COMPLETE RULEBOOK

AVIA

CRC Robotics

Junior Competition

2022-2023

A program of

AEST EAST

ALLIANCE POUR L'ENSEIGNEMENT DE LA SCIENCE ET DE LA TECHNOLOGIE
EDUCATIONAL ALLIANCE FOR SCIENCE AND TECHNOLOGY

Foreword

i. Welcome to the CRC Robotics Competition

On behalf of the Educational Alliance for Science and Technology (EAST) and CRC Robotics, welcome and congratulations to all the participants on joining your school's/organization's robotics team and embarking on the CRC Robotics Competition journey! Take it from the current leaders of CRC Robotics, who were all former student participants in the CRC Robotics Competition: you will remember this unparalleled experience for many years to come.

We wish to welcome and thank the many teachers, staff, parents, and mentors for embarking on this journey and for all the hard work you will put in to enrich your students' lives throughout this activity. A big thank-you to all the volunteers involved in CRC Robotics, whose dedication has allowed us to hold Avia 2023, our 22nd annual competition.

In addition, we wish to acknowledge all our partners, without whom CRC Robotics could not exist.

The 2022-2023 Junior CRC Robotics season will have a lot to offer: a new take on the triathlon game and access to watch the Senior games unfold, to pique the curiosity of young minds and open a path for them to experience robotics in the future.

We wish to thank the Principal of Curé-Antoine-Labelle High School, Karine Legendre, and her team led by Christian Robert and Dominic Ouimet for their warm welcome as the host school for a second year in a row and for the time and energy they've put towards the success of this event.

Good luck to all and we will see you at Avia 2023 on February 17, 2023 at Curé-Antoine-Labelle High School in Laval.

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ii. About CRC Robotics

CRC Robotics was founded in 2001 by a group of young professionals and teachers, fueled by their passion for robotics and education. Unsatisfied with the robotics competitions available for high schools and CEGEPs in Canada, they created an annual competition linking science, technology, engineering and mathematics (STEM) with computers, arts and languages.

We've since grown into an organization run by former participants willing to give other students the chance to participate in the CRC Robotics adventure that has been so much fun for them. The Competition now welcomes elementary, high school and CEGEP teams from coast to coast in a 3-day, action-packed event held annually.

We believe in providing exciting learning opportunities to students with various interests and goals. Under the umbrella of the Educational Alliance for Science and Technology (EAST), we hold events allowing tomorrow's leaders to find their passion and develop key skills that will serve as assets in an ever-changing, global world.

In essence, the CRC Robotics Competition is:

- A coherent body of several competitions, integrating different disciplines and unique challenges, including languages, computers, mathematics, science, art and much more;
- An experience that develops the qualities of a leader and teaches students about organization and teamwork, since everything is directed and performed by the students;
- An event that involves students from elementary schools, high schools, CEGEPs and professional vocational centres from all over Canada;
- A challenge that allows students to apply the theoretical knowledge gained in the classroom to a practical application in order to familiarize the students with technology outside of the classroom;
- A chance to take part in an extra-curricular activity and work with students and mentors from different backgrounds and domains (engineers, technicians, university professors, etc.).

iii. Roles within the CRC Robotics Competition

In the CRC Robotics Competition, there are three different roles: students, teachers, and mentors. We have laid out the following responsibilities for each:

1. **Students are to do all the planning and building**. They should be creating the strategies, designing the critical paths, and controlling all aspects of the team. Any work done on any aspect of the Competition must be done entirely by the students.

2. **Teachers are available to provide the support that students may need, only if they need it.** They should not be directing the students, but instead, acting as an advisor. If a student has a question, the teacher may point the student toward the answer or show the student how to find the solution. If a student is unsure of how to accomplish a specific task, the teacher may demonstrate, but any pieces attached to the robot are to be touched only by the students. However, we do realize that there may be times when an educator must step in for academic reasons. We believe that every teacher is a competent professional that can differentiate between teaching and doing.

3. **Mentors are external professionals who may be consulted throughout the course of this activity.** Their job is to help with questions which exceed both the students' and teachers' knowledge. An engineer would have more practical experience; however, the engineer may not direct the students as he/she is acting only as an advisor.

We value the participation of your team, but always keep in mind that this is the students' project. Let them show you what they are made of and let them develop their own skills! Their own work is what truly matters and that is what makes the CRC Robotics Competition so unique and relevant.

iv. Our Partners

One of the most important aspects of the CRC Robotics Competition is that it keeps registration fees for schools at a bare minimum to ensure an easy and equal access for schools from all socio-economic situations. This would not be possible without the help of our generous partners that, year after year, help us prepare this wonderful event for the students.

