

# SPINNY BOX

**Make a box that that spins an object when you shake it!**

## Tools & Materials

### Included in kit:

- Spiny Box Templates  
*If you need to print new templates, you can download them here:*  
<https://www.okdo.com/p/okdo-microbit-build-a-paper-robot-kit/>
- Continuous Rotation Micro Servo (EF90D, micro:servo 360°)
- 3x Crocodile to Male Jumper Pin Cables
- micro:bit v2 Board
- Micro USB Cable

### Not included in kit:

- Computer
- Scissors or Craft Knife
- Glue
- Tape



Spiny Box templates and instructions © Jasmine Florentine 2022

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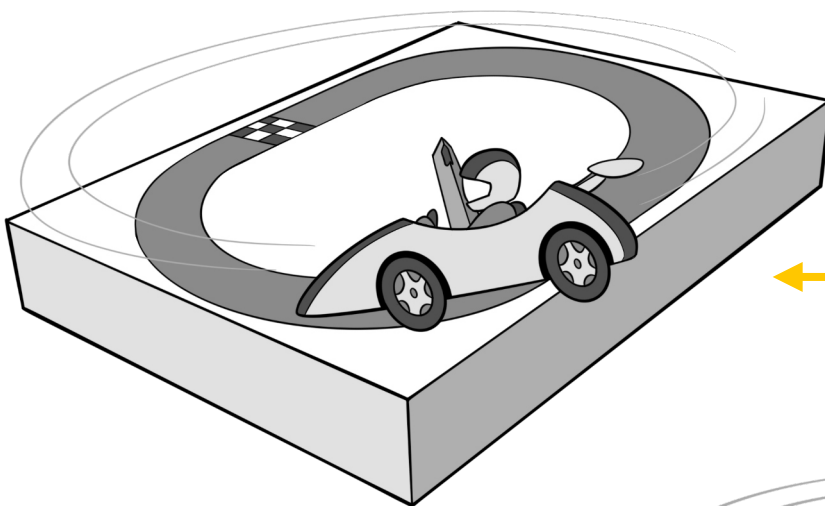
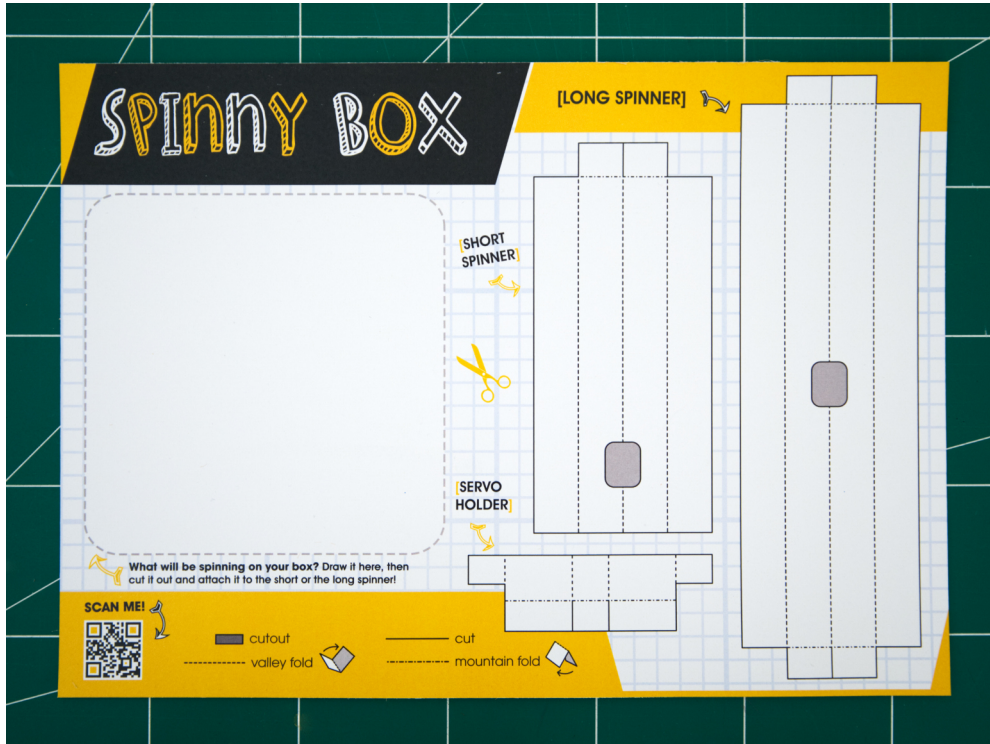
The included templates and instructions are made available under a CC BY-NC-SA-4.0 license. This means you are free to copy, print, translate, and remix elements of the templates as long as it is not for commercial purposes. We only require that you attribute Jasmine Florentine and OKDo and that any derivative works (such as translations and lesson plans) also use the same CC BY-NC-SA-4.0 license.



1

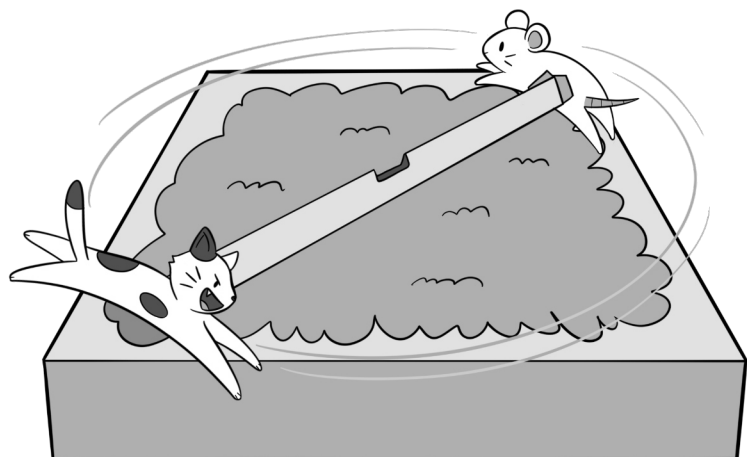
Start by cutting the pieces out of first page of the template. Don't worry about the grey cutouts yet.

The template has options for a short and a long spinner. You can choose whichever you want, or even make your own spinner at whatever length you prefer.



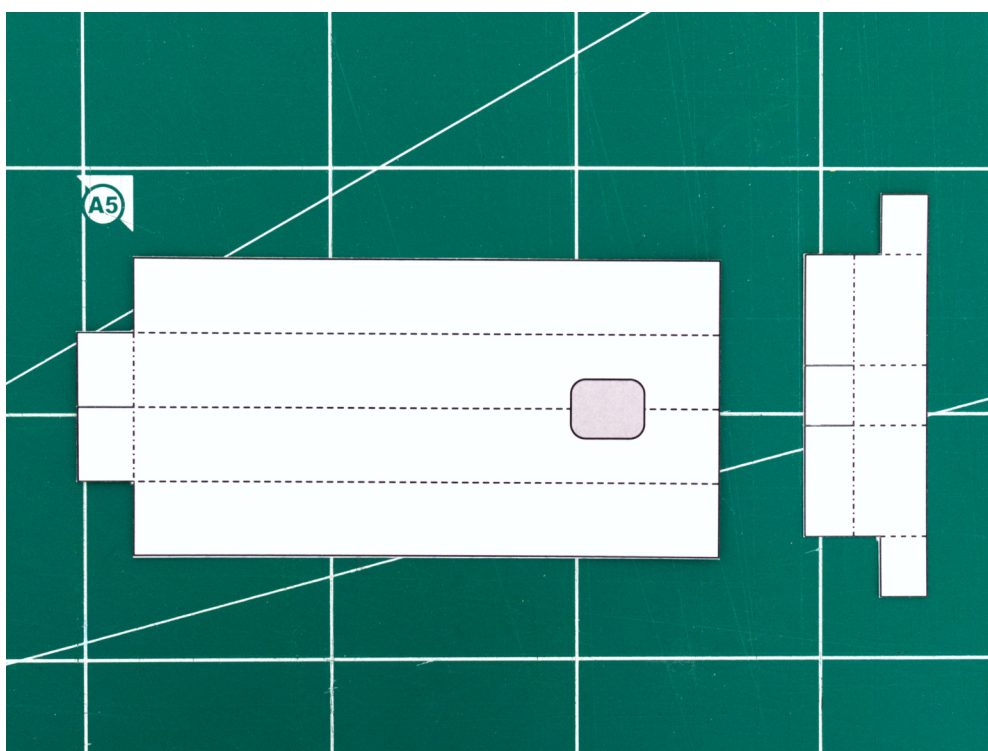
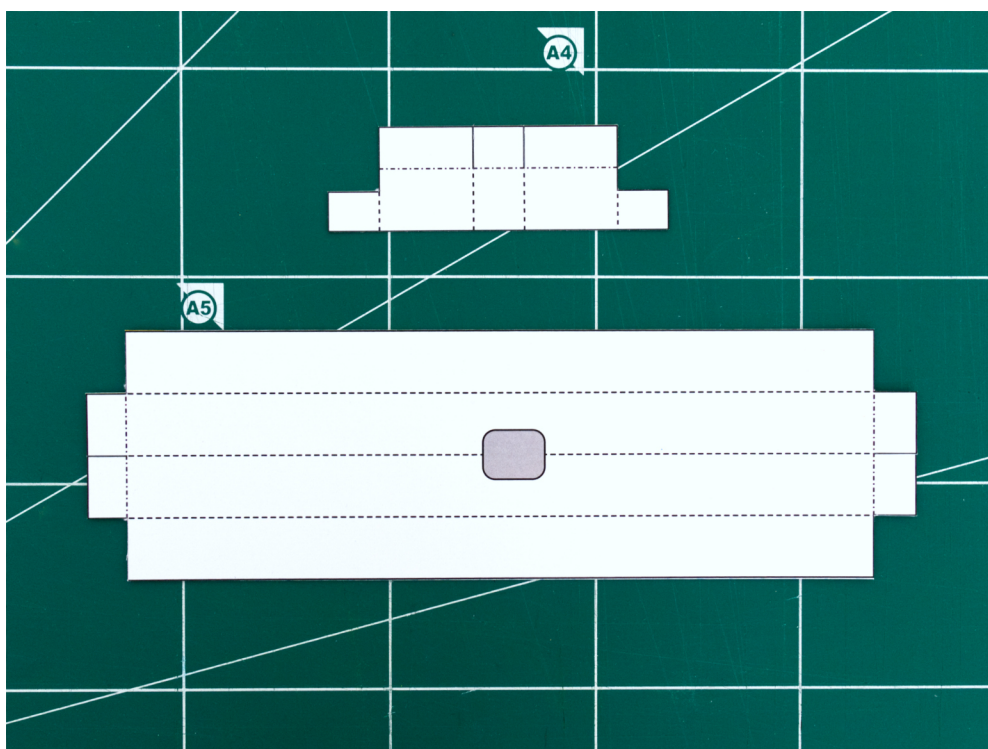
This example uses the short spinner to spin just one object around.

This example uses the long spinner to have two objects chasing each other as they spin around.



