

The 7th Kibo Robot Programming Challenge Rulebook for Beginner Course



Version 1.0 (Revision date: October 15, 2026)

Japan Aerospace Exploration Agency (JAXA)



Revision History

Revision history is listed below.

Revision Date	Version	Section	Revised Location
October 15, 2026	1.0	-	-



Table of Contents

1. Introduction.....	1
2. Preliminary Round.....	3
2.1. Preliminary Round Period.....	3
2.2. Game Rules.....	4
2.2.1. Game Flow	4
2.2.2. Preconditions.....	6
2.2.3. Game Content.....	2
2.2.4. Mission Completion Report.....	2
2.2.5. Number of Program Runs.....	3
2.3. Scoring	4
2.3.1. Scoring Elements.....	4
2.3.2. Checkpoint Passing Judgment Examples.....	5
3. Preliminary Round Event.....	7
3.1. How to Participate in the Preliminary Round.....	7
4. Final Round.....	8
Appendix	9

1. Introduction

The **Beginner's Course** of the **7th Kibo Robot Programming Challenge (Kibo-RPC)** is designed primarily for programming beginners and students at the junior high school level or below.

Compared with the Regular Course, participants compete under simplified game conditions with a lower level of difficulty. The winning team from each participating country or region (the finalist) will advance to the Final Round. Top-ranking teams will receive awards. Please note that even if a team wins the Beginner's Course, it will not be eligible to participate in the on-orbit Final Round Run conducted aboard the International Space Station (ISS).

Participants may also choose to enter the Regular Course simultaneously.

Teams are eligible to participate in the Beginner Course if they meet all of the following requirements:

- All team members must be **junior high school students or younger**.
- All team members must be **programming beginners (self-declared)**.^{*1}
- The team satisfies the above two requirements and wishes to participate in the Beginner Course.

^{*1}: Teams that have participated in previous Kibo-RPC competitions may also participate, provided that all team members are programming beginners.

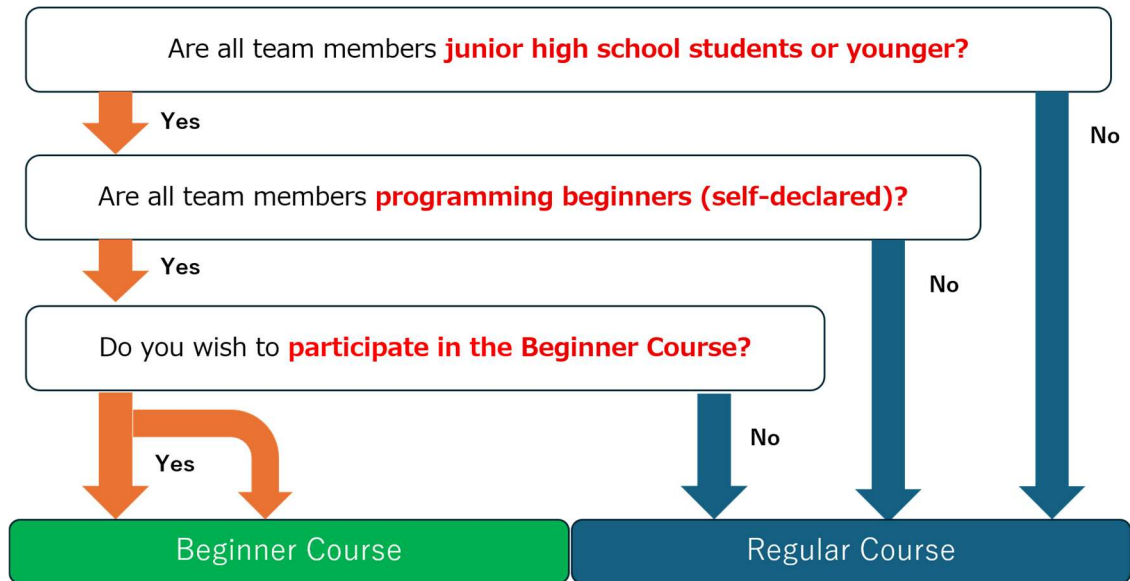


Figure 1-1. Eligibility Flowchart

The Beginner Course uses the same game rules as the Regular Course. However, robot attitude and AR marker identification results are not evaluated for scoring in the Beginner Course.

