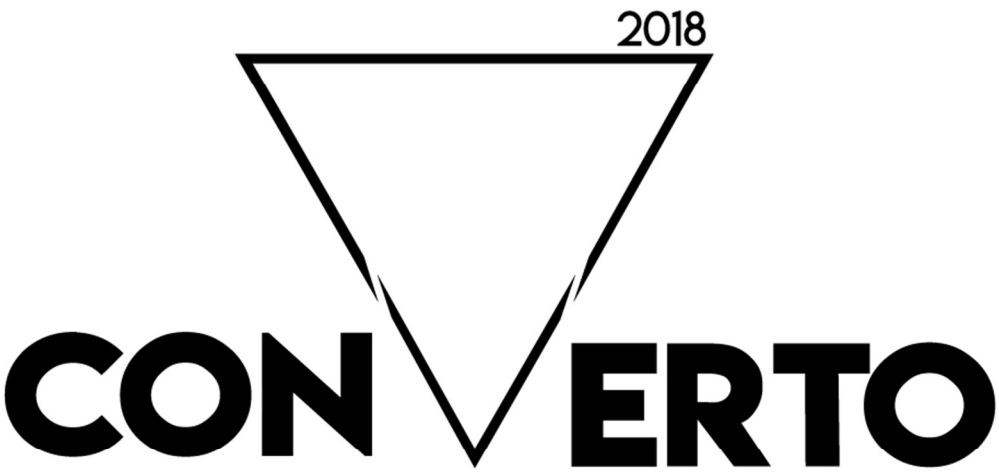
1.1.1.1.1

17th Annual CRC Robotics Competition

Full Rule Book

Version of October 30th 2017



Welcome to the CRC Robotics Competition

On behalf of the Educational Alliance for Science and Technology and the CRC Robotics Organizing Committee, welcome and congratulations to all the participants on joining your school's robotics team and embarking on the CRC Robotics journey!

Take it from the current leaders of the CRC Robotics Organizing Committee, who were all former student participants in the CRC: you will remember this unparalleled experience for many years to come. In fact, many of the over five thousand CRC Robotics Competition alumni will tell you that participating in the CRC was the most memorable, useful, important, and fun part of their high school and CEGEP lives.

This is now our 17th competition and we are very excited about the game this year. Thanks to the help of our great volunteers, we have much more to show off this time around! They have made it possible to improve aspects of the competition that could not have been advanced otherwise.

We wish to welcome and thank the many teachers, parents, mentors, and volunteers for embarking on this journey and for all the hard work you will put into enriching your students' lives throughout this activity.

We also wish to thank the Director General of Laval Senior Academy, Ms. Nathalie Rollin, and her team for their warm welcome and for the time and energy they've put towards the success of this event.

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

Good luck to all and see you at Converto 2018 from February 1st to 3rd, 2018 at Laval Senior Academy!

Jean-Philippe Gélinas
Coordinator
jp@robo-crc.ca

Simon Marcoux
Coordinator
simon@robo-crc.ca

David Martin
Coordinator
david.martin@robo-crc.ca

Natasha Vitale
Coordinator
natasha.vitale@robo-crc.ca

Jeremy Webb
Coordinator
jeremy.webb@robo-crc.ca

Goals, Objectives, and Roles

Our non-profit organization has set up this competition with the following goals in mind:

1. To set up a student-oriented and student-directed activity.
2. To create a project that integrates robotics, science, math, multimedia, language arts, public speaking, and computers.
1. To develop a hands-on approach to help our students link the classroom to the workplace.
2. To help to encourage girls to head into fields involving science and technology.
3. To put into practice, the educational reform and its cross-curricular competencies.
4. To provide a positive and rewarding experience to help reduce the dropout rate among young men.
5. To foster and build teamwork and communication skills.
6. To promote the idea of working together to accomplish a common goal.
7. To instil the concept that achieving team goals is more important than winning.

In this competition, there are three different types of involvement: students, teachers, and mentors. We have laid out the following roles for each:

1. **Students are to do all of 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 the robot, video, website, and kiosk must be done entirely by the students.
2. **Teachers are available to provide the support that students may need.** 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 towards 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 professional that can differentiate between teaching and doing.
3. **Mentors are outside professionals who may be consulted during 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 school, but please keep in mind that this is the students' project. Let them show you what they are made of and develop their own skills!

Converto 2018 – Participating Schools

Welcome and good luck to all!

Team number	School name
19	Cégep du Vieux Montréal
23	Cégep Saint-Laurent
3	Cégep Vanier College
18	Centennial Regional High School
20	Collège Citoyen
27	Collège D'Anjou
12	Collège de Bois-de-Boulogne
9	Collège Montmorency
6	Collège Notre-Dame 1
7	Collège Notre-Dame 2
11	Collège Sainte-Marcelline
8	Dawson College
26	École secondaire Chomedey de Maisonneuve
16	École secondaire Curé-Antoine-Labelle
14	École secondaire Jules-Verne
13	École secondaire St-Maxime
4	John Abbott College
1	Lake of Two Mountains High School
22	Laval Senior Academy
2	Macdonald High School
15	Marianopolis College
24	Riverdale High School
5	Rosemount Technology Centre
10	Royal West Academy
25	St. George's School of Montreal
17	West Island College

CRC Robotics Partners

CRC Robotics would like to express a heartfelt thank-you to our partners!

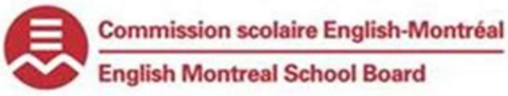


Table of Contents

Converto 2018 - Game Rules

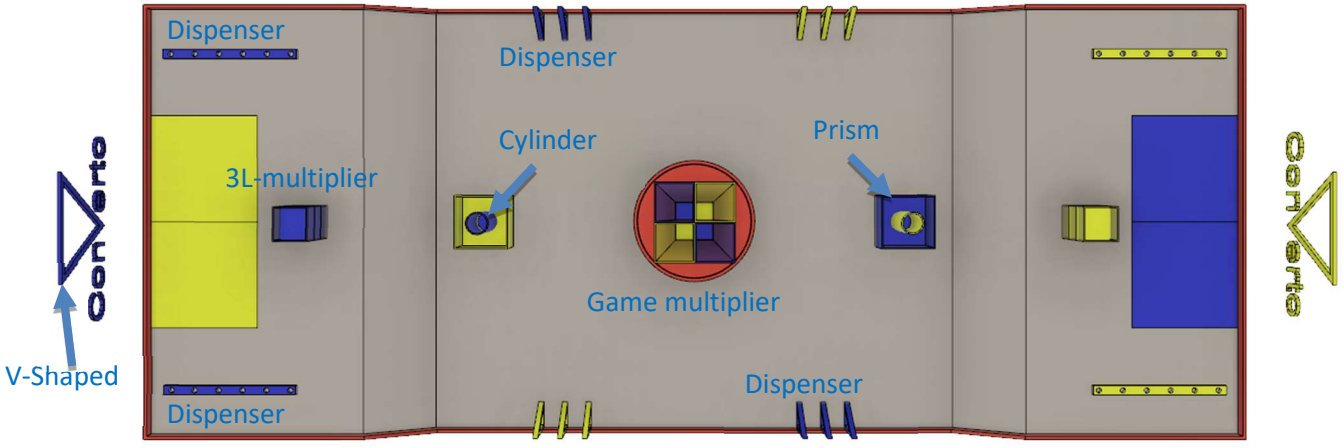
1. The Game

1.1 Two teams, blue and yellow, composed of two robots each, are competing to score the largest amount of points. A team scores points by placing game pieces (GPs) in the targets corresponding to their team's colour, which are located on the field. A team's score is maximized by placing GPs in the multipliers.

1.2 The robots start the game, each preloaded with 5 GPs, in the starting zones corresponding to their team colour. There are a total of 4 dispensers of GPs for each team: 2 on the upper level, each containing 6 GPs, and 2 on the lower level, each containing 9 GPs. The total number of playable GPs for each team is 40 (30 on the field and 10 preloaded in the robots).

1.3 When the game starts, robots may move all across the field to remove the GPs from their dispensers and use them to score points.

1.4 Each team has a total of 3 targets on the playing field, 4 dispensers, a target multiplier, and a game multiplier. Each target gives a number of points to a GP found in it. The table below shows the points per GP given by each target as well as its shape and location on the playing field. The image below shows their locations (for the blue team) on the field.



Target	Location	Points/GP
Cylinder	Lower level	30
Prism	Lower level	10
V-Shaped	Upper level	20

Note: The cylinder belonging to one team is located inside the opposing team's prism.

1.5 The total points merited by GPs in yellow targets will be awarded to the yellow team and the total of those in blue targets will be awarded to the blue team, regardless of which team placed the GPs in the targets. For example, if the yellow team places a GP in a blue target, intentionally or unintentionally, the points of that GP will be awarded to the blue team.

1.6 A maximum of 5 GPs are allowed on a robot at any given moment during the heat. A robot with more than 5 GP loaded will be asked to stop until the referee removes the faulty piece from the robot and places it back where it belongs. The drivers has to collaborate with the referee. A GP is considered "on the robot" if it is in contact with only the robot.

2. Removing GPs from the Dispensers

2.1 No points are awarded for removing GPs from the dispensers.

2.2 A team can only remove GPs from their own dispensers. If a robot picks up a GP from the wrong dispenser, it will be asked to stop until the referee removes the faulty piece from the robot and places it back where it belongs. The drivers has to collaborate with the referee.

2.3 A GP is considered removed from the dispenser when it is no longer in contact with the dispenser.

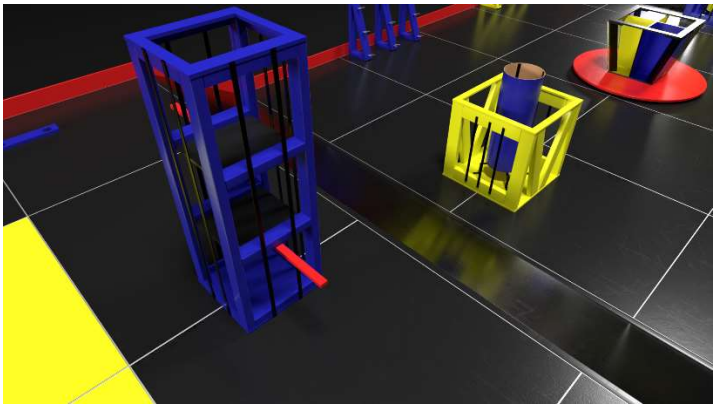
2.4 A GP on the field floor can be picked up by any team, regardless of which dispenser or robot it previously came from. For example, if a robot of the blue team removes a GP from a blue dispenser and that GP falls on the field floor, then that GP can be picked up by any robot from the yellow or blue team.

