
# Zone01 robotics challenges

## Rules and regulations 2014

## Version 1.0

( Last modification: 29 September 2013 )

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ROBOTICS CAMP
CREATING - BUILDING - PROGRAMMING

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ROBOTIQUE ZONE 01 ROBOTICS

( Last modification: 29 September 2013 )

# General Rules

## 1. General definitions

The rules of this section apply to ALL educational robotic challenges created by Zone 01.

**Student**: A student must be between 5 and 17 years of age and enrolled in a school.

**Responsible**: An adult must accompany a team of students. This adult will be responsible for all communications relating to the co-opetition, rules of the challenges, etc. This adult may be a parent, a teacher, an educational consultant, etc. In 2014, this adult will be even more part of the team! The responsible adult may not be the principal of a school.

**Team**: all students of a team must be present during the final (except in a case of illness). The teams must be associated with a school or a parent is permitted to take the initiative in forming a team. In this situation, the team is registered as a parent-child team and they are permitted to participate like all other teams.

Number of students in a team:
A. Novice (LEGO WEDO): 1 or 2 students
B. Junior (LEGO Mindstorms) : 2 to 4 students
C. Senior (LEGO Mindstorms) : 2 to 4 students
D. Probot: 4 to 10 students
E. Make-Art: 2 to 4 students

## 2. Registration and participation

All registrations must be submitted before the date indicated on the zone01.ca website. The registration fees, dates and details of the final event are posted on the zone01.ca website.

When registering, teams must choose a category according to their level of education:

A. Rookie (LEGO WEDO): kindergarten to grade 4
B. Junior (LEGO Mindstorms): grade 4 to grade 6
C. Senior (LEGO Mindstorms): Secondary 1 to secondary 4
D. Probot : Secondary 4 and/or secondary 5
E. Make-Art: Kindergarten, elementary and/or secondary

## 3. Choosing challenges

The adult responsible for a team has until February 1, 2014 to change or modify the choice(s) of their challenges. A team may not change their category.

For certain challenges, two levels of difficulty will be available: a white level and a black level

All teams are automatically enrolled at the white level. On site, a team may choose to participate in a challenge at the black level, which is more demanding, but worth more points. (The awards, for each level, will be presented separately)

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( Last modification: 29 septembre 2013 )

2014

New catégories for everyone!


SPECIAL THANKS

Zone01 would like to thank all the team members that has written the 2014 Zone01 challenges.

Martin Bellemare - CS des Patriotes
Georges Bourgouin - CS des Patriotes
Dominic Bruneau
Frank DeLuca - CS Sir Wilfrid Laurier
Yannick Dupont - Lego
Yvan Émond - CS des Patriotes
Benjamin Carrara - Brault et Bouthillier
Pierre Guiot-Guillain - Ruelle 80
Lysanne Landry - CS des Patriotes
Élizabeth Martel
Alain Pilon - Ruelle 80
Anthony Pilorzé - Ruelle 80
Marie-Andrée Rho - Séminaire Sainte-Trinité
Sonya Roussy - CS des Trois-Lacs
Érick Sauvé - CS de Laval
Rémy Taupier - Ecole Saint-Joseph (1985) inc.
Daniel Carré - École Paul-Hubert

Choosing the WHITE OR BLACK LEVEL will have to be done during the first try and YOU WILL NOT BE ABLE TO CHANGE THE LEVEL AFTERWARDS. If the black level is chosen, the team will have to make all their trials at the black level.

See the point section for more details.

## ATTENTION NEW RULE FOR 2014

A school may enter a maximum of 12 teams per category.A school may participate in a maximum of 24 challenges per category.

For example, a school may register 2 teams in the junior category and have each team participate in 4 challenges, for a total of 8 challenges. Another school may register 12 teams in the junior category and have each team participate in 2 challenges, for a total of 24 challenges. This school would not be permitted to register all their teams for 3 challenges because this would result in a total of 36 challenges.

Maximum number of teams permitted in each category:

| | |
|---|---|
| A. Novice: | N/A |
| B. Junior: | 80 |
| C. Senior: | 70 |
| D. Robot-Pro: | 10 |
| E. Make-Art: | N/A |

The system of registration is a "first come, first enrolled" basis until the maximum number of teams in a category is attained.

Any student participating on the day of the Zone 01 event must sign an authorization sheet to gain access to the co-opetition site. Refunds will not be issued in case of a refusal.

## Zone 01 co-opetition philosophy

The Zone 01 CO-OPETITION is a mixture of cooperation and competition. Therefore, with educational robotics, our goal is to develop student's sense of teamwork, sharing and mutual respect for one another while allowing them to advance technologically and scientifically

# 4. FAIR-PLAY rule, new in 2014

This year, a new rule will be implemented to ensure this co-opetition philosophy.

The FAIR PLAY rule requests all teams to respect the rules of the game described in the official document, but also the essence of the game. For all the challenges created by Zone 01, the "gray areas" are left voluntarily and involuntarily to provide room for creativity. If a team interprets the rules in a way to penalize another team, or to negatively influence a team's standings, the chief judge may request to change the strategy of this team.

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# 5. Robot design

To participate in the co-opetition, participants must comply with the following rules:

A. During the preparation

Teams must provide their own robotics equipment as well as their own computers and electrical extensions.

All LEGO Mindstorms robotic systems will be permitted at the Zone 01 co-opetition. However, when participating in the events, it is possible, that the NXT and EV3 robotic systems are better adapted than the RCX robotic system.

## Change for 2014

Robotic systems permitted by category:
NOVICE: LEGO Education WeDo and other LEGO pieces
JUNIOR: LEGO Education Mindstorms RCX, NXT and EV3
SÉNIOR: LEGO Education Mindstorms RCX, NXT and EV3
ROBOT-PRO: Tetrix, LEGO Education Mindstorms NXT and EV3
MAKE-ART: LEGO Education Mindstorms RCX, NXT and EV3, LEGO Education WeDo, ARDUINO and MAKEY MAKEY

Sensors and parts allowed in the Rookie, Junior and Senior categories
Sensors from third party vendors are permitted.
The Mindstorms sound sensor is not permitted.

It is forbidden to modify a LEGO piece in the construction of the robot. You cannot cut a LEGO piece; file down a LEGO piece or trim/streamline a LEGO piece.

If a rare LEGO piece (produced in very limited quantities which other teams would not be able to easily obtain through sites such as Bricklink or LEGO Pick a Brick) is used, it must be in accordance with the rule of FAIR PLAY (see above). If you are not sure about a specific LEGO piece and/or the interpretation of FAIR PLAY, please communicate with us BEFORE the day of the co-opetition.

All robots must be able to operate autonomously, therefore, the team must program the robot in advance, except in the Senior C1 challenge.

Any programming language that is compatible with the robotic systems mentioned above is permitted (Robolab, NXT-G, EV3, Labview, RobotC, etc).

B. At the the co-opetition

To ensure the rules are followed, all robots will be inspected before the start of the challenge by the judge. In particular, the focus will be on the dimensions and the weight of the robot.

A robot CANNOT be used for more than one team and a student CANNOT be a member of more than one team.

Any device or equipment that may interfere with the transmission and reception of an infrared signal, Wifi or Bluetooth will not be permitted during the event.

### Description of playing fields (surfaces)

Specifics for the 2014 edition

The creators of the challenges make every possible effort to describe the playing fields (surfaces) as exactly as possible.

Zone 01 enables schools to purchase the playing fields (surfaces) of the official challenges, by ordering them from the website www.zone01.ca.

