

1.2.2. Class Specifications

- A. The robot must be automatic.
- B. The ball is a standard 2" LEGO Duplo ball as found in the MindStorms robot set.
- C. The 10 pins are constructed from LEGO parts and arranged as shown in the diagrams below.
- D. The pins are constructed from a 6 long technic axle, a LEGO pulley, and two 2x2 round bricks as shown below. They are arranged with a front-back spacing of 4 LEGO units and a sideways spacing of 6 LEGO units as shown below (but they will NOT be placed on a LEGO base plate).



1.3. Game

1.3.1. Time of the Game

- A. Three minutes per round, total 2 round.

1.3.2. Start of the Game

- B. There are 30 minutes for debugging. Before debugging, the starting area and starting direction (forward direction of the robot head) of robots is announced. Apart from the positive forward direction of the pin, the other three directions can also be the initial forward direction.
- C. Before the referee blows the whistle, the contestant can put the robot within the starting frame of the first competition channel, while ensuring the vertical projection of the robot to fall within the 20cm*20cm frame. After the referee blows the whistle, 1 player can load the ball, the robot is started to automatically serve the ball.
- D. The contestant responsible for setting the ball should load the ball after the whistle blows.
- E. The robot must get started within the starting area and should not exceed the frame of the starting area before starting. Every contestant can only load one ball.

1.4. Scoring

- A. Scoring is the same as regular ten-pin bowling, except only 5 frames will be played in 1 round. In each frame, the robot has two chances to knock down as many pins as possible with the ball. One point is awarded for each pin knocked down. If all ten pins are knocked down with the first ball, a strike is awarded and the next two balls will count double. Or if all 10 pins are knocked down with two balls, a spare is awarded and the next one ball will count double. If all 10 pins are knocked down in the final frame, three balls are allowed in that frame.

B. After the robot starts, it should enter the launch area A area to finish the launch task to obtain corresponding scores. If the robot fails to enter the the launch area A area, the scores obtained will be invalid and the situation will be judged as a violation of rules on the current competition channel. If the robot's tire touches or exceeds the black line of the launch area A area when serving the ball or striking the ball in the launch area A area, the situation will also be regarded as a violation of rules, the scores of this strike will be invalid, and the game is over on the current competition channel. When launching a ball in the launching area, the vertical projection of the robot can not exceed two black lines in the launching area, the scores of this strike will be invalid, and the game is over on the current competition channel. If only the second serve on this competition channel is judged to violate the game rules, the scores of the first also is 0.

C. After the robot launches the first ball in the launch area A area, it should automatically return to the starting area. When the robot's tire touches on any black line within the starting area, the contestant can take up the robot, and the second ball can be set. Or the contestant can take up the robot and enter the second competition channel. (The contestant is allowed to give up launching the second ball.) If the robot cannot automatically return to the launch area A area or the contestant touches the robot before the robot's tire touches the black line within the starting frame, the situation will be judged as a violation of the game rules, the scores of the current competition channel will be zero, and the contestant can enter the next competition channel.

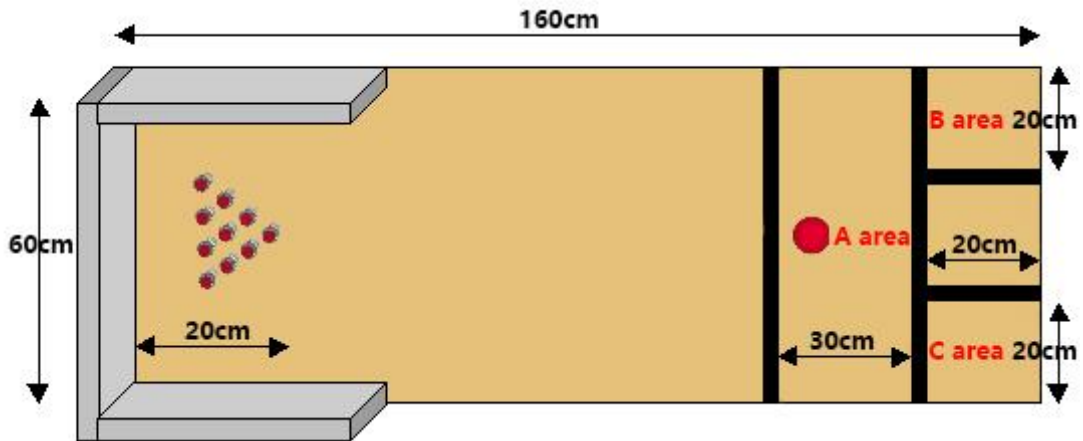
D. During the process of competition, if the ball hits any of the two walls to rebound and hit the pin, the situation is regarded as a violation of rules. If the ball directly hits the pin through rebounding, the game scores of this round are recorded as zero. (If the first ball of this game has valid scores, but the second ball hits the ball net to cause rebounding, the game scores of this round will still be zero.) The contestant can directly enter the competition of the next round. If the ball hits the ball net on two sides to cause rebounding but does not hit the pin, this game can be continued.

2. Robot Bowling - Senior Rule

2.1 General Requirements

2.1.1 Field Dimensions

- A. The alley is 160cm long x 60cm wide.
- B. The robot launch area A area is 30cm long x 60cm wide.
- C. Robot starting area B/C is 20cm long x 20cm wide. B or C may be the starting area of the robot. Published before the start of the game.
- D. As shown in the figure. Linewidth of three black lines is 1.5 cm-2 cm.
- E. 10 LEGO pins are arranged in a triangle about 20cm from the far end of the alley.
- F. The surface is smooth hardboard.



