THE CRC ROBOTICS COMPETITION
RULEBOOK

Outlining the preliminary rules for

ARCANUM 2022

A program of

AEST EAST

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 Arcanum 2022, our 21st annual competition.

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

The 2021-2022 CRC Robotics season will have a lot to offer: an enhanced Arduino-based robot control platform, more clear and finite evaluation rubrics and the integration of a junior category to the competition for younger students.

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 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 Arcanum 2022 from March 9th to 12th, 2022 at Curé-Antoine-Labelle High School in Laval.

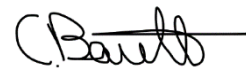**Natasha Vitale**
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ii.   About CRC Robotics

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 4-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.   Participating Schools

Once again, teams from coast to coast have decided to take on this year's CRC Robotics challenge:

2022 Team Number	School/Organization Name	Division	Rookie
1	West Island College	2	
2	Lake of Two Mountains High School	2	
3	Collège Sainte-Marcelline	1	
4	John Abbott College	2	
5	École secondaire Curé-Antoine-Labelle	2	
6	Macdonald High School	1	
7	Royal West Academy	2	
8	École secondaire Dalbé-Viau	2	✓
9	Champlain College Saint-Lambert	2	
10	Marianopolis College	1	
11	Cégep Vanier College	1	
12	École secondaire Monseigneur-Richard	1	
13	Collège André-Grasset	2	
14	St. George's High School	2	
15	Lower Canada College	1	
16	Cégep du Vieux-Montréal	2	
17	École secondaire Jules Verne	1	
18	West Island Black Community Association	2	✓
19	Collège de Bois-de-Boulogne	2	
20	Dawson College	1	
21	Collège Citoyen #1	1	
22	Collège Citoyen #2	1	
23	Collège Citoyen #3	1	
24	Collège Citoyen #4	1	

v.   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!

vi.　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	September 1, 2021 to October 1, 2021	Registration to the senior competition is opened to all high schools, CEGEPs and professional vocational centres in Canada. Late registration may be possible. Please contact info.crc@sciencetech.ca for more information.
Training Day	November 2021	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.
Preliminary Rulebook Release	October 18, 2021	A partial version of the rulebook is made available to participants on www.robo-crc.ca/participant-portal/ one week prior to Kickoff. This way, participants can familiarize themselves with this year's game and prepare questions to be asked at Kickoff.

Kickoff	October 25, 2021 at 7pm *Doors open at 6:30pm* Curé-Antoine-Labelle H.S. 216 Blvd Marc-Aurèle-Fortin Laval, QC, H7L 1Z5	The Kickoff officially marks the beginning of the season for the participants. The complete rulebook and the playing field are revealed, and the participant kit is distributed to the teams. For logistical reasons, a maximum of 8 individuals per team may attend.
CRC Workshops	November 2021 to January 2022	Webinar-style workshops are held throughout the season and give participants more detailed information on certain components of the competition. Check out www.robo-crc.ca/participant-portal/ for dates and topics.
Website, Video, and Tutorial Submission, and Programming Component Opt-In Deadline	February 14, 2022 at 11:59:59pm EST Using the Participant Portal: www.robo-crc.ca/participant-portal	Having the website up and running and uploading the video to YouTube might take several hours. We therefore recommend you not to wait until the very last minute before starting the upload and going through the submission procedure. If you encounter any problems, send a detailed explanation to natasha.vitale@sciencetech.ca **before** the submission date and time. The Submission Form will be made available as of February 7, 2022.
Deadline to make Website, Video, and Tutorial Public	March 9, 2022 at 7:59:59am EST	Teams must make their website, video and tutorial available to the general public and the other teams prior to the start of the competition. For more information, refer to the specific sections outlining the details of these components.
21st Annual CRC Senior Robotics Competition Arcanum 2022	March 9-12, 2022 Curé-Antoine-Labelle H.S. 216 Blvd Marc-Aurèle-Fortin Laval, QC, H7L 1Z5	Join us in the pinnacle of the 2021-2022 CRC Robotics season. After over four months of hard work, close to 25 teams will show off what their robot can do. An exciting, action-packed, 4-day event not to be missed!

