MAD SCIENCE

Elementary School

RUBE GOLDBERG Machine Contest®

2017 OFFICIAL RULE BOOK

Elementary School
RUBE GOLDBERG
Machine Contest®

TABLE OF CONTENTS

Rube Goldberg, Inc is a 501(c)3 not-for-profit dedicated to promoting STEM & STEAM education for students of all ages.

Elementary School
RUBE GOLDBERG
Machine Contest®

MISSION

MAD SCIENCE® is a leading science enrichment provider, delivering fun, exciting and hands-on STEM experiences for children 3 to 12 years old. Mad Science® reaches 6.5M children annually in over 160 markets around the world.

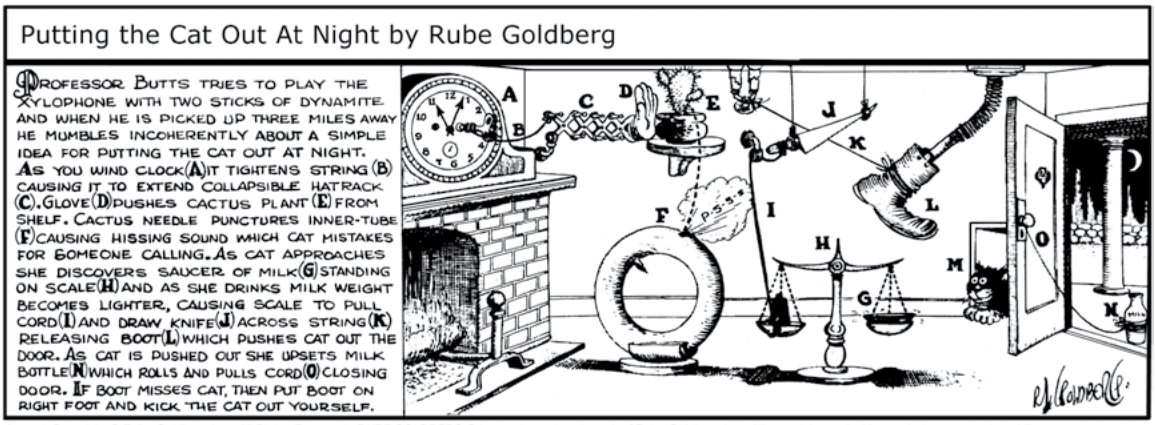
Mad Science® is on a mission to spark the imagination and curiosity of children by providing them with fun, interactive and educational programs that instill a clear understanding of what science is, and how it affects their world.

RUBE GOLDBERG MACHINE CONTESTS® (RGMCs) are designed to encourage teamwork and out-of-the-box problem solving for students of all ages.

STEM and STEAM friendly, RGMCs tackle the most mundane tasks (see past contests, pg 4) and ask participants to create their own overly elaborate and hilariously conceived wacky contraptions in honor of the competition's founding father.

Rube Goldberg (1884-1970) was a Pulitzer Prize winning cartoonist, best known for his nutty chain reaction inventions. The popularity of these cartoons made him a cultural touchstone, an adjective in Merriam-Webster's Dictionary, and a term that today is invoked daily in American media. (If you're not familiar with Rube Goldberg's work, go to the "Gallery" section of **rubegoldberg.com**.)

We encourage the use of every-day objects to create your Rube Goldberg Machine™ and to integrate as many recycled items as possible. Imagine the kinetic component of everything in the world around you and put it into motion in your Rube Goldberg Machine™!