Although it is not mandatory to purchase these playing fields (surfaces), it is recommended in order to calibrate the robot's sensors to their correct settings.
Some playing fields (surfaces) require a wooden construction. The drafting committee will publish photos of these wooden constructions on the website www.zone01.ca. They will also be made available to the teams during the training session in January 2014.

In any case, during the competition, the teams may not request a change of the official playing field (surfaces) or ask for special exemption or treatment. In other words, the official playing field (surface) is the one during the co-opetition. The teams (the robots) must adapt to the playing field (surface) at the co-opetition and not the contrary.

TIP: To avoid any frustration or disappointment:
Build your robots with the possibility of adapting or modifying it at the co-opetition. You should not rely solely on the surface that you have constructed. If you have any doubts about your strategy with the playing fields (surfaces), contact us before the event with your question!!

## 6. Problem with one of the challenges

The judges and the chief judge, may, at any time, question the design of a robot under the "FAIR PLAY" rule. If the chief judge finds an infraction (irregularity), the team will have 5 minutes to comply with the rules. If a team cannot comply within the 5 minute time limit, the team will receive "0" points for the challenge.

## 7. Points

If a team is registered for a specific challenge but decides not to participate, the team will receive "0" points for the challenge.

The scoring sheets that the judges will use at the co-opetition event will be available on the website: www.zone01.ca. These scoring sheets do not reflect the ultimate result of what the judges' view on the playing field (surface). The judges do not calculate the total points on-site.

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### New for 2014-BLACK and WHITE levels

All teams are automatically registered at the WHITE level.
Teams/schools who wish to go further can opt for the BLACK level, which provides for a tougher challenge. The BLACK level also enables the schools to acquire more points and to ultimately get closer in attaining the Zone 01 trophy.

A team that decides to participate in a challenge at the BLACK level will automatically be in the same grouping with other teams who also chose the BLACK level. These teams will only be able to receive medals designated for the BLACK level. They would not receive medals for the WHITE level.

## 8. Distribution of awards

ATTENTION: This year (2014 edition) there are many changes for the distribution of prizes.

Here is the prize list that will be presented at the event:

### A. Sponsor Prizes

These prizes and their award criteria will be revealed during the event.

### B. Special Mentions

### Changes for the 2014 edition

Is your robot unique or does it have an innovative mechanical design?
Have members of your team helped other teams in your school or elsewhere?
If you are the responsible adult for the team, have you noticed the improvement of a student in his/her attitude, behavior, work ethic, or simply in his/her robotic activity/project?

This prize category is linked to the student's preparation and not only to the performance/challenge at the event. We wish to emphasize the work of teams, students or even the responsible adult of a team who has not necessarily performed well in terms of accumulated points for the challenges, but in other important areas of educational robotics and co-opetition.

These prizes WILL BE AWARDED BASED ON A NOMINATION PROCESS. This year, the responsible adult of a team must register one or more students in order for them to have a chance at receiving such a prize. The form will be available on our Internet website as of November 1, 2013.

N.B. The panel of judges reserves the right to award any student a Special Mentions prize on site at the event.

The exact number of prizes will be unveiled at the closing ceremony.

## C Medals

### MAKE-Art Category

In this category, an external committee of judges will assess the student achievements according to three main criteria:
Technical aspect
Artistic aspect
Appearance of the project in connection with the theme

Medals will be given to the projects that obtained the best results from the external committee of judges.

## Junior, Senior and Robot-Pro Categories

### Change for the 2014 edition

#### Gold and Silver Medals

For each challenge, the teams that have accumulated the 2 best scores in their respective level (White and Black) will receive the gold medal and the silver medal.

#### Bronze Medal

A bronze medal is awarded to the team having obtained the 3rd best score in ONLY the Junior Strongman challenge.

## D Participation Prizes

Junior, Senior and Robot-Pro Categories
Participation prizes will be randomly drawn.

### E. Novice Category

Each novice team will receive a participation prize for having accomplished their first Zone 01 challenge!

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# F Zone 01 Trophies

The Zone 01 Trophies, Junior School of The Year and Senior School of The Year will be awarded to the school with the best overall performance. To be eligible, a school must meet the following criteria:

A- You entered at least 2 teams in the competition;
B- You have participated in all 4 challenges of the Junior or Senior category;

N.B. The results obtained in the Junior Strongman challenge are not used in the overall calculation for best performance, but the school should have participated in this challenge in order to be eligible for the trophy.

The schools that are awarded the Zone 01 trophy are responsible for building next year'-s trophy in the same category.

# Showcase !

ROOCKY category

Building

Program

Strategy

## Students! Here Ya here Ya students!

We need your help to entertainment the public at Tohu on March 2014! It's been several years that the RoboCircus has a big problem: the clowns are always feeling sick. Therefore, the owners have decided to resolve this unfortunate situation by replacing the clowns with entertaining robots! This way, it will be impossible for the robots to get sick and performances will continue throughout the year!

Therefore, your mission is to organize an automated puppet show. You will need to decide what kind of puppet(s) you will be using and how your puppet(s) will move and come alive. Use your imagination!

Your LEGO WeDo robot should be an automated puppet; for example:

* A string puppet (marionette)
* A hand puppet
* A rod puppet

You can use several materials: paper/cardboard, LEGO minifigure, other recycled materials. However, the mechanism to move the puppet must be built with LEGO WeDo.

These puppets must help you tell a story. You will need to use at least two of the following four characters:

1. A master of ceremony
2. The substitute clown
3. A silly monkey
4. You!

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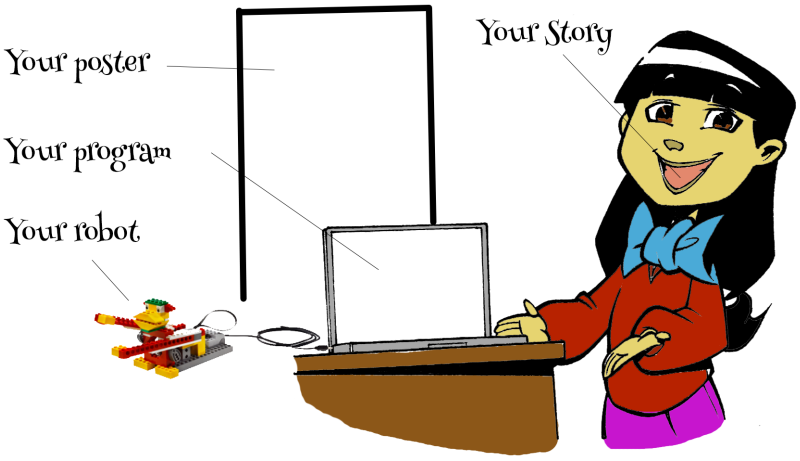
During your story, you can pause in order to change the characters (puppets) that are controlled by the motor(s) of the robot.

## 1. A few rules to follow...

- A novice team is made up of one or two students
- You must create a story to help resolve the RoboCircus problem
- The robot, including the puppets, must fit on a table with a dimension of 1m by 0.6 m
- You must show your design process, the name of your team members and an outline of your story on a backboard whose approximate dimensions are 122 cm (length) x 91.5 cm (height). You can buy a backboard or you can make one with your own material.
- Don't forget you must also present your story!