Table of Contents

1. The Competition

The Competition is a four-day event that takes place annually at one of the participating schools. The final Competition rules are made public at Kickoff, approximately four months before the Competition.

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.

- Wednesday Afternoon: Team Arrival and Kiosk Setup
- Wednesday Evening: Kiosk Setup & Evaluations

- Thursday Morning: Preliminary Heat Block #1 and Evaluations
- Thursday Afternoon: Preliminary Heat Block #2 and Evaluations
- Thursday Evening: Preliminary Heat Block #3 and Evaluations

- Friday Morning: Preliminary Heat Block #4, Evaluations and Junior Games
- Friday Afternoon: Preliminary Heat Block #5 and Junior Awards Ceremony
- Friday Evening: Preliminary Heat Block #6 and Evaluations

- Saturday Morning: Knock-Out Rounds
- Saturday Afternoon: Quarterfinals, Semi-Finals and Kiosk Dismantling
- Saturday Evening: Finals and Awards Ceremony

1.1   Components
The Competition is divided into seven (7) 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 Arcanum 2022. The teams must participate in a tournament with their own radio-commanded 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 Robot

The design and construction of the robot primarily involve the application of engineering, science, technology and mathematics to ensure that the robot can participate in this year's game. Since the game changes from year to year, the students cannot reuse the exact same robot from previous years; however, certain parts and mechanisms may be reused. More information on the robot can be found in Section 3 of the full rulebook.

1.1.03 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 heats. 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 4 of the full rulebook.

1.1.04 Programming

The programming component is designed to foster and hone the skills and thinking process required to code professionally. In a truly unique way, participants will tackle various online programming challenges that have real-life applications. Each challenge will provide participants with the required tools to succeed, and challenges will become more complex as teams move forward. More information on the programming competition can be found in Section 5 of the full rulebook.

1.1.05 Video

A fully bilingual video must be submitted and be publicly available prior to the Competition and must present a description of the CRC Robotics Competition in a creative and innovative way. This aspect involves the application of technology, computers and languages. More information on the video can be found in Section 6 of the full rulebook.

1.1.06 Website

A fully bilingual website must be created and publicly published prior to the Competition, with the goal of demonstrating the hard work of the team to the public. The website must include, but is not limited to, a list of participating students, a description of this year's game and the design and construction of the robot. This aspect involves the application of technology, computers and languages. More information on the website can be found in Section 7 of the full rulebook.

1.1.07 Tutorial

The tutorial component allows teams to demonstrate their mechanical, electrical, programming, video and coding talents, among others, by providing a step-by-step explanation to achieve any particular task. The tutorial must be accessible on the team's

website and can hold various media formats. More information on the tutorial can be found in Section 8 of the full 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 Division 1 and Division 2 for the following components:
   a. Robot Design;
   b. Robot Construction;
   c. Kiosk;
   d. Video;
   e. Website Content;
   f. Website Design.

1.2.02 Teams are divided among High School and CEGEP for the Programming component.

1.2.03 This year's Division is based on the overall result obtained by the team in last year's Competition. The team's Division is the same for all previously mentioned components. ***Note:** Due to the effects of the COVID-19 pandemic on the Competition, the divisions for Arcanum 2022 were based on the overall result from Flip 2020 and not from Invicta 2021.

1.2.04 The top half of the overall ranking will be assigned to Division 1. If there is an odd number of teams, the median team will be in Division 2.

1.2.05 The divisions are re-assigned every year.

1.2.06 New high school teams are automatically placed in Division 2 while new CEGEP teams and vocational centres are automatically placed in Division 1.

1.2.07 A team in Division 2 can win the Overall Ranking award.

1.2.08 The best Division 1 and Division 2 teams will receive separate awards for the components based on the ranking for each component.

