ROBO TRACER

Junior Category

RULES & REGULATIONS

PETROSAINS RBTX CHALLENGE 2022

Table of content:

PART 1

GENERAL BRIEF

1. The Challenge

This category is open to contestants aged 7 to 12 years old only.

The challenge is to program a robot that can move on a given line (black on white) and pass through all designated checkpoints on the competition field. The team to complete the challenge in the fastest time will be declared as the winner.

There are no restrictions on the type or brand of robot to be used. The robot can be custom made and built from scratch or bought off the shelves, as long as it complies with the stipulated rules and regulations. Teams must bear the cost or expenses of their own robots.

There will be an additional challenge included during the grand final stage that will be announce after the qualification.

1.1. Competition Phases

The competition is divided into **THREE (3)** phases as per the following:

i. Team Registration/Quiz and Video Submission Phase ***(refer to Part 2- Video Submission Brief)***
ii. Virtual Qualification Phase ***(refer to Part 3- Virtual Qualification Brief for details)***
iii. Physical Grand Finals Phase ***(refer to Part 4- Grand Finals Brief for details)***

Please refer to the guidelines for the video submission, virtual Qualifications & Grand Finals in Part 2, Part 3 & Part 4 accordingly.

Teams are required to submit a video of their completed challenge upon registration.

Based on their video submissions, selected teams will compete in the virtual **Qualification Phase** for a place in the Grand Finals

The **Grand Finals** will be held as a physical event whereby finalists will compete for the coveted title of Petrosains RBTX Challenge 2022 Robo Tracer Junior Champion.

1.2 PARTICIPANTS

1.2.1 All team members except for the guardian must be between **7 to 12 years of age**. (Maximum of two team members)

1.2.2 The guardian can be a teacher, parent, mentor, or technical advisor.

1.2.3 The guardian is not allowed to touch or repair the robot during all **THREE (3)** phases of the competition. (refer to 1.1 – i to iii)

1.2.4 The guardian must not be involved in the programming of the robot during all phases of the competition. (refer to 1.1)

1.2.5 In the case of any interference by the guardian with the robot or referee decisions during any phases of the competition, the team will risk disqualification.

2. Competition Field

It is compulsory for participating teams to print their own competition field for the **Video Submission**, **Qualification** and **Grand Finals stages.** The competition field template will be issued by the organizer in PDF format.

Each team is responsible to ensure 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.

2.1. Field specifications

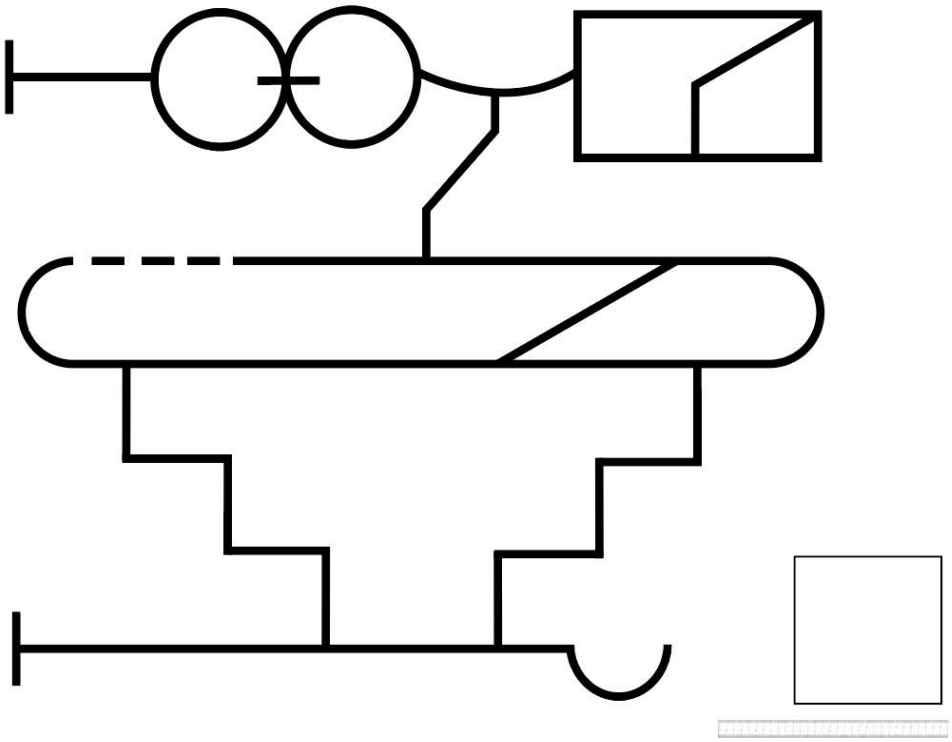
2.1.1 The maximum dimensions of the qualifying competition field are 1524mm x 1219mm.

