

Water Mill Rube Goldberg Machine

August 9, 2021- August 15, 2021

SPONSOR BACKGROUND

FIRST at Yale is a student organization on a mission to increase access to STEM education through FIRST robotics programs. FIRST, or For Inspiration and Recognition of Science and Technology, is a nonprofit organization that runs international robotics competitions for students from Kindergarten to 12th grade. To learn more, please visit firstatyale.org and firstinspires.org.

CHALLENGE OBJECTIVE

Modern water turbines generate electricity, which in turn powers the technology we use in our daily lives. Historically, water power was also used to grind grain into flour or operate sawmills. Your challenge is to design a non-electric Rube Goldberg machine that contains at least one water-powered element.

Each submission must start with a water wheel powered by a water stream from a sink or outdoor hose faucet that can spin a shaft in order to provide motion to part of your machine. The machine must end with an artistic display element showcasing your team name. For example, the artistic display could be a mechanism that unfurls a banner with your team name, or a small domino display. Be creative; there are no specific requirements for the artistic display other than including your team name and incorporating a simple machine. You are also encouraged to make it Connecticut themed!

These machines will be judged based on the number of **simple machines (i.e. inclined plane, lever, wedge, wheel and axle, pulley, and screw)** successfully incorporated into the design between these specified start and end tasks. Be as creative as you can!

DESIGN AND CONSTRUCTION RULES

- This is a team project. DO NOT work on this project alone.
 - Tip: If your team is completing the challenge remotely, consider having each team member work on one or more components of the machine at home. Unlike in-person Rube Goldberg machine challenges, this challenge does not require teams to physically integrate all components.
- All team members should be in the same age bracket (middle school students cannot work on the same team as high school students, and all contributing members of the project must be student team members, i.e. no adults should assist in any way.)
- The machine should be safe: no sharp edges or points and no items that produce flames.

MATERIALS ALLOWED

- All electronics are prohibited (both battery powered and wall-outlet powered)
- Only inanimate objects allowed (i.e. no human or pet interaction)
- You may only use common household items or items bought from a dollar store for this challenge. The sum of all purchases should be no greater than \$30 (for the entire team).

CONTENT REQUIRED FOR SUBMISSIONS

- Upload **videos of each portion** of the Rube Goldberg machine to this [link](#).
- Upload team's **Bill of Materials** to this [link](#).

SUBMISSION PROCESS

- Include your **name, team name, and where your video is placed in the sequence**. For instance, if your name is Jane Smith, your team is called the RubeRobots, and you are the 4th video out of 5, your video should be named **Jane_Smith_RubeRobots_4_of_5**.
- Create a Bill of Materials for all the items used to construct your machine. All items must be listed, including fasteners like glue or tape. All purchased items should have their price included, and all materials found at home should be marked as such (i.e. a note stating "found at home" in lieu of cost). The Bill of Materials should be in spreadsheet format (e.g. Google Sheets) and should include the team name and "BOM". For example, if your team is called the RubeRobots, your file name should be **RubeRobots_BOM**.

HOW WILL WINNERS BE SELECTED?

- The team with the highest number of points from the table below will be deemed the winner!

Description	Points
Start with faucet and water wheel	+5
End with an artistic display element showcasing the team's name (must contain a simple machine)	+5
Each unique component/simple machine included in the Rube Goldberg machine	+1 for each component/simple machine
Observed continuity between videos, i.e. the judges understand how the Rube Goldberg machine would work if all of the components were physically connected	+3 between each video
Human interaction (e.g. manually moving objects) between components	-0.25 for each interaction