Lawrence Technological University

Be curious. Make magic.

LAWRENCE TECHNOLOGICAL UNIVERSITY ROBOFEST®

GAME

Building Bridges

V1 – Initial Version for 2026 Season

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**

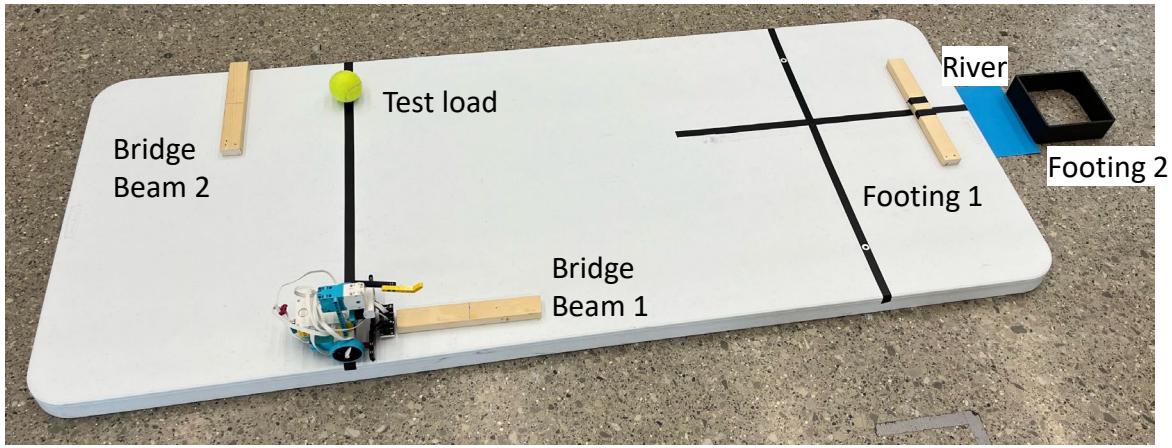
1.1 Game Scenario

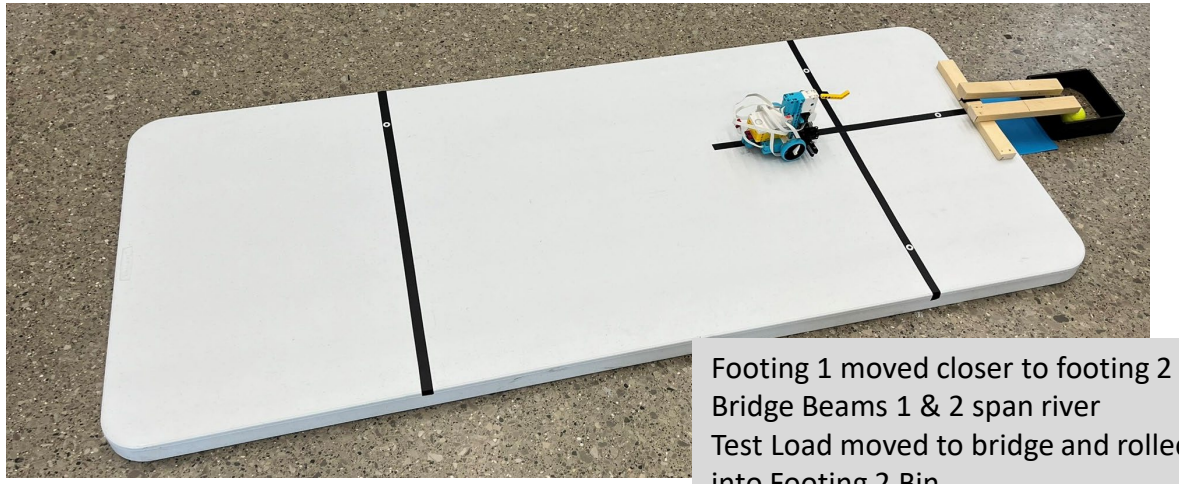
Robots build bridges by performing precision tasks, such as positioning heavy materials. They improve safety, efficiency, and accuracy through autonomous operation and collaboration with human workers.

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





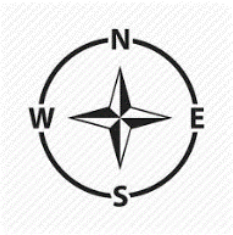
Footing 1 moved closer to footing 2
Bridge Beams 1 & 2 span river
Test Load moved to bridge and rolled into Footing 2 Bin
Robot stopped