2.1.2 The maximum dimensions of the grand final competition field are 3857mm x 2638mm.

2.1.3 The lines to be followed are 10 mm to 12 mm in width and are black in colour.

2.1.4 Expect all measurements and dimensions to have a 10% tolerance.

2.1.5 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 Video submission phases and Virtual Qualification phases.

3. The Robot

Each team must have its own individual robot and must not be shared with other participants of the Petrosains RBTX Challenge 2022.

3.1. Dimensions

Each team must comply with the following robot specifications:

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

3.2. Control and Programming

3.2.1 The robot must be controlled autonomously with no human aid.

3.2.2 The controller unit should be embedded in the robot and cannot be placed on the robot's exterior.

3.2.3 The robot must be programmed by the team members (either text-based or graphical programming).

3.3. Sensors

A maximum of five (5) line sensors are allowed.

3.4. Display

The robot must be equipped with an onboard display with an accurate stopwatch capability.

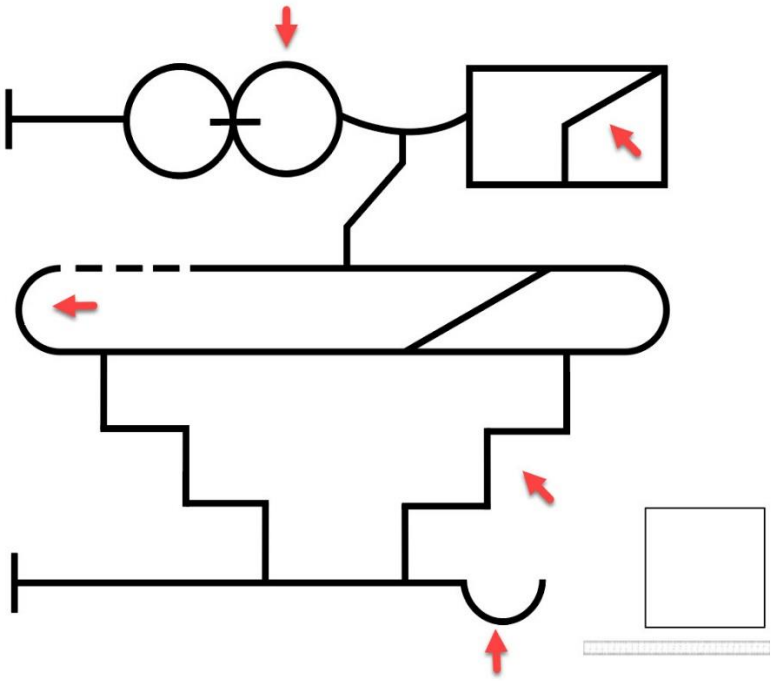
3.5 Start Button

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.

4. Checkpoints Position



Remark: The checkpoint positions for the Video Submission phase are as per displayed. However, these checkpoints may change for the Virtual Qualification.

4.1 Place visible marks that are easily moved or replaced on the competition field to indicate the checkpoints.

4.2 The location of the checkpoints will be at the sole discretion of the competition organizer and will be informed to all teams as per the following:

i. Video Submission Phase – At the start of the registration period

ii. Qualification Phase – One (1) month before the Qualification stage competition date

iii. Grand Finals Phase– On the day of the Grand Finals competition date

4.3 The direction of the pointed arrow will indicate where the robot should pass to collect points.

5. Scoring

5.1 One (1) point is given each time the robot passes a checkpoint for the first time. No extra point will be given for the robot if it passes the same checkpoint during the round.