1.2.09 Teams will know their division on the night of the Competition Kickoff. However, if a team registers afterwards, these assignments can be modified. If it is the case, teams will be advised.

1.2.10 A Division 2 team can request to be upgraded into Division 1.

1.2.11 CRC Robotics has the final say in the division distribution.

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 Game

The Game award is presented to each team that was a finalist in this year's game. Finalists are the teams that participated in the final round of the game.

1.3.02 Robot Design

The Robot Design award is presented to the three teams that received the greatest scores from our engineering judges and that were deemed to have best designed their robot for the purpose of this year's game.

1.3.03 Robot Construction

The Robot Construction award is presented to the three teams that received the greatest scores from our engineering judges and that were deemed to have best constructed their robot for the purpose of this year's game.

1.3.04 Kiosk

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

1.3.05 Programming

The Programming award is presented to the three teams that achieved the highest scores in the programming component of the Competition and that were deemed to have the best executed code to accomplish the tasks at hand.

1.3.06 Video

The Video award is presented to the three teams that received the greatest scores from our professional/expert judges and that were deemed to have the best executed video.

1.3.07 Website Design

The Website Design award is presented to the three teams that received the greatest scores from our professional/expert judges and that were deemed to have the best website from a technical standpoint.

1.3.08 Website Content

The Website Content award is presented to the three teams that received the greatest scores from our professional/expert judges and that were deemed to have the best written content on their website.

1.3.09 Tutorial

The Tutorial recognition is presented to the team that was deemed to have the best explanation of the task selected. This winner is selected by the CRC Robotics Organizing Committee.

1.3.10 Never Say Die

The Never Say Die recognition is presented to the team that encountered many obstacles throughout the course of the Competition and that persevered to finally overcome those hurdles despite all hurdles. This winner is selected by the CRC Robotics Organizing Committee and receives a trophy that symbolizes all their hard work and perseverance.

1.3.11 Sportsmanship

The Sportsmanship recognition is presented to the three teams that are deemed the most respectful towards their peers and exhibit behavior based on values of respect and integrity that go beyond the Competition's rules and etiquette. The winning teams are selected by their peers and the team in first place also receives a trophy that symbolizes their sportsmanlike conduct: The Founders' Trophy.

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. Kiosk, Programming, Robot Design, Robot Construction, Website Design, Website Content, and Video components follow the formula mentioned above.
3. The game component counts for double the value of the formula mentioned above.
4. In the case of a tie, the teams receive the same score for that category.

5. 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. Game

The game component requires robots to score the greatest number of points while working in teams. It is the main component of the CRC Robotics Competition, giving each school an equal opportunity to demonstrate their robot design, robot construction and strategic playing skills. Refer to the Survival Guide for tips and suggestions.

CRC Robotics reserves the right to modify any and all values outlined in the following subsections at any time throughout the season. All teams will be promptly notified if a modification is made.

2.1   Teams

2.1.01 There is only one team, the red team, that participates in each game.

2.1.02 A team consists of X robots working cooperatively in each game.

2.1.03 The robots change partners in each game.

2.2   Playing Field

2.2.01 The playing field is composed of 3 platforms. Two platforms, on the upper level, are separated by a platform on the lower level. Two ramps allow you to move from the lower level to the upper level.

2.2.02 There are two starting zones on each of the three platforms.

2.2.03 There are multiple stations on the field that need to be repaired.

2.2.04 Two rails connecting both platforms can be lowered by activating both levers located on the opposite corners of the field.

2.2.05 Once lowered, the rails cannot be raised for the remainder of the heat.

2.2.06 It is strictly forbidden to cross the rails before they have been lowered completely.

2.2.07 The image below shows an isometric view (not to scale) of the playing field. Please refer to the full rulebook.

2.2.08 Unless otherwise communicated by the CRC Robotics Organizing Committee, in the event of a modification, measurements of the playing field recorded at Kickoff will be considered accurate. Teams are allowed a certain period of time at Kickoff to measure the different elements of the playing field. Should a team not be able to attend Kickoff

due to extenuating circumstances, measurements will be provided to them from another participating team that volunteers to do so.

