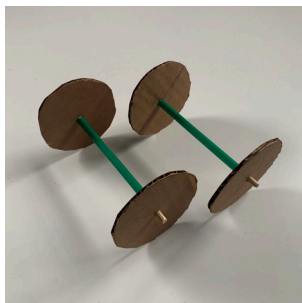
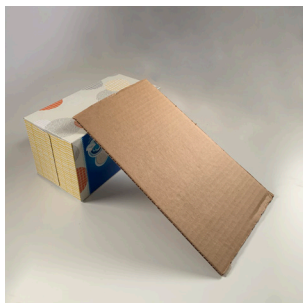


TAKE & MAKE KIT

Rube Goldberg Machine

TIME: 45 minutes
CONTAINS SMALL PIECES

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What's in this kit?

Rube Goldberg was a cartoonist who made drawings of machines that were designed to complete everyday tasks in elaborate ways. His machines were often over the top, using outrageous methods to accomplish the job, but they were always fun and interesting to watch. This kit will help you make your own machine inspired by Rube Goldberg!

You will learn:

- Physics
- Engineering
- Simple Machines

Let's Get Started!

Materials

Plastic ball
Wooden spool
Wooden stick
Marbles
Water balloons
String
Recyclable materials (boxes, cans, toilet paper rolls, bottles)
Household items (books, cups, batteries, thumbtacks, coins)

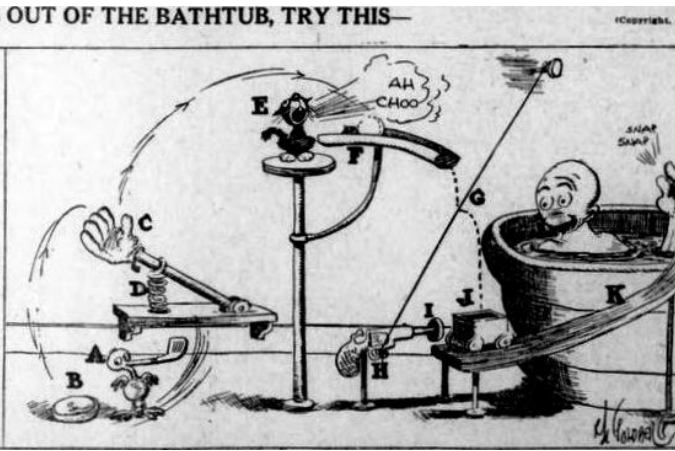
Tools

Scissors
Tape or glue

You can build your own Rube Goldberg Machine at home with the help of simple machines.

THE SOAP FALLS OUT OF THE BATHTUB, TRY THIS—

MAN IN BATH TUB SNAPS FINGERS AND PET DUF-BEAKED SOAP-HAWK (A) HITS SOAP (B) INTO ASEBALL GLOVE (C) - REBOUND OF SPRING (D) AUGES GLOVE TO THROW SOAP PAST CAT (E) INTO TROUGH (F) - BREEZE FROM LYING SOAP CAUSES CAT TO SNEEZE, BLOWING SOAP OFF TROUGH - SOAP HITS STRING (G), WHICH ULLS TRIGGER OF PISTOL (H), SHOOTING RAM (I) AGAINST SMALL RUC (J), INTO WHICH SOAP'S MERTIME FALLER - AIR CARRIES SOAP UP PLATFORM (K), DUMPING IT BACK INTO TUB AND MAN CAN CONTINUE WITH HIS BATH.



Rube Goldberg cartoon "If the Soap Falls Out of the Bathtub, Try This ..." on page 10 of the November 18, 1921 Duluth Herald.

Push and pull, lift and grab, release and capture. These are some of the reactions you can create with simple machines. When you combine several simple machines to create a compound machine, you can engineer a chain of reactions to do the work needed to complete your task.

What is work?

Work = Force x Distance

Imagine you are moving a box from one side of a table to the other side. To accomplish this you will have to apply a force to the box over a certain distance. In physics, this is considered work.

