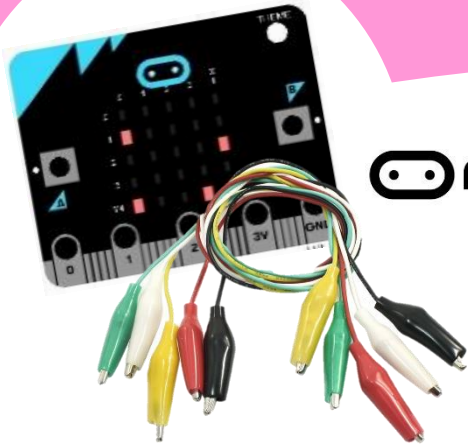


# CODING

STEM  
WORKS  
THINKit



 micro:bit

**Grades**  
K-12

## Career Pathways

Computer Scientist  
Programmer  
Astronomer  
Astrophysicist

## Academics

Math: Geometry, Measurement, Logic,  
Computational Thinking  
Science: Astronomy  
Computer Science: Block Coding

## Professional Career Skills

Collaboration  
Problem Solving  
Perseverance

## Materials

Computer  
Internet Access  
Micro:bit kit  
LEDs  
Conductive Tape  
Craft Supplies: Scissors, Tape, Glue,  
Cardstock, Markers

# Cosmic Constellations Activity

## Team Goal

### Level 1

Code the Micro:bit LED screen to share a pattern in a model.

### Level 2

Code Micro:bit to turn on LEDs in a circuit to help share information through a model.

### Level 3

Design your own code and circuit using Micro:bit to share information through a model.

STEM  
WORKS

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# Think like a computer scientist with Micro:bit



## Algorithm

As you drag and drop block code or write in Javascript, you are creating a list of specific steps. Your algorithm can be interfaced with through the LEDs, buttons and pins on Micro:bit.



## Cloud Computing

Micro:bit's Javascript coding software is internet-based, so information from the cloud is needed to write the program. But since you download the code, the internet is not needed to run a program.



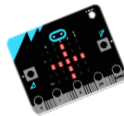
## Computer Program

You write multiple sets of algorithms, or directions, which can be stored and run on your Micro:bit.



## Computational Thinking

There are many different ways to solve a problem with Micro:bit. You need to recognize patterns, think abstractly, and write algorithms.



## Debugging

When you test your code with your Micro:bit, you might find a bug that needs to be checked and corrected before the code works!



## Database

The Javascript Blocks online software has an organized database of blocks and Javascript code that can be run on the Micro:bit. The code is organized into categories like input, logic, loops, music, etc.



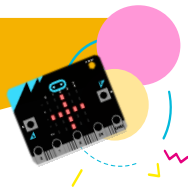
## Binary

A computer's brain reads only two options, like 1 or 0. All algorithms, or lists of steps, are made up of these two options. Code is translated into this binary "machine language."



## Machine Language

Inside the Micro:bit is a tiny processor. The code you write with Javascript is translated into a machine language, written in numbers, that the Micro:bit can understand.



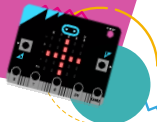
## Artificial Intelligence

Micro:bit can't hear your speech or recognize images. It can only sense when a complete circuit is made using buttons or pins.



## Programming Language

Your Micro:bit can interpret Javascript Blocks, which is a graphical programming language. It can also process code written in Javascript.



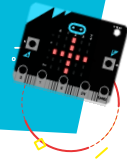
## Natural Language Processing

Micro:bit's processor does not have the ability to understand (process, respond or manipulate) your words.



## Parallel and Distributed Computing

Micro:bit would be more powerful if it could share processing with other Micro:bits. But it cannot share messages or solve problems together.



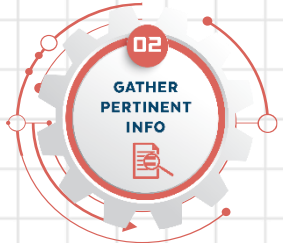


# Engineering Design Process Directions:



## Define the Problem

Choose a goal to tackle with your team!



## Gather Pertinent Information

Connect the Micro:bit to a computer with the USB cable.

Open the Javascript Blocks editor:  <https://makecode.microbit.org>



## Generate Multiple Solutions


Decide on the visual you want to share through code and a physical model. Choose the Coding Blocks to design new algorithms that help to share that information. Test algorithms as you design them using the screen simulator. (See [Micro:bit Programming Tips](#) sheet)



## Choose a Solution

Connect Micro:bit to the computer.

