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LAWRENCE TECHNOLOGICAL UNIVERSITY ROBOFEST®

GAME

Robot Parking Valet

Judge Training

This file can be found on the **Game** page on the website

Coaches are responsible for communicating rules updates to participants

www.robofest.net **robofest@ltu.edu** 248-204-3568

Room J233 Taubman Complex, LTU **21000 West 10 Mile Road, Southfield, MI 48075, USA**

Agenda

- Game Details
- Site Host and Judge Roles and Responsibilities
- Robot Impounding Process
- Violations, Full Reset, End of Run
- Procedure / Rules to Play 2 Rounds
- Scoring
- UTF Examples

Rules vs. Training Materials

1.1 Game Scenario

Looking for a parking spot can be a challenge. Imagine a future where your car is automatically parked: conveniently, safely and efficiently for you, then automatically brought to you, along with your keys, on demand. Robotic parking systems can even stack parked vehicles for even greater space utilization.

Qualifier Category: Teams compete at local qualifiers, or through video submission, to advance to the Robofest World Championship Finals

STEM Learning Goals: 1) Geometry/degrees/logic/computational thinking 2) Localization and navigation 3) Object detection and manipulation

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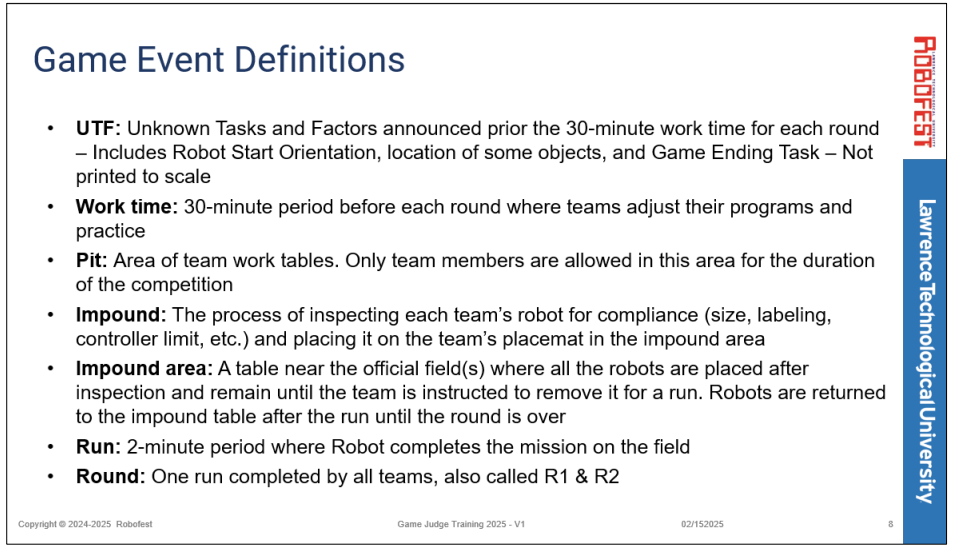

Game Event Definitions

- **UTF:** Unknown Tasks and Factors announced prior the 30-minute work time for each round – Includes Robot Start Orientation, location of some objects, and Game Ending Task – Not printed to scale
- **Work time:** 30-minute period before each round where teams adjust their programs and practice
- **Pit:** Area of team work tables. Only team members are allowed in this area for the duration of the competition
- **Impound:** The process of inspecting each team's robot for compliance (size, labeling, controller limit, etc.) and placing it on the team's placemat in the impound area
- **Impound area:** A table near the official field(s) where all the robots are placed after inspection and remain until the team is instructed to remove it for a run. Robots are returned to the impound table after the run until the round is over
- **Run:** 2-minute period where Robot completes the mission on the field
- **Round:** One run completed by all teams, also called R1 & R2

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For this training presentation, slides with a blue background are copied directly from the Game Rules, and maintain the section number information. Judges should refer to the rules when answering any team's questions.

Slides with a white background have been prepared to provide additional details for training purposes.

