

LAWRENCE TECHNOLOGICAL UNIVERSITY
ROBOFEST 2020 **GAME**

GolfBowl



V 1.2 – Final Version for 2020 season. Some minor changes after Kickoff version

This file can be found under the **Get Involved** → **Game** page on the website
Coaches are responsible for communicating rules updates to contestants

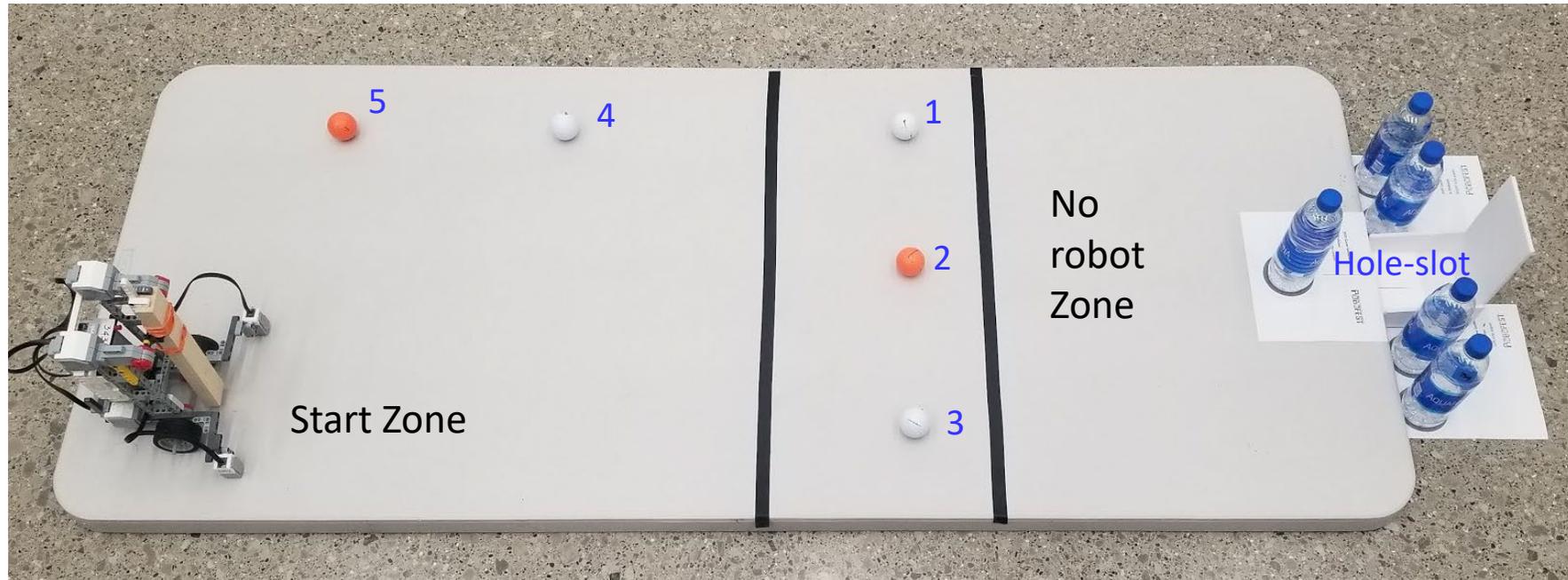
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1. Game Synopsis (1/2)