Now imagine that you are moving the same box again but this time you use a simple machine. Simple machines make work easier. They do this by adjusting the amount of force applied or the direction of a force. Consider the way this will help you create your Rube Goldberg Machine.

6 Simple Machines

Inclined plane

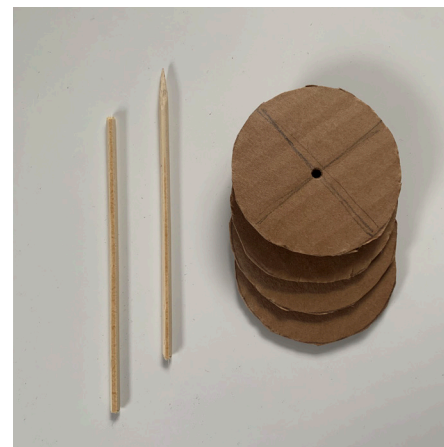
A flat surface raised on one end which moves an object up or down with less force. Use the surface of a book or a piece of cardboard and prop it up or against another object to raise one end. Use this like a ramp to slide objects in different directions.



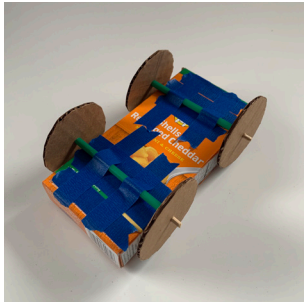
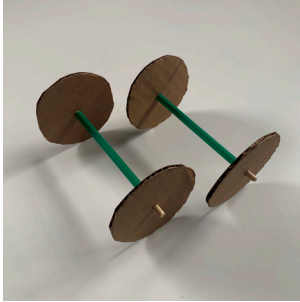
Wheel and axle

A circular object revolving around a central shaft reduces friction which allows the object to move easier (requires less force).

Recycle round container lids, cut out cardboard circles or use bottle caps to act as wheels. Use pencils, bamboo chopsticks or skewers as an axle. Cut out holes in the center of the wheels and attach them to the axle.

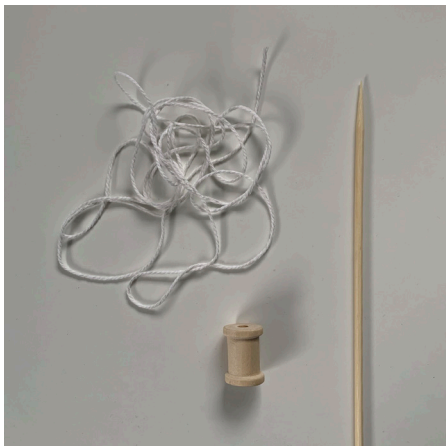


Build a cart! You will need drinking straws and a small box or container, or a flat surface for the body of your cart. Make two sets of wheels and axles. Glue or tape the straws onto the bottom side and slide the axle through before attaching the wheels.



Pulley

A wheel with a groove which allows a cord to pass through. The pulley changes the direction of the force being applied to the cord. A pulley can be used to lift and move heavy objects.



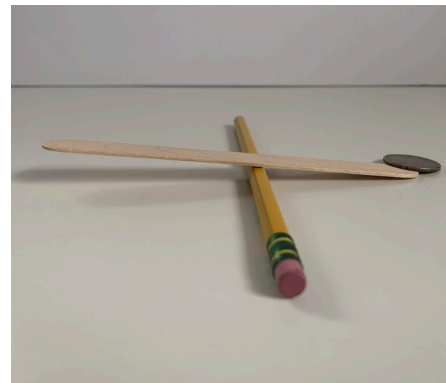
Create your pulley by finding a spot for the wooden stick to be secured. Slide the wooden spool into the stick and then wrap a length of the string around the spool. Tie an object on one end and pull the other end of the string to lift the object. You can also create pouches to tie onto each side and fill these pouches with different items.