We are always seeking to establish new partnerships to achieve our goal of positively improving as many student lives as possible. If you or someone you know is willing to help us in any way, please contact our Partnerships Team at partnerships.crc@sciencetech.ca. On behalf of the students, a heartfelt thank-you!

v. Season Calendar

Item	Date & Location	Description
Information Sessions	Year-Round	The CRC Robotics Organizing Committee is always available to meet you and present a what the Competition is all about and what it entails for students, teachers and their school or community organization. Interested parties may contact us via info.crc@sciencetech.ca.
Registration Period	November 21, 2022 to January 13, 2023	Registration to the junior competition is opened to all elementary schools and high schools (Grade 7 and 8 only) in Canada. Late registration may be possible. The rulebook is also released at the start of the registration period. Please contact info.crc@sciencetech.ca for more information.
Training Day	Year-Round	The Training Day is a hands-on tutorial and training day for teachers and mentors who wish to familiarize themselves with the technology involved in the CRC Robotics Competition as well as with the Competition structure and dynamics. The Training Day is organized according to the demand. Interested parties may contact us via info.crc@sciencetech.ca.
22nd Annual CRC Junior Robotics Competition Avia 2023	February 17, 2023 Curé-Antoine-Labelle H.S. 216 Blvd Marc-Aurèle-Fortin, Laval, QC, H7L 1Z5	Join us in the pinnacle of the 2022-2023 CRC Robotics season. After months of hard work, over 15 teams will show off what their robot can do. An exciting, action-packed event not to be missed!

1. The Competition

The Junior Competition is a one-day event that takes place annually at one of the participating schools of the Senior Competition. The final Competition rules are made public at the beginning of the registration period.

The following presents the typical Competition schedule. The official and detailed schedule is made available a few weeks before the Competition at www.robo-crc.ca/participant-portal.

- Friday Morning: Games & Evaluations
- Friday Afternoon: Awards Ceremony

1.1 Components

The Competition is divided into two (2) distinct components, which allows students to demonstrate their strengths in different ways and across various disciplines. While not mandatory, teams may choose a theme that would be applicable to all components of the Competition.

1.1.01 Game

This year's game is named Avia 2023. The teams must participate in a triathlon tournament with their own autonomous robot and must ensure that they follow this game's specific rules and regulations. More information on the game can be found in Section 2 of this rulebook.

1.1.02 Kiosk

The kiosk acts as an information booth, which presents the team's hard work to judges, fellow participants, and visitors to the Competition. It also acts as a workshop for the team's robot between the games. The kiosk often represents the team's theme for this year's Competition and essentially involves the application of art and communication. More information on the kiosk can be found in Section 3 of this rulebook.

1.2 Divisions

With a goal of making the Competition as fair as possible to teams with less experience, the CRC Robotics Organizing Committee has introduced a two-division system for certain elements of the Competition.

1.2.01 Teams are divided among Elementary School and High School for the Game and Kiosk components.

1.2.02 The best Elementary School and High School teams will receive separate awards based on their ranking in each component.

1.2.03 A team in any division can win the Overall Ranking award.

1.3 Awards and Recognitions

Awards and recognitions are presented to the most performing team(s) in each component. If the division system is used for the ranking of a particular component, then awards are presented to the most performing team(s) in each division for the component. Refer to Section 1.2 for details on components for which teams will be ranked within their division only. In the event of a tie, both teams receive an award and/or recognition. In this section, an "award" is a prize that is presented for a component whose score counts towards the overall ranking and a "recognition" is a prize that is presented for a component whose score does not count towards the overall ranking.

1.3.01 Individual Participation

The Participation recognition, in the form of a medal, is presented to every student that officially participated in one of the teams registered to the Avia 2023 Competition.

1.3.02 School Participation

Each participating school will receive a Participation recognition in the form of a plaque.

1.3.03 Game – Triathlon Challenge #1

This award is presented to the three teams who received the greatest scores in the first challenge of the Triathlon game.

1.3.04 Game – Triathlon Challenge #2

This award is presented to the three teams who received the greatest scores in the second challenge of the Triathlon game.

1.3.05 Game – Triathlon Challenge #3

This award is presented to the three teams who received the greatest scores in the third challenge of the Triathlon game.