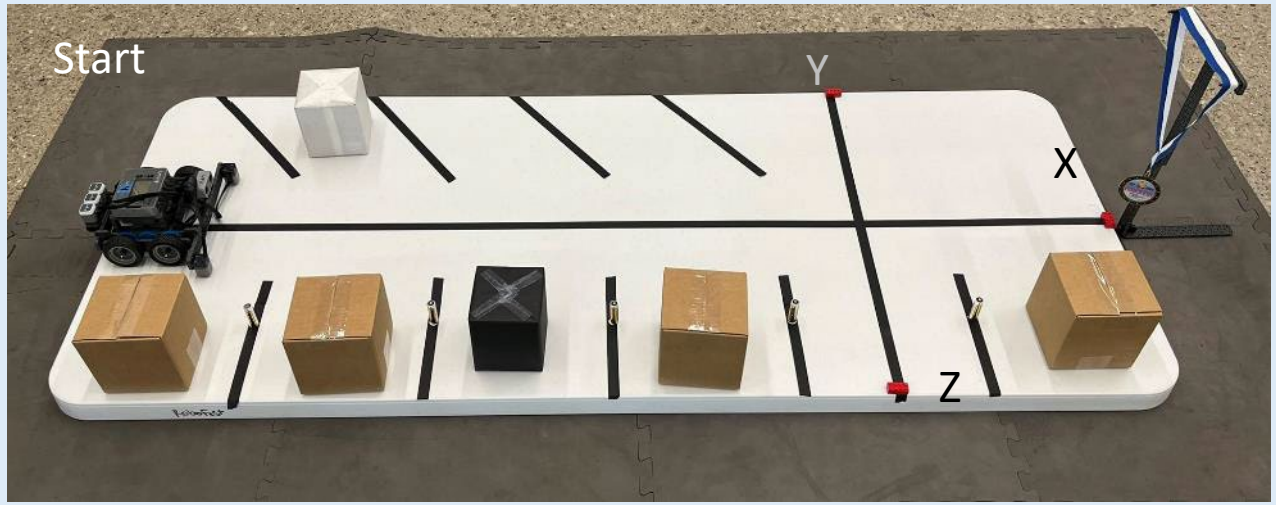
1.1 Game Scenario

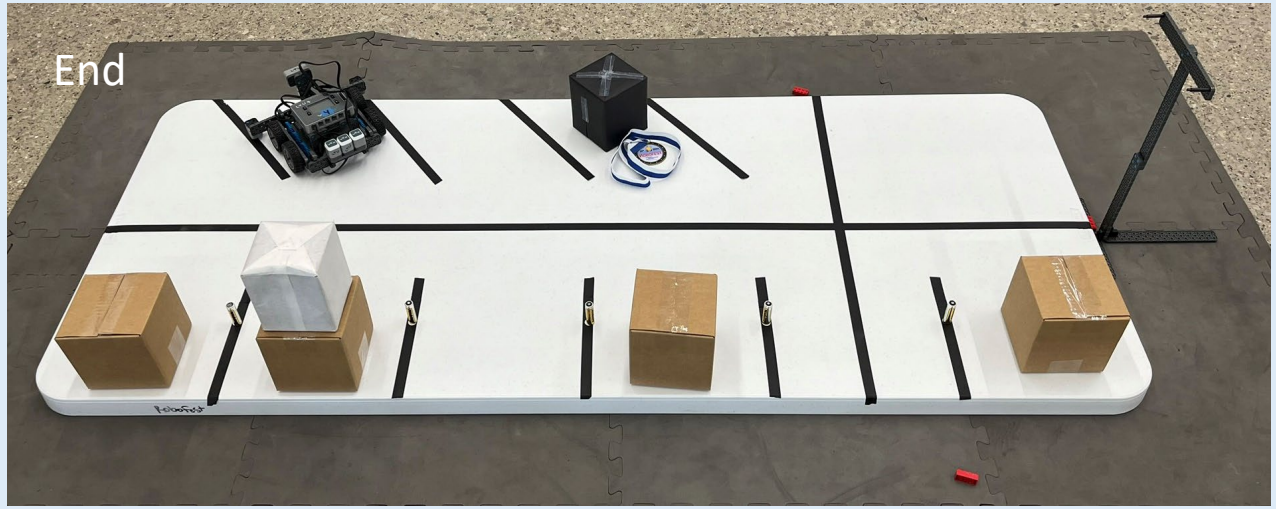
Looking for a parking spot can be a challenge. Imagine a future where your car is automatically parked: conveniently, safely and efficiently for you, then automatically brought to you, along with your keys, on demand. Robotic parking systems can even stack parked vehicles for even greater space utilization.

Qualifier Category: Teams compete at local qualifiers, or through video submission, to advance to the Robofest World Championship Finals

STEM Learning Goals: 1) Geometry/degrees/logic/computational thinking 2) Localization and navigation 3) Object detection and manipulation

1.2 Game Synopsis





- Survey the parking lot, move the Keys (medal) and the Black Vehicle (box) to the Pick Up area, park the White Vehicle (box) in a parking spot, park the robot in an unveiled location, while avoiding pylons and other vehicles
- For a game run, max 2 minutes are given and one full-reset is allowed
- All the tasks must be done autonomously without any external help
- Unknown Tasks and Factors (UTF) will be unveiled just before a 30 minute work-time for each of 2 rounds to include:
  - Robot Starting Orientation
  - Black Vehicle Location
  - White Vehicle Location (Jr only)
  - “Other Vehicle” Locations (Jr only)
  - Game Ending Robot Location and Task

Game Event Definitions

- **UTF:** Unknown Tasks and Factors announced prior the 30-minute work time for each round – Includes Robot Start Orientation, location of some objects, and Game Ending Task. Shown on a screen and provided hard copy to teams and judges.
- **Work time:** 30-minute period before each round where teams adjust their programs and have access to practice and official fields
- **Pit:** Area of team work tables. Only team members are allowed in this area for the duration of the competition
- **Impound:** The process of inspecting each team's robot for compliance (size, labeling, controller limit, etc.) and placing it on a placemat with the team number on the impound table
- **Impound Area:** A table near the official field(s) where all the robots are placed after inspection and remain until the team is instructed to remove it for a run. Robots are returned to the impound table after the run until the round is over
- **Run:** 2-minute period where Robot completes the mission on the field
- **Round:** One run completed by all teams, also called R1 & R2

