PETRONAS Powering Knowledge

#RBTX2024

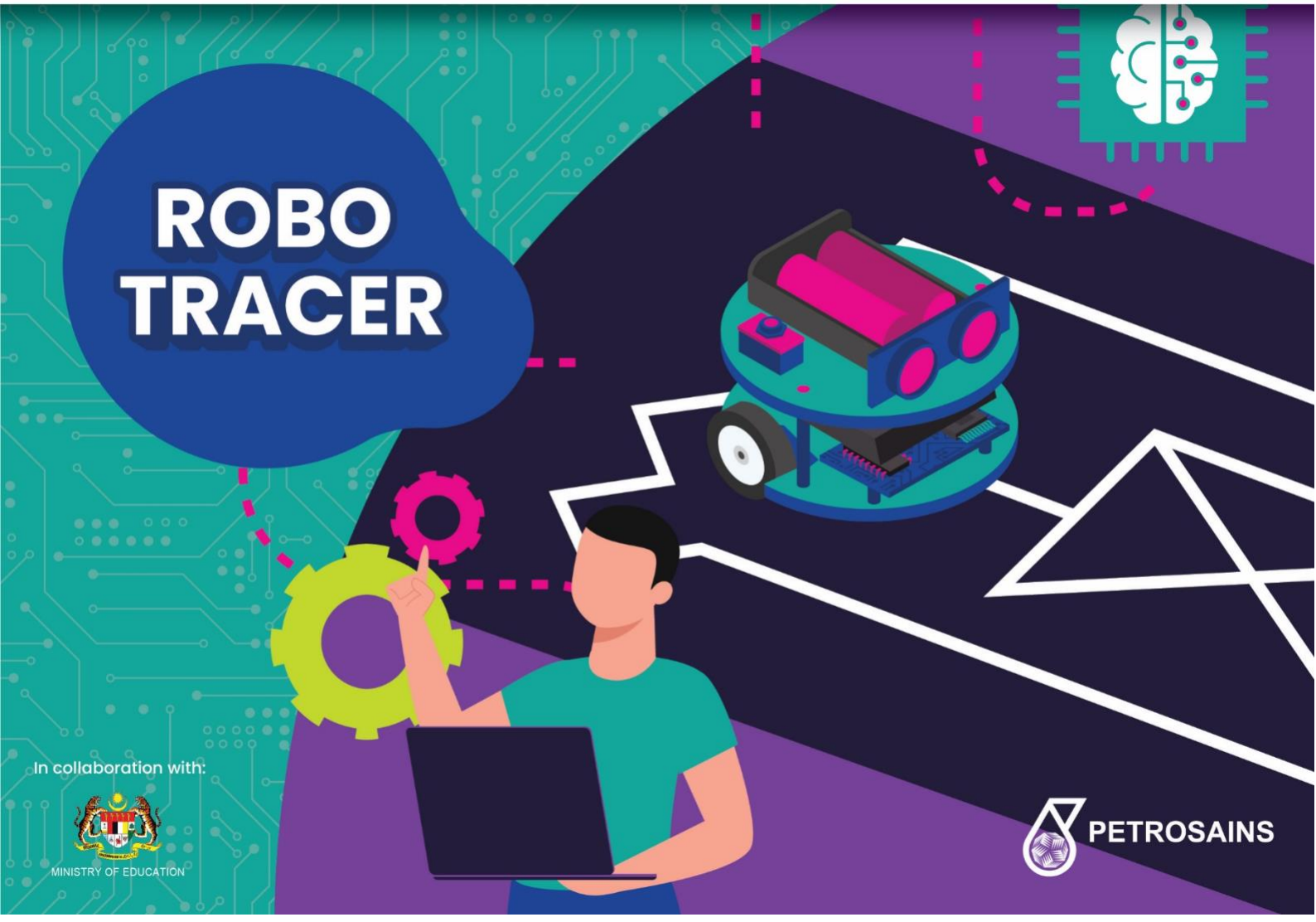
Awarded by:

PETROSAINS RBTX CHALLENGE 2024

RULES AND REGULATIONS

SPEED RIVALS

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.



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[Speed Rivals]

A time-based challenge where teams compete to complete the course in the fastest time possible. Teams aged 10 years old and above are challenged to program a robot that can move on a line track (black on white) and pass through all obstacles. The robot which finishes the race in the fastest time will be declared the winner.

