2026 Fall Botball
Game Review

KISS INSTITUTE FOR PRACTICAL ROBOTICS

Botball®

Version 1.0 (9/12/2025)

Contents

Revision History

Version 1.0 – Initial Draft

Contributors

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Numerous KIPR staff members and KIPR Community Members

Director's Note

Botball Community,

We are excited to welcome you to the 2026 Botball Fall Game! Once again, I want to thank our dedicated staff and the amazing volunteers who bring this program to life each year. Their creativity, hard work, and passion make it possible for us to deliver another thrilling challenge.

This year's game, **Pallet Pushers**, drops Botguy and the robots into the fast-paced world of an automated warehouse. Teams will face the challenge of moving pallets, stacking products, sorting items, and coordinating shipments to the loading docks. Efficiency, precision, and teamwork will be the keys to success.

As always, Botball provides more than just a competition — it's an opportunity to develop real-world problem-solving skills, test innovative ideas, and have fun along the way. I can't wait to see the clever solutions, unique strategies, and collaborative spirit that our Botball community will bring to the floor this December during the virtual competition.

Let the stacking begin!

Respectfully,

KIPR Executive Director

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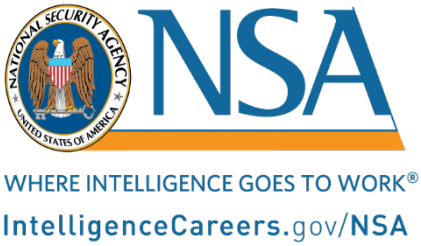

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This Year's Game

Pallet Pushers: Delivering the Future

Robots are stepping onto a bustling factory floor as the newest workers. Raw materials arrive at the **Outdoor Unloading Dock** and must be transported inside to **Work Stations** for processing. Finished goods are stacked on **pallets**, stored in the **Lower and Upper Storage** areas, or moved onto the **Raised Loading Dock** for shipment through the **Outdoor Loading Dock**. Along the way, robots may need to sort colorful **poms** into the **Pom Sorter** or carefully place them into **baskets**. **Traffic cones** act as safety markers that robots must avoid, while **Botguy** serves as the plant supervisor, needing to be relocated to oversee production.

Teams score by showing how efficiently their robots can keep the factory running—moving materials to the right stations, organizing storage, and preparing shipments—while navigating the challenges of a crowded, fast-paced workplace.