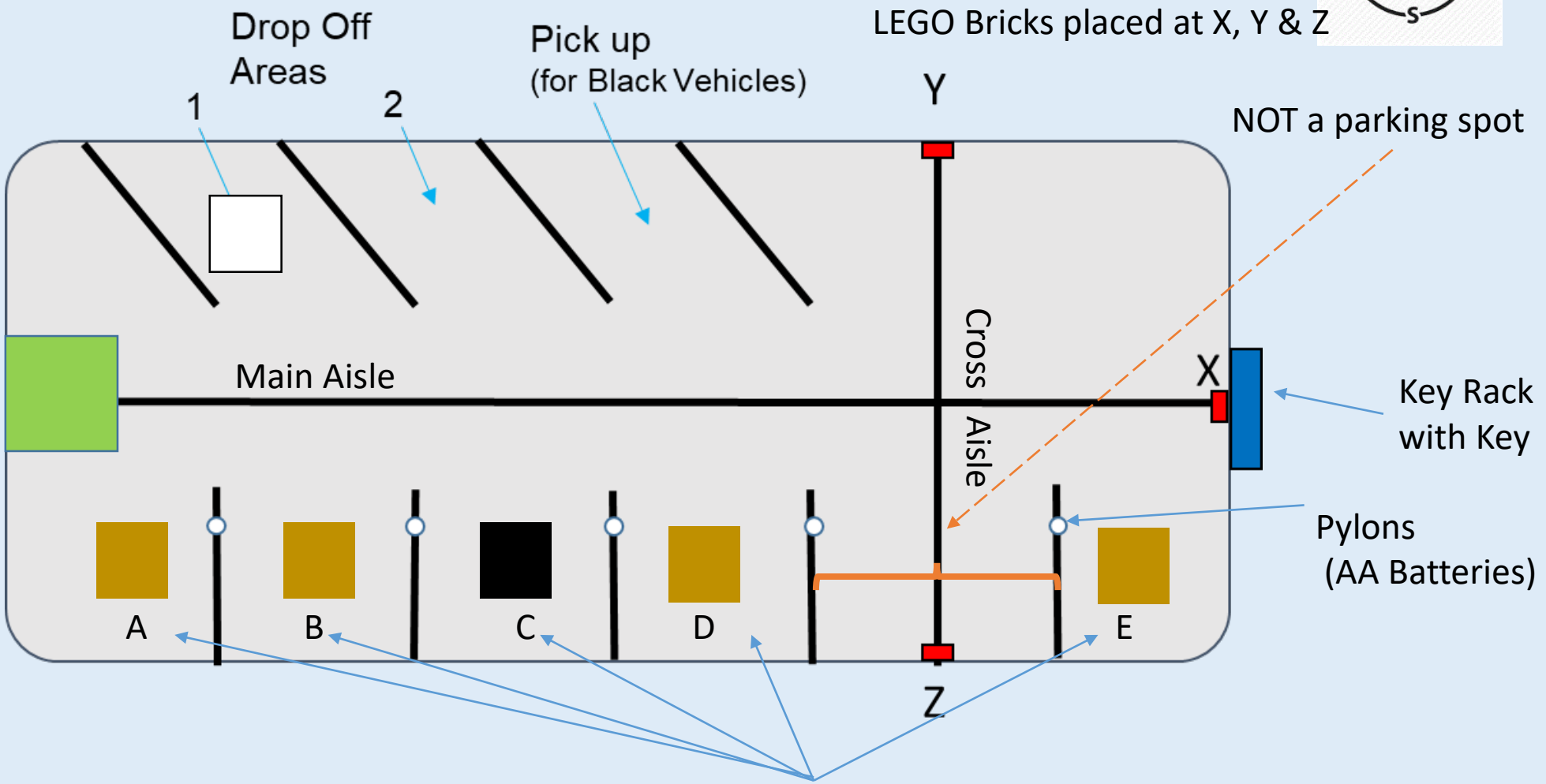
Game Field Definitions

- **Field:** All materials including 6-foot table, Vehicles, and other objects
- **Drop-off Vehicle:** White box
- **Pick-up Vehicle:** Black box
- **Parked Vehicles:** Brown boxes or similarly shaped objects
- **Key Rack:** Robot Parts or other materials, on the floor, taped to the floor & table
- **Key:** Robofest Participation Medal
- **Pylons:** (5) AA Batteries
- **Survey Markers:** (3) LEGO Bricks
- **Parking Lot Lines:** Black Electrical Tape
- **Scorecard:** Used by Judges to calculate all points for a run

3.1 Game Details: Field Setup

One White Vehicle parked in Drop Off Area 1 or 2

Robot starts on the Main Aisle with some part over West edge; **orientation will be unveiled**



Note: Items/landmarks may be added or modified for the World Championship Finals

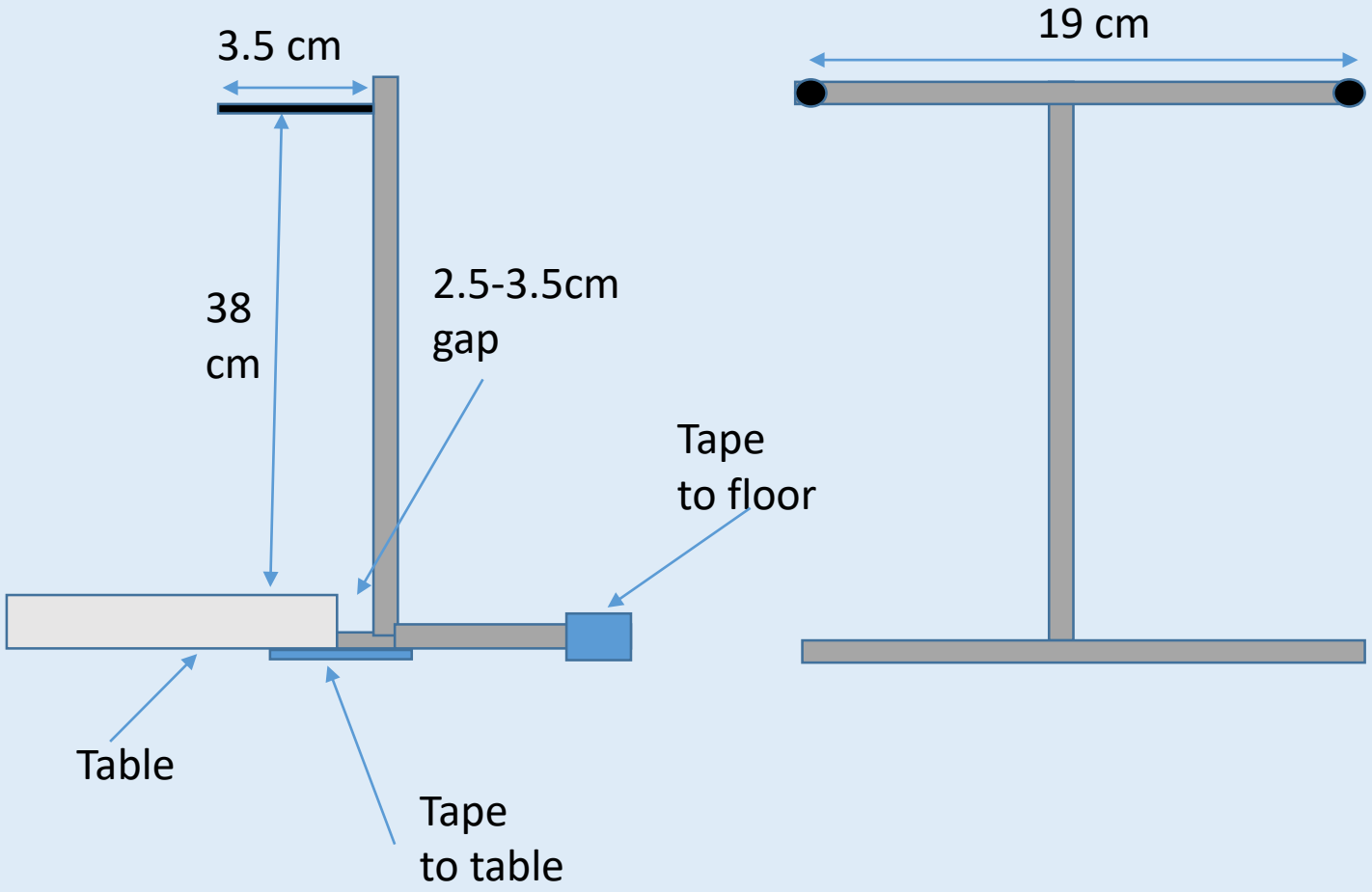
One Black Vehicle and other vehicles will be in one of these spots, or spot may be empty. Max 1 empty spot at start

