judges will call a fault on the team. Team members may not move the starting lights at any time after hands-off. Team members may not signal to their robots after "Hands-Off" to start their robots.

Timeout Card

Each team will be allowed a single Timeout. The timeout can only be used at virtual robot inspection if it is being used at the tournament or while that team is setting up at the table before "Hands-Off". While a team is at the table, any time **before** "Hands-Off", a team may elect to use their timeout and get a 3-minute timeout. Only a single timeout per team is allowed for the entire tournament. Teams are advised to save their timeout for the Double Elimination rounds, as Seeding rounds are best 2 out of 3.

After the Game Begins – Lights On

Once the starting lights have turned on, the round counts unless a judge rules otherwise. At the start of the game, the starting lights turn on and robots are then allowed to leave the *Starting Box*.

The round lasts two minutes (120 seconds). The lighting sequence is:

- 0 seconds: lights turn on; robots can leave starting boxes
- 15 seconds: lights turn off
- 120 seconds: Virtual judges calls time

End of Game

Robots must **stop driving their motors, including those on the Create, and stop servo <u>motion</u>** by the end of the round or that team will lose the round in all situations except against a team that does not break the boundary of the *Starting Box* (in Seeding, this condition will give a score of 0). Incidental motion from a servo holding a position under load is OK.

Scoring is based on the location of pieces at the end, not how the pieces got there. Scoring takes place when the round has ended and items have come to rest.

If all motion has stopped before 120 seconds, the judges may ask the teams if their robots are done and if so, then they may end the round at that time. Both teams must agree in order for this to end the round.

Final Scoring and Rulings

If your team does not agree with the score as calculated, then they must immediately notify the judge(s) **before** leaving virtual room and **before** any items have been moved on the table. If they do not agree with the table judge's ruling, then they may ask to speak with the Head Judge. The Head Judge will spend no more than 5 minutes on the decision. Teams will be required to <u>initial</u> the score sheet <u>before</u> leaving the table, signifying acceptance of the ruling. If they do not agree with the ruling, then the Head Judge is permitted to sign for the team to progress the event forward.

There are no instant replays. No external videos will be used in consideration of scoring. If a team is unhappy with a judge's decision, then they should politely challenge it then and there. **Challenges to scoring after the teams have agreed to the score will <u>not</u> be considered.**

<u>Spirit of Botball</u>: Mentors, spectators, and team members should respect teams' and judges' final decisions.

Challenges

Challenges may only come from judges and team members at the table. If either team wants to challenge the validity of the robots they are facing, then they have to bring it to the table judges' attention <u>during the inspection period</u> and the Head Judge will come over. Teams should bring the list of parts to the table to aid in the inspection. Challenges must be specific. Teams are encouraged to have a Bill of Materials for each robot they bring to the table as a means for minimizing the likelihood of a robot's construction being challenged. There is a Bill of Materials spreadsheet on the Team Home Base, which can be used to specify which kit parts are allowed to be used for the robots at the table.

The Head Judge is the final arbiter of a challenge and can dismiss what they believe to be spurious or irrelevant challenges. Teams determined by the judges to be in safety or performance-changing violation will be given 60 seconds by the judges to make a correction, remove offending pieces, or take the robot off the table; otherwise, the robot must be removed for the round or the team can forfeit. A robot that is determined before the beginning of a round to be in a safety or performance-changing

violation of the construction rules will not be allowed to play while in that state. A robot ruled to be unsafe for humans will not be allowed to run until modified.

If a team wants to execute a challenge, then they must wager their round. If the team that makes the challenge is correct, then they win the round and the other team is disqualified for that round. However, if the team that makes the challenge is incorrect then they will be disqualified for that round and the other team will win the round. In the case that both teams wish to make a challenge, the one to approach the judge with the challenge first will be the determining challenge. .

Seeding Rounds

Seeding rounds take place before Double Elimination. There will be three Seeding rounds. The order in which teams appear in each round is set by tournament software and is the same for each round. In Seeding, a team plays the game unopposed, and the score for both sides counts, where your Seeding Round score is (*the score for your side*) + (*the score for the other side*). Note that Seeding scores are the **sum** of the entire board and **teams are encouraged to cross sides and use the whole board for scoring during Seeding**. Unlike the Double Elimination rounds, a Create chassis is permitted to cross to the other side.

