SCRATCH in Practice

Creativity Explored with Tinkercad and Scratch

SiP

January 28, 2025

Getting Ready

- If you don’t already have one, we encourage you to create a free Tinkercad account so you can experiment and create along with us: tinkercad.com/join
- Go to scratch.mit.edu and log in to your account

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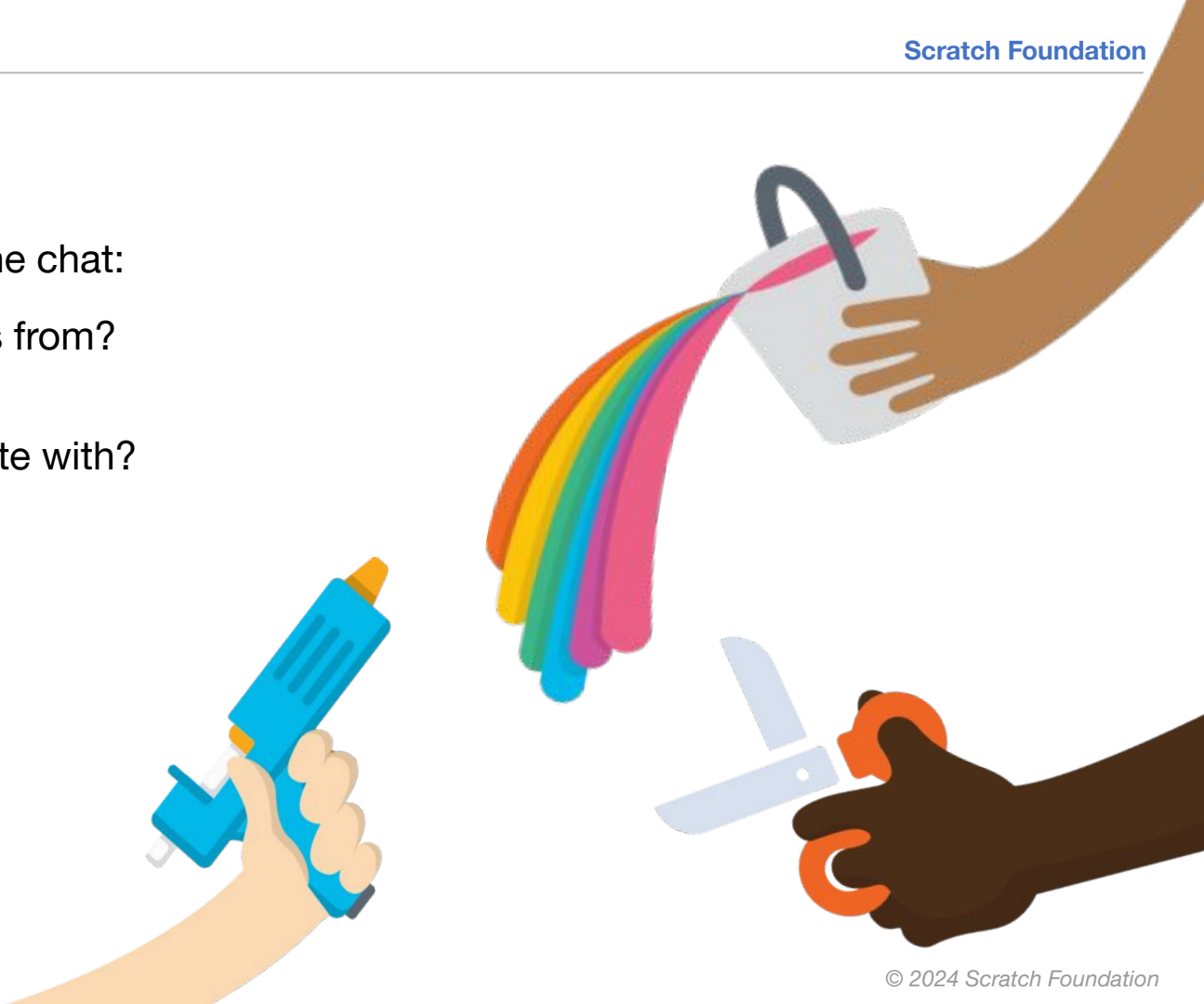
Icebreaker

Before we jump in, share in the chat:

- Where are you joining us from?
- What is your favorite medium/material to create with? Paint…paper and glue… pencils…digital tools…?



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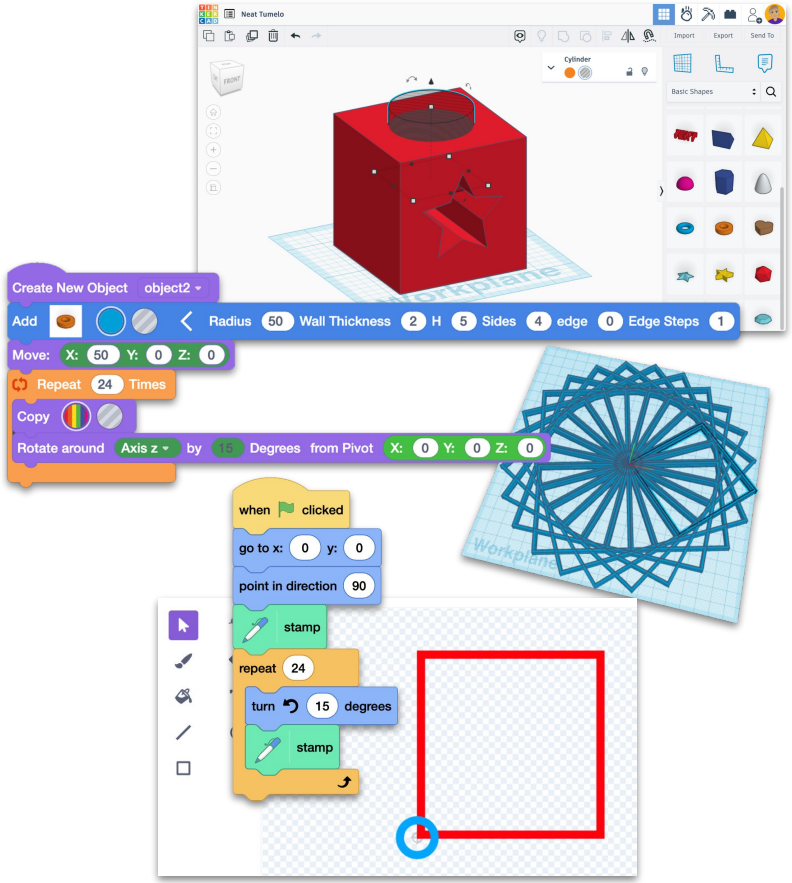
Agenda

- Learn some basic tips and tricks for Tinkercad
- Learn to create freehand and using Codeblocks
- Explore Scratch parallels and differences
- See some extension opportunities bringing Scratch and Tinkercad together

Session Objectives

- Participants will walk away from the session able to create simple shapes and pattern designs in Tinkercad
- Participants will have ideas for creative play opportunities



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Your Presenter

Maren Vernon

Scratch Learning Resource Designer,
@algorithmar

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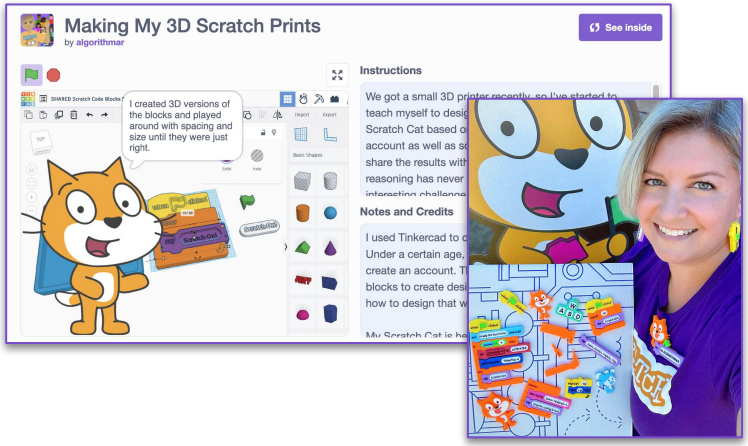
You can also find my work at scratchlycaterton and codifiedconcepts.



As I started to teach myself to design in 3D, I was inspired by the Scratch Cat and Scratch blocks and wanted to bring them into the physical world. Naturally, I made a Scratch project about it! :) You can see the project here: scratch.mit.edu/projects/864618134.

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About Scratch

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Scratch

Scratch's mission is to provide young people with digital tools and opportunities to imagine, create, share, and learn. It is a free platform where you can create your own interactive stories, animations, or games.

It is available to use online at scratch.mit.edu. Download the offline version at scratch.mit.edu/download.

