BOTTLESumo
TIME TRIAL

Synopsis: Be the Fastest Robot to Push the Bottles Off the Table & *Survive*

V 1.0 (02-06-21) – Final Version for 2021
This file can be found under the **Get Involved→BottleSumo** Page on the website
Coaches are responsible for communicating rules updates to contestants

www.robofest.net   **robofest@ltu.edu**

Lawrence Technological University

1. BottleSumo Time Trial Overview

Learning Objectives

- STEM subjects including physics
- Autonomous navigation
- Computer programming logic
- Edge detection
- Object detection
- Autonomous search algorithms
- Adjusting to environmental conditions
- Problem solving

Synopsis

- The objective of BottleSumo Time Trial is Be the Fastest Robot to Push the Bottles Off the Table & Survive

2. Age Divisions and Team Size

- Three Divisions
  - Junior Division (Grades 5-8)
  - Senior Classic Division (Grades 9-12)
  - Senior Unlimited Division (Grades 9-12)

- Team Size: Maximum three (3) members per team for Jr. Division and both Sr. Divisions

- Related important document - Robofest 2021 General Rules at robofest.net

- Each team member, as well as the coach, must submit a completed/signed Robofest Consent and Release Form online, emailed to Robofest office or turned in to Site Host on competition day

3. Robot Requirements (1/2)

- Robot must be fully-constructed upon arrival to the competition
- Robot must be fully autonomous. No human control, signal, or remote computer control (tele-op)
- One robot per team (same robot must be use entire tournament)
- Robots must have labels clearly indicating their team ID number and FRONT of robot (side with sensors)
- Teams will need a laptop computer to modify their programs for unknown starting task and to adjust for conditions that are unknown until the competition day

	Junior Division	Senior Classic	Senior Unlimited
Maximum robot weight	0.9 Kg	1.5 Kg	3 Kg
Robot Brain	LEGO NXT, LEGO EV3, LEGO SPIKE Prime or Vex IQ		Any
Maximum robot width, length, and height	Must fit in 20x20x20cm box. Robots may **NOT** expand their dimensions during the game.	Must fit in 30x30x30cm box. Robots **may expand** their dimensions, but the maximum dimensions allowable is 35x35x35cm.	
# of robot brains per robot	One brain only	Any	
Traditional sensor types	Any unless it can be harmful to humans.		

3. Robot Requirements (2/2)

	Junior Division	Senior Classic	Senior Unlimited
On-board vision sensor system	**NOT** allowed	Examples of allowed vision sensors: • NXTcam: • Pixicam: • Others such as smart phone vision:	
Number of sensors	At least one sensor that can detect dark/light contrast on the plane of the table AND at least one sensor that can detect objects in front . These may be needed for unknown start		
	Maximum 4 sensors (Sensor Multiplexer NOT allowed)		Unlimited (Sensor Multiplexers ALLOWED)
Number of motors	Maximum 3		Unlimited
Motor types	LEGO NXT(9842), LEGO EV3 (455202), LEGO SPIKE Prime (45602,45603) or Vex IQ (228-2560) only. Voltage altering over default voltage is **NOT** allowed. Other motors such as LEGO Power Function and EV3 medium motors **NOT** allowed		Any
Wheels, tread, or legs (the parts driven by motors which touch the ground)	Must be standard LEGO or Vex IQ parts that are completely unmodified. Vacuum or sticky material **NOT** allowed		Vacuum or sticky material **NOT** allowed
Other Material	Any. You may use tape, glue, rubber bands, etc. to construct the robot		
Programming language	Any		

4. Playing Field Table(s) (1/2)

- Competition tables are 30"x72" (actual size is about 75 cm x 182 cm) plastic folding tables

- The recommended brand is "Lifetime" which can be found at
  https://www.lifetime.com/lifetime-2901g-6-foot-folding-table-commercial

- The four corners of the table are rounded. The radius of the corner circle is 4cm ~ 7cm

- Table thickness is about 4.5cm

- Table surface is light in color, for example, almond, tan, or gray

- Exact size, color, brightness, and edge shape are unknown until the day of the competition

- The table(s) are placed on a dark colored floor with the legs folded under and raised up with rolls of packing tape, (a stack of three recommended)

