RUBE GOLDBERG MACHINES

INDEPENDENT INVENTOR ACTIVITY 4: CONTEST RUBE GOLDBERG MACHINES

NOTE: This lesson should be completed by students who wish to design and build an original Rube Goldberg Machine to be considered for competition in regional and national/international contests. Specific rules and requirements for eligibility apply.

Today I Will...

This activity will help you build an original Rube Goldberg Machine for regional and national competitions. The guidelines and activities included will ensure that you have all of the required project elements: a working Rube Goldberg Machine that performs the assigned task, a logbook (YIP RGM Inventor's Journal or other logbook), a live presentation and a video presentation.

NOTE: Building an RGM for competition takes days and even weeks to do, so you should plan ahead and try to spend as much time as you can working on your machine. This is not an activity to do in one afternoon.

Good Things to Know Before I Begin...

This activity will prepare you to present a Rube Goldberg Machine in regional and national competitions such as the Northern New England Invention Convention and the Rube Goldberg Machine Contest (RGMC) World Championships. It is important that you look at all the requirements, deadlines, and competition rules and that you share them with your family. In order to compete, you must have a working Rube Goldberg Machine, a live presentation to share, a recorded video presentation, and a logbook or Inventors' Journal that documents your work.

NOTE: Independent Inventors (like you!) must participate and present your Rube Goldberg Machine at the Independent Student Invention Fair to be eligible to compete in regional, state and national competitions such as the New England Invention Convention, Vermont Invention Fair and the Rube Goldberg Machine Contest World Championships. The Independent Student Invention Fair usually takes place in late February or early March. Visit the Compete Page on the YIP website for information.

We strongly recommend that you spend several good sessions working on your RGM. You should test your machine as you build to determine what does and does not work and then respond with appropriate fixes.

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.

Regarding supplies and materials used, duct tape will be prevalent in the students' builds. One of the best ways to attach items together for Rube Goldberg Machines is using a Hot Glue Gun. Hot glue can be applied to desktops or other surfaces without long term damage, while offering stronger attachment capability than regular glue. Please ask permission to use a hot glue gun at home and ask for help if needed to avoid getting burned.

You may use the YIP RGM Inventor's Journal to record your invention journey, from ideating the unique way you will solve the assigned task, to the design plans, to building and then testing and re-designing the machine. YIP RGM Inventor's Journals may be ordered downloaded and printed from the YIP website: https://www.unh.edu/leitzel-center/young-inventors-program/teach/curricula. Younger students (K-3) may need help from adults when writing. Journals should reflect age-appropriate documentation. You are encouraged to complete all pages in the journal as they work, however, you do not have to. Use the pages that apply.

NOTE: Inventor journals or logbooks of some kind are required for participation in the Northern New England Invention Convention.

Zach Umperovitch, the World's Leading Authority in Rube Goldberg Machines, has worked closely with YIP for nearly a decade, serving as a YIP Head Judge, performing educational outreach, as well as helping develop our RGM curriculum. He is a three-time Guinness World Records breaker, Professional RGM builder (including OkGo, Disney, Sonic, RedBull, and many others), National Contest Director at the Rube Goldberg Institute, and the Creator and Co-Host of "*Contraption Masters"* on Discovery Channel. Through partnership with YIP, his Youtube channel: Zach's Contraptions, features video resources specifically designed to provide simple to follow guidance, examples, and advice for building RGMs. Through a collaboration, Zach has produced a series of videos to support students specifically building Rube Goldberg Machines for competitions. These videos are available to all and are strongly recommended by the Young Inventors' Program as they explain in great detail (and humor) the specific requirements for an RGM, including how to incorporate the six simple machines into a project and how to accurately count the number of steps involved in an RGM. We encourage you to watch these videos. Links are included in Google Slides RGM Lesson 4.

I Will Need

- Google Slides: YIP RGM Lesson 4: Contest Rube Goldberg Machine **(optional)**
- YIP RGM Inventor's Journal (or other logbook)
- Rube Goldberg Cartoon **"Feed a Pet"** (included in Google Slides RGM Lesson 4)
- **VIDEO** (included in Google Slides):**The Art of Complicating Things: Intro to the World of Rube Goldberg Machines**
  LINK: https://youtu.be/9WL-jz5y8Go
- **VIDEO** (included in Google Slides): **How to Incorporate Simple Machines into Rube Goldberg Projects**
  LINK: https://youtu.be/CBLZUGgvqiE
- **VIDEO** (included in Google Slides): **Defining Steps and How to Build & Count Them in a Rube Goldberg Project**

LINK: https://youtu.be/mNprDmQlPFw

- **VIDEO** (included in Google Slides): **RGM: Tooth Paster 6000**
  LINK: https://youtu.be/vQsBytEOSB8?si=MATMbFUj_Q_SXO69
- **VIDEO** (included in Google Slides): **RGM: Plaque Preventer Paste Pincher**
  LINK: https://youtu.be/kJ_QQZDpb_Q?si=ZOBiENCPlMWuyudZ

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

- Hot glue gun and glue (recommended, see note)
- Recycled products
- Scissors
- String
- Tape
- Paper
- Everyday objects, etc.

