General Guidelines

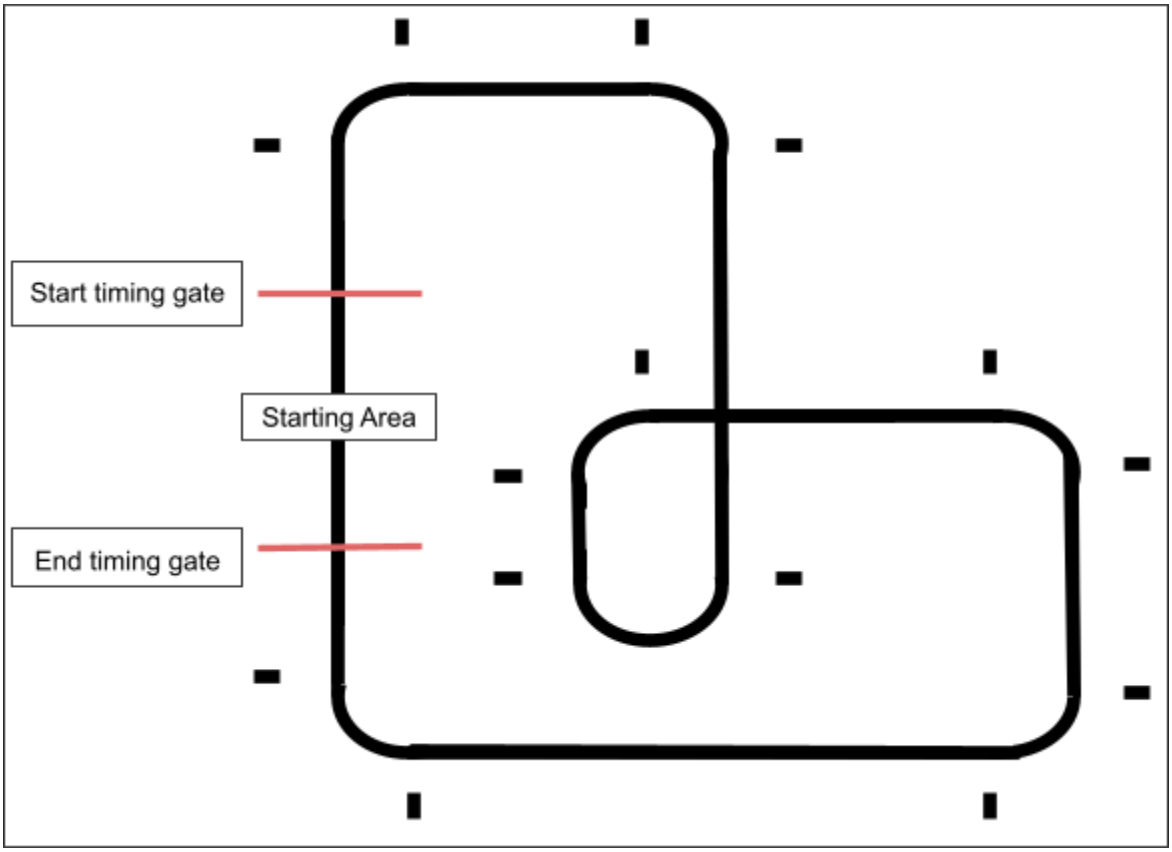
1. Submitted robots must be within 20cmx 20cm x 20cm in volume, and a maximum of 3 kg in weight.
2. Robots that throw things at its opponents are not allowed. Likewise, any detachable object from the robots is not allowed.
3. If, at any point in a run, a part of the robot is detached, an immediate loss will be declared. Screws, nuts, bolts, or any other parts that weigh less than a total of 5 grams will be allowed.
4. Robots that use fire or any combustible propellant are not allowed.
5. Devices that store liquid, powder, or gas are not allowed.
6. Parts that can damage the field such as sharp objects, ramming devices, etc. are not allowed. Parts that are intended to damage another robot is not allowed.
7. Robots must be autonomous. Remote controllers or physically manipulating the robot during the run will result in that run being declared failed.
8. Robots must have a space where a 2cm x 2cm sticker can be placed and clearly seen. This sticker will be provided by the organizers and will be used to easily identify the robots.
9. Participants are not allowed to touch the robots once they are activated and its test attempt has already begun. The robot may only be handled after the officials have declared the said attempt to be concluded.
10. The loss or victory of a robot is declared by the officials.
11. If a verdict cannot be made due to unclear circumstances whether a loss can be declared or not, a rematch may be declared by the officials.
12. There can only be a maximum of two rematches for any reason. After which a draw will be declared.
13. The event will be divided into three tests: Strength, Speed, and Intelligence.
14. In between each test, there will be allotted “repair time” spanning 30 minutes for charging, programming and tuning of the robots.
15. Officials and tournament organizers reserve the right to allow or disallow contestants to use play areas during the “repair time” before each test.
16. The contestants are required to submit their chosen robot for the next test to be conducted. Contestants shall submit their robot to the holding area within the last 5 minutes of the allotted 30-minute “repair time” right before the test.
17. The contestants are encouraged to use a unique robot to represent the team in each test. However, they may use a robot in more than one test, given that they may not swap out the robot once it has been submitted.
18. Contestants will be allowed to charge and swap-out batteries whilst they are in the holding area.
19. In the case when a robot will be used for more than one test, repairs and modifications may be made during the allotted repair time.

