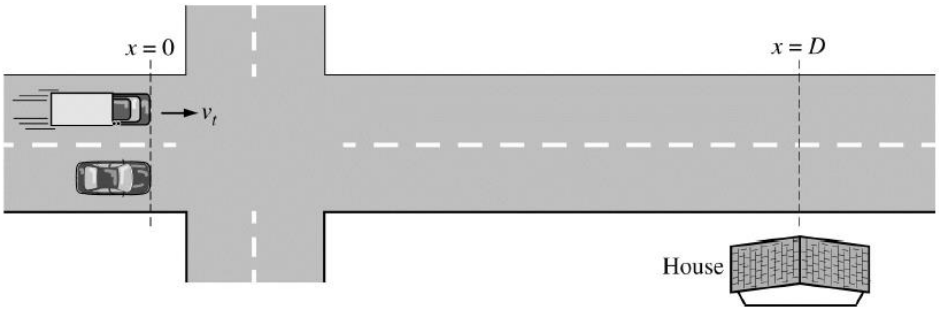
QQT EXAM TECHNIQUE **Name:** .....

This is an AP-1 FRQ from a couple of years ago. (12 pts, suggested time 25 mins)

LOOK! 25 mins is quite a long time.



The SINGLE most important thing you can do is really understand what is going on.

Label and doodle on the diagram.

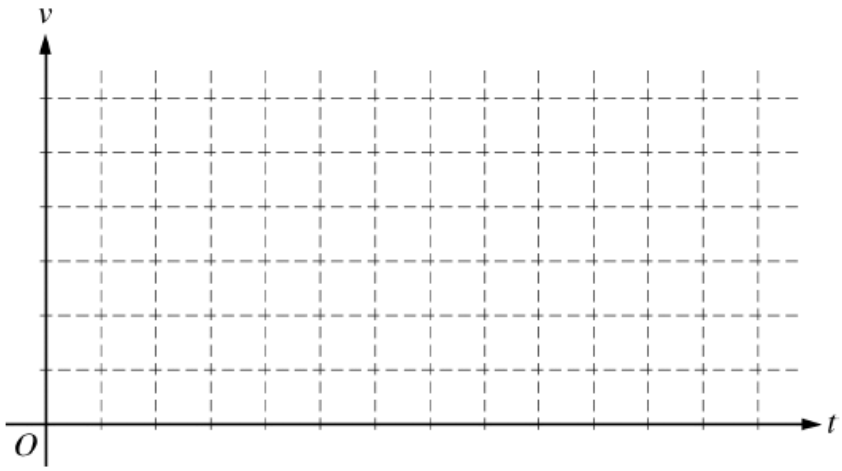
A car is stopped at a traffic light. The light turning green, and at time $t = 0$ the car starts moving and travels with a constant acceleration. At that instant a truck travelling at constant speed v_t is alongside the car, with the front of each vehicle at position $x = 0$, as shown above. The truck passes the car, but the car later catches up to the truck in front of a house, such that at time t_D the front of each vehicle is at position $x = D$.

a) On the axes below, sketch and label the graphs of the velocity of the car and the velocity of the truck as a function of time. Indicate any important velocities or times.

DO NOT EVEN START THIS GRAPH until you know the answer! It asks for values (in a crafty way…)

There is space around and under the graph for scratch work.

PENCIL



If you haven't understood the question and did not spend serious time getting the graph right – you are toast. If you did, this is a piece of cake question.

b) Two students are discussing how the speed of the car compares to the speed of the truck when both vehicles are in front of the house.

Student 1 says – "The distance travelled by the car and the truck is the same, and the time is the same, so they must have the same speed."

Student 2 says – "I don't see how that can be. The car catches up to the truck, so the car has to be going faster."

Standard text

i) Which aspect of Student 1's reasoning, if any, are correct? Support your answer in terms of relevant features of your graphs in part a).

ii) Which aspects of Student 2's reasoning, if any, are correct? Support your answer in terms of relevant features of your graphs in part a).

c) Derive an expression for the acceleration of the car. Express your answer in terms of D and v_t.

EXPLICIT calculations at last. So far it has all been hidden as a subtext.

Again – if part a) done well, this is easy.

d) Determine the time at which the speed of the car is equal to the speed v_t of the truck. Express your answer in terms of t_D. Justify your answer.