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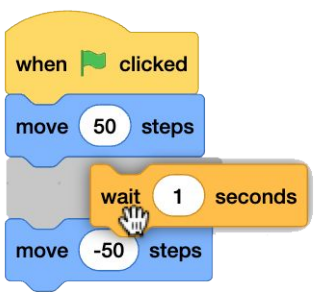
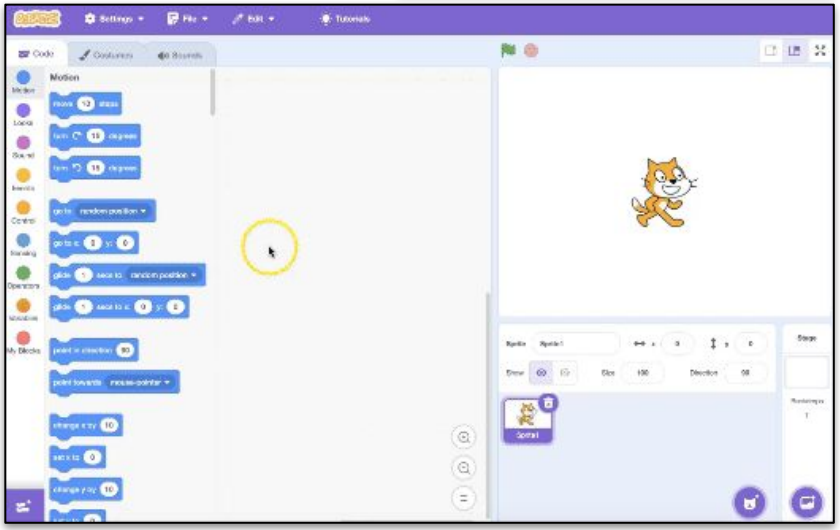
Block-Based Programming

Scratch pioneered block-based programming, enabling young people to learn to code creatively and interactively.

With Scratch, young people make animations, games, and digital stories by dragging and dropping code blocks.

Creating Scratch projects fosters the development of computational and creative thinking skills that are critical for future success: learners identify problems, break them into smaller parts, debug them, and iterate on solutions.





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Platforms

Scratch

scratch.mit.edu

Scratch is the world's largest coding community for young people and a coding language that allows them to create digital stories, games, and animations.

ScratchJr

scratchjr.org

With ScratchJr, young children (ages 5-7) learn important new skills as they program their own interactive stories and games. Designed for iPad.

Scratch Lab

lab.scratch.mit.edu

Scratch Lab is our innovation playground where the Scratch Team shares our experiments with new coding blocks for everyone to try out and give us feedback.

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Getting Started

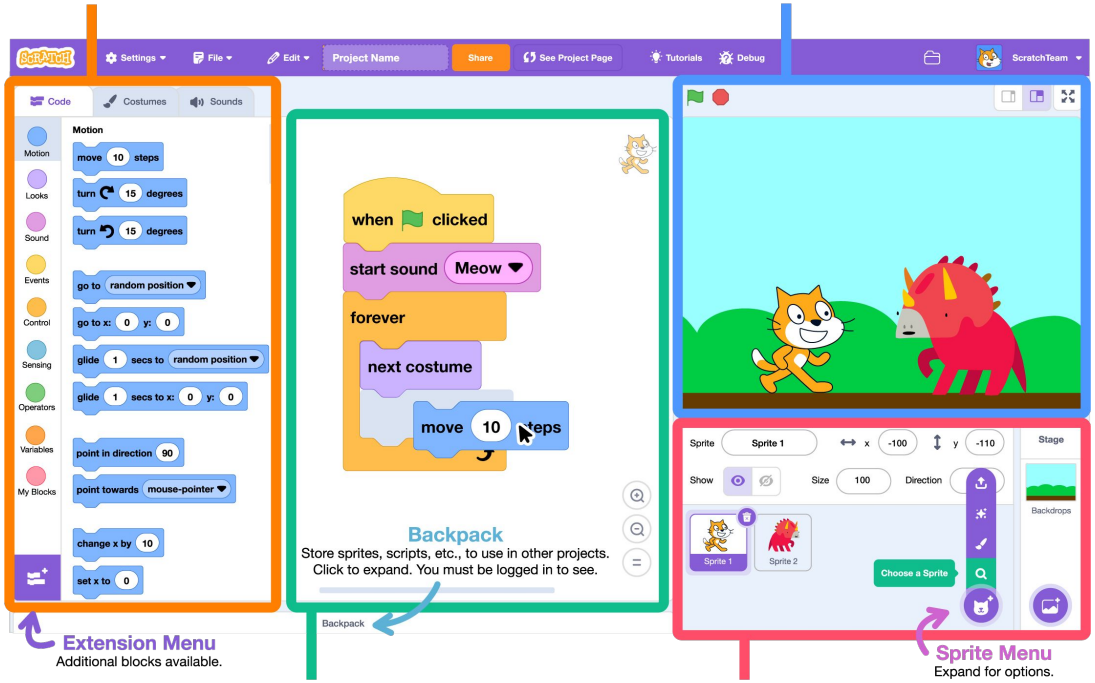
Click “Create” or log in to your free account to save projects.

go to: scratch.mit.edu

Set your language and block color mode.

Choose a sprite. Drag and drop code blocks to create a script.

scratchfoundation.org/learn/learning-library/getting-started



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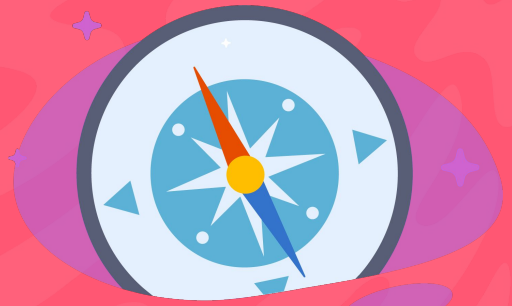
Creative Learning

As facilitators, we want to support **playful learning and tinkering mindset values** so that participants can:

- Engage playfully in **projects** that are meaningful to them and elicit joy
- Collaborate with **peers** to experiment, share, and celebrate ideas
- Develop a mindset that is **comfortable with the discomfort** of getting stuck
- Develop a mindset that thinks critically about **strategies for getting unstuck**

scratchfoundation.org/learn/learning-library/scratch-creative-learning-philosophy

Tinkercad Tips



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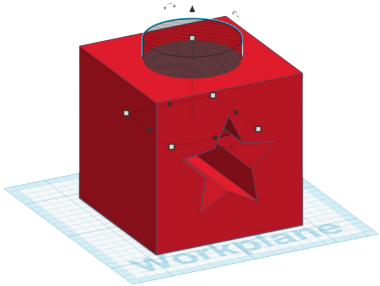
About Tinkercad



- A free 3D modeling program that runs in a web browser
- Can share designs publicly and publish them under Creative Commons license
- Can export designs in STL or OBJ formats, so that they can be 3D printed

- Design with shapes that can be a solid or a hole (or create your own shapes with the Scribble tool)
- Grouping solids and holes together creates new shapes, which in turn can be assigned the property of solid or hole
- Drag and drop shapes onto a workspace to create your design

- Codeblocks can be used to create and modify shapes with block-based code
- Circuits is a browser-based electronic circuit simulator that supports Arduino microcontrollers, Micro:bit boards, etc.

- Like Scratch, Tinkercad provides wide walls and high ceiling applications, and allows for creative expression

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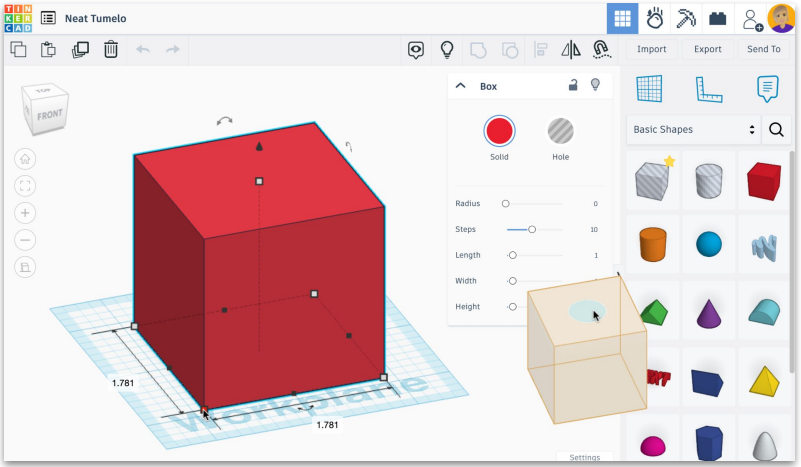
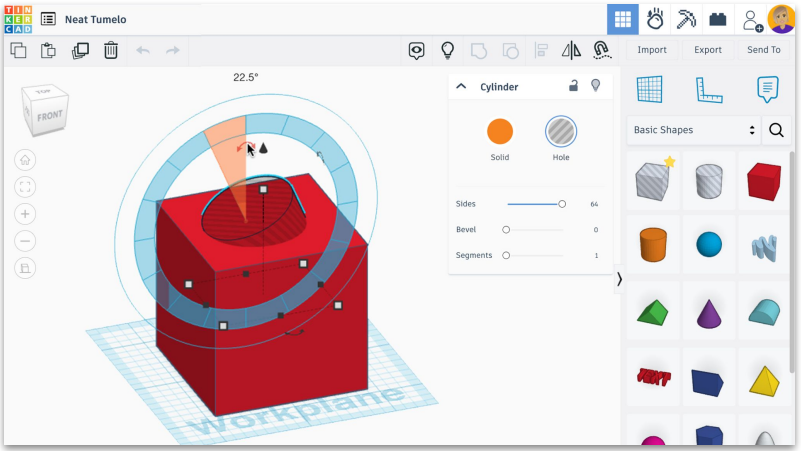
Tinkercad Basics

