PETRONAS Powering Knowledge

#RBTX2024

Awarded by:

PETROSAINS RBTX CHALLENGE 2024

RULES AND REGULATIONS

GREEN HEROES

VERSION 8 OCTOBER 2024

It is recommended that you review the General Terms and Conditions prior to reading the rules for a specific category, as it applies to all categories throughout the entire competition.

In collaboration with:

MINISTRY OF EDUCATION

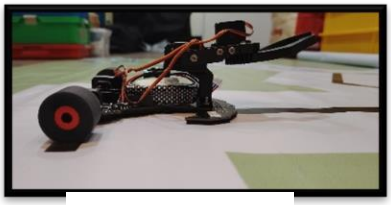
PETROSAINS

Table of content

Updates on the general rules.

The main changes in the general rules at **8 October 2024** are listed below:

6.0 COMPARISON OF EVERY STAGE

ITEMS	GRAND FINALS STAGE
Start and Restarts	b) The robot will be placed at the START line and checked by one of the referees.   Top view Side view **k**) The referee will record the **most recent RACETIME using official timer or watch**.
Scoring	b) 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. The referee will record the most recent RACETIME using their official timer or watch.
Checkpoint	~~The direction of the pointed arrows will indicate the checkpoints where participant may pass to obtain more points.~~ **NA**

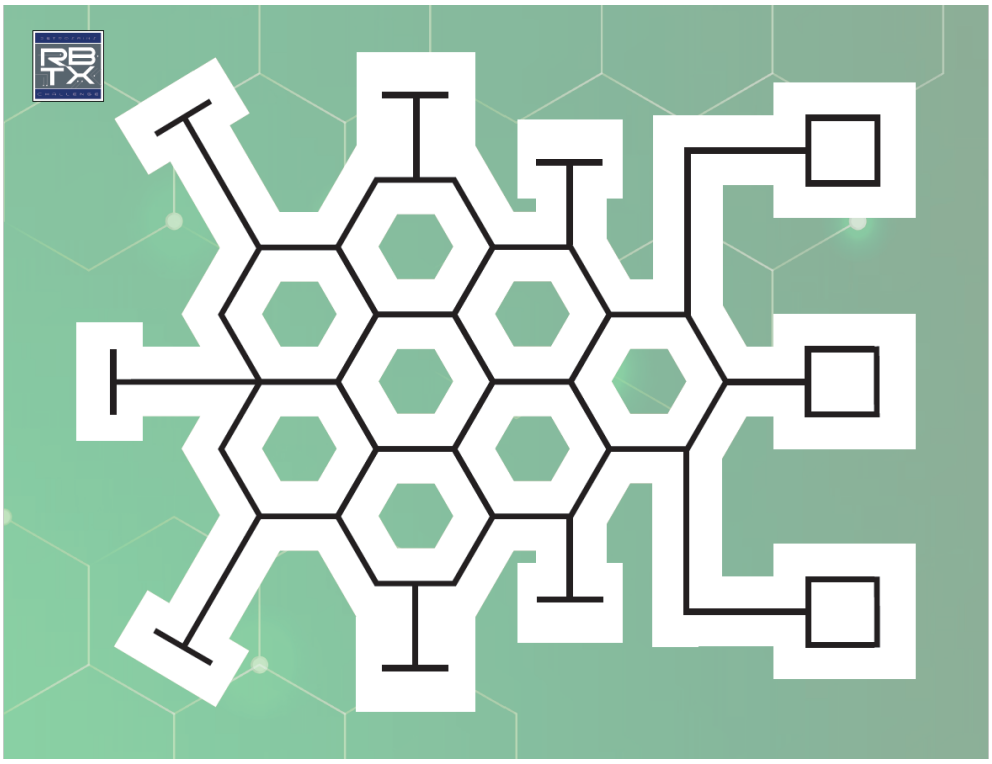
The main changes in the general rules from **2 August to 7 August** are listed here:

<table>
<tr><td>Rule 6.0</td><td>Point<table>
<tr><td>i) Point</td><td>1.1. THREE (3) points will be awarded for each object that is successfully placed in the correct location as long as any part of the object is touching the line. If the cube is outside of the line there will be no point added for the cube.</td><td>a) THREE (3) points will be awarded for each object that is successfully placed in the correct location as long as any part of the object is touching the line. If the cube is outside of the line there will be no point added for the cube.</td></tr>
<tr><td></td><td>2. NO POINT (0) if the object is placed in an incorrect location.</td><td>b) NO POINT (0) if the object is placed in an incorrect location.</td></tr>
<tr><td></td><td>3. An additional ONE (1) point will be given if the robot reaches the FINISH line.</td><td>c) A limit of TWO (2) points for each checkpoint passed through.</td></tr>
<tr><td></td><td></td><td>1. An additional ONE (1) point will be given if the robot reaches the FINISH line.</td></tr>
</table></td></tr>
</table>

The main changes in the general rules from 27 May to 2 August are listed here:

<table>
<tr><td rowspan="2">2.0 General Rules</td><td>2.1 Competition Phases
a. Online Learning: Participants are required to complete the Learn Coding to be eligible for certification of participation.</td></tr>
<tr><td>2.3.1 Field specifications
a. Dimension: 3 meter x 2.3 meter .</td></tr>
<tr><td>File</td><td>Updated cube file in Petrosains RBTX Challenge website</td></tr>
</table>

The main changes in the general rules from 1 May to 27 May are listed here:

Rule 2.0	Competition Field & Mission Items: Updated Track 
Appendix 1	Updated Example Task for Zone Qualifying & Cube Image

[Green Heroes]
A forward-thinking and action-oriented team challenge for participants **aged 7-12** . The challenge is not only engaging participants in a meaningful way but underscores the significance of **energy-efficient** thinking, encouraging participants to consider how their choices can contribute to a more sustainable future. ♻

1.0 INTRODUCTION

Robot tracer competitions and green technology may seem unrelated at first glance, but they can intersect in several ways:

Education and Awareness: Both robot tracer competitions and green technology initiatives often involve education and raising awareness. These competitions provide opportunities to educate participants and spectators about the importance of sustainability and the role of technology in addressing environmental challenges.

Automation for Environmental Monitoring: Petrosains RBTX Challenge Competition Robot Tracer Category involves robots to navigate through controlled environment to perform tasks. These tasks could include environmental monitoring for pollution or wildlife conservation purposes, aligning with the goals of green technology by using automation to collect data that can inform sustainability efforts.

Innovation and Collaboration: Collaboration between industries and disciplines is essential for advancing both green technology and robotics. Participants in robot tracer competitions may collaborate with experts in green technology to develop innovative solutions that benefit both fields.

By exploring the intersection between robot tracer competitions and green technology, we can promote the development of sustainable robotics solutions and inspire future **generations to pursue careers in science, technology, engineering, and mathematics (STEM) fields with a focus on environmental stewardship.**

2.0 General Rules

2.1 Competition Phases

b. **Registration:** Each team is required to register through the RBTX portal via RBTX microsite. Each participant can register for one team **ONLY**.
c. **Online Learning:** Participants are required to complete the Learn Coding to be eligible for certification of participation.
d. **Zone Qualifying Online Briefing:** Qualifiers are required to attend online briefings before zone qualifying to receive the updated game rules and regulations, competition schedules and flow. Participants are required to respond to the RSVP request prior to the Zone Qualifying stage.
e. **Zone Qualifying:** The zone qualifying stage will be held onsite. The zone level e-certificate will be awarded only to the qualifiers who attended and competed at the zone qualifying round. All costs incurred shall be borne solely by the participating teams.
f. **Grand Finals Online Briefing:** Finalists are required to attend online briefing before grand finals to receive the updated game rules and regulations, competition schedules and game flow. Participants are required to respond to the RSVP request prior to the Grand Final stage.
g. **Grand Finals:** Selected teams from the Zone Qualifying Stage will proceed to the Grand Finals which will be held onsite. All costs incurred shall be borne solely by the participating teams.

