Project Definition:

For this project, groups of five students where challenged with designing a gravity propelled vehicle that would travel down a ramp and stop close to a predetermined point. However, this gravity car does not travel in a straight line, but instead travels a curved path. The car must navigate between two cans that are located halfway between the start and finish points. The can will be located 70cm and 100cm away from the straight line connecting the start and end points of the car. The car must be able to complete this curved shot from the distances of 9m and 12m. To achieve this desired result, two unique features had to be added to the standard model of the gravity car. The first feature that needed to be added is a braking system that would stop the car at the desired point. This braking system would be created by a wing nut that slides within a grove down a threaded axle until it is stopped by a rigid block. The second feature that would be added to the car is a method of breaking and adjusting one side of the frame of the car. By doing this, the car would have two different lengths, allowing the car to travel in a curved line. The adjustment of the frame must be able to be done to one thousandth of an inch, an must be repeatable. The other dimensions of the car must be based off the scaled model provided to us in the instructions. The second part of the project that needed to be designed and modeled is the ramp. The ramp must be based on the scaled model provided and contain a release mechanism and a sighting system. The ramp itself must be smooth and must meet the floor at less than a .03in step. The release mechanism must allow for a smooth and repeatable release. The sighting system must position a laser pointer at an angle that will align the ramp to where the car can complete a curved run. The sighting system must be firmly positioned so that it will not move between runs. Other than the simple constraints we were given, there were some more requirements that we also had to meet. The first of these other requirements was that it must follow the Science Olympiad ruleset. Also, the total cost of materials of the car must be less than 300 dollars. Another of these requirements is that 16 inches cubed of 3-d printed parts can be used. The last of these other requirements is that FEA must be used to analyze at least one part. It is also important to note that motion analyses will be used to determine if the car can travel the desired path. Once all these requirements are met, all desired components are to be compiled into the rest of this report.

Project Purpose:

There are a few primary skills being tested in this project. One purpose is to test our practical skills on SolidWorks. We are displaying our ability to model and draw a variety of different parts and assemblies. We are also forced to organize these files and drawings in a way that makes sense and allows for easy location of parts. The second concept that this project is testing is our ability to work well as a team. To complete this project in a timely manner, we are forced to collaborate and rely on our teammates. The ability to communicate and collaborate with other team members is a skill that will be very valuable moving forward. Finally, the last skill tested by this project is the ability to look at a problem and formulate an organized solution. We were given a problem and had to come up with a practical solution that would be designable and effective. We then had to organize these solutions in a way that is easily repeatable and understandable. By analyzing our team’s ability to complete this task, we are being tested on our ability to operate in the workforce.

Teamwork:

Communication and team organization are very important parts of any group-oriented project. Teamwork was especially interesting for this group because we did not know each other prior to becoming group member. What is even more interesting is that our group hailed from four different countries and three different continents. Thankfully, everyone was very fluent in English, so this did not end up being the problem. The first problem that we ran into as a team is establishing a method of communication. We decided to use GroupMe as our primary form of communication. GroupMe is a texting app that allows people to be added in group texts. We decided on GroupMe because every group member was familiar with the app, and the app allows for easy documentation of conversation. The next challenge that we were presented was finding a time to meet as a group. At the beginning of the assigned time we met about once every other week, but as time went on we decided to meet once a week to discuss what we needed to work on. We also made a gantt chart that defined all of the team members roles. The gantt chart also helped us stay on a good schedule. However, it was common for group members to go outside their roles if another member needed assistance. The next challenge that was faced was finding a way to share files with each other when not all the members were present. We decided to use the website GitHub to share the SolidWorks files with each other. GitHub basically acted as a third-party storage system where group members could upload and download files at will. Another good thing about using GitHub is it keeps a log of changed files, so that we could look back at our older designs if we needed to analyze a change. This ease of file sharing allowed group members to work independently, while also being in contact with other group members ideas. For files that did not come from SolidWorks, we used DropBox to share files. We used DropBox because it was easier to use on personal laptops and mobile devices. This allowed for access to information quicker than it would be available on GitHub. All of the group members were helpful and willing to work towards a common goal. There were no problems with attendance on work ethic. The workload was spread fairly evenly across group members, and members who were given less immediate responsibility still utilize their time by helping others with their work.