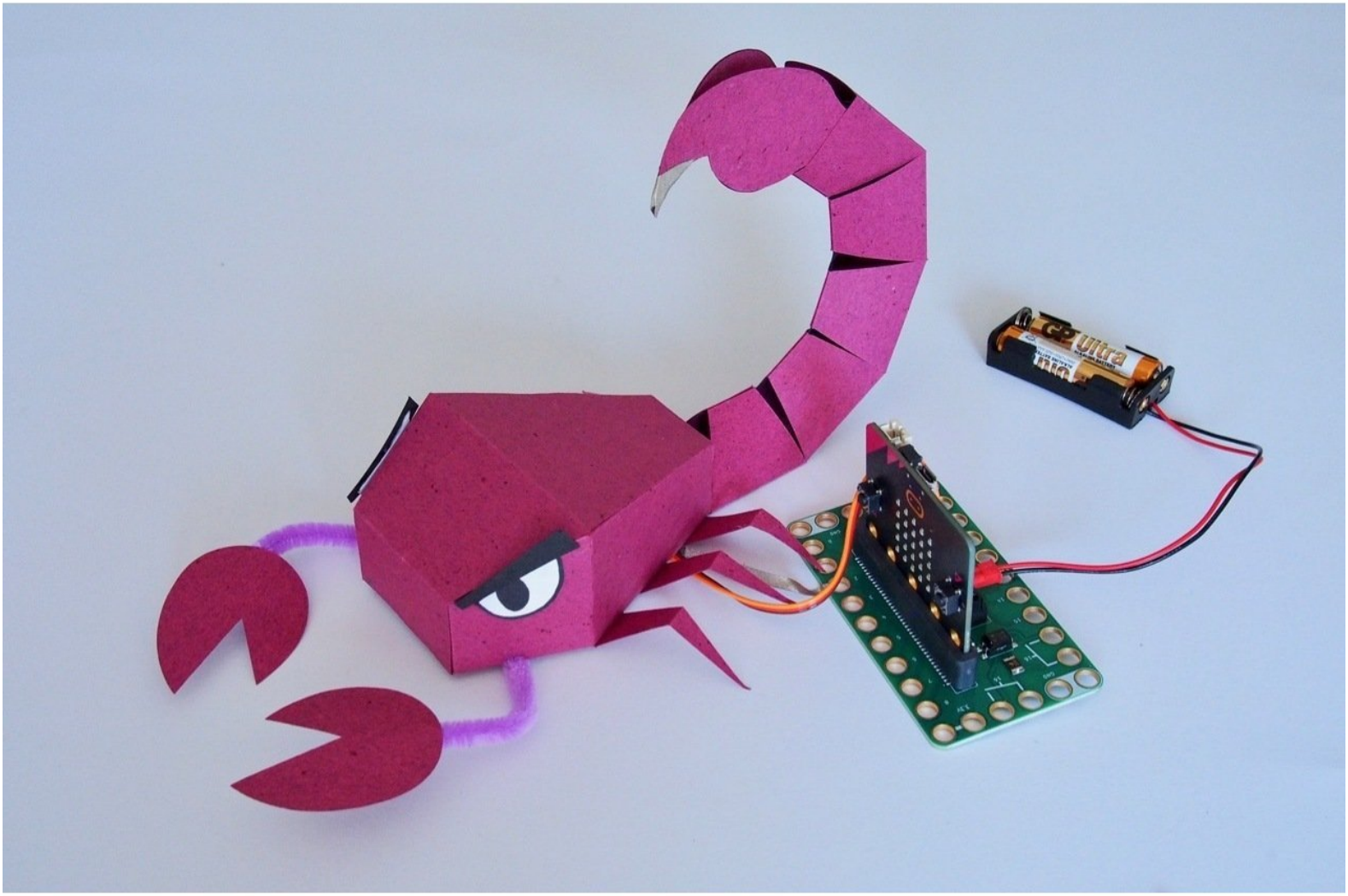
ScorpioBot

Make an angry scorpion that stings if you touch it!

Written By: Jasmine Florentine



INTRODUCTION

Make an angry scorpion that stings if you touch it!

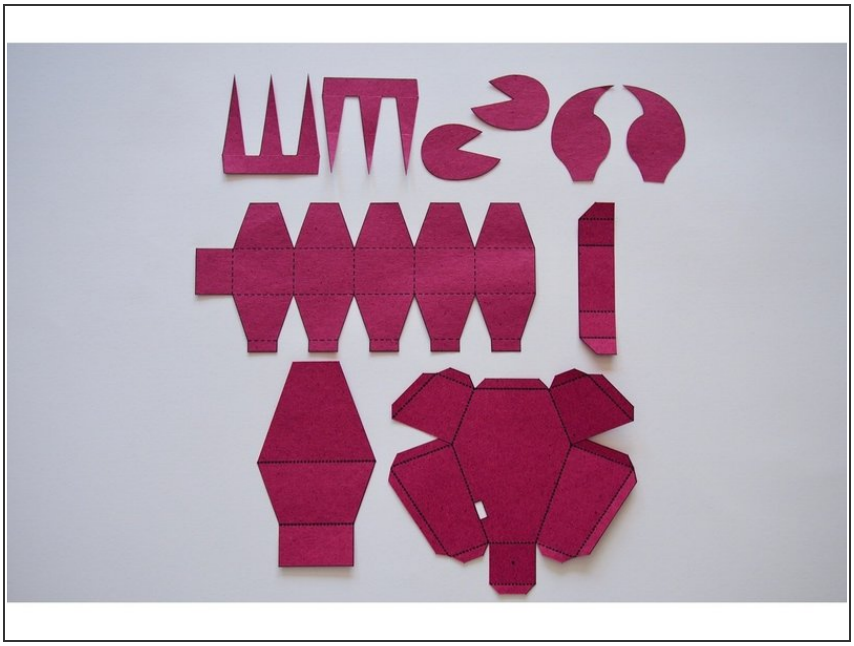
TOOLS:

- Glue (1)
- Scissors (1)
- Sewing Needle (1)
- Tape (1)

PARTS:

- micro:bit (1)
- Crazy Circuits Bit Board (1)
- Brick Compatible 270 Degree Servo (1)
- LEGO Beam 5 x 0.5 with Axle Holes on each end (11478 / 44864) (1)
- Maker Tape (1)
  1/8"
- Cardstock (2)
- Pipe Cleaners (1)
- Sewing Thread (1)

Step 1 — Print Template



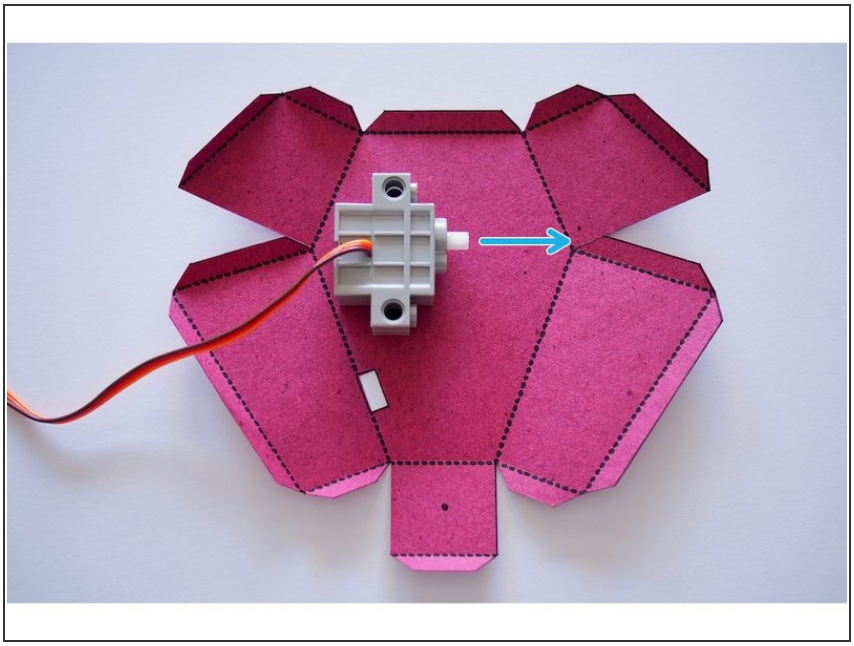
- Print the template.
- Cut the parts out. You may find it easiest to use a craft knife or small scissors for the cutouts.

⚠ Make sure the scale is at 100% when you print the template.

