


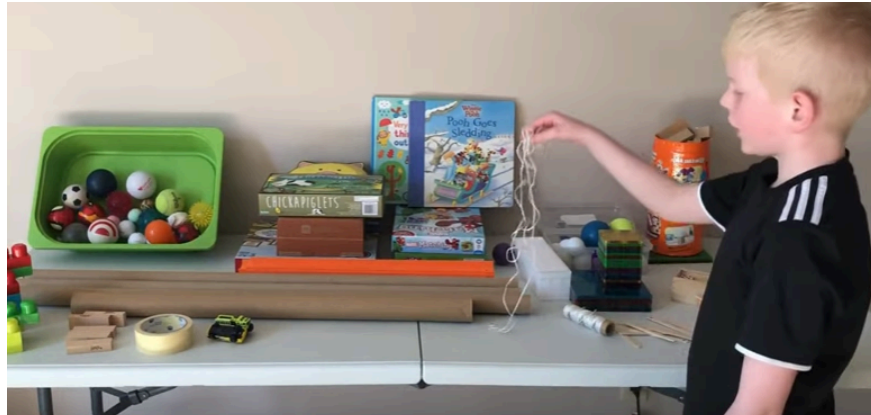
CREATE YOUR OWN RUBE GOLDBERG MACHINE! (LEVEL 2)

Description	Learners will gain an understanding of how these machines work and the role of chain reactions. They will reflect on the type and purpose of the machine they want to create, sketch out their designs, and gather household items to bring their contraptions to life.
Leading Question	How can we create a machine that helps us do something useful or fun in our house?
Subjects	Science (physics, engineering)
Total Time Required	50-80 minutes per day over 3 days.
Age groups	7 - 8 year olds
Supplies Required	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)
Supervision	supervised by parents/guardians
Learning Outcomes	Learners will be able to: <ol style="list-style-type: none"> 1. Define a Rube Goldberg machine and explain its purpose 2. Develop creativity and problem-solving skills by designing their own Rube Goldberg machine. 3. develop basic engineering skills by creating a machine that performs a simple task through a chain reaction. 4. Understand an example of a machine that uses scientific concepts (force) to work 5. Gain an understanding of what a machine is and provide examples of common machines. 6. Exhibit a comprehensive understanding of the fundamental principles of motion and force

DAY 1 - Today you will learn about what makes things move, and watch videos of a Rube Goldberg machine.

Suggested Duration	Activity and Description
10-20 minutes	Discuss: <ul style="list-style-type: none"> • Do you know what a machine is? Why do we need machines? • What are simple machines? Give some examples of simple machines.

	<ul style="list-style-type: none"> • What are compound machines? Give examples of compound machines <p>A machine is something that is designed to make our work easier. A simple machine is any device with few or no moving parts that is used to change the direction of motion or the amount of force needed in order to perform a task. Examples of simple machines are the lever, inclined plane, wedge, screw, pulley and wheel and axle. Compound machines are made up of two or more simple machines. Examples of compound machines are bicycle, wheelbarrow, scissors etc</p> <ul style="list-style-type: none"> • How do you think a machine, like a bicycle, for example, works? A bicycle works to move us from one point to another by applying force to the pedals • How does a machine make our work easier? Machines work by increasing or changing the direction of force • Is everything a machine? Is a book a machine? Why or why not? Machines serve us by making it easier for us to do something. Not all objects are machines. E.g. books, clothes, boxes, cups are not machines. But scissors, wheels, knives etc. are machines
<p>5-10 minutes</p>	<ul style="list-style-type: none"> • Watch the following videos of Rube Goldberg machines online to get excited about building your own.  <p>Rube Goldberg easy examples</p> <p>https://www.youtube.com/watch?v=OHwDf8njVfo</p>



How to make a Rube Goldberg Machine!

