



## CREATE YOUR OWN RUBE GOLDBERG MACHINE! (LEVEL 1)

<b>Description</b>	In this activity learners will gain an understanding of basic engineering principles and the value of resilience, creativity and attention to detail. Learners will gain an understanding of how these machines work and the role of chain reactions.
<b>Leading Question</b>	How can we create a machine that helps us do something useful or fun in our house?
<b>Total Time Required</b>	30-50 minutes per day, 2.5 hours over 5 days.
<b>Age group</b>	4 to 7 year olds
<b>Supervision</b>	supervised by parents/guardians
<b>Subjects</b>	Science (physics, engineering)
<b>Supplies Required</b>	Pencil, color pens, paper/notebook, household items to create the machine (ball, toy car, Legos, tape, straws, cards, dominoes, strings, etc. - any items found at home)
<b>Learning Outcomes</b>	Learners will be able to: <ol style="list-style-type: none"> <li>1. Define a Rube Goldberg machine and explain its purpose</li> <li>2. Develop creativity and problem-solving skills by designing their own Rube Goldberg machine.</li> <li>3. develop basic engineering skills by creating a machine that performs a simple task through a chain reaction.</li> <li>4. Understand an example of a machine that uses scientific concepts (force) to work</li> <li>5. Gain an understanding of what a machine is and provide examples of common machines.</li> </ol>
<b>Previous learning</b>	Basic understanding of force and motion strand (G1 science)

**DAY 1** - Today you will learn about what makes things move.

Suggested Duration	Activity and Description
10-20 minutes	<p>Discussion:</p> <ul style="list-style-type: none"> <li>● What is motion? <ul style="list-style-type: none"> <li>○ Reflect and answer. You may refer to your science textbook.</li> <li>○ Motion is when something moves from one place to another</li> </ul> </li> <li>● How do things move? Stand up and act out how these objects move:</li> </ul> <div style="text-align: center; margin: 20px 0;">  </div> <ul style="list-style-type: none"> <li>● Do these objects move on their own? <ul style="list-style-type: none"> <li>○ Reflect and answer</li> <li>○ Some objects (like people and animals) move on their own, while others (cars and trolleys) need someone to push or start them. This is called force.</li> </ul> </li> <li>● What is a machine? <ul style="list-style-type: none"> <li>○ Reflect and answer</li> <li>○ A machine is something that is designed to make our work easier. Give them examples: wheels, scissors, cars are all different types of machines</li> </ul> </li> <li>● Do machines move on their own? How does a bicycle move? <ul style="list-style-type: none"> <li>○ Reflect and answer</li> </ul> </li> <li>● A bicycle works to move us from one point to another by applying force to the pedals.</li> </ul>
10-20 minutes	<p>Pick an item either from the house or your imagination, draw it, and write how it moves. If you cannot write yet, you can draw an arrow, zigzag line etc. to depict the motion of the item.</p>

**DAY 2** - Today you will look at different videos and ways to build a new machine.

Suggested Duration	Activity and Description
5-10 minutes	<ul style="list-style-type: none"> <li>Watch the following videos of Rube Goldberg machines online to get excited about building your own. If you do not have access to the internet, look at one of the images below:</li> </ul>  <p style="text-align: center;">Rube Goldberg easy examples</p> <p style="text-align: center;"><a href="https://www.youtube.com/watch?v=OHwDf8njVfo">https://www.youtube.com/watch?v=OHwDf8njVfo</a></p>



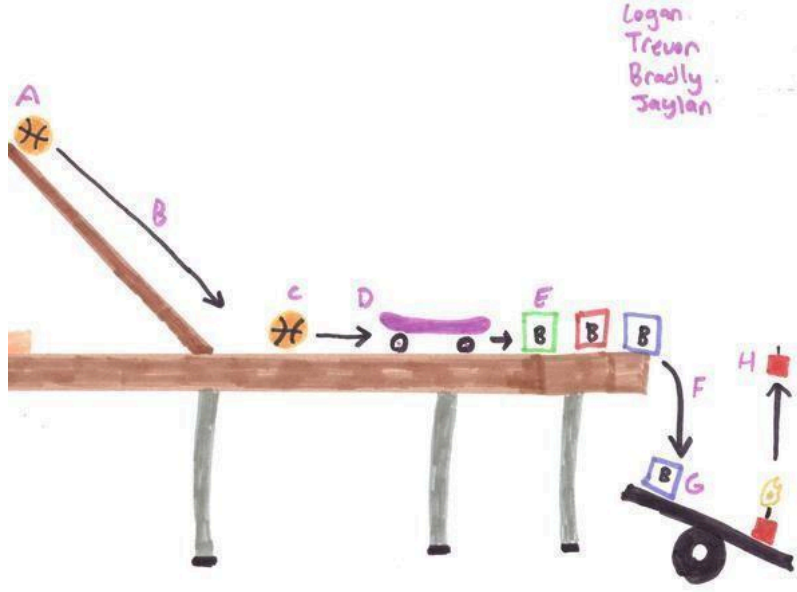
## How to make a Rube Goldberg Machine!