2.2 Participants

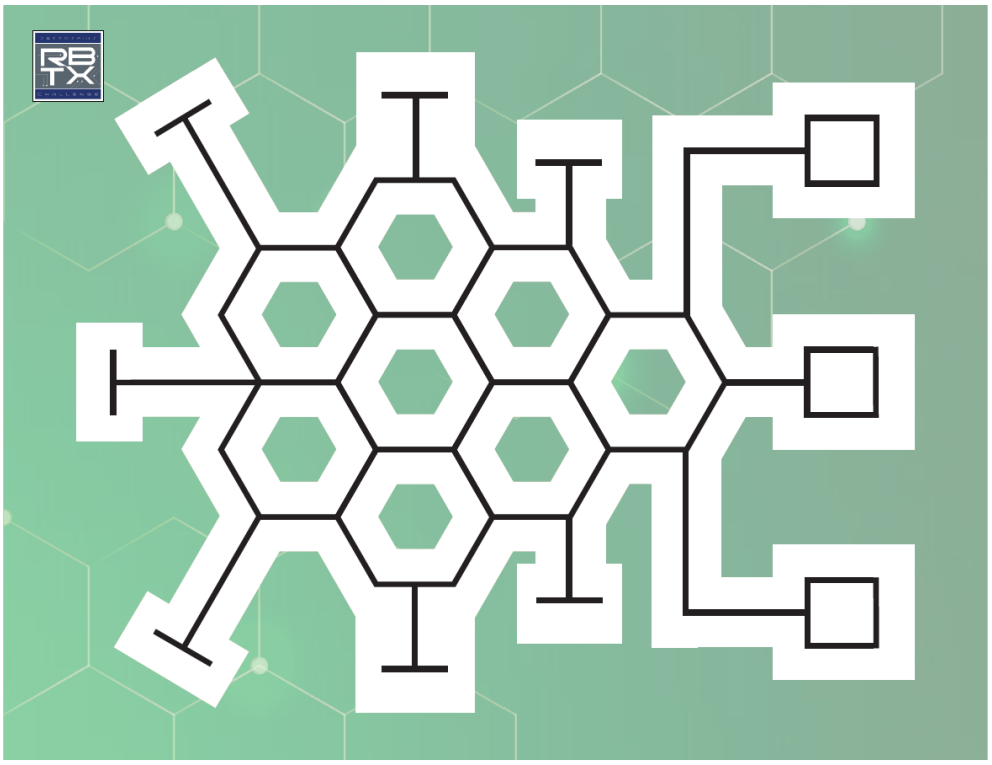
a. Everyone is allowed to sign up for one team in one category only. Participants are not allowed to sign up for more than one team, or in more than one category.
b. All team members except for the guardian must be between 7 to 12 years old of age. (Maximum of two team members).
c. No changes of participants are allowed once registration is complete.
d) The guardian can be a teacher, parent, mentor, or technical advisor aged 18 years and above.
d. The guardian is not allowed to touch or repair the robot during all phases of the competition. (Refer to **2.1 Competition Phases**)
e. The guardian must not be involved in the programming of the robot during all phases of the competition. (Refer to **2.1 Competition Phases**)
f. 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.
e) Participants must comply with the safety requirements throughout the competition.
g. Competitions usually have a code of conduct that participants must adhere to. This may include guidelines for respectful behavior, sportsmanship, and ethical usage of technologies. Organizers may prohibit practices such as cheating, sabotage, or malicious interference during the competition.