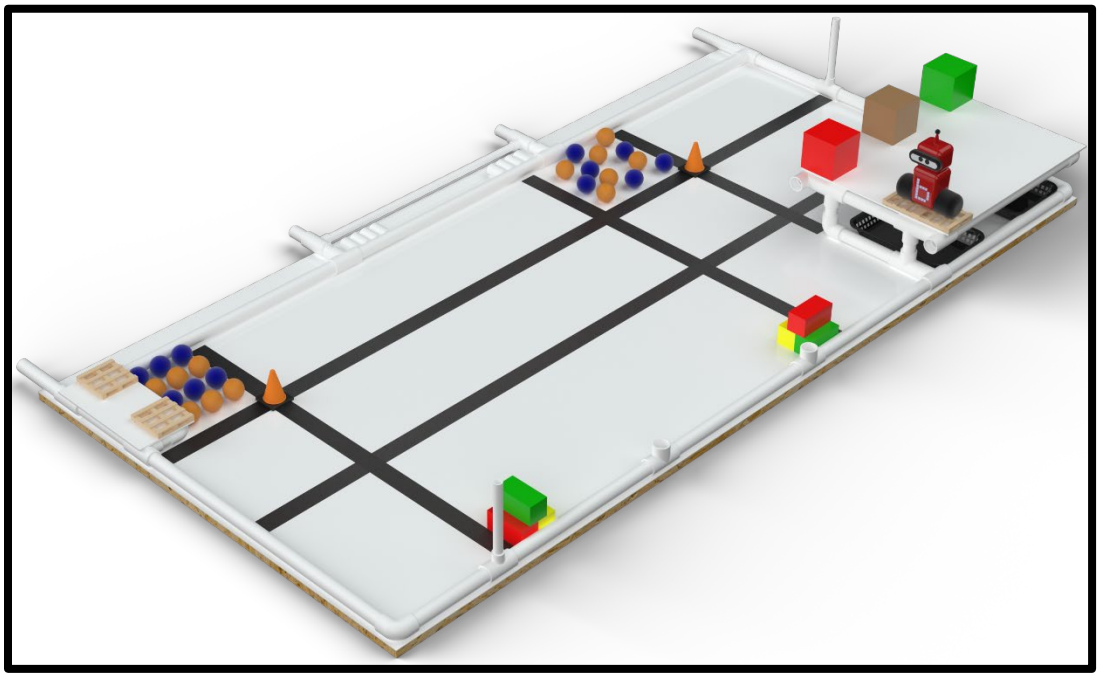

Figure 1 - Game Overview

Game Board Areas

Official game board specifications are on the Team Homebase. All tournament boards and game pieces will fulfill the following specifications within +/- 0.25” per 4’ or up to 1% of the specification.

The game board is composed of four ~4’ x 4’, reusable modules whose surfaces are pebble grain white fiberglass reinforced plastic panel (FRP). A fully assembled game board will be ~8’ 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.

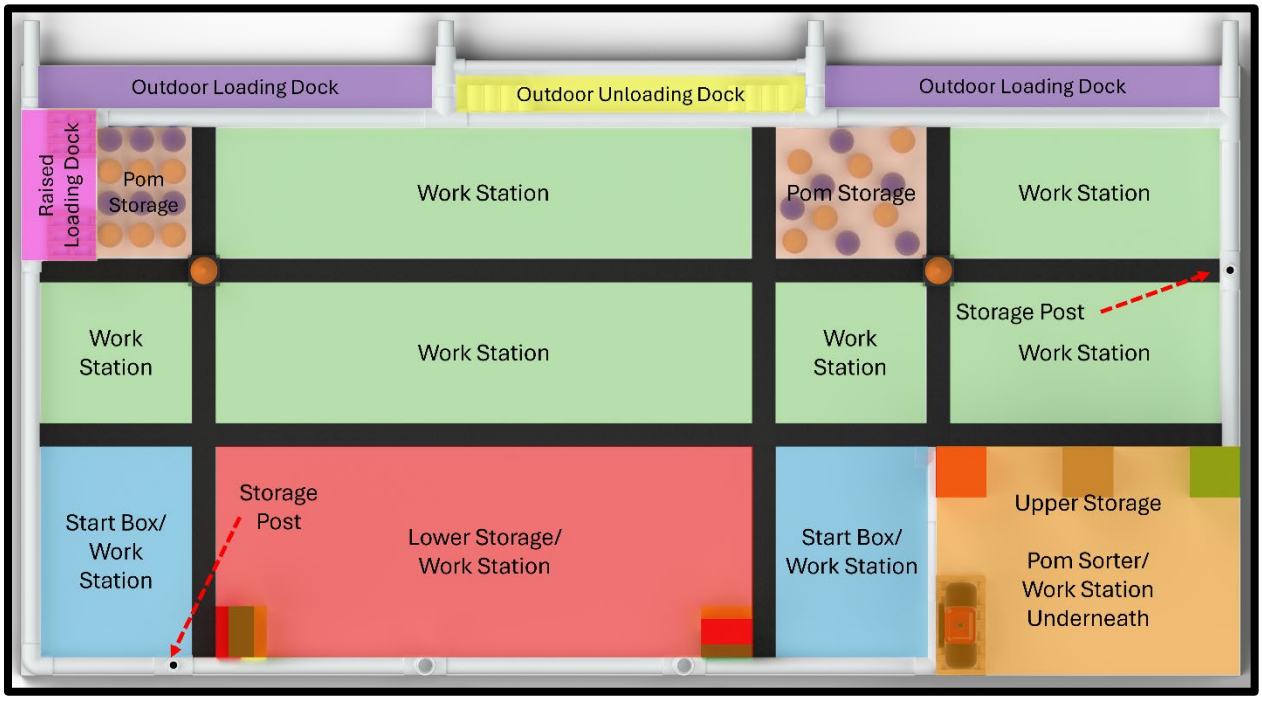

Figure 2 – Game Board Areas

Starting Boxes – The area delineated by the inside edge of the PVC pipes and black tape lines in the bottom left corner of a team’s side and in the area to the left of the area in the bottom right corner. The *Starting Box* height is 12” tall.