5.2 The robot is required to pass as many checkpoints as possible without any preferences given on sequence.

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 team with the **highest points will be ranked first**. If there are two teams or more with the same accumulated points, the team with the fastest final race time will be ranked higher.

5.6 The video submission, Virtual Qualification and Grand Final phases shall have its own minimum requirements to be assessed and are further described in the corresponding Part 2 & Part 3 Brief guide.

6. Code of Conduct

6.1. Fair Play

6.1.1 It is expected that the aim of all teams is to play a fair and clean game.

6.1.2 The rules are enforced at the discretion of the referees, officials, and local law enforcement authorities.

6.1.3 Participating teams and robot that does not meet the regulations and specifications will not be allowed to compete in the competition.

6.1.4 Participating teams that violate the code of conduct may risk being disqualified from the competition.

7. Judges

7.1 All decisions on scoring, gameplay and timing are made by the judges. Teams should completely respect their vote and decisions.

7.2 Judges may announce new rules or decisions pertaining to any issues that might not be mentioned in the existing rules and regulations, which must be abided by all participants.

7.3 All decisions are final.

PART 2

VIDEO SUBMISSION BRIEF

1. The Challenge

The challenge is to program a robot that can move on a given line (black on white) and pass through all designated checkpoints on the competition field. Teams will be ranked based on their point tally and time taken to complete the challenge.

Participating teams are required to record **a Video** of their robot completing the challenge in the fastest time and collecting the most points.

The following are the requirements for the video file:

i. Teams must provide a link to the video (which can be uploaded to any platform such as Google Drive, YouTube etc). The link must be listed and accessible for the organizer to view.
ii. The duration of the video must not exceed 10 minutes.
iii. All final audio/video presentations must be in MP4 Format (H.264 video and AAC audio codec).
iv. Video size set at HD (1280 x 720 or other '720p' setting)
v. The audio/video dimensions must have a minimum height of 480 pixels with an aspect ratio of 16:9.
vi. The naming convention for the video must include the team's name for judges' reference purposes.

All the requirements stated are to be adhered to.

2 General Rules

2.1 One (1) team member is elected as the robot handler. Only that team member is visually permitted to handle the robot during the video recording session of the game.

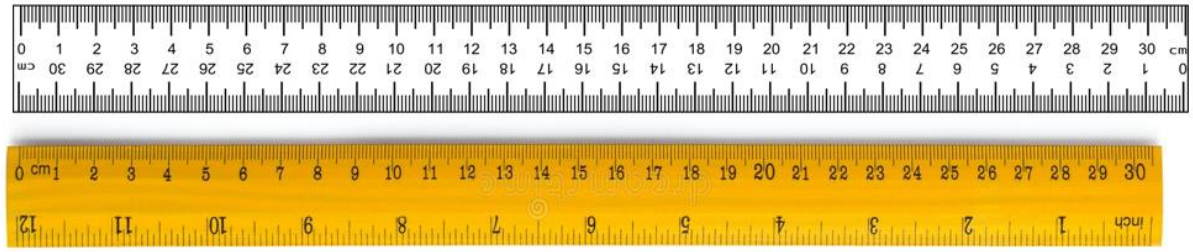
2.2 The guardian can assist the team in setting up the video recording session.

3 Game Play

3.1 Verification Phase

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

3.1.2 **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. Teams would also be randomly asked to verify the length of certain parts of the track.



3.1.3 **Robot Size Check** – 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.

3.1.4 **Robot Features Check** – Teams must include shots of their robot's features as per the competition requirements, such as a maximum of five (5) line sensors, onboard display with a timer (initiate the timer to prove its functionality) and power supply.

3.2 Competition Video Display Setup

3.2.1 The entire competition field must be in full view throughout the video.

3.2.2 Place any form of a stopwatch timer that is **visible** at the bottom right-hand corner of the video.

3.2.3 Any editing or manipulation of the video timing will cause immediate disqualification.

3.3 Competition Start

3.3.1 The video must consistently capture the robot's movement and the entirety of the competition field throughout the recorded run.

