



**ROBOT CHALLENGE**

**Egypt 2022**

**BOWLING**

**Competition**



# Robot Challenge

## Bowling Rules

This Category divides into three sections all of them open robots ( using any type of robot) :

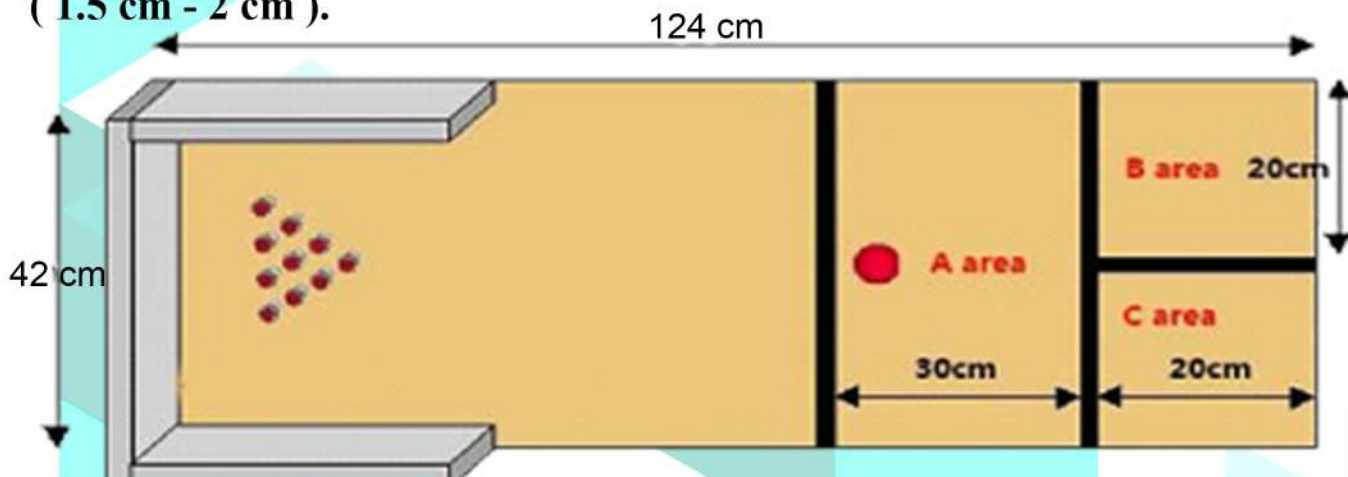
- 1- Junior ( Ages from 9 to 14 years old )
- 2- Senior ( Ages from 14 to 18 years old )
- 3- Adults ( Ages from 18 years old )

### Short Description:

Making an autonomous robot that can play a bowling game with certain rules to score as many points as it can.

### Junior Category - Field Dimensions:

- A- The alley of bowling is 124 cm long x 42 cm wide.
- B- The robot launch area ( A ) area is 30 cm long x 42 cm wide
- C- B or C may be the starting area of the robot  
( Published before the start of each Frame ).
- D- As shown in the figure, the Line width of three black lines is in range  
( 1.5 cm - 2 cm ).



- E- 10 LEGO pins are arranged in an equilateral triangle about 15 cm side length and 15 cm away from the back side of the field.
- F- The surface is smooth hardboard and the inner side of the field is covered with sponge to reduce the rebound of served balls.
- G- The 10 pins are constructed from LEGO parts and arranged as shown.
- H- The ball is a standard 2" LEGO Duplo ball as found in EV3 MindStorm Core robot set.
- I- The pins are constructed from a 6 long technic axle, a LEGO pulley, and two 2 x 2 round Bricks as shown in the figure.