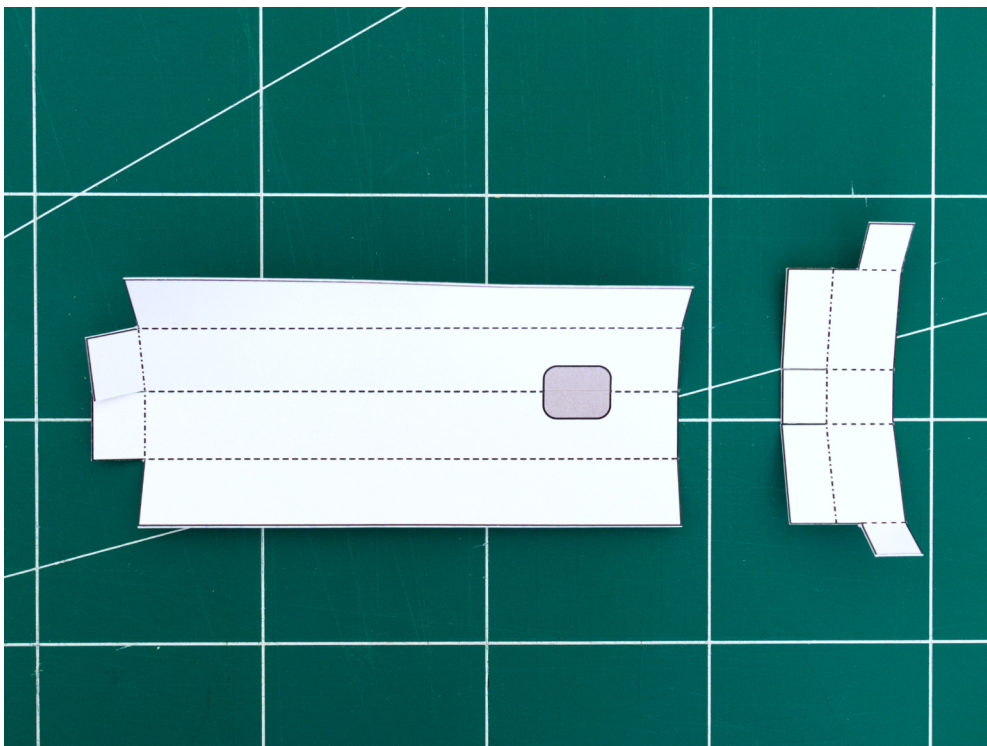
2

The top image shows the long spinner, and the bottom image shows the short spinner. For this tutorial, I'll use the short spinner.



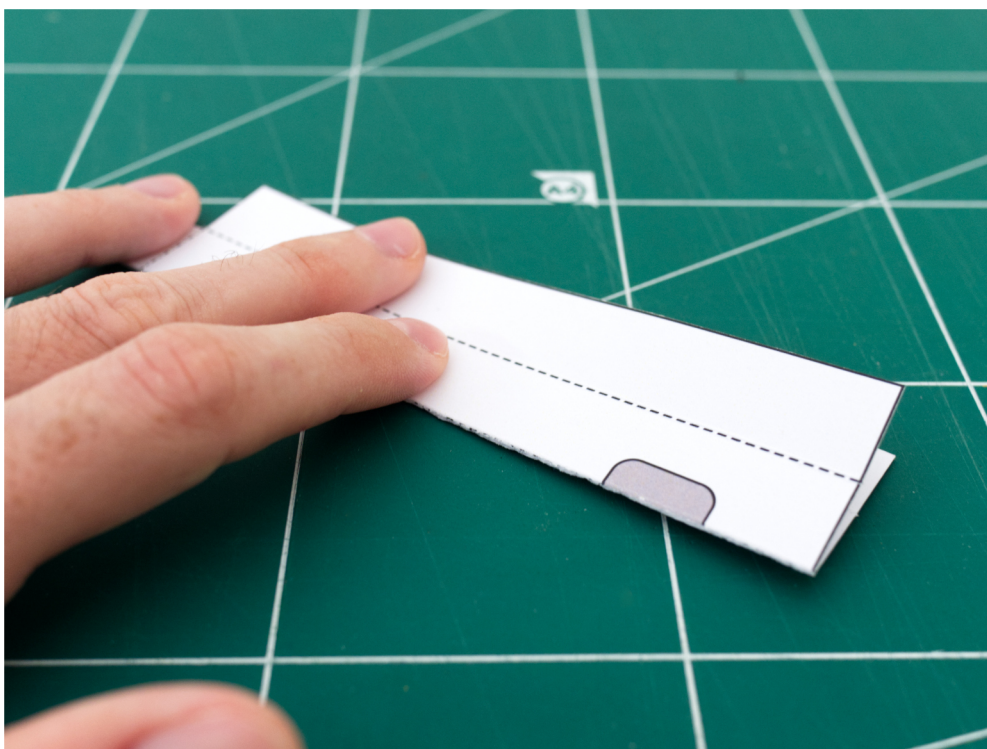
3

Pre-crease all the fold lines. This will make assembly easier later on.



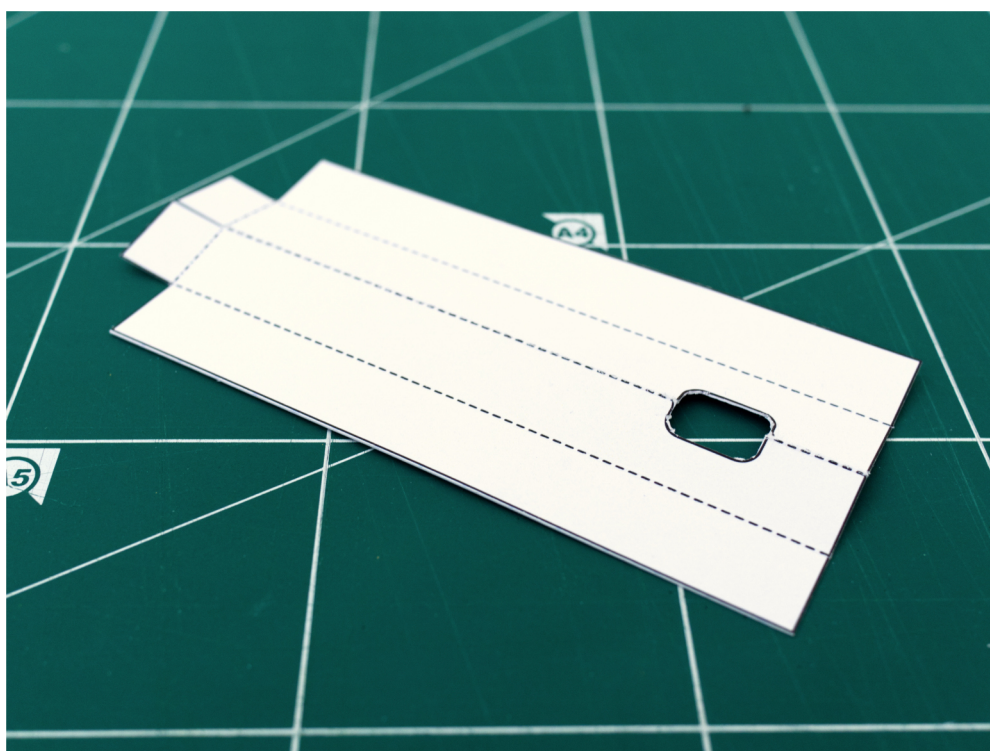
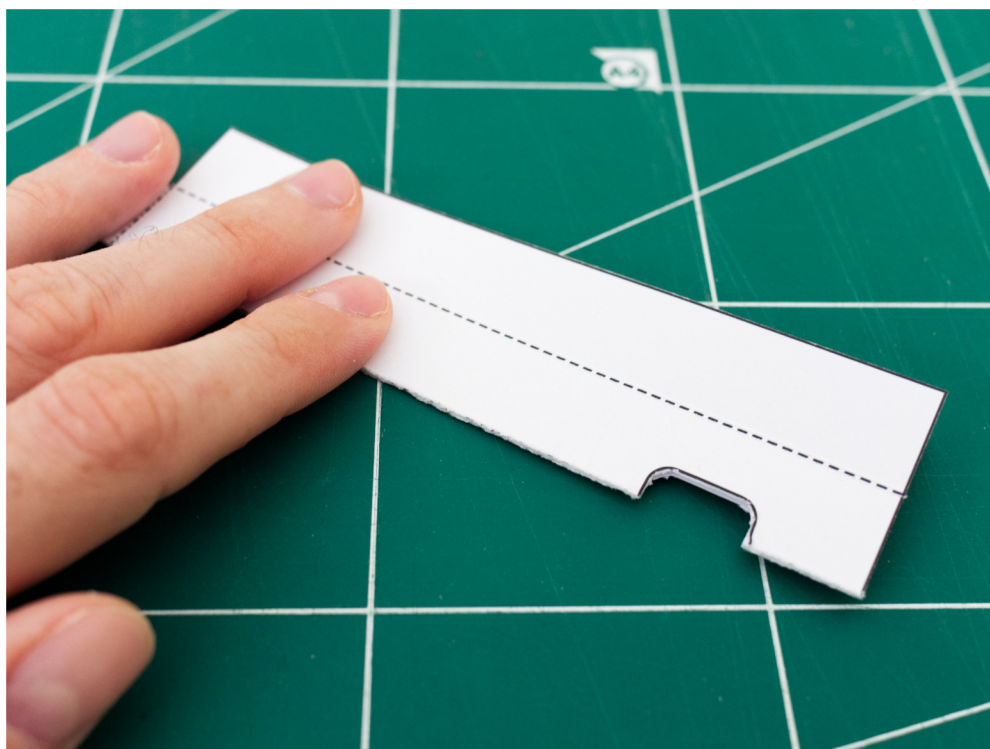
4

Fold the spinner in half with the printed crease lines facing outwards.



5

With the spinner folder in half, use scissors to cut the gray cutout.



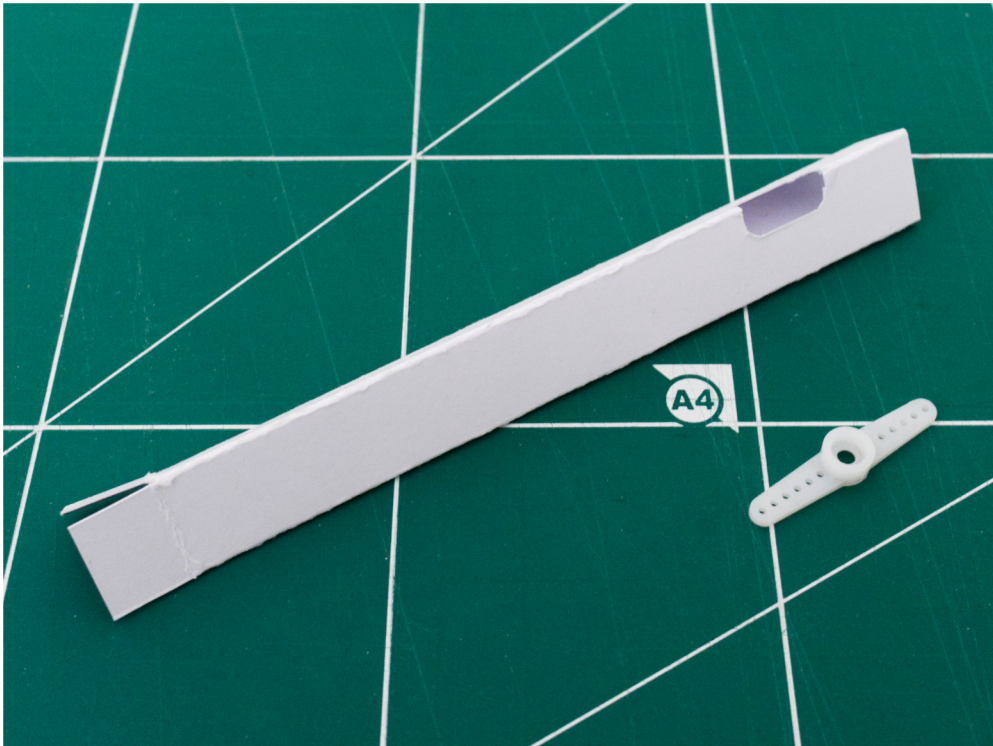
6

Fold and glue or tape the spinner into a triangle. I decided to hide the printed crease lines on the inside.



