2023 SEASON

Buccaneer Game Rules

Fifteen men on the dead-man's chest, Yo-ho-ho, and a bottle of rum!

Robert Louis Stevenson - Treasure Island (1883)

Welcome to the game of Buccaneer!

Working in your teams, you will design a Pirate Ship with your LEGO® robotics kit. Your ship will precisely navigate the ocean, avoiding hidden reefs and rocks. Armed with a cannon, your ship will raid other Pirate Ships and their Ports whilst defending your own Home Port. Your ship will return to your Home Port for reloading between trips.

A Special Thank You to Project Bucephalus

Unified Robotics partnered with Project Bucephalus to deliver Buccaneer as the game for the 2023 season. Buccaneer was developed by Project Bucephalus as part of their Introduction to Robotics after-school camps and programs, including programs for special education units.

Team 5985 Project Bucephalus is a *FIRST*® Robotics Competition team based in Wollongong, NSW, Australia. You can learn more about the team and their outreach programs by visiting projectb.net.au.

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GAME PHILOSOPHY

The primary goal is for participants to be engaged, challenged, and to have fun.

While we want to create an even and equitable playing field and experience, we need to understand that many of the students have varying levels of intellectual, physical and social disabilities. As such, we need to be flexible and accommodating with the rules. When in doubt, err on the side of accommodation and grace.

GAME DEFINITIONS

Ship   Your robot and anything combined with it.
Treasure   A standard 2×2 LEGO brick of any color.
Cannon   The ball-launching mechanism mounted on the robot.
Cannonball   A LEGO ball ([Bricklink Part #41250](#)).
Loot   The collection of Treasure stored at the Home Port.
**Stud**   A unit of measurement for LEGO pieces, determined by the bumps or holes on the piece.

GAME GOALS

1. Design a robot that looks like a Ship and can launch Cannonballs.
2. Program your Ship to complete as many laps of the Ocean as possible in a two-minute game.
3. Launch Cannonballs at the opposing robot and their Home Port.
4. Work with partners to reload your Cannon in the shortest possible time.

A LEGO Stud

A stud is the distance from the center of one hole/bump to the center of the next hole/bump on a LEGO piece. It is equivalent to 4.8mm or 0.19in.

For example, a 5×1 beam is 5 studs long and 1 stud wide.

1 stud   5 studs
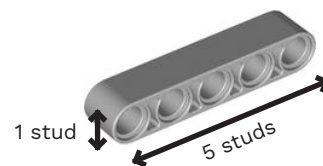
Robot Rules

The following robot rules are in place to offer a fun and fair competition among all teams, and attempt to best create equity among teams with different numbers of members, budgets, etc. At the competition, robots will be visually inspected to meet the basic motor and size restrictions. Our goal is to make sure all teams can play, with fairness in mind.

ROBOT MATERIALS

Teams are allowed to create robots using LEGO parts, as long as the robot meets all other listed rules:

R1. All robots must be built completely out of official LEGO pieces.

R2. Each robot is limited to the electronic components found in a single LEGO robotics kit:

  • SPIKE™ Prime kit: 1 Hub, 1 Color Sensor, 1 Force Sensor, 1 Distance Sensor, 1 Large Motor, 2 Medium Motors

  • MINDSTORMS™ EV3 Core Set: 1 MINDSTORMS brick, 1 Color Sensor, 1 Touch Sensor, 1 Ultrasonic Sensor, 1 Gyro Sensor, 2 Large Motors, 1 Medium Motor. **The EV3 Infrared sensor is not allowed.**

R3. Teams are encouraged to design creatively and make the robot their own. All decorations and modifications must adhere to the Robot Design Rules.

R4. Pull back motors or pneumatics are not allowed.

R5. Robots can only have up to three motors.

ROBOT DESIGN

D1. Design and build a robot Ship to play Buccaneer.

D2. Ships designed with a Cannon can only carry 1 Cannonball at any time.

