PS Physics ~ Rube Goldberg Project

Sometimes designing a silly, round-about way to do something can enable one to better understand the inner details of the more practical, direct solution. Whenever a machine is made too complicated to do a simple job, it is called a "Rube Goldberg".

Rube Goldberg's award-winning cartoons satirized machines and gadgets. These cartoons combined simple machines and common household items to create complex and wacky contraptions that accomplished mundane and trivial tasks. His inventions became so widely known that Webster's Dictionary added "Rube Goldberg" to its listing, defining it as "accomplishing a complex, roundabout means that seemingly could be done simply".

In this activity, you will design and build a Rube Goldberg machine. The machines that you build are different from the machines people are used to seeing. A good Rube Goldberg machine incorporates the everyday machines people are used to seeing and connects them in ways that may seem idiotic or ingenious. It is your mission to construct a machine that uses at least 6 individual steps/stages to complete one of the following tasks: (If you have an alternate task to complete, email me to get it approved)

- **Pop a balloon**
- **Turn on a light**
- **Empty water bottle/pop can into the trash (recycling!)**
- **Ring a bell**
- **Fill a cup with water**

To get started, you need to see some examples of what you will be making!

1. RESEARCH

You will look up examples of Rube Goldberg machines online. You need to provide links to or sketches of at least 2 different Rube Goldberg machines.

You will need to become familiar with the 6 simple machines. The notes with images and definitions of the 6 simple machines are at the end of this packet. You need to be able to recognize them and explain what they do. You will also be required to make some of these simple machines using regular household items.

2. WRITTEN COMPONENT (can be written on paper, or typed in a word document or all of the project put into a powerpoint)

For each of the two Rube Goldberg machine examples you choose to use, you need to write the steps from beginning to the end, be sure to note any simple machines that are used. Here is an example of how steps could be written:

EXAMPLES OF STEPS:

1. Ball rolls down a ramp and springs a mousetrap
2. The mousetrap pulls a string causing a scissors to cut
3. The scissors cut a cord, causing a weight to fall
4. Weight drops on tin foil, causing light bulb to turn on

3. PROJECT

Now that you have become familiar with how Rube Goldberg machines work, take a few minutes to look around your house and find things you could use to create your own! For example, a block and a book could be made into a ramp. Collect more things than you think you will need.

With your supplies ready, sketch out different ways to use them to create at least 4 simple machines in your own Rube Goldberg machine. Look at the tasks I've given you at the start of this project, as this will be the end task for your machine. There are 2 blank pages for you to use to sketch some ideas down. Use the third blank page provided to sketch your final machine. You may need to go back and edit your drawing to reflect your final Rube Goldberg project, as you experiment and tinker with the laws of physics and using simple machines.

A. Your machine must have a minimum of 6 connected steps/stages, and must include:
    a. One object that must be raised by your machine.
    b. At least 3 of the 6 simple machines (lever, screw, wheel and axle, pulley, inclined plane, wedge). For it to count as a machine, it must do <u>WORK</u>
B. Your project must have a minimum running time of 8 seconds
C. If your machine fails to work on its first attempt, no problem, make some adjustments and start again. If you can video your machine working, that would be ideal! Then email the video file to me. If you aren't able to video, you can send a picture of your machine.
D. Your machine should run smoothly all the way through. But, science is a lot about failing! So don't worry if you have to restart, adjust in the middle, restart, no problem.
E. Track the number of times your machine fails, and the number of times it runs successfully all the way through!

Grading: Your grade for PS Physics is based entirely upon this assignment. For all of your classes this trimester (PS Physics included), you'll either receive a "P" or an "I" (instead of one of the other traditional letter grades). In a recent email from our superintendent, Mr. Kress, to all students, parents, and teachers, he outlined why this is necessary and how grading will occur for the 3rd trimester as follows: "Without having students in school, there is no way we can assure equal access to support and equal opportunity for success. The only way we can address proper grading is to issue a "P" for PROFICIENT mastery, and an "I" for INCOMPLETE mastery… Once a student has completed and turned in the tasks/projects, the student will receive a "P" for passing the class." This assignment is due NO LATER than June 4. However, it can be turned in any time between now and June 4. That means if you work hard and get the project and report done and turned in, then you're basically done with PS Physics and are free to spend time working on other classes . Still, if you complete the assignment and would like to have additional, ungraded enrichment work to complete, I'd be happy to provide that for you at that time.

