

## Rubber Band Car Project Overview

**Goal:** Design, assemble, and operate a car that reaches the highest top speed on school floor tiles (not gym floor) and accurately predict the car's top speed and acceleration distance.

**Contest Scoring:**

1. Contest score = (Speed across the "finish line") - |Speed Prediction Error|
  - a. Example 1: You predict that it will reach a maximum speed of 4m/s, but actually reaches a speed of 5.5m/s. Your score is  $5.5 - 1.5 = 4$
  - b. Example 2: Predicted speed = 5m/s. Actual speed is 4m/s. Your score is  $4 - 1 = 3$

**Project Grading:**

- Participation (25%): designing a car, making the car, collecting data, participating in the contest.
- Slideshow (25%): Document your design process, data analysis, and results.
- Team Test (50%): As a group, you collect data on your car and use those data to perform calculations and predict its speed and acceleration distance. This score will be like a test, except that you can do corrections to get the points back. Your grade will be based on the correctness of your calculations, and the reasonableness of your data. After receiving initial feedback (initial grading), you will have one chance to fix your mistakes and resubmit for possible full credit.

**Car Design Restrictions and Clarifications:**

1. Allowed materials – cars will be constructed from the basic materials on the back of this sheet. Additional materials may be added as long as they can be removed so that the provided parts may be reused in good condition. Some carefully drilled holes (for screwed-on attachments) are okay.
2. Disallowed materials:
  - Glue on the provided materials (but attached items can have glue; they just can't be glued on)
  - Any material that significantly diminishes the reusability of the parts (because they will be used again next year).
  - Any additional item, other than basic material, that is used for its intended purpose (e.g. a Lego wheel being used as a wheel).
3. Energy and Propulsion Restrictions:
  - All of the car's energy must come from potential energy stored in stretched rubber bands that deliver their energy by applying tension to parts of the car (and *only* to parts of the car).
  - The car's sole means of propulsion must be the floor pushing it forward via friction (in response to at least one wheel pushing the floor backward with friction).
  - With the exception of the floor, ambient air, and the student releasing the car, everything that is touching the car at the starting line must travel together throughout the acceleration period (nothing may be left behind).
4. Open Division Rules/Exceptions:
  - Only the energy and propulsion restrictions apply (the "allowed materials" and "disallowed materials" rules do not apply).
  - Open division participants will only receive a prize if they receive the highest score in the open division and they receive a higher score than any car in the stock division.

## 5. Parts List (Stock Division Only)

- \*\*If you submit requests far enough in advance, I may be able to create new compatible parts (in addition to those below) that would be available to everyone.
- MDF frame materials (as short as 8" and as long as 23.5")
  - Two side panels (including one designed for a steering hub, if desired)
  - Cross braces (more for longer frames)
  - Front and rear end caps
- Two 5/16" steel axles, with a drilled hole for attaching a drive string
- Up to 8 skateboard bearings
- Four bearing hubs – including up to two steering hubs
- Four wheel hubs
- One each of:
  - Band stopper
  - Band harness
  - Release Pin Harness
  - Nail
- 80 pound monofilament fishing line
- No limit -- Standard Rubber bands for motor use
- Two large, wide, blue rubber bands for wheel traction
- Two small, wide, white rubber bands for wheel traction
- #6, 1/2" screws (for general use)
- #6, 5/8" screws (for steering hub adjustment)
- Any other materials that can be easily added to your car without compromising its ability of its parts to be reused (e.g. weights, extra snap-on or screw-on parts).