2. Preliminary Round

2.1. Preliminary Round Period

The Preliminary Round is held separately in each country/region during the period, so please participate in the Preliminary Round held in the country/region where you registered. Information on each country/region's Preliminary Round is posted on the official Kibo-RPC website (<https://jaxa.krpc.jp/>). For details, please contact the POC of your country/region.

Question deadline^{*1}: January 20, 2027, 12:00 (JST)

Program submission period: January 20, 2027, 23:59 (JST)

Preliminary round period: January 21 – February 17, 2027

^{*1} Any questions submitted after this date will receive a delayed response.

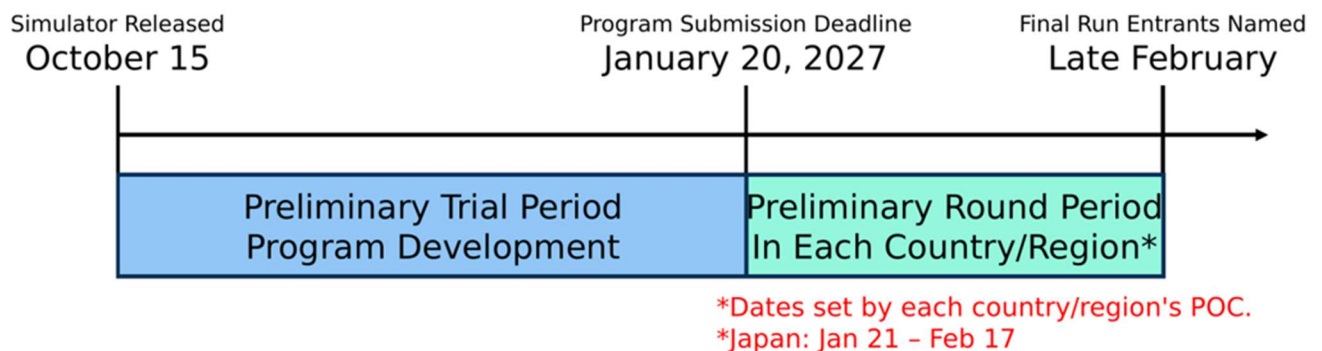


Figure 2.1-1 Schedule up to the Preliminary Round

2.2. Game Rules

2.2.1. Game Flow

In the Preliminary Round, participants shall develop a program using JAXA's web-based simulation environment to control the JAXA Int-Ball 2 (IB2) and complete the mission described below.

Starting from the Dock Station, the IB2 shall travel to the CheckPoints located throughout the Kibo module and visit them within the time limit. The mission ends when the IB2 reaches the Goal CheckPoint and reports the mission result.

The mission proceeds as follows:

1. The game starts when the IB2 automatically undocks from the Dock Station.
2. The program receives and reads the position and orientation information of the CheckPoints, which are automatically distributed at the beginning of the mission.
3. The IB2 visits the distributed CheckPoints by following an efficient path planned by the participant's program.
4. The mission is completed when the IB2 has visited all CheckPoints and reached the Goal CheckPoint.

