

**Utah Elementary Robotics
SUMO Rules**

**Competition During
USU Physics Day
@ Lagoon in
Farmington, UT**

**May 12, 2017
Starting at 10:30 AM**

COMPETITION OBJECTIVE

The aim of the competition is to foster math, science, engineering and team work in students in 6th grade.

DESIGN STATEMENT

Prior to the day of the competition, students will construct and program a small autonomous mobile robot. This robot will use designated pieces from the Lego Mindstorms Education Kit.

SUMO CHALLENGE RULES

1. It is suggested that all participants shall use the LEGO Mindstorms Education Kit (Either NXT or EV3 Kits) provided by their schools. If students use another style Mindstorms kit, the only pieces allowed for use as part of this challenge are those on the inventory of the LEGO Mindstorms Education Kit. Refer to the following web pages for items that are included in either the NXT or EV3 kits.

NXT

https://c10645061.ssl.cf2.rackcdn.com/resources/9797_v120.pdf

EV3

<https://c10645061.ssl.cf2.rackcdn.com/resources/45544sortingoverview.pdf>

2. **Suggestion is for two person teams (here after referred to as the team). The reason for this is that for the overall first place team, there are two identical prizes that are for each of the winners of that team. If there are more than two members on a team, it should be discussed with the team members prior to the competition that this may occur.**
3. Two exceptions for components used:
 - a. Components use for robot identification
 - b. For EV3 kits, the teams can use three motors
4. LEGO materials not included in the Lego Mindstorms Education Kit will result in team disqualification, except as described above.
5. Parts of the EV3 kits that give it a competitive advantage over the NXT will not be allowed. These pieces are wedge shaped and would give an advantage to the EV3's (See figure below).



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6. No glue, tape or modification of Lego pieces are allowed in the construction of Team Robots. Only exception to this is if white pieces are used for a ramp, then these pieces will be covered with tape so that the white pieces don't confuse an opponent's robot (not to hold the ramp together).
7. Each robot may only use the contents of a single Lego Mindstorms Education Kit.
8. The weight of the robot cannot exceed 1000 grams.

NXT/EV3 SUMO Challenge Rules 2017 – Rev 1

9. All robots must fit within a 12 inch by 12 inch square frame at the start of the challenge match. They can have any flat orientation within that frame; in other words, the front of the robot could be diagonal within the frame if the rest of it fits in a 12 inch by 12 inch square frame.
10. The robot will come built and programmed on the day of the competition.
11. Participants shall only use the Lego Mindstorms Education NXT or EV3 software provided with Lego kits. All other entries are not allowed. Only EV3 or NXT-brick-based designs will be accepted in this challenge.
12. All actions must be totally pre-programmed. The use of any form or remote control is prohibited. Once the round has started programming is not allowed.
13. Each robot will be identified with the team number and school. Lettering shall be easily visible so that judges can identify what robot is competing. Minimum height for lettering is 1 inch.
14. All robots shall be built and programmed by the team. Any robot where it has been determined that was built by a third party or programmed by someone other than the team members shall be disqualified. Only exception to this is assistance by the Teachers/Mentors during the instruction time and prior to the competition. **At the competition, only the team is allowed to perform any modification of their robots, rebuilding or reprogramming. Any violation of this rule could result in disqualification.**
15. The Sumo Challenge is limited to 6th grade students. If a younger student wishes to participate, it will need to be coordinated with the other mentors on a one for one basis. Students in 7th grade and higher will not be allowed to compete against the 6th grade students.
16. On the day of competition, each student team, with their robot will check in with the Sumo judges to have their robots measured and weighed. The Sumo judges will verify that each robot meets the requirements of items **4, 5, 6, 7, 8, 9 and 13** above, and then mark the robots to show that it meets these requirements.
17. The Sumo Challenge is conducted in a covered pavilion during the USU Physics Day at Lagoon. All Sumo Robots will need to be able to operate in the ambient lighting of the pavilion. No special accommodations for specific robots will be made do to special lighting requirements. Ambient sunlight has been an issue in the past, recommend running robots in various lighting conditions prior to the competition.
18. To give each student an equal amount of time for designing and building their robot, there is a limit of 15 classroom sessions for the Sumo project.