Lever

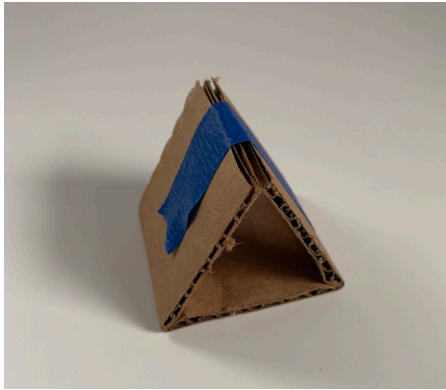
A lever is made with a beam and a fulcrum. You can place an object on one end of the beam and apply a force on the opposite end to lift the object. The beam sits on top of the fulcrum and the beam will pivot on the fulcrum to raise the object. The closer the object is to the fulcrum, the less amount of force is needed to pivot.

Use a rigid flat surface like a ruler, popsicle stick or piece of cardboard as your beam and place it on top of a pencil, a bottle, or fashion a triangle block out of cardboard for your fulcrum.

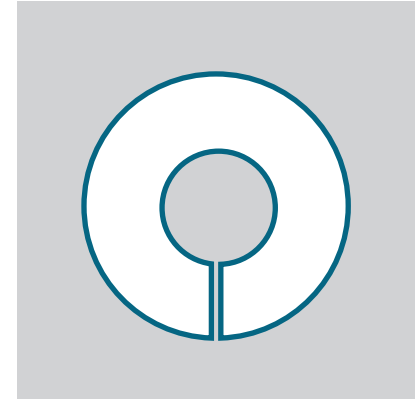


Wedge

An object that tapers to a thin edge. A wedge will create a sideways force in the direction it is pushed. It can be used as a tool to split, lift, or tighten and attach objects together. A wedge can also be attached to a handle (like an axe). You may have already created a wedge if you created a triangle block for the fulcrum of the lever. A wedge can also be a portable inclined plane.

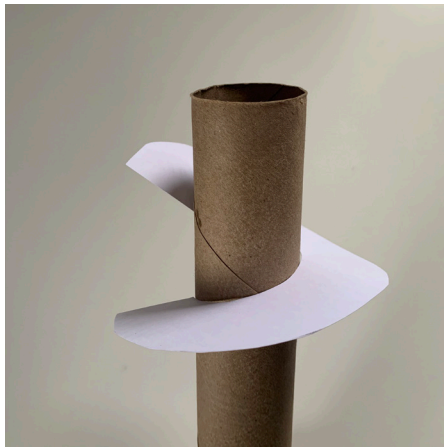


Imagine a spiral staircase. This is a screw! You can create one by cutting out several circles with a hole in the middle (make these the size of a paper tower tube or gift wrap tube) and then tape the circles around the tube. Use thicker paper for a sturdier ramp and go the extra mile by adding walls so things like marbles can run the course without slipping out too early.



Screw

A screw is an inclined plane twisting around a cylinder. Think of twisting a lid onto a jar. That twisting is made possible by the grooves which are inclined planes wrapping around. An office chair that spins and moves up and down is also made possible by a screw.



Ideas to try

These are the six classical simple machines. Take it one simple machine at a time until you get a hang of how each one functions. Get creative and decide which simple machines work best to complete your Rube Goldberg Machine. Give yourself as much room as possible to build up and down or sideways. Experiment and adapt your design as you problem solve and make decisions to create the best possible outcome.

Create a Rube Goldberg Machine to do each of the following tasks

- Pop a balloon
- Lift an object
- Reveal or hide an item
- Direct a ball into a cup

Challenge

Can you use all six simple machines introduced here in your Rube Goldberg Machine? This might be harder than it seems!

Go Beyond

Use what you've learned with simple machines to build a marble run. Create an obstacle course with whatever materials you have available and roll your marble from one point to another.

Can you get from point A to point B with only one initial push of your marble? How much force can you apply so your marble will move the desired distance?

Bonus!

Use the space here to make a drawing of your Rube Goldberg Machine, real or imaginary, just like Rube Goldberg the cartoonist!

HANG OUT,
MESS
AROUND,
GEEK OUT.



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