3. The V-Shaped (∇) Target or V-Target

3.1 The V-Target of a team gives points for every GP in it. The points obtained through the V-Target are directly related to the number of GPs in the 3L-Multiplier. Rules 3 and 4, as well as the game scoring examples, elaborate on the connections between the V-Target and the corresponding 3L-Multiplier.

3.2 A team can put GPs in the V-Target as long as no GP is placed in the 3L-Multiplier. Once a single GP is placed in the 3L-Multiplier, the team may no longer add GPs to the V-Target. A team may not put GPs in the opposing team's 3L-Multiplier (intentionally or unintentionally) to prevent that team from adding GPs in their V-Target, nor can it interact with their 3L-Multiplier in any way (see 4.6).

4. The 3-Level Multiplier



4.1 The 3L-Multiplier of a team is associated with the V-Target of that same team.

4.2 A maximum of 3 GPs can be placed by a team in their own 3L-Multiplier. All GPs exceeding 3 will be disregarded. The only purpose of the 3L-Multiplier is to influence the V-Shaped Target.

4.3 No points are awarded to GPs placed in the 3L-Multiplier.

4.4 The 3L-Multiplier is divided into 3 levels separated by hatches. The hatches can be opened by activating levers which would allow GPs to drop from the upper level (L1) to the middle level (L2) and to the lower level (L3). For a GP to reach L3, it must first be placed in L1. Then, opening the hatch between L1 and L2 will make the GP drop to L2. Then, opening the second hatch between L2 and L3 will make it drop to L3. A GP cannot be directly placed in L2 or L3, unless the hatches were previously opened.

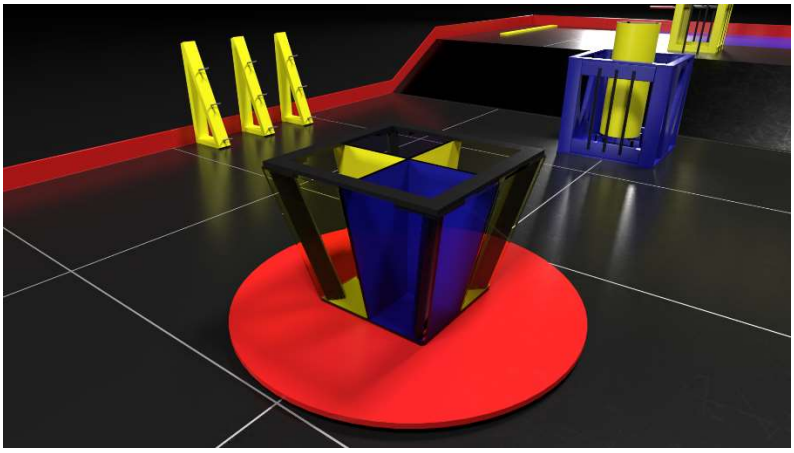
4.5 GPs should drop when a hatch is opened. If, for any reason, the GPs do not drop when the hatch opens, then GPs will be considered as dropped when the score is calculated.

4.6 The points below describe how the number of GPs in the 3L-Multiplier affect the score of the V-Target:

- 4.6.1 If zero GPs are in the 3L-Multiplier, then the score of the V-Target will be multiplied by zero.
- 4.6.2 A minimum of 1 GP in L1 will activate a x1, which will affect the score of the V-Target.
- 4.6.3 A minimum of 2 GPs in L2 will activate a x2, which will affect the score of the V-Target.
- 4.6.4 Three GPs in L3 will activate a x3, which will affect the score of the V-Target.

4.7 The V-Target score is affected by the game multiplier just like the score of the other targets (see rule 5).

5. The x2 Game Multiplier (The Quad-Core)



5.1 The Quad-Core is located at the center of the field. It is made of four identical compartments (Cores): two blue and two yellow. The Quad-Core is constantly rotating throughout the heat.

5.2 Each team will target the Cores of their team's color with GPs. If a team places a GP in the opposing team's Core, then that GP will count for the opposing team.

5.3 GPs in the Quad-Core are not awarded any points.

5.4 Unlike previous games, the x2 multiplier obtained by a team can be reduced depending on the number of GPs placed in the Quad-Core by the opposing team. The purpose of this modification is to optimize the impact of GPs added to the Quad-Core by a particular team, even if that team will not obtain the x2 game multiplier. That team will be able to reduce the x2 of the opposing team by adding game pieces to their Cores. The rules below detail the distribution of the game multiplier.

Let Y be the number of GPs of the yellow team and let B be the number of GPs of the blue team:

- If $Y \geq 2B$, then the score of the yellow team will be multiplied by 2.
- If $B < Y < 2B$, then the score of the yellow team will be multiplied by *Y/B*.
- If $B \geq 2Y$, then the score of the blue team will be multiplied by 2.
- If $Y < B < 2Y$, then the score of the blue team will be multiplied by *B/Y*.
- If *Y = B,* then the score of both teams is multiplied by 1.

The table below applies the rules above in different game scenarios.

			Game Score		Final Score		
Scenario	**Blue GPs "B"**	**Yellow GPs "Y"**	**Blue Score**	**Yellow Score**	**Blue**	**Yellow**	**Comments**
1	10	4	400	500	400x2=800	500x1=500	$B \geq 2Y$; the blue team wins the x2
2	10	6	400	500	400x1.67=668	500x1=500	$Y < B < 2Y$; the score of the blue team is multiplied by B/Y=10/6=1.67
3	10	8	400	500	400x1.25=500	500x1=500	Same as scenario 2
4	10	5	400	500	400x2=800	500x1=500	Same as scenario 1
5	10	10	400	500	400x1=400	500x1=500	B=Y; both teams get x1

Note: To allow the reader to focus on the changes between scenarios, the same game scores were repeated and the blue team was deliberately chosen as the one with the higher number of GPs in the cylinder.

6. During Play

6.1 GPs that leave the field will be put back closest to the exiting point. Please allow time for our volunteers to retrieve the GPs.

6.2 All heats are 5 minutes in duration. When the heat time is over, all robots must stop moving. GPs will be considered only when they stop moving, even if that occurs after the heat time is over.

6.3 If a team's robot needs assistance on the playing field, the team may ask the referee to assist their robot. A penalty of 20% per assistance (calculated at the end of the game) will affect the robot (not the team) assisted by the referee. Assistance can be (but is not limited to): putting a robot on the field if it tips over on the field, freeing a robot from a stuck GP, turning on the robot (if a team forgets to turn on their kill switch). Team members may not enter the field at any moment of the heat. If a team takes too long to ask for help, the referee may prompt them.

6.4 Referees reserve the right to not assist a robot even if asked to do so by the team members.

6.5 Robots will change partners from heat to heat.

6.6 Robots are strictly forbidden to come in contact with the targets, the dispensers, the game multiplier (Quad-Core), or the body of the 3L-Multiplier. Robots may only manipulate the levers on the 3L-Multiplier, in the normal intended manner, for the sole purpose of opening the hatches. Any attempt made by a robot to manipulate the levers in a manner that may

damage them will be stopped by the referee and will result in a 5% penalty (calculated at the end of the game), which will affect the robot (not the team). Robots may not damage the GPs.

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

6.7.1 Prevent robots from negatively blocking other robots.

6.7.2 Prevent robots from damaging the playing field and GPs.

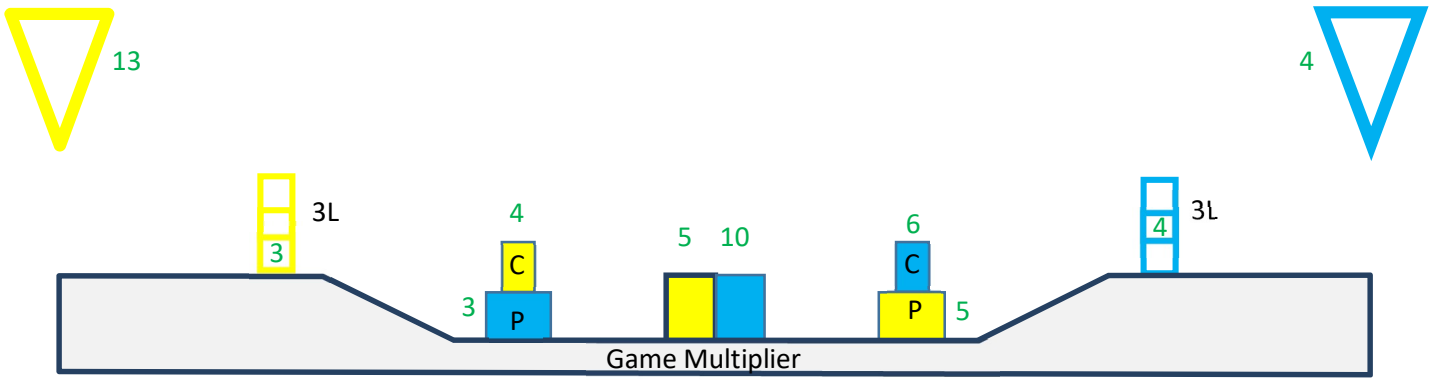
6.7.3 Prevent robots from violating the air space on the edges of the field.

6.7.4 Try their best to make sure the numbers displayed on the screens are updated. Their ruling overrides whatever is displayed on the screens.

7. Scoring Example

7.1 The following are scoring examples. They constitute an integral part of the rules and a reference for scoring disputes. The images below show a side view (not to scale) of the playing field. The numbers in green represent the number of GPs in every target/multiplier. Note that the V-Targets are in planes perpendicular to the view chosen of the playing field. For ease of visual representation, the V-Targets were joined to the view of the playing field.