20. Contestants must come in teams of 3-5 people. There is no limit as to how many teams a single institute or university may enter.
21. Teams can get a maximum of 100 points for each test.
22. The points will be cumulative across all three tests .
23. The team with the most cumulative points will be declared champion. The first and second runner-ups will also be awarded. Competition winners shall be awarded during the Corporate Connection.
24. Officials may change the rules prior to the event and will be announced if so.
25. In the case that smart timing equipment fails, officials and tournament organizers reserve the right to change methods of timing all test attempts
26. **Officials and tournament organizers do not in anyway guarantee ideal conditions for tracks and play areas. Thus complaints with regards to minor flaws (i.e Creases in the track material, minor damage to paint job of wooden platform and slight imbalance in the wooden platform) shall not be entertained.**

Test of Speed

A. The robot will track a line path with a width of 1 inch or 2.54 cm (+- 0.5 inch or 1.27 cm). The robot will be expected to run through the course at least 2 times per match, only the faster time of the two runs will be considered for the final ranking.
B. Only one robot will be on the track at all times.
C. Robots will start behind the start timing gate and in front of end timing gate , the clock will start as the gate sensor senses the robot and will only end once the robot successfully traverses the track and is sensed by the end timing gate.See example track below for illustration.
D. Timing gates will be placed such that it will not obstruct the track, therefore if in case a robot hits any part of the timing gate during a run, the robot will be considered “off-track” thus the run will be declared a failed run.
E. Contestants will be allowed to perform manual calibration whilst the robot is in the Starting Area (specified in the track regulations). Meaning, contestants will be allowed to lift the robot and move it above the track , within the said area, **without uploading/flashing any firmware** to the robot.
F. Track regulations and standards are attached on a separate page, however the summary is as follows:
    a. There will be no 90° turns.
    b. Changes in the track’s curvature will be marked by a rectangular marker to the left of the track.
    c. There will be intersections in the track where in the track intersects itself at a 90° angle. No intersections will be placed near a turn or change in curvature.
    d. Two timer gates (Start and End) will be placed at a straight stretch portion of the track separated by 35 cm.
    e. The timing gates will be at least 25 cm away from the first and last turn on the track. (See Track regulations)
    f. The edges of the timing gates will be at least 20 cm away from any adjacent section of the track. (See Track regulations)
    g. Minimum radius of all turns will be 10 cm. (See Track regulations)
    h. The area in between the Start and End timing gates shall be known as the Start Area.
    i. The official track to be used in the competition will be disclosed only on the day of the competition proper.

