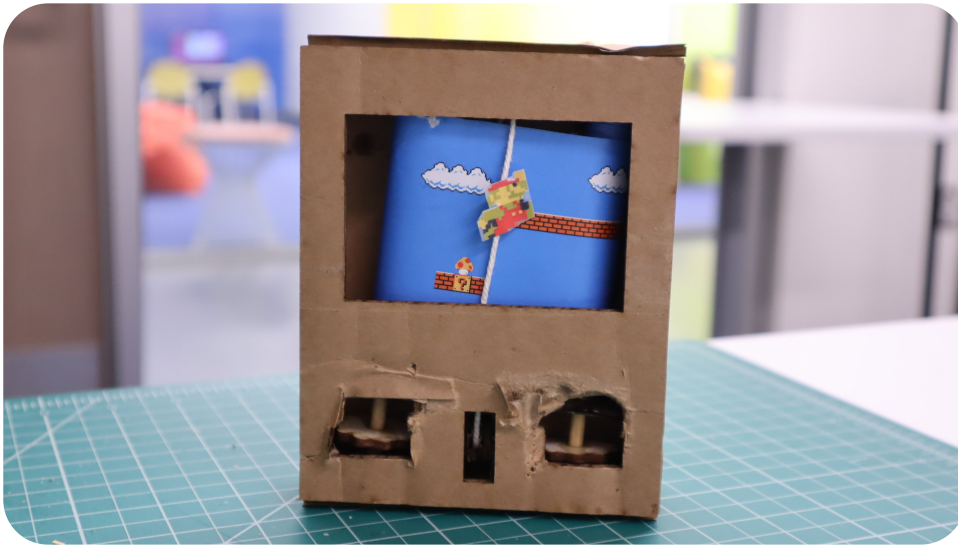


Do Space Summer 2021

TAKE & MAKE: CARDBOARD ARCADE



INTRODUCTION

Did you know that technology does not always involve electricity? A lot of machines existed before electricity was implemented with technology. For thousands of years, people used simple machines to make work easier. In this project, you will make a cardboard arcade game by using simple machines such as the "pulley" and the "wheel and axle."

WHAT YOU'LL NEED:

Here's what you'll find in the kit:

- 2 sticks
- A toothpick
- Roll of paper
- String
- Crayons
- 2 wooden wheels

You'll also need:

- Cardboard
- Scissors
- Glue
- Art Supplies
- Pen or needle

Subjects:

- Force and Motion
- Engineering
- Art

Standards:

- ETS2.A
- ETS2.B
- PS2.A

[nextgenscience.org](https://www.nextgenscience.org)

Maker Capacities:

- Tinker to Explore
- Finding Opportunities

[agencybydesign.org](https://www.agencybydesign.org)

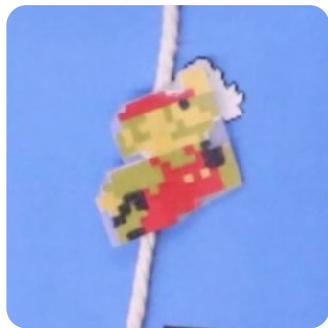
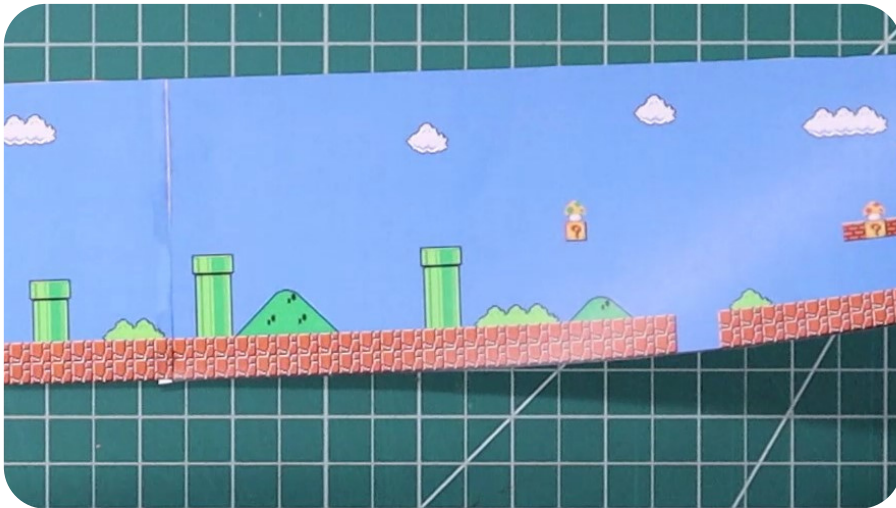
Key Terms

- Simple Machine
- Technology
- Work

Let's Make This!

