



## Junior Robotics Competition 2018 Creative Performance Rules and Guidelines

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### Preface:

The objective of the Junior Robotics Competition Creative Performance is for teams to prepare a technology-based creative performance of 1 to 2 minutes using autonomous robots that they have designed, built and programmed to engage the judges and audience. The challenge includes any type of creative performance, typically presented as a dance routine or the telling of a story. The performance may involve music, videos or presentations, all of which are encouraged. Teams should be imaginative, innovative and engaging, in both robot design and their presentation as a whole.

### Rules and Regulations:

The Chief Judge will apply all the rules fairly and without prejudice. All the decisions made by the Chief Judge before or during the competition are final. If you are unsure about any technology, protocol, technical requirement or other aspect of these rules please contact the Chief Judge for clarification.

Any argument with the Chief Judge or the assistant judges will result in a warning. If the argument continues or another occurs, this will result in immediate disqualification from the competition.

**Teams should make sure they review all the pages of these rules in detail.**

**General Rules:** be sure to review and comply with the general rules on the JRC website:  
<http://sciencetech.ca/events/junior-robotics-competition/>.

**Team Size:** Each team may have between 2 and 6 members.

### Overview

Teams are judged in two areas: Technical Interview and Creative Performance.

**Technical Interview:** A face-to-face interview up to 15 minutes in length, between all team members and judges in which robot design, programming and function are evaluated according to technical criteria. Students are expected to show a genuine understanding of the robotic technologies used in the Creative Performance, including robot programming.

Judges will be looking to confirm that the students built the robots and the scenery, props, etc. themselves. As such, team members must be prepared to answer questions about the technical aspects of the robot design. See the Creative Performance Score Sheet, Technical Interview section.

**Creative Performance:** A 2-3-minute Creative Performance in which a presentation is evaluated on creative, technical, innovative and entertainment criteria. Teams must demonstrate these criteria throughout their routine. See the Creative Performance Score Sheet, Creative Performance section.

### Team Poster (Optional)

Teams will be given a space to display a poster (60 x 84 cm max). The purpose of the poster is to introduce the team to the judges, other teams and visiting members of the public. Areas that are useful to include are: team name & members, annotated pictures of the robots, drawings and photos, and anything that helps explain how your team is unique.



## 1. Robots

### 1.1. Robot technology

- 1.1.1. Teams are required to construct their own robot(s). Commercial kits may be used but should be substantially modified or added to by the team. Points will be deducted if a kit or published instructions are used without modification.
- 1.1.2. Innovative or unusual use of technology (including sensors) is encouraged as part of creating an engaging performance.
- 1.1.3. Robots must perform **autonomously**. This means they cannot be controlled directly by people using a remote control device. Interaction with people can be achieved using non-touch sensors (colour, infrared, etc.). See section 3.6 regarding interaction between robots and humans for more details on how to achieve both autonomy and interaction.

### 1.2. Size & number

- 1.2.1. Robots may be of any size; however any robot taller than 1.5m should be discussed with the Chief Judge, Creative ahead of time for practicality (e.g. getting on and off the performance area quickly, etc.).
- 1.2.2. A team may have and use any number of robots. However, using multiple robots does not necessarily result in more points rewarded.

### 1.3. Design and Construction

- 1.3.1. Teams should build a robust robot that does not fall apart easily.
- 1.3.2. Teams are encouraged to design their robot appearance by themselves. If a team wants to use a famous character as their robot, the team should pay attention to the copyright of the character.
- 1.3.3. Under no circumstances will 120v electricity be allowed for use on the performance area.

### 1.4. Communication

- 1.4.1. Teams are encouraged to design their robot(s) to communicate with each other and/or with props in the performance (refer to sections 3.5.2 and 3.6). There must be no communication with robots or devices not in the performance (e.g. outside the black line).
- 1.4.2. Typical communication protocols are infrared (IR), Bluetooth (LE and classic) and ZigBee. Other protocols should be discussed with the Chief Judge, Creative before the competition to avoid potential interference with other teams or school systems.
- 1.4.3. Wi-Fi will not be provided for use by the teams. No Internet connection will be available at the site.

### 1.5. Lines and markers for sensing

- 1.5.1. Mats may be used on the floor as decoration or for interaction with robot sensors. Primary schools will not receive high points, and secondary schools will receive no points, for line following.
- 1.5.2. Markers or beacons may be used to assist robotic navigation, but teams must build and bring their own markers.



