# Tracy Lynn's "Yellow Banana": Problem Handouts

# Tracy Lynn's "Yellow Banana"

## Part 1

Tracy Lynn was a third year medical student at Municipal Medical School in Gotham City. She was in her last week of a rotation in the shock-trauma unit. She was leaving for a weekend trip to visit her boyfriend when her supervising resident physician, Dave, warned her (as he did every weekend), "Drive carefully. I don't want to see you in one of these beds when I come in on Monday!"

Tracy had always been a careful driver, but since working in shock trauma she had seen the devastating results of car accidents. In particular, she had come to see the protection that airbags and seatbelts gave to car accident victims. Dave always told her that air bags protected people much more that just seat belts alone.

### *Question*

Why are airbags (with lap and shoulder straps) safer than lap and shoulder straps alone? Justify your answer using physics principles.

Image of 1972 Pontiac Lemans courtesy of Collector Car TraderOnline.com

# Tracy Lynn's "Yellow Banana"

## Part 2

Tracy was on Highway 51 headed east out of town when, out of the corner of her eye, she noticed a white car hesitate, then start across the road in front of her. She slammed on her brakes in an attempt to avoid a collision, however she was too late! Her 1972 Pontiac LeMans (affectionately known as the "yellow banana"), weighing 4,300 pounds, broadsided the white Buick Century, which weighed 3,100 pounds. When the cars finally came to a stop, Tracy took inventory of herself and, except for a very sore chest (where the shoulder strap was positioned) and neck, she was shaken but okay. Tracy got out of her car to check on the driver of the white car. Unfortunately, the other driver was barely conscious, having been thrown against the side window and door of the car. She was not wearing a seat belt.

The traffic cop at the scene of the accident took careful measurements of the skid marks and the location of the vehicles. See the diagram at the end of this file. The speed limit on both roads was 45 mph. Tracy told the policeman that she thought she was traveling between 40-45 mph when she first saw the white car cross in front of her. The policeman noted that Tracy's car (vehicle two on the diagram) showed 20 feet of skid marks prior to impact while vehicle 1 showed no skid marks. After impact, both vehicles showed skid marks, with Tracy's car stopping at the curb, and the other car sliding an additional five feet on the grass. The traffic cop also noted that the roadway was mostly dry, while the grass was still damp from an earlier drizzle. The drag sled found the coefficient of friction of the roadbed to be 0.8.

An ambulance came and took both drivers to the hospital—Tracy to the emergency room for an EKG, chest and neck x-rays and the driver of the other car to shock trauma.

### *Question*

Why would Tracy need an EKG and x-rays? Explain your answer in terms of physics principles.

# Tracy Lynn's "Yellow Banana"

## Part 3

Tracy was discharged from the emergency room and returned to her apartment. While talking to her insurance agent, she realized that since she did not carry collision on her policy (due to the age of the car), she would need to get the insurance company of the other driver to fix the "yellow banana". After a call to the police, Tracy was able to talk to the other driver's insurance company. They would do nothing about her car until the police issued a citation to their driver.

In the meantime, Tracy was stuck—she didn't have a car, didn't know if her car was "fixable", and couldn't get an estimate of damages until the other insurance company accepted liability for the accident. Tracy asks you (with your knowledge of physics and car accidents) to go with her to the police station to analyze the details of the accident to prove her innocent of any blame.

### *Questions*

1. How would you reconstruct the details of the impact of the cars?
2. What physics principles would you need to use?
3. How fast were the two cars traveling just prior to impact?
4. How fast was Tracy's car moving before she initially hit her brakes?
5. Can you prove that Tracy was traveling within the speed limit?
6. If the driver of the white car was initially stopped at the stop sign, how fast was she accelerating prior to impact?
7. If the initial impact of the cars lasted .1 second, what force was Tracy (115 pounds) subjected to?
8. Explain why vehicle one traveled five feet farther than vehicle two before coming to rest. Would you have expected it to come to rest at the same time as vehicle two? Why or why not?

# Tracy Lynn's "Yellow Banana"

## Part 4

Tracy went to the storage yard to look at the "yellow banana" and the white buick. Her Le Mans showed moderate damage to the front of her car, but the other vehicle was almost bent in half. The damage to it was severe.

### *Question*

Can you explain, using physics principles, why the white car was more severely damaged than Tracy's car?

# Tracy Lynn's "Yellow Banana"

## Field Sketch