Utah Elementary Robotics
Amazing 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 5th 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. Other Mindstorms kit can be used, but only pieces from the Lego Education Kit are allowed in the Amazing Challenge.

AMAZING 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 kit, the only pieces allowed for use as part of this challenge for building the robot are those on the inventory of the LEGO Mindstorms Education Kit. The only exception to this is components use for robot identification.
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. The maze will be made from 2 X 10 pine boards.
4. The robots will run on a surface of "landscape weed barrier" fabric over the cement.
5. Minimum width of the paths will be 15 inches.
6. Minimum openings will be 15 inches.
7. Robot is to run the maze from start to finish without operator intervention. If the robot gets stuck, the operator can then assist the robot (cannot change location, just direction), but points will be deducted for the assistance.
8. Only components from the LEGO Mindstorms Education Kit are allowed as part of this challenge. Refer to the following web pages for verification.
   NXT
   https://c10645061.ssl.cf2.rackcdn.com/resources/9797_v120.pdf
   EV3
   https://c10645061.ssl.cf2.rackcdn.com/resources/45544sortingoverview.pdf
9. LEGO materials not included in the Lego Mindstorms Education Kit will result in team disqualification.
10. 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.**
11. No glue, tape or modification of Lego pieces are allowed in the construction of Team Robots.

12. Participants shall only use the Lego Mindstorms Education NXT or EV3 software provided with Lego kits. All other entries are not allowed. Only NXT or EV3-brick-based designs will be accepted in this challenge.
13. Each robot may only use the contents of a single Lego Mindstorms Education Kit.
14. All actions must be totally pre-programmed. The use of any form or remote control is prohibited.
15. 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.
16. Each robot will be allowed five minutes to complete the maze.
17. Judging of the robot will be a two phase judging. First phase is an evaluation of the software, team's software knowledge, and how they work together. The second phase is the robot running the maze and its mechanical design.
18. The Amazing Challenge is limit to 5th grade students. If a younger student wishes to participate, it will need to be coordinated with the other mentors. Students in 6th grade and higher will not be allowed to compete against the 5th grade students.
19. 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 amazing project.

JUDGING AND SCORING

For the Amazing judging there will be two categories. First is running the maze course. Second will be software judging.

Running the obstacle course

1. There will be two judges per maze course.
2. When a team's number is called, proceed to the game arena.
3. The teams will start their round when instructed by a judge to begin.
4. Judges will time and score the trip through the maze.

Software/hardware Judging

1. Teams will meet with two different software judges.
2. Both team members will be asked questions about their software and hardware design.
3. Scoring will be per the attached sheet.

Software Written Test

1. Students will complete a ten question written test on general Mindstorms knowledge.

JUDGING CATEGORIES

- **Team Work** – (40 points). How does the team work together, do they both/all participate, are ideas from all evaluated (does one person dominate)?

- **Software Knowledge** – (30 points). How well can the team explain the operation of the software? Is only one member of the team knowledgeable on the software? Is there any documentation in the software?

- **Software Test – (30).** Both team members will complete an individual test and their scores will be combined. Test will be on general knowledge of Mindstorms software, programming, sequencing and hardware.

- **Robot Design** – (20 points). Is the design functional (cables rubbing on wheels, dragging parts, over all opinion of design)?

- **Maze Running –** (20 Points). Each time the robot needs assistance, 2 points are deducted.

- **Time To Run The Maze -** (50 Points). Maze will be designed for a good robot to complete the maze in 25 seconds. A formula will be used to award points based on how much time a robots takes to complete the maze. The points will be pro-rated so that a team that fails to complete the maze will receive 0 points for this category. If a robot is faster, then there is a bonus for this category. Formula is (((300-time to run maze in seconds)/275) X 50).

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Lego Mindstorms Amazing Exhibition Score Sheet