2.3 Competition Field and Mission Items

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 in **exact measurement.**

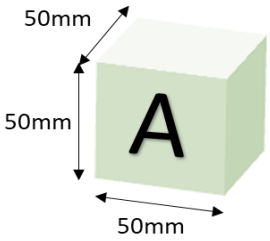
2.3.1 Field specifications

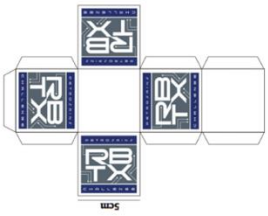
b. **Materials:** tarpaulin with matte surface**.**
c. **Dimension:** 3 meter x 2.3 meter .
d. **Grid lines:** 1.6cm to 2.0cm in width and are black in colour.
e. Expect all measurements and dimensions to have a 10% tolerance. A printable rule scaler and robot size checker will also be made available to ensure accurate competition field measurements and robot specifications.
f. The layout of the competition field is as follows:



2.3.2 Mission Item

The Mission Items are identified as image cubes with the size of **5cm W x 5cm L x 5cm H as follows:**





*Can be printed colour on A4 (300 - 350 gsm).

(For image, please refer Appendix 1)

2.3.3 The Mission

a. The robot shall begin from the starting point.
b. The robot should be able to pick up a mission item with a gripper, from “T” junction and transport it through the ‘Honeycomb’ path and place the mission item at designated drop point.
c. The robots can only carry, lift or push **ONE (1)** mission item from “T” junction to a specific spot at one time.
d. The robot must not cause damage to the competition field or the mission item.
e. If the mission item **falls or is wrongly placed on the drop point,** the robot handlers may request a **Restart** (Refer to 5 e. Error! Reference source not found.).
f. The starting point, the position of the mission items and the drop point of the mission items are at the sole discretion of the competition organizer and will be informed to all teams as per the following:

Zone Qualifying Phase – Two (2) weeks before the Zone Qualifying stage competition date.

Grand Finals Phase – On the day of the Grand Finals competition date the teams may face an additional challenge during the Grand Finals.

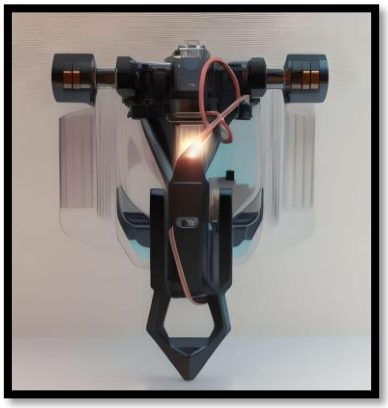
3.0 The Robot

Each team must have its own robot and it must not be shared with other teams of the Petrosains RBTX Challenge 2024.

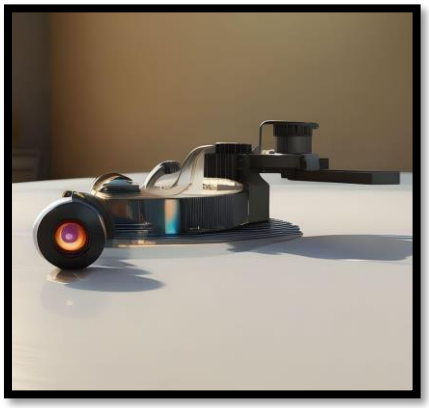
Every robot must comply with the following specifications.

3.1 Dimensions: Ensure all parts and accessories are **fully extended**:

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



Top View



Side View

3.2 Control and Programming

a. The robot must move autonomously using sensors, NO human aid is allowed.
b. The controller unit should be embedded in the robot and cannot be placed on the robot's exterior.
c. The robot must be programmed by the team members (either text-based or graphical programming).

3.3 Power Source

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

3.4 Sensors

a. Only a maximum of five-line tracking sensors are allowed.
b. No other form of sensors is allowed on the body.

3.5 Start Button

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

3.6 Construction

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

3.7 Gripper

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

4. Code of Conduct

4.1. Fair Play

a. It is expected that all teams aim to play a fair and clean game.
b. The rules are enforced at the discretion of the referees, officials, and local law enforcement authorities.
f) Participating teams and robotsthat do not meet the regulations and specifications will not be allowed to compete in the competition.
c. Participants must make sure their robot does not damage the track, or the team will be disqualified. Actions that can cause damage to the track are listed below:

i. Tearing the track
ii. Leaving any color marks to the track
iii. Damaging additional item on the track (timer/hump)
iv. Oil spillage
v. Glue/adhesive marks
i. Any sabotaging action

5. Judges

a. The judges' decision in determining the winner shall be final and no appeals against the decision will be entertained.
1.2. Teams should completely respect their votes and decisions.
b. Petrosains reserves the right at any time without prior notice to add, alter, modify, change or vary the terms and conditions contained herein, wholly or in part at its absolute discretion and the Participants agree to be expressly bound by such additions, modifications, change or variations which must be abided by all participants.