7.2 Scoring Example #1:



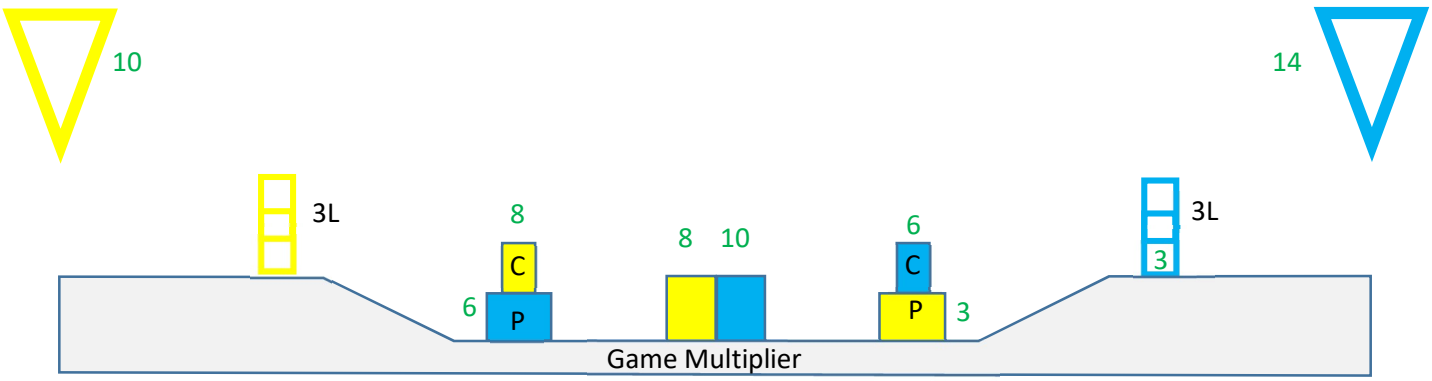
The table below shows the detailed scoring for every team depending on the given distribution of GPs.

	Points/GP	Yellow Team GPs	Yellow Team Points	Blue Team GPs	Blue Team Points
The Prism (P)	10	5	50	3	30
The Cylinder (C)	30	4	120	6	180
The 3L-Multiplier (3L)	0	X0	0	X0	0
		X1		X1	
		X2		4 X2	
		3 X3		X3	
V-Target	20	**13**	260x3	**4**	80x2
Multiplier	0	**5**	0	**10**	0
Total			950		370
Multiplier (check scenario 4 in 5.4)		no	X1	yes	X2
Final Team Heat Score			950		740

Note:

- Even though the blue team had 4 GPs in L2 of their 3L-Multiplier, it was only enough to activate a x2 to their V-Target score.
- The game multiplier was awarded to the blue team according to scenario 4 outlined in Rule 5.4.

7.3 Scoring Example #2:



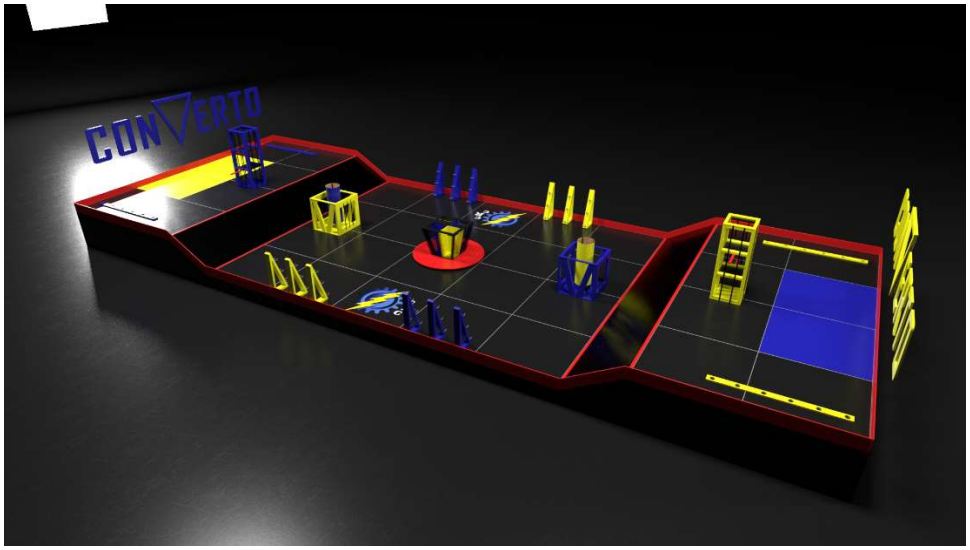
The table below shows the detailed scoring for every team depending on the given distribution of GPs.

	Points/GP	Yellow Team GPs	Yellow Team Points	Blue Team GPs	Blue Team Points
The Prism (P)	10	3	30	6	60
The Cylinder (C)	30	8	240	6	180
The 3L-Multiplier (3L)	0	0 X0	0	X0	0
		X1		X1	
		X2		X2	
		X3		3 X3	
V-Target	20	**10**	200x0	**14**	280x3
Multiplier	0	**8**	0	**10**	0
Total			270		1080
Multiplier (check scenario 3 in 5.4)		no	X1	yes	X1.25
Final Team Heat Score			270		1350

Note:

- The yellow team did not put GPs in the 3L-Multiplier, which resulted in a x0 for the GPs in the V-Target.
- The game multiplier was awarded to the blue team according to scenario 3 outlined in Rule 5.4.

8. Playing Field



8.1 The playing field is a large rectangle. The areas on the ends of the rectangle are elevated with respect to the central area. Ramps connect the areas with different elevations.

8.2 The pilot and the co-pilot (spotter) will be in their designated areas around the playing field in their designated seats provided by the CRC.

9. On Deck

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

9.2 If a robot, driver, or spotter of a team is not ready to start, the heat will start without the team in question.

9.3 All robots must be labelled with the school's name and number as well as its current game team color. These three elements must be clearly visible to the crowd and referees. Adding the robot's name is optional.

10. Starting Play

10.1 The drivers and spotters must remain seated during the entire game in their designated seats provided by the CRC, which are placed within the designated areas surrounding the playing field. Once the heat has begun, the drivers and spotters may not interfere with any items on

the field during the heat, including contact with the robot(s) or the playing pieces. Each person is also responsible for taking all necessary safety precautions.

10.2 Robots are to be brought to their designated starting bay. If robots arrive after a heat begins, they will not be permitted to participate in that heat.

10.3 Each robot may be preloaded with five GPs once they are on the playing field. The pieces will be on the playing field.

11. End of Play

11.1 All heats are 5 minutes in duration. When the heat time is over, all robots must stop moving. If, at that moment, a GP is still moving, it will be assigned the points of the zone in which it will come to a stop, even if that occurs after the heat time has ended.

11.2 Following the buzzer signalling the end of play, nobody may enter the playing field until the head referee indicates that they may.

12. Scoring

12.1 **Sharing robot**: In order to share points with its teammate, a robot must contribute to the score by putting a GP in a target (prism, cylinder, or either multiplier). The robot will then be defined as a sharing robot and will share the team's points.

12.2 **Inactive robot**: If a robot is not able to **fully exit the starting zone** during the heat for whatever reason or if it is simply absent, it will be considered as an **inactive robot**. A robot teaming up with an inactive robot **will see its score multiplied by 1.5 to compensate for the disadvantage of playing alone.**

12.3 **Broken robot:** If a robot makes it out of the starting zone and stops moving for whatever reason, it will be considered a broken robot and not an inactive robot. If the robot breaks before it meets the sharing requirements, then it will not share the team's score and the other robot's score (from the same team) will not be multiplied by 1.5 (because, initially, the broken robot was an active robot).

12.4 If a robot is inactive or broken (see 12.2 and 12.3) anywhere on the field for more than 30 seconds, it will be removed from the playing field to prevent it from blocking play.

12.5 The final score for each team is assessed at the end of the heat, although an estimated score might appear on the display as the heat is in progress.

12.6 No points are assigned to the GPs in the dispensers, on the robots, or on the playing field.

13. Preliminary Round Cumulative Score

13.1 After all the preliminary heats have been completed, each robot will cast out their two lowest scoring heats. The total of all other heats and the score of the skills competition will be added to determine each robot's final score for the preliminary rounds.

14. Playoff and Repechage Rounds Structure

14.1 The schedule of Playoff and Repechage rounds will be published at a later date.

15. Contact

15.1 Bumping and blocking may occur as robots attempt to acquire points. However, it is not permitted to intentionally hit other robots. If the referee sees that you have intentionally hit another robot, you will receive a penalty during the heat in which the incident occurred.

15.2 Our referees are experts in calling and assessing penalties and have the final word at all times on the playing field.

16. Penalties

16.1 Sometimes, it may be advantageous to take a penalty to improve the school's score during that heat. This strategy is acceptable as long as the penalty isn't taken at the expense of others (see Unsportsmanlike Conduct Penalties).

16.2 **Junk Penalty:** Various items may be placed on or around the playing field by a robot, on the condition that they are removed from the playing field 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 penalty of 4% of the total score for each item left on or around the playing field. Liquid counts as many items of junk.

16.3 **Unsportsmanlike Conduct Penalties:** While we trust that all participants will provide clear intentions, it may happen that certain conducts may occur that require sanctions, especially during the heat of battle. (To avoid such penalties, remain courteous.)

These penalties have a series of escalating consequences depending on the seriousness of the issue. Some examples of the types of behaviour that signal a lapse of sportsmanship behaviour are:

- A deliberate attempt to disable another robot.
- A deliberate attempt to hit another robot.
- Inappropriate behaviour directed at an official, another competitor, or a spectator.

An Unsportsmanlike Conduct Penalty is taken from the individual team's final total score and cannot be removed as one of the two lowest heat scores on the preliminary ranking.

Robot Safety, Power, Motors, and Control Rules

17. Robot Size

17.1 At the beginning of a heat, robots are limited to a 92cm x 92cm footprint (Length x Width) with a height limit of 123cm. These dimensions will be verified upon certification (see 18). When the heat begins, the robots may extend their footprint to a maximum of 123cm x 123cm while maintaining the maximum height of 123cm.

