ROBO TRACER

Open Category

RULES & REGULATIONS

(V4)

PETROSAINS RBTX CHALLENGE 2022

Version Updates

V2   : Updated Part 1. General Brief – 3. Robots – 3.1 Dimensions

            : Updated Part 4. Grand Final Brief – 3. Robots – 3.1 Dimensions

V3   : Updated Part 1. General Brief – 3. Robots – 3.1 Dimensions

V4   : Updated Part 4. Grand Final Brief – 3. Robots – 3.1 Dimensions

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PETROSAINS

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PART 1

COMPETITION BRIEF

1   The Challenge

This category is open to contestants aged 10 years old and above only.

The challenge of the competition is to program a robot that can move on a given line (black on white). The robot which completes the task 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. **It is encouraged to build robot from scratch rather than bought off the shelves**. Teams must bear the cost or expenses of their own robots.

1.1   Competition Phases

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

    i.   Registration and Video Submission Phase *(refer to **Part 2 – Video Submission Brief)***

    ii.   Virtual Qualification Phase *(refer to **Part 3 – Virtual Qualification Brief)***

    iii.   Physical Grand Finals Phase *(refer to **Part 4 – Grand Finals Brief)***

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

Based on their video submission, 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 Open Champion.

1.2 PARTICIPANTS

1.2.1   All team members except for the guardian must be between **10 years old and above only**. (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.

1.3   General Rules

1.3.1   Rounds

Every team will compete in **ONE (1)** round.

The round should not last more than three minutes (labelled as **Runtime**).

If the robot has yet to reach the finish line once the Runtime is over, the round will be automatically stopped.

1.3.2   Race clock

Once the robot moves from the Start line, a timer will start to count the **Race Time.**

The timer will stop when the robot reaches the finish line, and the final recorded race time value will be saved.

1.3.3   Robot Control

Once a robot has crossed the start line, it must remain fully autonomous, or the team will be disqualified.

1.3.4   Competition Area

A robot that moves out of the Competition Field will be disqualified. A robot shall be deemed to have left the arena when any wheel, leg, or track has moved completely off the competition surface area.

1.3.5   Losing the Line

Any robot that loses the line course must reacquire the line at the point where it was lost or at any earlier (already traversed) point.

2   Competition Field

It is compulsory for all participating teams to print their own competition field for the **Video Submission** and **Qualification Phases. The competition field template** will be issued by the organiser in PDF format.

There will be **TWO (2)** different track designs, one design for the Video Submission and Qualification phase and another design for the Grand Finals.

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   Lines to be followed are 18mm to 20mm in width and are black in color.

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

2.1.3   The dimensions of the competition field, including the border, is **8 feet in length and 4 feet in width.**

2.1.4   Characteristics of the line course are as follows:

    i.   Crossover, switchbacks, 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.

    ii.   The closest approach of the line course to the edges of the arena shall be no less than 15cm, measured from the center of the line.

    iii.   Sharp angles may occur.

2.1.5   A printable rule scaler and robot size checker will be made available to ensure accurate measurements of the competition field and robot specifications are met.

8 FEET

START

4 FEET
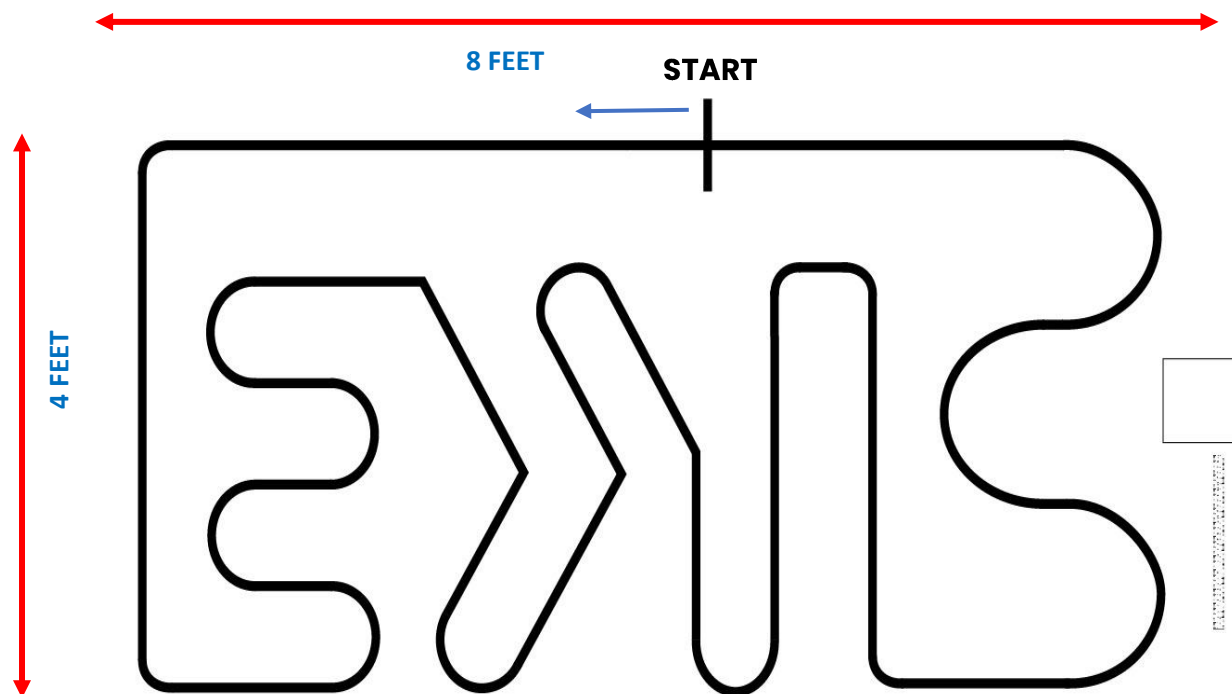
Remark: The track design for the Video Submission phase is as per displayed.