STEM Learning Goals

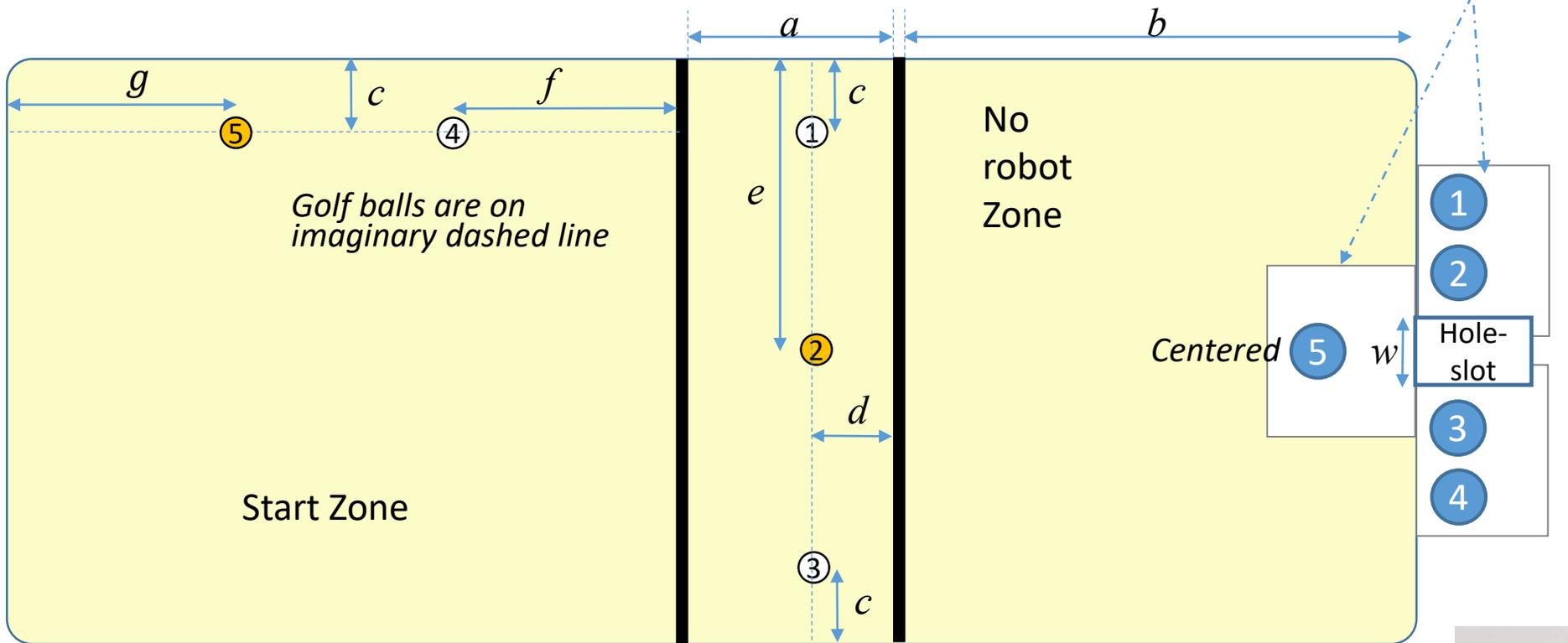
- Geometry/degrees
- Proportional logic
- Localization
- Navigation
- Computational thinking
- Physics
- Object detection (Sr.)

- Putt 5 golf balls into a Hole-slot with a wood piece attached to the robot. Alternative partial points will be given if bottles on the floor are knocked (bowled) over or moved. Penalty points are given if the bottle on the table is knocked over or moved.
- For a game, 2 minutes are allowed

1. Game Synopsis (2/2)

- White balls (balls 1, 3, 4) cannot be moved before putting. Orange balls (balls 2 & 5) may be moved by the robot before putting
- One full-reset of the playing field is allowed
- All the tasks must be done autonomously without any external help
- The robot may attempt/complete the putting in any order
- UTF (Unknown Task and Factors) will unveil the following just before the 30 minute work-time
 - The starting location and orientation of the robot
 - The locations of balls
 - How to end the game. New items/landmarks may be added on the table for the Game-Ending task

2. Playing Field (6ft table) Setup

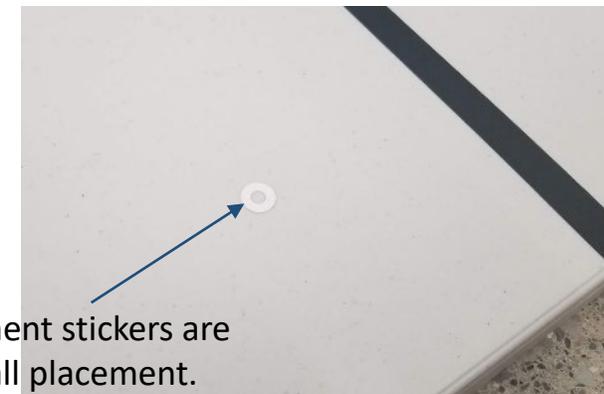


a	30cm (measure to the edge of tape)
b	55cm (measure to the edge of tape)
c	13cm
d	Unveiled before 30 min worktime $3cm \leq d \leq 15cm$ (measure to the edge of tape/center of ball; both for Jr and Sr)
f	30cm
w	12cm (inner edge)

$e \ \& \ g$	Jr: Unveiled before 30 min worktime
	Sr: Completely unknown. Robots must detect them.

$30cm \leq e \leq 45cm$ $20cm \leq g \leq 40cm$

d, e, g values will be different for each round.