INTRODUCTION

Robo Tracer, also known as line following, is a technique used in robotics where a robot follows a line, usually a contrasting colour, that is marked on a surface. This is accomplished using sensors, such as infrared or optical sensors, that detect the contrast between the line and the surrounding surface. By continuously detecting the position of the line, the robot can adjust its movement to stay on the line. Line following robot is commonly used in industrial and manufacturing settings, where robots can be programmed to follow a specific path to move materials or perform tasks. It is also a popular application in educational robotics, as it is a simple and engaging way to introduce students to robotics and programming concepts.

General Rules

1.0 Competition Phases

a) **Registration:** Each team is required to register through the RBTX website. Each participant can register for one team **ONLY**.
b) **Online Learning:** Participants are required to complete the learning modules and pass the assessment in the RBTX Portal to be eligible for certification of participation. Passing mark is 80%.
c) **Video Submission:** Teams are then required to submit a video of the complete challenge upon registration.
d) **Grand Finals Online Briefing:** Finalist 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.
e) **Grand Finals:** Selected teams from the Video Submission Stage will proceed to the Grand Finals which will be held onsite. All costs incurred shall be borne solely by the participating teams.

2.0 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 **10 years old and above only**. (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.
e) The guardian is not allowed to touch or repair the robot during all phases of the competition. (Refer to 1.0.Competition Phases)
f) The guardian must not be involved in the programming of the robot during all phases of the competition. (Refer to 1.0.Competition Phases)
g) 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.
h) Participants should comply with the safety requirements throughout the competition.
i) 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.

3.0 Competition Field and Mission Items

All participating teams must print their own competition field for the Video Submission Phases. The same track design will be used during the Grand Finals. The competition field template will be issued by the organizer in PDF format in **exact measurement.**

3.1 Field specifications

a) **Materials:** tarpaulin with matte surface**.**

b) **Dimension:** 2 meter L x 3 meter W.

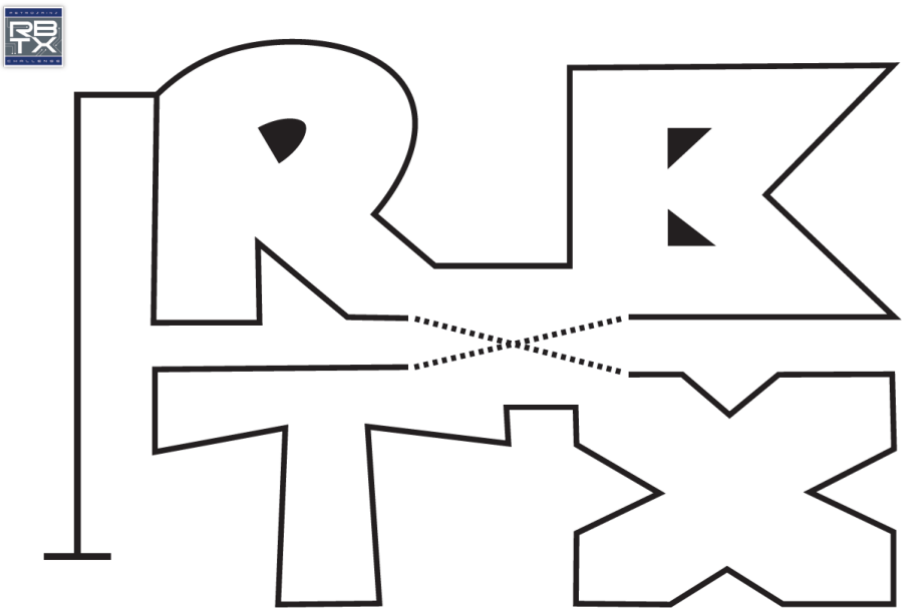
c) **Grid lines:** 1.6cm to 2.0cm in width and are black in colour.

d) **Characteristics of the line course:**
Crossover, and hairpins are possible. For switchbacks and hairpins, the adjacent sections of the line shall be no closer together than 15cm when measured from the center of each line.

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) Each team is responsible for ensuring the quality of the competition field, which includes the printing material, colour tone and accurate measurement. The field must also be smooth and free of smudges.

g) The layout of the competition field is as follows:



Remark: ***The track design for the Video Submission is as per display.***

4.0 The Robot

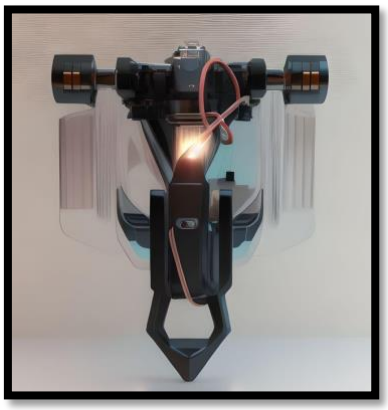
Each team must have its own robot and must not be shared with other participants of the Petrosains RBTX Challenge 2024.