1.3.06 Game – Overall

This award is presented to the three teams who received the greatest combined scores in all three challenges of the Triathlon game.

1.3.07 Kiosk

The Kiosk award is presented to the three teams that received the greatest scores from our judges and that were deemed to have the best designed and best maintained kiosk.

1.4 Overall Ranking

1.4.01 Scoring Logic

1. For each component of the Competition, the number of points equal to the total number of teams is given to a first-place ranking. The score given to other ranks can be calculated using the following formula:

$$Score = Total\ Number\ of\ Teams - Rank + 1$$

2. In the case of a tie, the teams receive the same score for that category.
3. The total number of points for all components determines the overall ranking.

1.4.02 Overall Ranking Award

The Overall Ranking award is presented to the three teams that receive the greatest score after combining the points in each component. They are deemed to be the best performing teams in the Competition as a whole. The team in first place also receives a trophy that symbolizes their success.

2. The Game – Triathlon

The main goal of the game is to construct a robot to perform tasks that challenge skills with sensors and motors. The challenges are designed to test these skills either individually or in harmony with other sensors. Unless otherwise stated in the specific game, the general rules prevail.

2.1 General Rules

2.1.01 The maximum power supply voltage is 10 volts.

2.1.02 The maximum weight for a robot is 2 kg.

2.1.03 The robot size must not exceed 32 cm in height and must fit in a cylinder with a diameter of 32 cm when all parts are extended.

2.1.04 There is no limit to the number of wheels a robot can have.

2.1.05 Robots must have a button (not the buttons on the EV3/nxt brick) that will allow the robot to start moving.

2.1.06 All challenges can be done one after another, in any order desired. The team can take a break between each challenge if desired.

2.1.07 In between matches, modifications of the build and programming of the robots are allowed.

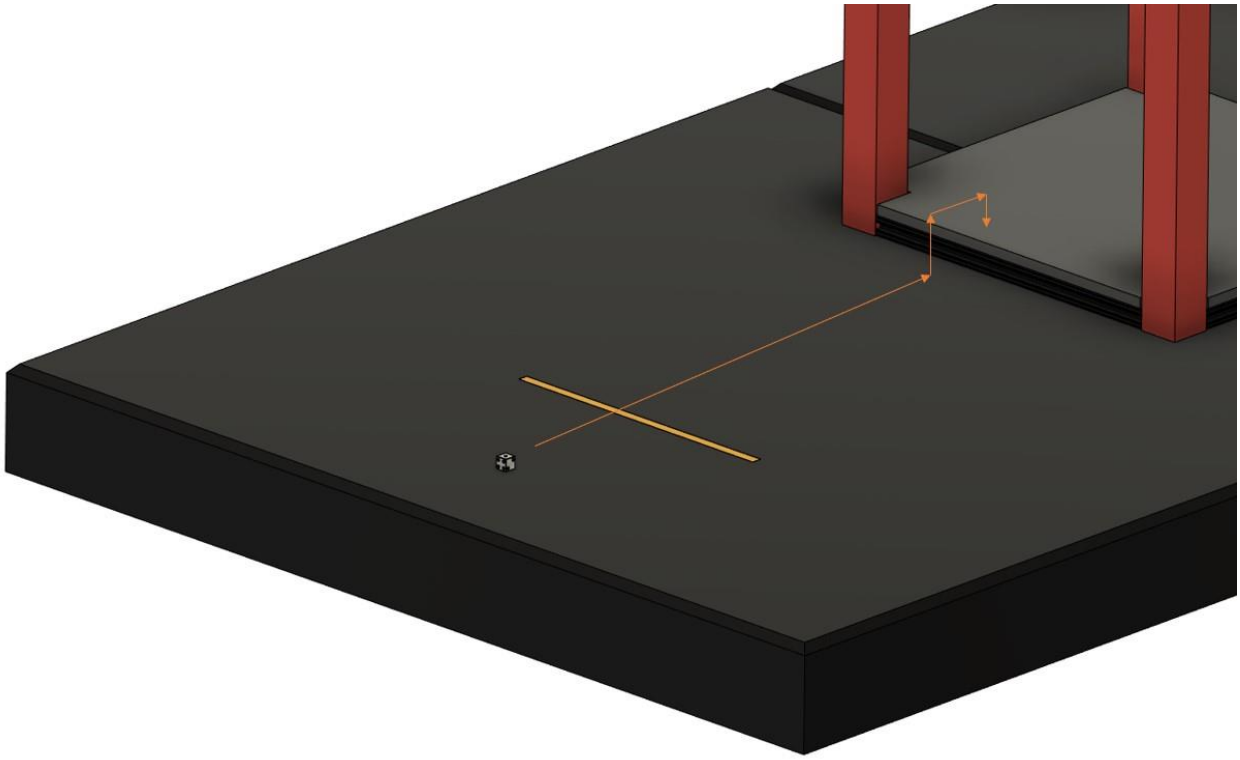
2.1.08 The same robot, a modified version or a completely different one can be used for each challenge.

