2023 Roller Coaster Design Challenge

LEVEL: Middle and High School (6th – 12th grade)

TYPE OF CONTEST: Team

COMPOSITION OF TEAM: 3 - 5 students per team. Students may only participate on one team.

NUMBER OF TEAMS: No limit on number of teams that build project but 6-10 entries (for UCR competition) per school recommended

OVERVIEW: Students will design and build a roller coaster model of their own design using any disposable material(s) that transports a standard glass marble a defined distance (determined by the students) from a defined beginning of the track (where marble is released) to a defined end (where marble stops).

MATERIALS: Standard Glass Marble
(apprx 14-16 mm in diameter)

Miscellaneous disposable materials
(e.g. foam pipe insulation, pool noodles, pvc pipe, cardboard, manila folders, etc.)

RULES:

1. Students may use any disposable material for rollercoaster. **Students may not use any pre-fabricated kits for the rollercoaster, i.e. K'nex rollercoaster kits**

2. Projects should fit within a **footprint** of **20 square feet.** Projects should also not exceed **10 ft.** in height. Be aware that points will be given for design (efficient use of space and materials) and ingenuity/creativity (uniqueness and ingenious use of actions and materials).

3. Marble must be shown/displayed prior to a coaster run (e.g. It must be clear required glass marble is being used). Marble must run through entire track, from a

defined beginning to a defined end, without any motorized (i.e. rubber bands, small motors, etc.) or outside assistance (i.e. team member intervention). Gravity must provide the only source of energy for the marble.

4. Teams will need to submit a video showing the entire device and its features (per the requirements) AND the successful operation of the device (from beginning to end of the run). Submitted videos should not exceed 2 minutes in length.

5. The roller coaster should complete its run (from beginning to end) after a maximum of one minute time.

6. Students must produce an engineering drawing or sketch of their roller coaster. A standard three view drawing that is properly labeled (dimensions, size of rollercoaster parts) is preferred. **School name, team member names**, and **roller coaster name** must be included on the drawing. Drawing may be done by hand or electronically.

7. A written "press release" describing the coaster and summarizing its highlights and special features should also be created (see rubric and addendum). **School name, team member names**, and **roller coaster name** must be included on the release and stated on the video.

JUDGING:

1. Submissions will undergo an initial screening, where the videos will be viewed and evaluated primarily on the video and coaster project featured. From this viewing, a group of finalists will be selected. Finalists will receive a complete evaluation of their submissions, as well as an in-person assessment of the project.

2. Videos must be viewable and accessible by our judges. If permissions are needed, please grant them to us. Videos that cannot be accessed will not be scored. Regarding quality, videos must be clear enough to be able to see the coaster and all of its actions and parts for evaluation. Roller coasters that cannot be clearly seen will not be assessed.

3. Teams will be evaluated on the criteria on the subsequent MESA roller coaster scoring rubric.

Please see an accompanying addendum for additional advisement on the competition components (press release, drawing and submission video).

MESA ROLLERCOASTER PROJECT-Scoring Sheet

Coaster Name:_____**School:**_____

Team Member Names:

PROJECT EVALUATION

1. DESIGN   **Points earned/Possible points**

a. # of elements   **pts.**
(1 pt. per element, 8 pts. max)
Elements are defined as drops, inversions, and helixes.
A <u>Drop</u> is defined as a downward portion of track that forms at least a 45 degree angle.
<u>Inversions</u> are portions of track that turns marbles upside down.
A <u>helix</u> is a turn of at least 360 degrees resulting in an upward or downward spiral

BONUS POINTS: For number of inversions: **pts.**
(1 pt. each, 4 pts. max)

b. Aesthetically pleasing   **/5 pts.**
(Is it neat? Clean? No roadway obstructions? Well constructed and solid? Of uniform or well patterned color?)
Full points given to coaster that meets above criterion. Points will be lost for coasters that do not meet one or more of the above criterion.

c. Creativity (Circle one per line/row)

		3 pts	**2 pts**	**1 pt**
i.	How original is the design:	Very Original	Good/Adequate	Not original or ingenious
ii.	Does it have a well-defined theme:	Very defined theme	Has a theme	Has no theme
iii.	How creatively did team use materials/items:	Very creative use	Good and effective use	Material use inadequate

Totals: _____   _____   _____

                                                          Subtotal creativity   /9 pts.

d. Length/Distance
   Coaster "ride" lasts less than 1 minute: **/2 pts.**
   Coaster has a well-defined beginning and end: **/2 pts.**
   Coaster meets footprint (area of 20 sq. ft.)   **/3 pts.**
   Coaster meets height requirement (<10 ft high)   **/3 pts.**

TOTAL   _____**pts.**

2. THRILL

a. Average speed throughout rollercoaster
*(Measured by dividing **length of track/time in seconds. Students must measure the length of their track.** The track length and time to complete run, from defined beginning to end, will need to be verified on the video provided. Please note that points will be awarded based on ratios of highest speed when compared to other teams)*

Distance covered (beginning to end) (inches):_____
Time (beginning to end) (seconds) :_____

Speed:_____ (in/s)

TOTAL:	**_____/10 pts.**

3. DRAWING

The drawing will be scored using the following criteria:

It is a three-view drawing: _____ (4 points)
Proper metric measurements used: _____ (4 points)
Drawing is labeled properly: _____ (4 points)
Drawing is thorough and of high quality: _____ (4 points)
Drawing is neat and clean: _____ (4 points)

TOTAL:	**_____/20 pts.**

4. PRESS RELEASE AND VIDEO

Proper grammar was used: _____ (4 points)
It is well written and persuasive: _____ (4 points)
It is one page long, with correct font and double spaced: _____ (4 points)

Three pictures of varying perspectives are provided: _____ (3 points)
The pictures provided are of good quality: _____ (2 points)

The video gives a good portrayal of coaster and elements: _____ (5 points)
The video is easy to follow and understandable: _____ (3 points)
The video portrays the coaster theme well: _____ (3 points)
Video is no longer than 2 minutes: _____ (2 points)

Total rating score:_____

TOTAL:	**_____/30 pts.**

GRAND TOTAL: [_____] pts.

In the case of ties, a tie breaking procedure will be utilized. The procedure will follow comparing these scoring conventions in the order shown: "press release," "design" score, "drawing" score and "thrill" points. Final discretion on the awarding of points and interpretation of the rules and guidelines lies solely with the judges. There is no arbitration and appeals in this competition.

Regarding the roller coaster footprint and size

Below is a visual representation of the size limitations of your coaster. Again, this is just a representation… your coaster must meet the size requirements in the rules, but do not have to exactly match the numbers shown in this image. This is just an example:

10 ft.

Coaster must not be higher than 10 ft

5 ft.

4 ft.

Footprint of coaster
Coaster must fit in a footprint with an area <u>less</u> than 20 sq ft

Area: *4ft x 5ft = 20 square feet*