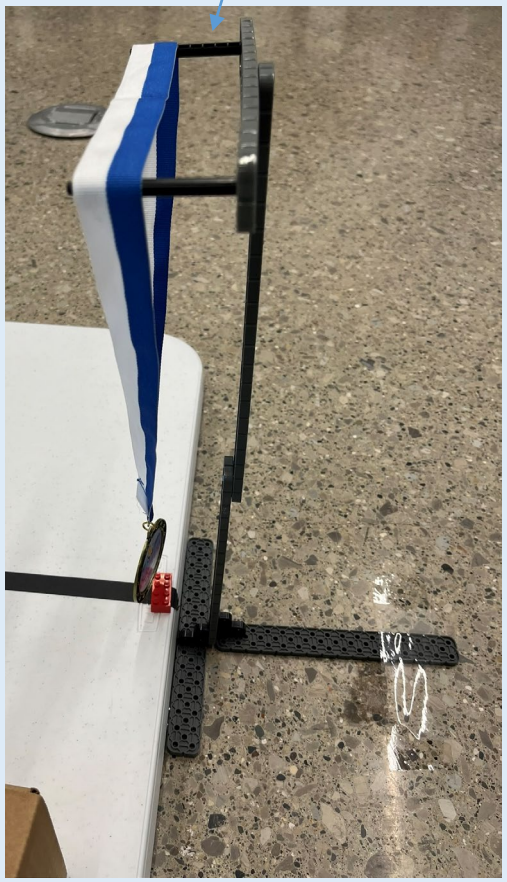
3.2 Game Details: Tasks

- Start the robot in the unveiled orientation
- Survey the parking lot (visit X, Y, Z) by pushing LEGO bricks off the table
- Pick up the keys from the Key Rack (can be done during survey)
- Deliver the keys and the Black Vehicle (box) to the Pick Up location
- Move the White Vehicle (box) from a drop off location to either:
  - A vacant spot (possibly A,B,C,D, or E) for 10 points OR
  - Stacked on a vehicle adjacent to a vacant spot for 16 points (see section 10.1)
- Park the Robot and complete the Game Ending Task defined in the UTF
- Avoid Pylons and other vehicles – Keep their locations intact

6.2 Key Rack

Using LEGO, VEX IQ, or similar parts





Example made
VEX IQ parts

Example made
of 1x2 wood

Site Host & Chief Game Judge Responsibilities (1/2)

- Review all Game Rules and Judge Training
- Recruit, assign and train volunteers to include Judges, Proctors, Timekeeper, Scorekeeper, Emcee, Registration
- Set up location to include:
  - Registration area (sign-in teams, collect missing waivers)
  - Pit (tables, chairs, practice field(s) access to power)
  - Official Competition area for pre-determined number of fields and Impound table(s)
  - Spectator Area
- Prepare/verify initial placement of field elements on official and practice fields (Robofest staff will prepare local materials)

Site Host & Chief Game Judge Responsibilities (2/2)

- Verify placement of vehicles on official tables after impound using correct Host UTF instructions for each round
- Manage or assign impound process to judges or proctors
- Manage the teams in and out of the impound area for each run:
  - Determine Team Order for each round
  - Call teams to proceed to impound to pick up robot and approach the field
  - Start and end each run
  - Instruct teams to return robot to impound
- Validate scores
- Award certificates and medals to teams, and trophies to winners
- Coordinate group photo

Judge Roles and Responsibilities (1/2)

- Review Game Judge Training and Game Rules
- Proctor the teams during event:
  - No adults in the pit during the competition
  - No adults in the pit or spectator area AND no contact with adults during the work time
  - Teams must share official and practice tables
- Impound robots – More details later
- Review UTF Sheet for each Round to determine:
  - Robot Start Orientation
  - Vehicle Drop Off Location
  - Parked Vehicle Locations / Empty Parking Spots
  - Game Ending Task

Judge Roles and Responsibilities (2/2)

- Work with partner Judge to guide the team at the start the run
- Watch for violations
- Reset the field if the team requests a reset
  - Team can be asked if they wish to reset
  - Judges should reset the field materials quickly while the team member resets the robot to the start position and restarts the robot
- Record Time (if it appears that team will achieve 100 points)
- Score the run on the Scorecard
- Review the scorecard with the team for agreement, sign it and ask team to sign it
- Turn in scorecard to the scorekeeper

Robot Impounding Process

- Only one team member should approach the impound table to minimize traffic and reduce the chances for accidental damage
- Judges will be provided with 35cm x 35 cm measure board to measure the robot
- **Judges should handle the robot as little as possible. Ask team members to place the robots on the measure board**
- Judges will check the robot for the following:
  - Maximum length and width: 35cm x 35cm *including expansion*
    - Ask if robot expands and team must show
    - Wires may extend beyond 35cm
  - All the wheels for driving touch the table surface
  - Robot is labeled with Robofest Team ID on any visible surface (Team Name is optional)
  - Robot front has a “Front” indicator
- Robots may not be charged at the impound. Robots should be turned off to save battery
- After inspection/approval, ask the team member to place the robot on their team placemat on the impound table

8 Violations, Full-Reset, End of Run Declaration

- When any of the following violations occur, Judges shall stop the game play (and robot if still moving) immediately to avoid further disruption of the field:
  - Human touches the robot or field materials. Once the robot starts moving, the player cannot touch it
  - Robot falls off the table (any part of the robot touches the floor)
  - Any other illegal activities that a Judge determines
- The team can request a one-time full-reset (with penalty points) at any time. If reset is selected, time continues to run while Judges reset the table
- Team may declare the end of the run at any time. Players should not move the robot until instructed by the Judge
- If the robot is still moving when team calls “end of run” (or at the time limit) no points will be awarded for the Game-Ending Task which requires the robot to stop

9.1 Procedure/Rules to Play 2 Rounds (1/3)

- 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
- When Unknown Tasks and Factors (UTF) are unveiled, teams will be provided a hard-copy of the UTF and/or it will be projected/displayed on a screen. See 11.1 and 11.2 for UTF examples
- 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)
- During the work-time, teams must share the fields
- Team members may ask clarifying questions about UTF, but any questions regarding the scoring and procedures should refer to rules

9.1 Procedure/Rules to Play 2 Rounds (2/3)

- All teams must submit their robot to the impound area when the 30 minute work-time has expired. Robots may be taken to be impounded early. Only one team member should deliver the robot to the impound table.
- Teams that do not impound their robots on time will be subject to penalty
- During the impounding process, Judges will inspect the robots. (Size of the robot, Team ID, “Front” label, number of computer controllers, etc.)
- No power will be supplied at the impound table and the entire robot must be impounded, including rechargeable batteries
- Teams will compete in a pre-determined order decided by the site host
- During the Game Rounds, all team members must remain in the team spectator area – no pit access allowed

9.1 Procedure/Rules to Play 2 Rounds (3/3)

- 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
- 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 Run
- Contestants must stay near the Start Zone. They should not follow the robot. They can approach the robot only to end the run, request a reset, or when Judge tells them
- Final scoring is done after the run is over
- A team member must sign the scorecard to confirm the team's score
- Teams will play two rounds, each round will have a different set of UTF's (Unknown Tasks and Factors)

10 Scorecard

File can be found on the website
https://www.robofest.net/images/2425/2025GameScorecard.pdf