Step 2 — Making the Body

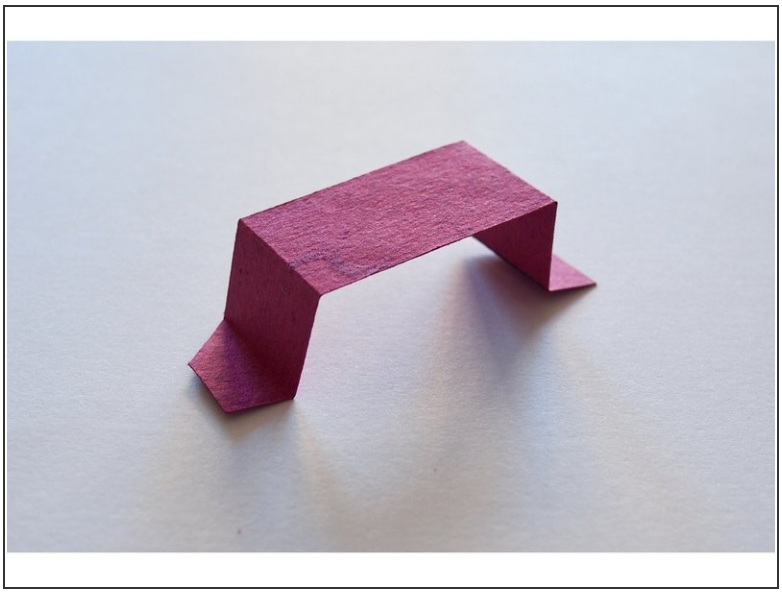
- Prefold the creases on the body — this will make it easier to put together later on.

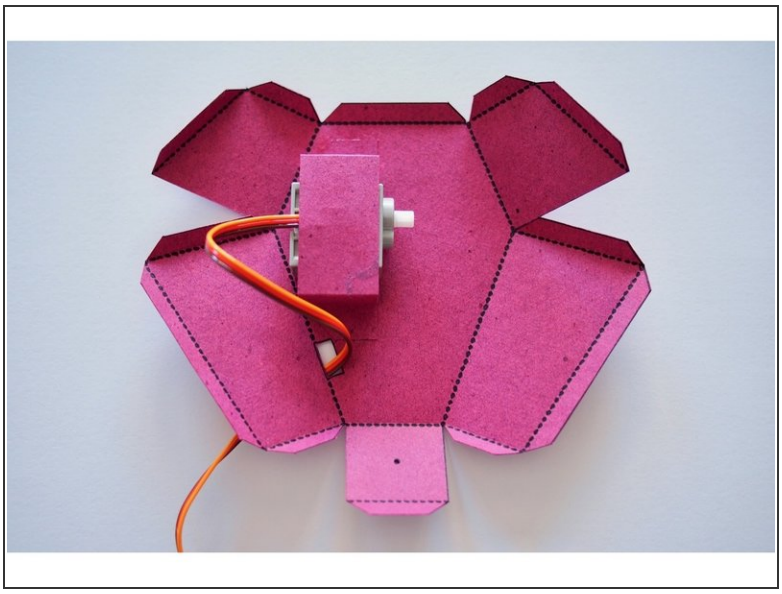
Step 3 — Position the Servo



- Position the servo on the body.
- You want the servo axle to be roughly aligned with the corner of the body as shown.
- You can also use the markings on the template to position the servo.

Step 4 — Attach the Servo



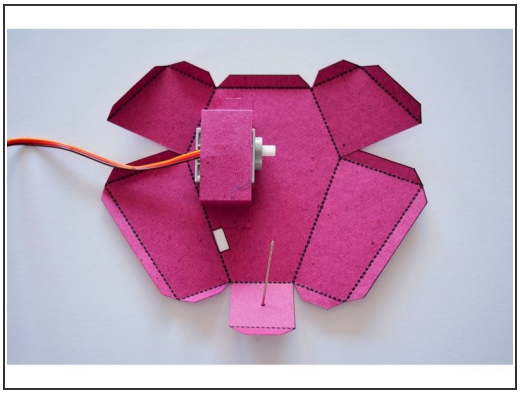


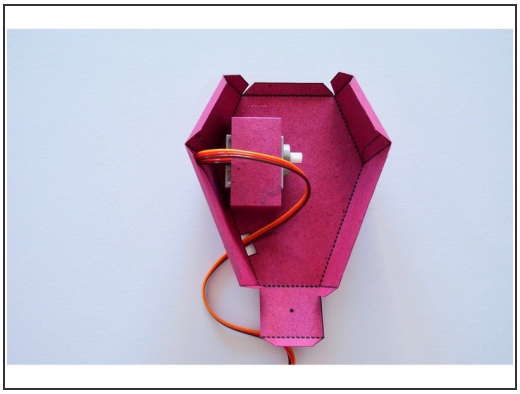
- Fold the servo holder.
- Glue the servo holder so it holds the servo in position.

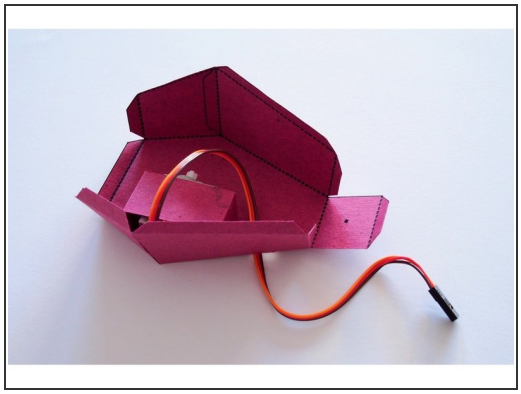
ⓘ You only need to put glue on the tabs where the holder attaches to the body, not on the servo itself.

- Thread the servo cable through the cutout in the body.

Step 5 — Fold the Body Part 1

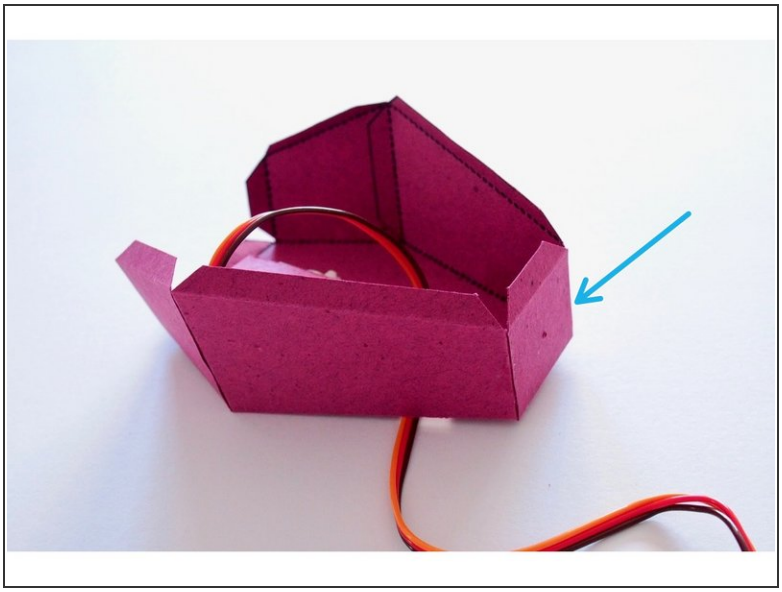


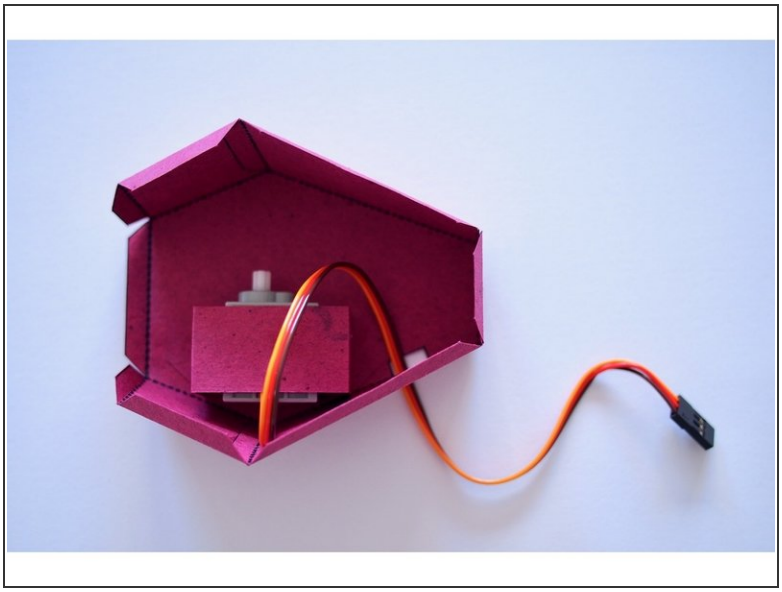




- Use a needle to poke a hole through the dot marked on the template.
- Fold and glue the sides of the body.

