1D Kinematics 9/13/16

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1D motion is pretty important, so you should try doing some harder 1D motions aside from plug and chug. Work together on these and ask questions. (Remember your units)

1. Mr. Street drops his coke from the second floor. It falls for 0.5 seconds until it hits his car that was parked below. The car is dented an astonishing 1 meter from the coke can. What was the average acceleration the car exerted on the can as it cushioned its fall? (Hint: Disregard acceleration due to gravity when calculating the average acceleration the car exerted.)

2. Eshan has been hog-tied to the tracks of a railroad. He sees a train approaching him at 150 km/h; it should take 2 minutes for the train to reach him. The train's brakes are only good enough to accelerate at $-0.879m/s^2$. How long does Eshan have to warn the train of his presence to save himself?

3. Siddharth is driving on the highway from Silver Spring to Cincinnati to pay tribute to Harambe. Half the time, he drives at 60 km/h, the other half he drives at 100 km/h. On the way back, he drives half the distance at 60 km/h, and the other half at 100 km/h. What was his average velocity to Cincinnati? His average speed back to Silver Spring? His average velocity for the entire trip?

4. Richard and Siddharth decide to have a foot race to see who's the coolest of them all. Richard gives Siddharth a 5 second head start because he knows he needs the handicap. Richard's top speed is $6m/s$ while Siddharth's is $4m/s$. Assuming both runners accelerate from rest at $1.67m/s^2$, how long until Richard passes Siddharth?

5. Richard and Siddharth have two cannons. The cannons are arranged vertically, with the lower cannon pointing upward (towards the upper cannon) and the upper cannon pointing downward (towards the lower cannon), 200 m above the lower cannon. Siddharth's cannon is the one on the ground. Simultaneously, Siddharth and Richard fire. The muzzle velocity of the Siddharth's cannon is $25m/s$ and the muzzle velocity of the Richard's cannon is $55m/s$. Assume g = $10m/s^2$. How long after the cannons fire do the projectiles collide? How far beneath the top cannon do the projectiles collide?