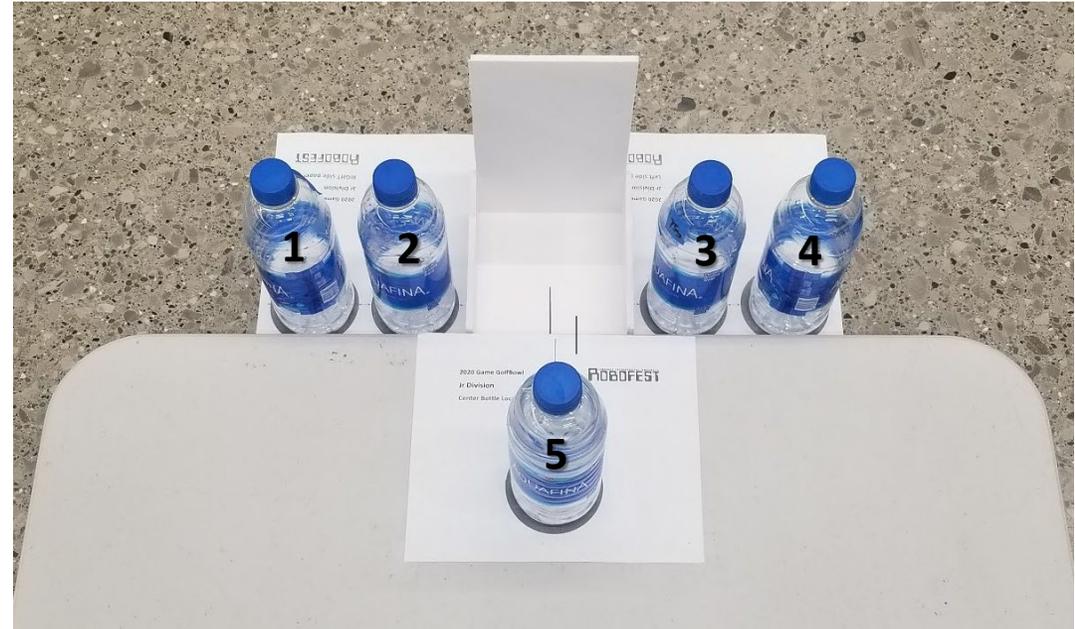
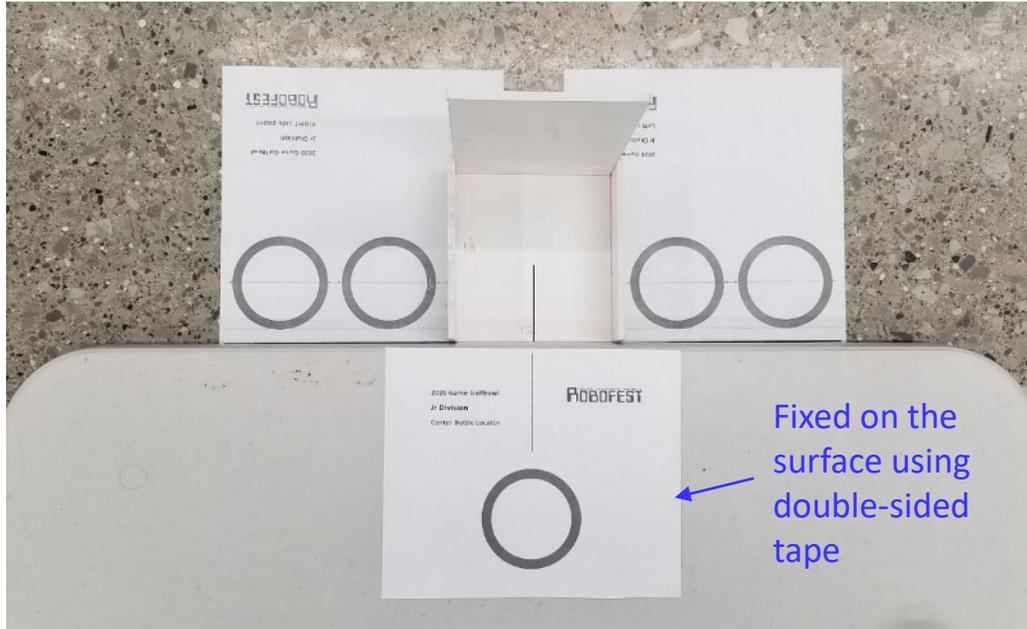


Hole reinforcement stickers are used to mark ball placement.

