Does weight affect a car in a curve?

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Problem

I was thinking of buying a car. I live in a rainy city. I wanted to know whether a heavy car or a light car stays better on course while driving around curves.

Hypothesis

I think a heavy car will stay better on course on a wet street than a light car. I think this is because the light car's wheels do not have a lot of weight on the wet street.

Material

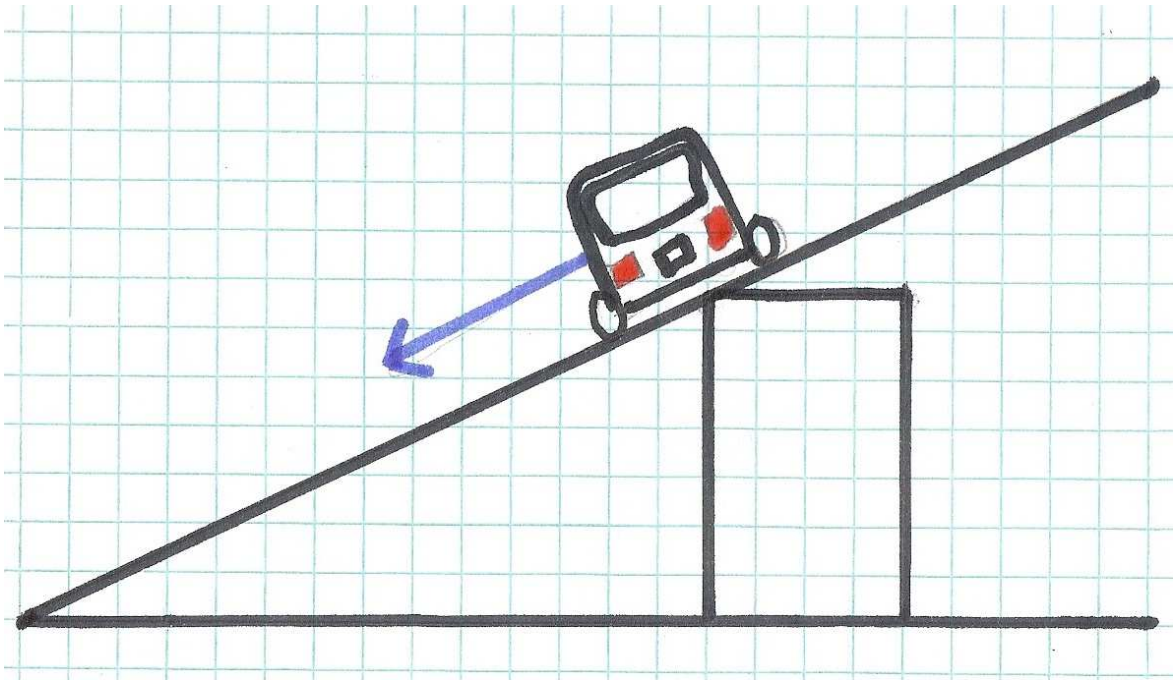
- 5 500 ml water bottles
- Fischer Technik
- 61 1/2 in by 17 5/8 in board
- measuring tape
- water
- string
- plastic table cloth
- rubber bands
- spray bottle
- a bucket
- two screw clamps
- board
- thread

Procedure

I performed three experiments.

Experiment 1

The first experiment was a simulation of a car in a turn.