MINDSTORMS SUMO

1. MINDSTORMS Sumo is a competitive sport where two autonomous LEGO MINDSTORMS robot contestants try to push or flip each other out of a circular ring. The last robot remaining operational within the ring wins the bout.
2. There are two rounds of sumo competition, the preliminary round and championship round.
 - a. There will be a preliminary round for each school in the competition. The preliminary round is held amongst a schools own teams to determine the top three teams for that school.
 - b. The championship round is held amongst the top three teams from each school to determine the top three teams for the event.

NXT/EV3 SUMO Challenge Rules 2017 – Rev 1

- c. Each of these rounds will be a double-elimination tournament to determine the top three for each round.
3. All sumo competition matches will be a best of three, head to head competition, double elimination tournament.
4. Pushing the opponent's robot out of the ring is the most common way to win a round, disabling your opponent (flipping, lifting, etc.) is allowed.
5. MINDSTORMS Sumo takes place in a circular ring (see Figure 1) 46 inches in diameter with a one and a half inch white border along the ring's perimeter. The surface of the ring is smooth pressboard or sanded plywood (painted black) and is about two and one quarter inches above ground level. The raised platform helps to determine when a robot has "fallen off".

THE NXT/EV3 SUMO CHALLENGE

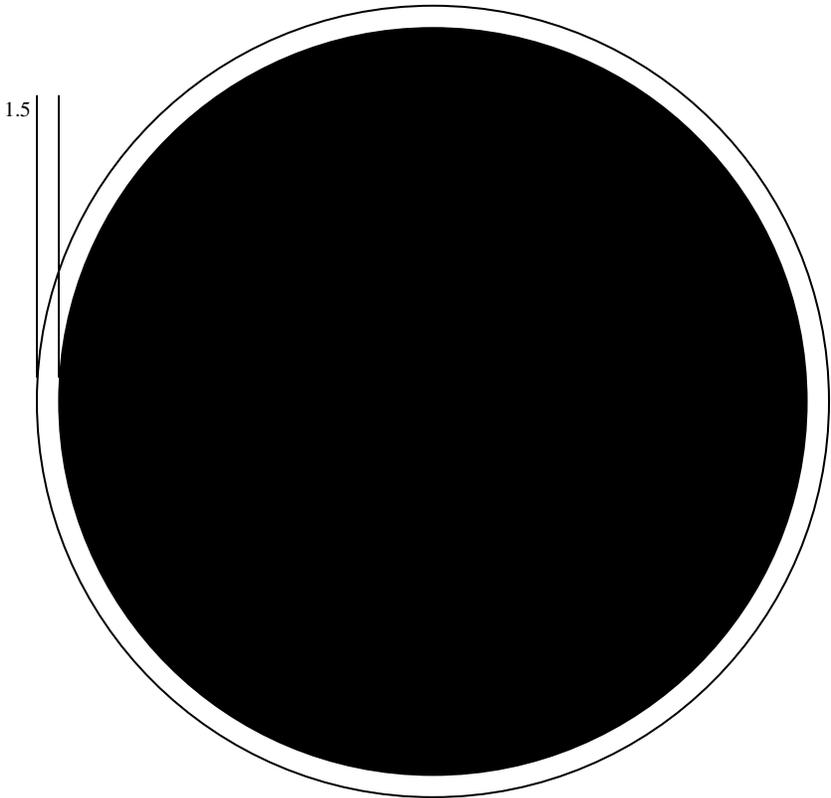
1. Each round of competition consists of three one minute bouts.
2. Each bout is limited to one minute. If no winner has been determined at one minute, this bout is called a draw.
3. MINDSTORMS NXT Sumo robots are placed in the approximate center of the SUMO ring. Facing back to back.
4. When the start button is pressed, the robots will **stand motionless for 5 seconds** prior to moving. Flashing lights, sounds or displays will be allowed during these 5 seconds. An early start will result in a loss of that bout (may be verified by checking software).
5. After the start button is pressed, the teams are not allowed to touch their robots until the bout is over. If a team moves, their robot after the start button is pressed, they forfeit that bout.
6. **The first movement of the robot will be directly to the outside of the SUMO ring (touch the white ring). At that point, they must turn around and begin to search for the opponent's robot.**
7. A robot must start moving forward within 15 seconds (ten seconds after the five second time delay) of the start of a bout, or forfeit the bout.
8. Parts that have fallen off during the bout may be reattached after each bout but the robot cannot be re-designed. The parts must be attached within one minute.
9. If the robots become entangled, and no movement toward the outer ring is occurring, the judge, at the judge's discretion, can call this bout a draw.
10. For a win, the losing robot has "Fallen Off" or "Disabled". Judges decision on this is final.
 - a. "Fallen Off" is determined when any part of a robot that is attached to the brick touches the floor. Parts that have fallen off and no longer attached to the brick are not considered for "Fallen Off" determination.
 - b. The robot will be considered to have "Fallen Off" if it becomes high centered on the outside edge of the table, and is not able to move.
 - c. "Disabled" is where the robot is no longer able to move, or has been flipped to a non-functional side.
11. Winner of the round is the robot with the most wins at the end of three bouts. If there is a tie, then a sudden death match will be held to determine the winner.
12. **The sumo competition arena is limited to teams that are competing and judges. Teachers, Mentors and other spectators are required to remain outside the competition arena.**