D3. No Ship can ever extend 20 studs from the center of the Ship towards the other Ship.

D4. Ships can reach **inside** their Ocean without limit.

D5. Ships must stay intact the entire game and cannot leave parts of themselves behind.

D6. In its starting position, the Ship must fit completely within the boundaries of a standard SPIKE Prime or MINDSTORMS EV3 crate lid (24 x 34.5 cm). There is no height restriction.

Allowed Distance Sensors

SPIKE Prime Distance Sensor

MINDSTORMS EV3 Ultrasonic Sensor

The MINDSTORMS EV3 Infrared Sensor is not allowed.

D7. Each Ship must have at least one Sail. The Sail is a targeting aid for other Ships and a way to identify your Ship.

   D7.1. At least one Sail must be at least 19 studs wide × 11 studs high in size. Any gaps in the sail cannot be large than 3×5 studs.

   D7.2. The Top edge of the sail must be at least 25 studs above the ground.

   D7.3. Sails can be decorated or modified but cannot interfere with the other player. They can be mounted at any part of the ship, in any orientation.

D8. The screen on the Brick/Hub must be visible.

D9. Buttons on the Brick/Hub must be accessible.

ROBOT PROGRAMMING

Robots can be programmed in any language and must include the following functions:

P1. Start Mode

   P1.1. The Ship's program is active but waiting for user input to start movement.

   P1.2. Display image on screen to indicate waiting status to the referee.

P2. Safe Mode

   P2.1. The Ship stops moving and firing Cannons when a Touch/Force Sensor is bumped.

   P2.2. The Ship starts moving when a Touch/Force Sensor is bumped if it was stopped.

   P2.3. Once the Ship start moving, it cannot fire cannons for a minimum of 5 seconds.

   P2.4. To indicate the Ship's status, use either the center light on a EV3 Brick or the Status Light on a SPIKE Prime Hub. Use Green for Stopped, Orange for not shooting, and Red for normal operation.

If you choose to use the SPIKE Prime or EV3 Classroom Apps, you can use Icon Blocks, Word Blocks, or Python to program their Ship.

However, Icon Blocks may be limiting to teams in order to program for the requirements for Buccaneers.

Field Rules

The Buccaneer field is constructed as follows:

F1. Buccaneer is played on a DARK-colored, low-pile carpeted surface.

F2. The Lines are made of WHITE tape (such as cloth, Duct, or Gaffer's tape) (approx. 50mm or 1.88in wide)

F3. The Wall is a piece of timber (dimensions in diagram) stabilized with two brackets screwed to the timber and then taped to the ground.