DRAW YOUR BACKGROUND:

Grab the roll of paper and draw out a long level from your favorite game or a scene from your favorite story. You can decorate it any way you want.



CREATE A CHARACTER:

You may also want to make a character for your arcade game. You cut out a small piece of paper and draw them out.

TIME TO CUT A LOT OF CARDBOARD:

You can cut the cardboard any size you want, but you need to make sure that all of the pieces fit. You can follow this guide's sizes if you are not sure how to size your arcade box.



Why does it work?

A pulley is just a grouping of one or more wheels over which is looped a rope (or sturdy chain, for heavier objects).

Scientists call these "simple machines" because they allow humans to multiply the forces that allow us to lift a heavy weight. Using a pulley greatly multiplies the force of your physical efforts.

A pulley with one wheel allows you to reverse the direction of your lifting force by pulling down on a rope (that's looped over the wheel), lifting your weight.

We use the pulley here to move our character up and down.

Mix-it up!

Try making two pulleys so you can move your character any direction! You could also try making a story.



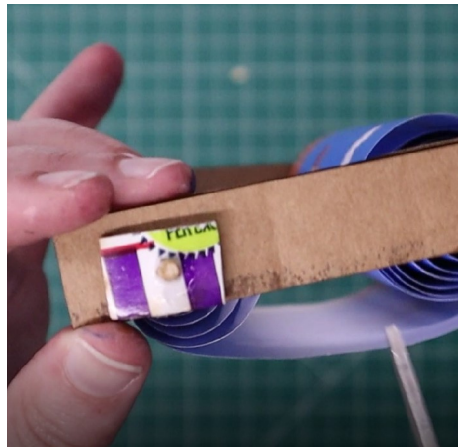
Share what you made! @DoSpaceOmaha #DoSpaceSummer



Let's Make This!

WHAT YOU NEED TO CUT:

- Backplate:
 - 6 in. by 7.5 in.
- Front Plate:
 - 6 in. by 7.5 in.
- Long sides:
 - 2 pieces. 1.5 in. by 7.5 in.
- Short Sides:
 - 2 pieces. 1.5 in. by 6 in.
- Sticks holder:
 - 2 pieces. 1 in. by 5 in.
- Stick wheels:
 - 2 pieces. 1 in. by 1 in.
- Pulley wheels:
 - Cut into circles.
 - 2 big pieces. 1.5 in. by 1.5 in.
 - 1 small piece. 1 in. by 1 in.
- Pulley holder:
 - 2 pieces. 1 in. by 1 in.

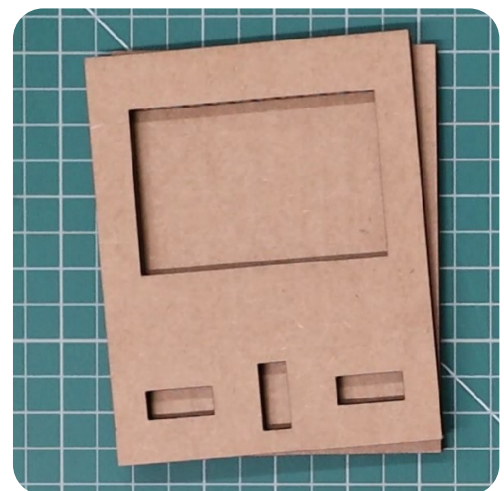


ADDITIONAL CUTS:

The front plate needs slots cut into it to make holes for the wheels.