Obtainable materials

- Backboard
- LEGO Education WeDo kit
- LEGO Education WeDo Resource kit
- Any other LEGO pieces
- LEGO WeDo software or Scratch software
- LEGO characters or characters made of paper/cardboard or other recycled material
- Apple iPad or Tablet Google Android applications
- LEGO Plate 48x48

Project steps

1. Choose your four characters, define their roles and their characteristics
2. Come up with a funny story
3. Create the characters. Choose the materials: paper/cardboard, LEGO minifigure, other recycled materials
4. Create your mechanism. Make sure your characters can be controlled with the LEGO WeDo motors and adjust them as needed
5. Program your story (puppets) by using the LEGO WeDo or Scratch software
6. Memorize and practice your presentation in order to impress the RoboCircus audience!

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## Need help?

Visit our website at www.Zone01.ca in the Help section.

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# Strongman Challenge

JUNIOR category

Building ✪✪

Programming ✪✪

Strategy ✪✪

## 1. Setting the Scene

How many kilograms can you push? Following in the same footsteps as Louis Cyr, the RoboCircus is searching for the strongest robot. Attention, this year, the winner will have an additional challenge to undertake during the closing ceremony!

## 2. Concepts covered (elementary)

Simple Machines

Forces, friction, movement

Traction and gears

## 3. General function of the robot

Participants must build and program a robot that is able to:

- detect the white border on the circular edge of the playing field;
- detect the opponent's robot;
- push or pull (force) the opponent's robot COMPLETELY outside the circular playing field without going out yourself.

## Description of the robot

The robots that participate in this challenge must not exceed the following limits:

- weight: 1 kg (1000 g)
- length : 30 cm
- height : no limit
- width : 30 cm

NO LEGO PIECE can be modified in anyway (cutting, filing, folding, etc.)

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Dernière version (29/10/13)

NOTICE
The robots need to function autonomously. No telecommunications, ipod, ipad or any other similar devices are permitted near the arena.

The following elements of a robot are NOT ALLOWED in a round:

- Any materials or parts whose purpose is to attack. For example, programming a robot to break pieces, deploying a part, swinging an arm, etc.
- The goal of the challenge is to push and not to break your opponents robot (A robot will not be disqualified if small parts detach or fall off accidently, provided that, it is not the intention of the opposing robot).
- Parts of the structures of a robot that can be extended.
- External objects that can be projected.
- Check the guide in the general rules.

ATTENTION: NEW THIS YEAR
ONLY the wheels of the robot can touch the ground. All the other parts of the robot must be off the ground. There needs to be a space equivalent to the thickness of a LEGO piece between any part of the robot and the ground. Any pieces or parts, other than the wheels, touching the ground must be removed or adjusted.

The following elements of a robot are ALLOWED in a round:

- Defence structures such as bumpers, ramps, etc.
- LEGO elastics or elastics with model no. 3031507, 64mm x 1.5mm

## 4. Other elements necessary for this challenge

- Light sensor(s) and/or colour sensor(s)

## 5. Description of the playing field

The playing field is a black, circular area (mat) 1 meter in diameter bordered by a 2 cm white stripe. In the center of the playing field, there are two gray parallel lines placed 10 cm apart. These lines represent imaginary lines extending to the edges of the circlular playing field.

At the beginning of the round, the robot of each team must place their robot directly in the center of the arena behind the gray line. THE LEFT OR RIGHT SIDE OF THE ROBOT MUST TOUCH THE GRAY LINE.

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## Plateformes acceptées

**RCX-NXT-EV3 simultanément**

ATTENTION
NOUVEAU
CETTE ANNÉE

Les robots ne peuvent utiliser plus de TROIS moteurs pour ce défi.

Tous les types de moteurs LEGO sont acceptés.

Élastique permis

Visitez www.zone01.ca pour la liste du matériel disponible

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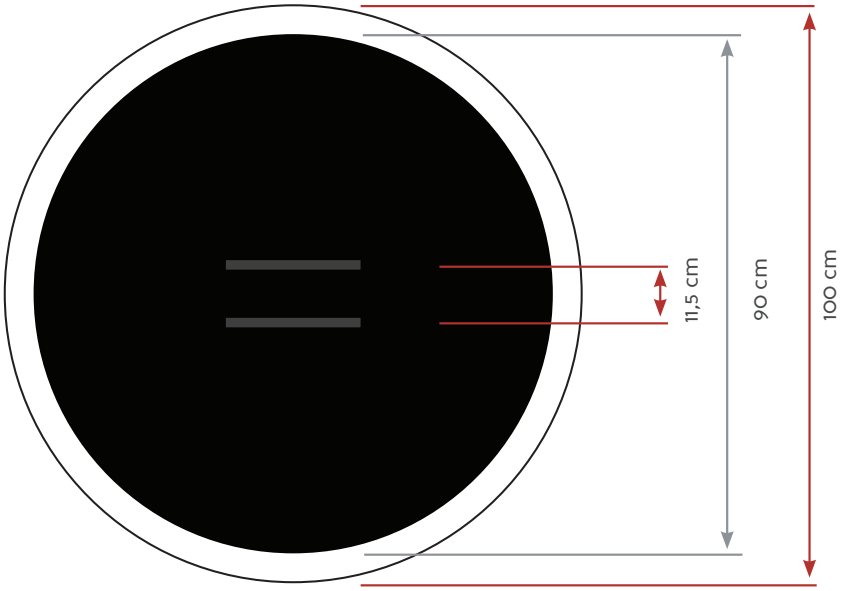
## 6. Diagram of playing field




## 7. Match Procedure

Each team will compete in 3 rounds against the same opponent in the same match. If they choose, a team may change their program for each round. A match lasts a maximun of 3 minutes.

## 8. Déroulement d'une ronde

- Only one member of each team may approach the playing field.
- When the two teams present themselves, the robots must be inspected by a judge.
- Prior to the start of the round, the robots will be weighed using an electronic scale and placed in a 30 cm x 30 cm box to ensure that each robot complies with the rules of the challenge.
- At a signal given by the judge, each team can activate the program on their robot.
- There must be a 5 second delay before the robot starts moving. This delay is necessary to enable the participants to move back, away from the playing field.
- Each robot must move in reverse and in a straight line parallel to the gray line of the playing field, and then, it must detect the white border on the edge of the playing field behind its gray line. Once this white border is detected, the robot must display a light and a message on the screen. The robot can then begin to seek the opposing robot and push or pull (force) it out of the playing field.

A robot cannot be touched once the round starts. However, the judge may demand to replay or restart the round of a match. If so, the designated participant of each team can retrieve his/her robot, stop the program and, at the signal of the judge, reposition the robot behind the gray line.

At the signal of the judge, the same designated member of the team restarts the same robot program. The stopwatch of the judge will be stopped during the preparations of a new replay or restart of the match; however, no robot may leave the playing area.

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## 9. More details

False Start

- Not complying with the 5-second delay at the beginning of the round
- A robot begins the round before the signal of the judge

The judge may start a NEW ROUND WHEN one of the following situations occur:

- A robot COMPLETELY leaves the playing field (2 points for the opposing team)
- A second "false start" for the same team (2 points for the opposing team)
- A student touches one of the robots in the playing field (2 points for the opposing team)
- The robots are tangled, or stuck to each other for more than 10 seconds without any movement being observed (1 point for each team)
- When the robots exit the playing field at the same time (1 point for each team)
- The robots stop at the same time and remain motionless without touching each other for more than 10 seconds (1 point for each team)

The penalties:

- A second "false start" for the same team (2 points for the opposing team)
- A student touches one of the robots in the playing field (2 points for the opposing team)

## 10. BLACK and WHITE PART

There is no separation of the BLACK and WHITE sections for this challenge.

