# Exhibition Rules for Robot Balance Beam

# (college exhibition performance)

## General Rules

1. The rules of exhibition at WORLD ROBOT OLYMPIAD 2008 are constituted by the WORLD ROBOT OLYMPIAD committee and are only applicable during this exhibition.

2. Qualification for participation and team composition

   1. Qualification of participation

      Contestant must be a college student who was born between January 1 1988 and December 31 1989.12.31.

   2. Team composition

      A team consists of 1 coach and 2 or 3 contestants.

3. Material:

   1. Except for specific designations in exhibition rules, material that teams use to assemble their robots, including controller, must be from LEGO® MINDSTORMS™ RCX or LEGO® MINDSTORMS™ Education NXT sets. A team using materials that are not approved by the committee will be considered disqualified at that match.
   2. Teams should prepare and bring all the equipment, software and portable computers they need during the exhibition.
   3. Teams should bring enough spare parts. Even in the case of any accidents or equipment malfunction, the committee is not responsible for their maintenance or replacement. Coaches are not allowed to enter the court for any instructions or guidance during exhibition.
   4. Robots are not allowed to use screws, glues or tape to fasten any components, non-compliance with these rules will result in disqualification.
   5. The motor and sensor that can be used are supplied by LEGO, as shown in Figure 1. The third-party product is not acceptable. Teams are not allowed to modify any original parts (for example: RCX, NXT, motor, and sensors, etc). A robot made with modified parts will be disqualified at that match.

4. Regulation about robot:

   1. Amounts of motors, sensors and controllers (RCX or NXT) used during the exhibition are not restricted.
   2. Programming languages and interfaces during this exhibition are not restricted.
   3. Except for special designations in exhibition rules, any actions or movements by the participants are not allowed to interfere or assist team's robot while it is functioning. Teams that violate this rule will be disqualified at that match.

4. A robot must be autonomous and finish the missions by itself. Any radio communication, remote control and wired control systems are not allowed while the robot is running. Teams in violation of this rule will be disqualified and must quit the exhibition immediately.
5. If robot is equipped with NXT as a controller, the Bluetooth function must be switched off.

5. Exhibition
    1. Each team run and show performance once.

6. Court
    1. Team must assemble their robot in an area designated by the exhibition (each team has its own area). Other people are not allowed to enter the exhibition area except contestants, WRO organizing committee staff and special personnel.
    2. The standard of all models and courts are according to what are provided by the exhibition on the exhibition day.

7. Prohibited matter
    1. Destruction of exhibition courts, model or robots of other teams
    2. Use of dangerous items or behaviors that may cause interference
    3. Inappropriate words and/or behavior toward other teams, audience, judges and staff
    4. Any other situation judges might consider as interference or violation of the spirit of the exhibition

8. The judges have final authority during the exhibition. Their decisions will not and cannot be changed. Even if judges review the exhibition video, they may not change their decisions.

9. The team point won't change even if Contestants have any statement after signing the point sheet.

10. If a team is considered disqualified by any judges, robot of that team should quit that match immediately, and receives no score at that match.

11. The committee has the right to revoke a team's qualification if that team violates any rules.

12. Any communication devices and methods are strictly prohibited while the exhibition is in process. Anyone outside the exhibition area is also banned from talking to or communicating with contestants. Teams violating this rule will be considered as disqualified and should quit the exhibition immediately. If communication is necessary, the committee may allow team members to communicate with others under supervision by exhibition staff.

13. If the exhibition is delayed due to unavailability of courts/models or incapability to determine scores, judges may hold a return match, and contestants will not raise objections. If contestants believe that the courts or models affect their score, they can address their opinions and request a rematch on the spot. Judges then will decide whether to hold a return match. Any opinions after the rematch

will not be accepted. If a rematch is held, the score of the rematch will be the final; no matter if the robot finishes the match or not.

14. If teams have any opinions or doubts, they must address them to the judges on the spot. The judges then make a decision on the validity of these opinions or doubts. Any opinions addressed after the match will not be accepted once contestants leave the court. If there is any disagreement or misunderstanding of the rules, the final decision will be made by the judges.