Inventor Activities

Make sure you have a YIP RGM Inventor's Journal (downloaded or mailed from YIP) or other logbook to use to document your project from start to finish. Pages in the YIP RGM Inventor's Journal will guide you through the invention/engineering/design process with prompts and space for recording ideas, data, and other notes. You are encouraged to complete all pages of your YIP RGM Inventor's Journal, however, if a page does not apply, it may be skipped.

NOTE: Inventor journals or logbooks of some kind are required for participation in the Northern New England Invention Convention.

Look at the picture of the Rube Goldberg Cartoon "**Feed a Pet"** (included in Google Slides RGM Lesson 4). Can you identify the simple machines? Also notice the cartoonish humor exhibited in the cartoon to solve the task. These are all elements of an RGM.

The Rube Goldberg Institute and the Rube Goldberg Machine Contest World Championships have announced the assigned task for 2025: Feed A Pet. **All Rube Goldberg Machines must complete this task (Feed A Pet) in order to be eligible to compete.**

If you completed YIP RGM Independent Activity 3, you practiced designing and building a basic Rube Goldberg Machine. Now, you must do the same thing, on a larger scale, using more simple machines and involving more steps (see division level rules below), to design and build a Rube Goldberg Machine that will **Feed A Pet**.

We strongly encourage you to use the RGM resources provided by Zach Umperovitch, Director of the Rube Goldberg Machine Contest, to learn more about what makes a machine successful in competition. You may watch all/part of these videos for guidance.

Video: The Art of Complicating Things: Intro to the World of Rube Goldberg Machines (included in Google Slides RGM Lesson 4)

Link: https://youtu.be/9WL-jz5y8Go

How to Incorporate Simple Machines to Rube Goldberg Projects (included in Google Slides, RGM Lesson 4)

Link: https://youtu.be/CBLZUGgvqiE

Defining Steps and How to Build & Count Them in a Rube Goldberg Project (included in Google Slides RGM Lesson 4)

Link: https://youtu.be/mNprDmQlPFw

It is your responsibility to make sure your RGM meets the requirements for the Rube Goldberg Machine contests. Please read the specific rules for each age group division, refer to the following links:

2025 Official RGM Contest Rulebooks

Apprentice Division (Elementary School)
Division I (Middle School)
Division II (High School)

Refer to the chart below for specific age group/division requirements:

	Apprentice Level: Grades 3 - 5	Division I: Grades 6 - 8	Division II: Grades 9 - 12
Maximum Physical Size	6ft (W) x 6ft (L) x 6ft (H)	10ft (W) x 10ft (L) x 10ft (H)	10ft (W) x 10ft (L) x 10ft (H)
Minimum # of Steps (Transfers of Energy)	**10 Steps**		
Maximum # of Steps (Transfers of Energy)	**None**		
Minimum # of **DIFFERENT** Simple Machines Incorporated	**Four (4)** Lever, Incline Plane, Wheel & Axle, Screw, Wedge, Pulley		
Minimum # of **DIFFERENT** Energy Transfer Styles Incorporated	**One (1)** Mechanical, Electrical, Air Flow, Chemical, Thermal, Hydraulic, Erosional		
Theatrical / Verbal Presentation	**TWO (2)** Minutes or Less		
Single Run Time	Maximum **Three (3)** Minutes		
Guaranteed # of Machine Runs	**Three (3)** Runs		
Hazardous Materials, Explosives, Flames, Electrical Arcing	**Not Permitted**		
Incorporation of Live (or Previously Alive) Animals	**Not Permitted** - Including Taxidermied Animals		
Political References	**Not Permitted**		
Objects Flying Beyond Machine Boundaries	Allowed with **PRIOR** Safety Approval		
Group Size	Up to 15 Students per Team **(Individual Students are Allowed for Apprentice)**		

For competition in the Northern New England Invention Convention, in addition to the Rube Goldberg Machine, students must have an Inventor's Journal (such as the YIP RGM Inventor's Journal or other logbook), an oral/live presentation and a pre-recorded video presentation.

NOTE: The activities below will support you in completing these required elements.

Refer to the following requirements for the Live Presentation, Video and Display Board to make sure students have included the essential elements:

Live Presentation Requirements:

All presentations should include the following information and should be no more than 6 minutes in length.