3   The Robot

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

3.1   Dimensions

Each team must comply with the following robot specifications:

Width – 200mm max –fully extended.

Length – 200mm max –fully extended.

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.

3.3   Sensors

No limit on the number of sensors used.

3.4   Power Source

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

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

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 complies to the above specifications.

4   Game Play

4.1   Game Zone

An area around the competition field will be designated as the **Game Zone.** No one is allowed inside the game zone except for the robot handlers.

4.2   Start and Restarts

4.2.1   One (1) team member is elected as the robot handler. Only that team member is permitted to handle the robot during the game.

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

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

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

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

4.2.5   The race time will be reset to zero at every restart. However, the runtime will continue during all restarts.

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

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4.2.7 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

4.3 Following the line

4.3.1 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.

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

5 Scoring

5.1 **Race time** is the time recorded for the robot to complete tracing the route from start to finish.

5.2 The team with the fastest race time will be the winner. If there are two teams or more with the same race time, these teams will compete in an extra round to determine the final winner.

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 robots that do not meet the stated specifications will not be allowed to compete.

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 of the competition is to make a robot that can move on a given line (black on white). The robot which completes the task in the fastest time will be declared as the winner.

Participating teams are required to record **a Video** of their robot completing the challenge in the fastest time and by 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 the judges' reference.

All the requirements stated are to be adhered to.

2   Game Play

2.1   Verification

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

2.1.2 **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.
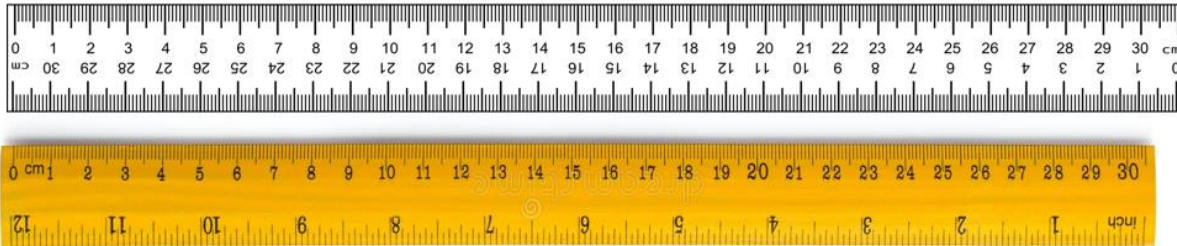
2.1.3 **Robot Size Check** – Place the robot inside the robot size checker on the track. Teams must show that the robot can fit within the outline of the robot size checker.

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

2.2 Competition Video Display Setup

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

2.2.2 Place any form of a <u>stopwatch timer</u> that is **visible** at the <u>bottom right-hand corner of the video.</u>

2.2.3 Any editing or manipulation of the video timing will cause <u>immediate</u> disqualification.

2.3   Competition Start

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

2.3.2   Participants may first implement any calibration procedures.

2.3.3   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.

2.3.4   After pressing the start button, the robot should then begin to trace the line and complete the run in the fastest time.

2.3.5   Simultaneously with 2.3.4, a team member shall start the stopwatch timer that is visible in the video.

2.4   Following the line

2.4.1   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.

