

Robot ZONE [01]

Race Challenge

Formula [Kart]



Crédit photo : Photo by [Marcelo Souza](#) on [Unsplash](#)

Scenario :

Welcome to the brand new Formula [Kart] of Zone01! This breath of fresh air will bring new tracks using Zone01's exclusive X-Line.

You must now design a kart for your team to compete in the 2023 championship. Will you be up to the task?

Description of the robot

All of the following requirements must be met. An inspection will be performed on each car.

Platforms

The challenge is created for the LEGO Spike Prime platform. The LEGO Mindstorms Inventor platform is also allowed. A [basic building plan](#) is provided by Zone01. You can improve it!

Power source

Only the LEGO rechargeable battery or 4 AA alkaline batteries can power the Hub.

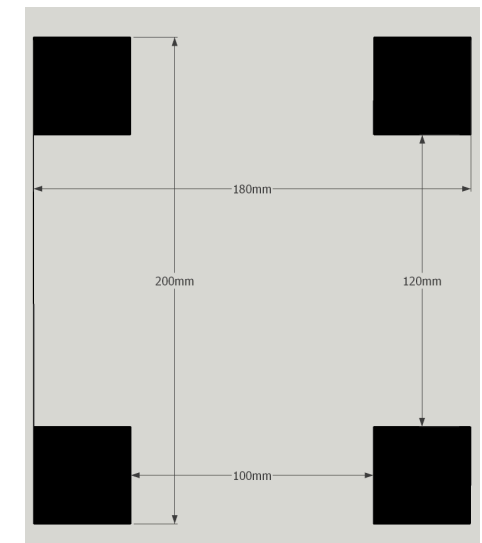
Dimensions :

The following dimensions must be respected:

- Max length : 30 cm
- Max width : 20 cm
- Max height : 15 cm

Wheel location

The front and rear wheels of your car must touch the ground in the black squares on the picture beside.



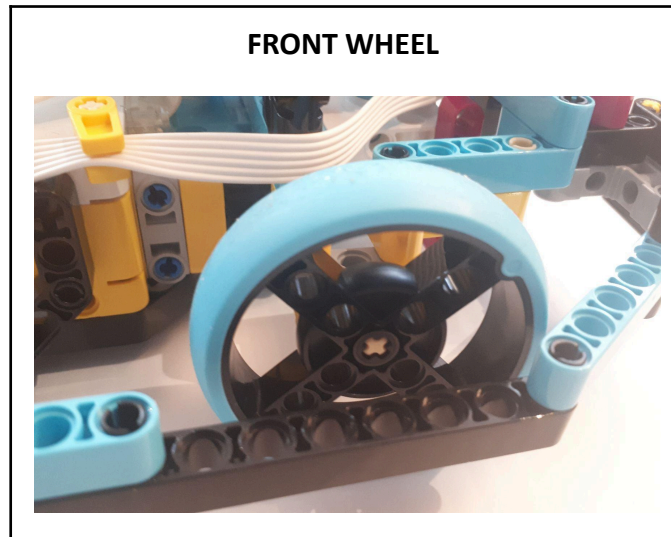
Motors

2 motors are located at the rear of the vehicle to propel each wheel. One motor is used to control the direction of the front wheels.

A 4th motor can be used if the team wishes to motorize its sensors.

Wheels and tires

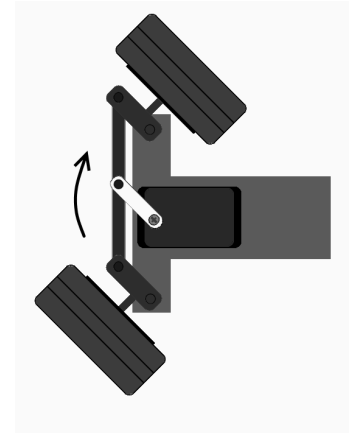
The wheels and tires of the car are form the Spike Prime kit [#39367c01](#)



Direction

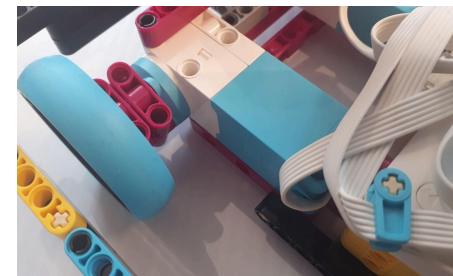
Unlike vehicles usually built with the Spike Prime kit, **your F-Kart must use directional front wheels**. The wheels each swivel to the left or right at the same time using a motor. Since the front wheels are touching the ground at all times, it is not possible to make a turn by simply varying the speed of one of the rear drive wheels.