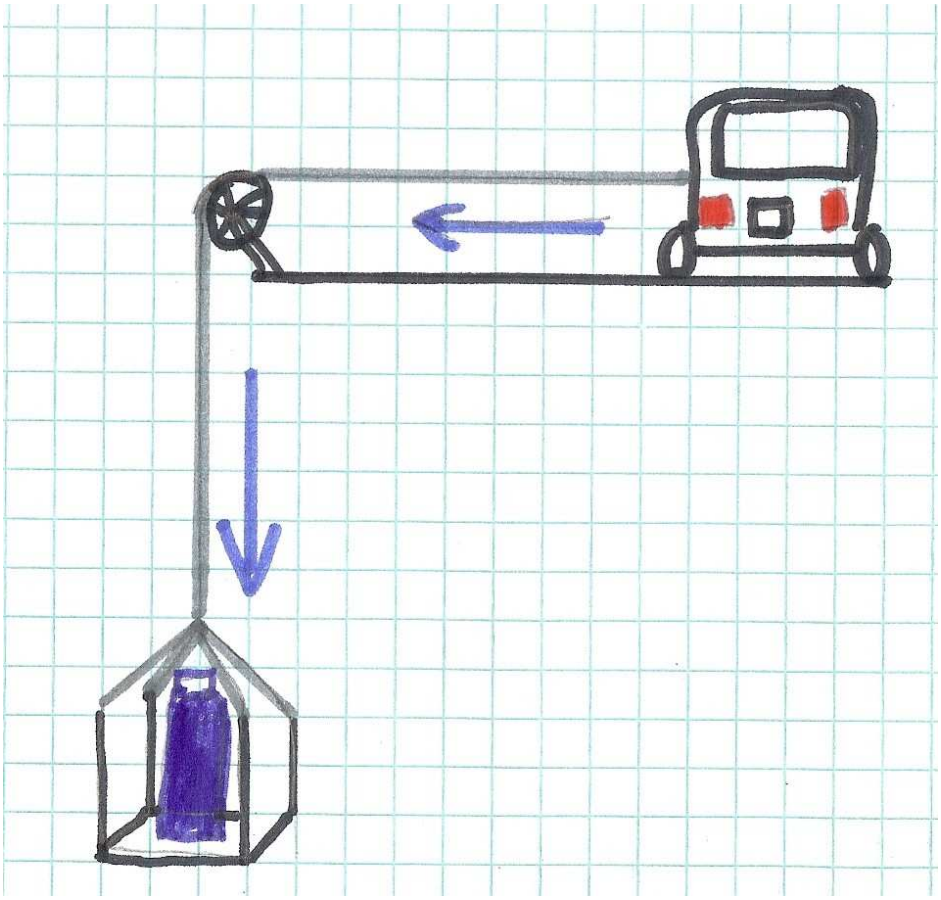


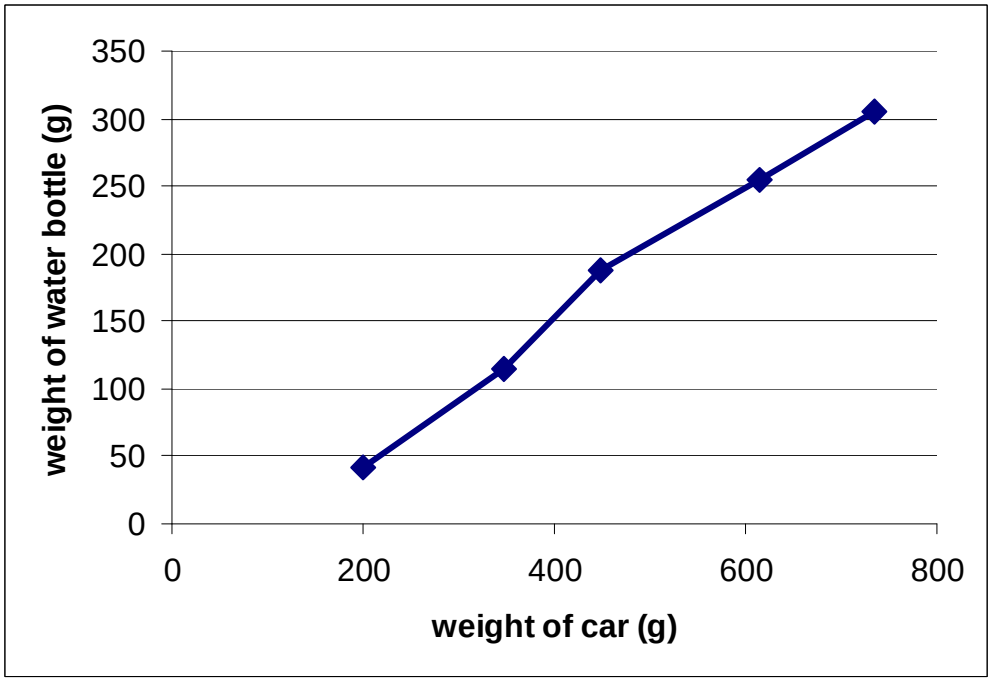
First I built a small car out of Fischer Technik. Then I went outside and placed one side of the board on the bucket, such that the board is tilted. Next I put the plastic table cloth on the board and sprayed water on it. Then I put a car on the board and made the board steeper. I then measured at what point the car would lose grip and slide down the wet tablecloth. In this experiment, a steeper board simulates a tighter turn.

weight of car (g)	angle of board (degrees)
200	27
348	27
448	27
614	27
734	27

Then I filled four bottles with different amounts of water. I attached one bottle at a time to the car using the rubber band to increase the weight of the car. I repeated the experiment with each water bottle.