3. List of Materials/Properties of the Field

- 6ft plastic folding tables placed on the floor:
 - 30"x72" (actual size is about 75 x 182cm)
 - The recommended brand is "LifeTime". The 4 corners are rounded with a radius of 4cm ~ 7cm. Thickness is about 4.5cm. Other thickness may impact scoring.
 - The surface is light in color such as white, gray, or almond; however, the exact size, color, brightness, and edge shape of the table is unknown until the competition day
 - Fold-In-Half plastic tables can be used if the center seam is covered with (masking) tape similar to the table color. The color of the tape would also be an unknown factor in that case
 - Pieces of plywood cut similarly to the folding tables can also be used if plastic folding tables are not available.
- Floor color under tables: Unveiled at the beginning of competition day, possibly not homogeneous. However, all the colors should be noticeably darker than the table color
- Hole reinforcement stickers: Used to mark the location of golf balls ([link](#))
- Golf Balls: Standard white golf balls ([link](#)) and orange golf balls ([link](#))
- Water Bottles: 500ml (16.9 FL Oz) bottle. The height is about 20cm. Bottle diameter is approximately 7cm in diameter. Unveiled at the competition site. Details about weight can be found in Section 4
- Bottle locator template. See Game Page at: <https://www.robofest.net/index.php/current-competitions/game>
- Hole-slot: made of white foam board. For building instruction and template, visit Game page at: <https://www.robofest.net/index.php/current-competitions/game>
- Black electrical tape: width of the standard tape is $\frac{3}{4}$ " or 1.9cm

4. How Bottles will be Prepared & Located



Exact locations of bottles is defined on the “bottle locator template” papers. Same for both Jr and Sr

The size, shape and brand will be the same for all 5 water bottles on the playing field

Initial Setup of bottles

Bottle Weight:

- #1, 2, 3, 4 Bottles: Partially full, around **75 gram**
- #5 full water bottle = around **524g** (Actual bottles to be used will be unveiled on the competition day.)

5. Violations and Full-Reset

When any of the following violations occur, Judges shall stop the game play immediately to avoid further disruption of the field:

- Human touch of the robot or playing field materials. Once the robot starts moving, the player cannot touch it
- Robot falls off the table
- Robot invades the “No Robot Zone”. Any part of the robot must not “**touch**” the “No Robot Zone” table surface. On the black line is OK. A part of the robot can *hang over* the zone.

The team can request one-time full-reset (with penalty points) at any time OR declare the end of the game. If reset is selected, time continues to run while Judges reset the table.

Note : bottles moved or knocked (bowled) over by the above violations are not counted. Bottles will be reset.

If the ball went into the hole-slot by the above violations, it shall not be counted. Judges will remove it.

6. Invalid Putting Penalty for the Balls in the Hole-slot

When a ball goes into the Hole-slot as the result of the following actions, Judges shall announce “Invalid Ball No. x” and the ball remains in the slot and is recorded as invalid ball on the scoring sheet.

- Any ball goes into Hole-slot pushed or touched by robot body/part (not by the wooden putter)
- White ball putted after moving (White balls must be putted from their original location)
- White ball hit more than one time by wooden putter

Note:

- Bottles moved or knocked over by the invalid putting (not by violation) are OK and counted as they are
- If balls moved off the table as a result of the invalid putting (not by violation), “balls removed from the table” point will still be awarded

7. Procedure/Rules to Play 2 Rounds (1/2)

1. Only contestants are allowed to access the pit area, team tables, practice fields, and official game fields throughout the competition, including during the setup time before the opening ceremony, during work time and breaks. Adult coaches, mentors, or other volunteers may assist with transporting team materials only if necessary, escorted by proctors
2. When Unknown Tasks and Factors (UTF) are unveiled, teams will be provided a hard-copy of the UTF or it will be projected on a screen. See 8.1 and 8.2 for UTF examples
3. Teams will be given a 30-minute work-time after UTFs are unveiled to work on their robots. Prior to the start of the work time, all people except contestants and authorized staff/volunteers will be **dismissed** from the competition area(s)
4. During the practice time, teams must share the playing fields
5. All teams must submit their robot to the impound area when the 30 min work-time has expired. Robots may be taken to be impounded early. Only one team member should deliver the robot to the impound table. Penalty may be applied if not impounded in time
6. During the impounding process, judges will inspect the robots. (Size of the robot after expanding, putter length, Team ID & Name, "Front" label, number of computer controllers, etc.)

