Name:

# Investigating Force, Acceleration and Velocity

adapted from the work of Prof. Dewey Dykstra of Boise State University

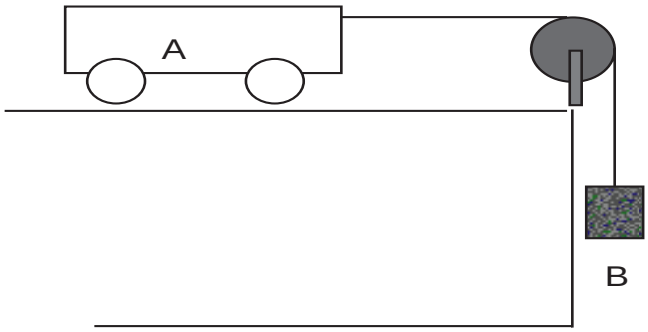
- Consider a cart being pushed along a horizontal table at **constant velocity**. Sketch below at three different times all of the forces you belive are acting on that cart. Be sure to indicate the relataive size of those forces by the relative size of the vectors.

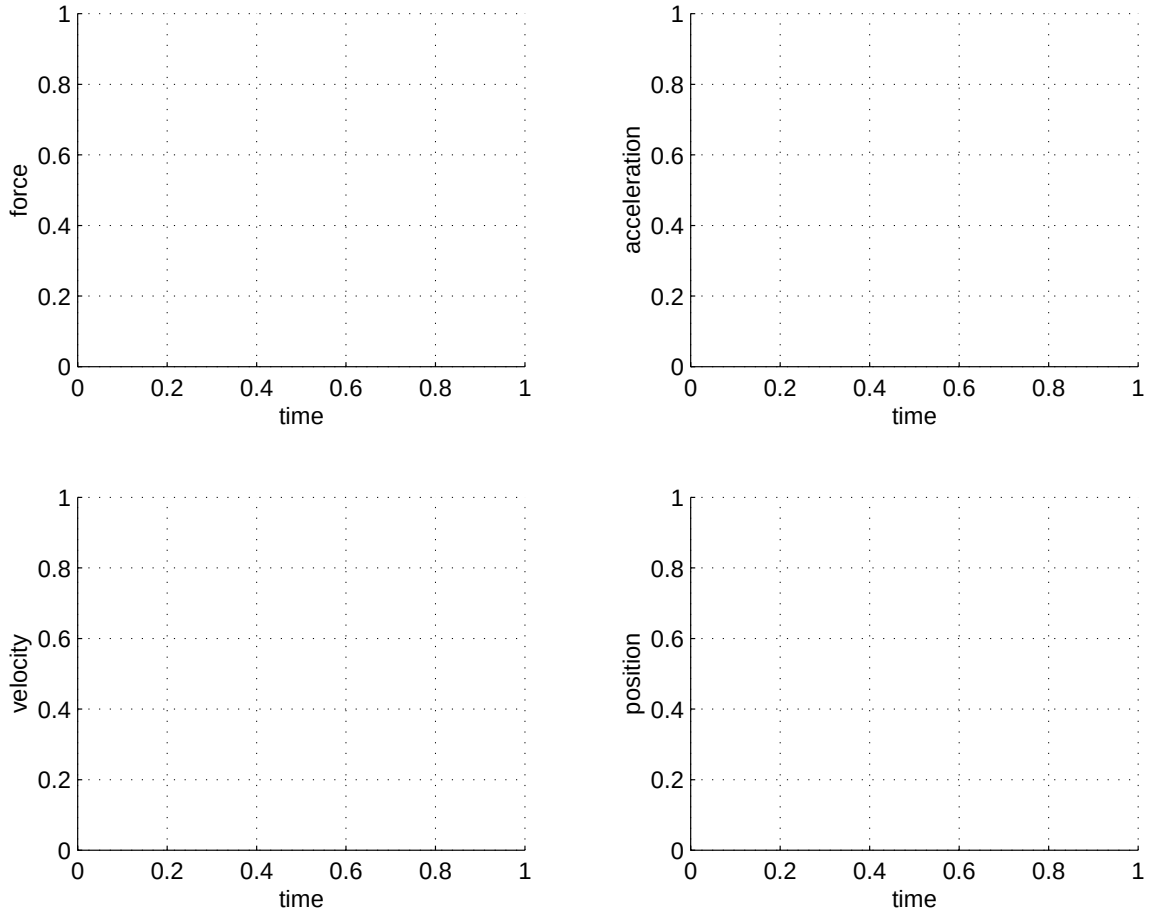
- Discuss as a group what forces are acting. Modify your diagrams above if your group members mention other forces that you believe are acting on the cart.
- Discuss as a group how these forces combine to make the cart move at constant velocity. Write your group conclusions below.

- Consider a cart being pushed along a horizontal table at **constant acceleartaion**. Sketch below at three different times all of the forces you belive are acting on that cart. Be sure to indicate the relataive size of those forces by the relative size of the vectors.

- Discuss as a group what forces are acting. Modify your diagrams above if your group members mention other forces that you believe are acting on the cart.
- Discuss as a group how these forces combine to make the cart move at constant accleration. Write your group conclusions below.

- Consider a cart on a horizontal table being pulled by an object which hangs over the table. Sketch below the force, accleration, velocity, and position of the cart on the table. (Ignore the scales on the plots!)




- Explain why you drew your predictions as you did.

- **Procedure:** Now you can check the predictions that you made on the last page. Be sure to do this for several different masses of the hanging objects. Print plots for each of your runs.

- **Preparing the equipment:**

  - *Getting the track ready:* Bring the track down so that it is about 8 inches off the table. Support the middle of the track with an adjustable jack. **Be sure that the jack is not pressing the track upward, merely keeping it from sagging**. Check that the track is level with the one of the levels in the room.

  - *Getting the equipment:* Make sure you have a cart with an attached force sensor, two bar weights, a long string, a weight hanger and three or four small weights (about 20 gm each).

  - *Preparing the computer and force probe:* Turn on the computer and the ULI (universal lab interface). Plug the force probe into `Din 1`. Launch MacMotion. Display four graphs at once (position, velocity, acceleration, and force). Make the graphs large!

  - *Calibrating the Probe:* Under the `Collect` menu, choose `Calibrate Force Probe` (at the bottom), and then `Calibrate Now`. It will ask you to remove all force from the probe. Do so. Then it will ask you to apply a known force. Hang a 1000 gm weight, with a force of 9.81 Newtons. Type this value in. [You can check the calibration by hanging a different weight, and clicking on start. The force plot should show the appropriate constant value.]

- What can you conclude from these experiments about how forces combine to give constant acceleration? to give constant velocity?