2.2 Scoring Points

2.2.01 This year, teams will get a bonus card, on which they can write the name of the challenge that they believe will be their most successful. This will add points to their overall score if they guess correctly. This will allow teams to reflect on their design and programming before the Competition begins.

2.3 Challenge #1 – Stock Management

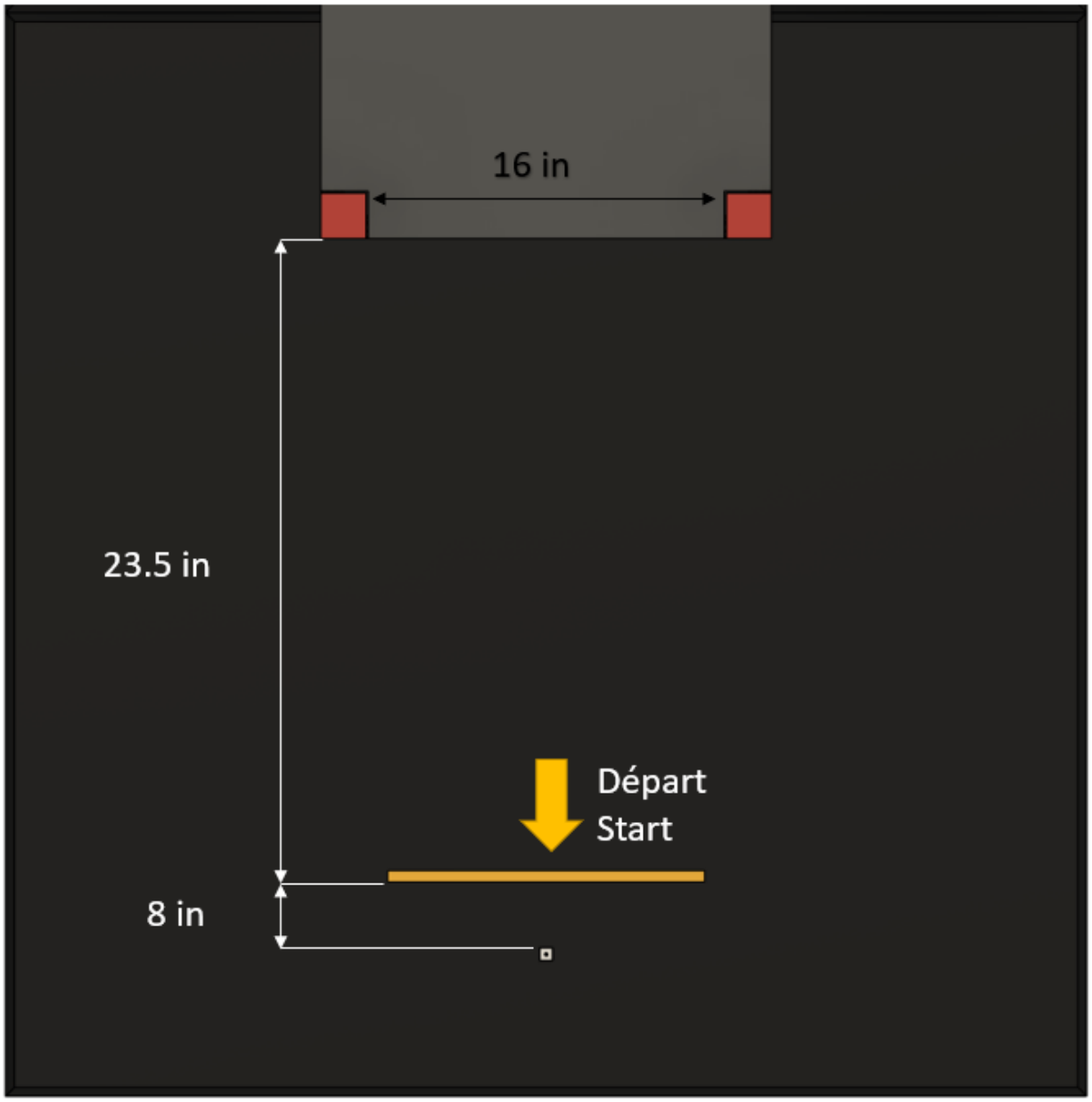
2.3.01 Construct and program a robot able to pick up a box that has fallen out of inventory and place it back on the correct shelf behind it.