- Create a Tinkercad account tinkercad.com/join
- On your dashboard, click “+ Create” to create a new 3D design
- Pick a shape from the shape library and drag and drop it onto the workspace
- Click the squares on the corners to resize the shape, or type specific numbers directly into the measurement boxes to specify exact measurements
- Grab and drag a rotation handle to rotate the object along the correct axis, or type the degree into the box
- You might need to rotate the camera perspective to see all of the rotation handles or resize dots
- You can make any object a shape or a hole





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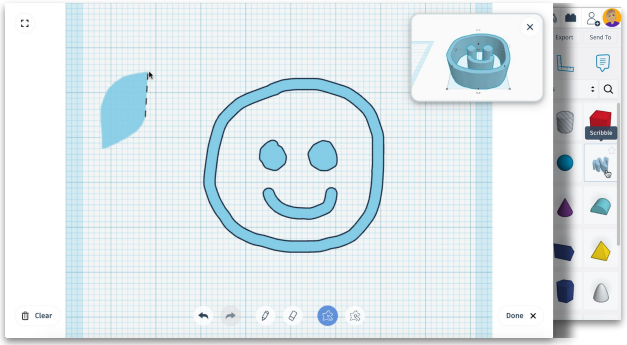
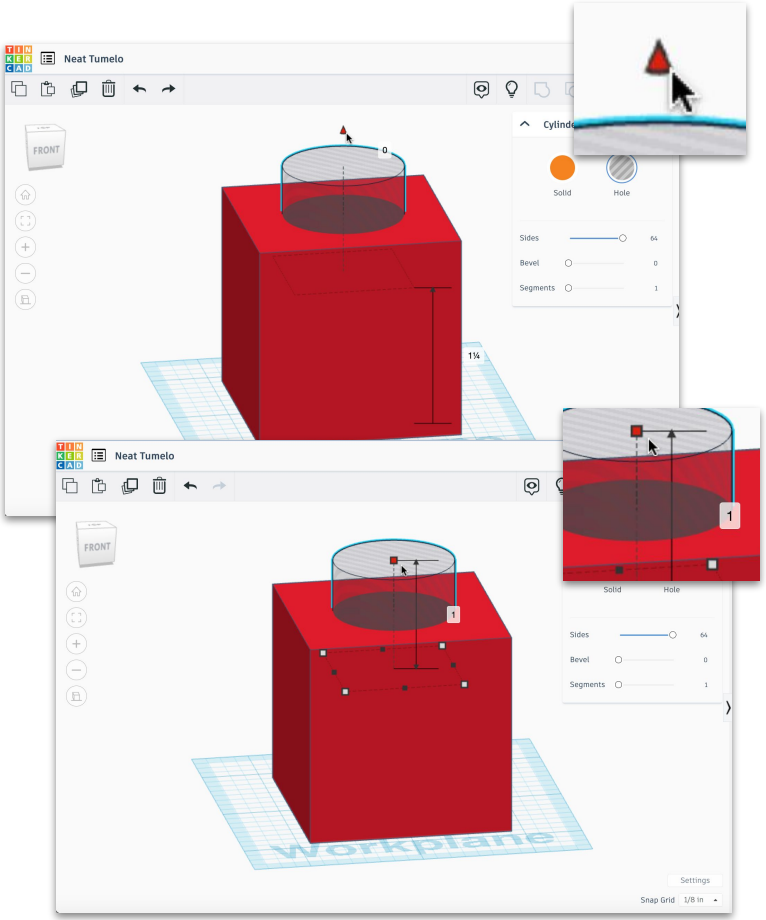
Tinkercad Basics

- Adjust the position of the object on the Z axis with the triangular point
- Adjust the height of the object
- You might need to rotate the camera perspective to see the position of each object on the X, Y, and Z axis



- You can also use the Scribble tool to hand-draw a shape.



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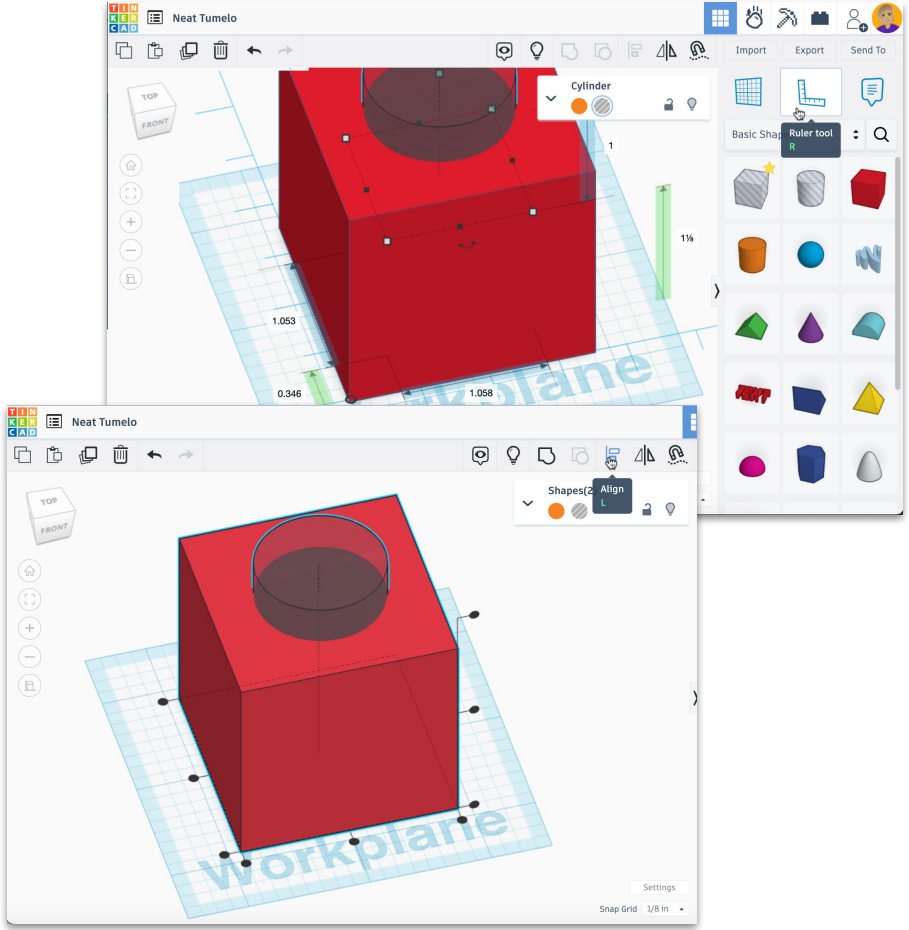
Tinkercad Basics

- Press the R key to see a ruler and click anywhere on the workplane to place the ruler. With the ruler placed, click an object and you'll see all of its dimensions displayed, as well as its relative position to the ruler

- Use the align tools to adjust the placement of objects relative to each other



Find additional tips and tricks here:
tinkercad.com/blog/22-tips-for-working-faster-in-tinkercad
More on the ruler here:
tinkercad.com/blog/tinkertip-r-is-for-ruler

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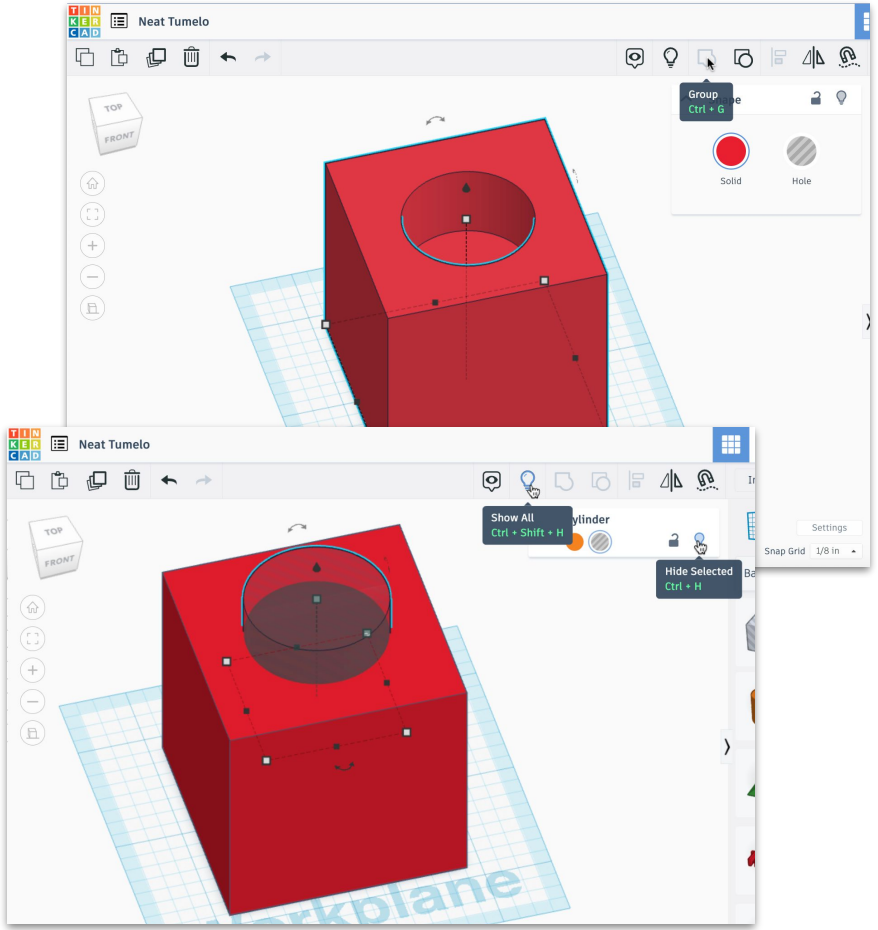
Tinkercad Basics

