

## Week 4 or 5: The relationship between force and motion

In lab, you will explore the relationship between force and motion.

You are given a car with tabs, a string, a weight hanger, few weights, a laser gate interfaced to a PC.



1. Design an experiment to measure the velocity as a function of time for the system in the figure above.
2. From your time and velocity data determine whether the car moves with constant acceleration. Explain!
3. Vary the hanging mass between 5gr (the hanger) and 20gr keeping the total mass of the system constant. Measure the acceleration for each situation ( double check that the acceleration is constant in each case).
4. Make an appropriate graph of the data you obtained in 3 to determine the relationship between force and motion. You should make the graph first by hand and then using the “linefit” program on the computer.
  - a) What is the meaning slope?
  - b) Does the graph go through the origin? Explain
  - c) From your graph determine the effective mass of the pulley.
5. What law of physics have you demonstrated?
6. Calculate how much hanging mass you need to have so that a car with a total mass of 500 gr has an acceleration of  $50 \text{ cm/s}^2$ . Test your prediction.