



Women in Engineering Junior Badge

Created by Girl Scout of Central and Western Massachusetts. The requirements have been modified slightly to align with Magic Mountain GSGLA Day. For the original requirements, please visit www.gscwm.org.

Complete 6 of the 10 activities below. Starred activities (*) may be completed during Magic Mountain GSGLA Day.

- 1) Find the definition of engineer, then create a list of at least 3 kinds of engineers. Select one and find out the primary things those engineers build or design.
- 2) *Visit an amusement park or playground and study the design of a ride or piece of playground equipment. Identify where friction occurs to slow down the motion of the ride and observe where an outside force is applied to a ride or to the use of the playground equipment to cause motion to occur.
- 3) Have a practicing engineer show and explain about the tools she uses. Look at a blueprint of something she is working on. Learn about projects or products engineers are working on to make a better future.
- 4) Put together a puzzle upside-down. This is similar to the trial and error method of engineering.
- 5) *Make a scale drawing of a three-dimensional object at an amusement park or park. Show a side view, a top view, and a front view on the same piece of paper.
- 6) *Participate in one of the Girl Scout “Olympi-gineering” activities during Magic Mountain GSGLA Day and describe the ways in which the activity relates to the field of engineering. The schedule of available challenges will be available at the Girl Scout table at Six Flags Magic Mountain during GSGLA Day.
- 7) Create an artistic and sturdy structure from construction materials of your choice. Tell how you used your knowledge of art and science to build your structure.
- 8) Make a model of a 3-dimensional object, a kit may be used. Then try building a 3-dimensional object of your own design.
- 9) *Have a “construction materials hunt” at Six Flags Magic Mountain or other location of your choice. Locate something made out of each of the following materials and for each thing you find, discuss why that particular material was probably chosen for the constructed item.

Material	Where	Why was this material used?
brick		
paper		
cement		
plastic		
wood		
metal		
stone		
cinder block		
sheetrock		
concrete		
stone		

10) *Visit the ride SCREAM at Six Flags Magic Mountain. Stand outside the ride at a place where you can watch the coaster. Watch a rider and try to determine what forces the rider feels on his/her body at various points during the ride. Would the seat be pushing on the rider's bottom? Would the shoulder harness be holding the rider in the seat? Would the side of the car be pushing on the rider? Would the back of the seat be pushing the rider forward? Would the shoulder harness prevent the rider from flying forward?



Consider what is happening as the coaster is in the following situations. For each of the situations predict what forces you or another rider would feel:

- going up the first hill
- going down the first hill
- making a sharp left or right hand turn
- going over the top of a hill when right side up
- going through the top of a loop upside down
- leaving a loop while right side up

Watch the way the riders move. Does their hair hang down?

Now ride the ride or interview someone who did. Try to remember the forces you felt at some of the points listed above. Work with a group. Assign each person a specific point at which to collect data. Do your observations agree with your predictions made above? Discuss

Stand at a place where you can see the coaster going through the first loop. Measure the time it takes for the entire coaster train to go through the loop. Start your stopwatch when the first car gets to the top of the loop and stop when the last car passes this point. The coaster train is 13.1 meters long. Calculate the speed of the coaster train as it goes through the top of the loop using the equation: $\text{speed} = (\text{distance}) \times (\text{time})$. Show your work.

As you go through the top of the first loop try to remember the force you felt. Did the seat push on your bottom or did the shoulder harness hold you in your seat?

Describe the force you felt at the top of the loop.