12.75 cm
3 stacked packaging tapes

Raised Table Setup for all Divisions

4. Playing Fields (2/2)

- **Junior Division:** Made up of one table and two bottles

COMMON CAMERA VIEW for Jr Div
Example of BottleSumo Initial Robot and Bottle Configuration, Junior Division
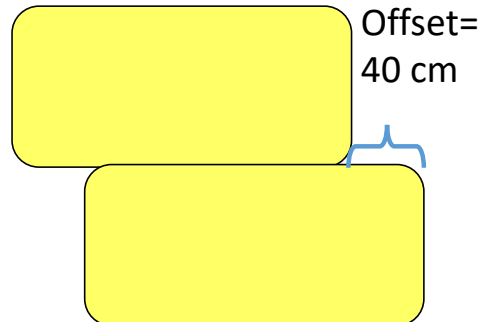
Team Table

CAMERA

- **Senior Division**: Made up of two offset tables and three bottles

Team Table

Offset= 40 cm

COMMON CAMERA VIEW for Sr Div

Example of Initial Robot and Bottle Configuration, Senior Division

CAMERA

Note: Camera and team table location not required for in person competitions.

Connect tables with tape of a matching color

5. Bottle Specifications

- A two-liter bottle is covered with Legal size (8.5"x14") white paper

- Red electrical tape or color paper is used to create a 3.8cm red stripe as shown 8cm from the bottom of the bottle

- Bottle is filled with approximately 1 liter of water – total weight is 1kg

- If the two-liter bottle shown right is not available, a slimmer bottle may be modified by using materials like *yoga mats or sponge sheets*. You may also use the thin bottle as is.

21.6cm (8.5")

3.8 cm

8 cm

Bottle diameter = 10cm (3.94")
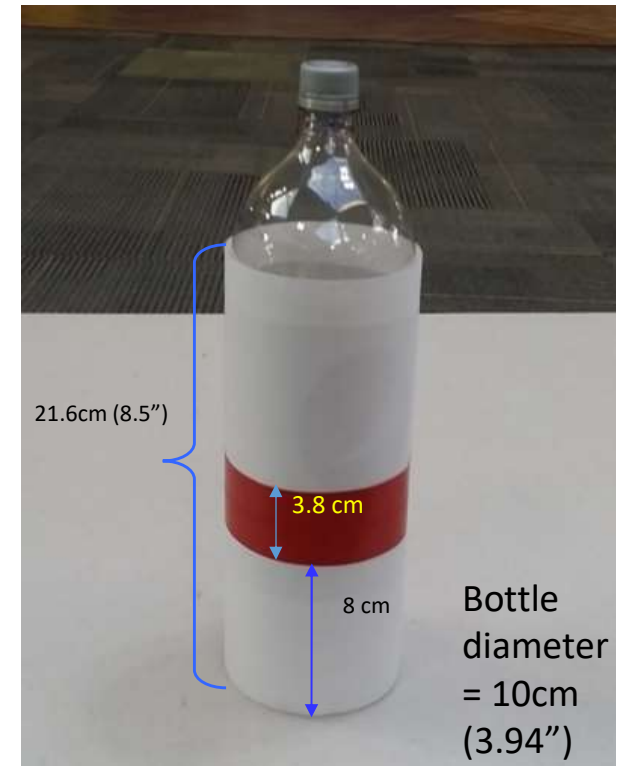
Bottle Dimensions

6. Unknown Start Task – Example

- The way to start the robot moving is an **<u>Unknown Task</u>** that is unveiled 20 minutes prior to the start of the time trial

- *Unknown Task Example :*
  - *Robot will wait 5 seconds. Judge will place the bottles on the table during the 5 second period*

- *Additional examples can be found at robofest.net*

7. Competition Procedures

- Only participants are allowed to access the pit area, team tables, practice fields and official game fields throughout the competition day. Adult may assist with transporting team materials, but can not stay in pits

- Robots will be inspected as part of the check in process (size, weight, labels, materials, etc. Read slide #3 and #4)

- Immediately after opening ceremonies, the Unknown Task is unveiled. 20 minutes will be given to teams to work on their robots

- After the 20 minute work period, all the robots will be checked for size and weight

- Bottle locations will be unveiled after the 20 minute work period

- After the 20 minute work time, team members should not touch their robot until instructed by a judge

8. Time Trial Round (1/2)

- Judge will measure the time taken for each robot (one per table) to push 2 bottles (Jr. Division) or 3 bottles (Sr. Divisions) off the table

- Maximum time given is 2 minutes

- Unknown Task must be used to initiate the robot or it will be penalized and *not allowed to continue*

- Time will be recorded to 1/100 of a second

- If a robot commits "Sumocide" by falling off the table, survival time and number of bottles pushed off the table will be recorded. (See penalty points on slide #12 and examples on #17)

- Robot must remain on the table for at least 3 seconds after the last bottle is pushed off or it will be penalized (See #12 and #17)

8. Time Trial Round (2/2)

- After the 20 minute work time, the bottle locations for round 1 will be announced.