The figure on the right shows an example of a valid direction.



Gearbox

The Kart model proposed by Zone01 does not use gear. The wheels are fixed directly to the motors. It is allowed to add gears, it is up to you to experiment! Automatic gearboxes are not allowed.



Bumpers

Your kart needs to have a bumper that goes all the way around the vehicle. This will prevent damage in case of a collision.

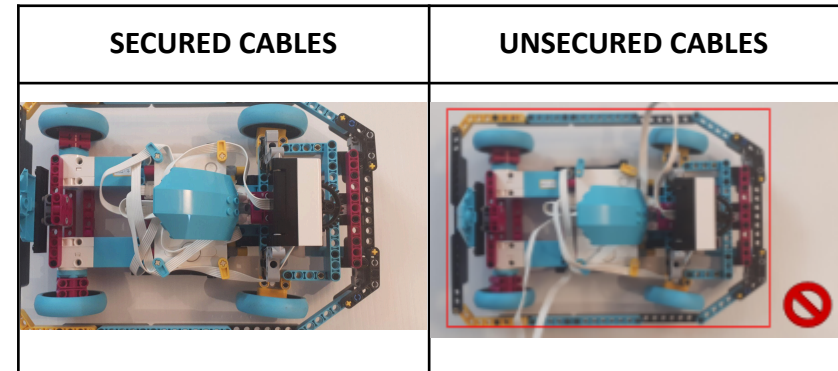
Sensors

Only the sensors available in the Spike Prime or Mindstorms Inventor kits may be used. One ultrasonic sensor must be used to detect the presence of a car in front. A second color sensor is recommended to better follow the racing line.

Cables

Cables should be secured to the car to prevent them from coming into contact with other cars.

An opposing car should not be able to get caught in the cables of your car. A car deemed unsafe will not be allowed on the track.



Inspection

On race day, cars will be inspected for compliance with the technical regulations. The car must be laid out on a printed sheet showing the permitted tire locations. All tires must touch only the black areas of the sheet. No other parts may touch the ground.

The car will then have to be able to pass through a frame on the length and width to validate that it respects the length, width and height requirements.

Race plan (sport rules)

Free practice

On the day of the competition, a free practice session will allow teams to find the right settings for the track and improve their times.

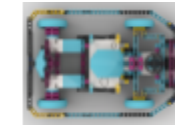
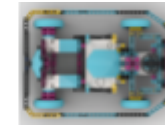
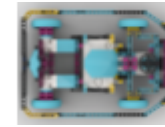
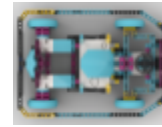
Qualifications

A qualifying session will allow each team to complete timed laps of the circuit. The best times will determine the starting grid.

Autonomous race start

This is a standing start race. This means that at the starting signal, the drivers will start the car by pressing the central button on the brick.

If a car starts before the starting signal, it will be considered as a false start. In case of a false start, the car at fault will be relegated to the back of the grid prior to a new start. A car making two false starts will be disqualified.



Overtakes

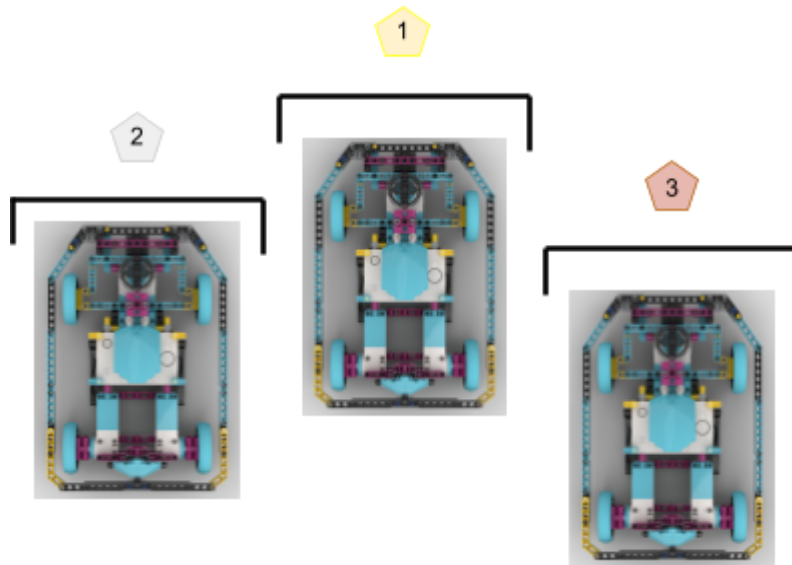
It is permitted to overtake an opponent as long as it is done without causing a collision. On the long straight, the lane will be doubled to allow overtaking.