2.3   Game Pieces

2.3.01 The game pieces (GP) are X.

2.3.02 X number of GPs are available during each heat.

2.3.03 There is no limit to the number of GPs a robot can hold at any given moment during the game.

2.4   Putting Game Pieces into Play

2.4.01 Each robot can be preloaded with a maximum of 4 GPs. If a robot is preloaded with less than 4 GPs, the remaining GPs will be placed on the floor in the robot's starting zone.

2.4.02 X GPs are found on the floor of the starting zones on the lower level. 10 GPs are preloaded in the reservoir.

2.4.03 The GPs on the floor can be picked up by any robot.

2.4.04 It is prohibited to launch, throw, or add mechanical acceleration to the GPs. They can only be dropped or put down on the floor in a controlled manner.

2.4.05 GPs that leave the field will be considered out of play and can no longer be used. It is not permitted to intentionally remove GPs from the playing field.

2.5   Stations

2.5.01 There are five stations that can 'break' during the heat.

2.5.02 Here are the five stations and their method of repair:

   a.   The Particle Accelerator is a long X. There is an open trap door in the middle of the X. To repair the Particle Accelerator, a GP must be inserted in the X from the far right and travel the entirety of the X. The trap door can be closed momentarily by pushing the button in front of the station, thus letting the GP pass through.
   b.   The Reservoir is X.
   c.   The Triage Centre is made up of three vertical X of different heights and colours (yellow, red and blue). To repair the Triage Centre, the team must

insert 3 GPs into the right X, one after another, in the order identified by the indicator light. The order of the colours is random and changes after each GP.

 d. The Airlock is divided into 4 levels, separated by gates. The gates must be pushed or pulled to allow the GP to drop from the upper level (L1) to the middle level (L2), then to the lower level (L3) and finally into the repair level (RL). Pulling on the gate between L1 and L2 will let the GP fall from L1 into L2. Then, pushing on the gate between L2 and L3 will let the GP fall from L2 to L3. Lastly, pulling on the gate between L3 and RL will let the GP fall into RL, repairing the station. A GP must be inserted into L1 from the top of the Airlock.

 e. The Control Centre is X.

2.5.03 Each station has an indicator light that indicates which station must be repaired during the wave. If the indicator light is red, the station needs to be repaired. If the indicator light is green the station has either been repaired or is in no need of repair.

2.6 Turbo

2.6.01 The Turbo is a scale situated at the center of the playing field. To activate the Turbo, the scale must be tilted to one side for at least X seconds.

2.6.02 The Turbo supercharges the stations located on the upper platform on the side to which it leans.

2.6.03 The Turbo does not have an effect on X. It cannot be supercharged.

2.6.04 The supercharged platform will be identified by lights on the playing field.

2.7 Waves

2.7.01 A wave consists of a certain number of stations that need to be repaired in X. If all the actuators are repaired within this timeframe, the wave ends and is considered complete.

2.7.02 If the team is not able to repair all the stations before the X timeframe is over, the wave ends and is considered incomplete. In this case, all the stations needing repair will repair themselves automatically. A station that was automatically repaired can break again in a subsequent wave. No points will be awarded for stations that are repaired automatically.

2.7.03 The first wave begins at the start of the heat. Once a wave ends, a new one begins automatically.

2.7.04 Before each heat, all 5 pilots must agree upon a level of difficulty: 1, 2 or 3. This decision cannot be modified after the start of the heat. If the pilots cannot agree on a level of difficulty, they will be assigned Difficulty Level 1 by default.

2.7.05 The level of difficulty determines the number of stations to be repaired in each wave. The level of difficulty also determines the number of bonus points obtained if all the required stations are repaired before the end of a wave.

Level of difficulty chosen before the heat	Number of stations to repair during each wave	Completed wave bonus
1	X	25 pts.
2	X	50 pts.
3	X	100 pts.