F4. A plastic cup/container (the Loot container) is to be placed behind the island (or off to the side) to store Treasure.
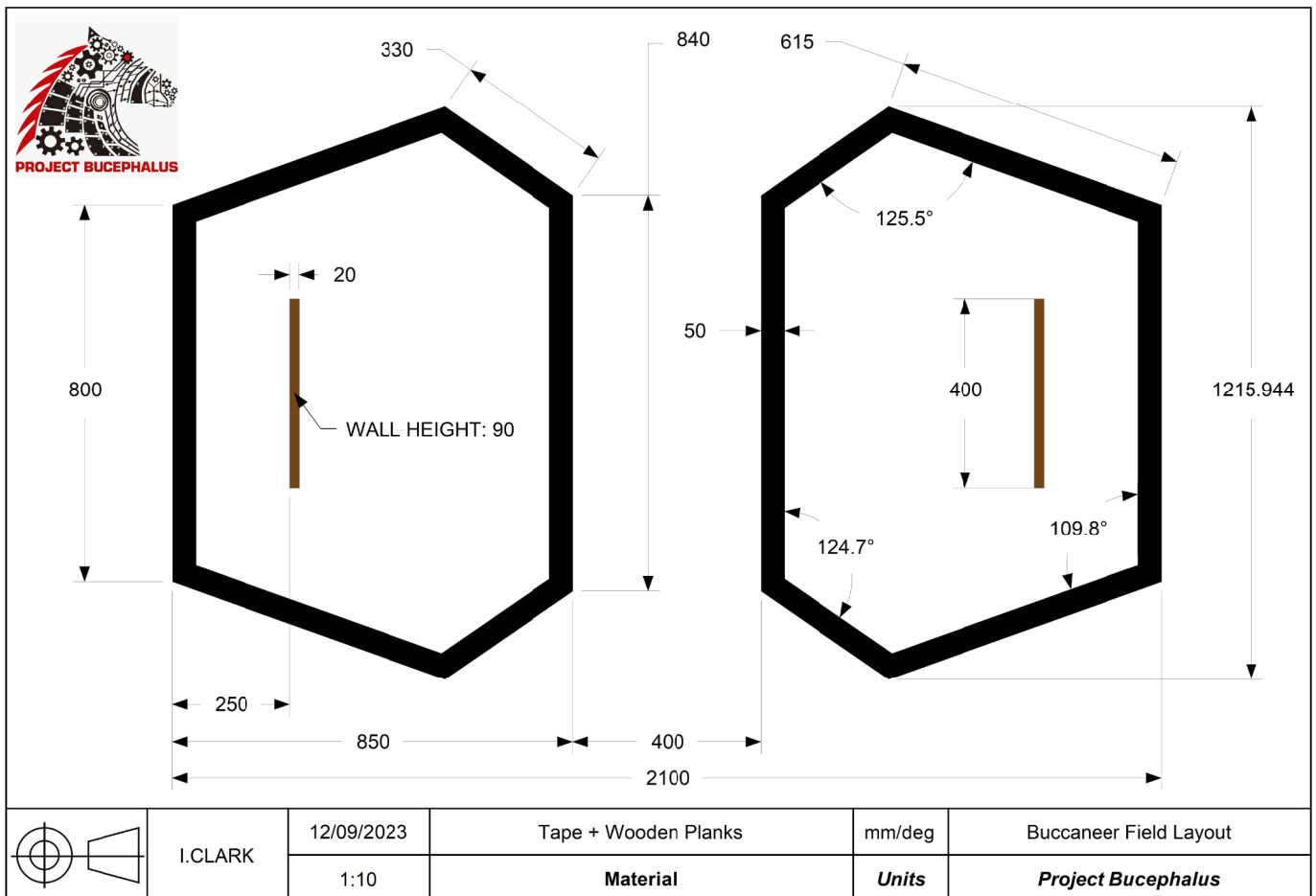
F5. Field Dimensions are as outlined below (in mm).
Note: Volunteers will do their best, but some variance is expected and accepted between individual fields.

Practice Fields

You will need to build some kind of practice area to test your Ship. We suggest the following for creating a half-field:

• Lay out a surface that can be used throughout the season. Obtain a 1m×1m square (or a 6ft×4ft rectangle) of dark carpet OR mark out a section of your classroom floor.
• Lay out the Tape Lines for the Firing Line and Home Port Line paying attention to the length and distance between them.
• Lay out the remaining lines as best you can.

Remember: Variations are expected between fields.

|	12/09/2023	Tape + Wooden Planks	mm/deg	Buccaneer Field Layout
I.CLARK	1:10	**Material**	*Units*	*Project Bucephalus*

