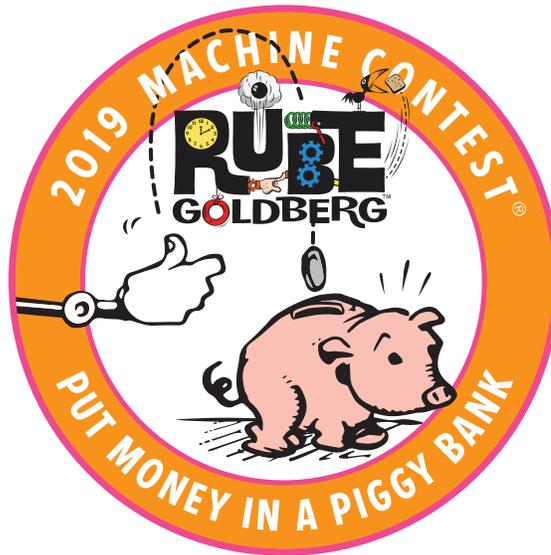# 2019 DESIGN AND BUILD FOR <u>LIVE CONTEST</u>

The 2019 Task is **Put Money in A Piggy Bank.**

The task changes on an annual basis and is determined by Rube Goldberg, Inc.

> **NOTE:** Steps, pieces and components from previous machines may be recycled, but the RGMC relies on the ingenuity of students and teachers to create entirely new machines for each year's contest.

THIS IS A STUDENT COMPETITION
- **Only students may build the machine.**
- **Only students may set up the machine.**
- **Only students may touch the machine (e.g., do interventions, fix the machine, etc.) during the competition.**
- **People who are not on the team may help transport the machine.**

Safety is always the first priority. For scenarios that require building and lifting large pieces of a machine into place, or using tools that require adult assistance, adult help is acceptable.

Machine Specifications	Minimum	Maximum
Complete official task	Required	
Steps	10 steps - APPRENTICE and DIVISION I 20 steps - DIVISION II	75 steps
Machine volume (Footprint Area x Height of highest point on the machine)	0 ft³ (0 m³) (None)	300 ft³ (8.5 m³)
Maximum machine dimensions	0' x 0' x 0' (0m x 0m x 0m) None	L W H 10' x 10' x 8' 3m x 3m x 2.4m
Machine introduction and walk-through	0 minutes (None)	3 minutes
Single run time	0 minutes (None)	2 minutes
Reset time	0 minutes (None)	8 minutes
Machine noise	0 dB (None)	100 dB
Air compressor hoses, AC or DC power cords, and/or water hoses running to or from the machine	0	2 total
Hazardous materials, explosives, or flames	Not allowed	
Electrical arcing	Allowed with safety precautions	
Live animals	Not allowed, but humans are encouraged	
Corporate logos	Corporate logos are allowed and may be used within the machine footprint, on team clothing, and on team website pages. All responsibility for logo copyright permission rests with the team.	
Use of profane, indecent, or lewd expressions	Not allowed	
Objects flying beyond machine footprint	Not allowed	
Safe for participants and observers	Required	

Refereed Machine Run Specifications	Minimum	Maximum
Machine introduction and walk-through	None	3 minutes
Team members participating during refereed and judged machine operations	None	4
Team members in contact with machine during a Contest Run	None	2 simultaneously
Reset time limit	None	8 minutes
Destructive action against other machines	Contest disqualification	

LIVE ONLY

Calculating Machine Volume - Complete this on your Team Page

<u>ALL TEAMS IN THE LIVE CONTEST</u> must design their machine to fit in an overall <u>volume of 300 cubic feet</u> (8.5 cubic meters). The machine volume is defined as the overall footprint (area) of the machine (rounded up to the nearest foot) multiplied by the height of the tallest step.

Teams may build a machine in any shape they wish, so be creative!

How to Calculate the Volume of a Machine

1. Calculate the volume online on your Team Page. You may also draw out your machine footprint on the grid found in FORMS.

    NOTE: The overall dimensions of your machine may not exceed 10′ length x 10′ width x 8′ height (3 m x 3 m x 2.4 m). If any part of the machine enters any of the 1′ x 1′ (0.3 m x 0.3 m) squares (even if it does not touch the ground/table), the entire square must be counted.

2. Count the number of 1′ x 1′ (0.3 m x 0.3 m) squares into which the machine footprint falls. This is the area of the machine footprint.
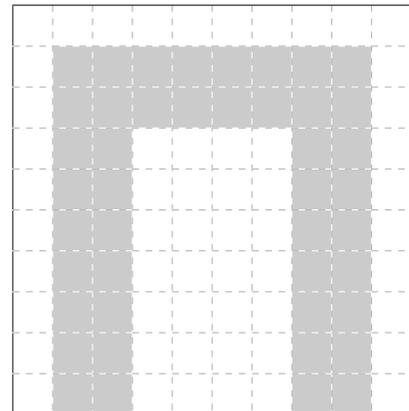
    EXAMPLE: area = 44 squares

    Example

3. Measure from the lowest to the highest point of your machine; this is the height of your machine.

    NOTE: If the ENTIRE machine sits on a table, the height of the table may be excluded from the height of the machine. If only ONE section of the machine uses a table, then the height of the table must be included in the height of the machine.