Choose the algorithms to download onto the Micro:bit.

Click  **Download** and save the program file to your “MICROBIT” drive.



## Design a Culturally Responsive Solution

As needed, modify and design your model to work with algorithms so you share accurate information. How has your team been sharing responsibilities and resources?



## Test and Optimize

Disconnect the Micro:bit from the computer and connect to the battery.

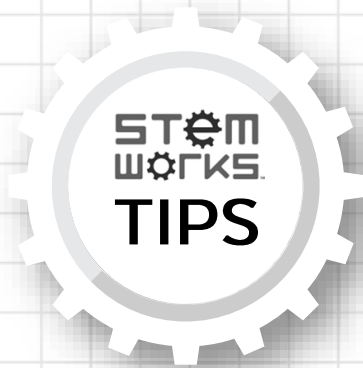
Run your program. Does it accurately share information and work with your model? Use what you learned to improve your interactive solution.



## Share & Reflect

How did your team find solutions and practice perseverance?

Talk to your team: What went well? What could have gone better?

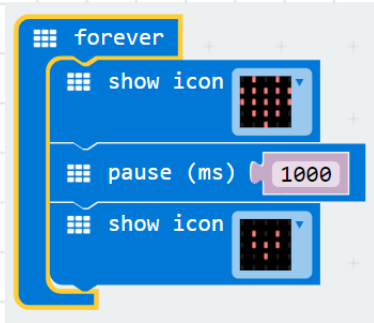


# micro:bit Programming Tips

<https://makecode.microbit.org>

Find each Javascript Block in the color coded menu to write algorithms. Be creative as you build multiple algorithms for a program that illuminates your constellation model.

## Javascript Block Code for LED



### Description

This Section loops forever.

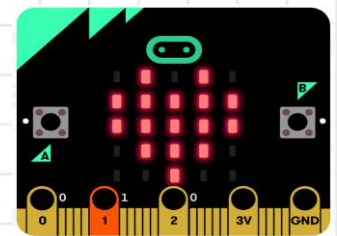
LED screen lights up these pixels.

Wait for one second.

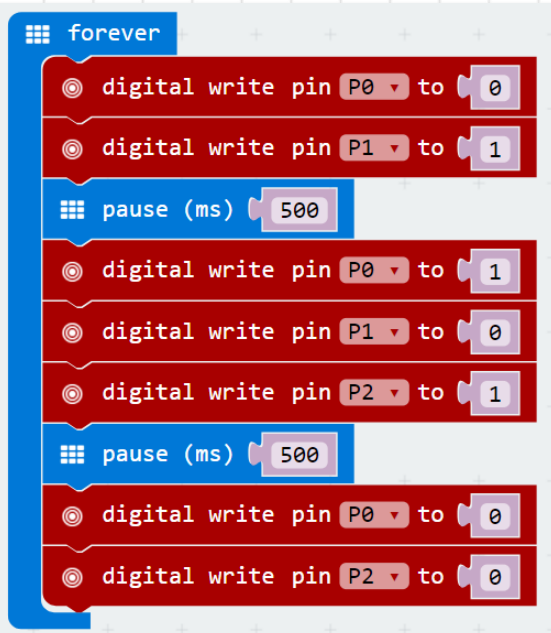
LED screen lights up these pixels

### Purpose

Use code to animate the Micro:bit's LED screen



## Javascript Block Code for LED



### Description

This Section loops forever.

LED connection to Pin 0 is off.

LED connection to Pin 1 is on.

Wait for half a second.

LED connection to Pin 0 is on.

LED connection to Pin 1 is off.

LED connection to Pin 2 is on.

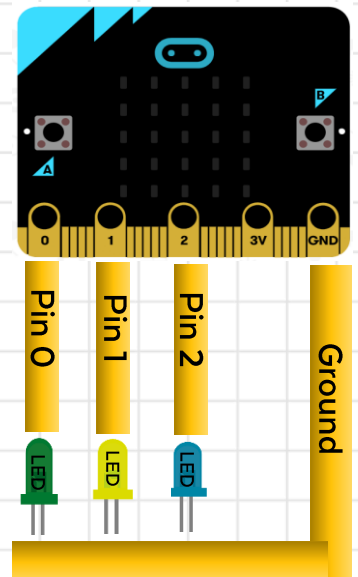
Wait for half a second.