17.2 Robots may not use the 30cm extensions to block other robots. Extensions may only be used to score points.

17.3 A robot may have moving parts as long as they do not extend beyond the specified maximum dimensions before the heat and during the heat.

17.4 Robots must be made to regain their initial size unassisted. These criteria will be verified upon certification.

17.5 Robots that do not comply with the rules on dimensions will not be allowed to compete.

18. Robot Certification

18.1 All robots must be certified before the first heat to ensure that the construction and safety rules have been respected.

18.2 Schools may make as many modifications as they would like between heats. However, each modification requires a new certification of the robot. If a robot has not been re-certified after a modification, all of the points received from the heats since the last certification will be canceled.

18.3 Any robot that is deemed "dangerous" runs the risk of being disqualified if the necessary safety measures have not been put in place.

18.4 The official certification sheet can be found in the appendix of this rulebook.

19. Electronics

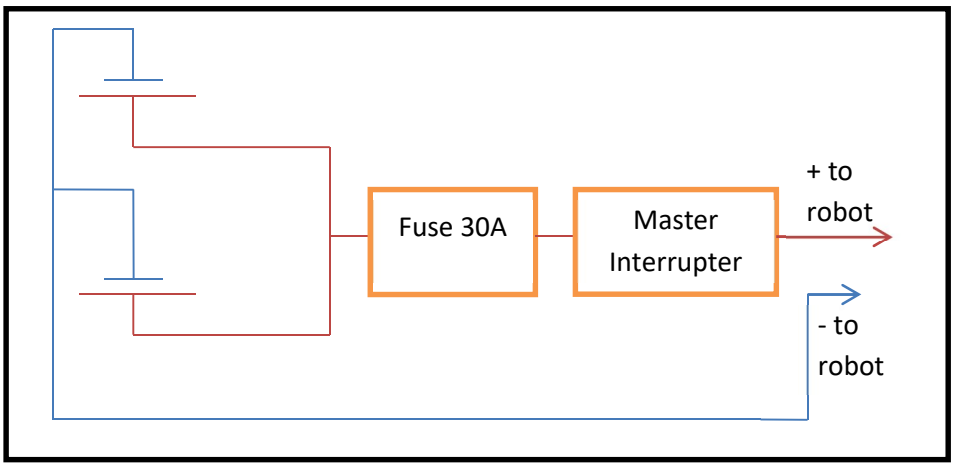
19.1 The robot must have an easily identifiable and accessible ON/OFF kill switch provided by the CRC (included in the kit). No other kill switch will be accepted. The kill switch must be connected to the circuit such that it kills the robot's 12V-circuit when the switch is pushed and not pulled.

19.2 The robot must have a fuse (with reset or single usage) between the Makita batteries and the robot.

19.3 The robot must have a fuse to limit the total output of all batteries to 30A.

19.4 The 12V circuit must get its energy from two Makita batteries connected in parallel. You may purchase backup batteries; however, they must be identical to the 12V Makita batteries provided in the starter kit. You may not use more than 2 Makita 12V batteries.

19.5 Here is a schematic of the minimum safety requirements for the 12V-circuit of the robot:



19.6 The VEX interface can have an unlimited number of VEX batteries connected in parallel; however, note that it is not recommended to have more than one.

19.7 The addition of capacitors to the main circuit of the robot is permitted. The role of the capacitor is to reduce the magnetic field emitted by the motor. However, no electrolytic capacitors are permitted for this task. The capacitor may not be used to accumulate charge. If your capacitor is polarised (if it contains only one direction for connection), it is considered illegal.

19.8 The electric circuit will be inspected for its integrity and must be easily accessible for certification. If parts are protected inside boxes, the boxes will need to be opened during certification.

19.9 All replacement batteries must be identical to the ones provided in the kit.

19.10 The 12V batteries on the robot have to be inserted in the socket of the drills. The drill socket can be separated from the motor.

20. Pneumatics

20.1 If the robot uses any pneumatics, your robot must also have an easily identifiable and easily visible ON/OFF pneumatic kill switch. All the actuators/valves must be at the ambient pressure when it is OFF.

20.2 In a similar fashion to the protection of the electronics system with a fuse, the pneumatic system must be equipped with a suppression value that can be controlled to release any measure of pressure greater than 90 psi.

20.3 The pneumatic system of the robot must be divided in two parts. Their maximal pressures are:

- Tank section: 90 psi
- Low pressure section (actuators/valves): 55 psi

20.4 All pneumatic pieces (actuators, valves, cylinders, tanks, switches, etc.) must be original and unmodified. All the serial numbers must be visible for certification.

20.5 Each actuator/cylinder must be controlled by only one valve.

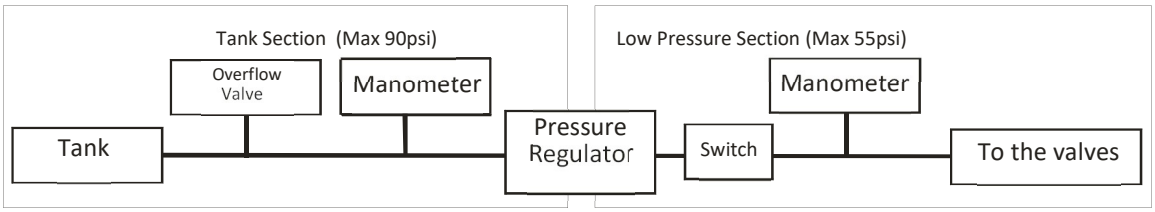
20.6 All the valves must be controlled by the VEX microcontroller. It is possible to add relays or power modules to control the valves but they must be controlled by the VEX microcontroller.

20.7 The valves must have a maximal input hole of 1/8" or 3mm.

20.8 The tubes between the valves and the actuators/cylinders must have a maximal diameter of 3/16" or 5 mm.

20.9 You may plug several tanks in series or in parallel but their pressure cannot exceed 90 psi.

20.10 There must be 2 nanometers installed, one in each section:



20.11 Failure to respect these rules will cause the robot to fail the certification process.

21. Alternative Power Sources

21.1 All energy used by the robots must come from the batteries and must respect rule 19. The use of pneumatic systems is legal (see Pneumatics Rule 20). There is no restriction with regards to gravity.

21.2 Any battery compatible with the transmitter may be used to power it.

21.3 If spring systems are used, they must be in relaxed states or compressed or stretched by the same batteries and motors used during the heat before the heat begins.

21.4 The use of springs that store energy and consequently release energy in an oscillating manner is permitted on the condition that they conform to the rule above.

21.5 A spring that, after having started the heat in a compressed or stretched state, releases its energy during the heat, but cannot return to its original state will be deemed illegal.

21.5.1 A legal example: the motor is unable to lift an arm without human interference. In this case, schools may add a pre-stretched spring to help it. When the motor moves, it adds energy to the spring system and then releases it. This case is permitted as it can be compared to the use of a counter-weight.

21.5.2 An illegal example: A loaded spring system is used to shoot an arm out at the beginning of the heat but is unable to draw it back in. This case is not permitted.

22. Motors

22.1 No major modifications may be made to the motors. In doubt, contact the organizers.

23. 12V Motors (Power Motor)

23.1 No motors other than the ones provided in the starter kit or motors exactly identical to them are permitted.

23.2 **NEW!** The maximum number of power motors is increased to 8, with a maximum of 4 power motors of a given type (drills, banebots, black motors).

23.3 It is permitted to change the ratio of the gear boxes of the Banebot motors and the gear boxes may be removed completely. The gear box provided can be used as a reference.

24. VEX Motors and Servo Motors

24.1 Only the VEX motors (3-wire, 2-wire 393, and 2-wire 269) are allowed.

24.2 Non-VEX servo motors (5 volts) are allowed only if they do a partial rotation.

24.3 There is no limit to the number of VEX motors or servo motors that you may use. **Caution**: There is a limit to how much current the VEX CPU can handle safely.

25. Other Power Systems

25.1 Solenoids and muscle wires are permitted as long as they are not used for motion as they are considered linear motors. An example of a motionless use is the activation of a switch. If these are deemed to be used for motion, they will be considered illegal.

25.2 Cooling fans are permitted only in situations where they cool the motors or electrical components that can potentially overheat. Fans cannot be used for any other function.

25.3 All other systems (i.e. a flash light) must be adapted to draw their energy from the batteries provided. Blinding lights or other components deemed distracting by our judges at certification must be disconnected.

25.4 Lasers are **prohibited**.

26. Motor Controller

26.1 The auxiliary motors can be controlled with relays, interrupts, switches, and control interfaces (VEX Pro Spike Blue, Sabertooth, Jaguar, Victor, Talon, etc.).

27. Robot Transmissions / Control

27.1 Only Wi-Fi transmissions from the VEX transmitter are allowed to control the robot. The VEX CPU must send all control signals.

27.2 The robot must be controlled by a single controller.

27.3 It is permitted to use the VEX interface for other control systems. It is also possible to use sensors and/or microprocessors to improve control as long as the VEX interface is the main controller.

27.4 It is forbidden to use any other transmitter (RF, Wi-Fi, etc.) to increase the number of channels or to disrupt those of the other competitors.

27.5 You may attach a camera to your robot, but the images may not be transmitted live.

Overall Ranking

Given that the ultimate objective of participating in the CRC Robotics Competition is to learn how to build a functional robot, we like to reward as many teams as possible with awards. The overall ranking in the competition follows the regulations below. With a goal to make the competition as fair as possible to teams with less experience, the CRC committee has introduced a two-division system for certain elements of the competition.