15. If there is anything not covered by the rules, the final decision will be announced by the judges at the exhibition. The judges have the utmost authority to explain and enforce the rules

WRO2008 Eligible motor and sensor for regular

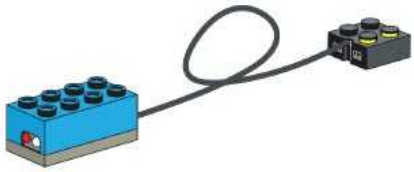
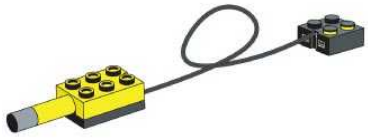
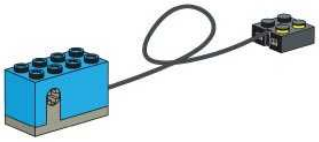
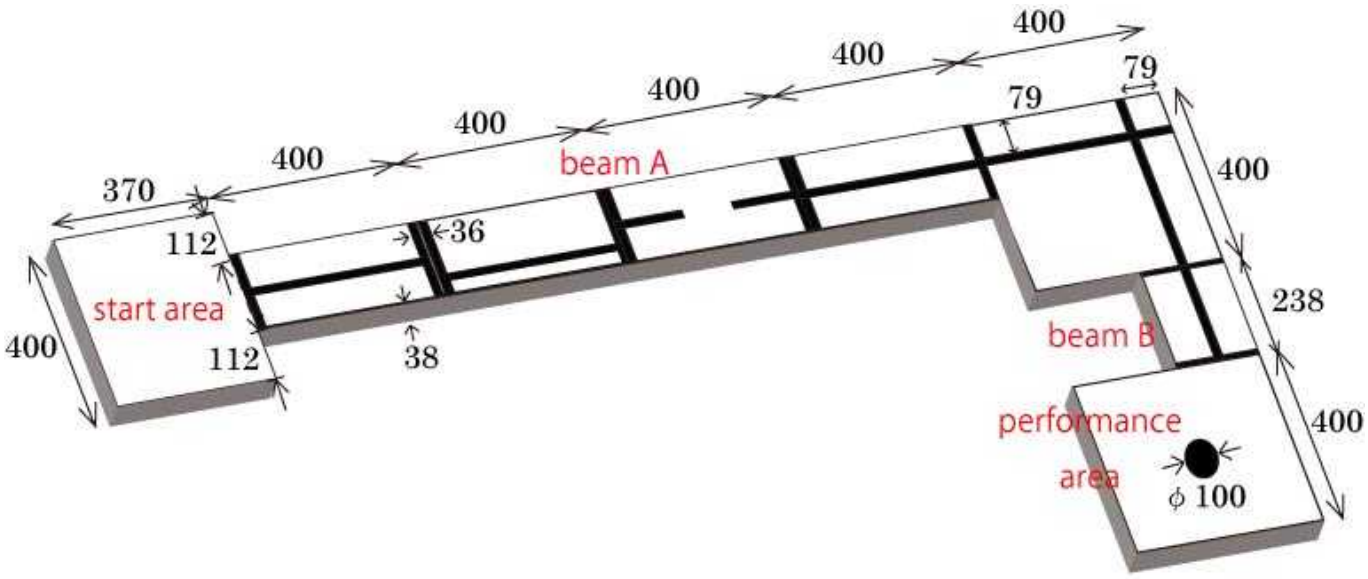
| | | |
|---|---|---|
| 5225 |  | LEGO TECHNIC GEAR MOTOR |
| 9758 |  | Light Sensor |
| 9889 |  | TEMPERATURE SENSOR (9V) |
| 9891 |  | ANGLE SENSOR (9V) |
| 9911 |  | TOUCH SENSOR AND LEADS |
| 9842 |  | Motor with Tacho |
| 9843 |  | Touch Sensor |
| 9844 |  | Light Sensor |
| 9845 |  | SOUND SENSOR |
| 9846 |  | Ultra Sonic Sensor |

Fig.1 Usable sensors

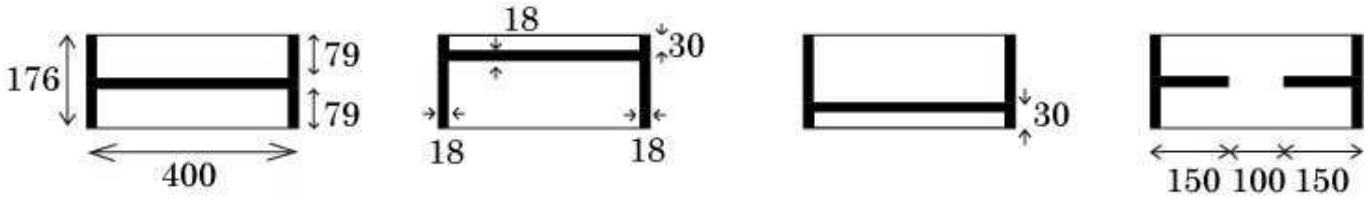
# Robot Balance Beam (college exhibition performance)

Robot goes to the performance area, passing on the balance beam, and performs the compulsory performances in performance area.