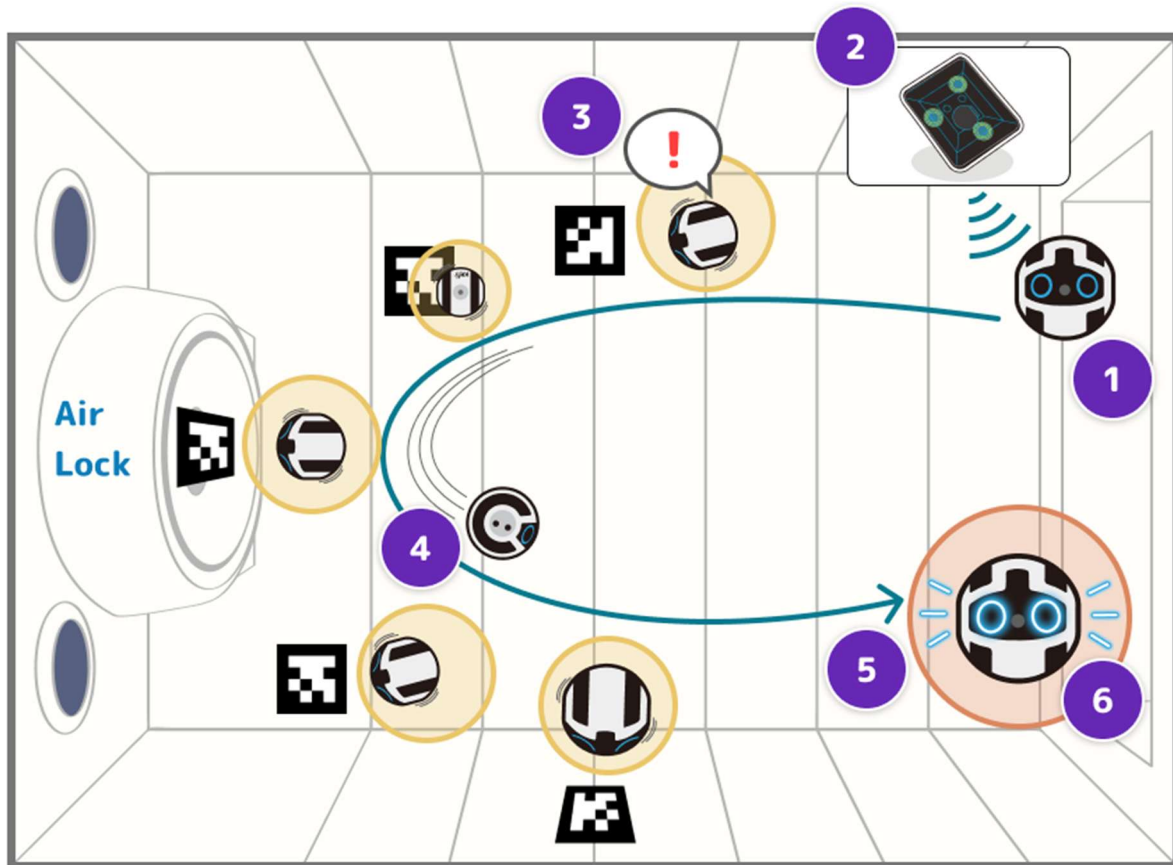


Figure 2.2.1-1 Overview of the Preliminary Round Game

2.2.2. Preconditions

Table 2.2.2-1 Preconditions for Preliminary Round

#	Content
1	The starting position shall be the Dock Station. Time measurement begins when the undocking procedure is completed.
2	The mission includes between 6 and 12 CheckPoints, depending on the difficulty level. (A passing point defined relative to an AR marker is referred to as a CheckPoint.) Each CheckPoint is defined as a spherical region and is placed at a random position relative to its corresponding AR marker.
3	The following disturbance module is enabled as an environmental factor (simulation only): ① Microgravity Module
4	The following information is provided to participants in advance. - Fixed values ① Position of the start point (StartPoint) ② Position and attitude of the rounding completion report position (RoundingCompletionPoint). ③ Total number of CheckPoints ④ Range of the CheckPoints (by difficulty level) ⑤ Position information and IDs of the AR markers ⑥ Position of the goal point (GoalPoint) - Variable values (random) ① CheckPoint (passing point) with each AR marker as its origin = parameters of a specified distance
5	The following information is not provided to participants. ① Position and attitude pattern of the CheckPoints at the time of simulation execution ② Gravity generation pattern of the microgravity module
6	The time limit is 5 minutes from the start of the timer (the completion report must be included within the time limit).

■ AR Marker Position and Attitude Information

The following table shows the position and attitude information of the AR markers used in the IB2 simulator. (The origin of each position is the docking station.)