- Once a hole is in place, hold the Shift key and click the hole and the object to be cut by the hole so they are both selected
- Click the Group button (it may take a minute but the hole object will disappear)
- Ungroup to adjust the hole
- Grouping also allows you combine parts of your design for easy movement or modification, which can help prepare your design for 3D printing
- You can also use the lightbulb buttons to hide and show shapes



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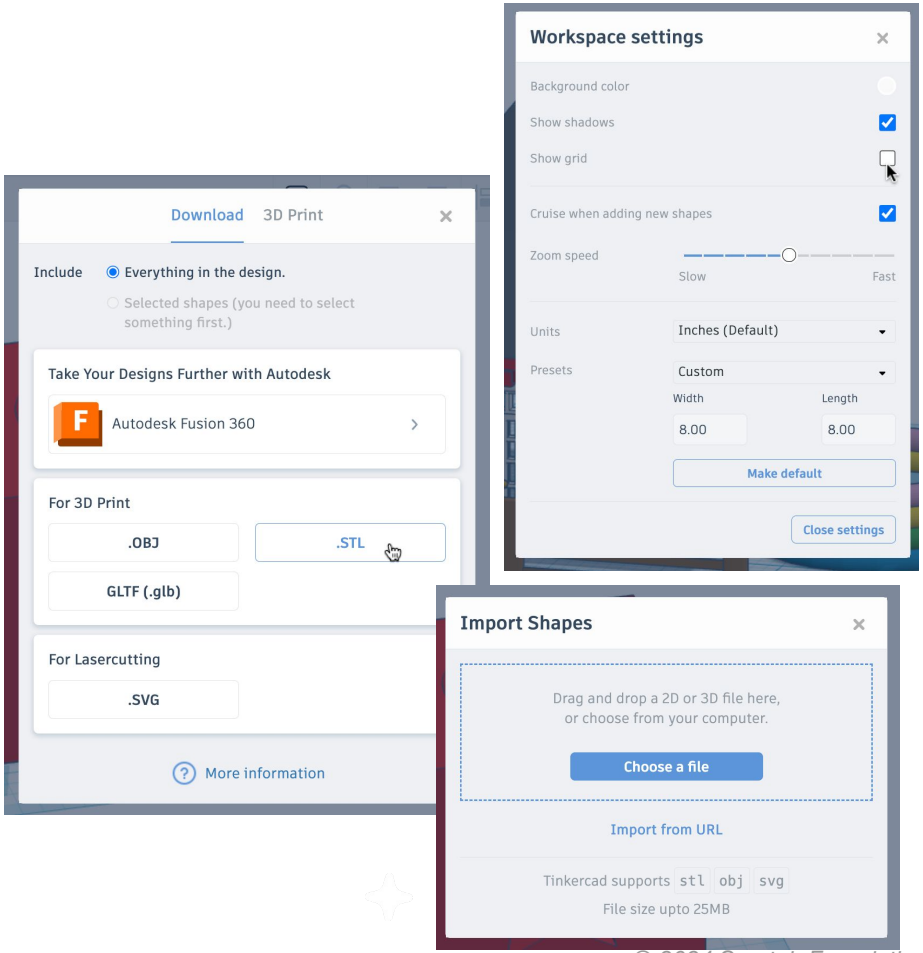
Tinkercad Basics

- You can adjust workspace settings such as size and whether or not you see the grid
- You can export your entire design or selected pieces of a design
- An STL (stereolithography) file is a common 3D model format used with many 3D printers
- Some 3D printers can't read STL files directly, so you may need to next prepare the project through a process called "slicing" (converting a 3D model to instructions for the 3D printer)
- You can also import shapes such as STL or SVG files



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Let’s Create!

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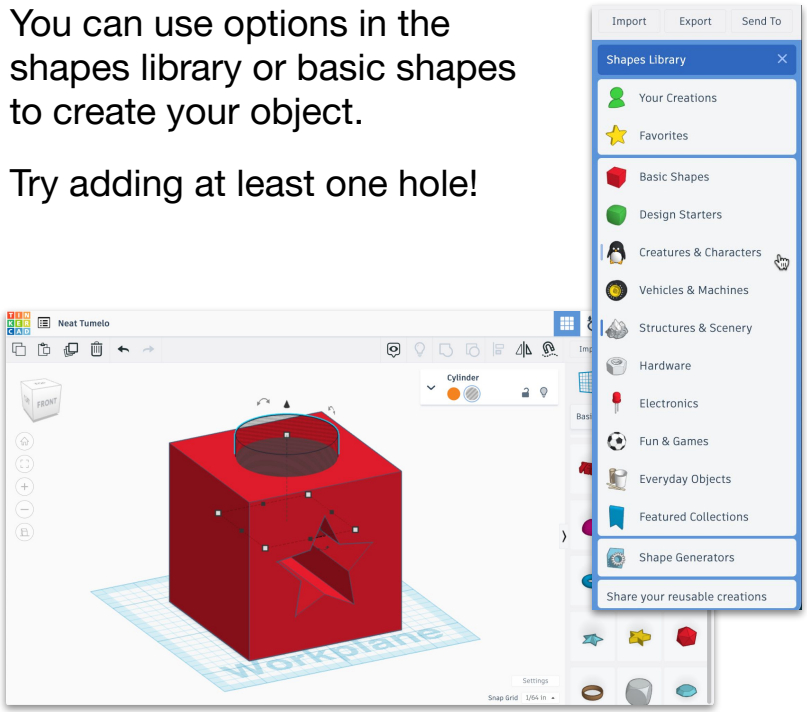
Let’s Experiment with Tinkercad!

Make a 3D Object!

You can use options in the shapes library or basic shapes to create your object.

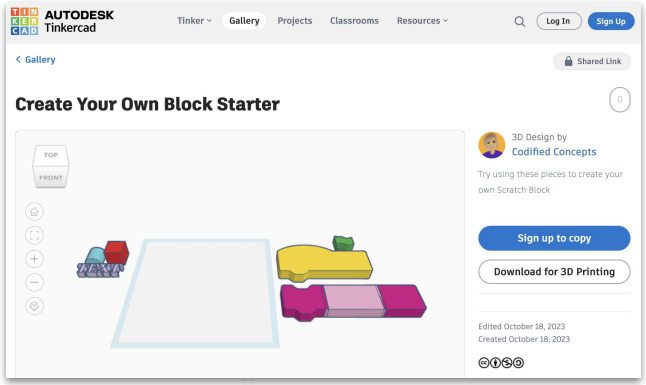
Try adding at least one hole!



Create Your Own Scratch Blocks!

Remix my starter project here with some block shapes: tinkercad.com/things/jcFxFiETJud?sharecode=yl-kuYfe8wOfq45lRDk1QvR0TX7K5vcEezy4q-EbID8

Try adding text, adjusting the size of objects, even adding holes where input ovals would be.



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Let’s Share in the Chat!

Did you create an object or try to create your own Scratch blocks? What did you make?

What is something unexpected you discovered?

What was the most challenging part of creating your project?

If you had more time what would you add or change?

What, if any, limitations did you find?

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SEC Org Created: 3D Printed Tactile Scratch Blocks

Created in partnership between Nextech, the Scratch Education Collaborative (SEC), and Andrew Woodard from Process Art Studio.

- Tinkercad as .STL files that can be remixed (log in to make a copy)
- Process Art Studio has downloadable .STL files and offers a printing service if you do not have the ability to print

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SEC Org Created: 3D Printed Scratch Tactile

Scratch Tactile is a kit based on the designs and creative philosophy of ScratchJr. It was created by Sistema THEAD, SCCL, in collaboration with the Scratch Foundation.

In particular, it provides students with visual impairments or other specific needs the opportunity to work on essential competencies.

- Scratch Tactile website for more information

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Create with Codeblocks!