[https://www.youtube.com/watch?v=TLk6\\_RHvW5M](https://www.youtube.com/watch?v=TLk6_RHvW5M)

To secure coins:



Source:

	<p>To put out a candle:</p> 
<p><b>5-10 minutes</b></p>	<p>Reflect:</p> <ul style="list-style-type: none"> <li>• What is happening in this video/image? Explain how the machines work.</li> <li>• A Rube Goldberg machine is a type of machine that is made to do for us a seemingly simple task (such as pressing a button, watering a plant, closing a door etc), in an indirect and complicated way. It has many different parts connected to each other. An event in one part triggers another event in the next part and this goes on until the final event is triggered to achieve the goal of the machine.</li> </ul>
<p><b>15 minutes</b></p>	<ul style="list-style-type: none"> <li>• Walk around the house collecting 5-10 items and place them on a table.</li> </ul>
<p><b>10 minutes</b></p>	<ul style="list-style-type: none"> <li>• After placing all the items, write down in a notebook or piece of paper:             <ul style="list-style-type: none"> <li>• Name of item</li> <li>• How it works (if we need to push, pull, press etc.)</li> </ul> </li> </ul> <p>TIP: If the learner cannot write yet, you can either discuss with them and write the answer down, or write it in dotted lines and ask them to trace it</p>

### DAY 3 - Today you will design your own Rube Goldberg machine!

Suggested Duration	Activity and Description
2 minutes	<ul style="list-style-type: none"> <li>● You will be creating their own Rube Goldberg machine at home! A Rube Goldberg machine must meet the following criteria               <ul style="list-style-type: none"> <li>○ It should have many small parts arranged close to each other</li> <li>○ It must do something at the end – like ring a bell, push a button, etc.</li> </ul> </li> </ul>
20-30 minutes	<ul style="list-style-type: none"> <li>● Reflect on the type and purpose of the machine you want to make. You can watch more videos if needed to get inspiration. Draw the machine you want to build in your notebook or on a piece of paper using a pencil.               <ul style="list-style-type: none"> <li>○ A machine to put sugar in tea, made of a small pall, a few wooden popsicle sticks and a cup with tea at the end.</li> <li>○ A machine to pop a balloon made of a small ball, toy car/light stone with a pin attached, a wooden plan or popsicle sticks and a balloon at the end.</li> </ul> </li> </ul>
10 minutes	<p>Discussion:</p> <ul style="list-style-type: none"> <li>● What is the purpose of your machine? What is making it easier for you to do?</li> <li>● What items in our house do you think you can use to create your Rube Goldberg machine that you have drawn and what will be the function of each part.?</li> </ul> <p>Lead designing the machine and assemble your machine based on your design without refining it.</p> <p>Take note of which parts of the machine work and which ones don't.</p> <p><u>Reflection:</u></p> <ul style="list-style-type: none"> <li>● If something does not work, what can you do to make it work next time?</li> </ul>

**DAY 4-** Today you will assemble and create your own Rube Goldberg machine.

Suggested Duration	Activity and Description
10-20 minutes	<ul style="list-style-type: none"> <li>• Time to test our design! Under the supervision of parents, you will assemble all the items, set up and test each part of the machine before moving to the next, e.g. a toy car with a pin taped to the top sliding down a ramp made of popsicle sticks and popping a balloon.</li> <li>• Create some items using paper or other adaptable material, if some items are unavailable</li> <li>• After the setup is complete, get the machine going and observe what happens</li> </ul>
10-20 minutes	<ul style="list-style-type: none"> <li>• Discussion:               <ul style="list-style-type: none"> <li>○ What do you think worked?</li> <li>○ What did not work?</li> <li>○ What can you change?</li> </ul> </li> </ul>
5-10 minutes	<ul style="list-style-type: none"> <li>• Ask for feedback from your parents and tell them what you love about the machine. Refine your design and add from the items list either to fix errors or expand the machine (by adding just one or two additional parts. Do not complicate the design).</li> <li>• If it didn't work, know that designing a machine is a process and making mistakes is a part of it. That is the purpose of testing, so we can learn from our mistakes and make things work better.</li> </ul>

**DAY 5 -** Today you will refine your machine so that it works perfectly!

Suggested Duration	Activity and Description
10 minutes	<ul style="list-style-type: none"> <li>• Refine the design of the machine based on yesterday's feedback by either expanding or refining it. You can draw the final design in color pens.</li> </ul>

<b>5-10 minutes</b>	<ul style="list-style-type: none"> <li>Assemble all the items necessary and set up the modified machine for another testing round of the final design presented to the rest of the family!</li> </ul>
<b>5 minutes</b>	<ul style="list-style-type: none"> <li>Start the machine!</li> </ul>
<b>5 minutes</b>	<ul style="list-style-type: none"> <li>Discussion:             <ul style="list-style-type: none"> <li>What do you think of your final design?</li> <li>What do you think worked?</li> <li>What didn't work?</li> <li>What can you change?</li> </ul> </li> </ul> <p>Family feedback should include:</p> <ul style="list-style-type: none"> <li>What they love about the Rube Goldberg machine</li> <li>Any questions they have</li> <li>Suggestions for making what did not work more effective</li> </ul> <p>Use the feedback from family members to revise the design of the machine</p>

<b>Additional enrichment activities:</b>	<ul style="list-style-type: none"> <li>There is always room for extending the complexity of the final design by adding more items.</li> </ul>
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## ASSESSMENT CRITERIA

The students should be able to:

- Define motion and give examples of objects that move independently or require external force.
- Create a functioning Rube Goldberg machine e that consists of 3 or more simple and/or compound machines, and that solves some problem/serves some purpose.
- Successfully identified and selected appropriate household items for their machine.
- Showed creativity and problem-solving skills in their machine design.