

ADDITIONAL PRACTICE

NAME _____ DATE _____ CLASS _____

1. In 1993, a group of students in England made a giant yo-yo that was 3.0 m in diameter and had a mass of 407 kg. With the use of a crane, the yo-yo was launched from a height of 57.0 m above the ground. Suppose the moment of inertia of the yo-yo was $5.00 \times 10^2 \text{ kg}\cdot\text{m}^2$ and the angular speed at the end of the descent was 28.0 rad/s. Calculate the linear speed of the yo-yo at the end of the descent.
2. In 1982, a team of 10 people rolled a cylindrical barrel with a mass of 64 kg for almost 250 km without stopping. Imagine that at some point during the trip the barrel is stopped at the crest of a steep hill. The barrel is accidentally released and rolls down the hill. If the linear speed of the barrel at the bottom of the slope is 12.0 m/s, how high is the hill? Assume that the barrel's moment of inertia is equal to $0.80mr^2$.
3. In 1988, cheese with a mass of $1.82 \times 10^4 \text{ kg}$ was made in Wisconsin. Suppose that the cheese has a cylindrical shape. The cheese is set to roll uphill, and the cheese rolls up the hill until its vertical displacement is 1.2 m, at which point it comes to a stop. Assuming that there is no slipping between the rim of the cheese and the ground, calculate the initial linear speed of the cheese.
4. In 1992, an artificial egg with a mass of $4.8 \times 10^3 \text{ kg}$ was made in Australia. Assume that the egg is a solid sphere with a radius of 2.0 m. Calculate the minimum height of a slope that the egg rolls down if the egg is to achieve an angular speed of 5.0 rad/s at the bottom of the slope. What is the translational kinetic energy of the egg at the bottom of the slope?
5. In 1994, a bottle over 3 m in height and with a radius at its base of 0.56 m was made in Australia. Treat the bottle as a thin-walled cylinder rotating about its symmetry axis, which has the same rotational properties as a thin hoop rotating about its symmetry axis. What is the linear speed that the bottle acquires after rolling down a slope with a height of 5.0 m? Do you need to know the mass of the bottle?
6. An onion grown in 1994 had a record-breaking mass of 5.55 kg. Assume that this onion can be approximated by a uniform, solid sphere. Suppose the onion rolls down an inclined ramp that has a height of 1.40 m. What is the onion's rotational kinetic energy? Assume that there is no slippage between the ramp and the onion's surface.
7. A potato with a record-breaking mass of 3.5 kg was grown in 1994. Suppose a child sees this potato and decides to pretend it is a soccer ball. The child kicks the potato so that it rolls without slipping at a speed of 5.4 m/s. The potato rolls up a slope with a 30.0° incline. Assuming that the potato can be approximated as a uniform, solid sphere with a radius of 7.0 cm, what is the distance along the slope that the potato rolls before coming to a stop?