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

2.5   Competition Finish

2.5.1   The competition is complete as and when any part of the robot touches the finish line.

2.5.2   A team member shall also stop the timer on the stopwatch at the same time as 2.5.1.

2.5.3   Show the final reading of the stopwatch timer clearly in the video.

3   Minimum Requirements

The robot shall complete the task within a maximum time limit of 1 minute and 30 seconds.

4   Code of Conduct

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

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

5   Judges

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

5.2   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.

5.3   All decisions are final.

PART 3

VIRTUAL

QUALIFICATION BRIEF

1   The Challenge

The challenge of the competition is to make a robot that can move on a given line (black on white). The robot which completes the task in the fastest time will be declared as the winner.

Based on their video submissions, the top ranked teams will be selected to move on to the Virtual 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.

All the requirements as stated in this Game Play brief are to be adhered to.

This Game Play brief shall be read together with the Robo Tracer open level competition brief.

2   Game Play

2.1   Virtual Competition Overview

2.1.1   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.

2.1.2   The competition run will be conducted online with referees remotely evaluating the race and run time and adherence to all competition rules and regulations.

2.1.3   The competition includes a minimum of one (1) referee, two (2) race coordinators and the participating team.

2.1.4   Participating teams may be required to record the live video streaming for backup purposes.

2.1.5   A compulsory briefing session will be conducted before the competition run for all participating teams on the morning of the competition day.

2.1.6   Each participating team shall have **ONE (1)** competition run.

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

2.1.8   If the robot has yet to complete the run despite exceeding the three minute runtime, the online referee in attendance will ask the team to stop.

2.1.9   Race clock

When the robot passes the start line, a visible stopwatch timer will be started by a team member to count the **Race time.**

The stopwatch timer will be stopped as the robot reaches the finish line, and the final recorded race time value will be saved.

2.1.10 There will be a dedicated track for the Qualification Phaseand the Grand Finals.

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

> i. Verification Phase
>
> ii. Competition Run Phase

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

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

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

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

2.1.16 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.

2.2   Verification Phase

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.

2.2.1 **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.
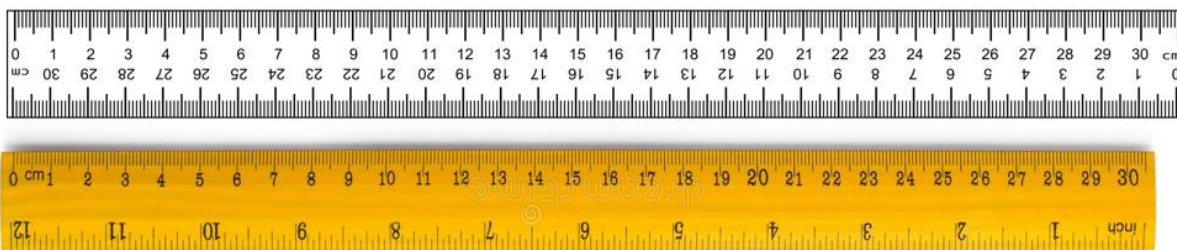
2.2.2 **Robot Size Check** - The robot size check is done by placing the robot inside the robot size checker. The robot must fit within the outline of the robot size checker.

2.2.3 **Robot Features Check** – Display and show the robot features as per the competition requirements.

2.3   Competition Run

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

2.3.2   Participants may first implement any calibration procedures.

2.3.3   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.

2.3.4   After pressing the start button, the robot should then begin to trace the line and complete the run in the fastest time.

2.3.5   Simultaneously with 2.3.4, a team member shall start the stopwatch timer that is visible on the screen.

2.3.6   Teams may restart their run if deemed necessary, within the three minute runtime.

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

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

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

2.3.9   The race time will be reset to zero at every restart. However, the runtime will keep running during all restarts.

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

2.3.11   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.

2.4   Following the line

2.4.1   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.

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

2.5   Competition Finish

2.5.1   The competition is complete as and when any part of the robot touches the finish line.

2.5.2   A team member shall also stop the timer on the stopwatch at the same time as 2.5.1.

2.5.3   Show the final reading of the stopwatch timer clearly on the screen.

3   Code of Conduct

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

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

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

4   Judges

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

4.2   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

4.3   All decisions are final.

PART 4

GRAND FINALS BRIEF

1   The Challenge

The challenge of the competition is to make a robot that can move on a given line (black on white). The robot which completes the task in the fastest time will be declared as the winner.

1.1   General Rules

1.1.1   Rounds

Every team will compete in two rounds.

One round should not last more than three minutes (labelled as RUNTIME).

If a robot has yet to reach the finish line once the RUNTIME is over, a BUZZER will go off and the team will be asked to remove the robot from the COMPETITION FIELD.