Work Stations – The ten surfaces of the game table delineated by the inside edge of the PVC pipes and black tape lines that does not include the *Pom Storage* areas or *Outdoor Loading and Unloading Docks*. This does include the *Starting Boxes, Lower Storage,* and *Pom Sorters*. This does not include the black tape.

Lower Storage – The area delineated by the inside edge of the PVC pipes and black tape lines directly between the *Starting Boxes*.

Pom Sorter – The area delineated by the inside edge of the PVC pipes and black tape lines directly to the right of the rightmost *Starting Box* and below the *Upper Storage* platform.

Upper Storage – The top of the corrugated plastic platform that sits directly above the *Pom Sorter*.

Raised Loading Dock – The top of the corrugated plastic platform in the top right corner of the board.

Pom Storage – The areas delineated by the inside edge of the PVC pipes and black tape lines, with one directly to the right of the *Raised Loading Dock* and the other two sections to the right of that.

Outdoor Loading Dock – The two areas delineated by the inside edge of the PVC pipes on the top outside edge of the table. One of these areas is on the left-hand side of the *Outdoor Unloading Dock* and the other on the right-hand side.

Outdoor Unloading Dock – The area delineated by the inside edge of the PVC pipes on the top outside edge of the table. It sits in the center between the two *Outdoor Loading Docks*.

Storage Posts – The two posts on the edge of the game table. One sits on the bottom edge of the leftmost start box. The other is centered on the black tape line dividing the two rightmost *Work Stations* at the top of the board.

Game Piece

Scoring Pieces

- 1 – *Botguy*
- 1 – *4" Red Cube*
- 1 – *4" Brown Cube*
- 1 – *4" Green Cube*
- *2 – Baskets*
- *2 – Traffic Cones*
- *4 – Pallets*
- *4 – 2" Red Cubes*
- *4 – 2" Yellow Cubes*
- *4 – 2" Green Cubes*
- *8 – 2" PVC Pipes*
- 12 – *2" Orange Poms*
- 12 – *2" Blue Poms*