## 11. Les points

A team may accumulate a maximum of 3 points per round for a total of 9 points for one match. A point(s) is awarded when:

- At the beginning of a round, the robot touches the white border of the playing field AND displays a light and a message on the screen. Each team can earn 1 point.
- The robot of a team is successful in forcing the robot of the opposing team to COMPLETELY exit the black surface (playing field). The winning team will earn 2 points.
- A robot exits the black surface (playing field). The opposing team earns 2 points.
- A robot that is tilted on its side or upside down and remains stationary is considered eliminated. The opposing team will earn 2 points.
- A robot that is tilted on its side or upside down and continues to move is still considered in play.
- The robots are tangled, or stuck to each other for more than 10 seconds without any movement being observed. Each team earns 1 point.
- When the robots exit the playing field at the same time. Each team earns 1 point.
- The robots stop at the same time and remain motionless without touching each other for more than 10 seconds. Each team earns 1 point.
- An infraction of the rules is committed. The opposing team will earn 2 points and win the round.

# Jugglebot Challenge

Category JR-SR

Building ✪✪✪

Programming ✪✪

Strategy ✪

## 1. Setting the Scene

A circus would not be a circus without a group of jugglers. Do jugglers use balls of all colors? Well, if not, this time around, you will see ... all the colors.

## 2. Programming Concepts covered

### Elementary

- Statistics
- Basic mechanism
- Robotics

### Secondary

- Random numbers
- Specification / Design
- Statistics

## 3. General Definition

Your robot will have to juggle balls of different colours. In this challenge, the robot can remain fixed and have a different form/build than usual. The robot must select the correct balls for juggling. The robot must then throw the balls (juggling movement) on a sloping panel. The robot must show that it is capable of juggling and to do this; it must achieve the maximum number of points in a time frame of 3 minutes.

## 4. Overall function of the robot

In this challenge, a juggling robot is one that detects the colour of the ball, by taking (throwing/pushing) the ball and then launching the ball.

The robots must be able to juggle with 3 balls (Junior) or 6 balls (Senior) chosen from among a batch of 9 balls of 3 different colors.

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## 5. Description of the robot

The robots that participate in this challenge must not exceed the following limits:

- Length: the robot's arm (hand/paw) must be in the starting area. No part of the robot can touch the juggling area.
- Heigth: no limit
- Width: no limit in the starting area, either 2 feet or 61 cm

ATTENTION: NO LEGO PIECE can be modified in anyway (cutting, filing, folding, bending, etc.)

## 6. Description of the playing field (surface)

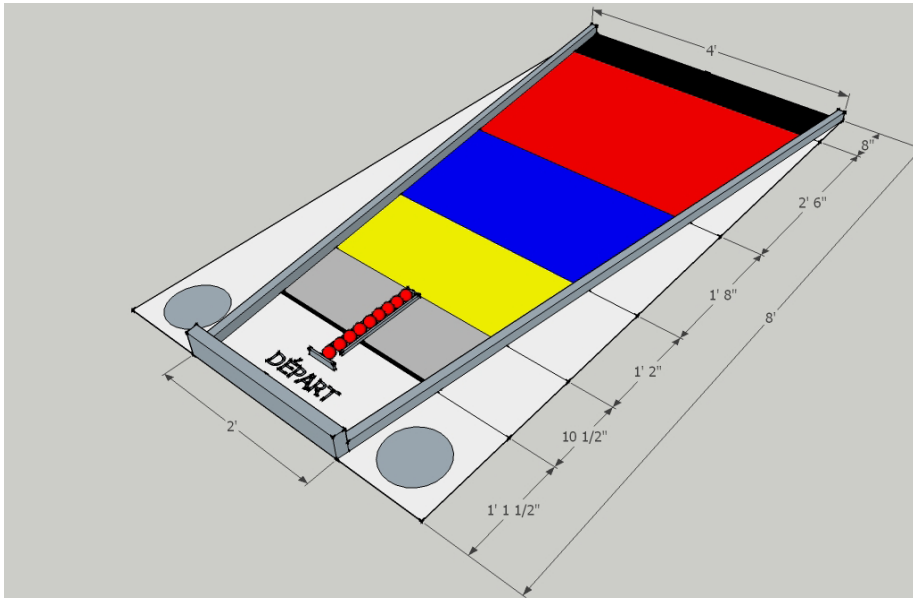
The playing field is an inclined sheet of plywood 4 feet by 8 feet. One of the 4-foot sides touches the floor, while the other side is elevated:

- For the junior and senior participants, the elevation should be 50 cm (a thickness of seven dictionaries)

A wall is installed along the bottom of the starting area. The robot can use this wall. This wall is 2" x 6" x 4 feet glued to the edge of the plywood.

Guiding walls are also installed on the playing field. They allow the balls to return to the robot. These guiding walls have a height of approximately 1.25 inches or 3.5 cm. At the co-opetition, these guiding walls will be made out of LEGO blocks with a thickness of 3 blocks.

## 7. Playing field (surface) to scale




## 9. Other elements necessary for this challenge

The balls
The balls used in this challenge are coloured foam balls. The selected

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## Accepted robots

**NXT-EV3**
**Judge seperately**

The angle of the surface

The angle of the surface is an approximate angle (plus or minus 5 degrees). Therefore, the robot should not be built on the basis for an exact angle.

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colours are RED, BLUE and YELLOW. The balls will be placed in the distributor randomly, with the exception, that 2 balls of the same colour do not follow each other. For example: red-yellow-blue, yellow-red-blue and blue-yellow-red.

## 10. The obstacles and accessories

Here is the ball distributor for this challenge.

You can build this ball distributor with the LEGO Mindstorms NXT kit (or EV3). You can also attach the distributor to the mat with Velcro.

## 11. Round procedure

For all categories, the following applies to all rounds:

- - The students install their robot on the playing field.
- - The judge places the balls randomly in the ball distributor.
- - The judge gives the signal to begin the challenge.
- - At this moment, a member of the team activates the program on the robot to execute its task.
- - The robot must first sort the 9 balls available in the distributor. For example, the robot separates the balls by choosing the correct ones and putting (throwing/pushing) them to one side. The robot eliminates the other balls by putting (throwing/pushing) them on the opposite side. The eliminated balls can then be collected by one of the team members.
- - Once the balls are sorted, the robot must launch the balls from one side of the distributor and catch them on the other side.
- - The balls must pass above the ball distributor.
- - The robot can catch (collect) the balls and launch them again.
- - Each team can earn points throughout the duration of the 3 minutes.

## Junior - WHITE Level

- Choose 3 red balls among the 9 balls of colours.
- Launch the 3 balls from one side of the robot and catch them (grasp) on the other side.

## Junior - BLACK LEVEL

- Choose 3 balls of different colours among the 9 balls of colours.
- Launch the 3 balls from one side of the robot and catch them (grasp) on the other side. The balls are launched toward the surface of the playing field and points are awarded based on how high the ball can reach.

## Senior - WHITE LEVEL

- Choose 6 balls, but it cannot be the yellow balls.
- -The 6 balls are juggled by launching them alternately from one side then from the other side. The balls are launched toward the surface of the playing field and points are awarded based on how high the ball can reach.

## Senior - BLACK LEVEL

- Choose 6 balls, 2 of each colour.
- The 6 balls are juggled by launching them alternately from one side then from the other side. The balls must reach the different coloured zones (see points section).