Judging Items (to be checked at the end of the run)			Possible Count	Actual Count	Point Value	Score Earned/Lost	max value
#1	Survey the parking lot	Visit X, Y and X (bricks pushed off)	0, 1, 2, 3		x 7		21
#2	Deliver Black Vehicle to Pick Up Location (only 1 yes)	Correct location (anything touching is inside lines)	0 (no) 1 (yes)		10		10
		Correct location (partial)	0 (no) 1 (yes)		7		
		Moved from original location	0 (no) 1 (yes)		5		
#3	Deliver Key to Pick Up Location (only 1 yes)	Correct location (Medal is completely within the lines - Ribbon can be outside)	0 (no) 1 (yes)		10		10
		Correct location (partial)	0 (no) 1 (yes)		7		
		Moved from original location	0 (no) 1 (yes)		5		
#4	Park White Vehicle (only 1 yes)	Stacked in Adjacent Spot	0 (no) 1 (yes)		16		16
		Stacked in Adjacent Spot (partial)	0 (no) 1 (yes)		13		
		Empty Spot	0 (no) 1 (yes)		10		
		Empty Spot (partial)	0 (no) 1 (yes)		8		
		Moved	0 (no) 1 (yes)		5		
#5	Pylons Avoided	Upright in original location	0, 1, 2, 3, 4, 5		x 3		15
#6	Game Ending Task achieved	Correct Stop location	0 (no) 1 (yes)		9		9
		Correct Calculation	0 (no) 1 (yes)		9		9
#7	Parked Vehicle Violations (Other vehicles moved completely out of origial parking space)		0, 1, 2, 3, 4		x -5		0
#8	Robot remained intact throughout the run		0 (no) 1 (yes)		10		10
#9	Reset was requested (reset penalty)		0 (no) 1 (yes)		-3		0
					TOTAL SCORE Total maximum score = 100		100
					Time Left in Seconds Record only if score is 100		

Scoring Spreadsheet

Robofest 2025
Robot Parking Valet

Location: SAMPLE
Division: Junior

*Time Left is only recorded if Round Score is 100

		Round 1			Round 2					FINAL SCORE		
Team ID	Team Name	Score	Achieved Both Parts of Unknown End Task (Y/N)	Time Left*	Score	Achieved Both Parts of Unknown End Task (Y/N)	Time Left*	Best Score	Average Score	(Best+Avg) 2	Rank	Place/Award
								0	0	0	1	
								0	0	0	1	
								0	0	0	1	
								0	0	0	1	
								0	0	0	1	
								0	0	0	1	
								0	0	0	1	
								0	0	0	1	
								0	0	0	1	
								0	0	0	1	
								0	0	0	1	

Do Not Display

Tie breaker calculation:
(1) best score of two rounds
(2) highest time left from best score
(3) rerun a 3rd round, if needed

Tie Breaker Information			
(1) Best Score	(2) Time for best Score	(3) Rerun (if needed)	Tie Calculation (determines rank in Column M)
0	0		0
0	0		0
0	0		0
0	0		0
0	0		0
0	0		0
0	0		0
0	0		0
0	0		0
0	0		0
0	0		0
0	0		0
0	0		0
0	0		0

Scoring Spreadsheet provided by Robofest Office
Scorekeeper should verify scorecard AND verify data entry of scores
Team rank including tiebreakers are calculated automatically

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9.2 Rules to Determine Winners and Break Ties

- Winners in each age division will be decided by the **(Best + Average)/2** score of the 2 rounds
- Tie breakers will be: (1) best score of two rounds, (2) highest time left from best score (if 100pts), (3) rerun, if needed
- For example:

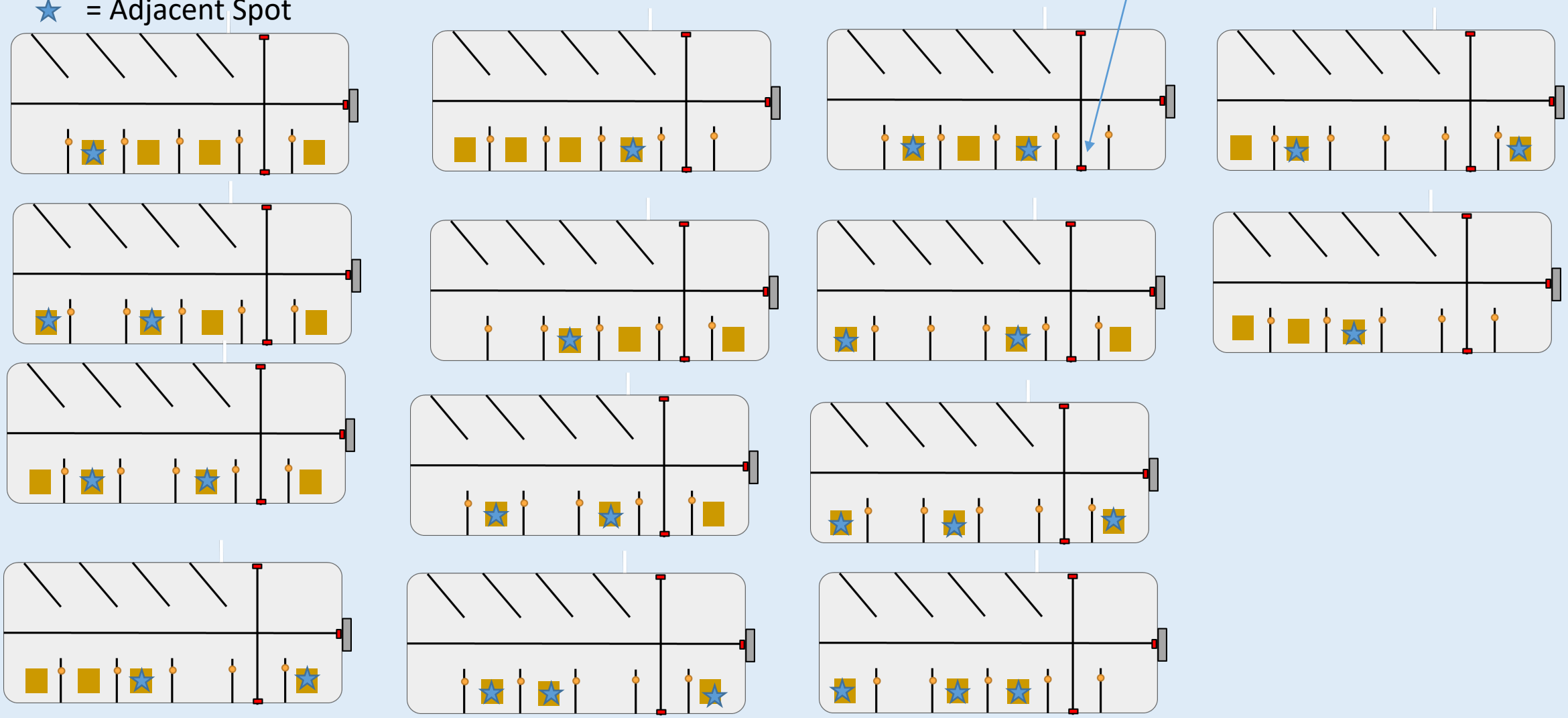
Team Name	Round 1 score	R1 time left	Round 2 score	R2 time left	**Avg. Score**	**(2) Best score**	**(1) (Best+Avg) 2 score**	**(3) Time left @ best score**	**Rank**
Team A	80		100	15	90	100	95	15	**1**
Team B	100	10	80		90	100	95	10	**2**
Team C	100	20	70		85	100	92.5		**3**
Team D	60		100	5	80	100	90		**4**
Team E	90		90		90	90	90		**5**