## Robot Bowling - Senior and Adults Rules Field Dimensions:

**A-** The alley of bowling is 164 cm long x 64cm wide.

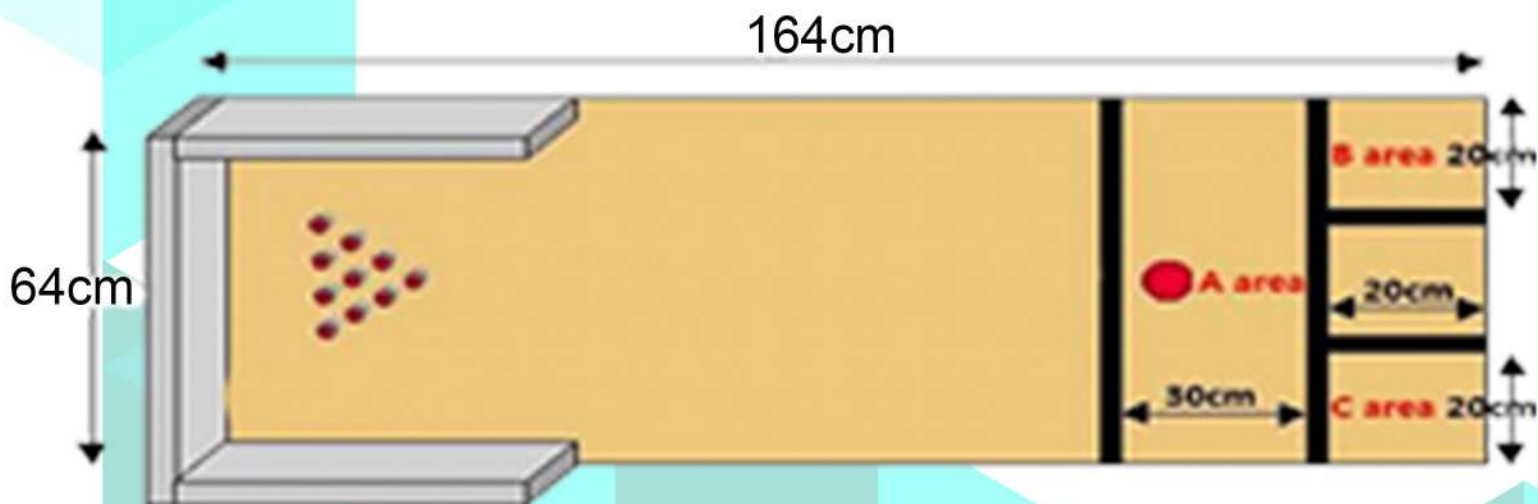
**B -**The robot launch area A area is 30 cm long x 60 cm wide.

**C -** Robot starting area B/C is 20 cm long x 20 cm wide.

**Note :** B or C may be the starting area of the robot.

( Published before the start of the game ).

**D -** As shown in the figure, the Line width of three black lines is in range ( 1.5 cm - 2 cm ).



**E-** 10 LEGO pins are arranged in an equilateral triangle about 15 cm side length and 15 cm away from the back side of the field.

**F-** The surface is smooth hardboard and the inner side of the field is covered with sponge to reduce the rebound of served balls

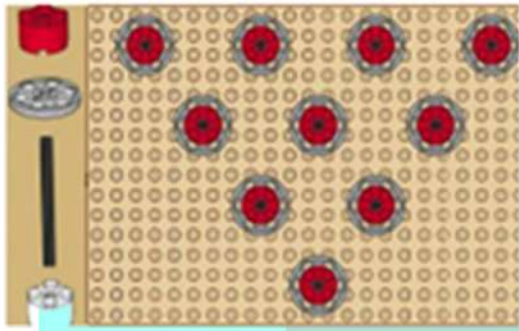
**G-** The 10 pins are constructed from LEGO parts and arranged as shown.

**H-** The ball is a standard 2" LEGO Duplo ball as found in EV3 MindStorm Core robot set.

**I-** The pins are constructed from a 6 long technic axle, a LEGO pulley, and two 2 x 2 round Bricks as shown in the figure.







### **Game Specifications:**

- 1- The total time for each round is 3 minutes. 1 Round consists of 5 Frames each frame has 2 shots to knock down the pins.
- 2- The total number of rounds and qualification system announced before the competition
- 3- The robot must be autonomous.

### **Robot Dimensions:**

The dimension of the robot are ( 20 cm L x 20 cm w ) maximum , with no restriction for the height, the robot components are allowed to stretch, but the maximum size of the robot after stretching should not exceed 30 cm L\*30 cm W, with no restriction for the height.