## White Level and Black Level of the challenge JUNIOR

| White Level | Black Level |
|---|---|
| 10 points for each red ball chosen, 30 points maximum | 10 points for each different coloured ball chosen, 30 points maximum |
| 5 points for each ball that at least reaches the yellow zone | 5 points for each ball that reaches the yellow zone |
| 5 points for each ball that is launched from one side and falls down the other side | 7 points for each ball that reaches the blue zone |
| | 10 points for each ball that reaches the red zone |
| | 5 points for each ball that is launched from one side and falls down the other side |
| **Total Max: 60 points** | **Total Max: 75 points** |

## SENIOR

| White Level | Black Level |
|---|---|
| 10 points for each ball chosen other than yellow, 60 points maximum | 10 points for each ball chosen with a limit of 2 per colour, 60 points maximum |
| 5 points for each ball that reaches the yellow zone | 5 points for each ball that reaches the yellow zone |
| 7 points for each ball that reaches the blue zone | 7 points for each ball that reaches the blue zone |
| 10 points for each ball that reaches the red zone | 10 points for each ball that reaches the red zone |
| | or |
| | 15 points for each ball that reaches the coloured zone corresponding to the same coloured ball |
| 5 points for each ball that is launched from one side and falls down the other side | or |
| | 50 points for each ball that reaches the black zone |
| | 10 points for each ball that is launched from one side and falls down the other side |
| **Total Max: Unlimited** | **Total Max: Unlimited** |

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# Tightrope Challenge

Category JR-SR

Building ✪✪✪

Programming ✪✪

Strategy ✪

## 1. Setting the Scene

The tightrope walk on the iron wire is always an exceptional feat to watch. Tightrope walkers must combine balance, flexibility and concentration in order to not slip and fall. Let's see if robots can accomplish the same acrobatic feat that human tightrope walkers do successfully.

## 2. Concepts covered

### Primary

- Balance
- Sensors

### Secondary

- Ramdom numbers
- Programming Concepts covered

## 3. General Definition

The robot must show evidence of flexibility and balance while avoiding falling off a mounted beam. The robot will have 3 minutes (junior) or 4 minutes (senior) to do its routine.

## 4. Overall function of the robot

Participants must build and program a robot able to move/progress on a beam while performing actions and avoiding obstacles. The robot must have a maximum length of 1 foot. The robot may not touch the ground. The robot can detect the colours on the playing field (mat and the beam). The robot can also grab or grip onto the beam in anyway.

The Junior participant's robot must progress along the beam in one simple direction.

The Senior participant's robot must progress along the beam in one direction and then return.

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## 5. Description of the robot

The robots that participate in this challenge must not exceed the following limits:

length: 30.48 cm or 1 foot
height: no limit
width: no limit

NO LEGO PIECE can be modified in anyway (cutting, filing, folding, bending, etc.)

## 6. Description of the playing field (surface)

The beam on which the robot moves and progresses along is a plank of wood 3.5 inches wide by 1.5 inches thick and 8 feet long (commonly known as a 2X4X8). This beam is placed perpendicular to another plank of wood with a thickness of 1.5 inches and 3.5 inches in length by 12 inches in width (the planks will be screwed together in order to solidify the surface). A black line is drawn at the center of the beam from one end to the other. This black line will be painted with the same colour code as the mat placed underneath (see illustration). The objects (the bases for the balls and doors) are placed in specific locations on the mat (surface).

For the junior challenge

| Obstacle | Distance from the starting point | Execute or avoid | What the robot should do |
|---|---|---|---|
| 1 | 1 foot | Execute | Displace the red ball |
| 2 | 2 feet | Execute | |
| 3 | 3 feet | Execute | |
| 4 | 4.5 feet | Avoid | Automatic green barrier (5 seconds open, 5 seconds closed) |
| 5 | 6 feet | Avoid | |
| 6 | 7 feet | Execute | Press touch sensor |

For the senior challenge

| Obstacle | Distance from the starting point | Execute or avoid | What the robot should do |
|---|---|---|---|
| 1 | 1 foot | Execute | Displace the red ball |
| 2 | 2 feet | Execute | |
| 3 | 3 feet | Execute | Déposer une balle |
| 4 | 4.5 feet | Avoid | Automatic green barrier (5 seconds open, 5 seconds closed) |
| 5 | 6 feet | Avoid | |
| 6 | 7 feet | Execute | Press touch sensor |

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## Plateformes acceptées

**NXT-EV3**
**Jugés séparément**

La poutre

Bien que nous sélectionnions la poutre la plus droite possible, il se peut qu'il y ait une légère courbure dans le bois puisqu'il n'y aura des appuis qu'aux extrémités.

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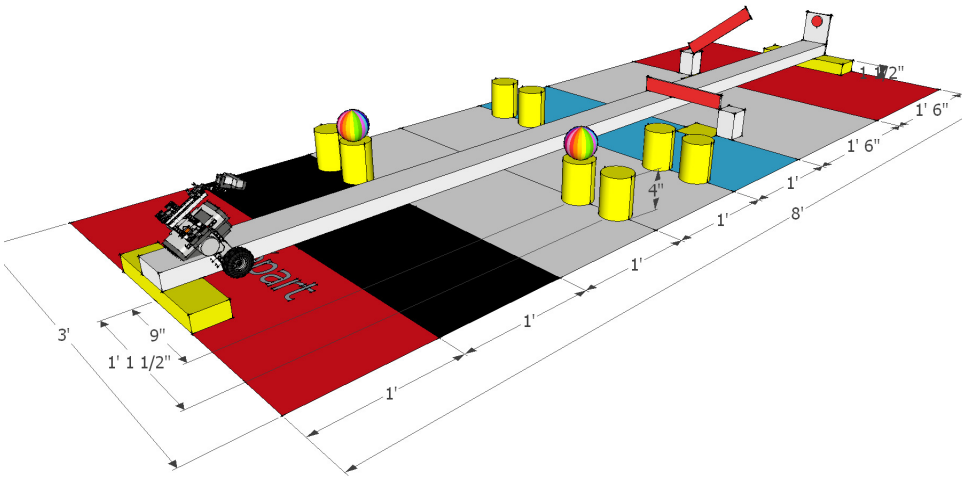
Thanks for helping Zone01 providing great robotic challenges!

# 7. Playing field (surface) to scale

## Junior




## Placement of balls for this challenge

## Junior White Level

| | A | B | C |
|---|---|---|---|
| 1 | - | - | - |
| 2 | R | - | R* |
| 3 | - | R | B* |
| 4 | - | - | - |

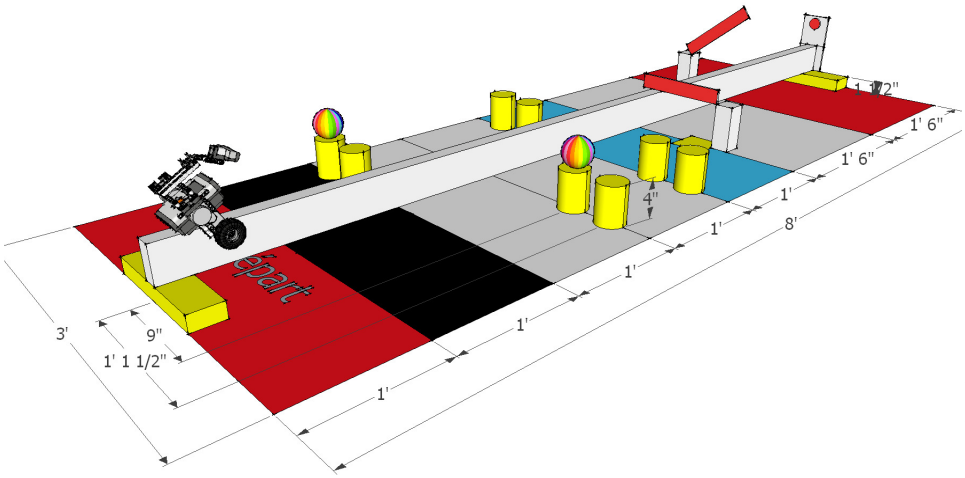
The positions of the balls and its colour are known for base A and B. The position is also known for base C but the colour of the ball is placed randomly. The robot must strike the red ball only.