Seed scores of less than 0 will be counted as 0, except when a team passes on a round, in which case their score will be -1 for the round. A team's Seed Score is the average of their best two Seeding rounds. The tableside used by a team for a Seeding round (the side from which the robots will start) is determined when teams are called to be on deck for their turn in a Seeding round.

A student team member must bring any concerns about the seeding round scores to the attention of the Head Judge before the bracketing for the double elimination rounds. Bracketing occurs within ~5 minutes of the completion of the last seeding round. Only math errors on scoring will be accounted for.

Double Seeding Rounds

Double Seeding will only be played at the Global Conference on Educational Robotics.

Double Elimination (DE) Rounds

A team is out of the Double Elimination tournament when it has lost two games. Initial matches are decided by KIPR tournament software using Seeding round scores. As the tournament progresses, the order of matches and table sides for the competing teams are determined using KIPR tournament software. The two teams for a match play each other and the highest score at the end of the game wins, subject to tie breakers and special scoring conditions. The size of Double Elimination scores does not affect ranking, only wins and losses.

During a Double Elimination match, a team's Create chassis may not ever be entirely on the other team's side. During match play, the table judge, through observation, may decide that a robot is guilty of interference, and then disqualify the team for that round.

Alliance Matches

Logistics

At selected tournaments, if a team is eliminated from the Double Elimination tournament before the Finals of Double Elimination play, then that team may sign up to play in Alliance Matches. Alliance Matches will pair up two teams to play the game collaboratively with the goal of scoring the most points. Each team will bring one robot to the table to run simultaneously. The teams will place their robots in any of the *Starting Boxes* (i.e. both on the same side or split between the two sides).

Scoring

Alliance rounds will follow all of the same scoring rules as a regular Seeding round. The total Alliance score is (*Your side's score*) + (*Ally side's score*). The Alliance team with the highest combined score from a single run will win the Alliance Tournament. Alliance matches will be conducted until tournament officials suspend play (usually when the final Double Elimination rounds are near complete).

Tiered Rounds

Logistics

At selected tournaments, if there are enough teams, then there might be a chance of breaking out the Double Elimination rounds into multiple tiers. The objective is to play against your peers.

Virtual Tournaments

Virtual Tournaments will require the team to have a competition game board that meets requirements, access to the internet and two cameras (one static to show the game board and one mobile for robot inspection and judges scoring questions) to participate.

Construction Rules

The official construction rules for the 2020 Botball Game consist of the latest revision of this 2020 Botball Game Review document and any updated game rules posted on the Team Home Base (including those posted in answers to FAQs or otherwise). Posts on the 2020 Team Home Base in the Game Rules Question area will be used to update the document and provide notice of any rule changes or adjustments.

Kit Rules

1. Sensors from the 2017, 2018, 2019, 2020-21, 2022 kit may be used as long as they don't exceed the type or number in the 2023 kit.

2. Only the larger metal chassis (steel) will be allowed in robot construction.

1. Robots may be constructed out of any or all of this year's kit parts except: the boxes, bags, wrapping or packing material, the chargers, download cables, wrenches, screwdriver and color stickers. Materials supplied at the workshop for creating your game board (e.g., Botguy, poms, etc.) are not part of the kit and cannot be used on your entry. The included camera and Create are the only USB devices that may be plugged into a robot during the game. **Consult the official parts lists for allowable kit parts!**

2. Small removable mounting dots/strips such as those produced by Glue Dots, UGlu and/or Scotch Brand Restickable Dots/Strips, blue tack (acquired at team's expense) may be used for construction purposes. They may not be exposed for sticking things otherwise in any manner. In particular, this means you may **not** use your mounting dots/strips to contact the game board, game elements, or the other team's entry. **Note that neither hot melt glue nor any other adhesives, other than removable mounting dots/strips, are allowed in robot construction.**
   a. Mounting dots/strips are available at stores such as Home Depot, and online from vendors such as Amazon.

3. Judges may require excessive adhesive to be removed. Teams should always try to come up with a mechanical means for construction and only resort to using adhesive methods as a last resort.

4. Supplied servo accessories such as grommets, screws, etc. may only be used to mount pieces to the servo horn.

5. Servos and motors may be mounted to structural pieces using the supplied machine screws.

6. Teams may trim the connector potting material as needed to ease insertion or mounting of sensors. Damaged pieces will be replaced at team's expense.

