Rules Updated May, 2009 by Luke Laurie
Contact: mrlaurie@yahoo.com

The Spirit of the Rules:

Robochallenge is all about bringing the excitement of engineering and problem solving to young students who might not otherwise be exposed to fields of science, technology, engineering, and mathematics. The rules should not be interpreted in a way that will exclude students from participation.

If a competitor has a robot that does not fit the rules, judges and teachers should make every effort to accommodate students to allow them to participate. Students should be allowed to make changes to robots and programs that will help them compete. Judges may also make exceptions where necessary to include students.

The Spirit of Competition:

Students should practice sportsmanship during competitions. Every attempt has been made in designing RoboChallenge rules to make the competitions easy to judge. Sometimes, however, matches can be close, and judges need to make difficult decisions. It is important for competitors to recognize that winning isn't everything, and there is much to be learned from participation, and much to be learned from the success of others. Competitors should be respectful of judges' decisions.

Summary of major changes to rules:

People who have participated in RoboChallenge in the past may notice some changes to the rules. Rules have been changed to accommodate more variety of robots, including non-LEGO bots. Sumo and Tug O' War rules were used in 2009 as a demonstration event at MESA regional competitions.

- **SUMO:**
  - Any kind of materials may be used, including different wheels, motors, etc. Robots do not need to be LEGO.
  - Size and Mass: Robots can be bigger and heavier, up to 30 cm x 30 cm, and 1000g.
  - **The SUMO Board should be BLACK with a White border.**
- **VEX SUMO**
  - Remote controlled Bots are allowed
- **TUG O'WAR:**
  - Any kind of materials may be used, including different wheels, motors, etc. Robots do not need to be LEGO.
  - Mass: Maximum 1000g
- **LINEOLLOWING:**
  - For easier judging, we've gone back to only recording the time elapsed.
- **GOAL KICK:**
  - Any kind of robot may be used
  - Robots get to shoot from different distances and angles.
- **DRAG RACE:**
  - Any kind of robot may be used.
- **ROBOT OPEN COMPETITION:**
  - Formerly known as Talent Show. Students may enter any creative robot.

Sumo: (Autonomous or Remote)

Summary:

Sumo is a test of engineering design, as well as programming and strategy. Remote Sumo also tests competitors' reflexes. Two robots try to push each other out of a circular ring.

There are two categories, autonomous, where the robots control themselves, and remote, where a remote control of some kind is used. (*For MESA rules in 2009, high school students could compete with Autonomous robots only*.) A robot can be built to enter both categories, but autonomous robots compete only against other autonomous robots, and remote only against other remote robots. Robots may be tethered (with a wire) or wireless, but the remote control and wires must not interfere with the match.

Rules:

1) Sumo Robots have a mass limit of 1000 grams, and must be smaller than 30 cm by 30 cm. They may be any height. Robots may be made of LEGOs, includingVEX or RCX, or other materials.

2) Robots must be safe. A robot should not be a danger to competitors, other robots, or the competition arena. They should not have sharp parts, and should not have pieces that shoot or could fly off.

3) The arena will be a white circle 32" in diameter, with a 2" black border. (other sizes may be used)

4) Robots begin on opposite sides of the arena, but may face any direction chosen by the controller. After each round, opponents switch sides.

5) Autonomous Robots must wait 5 seconds before moving.

6) Each round, Sumo robots attempt to push each other out of the circle. Rounds are 1 minute. The winning robot wins 2 out of 3 rounds. If no robot has won after 1 minute the round is considered a draw. Judges may decide to do rounds over if there is a draw.

7) The robot that pushes another robot out of the ring is the winner. If both robots fall out of the ring, the first robot to falls out of the ring loses.

8) If robots become entangled, or stuck in a prolonged pushing match, the judge will halt the bout, and the robots will be restarted at their starting positions.

9) Competitors and spectators may not touch robots, the arena, or otherwise interfere during the match. They should not be close enough to the arena to interfere with sensors.

Hints:

- Make your Sumo sturdy so it won't break.
- Make your opponent lose traction. Get under the other robot.
- Test your robot to make sure it never accidentally falls out of the ring.

VEX Sumo: (Remote)

Summary:

VEX Sumo is a test of engineering design skill, hand-eye coordination, reflexes, and strategy. Two remote controlled VEX robots try to push each other out of a circular ring. Each round is 1 minute, robots must win 2 out of 3 rounds. The arena is a BLACK circle with a WHITE border. VEX sumos must be less than 40 cm by 40 cm (length and width), and less than 3 kg (3000g).

Robots can be remote controlled using the VEX remote control, though each competing robot must use a different frequency crystal.