1. For each component of the competition, the number of points equal to the total number of teams can be given for a first place ranking. The score given for other ranks can be calculated using the following formula: Total Number of Teams – Rank + 1.
    a. Journalism, the robot design, the robot construction, the programming competition, the website, the kiosk, the video, and the programming competition follow the formula mentioned above.
    b. The game counts for double the value of the formula mentioned above.
2. In the case of a tie, the teams receive the same score for that category.
3. The total number of points for all the components determines the overall ranking.
4. For the website, journalism, and the video, no submission will result in a score of zero.
5. **For the sportsmanship award, it will no longer be considered in the overall ranking. It will instead have its own trophy to promote the CRC spirit.**
6. Each component of the competition has a separate ranking.
7. **Teams will be divided between Division 1 and Division 2 for the following components: journalism, website, kiosk, video, robot design, and robot construction.**
    a. This year's division is based on the overall result obtained by the school in last year's competition.
    b. The top half of the overall ranking will go in Division 1. If there are an odd number of schools, the median school will be in Division 2.
    c. The divisions should change every year.
    d. New high schools are automatically placed in Division 2. New Cegeps and adult schools are placed in Division 1.
    e. A team in Division 2 can win the overall ranking award.
    f. The best Division 1 and Division 2 teams will receive separate prizes for the components based on the overall ranking for each component.
    g. **Teams will know their division at the kickoff. However, if a team registers afterwards, these divisions can be moved. Either way, give it your all!**

Example 1: 5 Division 1 and 0 Division 2 teams. Points for the website and the game - Case with ties for points.

Team	Game	Website
A	1st (10 points)	2nd (4 points)
B	3rd (6 points)	2nd (4 points)
C	2nd (8 points)	1st (5 points)
D	4th (4 points)	4th (2 points)
E	5th (2 points)	4th (2 points)

Example 2: Division 1 and Division 2 ranking for journalism (8 teams).

Team (Division)	Points for Final Ranking
A (1)	8
B (1)	7
C (2)	6
D (2)	5
E (1)	4
F (1)	3
G (2)	2
H (2)	1

Distribution of awards: Top 3 Division 1 (A, B, E) and Top 3 Division 2 (C, D, G)

Programming Competition

In an attempt to promote competitors to program their robot, the programming competition will once again take place this year. Once again, it will be **independent of the main game.** Here are the rules for the programming competition:

P-1. **The programming counts in the overall score in its own category.** A team that doesn't participate in the programming competition will earn a score of zero.

P-2. The programming competition rules overrule the rules of the main game in cases of contradictory rules.

P-3. The competition will be held on Friday in a specified location at the event. If possible, the stations will be available to the schools so they can practice their program accordingly to a schedule determined on Thursday. The time allowed with the stations will be limited, supervised by a comity and will not be judged. It is strongly suggested to use this time to test your program one last time, and not for the first time!

P-4. The robot used for the programming competition **will be supplied** by the CRC. It will consist in an automation station that manipulates golf balls. The terms "robot" and "station" are used as synonyms in this section. The robot plans will be made public in order for you to recreate them during the construction season. You will also be able to contact the CRC in order to borrow one of our programming stations accordingly to a predetermined calendar. Priority will be given to schools with only one microcontroller.

But

P-5. Each team must prepare un or multiple programs to accomplish the following tasks:

- Task 1: With either the first or second distributor, make a ball reach the arrival bucket.
- Task 2: Make all the balls of the first distributor reach any arrival bucket of the first tower and all the balls of the second distributor reach any arrival bucket of the second tower.
- Task 3: Have half the balls reach any bucket of tower 1 and the other half reach any bucket of tower 2. Balls will be distributed randomly between both distributors.
- Task 4: Have all the balls reach the arrival bucket of tower 1 by sorting them by color. Balls will be randomly sorted in the two distributors.
- Task 5: Have half of the balls reach the arrival buckets of tower 1 and sort them by color and have the other half of the balls reach the arrival buckets of tower 2 and also sort them by color. Balls will be randomly sorted in the two distributors.

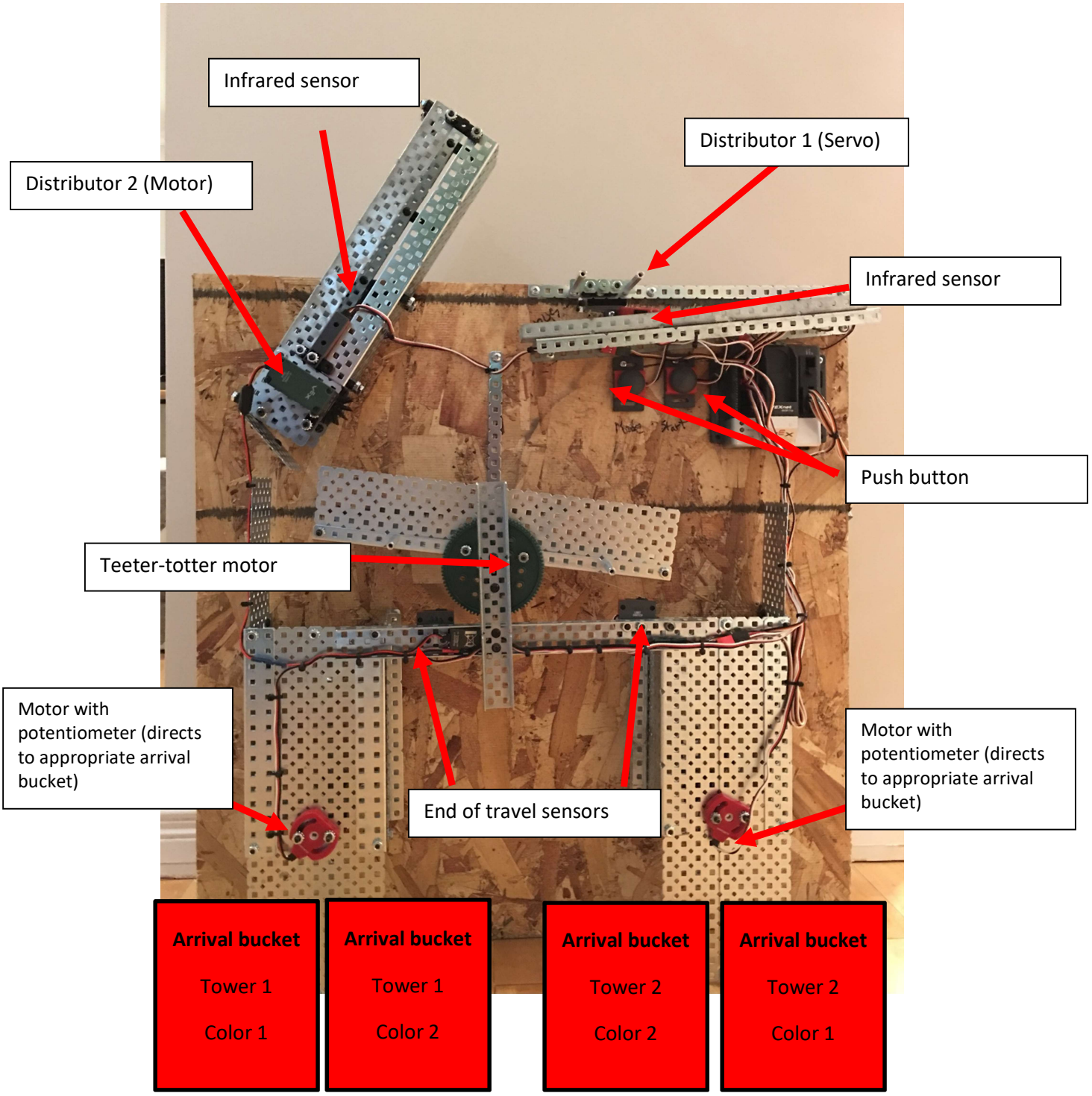
P-6. The ball with be enclosed, to avoid any human intervention, to move from a station to another. The 3 steps of the path are as follow:

- Exiting of the balls from the distributors.
- The passage of the balls threw the teeter-totter.
- The arrival of the balls in the appropriate bucket.

P-7. 10 golf balls of 2 different colors will be preloaded randomly in the 2 distributors a the begining of an attempt. The rhythm of distribution will be controlled by the program and is at the programmer's discretion. One a ball has completed the path and has reached an arrival bucket. It will stay there until the end of the attempt.

Programming station

P-8. The programming competiton will be held in and area determined at the event. The stations will be installed on a table. Here is the competition station:



Flow of the competition

P-9. When the game starts:

A referee will be responsible for each station. The referees' decisions are final.

If a team wishes to partake in the programming competition, they must communicate with the referees as soon as possible to be able to get a round. Registrations will be done on a first-come, first-served basis.

Each team is allowed a maximum of 2 rounds, each of 2 attempts per task.

The teams will use the computer provided by the CRC to download their program in the station. The teams must bring their program on a USB key. No other transmission medium will be accepted.

The team will have a maximum of 10 minutes per attempt at a single station.

The team is allowed to use this time to calibrate their program according to the reflexivity of the balls used for the attempt. It is strongly recommended to prepare such a calibration procedure in advance. The program cannot be in autonomous mode to achieve this calibration.

The golf balls used in the context of the evaluated attempts will be revealed on the Thursday and will be available to participants from then on.

P-10. During the game:

An attempt starts when the team informs the referee that they are ready. The program is then launched.

The objective is to complete all required tasks in the allotted 10 minutes.

Scoring:

10 points will be attributed for each completed task.

Misplaced balls have a scoring value of (-1) point

The total scoring of a team is obtained by adding up the 2 best attempts' scores. A maximum of four attempts are allowed on the Friday.

The team with the highest final score wins.

In the event of a tie at the top of the standings, the shortest execution time of the 5th task will determine the winner.

The table below shows an example of a team's score:

		Task 1	Task 2	Task 3	Task 4	Task 5	Sorted wrong	Score
1st round	**Attempt #1**	10	0	0	10	10	1	29
	Attempt #2	10	10	10	10	10	8	42
2nd ronde	**Attempt #3**	10	10	10	0	0	2	28
	Attempt #4	10	0	10	10	10	5	35
							Total	**77**

Skills Competition

In an effort to evaluate each robot on an individual basis, we have decided to introduce the skills competition. This competition will count towards 30% of the preliminary score. This year, three skills will be evaluated.

S-1. The rules for the Skills Competition override the rules of the regular game in cases where the rules are contradictory.

S-2. The Skills Competition will take place on the Friday. Contrary to prior years, we will not be using a first-come-first-served process due to space and logistics constraints. Instead, we will provide each team with a time-slot for the Skills Competition that will not interfere with the team's scheduled heats or other scheduled tasks.