PLAY AREAS

F6. The **Field** contains two play areas, one for each competitor. Each Ship travels clockwise around their play area.
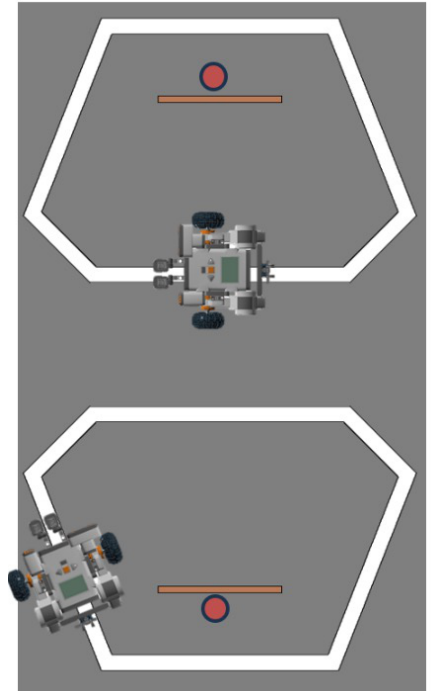
F7. The **Ocean** is the tape lines on the carpeted floor and the area around them. There are two Oceans in a Field. Only one Ship can be in each Ocean at a time.
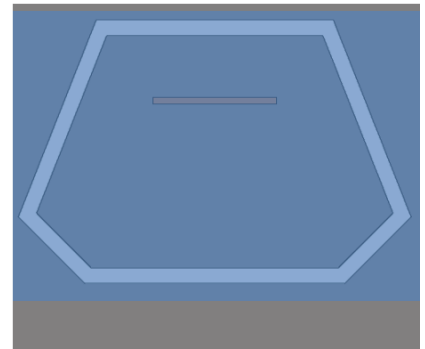
F8. The **Island** is a piece of timber secured to the ground. It acts a shield for Ships on the ocean.
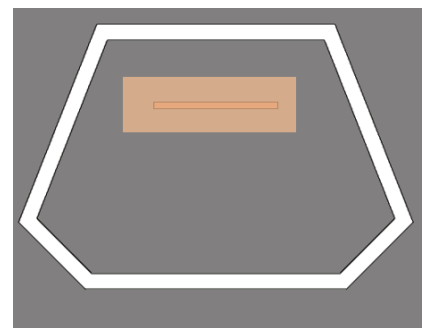
F9. The team's **Loot** is a storage container in which Treasure is placed each time a Ship completes a lap of the ocean. It can be moved to the side of the Ocean if required.
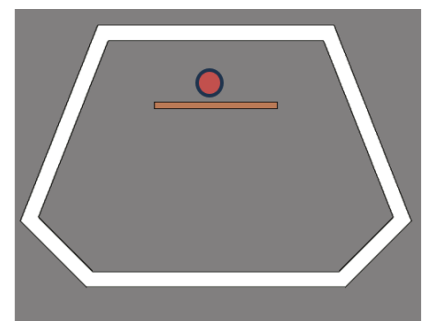
F10. Ships can fire cannons only in the **Firing Zone**.
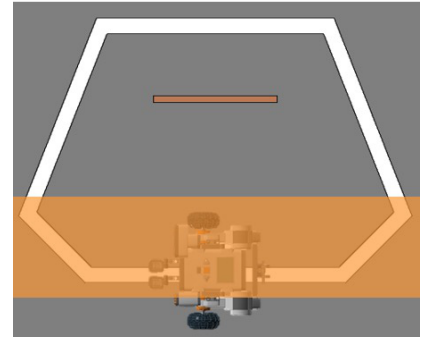
F11. The **Safe Zone** is the only area Human Player(s) can touch their Ship.
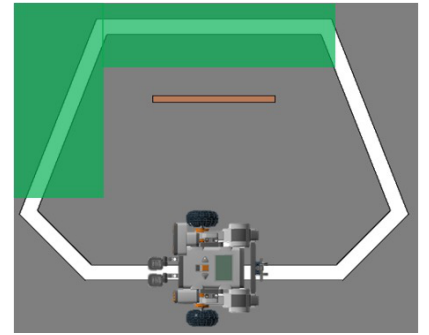
F12. The island shields Ships in the **Home Port** area. This is the only place cannonballs can be loaded onto a Ship.

Match Setup and Start

S1.   Buccaneer is played by teams consisting of at least two members with a single Ship.