Every robot must comply with the following specifications.

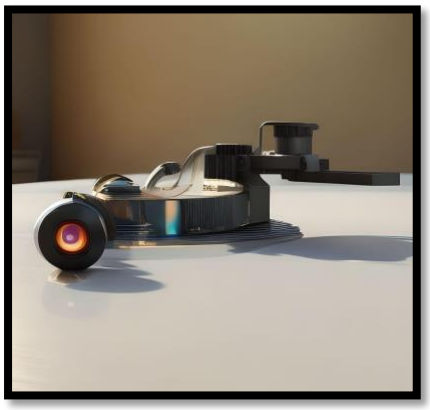
4.1 Dimensions

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

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



Top View



Side View

4.2 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).

4.3 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.

4.4 Sensors

No limit on the number of line tracking sensors used.

4.5 Start Button

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

4.6 Construction

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

5.0 Code of Conduct

5.1 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.
c. Participating teams and robot that does not meet the regulations and specifications will not be allowed to compete in the competition.
d. Participating teams that violate the code of conduct may risk being disqualified from the competition.

6.0 Judges

a. The judges' decision in determining the winner shall be final and no appeals against the decision will be entertained.
b. Teams should completely respect their vote and decisions.
c. 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.

7.0 Video Submission Brief

7.1 The Task

Participating teams are required to record a Video of their robot completing the challenge in the fastest time and passing through all obstacles given.

7.2 Requirement video file:

a. Upload your video to YouTube or Google Drive. Submit the link to the organizer. **The video must be private but accessible to the organizer only.**
b. The duration of the video must not exceed 3 minutes.
c. All final audio/video presentations must be in MP4 Format (H.264 video and AAC audio codec).
d. Video size set at HD (1280 x 720 or other '720p' setting)
e. The audio/video dimensions must have a minimum height of 480 pixels with an aspect ratio of 16:9.
f. The naming convention for the video must include the team's name for the judges' reference.
Eg: The Marvel XYZ

7.3 Competition Video Display Setup

a. The entire competition field (as stated in **2.3 Field specifications**) must be in full view throughout the video.
b. Place any form of a stopwatch timer that is visible at the bottom right-hand corner of the video.
c. Any editing or manipulation of the video timing will cause **immediate disqualification.**
d. The video must consistently capture the robot's movement and the entirety of the competition field throughout the recorded run.

