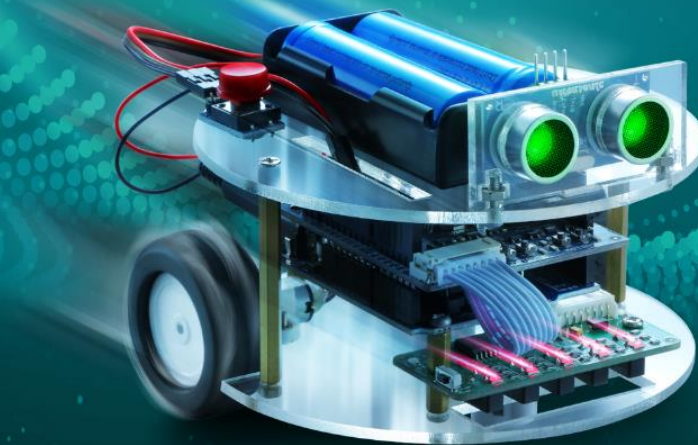


PETROSAINS RBTX CHALLENGE 2023



RULES AND REGULATIONS



ROBO TRACER Junior 7 -12 years old

It is recommended that you review the general terms and conditions prior to reading the rules for a specific category, as the general terms and conditions apply to all categories throughout the entire competition.

Version: 15 April 2023

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1. Introduction

The city park has overflowing waste bins and scattered litter which is harmful to the environment. To promote recycling and reduce waste generation, action needs to be taken to address the issue. This can be achieved by encouraging the public to use recycling bins, organizing cleanup events, and creating awareness campaigns to educate people about the importance of reducing waste generation and recycling. The goal is to maintain a clean and healthy environment for present and future generations.

Robo Tracer Junior category aligns with SDG 12, which focuses on responsible consumption and production. In this challenge, young innovators aged 7-12 years old are tasked to create a robot that collects and sorts waste into recycling and non-recycling bins in a city park, thereby reducing waste generation and promoting responsible consumption.

Theme

SDG12: Responsible Consumption and Production - Promotes sustainable consumption and production, as well as waste reduction through prevention, reduction, recycling, and reuse. Recycling is critical for responsible production and consumption, resource conservation, and environmental impact reduction.



Link to United Nations Sustainable Development Goals:- [Measuring progress towards the Sustainable Development Goals - SDG Tracker \(sdq-tracker.org\)](https://sdq-tracker.org)

2. General Rules

2.0. Competition Phases

- I. **Registration:** Each team is required to register through the RBTX website. Each participant can register for one team **ONLY**.
- II. **Online Learning:** Participants are required to complete the learning modules and passed the assessment in the RBTX Portal to proceed for the next level. Passing marks is 80%.
- III. **Zone Qualifying:** The zone qualifying stage will be held physically. Participants need to attend physically at the zone qualifying venue. All costs incurred shall be borne solely by the participating teams.
- IV. **Grand Finals:** Top teams from the Zone Qualifying Stage will be selected to move on to the onsite Grand Finals. All finalists will be informed of the competition schedule right after the completion of the qualifying stage. All costs incurred shall be borne solely by the participating teams.