Table 2.2.2-2 Coordinate and Attitude Information of the AR Markers

AR Marker	Target	Position			Attitude (quaternion)			
		x	y	z	x	y	z	w
ARmarker1	SAIBO	1.451	-1.001	0.681	-0.707	0.000	0.000	0.707
ARmarker2	RYUTAI	2.973	-1.001	0.718	-0.707	0.000	0.000	0.707
ARmarker3	MSPR_1	3.313	-1.001	0.523	-0.707	0.000	0.000	0.707
ARmarker4	MSPR_2	4.181	-1.001	0.523	-0.707	0.000	0.000	0.707
ARmarker5	RMS_Console	5.754	-1.001	0.838	-0.707	0.000	0.000	0.707
ARmarker6	EPS1	1.895	-0.282	-0.208	0.000	0.000	0.707	-0.707
ARmarker7	MELFI1	1.451	-1.001	0.372	-0.707	0.000	0.000	0.707
ARmarker8	EPS2_2	4.779	0.112	1.884	-0.707	0.707	0.000	0.000
ARmarker9	EPS2_1	2.066	1.046	-0.014	0.000	0.707	-0.707	0.000
ARmarker10	ECLSS_TCS2	5.851	0.010	1.884	-0.707	0.707	0.000	0.000
ARmarker11	Airlock	7.195	0.363	1.230	0.500	0.500	-0.500	-0.500
ARmarker12	Bay0_Closeout_Panel	0.000	-0.059	-0.102	-0.500	0.500	-0.500	0.500

■ Int-Ball2 Start Position

Table 2.2.2-3 Int-Ball2 Start Position and Attitude Information

		Position			Attitude (quaternion)			
		x	y	z	x	y	z	w
Start Position	DockingStation	0.200	0.000	0.000	0.000	0.000	0.000	1.000



Figure 2.2.2-1 Docking Station Coordinate System (Conceptual Image)

***Area is displayed as a plane.**

The position information corresponds to the AR markers, and a random pattern is set. Three margin levels are set for each CheckPoint, and points are assumed to be awarded according to each level.

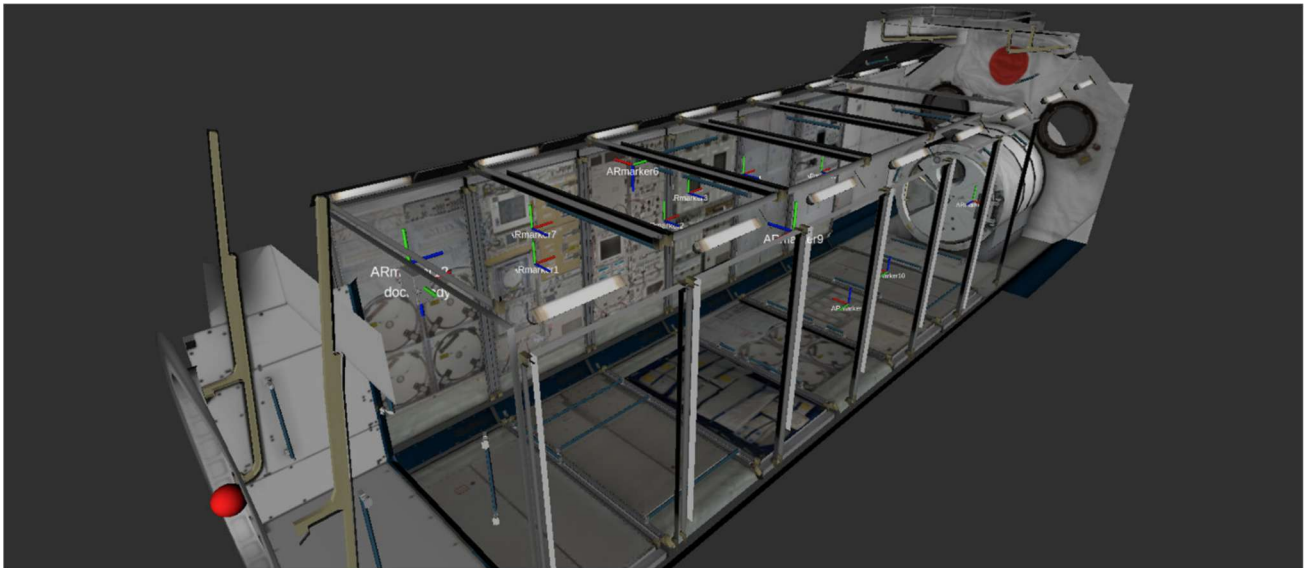


Figure 2.2.2-2 Images from Each Angle of the Simulator

2.2.3. Game Content

The game proceeds in the following three steps.