Example track layout:



j. The contestant will be performing their runs in random order to be determined either through draw lots or via randomized selection by tournament organizers .
k. Contestants are allowed to touch the robot (without leaving the trackside area) in between each run to clean wheels, tighten screws, make adjustments, etc. within the allotted repair time. However, they are not allowed to upload or flash a new ROM/program/software onto the robot. A maximum of 5 minutes will be given for repairs in-between runs.
l. In the case that a robot steers off-course and cannot get back on track **within 15 seconds**, the team/operator may request the run to be declared as a failed run **(IF and ONLY IF a rerun available)**.
m. In the case that a robot steers off-course it is expected to re-enter the track in front of the point at which it initially steered off-course. Officials and tournament organizers reserve the right to declare the run, failed , otherwise.

n. In the case that the robot steers off-course and wonders onto a seperate part of the track then the run is immediately declare a failed run since this will be considered “cutting-corners” and thus a form of cheating. This will result in a failed run.
o. If in case a failed run is declared, a contestant may avail of a rerun. **Only one rerun request will be allowed per team for the duration of their attempt at the Test of Speed.**
p. If the robot has no successful runs then the robot will immediately declared as a non-finisher.
q. The points for the finishers of this test will be determined by the following formula:

$$Points = \frac{(Number\ of\ finishers + 3) - rank}{Number\ of\ finishers + 2} \times 100$$

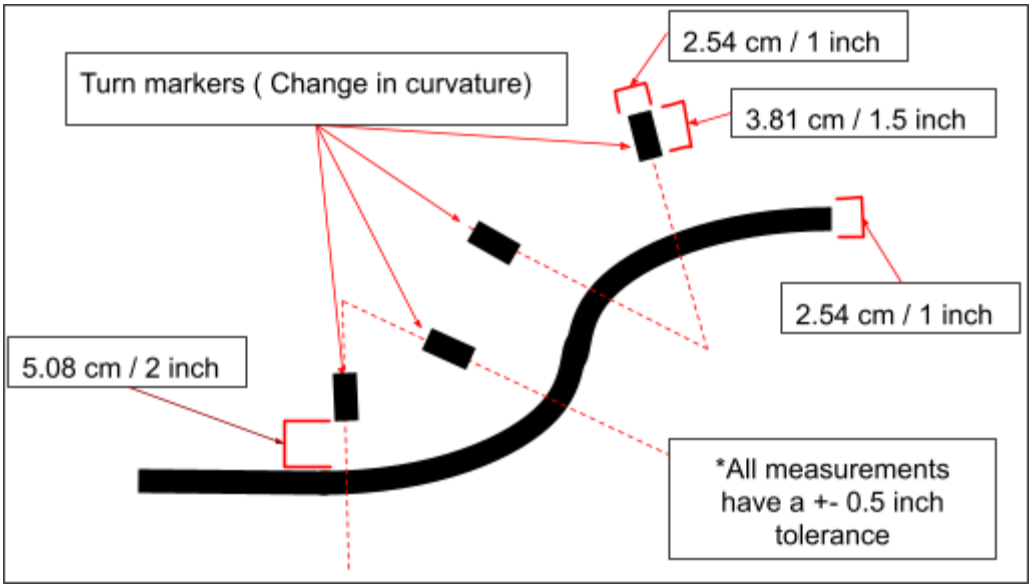
Note: This formula was designed to simulate two extra ranks to official tally of finishers , this is so that non-finishers receive a significantly lower point score than that of the finishers (but will still receive points nevertheless)

r. Ranking will be determined by the best run time of the robot during its attempt. The fastest will be declared as the 1st and so on and so forth.
s. The points for all non finishers will be determined by the following formula:

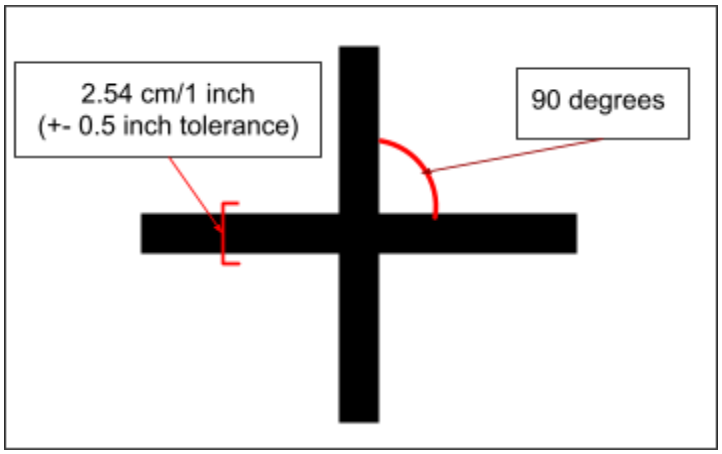
$$Points = \frac{1}{Number\ of\ finishers + 2} \times 100$$

Note: Points for **ALL** non-finishers of this test will be equivalent to 2 ranks lower of the lowest ranked finisher,this is so that they will still receive a score however still having significantly less than the lowest ranked finisher .