## 1.6. Additional advice for designing and constructing robots

- 1.6.1. The floor mat is constructed of white linoleum, and may contain scuffmarks, particularly towards the end of the competition. If robots rely on colour sensors, teams are encouraged to use mats rather than rely on the colour of the floor. Tape should not be used directly on the floor.
- 1.6.2. Every effort will be made to make the floor flat; however, robots must be prepared for irregularities of up to 5 mm in the floor surface.
- 1.6.3. Calibration: Lighting may not remain constant throughout the competition. In some cases lighting may be bright, affecting the reliability of colour sensors. Metal components under the floor might affect compass readings. Teams should come prepared to calibrate sensors at the venue and/or have back-up plans or alternate programs in case the lighting or building conditions are too difficult to calibrate to.
- 1.6.4. Lighting will not be altered or changed for individual teams. If you have specific lighting concerns, you are invited to contact the Chief Judge, Creative well ahead of the event to discuss options.

## 2. Technical Interview (40% of total score)

### 2.1. Interview procedure

- 2.1.1. All teams will have up to 15 minutes for the technical interview judging during the competition. The Creative Performance Score Sheet, Technical Interview portion, will be used. It is strongly recommended that teams review the Score Sheet before the competition.

### 2.2. What to bring and demonstrate

- 2.2.1. Teams should ensure that they bring all their robots and copies of all their programs in a format that can be easily viewed (on a laptop is acceptable).
- 2.2.2. A Technical Sheet should be completed for each robot and submitted either to the Chief Judge by email or during the interview, prior to judging. The template is available on the JRC website in MS Word format.
- 2.2.3. Demonstrations and explanations can/should include:
  - The capabilities of the robot(s) and how they work;
  - The robot programming language, key capabilities and any software algorithms;
  - Choice of sensors and what they detect;
  - How robots interact with people, other robots or props (e.g. sensors, Bluetooth or IR);
  - Any interesting drive mechanisms and how these are controlled;
  - Obstacles or particular challenges you overcame, including reliability and stability.



### 3. Creative Performance (60% of total score)

#### 3.1. Overview

3.1.1. The Creative Performance is an opportunity to demonstrate the technical aspects of the robot(s), design and construction through a performance. This could be, for example, a dance routine, magic show, theatre performance, or the telling of a story. Teams are encouraged to be imaginative, innovative and take creative risks in their use of technology and materials when creating their performances. Refer to the Creative Performance Score Sheet for more details.

#### 3.2. Creative Performance

3.2.1. All teams will be given two opportunities to perform before the judges. The highest scoring performance (best of two) will be used and points for the other performance will be ignored.

3.2.2. The duration of the performance routine must be between 1 and 2 minutes.

3.2.3. Each team will have a total of 5 minutes for set-up, introduction and performance, plus re-starts. It does not include time needed for packing up and clearing the floor mat. If the time limit is exceeded due to circumstances outside the team's control (for example problems with starting the music by the technicians) there will be no penalty. The Chief Judge has the final say on any time penalties.

3.2.4. After each performance, a team must fully tidy up, pack up and remove any objects related to their performance within a maximum of **one minute**. **The maximum time on the floor is six minutes**.

3.2.5. Teams are strongly encouraged to use the time while they are setting up the performance area to introduce to the audience the performance and the features of their robots.

3.2.6. **Restarts:** Teams can request to restart their routine if necessary. This will be permitted at the discretion of the judges. Penalty marks will be deducted, but restarts often result in fewer deductions than other problems, and are often worthwhile requesting. Teams should consult the Creative Performance score sheet ahead of time to understand when a restart might be worth it. Typically no more than two restarts are permitted because of the time required. The team will be asked to leave the floor after 5 minutes.

#### 3.3. Music & video

3.3.1. Teams are encouraged to use music and/or create a presentation or video to supplement their performance. A projector and screen will be provided, however height/size cannot be guaranteed.

3.3.2. A sound technician will start the music and/or the visual presentation for the performance routine.

3.3.3. Music or video must be provided on a USB stick, clearly labeled with the team name and given to the sound technician before the team's practice period. Teams may find it helpful to include a few seconds of silent lead-time and a "beep" as a start signal.

3.3.4. Efforts will be made to provide a VGA cable for a laptop, however the length of the cable cannot be guaranteed. It is therefore recommended that a USB stick be used instead.



