



Robot Wars

Contact:

Robin Schamber rschambe@uwyo.edu

The first annual Wyoming 4-H Robot Wars robotics contest is modeled after the National Robotics Challenge which began as the Society of Manufacturing Engineers Robotic Technology and Engineering Challenge in 1986. The contests used have been modified to fit the needs and capabilities of Wyoming 4-H project members and the contest is open to any 4-H member currently enrolled in the Robotics project. Wyoming 4-H is in agreement with the mission statement of the National Robotics Challenge – “to provide educational robotics competitions where students can develop the creativity, engineering, problem solving and leadership skills they will need in the world of tomorrow.”

A brief description of each segment of the contest follows. Scores will be taken from three of the contests to compute the overall score for the overall champion award. Complete rules for each contest can be found on subsequent pages.

Art Robot Contest: Members must design and build a robot that will create a work of art. This contest will be scored according to age level, degree of difficulty, presentation to judge and level of artwork created (see rules and score sheet). A work of art could be defined as either graphic works or non-graphic works such as music and/or dance/choreography. This contest is designed to evaluate the level of programming, creativity and problem solving for each member. All designs and programming must be done prior to the contest and member must be prepared to demonstrate their robot in action to the judges. This contest will contribute up to 30 points towards the overall score.

Robot Construction: Members will select a task for their robot to perform and then design, build and demonstrate that the robot can perform the selected task. All design and programming work must be done prior to the contest and member must come prepared to demonstrate their robot performing the task for the judges. Members must bring all materials and props for their demonstration with them. This contest will contribute up to 30 points towards the overall score.

Pick and Place programming: Members will be given an object to pick up and be placed in a certain area by the judges. The member will have one (1) hour to design a robotic arm and program the robot to pick and place the object. This contest is designed to assess “on site” each member’s ability to problem solve, design and program their robot independently. This contest will contribute 40 points towards the overall score.

Mini-Sumo Robot: In the case of a tie for the overall championship calculated by tabulating the scores of the above contests, the Mini Sumo Robot contest will serve as a tie breaker. In the event of a tie, members will be given one (1) hour to prepare for the championship tie breaker. The member will design and build a self-propelled, remote controlled or sensing robot designed to force another robot outside a circle four (4) feet in diameter.

Please note: Members must bring their own robot kit (preferably the Lego Mindstorms NXT) and any additional Lego pieces necessary for their demonstrations. It is also recommended that members bring their own laptops/software, however, there will be several laptops with installed Mindstorms NXT software installed available for use.

For ideas and helpful tips/discussions, visit the National Robotics Challenge Yahoo! group for help facilitating communication and assisting participants. The group’s page can be found at <http://groups.yahoo.com/group/NationalRobotsChallenge>



General Competition Information

Age Groups: Junior (8-10)
Intermediate (11-13)
Senior (14 & up)

Requirements: The contests are open to any 4-H member currently enrolled in the Robotics project. Members may enter one or all of the contests. Only those members entering all three contests will be eligible for the overall champion award. Due to the nature of the Art Robot and Robot Construction contests, participants will be allowed at least 30 minutes to make mechanical modifications to robots between contests. All programming for these contests should be completed prior to arrival at the contest.

Judging

All of the contests are ranked based on the criteria in the rules and score sheets. Members are judged on their application of technological principles and concepts and their ability to solve difficult problems. During the judging for each contest, only the contest facilitator and judges/officials are permitted in the designated contest area. Leaders, other members, parents and additional competition attendees are prohibited from entering the designated area of the contest while judging is occurring. For all contests and special awards, the decisions of the judge(s) are final and binding.

Awards:

Awards will be given to each of the three age groups for each of the three contests (Art Robot, Pick and Place and Robot Construction). Grand and Reserve Champion awards will be based on point totals for each of the contests. In addition, an overall robotics champion and reserve champion will be awarded to the members in each age division with the highest combined total scores for the three contests.



Art Robot Challenge

Members must design and build a robot that will create a work of art. The robot will be judged on three criteria: design of robot, aesthetic quality (of final artwork) and diversity of colors and/or materials/mediums or maneuvers used.

Rules

1. The Art Robot entry must meet the RI/SME definition of a robot: "A robot is a re-programmable, automatically-controlled, multi-functional mechanism which can be integrated into a system and interact with its environment by acquiring and processing sensory data to perform various tasks." (Any Lego Mindstorms NXT robot and sensors currently used by Wyoming 4-H meet these standards.) ***Definition provided by the Society of Manufacturing Engineers (SME)***
2. The Art Robot must be autonomous (self-controlled) upon start. Remote control of the robot is strictly prohibited.
3. The Art Robot may create a graphic work of art using markers, crayons, pencil, paint or other mediums so long as the robot is moving the brush/pen in a 2 or 3 dimensional axis.(printers do not qualify).Non-graphic works of art must be fully programmed and designed by the member (using the musical tutorials will not be allowed).
4. Each member will be allocated five (5) minutes to demonstrate the operation of the Art Robot and five (5) minutes for a discussion with the judge(s).
5. Members must be prepared to verbally present to the judge(s) the following:
 - a. A statement of the task being demonstrated; (i.e. what will the robot do?
 - b. How they came up with the design of the robot, the components involved and the troubleshooting it involved
6. Decisions of the judges are final and binding.