6. Comparison of Every Stage

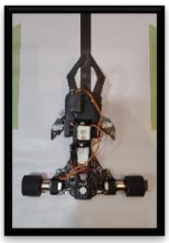
ITEMS	ZONE QUALIFYING STAGE	GRAND FINALS STAGE
a) Phases of Competition	**a) Track Testing** Tuning the robot during the allocated time.	**a) Construction and Programming** The minimum Construction and Programming time is ONE hour. It can be extended depending on track complexity and subjected to committee discretion. ▪ The robot must be programmed by the team members only and uploaded **during the Construction and Programming phase**. No pre-programming of the robot and/or switch-based coding is allowed. ▪ 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. • 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.

<table>
<tr><td></td><td>b) Quarantine
Upon completion of track testing during allocated time, all robots will be placed in the Quarantine area by the contestants.
No addition, removal, or changes of hardware or coding is allowed during this period up until the end of your turn.</td><td>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 coding is allowed during this period up until the end of your turn.</td></tr>
<tr><td></td><td>c) Competition Run
In the Competition Run, contestant will bring their robot from the Quarantine Area to the competition field. Competition begins upon referee’s que.</td><td>c) Competition Run
In the Competition Run, contestant will bring their robot from the Quarantine Area to the competition field. Competition begins upon referee’s que.</td></tr>
<tr><td rowspan="4">b) Competition Run and Tasks</td><td>a) Each team will have one competition run.</td><td>a) Each team will have TWO (2) competition runs.</td></tr>
<tr><td>b) Every group will test and compete on the same field.</td><td>b) Every group will test and compete on the same field.</td></tr>
<tr><td>c) The starting point, 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.</td><td>c) Expected additional challenge during grand finals.</td></tr>
<tr><td colspan="2">d) The competition runs should not last more than three minutes (labelled as RUNTIME).

e) Robot must complete the mission before the RUNTIME ends.

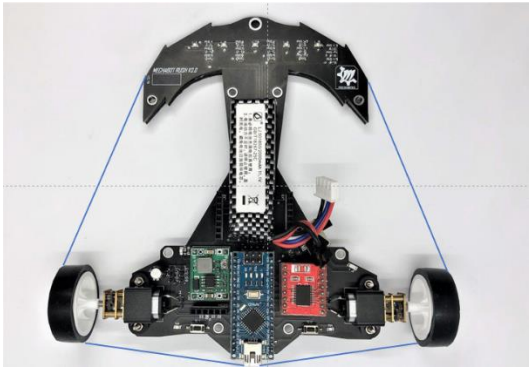
• If a robot has yet to complete all the tasks once the RUNTIME is over, the team will be asked to remove the robot from the</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">COMPETITION FIELD and it will be recorded as did not finish.</td></tr>
<tr><td>c)Game Field</td><td>An area around the field will be designated as the Testing area. No one is allowed inside the game zone except for the robot handlers, referees, and Petrosains' RBTX advisors.</td><td>An area around the field will be designated as the CONSTRUCTION ZONE. No one is allowed inside the game zone except for the robot handlers, referees, and Petrosains' RBTX advisors.</td></tr>
<tr><td>d) Game Zone</td><td colspan="2">An area around the field will be designated as the GAME ZONE. No one is allowed inside the game zone except for the competing participants, referees, and Petrosains' RBTX advisors.</td></tr>
<tr><td>e) Start and Restarts</td><td colspan="2">a) One team member is elected as the robot handler while another member is mission assistant. Only the robot handler is permitted to handle the robot during the game.

b) The robot will be placed at the START line and checked by one of the referees.
  
