Upper Merion
Six Flags Great Adventure
Physics Day

photo credit: Mr. Mont

Questions & Problems

Start a Google Doc with the name PARK PHYSICS + (your name)

The chart below tells you how many questions/problems you must choose.

Screenshot the question into the Google Doc and answer them there.

If there is mathematical work, feel free to do it on paper, take a pic and then insert the pic into the google doc.

	Going to Great Adventure	**Not Going**
CP	5 total One from each page (including the "At the Park" page.) At least two should be problems.	4 total One from each page (excluding the "At the Park" page.) At least one should be a problem.
Honors	5 total One from each page (including the "At the Park" page.) At least one should have an asterisk. At least two should be problems.	4 total One from each page (excluding the "At the Park" page.) At least one should have an asterisk. At least one should be a problem.

1. Carney Games

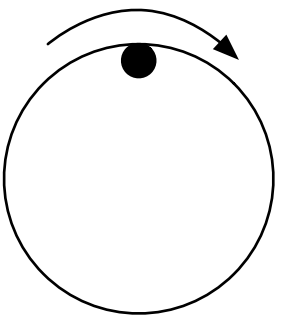
1Q1 Choose a carnival game. Describe the game and show pictures. What is it about the physics of the game that makes the game difficult? What are the common mistakes that people make when playing? What is the winning strategy? [Show pictures and cite all sources!]

2. Horizontal Circles

QUESTIONS

2Q1 You are trying to convince your friend to sit in the best seat while on the SkyScreamer swings ride. Explain which seat she should sit in - the inner or the outer one - and why.

photo credit: SixFlags.com



Top view

2Q2 On the Swashbuckler ride, you are spun fast enough that you feel as if a force is pulling you toward the outside. But the force on you is actually pointing which way? If you were released from the circle at the moment shown, which way would you go?

PROBLEMS

2P1 SkyScreamer ride hurls you around a circle of radius 14.9 m and has a maximum speed of 17.9 m/s. How many g's is that?

photo credit: Mr. Mont

2P2* SkyScreamer ride hurls you around a circle of radius 14.9 m and has a maximum speed of 17.9 m/s. What is the angular velocity?

3. Vertical Circles

QUESTIONS

3Q1 For riders on a vertical loop - which part of the loop has the most potential of danger for riders - the top, sides or bottom of the loop? Do engineers design the loop to be more open or tighter at that point? Why?

photo credit: Mr. Mont

3Q2* On a ferris wheel type of ride, where is the Normal Force GREATER than a rider's weight - top, sides or bottom? Where is the Normal Force LESS than a rider's weight - top, sides or bottom?

PROBLEMS

3P1 Riders on Batman the Ride experience as much as 4 g's in the loop. Assuming they are moving at ride's top speed of 22.3 m/s, calculate the radius of that part of the loop.

photo credit: Mr. Mont

photo credit: SixFlags.com

3P2 How many g's do riders experience on the Dare Devil ride? At the bottom of their swing, they are moving at 26.8 m/s in a circle of radius 47.2 m.

4. Coasters

photo credit: Mr. Mont

QUESTIONS

4Q1 What kind of energy do riders on typical roller coasters mostly start with? What kind of energy do riders on King Da Ka start with?

photo credit: Mr. Mont

4Q2* El Toro is one of the world's largest wooden roller coasters. Many riders will notice more bumps and vibrations during the ride than steel coasters. What does that mean about how efficiently El Toro converts energy into Kinetic for riders?

PROBLEMS

photo credit: wikimedia commons

4P1 The first drop on Nitro is 65.5 m. Use that drop to calculate the speed at the bottom of the drop using Conservation of Energy (assuming no friction and v = 0 at the top.) Comparing that to its actual speed of 35.8 m/s, would you say that Nitro has minimal or considerable friction?

4P2 Calculate the average speed of each of the coasters. What parts of the design cause a coaster to have a SLOW average speed?

Coaster	Length (m)	Ride Time (s)	Average Speed (m/s)
Batman the Ride	821	100	
Nitro	1609	180	
Superman	843	145	
Crazy Train	360	105	

5. At the Park

All measurements should be taken from the ground.
Do not have your phone out on a ride!

PROBLEMS

5P1 Time the drop of Zumanjaro. Use that time and the acceleration of gravity to calculate a top speed at the bottom if there were no drag or braking system. Compare that to the ride's actual top speed of 40.2 m/s - how close is that to what you calculated?

5P2* Time the period of the Carousel at top speed. Calculate the angular velocity of riders.

5P3 Time the coaster El Toro from the top to the bottom of the first hill. Use that time and El Toro's top speed of 31.3 m/s to calculate an average acceleration (assuming it starts from rest at the top.)

photo credit: Mr. Mont

5P4* Time The Slingshot riders ON THE WAY BACK DOWN from the time they pass their level of the uprights to their stop at the bottom. Using the height of the uprights as the distance they travel (44.8 m) calculate their deceleration.

6. Sources

https://www.sixflags.com/greatadventure/things-to-do/all-rides

List of rides at Great Adventure

http://www.greatadventurehistory.com

Amazing site detailing all of the rides there are and have ever been at the park. Fascinating photos of many rides being constructed as well as useful ride data.

http://rcdb.com

The roller coaster database. A great source of data on roller coasters around the world.