RUBE GOLDBERG MACHINES

INDEPENDENT INVENTOR ACTIVITY 3: DESIGNING A RUBE GOLDBERG MACHINE

NOTE: For students who wish to design a Rube Goldberg Machine to be considered for competition in regional and national/international contests, please see RGM Independent Inventor Activity 4, as competitions have specific rules and requirements for eligibility.

Today I Will...

Today you will investigate how simple machines are combined to create a Rube Goldberg Machine. You will examine how the components work together and observe what happens when sections of the complex system work and when they fail. You will begin to understand how cause and effect relationships and patterns play out within the idea.

Good Things To Know Before I Begin...

This activity is a good warm-up to do before you start to build a larger Rube Godberg Machine for any sort of invention fair or competition. When you successfully complete the assigned task, you can add more challenge by adding another step or incorporating another simple machine to your RGM so that it still completes the task.

We recommend that you create an Invention Box, a large box or bag filled with materials and supplies to build design models and prototypes. It may include things such as recycled materials (cereal boxes, toilet paper rolls, plastic bottles, yogurt containers, Styrofoam plates, etc.), craft supplies (pipe cleaners, beads, pom poms, popsicle sticks, clothes pins, etc.), yarn and string, construction paper, scissors, tape (duct tape, clear tape, washi tape), rubber bands, glue, markers and more. For more ideas about how to make an Invention Box, you may watch this video, Dr. Pascha Makes an Invention Box, MIT Lemelson Full Steam Ahead, 2020. Link: https://www.youtube.com/watch?v=OZZFDIa1-0U.

Hot glue guns are recommended for inventing because they dry quickly and securely. Please ask permission to use a hot glue gun at home and ask for help if needed to avoid getting burned.

I Will Need...

- Google Slides: YIP RGM Lesson 3: Designing a Rube Goldberg Machine **(optional)**
- **VIDEO** (included in Google Slides): **Audri's Rube Goldberg Machine Monster Trap**
  LINK: https://www.youtube.com/watch?v=0uDDEEHDf1Y
- 1 paper cup
- 1 ball (that will fit into cup)

RGM Building materials which may include (but you can use whatever is available)

- Hot glue gun and glue (recommended, see note)
- Tape
- Toilet paper or paper towel rolls
- Cardboard boxes of various sizes
- Blocks, books or cd's for stacking and using as dominoes, etc..
- Match box cars or other items with wheels
- String
- Craft sticks, straws, pipe cleaners

Inventor Activities

Watch this video of a young inventor's example of a Rube Goldberg Machine.
NOTE: You will not watch the entire video at once. Use the time markers listed and stop the video after the stated amount of time so that you can focus on specific parts of the machine.

Share Video: Audri's Rube Goldberg Monster Trap from the beginning to 1:38, then stop.
Link: https://www.youtube.com/watch?v=0uDDEEHDf1Y, (Video included in Google Slides RGM Lesson 3).

Ask students to turn to a partner and discuss how Audri explained how the machine was going to work. What simple machines did they see? What forces might be used? What are some of the cause-and-effect relationships in the machine?

Now, we're going to watch what happens next.

Share Video: Play video from 1:38- 2:23. You will notice several failures in the operation of the machine. Go back and play video from 2:18 - 2:23 again. This is when the machine fails for the second time. Observe carefully. (Replay video section again if needed).

Why did the machine stall? Why didn't the ball push the tube to make the glass fall? How could they have fixed this?

Share Video: Play video from 2:37-3:15, where the machine is successful.

How might you compare what you saw when the Rube Goldberg Machine worked versus when it did not. How does looking at the entire system help you understand why the machine worked in some parts but not as a whole?

Activity: Build a Rube Goldberg Machine
Now you are going to create your own Rube Goldberg Machine using what you know.

CHALLENGE: The task is to put a ball into a cup. And the Rube Goldberg Machine must include at least 3 simple machines and must involve at least 3 separate steps.

Consider what simple machines you will use and how the machines will connect to create the sequence of steps leading to the completion of the task. Also think about the materials you will need.

HINT: You might consider building machine backwards, starting with the step that will put the ball into the cup, and then thinking about what comes before that, and before that, and so on.

If things are not working, it is okay to change your original design plans as you make necessary adjustments. You may want to take notes and record the changes they make.

Once you have a working Rube Goldberg Machine that successfully puts the ball into the cup, we challenge you to add to it. Add 1-2 more simple machines (ones that have not yet been used) and/or to add 1-2 more steps to complete the same task.

Share your RGM with someone at home.