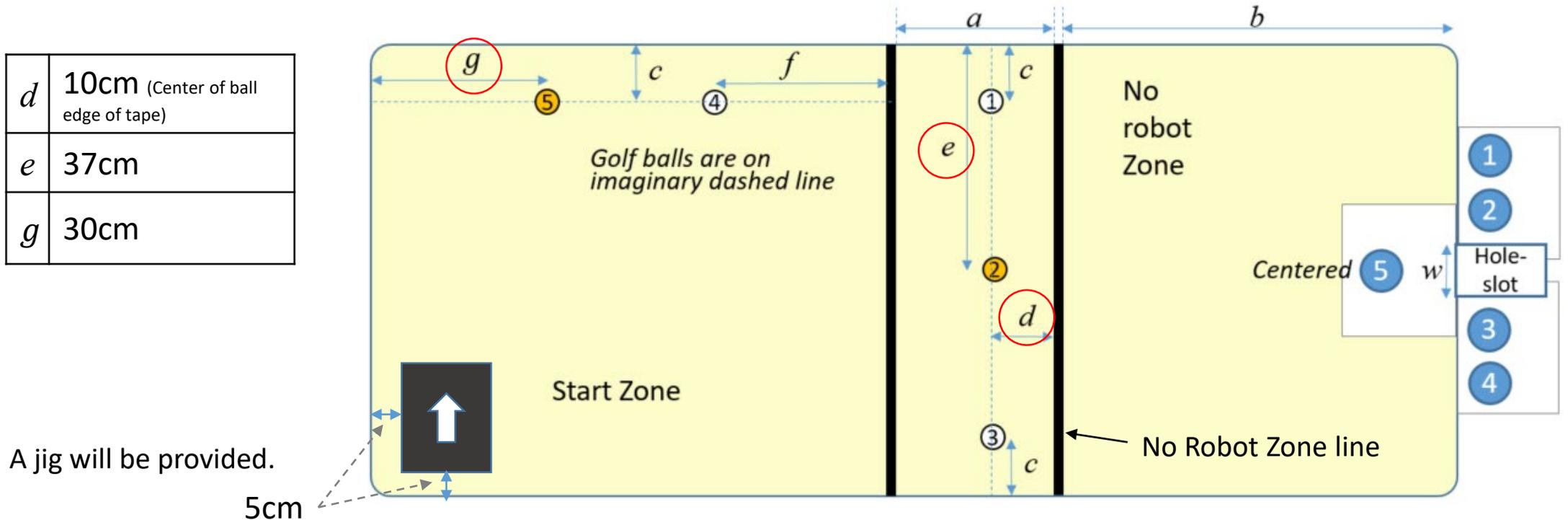
7. Procedure/Rules to Play 2 Rounds (2/2)

7. No power will be supplied at the impound table and the entire robot must be impounded, including rechargeable batteries
8. Teams will compete in a pre-determined order decided by the site host
9. During the Game Rounds, all team members must remain in the team spectator area – no pit access allowed
10. When a team is called to compete, a maximum of two contestants per team are allowed to retrieve the robot from the impound area and to be present at the playing field during the run
11. Judge (or Emcee) will check if (1) timer is ready (2) Judges' are ready, (3) teams are ready. Then count down "3-2-1 - Go" to start a Game
12. Contestants must stay near the Start Zone. They should not follow the robot. They can approach the robot only when they decide to pick it up or if the robot is in the Start Zone
13. Final scoring is done after the run is over. A team member must sign the score sheet to confirm the team's score. Displaying scores after the round is highly recommended

8.1 UTF Example (Jr)

- The starting location, ball locations and orientation of the robot: see the diagram below
- Game-Ending task: Detect the No Robot Zone line and stop there. The robot must be stopped with a sensor positioned above the line