Top view Side view

c) The team may restart as the handlers deem necessary within the RUNTIME.

d) A robot must restart if:
• The robot handler asks for a restart.
• The robot is touched by a contestant.
• The robot moves off the field.</td></tr>
</table>

	e) It is **advised** for the robots to **restart** if: • The mission items fall or are wrongly placed on the track. • The robot is unable to return to the start line. f) At any restart, the robot and the image cube must be positioned back at its original starting line. g) During the restart process, the handlers are allowed to make minor adjustments to the robots but not in terms of programming or replacing parts. Adjusting the sensor position on the robot is allowed during the allocated RUNTIME. h) 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. i) There is no limit for the number of restarts within the RUNTIME of three minutes. j) The referee will record the most recent RACETIME using official timer or watch.
f) Following the Line	a) 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.  b) A team's robot must remain on the field until it has completed its game.

<table>
<tr><td>g)Checkpoint</td><td>NA</td><td>~~The direction of the pointed arrows will indicate the checkpoints where participant may pass to obtain more points.~~

NA</td></tr>
<tr><td>h) Scoring</td><td colspan="2">1. RACE TIME is the time recorded for tracing the route from START to FINISH.

a) 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. The referee will record the most recent RACETIME using official timer or watch.

10.3. The final score will be the total points accumulated based on the number of mission complete and the robot reaches the finishing line.

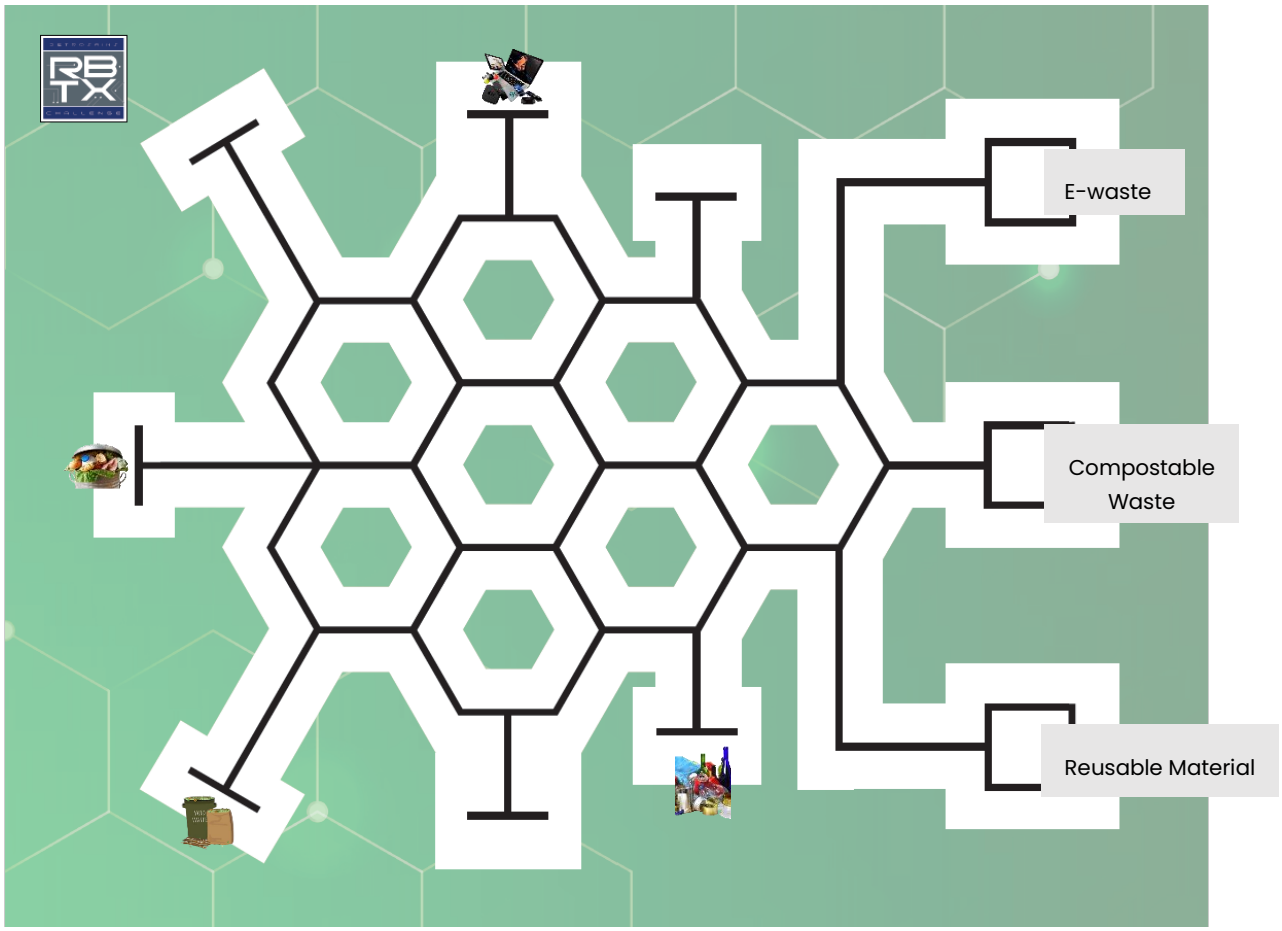
2. The final mission time is concluded once any part of the robot returns to the start line.

