A Bad Day for Sandy Dayton: Problem Handouts

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A Bad Day for Sandy Dayton

Part 1

Sandy was on her way to the University on a beautiful mild day in March. She was listening to her favorite CD while she thought about the spring break trip she was planning with two of her friends. Just as she approached the corner of South College and Delaware Avenues, she noticed that the light had turned yellow and students were already starting to move across the intersection. She slammed on her brakes and came to a screeching halt. A large delivery truck was following closely behind Sandy's car. Sandy heard brakes screeching behind her and then felt the truck crash into the rear of her car. The impact shoved her car into the intersection before it came to a stop. Luckily, Sandy escaped serious injury, as did the driver of the truck. Unfortunately, her car looked like it would be totaled.

Two Newark policemen arrived on the scene to investigate the accident. Once they decided that there were no serious injuries, they started investigating the crash.

Questions

1. What questions do the police officers need to answer in order to reconstruct the accident and decide if one of the drivers should be cited?
2. What information will the officers already know, what measurements will they need to make, and what data will they need to gather?
3. If Sandy had been traveling at a constant speed of 30 mph, how could you represent her motion as she drove on S. College Ave.?
4. If she is traveling at a constant speed, what can you say about the forces on the car?
5. What factors influence how quickly a driver can come to a stop?
6. Which factors are influenced by the driver and which are not?

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Part 2

Sandy got out of her car and started shaking. She couldn't believe she was okay; the car certainly wasn't. The driver of the delivery truck came over to her and said, "Lady are you crazy—why'd you slam on your brakes? The light was just turning yellow! This accident is your fault!" He then ran over to the policeman and repeated his statements—in fact he repeated his statements several times to the gathering crowd. Sandy was still shaking when the Newark policeman came over and said, "I'm Officer Matthews, are you feeling alright or would you like to be taken to the emergency room?" Sandy told him that her chest hurt from the shoulder strap of her seatbelt, and her neck hurt, but other than that she felt okay. Her car was a "vintage" 1978 Ford, with fixed seatbelts and no airbags. Officer Matthew suggested that she be checked at the emergency room and called for an emergency vehicle to take her there. He reassured her that he would come to the hospital to get more information from her.

One hour later, Sandy was still waiting for some x-rays and an EKG when Officer Matthews walked in. She was still giving him information when the nurse came to get her for the medical tests. Officer Matthews returned to the police station to finish the sketch of the accident and record some of the measurements and data he had gathered while investigating the accident.

Questions

1. What are some reasons that Officer Matthews suggested that Sandy go to the emergency room?
2. Why was she having x-rays and EKG?
3. Describe what happens to a person's body in a rear-end collision in terms of forces on the car and body.
4. What are the safety advantages of flexible seatbelts and airbags?

A Bad Day for Sandy Dayton

Part 3

Officer Matthews was back at the station, and was preparing to file his report on the accident at the corner of S. College and Delaware Ave. He read through the various statements of the drivers, and witnesses to the accident.

This is part of the statement made by Sandy Dayton, the owner of the 1978 Ford:

I was heading to class in my car when the light at the intersection turned yellow. I saw students starting to cross, so I hit my brakes, coming to a stop. I heard more screeching of brakes, then a van crashed into the back of my car, throwing my car into the intersection. I was traveling at the speed limit, but the driver of the van must have been speeding. I think my car must be totaled! Did you get the van driver's insurance information?

This is part of the report submitted by the police accident reconstructionist who examined the vehicles at the scene:

At the scene of the accident, it was apparent that the front of the van had been damaged. The car was badly damaged in the rear. There were skid marks, showing that both vehicles had braked. The speedometer of the van was stuck at 15 mph, leading me to believe that the van was traveling at least 15 mph when it crash into the other vehicle.

This is part of the statement made by the driver of the van, Jerry Lane:

I had just delivered some boxes at the Ag school and was on my way to deliver the last of my load at Clayton Hall, coming up South College. This college kid in an old beat-up Ford was in front of me when all of a sudden, she slams on her brakes. So did I, but I still slammed into her. The light had just turned yellow, we both had time to go through the light. This is her fault!

