

2020 Rube Goldberg Machine @ Home



Designed By: **Mr. Scott E. Mitchell**
Dakota High School
April 20th – June 5th
Email: smitchell@cvs.k12.mi.us
Website: www.dakotadesigntech.com

2020 Rube Goldberg Machine @ Home

Note: This will be your last project for the year so have some fun and be creative. Research as much as possible before you start and make a plan to be successful. If at any time you have questions or concerns, please reach out to me at: smitchell@cvs.k12.mi.us

Please *read all information and instructions* before beginning this activity.

What is Rube a Goldberg Machine:

A **Rube Goldberg Machine**, named after American cartoonist [Rube Goldberg](#), is a machine intentionally designed to perform a simple task in an indirect and overly complicated way. Usually, these machines consist of a series of simple unrelated devices; the action of each triggers the initiation of the next, eventually resulting in achieving a stated goal or outcome.

Challenge:

The student will *research, sketch, construct and document by photos and video* a multi-functional **Rube Goldberg** machine using only available household items. This challenge should be fun and inspirational and will require a lot of "Trial and Error". Remember to be patient and laugh a lot.

Objectives – Standards:

- Students design and conduct a scientific investigation through research. **(YouTube)**
- Students demonstrate applied physics principles of motion, vector geometry and friction.
- Students develop and evaluate inferences and predictions that are based on data and guesswork.
- Incorporate problem solving techniques.
- Understand the basics of simple machines.
- Incorporate design and sketching techniques.
- Work with tools to process materials and assemble a product.
- Demonstrate gluing or fastening techniques.
- Better understand Newton's Law of Motion.
- Demonstrate the application of gravity power to generate motion.
- Students solve problems involving scale factors, using ratio and proportion.
- Demonstrate skills in accommodating friction and mathematical alignment geometry.
- Demonstrate basic understanding of aerodynamics and the effects of acceleration.
- Apply mathematical calculations and measurements and recognize and apply mathematics in contexts outside of mathematics.
- Students learn that modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions.
- Students develop an understanding of the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.
- Students learn to test and evaluate the design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.
- Students learn to make a product or system and document the solution.
- Students may work individually or may be assisted by parents or siblings.

"Fun for the entire Family"

Project Constraints or Restrictions:

- Students may use **any** existing household materials to build their Rube Goldberg Machine project including, but not limited to recyclable items, tools, food, toys, gizmos, or gadgets.
 - **Note:** *Students are not allowed to use combustible or dangerous materials to complete their project. Please get permission first from your parents / guardians to use any household materials.*
- *Research, Research, Research and Be Creative!!!*
 - **Note:** *Students may not go out and buy new materials*
- Your project should consist of at least 20 different simple tasks to reach the ultimate outcome.
 - *Add more tasks to achieve Extra Credit (see Grading)*
- You determine the outcome of your Rube Goldberg machine. (use your imagination)

Examples:

- turn a light on / off
 - crush a beverage can
 - drop a bottle in a recycling bin
 - water a plant
 - pop a balloon
 - fill a glass with water
 - shut a door
 - squeeze toothpaste onto a toothbrush
 - turn off an alarm clock
 - brain surgery
- No height, width, or length requirements. "Go BIG or Go HOME"

Helpful Hints

- Choose a concept that fits your personality and demonstrates your creativity.
- The most successful project is usually those that are planned out and built with precision.
- Examine and analyze how each object works individually and then collectively before building.
- Remember to have fun and to not over think it.

Safety First:

Be careful and avoid injury when working with all tools and equipment. Disclaimer: This project may require the use of simple or advanced tools that could be dangerous and might cause an injury if not handled with care. Follow all safety procedures and guidelines for each tool as provided for by the instructor and identified in the fabrication lab safety guidelines.

Procedures:

Remember this is a true **Engineering Challenge and Project**, just done at home.

