

AMUSEMENT PARK PHYSICS MIND BOGGLERS

- List the rides that represent uniform circular motion.
- List the rides that represent vertical circular motion which may not necessarily be uniform circular motion.
- Why can't the formula $4\pi^2 + T^2$ be used for non-uniform vertical circular motion?
- Please list any velocity dependent forces. Is gravity a velocity dependent force? Please support your answer.
- Why do amusement park operators run the rides empty, first?
- Define a conservative force. Is the force of gravity a conservative force? Is the force of friction a conservative force?
- In your opinion, should amusement park rides be designed for speed or acceleration?
- Fill out the following chart. Please indicate whether the listed quantity is a vector or scalar. Also, give the correct SI unit for the listed quantity. Please draw the correct symbol for each quantity.

QUANTITY	TYPE	UNIT	SYMBOL
Work			
Power			
Acceleration			
Force of Friction			
Potential Energy			
Kinetic Energy			
Speed			
Mass			
Height			
Time			
Angular Velocity			
TME			
Revolutions			
Angle Theta			

MIND BOGGLERS-Continued

9. Why is a simple pendulum like a roller coaster ride?
10. Please design your own roller coaster. Label regions of maximum and minimum kinetic energy. Also, label regions of maximum and minimum potential energy.
11. Define in your own words kinetic and potential energy. Can an object have potential energy but not kinetic energy? Give an example at Six Flags Great America. Can an object have kinetic energy but not potential energy? Give an example at Six Flags Great America. Can an object have zero potential energy and zero kinetic energy? Give an example at Six Flags Great America today.
12. Can a roller coaster have an eastward velocity and a westward acceleration? Can a roller coaster have an eastward velocity and a downward acceleration?
13. What rides at Six Flags Great America essentially start with all potential energy and very little kinetic energy? What rides at Six Flags Great America start with kinetic energy and very little potential energy?
14. Give an example of a ride at Six Flags Great America where the speed is constant but the acceleration is zero.
15. Do your sense organs feel velocity or acceleration? Is the human body an accelerometer? Please explain.
16. Cite four examples at Six Flags Great America where Newton's First Law is illustrated.
17. What is the mean free path for your bumper car ride?
18. In your opinion, where is the center of mass of Six Flags Great America?
19. Cite an example at Six Flags Great America where the following cases are true: The angle between a velocity vector and the acceleration vector is 180 degrees; $180 > 0 > 90$ degrees; 90 degrees; zero degrees.
20. Does the phrase, 3 "g's," refer to a force or to an acceleration? Please Explain.

GREAT AMERICA PHYSICS SCAVENGER HUNT

Can you find an example of each of the following quantities, entities, or concepts in the park?

QUANTITIES, ENTITIES, CONCEPTS	EXAMPLE
Constant Speed	
Constant Velocity	
Acceleration	
Circular Motion	
Centripetal Force	
Centripetal Acceleration	
Inertia	
Net Force	
Equilibrium	
Frictional Force	
Fluid Force	
Inertia Frame of Reference	
Non-Inertial Frame of Reference	
Action-Reaction forces	
Newton's First Law	
Kinetic Energy	
Potential Energy	
Work	
Conservative Force	
Non-Conservative Force	
Sensation of Weightlessness	
Doppler Effect	
Plane Mirror	
Concave Mirror	
Convex Mirror	
Refraction	
Standing Wave	
Polarization	
Strobe Light	
Free Fall	