Step		Description
1	Game start	The timer starts when the Undock is completed.
2	Visit each CheckPoint	Visit all assigned CheckPoints.
	a Move	Move to any CheckPoint.
	b CheckPoint Validation	Remain within the CheckPoint margin for one second.
3	Mission Complete Report	After visiting the CheckPoints, report to the crew that the patrol has been completed. * If the report cannot be completed within the time limit, no points are awarded for the patrol completion report.

2.2.4. Mission Completion Report

The mission completion report must be submitted upon arrival at the GoalPoint.

Please see the Programming Manual for the API to use in the Mission Completion Report.

2.2.5. Number of Program Runs

In the Preliminary Round, each program will be automatically executed 10 times to ensure fairness with respect to the random elements included in the simulation. Different random conditions will be generated for each of the 10 runs. The final score will be the average score of the 10 runs, and this average will be used to determine the ranking. This allows all participants to compete on the same terms, regardless of whether their results happen to be good or bad. Please see Section 2.3 for details regarding scoring criteria.

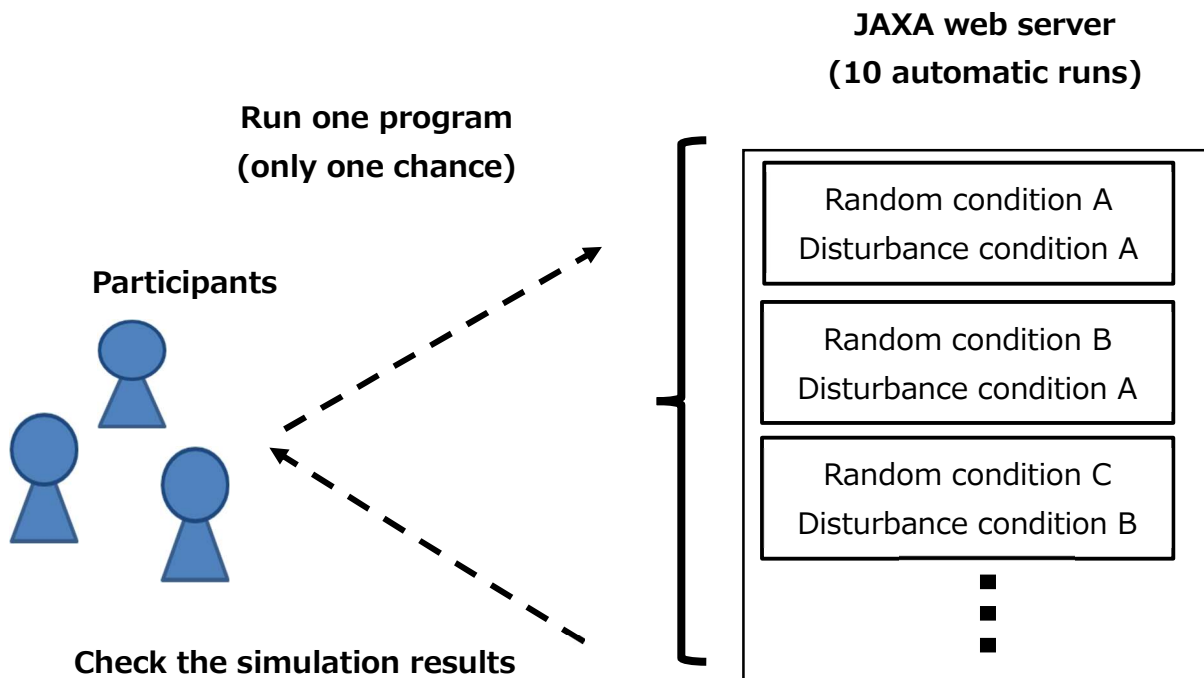


Figure 2.2.5-1 10 Runs

2.3. Scoring

2.3.1. Scoring Elements

Your team's score will be calculated based on the following factors

Checkpoint	Scoring Item	Scoring Criteria
At CheckPoint passing judgment	The score is awarded based on the CheckPoint validation result provided by the game API. Scores from all validated CheckPoints are accumulated.	Points are awarded when the IB2 remains within the specified position margin of a CheckPoint for one second. Three margin levels (Lv1 to Lv3) are defined, and the score awarded depends on the achieved level.
Mission Remaining Time	A score multiplier is determined according to the remaining time at the time of the mission completion report and is applied to the total score (Score).	The more time remaining at the time of the mission completion report, the higher the multiplier that is set. The final score is calculated by multiplying the total score (Score), which is the sum of all points, by this multiplier.

