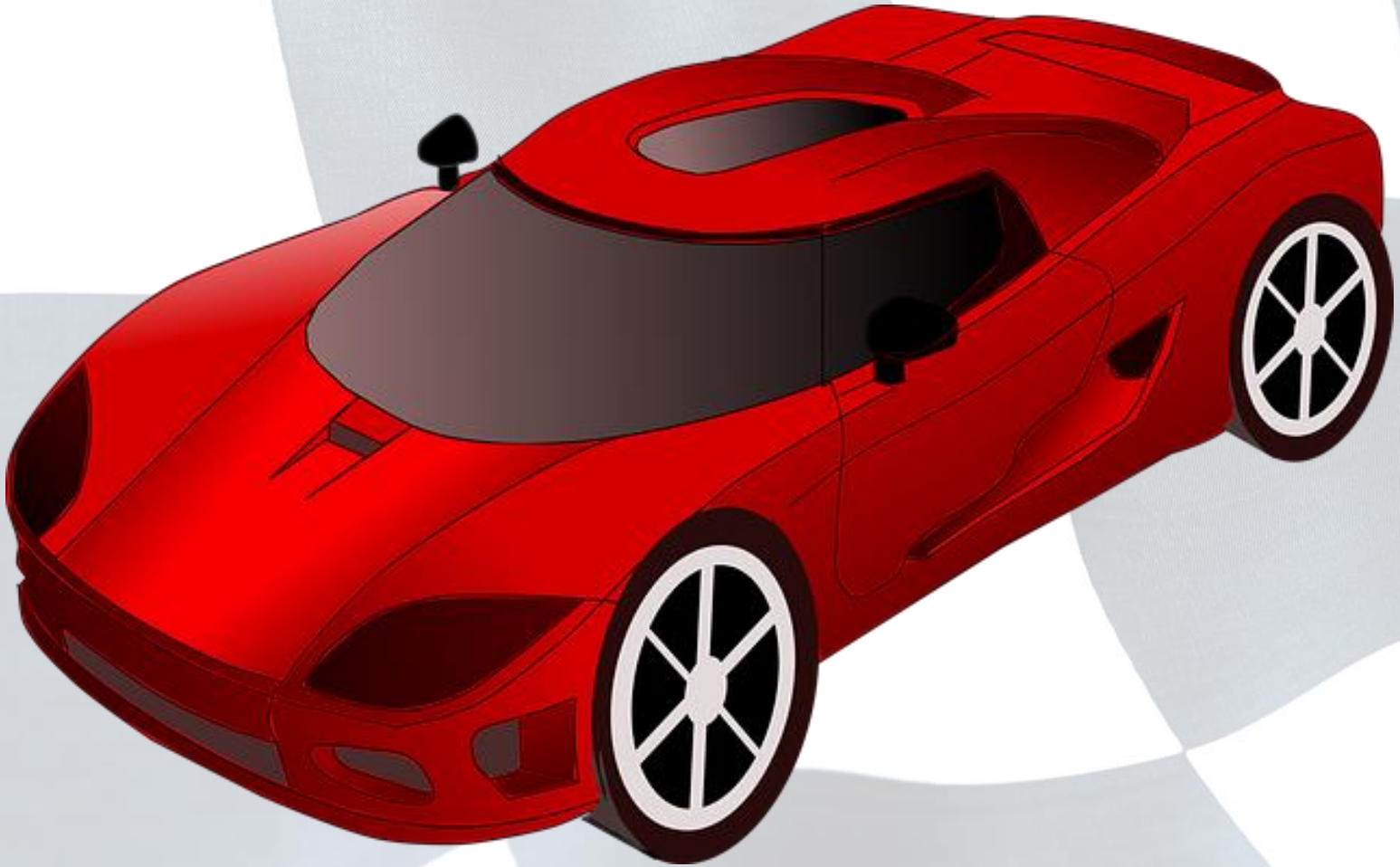
Weights & Shapes For the Win!



Riley Hillegass
Grade 4
Mrs. Edelman
St. Joseph - Garrett
Garrett, Indiana

PURPOSE

The purpose of my 2026 Science Fair Project was to determine what shape I should cut my Pinewood Derby car block into. I also wanted to determine if the placement of the weights impacted the car to be faster or slower. This information would guide my Dad and me as to where the weights should be placed in my car to increase its speed to have a faster car at the upcoming Cub Scouts Pinewood Derby.