7. Plastic servo horns may be trimmed as desired. Damaged pieces will be replaced at team's expense.

8. Teams are allowed to add the following pieces to their entry:
   a. Up to 100cm of thread, string or fishing line (maximum diameter 1mm, **non-metallic only**) may be used as desired except for offensive measures such as entanglement and entrapment.
   b. Paper (maximum 20#) so long as all the pieces can be taken from the **same single** standard US letter-sized (8.5" X 11") or A4-sized (210mm x 297mm) sheet. See rule 9.
   c. Standard 3/16" thick foam board as long as all the pieces can be taken from the **same single** standard US letter-sized or **#1**, A4 footprint. See rule 9.

d. Up to 10 standard office rubber bands of maximum size #19 may be used (#19 is 3.5" x 1/16" x 1/32").

e. Up to 10 Paper Clips, smooth, metal (between 1" and 1 ½" in length). Paper clips can be bent in any fashion but cannot be cut, broken or plugged into any wire or robot controller

f. Coins, up to 250 grams (~100 U.S. pennies) to be used as a counterweight only. Please be prepared to prove that it is within the legal weight limit if necessary. Coins may be rolled in wrappers (up to two rolls) to make it easier to weigh.

9. If the team's entry uses paper and/or foam core board, then the team **MUST** bring a template showing how the material you are using was cut out of **ONE** 8.5" X 11" (or A4) paper sheet and one 8.5" X 11" (or A4) 3/16" foam core sheet. The paper/foam core board may only be held in place through the use of other kit parts (including removable mounting dots/strips detailed above if used as allowed for other kit parts). **Paper and foam core board may only be black or white; only grayscale may be used for printing including official logos for sponsors of your team, or QR codes.**

10. Rubber bands may not be glued or melted. Rubber bands may be cut, but only a total of ten whole rubber bands or five cut rubber bands may be used on a team's entry. For any combination having both whole and cut rubber bands, the limit is 5.

11. Soda straws, paper, electrical tape and/or foil may be used as light guides for sensors (light guides may be shielded by using tape, but not in a fashion that is for structural purposes or for manipulation). Light guide materials are in addition to the allowable parts. The light sensors in the kit usually do not require a light guide unless there is a lot of direct sunlight in the room.

12. Teams are not allowed to shield robot sensors externally to their official entry (i.e., teams are not allowed to stand between their robots and the audience to keep the robots from sensing the audience). Teams should orient and calibrate the sensors on their robot appropriately so that this is not an issue. Teams using cameras may request that anyone whose attire includes significant color markings closely matching game object colors stand well back from the table.

13. Team are limited to ten (10) 4" white zip ties (included in the kit), and they may be used for any purpose. You may replace damaged ties with ones of equivalent size (black or white).

14. Lego parts cannot be physically modified. This includes threading axle holes with screws.

15. Metal parts may not be cut or broken to a smaller size. Only straps and plates as listed in the kit may be bent if desired.

- Warning: At tournaments KIPR will not provide replacements for metal parts that have been altered or damaged. Replacements may be purchased from the online Botball Store.

16. Optional Create parts are the top plate, dust bin, and brush bar box. If any optional pieces are removed, they may NOT be reused anywhere else on the entry. The Create may not be assembled/disassembled otherwise.

17. Teams are limited to the number and size screws as follows: 20 -#8-32 quarter inch, 45 -#8-32 half inch, and 35 -#8-32 three-quarter inch screws. All #8-32 screws are black. There are 10 silver M3 x 14mm screws and six silver M3 nuts. There is also #8-32 threaded rod: 10 - 1", 2 - 2", 2 - 3", and 1 - 6" long.

Robot Logistics

1. Each robot if named can only have a name (G-rated) approved by an adult team leader before the tournament.

2. Multiple teams may not share the same robot during the competition.

3. Multiple processors (such as two KIPR robot controllers) may exist on a single robot.

   a. You may use any combination up to two of the KIPR wallaby and/or wombat

4. It is not necessary to use all the parts in a kit.

5. Each *Starting Box* is 12" tall.

6. The *Starting Box* boundaries are given by the **interior edge** of the PVC and **interior edge** of the black tape that delineates it.