### **Start of the Game:**

**“ Robots must pass inspection prior to compete “**

- A- There will be calibration once at the beginning of the competition.
- B- Before each Frame , the starting area ( B or C ) and the front direction of the robot is determined according to the decision of the referee.
- C- Before the referee blows the whistle, the contestant can ensuring the vertical projection of the robot to be within the starting area ( B or C ).
- D- one player can load one ball only and the robot is started to automatically serve the ball from area ( A ) .
- E- At the second shot , the contestant must set the robot in the same starting area and at the same direction as it was in the first ball serving
- F- The robot must get started within the starting area ( B or C ) and can expands only in Launching area ( A ).





## scoring:

Frame No.		1		2		3		4		5		
1 <sup>st</sup> ball scoring	2 <sup>nd</sup> ball scoring	X1	Y1									
Total scoring of the frame (TSF)		TSF 1 = X1+Y1		TSF 2 = (X2+Y2)+TSF1						TSF 5 = (X5+Y5)+TSF4		

- 1-  $X_n$  is the score of the first ball in Frame  $n$ , where  $n$  is (1.,2,3,4,5)
- 2-  $Y_n$  is the score of the Second ball in Frame  $n$ , where  $n$  is (1.,2,3,4,5)
- 3- AS shown in the figure the total score of frame number ( $n$ ) which is (TSF  $n$ ) is added to the total score of the next frame which is (TSF  $n+1$ )
- 4- Therefore, the total score of the final frame (5<sup>th</sup> Frame) will be the final score of the Round
- 5- The 5<sup>th</sup> Frame has 3 balls to serve if the robot knocked down all ten pins by the 1<sup>st</sup> ball it will serve the 2<sup>nd</sup> and the 3<sup>rd</sup> ball and also if the robot knocked down the all ten pins by the 1<sup>st</sup> and the 2<sup>nd</sup> balls it will serve the 3<sup>rd</sup> one. But if the robot didn't knock down the all ten pins either by the 1<sup>st</sup> or by the 1<sup>st</sup> and 2<sup>nd</sup> balls it can't serve the 3<sup>rd</sup> ball.
- 6- The stop watch starts with the referee whistle and ends after 3 minutes or after the robot completes the 5<sup>th</sup> Frames .
- 7- The time is paused after each frame and continued with the start of the next frame.
- 8- The time taken by the robot to finish the round is scored in the scoring sheet.

## Special Cases for Scoring:

- 1 . If all ten pins knocked down by the first ball of the frame :  
( is called a Strike) There will be no second ball for this frame and the total score of the frame (TSF) (which is 10 points until now) will be pended until the next frame is played and the total score of this frame will be added to the previous (TSF) in which the robot made a STRIKE. AS Shown:

Frame 1		Frame 2	
10	—	3	4
10+7=17		17+7=24	





### Special Cases for Scoring:

**2 .** If all ten pins knocked down by the two balls (1st and 2nd balls) of the frame : ( is called a Spare) For example : in the 1st Frame the score of the 1st ball (X1) is 4 points and the score of 2nd ball (Y1) is 6 points then a spare is rewarded and the score of the 1st frame (which is 10 points until now) will be pended until the 1st ball of the next Frame is played (Which is X2) and score of X2 will be added to the (TSF 1) in which the spare was awarded.As shown:

Frame 1		Frame 2	
7	3	3	4
10+3=13		13+7=20	

### Notes:

- 1- If any part of robot exceeds the black line of the launch area A area while Serving the ball from the launch area A , the score of this ball will be zero. and the knocked down pins by fault remains knocked.
- 2- During serving of the ball , if the ball hits any of the two walls to rebound and hit the pin, The score of this ball is recorded as zero. and the knocked down pins by fault remains knocked.
- 3- After the robot launches each ball from the launch area A, it must return back to the starting area.
- 4- If the robot exceeds any black line within the starting areas when it returns back, the contestant can take up the robot, and the second ball can be set.
- 5- The sum of the frames is the final score.
- 6- If the final score of two teams are the same, the team with more time remaining wins.

For Further Questions:

Technical Support : 01022758877

Good Luck.

