Rancho Cordova Robotics Competition Game Manual – Precise, Powerful and Prompt

Version 2.1 dated May 14, 2022

This Game Manual will be the single source for all the rules and regulations for the **Rancho Cordova Robotics Competition** scheduled to be held on **21 May 2022**. The competition is open to all Rancho Cordova middle school students.

Materials

- The (LEGO) materials to build the robot will be provided
- No additional materials should be used including thread, glue, stickers etc.
- Maximum of 1 Controller or Hub:
    - 1x LEGO® Technic Large Hub for SPIKE Prime or
    - 1x LEGO® Mindstorms Robotics Inventor Hub
- [Catalog of the parts](#)

Robotics Competition

- The competition judges the robot(s) on accuracy, strength and speed and to accomplish that, the competition will be divided into two separate events
    - The first part of the day will be a Line Follower Competition. The goal of this competition is to find the **fastest robot** (→Prompt) that follows a custom racecourse with least number of errors or missteps (→Precise).
    - The second part of the day will be a Sumo-bot Competition. The goal of this competition is to find the **strongest robot** (→Powerful) that can push the other robots out of a circular sumo-wrestling mat/table (will be called Sumo-bot Ring from now on) while it remains within the Ring.
    - Each team can build ONE modular robot that can be quickly modified to participate in both events.
    - By essentially providing two different set of conditions and a limited number of parts, we want to encourage the teams to think in terms of **modularity, adaptability and strategy**.
- **Line Follower Competition**: The robot must be built with one- or two-color sensor(s) to follow a custom line drawn on a 4 feet x 8 feet mat.
    - A sample line follower mat will be made available
    - The fastest time will be given the maximum points
    - Points will be deducted for every misstep
    - Three different tracks will be used in the competition
- **Sumo-bot wrestling Competition**: The robot should be able to stay within a circular mat and push other robots out of this mat area
    - A sample sumo-bot wrestling mat will be provided
    - The least time to push the other robot will be given additional points

Game Rules

Rule01 The Competition Robot

The Competition Robot and all its accessories should be built from LEGO elements that are provided. No additional materials should be used. Primarily these elements are from

- LEGO® Education SPIKE™ PRIME set (and)
- LEGO® Education SPIKE™ PRIME Expansion set

Rule02 Software

Variants of Scratch and Python are supported by SPIKE PRIME. You can use either the intuitive drag-and-drop coding language based on Scratch or text-based coding with Python.

Rule03 Control of the Robot

The robot should be able to move autonomously (or simply on its own) using the programs that are in the controller hub. Remote control of the robot is NOT ALLOWED. The Robot's Bluetooth and other connections should be turned OFF.

Rule04 Name of the Team and the Robot

Each team should have a name. The team should also name their robot. If the robot does not have a name, the team name will be used in place.

Rule05 Definition of Line Follower Robot

The robot can be programmed to follow a line. The width of the line is <**1 inch**>, and it is drawn in Black on a White background. The robot should be able to accurately follow the line through the straightaways and curves autonomously. A simple robot line following course will be provided but the Competition will have a course that is larger and different.

Rule06 Definition of Sumo-bot or Sumo Wrestling Robot

In a Sumo-bot wrestling competition, two robots are in a circular mat/table (or we will call it a Sumo-bot Ring) with black background and white border or white background and a black border. A sample sumo-bot ring will be provided but the Competition will have a mat that will be larger. The sumo-bot should be able to use the color of the border to remain within the Ring while trying to push the opposing robot out of the Ring. The competition Sumo-bot Ring is a wooden round tabletop (with a diameter of 3-feet) and is painted flat black with a white border.

Rule07 Starting Position

- The Starting Position of the Robot will be clearly marked on the **Line Follower Course** as **START or with a horizontal grey line**.

- On the **Sumo-bot Ring**, the position for the two robots will be marked using two grey lines. Robot_A will be setup first, followed by Robot_B. The two robots will be placed parallel to each other and facing away from each other. This Starting Position will be followed for all matches and Resets.

Rule08 Points for the Line Follower Competition

<To Be Updated>

Rule09 Points for the Sumo-bot Competition

<To Be Updated>

Rule10 Engineering Notebook: Required Documentation for the Team

The Robotics Competition in May 2022 is a culmination and celebration of every team's effort. We want to understand the journey the team took to reach this destination. This will help us to learn what worked well and what did not work well. It will also provide us a glimpse into the team's progress and learning curve. So, use the provided Engineering Notebook to document your robot design and programming along with your learnings. The Engineering Notebook can be hand-written, and illustrations related to robot, programming and strategy can also be provided. The other essential elements of this Engineering Notebook are: <date>, <time>, and <name_of_writer>.

Rule11 Dimensions for the Line Follower Robot

There are no size specifications or restrictions for the line-follower robot. Keep in mind that the robot must follow a line whose width is **1-inch** and the fastest time will be given the highest points.

Rule12 Dimensions for the Sumo-bot

The sumo-bot should weigh less than **750 grams** and should fit within a **10-inch by 10-inch by 10-inch** cube (height, width and length are each less than 10 inches). The robot can expand autonomously after the start of the match.

Rule13 Line Follower Challenge

The starting position for the Line Follower is explained in **Rule07**.

- When the Referee calls, "1, 2, Follow", the Robot should be started with a button press on the robot
  - The robot should NOT be started by any remote means, including starting the robot from a laptop
- Only one team member is allowed near the Line Follower Table
- The team member who started their Robot should step back after the Robot starts following the line

- The fastest time to complete a given track will be given the maximum points
- Any missteps will be penalized with negative points
- We are trying to evaluate if there can be partial scores (like robot completed half of the track correctly)
- There will be 3 different Line Follower tracks and each team will be given ONE try on each track

Rule14 Sumo-bot Match

The starting position of the two Sumo-bots is explained in Rule07.

- When the Referee calls, "1, 2, Sumo", the Robot should be started with a button press on the robot
    - The robot should NOT be started by any remote means, including starting the robot from a laptop
- The Team member(s) who started their Robot(s) should step back once the Robots are running
- Duration of each match = 2 minutes.
- If the two robots are deadlocked or entangled for 15 seconds, the Referee will call for a Reset.
- If a robot drives out of the Sumo-bot Ring without making any contact, the Referee will call a Reset.
- After the robots make contact, the first robot that falls out of the Ring will be the loser.
- If no robot falls out of the ring, the match will be declared a tie
- Points: Win = 2 points; Tie = 1 point each
- If a robot Wins, the time it takes to win will be given additional points that will be used for ranking the teams
- If in the event of a tie during the playoffs, a sudden death match will occur.
- Additional considerations:
    - If any part of a robot touches the floor outside the sumo-bot ring, the Referee will award a win to the opposing team.
    - If a robot becomes disabled and cannot move, the Referee will award a win to the opposing team.
    - If both robots fall out of a ring at the same time, the robot that touches the ground first loses.
    - If the Referee is not in a position to see which robot touches the ground first, the Referee will declare a rematch.
    - All rulings by the Referee are final.

A Look at the Day of the Competition

- Registration
- Line Follower Competition
- Demo – 3D printers and Drones
- Demo – local Robotics teams
- Sumo-bot Wrestling Competition
- Awards