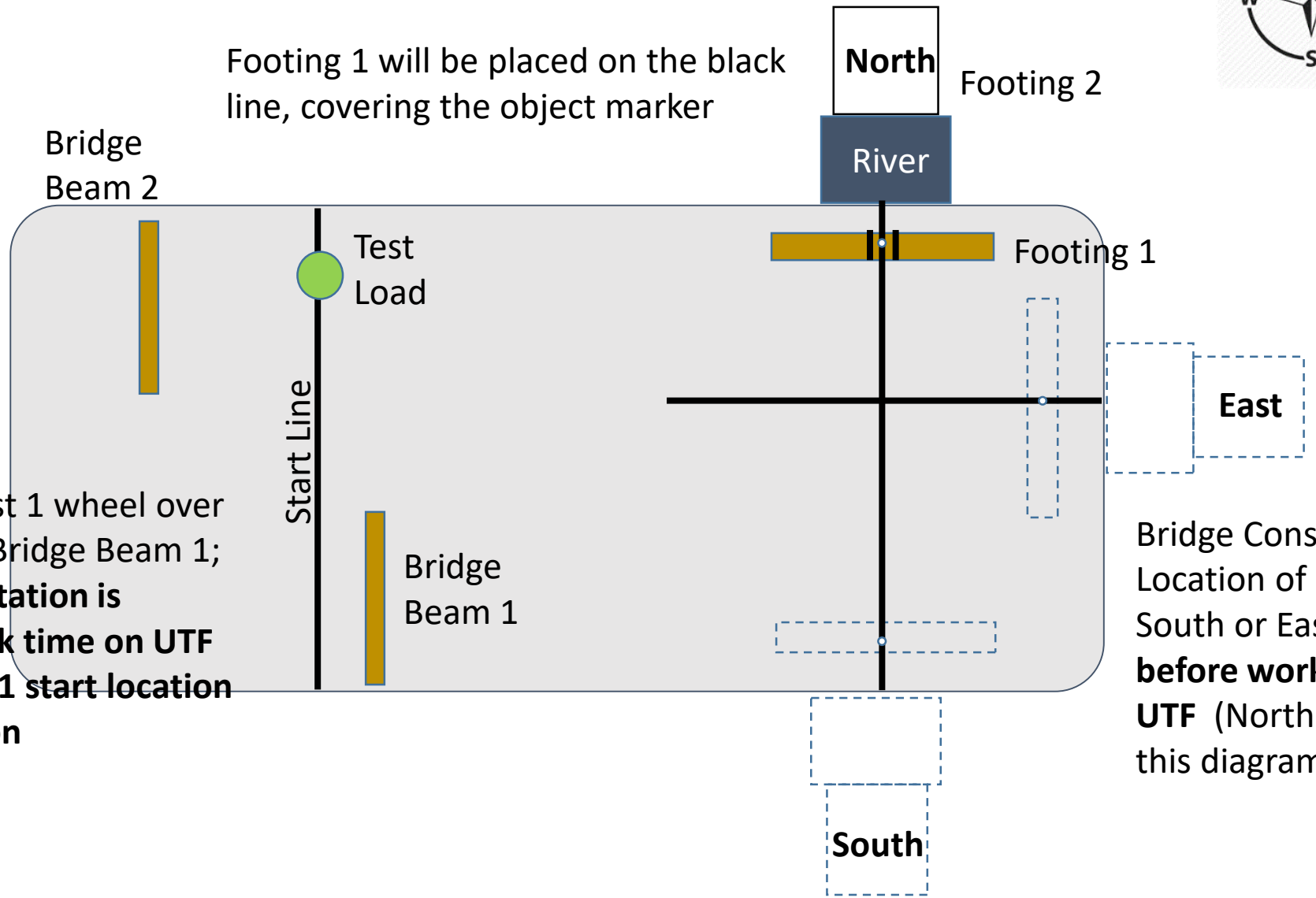
- Build a bridge to one of three possible locations. Move Footing 1 in place. Span the river with 2 Bridge Beams. Roll the Test Load across the bridge
- For a game run, max 2 minutes are given and one full-reset is allowed
- All the tasks must be done autonomously without any external help
- Unknown Tasks and Factors (UTF) will be unveiled just before a 30 minute work-time for each of 2 rounds to include:
  - Target Bridge Location
  - Robot Starting Orientation
  - Start line location
  - Bridge Beam 2 location
  - Test load location
  - Game Ending Robot Location and Task

2 Age Divisions, Team Size and Fees

- Age Divisions:
  - Junior Division (Grades 5-8)
  - Senior Division (Grades 9-12)
- Team Size: Maximum five (5)
- Team Registration Fee:
  - $100 - Local or Video Qualifier (may differ for international events)
  - $100 - Robofest World Championship Finals (if team advances)
- Teams must review and abide by: Robofest 2026 General Rules
- Each team member must bring the signed Robofest Consent and Release Form on the day of the event, if not completed online

3.1 Game Details: Field Setup





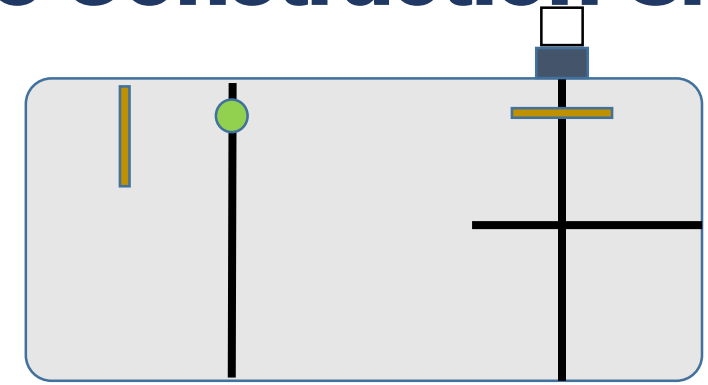
Robot starts with at least 1 wheel over start line and touching Bridge Beam 1;

- **Robot starting orientation is unveiled before work time on UTF**
- **Actual Bridge Beam 1 start location is at team's discretion**

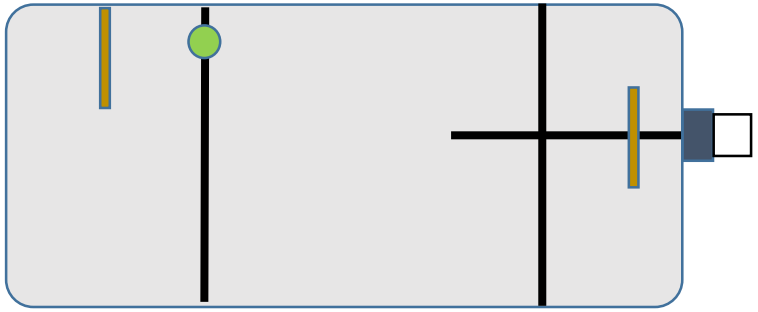
Bridge Construction Location of either North, South or East is **unveiled before work time on UTF** (North is shown on this diagram)

