Design Challenge # 5 – Relay Race

Challenge: To work in a team of 6-8 members to design and build three different LEGO robots that can participate in a relay race and bring the puck to goal.

Rules:

- The first robot must start behind the starting line and at the center of the line, which is marked by black tape.
- The first robot retrieves a puck from inside a box (Box # 1) that is marked by white tape, brings the puck to the transfer point. The puck must cross the transfer point and stay within its boundaries (marked by a 12”-line of black tape) before the second robot can start the second leg of the race.
- The second robot must start out on the other side of the transfer point from the first robot, at any point along the marked 12”-line of black tape. This robot will have its own puck, bring the puck to Box # 2 (also marked by white tape) and drop it inside the box. The puck must stay completely inside Box # 2 before the third robot can start the third leg of the race.
- The third robot will start out right next to Box # 2 (closest wheel is within 4” of the box boundaries), orienting in any direction selected by the team. None of its components should cross the box boundary. This robot will also have its own puck. Its task is to bring the puck pass the goal line which is 6”-wide and marked by black tape.
- Robot can move the puck throughout the course using any method, as long as it has full control and possession of the puck. No kicking/throwing of the puck to the target is allowed.
- Team must make use of at least two different types of sensors (light, touch or ultrasonic) during the competition. Team will receive penalties for using fewer sensors.
- Team will receive bonus points if only one puck is used throughout the three legs of the race.

Competition:

- Decide if you want to use the brick post on either one of the white boxes. If so, you can choose to place the brick post anywhere around the white box.
- Decide if you want to strive for using only one puck throughout the three legs of the race.
- One team will compete at a time.
- Teams will compete in random order determined by the instructor.
- Your robots must be ready to go when called.
- Team will receive penalty when the next robot starts without previous robot completing its leg of the race.
- Team who completes all 3 legs of the race without violating any rules with the fastest time will win the competition.
**Grading:**

Your team performance score will be based on the following metric:

- **100 points** – Completed all 3 legs with the puck at goal in fastest time.
- **95 points** – Completed all 3 legs of the race correctly with the final puck at goal.
- **85 points** – Have all three robots in the race, but only completed 2 legs of the race.
- **75 points** – Have all three robots in the race, but only completed 1 leg of the race.
- **65 points** – Have all three robots built, entered the competition. Robots moved around but were unable to complete any leg of the race correctly.
- **55 points** – Have at least two robots built.

**Bonus:**

+ **5 points:** Used one single puck throughout all three legs of the race.

**Penalties:**

- **5 points:** Every time the next robot starts without previous robot completing its leg of the race.
- **5 points:** Used only one type of sensor in the race.
- **10 points:** Used no sensors in the race.
- **2 points:** Puck # 1 did not cross the transfer point completely.
- **2 points:** Puck # 2 did not go inside Box # 2 completely.
- **2 points:** Puck # 3 did not cross the goal line completely.