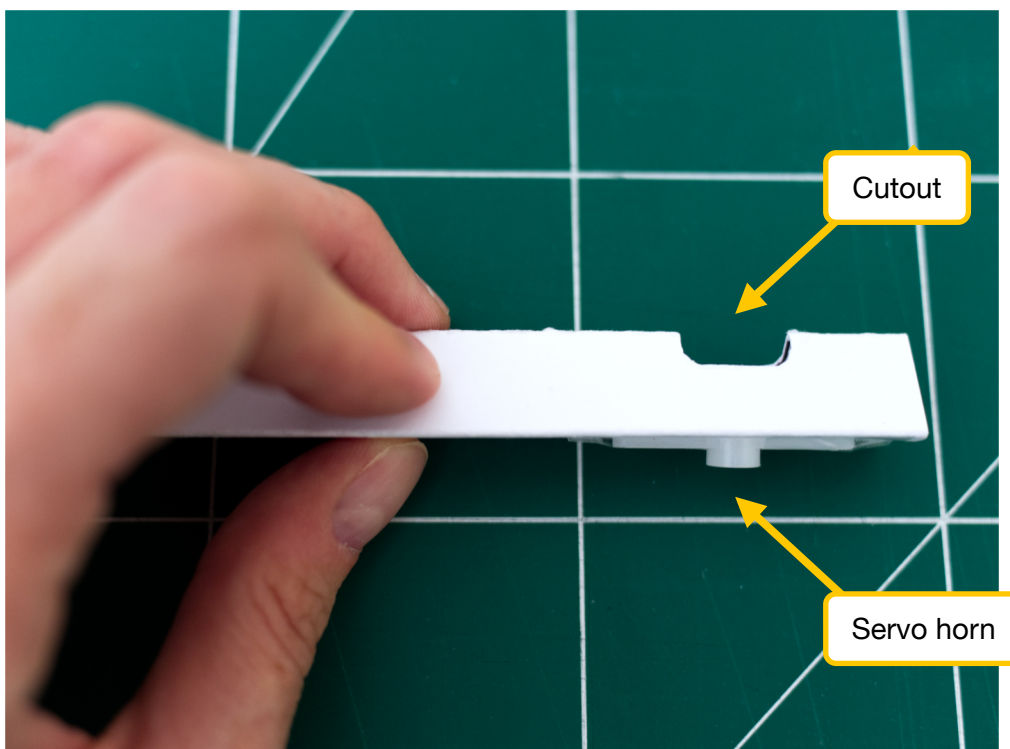
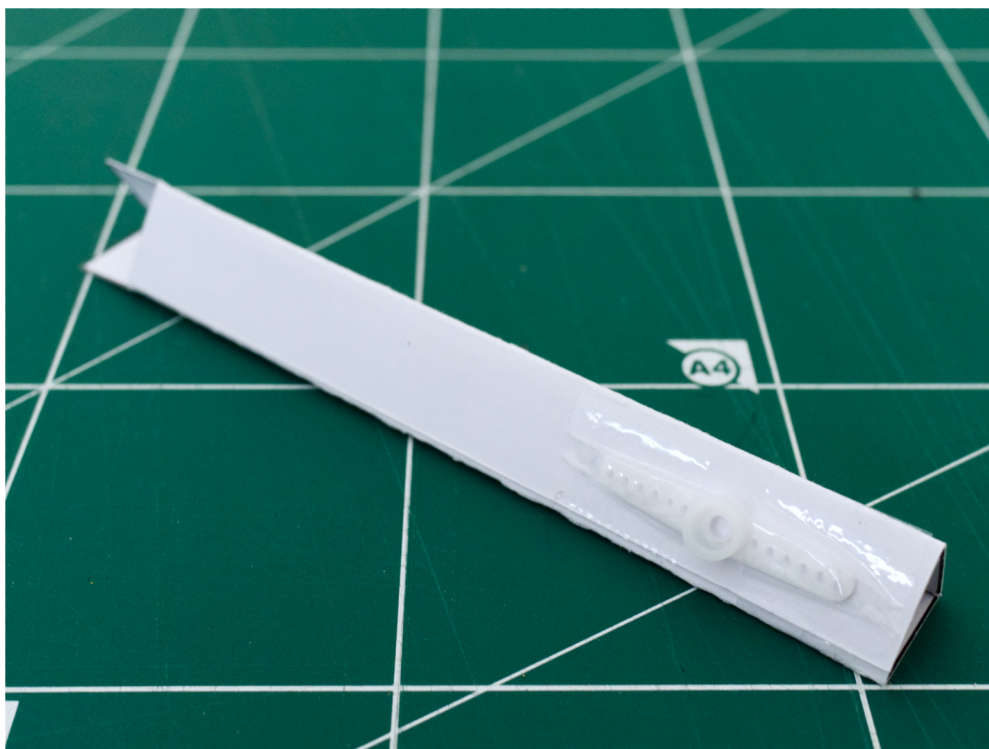
7

Find one of the servo horns like the one pictured below.



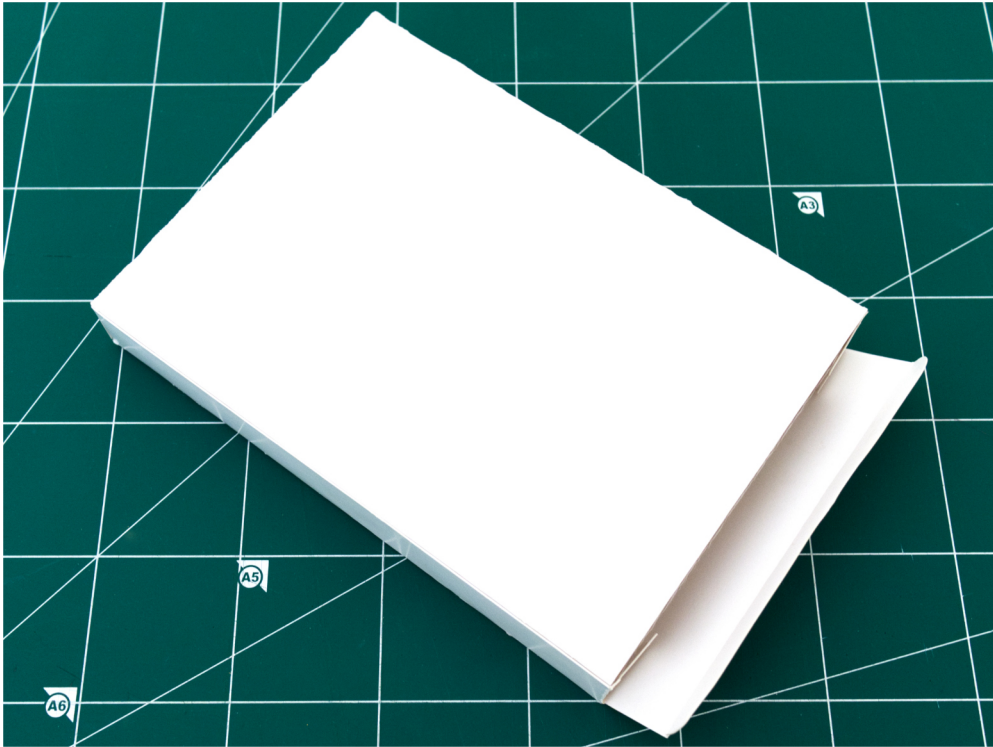
8

Tape the servo horn to the bottom of the spinner as shown. You'll want to position it so it sits below where the cutout is.



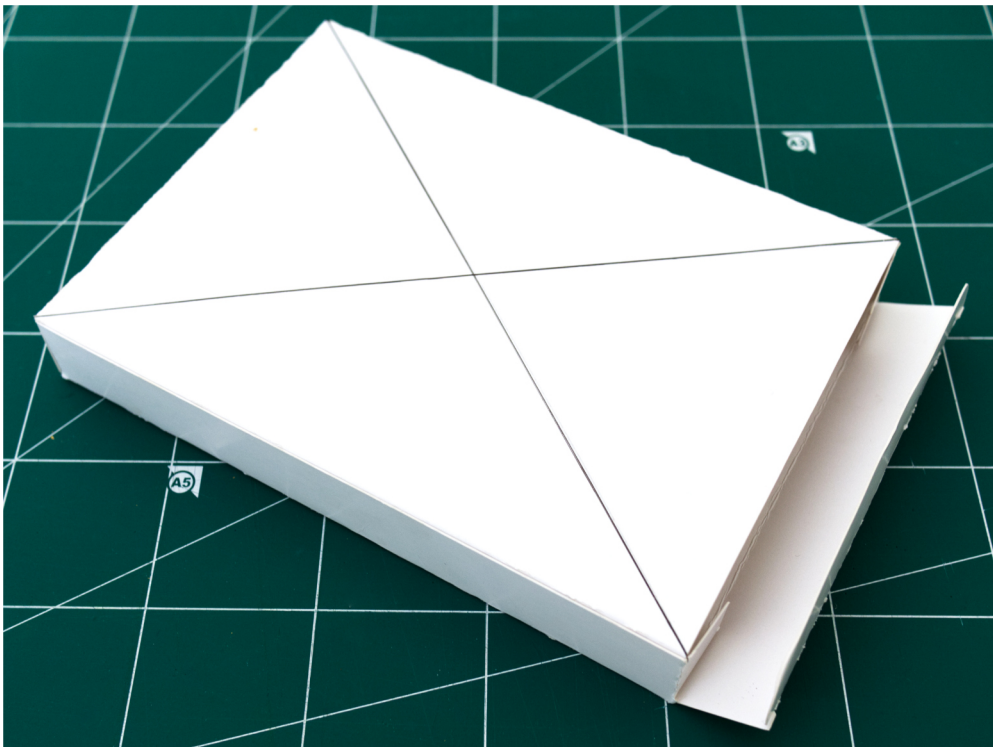
9

Let's move on to the box! You can use any box for this project, but I used the one that the Paper Robot kit came in. (This one is white so it's easier to see for the instructions).