The two lanes become one lane at the end of the straight. Race officials will decide which car is in front and show a stop sign to the car that must make way.

End of the autonomous race

The race ends when the first car completes the scheduled number of laps. The number of laps to be completed will be announced on the day of the race and will depend on the configuration of the track.

The other cars will finish their race when they cross the finish line, regardless of the number of laps completed. They will have a maximum of 1 minute to complete their lap after the winner has crossed the finish line.



Zone01 has produced this short tutorial on how to use the remote control. It will be added here soon.

*** Tutorial ***

Driving in remote control mode must be done from a fixed position.



Remote controlled race (optional)

The optional remote controlled race will start with a standing start with the same starting grid as the autonomous race.

The driver will be able to remotely control his car using a tablet or a compatible remote control, either the PlayStation Dualshock 4 or the Xbox Wireless Controller. These require the LEGO Mindstorms Inventor application and a firmware update to the Spike Prime brick.

Circuits and tracks :

Zone01 X-Line

The racing line is the *X-Line* exclusive to Zone01. It is made of a central black line of 4 cm wide and additional lighter lines placed on each side of the central line.



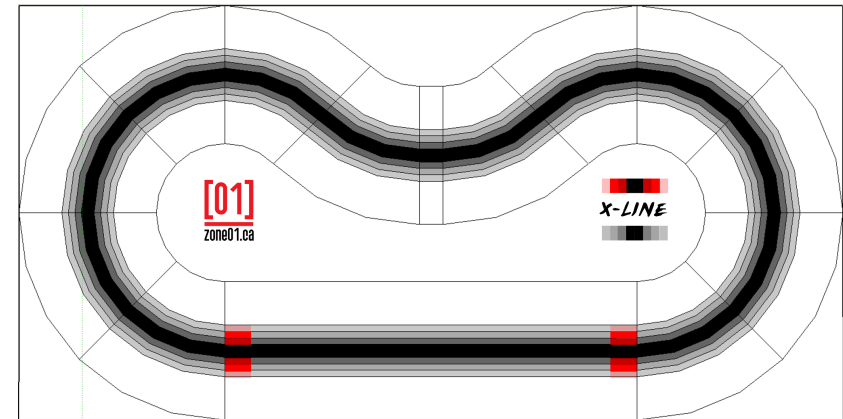
The line has been designed and studied especially for Zone01 races with LEGO sensors.

Practice track

A practice track is available as a play mat on the Zone01 website. It includes a series of turns and a straight line using the official *X-Line*. It is perfect to practice in class.

On the practice track, a red X-Line on a short distance announces the start and end of the straight.

[Link to Z01-Kart mat](#)



Track during the events

At each event, the track configuration could be different from the previous race. Each track will be a series of turns and straights. The official track will be longer than the practice track to allow multiple cars to run at the same time and will also use the *X-Line*.

On the long straight, a lane parallel to the main line will allow overtaking. The X-Line will be red on a short distance to announce the approach of a left or right passing lane.

Penalties

The car leaves the track and the intervention of a race officer is necessary	+5 seconds
Car causes a collision	+10 seconds

Suggested strategies

1. The car is able to detect the car in front of it and avoid a collision
2. The car is able to follow the line at low speed and to complete several laps without going off the track
3. (Advanced) The car is able to accelerate on straights and slow down on curves
4. (Advanced) The car can detect the passing line and change lanes safely
5. In remote control mode, drivers can drive the car from a fixed location

Frequently asked questions (FAQ)

As the season progresses, questions and clarifications are added to the challenge. Be sure to check out the FAQs below.