- After the first run, teams are NOT allowed to modify robot or program.

- The bottle locations for the second round will be announced after the 1st round.

- Winners will be decided by the average results from the 2 rounds.

- Teams will be ranked based on **1) Unknown task completion, 2) Number of bottles, 3) Staying on the table for at least 3 sec after the last bottle off, 4) Elapsed Time**

- To allow averaging of scores, the following penalties apply
    - Unknown task not completed (Time will be **1000 sec**)
    - Bottles left on table (Time will be **250 sec** per bottle, plus any other penalties)
    - Robot does not remain on table for 3 sec after last bottle (Time will be **250 sec** - survival time, plus any other penalties)
    - See Section 13 for scoring examples

9. How to Start a Run

- The specific robot starting location and orientation will be unveiled
- Team will place robot on table in the specified location and assure that it is ready
- Judges will place bottles according to instructions
- Judges will signal when everything is ready
  - Playing field setup
  - the team
  - Judge
  - Videographer (online and video only)
  - Site Host will
    - Check that Sites are ready
    - Verify timer is ready
    - 3-2-1 "Go"
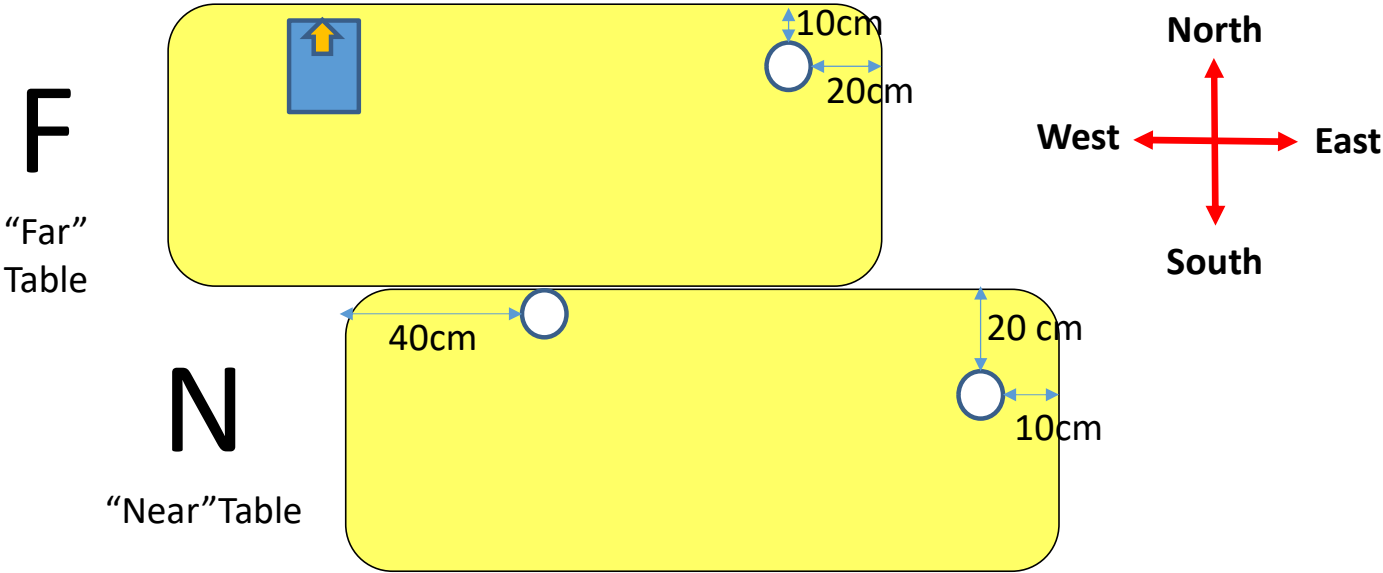- Teams start their robot then step back