10

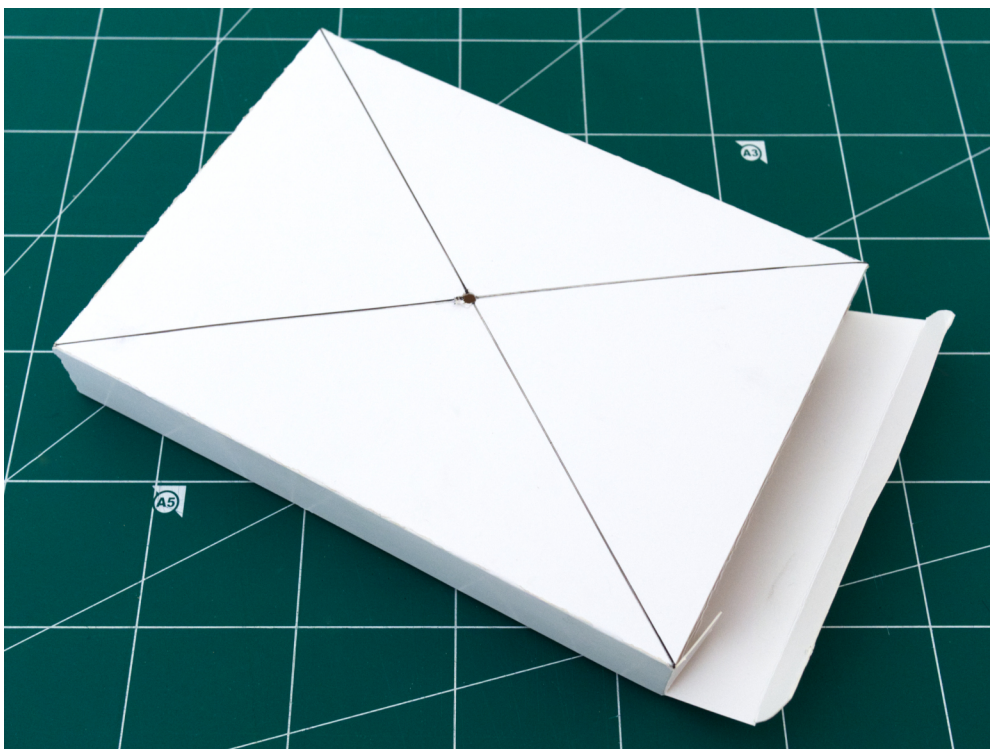
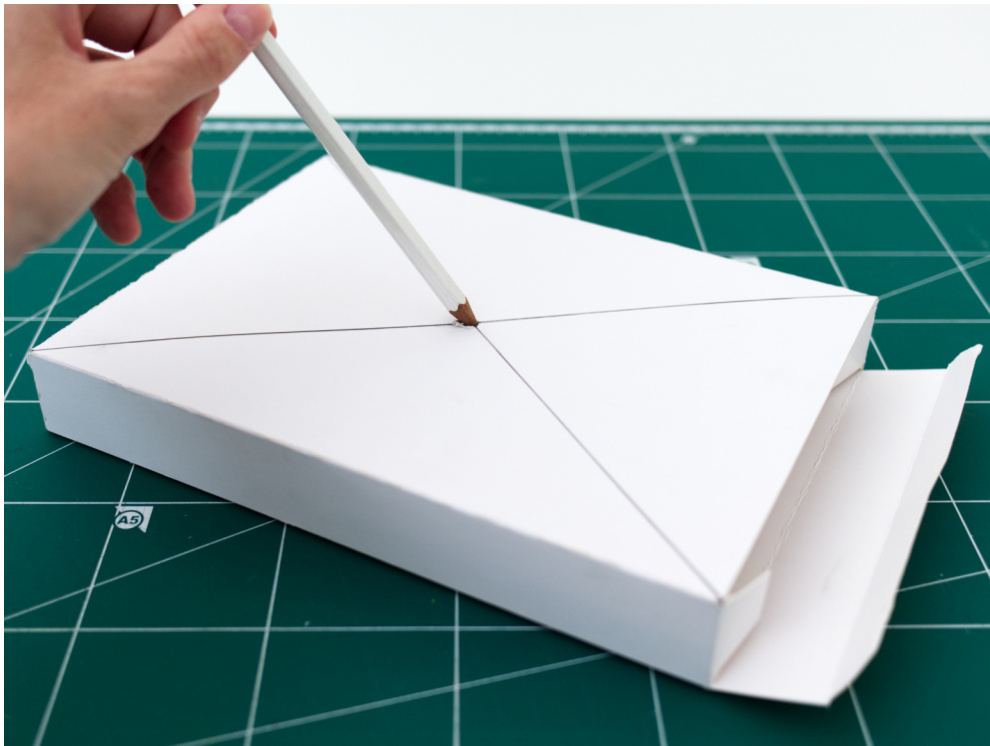
You can position the spinner anywhere on the box, but if you want to center it like I did, mark two diagonal lines on the box to find the center.





11

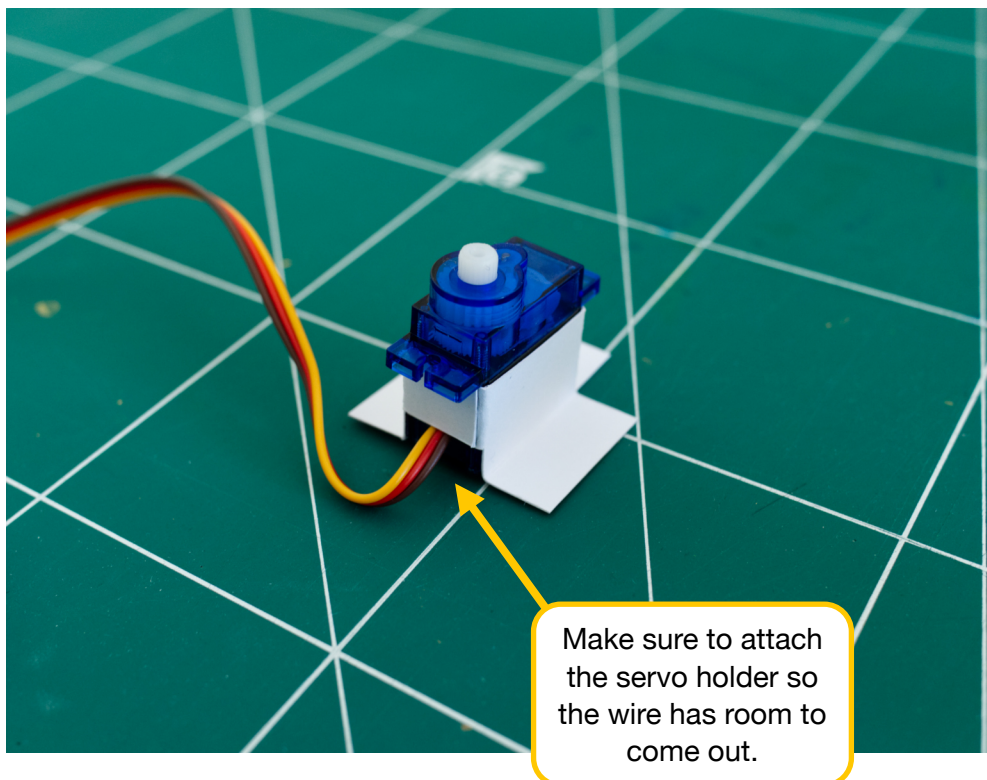
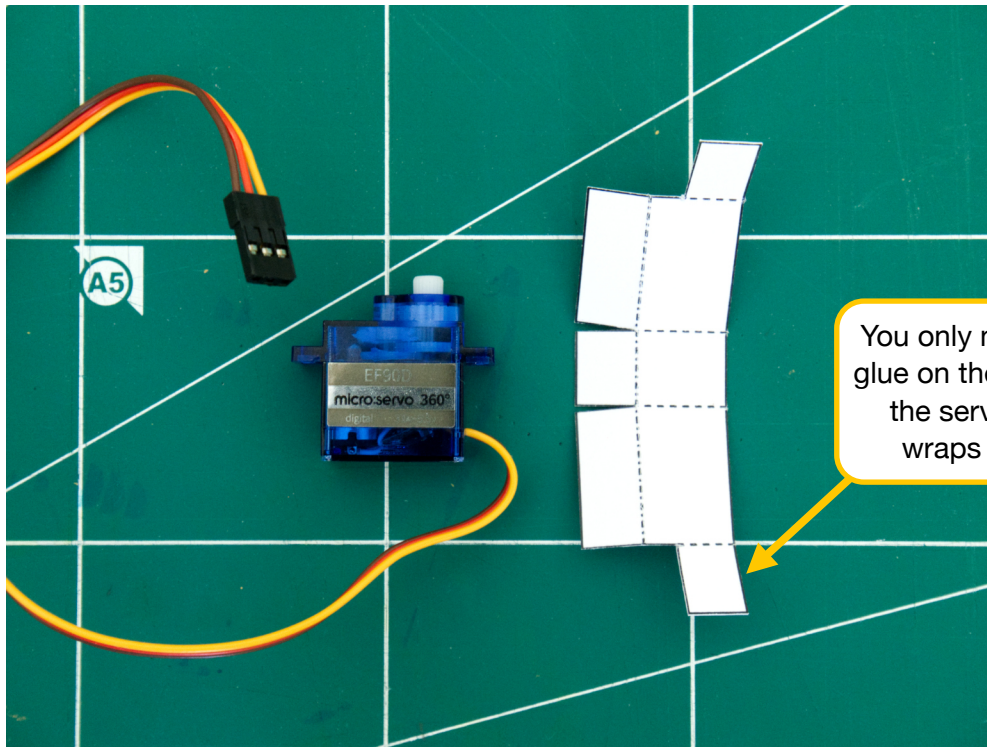
Use a sharp pencil to poke a hole in the box where the two diagonal lines cross (or wherever you want to position the spinner).



