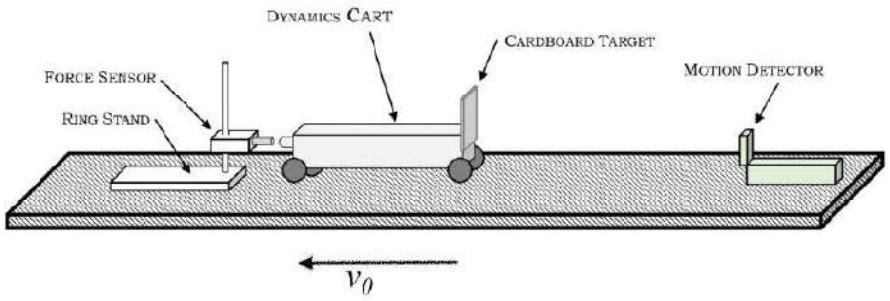
NAME _____ DATE _____

Scenario

Carlos and Dominique have been challenged to design an experiment to determine the impulse given to a cart as it collides with a barrier using two different mathematical or graphical ways. Dominique sketches the following diagram of the laboratory setup and writes the procedure below.



Materials: computer, force sensor, motion sensor, cart, cardboard target, mass balance

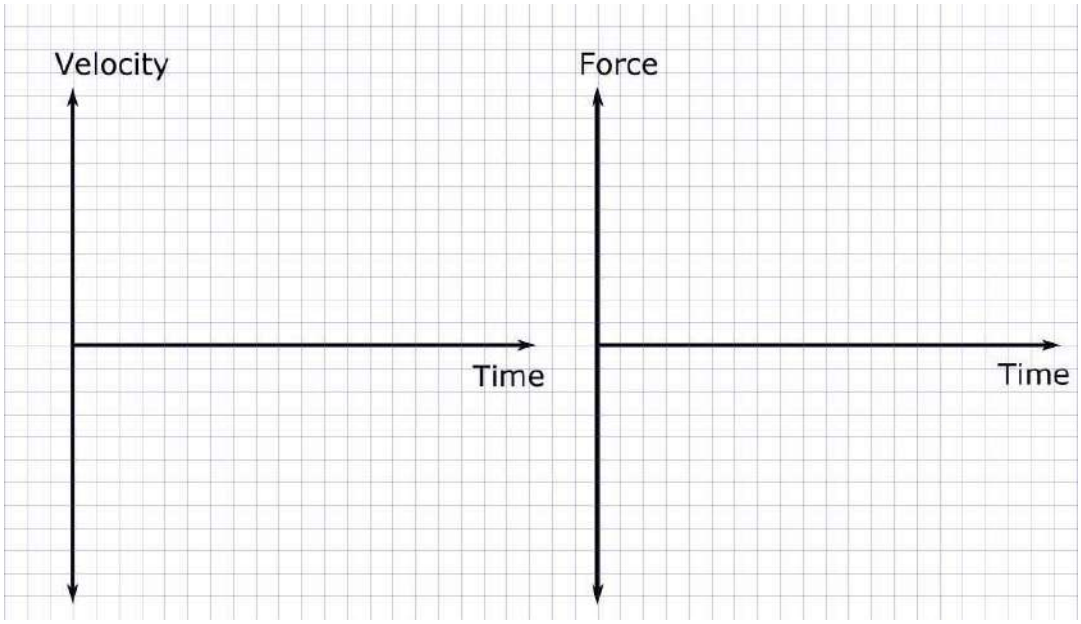
Experimental Design

PART A: Edit Dominique's procedure for length and clarity. Cross out any unnecessary statements, change the order of statements, correct statements for errors, or write new sentences if necessary.

1. Gather all materials. 2. Record the mass of the cart. 3. Plug in both the motion detector and the force sensor. 4. Check that each device is working. 5. Secure the motion detector to the ring stand. 6. Attach the cardboard target to the cart so that it can be "seen" by the motion sensor. 7. Align the motion sensor with the target cardboard. 8. Create a data table in your notebook. 9. Set the motion sensor to record in cart mode. 10. Begin recording force and motion data with the computer. 11. Give the cart a push toward the force sensor and away from the motion detector. 12. After the cart collides with the force sensor and has bounced back, stop recording force and motion data. 13. Determine the impulse. 14. Repeat steps 9–12 with different initial pushes to reduce error. 15. Clean up the lab station and put away all materials.	

Using Representations

PART B: Sketch a graph of what the velocity as a function of time and the force as a function of time should look like for the time just before the collision to just after the collision.



Data Analysis

PART C: Explain how these representations can be used to determine the impulse given to the cart during the collision. Explain how you could determine the impulse given to the cart from each graph.