

# GENERAL RULES

VERSION: JULY 6<sup>TH</sup> 2021



## FUTURE INNOVATORS

WORK ON A PROJECT  
AND DESIGN AND  
BUILD A ROBOT

**AGE GROUPS:**  
8-12 / 11-15 / 14-19

# WRO<sup>®</sup> 2022 SEASON THEME NAME

## SEASON LOGO

WRO INTERNATIONAL PREMIUM PARTNERS



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NETWORKS

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## New General Rules for the WRO 2022 season

With the update of the WRO competition program for the WRO 2022 season, we have updated the general rules of our categories as well. Our goal has been to make the rules more precise, in some cases shorter and more adaptable for National Organizers in their countries.

**Therefore, please take a look at the full document before you start your WRO 2022 season.**

In addition, please note that during the season there might be clarifications or additions to the rules in the official WRO Questions & Answers section of the WRO website. The answers are supplementary to the rules.

You can find the WRO 2022 Q&A on this page:

<https://wro-association.org/>

### **IMPORTANT: Use of this document in national tournaments**

This rule document is made for all WRO events around the world. It is the basis for the judging at International WRO events. For the national competition in a country, a WRO National Organizer has the right to make changes to these international rules to suit local circumstances. All teams participating in a national WRO competition should use the General Rules as provided by their National Organizer.

## PART 1 – GENERAL RULES

### 1. General information

#### Introduction

In the WRO Future Innovators category teams develop a robot that helps solve real-world problems. There is a new theme every year, often connected to the UN Sustainable Development Goals. After research into the theme each team develops an innovative and functioning robotic solution. They present their project on the competition day.

#### Focus Areas

Every WRO category has a special focus on learning with robots. In the WRO Future Innovators category, students will focus on developing in the following areas:

- Research and development: identify a specific problem within the season theme, research and come up with a creative solution.
- Prototyping: turning your idea into a functional robot solution.
- Technical engineering skills: implementing a robotic solution while using different source of materials (controllers, motors, sensors, 3<sup>rd</sup> party equipment etc.).
- Software engineering skills: developing a code that supports the robotic solution (e.g., using sensors, interaction between multiple devices).
- Innovation: Think about potential users, the impact and how you could turn your prototype into reality.
- Presentation skills: Prepare a project booth and present the idea to judges & audience.
- Teamwork, communication, problem solving, creativity.

#### Age-appropriate judging

All teams in this category are judged on several criteria that fit in tree scoring rubrics. The scoring rubrics have a slightly different weight / importance for the different age groups (e.g., for younger students there is more focus on the presentation, for older students there is more focus on innovation and technical aspects).

#### Learning is most important

WRO wants to inspire students around the world for STEM related subjects and we want the students to develop their skills through playful learning in our competitions. This is why the following aspects are key for all our competition programs:

- Teachers, parents or other adults can help, guide and inspire the team but are not allowed to build or code/program the robot.
- Teams, coaches and judges accept our WRO Guiding Principles and WRO Ethics Code that should encourage all to commit to a fair and more meaningful learning experience.
- On a competition day, Teams and Coaches respect the judges' final decision and work with other teams and judges on ensuring a fair competition.

More information on the WRO Ethics Code can be found here: <https://wro-association.org/>

## 2. Team and Age Groups definitions

- 2.1. A team consists of 2 or 3 students.
- 2.2. A team is guided by a coach.
- 2.3. 1 team member and 1 coach are not considered a team and cannot participate.
- 2.4. A team may only participate in one of the WRO categories in a season.
- 2.5. A student may only participate in one team.
- 2.6. The minimum age of a coach at an international event is 18 years old.
- 2.7. Coaches may work with more than one team.
- 2.8. The age groups in Future Innovators competitions are:
  - 2.8.1. Elementary: students 8-12 years old (in season 2022: born years 2010-2014)
  - 2.8.2. Junior: students 11-15 years old (in season 2022: born years 2007-2011)
  - 2.8.3. Senior: students 14-19 years old (in season 2022: born years 2003-2008)
- 2.9. The maximum age indicated represents the age that the participant turns in the calendar year of the competition, **not** his/her age on the competition day.