HYPOTHESIS

My hypothesis for my project is that for the vehicles of equal weight, but different shapes, the vehicle I called “Streamline”, would be faster than “Bus” and “Griswold”.

For the cars with the same shape and equal weight distributed in different places on the car, I believe the car with the weight in the back (Car #1) will be the fastest.

MATERIALS

- Racetrack with:
  - 3 lanes
  - Starting mechanism
  - Finish line mechanism
- Three vehicles that are different shapes:
  - One with a flat front – “Bus”
  - One which is elevated in the middle – “Griswold”
  - One which has a steady increase in height from front to back but remains short in back – “Streamline”
- Three identical cars in shape and equal weights distributed:
  - In the front of the car
  - In the middle of the car
  - In the back of the car

- Pinewood Derby Weights
- Electrical Tape
- Silver Colored Permanent Marker
- Pinewood Derby Scale
- Paper
- Writing Tool

PROCEDURE

1. Weigh the 3 vehicles with different shapes.
2. Add weights to the vehicles as needed to ensure that they weigh the same with the only difference being their shape.
3. Identify the vehicles of different shapes as: “Bus”, “Griswold”, and “Streamline”.
4. Identify the identical cars as: “1”, “2”, “3”, on the bottom of each vehicle with the silver permanent marker.
5. Weigh the identical cars to ensure that they are the same weight before adding weights to the front/middle/back of the car.
6. Add equal weight to the top of the identical cars using equal 1-inch lengths of electrical tape.
    - Place weight on Car #1 on the back of the car above the back wheels.
    - Place weight on Car #2 in the middle of the car.
    - Place weight on Car #3 in the front of the car above the front wheels.
7. Reweigh all the vehicles/cars in each group to ensure they are identical in weight.

PROCEDURE

8. Vehicles/cars will be raced on the racetrack with 2 “heats” for the vehicles with different shapes and 2 “heats” for the cars with different weight placements. Each “heat” will include 3 races with each vehicle/car running one race in each lane.
9. Place the 3 vehicles with different shapes on the 3 tracks in the starting box.
10. Push the switch to release the vehicles to roll down the track.
11. Utilizing the finish line device, record which vehicle finished 1st, 2nd, and 3rd.
12. Move the vehicle from lane 1 to lane 2, from lane 2 to lane 3, and from lane 3 to lane 1 and repeat for a total of 6 races. (Each heat includes 3 races in different lanes.)
13. Repeat steps 9-12 utilizing the three identical shaped cars with identical weights placed in different locations on the car.
14. At completion of all heats/races, determine the overall winner of the different shaped vehicles and the overall winner of the identically shaped cars with different weight distribution by counting the number of times each car finished a race in 1st place.

RESULTS

The overall winner of the “Shapes” race was the vehicle identified as “Streamline”. It finished 1st in all 3 races of both heats. “Griswold” finished 2nd in all 3 races of both heats. The vehicle identified as “Bus” finished 3rd in all 3 races of both heats.

The overall winner of the “Weights” races was Car # 1 that had the weight distributed in the back of the car. It finished 1st in all 3 races of both heats. Car # 3 that had the weight distributed in the front of the car finished 2nd overall with 2nd place finishes in 4 of the 6 races and 3rd place finishes in 2 of the 6 races. Car # 2 with the weight distributed in the middle of the car finished 3rd overall with 2nd place finishes in 2 of the 6 races and 3rd place finishes in 4 of the 6 races.

CONCLUSION

In conclusion, I found that my hypothesis was correct for both the "Shapes" and "Weights" placement in toy vehicles. The shape of the vehicle and the distribution of weight did influence racing down a racetrack. I thought that the "Streamline" vehicle would be faster than the "Bus" and "Griswold" vehicle and that proved to be true. I proposed that the car with the weight placed on the back of the car above the rear wheels would be fastest and that was accurate too.

When I help my Dad cut out my Pinewood Derby car this year, we will make it short in the front and slowly increase in height. We will also place the weights in the rear of the Pinewood Derby car.

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