Experiment 2



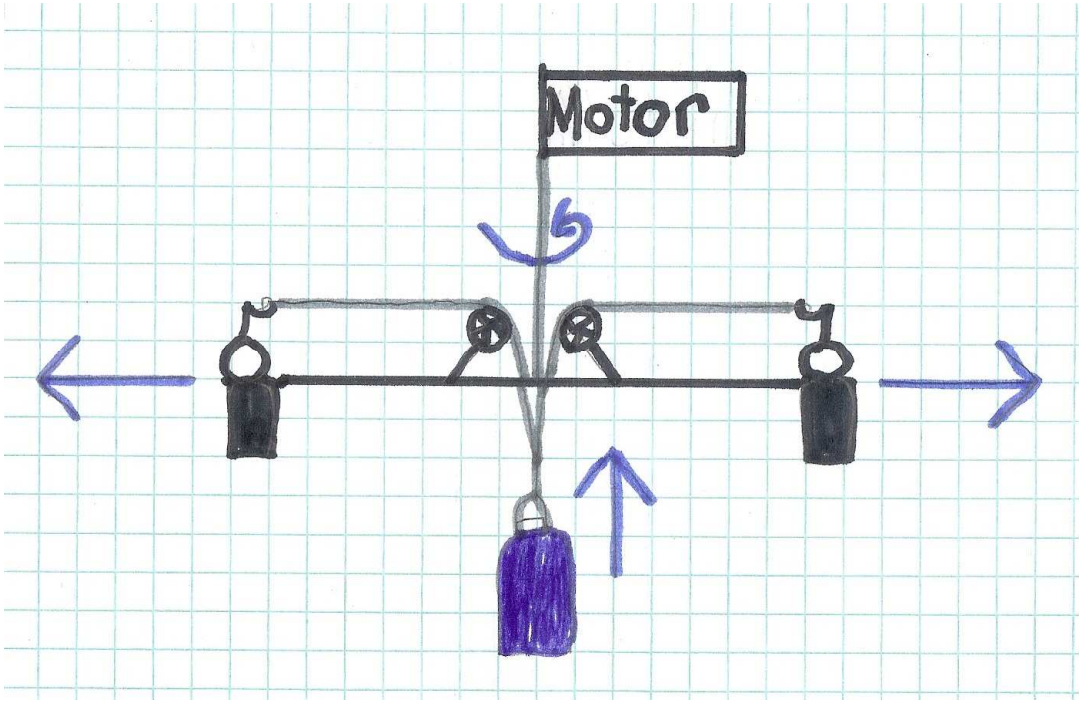


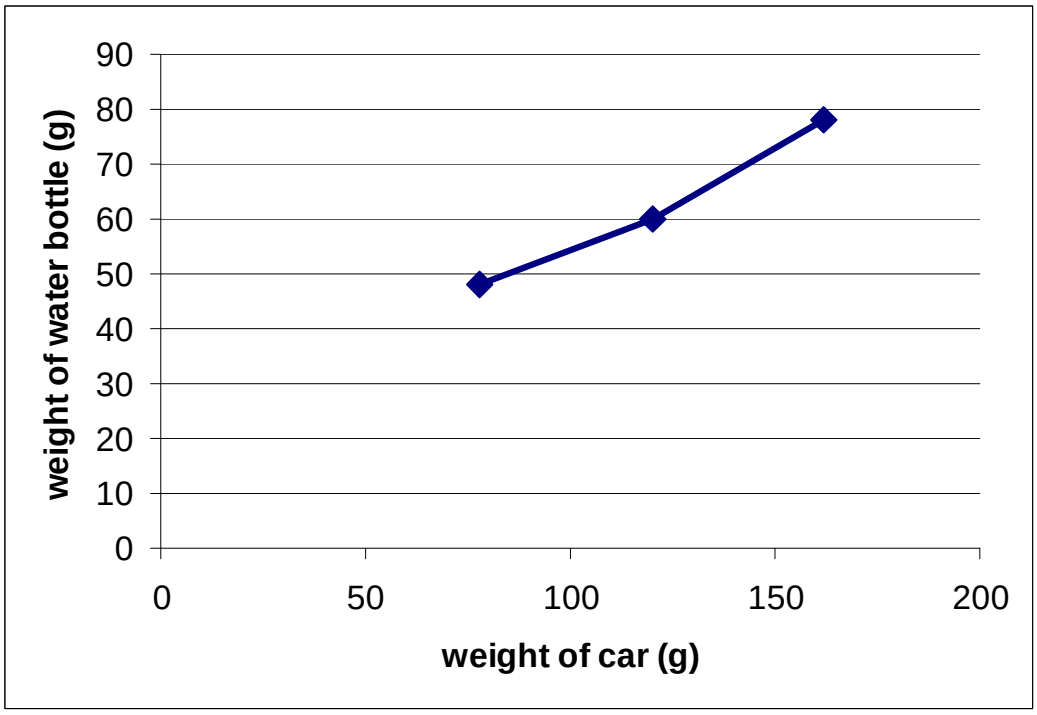
The second experiment I measured the friction force of the car.

First I built a platform and a wheel out of Fischer Technik. Then I connected the string to the car over the wheel and down to the platform. I used the fifth bottle as weight and put it on the platform. Then I filled the