### 3.4. Performance Area

- 3.4.1. The size of the performance area will be 4 x 3 meters for robots with the 4m side facing the judges. This rectangular area is on a floor mat of 5 x 4 meters (see Figure 1 at the end of these rules).
- 3.4.2. The boundary of the performance area will be marked with a 50 millimeter (mm) black tapeline for easy detection by robots. The floor provided shall be made of flat (non-glossy) white linoleum.

### 3.5. Scenery

- 3.5.1. Static props only count towards the points for entertainment value. The focus should be on the robots. Robots can sense static props to perform a certain task or trigger a performance.
- 3.5.2. Interactive props that communicate via sensors, Bluetooth or Zigbee are encouraged.

### 3.6. Human-robot and robot-robot interaction

- 3.6.1. **At the beginning** of the performance **only**, robots may be started manually by human contact (button or touch sensor), other sensor interaction or remote control (refer to 1.4.2 for allowed wireless communication). **No other physical contact is permitted** between team members and the robot(s) during the performance.
- 3.6.2. Human-robot interaction with the robot's sensors (without touching) is encouraged. Direct interaction to alter the robot's behavior (e.g. to make it change direction) will be rewarded less than more intelligent interaction (e.g. a robot following a human using a camera).
- 3.6.3. Interaction between robots is recommended. Robots are allowed to physically touch one another and interact through sensors or wired/wireless communication (refer to 1.4).
- 3.6.4. The following is an example showing both human-robot and robot-robot communication: A person interacts with an infrared or colour sensor on one robot, that triggers code to send a message to a second robot, which in turn carries out code based on that message.
- 3.6.5. A maximum of two human performers may perform inside the black line at any time. Other human performers may be outside the line but should keep to the 5 x 4 meter area.

### 3.7. Penalties

Penalties are deducted from the score for any of the following reasons. Teams should consult the score sheet for more details on penalties.

- 3.7.1. If a team exceeds the time limits explained in 3.2.3 and 3.2.4.
- 3.7.2. If all the robot's contact points (e.g. wheels) move outside the marked boundary of the performance area. A contact point is the point at which a robot touches the performance area.
- 3.7.3. For a restart (unless waived by the Chief Judge for reasons outside the Team's control).
- 3.7.4. Teams who, in the opinion of the judges, have knowingly produced duplicate robots, costumes or performance movement (duplicate music is allowed) of another team or reused previous years' robots (with or without modifications), costumes or performances.



### **3.8. Preparation for the Creative Performance**

- 3.8.1. It is the responsibility of the team to verify that the music and video/presentation is functional before their first performance by checking with the sound technician. It is always a good idea to email files to the Chief Judge, Creative ahead of the competition to check that they are compatible with the sound and video system.
- 3.8.2. The main performance area will be made available for teams to practice on. In fairness to all teams who may wish to practice, a schedule will be posted with one 10-minute practice time per team for practices and calibration. Please be respectful of the allocated time and clean up the floor within the 10 minutes for the next team.

### **3.9. Content, Security and Safety**

- 3.9.1. Any performance that includes violent, threatening or criminal elements, or uses inappropriate words or images will be disqualified.
- 3.9.2. Participants are asked to carefully consider the wording and messages communicated in any aspect of their performance. What seems acceptable to one group may be offensive to friends from a different country or culture.
- 3.9.3. Routines may not include explosions, smoke or flame, use of water, or any other hazardous substances.
- 3.9.4. Teams should consider safety in the design of their robots. For example, tall robots should be built to be stable to avoid accidentally falling on a participant. Large moving parts should be protected to avoid injury. Special batteries or other parts should be transported with appropriate care.

## **4. Judging and Awards**

### **4.1. Judging**

- 4.1.1. The judging criteria and allocation of marks are given in the respective score sheet sections.
- 4.1.2. The total score of each team is calculated by combining the scores from the team's technical interview and the highest score from two Creative Performances.
- 4.1.3. Secondary teams will need to demonstrate a higher level of competency for the same points.
- 4.1.4. The five highest scoring teams will move on to the finals, which are combined for both Primary and Secondary schools.

### **4.2. Prizes and awards**

- 4.2.1. Medals will be awarded to each of first, second and third place teams.
- 4.2.2. At the discretion of the judges, select awards from the following categories may be given:
- Use of Sensors Award
  - Programming Award
  - Robot Interaction Award



JRC 2018 RoboJunior – Creative Perform Rules  
Revision 1 (Revised Dec. 30, 2017)

- Design & Construction Award
- Video/Presentation Award
- Novice Team Award

Or another category determined at the discretion of the judges.

**Figure 1: Layout of the performance floor and approximate screen location**

