Tracy Lynn's "Yellow Banana": Instructor Guide

Title:

Tracy Lynn's "Yellow Banana"

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Discipline:

Physics and Astronomy

Target Audience

Introductory, majors and nonmajors

Keywords

Car accident, car safety, force, momentum, motion

Length of Time/Staging

Approximately one week

Abstract

This problem is based on an actual car accident with the names changed to protect privacy. The streets in the accident scene do not meet at right angles, so this problem is more difficult for

students. Students learn about conservation of momentum in working through this problem. I have also used this as a take-home part of the final exam.

Date Submitted

10/27/2000

Date Published

3/10/2000

Format of Delivery

Can be presented as one page or subdivided.

Student Learning Objectives

Students learn to:

1. Sketch graphs to represent the motion of an object and describe motion as represented by a graph.
2. Calculate the speed and acceleration of an object using data (gathered experimentally or derived from graphs).
3. Design and conduct a series of investigations to determine how changing an object's mass and forces acting on an object affect its motion.
4. Use knowledge of forces that cause motion to solve realistic automobile accident.
5. Understand the relationship between velocity and stopping distance using the coefficient of friction between the tires of a car and the roadway.
6. Understand and be able to explain the transfer of energy in many different phenomena, including automobile accidents.
7. Be able to reconstruct an auto accident using conservation of momentum principles.
8. Explain how seatbelt and airbags work and why they minimize forces on a person in an accident.

Student Resources

National Highway Traffic Safety Administration

Custom Design & Consultation:

Accident Reconstruction Resources

National Association of Investigative Specialists:

Links related to accident investigation, highway safety, and accident reconstruction

Texas Association of Accident Reconstruction Specialists:

Hot links to related sites

PBS Nova Online: Escape!:

Car Resources

Author's Teaching Notes

This problem is designed for a week to ten days of class. It is more complex because the streets in the intersection do not cross at a 90° angle. I have given this problem as a take-home final exam question for groups who have done the more simple auto accident reconstruction earlier in the course ("A Bad Day for Sandy Dayton," also available online). There is an emphasis on Newton's Third Law, since many students don't apply it when faced with the real world effects of a large, heavy car or truck hitting a smaller one.

The safety features of seatbelts and airbags is also emphasized in this problem. Students can research those issues, along with the idea of crumple zones, and how much force will damage the heart, brain, or other organs.

Assessment Strategies

Students can be required to submit a final analysis of the problem or submit answers to all questions.