10.1 Scoring Definition: “Adjacent Spot”

Initial field set up with Black Vehicle removed

★ = Adjacent Spot

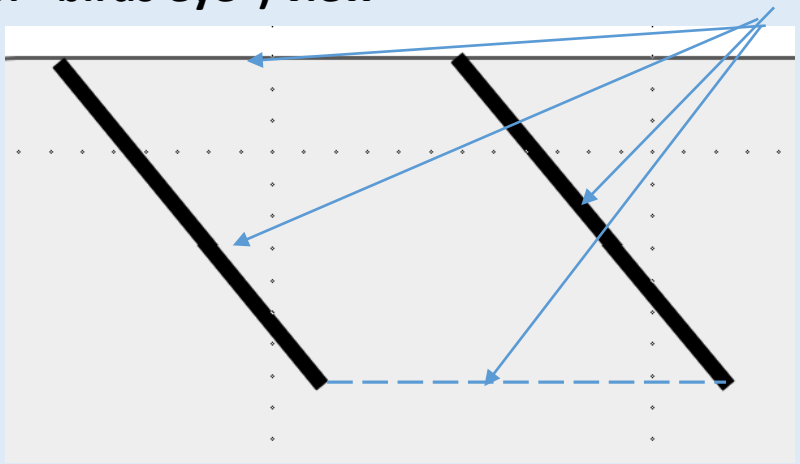
Note: Area near “Z” is an aisle, not a parking spot



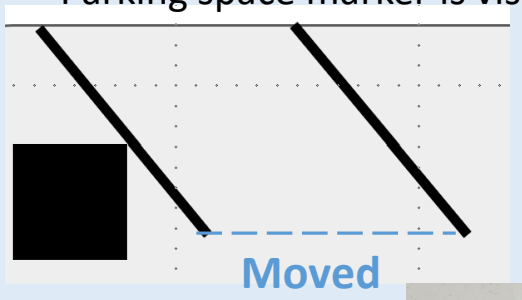
10.2 Scoring Definition: “Black Vehicle to Pickup Location”

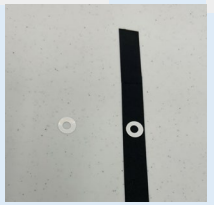
All parts of the vehicle are within the lines in plan (projected or “birds eye”) view

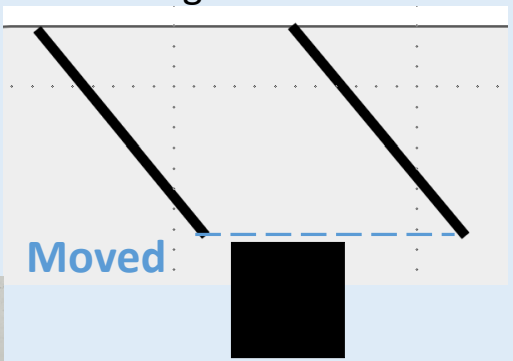
Note: The black lines are included “inside” the lines

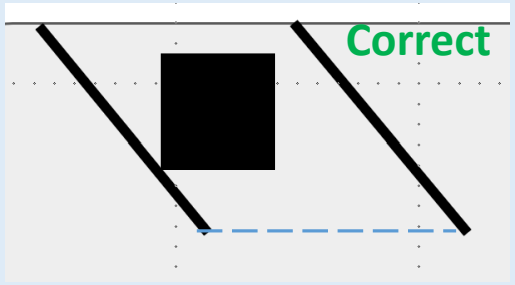


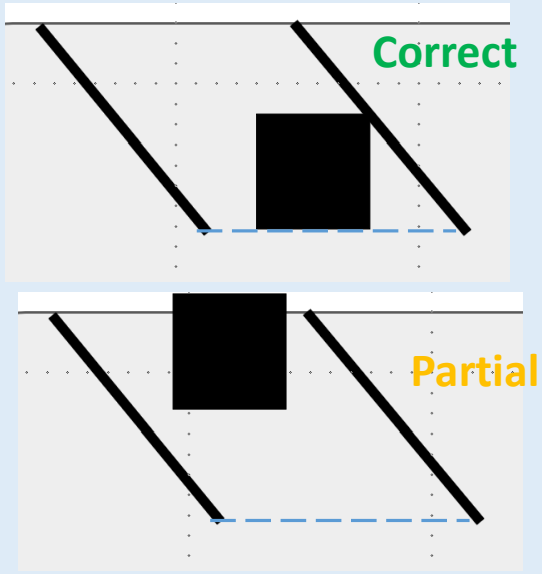
Parking space marker is visible, but nothing is inside lines