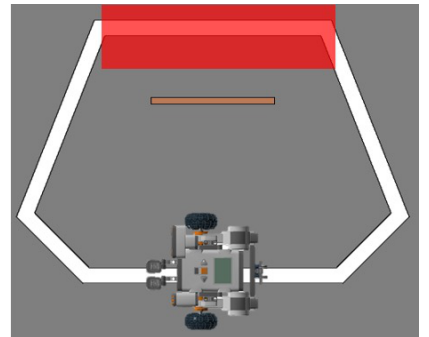S2.   Each Buccaneer match consists of two teams with Ships on opposing Oceans.

S3.   Teams are given about one minute after being called to the field to arrive and begin setting up their Ships. If a team does not report to the field within a reasonable amount of time, they forfeit the match.

S4.   Teams are given sufficient time to select the program to run and get their Ship into Start Mode (See Rule P1).

S5.   Before each match, Ships are preloaded with a Cannonball and placed in the Home Port facing clockwise and have their programs activated, waiting for start signal.

S6.   The Field should be clear of any debris or unintended objects or markings. Students and spectators should be several feet away from the field, to not interfere with the Ship sensors.

S7.   The teams indicate readiness to start the match by giving the Referee a thumbs-up signal.

S8.   The Referee starts the match by counting down "3-2-1-GO!" When the Referee says "GO," teams start their Ships. Teams then immediately move to an area near the Safe Zone so that the Ships do not detect and fire at them.

Game Rules

G0. It is not unusual for a student to have difficulty starting or interacting with their Ship. This can be especially true for students with disabilities. The Referee may need to assist If the team member is having a difficult time interacting with their Ship. The referee has the option of "loading" a cannonball on a Ship if the team is having too many difficulties.

G1. Each game lasts no more than 2 min.

G2. All Ships must always travel clockwise.

G3. Ships don't always have to be in motion and don't have to move at constant speed.

G4. A Ship's position is determined by the location of its powered wheels.

G5. Ships hit a reef and Sink if they:

    a. are off their line for > 5 seconds

    b. travel in the wrong direction for > 5 seconds

    c. cause a collision with another ship.

G6. A Sunken Ship is out of the game but keeps any points.

G7. Referees should deactivate any sunken ships.

G8. Ships must have a "Safety Switch" to enter Safe Mode that halts movement and launching when pressed (See Rule P2). A second press restarts normal operation.

G9. Different team members must use the Safety Switch and load Cannonballs.

G10. Ships can only be touched inside the Safe Zone. A Ship must be stationary and in Home Port to load a Cannonball.

G11. Ships score points by hitting the opponent's Island and/or Ship with the Cannon.

G12. Ships can only carry 1 Cannonball at any time.

G13. Ships can be hit by a Cannonball at any time.

G14. Cannonballs leaving an Ocean are collected by designated volunteers and returned to players. Players cannot enter the playing field to fetch cannonballs.

G15. Ships earn Treasure by completing laps of the ocean. Each time a Ship enters Home Port, a single piece of Treasure is added to the Loot by the referee. Points are given for each Treasure in the Loot at the end of the game.

G16. Ships do not gain Treasure for a lap where the ship touches the Island OR if it is touched by their team outside the Safe Zone.

G17. Points are tallied at the end of the game when 2 min have passed or when all Ships have been Sunk. The team with the highest score wins the match, even if the ship has been Sunk.

G18. The following information will be recorded by a scorekeeper to be used as tiebreakers as needed at the end of qualification play:

- whether the Ship reasonably resembles a ship.

- number of Raids.

- number of Broadsides.

- number of Loot collected at the end of the game.

- whether the Ship has been Sunk.

SCORING TABLE

All points listed below are cumulative.