2.1. Participants

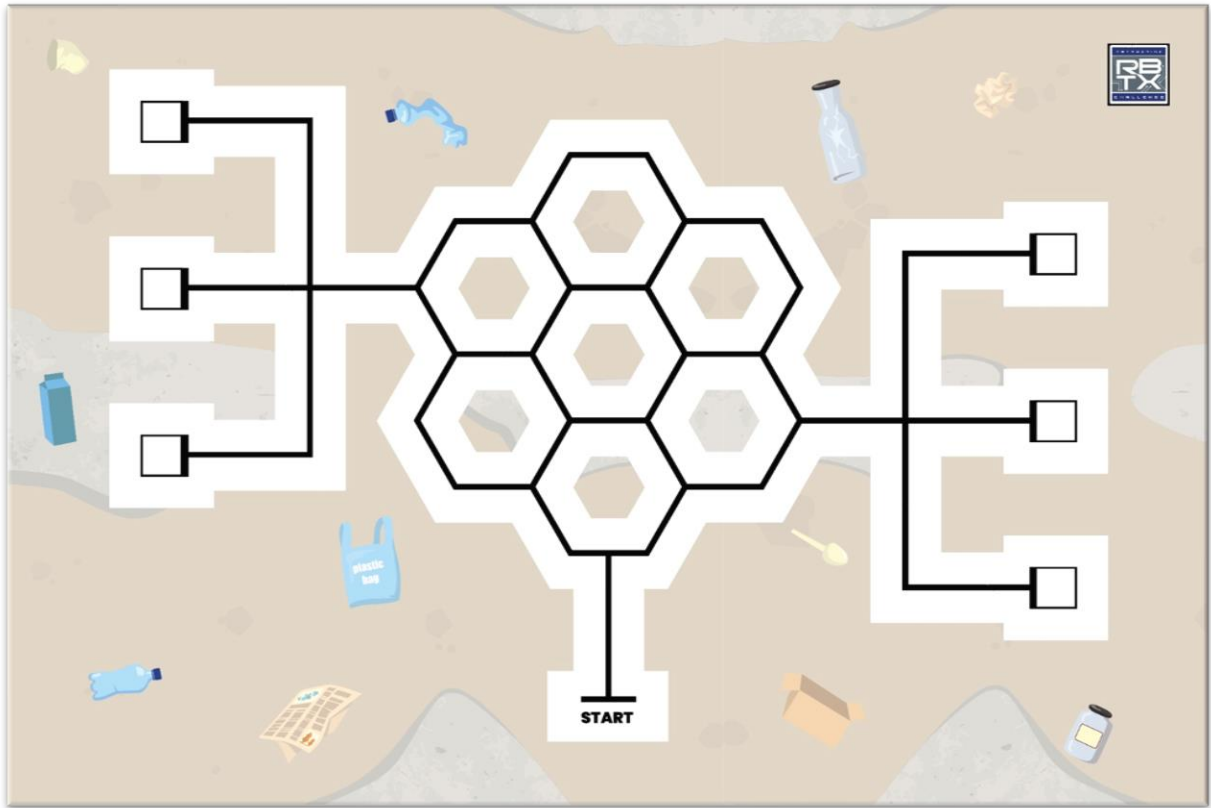
- 2.1.1. All team members except for the guardian must be between 7 to 12 years of age. (Maximum of two team members).
- 2.1.2. The guardian can be a teacher, parent, mentor, or technical advisor.
- 2.1.3. The guardian is not allowed to touch or repair the robot during all phases of the competition. (Refer to 2.0.Competition Phases)
- 2.1.4. The guardian must not be involved in the programming of the robot during all phases of the competition. (Refer to 2.0.Competition Phases)
- 2.1.5. In the case of any interference by the guardian with the robot or referee decisions during any phase of the competition, the team will risk disqualification.

2.2. Competition Field

- 2.2.1. It is encouraged for participating teams to print their own competition field for the preparation & practice for the Zone Qualifying and Grand Finals stages. The competition field template will be issued by the organizer in PDF format.

2.2.2. Field specifications

- a. The maximum dimensions of the Zone Qualifying and Grand Finals competition field are 3 meter x 2 meter.
- b. The lines to be followed are 14 mm to 16 mm in width and are black in colour.
- c. Expect all measurements and dimensions to have a 10% tolerance. A printable rule scaler and robot size checker will also be made available to ensure accurate competition field measurements and robot specifications.



Remark: This field design will remain for the Zone Qualifying phases and Grand Finals phases.

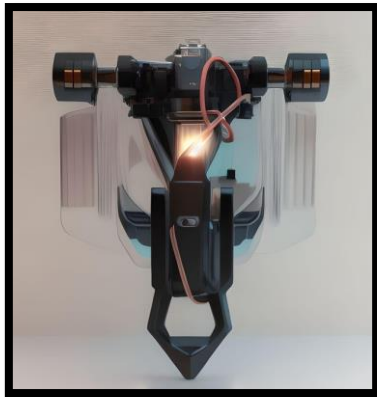
3. The Robot

Each team must have its own robot and must not be shared with other participants of the Petrosains RBTX Challenge 2023.