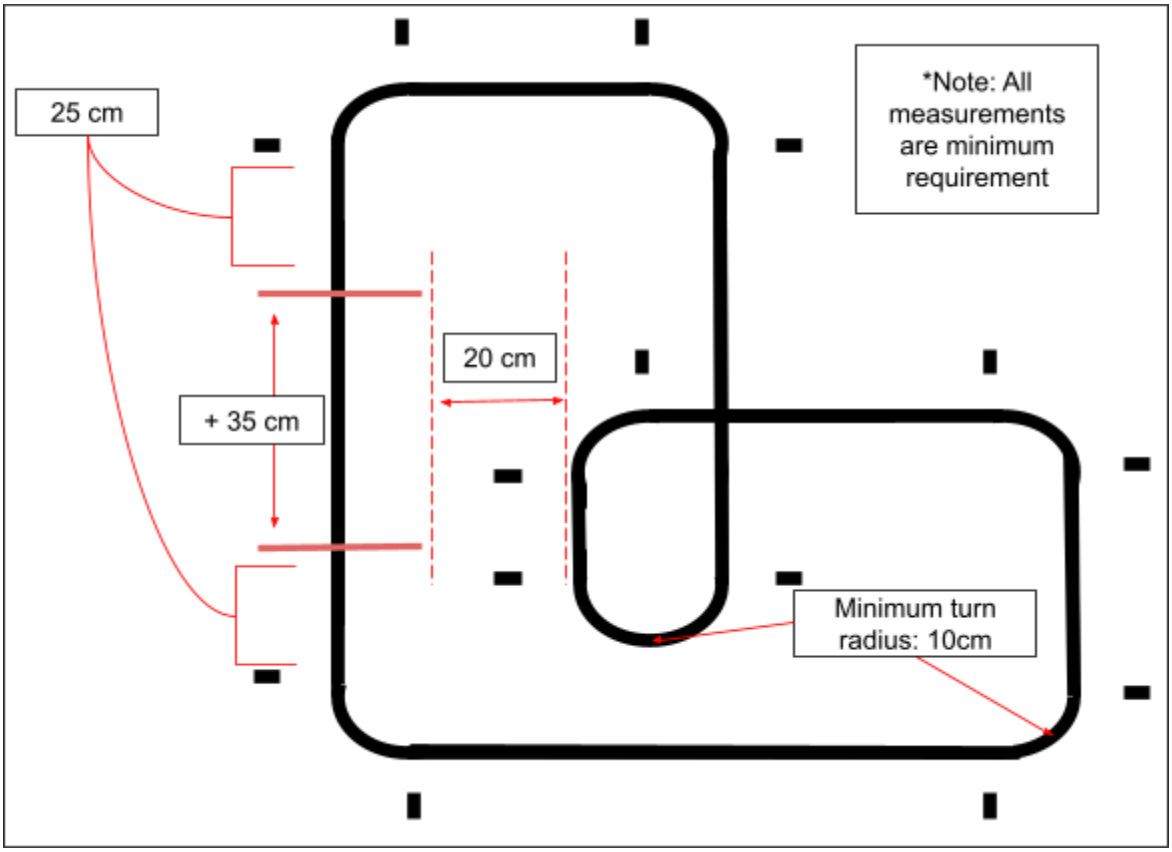
Test of Speed Track Regulations



Line dimensions and turn marker layout



Intersection

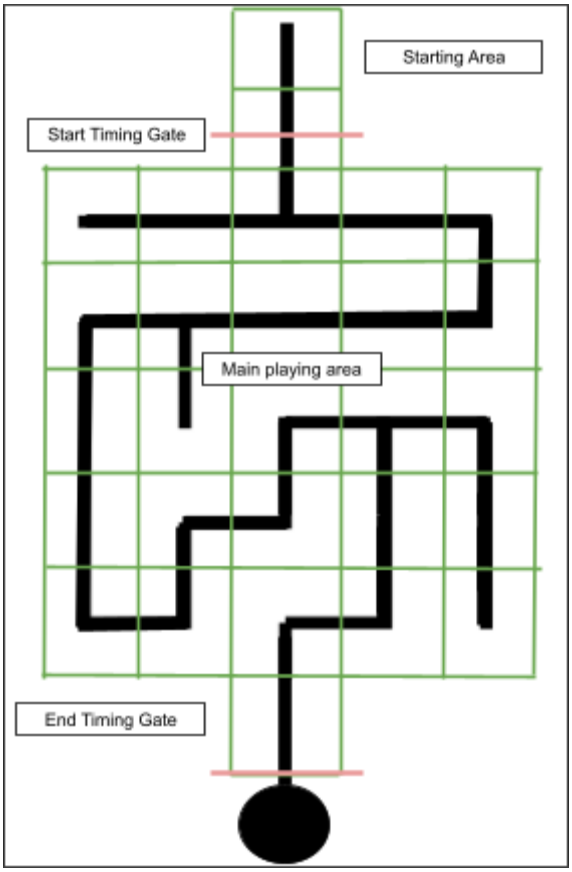


Minimum space requirements for track layout

Test of Intelligence

A. The robot's goal is to search through the line maze, solve the maze, and reach the destination cell as quickly as possible. The end of the maze will be marked with a black circle.
B. Line Maze Specification:
    a. The main playing area will be an "9 cells by 9 cells" line maze with a line width of **1 inch or 2.54 cm (+- 0.5 inch or 1.27 cm).**
    b. Adjacent to cell at the first row , middle column of the maze, 2 extra cells will be allotted for the Starting Area and Start timing gate respectively.
    c. Similarly, adjacent to the end goal of the maze and additional 1 cell will be allotted from the End timing gate.

Sample 5x5 Line Maze:



C. Each cell is 30cm x 30cm in dimension.
D. A maximum of 8 minutes will be given each run, after which the run will be declared a failed run.

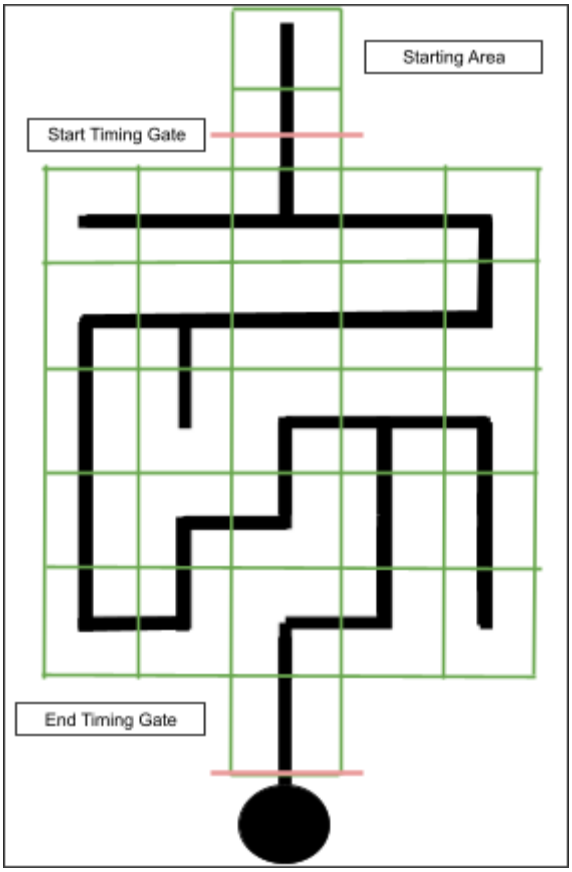
E. Time will start at the instance that the Start timing gate senses the robot and will only stop once the robot reaches the end or maximum time of 8 minutes is reached
F. Similar to the test of speed, the contestants will be allowed to manually calibrate their sensors in the allotted Starting area, specifically they are allowed to pick up and move their robot over the line maze within the said area.
G. There will be two runs for this test. Only the best run time among the two will be considered for ranking. This is built on the assumption that the two runs were successful and the robot reached the destination cell within the allotted time.
H. In between runs, participants will be allowed to clean wheels, switch run-modes, tighten screws, etc. within an allotted time of 5 minutes (maximum). Operators are not allowed to upload new software or flash new programs to the robot and they must stay at the "trackside". However they are allowed to manually calibrate their sensors via a screwdriver.
I. The only tools allowed to be held whilst in the start area
J. "Hardcoding" is strictly prohibited. This will be checked by the officials before the start of the team's first attempt.
K. The robot's projected body (including wheels) should always be above the line (i.e it must be on top of the line). In the case that the robot veers off course (by at least 5 inches) and skips a portion of the maze then the run will be declared void and a rerun may be availed by the current contestant.
L. A rerun may only be requested once during the current attempt. The contestant may call this request once the robot enters the main playing area.
M. if a rerun is called DURING the current run, the current run IS NOT DECLARED FAILED, thus no tentative points from the point map shall be recorded for the current run.
N. Those that were able to complete the maze within the allotted time will be ranked under the "Finishers" bracket where they will be ranked based on their best runtime (shorter is better).
O. Those ranked under the "Finishers" bracket will receive points (with a maximum of 100 and a minimum of 50) for the test of intelligence based on this formula:

$$Points = 100 - \left(\frac{50}{Number\ of\ finishers} \times (rank - 1)\right)$$

P. **In the case that the robot fails to reach the destination before the allotted time ends <u>in any run</u>, the team will receive points based on a where it landed after the time finishes. A point map will be provided to determine the tentative points to be recorded for that run.**
Q. In the case that the robot fails to reach the destination on both runs,The higher number of tentative points awarded via point map will be their awarded as their official points for the test of intelligence.

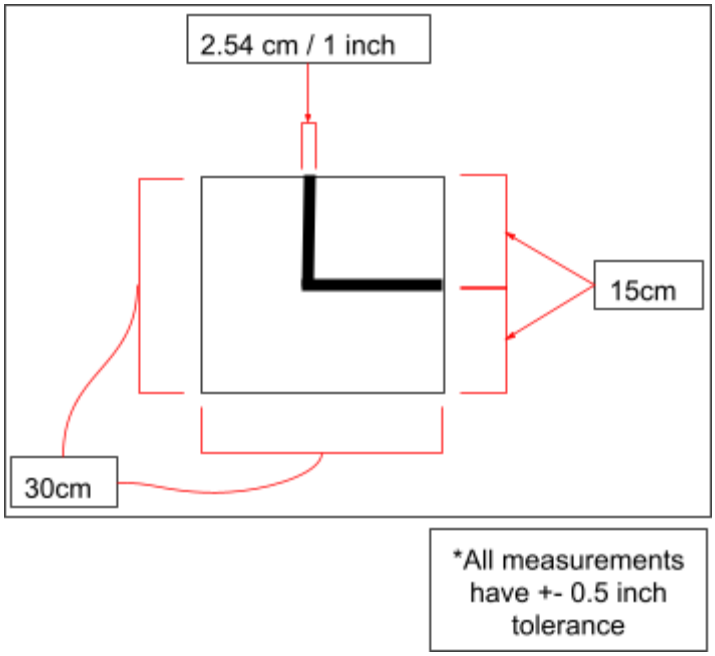
R. A finished table of points, scores and rankings will be shown at the end of the test of speed and during the 30 minute repair time before the next test.

Test of Intelligence Track Regulations



Example 5 by 5 Cell Line Maze with green reference cell markers

(Note: that there will be no cell markers on the actual Line Maze)