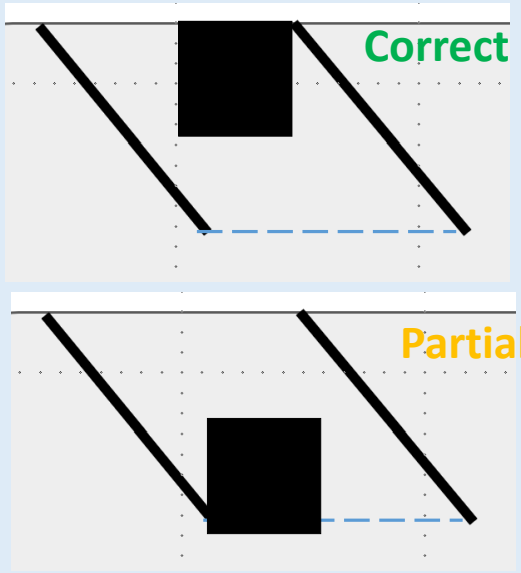


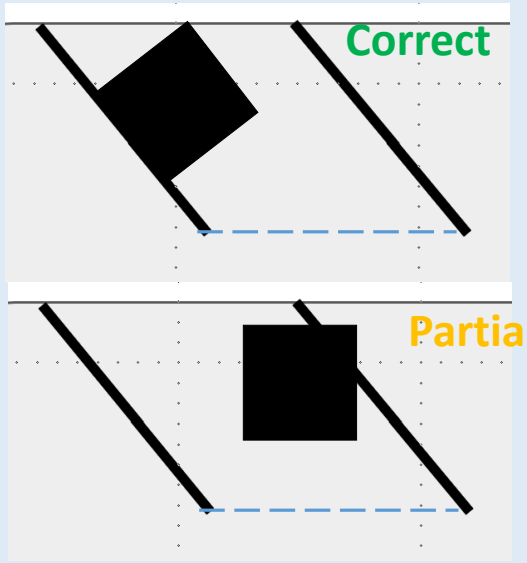








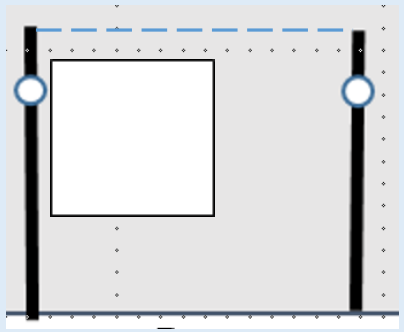




10.3 Scoring Definition: “Park White Vehicle”

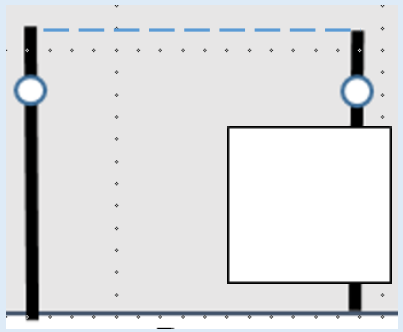
All parts of the vehicle are within the lines in plan (projected or “birds eye”) view

Note: The black lines are included “inside” the lines



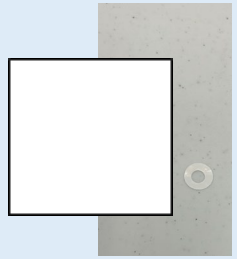
Entire box inside lines

In Empty Spot

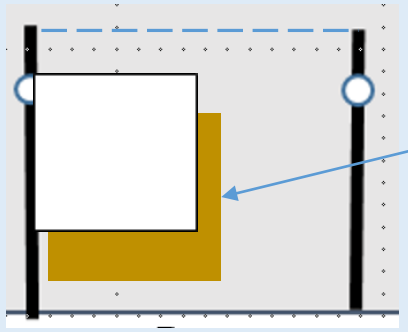


At least some part inside lines

In Empty Spot Partial

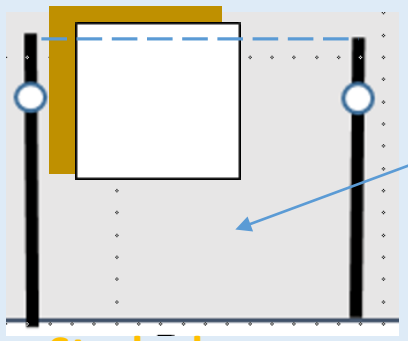


Drop off Area marker is visible, but nothing is inside lines



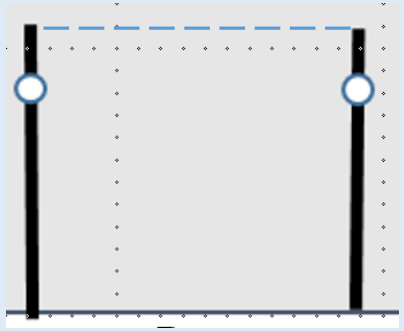
Both vehicles inside lines

Stacked



At least some part of both inside lines

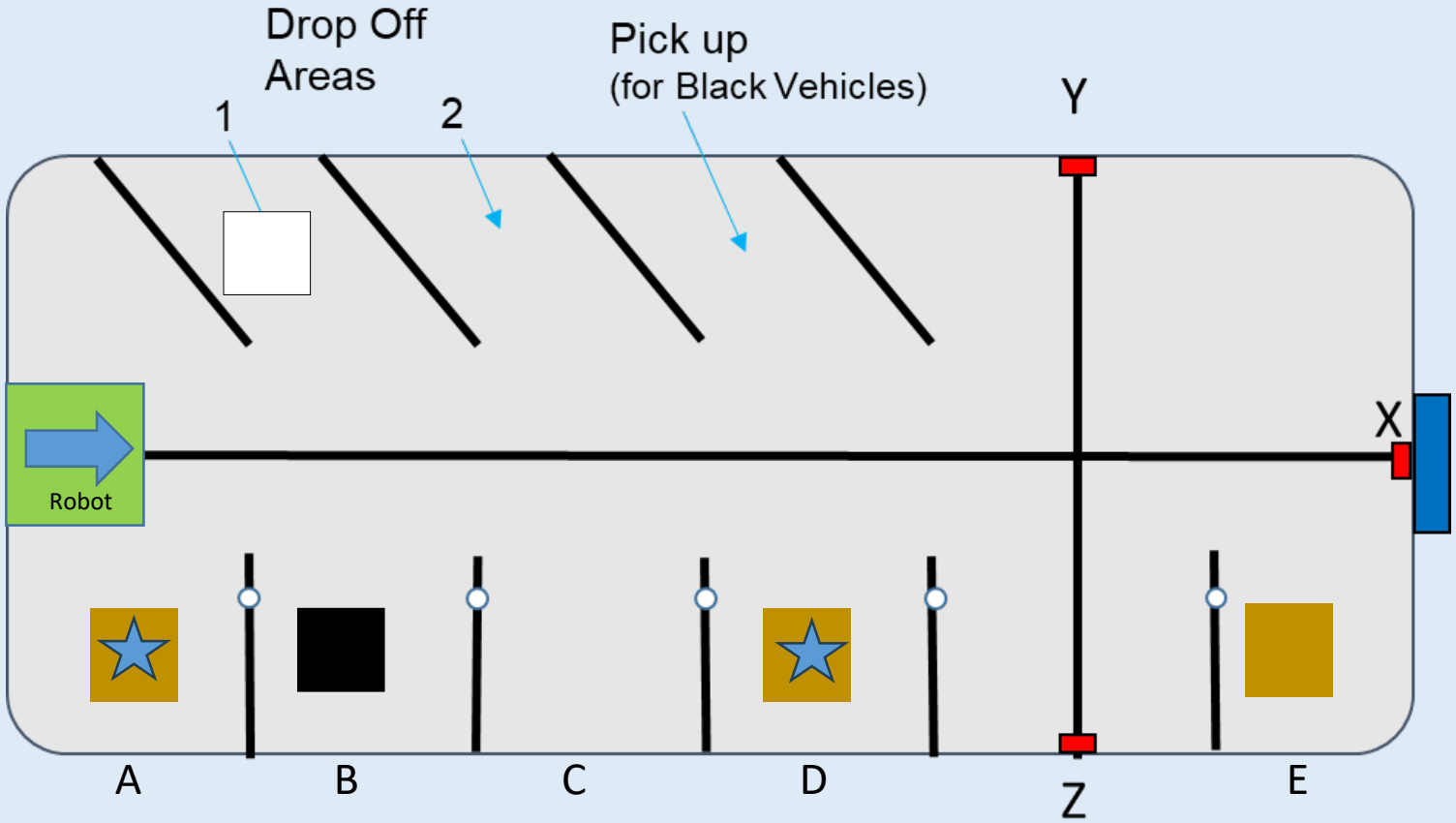
Stacked Partial



Moved

11.1 UTF Jr Division Example

Note: actual UTF's will be different for each round. UTF's may include different stopping locations/conditions and/or measurements/calculations from the examples