## 3. Responsibilities and team's own work

- 3.1. A team should behave fairly and be respectful towards other teams, coaches, judges and competition organizers. By competing in WRO, teams and coaches accept the WRO Guiding Principles that can be found at: <https://wro-association.org/>
- 3.2. Every team and coach need to sign the WRO Ethics Code. The organizer of the competition will define how the Ethics Code is collected and signed.
- 3.3. The construction and coding of the robot may be done only by the team. The task of the coach is to accompany them, help them with organizational and logistical matters and support the team in the case of questions or problems. The coach cannot be involved in the construction and programming of the robot. This applies to both the day of the competition and the preparation.
- 3.4. If any of the rules mentioned in this document are broken or violated, the judges can decide on one or more of the following consequences. Before a decision is reached, a team or individual team members may be interviewed to find out more about the possible violation of the rules. The interview can include questions about the robot or the program.
  - 3.4.1. A team may get up to a 50% reduced score for one or more judging rounds.
  - 3.4.2. A team may not qualify for the national / international final.
  - 3.4.3. A team may be disqualified completely from the competition immediately.

## 4. Game documents and rule hierarchy

- 4.1. Every year, WRO publishes a new version of the general rules for this category including the season challenge and the scoring sheets for the different age groups. These rules are the basis for all international WRO events.
- 4.2. During a season, WRO may publish additional Question & Answers (Q&As) that can clarify, extend or re-define rules in game and general rule documents. Teams should read these Q&As before the competition.
- 4.3. The general rule documents, the scoring sheets and Q&As may be different in a national competition in a country due to local adaptations by the National Organizer. Teams need to inform themselves about the rules that apply in their country. For any international WRO event, only the information WRO has published is relevant. Teams that qualify for any international WRO event should inform themselves about possible differences to their local rules.
- 4.4. At the competition day, the following rule hierarchy applies:
  - 4.4.1. General rule document provides the basis for rules in this category.
  - 4.4.2. Questions & Answers (Q&As) can override rules in the general rule document.
  - 4.4.3. The judges on the competition day have the final word in any decision.

## 5. Robotic solution & project booth

- 5.1. Teams in this category build a robotic solution inspired by the theme of the season (see PART 3). A robotic solution has the following characteristics:
  - 5.1.1. The solution is a robotic device that has several mechanisms, sensors and actuators and is operated with one or more controller(s). A robotic device should do more than a machine that is only repeating a certain workflow and should make autonomous decisions.
  - 5.1.2. The solution can use one or multiple robot devices. Every robot should work autonomously and not be operated by a remote control. Any remote controlled or additional devices are only allowed if this is connected to the solution for the real world (e.g. interacting with humans). If multiple robots are used, they should ideally communicate with each other (digitally or mechanically).
  - 5.1.3. The solution should be innovative and should help humans in their daily life. They can replace certain parts of human tasks or make it possible to do things we could not do before. Teams should always think about the effect it will have on people and society if robots help or replace humans.
  - 5.1.4. The robot solution presented can be a model of what the solution would look like in real life. However, this model should demonstrate as closely as possible the performance and functions and scale to the actual robot if it would be produced, especially in the older age groups.