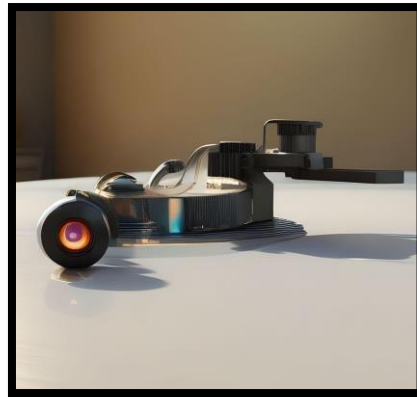
3.0. Dimensions

Each team must comply with the following robot specifications:

Width	– 200mm max
Length	– 200mm max
Height	– no limit



Top View



Side View

3.1. Control and Programming

- 3.1.1. The robot must be controlled autonomously with no human aid.
- 3.1.2. The controller unit should be embedded in the robot and cannot be placed on the robot's exterior.
- 3.1.3. The robot must be programmed by the team members (either text-based or graphical programming).

3.2. Power Source

- 3.2.1. The robot must be powered by a power source such as a battery fixed onto the robot.
- 3.2.2. The robot cannot be powered by a stationary power source connected to the robot by a cord.

3.3. Sensors

- 3.3.1. A maximum of five-line sensors are allowed.
- 3.3.2. Ultrasonic/IR sensors are allowed as long as the robot body does not violate the robot dimension (Refer to Error! Reference source not found.. Error! Reference source not found.).

3.4. Start Button

The robot **must be equipped with a push-button** to initiate the starting sequence.