Task	Points	Description
Loot	1	Awarded for each Treasure counter in the Loot pile at the end of the game.
Raid	1	Awarded for each Cannonball that strikes the opponent's island during the game.
Broadside	2	Awarded for each Cannonball that strikes the opponent's Ship during the game.
Design	3	Awarded at the start of the match if the team's Ship resembles a ship! (Referee Discretion)

Example of a Ship
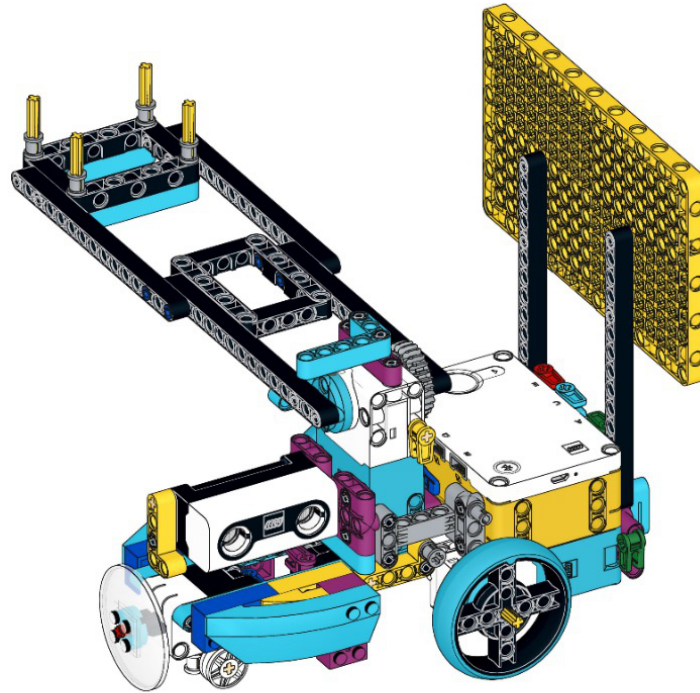
Recommended Ship Features:

- Use a Touch/Force Sensor to trigger Safe Mode.
- Use a Light/Color sensor(s) to follow a line.
- Use an Ultrasonic/Distance Sensor to detect targets.
- Use your third motor to build a ball Launcher to shoot Cannonballs.
- Make sure your Ship's Screen and Buttons are accessible!
- Make your charging port accessible!

Tips:

- Will you follow the inside or outside of the line?
- Make your Ship balanced and stable.
- Test line follow performance at different speeds.
- Test reaction time and target detection – the location of the Distance Sensor can have a huge impact on accuracy.
- Make sure your Ship is tested on a carpet surface.
- Will changing your speed make it easier or harder to hit a target, or be hit by another Ship?
- Catapults aren't the only way of launching a ball!

Tournament Rules

The tournament is played in two parts. Part one is the Qualification rounds. These are random matches among all the Ships (or all the Ships in a given Division). Part two is the Elimination Rounds. This uses a bracket-based, winner-advances model for the matches, until one Team remains, and is the tournament champion!

QUALIFYING ROUNDS

Depending on the total numbers of Teams in the event, Divisions may be used to ensure all Teams have the most matches possible, in a reasonable amount of time. Here are some examples of tournament structure depending on the number of Teams participating:

Total Number of Teams	Number of Divisions	Number of Teams per Division	Number of Matches a Team will Play	Number of Teams Advancing
7-12	1	7-12	6-11	4 or 8
14-22	2 or 3	7-11	6-10	4 or 5 (plus wildcard)
24-36	3 or 4	8-12	7-11	4 or 5 (plus wildcard)

A match schedule will be created that randomly assigns Teams to play one another. Each Team will play against each other Team (or each other Team in their Division) at least once. Depending on the event timing, the schedule may be repeated for more matches. Teams will earn Tournament Ranking Points—2 for a win, 1 for a tie, 0 for a loss—for each match played.

RANKING TEAMS AND TIEBREAKERS

After the qualifying rounds, Teams will be ranked based on their Tournament Ranking Points and any necessary tiebreakers. For events with multiple Divisions, each Division will be ranked individually.