12

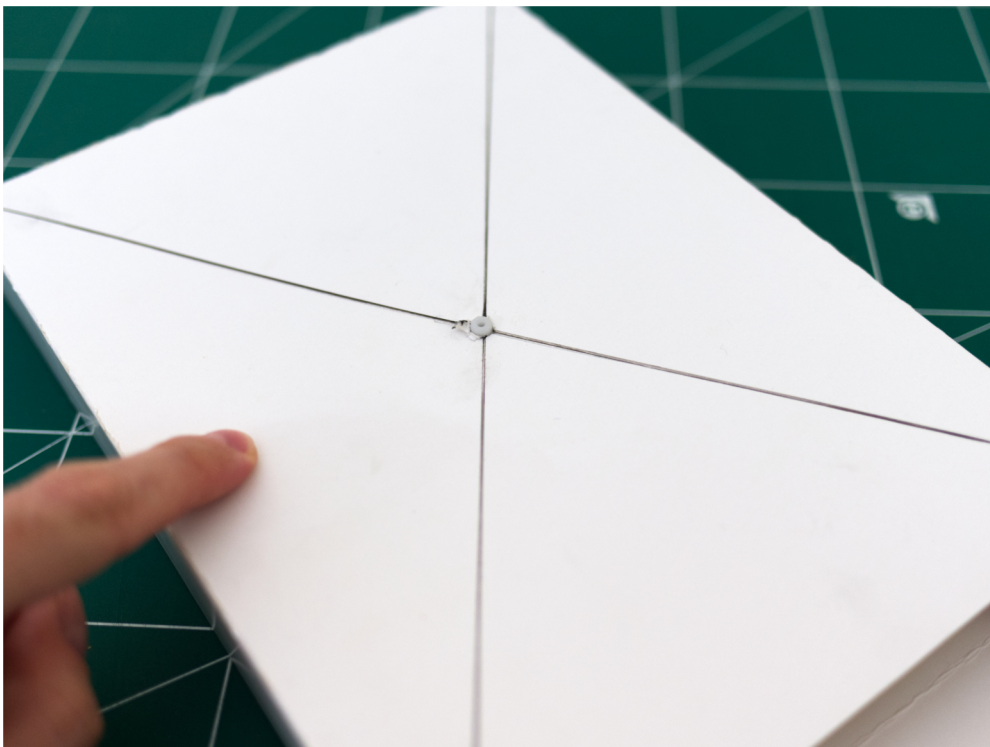
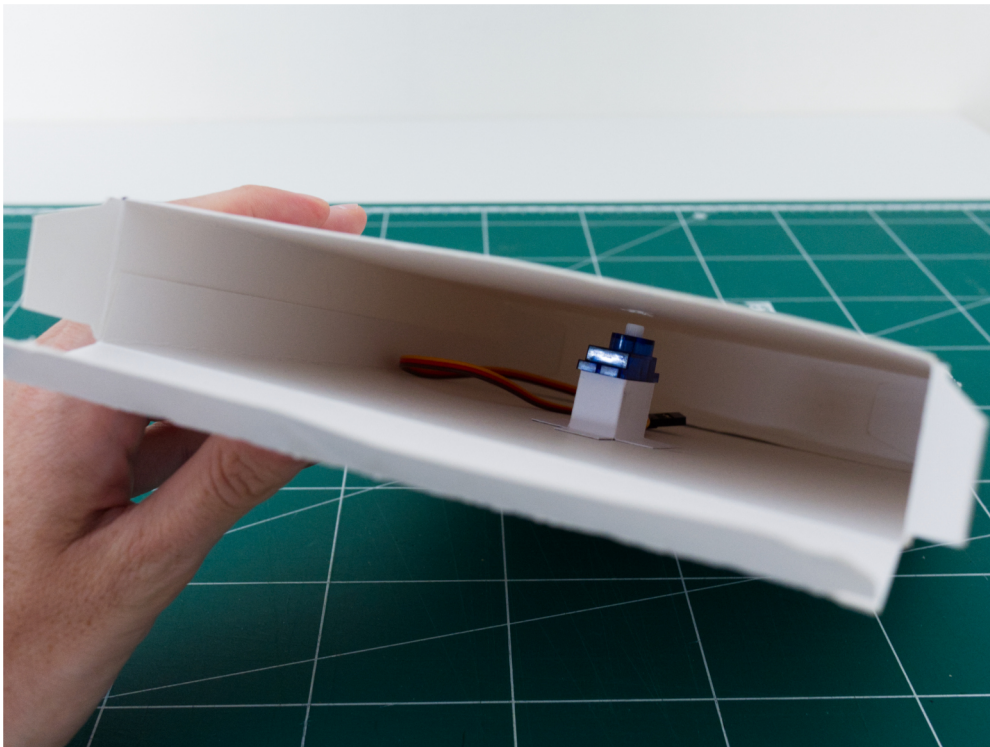
Glue or tape the servo holder around the servo. You don't need to put glue on the servo itself, just on the paper tabs that wrap around the servo body.

Note: For this project, make sure you're using the **continuous rotation 360° servo** (the one labeled EF90D).



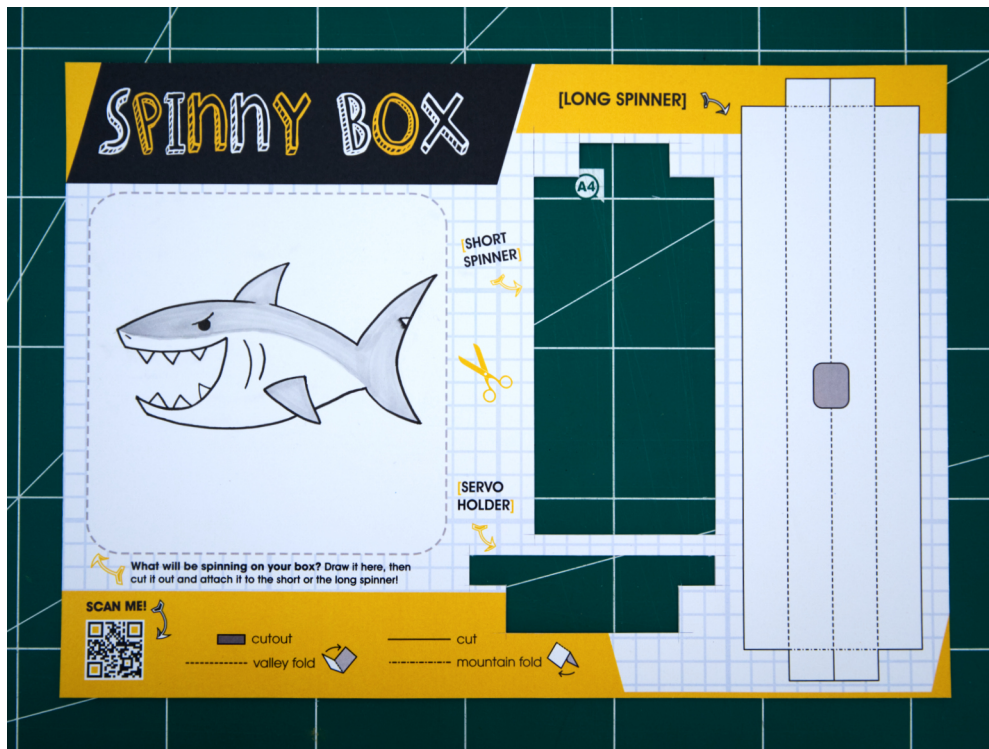
**13**

Glue or tape the servo to the inside the box so the axle sticks out the hole you made earlier. If you have trouble positioning the servo, you can always cut the box open along the side and then tape it shut again after.



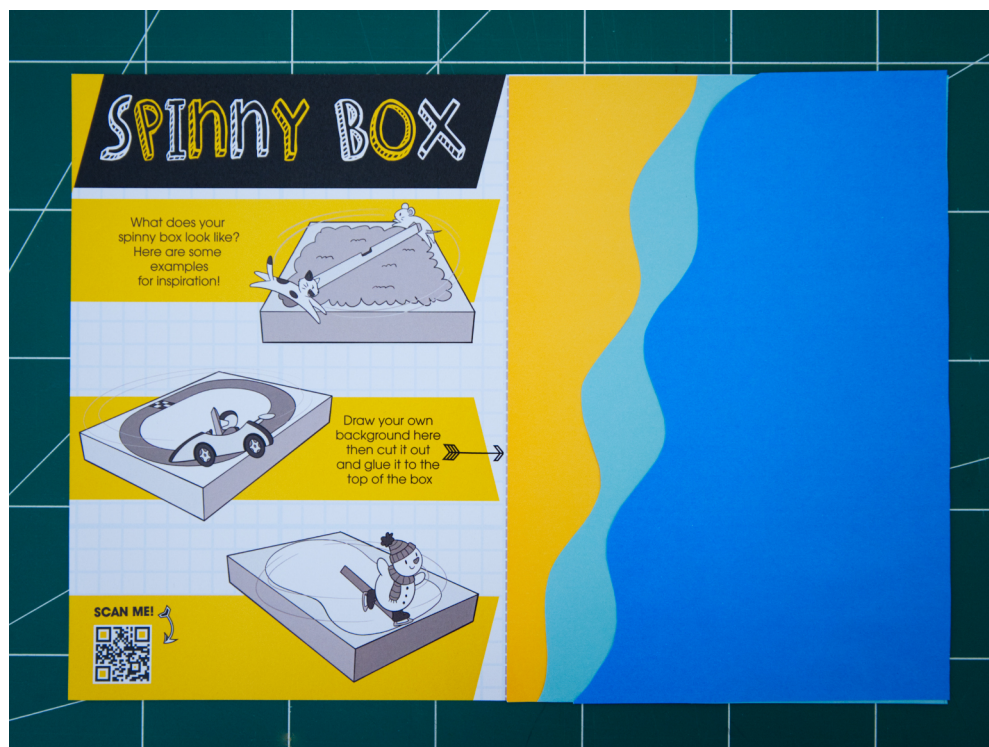
14

It's time to decide what your Spinnny Box will look like! First decide what will be attached to the spinner arm. You can use the empty space on the template to draw it and cut it out.



15

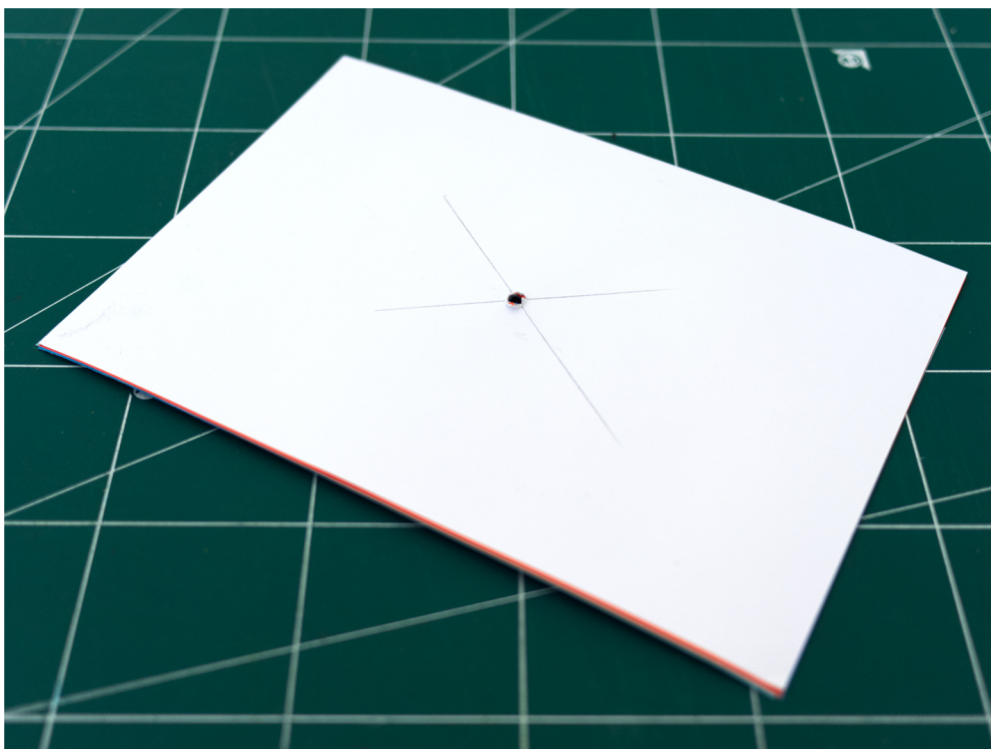
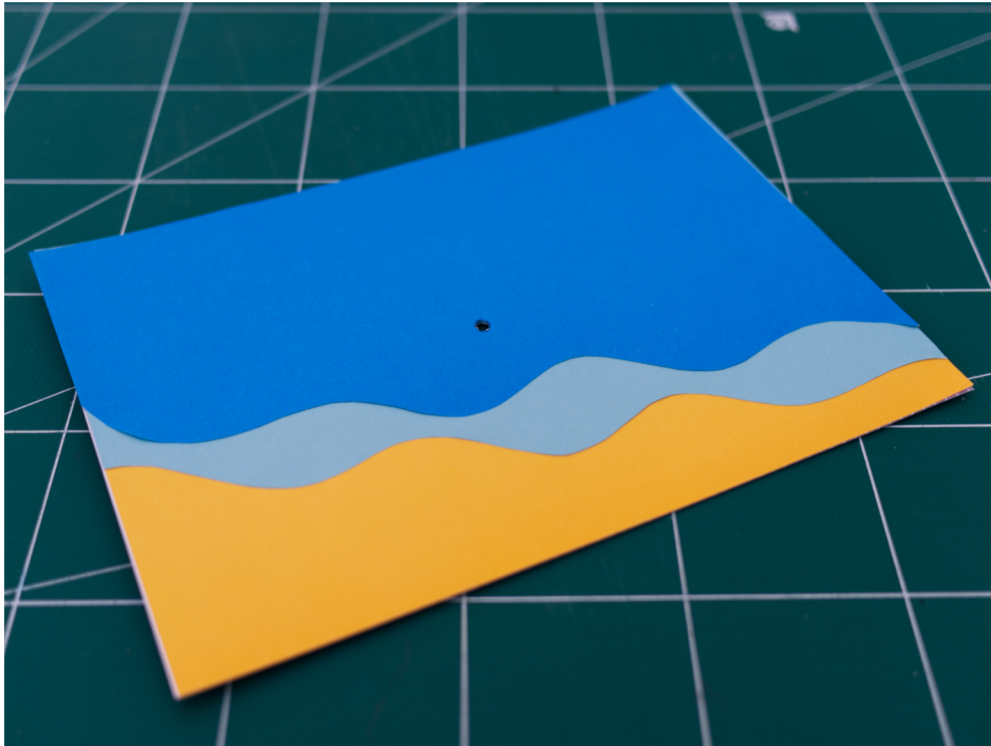
Then, you'll need a background. The white space on the second page of the template is provided for you to draw or color on and glue onto the box. I used paper cutouts to create a beach scene for my shark.



