

Name:

Date:

Class:

How Does a Roller Coaster Work? Worksheet

Objective: Use the engineering design process to design, test, and model a paper roller coaster system.

Part 1: ASK & RESEARCH: Roller Coaster Phenomenon

Have you ever been on a roller coaster? Watch a ride on [Cannibal at Lagoon](#), and then make three observations on how the roller coaster works over time. (Look for changes in the coaster's speed, height, and how it moves without an engine!)

Observation 1:

Observation 2:

Observation 3:

What questions do you have about the way the roller coaster works?

Question 1:

Question 2:

Today we are going to design a paper roller coaster system. Your engineering team's goal is to successfully guide a marble passenger through a track containing a starting hill, a vertical loop, and a banked turn into a secure catch mechanism. Watch this video on how to make a roller coaster from poster paper: [Paper Roller Coasters](#) (2:10 minutes).

Make a roller coaster that meets the following requirements:

- Use the template handout, board, and tape only.
- Performance Profile: Maximize your track design to keep the marble moving using only gravity.
- Have at least one hill, one loop and one turn.
- Keep the marble on the coaster the whole time.
- Catch the marble at the end (no objects flying off the end).
- You have 20 minutes to cut out and build your coaster (all hands on deck).

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Part 2: IMAGINE & PLAN

Individual Brainstorming: Sketch one initial idea for your track layout. Label where you think the marble will have the most potential energy (PE) and the most kinetic energy (KE).

Team Diagram: After sharing ideas, draw your team's chosen final track blueprint. Use directional arrows to map the predicted path of your marble passenger.

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Part 3: CREATE, TEST & IMPROVE

Create & Test: Build your cardstock prototype track and test it with your marble passenger.

Improve: Modify your starting hill heights or bank your curves if your passenger stalls or derails!

Take a picture or draw the finished roller coaster you built. Be ready to demonstrate it to another group.

Part 4: Peer Review Gallery Walk

Which team's roller coaster design did the best job of keeping the marble moving safely while using its height to clear the loops and turns? What specific parts of their track made it work so well?

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Part 5: Final System Modeling & Explanation

Make a model to explain how the roller coaster works. Use ideas related to energy and motion.

- Include the necessary components.
- Use arrows to show the motion of the marble (where is it fastest and slowest).
- Predict and label where gravitational PE transforms into KE.
- Show how height and gravity interact with your track system over time.

Write a paragraph to explain your model. Be prepared to share your model with someone else.