2.2. Requirements for Robots

2.2.1. General Robot Specifications

A. Robot Dimensions: 20cm l x 20cm w. The robot components are allowed to stretch, but the maximum size of the robot after stretching should not exceed 30cm*30cm.

B. There is no restriction on robot equipment.

2.2.2. Class Specifications

A. The robot must automatic.

B. The ball is a standard 2" LEGO Duplo ball as found in the MindStorms robot set.

C. The 10 pins are constructed from LEGO parts and arranged as shown the the diagrams below.

D. The pins are constructed from a 6 long technic axle, a LEGO pulley, and two 2x2 round bricks as shown below. They are arranged with a front-back spacing of 4 LEGO units and a sideways spacing of 6 LEGO units as shown below (but they will NOT be placed on a LEGO base plate).



2.3. Game

2.3.1. Time of the Game

A. Three minutes per round, total 2 round.

2.3.2. Start of the Game

B. There are 30 minutes for debugging. Before debugging, the starting area and starting direction (forward direction of the robot head) of robots is announced. Apart from the positive forward direction of the pin, the other three directions can also be the initial forward direction.

C. Before the referee blows the whistle, the contestant can put the robot within

the starting frame of the first competition channel, while ensuring the vertical projection of the robot to fall within the 20cm*20cm frame. After the referee blows the whistle, 1 player can load the ball, the robot is started to automatically serve the ball.

D. The contestant responsible for setting the ball should load the ball after the whistle blows.

E. The robot must get started within the starting area and should not exceed the frame of the starting area before starting. Every contestant can only load one ball.

2.4. Scoring

A. Scoring is the same as regular ten-pin bowling, except only 5 frames will be played in 1 round. In each frame, the robot has two chances to knock down as many pins as possible with the ball. One point is awarded for each pin knocked down. If all ten pins are knocked down with the first ball, a strike is awarded and the next two balls will count double. Or if all 10 pins are knocked down with two balls, a spare is awarded and the next one ball will count double. If all 10 pins are knocked down in the final frame, three balls are allowed in that frame.

B. After the robot starts, it should enter the launch area A area to finish the launch task to obtain corresponding scores. If the robot fails to enter the launch area A area, the scores obtained will be invalid and the situation will be judged as a violation of rules on the current competition channel. If the robot's tire touches or exceeds the black line of the launch area A area when serving the ball or striking the ball in the launch area A area, the situation will also be regarded as a violation of rules, the scores of this strike will be invalid, and the game is over on the current competition channel. When launching a ball in the launching area, the vertical projection of the robot can not exceed two black lines in the launching area, the scores of this strike will be invalid, and the game is over on the current competition channel. If only the second serve on this competition channel is judged to violate the game rules, the scores of the first also is 0.

C. After the robot launches the first ball in the launch area A area, it should automatically return to the starting area. When the robot's tire touches on any black line within the starting area, the contestant can take up the robot, and the second ball can be set. Or the contestant can take up the robot and enter the second competition channel. (The contestant is allowed to give up launching the second ball.) If the robot cannot automatically return to the launch area A area or the contestant touches the robot before the robot's tire touches the black line within the starting frame, the situation will be judged as a violation of the game rules, the scores of the current competition channel will be zero, and the contestant can enter the next competition channel.

D. During the process of competition, if the ball hits any of the two walls to rebound and hit the pin, the situation is regarded as a violation of rules. If the ball directly hits the pin through rebounding, the game scores of this round are recorded as zero. (If the first ball of this game has valid scores, but the second



ball hits the ball net to cause rebounding, the game scores of this round will still be zero.) The contestant can directly enter the competition of the next round. If the ball hits the ball net on two sides to cause rebounding but does not hit the pin, this game can be continued.

3. Notices

A. If the robot serves the ball not in the strike area, it will be regarded as a violation of rules, and the scores for this round will be zero, and the contestant can directly take the robot to enter the next competition channel. (Failure to enter the strike area: The robot's tire should be maintained between two black lines of the strike area. When the robot strikes the ball but the tire touches the black line, it will also be regarded as a violation of game rules.)

B. If the ball accidentally drops onto the competition channel before the robot starts from the starting area, the situation is not deemed as a violation of rules, but the robot should automatically return to the starting area before the next ball is loaded to continue to finish the task on this competition channel.

C. After the robot finishes striking one ball, it should return to the starting area. If the contestant takes up the robot before the robot touches the black-line frame of the starting area, the situation is regarded as against game rules, and the scores of the current round will be zero. The robot will have to enter the next competition channel.

D. The bottom of the competition channel has no black lines or retaining wall. If the robot falls into the competition platform, the scores of the current round will be zero, and the robot will have to enter the next competition channel.

E. The sum of the two rounds is the final score. If the final score are the same, if the final score is the same, the team with more time remaining wins.

4. Declaring Objections

4.1. Declaring Objections

A. No objections shall be declared against the judges' decisions.

B. The lead person of a team can present objections to the Committee, before the match is over, if there are any doubts in the exercising of these rules. If there are no Committee members present, the objection can be presented to the judge before the match is over.

5. Flexibility of Rules

As long as the concept and fundamentals of the rules are observed, these rules shall be flexible enough to encompass the changes in the number of players and of the contents of matches. Modifications or abolition of the rules can be made by the local event organizers as long as they are published prior to the event, and are consistently maintained throughout the event.

6. Liability

 **RobotChallenge – Robot Bowling Rules**

- A. Participating teams are always responsible for the safety of their robots and are liable for any accidents caused by their team members or their robots.
- B. The RobotChallenge organization and the organizing team members will never be held responsible nor liable for any incidents and / or accidents caused by participating teams or their equipment.