

## CHALLENGE #4: MARBLE ROLLER COASTER (EXPLORATORY)

### YOUTH WILL BUILD A MARBLE ROLLER COASTER THAT MOVES A MARBLE TOP TO BOTTOM



#### MATERIALS:

Paper plates with tall sides, paper bowls, paper towel rolls, plastic cups, blocks, hot glue, scissors, tape.



#### VOCABULARY:

**POTENTIAL ENERGY:** Stored energy or energy of position. When the marble is in place at the top of the roller coaster, it has **POTENTIAL ENERGY** because it is in a high position and a tendency to roll down the track due to gravity.

**KINETIC ENERGY:** Energy of motion. While the marble is rolling down the track, it has **KINETIC ENERGY**.



#### 4-H LIFE SKILL:

**CRITICAL THINKING:** You will need to **THINK CRITICALLY** about how to adjust the roller coaster track and supports to keep the marble on the track.

### DO: YOUTH COMPLETE THE ACTIVITY

Watch the challenge: <https://go.umd.edu/rcchallenge>



## CHALLENGE #4: MARBLE ROLLER COASTER (GUIDED) YOUTH WILL BUILD A MARBLE ROLLER COASTER THAT MOVES A MARBLE TOP TO BOTTOM



**MATERIALS:** 15 paper plates with tall sides, 10 plastic cups, scissors, tape and a marble.



**VOCABULARY:** **POTENTIAL ENERGY:** Stored energy or energy of position. When the marble is in place at the top of the roller coaster, it has **POTENTIAL ENERGY** because it is in a high position and a tendency to roll down the track due to gravity.  
**KINETIC ENERGY:** Energy of motion. While the marble is rolling down the track, it has **KINETIC ENERGY**.



**4-H LIFE SKILL:** **CRITICAL THINKING:** You will need to **THINK CRITICALLY** about how to adjust the roller coaster track and supports to keep the marble on the track.

### **DO: YOUTH COMPLETE THE ACTIVITY**

Watch the challenge: <https://go.umd.edu/rcchallenge>  
then follow steps 1-5 on the following page.



## CHALLENGE #4: MARBLE ROLLER COASTER (GUIDED STEPS ONE THROUGH FIVE)

### STEP 1. IDENTIFY THE PROBLEM

Design and build a roller coaster track for a marble to go from a start position, down a track, to a cup at the bottom.

### STEP 2. IMAGINE SOLUTIONS

Think about all of the possible ways you can make your roller coaster. You can cut the curved rims off of paper bowls and paper plates to make the track for the marble to roll down. Tape the rims of cups together to make the supports that will raise the start of the track.

### STEP 3. PLAN POSSIBLE SOLUTIONS (SKETCH IT HERE)

### STEP 4. CREATE YOUR MARBLE ROLLER COASTER

1. Use your scissors to cut the curved rims from your paper plates or bowls.
2. Tape the rims together to make a track.
3. Tape cups together to make a support structure, and tape the start of the track to the top of the cups to increase the potential energy.
4. Place a cup at the end of the track to catch the marble.
5. Try it! The **POTENTIAL ENERGY** of the ball at the top of the track becomes kinetic energy as it travels down the track.

### STEP 5. IMPROVE YOUR DESIGN

Do you need to change anything to make your roller coaster better? Perhaps you need to add more materials to help the marble stay on the track around the curves. You can go back to Step 1, and make the changes to improve your roller coaster.

## CHALLENGE #4: MARBLE ROLLER COASTER

### REFLECT: GUIDE YOUTH THROUGH THE REFLECTION PROCESS

See a solution here: <https://go.umd.edu/rcsolution>

Did the marble travel faster in some parts than others? Why do you think that is?

What was the most difficult part of creating the roller coaster? How did you use **CRITICAL THINKING** to overcome the challenge?

Where did the marble have the greatest amount of **POTENTIAL ENERGY**? The least amount?

### APPLY: CHALLENGE THE YOUTH TO APPLY WHAT THEY'VE LEARNED TO OTHER PARTS OF THEIR LIVES

What are other examples of **POTENTIAL** and **KINETIC ENERGY** in your everyday life?

Why do engineers need to have an understanding of **POTENTIAL** and **KINETIC ENERGY**?

### REFERENCES:

Brown, B. (n.d.). *The best STEM challenge ever*. Teach outside the box. <https://teachoutsidethebox.com/2017/04/best-stem-challenge-ever/>

D'Augustino, Tracy D. (2016, March 16). *4-H family engineering night engages youth in science*. Michigan State University. [https://www.canr.msu.edu/news/4\\_h\\_family\\_engineering\\_night\\_engages\\_youth\\_in\\_science](https://www.canr.msu.edu/news/4_h_family_engineering_night_engages_youth_in_science)

Dees, S. (2012, September 5). *Paper plate marble track*. Frugal fun for boys and girls. <https://frugalfun4boys.com/paper-plate-marble-track/>