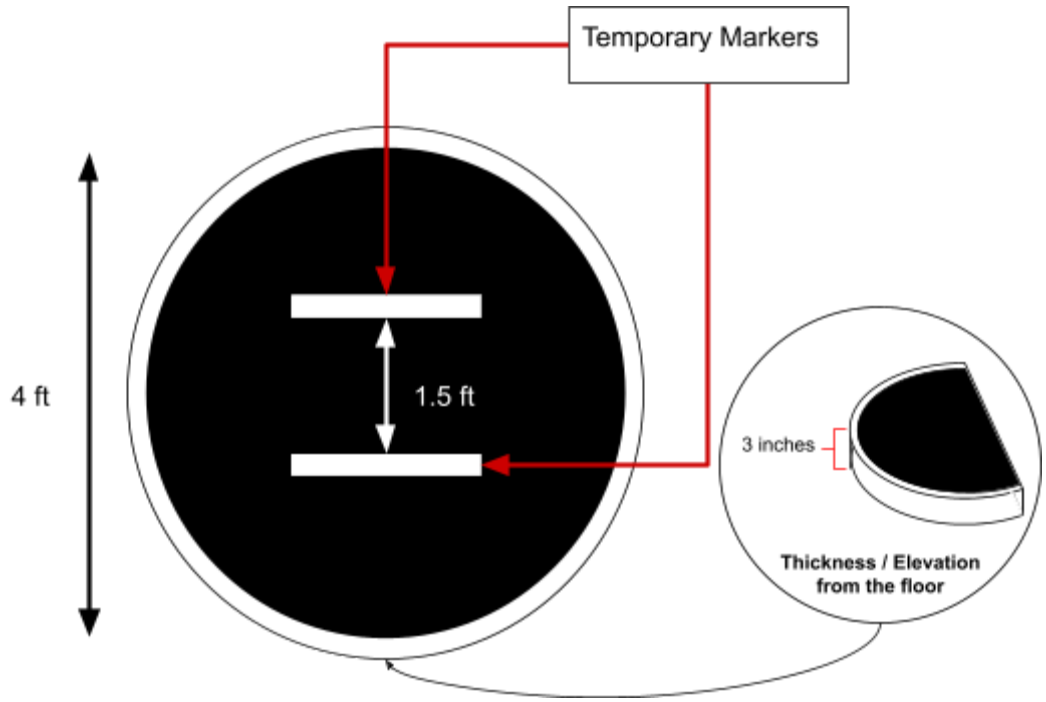


Line Maze Cell dimensions

Test of Strength

A. In this test, the robot's objective will be to eliminate its opponent by forcing said opponent off the arena/platform.
B. A loss will be declared once a robot is pushed off the platform and any part of the said robot touches the ground.
C. The Test of Strength shall be conducted in a double-elimination tournament format in which initial bracket placement is to be determined by draw lots or pre-tournament randomization by tournament officials.
D. During the tournament, all matches shall be in the form of a "best of three" in which the robots will clash in three rounds and the winner will be determined by the team with the highest number of won rounds.
E. Each round will last for 2 minutes.
F. In case each team has amounted equal numbers of wins due to a draw called on one of the three rounds. A sudden death round will be initiated in which the winner of that round will be the winner of the match.
G. If in case that the sudden death round is declared a draw then consequent sudden death rounds will be initiated until a robot is declared a winner or one of the robots is unable to continue the match for any reason.
H. At the cue of the referee, each contestant will place their robot behind a temporary markers on the battlefield. Dimensions of the battlefield will be given. Note the robots do not have to be placed directly behind the line. They may be placed farther back, or offset to the side, as long as they stay behind the imaginary line extending from the placed temporary markers. After touching the platform, the Robots may not be moved from their position.At this time the Temporary Markers will be removed from the platform.

I. Official Dimensions:
Radius: 2ft
Thickness: 3 inches (measured from the competition floor)



J. At the cue of the referee, the participants must activate the robot via the **compulsory mechanical switch** without pushing or physically propelling the robot forward with their hands. There will be no required programmed delays before the robot begins to move upon activation.
K. If both robots are still inside the battlefield after the expiration of the allotted time period (2 minutes), (i.e no winner/loser has been declared) a draw will be declared for that round by the officials.
L. If the robots do not come into contact with each other within a timespan of 20 seconds and no clear progress has been made in the match, officials may declare the **round** void and conduct the rerun of the **round**.
M. In the case where a rematch is to be conducted, the contestant will be given a grace period of exactly 10 minutes to perform minor repairs and maintenance that does not add material onto their respective robot (i.e adding or swapping out parts is not allowed, only removing, fastening and cleaning of parts), however flashing or uploading of new ROMs/software into the robot will NOT be allowed
N. A maximum of 2 reruns for each round considered void can be called, after which a draw will be declared for that round.
O. At any point during the match, participants may concede defeat and the opponent will then be declared the winner by default.

P. The points for this test will be awarded based on their ranking on the final tournament bracket. Because of this, it will be possible for two teams to share the same rank and thus be awarded the same amount of points based on the formula below :

$$Points = \left(\frac{(Total\ number\ of\ ranks + 1) - rank}{Total\ number\ of\ ranks}\right) \times 100$$