

Harmless Holder Instructions



Here are some of the materials you can use

- corrugated cardboard (approx. 8 ½ x 11 in. [22 x 28 cm]) (corrugated cardboard has grooves in the middle, like a cardboard shipping box)
- duct tape
- 6 full cans of seltzer or juice (12 oz. cans)
- 4 paint stirrers (found in paint supply or hardware stores)
- 1 plastic six-pack ring
- 4 rubber bands
- ruler
- sponges and towels (in case of spills)
- string
- wax paper



Prepare ahead of time

- Have paper and pencil ready to write down ideas and sketches as you design.
- Examine a plastic six-pack ring. What does it look like? Feel like? Does it stretch?
- Put out towels and sponges to use in case you have spills.



Prepare ahead of time (continued)

- Think about how birds, fish, and other animals might get tangled up in a plastic six-pack ring.
- TIP: *To experience how an animal might feel when it can't free itself from a plastic ring, slip a rubber band around your right wrist and try using only your right hand to get it off.*

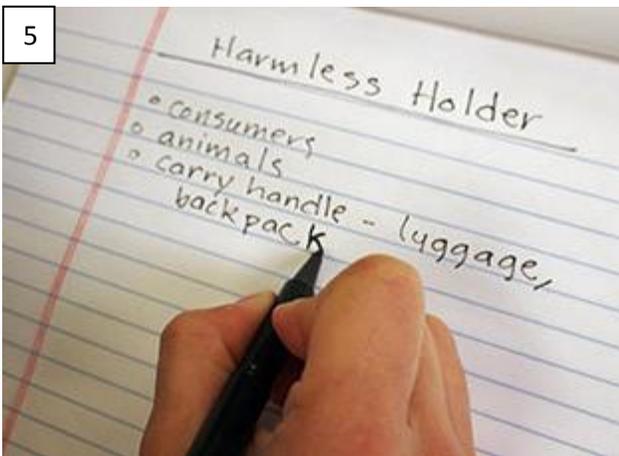
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Think about the challenge

- Is it the plastic material or the shape of the rings that causes the problem for animals?
- Who might use a safe holder? (Consumers and people who care about the environment)
- What containers hold items that are the same size and shape? (Eggs cartons, fruit cartons, tool racks, etc.)
- What are some different kinds of handles used to carry objects? (Lunchbox handles, backpack straps, wheelbarrow handles)
- TIP: *Inventors and engineers work to invent and solve problems to help make the world a better place to live.*

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Think about and write down ideas

- Why are rings made of plastic?
- How will you carry your holder?
- How will your holder secure remaining cans after you take one can out of the holder?
- Will the cans be stacked up or sit side-by-side?
- TIP: *Plastic is strong, waterproof, lightweight, easily molded, flexible, durable, and inexpensive.*
- TIP: *Inventors' and engineers' initial ideas rarely solve a problem. Instead, they try different ideas, learn from mistakes, and try again. This series of steps is called the design process.*

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Look at the materials

- Are any of the materials good for the environment?
- What materials might make a holder that resists the pushes and pulls, or the force, of the heavy cans?
- What will you use to make a strong, comfortable handle?
- How will you attach the handle to the holder?
- TIP: *Paper, string, and wood are materials that are good for the environment because they are biodegradable, that is, they decay over time after they are thrown in the trash.*

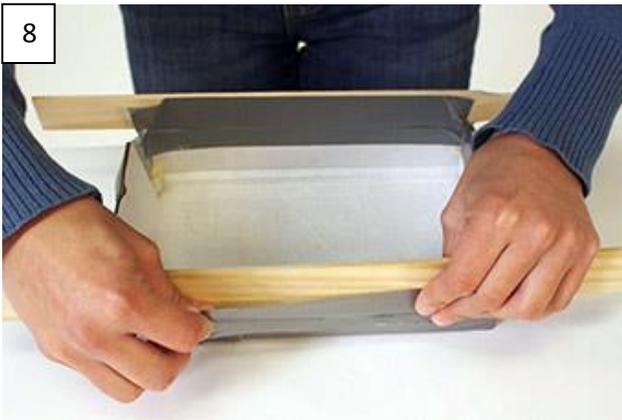
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Design and build the can holder