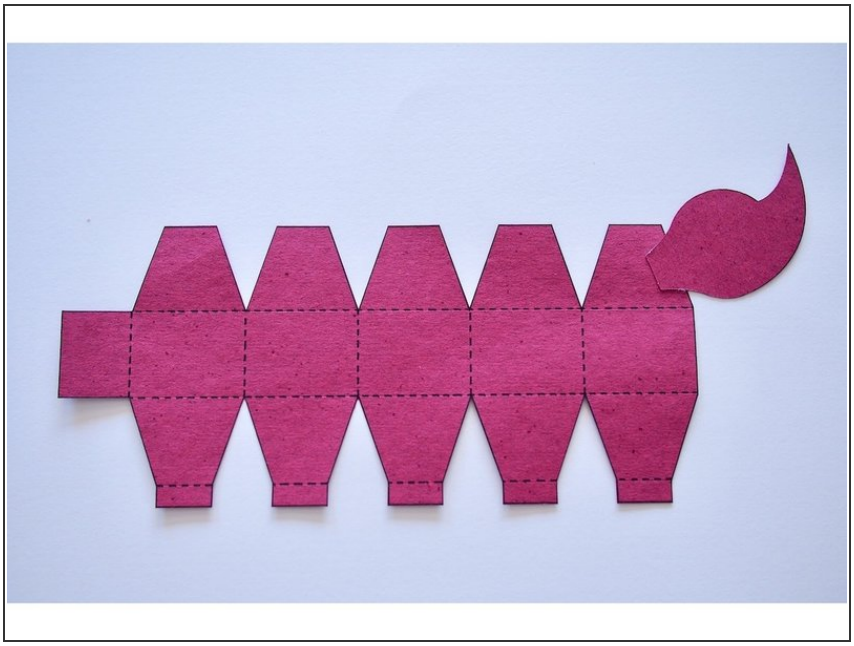
Step 6 — Fold the Body Part 2





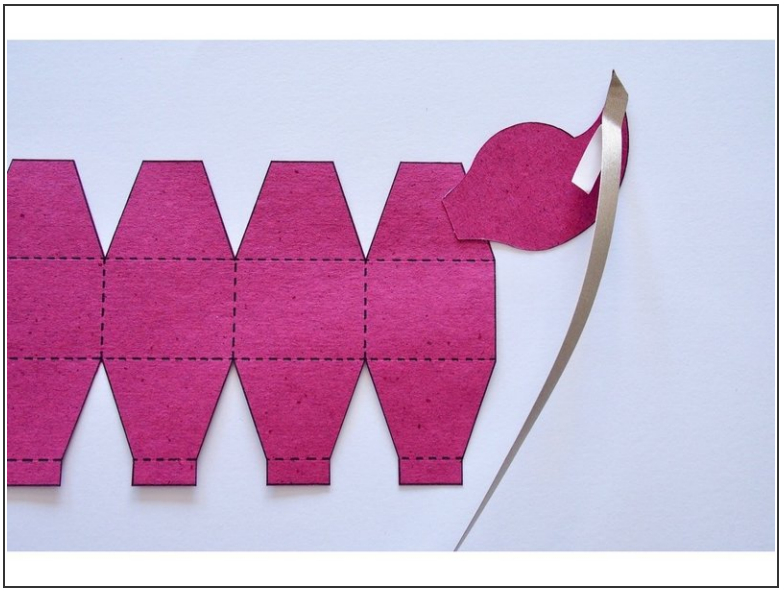
- Fold and glue the back tab of the body.

Step 7 — Making the Tail Part 1



- Glue one side of the stinger onto the tail as shown.
- Make sure you're gluing to the end of the tail *without* the tab.

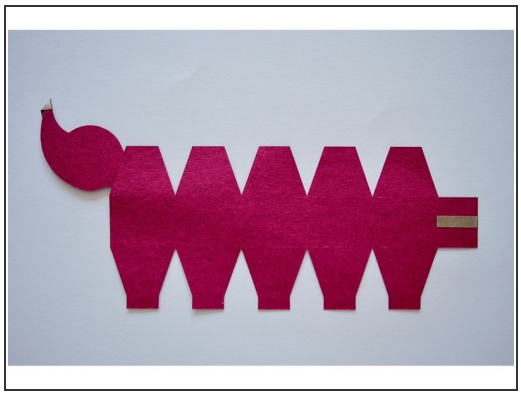
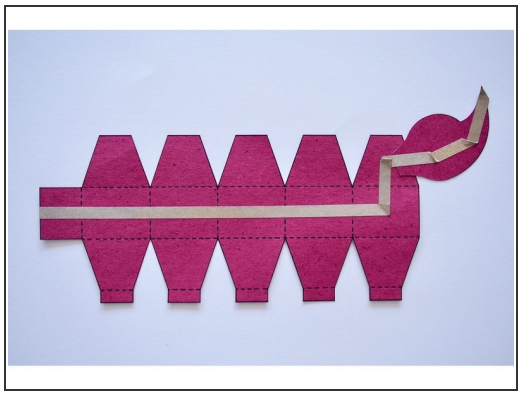
Step 8 — Making the Tail Part 2



- Cut a piece of Maker Tape that's a few inches longer than the tail.
- Attach the Maker Tip to the tip of the stinger.
- Wrap the tape around so only a tiny bit is visible on the outside (the side without the template markings), and the rest of it is on the inside of the tail.

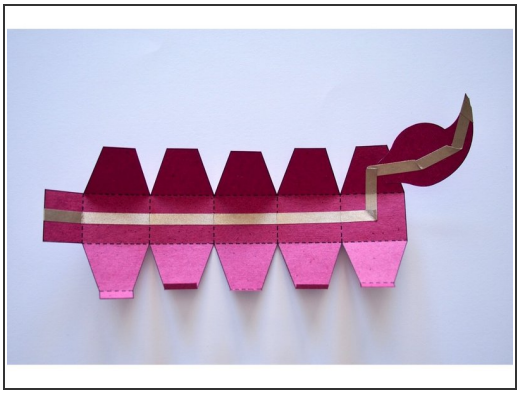
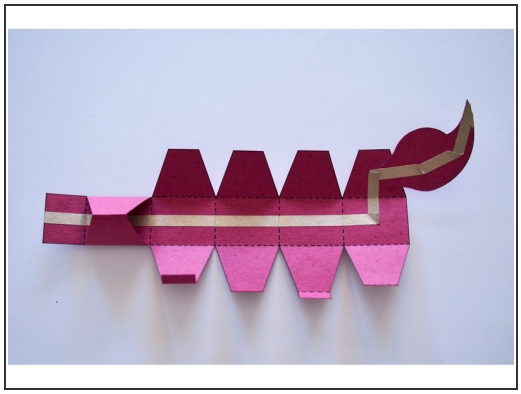
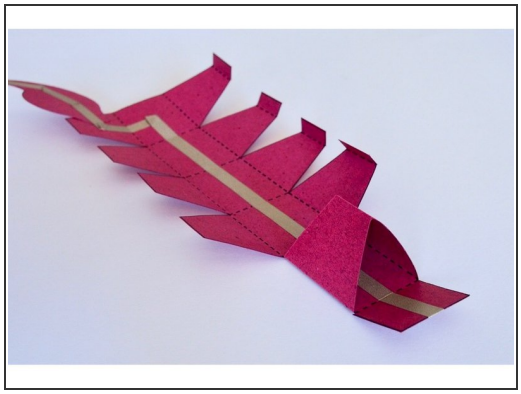
ⓘ I used 1/4" wide Maker Tape for the tail, but 1/8" should work fine as well, and will be necessary later on.