2.3.2. Checkpoint Passing Judgment Examples

Example of Points Awarded

Points are awarded when the IB2 remains within the specified position margin for one second.

Unlike the Regular Course, the IB2 camera is not required to capture the AR marker when validating a CheckPoint in the Beginner Course.

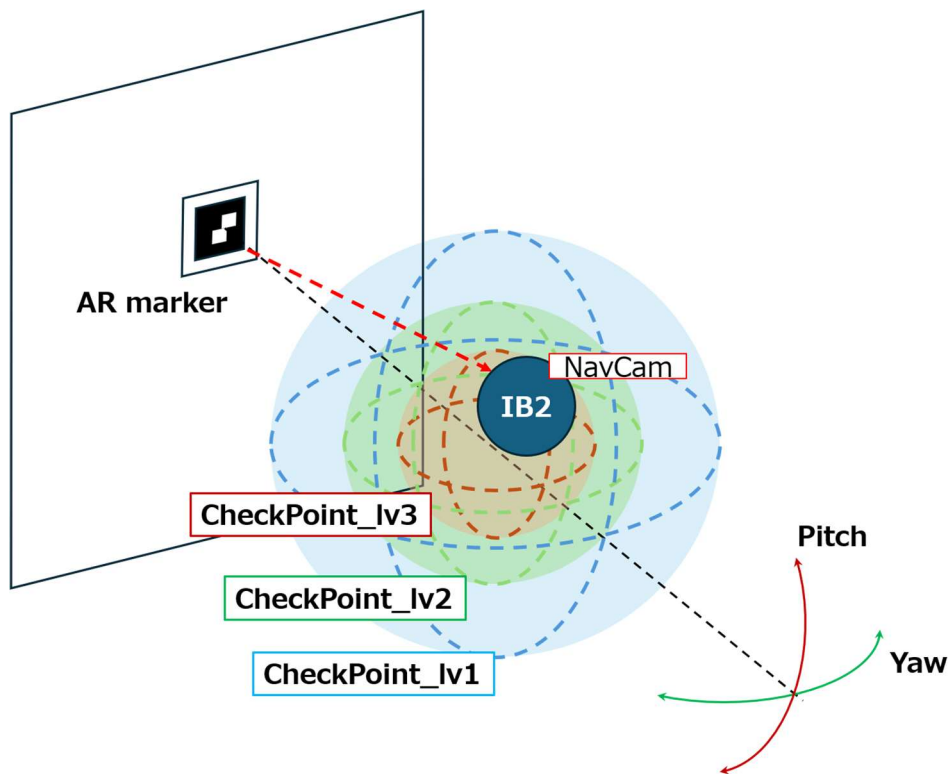


Figure 2.3.2-1 Example of a Case in Which Points Are Awarded

Example of No Points Awarded

No points will be awarded if the IB2 does not remain within the specified position margin for one second.