- Decide on the material you will use for your holder.
- Decide on the size and shape of your holder.
- Measure the materials and build the holder.
- TIP: *If your design doesn't support the weight of the cans, try making the sides or corners stronger with extra cardboard or add a layer of tape.*

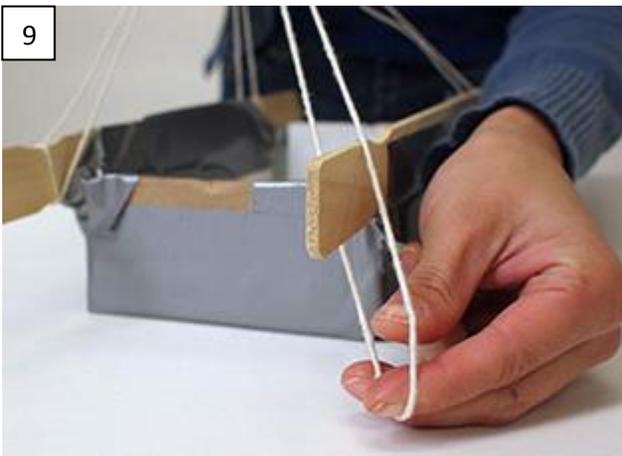
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Design and build the can holder (continued)

- Decide how you will reinforce or support the sides so cans don't fall out of the holder.
- Build the support into the sides.

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Design and build the handle

- Decide what type of handle your holder will have.
- Choose the materials and build your handle.
- Attach it to your holder.

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Load the cans

- Load the cans into the holder.
- Decide how you will secure the cans so they stay in place when you remove a can.
- Secure the cans.

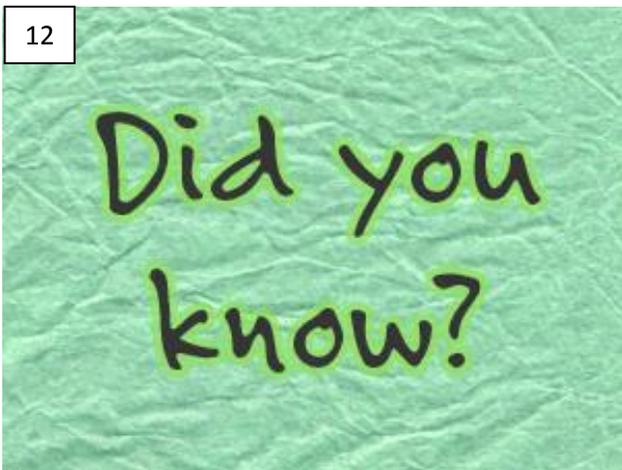
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Test your holder

- Grab the handle and lift the holder.
- Take one can out to test your holder.
- Modify your holder if the cans fall out or the holder collapses. Then test it again.
- TIP: *If your holder collapses when you take out a can, try helping it resist the pushing/pulling force by strengthening the places where parts join together and where the cans put stress on the holder.*
- TIP: *When engineers solve a problem, they try different ideas, learn from mistakes, and try again. Study the problems and then redesign. If things don't work out, it's an opportunity—not a mistake!*

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Did you know?

- **Plastic Fleece Jackets**
Did you know that recycled plastic bottles can be turned into lots of different things—even things you wear, like fleece jackets! Using recycled plastic soda bottles in clothing (about 25 bottles make one jacket) allows manufacturers to use fewer resources, discard less waste, and to help protect people's health.

Scientists, manufacturers, and engineers have given old plastic bottles a whole new life by turning them into all kinds of things, including picnic and park benches, chairs and tables, frisbees, backpacks, stadium seats, shower stalls, and swing sets.



Try this next!

- **Make your carrier consumer-ready.**
Redesign and decorate your can holder so it will catch the attention of and be appealing to you and your friends and to all consumers!