The Research:

1. Research and Brainstorm ideas for the Rube Goldberg project using the Internet.
 - *A good place to start is [Google](#) and [YouTube](#)*
 - *Research Simple Machines and Mechanisms*
 - *Research Forces, Friction and Motion*
 - *Rube Goldberg Example Links:*
 - <https://www.wikihow.com/Build-a-Homemade-Rube-Goldberg-Machine>
 - <https://www.connectionsacademy.com/support/resources/article/build-your-own-rube-goldberg-machine>
 - <https://youtu.be/nORRgU8sGdE>
 - <https://youtu.be/Av07QiqmsoA>
 - <https://www.cteonline.org/curriculum/project/arduino-controlled-rube-goldberg-machine-pbl-project/jACCCp#home>
 - <https://www.cteonline.org/curriculum/lessonplan/rube-goldberg-simple-machines/dbCyd1>
 - <https://www.edutopia.org/film-fest-rube-goldberg-learning-ideas>

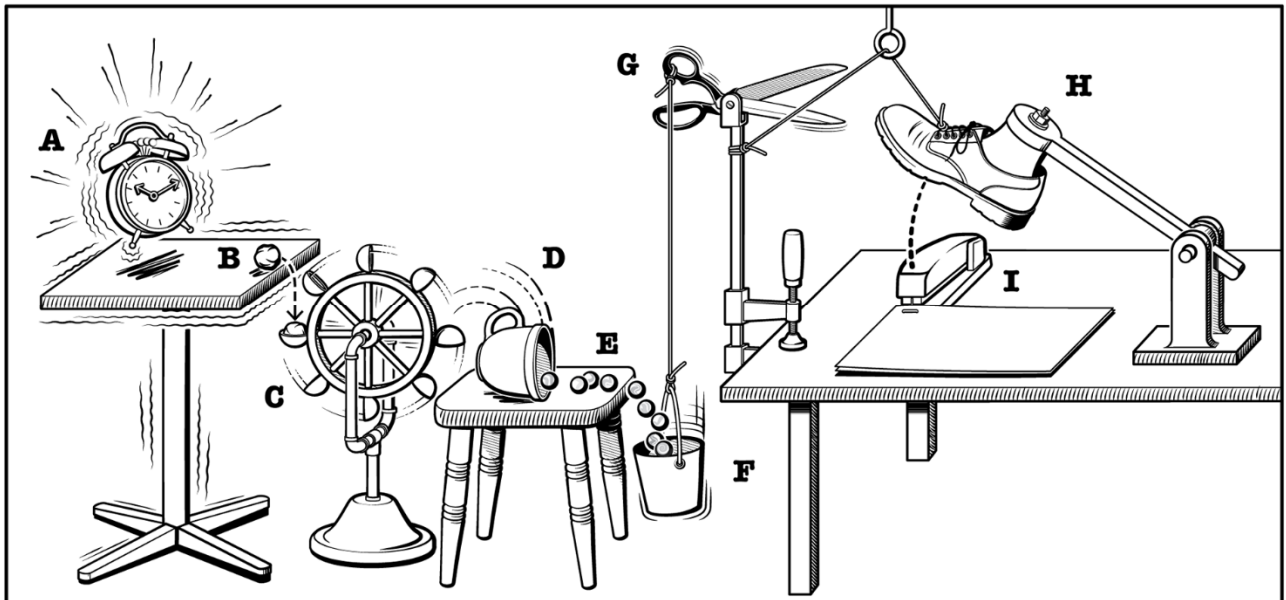
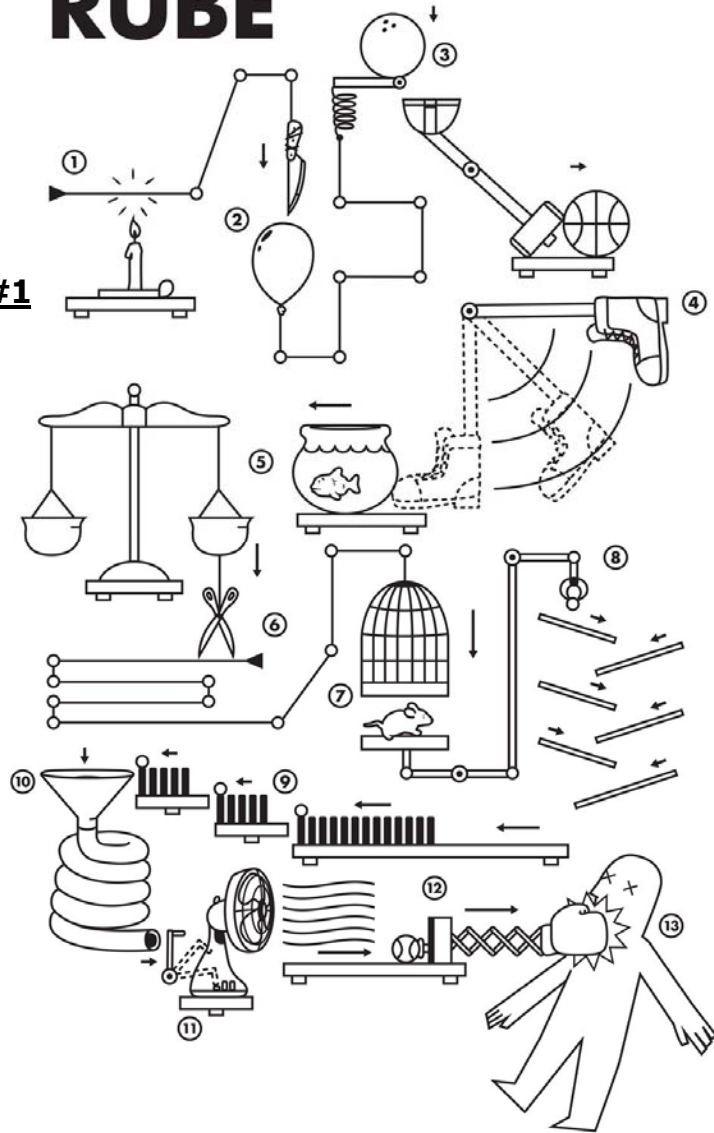
The Sketch:

1. Once you have your idea, start to Sketch and Layout them on one 8½" x 11" ("A" size) piece of paper using a plain or colored pencils and / or pens. You may sketch using **free-hand** and/or **drafting tools** or if you have access to **AutoCAD** or **Inventor** and feel more comfortable using these platforms to sketch and layout, go for it.
 - *You do not have to be an artist to sketch, simple ideas and stick figures work for me. Your sketches do not need to be precise or to scale but should give a general impression of each task and a general idea of the size and shape of each proposed project.*
2. Show or indicate by number or letter on the sketch the 20 different simple tasks. Add small direction arrows to show motion. (see examples)
3. Once the sketch is completed, take a photo with your phone or scan it into your computer / phone, or if you are using CAD print it out and take a photo or save as a PDF for documented proof.
 - *Sketch will be submitted in Final Summary and Reflection Report*

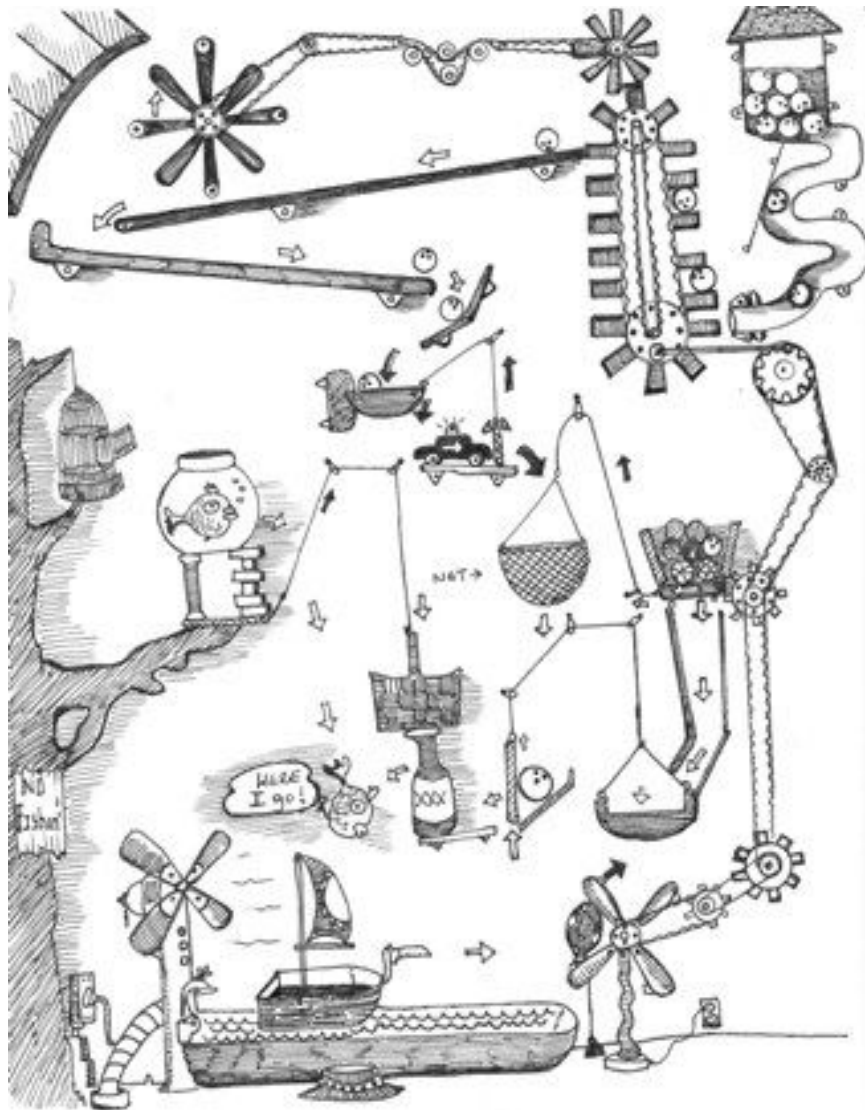
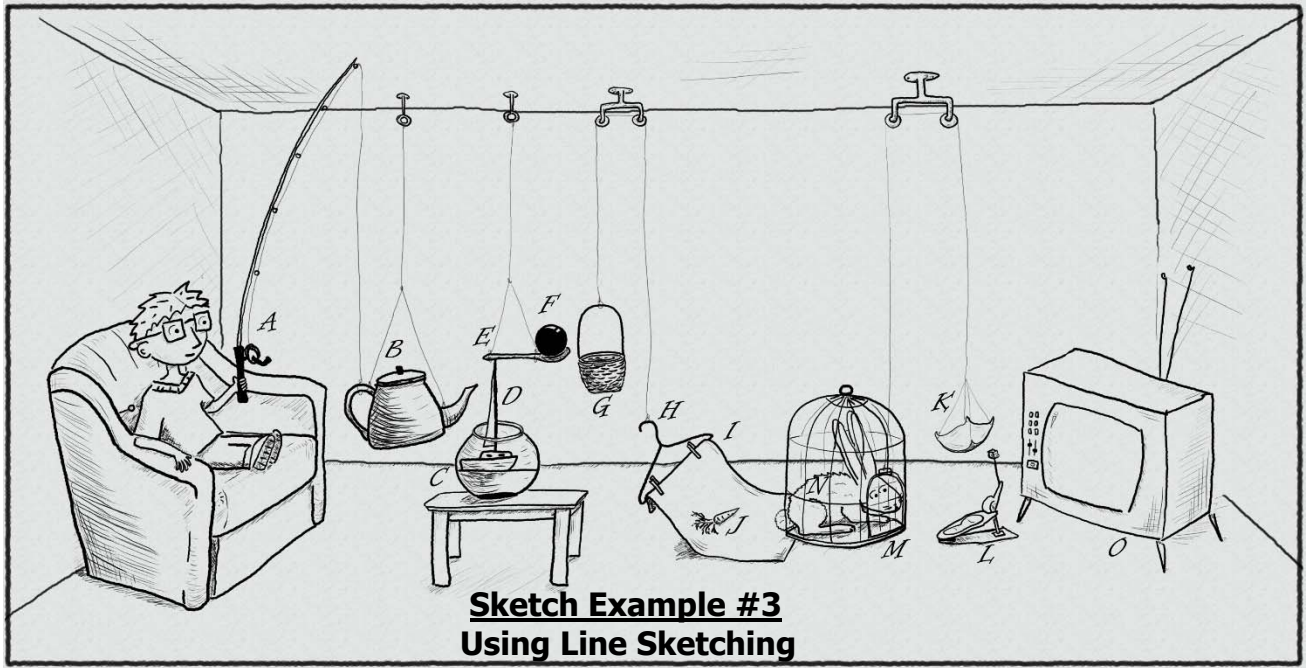
(See Sketching examples on next two pages)