3.2 Possible Bridge Construction Sites

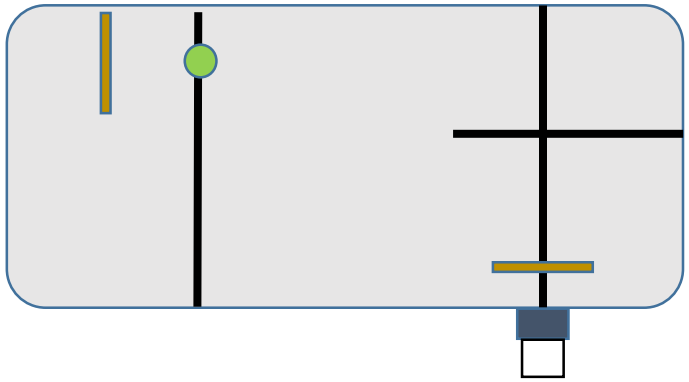
North

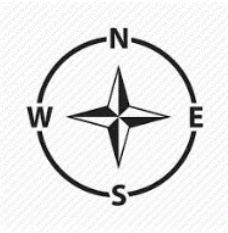


East



South



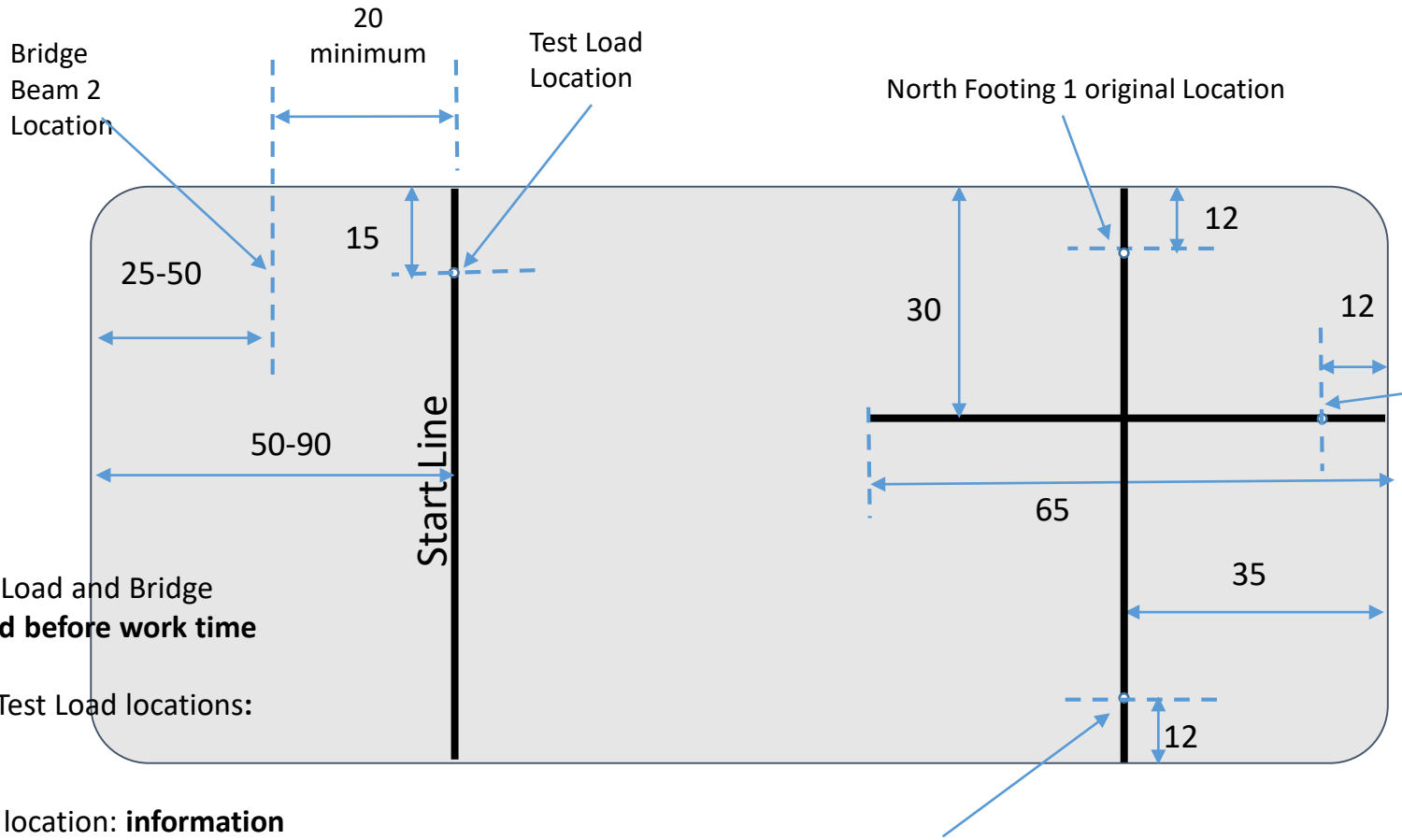


Bridge Construction Location of either North, South or East is **unveiled before work time on UTF for all teams**

3.3 Field Specifications

All dimensions in cm

Locations are +/- 2cm



Jr Division Start Line, Test Load and Bridge Beam 2 locations: **unveiled before work time**

Sr Division Start Line and Test Load locations**: unveiled after impound**

Sr Division Bridge Beam 2 location: **information to determine actual location provided on UTF**

Hole reinforcement stickers are used to mark the test load and footing 1 original locations

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

4.1 Game Details: Tasks and Scoring (1/2)

- All items to be checked at the end of the run except Robot Start, Test Load Delivery, and Reset
- Robot must start in the unveiled orientation as instructed on the Unknown Tasks and Factors (UTF)
- Move Footing 1 from original location into position to hold the bridge beams
  - 15 points (maximum value): if moved to correct location (On line, between object marker and edge of table, marker fully visible)
  - 10 points: if moved (object marker is fully visible)
- Deliver Bridge Beams 1 & 2 to the footings to span the river (each beam is scored separately)
  - 20 points (maximum value): Spans the river with perfect placement (One end on each footing, tape mark on footing 1 is fully covered)
  - 15 points: Correct location (One end on each footing, tape mark on footing 1 remains visible)
  - 10 points: One end is touching either footing 1 or footing 2
  - 5 points: Moved from original location