## Junior black Level

| | A | B | C |
|---|---|---|---|
| 1 | R | - | R* |
| 2 | - | - | - |
| 3 | - | - | - |
| 4 | - | R | B* |

The positions of the balls and its colour are known for base A and B. The position is also known for base C but the colour of the ball is placed randomly. The robot must strike the red ball only.

# Senior




## Senior white Level

| | A | B | C |
|---|---|---|---|
| 1 | R | - | B |
| 2 | - | - | A* |
| 3 | - | - | A* |
| 4 | - | R | B |

The positions of the balls and its colour are known for base A and B. The robot must place a ball on position 2 or 3 of base C (team's choice). However, the balls in position 1 and 4 must remain on their base.

## Senior black Level

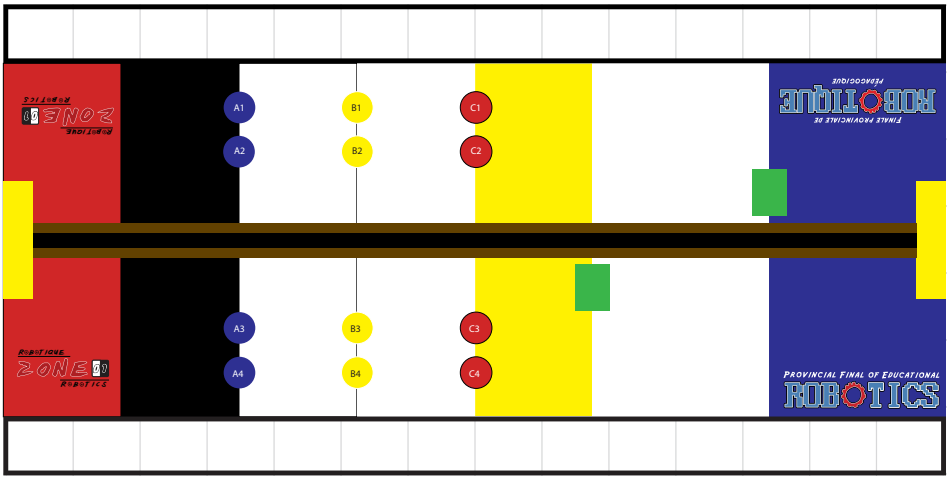
| | A | B | C |
|---|---|---|---|
| 1 | B* | - | A* |
| 2 | R* | - | A* |
| 3 | - | B* | A* |
| 4 | - | R* | A* |

The position of the red ball is not known for base A, but it is located in either position 1 or in position 2. A blue ball is in the other position.

The position of the red ball is not known for base B, but it is located in either position 3 or in position 4. A blue ball is in the other position.

The robot must place a ball on the available position of base C. The judge will randomly place balls on 3 base C positions.

## 8. Plans détaillés




### Junior

1.5 inch x 3.5 inch x 8 feet, the robot moves or progresses along the wide part on the wood beam

### Senior

1.5 inch x 3.5 inch x 8 feet, the robot moves or progresses along the narrow part of the wood beam

## 9. Other elements necessary for this challenge

- A 1.5 inch x 3.5 inch x 8 feet (2" X 4" X 8')
- Two pieces of 1.5 inch x 3.5 inch x 1 foot (cuts of a 2" X 4" X 8')
- Ribbon to paint, black, white, red and blue cyan paint or a challenge mat
- A Lego Mindstorm NXT kit (or EV3) for the construction and programming of obstacles
(Bases for the balls and robot-doors) (It is not necessary to construct the robot-door for this challenge. You could use your hands or a piece of cardboard.)
- Balls from the LEGO Education NXT kit
- Screws, screwdriver

## 10. The obstacles and accessories

Here are the bases to accommodate the balls, the NXT balls

Here are the robot doors for junior and senior

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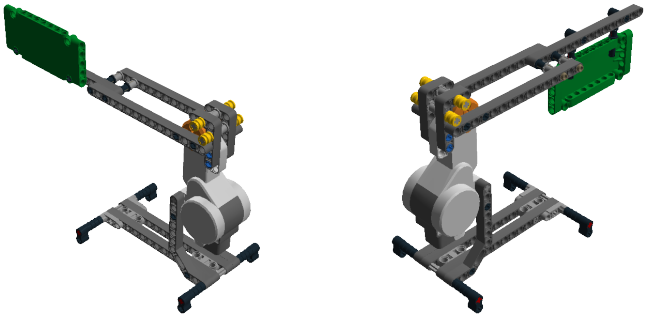

Here are the robot base controlling the doors

Here is the button at the end of the journey

You will find the instructions for building these at the www.zone01.ca site.

## 11. Round procedure

## Junior - White

You will have to displace 3 red balls off their base.

- The 3 balls are placed at predetermined positions (see plans) by the judge.
- The participants position their robot in the starting area, which measures 1 foot long. (The robot can exceed in both width and height but not in length)
- The judge will activate the robot barriers placed on the playing surface.
- When the judge gives the signal, the participants start their robot.
- The robot moves along the beam and displaces the red balls from their bases according to the code explained previously.
- ATTENTION! The blue balls should not be touched; otherwise, there will be a penalty!
- Arriving at the barriers, the robot must avoid touching the barrier. The barrier gates open and close every 5 seconds.

- The robot must press the button at the end of the journey in order to complete and validate the course.

Attention! The robot must travel along the beam without falling. In the event of a fall, the team will receive a penalty from the judge. The team can however resume the challenge from the beginning. The time will continue to roll for a maximum of 5 minutes.

## Junior - Black

You will have to displace 3 red balls off their base.

- The 3 balls are placed at predetermined positions (see plans) by the judge.
- The participants position their robot in the starting area, which measures 1 foot long. (The robot can exceed in both width and height but not in length)
- The judge will activate the robot barriers placed on the playing surface.
- When the judge gives the signal, the participants start their robot.
- The robot moves along the beam and displaces the red balls from their bases according to the code explained previously.
- ATTENTION! The blue balls should not be touched; otherwise, there will be a penalty!
- Arriving at the barriers, the robot must avoid touching the barrier. The barrier gates open and close every 5 seconds.
- The robot must press the button at the end of the journey in order to complete and validate the course.

Attention! The robot must travel along the beam without falling. In the event of a fall, the team will receive a penalty from the judge. The team can however resume the challenge from the beginning. The time will continue to roll for a maximum of 4 minutes.

## Senior - White

You will have to displace two red balls off their base and place one red ball on its base.

