

NAME _____

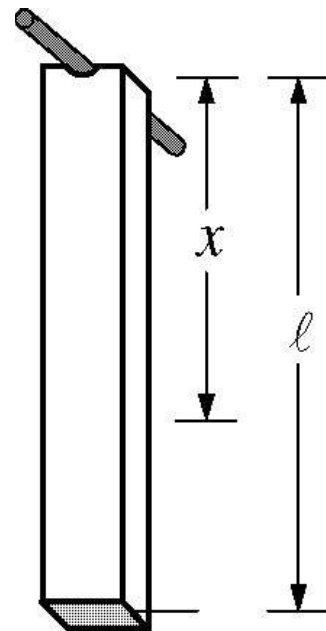
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Scenario

A bar of length ℓ is constructed so that it is not uniform in its density. At one end, the alloy is rich in aluminum, which has low density. At the other end, more tin is mixed in, which is more dense. The materials are painted over so that it is not possible to determine visually which end is made of which metal. Blake must determine the rotational inertia of the bar if it is pivoted about its less-dense end.

PART A: The center of mass is located a distance x from the less-dense end. Explain how Blake can determine the location of the center of mass of the bar and determine which end of the bar is less dense.

PART B: Once the less-dense end and the distance x are determined, the bar is fixed to a horizontal axle as shown in the diagram. Write a procedure that Blake could follow to make measurements that could be used to calculate the rotational inertia of the bar about this axis assuming friction is negligible. Give each measurement a meaningful algebraic symbol and explain how commonly available equipment is used to make that measurement.



PART C: Explain how the measurements that you made can be used to calculate the rotational inertia of the bar about its axis. State clear equations using the algebraic symbols defined in Part B, explain how these equations are chosen, and what each term of the equation represents.

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