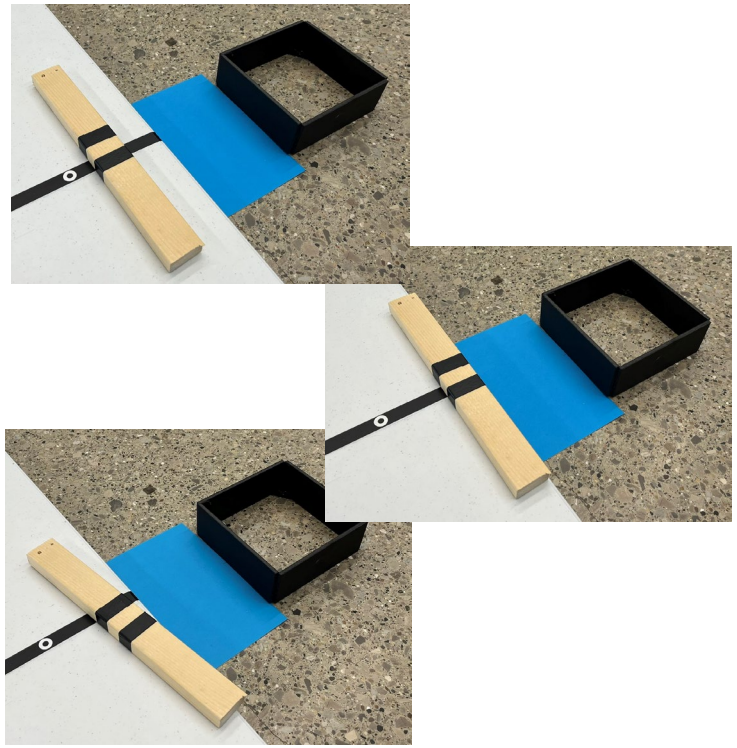
4.1 Game Details: Tasks and Scoring 2/2

- Deliver the Test Load to the Bridge and roll it across to the bin in footing 2
  - 20 points (maximum value): Load is placed on the bridge beams BEFORE midpoint mark on beams and rolls to into the bin
  - 17 points: Load is placed on the bridge beams AFTER midpoint mark on beams and rolls into the bin
  - 15 points: Load is placed on the bridge beams and comes to rest on the bridge beams
  - 12 points: Load is placed in footing 2 bin without touching Bridge Beams
  - 10 points: Load moved from original location and ends up anywhere outside the bin
- Complete End Tasks (each task scored separately, Maximum 14 points)
  - 7 points: Robot is stopped in the correct location as instructed on the UTF
  - 7 points: Robot is stopped in any location on the field and has correct display to the equation on the UTF

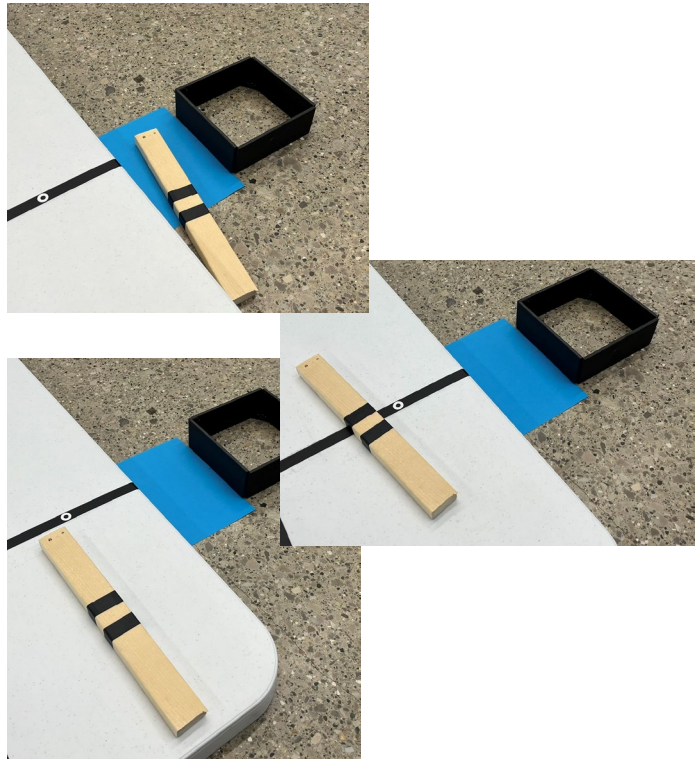
Review Scorecard (section 10) for more scoring and penalty details

4.2 Game Details: Footer 1 Scoring Examples

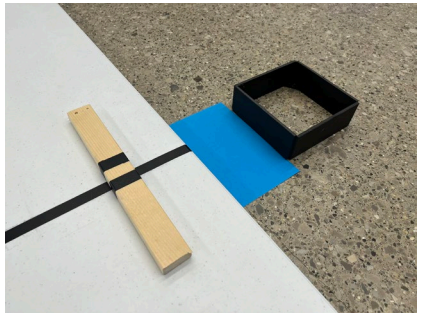
Moved into correct location (On line, placed between object marker and edge of table with marker fully visible)

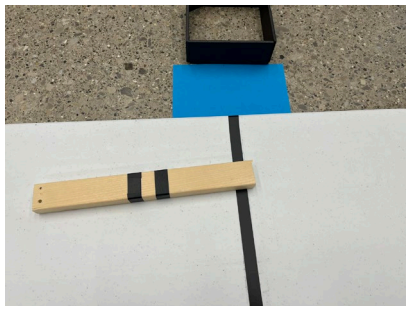


Moved from original location (Any other location with marker fully visible)



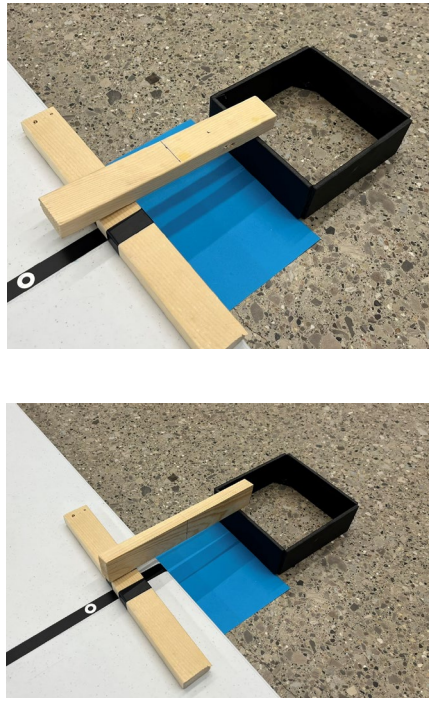
Not Moved (Any position with marker not fully visible)