10.4. If two or more teams that complete the challenge manage to accumulate the same points, the team that obtains faster race time will be ranked higher.</td></tr>
<tr><td rowspan="2">i)Point</td><td>10.5. THREE (3) points will be awarded for each object that is successfully placed in the correct location as long as any part of the object is touching the line. If the cube is outside of the line there will be no point added for the cube.</td><td>a) THREE (3) points will be awarded for each object that is successfully placed in the correct location as long as any part of the object is touching the line. If the cube is outside of the line there will be no point added for the cube.</td></tr>
<tr><td>1. NO POINT (0) point if the object is placed in an incorrect location.</td><td>2. NO POINT (0) point if the object is placed in an incorrect location.</td></tr>
</table>

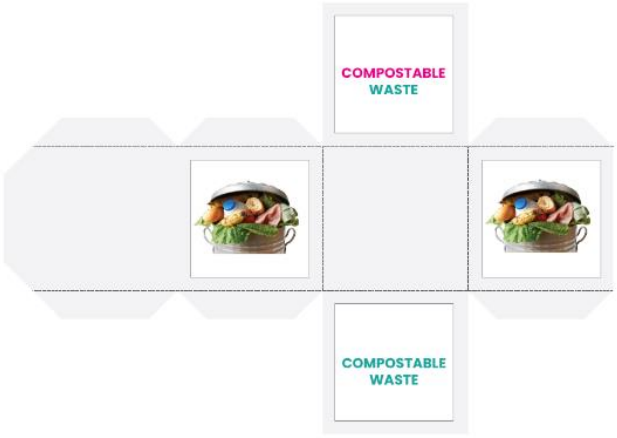
	2. An additional **ONE (1)** point will be given if the robot **reaches the FINISH line.**	~~3. A limit of **TWO (2)** point for each **checkpoint passed through**.~~
		4. An additional **ONE (1)** point will be given if the robot **reaches the FINISH line.**
j) Finalist / Winner selection	The winner will be decided based on the following criteria: a.Highest score 6.1 The team with the fastest RACE. 6.2 As per the judges' decision.	The winner will be decided based on the following criteria: a. Highest score b. The team with the fastest RACE. c. As per the judges' decision.

APPENDIX 1

A.EXAMPLE TASK FOR ZONE QULAIFYING



B. CUBE IMAGE


COMPOSTABLE WASTE
COMPOSTABLE WASTE


REUSABLE MATERIAL
REUSABLE MATERIAL


E - WASTE
E - WASTE
REUSABLE MATERIAL
REUSABLE MATERIAL


COMPOSTABLE WASTE
COMPOSTABLE WASTE
E - WASTE
E - WASTE