

Pythagoras Cup

Make your own Pythagoras cup and trick your friends with this disappearing water act!

Ages: 9 - 16

30 minutes - 1 hour

Adult Supervision

The Pythagoras cup is a fun example of a siphon, a device that uses gravity to drain a container of liquid. As the cup is filled with water, the short end of the straw starts to fill up, reaching the same height as the water in the cup. Once that water level reaches the bend at the top of the straw, some of the water begins to drain down the long end of the straw due to the pull of gravity. At this point, the straw begins to act like a siphon: the draining water in the long end of the straw creates an area of low pressure at the bend in the straw. The weight of the water in the cup can now push more water into the straw, and this water rushes towards the low-pressure area, up and over the bend in the straw and out of the bottom of the cup. Once this cycle has begun, the siphon will actually drain out all of the water in the cup.

Legend has it that Pythagoras, the Greek mathematician who came up with the Pythagorean theorem for right triangles, invented the Pythagoras cup to encourage moderation when drinking wine. The Pythagoras cup will work like a regular cup as long as it isn't filled to its brim, but if a greedy person over-fills the cup, the siphon kicks into action and spills the entire contents of the cup onto the drinker.

MATERIALS

- Plastic cup (3)
- Push pin
- Scissors
- Bendy straw
- Hot glue / hot glue gun
- Plastic cup lid (straw slotted)
- Water
- Food coloring (optional)

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STEP-BY-STEP TUTORIAL

- Step 1**
Cut the end of the straw nearest the bend on a 45 degree angle. Then, cut the tip off of the pointy side. Tip: Depending on the size of your plastic cups, you may also want to cut your straw shorter. Make sure you are cutting the end furthest from the bend if you are shortening your straw.



- Step 2**
Bend the straw.



- Step 3**
Using the push pin, make a small hole in the center of the bottom of one of the plastic cups. Then, widen it using your scissors. The straw should just fit in the hole.



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- 4) **Step 4**
Push the straw through the cup so that the bendy end of the straw is inside the cup. Then, hot glue the flat end of the bendy side of the straw to the bottom of the plastic cup.



- 5) **Step 5**
Turn the cup upside down and seal the space around the straw with hot glue.



- 6) **Step 6**
Place the clear plastic lid on top of the second cup.



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7)

Step 7

Then, carefully place the first plastic cup on top of the lid so that the straw goes through the hole in the lid.



8)

Step 8

Now you are ready to experiment with your Pythagoras cup! Fill the third plastic cup with water and begin to pour it into the top cup. What happens if you fill the cup below the straw? What happens if you fill the cup above the straw? Tip: Add food coloring to the water to see the trick better!



After you have made your first Pythagoras cup, try modifying it to make a trick cup to fool your friends! Instead of using a second cup to catch the water, cut the straw so that it is flush with the bottom of the first cup and ask your friends if they'd like a drink!

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The experiment can be connected to sustainability, net zero, and circular economy principles by demonstrating the importance of balance and resource management. In the experiment, when too much liquid is added, the siphon mechanism forces the cup to empty, symbolizing the consequences of overconsumption in a linear economy. This mirrors how unsustainable resource use leads to environmental damage, while a circular economy focuses on maintaining balance through reuse, recycling, and regeneration of materials. Additionally, the cup's ability to self-regulate and stop overflowing parallels the net zero concept, where the goal is to achieve balance between emissions and reductions, preventing excess environmental harm. The closed-loop function of the siphon can represent the circular economy's aim to keep resources in use as long as possible, minimizing waste and promoting sustainable resource flow.

SOURCE

<https://www.kiwico.com/diy/stem/motion-mechanics/pythagoras-cup>

KiwiCo was founded to nurture children's creativity and problem-solving skills through hands-on projects, making it easier for parents to provide enriching activities. The company simplifies the process of building, exploring, and creating together by designing fun and educational experiences that foster creative confidence. With a growing team of designers, experts, and kid testers, KiwiCo aims to equip children with the skills they need to face future challenges. Founder and CEO Sandra, an engineer and mother of three, created KiwiCo to inspire curiosity and exploration in families.