LED connection to Pin 0 is off.

LED connection to Pin 2 is off.

### Purpose

You will build a model and write code. Algorithms will control when electricity is sent through each pin to turn on and off LEDs.



## Micro:bit & Circuits

Cut out your constellation box.

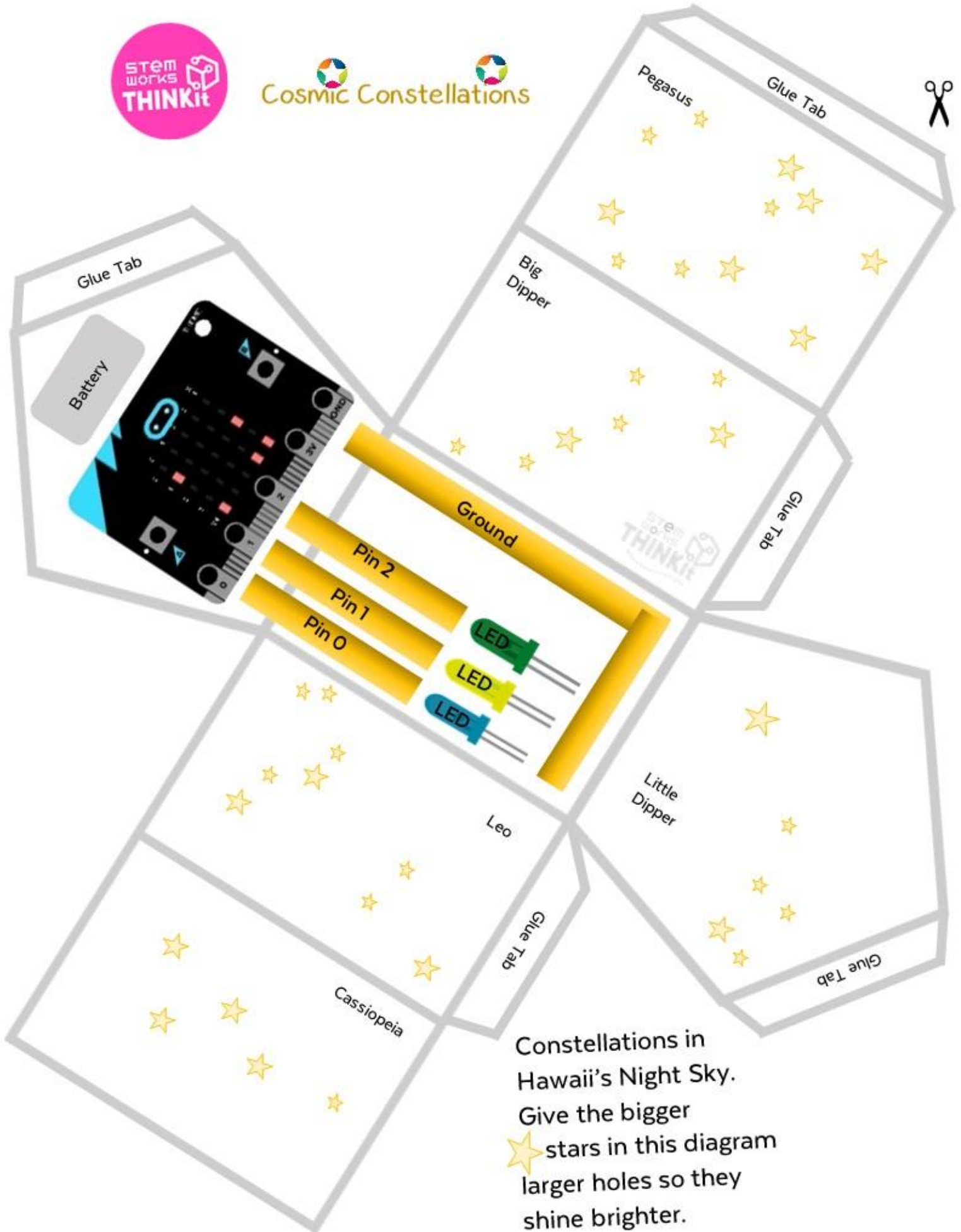
Poke out each star in the constellations with a sharp object.

Code algorithms to turn on and off the LED lights and LED pixel screen.