- 5.2. There is no restriction on the use of controllers, motors, sensors, or any other building equipment the team needs to create their robotic solution and project booth; however, it should not be the intention to use as much materials as possible. The judges will base their scoring on the project idea connected with a meaningful use of materials for every robotic solution.
- 5.3. Teams can use any software / programming language to code the robotic solution. All software / code that is used for the solution must be coded by the team itself or must be readily available to everyone (e.g. free open source tools).
- 5.4. Teams present their project and their robotic solution in a project booth (or other defined area) that is the same size for all teams at the tournament. The international booth size is 2m x 2m x 2m (even if the provided walls are larger. Each team will be provided with 3 vertical display surfaces within the booth, as close to the booth size as possible. The robotic solution and all booth decorations etc. should fit inside the booth, otherwise the team cannot be judged.
- 5.5. To explain their thinking to visitors, the team should use their booth to present information about their project in addition to showcasing their robotic solution. (Information about the team, the research, the development of the solution, etc.) There is no pre-described format for presenting the information, the team can use posters, displays or other materials.
- 5.6. A team must be able to demonstrate all aspects of the robotic solution within the booth. The team may be outside (in front) of the booth to present their solution.
- 5.7. Teams will be provided with the option of using a table. The size of a table will be 120cm x 60cm (or as close as possible). The table size will be consistent across teams. If a team uses the table, the table must be placed inside the project booth. Teams are allowed up to 3 chairs in the booth area.
- 5.8. The use of fire or mist is prohibited for safety reasons (e.g. to prevent legionnaires' disease). If you need to use liquids for your project, please check with the venue and competition organizer before the event. The use of liquids may be restricted to water only and may be restricted to a specific amount or may be forbidden completely pending on the regulations associated with the event. If fire, mist or liquids are important for your solution, think about other ways to showcase it in your video and in your project booth.
- 5.9. It is permitted to develop a project from a previous year; however, the team should describe how this project is clearly different or more evolved from the previous project in their report.

## **6. Additional materials**

- 6.1. The overall judging in this category is based on the robotic solution itself, the presentation on the competition day (information given by the team and presented in the booth) and the following additional materials:
  - 6.1.1. Project report (see 6.4).
  - 6.1.2. Project video (see 0).
- 6.2. The project report is mandatory for all teams in all competitions. The project video is only mandatory for teams participating in the International Final.

- 6.3. Additional materials must be submitted before the competition day, giving the judges enough time to prepare. The competition organizer will announce the submission deadline. For the International WRO Final, all materials must be submitted electronically. On the competition day the team should bring a minimum of 2 printed project reports, one to hand over to the judges and viewing copy for interested visitors.
- 6.4. The **project report** has the following requirements:

Goal	Help the judges understand the project and prepare questions for the judging session.
Maximum number of pages	20 pages single sided (10 pages double sided), including attachments, not including front-page, table of contents and list of sources. Longer reports will not be judged and will result in a score of zero points.
File type	PDF
Maximum file size	15 MB
Content structure	<ul style="list-style-type: none"> <li>• Team introduction and roles (max. 1 page)</li> <li>• Summary project idea (max. 1 page)</li> <li>• Presentation of the robotic solution (max. 12 pages including photos of your robotic solution and/or screenshots from the coding): <ul style="list-style-type: none"> <li>○ Evolution of project idea during the preparation</li> <li>○ Research into similar ideas that are available (if any)</li> <li>○ Construction of the solution</li> <li>○ Coding of the solution</li> <li>○ Challenges during the development process</li> </ul> </li> <li>• Social impact &amp; innovation (max. 6 pages): <ul style="list-style-type: none"> <li>○ Impact of your solution on (local/global) society (include possible negative effects)</li> <li>○ One tried, practical use case of your idea</li> <li>○ Junior &amp; Senior age group only: Answer the other questions for this area that are asked in the scoring sheet for these age groups.</li> </ul> </li> </ul> <p><i>IMPORTANT NOTE: For the Elementary age group the chapter about the robotic solution should be max. 15 pages, the chapter on social impact &amp; innovation max. 3 pages.</i></p>
Language	For the WRO International Final, the report must be done in English.
Expectation	The project report should be made by the team only, not by the coach or others. A coach or others may only help or guide in any technical issues that teams have while preparing the report (especially for younger kids). We expect a more professional style of document, language and wording from older students than from younger students. Judges will consider whether the report is delivered at a level appropriate to the age of the team when scoring.
Template	A project report template is available here: <a href="#">Link to Template will follow</a>



The **project video** has the following requirements:

Goal	Present the team and the robotic solution to the general public. Demonstrate how the robotic solution works. The video is also a guide for the judges, it gives you some extra time to present your robot solution.
Maximum length of the video	90 seconds (1.5 minutes).
File type	.avi, .mpeg, .wmv, .mp4
Maximum file size	100 MB
Goal	<b>In the video the team shows their robotic solution while it is running. The team can do this in the real-world environment.</b> The team should not repeat everything they have written in the report. Teams should briefly introduce themselves and the project idea, but the main part of the video should show how the robotic solution works.
Language	For the WRO International Final, the video must be done in English. (English subtitles can be used to help with understanding, but these are optional.)
Expectation	The video should be done by the team, not by the coach or others. A coach or others may only help or guide with regard to any technical issues that teams have while preparing the video (especially for younger students). Judges will consider whether the video is delivered at a level appropriate to the age of the team when scoring. Please note: Judges do <u>not</u> expect a professional video production. It is completely acceptable if teams just use a mobile device (e.g. smartphone, tablet) to capture the video in one go.

## 7. Presentation & Judging

- 7.1. Teams in this category need to go through the following process on the competition day:
  - 7.1.1. Setting up their project booth and testing of the robotic solution
  - 7.1.2. Inspection of the booth (e.g. check for booth size)
  - 7.1.3. Presentation of the robotic solution in one or multiple judging sessions (see 7.2).
- 7.2. Each judging session takes 10 minutes. Judges will form groups of 2-3 judges and visit teams at their booth. First, the team has 5 minutes to present the project idea and demonstrate the robotic solution live at the project booth. Judges will keep time and stop the team after 5min. Then, judges will ask questions about the project and the robot solution.
- 7.3. In general, teams must maintain a presence within the team's booth during competition hours in order to present to members of the general public but, of course, the team should take a look at other projects and ideas as well.
- 7.4. A team should inform themselves of the schedule of the competition day and should be present at their booth in time for a judging session. The team must make sure that the booth is ready, and the robotic solution is on stand-by for a live presentation before the judges arrive.



- 7.5. If a robotic solution does not function during a judging session the judges will see if they can come back at a later time and/or the team can demonstrate the solution in the next judging session.
- 7.6. For the WRO International Final, the language for the presentation is English. If a translation is necessary, this should be done by someone without a direct connection to the team (e.g. a National Organizer). Use of translation applications is allowed to translate incidental words/phrases. For competitions in countries, National Organizers can decide on the language.
- 7.7. The judging at the International WRO Final will be executed in the different age groups with the appropriate scoring sheet for each age group. This will result in there being winning teams for each age group. At WRO Friendship Invitationals all teams can be judged together as one group if not enough teams are available to judge in the different age groups. National Organizers can decide the same for national competitions.
- 7.8. Judges will prepare themselves for the competition by reviewing the report and video. In addition, at least one judging meeting will take place in the morning of, or the days before the competition. Here, the judges will discuss the judging process and will align on a joint understanding of the scoring sheets.
- 7.9. Judges should not judge teams from their own school / institution or country. If not enough judges are available, other judges from the judging group will ask the questions to the team during the judging session.
- 7.10. Judges will always view the performance of the team during the judging session and on the full competition day. Judges can deduct points on situations outside of a judging session as well, e.g. if the judges see that the coach is doing the work of a team.

## **8. Awards and recognition at International Final**

- 8.1. At the WRO International Final a 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> place are awarded to the teams that overall score best in their age group.
- 8.2. In addition, there will be a number of specific awards that will be presented to teams at the WRO International Final. These are awarded based on the assessment of the judges of an age group (or all judges of the competition), independent of the overall scoring of the teams. Specific sponsor awards can be added as well. National Organizers can decide to use the same award in their countries or award different awards as long as they are in line with the spirit of our WRO competition.