Parallels and Differences Between Tinkercad and Scratch

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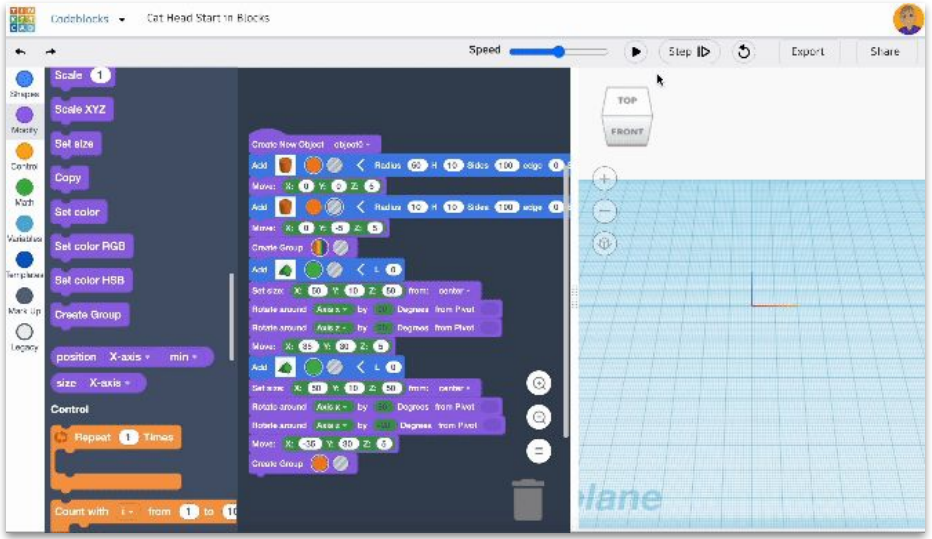
Create 3D Objects with Scratch-like Blocks

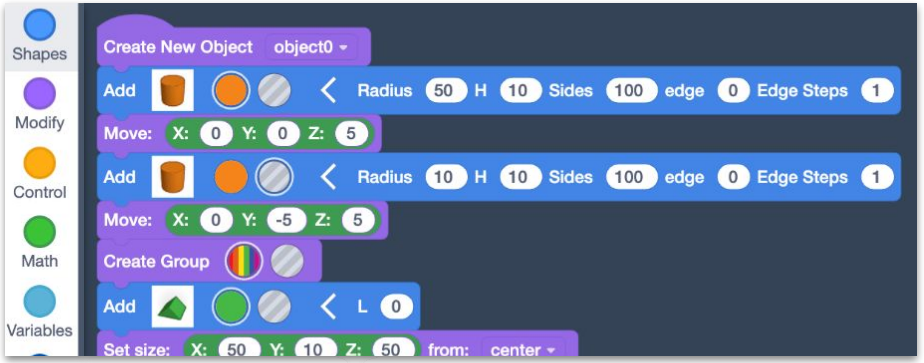
You can use Tinkercad Codeblocks to create designs as well. This is a great way to create precise designs using math, as well as create repeatable patterns and iterate quickly on your work utilizing loops.

Find more information and resources here:

- *tinkercad.com/blog/official-guide-to-tinkercad-codeblocks*
- *tinkercad.com/learn/codeblocks*
- *instructables.com/Learn-to-Design-With-Code-Using-Tinkercad-Codebloc*

My example shown is here:
tinkercad.com/codeblocks/2X9tUpO18IX





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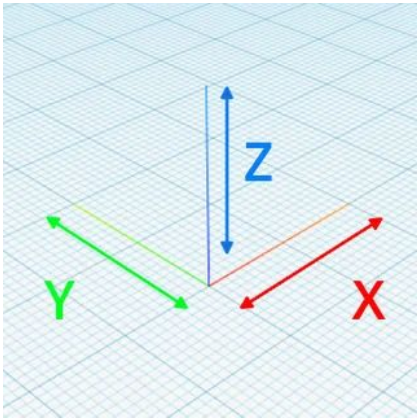
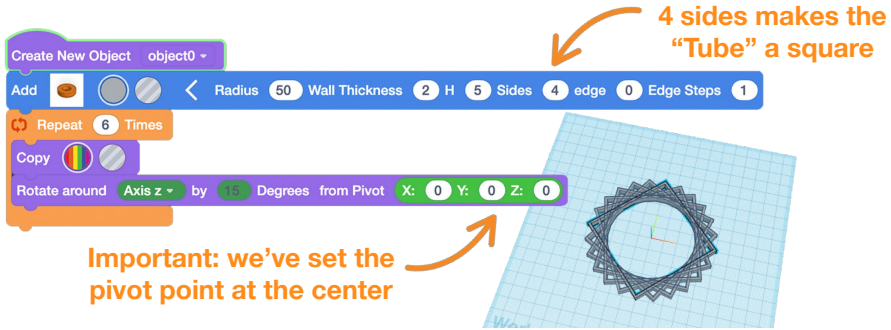
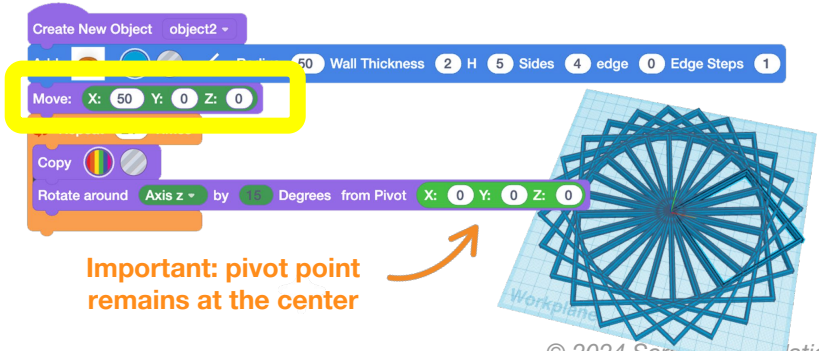
Make Geometric Shapes in Tinkercad

- All non-shape blocks require a Shape to do their action. So you must first add a Shape, and then use a block like Move. (Attaching the Move block on top of a Shape won't affect an action on that Shape.)
- Every Shape loads at the origin point at the center of the workspace.
- Try first rotating a Shape around an axis like Z. (The X axis is represented by the red line near the center of the Workspace, the Y axis is green, and the Z axis–which runs up and down–is blue.)
- Now, try adding a Move block and changing the X or Y position by the same number as the shape's radius or length before rotating.







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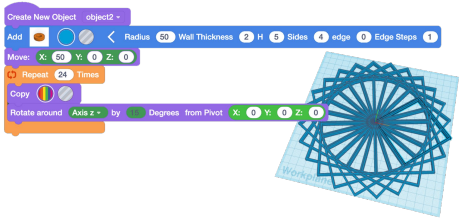
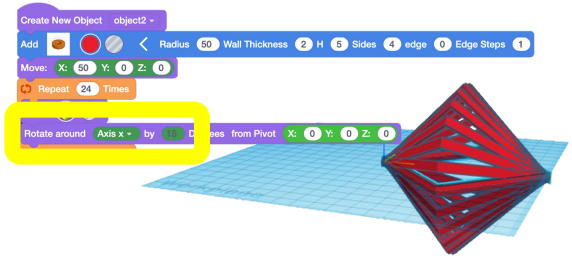
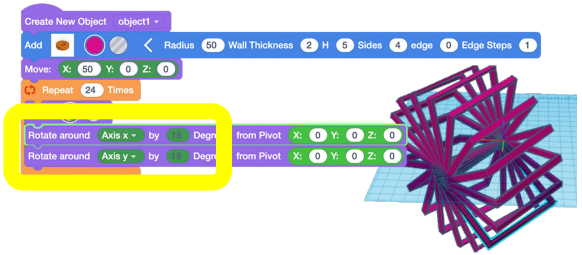
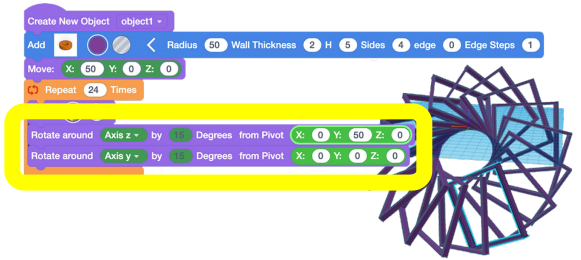
Make Geometric Shapes in Tinkercad

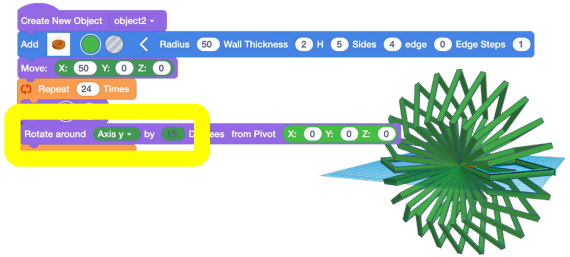
Keep experimenting! What happens when you change or add additional parameters, like rotating on the X and Y axis? Or moving the pivot point? You can find my playtests here: tinkercad.com/codeblocks/4tmop4UEhoy

