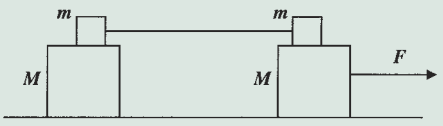
Physics Challenges for Teachers and Students

A New Kid on the Block

Four blocks are arranged on a smooth horizontal surface as shown. The masses of the blocks are given (see the diagram). The coefficient of static friction between the top and the bottom blocks is μ_s. What is the maximum value of the horizontal force F, applied to one of the bottom blocks as shown, that makes all four blocks move with the same acceleration?



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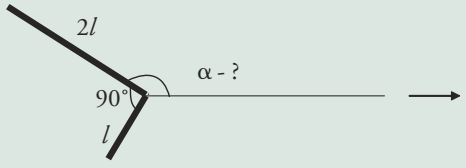
Breaking Uneven

A straight metal rod of length $3l$ is bent through the right angle as shown. The bent rod is then placed on a rough horizontal table. A light string is attached to the vertex of the right angle. The string is then pulled horizontally so that the rod slides at a constant velocity. Find the angle α that side $2l$ would make with the string.



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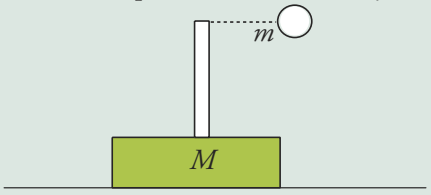
A Vicious Semicircle

A block of mass M can slide without friction along a horizontal table. A simple pendulum of mass m and length l is mounted on the block so that it can swing freely in the vertical plane. The pendulum is released from the horizontal position as shown. Find the maximum tension of the string during the subsequent motion of the pendulum. Assume that the string is light and that the pendulum bob is very small.



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Note to contributors: As the number of submissions grows, we request that certain guidelines be observed, in order to facilitate the process more efficiently:

–please email the solutions as Word files;

–please name the file "November04LSimpson" if—for instance—your name is Lisa Simpson, and you are sending the solutions to November 2004 *Challenges*;

–please state your name, hometown, and professional affiliation in the file, not only in the email message.

Many thanks!

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