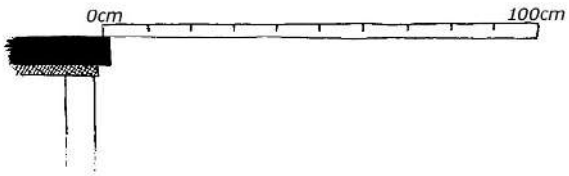
NAME _____ DATE _____

Scenario

A meterstick is set on the edge of a table so that all but a negligible bit of its length is off the edge of the table as shown. The meterstick is released from rest horizontally. The meterstick's mass is M and its length is L. The rotational inertia of the meterstick around the end is $I = \frac{1}{3}ML^2$.



Using Representations

PART A: Sketch a force diagram for the meterstick just after it has been released—meaning that it is still horizontal, but there is no longer anyone supporting the right end of the meterstick. (Remember that a force diagram differs from a free-body diagram in that the forces are drawn *at the point of application* rather than just at the center of mass.)

PART B: Identify the point on the meterstick around which the meterstick is pivoting. Mark this point with an X.

Is there more than one choice for the pivot point? What are the implications?

Use an Equation

PART C: Determine the net torque about the meterstick's left end, instantaneously after being released.

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PART D: Starting with Newton's second law in rotational form, derive an expression for the initial angular acceleration of the meterstick in terms of M, L, and physical constants.

PART E: Derive an expression for the linear acceleration of the far end of the meterstick (not on the table) in terms of g. What is the consequence of your answer? Explain in terms of what would happen to a penny placed on the end of the rod before it was released.

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