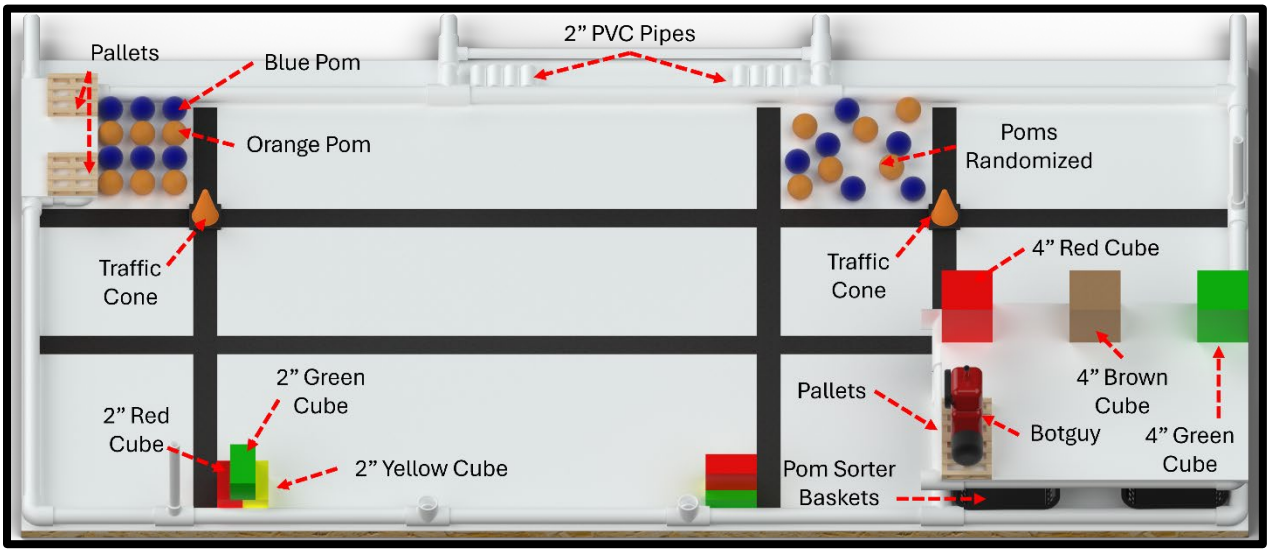

Figure 3 - Game Pieces

Starting Positions

- *Botguy* – Will be placed facing the *Start Boxes* on top of two *Pallets* in the bottom right corner of the *Upper Storage*.
- *4" Cubes* – Will be placed on top of the *Upper Storage* with the red cube on the left corner, the green cube on the right corner and the brown cube in the center. There should be 6" of space between the cubes.
- *Baskets* – Will start in the *Pom Sorter* area beneath the *Upper Storage*. Each basket will start pushed back into the PVC corner of the area.
- *Traffic Cones* – Will be roughly centered on the black tape intersections of the bottom right edge of each *Pom Storage* area.

- *Pallets* – Will be placed one each in the top and bottom right corners of the *Raised Loading Dock* and two on top of the *Upper Storage* in the bottom right corner, flush with each other along the edge closest to the *Starting Box*.
- *2" Cubes* – Will be placed in the bottom left and right corners of the *Lower Storage* in a stack with one color on top and two colors on the bottom. The position of the colors of cubes in each stack will be randomized, although each pair of a color will stay together. The cubes in the left corner will have the flat face of the stack face the PVC pipe and the cubes in the right corner will have the flat face of the stack face the *Start Box*.
- *2" PVC Pipes* – Will be placed in the bottom left and right sides of the Outdoor Unloading Dock. 4 pipes each will start on each side with the holes facing towards the *Lower Storage* and flush with the bottom pipe. The circular edge of the pipe closest to each side will be flush with the edge of the T-connector that sticks out over the bottom pipe. The rest of the pipes will be flush with each of these.
- *Poms* – Will start inside the *Pom Storage* areas. In the left *Pom Storage* area, the poms will be in rows of three with 2.5" between the centers of each pom. The center of the first blue pom in the corner will start 1" from each of the PVC walls. The center of each row after that will be placed 2.5" from the center of the previous row, alternating colors. In the right *Pom Storage* area, the poms will be dropped in randomly and contained by the black tape and the PVC pipe.

Areas	Itemized Points	Multipliers	Totals
Starting Boxes Cubes Baskets	#_____ X 2 =_____ #_____ X 15 =_____ **Subtotal** =_____	Botguy X 2	
Work Stations Poms	#_____ X 2 =_____ **Subtotal** =_____	# of Stations with Both Pom Colors X _____	
Lower Storage Cubes on Pallets Botguy Stored Traffic Cones	#_____ X 5 =_____ #_____ X 20 =_____ #_____ X 25 =_____ **Subtotal** =_____	# of Pallets X _____	
Storage Posts 2" PVC Pipes	#_____ X 30 =_____ **Subtotal** =_____	# of Posts X _____	
Pom Sorter Unsorted Poms in Baskets Sorted Poms in Baskets	#_____ X 5 =_____ #_____ X 10 =_____ **Subtotal** =_____	Sorted Baskets X _____ Returned Baskets X _____	
Upper Storage Cubes on Pallets Traffic Cones	#_____ X 10 =_____ #_____ X 15 =_____ **Subtotal** =_____	# of Pallets X _____	
Raised Loading Dock Cubes Cubes on Pallets	#_____ X 5 =_____ #_____ X 10 =_____ **Subtotal** =_____	# of Pallets ___ X 2 = ___	
Outdoor Loading Docks Unsorted Cubes Sorted Cubes Cubes on Pallets	#_____ X 5 =_____ #_____ X 10 =_____ #_____ X 5 =_____ **Subtotal** =_____	Highest # of Sorted Cubes on a Pallet X _____	