S-3. The Skills Competition will be held from 9am to 7pm. A more precise schedule will be handed out at the competition.

S-4. The robot used in the Skills Competition must be the one used in the main competition without any specific changes for the skills. The robot must be certified.

S-5. Each robot will be allowed two runs for each skill.

S-6. The Skills Competition will be held in the kiosk or the Cafeteria area, and will be judged by CRC officials.

S-7. A robot is required to complete the three skills described below. Failure to complete a skill will impart a zero score for that specific skill.

S-8. A driver may control the robot for the Skills Competition.

Skills:

S-9. Skill #1: The robot must, in the shortest possible time, start from a designated zone, pick up 3 GPs from either the horizontal dispenser (similar to the ones on the upper level of the field) or from the inclined dispenser (similar to the ones on the lower level of the field). The GPs can be picked up one at a time or all 3 at once. A GP is considered picked up when it is under full control of the robot and does not touch any part of the playing field. If the robot design does not allow for 3 GPs to be under the control of the robot at the same time, neither the driver nor any of its team members is allowed to manually remove GPs from the robot by touching the robot or the GP. The robot must discard these pieces on its own.

S-10. Skill #2: The robot must, in the shortest possible time, start from a designated zone with 3 preloaded GPs, put 2 GPs in the V-Target, 1 GP in the 3L-Multiplier, and open the upper hatch of the upper level scoring tower. If a robot design does not allow for 3 GPs to be preloaded on the robot, it will have to come back to the designated starting zone to be loaded with additional GPs.

S-11. Skill #3: The robot must complete an obstacle course in the shortest possible time. A time penalty of 0.5 seconds will be added to the total time of the robot for every contact the robot makes with an obstacle on the course. If robots cannot reach the end of the course, they will be ranked according to the distance travelled.

Playing Field:

S-12. The playing for the Skills Competition is actually a part of the old CRC playing field. Its surface texture differs slightly from that of the actual playing field. Some skills could, however, take place on the actual playing field.

Requirements and Judging Criteria for the Robot (Design and Construction), Kiosk, Video, Web Design, and Web Journalism Components

In accordance with the CRC's goal to create a project where science, math, multimedia, language, arts, and computers are integrated, the robot is only one of the four main components of the competition.

As the world requires people to acquire more diverse skills rather than to be singularly specialized, the CRC wishes to give students with varied interests an opportunity to develop and discover their skills through the creation of a video, a website, and a kiosk.

The following are the rules and requirements, as well as the judging criteria, for the video, website, online journal, and kiosk components.

Note: Any components not received by the due date will be given a late penalty of 20% that will be deducted from the total score of each component received within 24 hours of the deadline.

A component received more than 24 hours after the deadline will not be judged.

Robot and Kiosk Judging Scheme

Preliminaries

The objective behind the preliminaries is to determine which teams will advance to the final evaluation. 50% of the teams will move on to the final evaluation.

Forming the Pools

- Teams will be separated into three groups (A, B, and C).
- La répartition est basée sur le classement de l'année précédente afin d'avoir des groupes homogènes.
- Teams that did not participate in the prior year will be placed randomly.

Preliminary Jury

- Each group will have one jury, for a total of three juries.
    - Each jury will be composed of mentors and a CRC member that will act as moderator.
- The jury from group A will evaluate group B, the jury from group B will evaluate group C, and the jury from group C will evaluate group A.

Roles of the Jury

- Each jury has to determine which teams advance to the final evaluation round.
    - 50% of the teams proceed to the final round.
    - In case of a reasonable doubt on the last team to send to the finals, a jury can, at its discretion, send an extra team to the finals and let the final jury decide on its ranking.
- Teams that do not make it to the finals will be ranked by the preliminary jury.
    - The following table shows an example of the ranks obtained by the non-finalists for 18 teams:

Group A	Group B	Group C
Finalist	Finalist	Finalist
Finalist	Finalist	Finalist
Finalist	Finalist	Finalist
10th	10th	10th
13th	13th	13th
16th	16th	16th

Schedule and Presentations

- The schedule of the presentations will be announced at a later date.
    - For kiosks, there will be no schedule presented. 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.
- Preliminary presentations will take place in the kiosk of the evaluated team.

- The presentations will have the following structure:

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

- Visual support is permitted.

Finals

Final Jury

- For the robots, there will be 5 engineers for the design and 5 engineers for the construction.
- For the kiosks, the jury will be composed of teachers from the host school.

Role of the Jury

- The role of the jury will be to rank the finalist teams to have a final and definitive ranking.

Schedule and Presentations

- The exact schedule of the presentations will be handed out on the Friday morning when the kiosks open.
    - For kiosks, there will be no schedule presented. 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. Furthermore, a team may receive more than one visit during the final judging phase.
- The final evaluations of the kiosk will take place in the kiosks.
- The final presentations of the robots will take place in a closed room. The exact location will be announced at a later date.
- The presentations will have the following structure:

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

- Visual support is permitted.

Video Competition Requirements

The purpose of the video component is to give each team an equal opportunity to showcase their filming and editing skills as well as their story-telling and acting talents. Specifically, this aspect of the competition allows each team to create an exceptional video encompassing their team, their school, and their robot as well as describing the steps that were taken to build the robot and the problems that were encountered and solved along the way. Equally importantly, it is an aspect that can uncover each student's creative side.

V-1. Required Format:

V-1.1. The video must be no less than 4 minutes long and no more than 5 minutes long. If the video does not meet these requirements, it will not be considered when discussing the Top 3 award winners.

V-1.2. The video must be played on YouTube and it is each school's responsibility to ensure that YouTube does not mute the soundtrack used during the video due to copyright infringement or any other reasons. If the video does not meet these requirements, it will not be considered when discussing the Top 3 award winners.

V-1.3. The video may have a fictional storyline or be of a journalistic or documentary style. If a fictional storyline is chosen, ensure the storyline is related to the construction of the robot, school description, etc.

V-2. Required Content:

V-2.1. An explanation of the game.

V-2.2. A description of your school including the school location and type of school.

V-2.3. Explanation of the different steps involved in the construction of the school's robot.

V-2.4. The English and French languages must be equally present during the video, either through dialogue, commentary, or subtitles. If the video does not meet these requirements, it will not be considered for Top 3 award winners.

V-3. Important Remarks and Suggestions:

V-3.1. Develop a theme or a storyline that is consistent throughout the entire video.

V-3.2. Try to make it as entertaining as possible to a general audience that probably isn't familiar with robotics and/or the CRC.

V-3.3. A 5-minute video usually requires an abundance of raw footage and planning. **Start planning and filming now**!

V-3.4. Work closely with all of the other groups (Robot, Web Design, Journalism, and Kiosk) since all components are inter-related.

V-3.5. The production of the video is your entire responsibility. For optimal results, please refer to the evaluation form.

V-3.6. Do not use profanity, violence, or inappropriate material in your videos. Be mindful of sensitive material. If a video is deemed to have inappropriate content, it will not be presented at the competition, even if it ranked well otherwise.

V-3.7. **NEW! Teams are invited to film during the competition and filter their best 2 minutes of videos. These videos can be submitted to the CRC during the competition and might be included in the highlight video!**

V-4. Due Date:

V-4.1. Your video must be uploaded to YouTube **on or before January 18th, 2018**.

V-4.2. The URL must be submitted using the following submission form online **no later than 11:59 p.m. on January 18th, 2018**. Consult http://robo-crc.ca/submit for the form.

V-4.3. Please follow all other submission instructions and requirements as described on the submission page above.

V-4.4. You may select the option on YouTube to make your video private (non-searchable) and submit that private URL on the form using the link above; however, your video must be made public for the above deadline so that other teams view your video once the competition has begun.

V-4.5. **Please submit your Video Permission Form as soon as possible, if necessary.**

V-4.6. If your school does not allow you to upload your video onto YouTube, please notify us as soon as possible.

V-4.7. If you are unable to upload your video onto YouTube, you must send an explanation to david.martin@robo-crc.ca **before 11:59 p.m. on January 18th, 2018** and we will do our best to accommodate your team based on your explanation.

V-4.8. If your video is not uploaded to YouTube before the deadline and we do not receive an explanation, then your video may not be judged.

Video Judging Rubric

Rubric Context:

Given a *familiarity* with the rulebook and given a band grading schema of the form:

1 Unacceptable / Missing

2 Below Average

3 Average

4 Above Average

5 Excellent

Video Judging Rubric:

1 Does the video follow the minimum requirements: Is between 4 and 5 minutes long, has no copyright claims, and is fully bilingual? **[Y/N]**

2 Rate the description of the school and the team, the explanation of the game, and the explanation of the steps involved in building the robot. **[1-5]**

3 Rate the quality of the picture, sound, and editing from a technical standpoint. **[1-5]**

4 Rate the quality of the acting and narration. **[1-5]**

5 Rate the video's entertainment value and the integration of entertainment and information in a logical and clear way. **[1-5]**

6 Rate the level of creativity in camera shots and angles, in editing, and in choice of music. **[1-5]**

7 Rate the strength, creativity, originality, and engagement of a central theme and storyline and the consistency with which it is maintained throughout the film. **[1-5]**

Web Design and Web Journalism Contests

A web site is an essential communication tool in almost all disciplines. The web site component of the competition is an opportunity for each team to design a fully bilingual site showcasing the team and its members, mentors, and teachers as well as the situations encountered during the preparation for the competition. Each team must also describe their robot and explain the game in their own words.

The website is composed of two separate components: a web journalism contest, which rewards the language arts, and a web design contest, which recognizes the technical merit and visual design. Remember that those designing the site will have to work closely with those creating content for the site.

Due Date: The web site must be submitted **no later than 11:59 p.m. on January 18th, 2018**.

Be sure to follow the submission instructions here: http://robo-crc.ca/submit.

Judging will commence immediately after the submission deadline.

Web Journalism Contest Requirements

The purpose of the journalism component is to give each team an opportunity to showcase their written communication talent. Specifically, this component of the competition allows each team to document the entire process that was taken to arrive at the competition with a functional robot, from design to testing to building. Remember, when writing content for a website, it must be written as if it is for someone who knows nothing about the competition, the team, or the process. It must be explained in as much detail as possible and should include images, schematics, and other aspects that can be helpful in informing and engaging an audience.