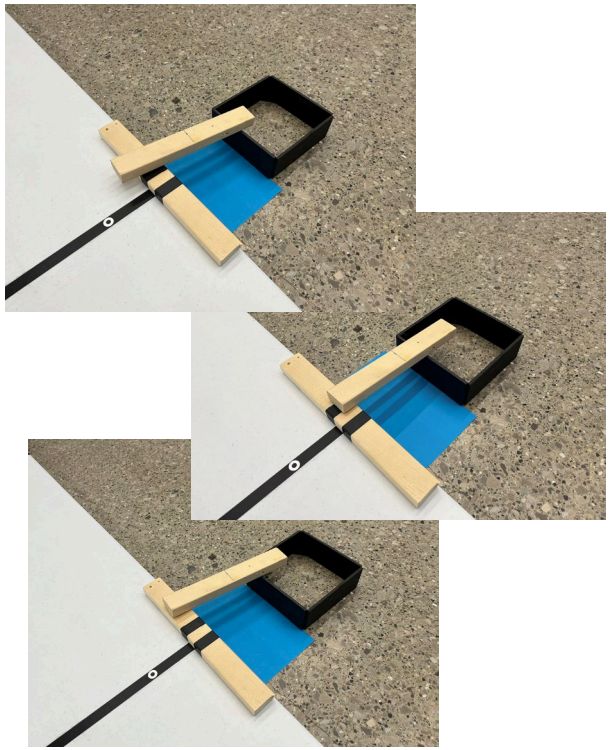


4.3 Game Details: Bridge Beam Scoring Examples

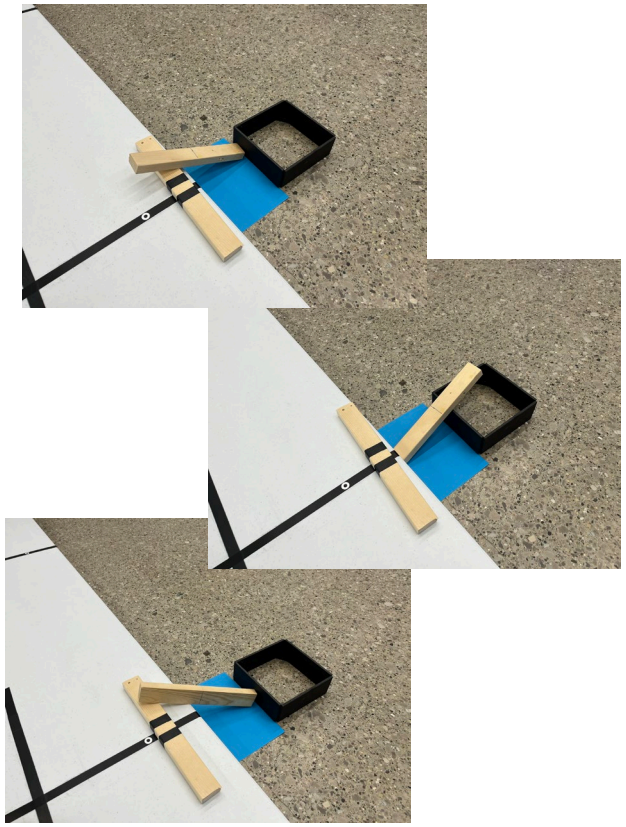
Spans the river with perfect placement (One end on each footing & tape mark on footing 1 is fully covered)



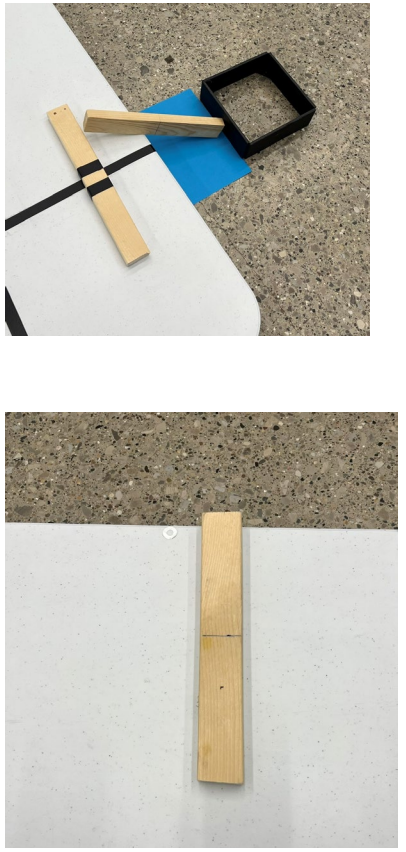
Correct location (One end on each footing, tape mark on footing 1 remains visible)



One end is on either footing 1 or footing 2



Moved from original location



5 Differences Between Jr and Sr Divisions

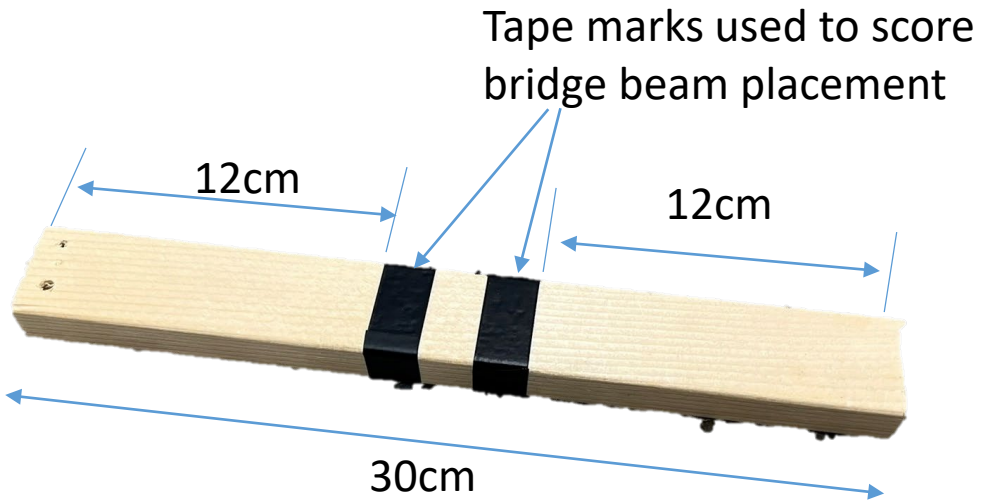
	Junior (5th ~ 8th grades)	Senior (9th ~ 12th grades)
Game-Ending Task	Easier – Unveiled before worktime	Harder – Unveiled before worktime
Start line location	Unveiled before worktime	Unveiled **after** impound
Bridge Beam 2 Location	Unveiled before worktime	Information to determine actual location provided on UTF
Number of onboard computer controllers	One	No limit
Vision (Camera) sensor	Not allowed	Allowed