Step 9 — Making the Tail Part 3

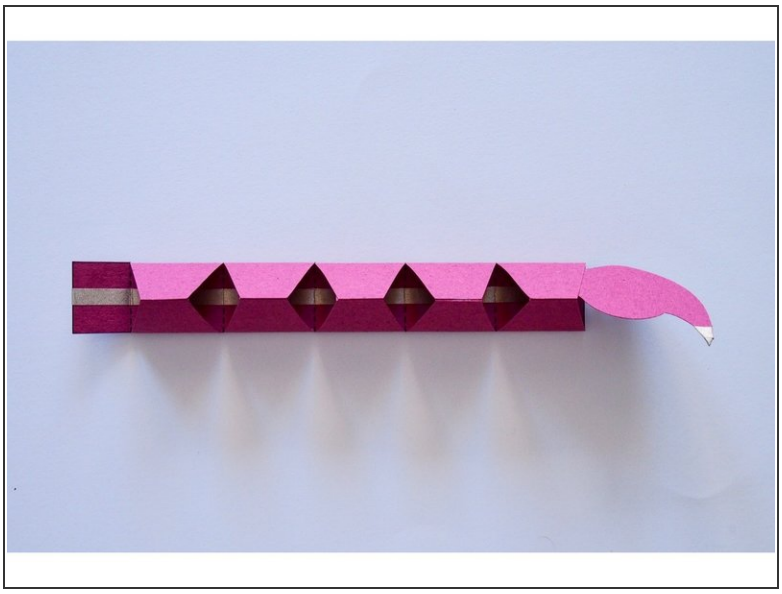
- Tape the rest of the Maker Tape along the length of the tail as shown.
- At the very end, fold over about an inch of tape so it overlaps onto the tab on the front side of the tail.

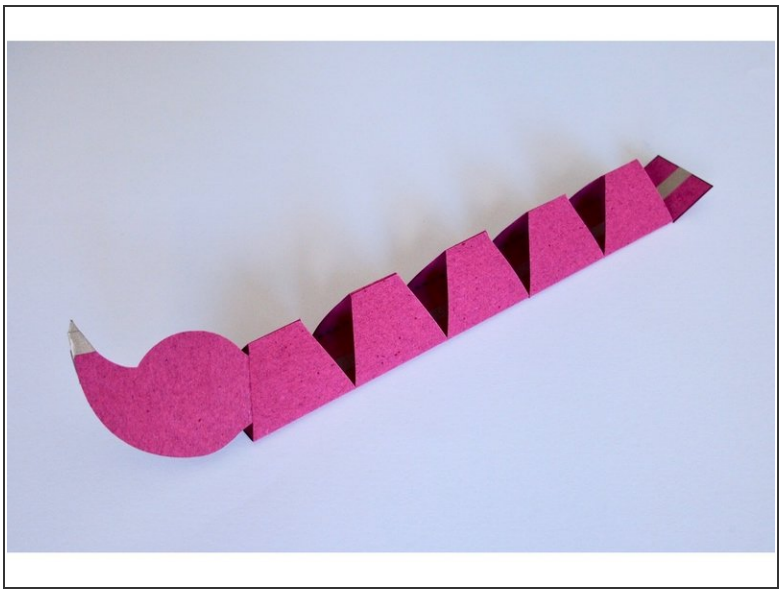
Step 10 — Making the Tail Part 4

- Prefold the creases on the tail.
- Fold and glue the first section of the tail to make a triangular shape as shown.

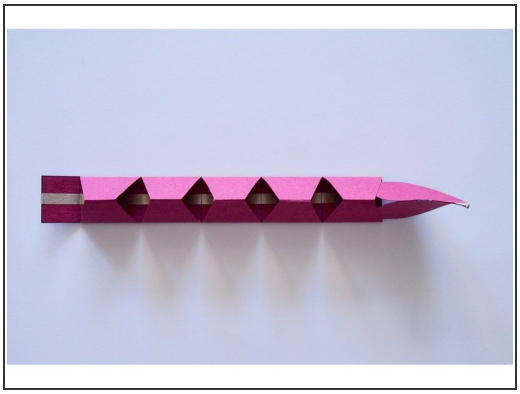
Step 11 — Making the Tail Part 5

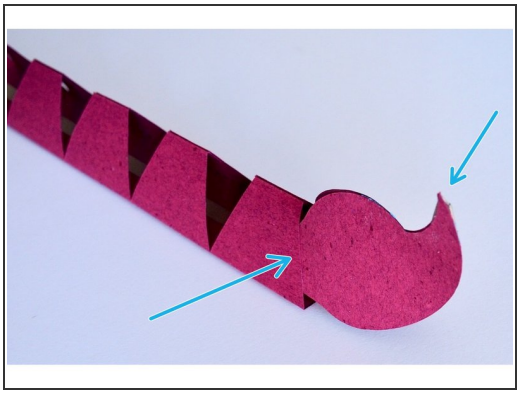


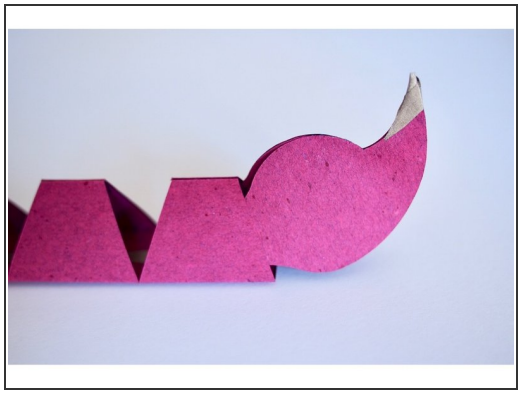


- Fold and glue the rest of the tail sections.

Step 12 — Making the Tail Part 6

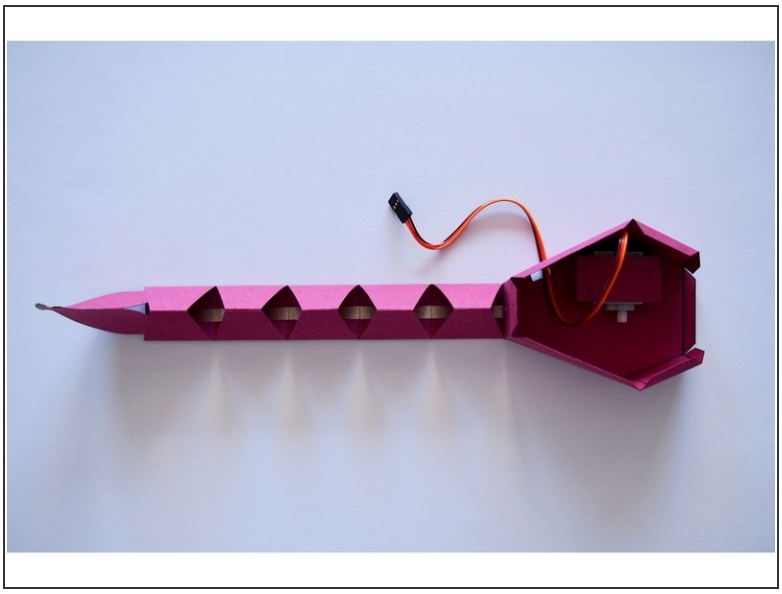


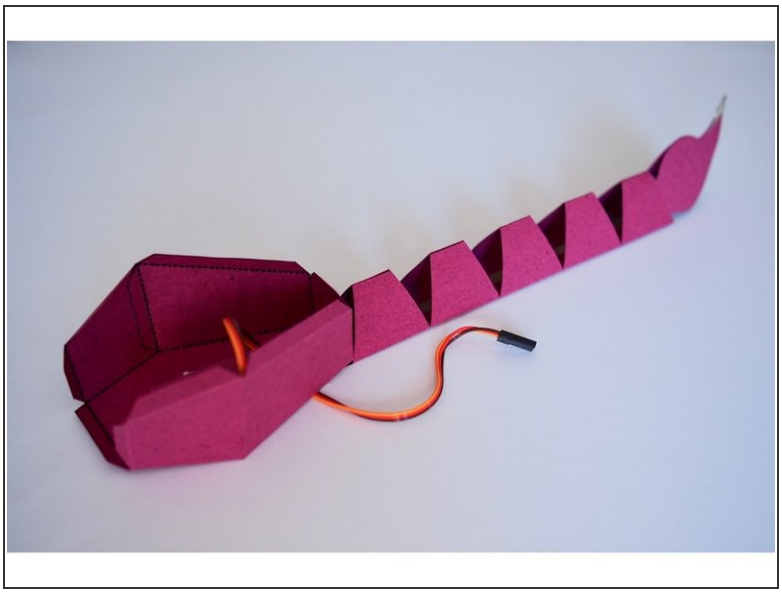




- Glue the other half of the stinger on. The two pieces won't glue flat, so you only need to put glue where marked in the picture.
- You can also add a bit more Maker Tape to the stinger to make both sides of it conductive.