3.3.2 Participants may first implement any calibration procedures.

3.3.3 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.

3.3.4 After pressing the start button, the robot should then begin to complete the task of passing through all designated checkpoints within the least amount of time.

3.4 Following the line

3.4.1 For the purposes of determining if the robot has moved outside the line or strayed off the field, the competition 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.

3.4.2 The robot must remain on the field until the game has been completed.

3.5 Competition Finish

3.5.1 The competition is complete as and when any part of the robot touches the finish line after passing through all the designated checkpoints.

3.5.2 The onboard timer should stop automatically, and the visual stopwatch timer should be stopped manually.

3.5.3 Show the comparison of the onboard timer and the stopwatch timer visually in the video recording.

4 Task Completion

4.1 The robot must complete the challenge within a maximum time limit of one (1) minute and 30 seconds per game run.

4.2 All other scoring requirements are stated in **Part 1 - General Brief** clause 5.

5 Code of Conduct

5.1 It is expected that the aim of all teams is to play a fair and clean game.

5.2 The rules will be enforced at the discretion of the referees, officials, and local law enforcement authorities.

PART 3

VIRTUAL QUALIFICATION

1 The Challenge

The challenge is to program a robot that can move on a given line (black on white) and pass through all designated checkpoints on the competition field. Teams will be ranked based on their point tally and time taken to complete the challenge.

Based on their video submissions, the top ranked teams will be selected to move on to the Qualification Phase and subsequently the Grand Finals. The qualified teams shall be notified in advance for their game schedule. All qualified teams are required to compete via **live video streaming** on a **virtual competition platform**. Teams will be at their own location with their own printed track and robot.

In addition to the scoring, selected teams will be called upon for an interview session before the selection for the grand finals are made.

2 General Rules

2.1 One (1) team member is elected as the robot handler. Only that team member is visually permitted to handle the robot during the virtual live video streaming session of the game.

2.2 The guardian can assist the team in setting up the live video streaming session.

2.3 The guardian is not allowed to touch or repair the robot and do any form of programming as stated in clause 1.2.3 and 1.2.4 of the General Brief as per the following:

1.2.3 The guardian is not allowed to touch or repair the robot during all **THREE (3)** phases of the competition. (refer to 1.1 – i to iii)

1.2.4 The guardian should not be involved in the programming of the robot during all phases of the competition. (refer to 1.1)

3 Competition Overview

3.1 Virtual Competition

3.1.1 The participating team will be given access to the virtual competition platform at a designated time. This will be informed to the team at least 24 hours before the competition run.

3.1.2 The competition run will be conducted online with referees remotely evaluating the number of points accumulated, race and run time and adherence to all competition rules and regulations.

3.1.3 The competition includes a minimum of one (1) referee and the participating team.

3.1.4 A compulsory briefing session will be conducted before the start of the competition run for all participating teams.

3.1.5 Each participating team shall have one (1) competition run.

3.1.6 The competition run should not last more than three (3) minutes (labelled as **Runtime**).

3.1.7 If a robot has yet to pass through all checkpoints once the runtime is over, the referee in attendance will ask for the team to stop, and their points will be finalised.

3.1.8 Race clock

When the robot passes the start line, an onboard timer will begin to count the **Race Time.**

As it reaches the finish line, the timer will stop, and the final recorded race time value will be saved and shown on the robot's onboard display.

3.1.9 The checkpoint positions will be revealed one (1) day prior to the competition date as mentioned in clause 4.2 of the **Part 1-General Brief.**

3.1.10 The live video streaming session of the Virtual Competition will be conducted as per the following:

i. Step 1: Verification (Game Track & Robot)