6 Materials List

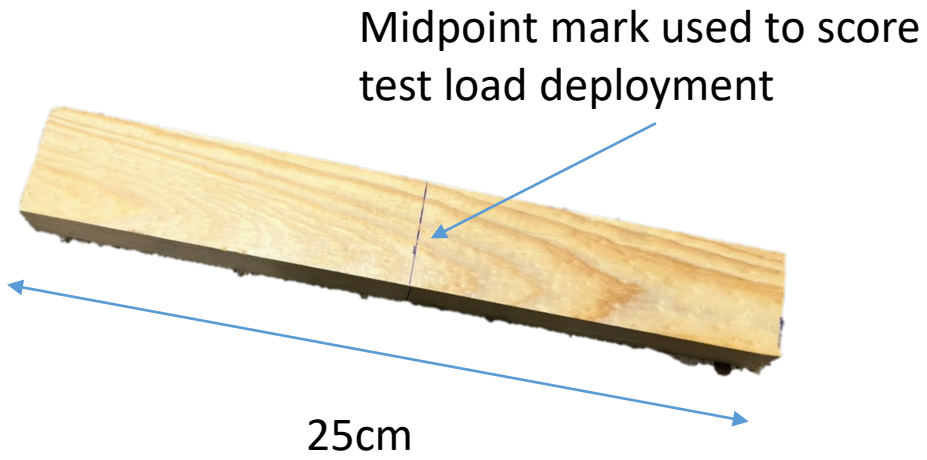
- Field: 6ft plastic folding table placed on the floor:
  - 30in x 72in (actual size is about 75cm x 182cm) - Recommended brand is “LifeTime”
  - Corners are rounded with a radius of 4cm ~ 7cm. Thickness is about 4.5cm
  - Surface is light in color such as white, gray, or almond; exact size, color, brightness, and edge shape is unknown until competition
  - Fold-In-Half plastic tables can be used if the center seam is covered with tape similar to the table color
  - Pieces of plywood cut similarly to the folding tables can be used if plastic folding tables are not available
- Floor color under fields: Unveiled at the beginning of competition day, possibly not homogeneous. However, all the floor colors should be noticeably darker than the field color
- Footing 1: 30cm long 1x2 wood, approx. with tape marks 12cm from each end (See Section 6.1)
- Footing 2: structure made of foam board (See Section 6.2)
- River: 10cm x 21cm piece of dark paper
- Bridge Beams 1 and 2: 25cm long 1x2 wood, approx. with line to mark halfway point of beams (See Section 6.1)
- Test load: tennis ball (any color)
- Lines: Black electrical or painters tape, approximately 19mm wide: used on table and footing 1
- Object Markers: Hole reinforcement stickers: used to mark the location of Footing 1, Test Load, and Beam 2 (link)
- Transparent Tape: used to secure Footing 2 to River and Table

6.1 Footing 1 and Bridge Beams

- Footing 1
  - 1x2 Lumber
  - 30cm long
  - Taped as shown with electrical or painters tape
  - Between 75-113g



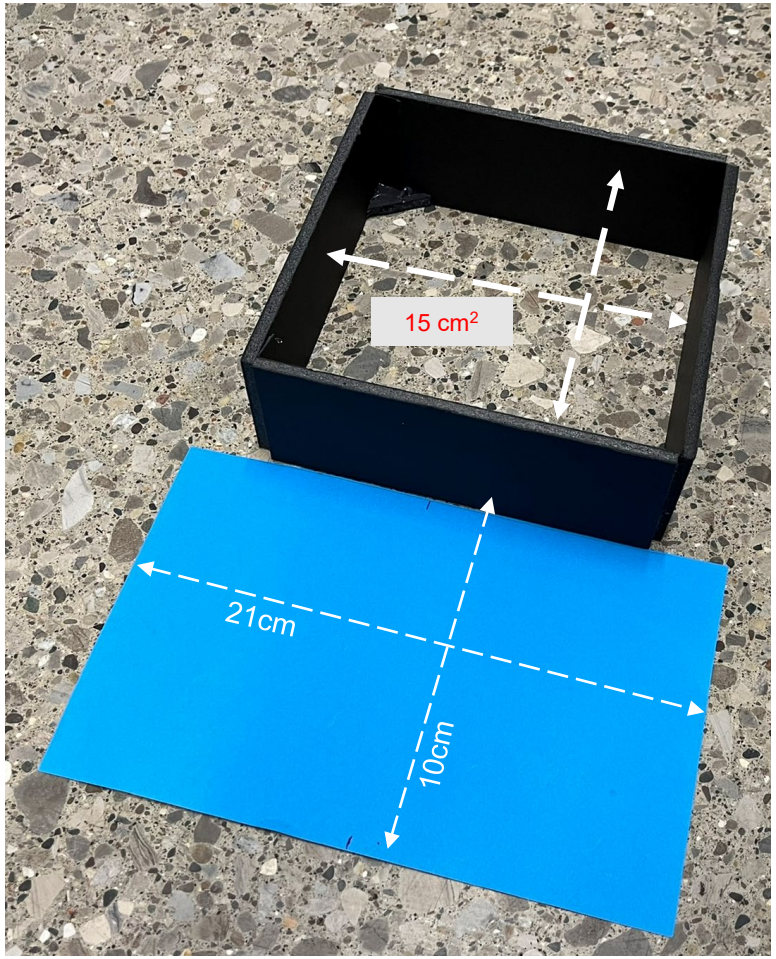
- Bridge Beams (qty 2)
  - 1x2 Lumber
  - 25cm long
  - Line at the midpoint
  - Between 60-90g



6.2 Footing 2 and River

- Footing 2
  - Walls 5cm x 15cm foamboard
  - Can be cut from 5cm x 61cm piece and taped together
- River
  - Made from 10cm x 21cm paper
  - Medium to Dark Blue (unveiled at competition)

Footing and river are taped together and to the game field with transparent tape



7 Robot Specifications

- Team may only compete with 1 robot at a competition
- Robot must be created by students. If a team is identified to have a robot too similar to another robot (including robots from the same organization and both Jr and Sr divisions) or clearly not their own, team will be subject to investigation and possible disqualification
- Any robot kit/material may be used to construct your robot including tape, glue, bolts and nuts, rubber bands, etc. (Scoring Objects i.e. beams or tennis balls are not allowed)
- **Maximum length and width: 50cm x 35cm *including expansion (must show during impound inspection)***
- Height limitation: none
- Weight limitation: none
- Any number of sensors/sensor types unless harmful to humans (except vision/camera is not allowed for Jr Division)
- Any number/type of motors/servo motors (multiplexor is OK to use)
- All the wheels for driving must touch the table surface during inspection
- Labeling requirements:
  - Robofest Team ID on any visible surface – (Team Name optional)
  - “Front” indicator which must remain the same for both rounds of the competition
- Display screen for any Game-Ending Task that requires robot to display numbers
- Robot must be started using a button or sensor on the robot (not by tablet, computer, etc.)
- Robot can not damage field or game elements or will be subject to penalty and disqualification

8 Violations, Full-Reset, End of Run Declaration

- When any of the following violations occur, Judges shall stop the game play immediately (and robot if still moving) to avoid further disruption of the field:
  1. Human touches the robot or field materials. Once the robot starts moving, the player cannot touch it
  2. Robot falls off the table (any part of the robot touches the floor)
  3. 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 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 (at the discretion of the Chief Game Judge)
- 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)