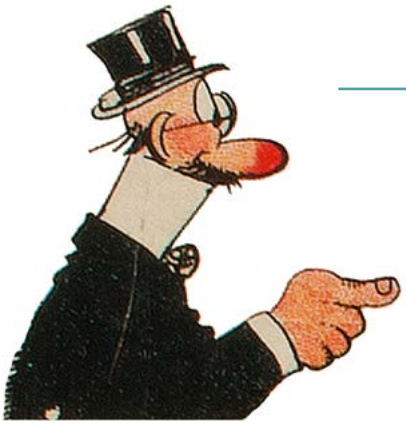


Elementary School Rube Goldberg Machine Contest®

Mad Science

PAST CONTEST TASKS

2016	Open An Umbrella
2015	Erase A Chalkboard
2014	Zip A Zipper
2013	Hammer A Nail
2012	Inflate A Balloon and Pop It!
2011	Watering A Plant
2010	Dispense an Appropriate Amount of Hand Sanitizer into a Hand
2009	Replace an Incandescent Light Bulb with a More Energy Efficient Light Emitting Design
2008	Assemble a Hamburger
2007	Squeeze the Juice from an Orange
2006	Shred 5 Sheets of Paper
2005	Change Batteries and Turn on a 2-battery Flashlight
2004	Select, Mark and Cast an Election Ballot
2003	Select, Crush and Recycle and Empty Soft Drink Can
2002	Select, Raise and Wave a U.S. Flag
2001	Select, Clean and Peel an Apple
2000	Fill and Seal a Time Capsule with 20th Century Inventions
1999	Set a Golf Tee and Tee Up a Golf Ball
1998	Shut Off An Alarm Clock
1997	Insert and Then Play a CD Disc
1996	Put Coins in a Bank
1995	Turn on a Radio
1994	Make Cup of Coffee
1993	Screw a Light Bulb into a Socket
1992	Unlock a Combination Padlock
1991	Toast a Slice of Bread
1990	Put the Lid on a Ball Jar
1989	Sharpen a Pencil
1988	Adhere a Stamp to a Letter
1987	Put Toothpaste on a Toothbrush



WHAT'S UP!

Dear Fellow Elementary School RGMC Participants,

Mad Science® and Rube Goldberg, Inc present the second Rube Goldberg Machine Contest® open to elementary school-aged children (grades K-6, ages 5-12).

The contest is free and will only take online submissions through our website at **rubegoldberg.madscience.org**. Only elementary school teachers will be able to form teams and register to compete, as well as, upload any videos or images. Teachers will also be responsible for obtaining release forms for any children appearing in videos and images submitted. If a teacher is not able to obtain a release form for a child, that child may still participate in the contest but must be absent from all media. There is no limit to the number of children that can compete on a single team, or the number of teams a school can register. Please note that in the case of a home schooled child, a parent may fill the roll of team administrator and the child may participate as a single entrant.

Make sure to read through all the rules and guidelines, and be mindful of deadlines.

GOOD LUCK and HAPPY RUBEING

Sincerely,

The Mad Science and Rube Goldberg Team

Rube Goldberg (rōōb gōld'berg), n. a comically involved, complicated invention, laboriously contrived to perform a simple operation – *Webster's New World Dictionary*

RUBE GOLDBERG MACHINE CONTEST SCHEDULE

ONLINE CONTEST

Team Registration opens November 1, 2016

ELEMENTARY SCHOOL DIVISION
Grades K-6 (ages 5-12)

Create an account at rubegoldberg.madscience.org
Register your team.

January 13, 2017 at 12:00pm EST *(Friday at noon!)*
Registration closes.

May 1, 2017 at 12:00pm EDT *(Monday at noon!)*
Team Page submission deadline.
All teams must complete a Team Page and mandatory submissions.

May 15, 2017
Online winners announced.

1. TEAM ELIGIBILITY

- All teams must be comprised of at least 3 eligible members (with the exception of home schooled children – single entrants accepted).
- All team members must be in grades K-6 (ages 5-12).
- Each team must have a teacher acting as administrator for the contest. In the case of a home schooled child, the parent must act as team administrator.
- With the exception of a home school team; all students in a team must attend the same school.

2. REGISTER A TEAM

TEAM registration opens at **rubegoldberg.madscience.org** on November 1, 2016.

- Go to **rubegoldberg.madscience.org.**
- Click on Register.
- Create an account.
- Follow the prompts and register.

NOTE: A school may register multiple teams, each with a unique machine.

