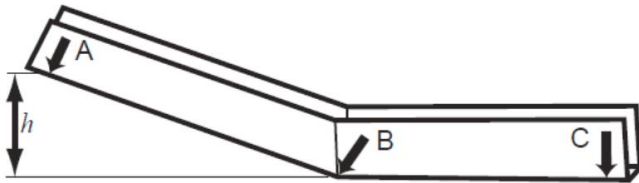


## Roller Coaster Design Project

**Problem:** You have been hired to design the newest roller coaster. The head of Disney World's Islands of Adventure is not convinced that you can design a new roller coaster that includes a "thrill" factor and is still safe enough for her children to ride. Use science to prove to the project manager that roller coasters **can** be fun and safe. You will design, construct, and test a roller coaster with the following constraints.

### Constraints:

- You will be working in a group of three or four. You will remain in these groups for the entirety of the project. You may not combine or switch groups;
- The height of the roller coaster structure must be between 30 centimeters and 100 centimeters;
- The track length must be at least 150 cm long;
- There must be at least one loop;
- There must be at least eight changes in direction;
- One part of the track must have a slope that flattens out for a short distance before making any turns**



- There must be one funnel;
- The cup at end of track must stand upright and catch the marble without the marble missing or jumping out of the cup;
- The track must be mounted to the cardboard base;
- You must use masking tape to attach the structure to the cardboard base. For all other components, use clear tape;
- The marble must stay on the track at all times without using added barriers to the track;
- The total cost of roller coaster must stay under the \$65 budget; and
- Each group may only purchase one pre-made part (extra \$5).

### Additional notes:

- Each group must complete a design sheet for the roller coaster track and a design sheet for the roller coaster structure.
- I will provide a 15% discount for columns/beams groups purchase on the first day.
- I will judge roller coasters based on adherence to the constraints.
- Each group will need to choose an accountant, a supply manager, a quality control manager, and a cleanup manager. These jobs are in addition to helping to design, build, and test the roller coaster.
  - **Accountant:** This person will keep track of the budget sheet. He or she will make supply purchases, account for every purchase, and keep a running balance. Every time the accountant makes a purchase, the money sheet must accompany him or her for the order to be delivered. There may be spot checks for the budget sheet. Failure to produce an up to date budget sheet will result in an immediate loss of points. Please note that other group members are responsible for filling in for the accountant, should he or she be absent.
  - **Supply manager:** This person will maintain all roller coaster supplies. He or she will be responsible for retrieving and returning the roller coaster from the designated space each day. He or she will make sure that all roller coaster supplies are carefully put in the group's designated space to minimize loss.
  - **Cleanup manager:** This person will make sure the team station is clean and orderly each day. He or she will check the floor and counter for tape, paper pieces and general trash. He or she will make sure all tools (tape, scissors, ball point pens, magazines, rulers) are returned to their proper bins. (All team members should be assisting with clean up each day. No one can leave the station area until the cleanup manager signs off.)
  - **Presentation manager:** This person will be responsible for assigning tasks related to the presentation and making sure that the presentation contains all the required elements. He or she will also be responsible for retrieving and returning the group binder from the designated space each day. The manager will need to access Google Drive and submit the finished presentation URL. All group members are expected to contribute to the presentation, but the manager is responsible for the final check and submission.

## **Roller Coaster Presentation**

Your group will be creating an electronic poster of your roller coaster. This poster is an interactive presentation where you will detail your group's design process by including pictures, links, informational text, or videos. Be creative, but make sure to not clutter the poster with too many tags. Make sure to include a tag for each of the following:

- The names of all group members;
- A video of the roller coaster running (you can do real time, slow motion or effects).
- Information on the average speed;
- Information showing which area was measured for energy calculations. Include the kinetic energy, the potential energy, and a conclusion on why these values are the same or different. Be sure to include units; and
- Information about your budget (how much the group spent, what the group purchased, how much the group had leftover).

### **Additional tips for your presentation:**

- Take a clear picture of your roller coaster that shows all the parts.
- The video can be saved to your Google Drive and then can be added to the presentation using its URL.
- You are not limited to the tags above. You may include any other tags that highlight interesting components, explanation of supports, comments on fun factors, or challenges the team faced.