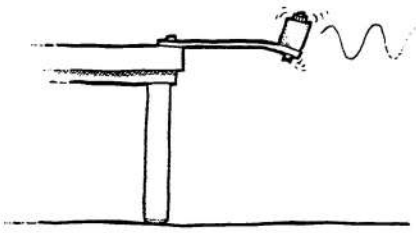
NAME _____ DATE _____

Scenario

A flexible metal plate is attached to one end of a table as shown in the diagram. Dominique connects a mass to the other end of the plate, displaces the mass a small distance, and observes that the mass vibrates up and down with a period that can be measured. She asks the following question: "I know the mass is oscillating but does the mass exhibit simple harmonic motion?" Dominique finds the following text in a textbook:



Not all oscillations (periodic motions) qualify as "simple harmonic motion." Simple harmonic motion is a special class of oscillatory motions. To qualify as simple harmonic motion, an oscillation must meet all of the following requirements:

- The graph of position as a function of time must take the shape of a sine graph.
- The net force exerted on the object must be directly proportional to its displacement from equilibrium and opposite in direction.
- The period of the motion must be independent of the amplitude.

Dominique wishes to determine experimentally whether the mass exhibits simple harmonic motion. (Note: The statements above are equivalent—if one is true, they are all true.)

Experimental Design

PART A: Dominique has access to the materials below. Mark the space next to each piece of equipment that she would need in order to perform an experiment to determine whether the plate exhibits simple harmonic motion.

_____ Meterstick _____ Stopwatch _____ Photogate

_____ Spring scale _____ Motion sensor _____ Other attachable masses

_____ Balance _____ Camera with frame-by-frame playback

PART B: Outline a procedure that Dominique can use to determine whether an object fixed to the metal plate exhibits simple harmonic motion.

Data Analysis

PART C: Explain how the data can be represented to answer Dominique's question about the motion of the object fixed to the metal plate. Give an example of a representation that would indicate that the object exhibits simple harmonic motion.