10. Jr Division Bottle Locations Example

"North" side

"West" side

10cm

10cm

"East" side

10cm

80cm

"South" side
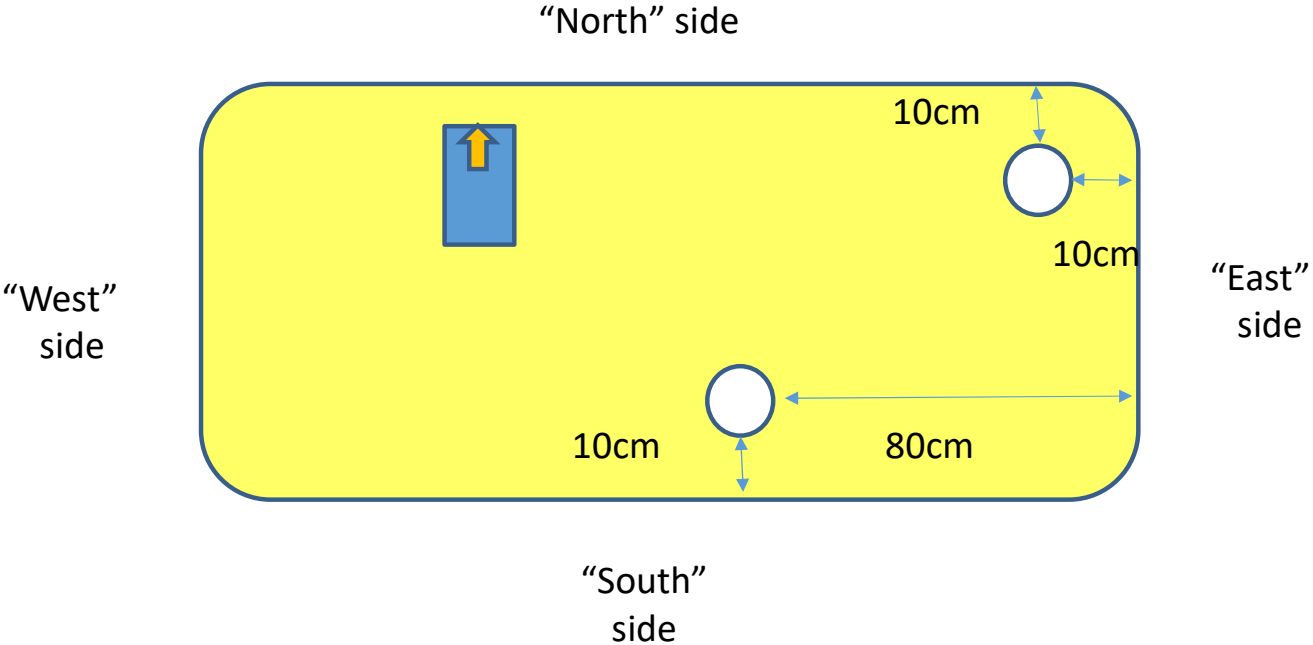
CAMERA   Standard Camera View

Note: Camera not required for in person competitions.

11. Sr Bottle Locations Example

F "Far" Table

N "Near" Table

10cm
20cm
40cm
20 cm
10cm

North
West — East
South

Standard Camera View

CAMERA

Note: Camera not required for in person competitions.

12. Score Sheet

| **BottleSumo Time Trial Scoresheet**		
Division (circle one) Jr Sr	Team ID _____ Team Name _____	Round (circle one) 1 2
Unknown Start was Correct?	Y N	
Number of Bottles pushed off	0 1 2 3 (Sr Only)	
Did the robot stay on the table for 3 sec after last bottle?	Y N	
CHECK ONE BELOW ____**Completion Time** (if all bottles off and robot on table; do not include 3 sec after bottle off) **OR** ____**Survival time** (if bottles left or robot falls off table)	 Elapsed (from Zero)	 Remaining (from 120 sec) Record BOTH times
Judge's Initials	_____	
Team Member's Initials	_____	