bottle with water until the car started to slide sideways. The heavier the platform with the weight the larger the friction force is.

weight of car (g)	weight of water bottle (g)
200	42
348	114
448	188
614	254
734	305

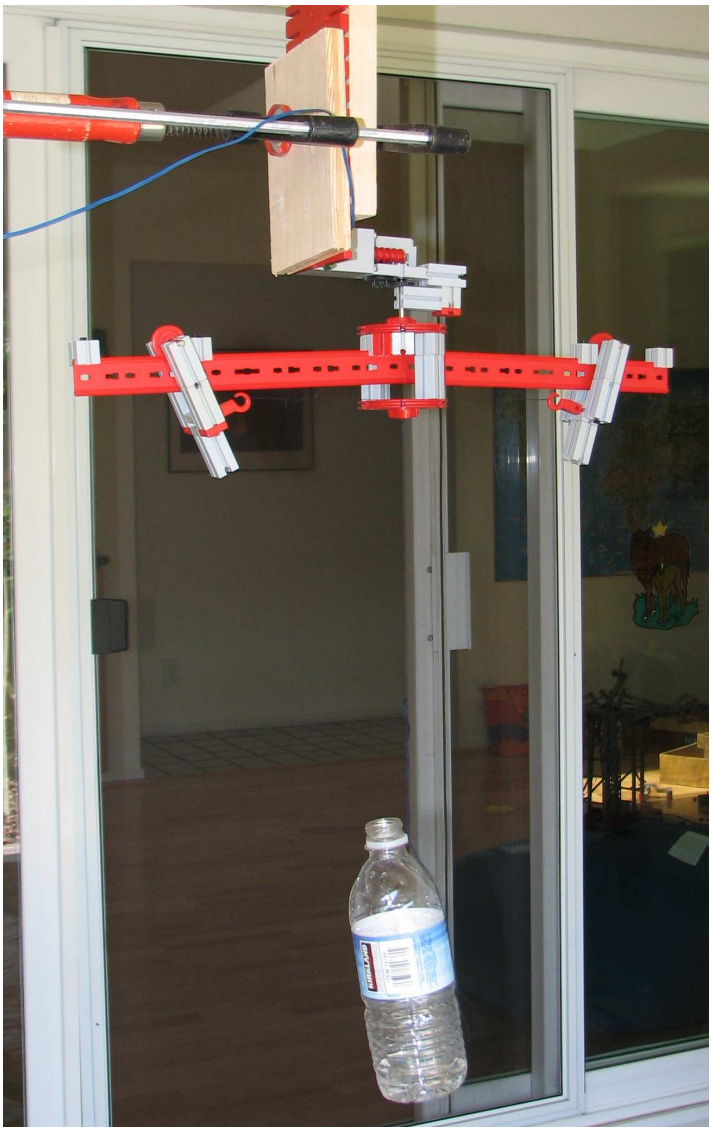
Experiment 3





The third experiment I measured the centrifugal force. If the centrifugal force is too big the car will skid.