Scoring Rules

1. **Black Tape Rule:** Any game piece touching any (Black Tape), does not score, excluding those scoring via the *Volume Rule*.
2. **General Scoring Rule:** A game piece must touch the surface of the scoring area to score, except game pieces following the *Volume Rule*.
3. **Volume Rule:** To score in the *Baskets,* some part of a pom must break the volume of the scoring area. If two volumes overlap, game pieces will score inside the first volume that they break, rather than the one they score the highest in. To score a 2" PVC Pipe on a *Storage Post*, the post must break the volume of the pipe.
4. **Sorting Rule:** Cubes and poms are the only game pieces that may be sorted. Only cubes may break a cubes sort and only poms may break a pom sort. There must be at least two of the same color of a game piece and only one color on a pallet, in a basket, or in a scoring area to count as sorted
5. **Electricity Rule:** Cubes that are stacked on top of other cubes or pallets will count as if they are touching the surface below the lowest cube or pallet in the stack.
6. **Traffic Cone Rule:** If a traffic cone is touching the surface of the game table or platform in an area and not touching black tape, all other objects in that area as delineated by black tape, PVC, or ledges on platforms, will not score. To store a traffic cone, it must be touching the top of the 1" PVC pipes on the bottom side of the *Lower Storage* and not touching the surface of the game table.
7. **Basket Rule:** In order for a basket to count as returned, it must be touching only the surface of the game table in the *Pom Sorter*.
8. **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. A game piece that acts as a multiplier will only multiply in the area that results in the greatest increase in base points for an area.
9. **Robot Rule:** For the purposes of scoring, a robot is defined minimally as a KIPR Robot Controller with at least two motors connected to it. A robot with 2 controllers counts as a single robot.
10. **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. Largest number of sorted cubes on the *Outdoor Loading Docks*.
2. Largest number of cubes on pallets.
3. Largest number of sorted poms in baskets.
4. Largest number of pipes on *Storage Poles*.
5. Largest number of stored traffic cones.
6. Tallest stack of scored cubes.
7. Largest number of work stations with both pom colors.

8. Botguy in *Lower Storage*.
9. Botguy in *Start Box*.
10. Team with largest number of different types of objects scoring in work stations.
11. Fewest number of game pieces on black tape.
12. Team with the robot (defined by the KIPR Robot Controller power switch) closest to *Botguy.* This tiebreaker will only be used if a match has already been replayed once.

In the finals of a tournament, tie breakers will not be used to indicate a winner; the match will be replayed until one team scores more points than the other.

Game Play

Fair Play and Spirit of Botball

An adult mentor must be present at all times during the virtual competition.

Botball is about the development of **student** skills. Once a team enters the pits with their robots, we require that the **robots not leave the pits** for any purpose until the conclusion of the tournament or suspension of play for the day. Adults are not allowed into the pits, except to help teams carry in equipment as they arrive in the morning. All adults accompanying 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. **Teams hosting a tournament at their school must check their robots into the pit area at least one-hour prior to the start of the seeding rounds.**

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

Students know this, and adults know better!

Mentors, parents, adults, or other non-students who wish to actively participate in the construction, programming, testing, or documentation of a robot are invited to participate in other activities such as the KIPR Aerial.

Team T-Shirts

Botball teams are encouraged to design and wear their own Botball competition t-shirts. Graphics must be family and school appropriate and not explicit or suggestive of inappropriate content. If teams are wanting to wear their shirts to the table, it is recommended that the shirts contain mostly neutral colors so as not to potentially confuse any cameras on robots at the table.

Inspections

Adult mentors are required to attest that their teams game board is built to correct specifications and that their robots are not breaking any of the construction rules.

In the Spirit of Botball, teams that notice part violations or construction violations on other teams' robots should inform the team or the head judge before any competition rounds. Encouraging other teams to challenge part violations prior to or during competition rounds is not in the Spirit of Botball.

Setup – Before Hands-Off

Up to two students from a team may bring the team's robot(s) to the tournament table and perform the setup. Switching out members at the table is allowed at the discretion of the head judge. If at any point during or after setup, a team is observed with a laptop near the game table and appears to be reprogramming their robot, then the team may be disqualified by the Head Judge. If a wait_for_light function needs to be uncommented or added to the code, a student may ask the Head Judge to observe them while it is added back in at the Head Judge's discretion.

Teams will have **90 seconds** to complete their setup and calibration. Teams will place their robot(s) within their *Starting Box* as desired. Teams must position their light sensors to sense the lights that will be on the outside edge of the starting boxes.