    EXAMPLE: The tallest part of the machine is a 5′ tower, so height = 5′

4. Calculate the Machine Volume using the formula: area x height = machine volume

    EXAMPLE: 44 squares (area) x 5′ (height) = 220 ft³

5. Your Machine Volume must be equal to or less than 300 cubic feet (8.5 cubic meters)

    EXAMPLE: 220 ft³ ≤ 300 ft³ (maximum) g Machine Volume is within specifications

CAUTION: Machines that exceed the maximum machine dimensions of 10′ L x 10′ W x 8′ H (3 m L x 3 m W x 2.4 m H) will be disqualified.

Teams and machines are evaluated by two distinct sets of contest officials: Referees and Judges.

REFEREES are engineers, teachers, contest organizers and contest veterans who sweat the small stuff and fully understand the contest rules and specifications.

<u>What they do</u>: Referees use specific criteria to quantitatively evaluate your machine and team requirements. Referees will score your machine at specified assigned times. At this assigned time, the team will introduce their machine, complete run #1, reset, and then complete run #2. The referees will evaluate the team & machine on the items found on the sample Referee Form in the FORMS SECTION.

JUDGES are artists, sponsors, celebrities/local personalities, industry engineers, and contest veterans who recognize team spirit, communication, and the fun, playful and creative elements of RGMs.

<u>What they do</u>: Judges will walk the floor and pods freely while teams run their machine continuously for the audience and referees. The team's job is to demonstrate to the Judges the items found on the judging form. The Judges use their personal judgment and point of view to evaluate your team and machine in the three judging categories. These categories and their explanations can be found on the Judging Form, in the FORMS SECTION.

For contest scoring and determination of 1st, 2nd, and 3rd place teams, Contest Hosts MUST have access to Microsoft Excel during the contest.

1. Build a recognizable theme into your machine.

2. Strive to create an image for your team based on the theme of your machine. For example, wear costumes, make-up, or use props that relate to your theme and that make the presentation more fun and entertaining.

3. Successful machines use music, sound effects and other devices that engage the audience with their machine.

4. Build a machine that avoids, or at least keep to a minimum, common chain reaction steps like dominoes and marble runs.

5. Like Rube's cartoons, use everyday objects in your machine -- from tea kettles to bicycles -- and try to use them in unexpected ways.

6. Your Machine Introduction should include the story your machine tells, and an explanation of how the steps represent the theme and key elements of the story. The Machine Introduction should not be a step-by-step explanation of how the steps work, but rather a story that references the most unique and important steps of your machine.

7. **40% of your total score** for 1st, 2nd, and 3rd place will be based on criteria evaluated by referees. These scores are based on the FACTS of your machine and how it runs. For example, how many steps did it have, how many interventions were done, how many penalties, did it complete the task?

8. **60% of your total score** for 1st, 2nd, and 3rd place will be based on the views of the judges. One Judge may love the theme and execution of your machine and another may not. Again, the more fun, entertaining and well-conceived your machine and presentation, the higher you'll score with the judges.

10. Teams that score highly with Judges are respectful of their teammates and work well together. Teamwork is a huge part of having a successful RGM.

11. FOR APPRENTICE TEAMS ONLY: **100% of your total score** for 1st, 2nd, and 3rd place will be based on the views of the judges.

Machine Introduction and Walk-Through: This is your team's chance to shine and be creative! We want to hear the story your machine tells, and understand how the steps represent the theme and key elements of your narrative. The Machine Introduction should not be a step-by-step explanation of how the steps work. This is where your personality, humor, and team spirit engages the audience and gets them excited to see your machine.

Materials: RGMs should be "green" machines, made of as many recycled items as possible. Everyday, household objects are best and you can use just about anything! Not just toys, but a lamp, chair, fork, your grandpa's suspenders – you name it! Try using items differently than for their original purposes – an overturned bike's wheels can generate momentum, or a chair on top of a table can give you the power of gravity. Creativity is key - look in the basement, garage or junk drawer, rummage around for old keys, check out a yard sale for weird stuff no one else wants!

Dominoes and marble runs: Rube Goldberg never used dominoes in any of his machines! Marble runs and falling dominos are fun to look at – but they're not very creative. We encourage you to be resourceful and find alternatives in creating your machine's energy transfers.

> IMPORTANT: Identical transfers of energy in succession will be counted as 1 step.
> For example, a thousand dominos falling onto each other will be counted as one step.

Humor: Rube Goldberg was both an engineer and a cartoonist. In theory all of his wacky inventions would work, but his main goal was to make you laugh! So...RGMs should work but they also need to capture attention. The more theatrical and funny your machine is, the better it will score! The most successful teams have diverse members from engineers to artists, mathematicians to comedians, all working together.

Plan enough time to build your machine: Making something look easy is hard – and it takes a lot of time. We recommend at least three months to build, test and ready your machine for competition. Run your machine often-make sure the steps are all working as they should. The most successful machines are not built the week before the competition!

Travel: Design and build your machine modularly so transportation is easy and efficient. Travel is tough on machines! Make your machine in small, sturdy sections which can be transported easily and safely – and quickly and simply set up. Duct tape and cardboard machines usually fall apart on their way to competitions. Bring extra materials to the competition, just in case! Double-check the dimensions of doorways, elevators, hallways and stairwells at the competition site – and whatever vehicle you're using for transport - and make sure your machine fits!

If you are stuck, check out the many videos and pictures on our website at rubegoldberg.com/contest/