3. DESIGN AND BUILD A MACHINE

2017 Task

The task is determined by Rube Goldberg, Inc. and changes on an annual basis.
The 2017 Task is **Apply a BAND-AID® brand adhesive bandage**.
Note: You are not required to use a specific brand in your machine.

Machine Specifications & Rules

Specification	Minimum	Maximum
Complete official challenge	Required	
Steps	10 steps	75 steps
Height	None	8' (2.4 m)
Overall Footprint Area	None	10' x 10'(3 m x 3 m)
Machine volume (Footprint Area x Height of highest point on the machine)	None	250 ft^3 (7.1 m^3)
Single run time	None	2 minutes
Machine explanation and walkthrough	None	3 minutes
Reset time	None	Not applicable
Machine noise	None	Suggested 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	
Corporate logos	Allowed, with written permission from the logo owner. All responsibility for 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	

3. DESIGN AND BUILD A MACHINE *continued*

Calculating Machine Volume

ALL TEAMS must design their machine to fit in an overall volume of 250 cubic feet (*7.1 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

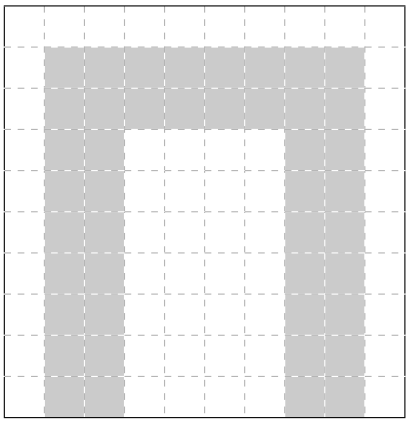
1. Draw out your machine footprint on the grid on page 15. You can also calculate the volume online on your team page.

   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 ft^3

5. Your *Machine Volume* must be equal to or less than 250 cubic feet (7.1 cubic meters)

   EXAMPLE: 220 ft^3 ≤ 250 ft^3 (maximum) → *Machine Volume is within specifications*

3. DESIGN AND BUILD A MACHINE *continued*

Frequently Asked Questions

Q: What kind of adhesive bandage should we use?

A: You can use any type or brand of adhesive bandage in the task. This year's task is sponsored by BAND-AID® Brand Adhesive Bandage, but you are NOT required to use a specific brand in your machine.

Q: What is a step?

A: A step in the machine is a transfer of energy from one action to another action. Identical transfers of energy in succession should be counted as 1 step.

Example: A sequence of dominos hitting each other should be counted as 1 step. Counting 100 dominoes as 100 steps is repetitive and not in the spirit of Rube Goldberg.

Q: What is an intervention?

A: Any physical touching or action to continue the operation of the machine through human interaction after the machine begins its Contest run.

Example: Your machine stops because one step does not trigger another. A team member interacts with the machine through a physical touch or other device to trigger any steps that follow.

Q: What is a touch?

A: Any physical touching or action to continue the operation of the machine through human intervention after the machine begins a Contest run. Multiple touches on the same step in the same Contest run count as a single touch.

Q: Can programmable logic controllers or microcontrollers be used?

A: Yes, but their use must fit within the definition of a step. Steps that use controllers should be clearly stated in the written step list and include detailed information on how the transfer of energy is accomplished. Using controllers as a fail-safe is illegal and will result in disqualification.

*Example:*A ball falls onto a switch connected to a controller that turns on a motor.

NO: If the ball misses the switch but the controller still starts the motor, the controller is not transferring energy from one action to another action. It is acting as a fail-safe instead of a step and is illegal.

YES: If the ball hits the switch and the controller starts the motor, the controller is transferring energy from one action to another action and is consistent with the definition of a step.

Q: Does completing the task have to be the absolute last step?

A: Any steps that occur after the task has been completed do not count. However, you are free to have steps after the task is completed, even though they do not count toward your total number of steps.

Q: Can I enter a machine that has been previously built and posted online?

A: No. All entries must be new machines built for entry into the current Contest.