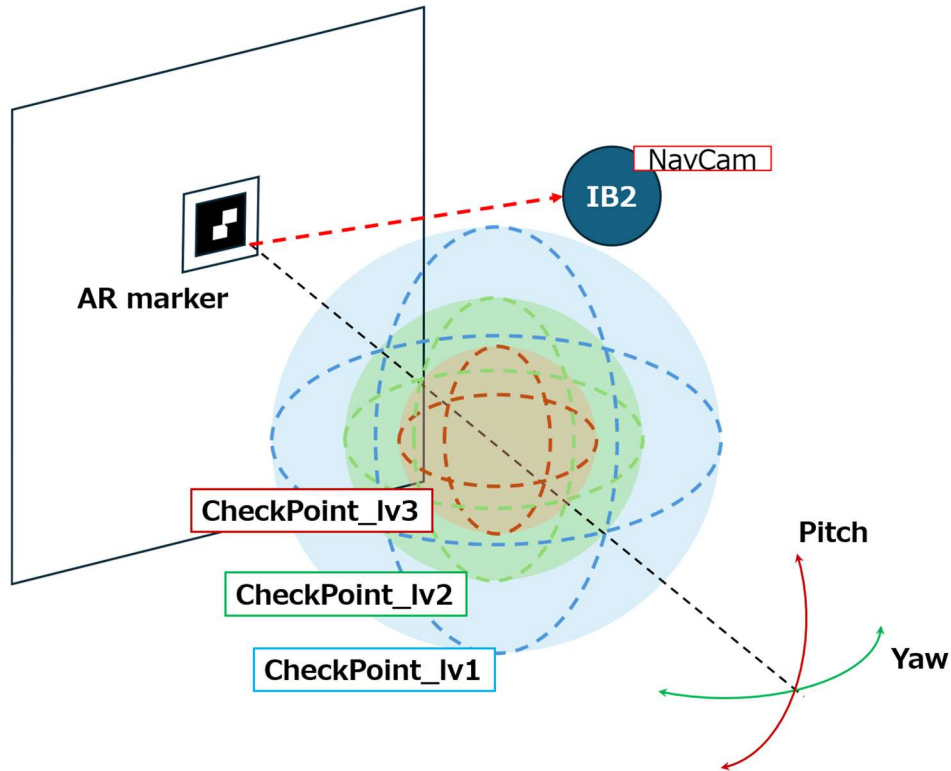
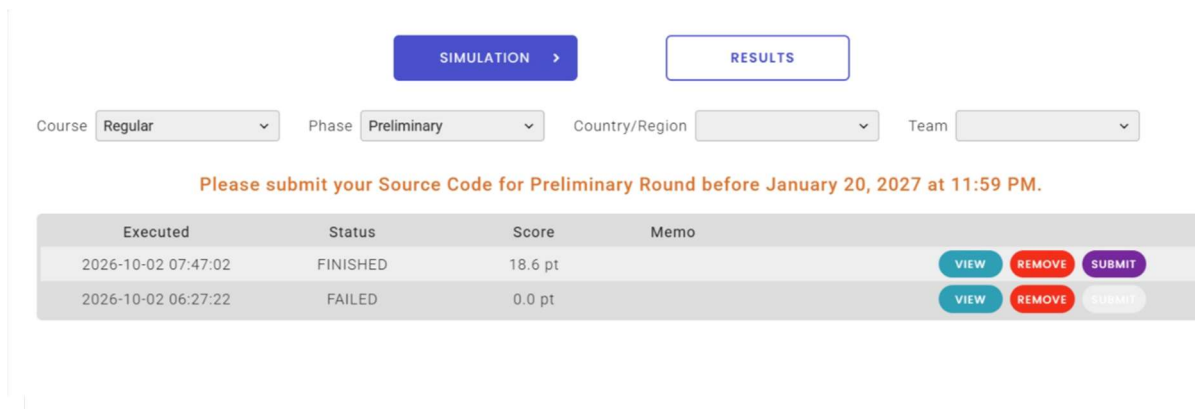


Figure 2.3.2-2 Example of a Case in Which Points

3. Preliminary Round Event

3.1. How to Participate in the Preliminary Round

Participants must submit program for the preliminary round by the submission deadline (Jan 20, 2027). Even after submitting a program once, the participants may resubmit a program anytime they want within the deadline.



The screenshot shows a web interface for the Preliminary Round. At the top, there are two tabs: 'SIMULATION' (active) and 'RESULTS'. Below the tabs, there are four dropdown menus: 'Course' (set to 'Regular'), 'Phase' (set to 'Preliminary'), 'Country/Region', and 'Team'. A message in orange text states: 'Please submit your Source Code for Preliminary Round before January 20, 2027 at 11:59 PM.' Below this message is a table with two columns: 'Executed' and 'Status'. The table has two rows: one with a timestamp '2026-10-02 07:47:02', status 'FINISHED', and score '18.6 pt'; the other with a timestamp '2026-10-02 06:27:22', status 'FAILED', and score '0.0 pt'. To the right of each row are three buttons: 'VIEW' (blue), 'REMOVE' (red), and 'SUBMIT' (purple).