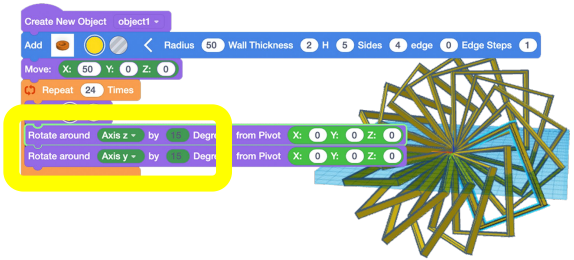


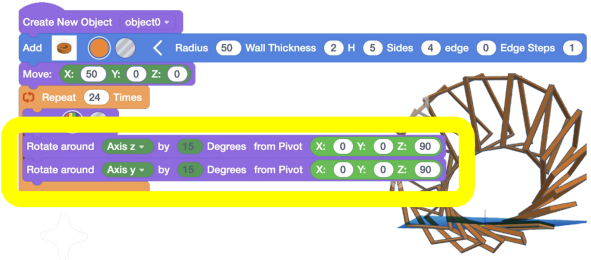












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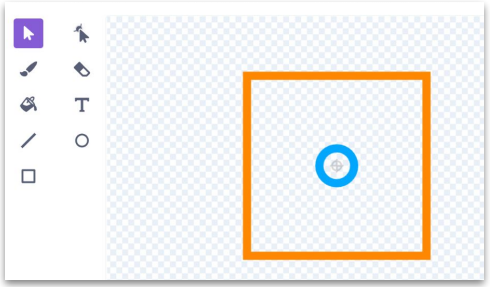
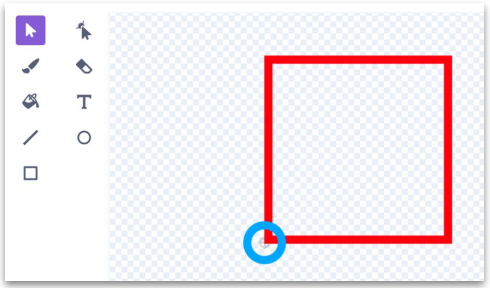
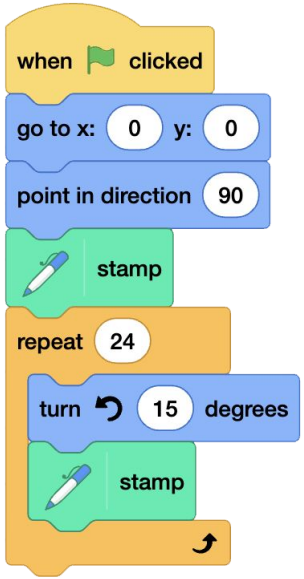
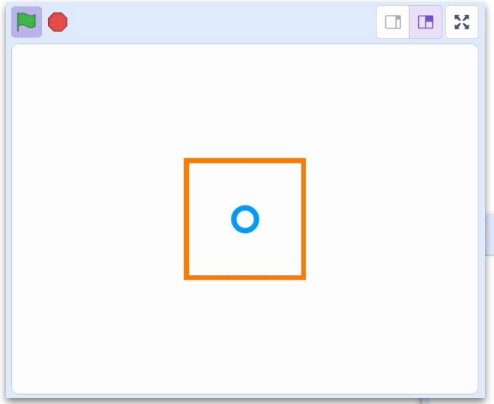
Make Geometric Shapes in Scratch

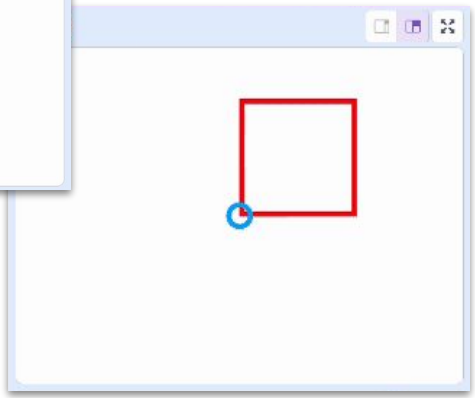
We can actually replicate this in Scratch! Create a square sprite in the Paint Editor and center on the costume. Run the code here using the Pen extension Stamp block to add a copy of the shape before rotating. Then, move the square on the costume so the corner is on the centerpoint. Run the code again.











See my project here scratch.mit.edu/projects/917635123

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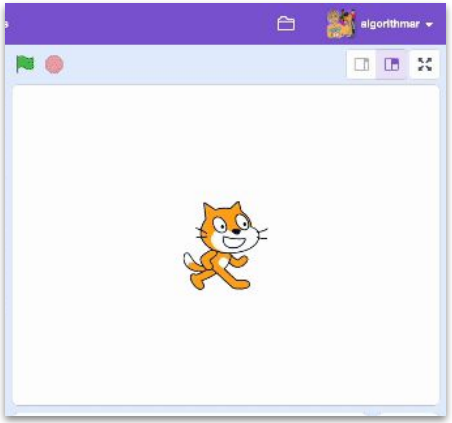
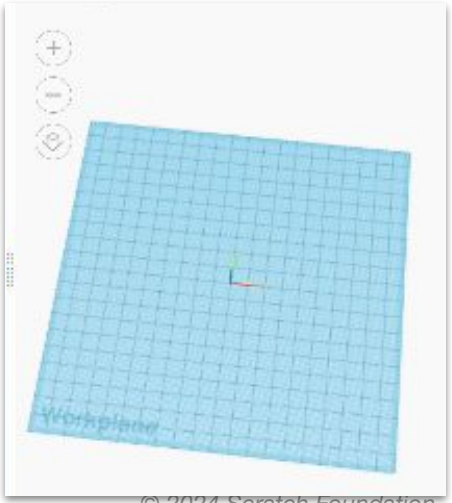
Make Geometric Shapes

1. Try making a design out of geometric shapes using Pen extension blocks in Scratch (either pen drawing/and or stamping a geometric shape).
2. Now, try to replicate the design using Tinkercad blocks. Reflect on what is similar and what is different.
3. Then print the 3D version!





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Make in Scratch, Then Print 3D!

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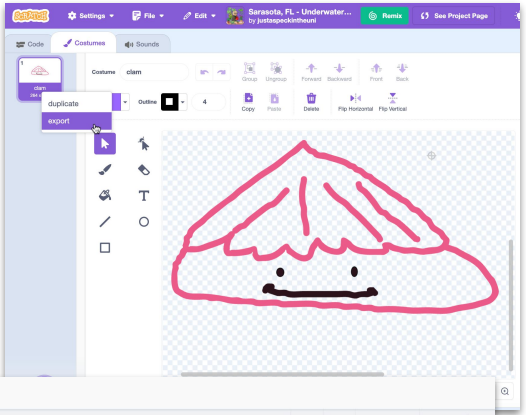
Design in Scratch, Then Make 3D

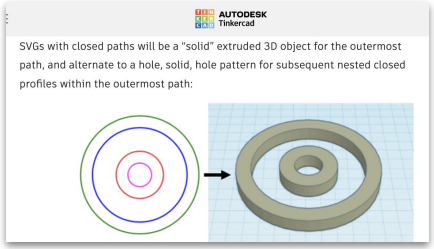


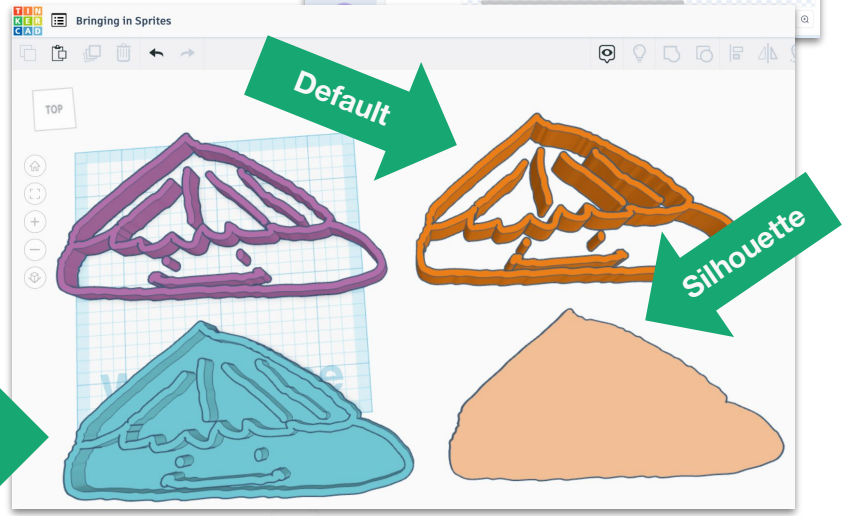
1) Make a sprite using the Scratch paint editor tools. (Note, you could also use the Tinkercad Scribble tool, but may be more challenging.)

2) Export the costume (will export as an SVG).

3) Import SVG into Tinkercad, adjust, and print as 3D.