This is a copy of part of Officer Matthew's report on the accident at S. College and Delaware Avenue:

At 11:35am, Newark Officer Davidson and I received a call on our car radio, directing us to an accident on the corner of S. College and Delaware Avenue. The accident was reported by an unknown witness via a 911 call. We arrived at 11:40am. There was a large group of people around. The driver of the car was sent to the emergency room after complaining of neck and chest pain. The accident appeared to have resulted from a van colliding into the rear of a stopped car at the intersection. The impact moved the car into the intersection. We set up flares, directed traffic around the wreckage site, and called for a police accident investigation team to be sent over.

We interviewed some witnesses, including several students. Several told us that it seemed both cars were speeding and almost ran over some students who started to cross the road as the light turned yellow. Others felt that the car and truck were traveling at normal speeds for the area. We took a full statements from three witnesses. We also took a detailed statement from the driver of the van, who appeared to be unhurt. At 12:30pm, I left Officer Davidson and the Accident Investigators at the scene and went to the emergency room to interview Ms. Dayton.

Questions

1. From the various accounts of the police officers, the two drivers, and witnesses, what facts do we know in this case?
2. What information do we need to know in order to determine whether a car can safely (legally) go through an intersection when the light turns yellow as opposed to stopping?
3. What additional information do you need to obtain from the accident report in order to know if Sandy and/or Jerry were speeding?

A Bad Day for Sandy Dayton

Part 4

Officer Matthews received a more detailed report from the police accident investigator: The 1978 Ford was 30 feet into the intersection, coming to a stop close to the northeast corner of S. College and Delaware Avenue. The 1988 Chevrolet van was found directly behind the car. Both vehicles showed skid marks from the south side of the intersection to the position where they came to a stop. Our analysis showed that the Ford left an 80-foot skid mark prior to being struck by the van, while the van left a 20-foot skid mark prior to impact.

A drag sled was used to determine that the average deceleration on the road was 19 ft/s^2. The speed limit on S. College is 25 mph. The van weighs approximately twice the weight of the car, and since the car was stopped just prior to impact, speed of the van prior to impact was approximately 1.5 times the speed of the two vehicles just after impact.

Questions

1. Sketch the intersection, positions of the car and van, and appropriate skid marks.
2. Using what you know about reaction time and stopping distance, how far from the intersection was Sandy when she first saw the students and yellow light?
3. Explain the sequence of events from the time Sandy first noticed the yellow light to the time when both vehicles came to a stop in the intersection.
4. Should either driver be charged with speeding? Justify your answer with data.
5. Was Jerry following too closely behind Sandy? Do we have data to help answer that question?
6. Should Sandy or Jerry be charged in the accident? Justify your reasoning.