2.3.02 The field itself will be a black painted surface approximately 4 ft by 4 ft. On one side of the field is a 1.5 inch high ledge.

2.3.03 The box will be a standard 16mm x 16mm x 16mm dice.

2.3.04 The robot must be placed behind the yellow line. The timer starts when any part of your robot crosses the yellow line.



2.3.05 Your robot has 2 minutes to pick up the dice and place it on the shelf on the opposite side of the field. The timer will be stopped when the dice becomes immobile and fully on the ledge.

2.3.06 The robot must stay inside the area. If any part of the robot touches the outside of the field, the robot will be taken off the field and given a 10-second penalty. Once this time is up, the robot will be placed back onto the playing field in its original starting zone.

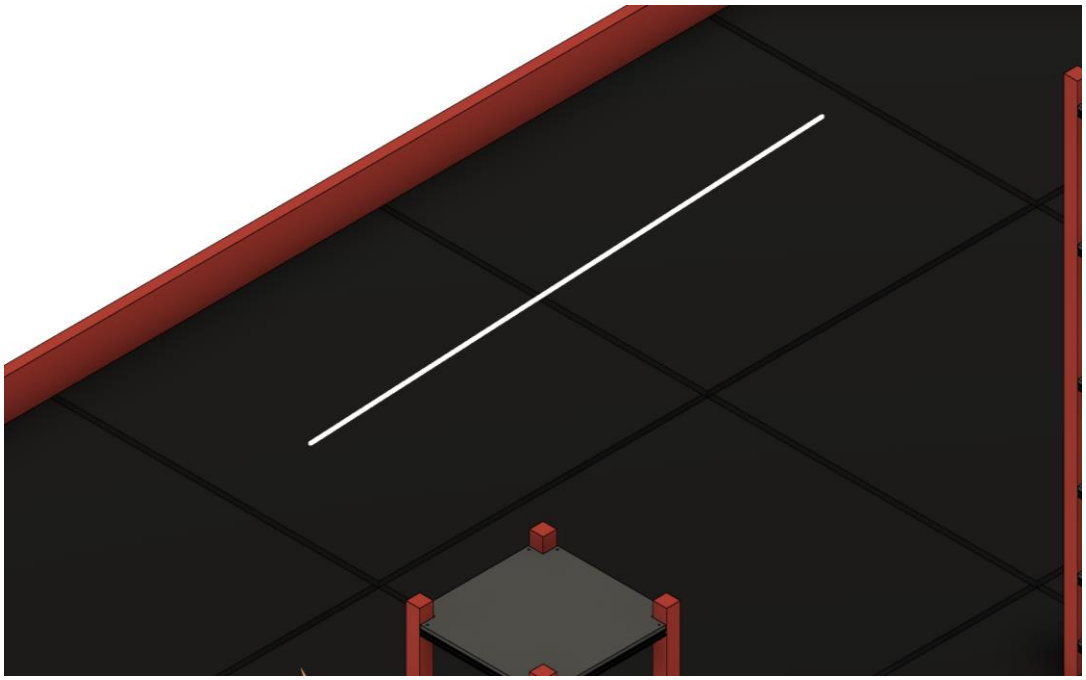
2.3.07 If parts become dislodged during the game, the game time will be paused, and the referee will remove that part from the field. If that part is essential for the robot's mobility or sensory input, the team will have 10 seconds to put it back on. No changes from the original design will be allowed and absolutely no programming changes will be tolerated.

2.3.08 A team can play this game a maximum of 2 times during the Competition.

2.3.09 The winner of this challenge will be the robot that can complete the challenge in the least amount of time.

2.4 Challenge #2 – Vent Cleaning – Elementary School

2.4.01 Your robot will be placed on a black surface. In front of your robot will be a white line (see the image below). Your task is to measure the length of the line in centimeters.



2.4.02 The field will be a black painted surface with a white line made of tape on it. The maximum length of the line is 2m.