- The 2 balls are placed at PREDETERMINED positions (see plans) by the judge.
- The participants position their robot in the starting area, which measures 1 foot long.
- The judge will activate the robot barriers placed on the playing surface.
- When the judge gives the signal, the participants start their robot.
- The robot moves along the beam and displaces the red balls from their bases according to the code explained previously.
- The robot must then place a ball on one of two available bases (team's choice) on either side of the beam. ATTENTION! The blue ball on the outside bases must not fall.
- Arriving at the barriers, the robot must avoid touching the barrier. The barrier gates open and close every 5 seconds.
- The robot must press the button at the end of the journey in order to validate the halfway point of the course before continuing.
- The robot must then return to his point of departure to complete its journey (by avoiding the barrier doors and by not letting the placed balls fall off their bases)
- After the button is pressed, the barrier doors will open for 10 seconds and close for 2 seconds in order to help you!

Attention! The robot must travel along the beam without falling. In the event of a fall, the team will receive a penalty from the judge. The team can however

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resume the challenge from the beginning. The time will continue to roll for a maximum of 4 minutes.

## Senior Black

You will have to displace two red balls off their base and place one ball on its base.

- The position of the red ball is not known for base A, but it is located in either position 1 or in position 2. A blue ball is in the other position.
- The position of the red ball is not known for base B, but it is located in either position 3 or in position 4. A blue ball is in the other position.
- The participants position their robot in the starting area, which measures 1 foot long.
- The judge will activate the robot barriers placed on the playing surface.
- When the judge gives the signal, the participants start their robot.
- The robot moves along the beam and displaces the two red balls from their A and B bases.
- The robot must then place a ball on the AVAILABLE POSITION (EMPTY) OF BASE C. The bases are placed on either side of the beam.
- Arriving at the barriers, the robot must avoid touching the barrier. The barrier gates open and close every 5 seconds.
- The robot must press the button at the end of the journey in order to validate the halfway point of the course before continuing.
- The robot must then return to his point of departure to complete its journey (by avoiding the barrier doors and by not letting the placed balls fall off their bases) Attention! The barrier doors will now open for 10 seconds and close for 5 seconds in order to help you!

Attention! The robot must travel along the beam without falling. In the event of a fall, the team will receive a penalty from the judge. The team can however resume the challenge from the beginning. The time will continue to roll for a maximum of 4 minutes.

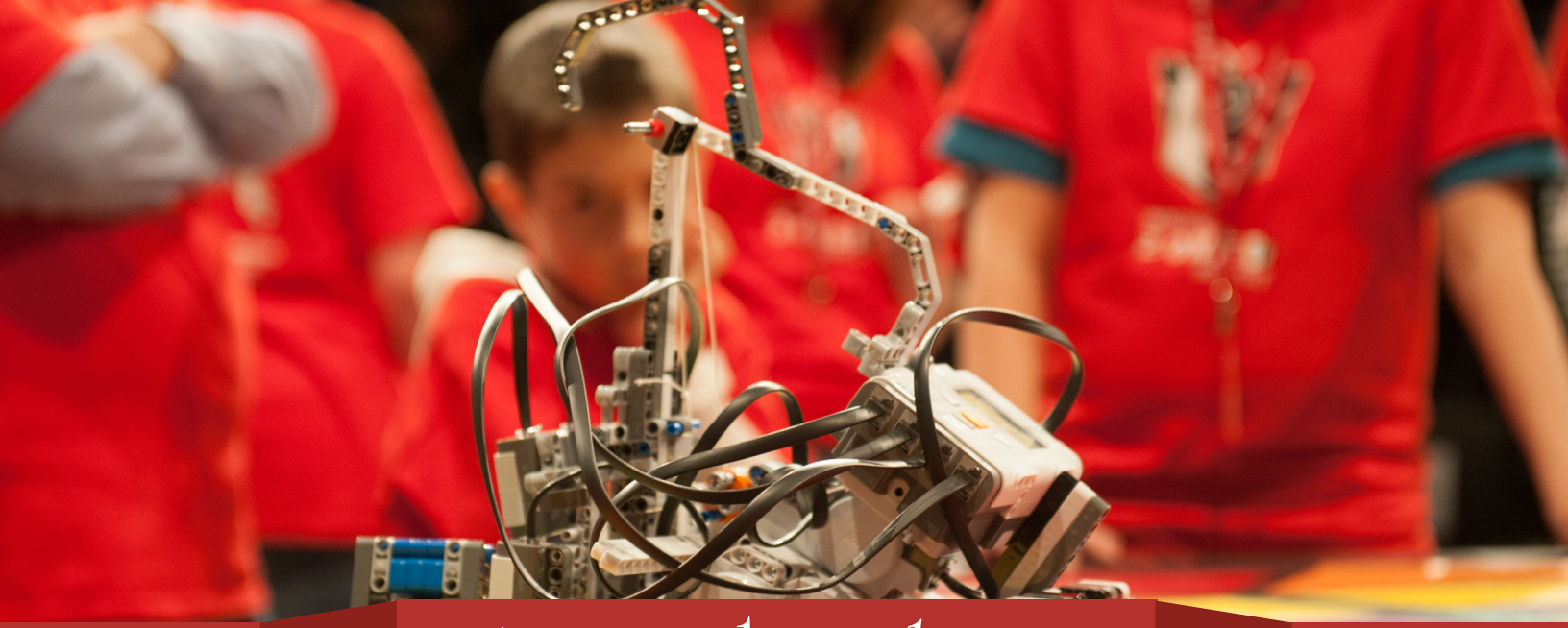
## White Level and Black Level of the challenge Junior

| White level | Black level |
|---|---|
| 100 points can be accumulated | 200 points can be accumulated |

## Sénior

| White level | Black level |
|---|---|
| 100 points can be accumulated | 300 points can be accumulated |

## Pointage Junior



# Clown Acrobots Challenge

JUNIOR categorie

Building ✪✪

Programming ✪✪

Strategy ✪✪

## Setting the scene

The circus is an entertaining world of athletes and acrobats who practice their talents to produce exciting routines. These acrobats are experts in balance, coordination, dance and agility. Are you ready to start the acrobot party? Let's go!

## Concepts covered (elementary)

### Primaire

Cartesian plane
Measuring distance
Circumference
Angles

## General function of the robot

A team has to design a choreographed dance with one or two robots. Certain criteria must be met. The robots must demonstrate agility, rhythm (pacing to follow the music), energy (power/drive), balance and flexibility. The robots must perform its movements to the beat of a song (music).

## Description of the robot

The robots participating in the acrobot rhythm challenge must not exceed the following limits (closed or extended):
length: 30 cm
height: 50 cm
width: 30 cm

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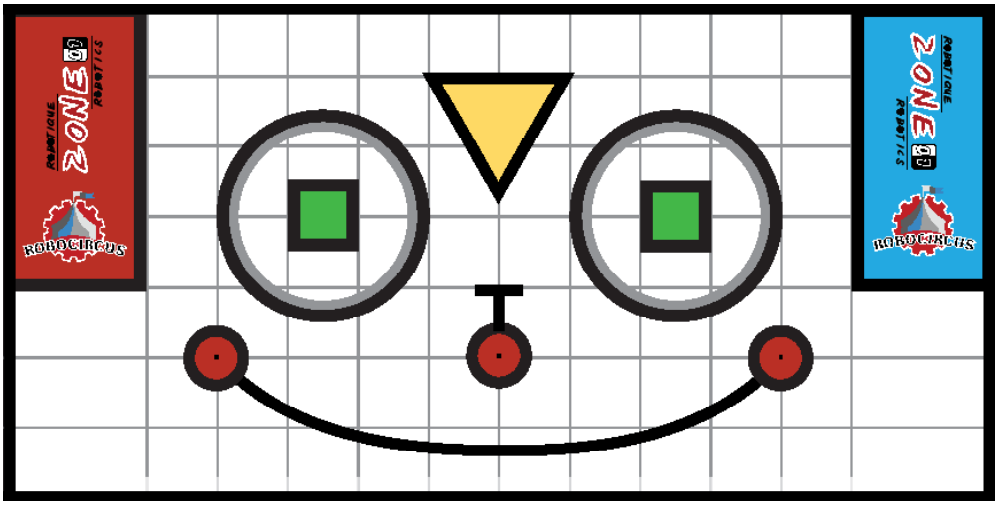
The robots should have an articulated (jointed) arm to greet, make a gesture, move a ball or pick up a ball. Be creative! This robot arm can be a coordinated or combined effort with its robot partner. The arm when extended must be within the limits described above. Each robot must have a touch sensor.