Art Robot Score Sheet Device Evaluation/Interviews

Member Name: _____

Age Group: ___ Junior ___ Intermediate ___ Senior

1. Robot Design Points

<i>Design Criteria</i>	<i>Excellent</i>	<i>Good</i>	<i>Average</i>	<i>Fair</i>	<i>Poor</i>	Total
Suitability of Mechanical design	5	4	3	2	1	
Applicability of Electronic design	5	4	3	2	1	
Presentation/Interview	5	4	3	2	1	
Total						____/15

2. Aesthetics and Quality of work

<i>Design Criteria</i>	<i>Excellent</i>	<i>Good</i>	<i>Average</i>	<i>Fair</i>	<i>Poor</i>	Total
Aesthetics-use of different colors and/or mediums	5	4	3	2	1	
Quality	5	4	3	2	1	
Presentation/Interview	5	4	3	2	1	
Total						____/15

Total Score: _____/30points

Judge's Comments:

Judge's Signature _____



Pick and Place Programming

In the Pick and Place Programming Contest, the member is required to pick and place objects as designated by the judge.

Rules

1. The member will be required to pick/place an object or objects using a programmable robotic arm.
2. Members may have a basic robot design built prior to the contest (for example; the NXT taskbot or tribot), however the robotic arm used for the pick/place must be designed on site. All programming must be done on site.
3. Scoring will be based on design, programming (programming time and accuracy), problem solving and accuracy of the placement of the designated object or objects. Measured time to complete the task will be used to break any ties.
4. The robot is expected to start from a designated "home" position and return to the "home" position.
5. Each member is to supply their own tabletop robot and computer (there will be several laptops available with the NXT software on site).
6. The decisions of the judges are final and binding.



Pick and Place Programming Score Sheet

Member Name: _____

Age Group: ___ Junior
 ___ Intermediate
 ___ Senior

Design and programming start time: _____ End time: _____

Design, Programming and Accuracy:

<i>Design and Programming Criteria</i>	<i>Excellent</i>	<i>Good</i>	<i>Average</i>	<i>Fair</i>	<i>Poor</i>	<i>Total</i>
Timeliness of design/program completion	10	8	6	4	2	
Problem solving capability	5	4	3	2	1	
Functionality of design	5	4	3	2	1	
Functionality of program	5	4	3	2	1	
Robot start and return to home	5	4	3	2	1	
Accuracy of object(s) picked/placed	10	8	6	4	2	
Total: _____/						40

Judge's Comments:

Judge's Signature: _____



Robot Construction Contest

In the Robot Construction Contest, members will select a task for a robot to perform and then design, build, and demonstrate that the robot can perform the selected task. Tasks and solutions should be well thought out, innovative and creative ideas that provide solutions to real world wants, needs and challenges.

Rules

1. The actual robot must be built by the contestant from Lego pieces. (i.e. robot needs to be built by member from individual kit components such as Lego Mindstorms NXT kit).
2. Commercially available components or specially constructed components are acceptable for use in the building of the robot.
3. The demonstration of the robot's capabilities cannot exceed 5 minutes, with an extra 5 minutes for questions from the judges.
4. The robot and its components must fit and function within an 8' x 8' footprint.
5. Scoring is based upon uniqueness of the task, quality of the design, functionality of the task, operation of the robot, workmanship, and the interview with the judge.
6. Members must be prepared to verbally present to the judge(s) the following:
 - a. A statement of the purpose or function of the robot (i.e. what task will the robot be doing)
 - b. A statement of the process used to design the robot and the troubleshooting involved
 - c. A description of how the programming was done
7. Decisions of the judges are final and binding.



Robot Construction Score Sheet

Member Name: _____

Age Group: ___ Junior ___ Intermediate ___ Senior

Judging Criteria	Excellent	Proficient	Emergent	Novice	Points Awarded
Member and project demonstrate thorough Robot solution/task design process (scientific method, technological problem solving process, etc.)	5	4	3	2	
Robot design and programming utilize both simple and complex processes (sensors, attachments, mechanics etc.)	5	4	3	2	
Innovativeness, creativity of task/design	5	4	3	2	
Degree of difficulty of task/solution	5	4	3	2	
Judge Interview: Member demonstrates knowledge of design and programming problem solving and mastery	10	7	4	2	

Total Score: _____

Judge's Comments:

Judge's Signature: _____



Mini-SUMO Robot Contest

In the event of a tie in any of the age groups' total combined score for the overall champion award, the Mini-SUMO robot contest will be used as the tie breaker. The Mini-SUMO Robot Contest requires the member to build an autonomous sensing robot, designed to force another SUMO Robot outside a four (4) foot diameter circle. The competition circle will be a flat black, 3' 6" in diameter, surrounded by a one-inch (1") wide (painted or taped) flat, white ring. Another white, one inch (1") wide ring will surround the inner ring with one inch (1") between them. When any part of the SUMO touches or crosses over the 1" white outer ring it will lose the heat.

Rules

1. The SUMO must use sensing devices to govern the motion of the SUMO and must use sensors to detect the other SUMO and/or the edge of the white circle.
2. Sumos cannot exceed 3 Kilograms in weight.
3. Sumos cannot exceed a maximum size of 20cm x 20cm x 20cm. **Device evaluation will take place at the time indicated on the Official Schedule.**
4. The SUMO drive wheels **must** be non-destructive to the playing surface.
5. The SUMO may not have a remote off/on switch.
6. At the beginning of each competition, with the power switch in the "off" position, the SUMO handler(s) will position their SUMO in the head to head position as instructed by the judges. At the command of the judge/facilitator, the handler(s) will turn the power switch to the "on" position.
7. When one SUMO causes **any part** of the other SUMO past the outer white circle, that SUMO is declared the winner of that engagement.
8. If both SUMOs leave the circle at the same time, a "non-contest" is declared and the two SUMOs are repositioned and the contest begins anew.
9. Decisions of the judges are final and binding.