Rules:

1) Sumo Robots have a mass limit of 3000 grams, and must be smaller than 40 cm by 40 cm. They may be any height. Robots may be made VEX or other materials.

2) Robots must be safe. A robot should not be a danger to competitors, other robots, or the competition arena. They should not have sharp parts, and should not have pieces that shoot or could fly off.

3) The arena will be a 4' circular board, 3/4" thick, painted with a BLACK circle 40" in diameter, with a 4" WHITE border. (Other sizes may be used if necessary, but it is important that the board is black, and the border is white. In our older rules the colors were reversed.)

4) Robots begin on opposite sides of the arena, but may face any direction chosen by the controller.

5) Each round, robots attempt to push each other out of the circle. Rounds are 1 minute. The winning robot wins 2 out of 3 rounds. If no robot has won after 1 minute the round is considered a draw. Judges may decide to do rounds over if there is a draw.

6) A robot that pushes another robot out of the ring is the winner. If both robots fall out of the ring, the first robot to falls out of the ring loses.

7) If robots become entangled, or stuck in a prolonged pushing match, the judge will halt the bout, and the robots will be restarted at their starting positions.

8) Competitors and spectators may not touch robots, the arena, or otherwise interfere during the match. They should not be close enough to the arena to interfere with sensors.

Hints:

- Practice driving.
- Make your opponent lose traction. Get under the other robot.
- A fast robot will likely be weaker in a pushing match.

Tug O' War

Summary:

Tug O' War is a mechanical design challenge applying understanding of torque, force, and friction. Tug O' War robots are strong, sturdy robots that are designed to pull another robot when connected by a 60 cm string. Tug O' War has been a RoboChallenge competition since the year 2000. Robots may be made of LEGOs or other materials.

Robot Design Rules:

1) Maximum Mass: 1000 grams

2) There must be some kind of tow-bar or hook that will allow a robot to connect to the paperclip on the tow-string. The robot needs to be connected to the string on the side of the robot facing the line. No part of the robot can extend past the paperclip that connects the tow-string (the robot, however, may have its own string to connect to the tow-string. This string would count as part of the robot).

3) Wheels and other parts may not be treated with any fluids, glue or other substances.

4) Robots DO NOT need to be made of LEGOs.

How to run a competition:

1) Robots begin approximately 30 cm from the centerline (approx. 60 cm apart). The line may be marked with tape.

2) The tow-string should have slack (not tight) and should be centered. The string must be 60 cm long, with a mark at its midpoint, and small paperclips on each end. No part of the robot shall extend past the paperclip when the round begins.

3) Robots must be safe. A robot should not be a danger to competitors, other robots, or the competition arena. They should not have sharp parts, and should not have pieces that shoot or could fly off.

4) If any part of a robot crosses the centerline, or any part comes off a robot, that robot looses that round.

5) After being triggered, a robot must wait at least 2 seconds before moving.

6) If, after 1 minute, no robot has crossed the centerline, the round is to be considered a draw.

7) A robot must win 2 out of 3 trials.

8) In the case of a draw, where neither robot is successful in pulling the other across the line, the winner is determined by holding a tie-breaking round. In this round, the winner is determined by measuring the distance of each robot from the centerline at the end of the time limit. The robot closest to the line loses.

9) If the judge determines that a robot is incapable of pulling the other robot across the line (for example a robot can't move or pull at all), that robot will be disqualified.

Hints:

- Make your Tug O' War Robot sturdy so it won't break.
- Use gears to have more torque.
- Check your batteries.
- Don't stall the motors- the batteries will be drained.
- Use weight to give your robot more traction.

Linefollowing

Summary:

A robot must navigate a course following a single black line of electrical tape on white butcher paper or another white or light-colored surface. The line may have twists, turns, and corners, and should get more and more difficult as it gets closer to the end.

The line course should be set up in an area where light will not change, such as near windows or flashing lights.

Rules:

1) Robots must be autonomous.

2) The line will be black electrical tape (3/4 inch) on white butcher paper.

3) The path will be unknown to contestants prior to the event.

4) Each robot gets two tries.

5) The timer will begin the trial by saying, “On your mark, get set, go.”

6) The timer will stop the time when any part of the robot reaches the end of the line. Judges will record the time it takes to complete the line, or if they do not complete it, they will record how far the robot went, by making a light pencil mark, or recording with a digital photo.

7) A judge may stop the trial if it does not appear that the robot will finish the task.

8) The path will be made without overlapping lines. It will be a clear, unbroken line, with curves, sharp turns, and straight portions. Lines will not pass within 6 inches of another line.

9) The order of winners will be determined by least time to finish the line, and secondarily by how far they went on the line for robots that did not complete the line.