ii. Step 2: Competition Run

3.1.11 The competition field must be in full view throughout the live video streaming session.

3.1.12 Teams must place any form of a stopwatch timer that is visible at the bottom right-hand corner of their screen.

3.1.13 Any editing or manipulation of the timing will cause immediate disqualification.

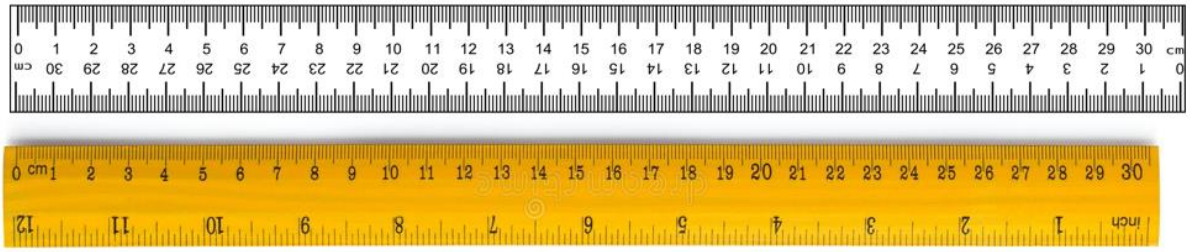
3.1.14 Participating teams shall ensure and are responsible for a stable internet connection throughout their competition run.

3.1.15 In the event that a participating team has a technical problem during their competition run, the referee, at their sole discretion, will decide if the run must be cancelled or restarted.

3.2 Verification

Prior to the start of the game, participating teams must first verify their competition field measurements, robot size and robot features. This will include testing the visual stopwatch timer and the robot's onboard display timer capabilities.

3.2.1 **Track Scale Check** – Verification of the competition field measurement is done by placing a standard 30cm stationary ruler on the track beside the scale checker. Teams will also be randomly asked to verify the length of certain parts of the track *(see next page).*



3.2.2 **Robot Size Check** - The robot size check is done by placing the robot inside the robot size checker . The robot must fit within the outline of the robot size checker.

3.2.3 **Robot Features Check** – Display and show the robot features as per the competition requirements, such as a maximum of five (5) line sensors, onboard display with a timer (initiate the timer to prove its functionality) and power supply.

3.3 Competition Run

3.3.1 Teams must consistently capture their robot's movement and the entirety of the competition field throughout the virtual competition run.

3.3.2 Participants may first implement any calibration procedures.

3.3.3 Teams must display their robot's onboard display timer and ensure that it is at zero.

3.3.4 The handler will then place the robot at the designated start line.

3.3.5 After pressing the start button, the robot should then begin to complete the task of passing through all designated checkpoints within the least amount of time.

3.3.6 Teams may restart their run if deemed necessary, within the runtime.

The restart can be requested only if the robot does not follow the line, has stopped halfway, or has lost direction.

3.3.7 At any restart, the robot must be positioned back at the start line.

3.3.8 Adjusting the sensor position on the robot is allowed during the allocated runtime.

3.3.9 The race time will be reset to zero at every restart, and all checkpoint marks will also be zero. However, the runtime will continue during all restarts.

3.3.10 There is no limit for the number of restarts within the runtime of three minutes.

3.3.11 A robot must restart if:

- The robot handler asks for a restart.
- The robot is touched by a participant.
- The robot moves off the field.

3.4 Following the line

3.4.1 For the purpose of determining if the robot has moved outside the line or strayed off the field, the competition 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.

3.4.2 The robot must remain on the field until the game has been completed.

3.5 Competition Finish

3.5.1 The competition is complete as and when any part of the robot touches the finish line after passing through all the designated checkpoints.

3.5.2 The onboard timer should stop automatically, and the visual stopwatch timer should be stopped manually.

3.5.3 Show the comparison of the onboard timer and the stopwatch timer visually in the screen.

4 Scoring

4.1 One (1) point is given each time the robot passes a checkpoint for the first time. No extra points will be given if the robot passes the same checkpoint during the round.

4.2 The robot is required to pass as many checkpoints as possible without any preferences given on sequence.

4.3 **Race time** is the time recorded for the robot to complete tracing the route and passing all checkpoints.

4.4 The race time is started by the onboard timer once the robot starts to move.

4.5 The final race time is concluded as and when any part of the robot touches the finish line and stop automatically as stated in clause 3.5.2.

4.6 The team with the highest points will be the winner. If there are two teams or more with the same accumulated points, the team with the fastest final race time will be at a higher standing.