- Teams may use starting lights attached to their game table, similar to ours, or handheld lights that teams use to trigger the light sensor when the judge indicates to start.
- If judges determine a team is taking too long to calibrate, then they will issue a warning and set a timer for 60 seconds. A team that is not ready after 60 seconds may be disqualified from the round. The maximum setup time, which may be extended at the 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 camera. No part of a team's robot(s) may leave the *Starting Box(s)* until the round has begun. Movement is okay so long as the *Starting Box(s)* 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. A judge may move the light to avoid potential damage to a light. Team members may not signal to their robots after "Hands-Off" to start their robots. Team members will be asked to stand on the side of the game table furthest from the camera. If a team member at the table is wearing a shirt with large solid colors that are similar to game pieces on the table, they will be asked to crouch during the round if the robots are using cameras.

Timeout Card

Each team will have a single red Timeout that may be used once during the virtual tournament. The timeout can only be used before "Hands-Off", which will give a 3-minute timeout. The team may spend that time working on their robot. Teams are advised to save their timeout card for the Double Elimination rounds, as Seeding rounds are the best 2 out of 3.

If, during virtual robot inspections, your robot is deemed to have an illegal part **during seeding rounds**, then you may use your time-out card to take your robot to the pit to remove the part. It is highly recommended that teams carefully and meticulously review the parts on their robot before the virtual

tournament. It is in the **Spirit of Botball** for teams to notify other teams and/or judges of observed violations by other teams.

If any parts were added or modifications made to the robot during the time-out period, the head judge may ask to have the robot inspected for any parts violations once it re-enters the game table. Teams may not trade out robots or bring additional independent structures to the game table during a time-out.

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 judge will keep track of the time and notify teams when there are 5 seconds remaining.

End of Game

Robots must **stop driving their motors and stop servo motion** 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 a *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 table judge(s) **before** leaving the table 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 must initial the score sheet before leaving the table, signifying acceptance of the ruling. If they do not agree with the ruling, the Head Judge can sign for the team to progress the event forward.

There are no instant replays. No external videos will be used for scoring. If a team disagrees with a judge's decision, then **only the two team members at the table** may politely discuss the issue with the table judge and/or head judge. **Issues with the scoring after the teams have signed the score sheet may not be considered.**

The head judge reserves the right to make rulings on specific rules or wording in the game review that will be in effect for the remainder of the tournament.

Spirit of Botball: Mentors, spectators, and team members should respect teams' and judges' final decisions. A head judge may overrule any previous rule or loophole that they believe to violate the Spirit

of Botball.

Challenges

Challenges may only come from judges and only the four (two per team) members at the table. Challenges from judges will not disqualify a team from playing the round (i.e. robot height, fitting in start box, obvious part violations). If either team wants to challenge the validity of the robots they are facing, they must bring it to the table judges' attention during the inspection period, 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 parts list for each robot they bring to the table to minimize the likelihood of a robot's construction being challenged. There is a parts list on the Team Homebase, 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. **This includes challenges to robots and or parts that they deem to not provide any competitive advantage or are against the Spirit of Botball to the team.** An Example of against the **Spirit of Botball,** would be a team knowing about the issue and planning to challenge prior to the robot inspection at the game table. If the team knows prior to arriving at the table in the **Spirit of Botball** they will let the other team or a KIPR official know so that the team has the opportunity to correct the issue. 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 determined before the start 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 or deemed spurious by the Head Judge, they will be disqualified for that round and the other team will win. 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.

If a team notices that another team has a challengeable issue during seeding, another double elimination round, or any other time and is not facing that team, in the Spirit of Botball and fair play, they should inform the Head Judge so that the Head Judge may consult with the team.

Acknowledgements

The KIPR Robot Controller is a powerful device, but the use of threading can cause unpredictable results, such as the robot not stopping when utilizing the *shutdown in* function. Teams are encouraged to limit their use of threading and to make sure they take precautionary steps to stop their robot within the time limit of the game. If the robot fails to stop moving after the time limit, then it will result in a score of 0 for a Seeding round or a disqualification for a Double Elimination round.

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**.

Seed scores of less than 0 will be counted as 0. 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 arrive at the table and at the judges' discretion for their turn in a Seeding round.

