Texas Alliance for Minorities in Engineering

The 2012 BB-Coaster Challenge

Supply list:

1 spoon straw	masking tape
10 drinking straws	1 paper cup
10 stirrer straws	3 metal BBs
1 poster board	1 lump of clay
1 pair of scissors	1 paper lunch bag

Objective:

Design and build a 3D coaster of straws through which a metal BB must travel. The objective is for your team to design an innovative coaster that scores the most points based on several criteria: the height of the track from the board, the length of the track, the time taken for the ball to travel through the track, and the number of turns and loops in the track. The team with the highest total number of points wins. Awards will also be given to teams that design the most creative working designs.

Instructions: READ INSTRUCTIONS AND RULES THOROUGHLY.

1. You have 45 minutes to assign team roles, design, build and test a BB-coaster. When time is called, you must put all materials down and step away from the table. Judges will call your Lead Test Engineer to the table when they are ready to test your design.
2. Discuss and assign member roles – each team member must participate and each role must be assigned. If your team has less than five members, some of the members will serve in more than one role. The roles –
   - PROJECT MANAGER will serve as the team leader. He/she is responsible for verifying that all documentation is complete, all requirements are met, and that the project is completed on time.
   - LEAD DESIGN ENGINEER will lead the design phase for your team. He/she will lead the team in determining what approach they will take to earn points.
   - LEAD MATERIALS ENGINEER will ensure only materials provided are used in the project and see that materials are not lost or misplaced during the building phase.
   - LEAD CIVIL ENGINEER will lead the construction phase. He/she makes sure that the structure and its supports are stable and that the BB can travel through the track and document the design for scoring.
   - LEAD TEST ENGINEER will act as the team's representative during judging and complete "testing phase" section on the Team Information and Documentation Form.
3. Fill out the Team Information and Documentation completely for your BB-coaster in the space provided.

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Rules:

- Work with your assigned team. No one other than your team members can participate in planning and building your coaster.
- Each member must have an assigned role and all roles must be assigned.
- You may only use the supplies given to your team for your project.
- The track must start with the red spoon straw and end with the cup.
- Once you have dropped the ball onto the track, you may not touch or interact with the BB-coaster in any way.
- All support for the BB-coaster track must be attached to the baseboard. You may situate and support the board however you like, but you may not use any external supports for the track itself.
- You may not cut the baseboard. All other materials may be manipulated however you like.
- When you are done, leave your Team Information and Documentation Form on the table with your coaster.
- Judging will consist of three test runs unless your BB gets stuck in the track.
- You will only be scored on the portion of the track that the BB traverses.
- In the event of a tie, the quality and completeness of the documentation will be the tie breaker.

Suggestions:

- Spend at least 5-10 minutes planning and drawing your design before building.
- Test your BB-coaster as you build to make sure it works.
- Be creative. There are many different ways to build a winning coaster, so think about different approaches you could use. Your project will be judged using the following metrics:

Metric	**Point value**
Completes task (BB travels from spoon straw to cup successfully)	50 points
BB stays in cup	50 points
Time for BB to travel through track	50 points per second
Height of track	5 points per inch
Length of track	1 point per inch
Turn greater than or equal to 90 degrees	10 points per turn
Vertical loop in track	50 points per loop

The score for your team will be the best score from one of your three runs. The time for a run will only count if the BB completes the task. If a BB gets stuck in the track during judging, your testing is complete.

IMPORTANT: Height of track, length of track, number of turns and number of vertical loops will be counted only for the WORKING segment of the track as determined by the longest run. In order for a section of track to qualify for scoring, the BB must have traveled that section of the track in its longest trial run.

For example, if the BB never completes a full run and stops after traveling half the track, only half the track length, the maximum height to that point, the number of turns and loops to that point will be scored.

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Team Information and Documentation Form

Team Number: _____ Coaster Name: _____

Team Members:

Role	First Name	Last Name
Project Manager		
Lead Design Engineer		
Lead Materials Engineer		
Lead Civil Engineer		
Lead Test Engineer		

Design Notebook:
Describe your design approach – which of these was important for your coaster? Longest run, most turns, longest track, tallest tower, etc.

_____

_____

_____

_____

_____

Describe what happened when you tested your project the first time:

_____

_____

_____

_____

What changes did you make to address any design challenges?

_____

_____

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_____

Describe what happened when you re-tested your project:

_____

_____

_____

_____

DESIGN DRAWING/PLANS:

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Scoring Sheet

Team Number: _____ Coaster Name: _____

Scoring Metrics:

- Completes task (BB travels from spoon straw to cup successfully)
- BB stays in cup at the end of the run
- Time for BB to travel through track to the nearest tenth of a second
- Height of track to the nearest tenth of a centimeter
- Length of track to the nearest tenth of a centimeter
- Turn in track greater than or equal to 90 degrees
- Vertical loop in track

Metric	Test Run 1	Test Run 2	Test Run 3
Completes task	yes no	yes no	yes no
Ball stays in cup	yes no	yes no	yes no
Time for run			

If the BB does not complete the run through the track, scores for track height, track length and the number of turns and loops should only include the portion of the track that the BB traversed on its longest run.

Metric (for the longest run)	Measurement
Height of track to nearest tenth of a cm	
Length of track to nearest tenth of a cm	
Number of turns greater than or equal to 90 degrees	
Number of vertical loops	