d	10cm (Center of ball edge of tape)
e	37cm
g	30cm



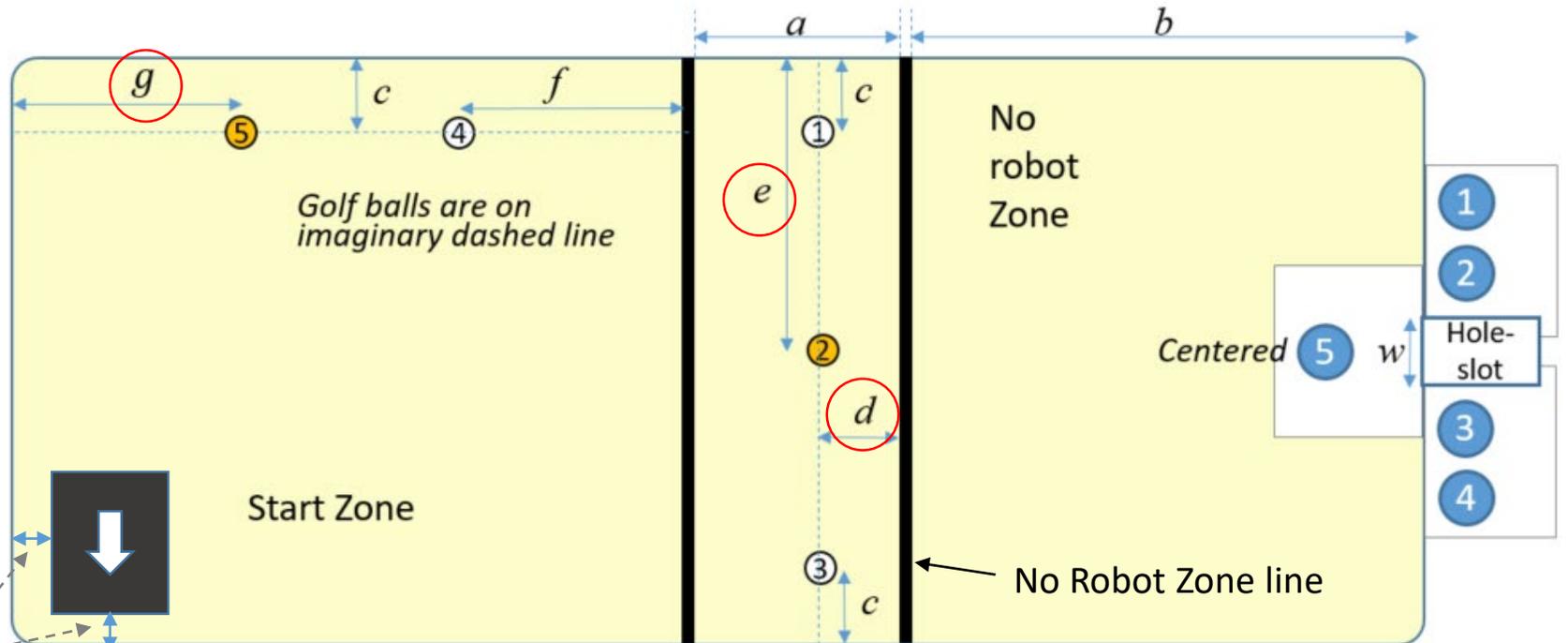
8.2 UTF Example (Sr)

- The starting location, ball locations and orientation of the robot: see the diagram below
- Game-Ending task: Detect the No Robot Zone line and stop there. The robot must be stopped with a sensor positioned above the line

d	13cm (measure to the edge)
e	$30cm \leq e \leq 45cm$
g	$20cm \leq g \leq 40cm$

A jig will be provided.

5cm



9. How to Score (1/2)

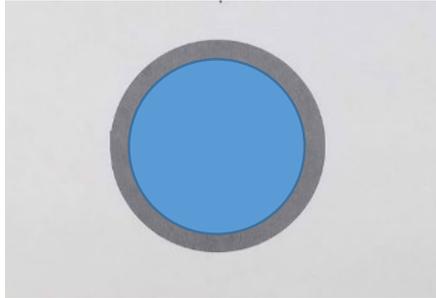
Scoring Sheet file can be found at: <https://www.robofest.net/index.php/current-competitions/game>

Judging Items (to be checked when the Game is ended)		Point Value	Score Earned / Lost
Bottle #1	Completely knocked over	11	
	Moved outside the solid circle line	3	
Bottle #2	Completely knocked over	13	
	Moved outside the solid circle line	5	
Bottle #3	Completely knocked over	13	
	Moved outside the solid circle line	5	
Bottle #4	Completely knocked over	11	
	Moved outside the solid circle line	3	
Bottle #5 (center)	Completely knocked over OR Moved outside the solid circle line	-2	
W: Number of white balls in the Hole-slot	0 1 2 3	15 each	$W \times 15 =$
C: Number of colored balls in the Hole-slot	0 1 2	18 each	$C \times 18 =$