A coach or team member must bring any concerns about the posted 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 or incorrect placement of scores will be accounted for.

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 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.

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).

Virtual Tournaments

Virtual Tournaments will require an adult mentor present at all times and teams to have a competition game board that meets the requirements, access to the internet, and two cameras (one static to display the game board and one mobile for robot inspection and judges' scoring questions) to participate. The head judge may accommodate some exceptions to rules related to game board setup.

Construction Rules

The official construction rules for the 2024 Botball Game consist of the latest revision of this 2024 Botball Game Review document and any updated game rules posted on the Discord FAQ. Posts on the 2024 Discord FAQ 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 and 2020-24 kit may be used so long as they don't exceed the type or number in the 2025 kit.
2. KIPR Metal Parts – Only the metal chassis (steel) will be allowed in robot construction.
3. 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 is the only USB device that may be plugged into a robot during the game. **Consult the official parts lists for allowable kit parts!**
4. 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.**
5. Mounting dots/strips are available at stores such as Home Depot, and online from vendors such as Amazon.
6. Wire management:
    a. Tape (no game piece colors) may be used for managing and/or labelling wires. It may not be used for construction or structural purposes.
    b. Twist ties may be used for managing wires. They may not be used for construction or structural purposes.
7. 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.
8. Supplied servo accessories such as grommets, screws, washers, etc. may only be used to mount pieces to the servo horn.
9. Servos and motors may be mounted to structural pieces using the supplied machine screws.
10. Teams may trim the connector potting material as needed to ease insertion or mounting of sensors. Damaged pieces will be replaced at the team's expense.
11. Plastic servo horns may be trimmed as desired. Damaged pieces will be replaced at the team's expense.
12. 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 13.

c. Standard 3/16" thick foam board **or** corrugated plastic as long as all the pieces can be taken from the **same single** standard US letter-sized or **#1**, A4 footprint. See rule 13.

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, paper, or tape (up to two rolls) to make it easier to weigh.

13. If the team's entry uses paper and/or foam core board or corrugated plastic and it appears to be more than allowable or is hard for the head judge to determine the amount used, then the head judge **MAY** ask to see their template showing how the material being used 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 or corrugated plastic sheet. The paper/foam core board or corrugated plastic 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 or corrugated plastic may only be black or white; only grayscale may be used for printing including official logos for sponsors of your team, or QR codes.**

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

15. **The light sensors in the kit DO NOT require a light guide unless there is a lot of direct sunlight in the room.** 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.

16. 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.

17. Teams 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).

18. Lego parts cannot be physically modified. **Threading axle holes with screws will be allowed as an exception to this rule.**

19. 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. **Brackets cannot be bent**.

    a. If the **edges** of metal parts have sharp edges or burrs, they may be sanded or filed until smooth.

    b. Metal surfaces may be sanded to reduce friction.

    c. 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.

20. Teams are limited to using only 4’ of the ABS plastic rods they receive. Teams may buy more of this at their own expense (Warning: some teams may have received up to 5’ last year).

3D Print Rules

1. Only PLA may be used to print parts.
    a. Parts must be printed using a grayscale-colored PLA material.
    b. PLA material must only contain PLA.
    c. PLA must be printed and not in its raw unprinted form.
2. The number of 3D printed parts may not exceed 4 total between both robots at the table.
    a. A part is a single static piece.
    b. If parts are connected by material with the intent of skirting this rule then they will not be allowed.
    c. If there are moving parts in a 3D printed assembly, each movable part counts towards the 4 total parts. Examples include, a chain with 10 links in one print would still count as 10 parts, two or more parts tethered by a piece of material will be counted as two or more parts.
    d. Only four 3D printed parts for use on the robot may be brought to the On-Deck area, excluding the required duplicate identical copies for measurement and any jigs being used for positioning the robots.
3. A single part cannot exceed the print volume of an Ender 3 V3 SE. The print volume of an Ender 3 V3 SE is 220 mm x 220 mm x 250 mm.
    a. If using a part on a robot, a second identical copy of the part may be required for judges to check the measurements. If a second identical copy of the part cannot be provided to the judge, the robot it is attached to may be disqualified for the round.
    b. A second identical copy of the part may be needed for onsite presentations.
    c. A box for measuring parts will be provided throughout both practice and tournament for teams to check part dimensions.
    d. At tournaments, judges may have a box of the correct dimensions that a part must fit in.
4. A STL file must be submitted for each part that may be in use on a robot prior to the tournament.
    a. The STL file(s) for regional tournaments must be submitted during the 3rd period of documentation for the region.
        i. Teams will be asked to show proof of STL file submission to the judge at the table if they are using a 3D printed part outside of the KIPR parts lists.
    b. The STL file(s) for GCER or the fall game may be submitted during the first practice each day of GCER or before the start of competition in the fall game.
        i. Teams should email any new parts to stls@kipr.org
        ii. Teams should check in any new parts during the first practice of each day and receive a confirmation from KIPR staff that part will be allowed.
    c. STL files will be released to the whole Botball community on the team home base after the last regional tournament and after GCER.