We respect the privacy of students. Students who do not wish to put their names, photographs, or any personal information on their team's web site *may omit it with no penalty*.

Required Content:

J-1. The website must be fully bilingual. If the website does not meet these requirements, it will not be considered when discussing the Top 3 award winners.

J-2. Each team member's:

- a. name,
- b. picture (if they choose), and
- c. sub-team(s).

J-3. Each teacher's and mentor's:

- a. name,
- b. picture (if they choose), and

c. area(s) in which they provided help.

J-4. An explanation of the game in your own words.

J-5. A description of:

a. your school,

b. your school's location, and

c. your school's type (e.g. high-school, CÉGEP, vocational training institute, etc).

J-6. Description of the robot, including:

a. the steps in the design and construction of the robot,

b. the problems that were encountered along the way,

c. the solutions to the aforementioned problems,

d. conception and prototype plans and drawings,

e. final design plans and drawings,

f. photos of your robot, and

g. **a tutorial (see the section on tutorials in the Annex)**

J-7. Student experiences, especially:

a. what your team learned,

b. what the team enjoyed regarding the preparation for the competition,

c. what concepts or aspects the team struggled with, and

d. the sacrifices made for the team.

J-8. The website must not use copyrighted material, which you do not have permission to use.

Web Journalism Judging Rubric

Rubric Context:

Given a *familiarity* with the rulebook and given a band grading schema of the form:

1 Unacceptable / Missing

2 Below Average

3 Average

4 Above Average

5 Excellent

Web Journalism Judging Rubric:

1. Is the website fully bilingual? **[Y/N]**
2. Rate the quality of the language used. **[1-5]**
3. Rate the creativity, originality, and engagement of the content. **[1-5]**
4. Rate the description of the school, including the identification of all team members, sub-teams, teachers, and mentors as well as their contributions. **[1-5]**
5. Rate the quantity and quality of the students' experiences. **[1-5]**
6. Rate the description of the game. **[1-5]**
7. Rate the description of the steps involved in building the robot, including diagrams, plans, photographs, etc. **[1-5]**

Website Design Contest Technical / Design Requirements

The purpose of the technical / design award is to reward a website's technical merit, good design, and favourable user experience. How would they find information they're looking for easily? How would you impress your users and make them want to tell others about your website? Remember that your beautiful design will require great content.

We strongly recommend that you visit the Resources section of the CRC website for more information, examples, and tutorials for creating your first website even if you're completely new to website design.

Judges may view your website in *any major browser*. Netscape is not considered a major browser.

W-1. The website should look professional and your design's colour scheme, font choice, and layout should be balanced, pleasant, and interesting. Please consult the Resources section of the CRC website for examples and explanations of good and bad designs.

W-2. The pages and menus should be organized in a way that helps the user easily find all of the required information.

W-3. The content on each individual page should be clearly organized.

W-4. You should include some aspect of social interaction such as surveys, a Twitter feed, a Facebook page, a YouTube channel, a puzzle or game, etc.

W-5. Your website should be bug-free (no script errors, no broken links or broken images, etc.).

W-6. The website should validate against *any one* of the following HTML standards you choose with as few errors as possible (warnings will be ignored):

a. HTML5 (http://www.w3.org/TR/html5/)

b. HTML 4.01 Transitional ()

c. XHTML 1.0 Transitional (http://www.w3.org/TR/xhtml1/).

W-7. Your website should also validate against CSS 1.0 or better with as few errors as possible (http://www.w3.org/TR/REC-CSS1/).

Web Design Judging Rubric

Rubric Context:

Given a *familiarity* with the rulebook and given a band grading schema of the form:

1 Unacceptable / Missing

2 Below Average

3 Average

4 Above Average

5 Excellent

Web Design Judging Rubric:

1. The overall design, choice, and combination of colours, fonts, and layout are appealing and conducive to a pleasant user experience. **[1-5]**
2. The site structure, page structure, and menu design make finding information easy. **[1-5]**
3. There is an aspect of user / social interaction. **[1-5]**
4. There are no uncaught exceptions, broken links, or broken images. **[1-5]**
5. The site's code is well-formed and validated. **[1-5]**

Because we would like to reward technical merit, in a case where two sites have comparable ranks, the site that employed the fewest pre-made modules will receive the higher rank.

Kiosk - Rules and Requirements

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 while also developing presentation and art skills.

Remember that the kiosk is also the school's only functional pit area for repairs, maintenance, and modifications to the robot during the competition. The kiosk is not intended as a central lounge for team members. One part of the kiosk must be organized as a functional pit area that can be used to work on the robot and to store materials and tools while the rest of the kiosk will be a showcase for other schools and the public to visit. We recommend that you plan for a restricted area of your kiosk for pit only.

K-1. Format:

- K-1.1. Space given: 12 feet by 12 feet squared and 4-foot-high separators to the left and right of the square.
- K-1.2. Objects provided by the CRC: 1 2x5 foot table (if desired), 1 electrical outlet with 2 plugs, 120V, 15Amp.

K-2. Required Content:

- K-2.1. Distinct and delineated pit area for robot maintenance, modifications, and repairs.
- K-2.2. School and robot demonstration and presentation area (description of the robot including the steps taken during construction, the problems that were encountered along with the solutions to those problems, and the workings of the final version of the robot).
- K-2.3. Fully bilingual reception and interaction with the public.
- K-2.4. Clearly identified team number and school name.

K-3. Rules and Requirements:

- K-3.1. Only students are permitted to be in the pits and working on the robot. **Teachers and mentors may only provide advice and guidance from the sidelines; they may not be in the pit touching or working on the robot.** There will be referees present in the pits. Repeat offenders run the risk of being disqualified from the kiosk competition.
- K-3.2. You are not permitted to have any liveable space on a second level due to safety concerns **including during set-up time**.

K-3.3. **Your kiosk will be required to pass a safety inspection in order to be judged. There is a safety checklist attached to the end of the rule book.**

K-3.4. Please respect the surrounding kiosk areas as you run the risk of being penalized for any behaviour that has a negative impact on other kiosks. (e.g. loud music, extending beyond your kiosk footprint, etc.). The kiosk should be visually appealing all around (inside and outside), not only its facade as it is possible that the outside walls can be seen from neighbouring kiosks. You may be required to **paint or cover the outer sides and back of your kiosk** during certification if it is not already done so, so plan accordingly.

K-3.5. During construction, if any CRC officials feel that there is a risk of accident either with the kiosk or with the construction methodology (unsafe ladder, tools, etc.), the CRC will consult the team and stop the building process until a safe approach or correction can be agreed upon.

K-3.6. In an effort to have the best experience possible for teams, **we ask that kiosks are painted and cut before teams arrive at the competition**. Minor tweaks will be permitted, but if you are building your kiosk on site for the first time, a penalty might be sanctioned.

K-3.7. If a school registers multiple teams, the kiosks might not be put together unless it is specifically requested. If the school decides to do one combined kiosk, judges will be informed to evaluate them separately without considering the other parts.

K-4. Suggestions:

K-4.1. Plan adequate space for tools, maintenance, and repair materials and adequate work space for the robot.

K-4.2. Remember that because the kiosk is also the pit area for the robot, there must be clear access for the robot and a few selected student team members from the school who will be coming in and out of the pit area, sometimes in a hurry or on short notice.

K-4.3. Make sure to have at least 1 ***bilingual*** student speaker for the school in the kiosk at all times giving presentations and answering questions from the public and the judges.

K-4.4. Make sure you bring lighting equipment to ensure adequate lighting in the pit area for safety measures and for aesthetics.

K-4.5. Create an attractive and aesthetic environment that entices and encourages the public to inquire about the school, the team, and the robot.

K-4.6. You may bring a television, DVD/Blu-ray, PC, laptop, or other audio-visual equipment. Keep in mind that the CRC only supplies each school with 2 power connections (bring adapters and extensions if necessary), but make sure to be respectful of other kiosks in terms of noise, visual pollution, and proper behaviour.

K-5. Due Date:

K-5.1. **The kiosk must be fully mounted and ready for judging by 5 p.m. on the Thursday night.**

K-5.2. **Kiosks may not be dismantled until instructed to do so on Saturday afternoon.**

K-5.3. Dismantle and clean your respective kiosk area and ensure that no damage was done to the area or property by 6:00 p.m. on Saturday night. 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.

Kiosk Judging Form

Scores :
1 = unsatisfied criteria
10 = exceptional

Team name & #: _____ Final Result = _____

Section A: Required Content (31%)

The Kiosk must fulfill the following required content:

Inviting to the public (Approachable, welcoming…)	**(Worth 6% overall)**	1 2 3 4 5 6 7 8 9 10
Level of bilingualism (Use & quality of French and English…)	**(Worth 6% overall)**	1 2 3 4 5 6 7 8 9 10
Interaction with the public (Friendly, Polite, Cooperative…)	**(Worth 8% overall)**	1 2 3 4 5 6 7 8 9 10
Respect for others (Respect for other kiosks, noise & visual pollution kept to a minimum)	**(Worth 6% overall)**	1 2 3 4 5 6 7 8 9 10
Showcase/Description of your school and team	**(Worth 5% overall)**	1 2 3 4 5 6 7 8 9 10

Judges Comments: _____
_____
_____

Section B: Technical Aspects (31%)

Technical aspects relate to organization, functionality, safety measures, and neatness. This section is not related to creativity, presentation, or aesthetics.

Kiosk design, layout, and practicality (Organization, plan, functionality…)	**(Worth 9% overall)**	1 2 3 4 5 6 7 8 9 10
Engineering and construction of kiosk (How well is the kiosk designed and built, how structurally sound is it…)	**(Worth 7% overall)**	1 2 3 4 5 6 7 8 9 10
Safety measures (Proper and safe layout of tools and materials)	**(Worth 5% overall)**	1 2 3 4 5 6 7 8 9 10
Security measures (Public safety, number of people inside the school's pit area…)	**(Worth 5% overall)**	1 2 3 4 5 6 7 8 9 10
Respect for the surroundings (Cleanliness and damage to area or property…)	**(Worth 5% overall)**	1 2 3 4 5 6 7 8 9 10

If any damage is done to the property or area, added penalties may be deducted from the kiosk component's total mark.