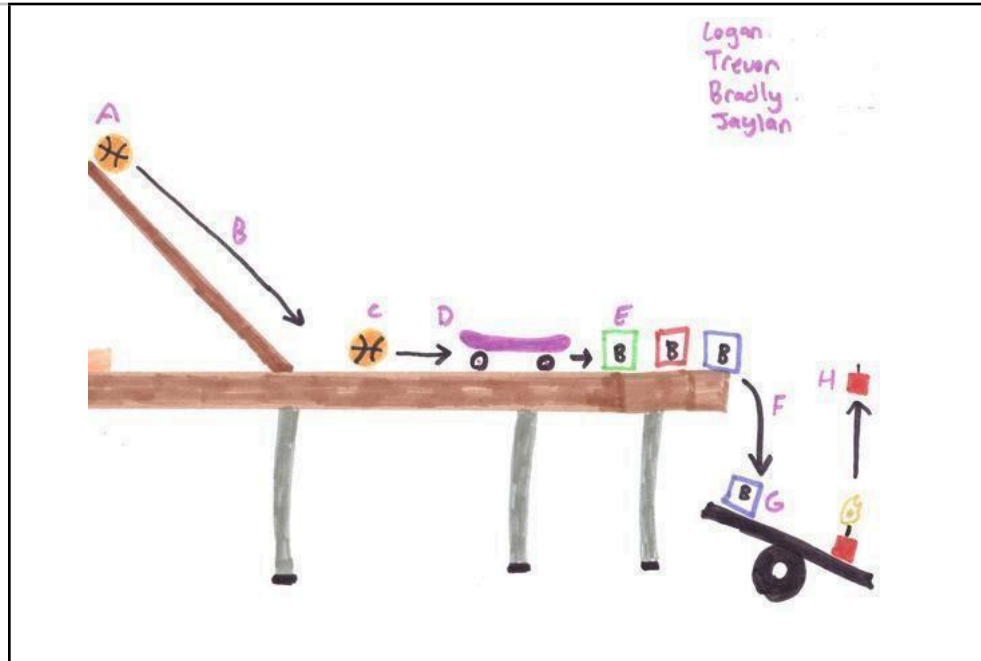
https://www.youtube.com/watch?v=TLk6_RHvW5M

If you do not have access to the internet, you can use images included here

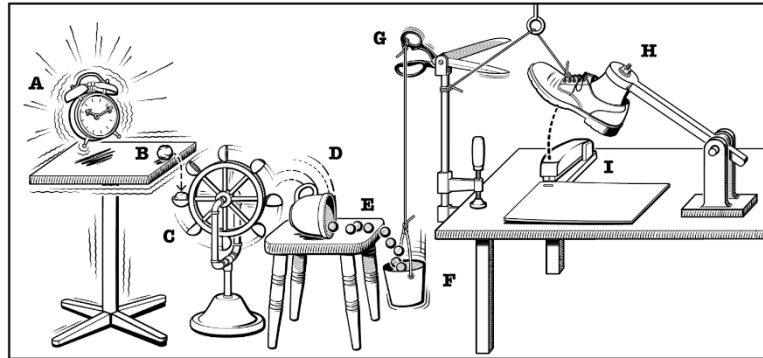
To secure coins:




To put out a candle:



To staple paper:



To spray a piece of cloth:

	
<p>5 minutes</p>	<ul style="list-style-type: none"> ● Discussion: <p>Do you know what type of machine the Rube Goldberg one from the video you just watched/image you have just seen is?</p> <p>A Rube Goldberg machine is a compound machine that is intentionally designed to “solve a seemingly simple problem” (such as pressing a button, watering a plant, closing a door, filling a glass with water etc), and is composed of several simple and compound machines that are connected to each other such that exerting force on the first component to “start” the machine results in the exertion of force on the next component and so on until the last component is struck.</p>
<p>15 minutes</p>	<p>Discover some machines at home! Spend some time walking around the house collecting 5-10 machines and place them on a table.</p>
<p>20-30 minutes</p>	<p>After all the machines are placed on the table, write down in a notebook or piece of paper:</p> <ul style="list-style-type: none"> ● Name of machine ● Why they think this is a machine ● What work does it make easier for us to do ● How it works ● If it is a simple or compound machine <p>Share your work with the family members.</p>

DAY 2 - Today you will design your own Rube Goldberg machine

Suggested Duration	Activity and Description
2 minutes	<ul style="list-style-type: none"> You will be creating your own Rube Goldberg machine at home! A Rube Goldberg machine must meet the following criteria: <ul style="list-style-type: none"> It should be composed of many simple and compound machines It must solve a problem or perform a task at the end – like ring a bell, push a button etc.
20-30 minutes	<ul style="list-style-type: none"> You will reflect on the type and purpose of the machine you want to make. You can watch more videos if needed to get inspiration. <div data-bbox="472 909 1081 1203" data-label="Image"> </div> <p data-bbox="475 1213 1094 1241">How to Make a SIMPLE Rube Goldberg Machine - Become a Beginner</p> <p data-bbox="467 1289 1081 1320">https://www.youtube.com/watch?v=PK2_gA2OeMI</p>
5-10 minutes	<ul style="list-style-type: none"> 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"> 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. 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.
20 minutes	<p>Design the machine and test it without refining it:</p> <p>Discuss:</p>

