



15-minute STEAM: Two Types of Toy Tops



Tops are one of the oldest and most beloved toys. Clay tops have supposedly been found in the Middle East dating all the way back to 3500 BC and wooden tops in Egypt from as early as 2000-1400 BC. These toys are the epitome of “timeless”. No one knows exactly how old it is, but it's definitely been around for thousands upon thousands of years

Top with CD & bottle cap

- CD
- Strong Glue
- Small plastic cap
- Marble
- Optional: Permanent markers or Chalk markers

1. Decorate your CD. Use chalk markers or permanent markers to draw various designs on the shiny sides.
2. Turn your decorated CD over and use your strong glue to glue a marble into the center hole of the CD. You can place the CD on a lid or bowl to hold it in place while gluing.
3. Turn your CD right-side up and glue a plastic cap to the center of the top of the CD
4. Once the glue is dry, use the plastic cap to spin your top and start exploring physics!

Top with wooden dowel & wooden toy wheel

- Wooden Toy Wheels
- Marble
- Wooden Dowel
- Strong Glue
- Various Colors of Sharpies

1. Use permanent markers to color the toy wheel
2. Add some strong glue to the end of the wooden dowel and insert into the center of the wooden wheel.
3. On the opposite side of the wooden wheel, add a generous amount of glue and place a marble in the center of the wheel
4. Let them dry for at least 2 hours (if not longer)

The Science

So what makes a top spin and eventually wobble and tip over? All kinds of forces are at play!

The science behind spinning tops is actually very complex. Here's a very simplified version as to what's going on: When you spin a top into motion, you're applying a force that converts the top's potential (stored) energy into kinetic energy, or energy of motion. The top eventually stops spinning because of friction and gravity. The surface below the top provides friction, eventually causing the spinning to slow down, and the top begins to wobble. As it begins to wobble, the top tilts, allowing gravity to pull it over

As it spins in its upright position, it rotates around an invisible vertical axis. The principle of conservation of angular momentum holds that the top would keep spinning indefinitely if there were no other external forces acting upon it.

However, that is not the case. Tops are never perfectly balanced and weighted. Moreover, the surfaces they spin on aren't perfectly level either. These imperfections allow other forces, including friction and gravity, to come into play.

When it's spinning, a top balances on a tiny tip. This minimizes the amount of friction generated by its contact with the surface below it. Eventually, though, friction will begin to slow the top's spin. When this occurs, the top begins to wobble, demonstrating a scientific principle called precession.

As it begins to wobble, the axis of the top tilts to the side, which allows the force of gravity to exert a force known as torque on the top. The effect of the torque is to create additional spin while also causing the top to precess (swing) outward. As the top's spin continues to slow, it precesses faster in an attempt to conserve its total angular momentum. This is why the wobbling gets worse right before it falls and comes to a stop.

Taken in part from buggyandbuddy.com/cd-spinning-top & icanteachmychild.com/worlds-best-spinning-top



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