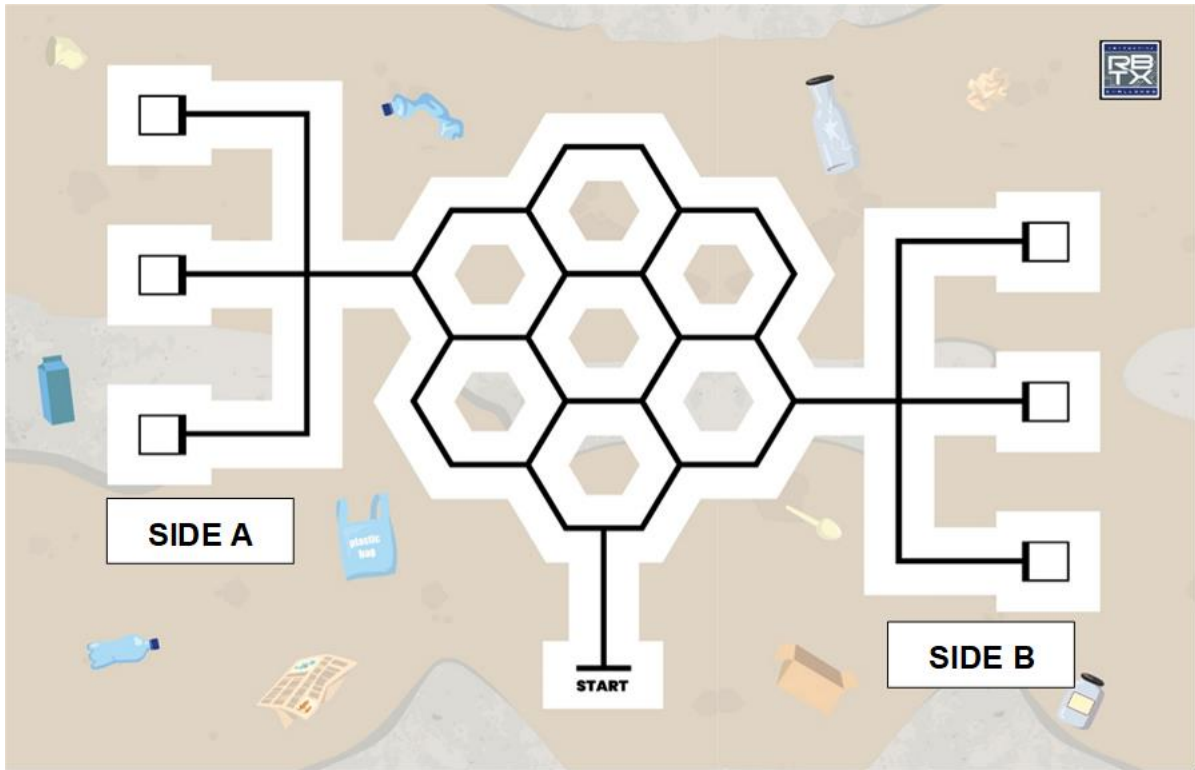
3.5. Construction

Any robot kit or building material may be used, as long as the robot meets the above specifications.

3.6. Gripper

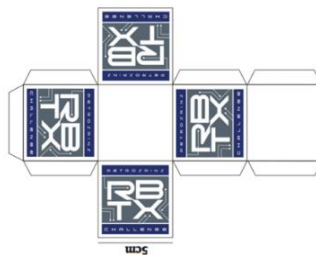
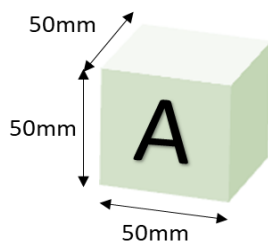
The robot must be equipped with a (ONE) gripper only just to move the mission items. The gripper shall not damage the competition field or harm nearby people.

4. Tasks position



Remark: Tasks positions for practice purposes are as displayed. However, these positions may change for the Zone Qualifying and Grand Finals.

- i. The robot should be able to collect objects from side A and transport it to the correct locations on side B through the 'honeycomb' line or vice versa.
- ii. The objects are identified as Brown, Blue and Orange coloured cubes with the size of 50mm x 50mm x 50mm (Width x Length x Height) as follows:



*To be printed on A4 (350- 400gm) coloured paper accordingly – brown, blue, orange.

4.0. Moving the TASK OBJECT

- 4.0.1. There are no restrictions on how the robots can move the mission items, as long it does not cause damage to the competition field or the mission item.
- 4.0.2. The robots may push, carry, lift, or drag to move the mission item.

- 4.0.3. The robots may be equipped with claws, grippers, scoops, pushers and so forth to move the mission items.
 - 4.0.4. The robots can only carry ONE object from SIDE A to SIDE B at one time.
 - 4.0.5. If the task object **falls or is wrongly placed on the location**, the robot handlers may request a **Restart** (Refer to **8.4.2.Start and Restarts**).
- 4.1.** The position of the objects and locations will be at the sole discretion of the competition organizer and will be informed to all teams as per the following:
- i. **Zone Qualifying Phase** – Two (2) weeks before the Zone Qualifying stage competition date.
 - ii. **Grand Finals Phase** – On the day of the Grand Finals competition date
 - iii. The teams may face an additional challenge during the Grand Finals.

5. Scoring

- 5.0. THREE (3) points will be awarded for each object that is successfully placed in the correct location, and ONE (1) point if the object is placed in an incorrect location.
- 5.1. Additional ONE (1) point will be given if the robot reaches the finishing line
- 5.2. If there are two teams or more with the same accumulated points, the team that is successfully placed in the correct location will be ranked higher.
- 5.3. Race time is the time recorded for tracing the route from start to finish.
- 5.4. Race time is started once the robot starts moving, and the final Race time is concluded and displayed on the robot as and when any part of the robot touches the finish line.
- 5.5. The final mission time is concluded once any part of the robot returns to the start line.
- 5.6. If two or more team that complete the challenge manage to accumulate the same points, the team that obtain faster race time will be ranked higher.
- 5.7. The Zone Qualifying and Grand Final phases shall have their minimum requirements to be assessed and are further described in the corresponding to **8.Zone Qualifying Stage** and **9. Grand Finals Stage**.

