WHO'S AT FAULT?
PHYSICS AND AUTOMOBILE ACCIDENT RECONSTRUCTION

INTRODUCTION

On August 7, 2012, an automobile accident occurred at the intersection of Elwood and Awesome Streets in Joule, NJ between a compact car (driven by Mr. C. McInerney) and a tractor-trailer (driven by Ms. D. Lang). At this intersection, the truck driver had a flashing yellow light while the car driver had a flashing red light. Neither driver claims responsibility for the accident.

The car driver, Mr. McInerney, claims:

o have made a full stop at the light before entering the intersection
hat Ms. Lang did not slow down prior to the collision

driver, Ms. Lang, claims:
a) to have been braking before the collision
b) that Mr. McInerney did not stop at the flashing red light

YOUR TASK

The court has asked your accident investigation agency to provide a comprehensive analysis of the collision from a physics perspective. Your team must put together a formal report for the court that assesses the claims of both drivers and determines if one, or both, of the drivers is at fault.

YOUR DELIVERABLES

Your agency is to provide the court with a **professional written report** that includes:
1. Background information about the physics principles that apply to an automobile collision *[forces & motion, work & energy, friction, conservation of momentum, kinematics]*.
2. Detailed calculations that determine:
   a. The coefficient of kinetic friction between the tires and the road for both the car and the truck.
   b. The speed of each vehicle just after the collision
   c. The speed of each vehicle just before the collision
3. A detailed opinion (conclusion) about which driver was at fault. The opinion must be justified using scientific principles and the detailed calculations that you have provided.

Your agency is to provide to the court **verbal testimony** a report summarizing the findings and conclusion of your report. Your testimony must include a visual component that enhances the presentation – diagrams/schematics.

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CRASH DETAILS

The diagram below provides details about the collision. In addition, the court has provided you the following information from the crash scene investigators:

1. The police department determined that the force required to drag a 130 N (29 lb) car tire across the pavement at a constant velocity is 100 N (23 lb). Specifications from the truck's manufacturer claim that (for technical reasons) the effective coefficient of friction for truck tires is only 70% that of car tires.
2. After collision, the truck and car skidded at the angles shown in the attached diagram. The car skidded a distance of 8.2 m (27 ft) before stopping while the truck skidded 11 m (37 ft) before stopping.
3. The weight of the car is 13,600 N (3050 lb) and the weight of the truck is 69,700 N (15,695 lb).
4. The pre-crash angle between the velocities of the truck and car was 90°.
5. The truck driver claims to have begun braking in anticipation of a collision; traveling at only 6.7 m/s (15 mph) at the moment of impact.
6. Police measurements show that the distance for the car from the traffic light to the collision point was 13.0 m (42.5 ft).
7. Ford Motor Corporation specifications indicate that the maximum acceleration of a comparably loaded Ford Escort is about 3.0 m/s².