2.4.03 At the beginning of the game, the judge will place your robot at an unknown distance in front of (and facing) the white line.

2.4.04 When the game begins, your robot must advance to the white line, and begin measuring.

2.4.05 The accuracy of your measurement will be important; your measurement may include decimal places.

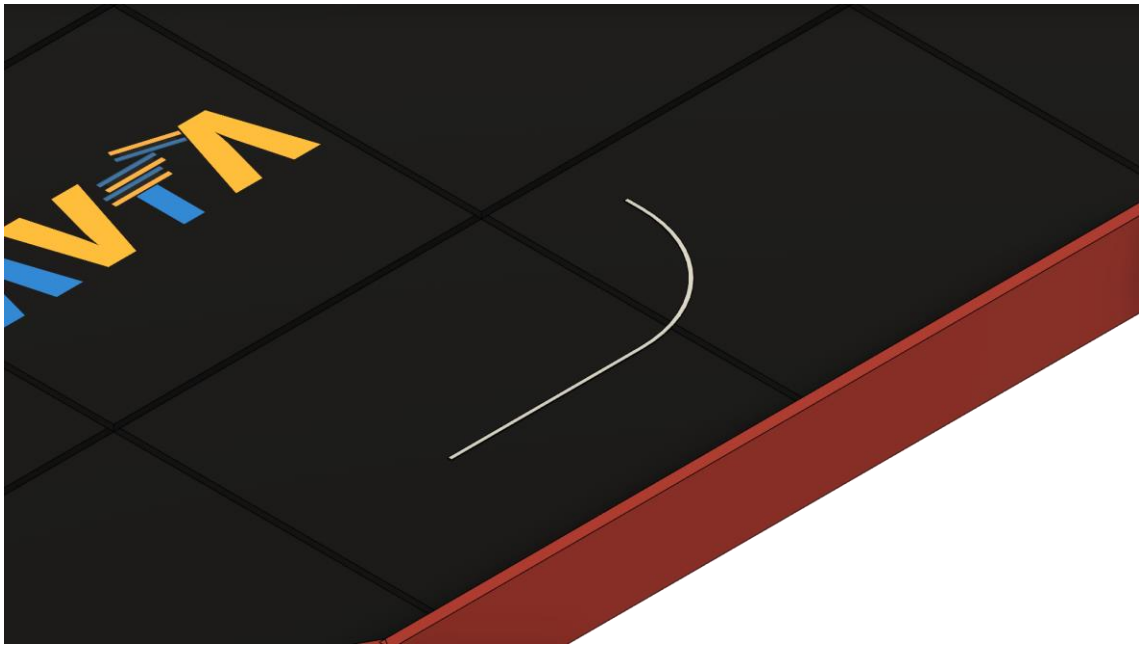
2.4.06 The maximum time allowed for this challenge is 2 minutes. If your robot does not complete the measurement of the line in that time, you will forfeit the round.

2.4.07 A team can play this game a maximum of 2 times during the Competition. Each round will have a line of a different length.

2.4.08 The winner of this challenge will be the robot that most accurately measures the lines (percent error will be used). In the event of a tie, the robot that takes the measurements the fastest wins.

2.5 Challenge #2 – Vent Cleaning – High School

2.5.01 Your robot will be placed on a black surface. In front of your robot will be a white line that forms an arc. Your task is to measure the length of the line in centimeters.



2.5.02 The field will be a black painted surface with a white line made of tape on it. The maximum length of the line is 4m.

2.5.03 When the game begins, your robot must advance to the white line, and begin measuring.

2.5.04 When your robot reaches the end of the line, it must clearly display the length of the line in centimeters on the EV3/NXT 's display panel.