"SVGs with closed paths will be a "solid" extruded 3D object for the outermost path, and alternate to a hole, solid, hole pattern for subsequent nested closed profiles within the outermost path."
Tips and Tricks here:
tinkercad.com/blog/import-and-export-svg-files-tinkercad





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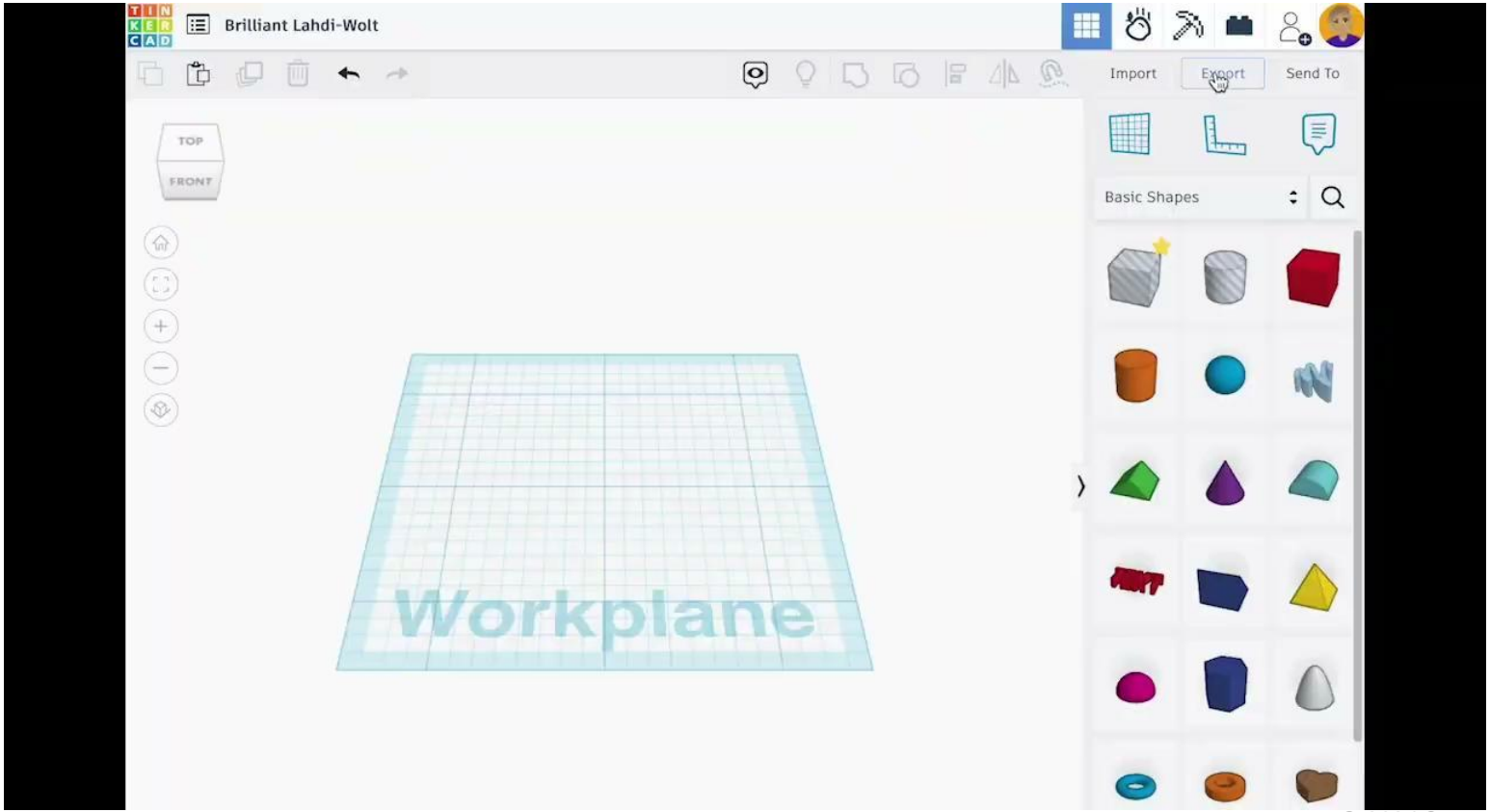
Design in Scratch, Then Make 3D



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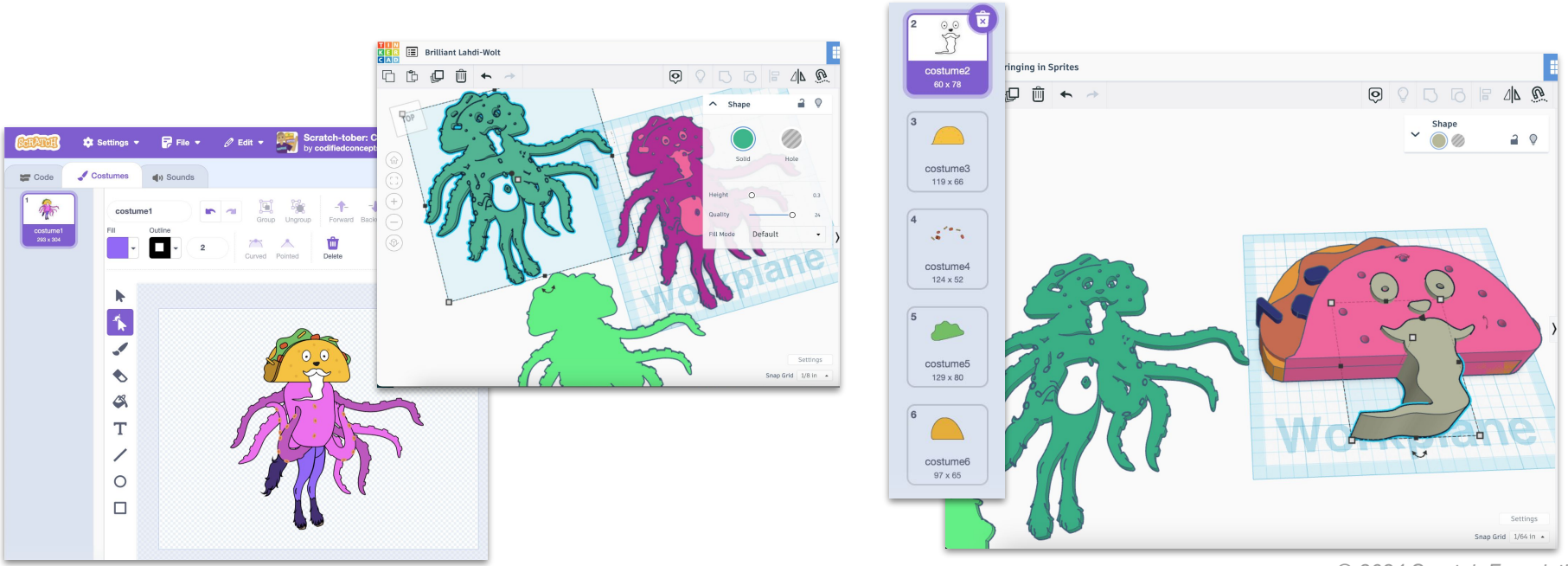
Design in Scratch, Then Make 3D

A more complex sprite (like the one on the left using a lot of vector objects layered atop each other) may come in less defined. It might be best to break up the layers into individual costumes (as seen on the right) to import separately so you can create a layered 3D sprite.



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Make in Tinkercad, Then Bring into Scratch!

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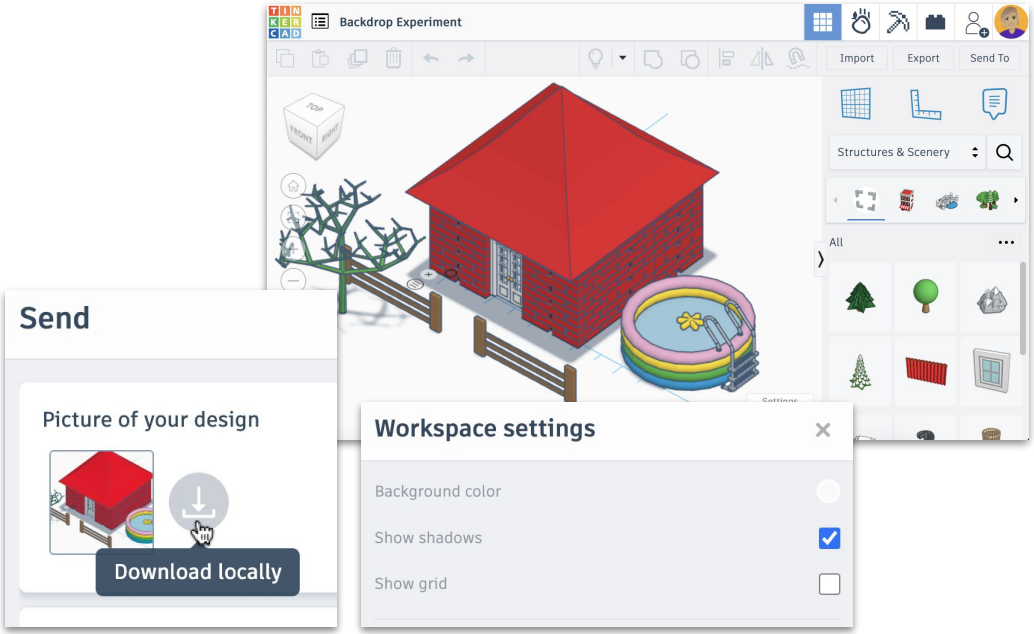
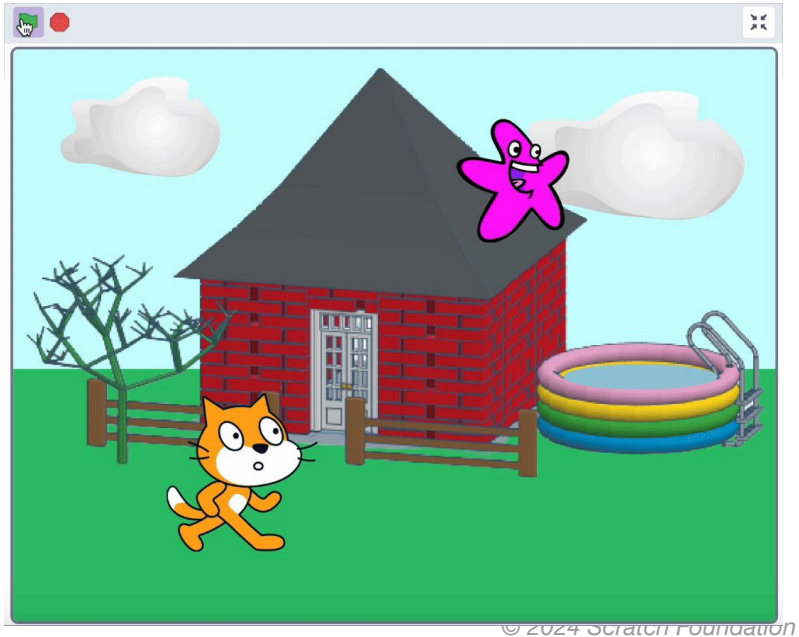
Make 3D Scratch Backdrops