<b>Additional Awards WRO International Final</b>		
<b>Age group</b>	<b>Award name</b>	<b>Description</b>
Elementary	Team Spirit Award	This trophy goes to a team that has demonstrated the best team spirit during the presentation and/or competition day(s).
Junior	Technical Solution Award	This trophy goes to a team that presents a truly robotic solution that is both simple and innovative and that is only as complex as is necessary.
Senior	Start-Up Idea Award	This trophy goes to a team that has clearly positioned their project as a prototype for further development. The project idea is innovative and new and will have a positive impact on society.
All age groups	Project Report Award	This trophy goes to a team that has documented their work well and designed their report in such a way that it is interesting and easy to understand for outsiders.
All age groups	LEGO® Education Creativity Award	This trophy goes to a team that mainly uses LEGO® branded controllers and that demonstrated a wonderful use-case of LEGO® materials in their robotic solution. This award is judged by LEGO® employees.
All age groups	Team Award	This trophy goes to the team that got the best score from voting that teams have done among each other. The competition organizer will organize this award with the teams and can decide if this is an award for every age group, only one age group or all age groups.

- 8.3. Every team/participant at the international final will receive a certificate that is based on their score (Independent of the presented awards.) Teams receive a bronze, silver or golden certificate based on their overall ranking.

<b>Overall ranking (in age group)</b>	<b>Certificate</b>
< 50%	Bronze
50-80%	Silver
> 80%	Gold

## 9. Glossary

<b>Coach</b>	A person assisting a team in the process to learn different robotics aspects, teamwork, problem solving, time management, etc. The role of the coach is not to win the competition for the team, but to teach them and guide them through the problem identification and in discovering ways to solve the competition challenge.
<b>Competition organizer</b>	The competition organizer is the entity that hosts the competition a team is visiting. This can be a local school, the National Organizer of a country that runs the National Final or a WRO Host Country together with WRO Association running the International WRO Final.
<b>Judging Group</b>	In general, 2 or 3 people form a judging group. These group will visit the teams in a judging session and ask questions. The same people will have seen the project report and video before the judging session as well.
<b>Judging Session</b>	Teams are judged in judging sessions. Every session has 10 minutes, 5 minutes for a presentation from the team, 5 to answer questions from the judges.
<b>Project Booth</b>	The project booth is the place where teams present their solution. The project booth's dimensions are 2m x 2m x 2m.
<b>Robotic Solution</b>	The robotic solution is the core result of the team's work. A team presents their solution to judges. A robotic solution cannot be larger than the project booth.
<b>WRO</b>	In this document, WRO stands for World Robot Olympiad Association Ltd., the non-profit organization running WRO world-wide. WRO is responsible for the (international) game and rule documents.

## PART 2 – SCORING SHEETS

Presented below are the scoring sheets as used in the international final.

The Judges are asked to grade all criteria on a scale from 0 to 10, similar to grading in some educational systems. Based on that grade the number of points the team gets for that specific aspect of the competition is calculated. The maximum points are presented on the scoring sheet.

At the international final judges work in pairs or little groups. Teams are visited by at least 2 judge groups. The judges score each criterion and discuss their scoring after each round. The winners are selected on the base of the scoring of the judges and a discussion in a judge meeting after all judging rounds are completed.

**Use of scoring sheets in national competitions:**

National Organizers can choose to adapt these scoring sheets for regional and national competitions.

The scoring sheets have been developed in such a way that it is possible to judge teams from different age groups together. The focus is a little different for each age group, but they all can achieve a maximum of 200 points. This makes it easier to judge at smaller events, when there are not enough Future Innovators teams to be judged in separate age groups.

## WRO Future Innovators - Elementary

**Criteria**

**Score max  
0-10\* points**

<b>PROJECT &amp; INNOVATION</b>	<b>Idea, Quality &amp; Creativity</b>		<b>30</b>
	<b>Research &amp; Report</b>		<b>15</b>
	<b>Usage of the idea</b>		<b>15</b>
	<b>Key Innovation &amp; Slogan</b>		<b>10</b>
<i>TOTAL</i>			<i>70</i>