3. DESIGN AND BUILD A MACHINE *continued*

Frequently Asked Questions

Q: Would an inadvertent piece of popped balloon or silly string leaving the machine boundaries affect our team's score?

A: All objects must be contained within the calculated machine volume. This includes anything that is considered inadvertent. Safety is key to our spectators, Contest Officials, and all team members. If your team has identified a flying object within the machine, your team must contain the object. All objects, including inadvertent objects, that leave the machine boundary will result in a penalty.

Q: Where can I find answers to other frequently asked questions?

A: Visit **rubegoldberg.madscience.org/faq/**

Q: What tips do you have for machine building?

A: Read these hints to win big at our Elementary School Rube Goldberg Machine Contest!

1: Team Videos - 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 the story. The Machine Introduction should not be a step-by-step explanation of how the steps work, but rather a story told by the team members and that references the most unique and important steps of your machine.

2: Machine Parts - Make your Rube Goldberg Machine (RGM) with upcycled materials

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

3: Sense of Humor - Make people laugh

Rube Goldberg was a cartoonist – he was very funny! RGMs should work but they also need to capture attention. Build in a recognizable theme to your machine and then make it engaging and entertaining. The more theatrical and funny your machine is, the better it will score!

4: Timing - 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 before shooting your video. The most successful machines are not built the week before the deadline! Verify that your video links work when you submit

4. COMPETING IN THE CONTEST

Complete your Team Page by May 1, 2017, 12:00pm EDT *(Monday at noon!)*

1. On our web site: Go to Contest. Click Register Now. Create an account.
   - Information on how to set up your Team Page will be sent in an email.

2. Follow the directions on your Team Page to submit the following required information by May 1, 2017:
   - ☐ School, teacher and team information.
   - ☐ OUR STEP LIST: A Step list (3 pages maximum).
   - ☐ OUR MACHINE WORKSHEET: The Machine Volume Worksheet.
   - ☐ OUR MACHINE EXPLANATION AND WALKTHROUGH: A video explanation of the machine and step walkthrough (3 minutes maximum).
   - ☐ OUR MACHINE RUN VIDEO
     The video of the entire machine running (2 minutes maximum).

   NOTE: This video must be a single continuous view with the machine in view at all times and no video editing or breaks. Any evidence of editing will result in disqualification.

You must submit all the required information described above for your entry to be considered.

You can also add a team logo and further customize your Team page (optional).

Your Team page will only be editable until May 1, 2017 **12:00pm EDT.**

2017 RUBE GOLDBERG MACHINE CONTEST JUDGING CRITERIA

TEAM NAME:_____

100 Points Total Judging will be based on a 100-point scale broken down into the following categories:

MACHINE DESIGN (39 points) Are all steps visible and watchable by the judges and audience?

Everyday Items (0 to 5 points)_____
Does the machine re-purpose everyday items?

Laugh Barometer (0 to 5 points)_____
How funny and whimsical is the machine?

Theme or Story (0 to 5 points)_____
Does the machine tell a story?

Artistry and Construction (0 to 5 points)_____
How artistic and well-constructed is the machine?
Are all steps visible and watchable?

Absurd Complexity (0 to 19 points)_____
Minimum # steps:10 steps

less than minimum # steps: 0 points
minimum # - 25 steps: .....3 points
26 - 44 steps: .....7 points
45 - 59 steps: ..... 11 points
60 - 69 steps: ..... 15 points
70 - 75 steps: ..... 19 points

TOTAL POINTS MACHINE DESIGN.....

MACHINE RUN (46 points)

Reliability of the Machine (0 to 26 points)_____

Run (26 points, -2 points per step touched)

Task Completion (0 or 20 points)_____

Task was not completed.
(0 points)

Task was successfully completed.
(20 points)

TOTAL POINTS MACHINE RUN.....

COMMUNICATION AND TEAMWORK (15 points)

Team Chemistry (0 to 5 points)_____
How well did the photos and videos show the team communicating and working together?