If teams have the same number of Tournament Ranking Points, the following tie-breaker rules will determine the other. (This is true if two or more teams have the same number of Tournament Ranking Points.)

1. The first tiebreaker compares the average number of laps completed by each Ship during all their matches. The team with the higher average lap count will be ranked higher.

2. The second tiebreaker compares the average number of hits on opponent Ships during all the qualification matches. The team with the greatest number of hits will be ranked higher.

3. The third tiebreaker compares the chronological wins order. This looks across all of the Qualification Matches, counting how many wins in a row a given team achieved. For instance, if one team had four match wins in a row while the other team had only three wins in a row, the team with four in a row would be ranked higher.

4. The final tiebreaker is a coin flip, witnessed by members of both teams. The Head Referee will assign heads to one team, tails to the other, and flip a coin. The team that matches the visible coin face will be ranked higher.

After ranking, a number of Teams (or Teams from each Division) will be placed into a bracket for the Elimination Rounds. The number of advancing Teams must be a multiple of 2 (4, 8, 16, or 32) for a complete bracket.

BUILDING THE BRACKET

The Eliminations bracket is built in such a manner that the highest ranked teams play the lowest ranked teams in the first level of the bracket. For events with multiple Divisions, the bracket should be built such that teams compete against teams from other Divisions.

SINGLE DIVISION EXAMPLE

Ranking	
1. Team Awesome	5. Unicorn Bots
2. Cool Cat Bots	6. 3B (Big Bad Bots)
3. Super Duper Amazing Explosion	7. MegaBots
4. Team Name	8. Bits and Bots

QUARTERFINAL ROUNDS

| MATCH 1 | 1. Team Awesome |
| | 8. Bits and Bots |

| MATCH 2 | 4. Team Name |
| | 5. Unicorn Bots |

| MATCH 3 | 3. Super Duper Amazing Explosion |
| | 6. 3B (Big Bad Bots) |

| MATCH 4 | 2. Cool Cat Bots |
| | 7. MegaBots |

SEMIFINAL ROUNDS

| MATCH 5 | Winner of Match 1 |
| | Winner of Match 2 |

| MATCH 6 | Winner of Match 3 |
| | Winner of Match 4 |

FINAL ROUND

| MATCH 7 | Winner of Match 5 |
| | Winner of Match 6 |

MULTI-DIVISION EXAMPLE

Ranking			
1. Team Awesome	1. Super Duper Amazing Explosion	1. Cool Cat Bots	1. Team Name
2. 3B (Big Bad Bots)	2. Unicorn Bots	2. MegaBots	2. Bits and Bots
3. Purple Mayhem	3. Frank and Frank	3. Gear Robotics	3. Schoolyard Bots

QUARTERFINAL ROUNDS

MATCH 1
Div 1 Rank 1. Team Awesome
Div 4 Rank 2. Bits and Bots

MATCH 2
Div 2 Rank 1. Super Duper Amazing Explosion
Div 1 Rank 2. 3B (Big Bad Bots)

MATCH 3
Div 3 Rank 1. Cool Cat Bots
Div 2 Rank 2. Unicorn Bots

MATCH 4
Div 4 Rank 1. Team Name
Div 3 Rank 2. MegaBots

SEMIFINAL ROUNDS

MATCH 5
Winner of Match 1
Winner of Match 2

MATCH 6
Winner of Match 3
Winner of Match 4

FINAL ROUND

MATCH 7
Winner of Match 5
Winner of Match 6

PLAYOFF ROUNDS

Playoff rounds are played where Teams need to win 2 out of 3 plays, and the winner will advance to the next round. All rounds at the same level in the bracket are played before continuing onto the next level. (e.g. all quarterfinal matches are complete before starting semifinals.) The bracket will conclude with a finals match between the last two Teams, and the winner of this will be the Tournament Champions!