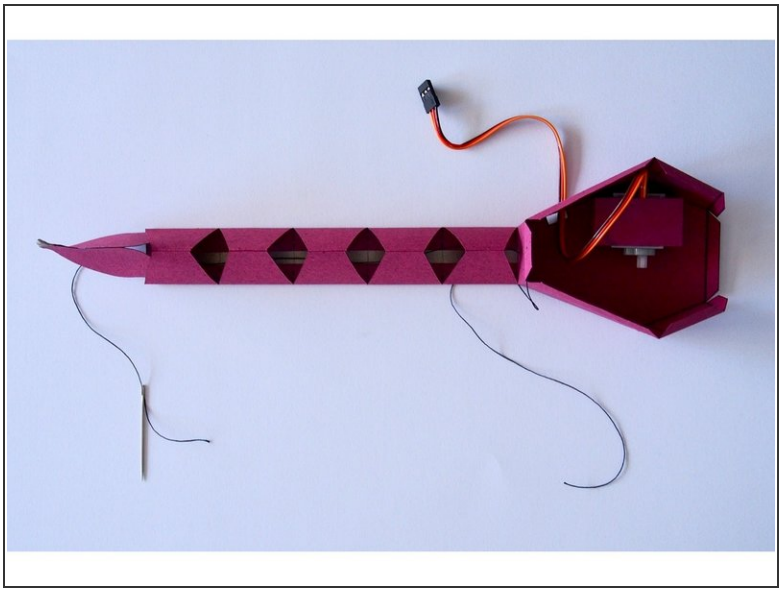
Step 13 — Attach the Tail





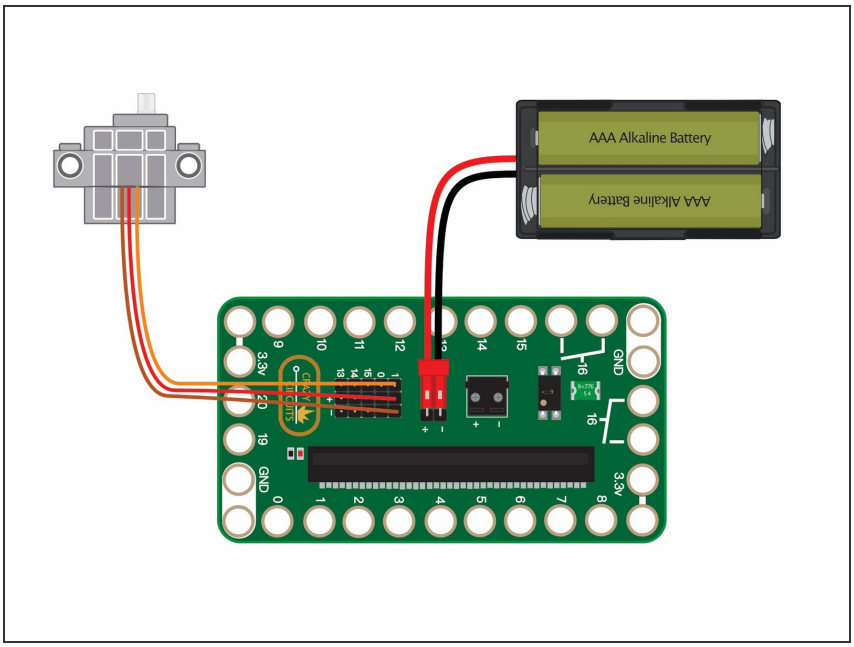
- Glue the tab on the tail to the bottom of the body to attach it.

Step 14 — Add the String



- Cut a piece of string a bit longer than the tail, and thread it all the way through.
- Tape one end of the string to the inside of the stinger.

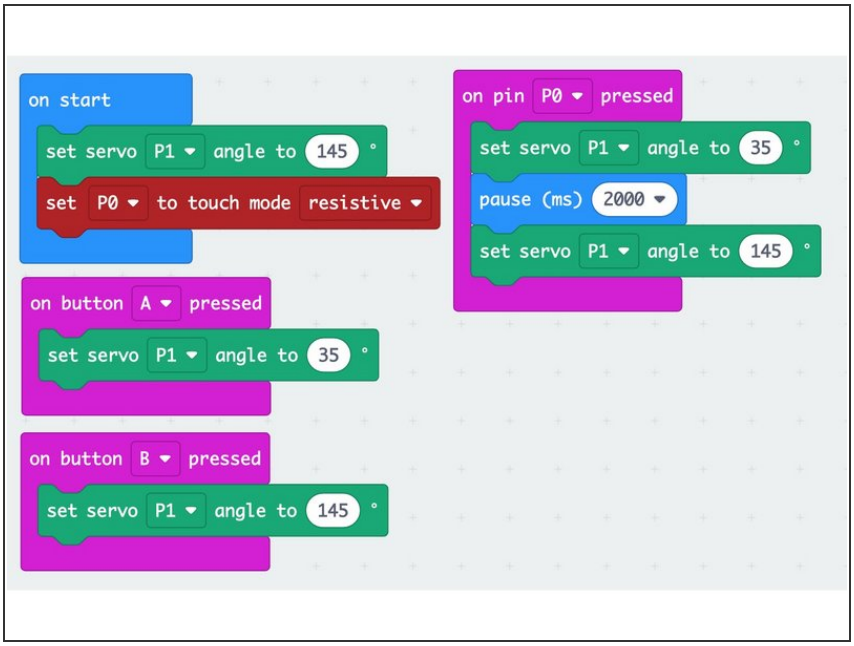
Step 15 — Building the Circuit



- Attach the servo to the Bit Board as shown.

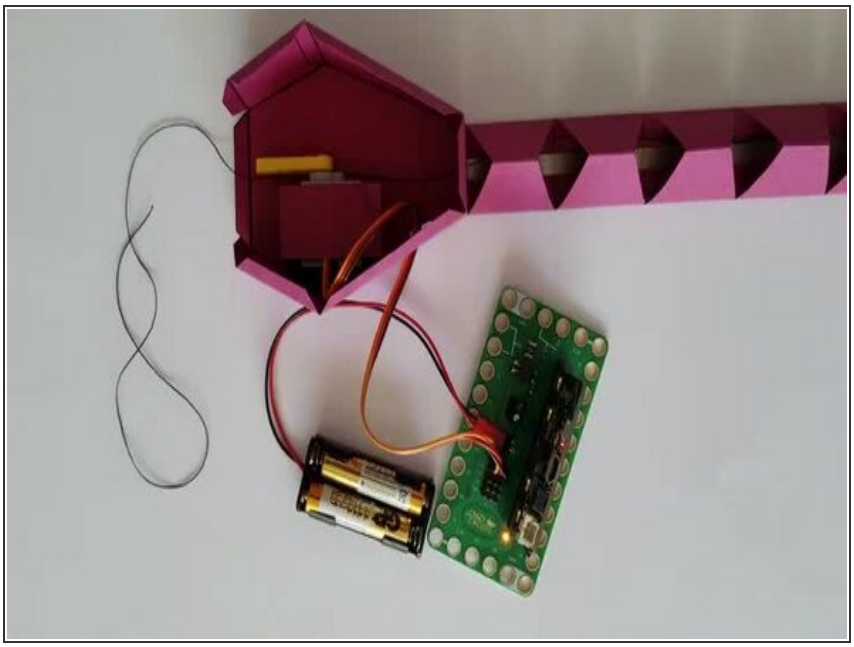
The orange wire should be closest to the **Pin 1** label on the board.