16

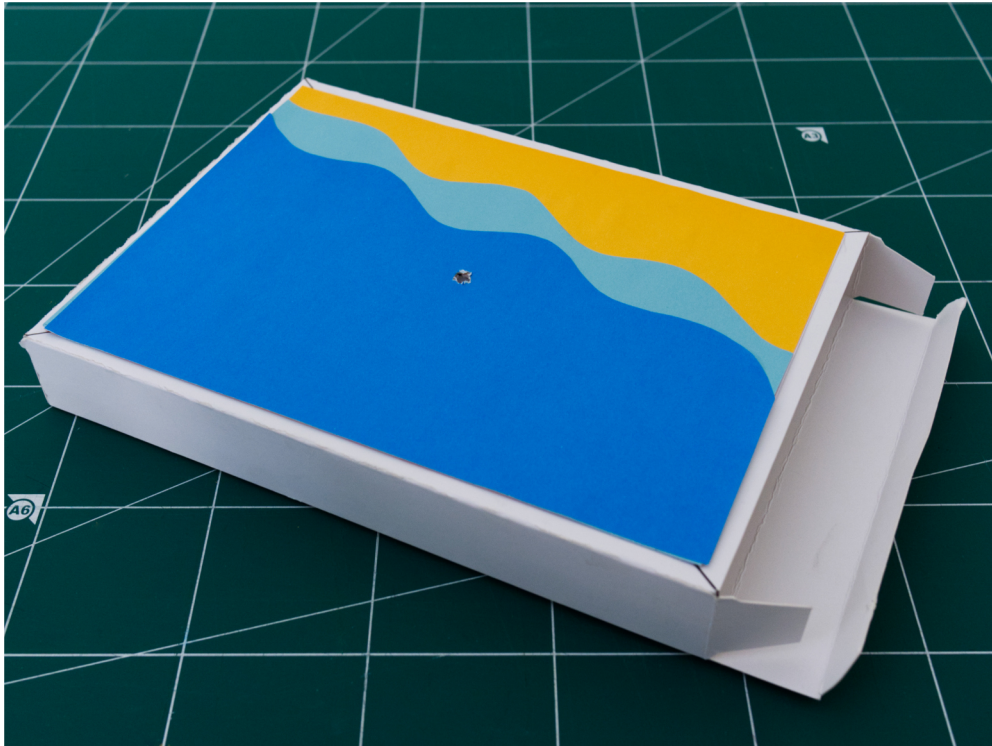
Use the pencil to poke a hole in the background scene (I drew two diagonal lines on the back to center the hole again).

You can also decorate and glue the background scene to the box and *then* poke the hole in it to make sure they're lined up (in other words, do steps 14-17, then go back and do steps 10-13).

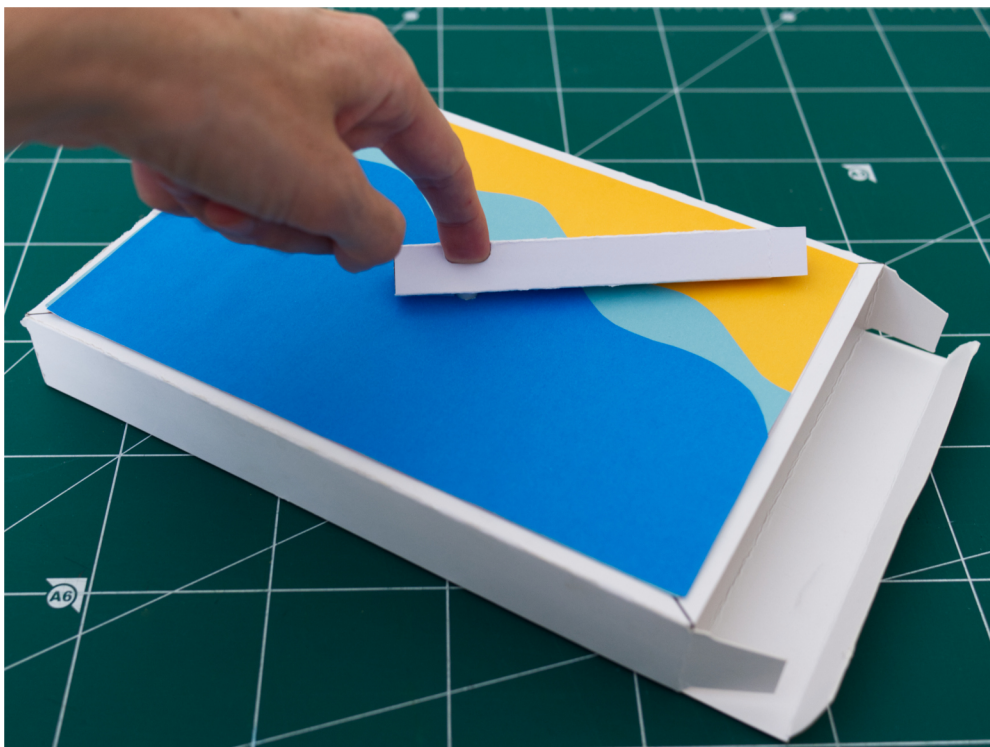


**17**

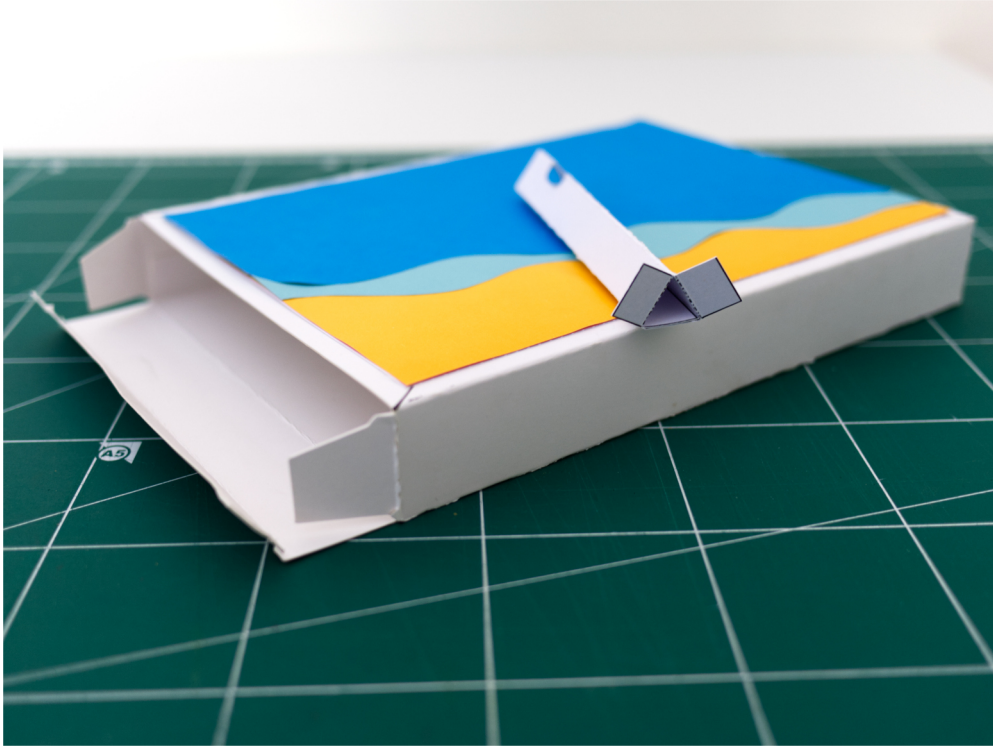
Glue or tape your background scene to the box. You'll note that the provided template is a little smaller than the actual box, so you can always draw on and use a bigger sheet of paper to cover the whole top if you prefer. You can even cover and decorate the sides of the box too!

**18**

Attach the spinner by pressing the servo horn onto the servo axle. The cutout in the spinner is there so you can use your finger or the back of a pencil to push the servo horn down onto the axle.