First I built a pole that has a wheel in the center out of Fischer Technik. I then cut two equal amounts of thread and pushed the threads through the small hole in the circle. After that I built two small carts that fit on the pole and put them on. Next I tied the thread to the carts. Then I connected the other side of the tread together and added a water bottle. After that I connected the motor to electricity and the pole started to spin. I then added or took away the water from the bottle until the carts went to the outside part of the pole. Next I measured the weight of the water bottle. After that I added weight to the carts and did the same process.



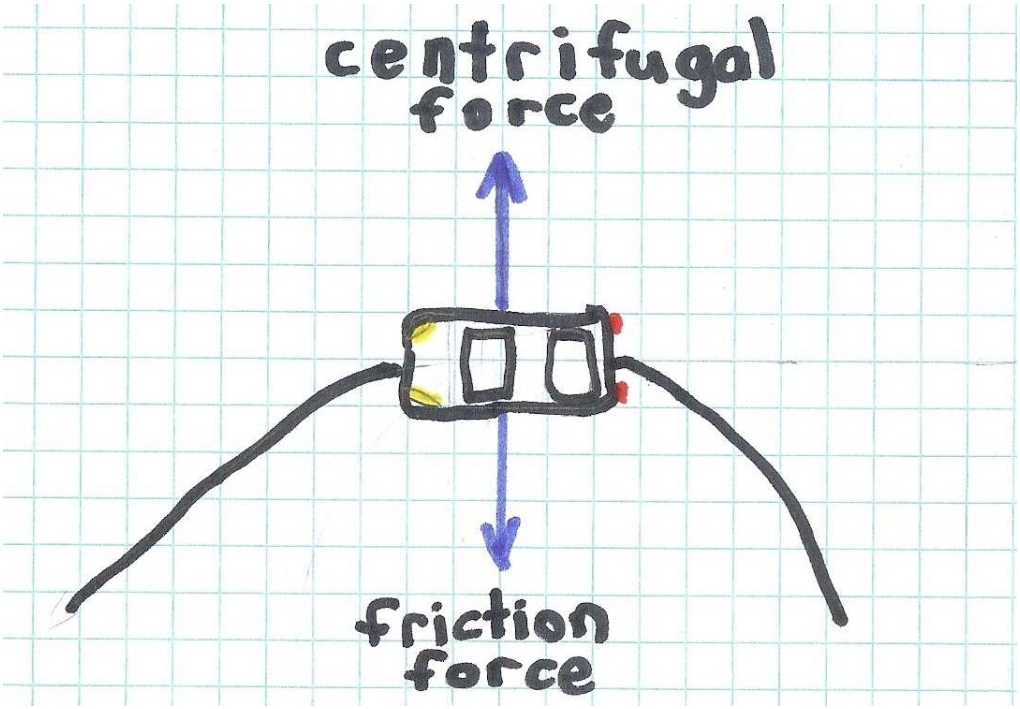
Results

In the first experiment I found out that on a wet table cloth all the cars started sliding at the same angle of the board. This proves that a car slides at the same speed if it drives around curves, no matter how heavy it is.

In the second experiment I tried to find out why the weight of the car does not matter. I measured the friction force to pull a car sideways. I found that a lighter car required less weight to pull it sideways than a heavier car. This proves that the friction force is larger for a heavier car.

In the third experiment I demonstrated that the heavier the car the more centrifugal force there is.

Conclusion



Skidding happens if the centrifugal force is larger than the friction force. The light car has a small centrifugal force and a small friction force. The heavy car has a large centrifugal force and a large friction force. Therefore it does not matter how heavy the car is.

Lots of people think heavy cars are safer on the road than a light car but my project proved that a heavy car and a light car are the same.

In a future experiment, I would like to investigate other reasons that make the car slide, e.g. the type of tires, weight distribution, height of car, suspension and so on.

Next Time

I would use a remote controlled car instead of Fischer Technik.