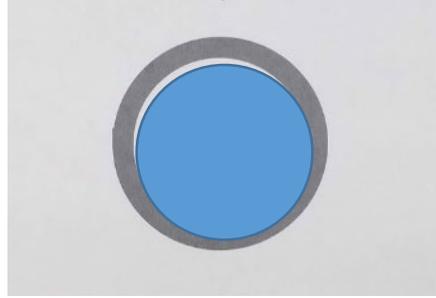
9. How to Score (2/2)

I: Number of invalid* balls in the Hole-slot	0 1 2 3 4 5	-3 each	$I \times -3 =$
R: Number of Balls removed from the table**	0 1 2 3 4 5	1 each	$R \times 1 =$
The robot remained intact throughout the run. No part was dropped on the table.		2	
A full-reset was done (full-reset penalty)*** <i>Note: partial reset is not allowed</i>		-3	
Game-Ending task is achieved		12	
<p>(*) Any ball putted not by wooden putter; white ball putted after moving or more than one hit.</p> <p>(**) if a ball is in the Hole-slot, it gets this additional 1 point.</p> <p>(***) when a violation occurs, the team can either stop the game or request a full-reset & rerun. When 2nd violation occurs, the game is terminated. Grab the robot immediately!</p>		Total Score	
		<i>Max. 100+</i>	
		If Total Score is 100+, record time in seconds	<i>Time Left</i>
<i>Elapsed</i>			

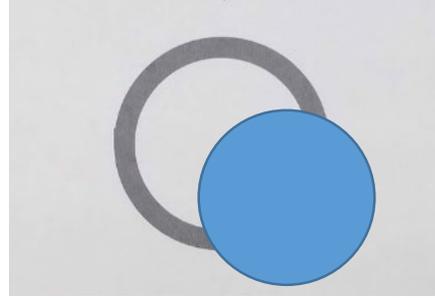
10. Bottle Scoring Examples



Initial Bottle Position



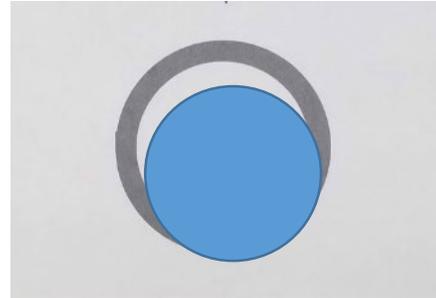
Not Moved



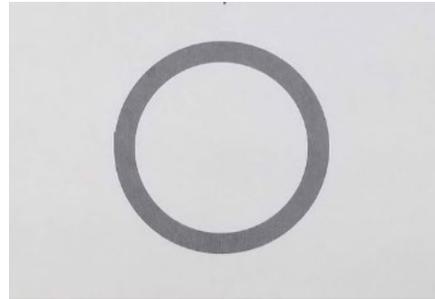
Moved



Not Moved



Moved



Moved
(Bottle completely out of circle)

Blue circles here refer to the projection, not the bottom, of the bottle.



Moved



Not moved

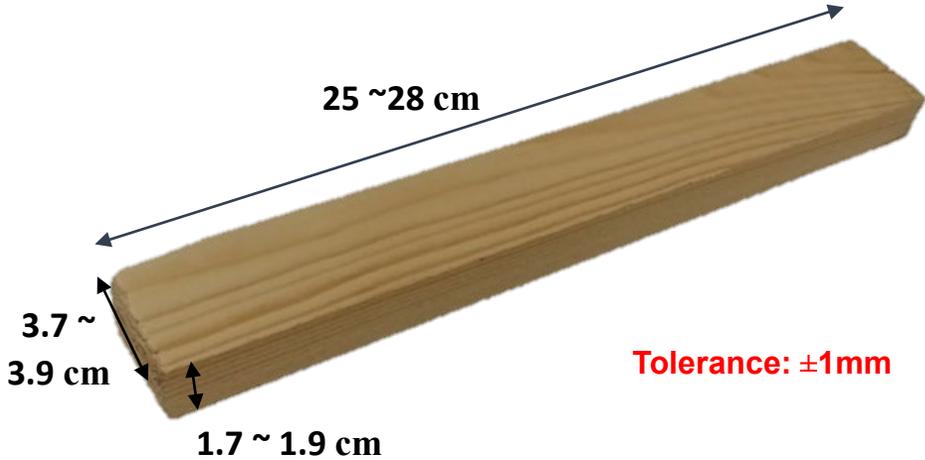
Lego blocks as a jig will be used to check as shown above.