1.1.2   Race clock

Once the robot moves from the START line, a timer will start to count the RACETIME.

As the robot reaches the finish line, the timer will stop and the final recorded RACETIME value will be saved.

1.1.3   Robot Control

Once a robot has crossed the START line, it must remain fully autonomous, or it will be disqualified.

1.1.4   Competition Area

A robot that moves out of the COMPETITION FIELD will be disqualified. A robot shall be deemed to have left the arena when any wheel, leg, or track has moved completely off the competition surface.

1.1.5   Losing the Line

Any robot that loses the line course must reacquire the line at the point where it was lost, or at any earlier (e.g. already traversed) point.

2   Competition Field

2.1   Field specifications

2.1.1   Lines to be followed are 18mm to 20mm in width and are white 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. Competitors must be prepared to deal with these slight imperfections.

2.1.4   There will be one START line and one FINISH LINE.

2.1.5   The dimensions of the COMPETITION FIELD is 10 feet in length and 6 feet in width.

2.1.6   Characteristics of the line course are as follows:

    i.   There shall be no crossovers (e.g. places where the line crosses itself)

    ii.   Switchbacks and hairpins are possible, but the adjacent sections of the line shall be no closer together than 15cm when measured from the center of each line.

    iii.   The closest approach of the line course to the edges of the arena shall be no less than 15cm, measured from the centre of the line.

    iv.   The minimal curve radius is 7.5 cm.

    v.   Sharp angles may occur.

3   The Robots

3.1   Dimensions

Each team must comply with the following robot specifications:

Width – 200mm max –fully extended.

Length – 200mm max –fully extended.

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.

3.3   Sensors

No limit on the number of sensors used.

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   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.

4.2   Start and Restarts

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

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

4.2.3   A robot may restart the run as the handler 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 directions.

4.2.4   At any restart, the robot must be positioned back at the START line.

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

4.2.6   The RACETIME will be reset to zero during every restart. The RUNTIME will keep running during all restarts.

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

4.2.8   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.

4.3 Following the line

4.3.1 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.

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

5 Scoring

5.1 RACETIME is the time considered for tracing the route from START to FINISH. The time it does that will be recorded.

5.2 RACETIME is started automatically by the on-field optical sensors that detects the robot's movement and/or by the referee.

5.3 The team with the fastest average RACETIME of Round 1 and Round 2 will be the WINNER. If there are two teams or more with the same fastest average RACETIME, the team with the fastest RACETIME during Round 2 will be at a higher standing.

6 Code of Conduct

6.1 Fair Play

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

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

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

6.2 Behavior

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

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

7 Judges

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

7.2 Judges 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.

8 Standard Operating Procedure (SOP)

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

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

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

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

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

8.6 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.

8.7 Close contact Employee or Individual shall undergo mandatory quarantine based on MOH current policies and undergo COVID-19 screening test if symptomatic.

8.8   Travellers are required to complete the following items before departing to Malaysia (example: before boarding the plane/while overseas):

a. Perform RT-PCR test two (2) days before departure;

b. Download, register and activate the MySejahtera application;

c. Complete the pre-departure form accessible via 'Traveller' icon in the MySejahtera application including the vaccination information and upload the vaccination certificate (if applicable) and RT-PCR test results; and

d. Non-Malaysian citizens travellers must be protected by COVID-19 insurance with a minimum insurance coverage of US$20,000.

8.9   Required to do the following upon arrival in Malaysia:

a. Bring along required documents as proof or upload to the MySejahtera for review; and

b. Undergo fever screening through thermal scanner or self-referral to a healthcare worker for further examination at health assessment counters located at the International Entry Point (PMA) if symptomatic.

8.10   Required to do the following during/after arrival in Malaysia:

a. Undergo professional RTK-Ag test at private facility within 24 hours from the time of arrival.

8.11   For travellers who are not fully vaccinated/unvaccinated, ensure the following items are fulfilled in compliance with relevant procedures:

a. Conduct mandatory quarantine (Observation or Surveillance of Contact under Act 342) at home/hotel/accommodation for five (5) days;

b. Complete Health Assessment Tool (HAT) daily through MySejahtera; and

c. Perform RT-PCR test on Day 4 or RTK-Ag test on Day 5.

8.12   For travellers who are commuting on a daily/frequent basis through land border, comply with the relevant procedures specified in the Transport and Movement Guidelines.

*subject to changes by MKN

ROBO TRACER OPEN SCORING CHECKLIST

Items	Yes	No
Verification		
Full Track View in Camera		
Printed Track Specification		
Stopwatch Visible on Screen		
Robot Size		
Robot Features		
i. No wireless modules		

Race Time	

Restarts	