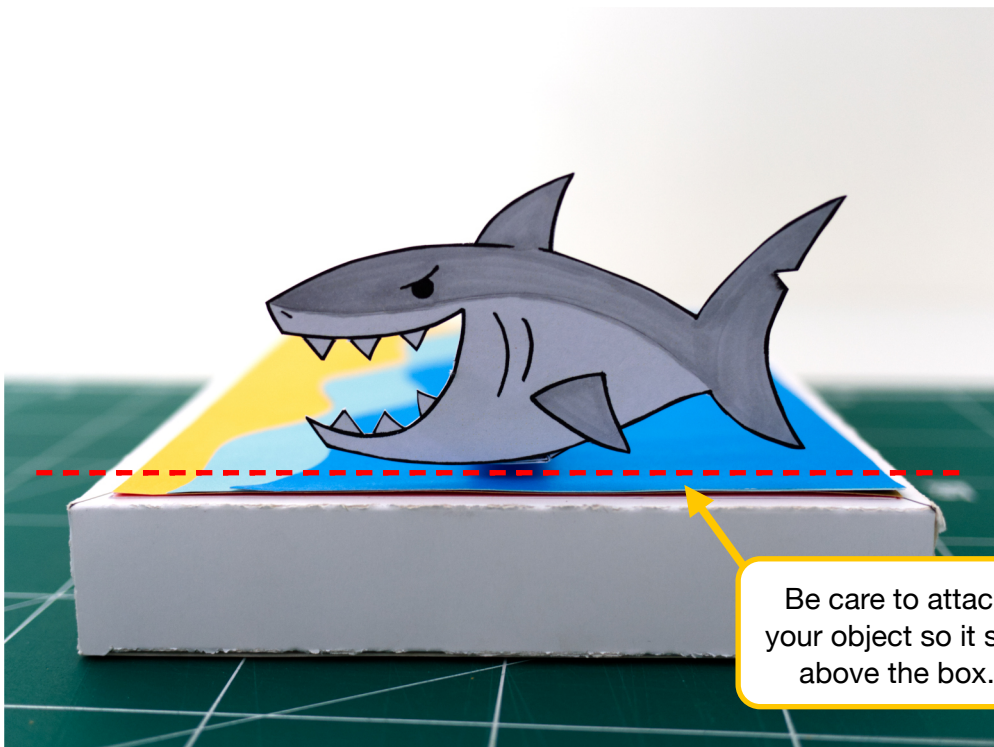


**19** Fold the tabs on the spinner out.



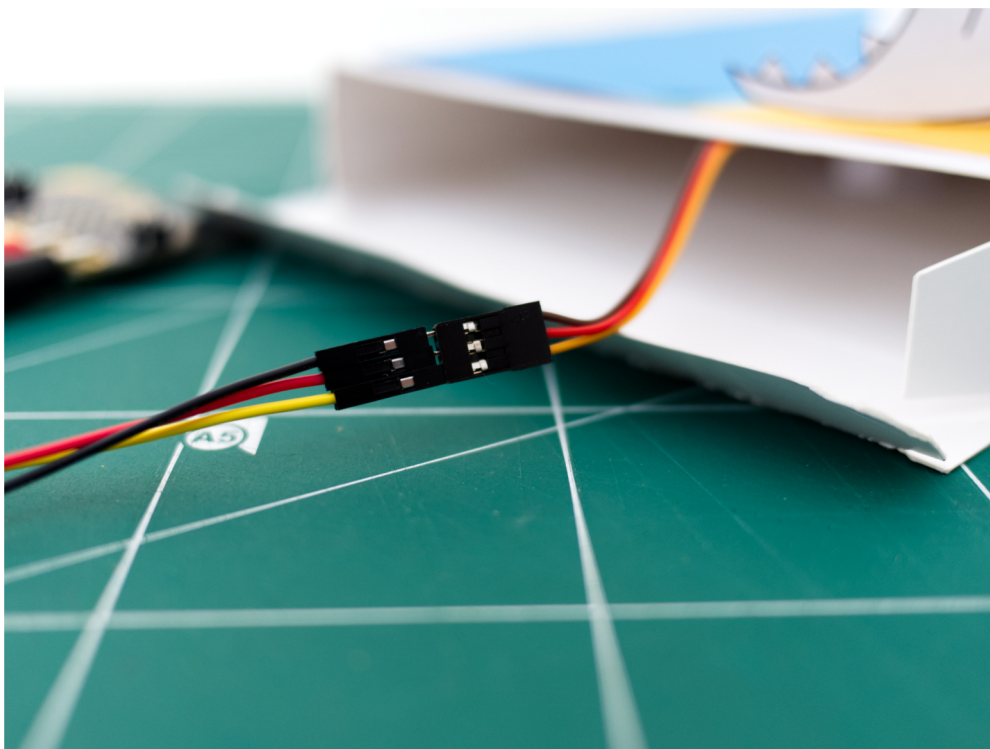
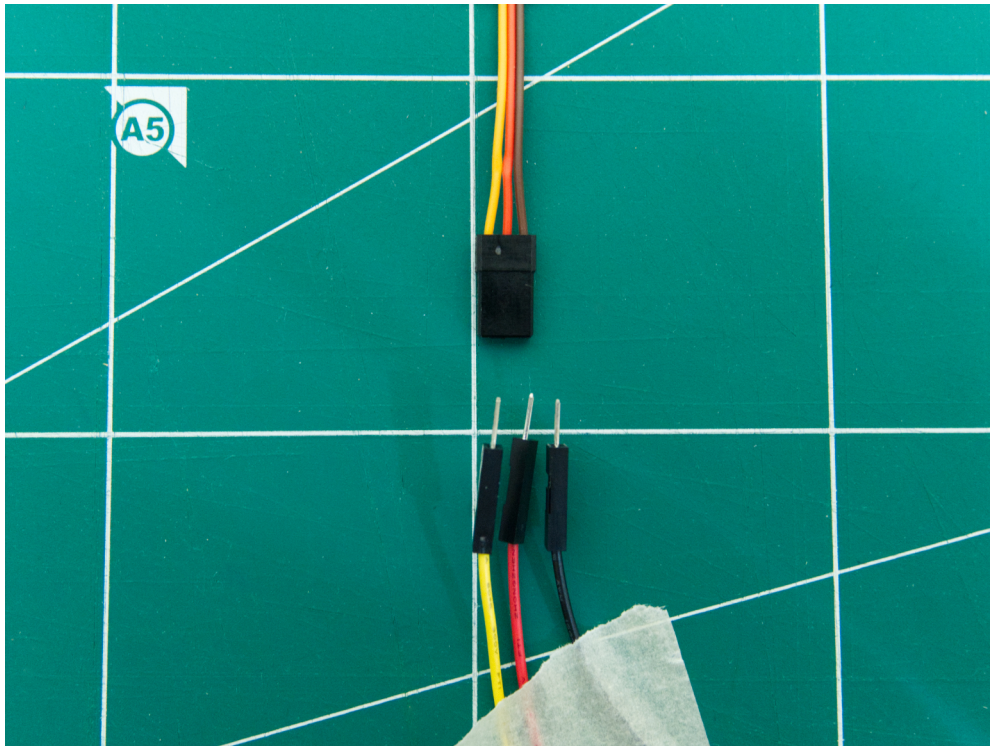
**20** Glue or tape your spinning object to the tabs. If you're using the longer spinner, you'll want to do the same thing for both ends of the spinner.

Note when you attach the object to the spinner that all parts of it sit *above* the box, otherwise it'll get caught when it's in motion.



**21**

Almost done! Now it's time to connect the electronics and program the Spiny Box. Connect 3 of the the crocodile to male jumper pin cables to the servo header. You can use any color of crocodile cables, but if you match the color of the servo wires to the crocodile cables, it will make it much easier to keep track of the connections.

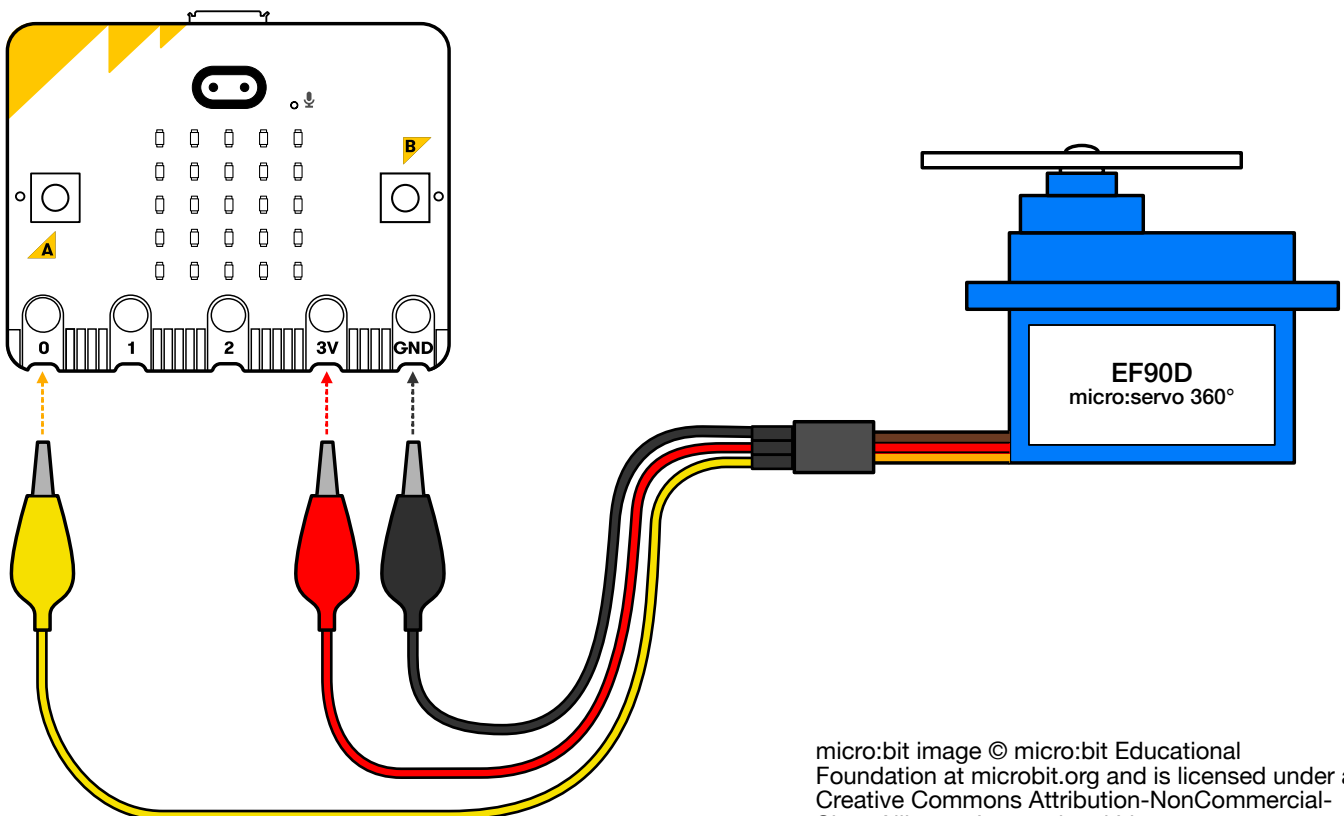
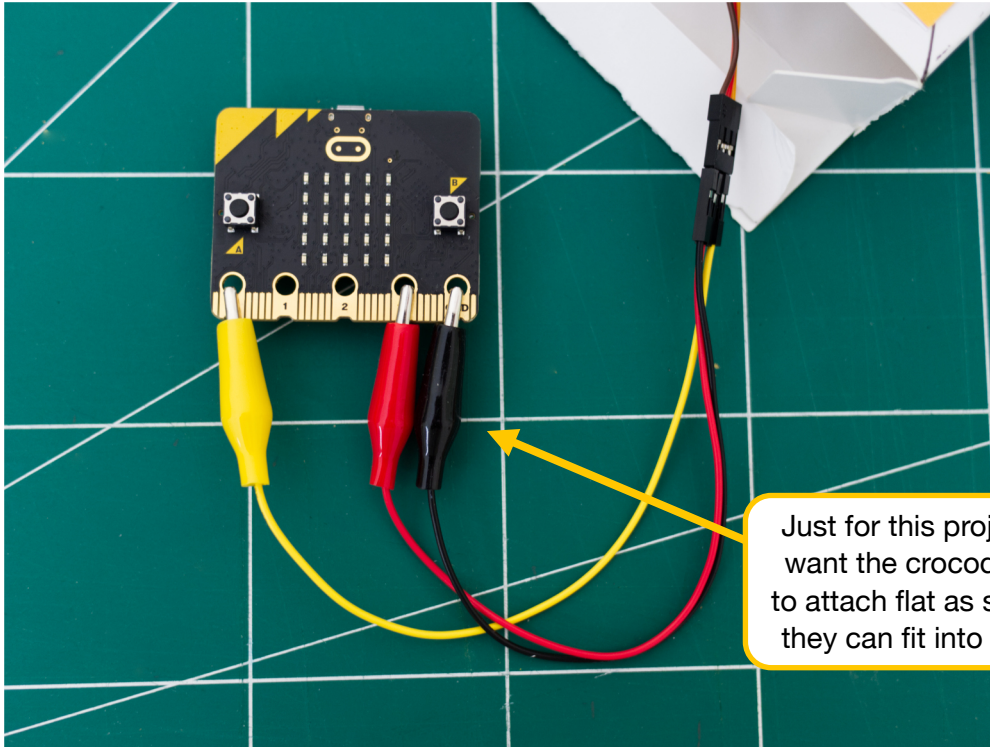