5 Code of Conduct

5.1 It is expected that the aim of all teams is to play a fair and clean game.

5.2 Participating teams that violate the code of conduct may risk being disqualified from the competition.

5.3 The rules will be enforced at the discretion of the referees, officials, and local law enforcement authorities.

6 Judges

6.1 All decisions on scoring, gameplay and timing are made by the judges. Teams should completely respect their vote and decisions.

6.2 Judges may announce new rules or decisions pertaining to any issues that might not be mentioned in the existing rules and regulations, which must be abided by all participants.

6.3 All decisions are final.

PART 4

GRAND FINALS BRIEF

1 The Challenge

The challenge is to build a robot that can move on a given line (black on white) and pass through all designated checkpoints on the COMPETITION FIELD. The robot with the fastest time will be declared as the winner.

There will be an additional challenge included during the grand final stage that will be announce after the qualification phase.

1.1 General Rules - (Phases for Qualifying)

1.1.1 Phases of Competition

The competition is divided into three phases as per the following:

i. Construction and Programming
ii. Quarantine
iii. Competition Run

The minimum Construction and Programming time is ONE hour. It can be extended depending on track complexity and subjected to committee discretion.

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, changes of hardware or software is allowed during this period.

In the Competition Run, contestants will take their robots from the Quarantine Area and place it on the track.

1.1.2 Competition Run and Checkpoints

Each team will have two competition runs.

Each competition run will have its own Construction and Programming and Quarantine phases.

The competition run should not last more than three minutes (labelled as RUNTIME).

If a robot has yet to pass through all checkpoints once the RUNTIME is over, a BUZZER will sound and the team will be asked to remove the robot from the COMPETITION FIELD.

The checkpoint positions will be revealed on the day of the competition and may change between competition runs.

1.1.3 Race clock

There will be optical sensors that can detect the robot's movements.

When the robot moves from the START line and passes these optical sensors, a timer will automatically begin to count the RACETIME.

The time that the robot takes to pass each checkpoint will be recorded. As it reaches the final checkpoint, the timer will stop and the final recorded RACETIME value will be saved.

1.2 Team Members & Mentors

1.2.1 All team members except for the team mentor must be between **7 to 12 years of age**. (Maximum of two team members)

1.2.2 Only one mentor in the team is allowed as a technical advisor.

1.2.3 The technical advisor is not allowed to touch or repair the robot during the phases of the competition (refer to 1.1.1)

1.2.4 The technical advisor should not be involved in the programming of the robot during the phases of the competition (refer to 1.1.1)

1.2.5 In case of any interference by the technical advisor with the robot or referee decisions during the competition, the team will risk disqualification.

2 Competition Field

2.1 Field specifications

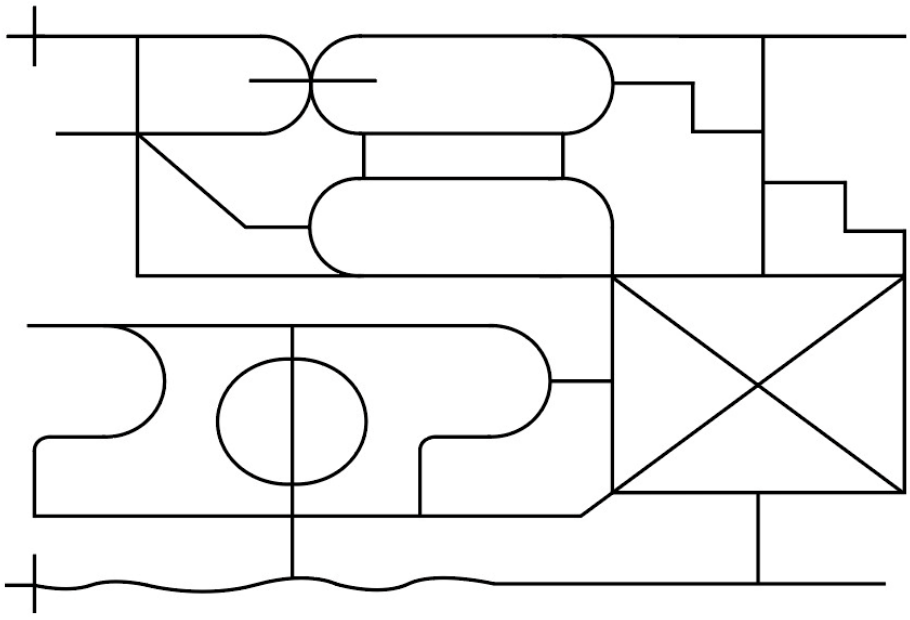
2.1.1 Lines to be followed are 10mm to 12mm in width and are black in colour.