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**	**(1) Best score**	**(Best+Avg) 2 score**	**(2) 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 Scorecard 1 / 2

https://www.robofest.net/images/2526/Game2026Scorecard.pdf

Judging Items (All items to be checked at the end of the run except items #4 and #8)			Possible Count	Actual Count	Point Value	Score Earned/Lost	max value
#1	Footing 1	Moved into correct location (On line, between object marker and edge of table, marker fully visible)	0 (no) 1 (yes)		15		15
		Moved from original location (Object marker fully visible)	0 (no) 1 (yes)		10		
#2	Bridge Beam 1	Spans the river with perfect placement (One end on each footing & tape mark on footing 1 is fully covered)	0 (no) 1 (yes)		20		20
		Correct location (One end on each footing, tape mark on footing 1 remains visible)	0 (no) 1 (yes)		15		
		One end is on either footing 1 or footing 2	0 (no) 1 (yes)		10		
		Moved from original location	0 (no) 1 (yes)		5		
#3	Bridge Beam 2	Spans the river with perfect placement (One end on each footing & tape mark on footing 1 is fully covered)	0 (no) 1 (yes)		20		20
		Correct location (One end on each footing, tape mark on footing 1 remains visible)	0 (no) 1 (yes)		15		
		One end is on either footing 1 or footing 2	0 (no) 1 (yes)		10		
		Moved from original location	0 (no) 1 (yes)		5		

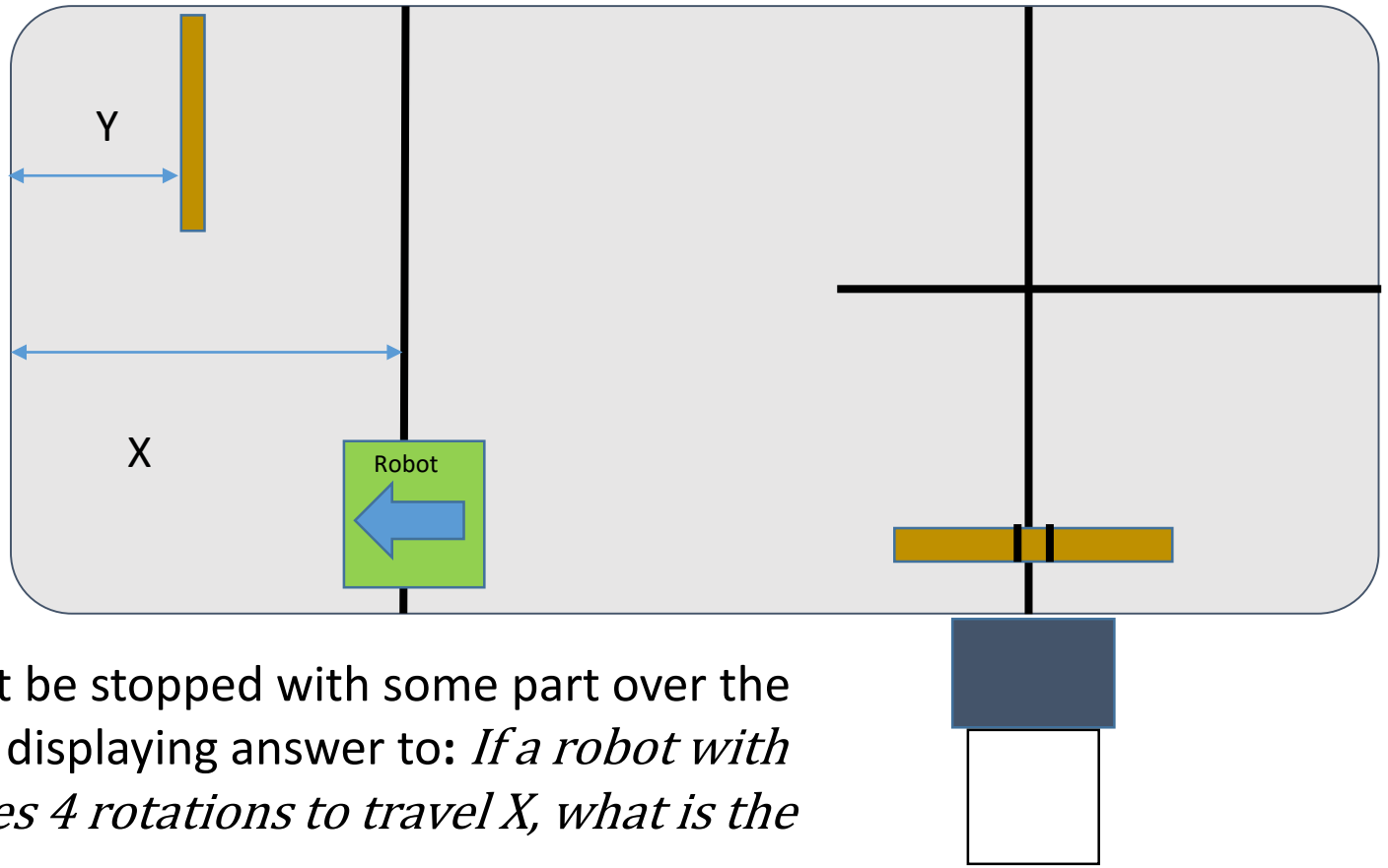
10 Scorecard 2 / 2

#4	Test Load	Placed on Bridge Beams BEFORE midpoint mark on beams, rolled to into footing 2 bin	0 (no) 1 (yes)		20		
		Placed on Bridge Beams AFTER midpoint mark on beams, rolled into footing 2 bin	0 (no) 1 (yes)		17		
		Placed on Bridge Beams remains on bridge	0 (no) 1 (yes)		15		
		Placed in footing 2 bin without touching Bridge Beams	0 (no) 1 (yes)		12		
		Moved from original location	0 (no) 1 (yes)		10		20
#5	Game Ending Task Achieved	Robot Stopped in Correct UTF Location	0 (no) 1 (yes)		7		7
		Correct Display Shown (Robot must be Stopped)	0 (no) 1 (yes)		7		7
#6	Robot remained intact throughout the run		0 (no) 1 (yes)		11		11
#7	Field/Field Object Damaged		0 (no) 1 (yes)		-15		0
#8	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		

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 West
- Bridge location: South
- X: 35 cm
- Y: 20 cm