Cut:

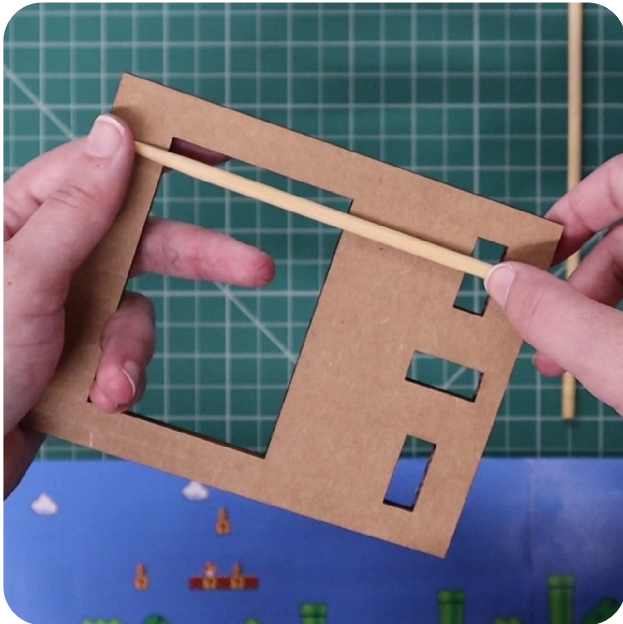
- Viewing slot near the top.
 - 3.5 in. by 3 in.
- A vertical slot at the middle bottom.
 - 1 in. by 1.5 in.
- Two horizontal slots by the vertical slots
 - 2 in. by 1 in.



Let's Make This!

ADDITIONAL CUTS:

We need to adjust the stick holders. They need a slot for our string to run through without snagging on the paper. Cut long rectangular slots in the middle in both pieces, as seen in the picture.



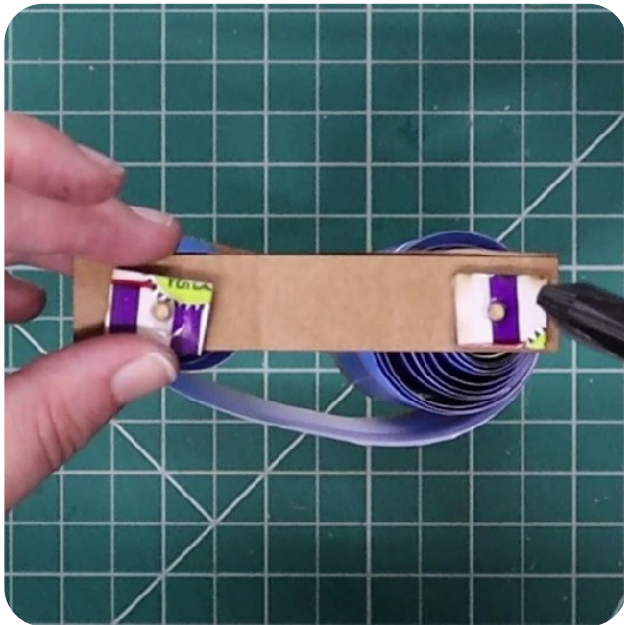
WHEEL AND AXLE:

We are making our "wheel and axle" next. Cut the two sticks down to a little less than the length of our box. Make adjustments as needed.

Let's Make This!

WHEEL AND AXLE:

Glue the stick to one end of the paper roll at a time. Try gluing the paper closer to the top of the sticks, but leave room for the stick holder. After letting the glue dry, roll up the paper into a roll.



WHEEL AND AXLE:

Attach the stick holder to the top and bottom of our roll. Do not glue the holder to the sticks. It stops the roll from turning. Attach two "wheels" to the top of the holder. Glue the wheels to the sticks. Do not glue the wheels to the stick holder. It stops the sticks from turning.

Let's Make This!

WHEEL AND AXLE:

Attach the wood handles to the bottom of our sticks. Glue the handles to the sticks. Test turning the sticks by the handles after the glue has dried.



WHEEL AND AXLE:

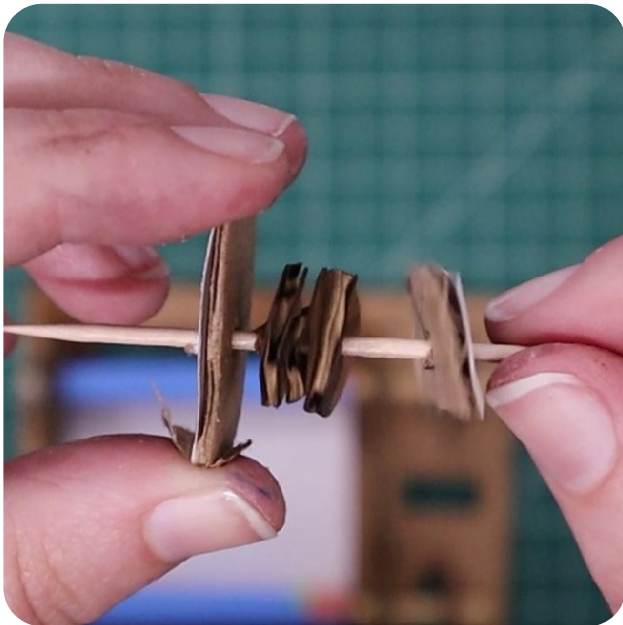
Glue the whole "wheel and axle" piece to the front arcade piece. Do not glue the paper or the sticks to the front piece.