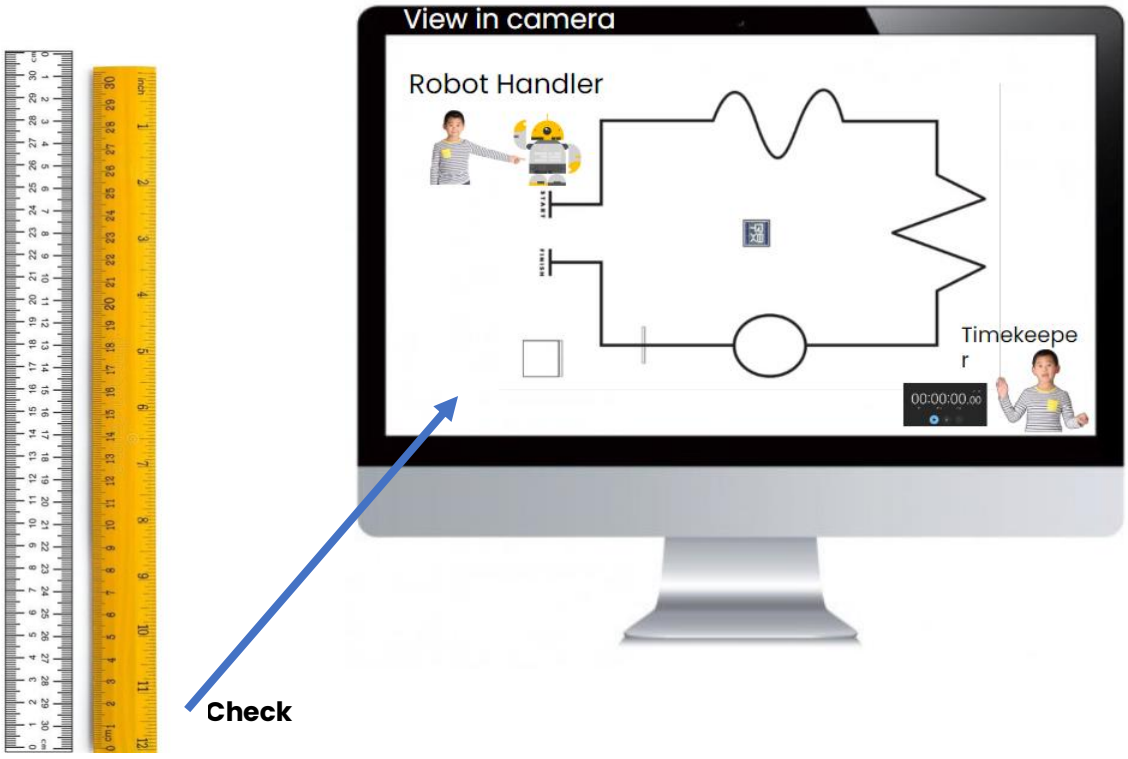
7.4 Verification

Sample of video format is available at the Petrosains RBTX Challenge microsite.

- Mention team's name, participants' name and institution's name
- Competition field setup
- Verify the track measurements, robot size and robot features. This will include testing the visual stopwatch timer and the robot's onboard display timer capabilities.

a) Start the video with a full view of the entire competition field.

b) Track Scale Check – Zoom the video to the scale checker to verify the track measurements. Place a standard 30cm stationary ruler on the track beside the scale checker.



Place the robot inside the robot size checker on the track. Teams must show that the robot can fit within the outline of the robot size checker.

Robot Features Check – Teams must include shots of their robot's features as per the competition requirements.

7.6 Competition Start

a. Participants may first implement any calibration procedures.
b. The handler must place the robot at the designated start line. A certain part of the robot must also be perpendicular to the designated start line.
c. After pressing the start button, the robot should then begin to trace the line and complete the run in the fastest time.
d. Simultaneously with (6.5.4), a team member shall start the stopwatch timer that is visible in the video.

7.7 Competition Finish

a. The competition is complete as and when any part of the robot touches the finish line.
b. A team member shall also stop the timer on the stopwatch at the same time as 7.6.1.
c. Show the final reading of the stopwatch timer clearly in the vid

8 Grand Final Phase

8.1 The Challenge

The Robo Tracer Open category challenged innovators aged 10 years old and above to program a robot that can move on a line track (black on white) and pass through all obstacles. The robot which finishes the race in the fastest time will be declared the winner.

8.2 Competition Field

8.2.1 Specification

a. The design and specification of the game field are identical to the Video Submission game field.

b. There will be additional obstacles which the placement will be revealed on the day of the Grand Final. The type of obstacles and the measurements will be disclosed during briefing session.

8.2.2. Disciplinary

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

8.3 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 **Game Rules**

8.4.1 Format and Rounds

a) Every team will compete in Double Elimination format.

Remarks: Double elimination format example. The number of teams that qualify for the grand final is subject to change.

b) Robot will be facing off against each other.
c) One team member is elected as the robot handler. Only that team member is permitted to handle the robot during the game.
d) At the beginning of each game, both teams must undergo coin flip to determine their starting game field side.
e) The robot will be placed at the START line and checked by one of the referees.
f) Each face off will go through **one (1)** game consists of **three (3)** rounds. **One (1)** minute will be allocated for each round. Participants need to win at least **two (2)** rounds to win the game.
g) At every round, the robot must be positioned back at the START line (In the box). The RACETIME will be reset to zero during every round.
h) Both teams must start at the same time. RACETIME will be started by the referee.
i) If a robot has yet to reach the finish line before the allocated **one (1)** minute is over, the team will be asked to remove the robot from the COMPETITION FIELD and ready for the next round.
j) The fastest robot to reach the FINISH line will be the winner.

8.4.2 Race clock

a. Once the referee **STARTS** the game, the **RACE TIME** and the **ROUND TIME will** also start.

b. The RACETIME will be reset to zero during every round.

c. As the robot reaches the finish line, the timer will STOP, and the final recorded **RACE TIME** value will be saved.

8.4.3 Losing the lines

Any robot that loses the line course must reacquire the line at the latest checkpoint before it was lost. At the same time the RACE TIME will be paused.

8.5 Scoring

a. The winner of the round will be decided based the fastest **RACETIME** between the two teams.

b. If both teams are unable to complete the track, the winner will be determined based on the criteria below.

- Robot that traced the farthest line in the shortest time.
- Least number of line sensor.
- Shorter robot.
- Heavier robot.