6. Code of Conduct

- 6.0. Fair Play
 - 6.0.1. It is expected that all teams aim to play a fair and clean game.
 - 6.0.2. The rules are enforced at the discretion of the referees, officials, and local law enforcement authorities.
 - 6.0.3. Participating teams and robot that does not meet the regulations and specifications will not be allowed to compete in the competition.
 - 6.0.4. Participating teams that violate the code of conduct may risk being disqualified from the competition.

7. Judges

- 7.0. All decisions on scoring, game play and timing are made by the judges. Teams should completely respect their vote and decisions.
- 7.1. Judges may announce new rules or decisions about any issues that might not be mentioned in the existing rules and regulations, which must be abided by all participants.
- 7.2. All decisions are final.

8. Zone Qualifying Stage

8.0. General Rules for Qualifying Phase

8.0.1. Phases of Competition

- i. The competition is divided into THREE (3) phases as per the following:
 - a. Track Testing
 - b. Quarantine
 - c. Competition Run
- ii. Upon the completion of Track Testing during the allocated time, all robots will be placed in the Quarantine area by the contestants. No addition, removal, or changes of hardware or software is allowed during this period.
- iii. In the Competition Run, contestants will take their robots from the Quarantine Area and place them on the track.

8.0.2. Competition Run and Tasks

- i. Each team will have one competition run.
- ii. The competition run will have its own Track Testing and Quarantine phase.
- iii. The competition run should not last more than three minutes (labelled as RUNTIME).
- iv. If a robot has yet to complete all the tasks once the RUNTIME is over, the team will be asked to remove the robot from the COMPETITION FIELD.
- v. The position of the objects and locations will be revealed within TWO (2) weeks before the day of the competition and may change between competition runs.

8.0.3. Race clock

- i. When the robot moves from the START a timer will begin to count the **RACE TIME**.
- ii. The time that the robot takes to pass each target will be recorded. As it reaches the final line, the timer will **stop and the final recorded RACETIME value will be saved.**

8.1. Team Members & Mentors

- 8.1.1. All team members except for the team mentor must be between **7 to 12 years of age**. (Maximum of two team members)
- 8.1.2. Only one mentor in the team is allowed as a technical advisor.
- 8.1.3. The technical advisor is not allowed to touch or repair the robot during the phases of the competition (Refer to **2.0. Competition Phases**)

- 8.1.4. The technical advisor should not be involved in the programming of the robot during the phases of the competition (Refer to **2.0. Competition Phases**)
- 8.1.5. In case of any interference by the technical advisor with the robot or referee decisions during the competition, the team will risk disqualification.

8.2. Competition Field

As stated in general rules. (Refer to **2.2. Competition Field**)

8.3. The Robots

As stated in general rules. (Refer to **3. The Robot**)

8.4. Game Play

8.4.1. Game Zone

An area around the field will be designated as the GAME ZONE. No one is allowed inside the game zone except for the robot handlers and the referees

8.4.2. Start and Restarts

- i. One team member is elected as the robot handler. Only that team member is permitted to handle the robot during the game.
- ii. The robot will be placed at the START line and checked by one of the referees.
- iii. A robot may restart the run as the handlers deem necessary within the RUNTIME. The restart can be requested only if the robot doesn't follow the line, has stopped halfway or has lost direction.
- iv. At any restart, the robot must be positioned back at the start line.
- v. Adjusting the sensor position on the robot is allowed during the allocated RUNTIME.
- vi. The RACETIME will be reset to zero on every restart and all checkpoint marks will also be zero. The RUNTIME will keep running during all restarts.
- vii. There is no limit for the number of restarts within the RUNTIME of three minutes.
- viii. A robot **must restart** if:
 - a. The robot handler asks for a restart.
 - b. The robot is touched by a contestant.
 - c. The robot moves off the field.
- i. It is **advised** for the robots to **restart** if:
 - a. The mission items fall or are wrongly placed on the track.
 - b. The robot is unable to return to the start line.