Let's Make This!

PULLEY:

Put the three pulley wheels together. Align them as big>small>big. Stick the toothpick through the pulley wheels. Glue the wheels to the toothpick.



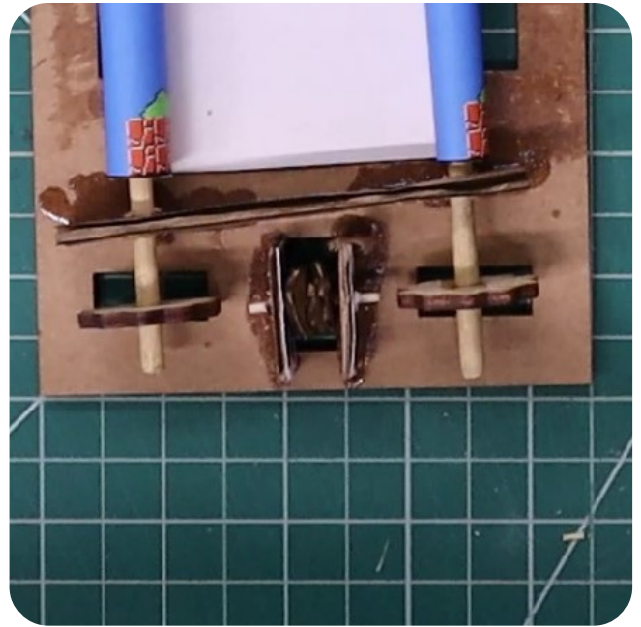
PULLEY:

Attach the pulley holder to both sides of our pulley. Test the pulley wheel by turning the toothpick. Do not glue the pulley holder to the toothpick.

Let's Make This!

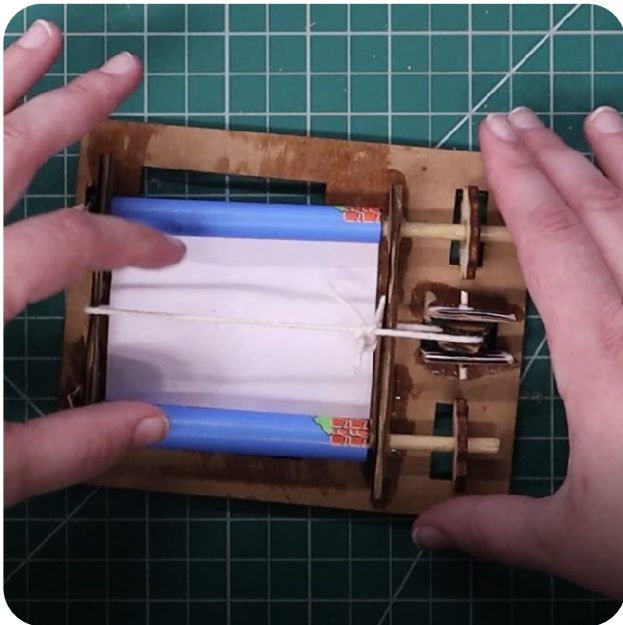
PULLEY:

Glue the pulley holder to the last spot on the front arcade piece. You may have difficulty reaching the pulley from the outside of the arcade. Make adjustments as needed.



PULLEY:

Insert the string in front of our paper roll and slide the string through our stick holder slots. Pull the string around our pulley and tie the string tight. Test the pulley by turning the toothpick. Cut the extra string off.



Let's Make This!

FINAL TOUCHES:

Glue all the sides and pack together. Give the arcade time to dry.



FINAL TOUCHES:

After everything is done drying, attach your character to the string. You are now done! Go ahead and play with your physical arcade game!