2.1.2 Expect all measurements and dimensions to have a 10% tolerance.

2.1.3 The organizing committee will make every possible attempt to ensure that there are no 'bumps' between the tiles although there may be slight deviations in height and width of up to 3mm. Contestants must be prepared to deal with these slight imperfections.

2.1.4 There will be one START line and 10 checkpoints in the entire field.

2.1.5 The dimensions of the COMPETITION FIELD are as follows:



3 The Robots

3.1 Dimensions

Each team must comply with the following robot specifications:

Width – 200mm max

Length – 200mm max

Height – no limit

3.2 Control and Programming

3.2.1 The robot must be controlled autonomously with no human aid.

3.2.2 The controller unit should be embedded in the robot and cannot be placed on the robot's exterior.

3.2.3 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.

3.2.4 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.

3.2.5 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.

3.3 Sensors

A maximum of five line sensors are allowed.

3.4 Power Source

3.4.1 The robot must be powered by a power source such as a battery fixed on to the robot.

3.4.2 The robot cannot be powered by a stationary power source connected to the robot by a cord.

3.5 Construction

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

4 Game Play

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.

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.

4.3 Start and Restarts

4.3.1 One team member is elected as the robot handler. Only that team member is permitted to handle the robot during the game.

4.3.2 The robot will be placed at the START line and checked by one of the referees.

4.3.3 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 the direction.

4.3.4 At any restart, the robot must be positioned back at the start line.

4.3.5 Adjusting the sensor position on the robot is allowed during the allocated RUNTIME.

4.3.6 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.

4.3.7 There is no limit for the number of restarts within the RUNTIME of three minutes.

4.3.8 A robot must restart if:

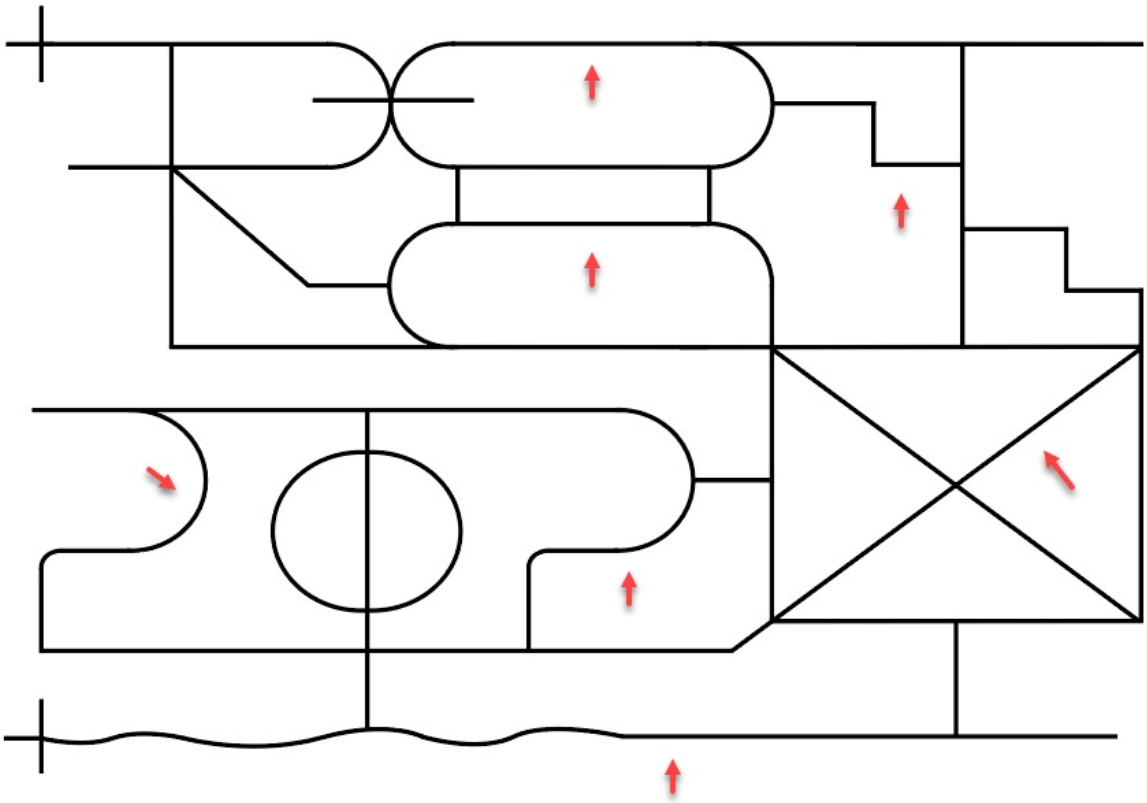
I. The robot handler asks for a restart.
II. The robot is touched by a contestant.
III. The robot moves off the field.