8.4.3. Following the Line

- i. To determine if the ROBOT has left the line or left the tile, the referee will use the CONVEX HULL of the robot. This measure is done by stretching an imaginary rubber band around the extremities of the robot and using the enclosed space as a silhouette.
- ii. A team's robot must remain on the field until it has completed its game.

8.5. Tasks position

As **stated in general rules. (Refer to 4. Tasks position)**

8.6. Scoring

As stated in general rules. (Refer to **5.Scoring**)

8.7. Code of Conduct

As stated in general rules. (**Refer to 6. Code of Conduct**)

8.8. Judges

As stated in general rules. (**Refer to 7. Judges**)

9. Grand Finals Stage

9.0. General Rules

9.0.1. Phases of Competition

- i. The competition is divided into three phases as per the following:
 - a) Programming
 - The minimum Construction and Programming time is ONE hour. It can be extended depending on track complexity and subjected to committee discretion.
 - b) Quarantine
 - Upon the completion of Construction and Programming during the allocated time, all robots will be placed in the Quarantine area by the contestants. No addition, removal, or changes of hardware or software is allowed during this period.
 - c) Competition Run
 - In the Competition Run, contestants will take their robots from the Quarantine Area and place them on the track.

9.0.2. Competition Run and Tasks

- i. Each team will have two competition runs.
- ii. The first **competition run will have its own Construction and Programming and Quarantine phase. And second competition run will ONLY have a Quarantine phase.**
- iii. The competition run should not last more than three minutes (labelled as **RUNTIME**).
- iv. If a robot has yet to complete all the tasks once the **RUNTIME is over, a BUZZER will sound, and the team will be asked to remove the robot from the COMPETITION FIELD.**
- v. The position of the objects and locations will be revealed on the day of the competition.

9.0.3. Race clock

- iii. There will be optical sensors or other similar devices that can detect the robot's **movements**.
- iv. When the robot moves from the START line and passes this device, a timer will automatically begin to count the **RACE TIME**.
- v. The time that the robot takes to pass each target will be recorded. As it reaches the final line, the timer will **stop and the final recorded RACETIME value will be saved.**

9.1. Team Members & Mentors

- 9.1.1. All team members except for the team mentor must be between **7 to 12 years of age**. (Maximum of two team members)
- 9.1.2. Only one mentor in the team is allowed as a technical advisor.
- 9.1.3. The technical advisor is not allowed to touch or repair the robot during the phases of the competition (Refer to **2.0. Competition Phases**)
- 9.1.4. The technical advisor should not be involved in the programming of the robot during the phases of the competition (Refer to **2.0. Competition Phases**)
- 9.1.5. In case of any interference by the technical advisor with the robot or referee decisions during the competition, the team will risk disqualification.

9.2. Competition Field

As stated in general rules. (Refer to **2.2. Competition Field**).

9.3. The Robots

The dimensions, power source, sensors, start button and construction are as in general rules (Refer to **3. The Robot**) but for control and programming is as below:

- i. The robot must be controlled autonomously with no human aid.
- ii. The controller unit should be embedded in the robot and cannot be placed on the robot's exterior.
- iii. The robot must be programmed by the team members (either text-based or graphical programming) and uploaded during the Construction and Programming phase. No pre-programming of the robot and/or switch-based coding is allowed.
- iv. Any type of communication device or medium of communication is prohibited during the Construction and Programming phase. These include but are not limited to handphones, internet connection, emails, WhatsApp, messengers, etc.
- v. Contestants should prepare a laptop/computer for this purpose and must carry a fully charged battery in case of a power supply problem at the competition venue.

9.4. Game Play

- 9.4.1. **Construction and Programming Zone**
An area inside the competition venue will be designated as the **CONSTRUCTION ZONE**. No one is allowed inside the construction zone except for the robot handlers and the referees.

9.4.2. Game Zone

An area around the field will be designated as the GAME ZONE. No one is allowed inside the game zone except for the robot handlers and the referees.