13. Round Scoring & Team Ranking Example

	R1	Note	R2	Note	Total	Avg	Rank
Team 1	1000	Failed unknown task	100.5	100.5s Completion time*	1100.5	550.25	4
Team 2	130	Last bottle off at 120s, sumocide at 121s. (250-120)	470	Sumocide at 30s; one bottle on the table (250-30+250)	600	300	3
Team 3	250	Robot survives on the table at the end; One bottle on the table	140	Sumocide at 110s; No bottle on the table (250-110)	390	195	2
Team 4	500	Robot survives on the table at the end; Two bottles on the table (250+250)	740	Sumocide at 10s; Two bottle on the table (250-10+250+250)	1240	620	5
Team 5	120	120s Completion time*	130	Last bottle off at 120s, sumocide at 123s (250-120)	250	125	1

(*) Note that the completion time does not include the 3 seconds (1-2-3) after the last bottle off

Note that Team 5 R2 had a better score than Team 3 R2 because it survived for a longer time.

14. Online Competition Rules

- Team ID sign needed

- Teams must use common Online camera set up (see below)

- Need to check playing field setup before the official runs

- Each location must have location judges to proctor & prevent unauthorized activities. See next slides

- Translators are allowed where needed

Team Table
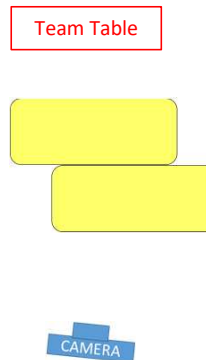
CAMERA

Preferred Camera View

15.1 Qualification & Roles of Location Judges

- Location Judges (LJ) must complete and sign the Pre-Event Checklist, show it during check-in and submit with the official scores
- LJ must sign a pledge document and recite the pledge during the opening ceremony
- LJ needs to be a person who does not have any direct relation to the team and approved by the National Director
- LJ must attend Online training

15.2 Qualification & Roles of Location Judges

- LJs are to proctor & prevent unauthorized activities
- LJ will score each round and submit the official scores
- LJs are responsible for capturing a video of each run for score verification, uploading it to a video sharing platform and sending the link to Robofest
- The video must show our identifiable screen & sound in the beginning & the end for us to verify whether the video was taken during the official time
- The videos must be uploaded and links must be sent within 1 hour of the end of the competition

16. Pre-Event Checklist Examples

ROBOFEST — Jr BottleSumo Time Trial — **BOTTLESumo**
Location Head Judge (LHJ) Pre-Event Checklist

LHJ* is required to PRINT THIS CHECKLIST and check off each item before logging in to the Webinar on event day. During Check-in, show this completed and signed sheet to LTU Staff.

*You must be registered as a Judge for the Event and and ZOOM Webinar via the Google Form link

Prior to Event (check each item with a heavy mark so it is visible on camera):
- ☐ Read and understand 2021 BottleSumo Time Trial rules
- ☐ Print Time Trial Forms http://www.robofest.net/images/1920/TimeTrialScoreSheets.pdf
- ☐ Prepare Field (see p6 of rules): 1 table, at least 12.75 cm off the floor
- ☐ Prepare 2 Water bottles: (see p7 of rules)
  - ☐ paper/tape applied
  - ☐ verify 1kg weight
- ☐ Prepare other materials:
  - ☐ scale
  - ☐ measuring Tape
  - ☐ pencil/pen
  - ☐ clipboard (optional)
  - ☐ tripod (optional)
- ☐ Prepare Zoom Webinar device (Laptop, Tablet or Phone)
  - ☐ stable internet connection
  - ☐ battery fully charged
  - ☐ camera accessible
  - ☐ set up so 1) camera is ready for initial presentation 2) camera can move to team pit area for work time and 3) camera can move to competition table for rounds
  - ☐ microphone/speakers (test volume, mute/unmute)
- ☐ Prepare Video & audio recording device
  - ☐ battery fully charged
  - ☐ enough memory storage

Event Day - Prior to Zoom Webinar Check-in:
- ☐ Confirm Recording Judge has the recording device with battery memory storage
- ☐ Confirm Coach has printed team sign and has it ready to show
- ☐ Confirm Coach has received Consent Form (online or hard copy) for each participant
- ☐ Check Robot Weight (maximum 0.9 kg)
- ☐ Check Robot Size w/l/h (maximum 20x20x20 cm - may not expand)
- ☐ Check Robot has "Front" label
- ☐ Inspect Robot for any illegal Materials (see pp 3 & 4 of rules)
- ☐ Assemble Judges and Team to prepare for Zoom Check-in

I _____ verify that I have completed each item on this checklist
(send an image of this form to esantos@ltu.edu with the completed scoresheets.)

