

The Texas 4-H Roundup Robotics Challenge Invitational

Robots are all around us. From the food we eat to the cars we drive, robots help make our lives easier and more efficient. The field of robotics is expanding at a rapid pace, and Texas 4-H is poised to help lead young people into this exciting field. Robotic elements can help improve human quality of life. Whether robots are used to explore dangerous environments, diffuse bombs, serve as replacement limbs, or just make life easier, the use of robots is becoming increasingly more common. In the 4-H robotics project, youth will learn about the interconnections of science, engineering, and technology.

OBJECTIVES

- DEVELOP an understanding of basic science concepts related to robotics
- APPLY the processes of scientific inquiry and engineering design
- BUILD skills in science, engineering and technology
- USE the tools of technology to enhance their learning
- EXPLORE related careers in these fields
- APPLY the skills and knowledge they are developing to new challenges.

The Robotics Challenge is a contest designed to allow members to demonstrate their robotics, engineering, and problem-solving skills. From a set of challenges revealed at the contest and within an allotted amount of time, teams of 3 to 5 members will build, program, and test their robot. Teams will then attempt to earn points by completing as many challenges as possible. This contest will follow the rules and procedures outlined below.



CONTEST OVERVIEW

The Robotics Challenge is designed as a blind challenge, meaning the contest theme, challenges, layout and items used will not be revealed until the morning of the contest. Teams will build and program a robot of their own design from scratch that can accomplish various game challenges.

PARTICIPANT RULES

- 1. Participation.** Participants must be 4-H members currently enrolled in a Texas 4-H and Youth Development county program and actively participating in the robotics project.
- 2. Age Divisions.** Age divisions are determined by a participant's grade as of September 1 of the current 4-H year. Juniors cannot compete in this contest.
 - Intermediate: Grades 6, 7, and 8
 - Senior: Grades 9, 10, 11, and 12
- 3. Invitational.** This is an invitational contest, which means that it is open to all intermediate and senior 4-H members. There is currently no qualifying robotics contest at any of the lower levels of competition.
- 4. Members per team.** A team will contest of at least three (3) and no more than five (5) members. This contest will follow all other general Roundup rules that pertain to invitational team structures.
- 5. Teams per County.** Each county may enter a maximum of 1 intermediate and/or 1 senior team. Due to time and facility limitations, entries will be determined on a first-come, first served basis. Teams will be required to complete an "Intent to Compete" form in the spring to claim on of the available slots. Those selected will then be given instructions on how to sign up for the Roundup contest on 4-H Connect.
- 6. Equipment.** Each team must supply their own equipment for the challenge. Each team may only bring the supplies listed below. Equipment will be checked by contest officials as teams check in for the contest. Any extra equipment or item that does not meet specifications will be returned to the team coach. All Lego pieces must be fully disassembled when checking in. No pre-assembled robots, arms, etc. allowed. No infrared beacons (remote) or sensors allowed.

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| Unlimited Quantity | Lego® Mindstorm® NXT or EV3 building pieces (excludes brick, motors, and sensors) |
| Unlimited Quantity | Backup rechargeable batteries or sets of AA batteries |
| 1 | Lego® brick |
| 3 | Lego® motors |
| 1 | Ultrasonic Sensor |
| 2 | Touch Sensors |
| 1 | Sound Sensor |

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| 1 | Light or color sensors |
| 1 | Gyro Sensor |
| 1 or 2 | Laptop computer or tablet with programming software (Lego® or non-Lego® is acceptable) |
| 1 | Power strip (3-prong, grounded)* |
| 1 | 25 ft. (max) extension cord (3 prong, grounded)* |
| 1 | Plastic container or cardboard box for transporting robot to and from game area |
| | Pencils and notepad with blank paper (for design and note-taking purposes) |
| 1 | Ruler or tape measure |

*No two-prong extension or powers strip plugs allowed. Computer power cords are allowed to be two-pronged.

7. **Bluetooth Connectivity.** Bluetooth connections can be made and utilized during the programming phase. It is not allowed during the competition phase while the robot is on the playing field.
8. **Minimum Construction Skills and Proficiency.** Competitors must be capable of designing and building a functioning Lego Mindstorm robot that includes the use of:
 - Motors
 - Light/color sensor
 - Touch sensor
 - Ultrasonic sensor
 - Levers, arms, claws, etc.
 - Incorporating non-Lego parts into robot design and/or function
9. **Minimum Programming Skills and Proficiency.** Competitors must be capable of programming a Lego Mindstorm robot in order for the robot to:
 - Move
 - Turn
 - Maneuver attachments effectively
 - Use sensors appropriately and effectively
10. **Awards.** Placings awards will be determined by the committee and are based on sponsorships. Special awards may also be given based on sponsorships and committee decision.
11. **Schedule.** Below is a tentative schedule for the contest.

8:00 Robotics team check-in: Set-up team pit area
 8:30 Challenge Release
 8:55 Coach Time
 9:00 Build Time
 12:00 Lunch Break

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| 1:00 | Robot Challenge |
| 2:30 | Cleanup Time |
| 3:00 | Awards Ceremony |

*The state contest schedule provided above is tentative and may be altered by the contest officials without advanced notice.

- 12. Participants with disabilities.** Any competitor who requires auxiliary aids or special accommodations must contact the State Extension Office at least two weeks before the competition.

RULES OF PLAY

1. Teams will report to the designated location for check-in.
2. An orientation will be provided for all participants where officials will review the challenge, rules, and scoring. Team captains will draw to determine match order.
3. Each team will be directed to a team pit (table and chairs). Each pit will have access to electricity to power laptops and robot batteries.
4. Each team will have 3 hours to design, build, program, and test their robot. A test/practice field will be available.
5. If time permits, teams are allowed to make alterations to their robot design and/or program between matches. Teams must report immediately to the staging area and playing field when called.
6. The robot must perform challenges autonomously.
7. Only registered contestants and contest officials will be allowed in the pit Robot Challenge areas.
8. Only two team members are allowed at the Robot Challenge match table during competition. Team members may switch between matches.
9. Teams that experience equipment malfunction(s) may not replace the part with supplies outside of the contest area (from leaders, volunteers, county Extension agents or contest officials). Instead, team members must work together and be creative in completing preparation without the malfunctioning equipment or visit with other teams to borrow the needed part.
10. Depending on the challenges, contest officials may provide non-Lego items that must be incorporated into the function of the robot and/or serve as part of a challenge.
11. Depending on the challenges, additional points may be awarded for use of sensors.
12. Coaches will be permitted to meet with their team for a 10-minute time period prior to Build Time. This time should be used to help team members develop a plan and foster positive youth development.

13. No cell phones or other types of communication devices are allowed in the pit or contest areas. Exceptions include the approved items listed in the Participant Rules. During Build Time and Robot Challenge, contestants are not allowed to communicate with spectators (including coaches and parents).
14. A match will range between 1 and 3 minutes in length, depending upon the challenges designed for competition. The specific time limit will be announced during the Challenge Release. Contest officials will make periodic announcements regarding time remaining in Build Time and Robot Challenges.
15. Teams will have two preliminary matches in which to earn points. The sum score of the two matches will determine teams that qualify for the finals. The top 3 teams in each age division will advance to the final match.
16. Finals will consist of two additional matches. The two scores from the final round will be added to the preliminary scores. Finalist teams will be ranked based on their total scores. Judges' results and decisions are final.
17. Tie-breaker procedures will be announced during the Challenge Release.
18. Teams must clean up their pit areas prior to the awards ceremony.
19. An awards program will be held at the conclusion of Cleanup Time.