**Situation:**

After constructing a successful free-fall ride, you are continuing your career an amusement park ride engineer. This time, your team’s project is to build a ride involving circular motion. The main focus of this ride should be motion in a circle, but if you want it to do other things as well, that is up to you. It is important that this ride is both FUN and SAFE. Your ride should not only have a theme, but it should also provide excitement for riders – (think force, weightlessness, etc). The presentation that your team is going to give of your ride is again going to be given to the board of directors, which includes both thrill-seekers who only care about the fun-factor, as well as ride safety specialists, who will be much more interested in how your ride keeps passengers safe. See below for the items that the board of directors is going to be looking for:

**Deliverables**

1. Written proposal of your ride – remember, this is being given to the board of directors – make it convincing! It should include the following things (you shouldn’t separate the proposal into sections, it should just be one cohesive statement):
   1. Why your ride is fun and exciting
   2. How your ride is unique from other circular motion rides
   3. Safety considerations for your ride
2. Scaled drawing of your ride (neat & in color) with all calculations labeled (work for the calculations can be shown separately)
3. Calculations / measurements for the following:
   1. General dimensions (height, length, width)
   2. Radius of the circular motion
   3. Maximum linear velocity of the ride
   4. Centripetal acceleration
   5. Source of force causing circular motion
   6. Maximum g-force riders experience (remember what the limit is to be safe)
   7. An accurate FBD for at least 2 different points on the ride
4. Scaled physical model of your ride with k’nex. Make sure that you have determined an appropriate scale and then apply it to the model!

**Grading**

Your group’s project will be graded with two separate rubrics –

1. The school-wide problem solving rubric will be used to assess how well you gathered and analyzed data and used critical thinking skills to build your ride and solve the many problems you encountered.

2. A separate rubric will be used for determining your grade on the project. It will include criteria for all of the deliverables outlined above, as well as a grade for participation and presentation.

**Schedule**

Friday (second half of class- 5/3): Brainstorm ride designs. Come up with theme/basic design. Begin calculations.

Monday & Tuesday (only a portion of each day will be devoted to the rides 5/6 & 5/7): Complete calculations. Create scaled diagram of ride. Complete proposal to Board of Directors.

Wednesday (all class - 5/8): Build scale model with k’nex.

Thursday (beginning of class – 5/9): Presentations of rides.

**Calculations**

Guide for thinking about calculations (these are just a GUIDE, you do not have to go by all of them, but you should look them over):

* What is the connection between velocity, centripetal acceleration, and centripetal force?
* Where would you be concerned about a large amount of centripetal force/acceleration?
* Where will the normal force exceed the normal force of a person on the ground? How does this make the ride exciting?
* Is there other movement besides circular motion? What are the velocities / accelerations?
* Where is there weightlessness?
* Make sure you show ALL listed calculations as well as ALL of the calculations you had to do to get to those answers. These can be on a separate sheet.