Student(s) Name(s)
Student(s) Grade(s)
Student(s) School
School City, State
Name of RGM
Task the RGM will complete
Explanation of the simple machines used in the RGM

Video Requirements:

All recorded video presentations should include the same information as for the oral/live presentation and

*Be filmed **horizontally***
Be recorded continuous- no stopping and re-starting during filming
May not be edited
Reading a full script is discouraged
Show the Rube Goldberg Machine parts/simple machines used
Show a successful run of the machine from start to finish (no stopping or editing)

Activity: Build a Rube Goldberg Machine that will "FEED A PET"

Your challenge is to design and build an original Rube Goldberg Machine that will successfully complete the assigned task for 2025: **FEED A PET.**

NOTE: All students MUST solve the 2025 assigned task to be eligible for competition in the Northern New England Invention Convention and for selection to the Rube Goldberg Machine Contest World Championships. Reminder: Machines that solve alternate final tasks are disqualified from competing in Regional and National/International events.

Take time to think about the design of your machine, the simple machines you wish to incorporate and how you want to connect these machines to create the sequence of steps leading to the completion of the assigned task. You should also consider the materials you will need. Draw a sketch of your initial design and label the simple machines and their parts. You may use your YIP RGM Inventor's Journal or other logbook to sketch their design and record your ideas.

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

At certain points during the building process, remember to test your machine. What is working well? What changes and modifications are required to make the machine successfully complete the steps and the entire task? Ask someone at home for feedback and use the Rube Goldberg Machine Testing Feedback Grid (several copies are included in the YIP RGM Inventor Journal) to record your observations. Then, draw their redesigned machine with the necessary changes on the Changes to My Rube Goldberg Machine worksheet

(included in the YIP RGM Inventor Journal). You may add additional pages to your journal if they need more space to draw and redraw your designs. Continue to test, fix, and re-design throughout the building process until they are satisfied with the final result.

*NOTE: We encourage you to **AVOID** marble run and domino topple style steps. You might try these step types, and notice how often these fail because one domino falls over and knocks the rest, or because the marble does not roll out the way you need it to. Consider replacing common dominoes with suitable everyday objects (such as textbooks) and larger rolling balls (such as basketballs) instead of marbles. Your machine will likely be more reliable using appropriate replacements.*

*Also remember that no matter how long your domino run is (regardless of the style of domino) that a series of dominoes **ONLY** counts as one single step. Marble run tracks are the same - no matter how many turns or pieces used, the entire marble / ball run counts as a single step.*

A step is defined as: "A transfer of energy from one object to another different object." Dominoes count as the same object and therefore only are considered one total step. Marbles / balls rolling are the same object traveling throughout the marble run and are counted as only one transfer of energy (step).

When finished testing, you should run their machine several times to ensure that it works consistently. You may make changes as needed.

All design notes, as well as drawings and model descriptions should be recorded in the YIP RGM Inventor's Journal.

Activity: Creating a Presentation

Once you have finished your machine to successfully complete the task you should make a presentation/pitch. Create an outline for your presentation by picking out the simple machines and features of your Rube Goldberg Machine and how they are put together to complete the assigned task, **FEED A PET**, successfully.

Refer to the following requirements for the Live Presentation to make sure you have included the essential elements:

Oral/Live Presentation Requirements:

All presentations should include the following information and should be no more than 6 minutes in length.

Student(s) Name(s)
Student(s) Grade(s)
Student(s) School
School City, State
Name of RGM
Task the RGM will complete
Explanation of the simple machines used in the RGM

You will need to develop a presentation to give live and to record on a video (both formats are required for regional and national competition. Communication is a key part of the invention process. Effective communication about your Rube Goldberg Machine can help others understand and use it.

Watch these real-life young inventors from the Northern New England Invention Convention and look for elements of a good presentation.

Video: RGM: Tooth Paster 6000 video presentation of a young inventor from the Northern New England Invention Convention as an example. (Video link included in Google Slides RGM Lesson 4):
Link: https://youtu.be/vQsBytEOSB8?si=MATMbFUj_Q_SXO69

Video: RGM: Plaque Preventer Paste Pincher video presentation of young inventors from the Northern New England Invention Convention as an example. (Video link included in Google Slides RGM Lesson 4):
Link: https://youtu.be/kJ_QQZDpb_Q?si=ZOBiENCPlMWuyudZ

After each video, think about the following:

1. Was the name/title of the RGM catchy- does it make you interested in it?
2. Could you see the simple machines and how they connected in sequence to complete the task?
3. Does the RGM complete the task successfully?
4. How do the inventor's work together in the presentation and on the machine?
5. Did the inventor talk about challenges? If yes, how did they overcome them along the way?

Refer to the following requirements for the Video Presentation to make sure you have included the essential elements:

Video Requirements:
All recorded video presentations should include the same information as for the oral/live presentation and

*Be filmed **horizontally***
Be recorded continuous- no stopping and re-starting during filming
May not be edited
Reading a full script is discouraged
Show the Rube Goldberg Machine parts/simple machines used
Show a successful run of the machine from start to finish (no stopping or editing)

The video should be a recording of the oral/live presentation and may be recorded on a phone, tablet or other device. Videos may NOT be edited in any way and should be filmed continuously (no stopping and re-starting).