4.4 Following the line

4.4.1 For the purposes of determining 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.

4.4.2 A team's robot must remain at the field until it has completed its game.

5 Checkpoints Position



5.1 Flags will be placed on the track to indicate the checkpoints.

5.2 The direction of the pointed arrow will indicate where the robot should pass to collect points.

6 Scoring

6.1 One (1) point is given each time the robot passes a checkpoint for the first time. No extra point will be given for the robot if it passes the same checkpoint during the round.

6.2 The robot is required to pass as many checkpoints as possible without any preferences given on sequence.

6.3 RACETIME is the time considered for tracing the route from START and as the robot passes each checkpoint, the time it does that will be recorded.

6.4 RACETIME is started automatically by the on-field optical sensors that detect the robot's movement and by the referee.

6.5 The final RACETIME is concluded as and when the robot passes the last checkpoint during its run. There is no requirement to reach the finish line in this competition.

6.6 If there are 2 teams or more with the same accumulated POINTS, the team with the fastest RACETIME during Competition Run 2 will be at a higher standing, followed by averaging the RACETIME of Competition Run 1 and Run 2.

7 Code of Conduct

7.1 Fair Play

7.1.1 Robots that cause deliberate interference with other robots or damage to the field will be disqualified.

7.1.2 Contestants that cause deliberate interference with robots or damage to the field will be disqualified.

7.1.3 It is expected that the aim of all teams is to play a fair and clean game.

7.2 Behaviour

7.2.1 Contestants who misbehave may be asked to leave the competition area and risk being disqualified from the contest.

7.2.2 The rules will be enforced at the discretion of the referees, officials, and local law enforcement authorities.

8 Juries

8.1 All decisions about scoring, gameplay and timing are made by the juries. Teams should completely respect their vote and decisions.

8.2 Juries may discuss and announce new rules or decisions pertaining to any issues that are not mentioned in the rules and regulations. Objections will not be entertained.

9 Standard Operating Procedure (SOP)

9.1 Scan the MySejahtera QR code when entering the premises or prior participating in activities.

9.2 Wear a face mask at all times when in the company of others.

9.3 Maintain physical distancing of at least 1 metre from others where possible.

9.4 Adhere to COVID-19 testing requirements as per the NTS1; and

9.5 Report test results on the MySejahtera application if COVID-19 positive; and

9.6 COVID-19 positive cases shall undergo self-isolation based on MOH directions and **will not be allowed** to participate in the Grand Finals of Petrosains RBTX Challenge 2022.

9.7 Close contact Employees or Individuals shall undergo mandatory quarantine based on MOH current policies and undergo COVID-19 screening test if symptomatic.

*subject to changes by MKN

ROBO TRACER JUNIOR SCORING CHECKLIST

Items	Yes	No
Verification		
Full Track View in Camera		
Printed Track Specification		
Stop Watch Visible on Screen		
Robot Size		
Robot Features		
i.=< 5 sensors		
ii. No wireless modules		
Track Setup		
Checkpoint Markers		

Race Time	

Checkpoints	

Number of Restarts :