Here is a guided checklist for your project:

1. Research
   - Understand what a Rube Goldberg machine is
   - Find two examples (online, in books, library, etc)
     - Sketch one (A)
     - Sketch a second (B)
   - Understand the 6 simple machines. Read about them in this packet, research them online, in the library, etc.
2. Written
   - Draw each of the 6 simple machines, write the definition of each on a piece of paper, poster, typed in word or in a powerpoint.
   - Write the steps for A (include a link, picture or a sketch of Machine A)
     - Be sure to note any of the 6 simple machines
   - Write the steps for B (include a link, picture or a sketch of Machine B)
     - Be sure to note any of the 6 simple machines
   - Sketch of your final design of a Rube Goldberg machine, include first 2 sketch ideas
   - Written out steps of your Rube Goldberg machine, INCLUDING all simple machines used
3. Project
   - Video of your Rube Goldberg Machine in motion. Video it until it is successful or 5 attempts. If you are unable to video, please describe each attempt (up to 5, or until successful) written in paragraph form, title each as "Attempt 1", "Attempt 2" etc.

TIPS:
Digital is ideal. Create in google docs or google slides, then share with my email. Take pictures of your sketches, upload them to a google slides you create, then share with me. Upload your video run, put your written components into a slide, make it a presentation.

Poster or paper: Write legibly, and include the above information, just written instead of typed, and sketches and drawings instead of pictures.

These can be submitted to me digitally by email at neffj@d55.k12.id.us, or physical copies of things can be dropped off at the main office at BHS between 11:00 AM-1:00 PM.

6 Simple Machines

(Include Name, Diagram & Definition)

Rube Goldberg Machine A

(Sketch/link/picture and written out steps.)

Rube Goldberg Machine B

(Sketch/link/picture and written out steps.)

My Rube Goldberg Design ideas:

My Rube Goldberg Design ideas:

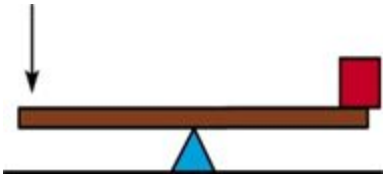
My Rube Goldberg Final Design Sketch:

My Rube Goldberg Machine Steps:

6 Simple Machines Explained

Lever – is a bar that is free to pivot, or move about a fixed point (fulcrum) when a force is applied.

MA = input arm length / output arm length

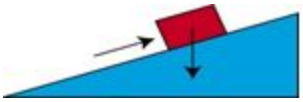


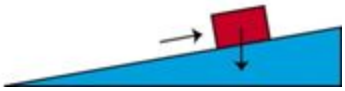
Input arm – is the distance from the input force to the fulcrum

Output arm – is the distance from the output force to the fulcrum.

Inclined Plane – is a slanted surface along which a force moves an object to a different elevation.

MA = length/height





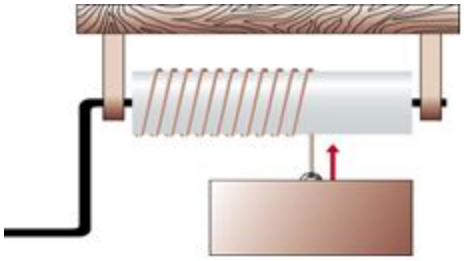
Wedge – is a V-shaped object whose sides are two inclined planes sloped toward each other.

Longer and thinner = more MA

Screw – is an inclined plane wrapped around a cylinder. The closer the threads the greater the MA.

Wheel and axle – is like a lever that rotates in a circle, it is a machine consisting of two circular objects of different sizes.

MA = radius of the wheel / radius of the axle



Pulley – is a chain, belt, or rope wrapped around a wheel.

MA = the number of supporting sections of rope.