Step 16 — Upload the Code



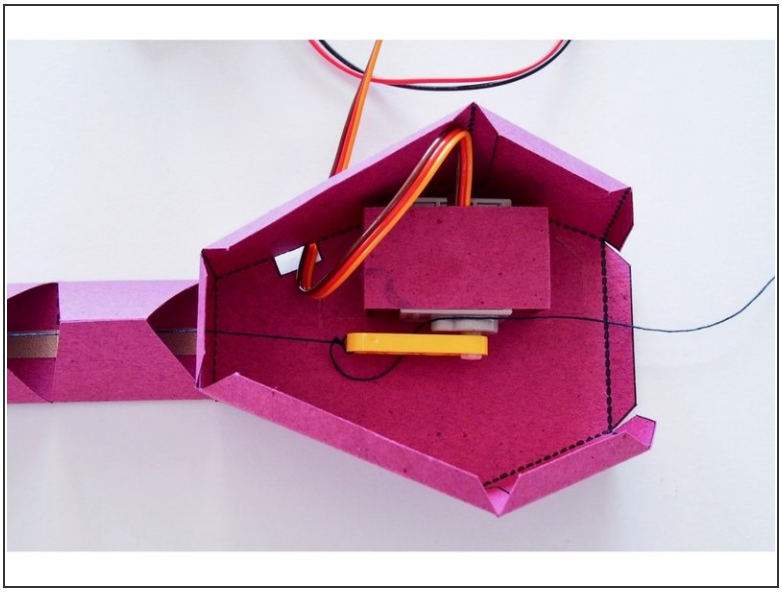
- Upload the Code from here: ScorpioBot
- Connect a USB cable to the micro:bit and then plug it into your computer.
- We'll be using makecode.microbit.org to program our board. It uses a simple drag and drop block interface.
- We're going to load the following code for our **ScorpioBot** program: https://makecode.microbit.org/_TvFipiLuH...

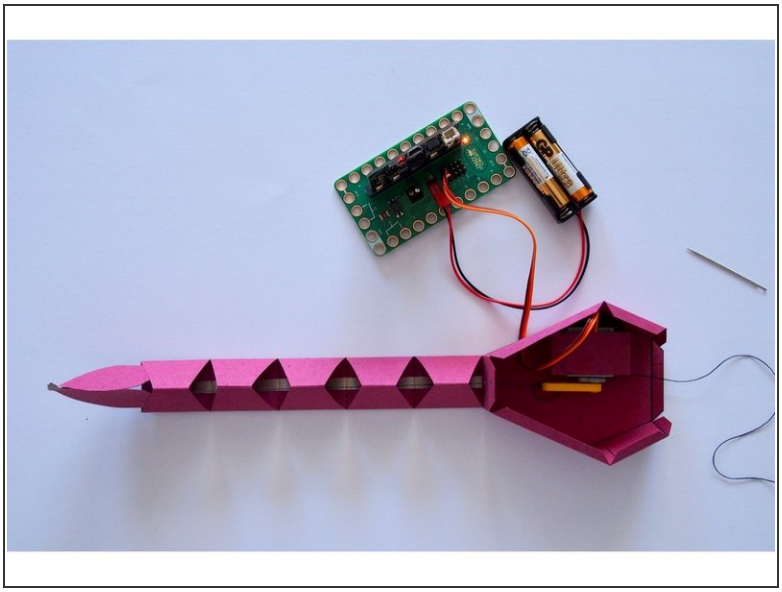
Step 17 — Test the servo.



- Push the buttons to test that the servo works.
- Once you know which direction the axle on the servo is oriented, attach the LEGO axle mount. (You want it oriented so it moves the way shown in the video).

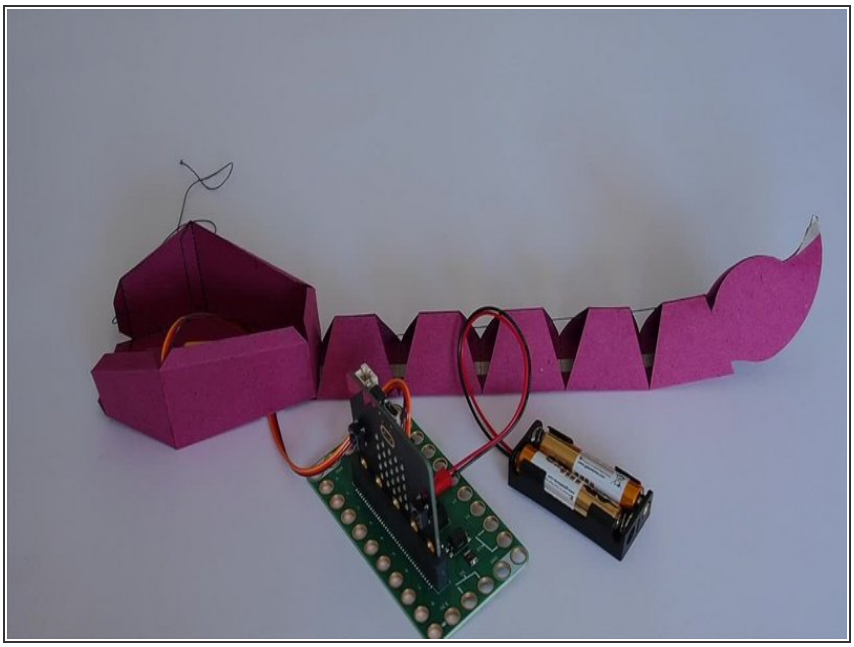
Step 18 — Tie the String





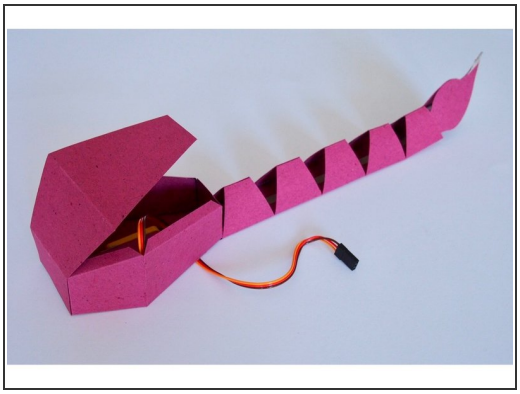
- Tie the string to the end of the LEGO Beam in such a way that it is lightly tensioned when the mount faces towards the tail, and tight enough to pull the tail up when the beam points away from the tail.

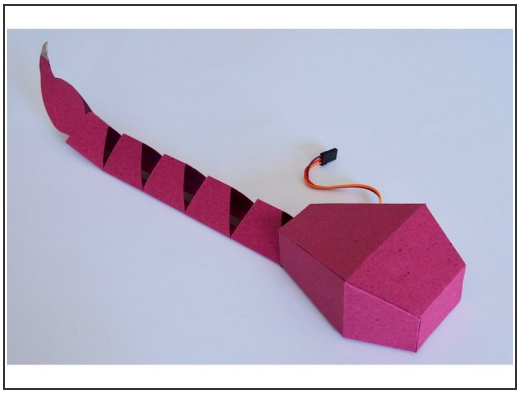
Step 19 — Test the Tail

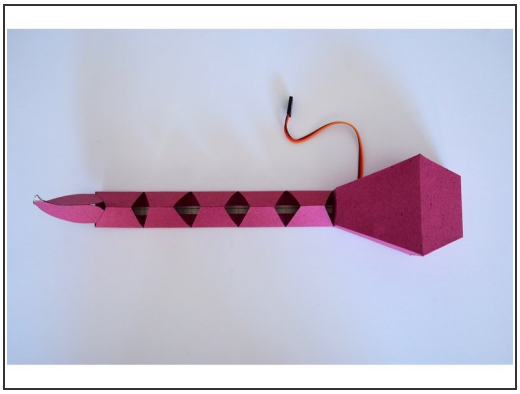


- Test that the tail pulls up. If it doesn't pull up all the way, you may need to tie the string tighter or shorten it a bit.