TEAMS

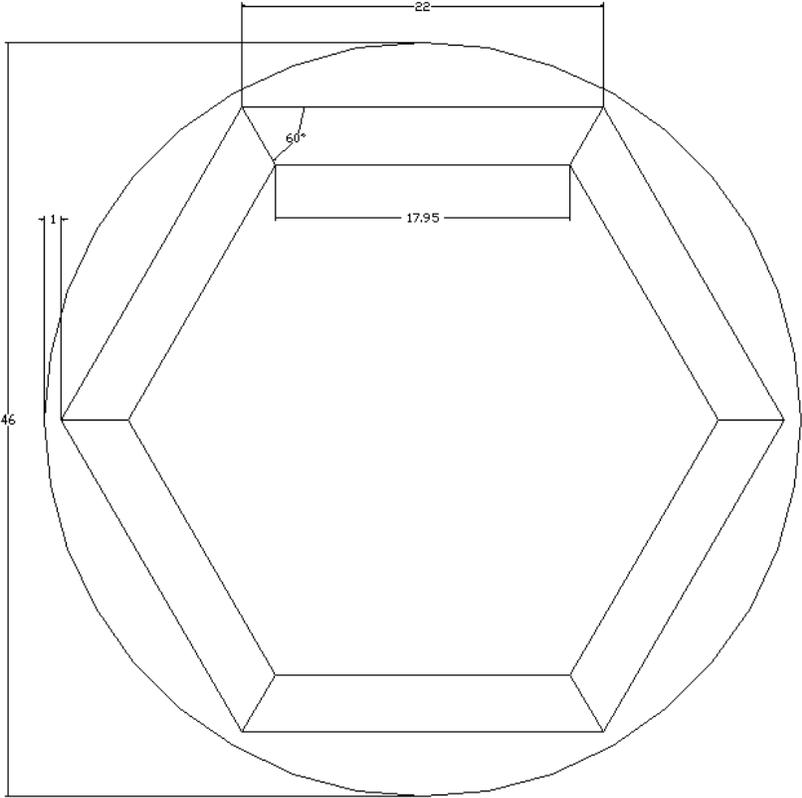
1. It is desirable that teams consist of 2 students. Under certain conditions, a 1 or 3 student team can compete (1 per school).
2. Suggestion is for two person teams. The reason for this is that for the overall first place team, there are two identical prizes that are for each of the winners of that team. If there are more than two members on a team, it should be discussed with the team members prior to the competition that this may occur.
3. During competition, teachers and mentors can only act in an advisory role.

JUDGING AND SCORING

1. When a team's number is called, proceed to the game arena.
2. The teams will start their match when instructed by a judge to begin.
3. The match will consist of a "best of three" match.
4. If one robot wins the first two bouts, the third bout is not required.
5. If there is an even number of wins, do to ties/draws, after the three bouts, another bout will be conducted and the winner of that bout is the match winner.
6. The top three teams from each school will advance to the overall championship round, which will be conducted the same as the individual school preliminary matches.



Sumo Table Top



Support Frame

Figure 1. Sumo Table measurements

Lego Mindstorms Sumo Exhibition Score Sheet

Match _____

Identify Robots below

Robot 1 _____

Robot 2 _____

	Robot 1 _____	Robot 2 _____
Bout 1		
Bout 2		
Bout 3		

For the Tier competition, record which robot wins which bout. This is a best of three competitions. So, first robot to win 2 Bouts is the winner. Additional Bouts may be required to resolve ties.