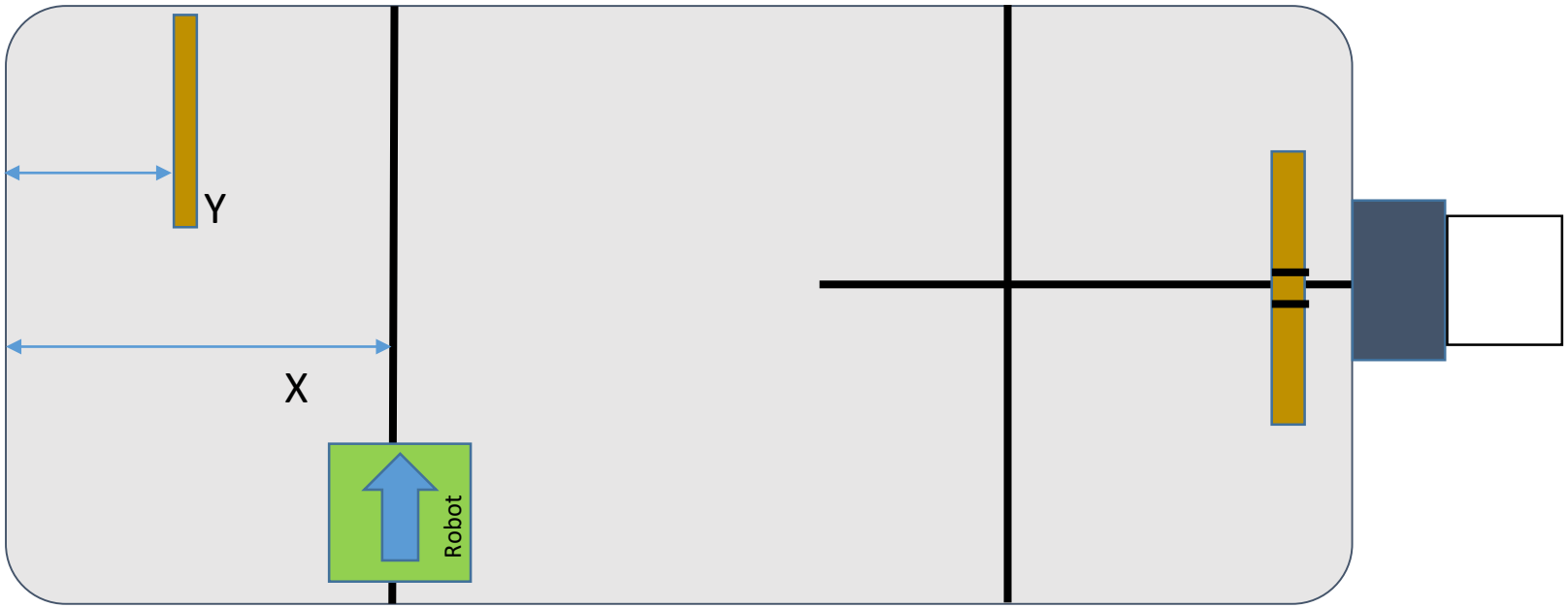


Game-Ending Task: the robot must be stopped with some part over the intersection of the black lines and displaying answer to: *If a robot with wheel circumference of 5cm takes 4 rotations to travel X, what is the distance of X in cm?*

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
- Bridge location: East
- X: 30-50 cm
- Y: X÷2



Game-Ending Task: the robot must be stopped with some part over the start line and displaying the answer to the equation $(X + 3)^2$

12 Game Video Qualifier Submission Option

- Teams that cannot attend an in-person qualifier or would like a second chance to qualify may compete via Video Submission
- Specific requirements for this option are outlined in section 6 of the Robofest 2026 General Rules

13 FAQ 1 of 2

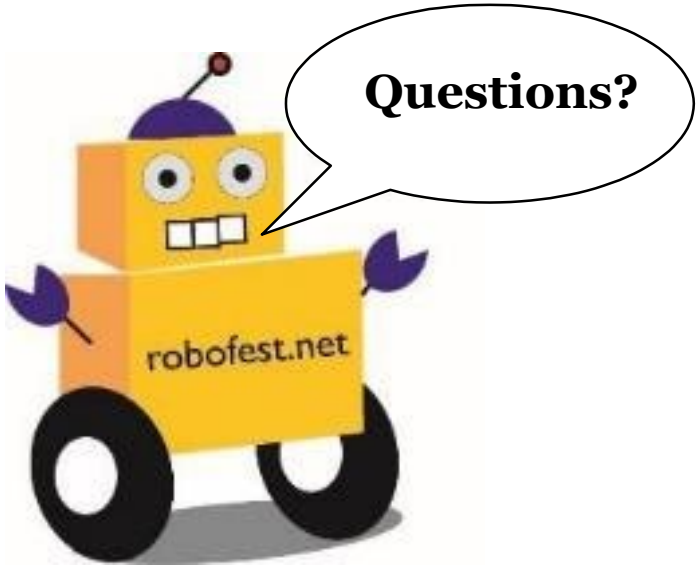
- Is there any limit on the number of controllers in Robot Game? For example, can I use 2 Spike Prime Hubs? **Jr Division is limited to one controller. There is no limit for Senior Division**
- Is a motor powered by an external battery legal? **Yes, if starts the round off (not moving) and is turned on autonomously (by a sensor or timer, for example)**
- How accurately do the objects have to be placed on the tables? **Judges should make sure that objects are placed on their markers and aligned within approximately +/- 1 cm**
- If the midpoints are different on the bridge beams when placed on the footers, which midpoint is used to determine the placement of the Test Load for scoring? **The midpoint closest to footer 2 (furthest from the robot) will be used for scoring**

13 FAQ 2 of 2

- What is the outcome regarding “staying intact” if a robot comes apart during the match, a team asks for a reset, puts the robot back together, and it stays together? Does the team get credit? **Yes, the game is judged at the end, so the team gets credit for “intact”, but it loses 3pts for a reset.**
- Do the UTF calculations have to be performed by the robot or can they be hand calculated and the robot just displays the answer? **UTF calculations (some or all) may be performed by hand, though some part of the calculation may need input from the robot, such as in the Sr UTF example.**

LAWRENCE TECHNOLOGICAL UNIVERSITY
ROBOFEST

Little Robots, Big Missions



Game Committee Members

Prof. Elmer Santos *
Mr. John Arnold
Dr. Christopher Cartwright
Prof. Peter Guenther
Mr. Steven Kryskalla

* Committee Chair

Send questions to: robofest@LTU.edu

ROBOFEST Lawrence Technological University