Step List and Machine Worksheet (0 to 5 points)_____
How clear, concise, and creative is the written explanation of the machine?
How well was the Machine Worksheet completed??

Machine Explanation (0 to 5 points)_____
How clear, concise, and creative is the the team's video explanation of the machine?

TOTAL POINTS COMMUNICATION AND TEAMWORK .....

PENALTIES (up to -30 points)

Rule Violations (up to -15 points)_____
Did any aspect of the machine or presentation violate the rules?

Out of Bounds Objects (up to -15 points)_____
-5 point deduction for each object that exits the machine boundaries.

TOTAL POINTS PENALTIES .....

TOTAL MACHINE SCORE.....

5. WIN!

Elementary School Division Contest

1st place prize: $1500 US
2nd place prize: $1000 US
3rd place prize: $500 US

All prizes will be awarded to the school of the winning team(s) and not to the team administrator or the individual team members.

In the case of a home schooled child the prize will be awarded to the parent (team administrator) to be used for educational resources.

Elementary School
Rube Goldberg Machine Contest®

Mad Science

MACHINE WORKSHEET - ONLY THE ONLINE VERSION NEEDS TO BE SUBMITTED

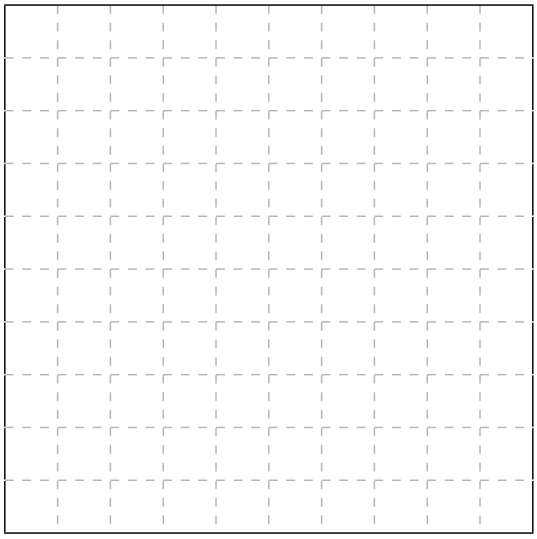
(Only the online version of this worksheet will be judged.)

Team Name: _____

School: _____

Division: Elementary School

Maximum machine dimensions:
10' L x 10' W x 8' H



Note: Each square is 1' x 1' *(0.3 m x 0.3 m)*

STEP 1: Draw the footprint of your machine

NOTE: If any part of the machine falls within a square, you must count the entire square.

STEP 2: Count the number of footprint squares

NOTE: Each square is 1' x 1' *(0.3 m x 0.3 m)*

AREA: _____ (choose one: ft^2 or m^2)

STEP 3: Measure the height of your machine.

NOTE: The maximum height is 8' (*2.4 m*)

HEIGHT: _____ (choose one: ft or m)

NOTE: If your ENTIRE machine sits on a table, the height of the table may be subtracted from the height of the machine. If only PART of the machine sits on a table, the table height must be included in the height of the machine.

STEP 4: Calculate the volume of your machine

_____ X _____ = _____

AREA (ft^2 or m^2) X HEIGHT (ft or m) = VOLUME (ft^3 or m^3)

STEP 5: Verify machine volume equal to or less than 250 ft^3 (7.1 m^3)

YOUR MACHINE VOLUME (ft^3 or m^3) ≤ 250 ft^3 (*7.1 m^3*)

_____ (ft^3 or m^3) ≤ 250 ft^3 (*7.1 m^3*)

We hereby confirm our calculations are correct. We understand at the time of the Contest, our machine may be measured by an RGMC official to confirm our submitted calculations. Deviations beyond the maximum allowed footprint and/or volume will result in Contest disqualification.

Teacher Administrator Signature _____ Date_____

CONTEST CONTACT INFORMATION

Sharon King, B.Sc.
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Mad Science Group Inc
email: sharonk@madscience.org

"To invent, you need a good imagination and a pile of junk."
– Thomas Edison