Step 20 — Attach the Back

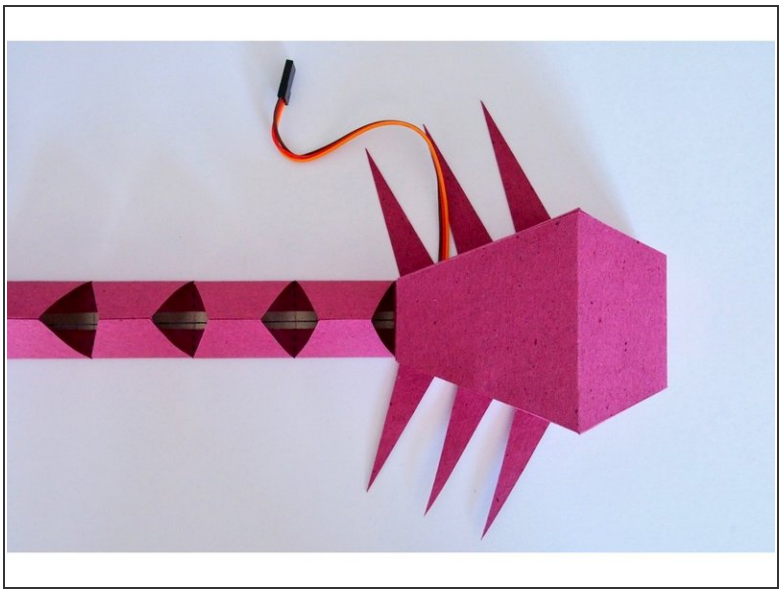


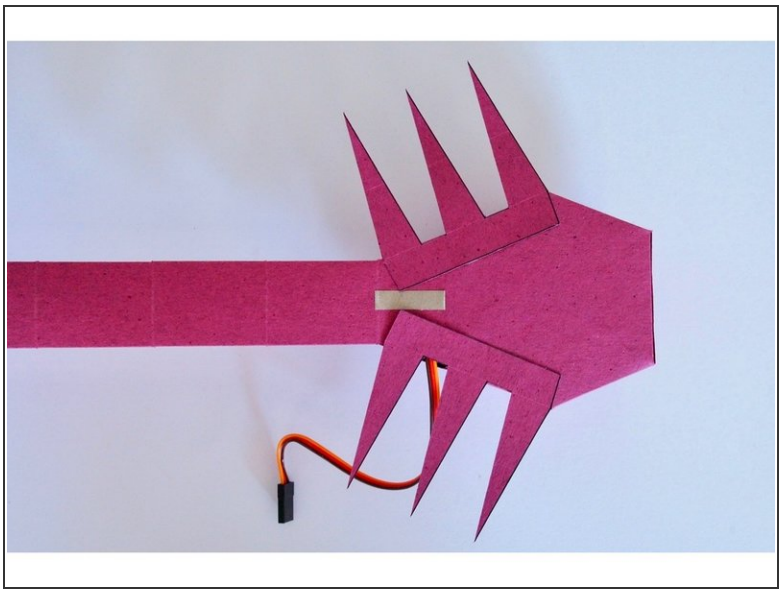




- Glue the back on to ScorpioBot, sealing the body up.

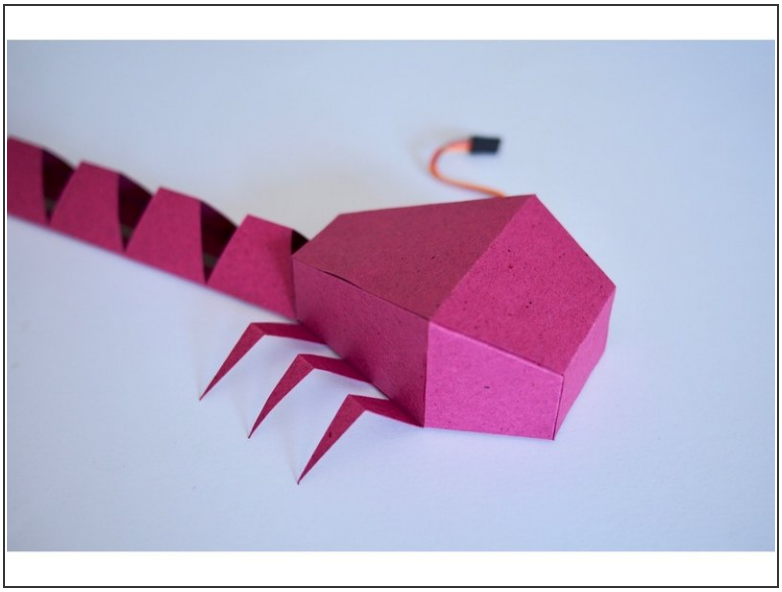
Step 21 — Attach the Legs

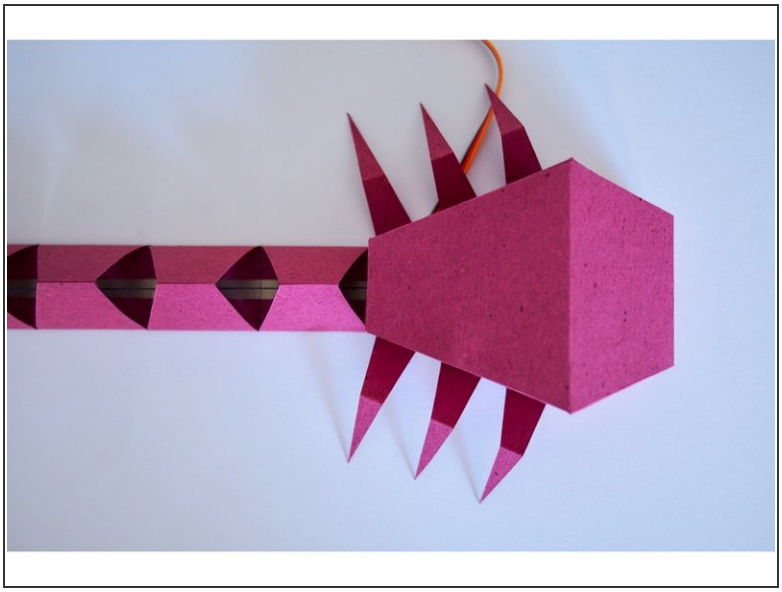




- Glue the legs to the bottom of ScorpioBot's body.

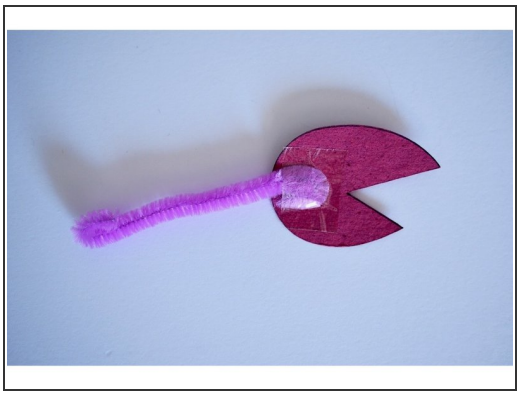
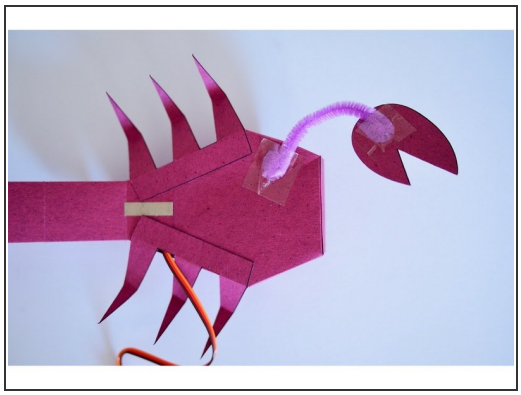
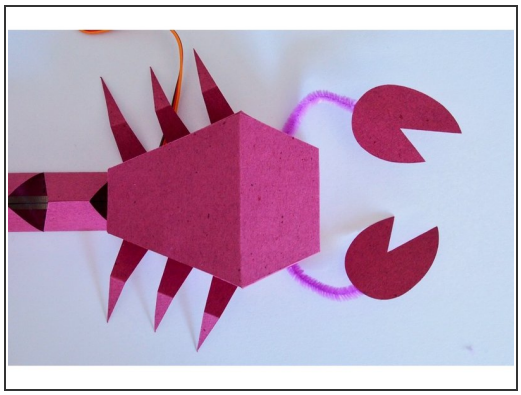
Step 22 — Fold the Legs