RÜBE

Sketch Example #1
Using CAD



Sketch Example #2
Using Illustration



The Build and Set Up:

1. **QUALITY COUNTS**...Keep in mind that accuracy will result in better performance during testing.
2. Gather the supplies and material you will need to build your Rube Goldberg Machine and identify each of the material components and possible purposes they will serve.
3. Determine where components will be placed and use appropriate attaching methods like fasteners, glue, tape, string etc.
4. Start assembling your Rube Goldberg Machine one section at a time and testing each area before moving on to the next. Make small changes and adjustments each time you test. Doing these simple tasks will make the outcome easier and more efficient.
 - *Remember you need 20 successful tasks and a final outcome.*
5. Take a few photos along the way of the build process to document your progress.

The Testing:

1. Test and evaluate your Rube Goldberg Machine as many times as needed to successfully complete the task.
2. Modify parts if necessary and retest.
3. Video the entire successful testing process from start to finish.

Photo and Video Documentation:

1. Take photos and a final video during this entire process.

Photo Requirements

- *Take a maximum of 12 photos showcasing basic construction and final set-up. These photos will be placed on your final summary and reflection report.*

Video Requirements

- *Take a video of your Rube Goldberg Machine while in action from start to finish. Video should be a minimum of 30 seconds to a maximum of 3 minutes. Make sure I can see your smiling face to show proof that this is your video.*
 - *If possible, depending on file size, email the video to me when completed for a grade or upload to YouTube and send me the link or upload and post to one of your social media accounts for extra credit (see grading). Also if you would like, I will place your video on the [Dakota Design Tech](#) website for the whole world to see.*

Final Summary Report:

1. Students will develop a **Rube Goldberg Machine** project summary and reflection paper.
 - *See attached Microsoft Word file for more information.*

Grading:

1. Points will be earned and calculated by using the entire sketching, fabrication, testing, videotaping process and final summary report.
 - *Sketch: **50 pts***
 - *Fabrication / Project Set-Up: **100 pts** (take pictures during this time)*
 - *Testing: **200 pts***
 - *Successful with all 20 simple tasks and final outcome completed*
 - *Video Documentation: **100 pts** (Email or send me a YouTube link during this time)*
 - *Final Summary Report: **50 pts***
 - *Extra Credit:*
 - *Students may earn points above and beyond the normal grade scale based on the performance and quality of the entire project.*
 - *5 points for each successful simple task after the first twenty (20)*
 - *20 points if you post your Rube Goldberg video to one of your social media accounts and show proof to the instructor*

Timeline – *(may change based on school district policies and procedures)*

Introduction / Research	Week 1	Apr 20 th – 24 th
Sketches	Week 2	Apr 27 th – May 1 st
Project Construction / Preliminary Testing	Weeks 3 thru 5	May 4 th – May 22 nd
Final Project Testing / Video	Week 6	May 25 th – 29 th
Final Summary Report Due (Seniors Only)	Week 6	May 29 th
Final Summary Report Due (Juniors Only)	Week 7	June 5 th

Note: This project timeline is only a guide and based on students working for only 15-30 minutes a day. If you finish this project early you may turn in all documentation and video anytime without penalty. Work at a pace that is comfortable for you. Remember have FUN!!!

What to Turn In and How:

Once you have your Sketch, Summary and Reflection Paper and Photos completed, make it into one PDF if possible, and submit those documents, along with your uploaded video to Mr. Mitchell's email: smitchell@cvs.k12.us