

Physics Challenges for Teachers and Students

► Rocket From the Pocket

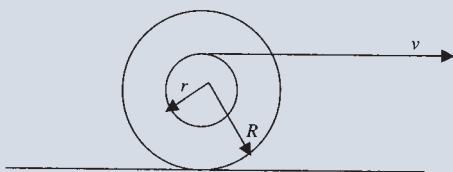
A spaceship is traveling in outer space at a constant velocity $v = 1000$ m/s. Suddenly, the commander observes an asteroid straight ahead. The distance to the asteroid is $L = 9.0$ km; the diameter of the asteroid is $D = 7.0$ km. The commander attempts to take an evasive maneuver by firing the emergency rocket. The rocket gives the spaceship a very quick change in velocity $\delta v = 300$ m/s. Is it possible for the spaceship to avoid the collision? Assume that the commander can fire the rocket in any direction.

DOI: 10.1119/1.1631631

► Spinning the Reel

A reel is being pulled along a horizontal surface by the string wrapped around as shown. There is no slipping between the reel and the surface. The string is pulled at a constant speed v . Find the angular speed ω of the reel assuming that r and R are given.

DOI: 10.1119/1.1631632



► High Jump

A student of height h jumps vertically up from the “squat” position. At the top point of the jump, the student’s center of mass is at a height $3h/4$ from the ground. Find the average force F acting on the floor prior to the moment when the student loses contact with the floor.

It is known that when the student stands on the floor, the center of mass is at a height $h/2$ from the floor; in the “squat” position, the center of mass is at a height $h/4$ from the floor. The mass of the student is m .

DOI: 10.1119/1.1631633

Contributors:

Our September challenges drew many responses from both the United States and abroad. Below are the names of the readers who were first to submit the correct solutions.

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The solutions, as well as the more complete list of their contributors, can be found on our website: <http://www.aapt.org/tpt>. We look forward to your future contributions.

Note to Contributors:

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

- email solutions as Word files;
- name the file “December03LSimpson” if — for instance — your name is Lisa Simpson, and you are sending the solutions to December 2003 Challenges;
- state your name, hometown, and professional affiliation in the file, not only in the email message.

Many thanks!

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