## Description of the playing field (surface)

The playing field (surface) of this challenge is 8 feet x 8 feet or 2 mats of 4 feet x 8 feet.

The playing field (surface) will include various forms (outlines, contours) in order to help the robot move and find its way through the routine. It will be possible to detect lines, colors, and to use balls.

## Playing field (surface) to scale



## Other elements necessary for this challenge

THE BALLS
The balls used are the ones included in the Lego Mindstorms NXT education kit. They are placed on a 2x2 LEGO brick within the red circles. The robot can pick up, hit, or move the balls to earn points.

THE HOOPS
The hoops are placed on the green square of the playing field (surface). The building instructions will be available on the Zone 01 website (www.zone01.ca).

THE MUSIC
You can use the music that Zone 01 will make available on their website, www.zone01.ca as of September 30, 2013. You can also provide your own original composition (music). The music provided by Zone 01 comes in three parts:

| | | |
|---|---|---|
| 1st part | 40 seconds | 120 bpm * |
| 2nd part | 40 seconds | 90 bpm * |
| 3rd part | 40 seconds | 120 bpm * |

*bpm: beats per minute

### Robot accepted

**NXT-EV3 marked separately**

### Tip and trick

Did you know that the new gyro sensor of LEGO Education Mindstorms EV3 could be well used in this challenge?

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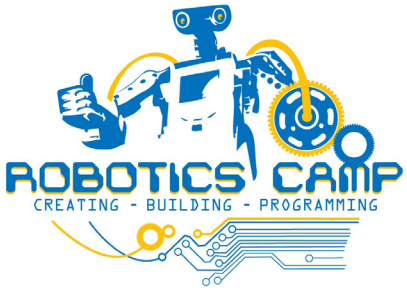


Thanks for helping Zone01 providing great robotic challenges!

# WHITE and BLACK level of the challenge

| White level | Black level |
|---|---|
| Dance to the music | Dance to the music |
| Using one robot per team | Using two robots per team. |
| Capable of making geometric shapes | Capable of making geometric shapes |
| | Synchronization between the two robots |
| | Use of accessories built with LEGO |

## Executing one routine at the WHITE LEVEL

At DEPARTURE, the following actions (points) must be done in order:

- Depart from the starting area on the side of the garden.
- The robot is directed towards one of the red points (circles) to perform an action with the available ball at that location (striking the ball, picking up the ball, raising the ball, etc.)

The following actions (points) must be made, but they can be done in any order:

- Make TWO circles, one clockwise and the other counterclockwise. There are circles on the playing field (surface) to guide you, however, you are not obliged to use them.
- Make a triangle. There is a triangle on the playing field (surface) to guide you, however, you are not obliged to use it.
- Ensure that an action is performed with the two other balls available on the playing field (surface).
- Pick up the 2 hoops that are placed on the squares
- Synchronize the robot to the beat of the music as music as possible

At the end of the routine, the following actions (points) must be done in order:

- COMPLETELY finish in the final area (Blue Zone)
- Perform a final move (salute, gesture) in the final area (Blue Zone)
- The routine made by the robot must be within the maximum allotted time of 120 seconds. Once your routine is complete, you can dazzle us with some new moves!

## Executing one routine at the BLACK LEVEL

At DEPARTURE, the following actions (points) must be done in order:

- Both robots must depart from different scenes (areas) of the playing field (surface); one robot from the courtside and the other robot from the side of the garden.
- Both robots MOVE AT THE SAME TIME and are directed towards two different red points (circles) to perform an action with the available balls at that location (striking the ball, picking up the ball, raising the ball, etc.)

The following actions (points) must be made, but they can be done in any order:

- The robots move toward each other and when they come into contact, their touch sensor is activated. Then, the robots move in opposite directions.
- Make a triangle.
- Ensure that an action is performed with the remaining ball that is available on the playing field (surface).
- Both robots make circles in opposite directions
- Both robots make circles parallel with one another in the same direction

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- Both robots move parallel with one another while making an arm movement simultaneously.
- Pick up the 2 hoops that are placed on the squares
- Use an accessory built with Lego and made by the team (hoops, ribbon, etc.)
- Synchronize the robot to the beat of the music

At the end of the routine, the following actions (points) must be done in order:

- Each of the robots COMPLETELY finishes the challenge in each other's departure area.
- Perform a final move (salute, gesture) in their final area (zone)
- The routine made by the robot must be within the maximum allotted time of 120 seconds. Once your routine is complete, you can dazzle us with some new moves!

## WHITE LEVEL Points (100 pts)

| | |
|---|---|
| Rhythm | 10 |
| Respecting the time limit | 5 |
| -Originality of dance | 10 |
| -Originality of the robot | 10 |
| -Utilizing the first ball | 5 - 3 - 0 |
| -Utilizing the two other balls | 5 - 3 - 0 |
| -Picking up the hoops | 10 - 5- 0 |
| - Making clockwise circle | 10 - 5 - 0 |
| - Making counter-clockwise circle | 10 - 5 - 0 |
| - Making a triangle | 10 - 5 - 0 |
| - Finishing in the right area (zone) | 5 |
| - Performing a final move | 10 - 5 - 0 |

## BLACK LEVEL Points (150 pts)

| | |
|---|---|
| Rhythm | 10 |
| Respecting the time limit | 5 |
| - Originality of dance | 10 |
| - Originality of the robots | 10 |
| Synchronization of the robots | 15 |
| Robots advance toward each other before contact | 10 |
| Robots move in opposite directions after contact | 5 |
| Robots move in parallel with arm movement simultaneously | 10 |
| Robots advance and make contact | 10 |
| - Utilizing the first two balls | 5 - 3 - 0 |
| - Utilizing the remaining ball | 5 - 3 - 0 |
| - Picking up the hoops | 10 - 5- 0 |
| - Making two circles in the opposite direction | 10 - 5 - 0 |
| - Making two circles in the same direction | 10 - 5 - 0 |
| - Making a triangle | 10 - 5 - 0 |
| - Finishing in the right area (zone) | 5 |
| - Performing a final move | 10 - 5 - 0 |

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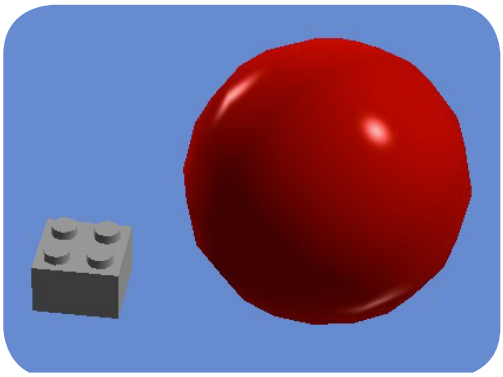
( 29/10/13 )

2 loops to build, building instructions on www.zone01.ca



3 balles et 3 support à balles