**Challenge: Tug-A-Bot**

In this challenge, you will design and build a Tug-A-Bot to compete in a game of tug-of-war. To complete the challenge, your robot must hold a rope for the duration of a match without breaking, move backwards when activated by a touch sensor, and stop movement when the touch sensor is pressed again. For full credit, you must win at least one match. To win a match, your robot must be the first to pull the “flag” over your side of a sheet of paper. The overall challenge winner will be determined in a round-robin style competition.

***Challenge Specifics:***

*Robot Configuration:*

* You may only use the parts in one kit to make your Tug-A-Bot. You may also use 2 of the large thin wheels, in addition to the parts in your kit.
* Tug-A-Bot may exceed 12” in any one dimension. The other dimensions must be 12” or shorter.
* A touch sensor must be mounted on the robot, in a location that will not touch the rope or interfere with the tug-of-war match in any way.
* The front-most part of your robot will consist of an attachment designed to securely hold one end of a rope (yarn).

*Attaching the Tug-of-War Rope:*

* A two-minute transition period will be provided at the start of each round for all robots to connect to one end of a rope, opposite their opponent. Students who are not ready at the end of this transition period will forfeit their match in that round.
* The rope can be connected to the attachment ONLY. It may not be directly connected to the brick or any other part of the robot.
* After connecting, the length of rope between the robots must be a minimum of 12-inches long.
* You can use any method to connect the rope to your robot’s attachment. A 20-inch total length of rope will be provided, and you can use up to 4-inches of one end to connect it to your robot.
* Students will place their connected robots on opposite sides of the short edge of a piece of paper with no slack in the rope. A flag will be placed on the rope, over the center of the paper.
* Following each match, robots will disconnect from the rope. Extra ropes will be available for future matches if ropes cannot be untied and need to be cut.

*Tug-Of-War Match:*

* Students will start their programs and a countdown will follow, after which the student will press the touch sensor once to start movement.
* The tug-of-war match will conclude when either the flag is pulled completely over one side of the paper, or one Tug-A-Bot is disabled. The robot that pulls the flag over its side first wins.
* If, after two minutes, there is no clear winner, the competition will be halted and students will press their touch sensor to stop the program. The Tug-A-Bot whose side of the paper the flag is on when time is called will be declared the winner of the match.

**Partner Names:**

**Dragster Name:**

**Tug-A-Bot: Grading**

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| **Criteria** | **Points Possible** | **Points Earned** |
| Engineering Journal with daily entries including initial sketch, at least 4 problems and their solutions, and detailed drawing of final design | 6 |  |
| Tug-A-Bot meets design specifications (found in “Robot Configuration”) | 2 |  |
| Tug-A-Bot moves backward when touch sensor is pressed once | 1 |  |
| Tug-A-Bot stops movement when touch sensor is pressed a second time | 1 |  |
| Attachment holds a rope through the duration of a tug-of-war match, without breaking | 2 |  |
| Win at least one match | 1 |  |
| *BONUS: 1st place +2, 2nd place +1* | *varies* |  |
| **TOTAL** | **13** |  |