11. Robot Specifications

- Maximum size is 50 x 50 x 50 cm *including expansion* (the swing of the putter). There is no initial size requirement
- Weight limitation: none
- Any number of sensors/sensor types (unless it is harmful to humans)
- Any number/type of motors/servo motors (multiplexor is OK to use)
- Any material/robot kit may be used to construct your robot including tape, glue, bolts and nuts, rubber bands, etc.
- A Robofest Team ID and Name tag on top of the robot is required
- A label identifying the “Front” side of the robot is required
- Must have a display screen for the Game-Ending task that may require to display numbers

12. Wood Putter Specifications

- United States Standard 1x2 un-painted wood piece
- Pine wood is recommended
- The dimension is shown on the right. The tolerance of the dimension is $\pm 1\text{mm}$. The wooden putter can be slightly modified (for example: drilled to make holes or sanded) as long as the dimensions are maintained
- The putter should be designed to hit the ball with wood part only
- Only one putter can be used
- The putter must be designed to be operated by one or more actuator(s)



13. Differences between Junior and Senior age divisions

	Junior (5 th ~ 8 th grades)	Senior (9 th ~ 12 th grades)
Game-Ending task	Easier	Harder
Location of orange golf balls	Unveiled before work-time	Completely unknown. Robots must detect orange golf balls
Number of on-board computer controllers	One	No limit

14. Rules to Determine Winners & Break Ties

- Winners in each age division will be decided by the **average** total score of the 2 rounds
- Tie breakers will be: (1) best score of two rounds, (2) highest time left from best score, (3) rerun, if needed
- For example:

Team Name	Round 1 score	R1 time left	Round 2 score	R2 time left	Avg. Score	(1) Best score	(2) Time left best score	Rank
Team A	80		100	15	90	100	15	1
Team B	100	10	80		90	100	10	2
Team C	90		90		90	90		3

15. Reminders of General Rules and Restrictions

- Proctors are watching for the following violations:
 - Coaches or parents in the pit area during practice or work-time (except for initial transport of materials)
 - Coaches or parents accessing the practice or official game tables at any time
 - Verbal/electronic communication between the team and coach/parent while the team is setting up and practicing in the pit area and during work-time
 - Team members leave the pit unsupervised during work-time before their robot is impounded
 - Any team member alters his/her own robot after impounding
 - Team handles or interferes with another team's computer or robot, either in the pit or in the impound area
 - Destruction of property
 - Use of inappropriate words and/or behavior toward team members, other teams, audience, judges or staff
- Any violations can result in deduction of points or disqualification at the judges' discretion
- If anyone sees any suspicious activities, please notify the nearest volunteer immediately
- Spectators are welcome to take pictures or video, but please make sure your flash is off

16. Notes

- Though every effort is made to be consistent and precise in all of the dimensions of the playing field and parts, Robofest assumes a tolerance of ± 5 mm, unless stated otherwise
- If there are multiple playing fields at the competition sites, the Chief Game Judge will check consistency between the playing fields. However, there is no guarantee to make them all identical
- Judges & contestants should maintain at least 1 meter distance from the field when the robot is in action
- Final decisions are at the discretion of the Chief Game Judge
- Additional FAQs, Rule Clarifications, and Rule Change documents will be posted at robofest.net
- Robofest 2019-2020 General Rules document at robofest.net
- Each team member, as well as the coach, must bring the signed [Robofest Consent and Release Form](#) on the day of the event, if not completed on-line
- Age Divisions: Junior (5th-8th) and Senior (9th-12th)
- Team Size: Max. 5
- Registration fee: \$50 USD

17. FAQs

- If a golf ball knocks down a bottle and goes in the hole-slot, can we get more than 100 points? **Yes**
- What if a ball went into Hole-slot hit by another ball? **Scored as Invalid, since it was not putted by the wooden putter**
- What if a ball moved a bottle hit by another ball? **This is OK. Scored as the bottle is moved**
- A bottle is moved by a ball bounced off the center #5 bottle. **This is OK. Scored as the bottle is moved**
- How to count a ball that was hit prior to time running out but scores after? **Counted as scored like basketball rules**
- A player failed in starting the robot. Can the player retouch the robot to start? **Yes**

18. Template Files

The following template files are on the Game Page at:

<https://www.robofest.net/index.php/current-competitions/game>

- Ball locator template files (left, right, and center in letter size) in PDF
- How to make the Hole-slot (Template for 11"x17" paper)

