The Barrel Ride

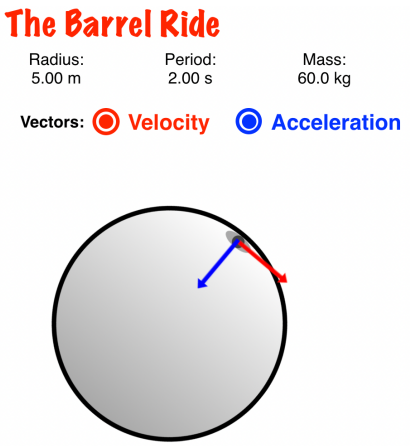
Purpose: To modify variables in order to design a barrel ride that is both thrilling and safe.

Getting Ready: Navigate to the **Barrel Ride Simulation** found in the **Physics Interactives** section at **The Physics Classroom**.

https://www.physicsclassroom.com/Physics-Interactives/Circular-and-Satellite-Motion/Barrel-Ride

Navigation:
www.physicsclassroom.com => Physics Interactives => Circular Motion and Gravitation => Barrel Ride

Getting Acquainted/Play:
This interactive consists of a barrel ride animation on the left side of the screen and a series of controls and output displays on the right side of the screen. The controls include a Parameter Input panel for modifying three parameters – the barrel radius, the period, and the rider mass. There are also Play | Pause | Forward | Reverse | Reset controls for controlling the animation. There are also numerous displays – which includes speed, acceleration, forces, and number of Gs. You will also find a safety and thrill rating on the bottom right of the screen.



Open the animation and spend some time familiarizing yourself with the interface. Change some input parameters, play the animation, and observe the output displays. Once you're acquainted with *finding your way around*, proceed to the directions.

Part 1: Ball on a String Moving in a Horizontal Circle

1. Make some changes in the barrel **radius** (**R**). How does increasing the radius affect the number of Gs experienced by the barrel rider?

2. The **period** (**T**) refers to the time it takes the barrel to make one complete revolution. Make some changes in the period. How does increasing the period affect the number of Gs experienced by the barrel rider?

3. Where does the rider **mass** (**m**) *fit into the equation*? Does a more massive rider experience more or less Gs than a less massive rider on the same barrel ride? What output parameters does a variation in mass affect? Provide some detail and evidence for the answers to these questions.

4. Pick a barrel radius and keep it constant. Record its value above the table. Then collect some data to determine the range of period values that would result in a safe and thrilling ride for such a barrel radius. Record both the unsafe/safe and the thrilling/unthrilling ride data in order to identify the range. Use the reported color for the last two columns. (Green = safe and Green = thrilling.)

Ride Data for R =_____ m

Period (s)	# of Gs	Safety	Thrill

5. Now repeat the above procedure for a constant period (**T**) value. Record its value above the table. Then collect some data to determine the range of radius values that would result in a safe and thrilling ride for such a barrel radius. Record both the unsafe/safe and the thrilling/unthrilling ride data in order to identify the range. Use the reported color for the last two columns. (Green = safe and Green = thrilling.)

Ride Data for T =_____ m

Radius (m)	# of Gs	Safety	Thrill

6. Identify the values of R and T for three safe and thrilling rides. Make sure every radius and period value is unique. Report your data in the table. Remember: green is safe. Green is thrilling.

Ride#	Radius (m)	Period (s)	# of Gs	Thrill	Safety
1				Green	Green
2				Green	Green
3				Green	Green

7. Now think like an engineer and a business person. If you were building a barrel ride for your amusement park or traveling carnival gig, which ride would you build? Discuss the question and commit to a decision. Support your decision with logic and reasoning.

8. Evaluate this claim:

   > The number of Gs experienced by a rider is always associated with the speed. When comparing rwo rides, the ride with the highest speed will always be the ride with the greatest number of Gs.

   Do you think this claim is true or false? _____ Experiment with the program in order to generate some data that support this claim or the counter-claim. Use the collected data as evidence to support your belief.