Create a 3D backdrop using shapes in the shape library. “Send to” download a picture and remove the background, if desired (see our guide here for more). Import the final result into Scratch as a backdrop and then animate the scene. scratch.mit.edu/projects/910146727





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Extension Opportunities

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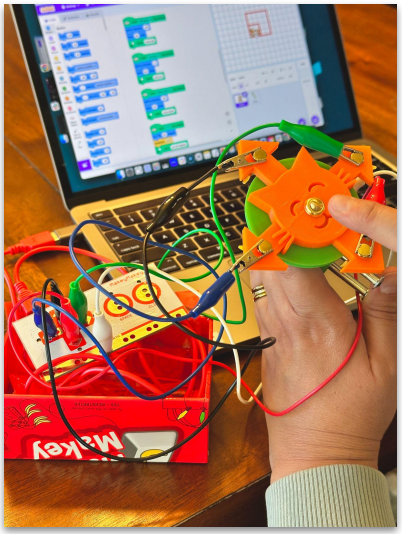
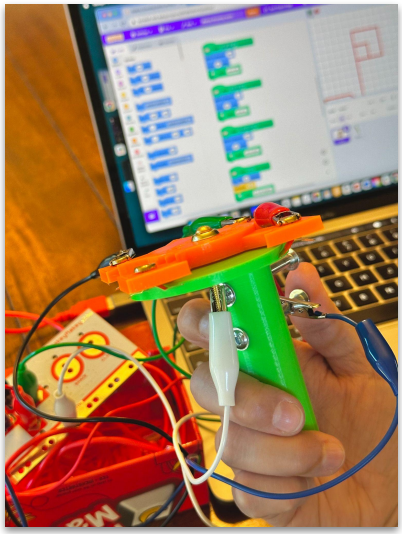
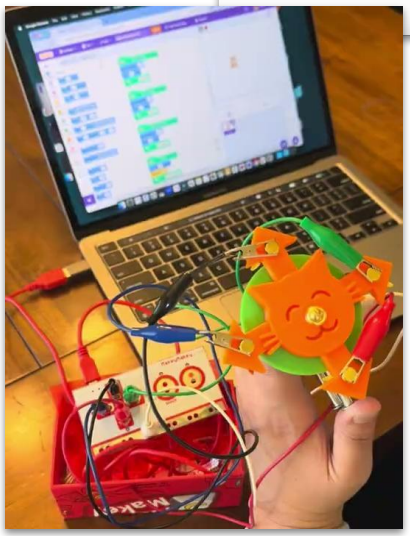
Makey Makey Controller

Create 3D objects that can interface with Scratch, such as a Makey Makey Controller.
My design example is available here:
tinkercad.com/things/93F8ZT1XY3G







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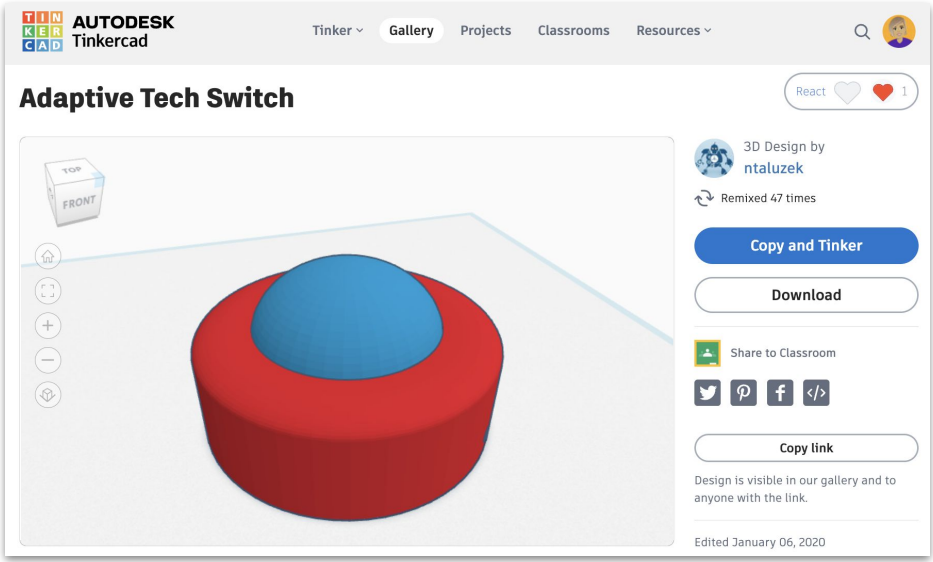
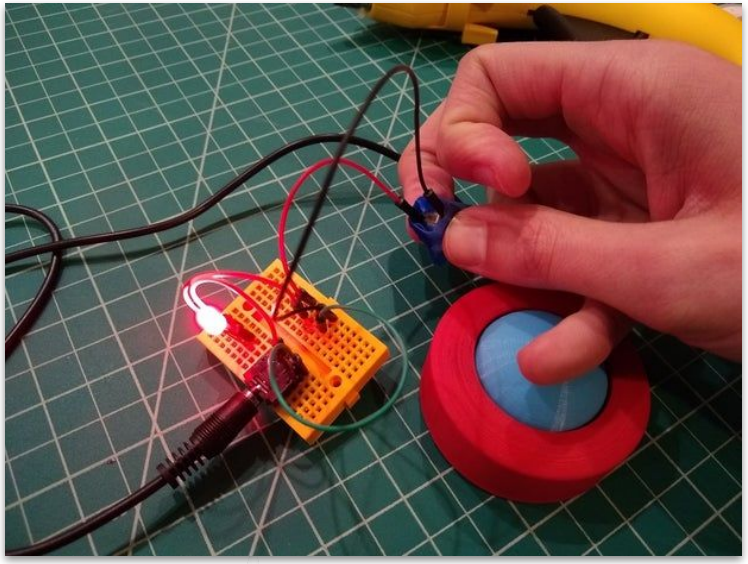
Accessible Buttons and Adaptive Switches

Make accessible buttons. Could be used with Makey Makey and Scratch. A helpful guide is here: tinkercad.com/projects/Create-Adaptive-Switches-With-TinkerCAD-and-3D-Pri





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Wrapping Up Our Session

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Scratch Cat, Earrings, and Blocks in 3D!

You can find me on Tinkercad as codified-concepts and on Scratch as algorithmar.

- My Scratch Cat is here: tinkercad.com/things/46hbbts7jZE
- My Scratch Blocks are here: tinkercad.com/things/avkxTbxfmj3
- My name tag is here: tinkercad.com/things/kXYiteBhhNk
- My earrings are here: tinkercad.com/things/kzoZFN2YcWy

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Let’s Reflect in the Chat!

Before you joined the workshop today, what was your experience with Tinkercad?

What were your expectations for today? What questions are you left with?

How might you implement what you learned today in your practice?

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Thank you!

Be sure to subscribe to our Scratch Foundation YouTube channel for Educators (@scratchfoundation).

Keep an eye on our Event page for additional opportunities: scratchfoundation.org/get-involved/events

Helpful Links:

- Scratch Application: scratch.mit.edu
- Learning Library: scratchfoundation.org/learn/learning-library
- Email Signup: scratch.mit.edu/connect
- Follow us on Instagram and Facebook @ScratchTeam
- Also see our YouTube channel @scratchteam for tutorials