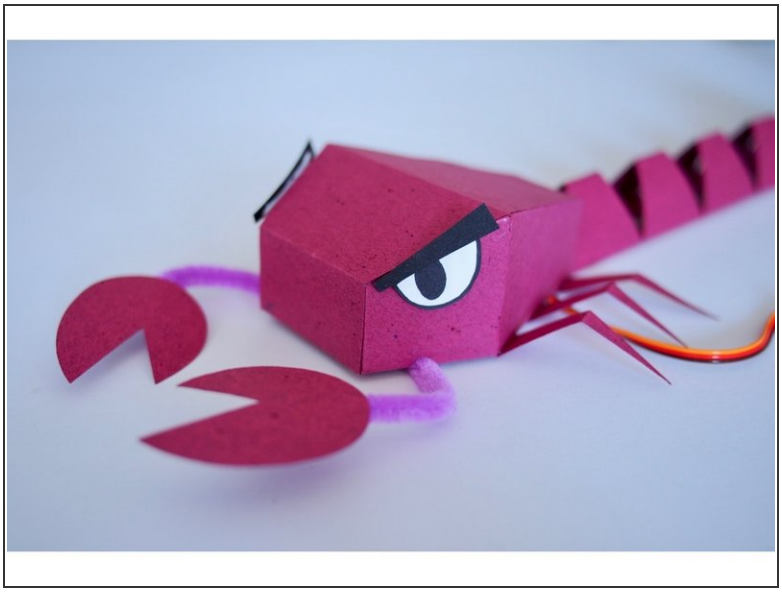
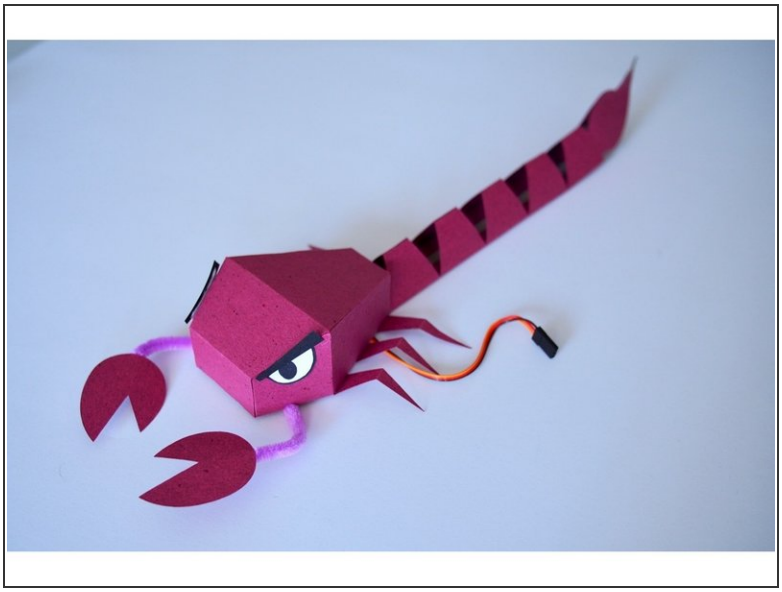
- Fold the legs to make them more insect-like.

Step 23 — Make the Claws

- Cut two short pieces of pipe cleaner.
- Fold the ends of the pipe cleaner over (this is so the tape has more of a grip area and keeps the pipe cleaner from turning).
- Tape one end of the pipe cleaner to the claw, and the other end to the bottom of the body.
- Do the same with the other claw.

Step 24 — Give it a Face

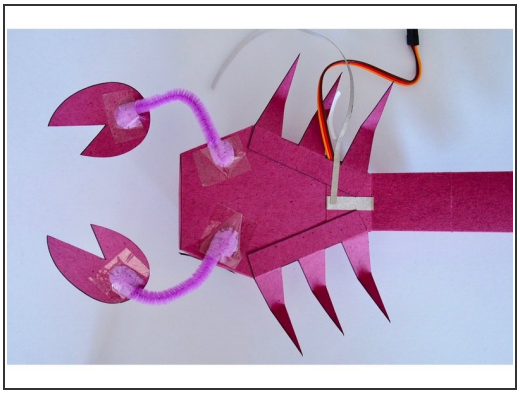



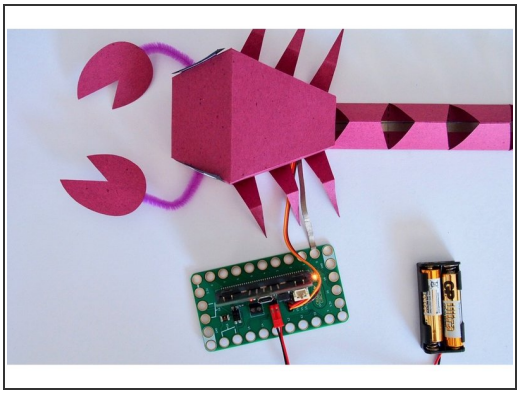
- Give ScorpioBot a face!

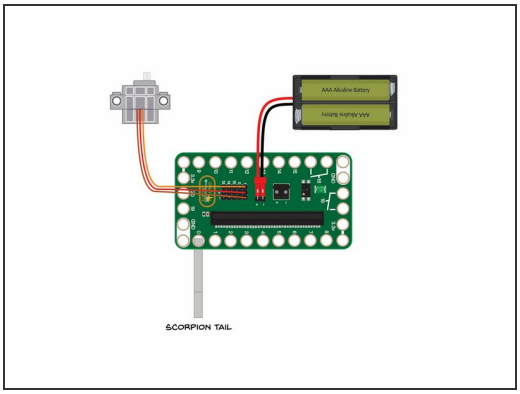
Expressive eyes can help convey emotions!

This document was generated on 2022-04-02 07:09:56 PM (MST).

Step 25 — Connect the Touch Sensor

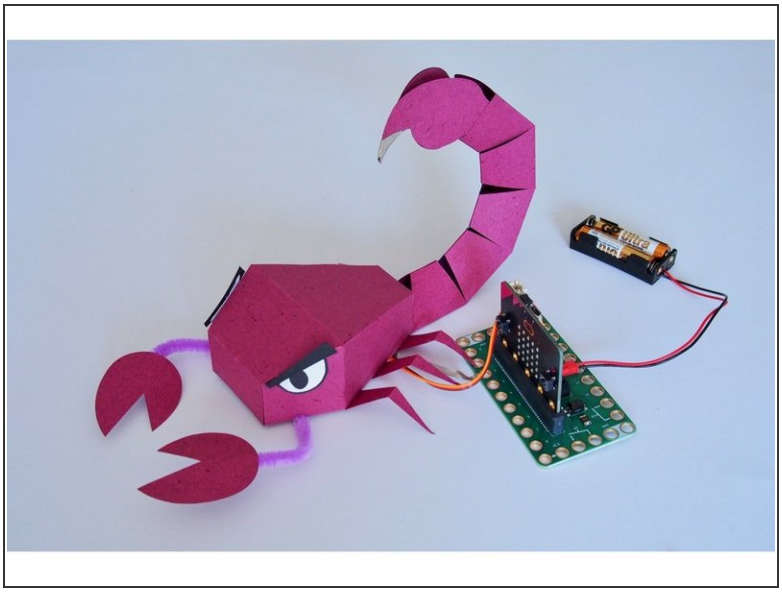


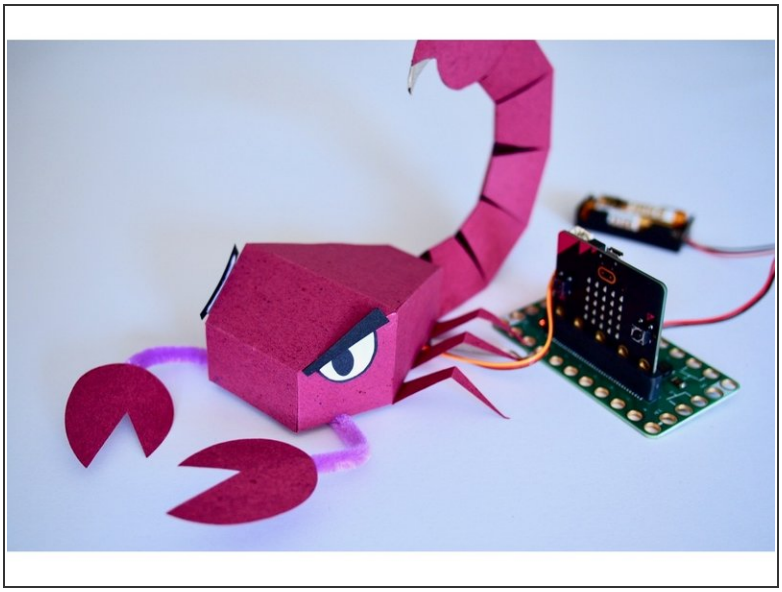




- Connect the Maker Tape on the bottom of ScorpioBot to **Pin 0** on the Bit Board with a piece of 1/8" wide Maker Tape.
- We looped the Maker Tape around the holes in the Bit Board, like in Step 4 of [this project](#).
- You can use a LEGO baseplate instead of looping the Maker Tape.

Step 26 — Test It





- Touch the **GND** pin on the Bit Board then touch ScorpioBot's stinger!

ⓘ I initially tried this with capacitive sensing (which doesn't require touching the GND pin), but found that the piece of Maker Tape I used was so long, that the capacitance of the tape itself affected the touch sensor!

