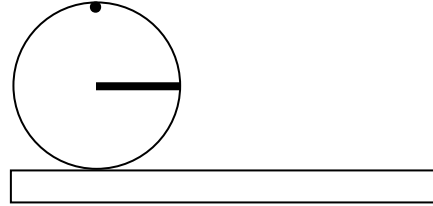


Rolling and Ramps

- 1) **Warm-up:** Consider a rolling wheel. What is the instantaneous linear velocity of a point at the bottom of the wheel in contact with the ground?



What is the relation between the velocity of the wheel as a whole (essentially the linear velocity of the axle) and the wheel's angular velocity?

What is the instantaneous linear velocity of a point at the top of the wheel, relative to the ground, in terms of the angular velocity?

- 2) A hollow 45.8 g cylinder of radius $R = 2.25$ cm rolls down a 27.3° ramp starting from a height of $h = 1.50$ m. The cylinder does not slip or slide as it rolls down. What is the linear speed v of the cylinder at the bottom of the ramp?

- 3) Which object would win a rolling race to the bottom of the ramp; the hollow cylinder above or a solid cylinder of exactly the same mass and radius?

First, each person make an intuitive prediction individually and circle one of the following;

Hollow cylinder wins the race

Solid cylinder wins the race

It's a tie between them

My lab partner is generally in charge of these things

Now use the awesome power of physics to predict mathematically which one will be the case. Discuss this with your team so that your whole group is in complete agreement about which one it will be.

Brain-buster: If the two cylinders above are rolled up the ramp, both starting with the same initial velocity, which one will roll to the highest point up the ramp?