<b>ROBOTIC SOLUTION</b>	<b>Robotic Solution</b>		<b>30</b>
	<b>Meaningful use of engineering concepts</b>		<b>10</b>
	<b>Code Efficiency &amp; Software Automation</b>		<b>10</b>
	<b>Demonstration of Robotic Solution</b>		<b>15</b>
<i>TOTAL</i>			<i>65</i>

<b>PRESENTATION &amp; TEAM SPIRIT</b>	<b>Presentation &amp; Project booth</b>		<b>30</b>
	<b>Technical Understanding &amp; Quick Thinking</b>		<b>15</b>
	<b>Team Spirit</b>		<b>20</b>
<i>TOTAL</i>			<i>65</i>

<b>Maximum Points</b>	<b>200</b>
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Comments:

*\* Judges give a score from 0-10. For example, if a judge scores "Idea, Quality & Creativity" with a 5, then the team will get 5/10 \* 20 = 10 points for this criterion.*

## WRO Future Innovators - Junior

**Criteria**

**Score max  
0-10\* points**

PROJECT & INNOVATION	<b>Idea, Quality &amp; Creativity</b>		<b>30</b>
	<b>Research &amp; Report</b>		<b>15</b>
	<b>Social Impact &amp; Need</b>		<b>10</b>
	<b>Key Innovation &amp; Slogan</b>		<b>10</b>
	<b>Extra element of entrepreneurship</b> a) Cost structure, b) Revenue Stream, c) Key Resources, d) Partners		<b>10</b>
<i>TOTAL</i>			<i>75</i>

ROBOTIC SOLUTION	<b>Robotic Solution</b>		<b>30</b>
	<b>Meaningful use of engineering concepts</b>		<b>15</b>
	<b>Code Efficiency &amp; Software Automation</b>		<b>10</b>
	<b>Demonstration of Robotic Solution</b>		<b>15</b>
<i>TOTAL</i>			<i>70</i>

PRESENTATION & TEAM SPIRIT	<b>Presentation &amp; Project booth</b>		<b>25</b>
	<b>Technical Understanding &amp; Quick Thinking</b>		<b>15</b>
	<b>Team Spirit</b>		<b>15</b>
<i>TOTAL</i>			<i>55</i>

<b>Maximum Points</b>	<b>200</b>
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Comments:

*\* Judges give a score from 0-10. For example, if a judge scores "Idea, Quality & Creativity" with a 5, then the team will get 5/10 \* 30 = 15 points for this criterion.*

## WRO Future Innovators - Senior

**Criteria**

**Score max  
0-10\* points**

PROJECT & INNOVATION	<b>Idea, Quality &amp; Creativity</b>		<b>20</b>
	<b>Research &amp; Report</b>		<b>15</b>
	<b>Social Impact &amp; Need</b>		<b>10</b>
	<b>Key Innovation &amp; Slogan</b>		<b>10</b>
	<b>Extra element of entrepreneurship</b> a) Cost structure, b) Revenue Stream, c) Key Resources, d) Partners		<b>10</b>
	<b>Next Steps &amp; Prototype Development</b>		<b>10</b>

*TOTAL*      **75**

ROBOTIC SOLUTION	<b>Robotic Solution</b>		<b>30</b>
	<b>Meaningful use of engineering concepts</b>		<b>15</b>
	<b>Code Efficiency &amp; Software Automation</b>		<b>10</b>
	<b>Demonstration of Robotic Solution</b>		<b>15</b>

*TOTAL*      **70**

PRESENTATION & TEAM SPIRIT	<b>Presentation &amp; Project booth</b>		<b>25</b>
	<b>Technical Understanding &amp; Quick Thinking</b>		<b>15</b>
	<b>Team Spirit</b>		<b>15</b>

*TOTAL*      **55**

<b>Maximum Points</b>	<b>200</b>
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Comments:

*\* Judges give a score from 0-10. For example, if a judge scores "Idea, Quality & Creativity" with a 5, then the team will get 5/10 \* 30 = 15 points for this criterion.*



## **PART 3 – SEASON CHALLENGE 2022**

*Here we will have text and text and text ...*