    d. STL files specifically provided by KIPR **from the parts lists** do not need to be submitted.
    e. STL files previously submitted in other years should be attributed but still sent into KIPR during documentation for regionals or by email for GCER and the fall.
5. 3D printing of jigs or other objects to assist in positioning robots in the start box is highly encouraged
    a. These parts will not count towards the part limit if they are not being used on the robots.
6. The surface of 3D printed parts may be sanded. The second identical copy of the part must also be sanded in the same manner.
7. The head judge may deny the use of a 3D printed part, at their discretion, based factors of safety or inappropriateness.
8. No 3D printing will be permitted at the event. Teams may use 3D printers in their own rooms at GCER.

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 processors (such as two KIPR robot controllers) may exist on a single robot.
    a. You may only use the Wombat controllers.
3. It is not necessary to use all the parts in a kit.
4. The *Starting Box* is 12" tall. A starting box is defined by the **interior edge** of the PVC and the **interior edge** of the black tape around the perimeter of the starting box.
5. All elements of a team's entry must be within the volume of a *Starting Box* at game start. A robot may not cross over the boundary between two *Starting Boxes* at the start.
6. After the game starts, robots are allowed to expand in size.
7. **While not always necessary,** starting light sensors may be shielded as demonstrated in the workshop slides and in the construction rules and neither sensor nor shielding may extend outside the *Starting Box*.
8. 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.
9. 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 ABS Plastic Rod **must** be permanently affixed to a robot (as defined by the *Robot Rule*)

by at least one end of the rod. Using the ABS Plastic Rod in a gear-driven system for motion of a robot component counts as being affixed to the robot. The ABS Plastic Rod may **not** be used as a projectile (even tethered) or as an independent structure. If the Head Judge deems the use of the ABS Plastic Rod to be in violation of this rule, the offending team will be disqualified for the round.

10. No electrical modifications may be made to any KIPR robot controller, any sensors, or any motors, except for substitution of batteries with one approved by KIPR.
11. No wire extensions may be used except those provided in the kit.
12. Offensive entanglement strategies that involve a robot and/or 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 or wires 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. 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.
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 or it will be removed from the table.

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. Teams found to be programming a robot while at the table or in the on-deck or area during rounds, excluding during the use of a timeout, will receive a DQ for the round.
3. The USB cables & chargers may not be used during game table tournament play.
4. Communication between robots for your team's entry is allowed.
5. Your robot controller may have WiFi turned on or off at the tournament.
6. 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 3 for regional tournaments and between 0 and 4 for GCER. Documentation scores at GCER will only include the Onsite Documentation score.

Documentation Scoring Formula

$$DocScore = \frac{2}{10}(Period1Doc\%) + \frac{2}{10}(Period2Doc\%) + \frac{2}{10}(Period3Doc\%) + \frac{4}{10}(OnsiteDoc\%)$$

Seeding Scoring Formula

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

Double Elimination Bracket Scoring Formula

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

Double Seeding Scoring Formula (GCER Only)

$$DoubleSeedScore = \frac{2}{3}\left(\frac{n - DoubleSeedRank + 1}{n}\right) + \frac{1}{3}\left(\frac{TeamAverageDoubleSeedScore}{MaxTournamentDoubleSeedScore}\right)$$

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