Executed	Status	Score	Memo
2026-10-02 07:47:02	FINISHED	18.6 pt	
2026-10-02 06:27:22	FAILED	0.0 pt	

Figure 3.1-1 Web Simulation Screen for the Preliminary Round

Before the preliminary round period begins, the result screen of the web simulator will be updated, allowing you to run your program in the "Preliminary" simulator. The participants need to run their program in the "Preliminary" simulator before submitting your program. After that, select the program you want to submit from the "Preliminary" results list on the "RESULTS" screen and press the newly added "SUBMIT" button to submit your program. When you press the "SUBMIT" button, it will switch to the "CANCEL" button, and you can resubmit another program by pressing the "CANCEL" button before the deadline.



Please be aware that the team can cancel the submitted program on the "RESULTS" page, but the team must be careful of the deadline, as the "SUBMIT" and "CANCEL" buttons will become inaccessible after the deadline.

NOTICE : The "SUBMIT" button can only be pressed for programs that are in "FINISHED" status on the "Preliminary" screen. If you only have a program in "FAILED" status, the team cannot submit their program and will not be able to participate in the preliminary round. Please make sure that the status of the program is marked as "FINISHED" on the "Preliminary" screen.

4. Final Round

Details of the Final Round will be announced at a later date.

Please note that, unlike the Regular Course, the Beginner Course will not include an on-orbit competition aboard the ISS.

Appendix

This will be the definition of terms used in the 7th Kibo-RPC.

#	Term (English)	Definition
1	Kibo-RPC	Abbreviation for Kibo Robot Programming Challenge, a programming competition using robots on the ISS.
2	ISS	Abbreviation for International Space Station.
3	Int-Ball2	The robot used in this competition: a simulator is used in the Preliminary Round, and the actual robot in the final.
4	IB2	Abbreviation of Int-Ball2 used in the main text.
5	Kibo	The Japanese Experiment Module developed by JAXA. Also known as JEM (Japanese Experiment Module).
6	Dock Station	The base set as the start position of Int-Ball2. Related terms: Dock: the vehicle is held at the Dock Station. Release: the vehicle is released from the Dock Station. The timer starts when the Release is completed.
7	Mission Start	The timing at which the Release is completed and the mission starts. The timer for determining the mission time limit starts at Mission Start.
8	Mission Finish	The timing at which the mission time limit ends or the mission completion report is started. Points for actions after Mission Finish are invalid.
9	(Mission's) time limit	The maximum time from Mission Start to Mission Finish.
10	CheckPoint	A point set as a spherical passing area based on the relative position and attitude with respect to an AR marker. It has three margin levels (Lv).
11	StartPoint	The starting point of the mission. Under the current rules, the Dock Station is the start position.
12	GoalPoint	The point to which the IB2 moves after passing all CheckPoints and where the mission completion report is made. The position is defined in the game specification.

13	AR marker	The marker used as the origin for recognizing the relative position and attitude and for generating CheckPoints. The game specification describes 12 markers in Kibo.
14	t	The remaining time at the point of the mission completion report. The unit is seconds (s).
15	time_max	The maximum time limit of the mission.
16	Score	The total score calculated as $Pt_all \times Mag_clear$ in the score calculation table.
17	Clear_time	The mission completion time. Used to calculate the clear time multiplier (Mag_clear).
18	Mag_clear	The score multiplier obtained according to the clear time. A maximum of 2x is assumed.
19	Pt_check	The points obtained when the IB2 remains for one second within the specified CheckPoint margin.
20	Pt_goal	The points obtained when the IB2 passes all CheckPoints within the time limit and reaches the GoalPoint.
21	Pt_all	In the score calculation table, the value obtained by adding Pt_goal to the total of Pt_check at each Lv.
22	Microgravity module	A disturbance element installed in the simulator environment.