There and Back Again

"Three Rings for the Elven-kings under the sky,
Seven for the Dwarf-lords in their halls of stone,
Nine for Mortal Men doomed to die,
One for the Dark Lord on his dark throne
In the Land of Mordor where the Shadows lie.
One Ring to rule them all, One Ring to find them,
One Ring to bring them all and in the darkness bind them
In the Land of Mordor where the Shadows lie."

- Lord of the Rings, by J.R.R. Tolkien

**Warning:**
Some creative license has been taken with the story. We are sorry if you are offended :)

**Goal:**
Your goal is to help Bilbo the BOE-Bot get the one ring to Mount Doom, destroy it and return safely.

**Possible Approaches:**
Your guide, Smeagol, has suggested three possible paths:

1. Over the mountains of Ephel Dúath, via the steep stairs of Cirith Ungol.
2. Following a winding path that leads through Shelob’s lair.
3. Trudging through the barren wastes of Gorgoroth

There are, of course, many obstacles in the way.

**Mount Doom:**
When you arrive at Mount Doom, you will discover 3 different ways of putting the ring into the fires and destroying it. The easiest, but least desirable way is to roll it along the ground. There is a medium-level opening which is better, but the highest opening is surely the best way to destroy the ring.

**The One Ring:**
The ring, strangely enough, looks very much like a ping-pong ball at first glance. However, the astute among you will notice that it has a gold band around it.

**Kit of Parts**
- Bilbo the BOE-Bot + electronics kit
- 1 Servo motor
- Additional sensors (reflective IR sensors, distance sensors)
**Rules**

- Do not use anything that is alive.
- Do not use extra motors or power sources. Use only the motors and batteries provided in your kit.
- Devices which store energy are permitted provided that they do not start with any stored energy.
- Do not attach your robot to the ramp or field walls.
- Do not damage the course.
- You must return the BOEBot kit and servo motor in its original condition after the competition is finished.
- You may only touch the robot when it is in the start area.
- You may place the “ring” on the ground anywhere in the start area.
- The robot and ring must be separated by a minimum distance of 5 cm at the start.
- The robot must start on the ground, fully contained within the starting square.
- The robot has “reached the finish area” when one of its wheels has fully crossed into the finish area.
- The robot has “returned to the start area” when it has first reached the finish area, and then the entire robot has crossed back into the starting square.
- You may spend a maximum of $20 on additional materials for your robot.

**Field**

There will be other smaller, movable obstacles such as gravel on the field. The colouring is just for effect. The actual field is made from unpainted lumber. The line is black electrical tape (¼” wide).
2D CAD

See attached CAD drawings of:

- The field
- The bridge
- The goal

Scoring

You will have two attempts on the course. The best will count.

- 200 points for getting to the finish area
- 100 points getting back to the start area
- minus your time in seconds
- plus goal scored:
  - Lower goal: 10
  - Middle goal: 30
  - Upper goal: 60

In the event of a tie, one tie-breaker match will occur.

Competition Requirements

The final competition will be on December 16th

You will need:

- A team name;
- A presentation of your design process, any special features of your robot (mechanical or programming), what you have learned, and what you would do differently next time
- A robot ready to complete the challenge!

The Game Hints

1. The song, *Ring of Fire*, talks about the “one ring”.
2. Ponder the wisdom of Sam. SAMWISE Gamgee was a hobbit who started out on the quest to return the ring.
3. Photo of Zhang Jike, the champion *table tennis* player: we are using ping pong balls as game pieces
4. “This is the Fourth Game Hint” written in runes from *Lord of The Rings*
5. “The world is indeed full of peril and in it there are many dark places”-Quote from Tolkien. *Spider web* is indication of Shelob’s lair, one of the obstacles.
6. The fabrication of the *bridge*
8. Jason, playing the part of Gollum.