	<ul style="list-style-type: none"> • What are the different types of machines we have seen in the videos/images? <ul style="list-style-type: none"> ◦ There's usually something that rolls, something that tilts, something that pulls/lifts etc. • What is the purpose of your machine? What is making it easier for you to do? What problem is it solving? • What items do you think you can use to create your Rube Goldberg machine you have drawn? <p>Using a similar list to the template below, gather all your toys or objects found in the house and write down what you think you can use in each category. Examples: balls, sticks, paper, ruler, bottles, bottle caps, cards, stones, candles, threads, pins, balloons etc. You can use any items you have at home or create ones out of paper or other easily adaptable material. You will then divide the items based on whether they roll, slide, pull etc.</p> <p>Template:</p> <table border="0"> <tr> <td>Item</td> <td>Role</td> </tr> <tr> <td>Ruler</td> <td>To be the ramp/course for the ball to roll on</td> </tr> <tr> <td>Ball</td> <td>To slide down the ramp and knock off the cards</td> </tr> <tr> <td>Cards</td> <td>To be knocked off by a ball and fall on something else</td> </tr> </table>	Item	Role	Ruler	To be the ramp/course for the ball to roll on	Ball	To slide down the ramp and knock off the cards	Cards	To be knocked off by a ball and fall on something else
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DAY 3 - Today you will assemble and create your own Rube Goldberg machine, and then refine your machine so that it works perfectly!

Suggested Duration	Activity and Description
10 minutes	<ul style="list-style-type: none"> • Time to test our design! Assemble all the items, and set up and test a part of the machine, e.g. a toy car with a pin taped to the top sliding down a ramp made of popsicle sticks and popping a balloon. When assembling the different parts of the machine, you should test each part before moving to the next. • You can also create some items using paper or other adaptable material, if some items are unavailable • After the setup is complete, get the machine going and observe what happens together
10-20 minutes	<p>Discussion:</p> <ul style="list-style-type: none"> • What do you think worked?

	<ul style="list-style-type: none"> • What did not work? • What can you change? (if it worked, can you expand the machine and add more parts)
10 minutes	<ul style="list-style-type: none"> • Ask for feedback and then refine the design and write a list either to fix errors or expand the machine (by adding just one or two additional parts. Do not complicate the design) • If you did not get it right this time, know that designing a machine is a process and making mistakes is a part of it. This is the purpose of testing, so we can learn from our mistakes and make things work better.
5-10 minutes	<ul style="list-style-type: none"> • Refine the design of the machine based on the feedback by either expanding or refining it. Draw the final design in color pens! • Set up and start the machine for another testing round of the final design.
5-10 minutes	<ul style="list-style-type: none"> • Discuss: <ul style="list-style-type: none"> o What do you think worked? o What didn't work? o What can you change?
10 minutes	<ul style="list-style-type: none"> • Make the necessary adjustments (if any) and set up the machine again to show and present to your siblings/rest of the family! First explain the purpose of the machine, its different parts, and finally set it off!
5 minutes	<ul style="list-style-type: none"> • Present the set up and start the machine again in front of the rest of the family! <p>Family feedback should include:</p> <ul style="list-style-type: none"> • What they love about the machine • Any questions they have • Any suggestions for improvements <p>Use the feedback to revise the design of the machine or the materials used</p>

Additional enrichment activities:

- There is always room for extending the complexity of the final design by adding more items.
- Older learners can also be asked to write a report documenting the process of creating the machine and detailing the types of component machines used, their operation mechanism, etc.

ASSESSMENT CRITERIA

A majority of my learners were able to:

- Successfully create a Rube Goldberg machine that consists of 5 or more simple and/or compound machines, and that solves some problem/serves some purpose.
- Present the final design showing understanding of its working and make
- Accurately explain the concepts of motion and force, as well as articulate how machines modify these principles.
- Provide clear examples of simple and compound machines and describe their respective functions.
- 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.
- Show creativity and problem-solving skills in their machine design.
- Critically reflect on their machines' performance, identify areas for improvement, and make effective adjustments.