2.8   Scoring Points

2.8.01 Repairing 1 station awards 50 points to the whole team.

2.8.02 Repairing 1 station supercharged by the Turbo awards X points to the whole team.

2.8.03 Repairing all broken stations before the end of the wave awards the Completed Wave bonus to the whole team. The value of the Completed Wave bonus is determined by the difficulty level.

2.8.04 If a team completes at least 1 wave during the heat, a game bonus is awarded to the entire team based on the duration of the last wave and the number of the last wave. The game bonus is calculated using the following formula: (using function FLOOR.MATH which rounds down the result from the calculation in brackets to the nearest whole unit):

*Game bonus points = FLOOR.MATH[(Time elapsed during last wave in seconds/ 10) * Number of the last wave]*

2.8.05 The following are scoring examples. They constitute an integral part of the rules and a reference for scoring disputes. Please note that this image does not represent the playing field to scale, the various elements of the field or the positioning of the starting zones. This image serves simply to help understand the scoring system. Refer to the complete rulebook.

2.9 Judges and Penalties

2.9.01 Our referees are experts in calling and assessing penalties and always have the final word on the playing field. However, during the 15 minutes following the end of a heat, a team can challenge its final score if it has video evidence to support its claims. A team may be deprived by the referees of its right to challenge if they find it is unnecessarily abusing it.

2.9.02 The referees on the playing field have full authority to judge all aspects of the game. In particular, the referees will:

- Prevent robots, robot extensions and dropped robot parts from negatively blocking other robots;

- Prevent robots from damaging the playing field and GPs;

- Prevent robots from violating the air space on the edges of the playing field;

- Try their best to make sure the numbers displayed on the screens are accurate and updated as soon as possible; however, their ruling overrides whatever is displayed on the screens.

2.9.03 Any robot that is deemed dangerous (based on its design or behaviour) by any of the referees runs the risk of being disqualified from the heat, and even from the tournament.

2.9.04 Various robot parts may be placed, intentionally or not, on or around the playing field by a robot, on the condition that they are removed from the playing field or from its surroundings by the robot before the end of the heat. If items are no longer in contact with the robot by the end of the heat, the robot that released these items will be liable to an individual junk penalty of 4% of its total score for the heat for each item left on or around the playing field.

2.9.05 If a liquid leaks from a robot during the heat, the robot that is leaking will be given a score of 0.

2.9.06 While we trust that all participants will provide clear intentions, certain conducts may occur that require sanctions, especially during the heat of battle. To avoid such penalties, remain courteous at all times. These penalties are considered as Unsportsmanlike Conduct and have a series of escalating consequences, depending on the severity of the issue. The number of points deducted from the robot's total score for that heat will be at the discretion of the head referee and will be proportional to the severity of the action. Some examples of the types of behaviour that signal a lapse of sportsmanlike behavior are:

- A deliberate attempt to disable or damage another robot;

- A deliberate attempt to hit another robot with a GP, robot part or playing field element;

- Inappropriate behaviour directed at an official, another participant, or a spectator.

2.9.07 The minimum score that can be awarded for any given heat is 0 points; therefore, if a penalty brings a robot's total score to below 0, the final score awarded to the robot for the heat will be 0.

2.9.08 If a team judges that its robot needs assistance on the playing field during a heat, its pilot may ask the referee to assist their robot. The assisted robot will be liable to an assistance penalty of 20% of its total score for the heat. The referees reserve the right not to assist the robot even if asked to do so by the pilot.

2.9.09 Any deliberate attempt to throw a GP or put a GP out of play will result in a 20% penalty of the robot's total score for the heat for each GP affected.

2.10   Heat Progress

2.10.01 All 5 robots must start inside one of the 6 available starting zones located on the two upper platforms and on the lower level.

2.10.02 All heats are 5 minutes in duration. When the heat time is over, all parts of all robots must stop moving. All the points generated by the team due to the motion of their robots after the heat ends will be canceled. Although an estimate might appear on the screens near the playing field, the remaining time until the end of a heat is controlled by the head referee.