Judges Comments: _____
_____
_____

Section C: Presentation (38%)

The presentation section relates to the creative, aesthetic, and logical flow of the kiosk.

Creativity of presentation	**(Worth 10% overall)**	1 2 3 4 5 6 7 8 9 10
Visually attractive to the public	**(Worth 10% overall)**	1 2 3 4 5 6 7 8 9 10
Proper use of light and sound	**(Worth 10% overall)**	1 2 3 4 5 6 7 8 9 10
Organization of content and information (Does the information flow together in an easy to follow and logical manner?)	**(Worth 8% overall)**	1 2 3 4 5 6 7 8 9 10

Judges Comments: _____
_____
_____
_____

Kiosk Certification Form

Electrical – Wiring & Outlets

	Acceptable	Unacceptable	Not Applicable
Wire Gauge			
Layout			
Protected			
Grounded			
Anchored			

Structural Integrity

Walls			
Roof			
Floor			

Safety

Tools properly stored			
Proper fastening / anchoring (Accessories, equipment, shelves, objects …)			
Public access			
Manoeuvrability inside kiosk (Ability to move around without hitting things)			
Safety equipment (**First Aid Kit**, goggles, gloves...)			

Aesthetics

Respects neighbouring kiosks (sound, paint /cover back and outer sides)			

_____ _____

CRC Signature Team Signature

Robot Evaluation Form - Design

For the evaluation of the concept, the judges will evaluate the ideas behind the robot independently from the quality of their realisation. The judges will evaluate the following:

Bad<<< >>>Good

- The design to play the game. Particularly:
  - The movement of the robot on the field
  - Its interaction with the playing pieces
  - The speed at which it accomplishes its tasks
  - Its stability and precision.

1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5

Notes (Strong/Weak points):

_____
_____
_____
_____

- The flexibility of the concept. Particularly:
  - Its capacity to adapt to different game strategies
  - Its capacity to be easily modified or repaired

2	4	6	8	10
1	2	3	4	5

Notes (Strong/Weak points):

_____
_____
_____

- The effort of creation involved in the concept. Particularly:
  - The originality of the concept (it is special, unpredictable)
  - The ingenuity of the concept (it brings intelligent solutions to problems)
  - The efficiency of the concept (it uses minimal resources for a maximal output)

1	2	3	4	5
1	2	3	4	5

1	2	3	4	5

Notes (Strong/Weak points):

_____
_____
_____
_____

- The presentation by the team. Particularly:
  - Clarity, originality and organisation
  - Capacity to answer the questions and defend their decisions

1	2	3	4	5
1	2	3	4	5

Notes (Strong/Weak points):

_____
_____
_____

Final ranking : _____

Robot Evaluation Form - Construction

For the construction part of the evaluation, the judges will evaluate the quality of execution or realisation of the ideas, independently of the quality of the ideas. The judges will evaluate the following:

Bad<<< >>>Good

- The structure of the robot. Particularly:
  - The nature and pertinence of the materials used — 1 2 3 4 5
  - The linkage between the pieces — 1 2 3 4 5
  - The precision of the construction and assembly — 1 2 3 4 5
  - The stability of the structure of the robot — 1 2 3 4 5
  - The impact strength (capacity to survive impacts) — 1 2 3 4 5

Notes (Strong/Weak points):

_____

_____

- The movement of the robot for the game. Particularly:
  - The stability and speed of the robot's movement on the field — 1 2 3 4 5
  - The stability and speed of the robot's parts — 1 2 3 4 5
  - Relevance in the choice of motors — 1 2 3 4 5
  - Relevance of the degrees of liberty and efficient guiding systems — 1 2 3 4 5
  - Repeatability of the movements — 1 2 3 4 5

Notes (Strong/Weak points):

_____

_____

- Robot maintenance. Particularly :
  - Easy access to different parts of the robots — 1 2 3 4 5
  - Easy access to the electrical circuit — 1 2 3 4 5
  - Modifying and replacing parts is easy — 1 2 3 4 5

Notes (Strong/Weak points):

_____

_____

- The construction matches the design — 1 2 3 4 5
- The aesthetics of the construction — 1 2 3 4 5

Notes (Strong/Weak points):

_____

_____

- The presentation by the team
  - Clarity, originality and organisation — 1 2 3 4 5
  - Capacity to answer the questions and defend their decisions — 1 2 3 4 5

Notes (Strong/Weak points):

_____

_____

Final ranking : _____

Certification : _____

Team : _____

Appendix A – Robot Certification Form

Robotique CRC Robotics

1) **Electricity**
   a) **Accessible circuit :** _____
   b) **Batteries in parallel:** _____
   c) **Visible Master Kill Switch:** _____
   d) **30 A fuse or equivalent :** _____
   e) **Capacitors :** _____
2) **Motors**
   a) **Banebot :** _____
   b) **Auxiliary :** _____
   c) **Drills :** _____
   d) **VEX Motors :** _____
   e) **Motors integrity :** _____
3) **Electronics**
   a) **Speed Controller :** _____
   b) **Other electronic devices :** _____
4) **Pneumatics**
   a) **Presence of pneumatics :** _____
   b) **Master kill switch :** _____
   c) **Pressure valve :** _____
   d) **Number of cylinders :** _____
5) **Robot**
   a) **Dimension of the robot :** _____
   b) **School visibility :** _____
   c) **Robot safety (Electric circuit, exposed screws, sharp edge, dangerous mechanism) :** _____
   d) **Note :**_____
      _____
      _____
      _____

_____ _____

CRC Signature Team Signature

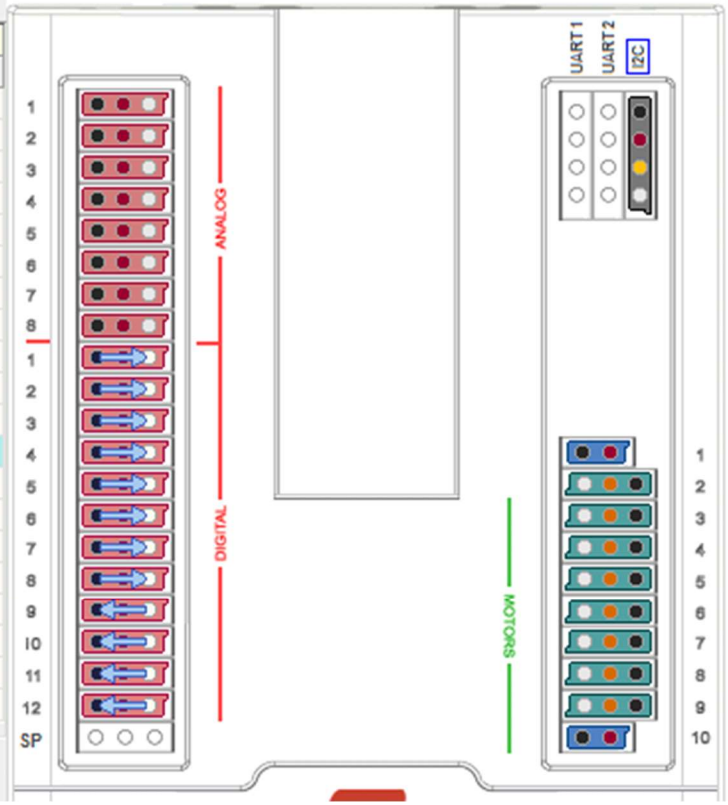
Appendix B – Specification for the Tutorial

In order to promote the sharing of knowledge and to encourage a spirit of cooperation between the CRC teams, the organizing committee has decided to introduce an honorific prize for the team who writes the best tutorial. The specifications below will help you to better meet our expectations.

1. Each team must provide a tutorial on their website.
2. The teams can demonstrate their mechanical, electrical, or programming talents.
    a. A tutorial on the construction of the kiosk counts as a mechanical tutorial.
    b. A tutorial on the programming of websites or robots counts as a programming tutorial.
3. The tutorials can take many forms:
    a. A theoretical explanation on a common system (e.g. internal functioning of DC motors, principles of mechanical gears, etc.).
    b. A step-by-step explanation to achieve a task.
    c. A practical description of a complex system to perform a given task (e.g. a ball shooter, a robotic arm, a steering system, an electrical system, etc.).
4. A team cannot resubmit a tutorial from a previous year.
5. Although teams are encouraged to explain something that has not yet been covered, it is not officially forbidden to cover a subject already presented on the CRC website; however, Rule 4 must still be respected.
6. Any media format can be used for a tutorial: images, text, video, Word document, PDF, etc.
7. All tutorials of adequate quality will be added to the CRC website permanently. The team will be credited for the article.
    a. If a team submits multiple tutorials, one will be chosen at random to be evaluated, but all of them may be added to the CRC website.
8. The award for the best tutorial will be judged by the CRC organizing committee.
9. As this is an honorific prize, this prize does not count in the overall competition standings.
10. The tutorial does not directly play a role in the scoring of the competition. However, a good tutorial can have a positive influence on your score and rank for journalism.

Appendix C – Controller Configuration for the Programming Competition

ANALOG & DIGITAL	
#	Description
1	Servo Infra
2	Moteur Infra
3	Tour 1 Potentia (Gauche)
4	Tour 2 Potentia (Droite)
5	
6	
7	
8	
1	Bump Switch 1 (Droite)
2	Bump Switch 2 (Gauche)
3	Limit Switch Tour 1 (Gauche)
4	Limit Switch Tour 2 (Droite)
5	
6	
7	
8	
9	
10	
11	
12	



I2C #	Motor Port #	Description
1	1	
2	2	
3	3	
4	4	
5	5	
6	6	
7	7	
8	8	
9	9	
10	10	

MOTORS		
#	Motor Type	Description
1	n/a	
2	n/a	Dispenser Servo
3	n/a	Dispenser Moteur
4	n/a	Moteur Pont
5	n/a	Moteur Tour 1 (Gauche)
6	n/a	Moteur Tour 2 (Droite)
7	n/a	
8	n/a	
9	n/a	
10	n/a	

Motor Type Information