**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 by complex, roundabout means what seemingly could be done simply.”**

**THE TASK**: 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 8 individual steps/stages to complete the following task:

***POP A BALLOON***

Your machine may take some time to put together. You will have some in-class time to plan and build this machine. You will need to put in the majority of the time outside of class. Some materials I will have in the classroom, but **you are responsible** for most of the materials you and your group will need to construct the machine especially since one of the ideas is to use household or everyday items in your build.

You may use almost any object that you can find. You are limited to “safe” things. No firecrackers or flammable items are permitted. Here are a few ideas:

Cardboard , Wood, Toys, Magnets, Straws, pulleys, Paper Clips, String, Coins, Balloons, Rubber Bands, Sand, Toothpicks, Marbles, Nuts and Bolts, springs, Plastic Containers, Plastic Tubing, hook/eye bolts and so much more!

**The following items are NOT permitted or have special restrictions**:

• Firecrackers, dangerous chemicals, and other unsafe items are not permitted

• Power tools other than glue guns are not to be brought to school

• You may not use more than one part of the game “Mousetrap” or any game that is like it.

• Points will be detracted if there is not diversity in your building materials (for example, your entire machine should not be built from Legos)

**Rube Goldberg Project Guidelines**

**GUIDELINES FOR BUILDING YOUR MACHINES**:

1. A Rube Goldberg Machine is designed such that a single action starts the machine, such as pressing a button, letting go of a marble, cutting a string, removing a barrier, etc. No other additional human actions are required once your machine has started.
2. Your machine must have a minimum of eight connected steps/stages, and must include:
3. One object that must be raised at least 30 cm by your machine
4. At least four of the six simple machines (lever, screw, gear or wheel and axle, pulley, inclined plane, wedge). For a machine to count, it must do **WORK** (move something up or forward).
5. Your project must have a minimum running time of 20 seconds, and a maximum run time of 3 minutes.
6. Up to 10 points of extra credit may be awarded for projects that exceed the requirements, either by adding two additional steps, using all six simple machines, and/or theme is exceptional.
7. Your machine may have a theme. EXAMPLE: a favorite movie, animal, a room in your house, something science related, etc.

**GUIDELINES FOR PRESENTING YOUR MACHINES**:

DEFINITION OF A STEP: A single step is defined as a transfer of energy, or 1 cause

through 1 effect.

EXAMPLES OF STEPS: (You may not use these exact steps in your machine)

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.

**Your machine should run smoothly all the way through. You will be penalized 5 points**

**EACH TIME you interact with your machine after its initial start, for up to 15 points lost**

**Grading Rubric**

**Keynote/Powerpoint/Video presentation – 20 pts**

1. Each group will do a Powerpoint (or Keynote) or video presentation to the class of their device AFTER they run the video of the machine working. Your presentation should include:

a. Machine Strategy – 4 pts

i. Discuss how you came up with your ideas. \_\_\_\_\_/2

ii. How did your ideas change during the project?\_\_\_\_\_/2

b. Machine Design – 6 pts (use photos!)

i. Where is potential energy stored in your machine?\_\_\_\_\_/2

ii. What are the energy transfers (steps)?\_\_\_\_\_\_/2

iii. What simple machines are used?\_\_\_\_\_\_/2

c. Team Strategy and Accomplishments – 6 pts

i. What were the different jobs on your team?\_\_\_\_\_/2

ii. Did you work together well? How did you solve differences of opinion?\_\_\_\_\_/2

iii. What is each member most proud of?\_\_\_\_\_\_/2

d. Quality of Presentation – 4 pts

i. Quality of design of powerpoint/keynote/video \_\_\_\_\_\_/2

ii. Quality of accompanying verbal presentation (can be voice on video)\_\_\_\_\_/2

**Subtotal:\_\_\_\_\_\_\_/20**

**Rube Goldberg Machine Grade-80 points**

1. Machine completes specified task \_\_\_\_\_(10 pts.)
2. Meets time requirements (20 sec-3 min) \_\_\_\_\_(5 pts.)
3. Machine has **at least** 8 distinct steps (5 pts. each) \_\_\_\_\_(40 pts.)
4. At least four simple machines are clearly represented and directly involved (5 pts. each) \_\_\_\_\_(20 pts.)
5. An object is elevated at least 30 cm by your machine \_\_\_\_\_(5 pts.)

Bonus Points (10 points max)

Project includes more than 4 types of simple machines

Project includes two extra steps

Theme goes above and beyond – exceptional!

**Subtotal: \_\_\_\_\_/80**

**Bonus Points\_\_\_\_\_\_/10**

**Total Presentation/Machine Score \_\_\_\_\_\_\_\_/100**

**What makes a good Rube Goldberg Machine?**

\* The machine works. A Rube Goldberg Machine is designed such that a single action starts the machine running (pressing a button, letting go of a marble, cutting a string, removing a barrier, etc.), and no other human actions are required.

\* Rube Goldberg Machines have a unifying theme. Examples of good themes include the Wizard of Oz, Star Trek, food, farm equipment, gardening, sports, etc.

\* No group is penalized for having electrically or chemically powered steps, however mechanical steps are more in the spirit of Rube Goldberg’s machines.

\* It has clearly visible steps. On many machines, it is hard to follow all the steps. Teachers appreciate machines that are laid out so that as many of the steps as possible are clearly visible in linear sequence. (A hits B, B triggers C, C cuts D, etc.)

\* Rube Goldberg Machines make you smile. The best machines use common objects in ways you would not expect, for example:

1) A wind-up toy hamster wiggles down a tube and hits a ball,

2) A tape recorder slowly winds a string, pulling up a pirate flag while playing the theme song from the Pirates of the Caribbean movie.

\* Don’t use flammable or other dangerous chemicals. This violates the rules.

Any questionable item must be given prior consent by the teacher.

**Rube Goldberg Project Contract**

We have read and understand the rules, guidelines, and grading rubric for the Rube Goldberg Project. We understand that “borrowing” or destroying of other groups materials will be not be tolerated.

We also understand that we, as a group, will receive one grade on our project. We should all work together as a team, dividing the work evenly among ourselves. Our ability as individuals to work effectively with our group will be graded in the presentation.

Group Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period\_\_\_\_\_

Member Names (print neatly):

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Member Signatures:

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