

Build a Fidget Spinner

Primary Audience: Elementary, Middle, High School

Description: Learners will be challenged to engineer a fidget spinner. First, we will provide you with a few different designs. Then, use one of the designs provided or create your own to build the best fidget spinner!

A few things you will want to think about:

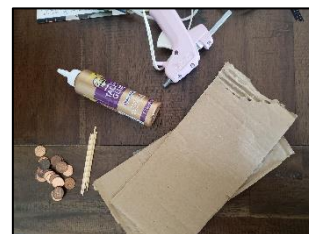
- What supplies do you have on hand?
- How big or small should your fidget spinner be? Will it fit well into your hand?
- What sort of design do you want on your fidget spinner?

Introduction: Below, you will see three different fidget spinner designs. Choose one to try or come up with your own design!

Version 1: Cardboard Fidget Spinner

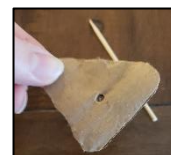
Materials:

- Cardboard - try cutting apart a cereal box, for example
- A toothpick or bamboo skewer
- (Optional) Coins - we used pennies
- Strong glue such as hot glue or PVA glue
- Scissors
- Something to poke a hole in the cardboard (e.g. a thumbtack or the sharp end of that bamboo skewer)



Instructions:

1. First, cut the cardboard body of your fidget spinner. You can choose your shape - see the image to the right for a few examples, or try your own! What shape do you think will work best?
2. Now, you'll need to poke a hole in the center of the cardboard body. The hole should be big enough for the toothpick or bamboo skewer to fit through, and a little wider so that it can spin easily.
3. Cut the toothpick or bamboo skewer - it does not need to be long! Roughly half an inch, but explore different lengths for your design.
4. Carefully glue a coin or a small square of cardboard to one side of the toothpick or skewer. You will need to be patient to let the glue dry before putting the body onto it. Then, slide the body onto the toothpick/skewer.
5. Now carefully glue another coin or cardboard cutout on top. You want to be sure that the glue doesn't stick to the body of the fidget spinner. Hint - try spinning the cardboard while it dries so that the glue won't stick to the body!



- Once dry, your fidget spinner should be functional. Now you can add any decorations or weights to your spinner. Test how well it works! If necessary, make any modifications or improvements.

Version 2: Skate Bearing Fidget Spinner

Adapted from kidsactivities.com

Materials:

- Skateboard bearings
- Duct Tape
- Cardboard or craft sticks (1" x 2.6")
- Washers or other similarly sized weights
- Scissors
- Card stock
- Hot glue gun or a strong glue like superglue

Instructions:

1. Cut two craft sticks in half. You will need three halved sticks. If you do not have craft sticks, use cardboard.
2. You can decorate the sticks as desired with markers, paint, duct tape, stickers, etc! Hint: duct tape wrapped around the sticks will reduce splinters.
3. Glue the craft sticks together in a triangle shape, being sure to place the skateboard bearing in the middle of the triangle and tighten the triangle until the bearing is held in place. Hint: a clip can help hold each joint tightly together while the glue dries.
4. Test to make sure it spins.
5. To improve spinning, you'll want to add some weight to each corner. Glue a washer to each corner.
6. Now test your design!



Other DIY Fidget Spinner Ideas:

- [LEGO Fidget Spinner](#)
- Don't have many supplies? For this [origami finger fidget spinner](#), all you need is one sheet of paper!

Extension: Improve your design:

- What can you do to make it spin faster? Think about how you can reduce *friction* in your design.
- If you weight your fidget spinner (for example, gluing a coin onto each arm), what changes about its motion?

What's Going On?

Remember Newton's First Law, which states that an object at rest will stay at rest and an object in motion will stay in motion unless acted upon by an unbalanced force? The same thing is going on here too, and we can think of it in terms of rotational motion. Your fidget spinner will continue spinning unless acted upon by an unbalanced torque (rotational force). Torques that slow it down could be things like friction and gravity.

Friction is a force that opposes motion when two surfaces are touching. You may have noticed that reducing the friction helps your fidget spinner to spin faster. For example, if you made Version 1 - the cardboard fidget spinner, there is friction between the rotating cardboard body and the toothpick or bamboo skewer in the center. If any glue accidentally got into the hole in the cardboard, there is even more friction, which will reduce the speed of the spinner. Skateboard bearings, on the other hand, are ball bearings. Instead of two surfaces sliding against one another, the balls are rolling against the sides as it spins. This reduces the friction and allows the fidget spinner to spin faster.



Adding *mass* to your fidget spinner by gluing coins or washers to the arms increases its *moment of inertia*. This makes it more difficult for friction to slow down the fidget spinner (because you can more easily change the direction of a lightweight item than a heavy item).

Additional Resources: Reach out the [COSI Department of Science Content](#) if you have any questions or comments.

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