01/25/2021

ROBOFEST — Sr UL/Sr CL BottleSumo Time Trial — **BOTTLESumo**
Location Head Judge (LHJ) Pre-Event Checklist

LHJ* is required to PRINT THIS CHECKLIST and check off each item before logging in to the on event day. During Check-in, show this completed and signed sheet to LTU Staff.

*You must be registered as a Judge for the Event and and ZOOM via the Google Form link

Prior to Event (check each item with a heavy mark so it is visible on camera):
- ☐ Read and understand 2021 ROWC BottleSumo Time Trial rules
- ☐ Print Time Trial Forms http://www.robofest.net/images/1920/TimeTrialScoreSheets.pdf
- ☐ Prepare Sr. Field (see p6 of rules): 2 tables with 40cm offset TO THE LEFT at least 12.75 cm off the floor
- ☐ Prepare 3 Water bottles: (see p7 of rules)
  - ☐ paper/tape applied
  - ☐ verify 1kg weight
- ☐ Prepare other materials:
  - ☐ scale
  - ☐ measuring Tape
  - ☐ pencil/pen
  - ☐ clipboard (optional)
  - ☐ Tripod (optional)
- ☐ Prepare Zoom device (Laptop, Tablet or Phone)
  - ☐ stable internet connection
  - ☐ battery fully charged
  - ☐ camera accessible
  - ☐ set up so 1) camera is ready for initial presentation 2) camera can move to team pit area for work time and 3) camera can move to competition table for rounds
  - ☐ microphone/speakers (test volume, mute/unmute)
- ☐ Prepare Video & audio recording device
  - ☐ battery fully charged
  - ☐ enough memory storage

Event Day - Prior to Zoom Check-in:
- ☐ Confirm Recording Judge has the recording device with battery memory storage
- ☐ Confirm Coach has printed team sign and has it ready to show
- ☐ Confirm Coach has received Consent Form (online or hard copy) for each participant
- ☐ Check Robot Weight (maximum)
  - ☐ Sr. Classic: 1.5 kg
  - ☐ Sr. Unlimited: 3.0 kg
- ☐ Check Robot Size w/l/h (maximum) 30x30x30cm to start - may expand to 35x35x35cm
- ☐ Check Robot has "Front" label
- ☐ Inspect Robot for any illegal Materials (see pp 3 & 4 of rules)
- ☐ Assemble Judges and Team to prepare for Zoom Check-in

I _____ verify that I have completed each item on this checklist
(send an image of this form to esantos@ltu.edu with the completed scoresheets.)

01/25/2021

Official forms can be accessed at BSTT page

BottleSumo 2021 Rules   02/6/2021

17. Event Timing for Online Competitions

- All teams will start simultaneously
- Site Host is the official timer
  - Local judges will use the Robofest start signal via Online connection
  - Local judge will enter an estimated time on the scoresheet
  - Official times will be determined by the Site Host after the event
- No reruns
- Judge should not instruct team to pick up robot until either
  - Robot has pushed off all bottles and survived 3 sec
  - Robot has fallen off the table
  - Robot is still on the table after 120s
- Robofest reserves the right to make judgements and score adjustments after review of team submissions

18. FAQ (Frequently Asked Questions)

- Can a robot have multiple programs to select from when a game is started? Yes. However, the selection must be done quickly.

- My robot failed the unknown start. Can I still do the time trial. No, scored as 1000 seconds.

- My start button was not pressed correctly. Can I touch the robot after the game started? No in general, but up to the Judge's discretion. Unknown Start Method must be used.

- If team A knocks all the bottles off in 30 seconds and meets all of the rules, their score is 250-30=220 If Team B knocks all 3 of in 40 seconds your scoring system awards team B 250 - 40, or 210, a lower score, and they win. This doesn't make sense. Common sense says team A wins because they accomplished their task faster. The (250 seconds minus survival time) penalty only comes into play if the robot does not survive for 3 sec after pushing off the last bottle. In the example given, the faster robot would be ranked higher, Team A (30s) ranked ahead of Team B (40s). The logic behind the penalty is that if neither robot survives, the robot which survived longer is ranked higher. Going back to the example, but assuming each robot fell off the table right after pushing off the last bottle, Team B (250-40=210) would be ranked ahead of Team A (250-30=220) because it survived for longer.