

**General Physics I–Honors: PHYS 101H (Fall 2023)**  
**Quiz 7**

Chris Monahan  
William & Mary

**Instructions**

In this quiz you will apply your understanding of angular momentum, rotational motion and static equilibrium. Read the following instructions carefully.

**DO NOT TURN OVER THIS SHEET UNTIL INSTRUCTED.**

This is a **group quiz**. You **must** work in pairs or in a group of three. Working alone or with a larger group will score zero.

Please write your names on the quiz. All pair or group members should write their name on the quiz and **submit one quiz per pair or group**. You will all receive the same grade for your submission.

You have fifteen minutes to attempt all three questions in this quiz. One question is multiple choice.

You may use electronic calculators.

You may **not** use:

- any formula sheets or notes;
- electronic devices, including phones, tablets and laptops (unless previously arranged);
- textbooks or other reference resources;
- course notes or slides.

**Question 1****4pts**

Consider a ball that rolls down a plane (which has friction and is at an angle  $\theta$  to the horizontal) without slipping. And consider a block that slides down a different, frictionless plane inclined at the same angle  $\theta$ , with respect to the horizontal. Is the linear acceleration of the centre of mass of the ball smaller, larger, or the same as the linear acceleration of the centre of mass of the block? Explain your reasoning, in full sentences. [Hint: there are two reasons for the correct answer!]

**Question 2****2pts**

A motorcyclist makes a jump over a long row of cars. Right after she leaves the takeoff ramp, she notices that her motorbike is angled slightly upward and has zero angular velocity. This is a problem! If this angle is maintained, she will not be able to land smoothly on the ramp, because the motorbike should be angled slightly downwards on impact with the ramp. What is the **best** way for the rider to correct this problem in the air?

1. Lean forward;
2. Lean backward;
3. Hit the gas;
4. Hit the brakes.

**Question 3****4pts**

Is it possible for a ladder to lean statically against a wall at an angle of  $60^\circ$  when there is friction with the wall (assume the coefficient of friction is very large), but not with the ground? Explain your reasoning, in full sentences.