2.5.05 The accuracy of your measurement will be important; your measurement may include decimal places.

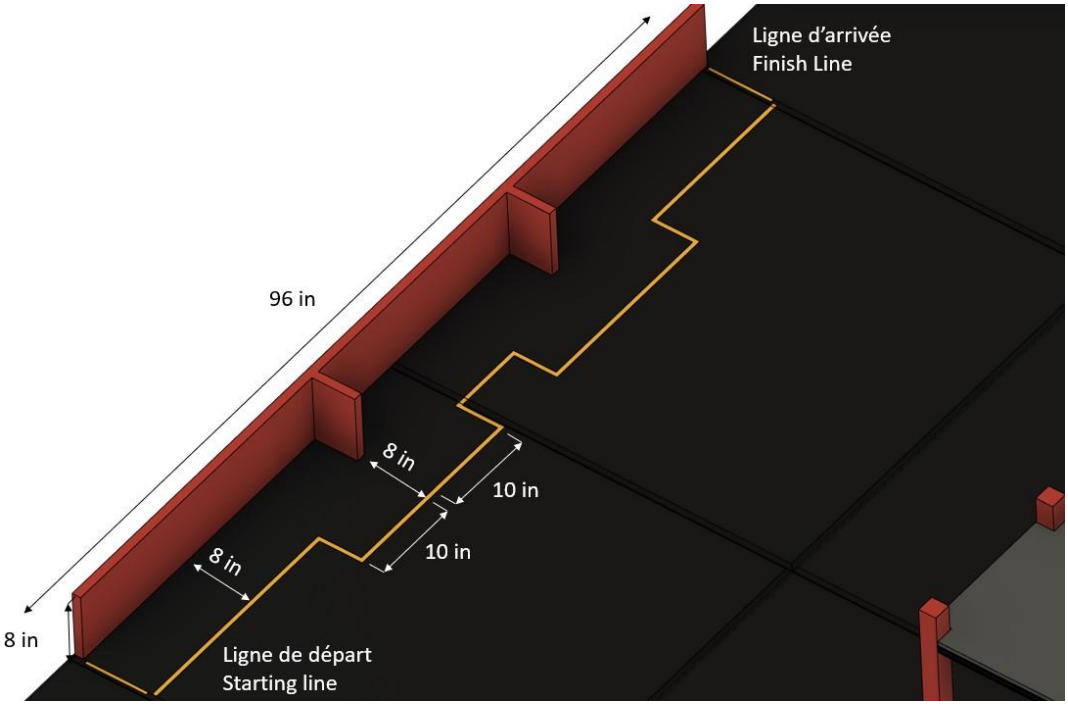
2.5.06 The maximum time allowed for this challenge is 2 minutes. If your robot does not complete the measurement of the line in that time, you will forfeit the round.

2.5.07 A team can play this game a maximum of 2 times during the Competition. Each round will have a line of a different length.

2.5.08 The winner of this challenge will be the robot that most accurately measures the lines (percent error will be used). In the event of a tie, the robot that takes the measurements the fastest wins.

2.6 Challenge #3 – Maintenance Route

2.6.01 The lights have closed due to an electrical failure. Your task is to navigate your robot through a path obstructed by obstacles to be able to turn the electricity back on. Each robot must start at the starting line and navigate through the path without touching the walls.



2.6.02 The field will be a black painted surface. On this surface will be a wall. A taped line following the wall will be considered the outside perimeter. Two obstacles will be placed along the wall.

2.6.03 Robots must not touch the wall or cross the outside perimeter. If this is to happen, the attempt will be awarded the "Did not finish" tag.

2.6.04 The timer starts when the robot crosses the starting line.

2.6.05 The timer ends when the finish line is crossed.

2.6.06 The maximum time allowed for this challenge is 3 minutes.

2.6.07 A team can play this game maximum 2 times during the Competition. The round with the fastest time will be taken into account in the challenge and the overall ranking.

2.6.08 The winner of this challenge will be the robot that can complete the path in the least amount of time.

3. Kiosk

The kiosk component requires the organization of an information kiosk and presentation of accomplishments to visitors and judges. This component gives each school an equal opportunity to showcase their school, their team and their robot(s) while also developing presentation and artistic skills. The evaluation rubric used by the judges to evaluate the kiosk may be found at the end of this section.

1.1 Constraints

3.1.01 Space Provided

One folding table will be provided to each team. The size of the table will be confirmed shortly.

3.1.02 Creativity

Each team will decorate their table to their liking. For instance, the team can use a poster with information about their robot, a tablecloth, organizational items, etc.

3.1.03 Identification

Each team's kiosk must have a clear and obvious identification of the team's name and full school name.

3.1.04 Respect for Neighbors

The surrounding kiosk areas must be respected; otherwise, the team at fault will be penalized for any behavior that has a negative impact on other kiosks (e.g. loud music, extending beyond the kiosk footprint, etc.).

3.1.05 Visual Appeal

Since kiosk spots are randomly assigned to teams, the surrounding areas (including the background) of a kiosk will not be judged for reasons of equality.

3.1.06 Bilingualism

The information displayed and available at the kiosk must be entirely bilingual.