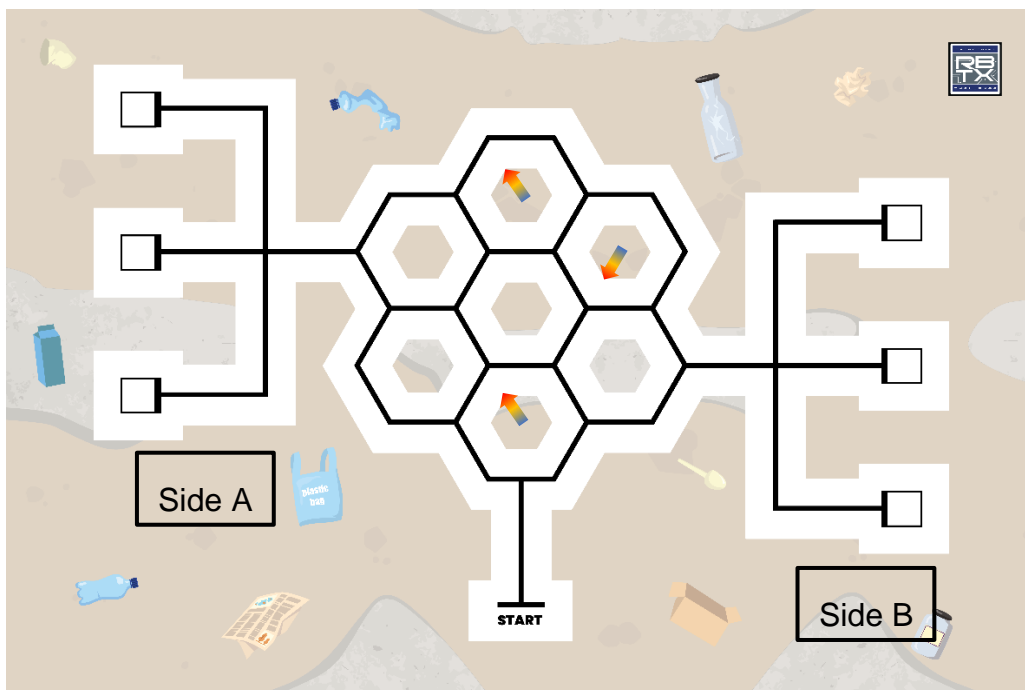
9.4.3. Start and Restarts

As stated in general rules. (Refer to **8.4.2. Start and Restarts**)

9.5. Following the line

As stated in general rules. (Refer to **8.4.3. Following the Line**)

9.6. Tasks position



Remark: Tasks positions for practice purposes are as displayed. However, these positions of objects, locations & checkpoints may change for the Grand Finals.

- i. The robot should be able to collect objects from side A and transport it to the correct locations on side B through the 'honeycomb' line and vice versa.
- ii. The direction of the pointed arrows will indicate where the robot should pass with the specific objects to dedicated locations.
- iii. The position of the objects and locations will be revealed on the day of the competition and may change between competition runs.

9.7. Scoring

- 9.7.1. THREE (3) points will be awarded for each object that is successfully placed in the correct location, and ONE (1) point if the object is placed in an incorrect location. And an additional ONE (1) point for each checkpoint if the robot successfully passes through while carrying the correct object.
- 9.7.2. Additional ONE (1) point will be given if the robot reach the finishing line.
- 9.7.3. Race time is the time recorded for tracing the route from start to finish.
- 9.7.4. Race time is started once the robot starts moving, and the final mission time is concluded once any part of the robot returns to the start line.
- 9.7.5. Race time is started once the robot starts moving, and the final Race time is concluded and displayed on the robot as and when any part of the robot touches the finish line.
- 9.7.6. If there are two teams or more with the same accumulated points, the team that is successfully placed in the correct location will be ranked higher.

9.8. Code of Conduct

As stated in general rules. (Refer to **6. Code of Conduct**)

9.9. Judges

As stated in general rules. (Refer to **7. Judges**)