Hints:

- Put your light sensors close to the ground.
- Make sure your robot isn’t tricked by bumps or wrinkles in the paper.
- Don't lose the line!
- Practice curves, straight lines, and corners.
- Make your program adjustable, in case you need to make changes.

Goal Kick

Summary:

This is a programming and design challenge in which a robot learns to be able to kick the ball like a soccer pro. A robot attempts to knock, bump, kick, throw, or hit a golf ball into a goal. The robot gets five tries. The builder may choose where to place their robot, and where to place the ball. The more difficult the shot, the more points are earned for each goal.

This challenge should be held on a smooth, flat, light colored surface. A goal set up that is approximately 30 cm (about 1 foot) wide, and 20 cm high (about 8 inches). This goal can be made of wood, cardboard, LEGOs, or other materials. The field may be marked in 30 cm (1 foot) increments with black electrical tape to make a grid of 30 cm squares. This grid may be used to help place the ball and robot, and to help determine the point total for each kick. The field should be available for each competitor to practice prior to the competition.

Rules:

1) Competitors take turns shooting goals until each has had five tries.

2) The robot and the ball may be placed anywhere in the competition area by the robot builder.

3) The robot may be triggered by hand, remote, or by voice or other signals. Robots may be remote controlled.

4) A judge records the location of the ball and the location of the robot prior to each “kick”.

5) If the ball rolls into the goal, the robot receives a score based on the starting location of the ball and robot.

6) The total points from all five tries determine a robot’s score.

Scoring:

1 point is awarded for each 30 cm (1 foot) increment of distance between the ball and the goal. (measured from where the ball is kicked or released by the robot.)

2 points are awarded for each 30 cm (1 foot) increment of horizontal distance between the ball and the line perpendicular to the center of the goal. In other words, a robot that shoots a goal at a diagonal will receive more points.

1 point is awarded for each 30 cm (1 foot) increment of starting distance between the robot and the ball (maximum 5 points). In other words, a robot that runs up to a kick from great distance will get more points. A robot that starts by holding the ball has a distance of 0 between the robot and ball.

Examples:

- A robot 30 cm behind a ball bumps the ball placed 30 cm from the goal would receive 2 points
- A robot 90 cm away from a ball rolls over, picks it up, and throws it 90 cm to the goal from a diagonal 30 cm from the middle, would receive 8 points for this amazing shot.

Hint:

- A robot that can make an easy shot many times will probably get more points than a robot that makes a difficult shot only once.

Drag Race

Summary:

Drag Race is a mechanical design challenge to build a robot car that can travel at high speed in a straight line. The track should be as smooth and flat as possible, and 4 meters in length. If space allows, a longer track could be used. Also, if space allows, multiple robots can be tested at the same time.

1) The entire robot begins behind the starting line.

2) The timer says ‘on your mark, get set, go’ and begins the timer.

3) A robot is triggered to begin its program by one of the builders. Robots may be triggered by hand or by a signal such as sound or light.

4) The surface will be whatever flat surface is available.

5) The distance between the start and finish line will be 4 meters, or whatever is convenient for the event host.

6) The timer will stop when any part of the robot reaches the finish line.

7) Projectiles are not permitted (a robot can’t shoot anything to the finish line).

8) In case of a false start, try again.

9) A robot gets 2 tries. The faster of the two is used to determine ranking.

Hints:
- Build a robot that goes straight. A longer robot, with wheels farther apart will usually go straighter.
- Experiment with different wheels and gears.
- Make your robot as light as possible.
- Have fresh batteries
- Try to program your robot so that it stops by itself to avoid crashing.

Robot Open Competition

Summary:

This is an open competition allowing Robot builders to create imaginative robots that perform any task. Robots are not limited by design constraints.

Rules:

1) Robots should not be built by instructions, they should be unique.
2) Judges should score the robots fairly.
3) Teachers should not judge their own students robots
4) Builders must demonstrate their robot to the judges, or, if that is not possible, provide a written explanation of what the robot is able to do.

Judges will score the robots in the talent show by whatever merits they see in the design and the presentation. They will consider what the robot does, how well the builders describe it, and whether it performs as described. Each judge will assign a 1-10 score. A tabulator will average the scores. The number of scores will depend on the number of judges. A minimum of five judges is recommended.

Scoring Example: 5 judges turn in their scores for a robot, they are 7, 8, 9, 5, and 8
The total of the scores is 37. 37 is divided by 5, the number of judges, to give an average (mean) score of 7.4

Examples:

A robot that can drive around a table top without off
A robot that can solve a maze
A robot that can dance
A robot that can find a specific color of dot on a white sheet
A robot that can play music
A robot that can play a game
A walking robot
A robot that can do something useful