3.1.07 Competition Readiness

In an effort to have the best experience possible for all teams, kiosk elements must be painted and cut before teams arrive at the Competition. Minor tweaks will be permitted, but if major parts of the kiosk are being built on site, a penalty will be sanctioned.

3.1.08 Safety Gear

Each kiosk must be equipped with at least one first aid kit. It is the responsibility of the participants and the adults in charge of each team to make sure proper safety gear is worn, when necessary, both inside and outside the kiosk.

3.1.09 Assembly Time Limit

The kiosk must be ready for judging within 1 hour of a team's scheduled arrival time. The arrival schedule will be sent by email to all teams in the days prior to the Competition.

3.1.10 Dismantling Time

Kiosks may not be dismantled until instructed to do so by the CRC Robotics Organizing Committee.

3.1.11 Dismantling

A team's kiosk area must be cleared and cleaned by 2:00 p.m. on the Friday afternoon of the Competition. No damage can be done to the area. Any team leaving any debris will be subject to a $200 fine as well as any cleaning costs incurred by the host school. Repeat offenders may be subject to further penalties.

1.2 Evaluation

3.2.01 The Evaluation Process

The evaluation of a team's work includes two stages: the Preliminaries and the Finals.

The Preliminaries:

- All registered teams are divided into pools. The number of teams per pool is dependent on the number of registered teams.
- The judges of each pool evaluate and rank teams' work. Judges are participating students from the CRC Senior Robotics Competition. Judges are never assigned to pools containing their past teams.
- Each pool is evaluated by different judges. Judges of all pools follow the same judging criteria for each category.
- The top teams in each pool will qualify for the Finals. The number of qualifiers per pool is dependent on the number of registered teams.

The Finals:

- Finalists are the top teams from each pool in the Preliminaries.
- There are no pools in the Finals. All finalists are evaluated by the same judges.
- Judges evaluate and rank the finalists' work. Judges are CRC Robotics volunteers and did not judge in the Preliminaries. Judges in the Finals follow the same judging criteria used in the Preliminaries.

- Based on the ranking provided by the judges, the top three teams in each division will receive awards.

3.2.02 Evaluation Criteria

The evaluation criteria are divided into three levels: Standard, Developed and Advanced.

- The Standard level provides minimal criteria that should be satisfied. These criteria may target specific rules in the rulebook or requirements which are considered essential for acceptable work.
- The Developed level includes criteria which, when satisfied, demonstrate a commendable work quality.
- The Advanced level groups criteria which, when satisfied, set a team apart from the rest.

3.2.03 Language

Teams must ensure to always have at least 1 bilingual student speaker in the kiosk, giving presentations to and answering questions from the general public. However, the presentation for the evaluation can be conducted in the language of preference of the team.

3.2.04 Presentations

Preliminary and final presentations will take place at the kiosk of the evaluated team.

3.2.05 Schedule

There will not be a detailed schedule provided for the judging of the kiosks. Instead, time intervals will be provided during which the judges may visit the kiosks. This measure is necessary given the nature of this component of the Competition. However, a visual signal in the kiosk area will inform participants that the kiosk judging is in session.

3.2.06 Visual Support

Visual support is permitted.

3.2.07 Structure

The presentations must abide by the following structure:

Length	Action
2min	The team presents the kiosk (without the judges interrupting).
2min	The judges ask their questions to the evaluated team.
5min	The judges give feedback, rank teams, discuss and move toward the next team.

1.3 Kiosk Evaluation Form

Topic	Level	Criterion
Creativity (60%)	Standard	**Is the kiosk's layout optimal for a functional workspace?** The kiosk demonstrates a good understanding in creating a functional workspace (i.e. tool placement and organization, functionality, etc.).
	Developed	**Is the kiosk engaging and reflective of the team's theme?** The kiosk is intriguing to the public. Students interact with the public in a respectful and friendly way.
	Advanced	**Does the kiosk surprise and amaze?** The kiosk has a "wow" factor. It creatively demonstrates excellence in detail and craftsmanship.
Presentation (40%)	Standard	**Did the team engage the audience with their journey?** The team can clearly explain their inspiration and justify the process regarding the design of the kiosk, considering their expertise, team size, challenges, and limitations.
	Developed	**Does the presentation add to the value of the kiosk?** The presentation of the kiosk is creative, engaging and related to the theme of the kiosk.
	Advanced	**Is the presentation an immersive experience?** The presentation generates connections facilitating the involvement of the audience as partners to the team.