2.10.03 Team members may not interfere with or touch any element of the playing field, robots or GPs during the heat.

2.10.04 The robots cannot damage the playing field or the GPs.

2.10.05 All robots must be labelled with the school's name (either full or shortened) and number. These two elements must be clearly visible to the crowd and referees. If these elements are not all visible, the robot will not be allowed to participate in the heat. Adding the robot's name (if any) is optional.

2.10.06 If a robot is not able to fully exit its starting zone during the heat for whatever reason and is not actively trying to score points from its starting zone, or if it is simply absent, it will be considered as an inactive robot. Robots with one or more inactive robots on their team will receive a 20% bonus of their total score for the heat for each inactive robot to compensate for the disadvantage of playing with less teammates. Inactive robots will be removed from the playing field after 30 seconds of inactivity to prevent them from blocking play.

2.10.07 If a robot makes it out of its starting zone and stops moving for whatever reason, it will be considered a broken robot. If the robot breaks before it meets the sharing requirements, then it will not share the team's score, but the other robot's score (from the same team) will not be multiplied by 1.2, because, initially, the broken robot was an active robot. Broken robots will be removed from the playing field after 30 seconds of inactivity to prevent them from blocking play.

2.10.08 If a robot is not able to move out of its starting zone but is actively participating in the making of points, it will share the team's points.

2.10.09 Following the buzzer signaling the end of play, team members are not allowed to enter the playing field, to touch any robot, or to touch the GPs before they are cleared to do so by the head referee. It is essential that the configuration of the GPs, at the end of the heat, remain intact for scoring purposes. The head referee will indicate when the team members are allowed to enter the playing field.

2.11 Pilot and Co-pilot

2.11.01 Each team's pilot, co-pilot (spotter), and robot participating in the next heat must be in the "On Deck Area" when the buzzer sounds to end the previous heat. If not, a penalty is assessed to the offending robot. It is the team's responsibility to make sure the team is on time, even if the schedule is delayed.

2.11.02 If a robot, pilot, or co-pilot of a team is not ready to start, the heat will start without the team in question.

2.11.03 The pilot and co-pilot must remain seated during the entire game in their designated seats provided by CRC Robotics, which are placed within the designated areas surrounding the playing field.

2.11.04 Each person is responsible for taking all necessary precautions to ensure their own safety.

2.11.05 Before the start of the heat, the referees will ask the red team for their choice of one of the 3 difficulties. If the team cannot agree on a difficulty level, they will be assigned Difficulty Level 1.

2.12 Tournament Progress

2.12.01 The tournament consists of 5 stages:

　　a. **Preliminary Round**: These heats are played on Thursday and Friday by all teams. After all the preliminary heats have been completed, each robot will cast out their two lowest scoring heats. Heats affected by an unsportsmanlike

penalty cannot be cast out. The total of all other heats will be summed to determine each robot's final rank for the preliminary round. Depending on a team's rank, teams can advance directly to semi-finals or quarterfinals, or they will play in the knock-out round.

b. **Knock-Out Round:** These heats are played on Saturday morning by teams that did not directly advance to quarterfinals or semi-finals. This round provides teams with an opportunity to advance further in the tournament. The final score of all the heats played by a robot in the knock-out round will be added to determine its ranking in this round.

c. **Quarterfinals:** Top teams from the preliminary and knock-out rounds advance to this stage of the tournament. The final score of all the heats played by a robot in the quarterfinals will be added to determine its ranking in this round.

d. **Semi-Finals:** Top teams from the preliminary rounds and quarterfinals advance to this stage of the tournament. The final score of all the heats played by a robot in the semi-finals will be added to determine its ranking in this round.

e. **Finals:** Top teams from the semi-finals advance to this stage of the tournament. The final score of all the heats played by a robot in the finals will be added to determine its ranking in this round.

2.12.02 The schedule for the various rounds will be published at the beginning of the Competition.