Physics Day

Six Flags® St. Louis

Student Introduction

Student Name _____

Team Member Names:_____

_____

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with sponsorship from

Vernier SOFTWARE

RIDER RESPONSIBILITIES

Rules:

[] Hard objects, such as clipboards, are NOT allowed on the rides. The equipment you carry on the rides must be of the type that if it is dropped and/or flies out of your hands it will not injure anyone.
[] All riders must remain seated from start to stop of each ride cycle.
[] All riders must keep their arms and legs inside the ride unit at all times.
[] All riders must use all restraining devices (lap bars, seat belts, etc.) as they were designed to function throughout the entire cycle of each ride.
[] In addition to the above, all riders must abide by all special rider policies listed at the individual rides.
[] Eating, drinking, and smoking are prohibited on all rides.
[] If possible, do not bring purses, cameras, etc., to the park. They are cumbersome and may be lost on the ride. Six Flags and its employees bear no responsibility for your personal belongings.

Bring:

[] Park ticket, meal ticket
[] Packet of ride questions
[] Large fanny pack or small backpack or large ziploc bag for materials
[] Calculator
[] Stopwatch/watch/cell phone with a timer
[] Pens and pencils
[] Your group's vertical and horizontal accelerometers
[] Dress appropriately — you will be outside all day with little shelter: April is often cold. Wear pants with pockets. Wear clothing that will dry out quickly if it gets wet. The wind chill on rollercoasters is considerable – bring something with long sleeves. If it rains, you will ride in the rain and like it.

Hints:

[] Many questions can be answered while in line for rides.
[] Plan ahead so you know what to observe while on the rides.
[] You may want to ride the rides more than once to make your observations.
[] If you purchased a ticket to eat at the World's Fair Pavilion, (11am – 12:30pm) there are sheltered picnic tables where you can sit down to finish your calculations.
[] Recording your problem solving procedure and not just your answer is essential for full credit. All calculations are to be in SI units.
[] Ahead of time, determine the length of your pace: 1 PACE = _____ meters

Logistics:

[] When and where will you meet to ride out to the park:
[] Which rides are you required to analyze:

[] When and where will you meet to leave the park:

An important note about Force Factor meters vs. Accelerometers!

Please note that the handheld or electronic devices that are commonly called "accelerometers" are not really accelerometers! These devices, that we call Force Factor meters, can be calibrated to measure the ratio of the normal force in the direction of measurement to the magnitude of the gravitational force. That ratio, the Force Factor, is a multiplier that can be used to find the normal force on an object. In other words, the Force Factor in a given direction multiplied by the magnitude of the gravitational force on an object equals the normal force on that object in that direction. Because of this, the labels on the graphs included in the materials do not read Acceleration vs. Time, but rather Force Factor vs. time.

EXAMPLES USING THE FORCE FACTOR METER:

- When you are at rest and the meter is pointing upward the Force Factor meter is calibrated to read a Force Factor of 1.0. This reading, really a multiplier of 1.0, means that you have a normal force upward on your body that is equal to the magnitude of the gravitational force on you.

- When you upside down at the top of a loop, on Mr. Freeze or Batman, and the Force Factor meter is pointed downward and reads 1.5. This reading means that you have a normal force on your body downward that is equal to 1.5 times the magnitude of the gravitational force on you.

- When you are slowing at the end of the Screamin' Eagle ride and the Force Factor meter is pointing in the direction you are moving and reads -0.7. This reading means that you have a normal force acting that is opposite the direction you are moving and equal to 0.7 times the magnitude of the gravitational force on you.

- These calibrations mean that in **any** orientation the Force Factor meter measures the ratio of the normal force on an object in the direction of measurement to the magnitude of the gravitational force on that object.

Remember that the Force Factor meter allows you to calculate only the normal force on the object not the net force and you need to consider all of the forces acting on the object – make a freebody diagram – in order to calculate the acceleration.