Download code onto your Micro:bit.

Attach conductive tape from each pin to an LED, use the constellation box for tips. Ground the LEDs with conductive tape. LEDs have a positive and negative side, so you might need to reverse their direction to have them turn on.

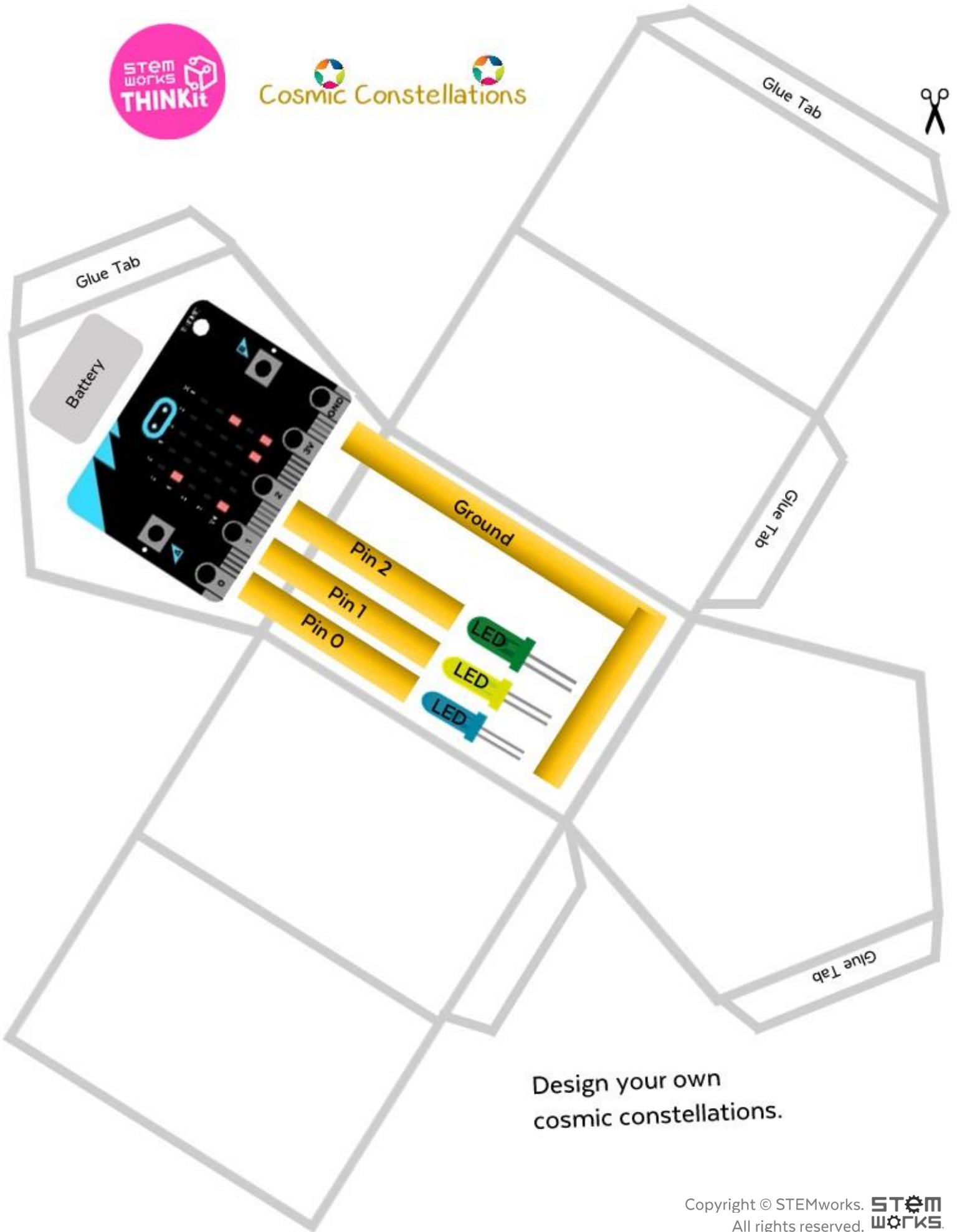
Connect the Micro:bit to a battery. Debug your code as needed. Then, close up your constellation box with tape or glue and enjoy!



Constellations in Hawaii's Night Sky. Give the bigger stars in this diagram larger holes so they shine brighter.







Design your own cosmic constellations.