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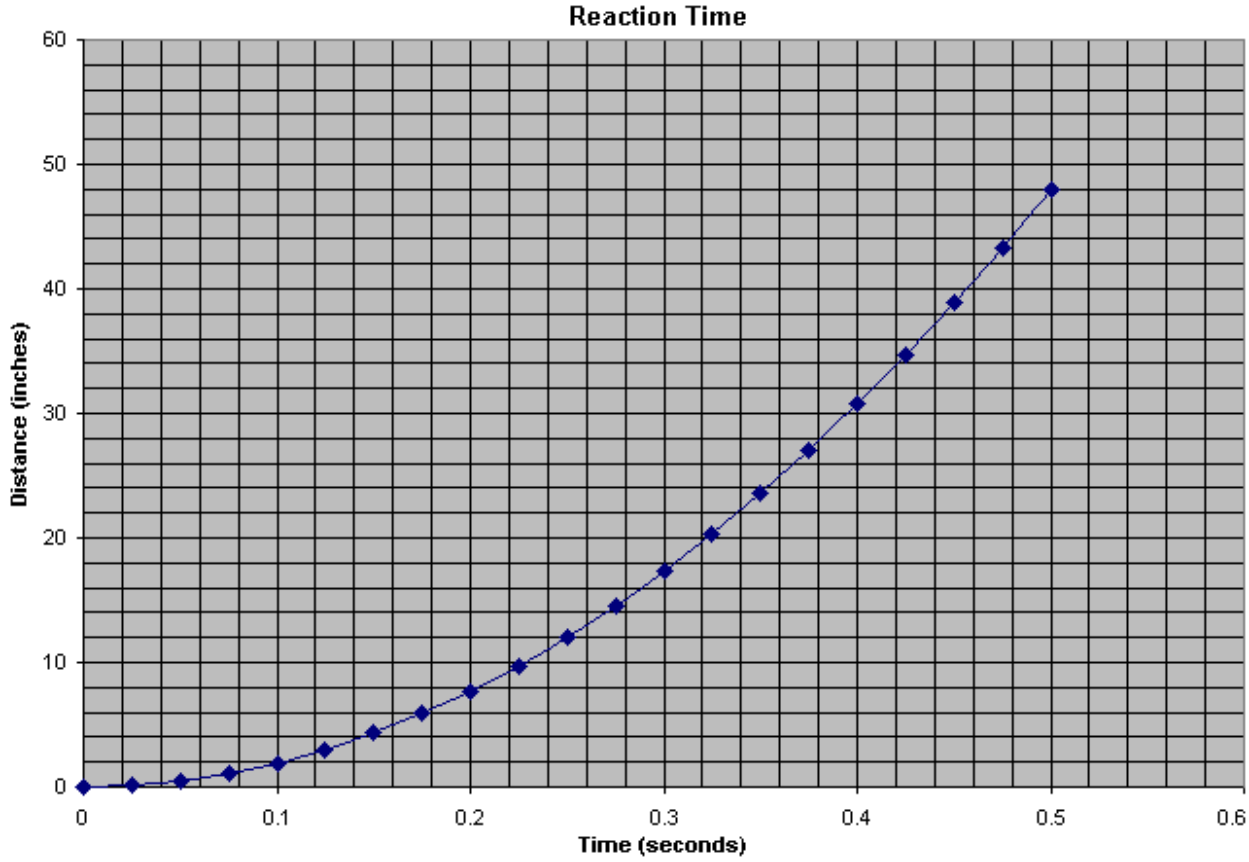
Graph 1



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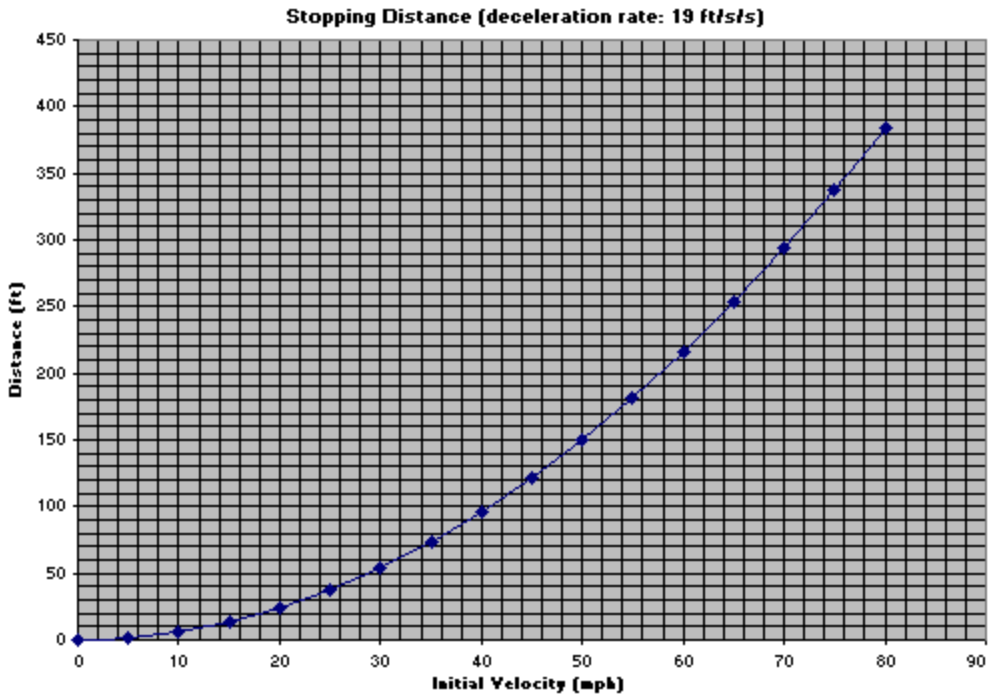
Graph 2