

Pinball Wizard

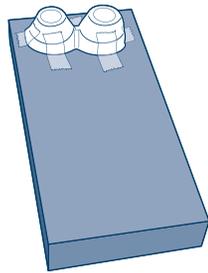


Make a pinball machine that can shoot a marble and send it zigzagging down an obstacle course.

1 Get what You need.

- shoe box top • clear tape • scissors • 2 cups from an egg carton • straws • brass fastener (1/2" or 3/4") • thin cardboard • marble • pencil
- optional: small paper cups, bottle caps, pipe cleaners, markers, aluminum foil, odds & ends

- ## 2 Tilt the box.
- Tape two egg carton cups to the bottom of one end of the box. This creates an inclined plane (a slanted surface) when turned right side up.



3 Design a lever.

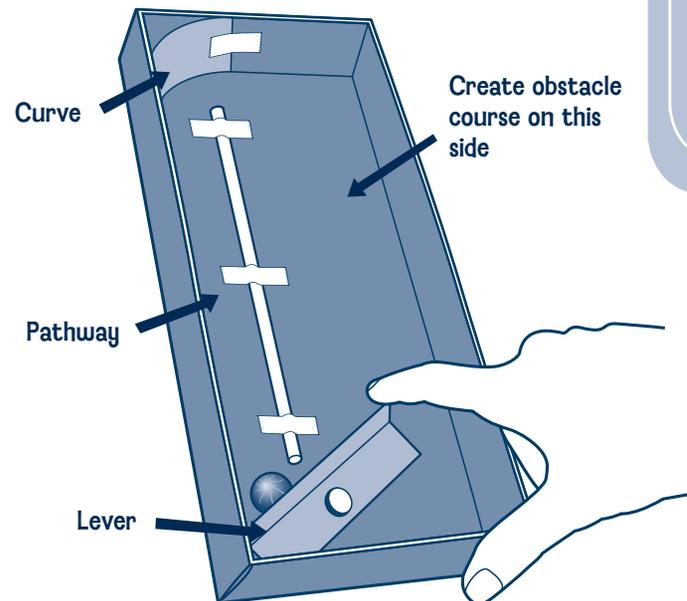
- Fold a 2-inch-long strip of cardboard in half lengthwise to make a lever.
- Position it in the lower-left corner of the box, as shown, so that the lever can shoot the marble.
- Attach it to the box with a brass fastener, poking a hole in both the lever and the box with a pencil.
- Flick the lever with your finger to test if it can shoot the marble. If necessary, shorten your lever or reposition it until it works.

- ## 4 Make a path.
- As shown, tape down a straw to lead your marble to the top of the box.

- ## 5 Add a curve.
- In the top left hand corner, tape a piece of paper to create a curve so your marble rolls smoothly to the right. Test and redesign until it works.

- ## 6 Build an obstacle course.
- Lead your marble to the bottom of the box by taping pieces of straw at different angles (these are inclined planes). Work from the top to bottom, testing as you go.

- ## 7 Get creative.
- Add curves, arches, or tunnels using cups, paper, tin foil, and anything else you can think of!



Chew on This

Your pinball machine was built using two kinds of simple machines: a lever and an inclined plane. The lever shot the marble to the top of the box with lots of force. The inclined planes made the marble wind its way down to the bottom.

Did you notice how much testing it took to get your pinball machine to work the way you wanted it to? Testing and experimenting are a big part of being a scientist and engineer—that's how brilliant solutions and great discoveries happen!

Dig Deeper

Take it outside. Make another pinball machine, this time using materials from nature to construct the obstacle course (rocks, twigs, leaves, etc.). Build a nature trail for your marble!

Magical marble tour. Send a marble on a long, crazy journey! Place some books under two legs of a table so that the surface is tilted. Your goal is to make a winding maze that leads the marble from the highest to the lowest point. Use books, cardboard, paper towel tubes, straws, paper cups, and tape.

Did You Know?

Pinball machines are mechanical wonders that launch a steel ball on a wild ride around a colorful table full of flashing lights, bells, buzzers, and flippers. The golden age of the pinball machine was in the 1950s and 1960s. Kids used to play them in penny arcades and amusement parks. But once video games became popular, pinball machines became an endangered species. Today, only one company still makes them.



Watch **FETCH!** on PBS KIDS GO! (check local listings) and visit the **FETCH!** Web site at pbskidsgo.org/fetch.



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Fold

Fetch!

Pinball Wizard

The **FETCH 3000**, my trusty computer, just crashed! I can't run the show without it! Even worse, I can't play video games without it! What's a high tech hound gotta do for a little fun around here? Hmmm . . . I've heard about an ancient game people played before we had computers—a pinball machine. Build one, and let's find out what this primitive contraption can do!

GOOO FETCH!