22

Connect the crocodile clips to the micro:bit. Make sure that they are connected as follows:

- Crocodile clip connected to the YELLOW servo wire → micro:bit Pin 0
- Crocodile clip connected to the RED servo wire → micro:bit 3V
- Crocodile clip connected to the BROWN servo wire → micro:bit GND



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**23**

Connect the micro:bit to your computer using the micro USB cord. The cord will be used both to transfer the code and to supply power to the micro:bit and the servo.

**24**

Get the code from here:

[https://makecode.microbit.org/#pub:\\_V047zJEgp2yV](https://makecode.microbit.org/#pub:_V047zJEgp2yV)

You may want to update the code to suit your design.

This number tells the micro:bit how fast the servo should spin and in which direction. The speed goes from 0 to 100% — use a bigger number to make the servo faster or a smaller number to make it slower. If you want it to spin in the opposite direction, delete the "-" (minus) sign.

This number tells the micro:bit how long to wait before it goes to the next line of code, which stops the servo. So a bigger number means the micro:bit will wait longer before telling the servo to stop (so it will spin longer). 4000 ms = 4 seconds. Try changing the number to make it spin for longer or shorter periods.

**25**

Upload the code to the micro:bit using the following instructions (choose in the instructions what type of computer and browser you're using for more specific directions):

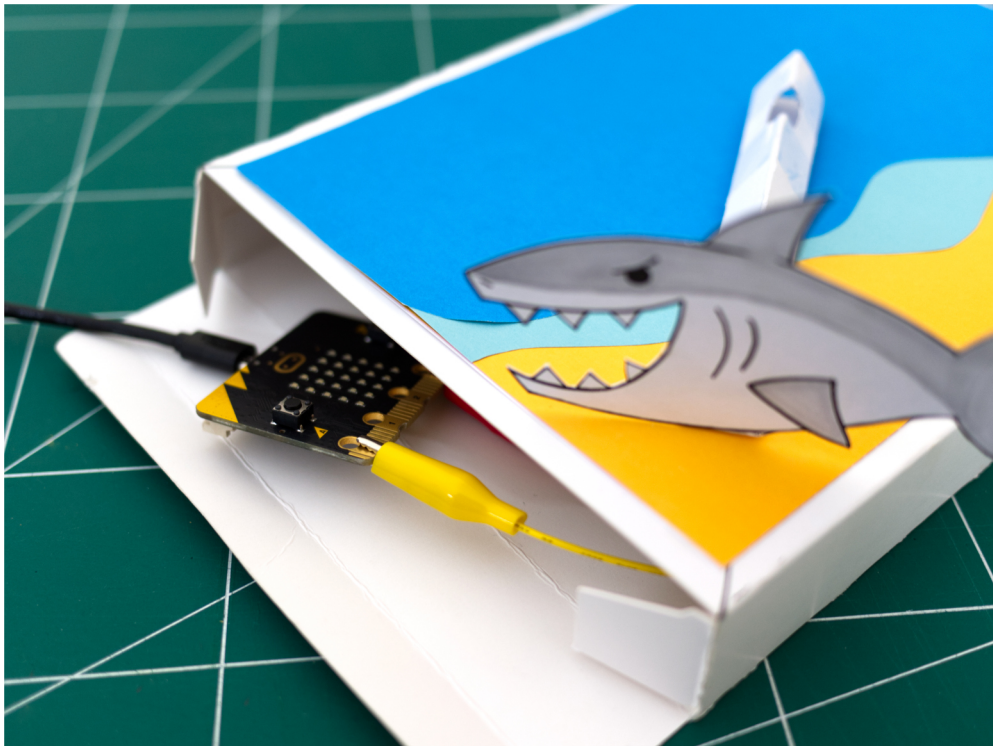
<https://microbit.org/get-started/first-steps/set-up/>

or

<https://makecode.microbit.org/device/usb>

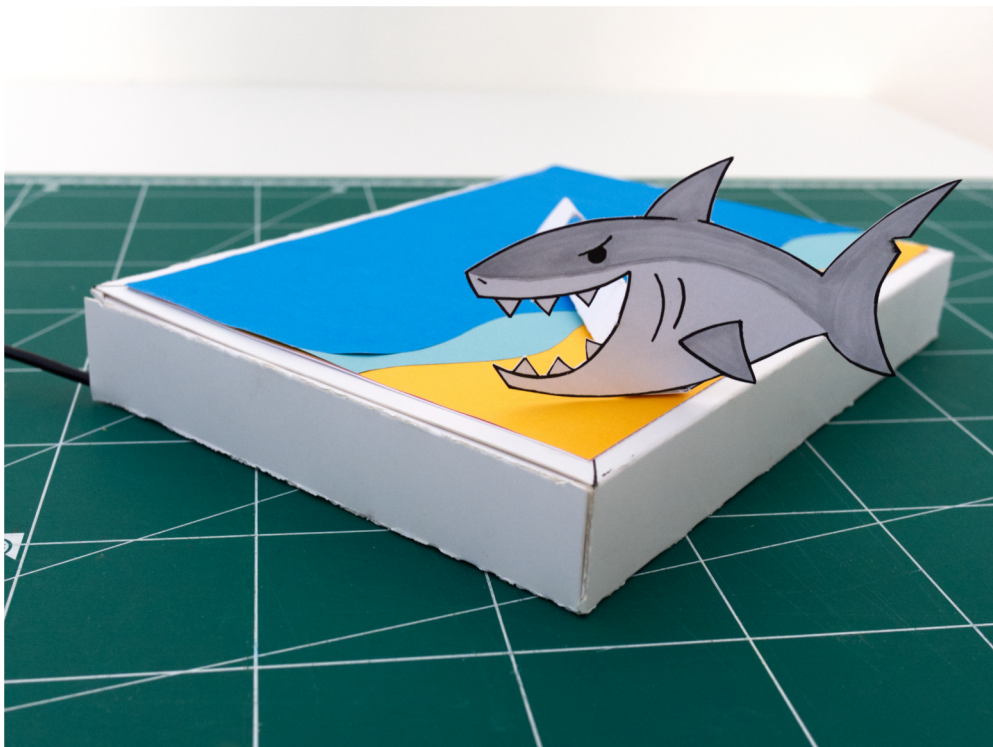
**26**

Now that it's programmed, you can put the micro:bit into the box. I used a small piece of tape so it doesn't move around too much.



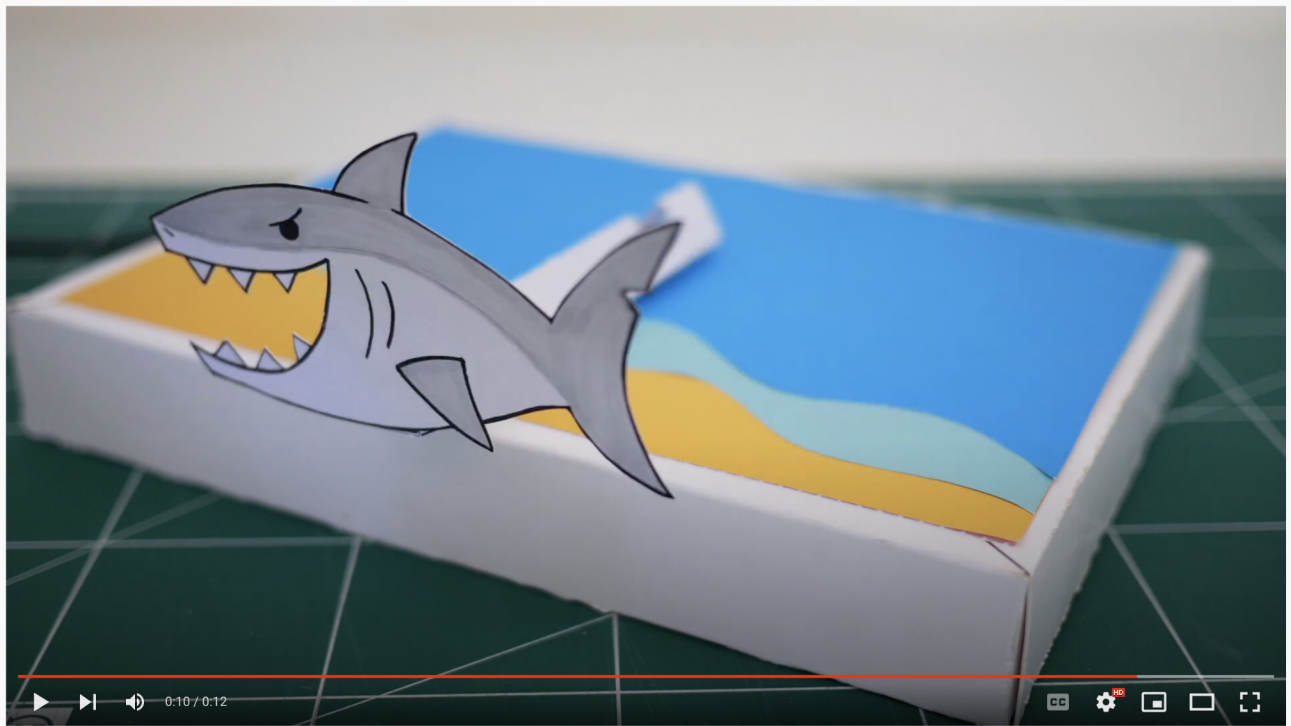
**27**

Close the box so the micro USB cord sticks out of one of the corners.



28

Test it out! Shake the box to make the object spin! Here's a video of it in action:  
<https://youtu.be/l-m-FingmLc>



29

Experiment! Play around with the code to make the spinner go faster, slower, or switch directions partway through. Try making longer or shorter spinners, or seeing what happens if you attach the spinner somewhere not in the center of the box. What other spinning scenes can you create?