7. All elements of a team's entry must be within the volume of the *Starting Box* at game start.

8. After game start, robots are allowed to expand in size.

9. Starting light sensors may be shielded as demonstrated in the workshop slides and <u>neither sensor nor shielding may extend outside the *Starting Box*</u>.

10. All independent structures not under computer control should be clearly marked with the team's number. Maximum label size is 1" diameter (Avery #5410), or you may use permanent marker directly on the structure. Teams may only run robots with their team number on them.

11. Robot teams can have a maximum of 4 independent structures on the game table at a time

    a. A team's entry, including any supplied game pieces, must fit in the *Starting Box* **without any external restraint** at game start (the *Starting Box* floor and border PVC is not an external restraint).

    b. Each structure must be large enough so that it does not, in the judge's opinion, constitute a jamming or entanglement hazard.

    c. Examples of structures include: robots, barricades, detachable baskets, etc.

    d. A team's entry can contain as many robots up to the structures limit as can be constructed from the parts in a single kit.

    e. Items intentionally ejected from a robot count as structures (judges judge intention); there are special rules regarding projectiles, discussed later.

    f. The igus© chain **must** be permanently affixed to a robot (defined as a KIPR Robot Controller with a minimum of two attached motors) by at least one end of the chain. Using the igus© chain in a gear-driven system for motion of a robot component counts as being affixed to the robot. The igus© chain may **not** be used as a projectile (even tethered) or as an independent structure. If the Head Judge deems the use of the igus© chain to be in violation of this rule, the offending team will be disqualified for the round.

12. No electrical modifications may be made to any KIPR robot controller, the Create, any sensors or any motors, except for substitution of batteries with one approved by KIPR.

13. No wire extensions may be used except those provided in the kit.

14. Entanglement strategies that involve an independent structure are not in line with the Spirit of Botball and may be subject to disqualification as determined by the Head Judge.

Safety

1. Human & Robot Safety:

   a. No untethered robot-launched projectiles, other than game pieces, are allowed.
   b. No tethered projectiles containing metal pieces are allowed.
   c. No metal pieces are to be used in effectors that move or rotate at high speed.
   d. No metal protrusions are to be used that are likely to cause electrical or safety risks for other robots (including arms and projectiles).
   e. Judges will determine how safe a robot is. <u>Teams may alert judges to a potential safety or entanglement hazard, but judges will interpret whether or not a robot is safe, needs to be modified, or is not allowed to run</u>.

2. Electrical tape, either black or white, may be used to cover metal pieces that are deemed to otherwise be a safety risk to robots or humans. Judges might require this to be done at the game table. Note that tape is not allowed to be used for structural purposes.

3. If the Head Judge decides that a robot is not considered safe, then the robot will not be allowed to run until it has been modified.

External Communication

1. No external communications (e.g., IR, Bluetooth, wireless, or semaphores) may be used during tournament play with the exception of robot to robot.

2. The USB cables & chargers may not be used during game table tournament play with the exception of the create cable.

3. Communication between robots for your team's entry is allowed

4. Your robot controller may have WiFi turned on or off at the tournament, however we strongly advise teams to use USB for Wallabies or ethernet communication at all times as teams can remotely access your wallaby and gain your password and Wombats may have signal issues.

5. Any teams found in violation of any communication hacking or tampering with another team's robots or equipment is in violation of the "Spirit of Botball" and may be disqualified from the rest of the tournament.

Teams found in violation of any communication rule may be disqualified from the tournament at the discretion of the Head Judge.

Overall Winner Calculations

A team's overall score is calculated as the sum of their Seeding, Double Elimination, and Documentation scores. The overall score is between 0 and 2.

Seeding Scoring Formula

$$\text{SeedScore} = \frac{3}{4}\left(\frac{n - \text{SeedRank} + 1}{n}\right) + \frac{1}{4}\left(\frac{\text{TeamAverageSeedScore}}{\text{MaxTournamentSeedScore}}\right)$$

Double Elimination Bracket Scoring Formula

$$\text{DoubleEliminationScore} = \left(\frac{n - \text{DERank} + 1}{n}\right)$$

Note: For all formulas n = Number of Teams at Tournament or in bracket
Note #2: Weighting of brackets and number of brackets will be released at GCER