1. Court:




1) The court would be 2370mm long, 1150mm wide and 38mm high. (The court will be white.) The black line will be 18mm wide.
2) The start area is 370mm long and 400mm wide.
3) The turn area and the performance area are 400mm long and 400mm wide. A crossing line will be drawn on the turn area. On the center of the performance area, a black circle will be marked, which has a diameter of 100mm. The performance area will be the finish area for getting the mission and time points.
4) The length of the balance beam A will be 1600mm long and the one of the balance team B, 238mm long. The width of both beams will be 176mm wide.
5) The balance beam A will consist of 4 sections and be combined with several components, which dimension will be 400mm long and 176mm wide.
6) Components: a central straight line, a straight line of the right side, a straight line of the left side, and a central dashed line. Sequences of these components will be announced on the morning of November 1st.



2. Rules:

1) A match will be 3 minutes, 2 minutes for the balance beam mission and 1 minute for the performance mission time. The time for a match can be extended to 5 minutes for the performance mission time when a robot can't arrive at the performance area within 2 minutes.

2) Robots must start from the start area. Any part of the robot is not allowed to exceed the start area before it starts.

3) Robot can touch only the top of the court during the match.

4) If a robot touches a floor, the robot cannot continue the match.

5) In the performance area, robot will show the compulsory performances in one minute.

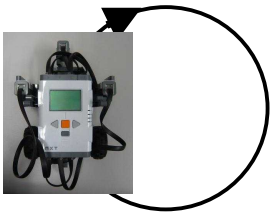
6) Robot must last a compulsory performance for over 5 seconds and after that it must keep stopping for over 5 seconds.

7) Robot must play a sound to tell a performance starts to the judge whenever the robot starts a compulsory performance.

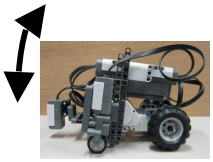
8) Compulsory performances have three types of actions: Spinning action, Shaking action, and Turning action. A point of each performance is different due to the difficulty of the action. Three actions are shown in the following figures.

Compulsory performances

1. Spinning action: Robot spines clockwise or counterclockwise.



2. Shaking action: Robot shakes his front or back vertically.



3. Turning action: Robot turns like the numeral 8.

9) Robot must do the compulsory performances so clearly that the judge can recognize. While robot is showing a performance, it must do the same action more than twice.

10) The combination of the compulsory performance is not restricted, but the obtained point can change up to the combination.

11) The performance will last for 1 minute. But if robot can't arrive at the performance area within 4 minutes, the performance time will be limited to the left seconds that is subtracted the time needed for the balance beam from 300 seconds.

eg. If robot takes 250 seconds to get the performance area, it's performance time will be 50 seconds. (=300 - 250)

3. Scoring:

There will be “mission points”, “time points”, and “performance point”. A team point is the total of these points.

1) Mission points:

1. Passing each balance beam section: 10 points * 5
2. Passing the turn section: 20 points

2) Time points

Robot will get time points when the robot arrives at the performance area as follows:

Time points = 120 (seconds) – mission times.

There is no time point when it takes over 120 seconds.

3) Performance points

1. The spinning performance: 10 points
2. The shaking performance: 20 points
3. The turning performance: 30 points

When a robot can do the same performance a few times, the performance point is given as following table.

Table. The performance point.

| Performance \ Times | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| The spinning performance | 10 | 5 | 3 | 2 | 1 |
| The shaking performance | 20 | 10 | 5 | 3 | 2 |
| The turning performance | 30 | 15 | 8 | 4 | 2 |

If a robot is unable to finish the match, or time runs out, then the team will get the mission points which it attained at that point.

EX1:

Robot started from start area, passing the balance beam and arrived the performance area for 90.5 seconds. Then the robot did the shaking performance twice and the turning performance three times.

Mission points = balance beam point (10 points * 5) + turn point (20 points) = 70 points.

Time points = 120 - 90.5 = 29.5 points.

Performance points = shaking point (20 + 10 points) + turning point (30 + 15 + 8 points) = 83 points.

Team point = 70 + 29.5 + 83 = 182.5 points.

EX2:

Robot started from start area, passing the balance beam and arrived the performance area for 90.5 seconds. Then the robot did the shaking performance twice, but it fell into the floor during the second shake.

Mission points = balance beam point (10 points * 5) + turn point (20 points) = 70 points.

Time points = 120 - 90.5 = 29.5 points.

Performance points = shaking point (20 points) = 20 points.

Team point = 70 + 29.5 + 20 = 119.5 points.

EX3:

Robot started from start area, but fell into the floor at the turn area.

Mission points = balance beam point (10 points * 4) = 40 points.

Time points = 0 point.

Performance points = 0 points.

Team point = 40 + 0 + 0 = 40 points.