School _____

Team Number _____

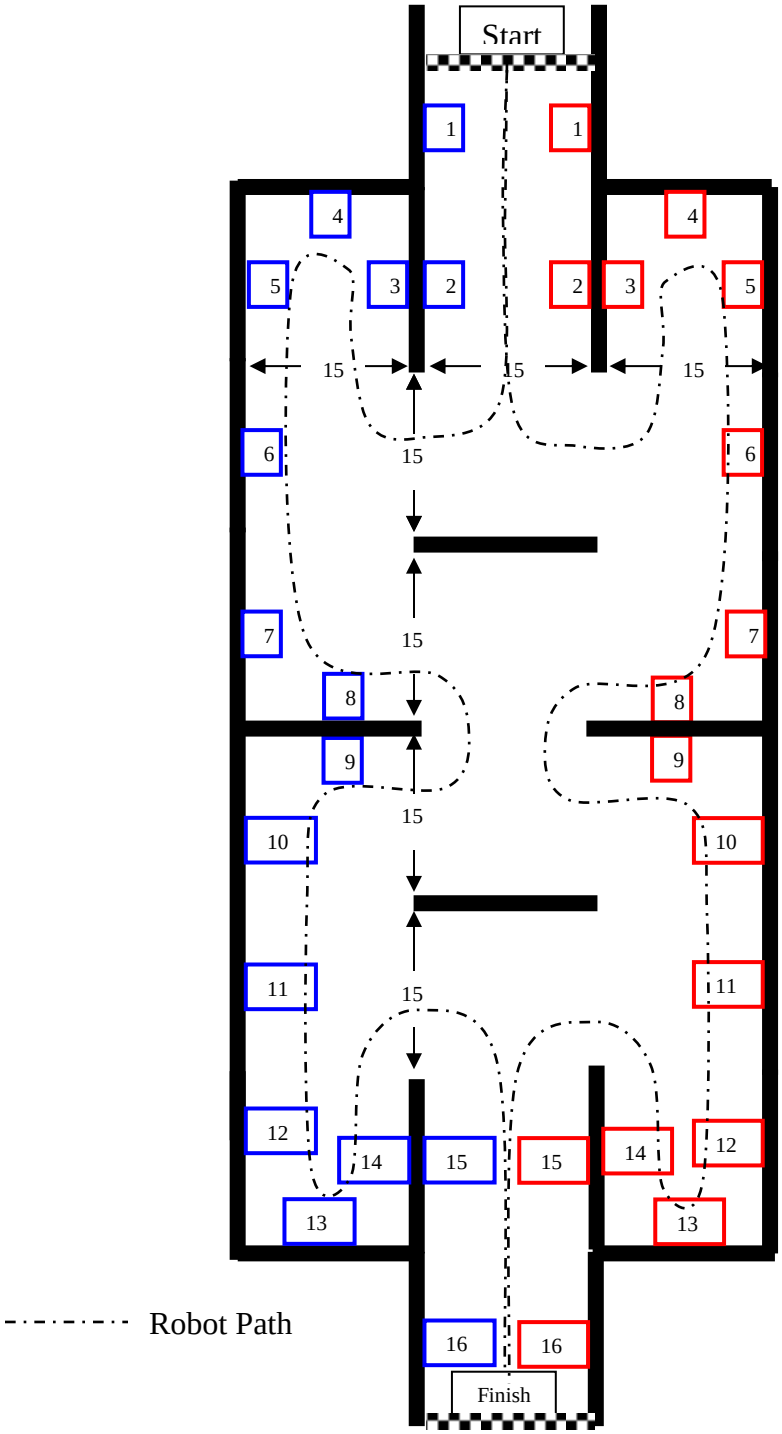
10 is excelled for this category
7.5 is good for this category
5 is average for this category
2.5 is poor for this category
0 is lowest score

	Category/Score	
Software Judges	Team Work (10 points each)	40
	How does the team work together	
	Do they both participate?	
	How do they encourage and support your partner?	
	Ideas from both/all evaluated (does one person dominate)	
	Software Knowledge (10 points each)	30
	How well can the team explain the operation of the software?	
	Is only one member of the team knowledgeable on the software?	
	Documentation of software	
	Robot Design	20
	Is the design functional (cables rubbing on wheels, dragging parts, overall opinion of design)	
Written Test	Software Test	30
Maze Judges	Maze Running	20
	Did it require assistance? Subtract 2 points each time the robot is assisted. (Start at 20 and subtract 2 per assist)	
		50
	How long did it take to run the maze? Enter Time in seconds.	

Maze Judges will enter the time for running the maze. Then the score keepers will calculate points for this category.

This is an example of maze to be navigated by the robots. A goal of the maze will be to make the right and left walls of equal length. The one drawn below is has even number of sides for either a left wall follower (red boxes) then a right wall version (blue boxes).

Maze design can change, but will maintain the spacing and wall heights requirements



Here is another example for an optional maze design. The robots will start and run up the center channel. Then depending on if it is a right wall or left wall follower, the robot will then navigate around the outside of the maze. No matter which side is run, there are an equal number of left and right turns, and a common distance to run.