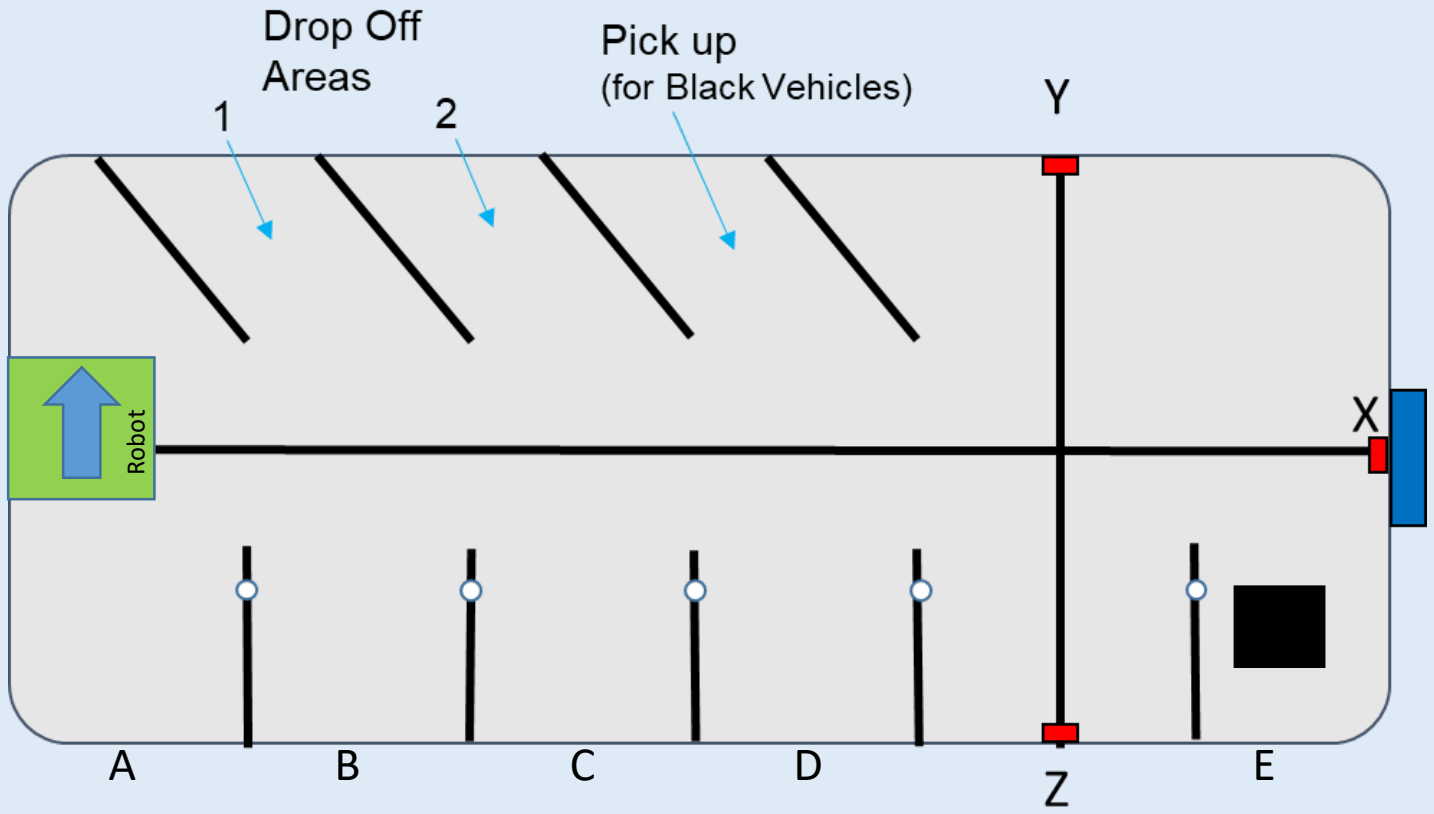
- Robot Start orientation- Facing East
- White Vehicle location- Area 1
- Black Vehicle location- Spot B
- Other Vehicles-as shown

★ = Adjacent Spot

Game-Ending Task: the robot must be stopped in Spot 1 (nothing touching outside the lines) facing northwest and displaying answer to: *If the distance from the robot to X is 155cm, how fast is the robot moving if it takes 6 seconds to go half the distance to x?*

11.2 UTF Sr Division Example

Note: actual UTF's will be different for each round. UTF's may include different stopping locations/conditions and/or measurements/calculations from the examples



- Robot Start orientation- Facing North
- White Vehicle location- Unveiled after impound
- Black Vehicle location- Spot E
- Other Vehicles- unveiled after worktime

Game-Ending Task: the robot must be stopped with some part over location Z and displaying the answer to the equation $(\boldsymbol{total\ number\ of\ vehicles\ in\ spots\ A, B, and\ C})^2$

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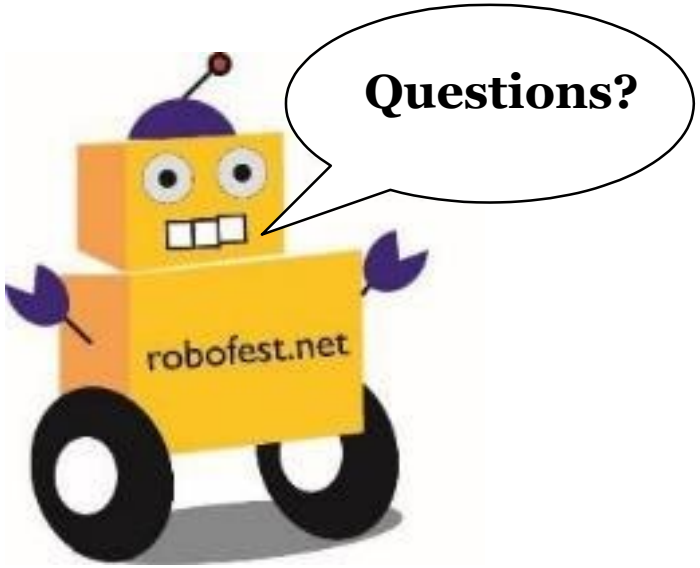
Little Robots, Big Missions



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