

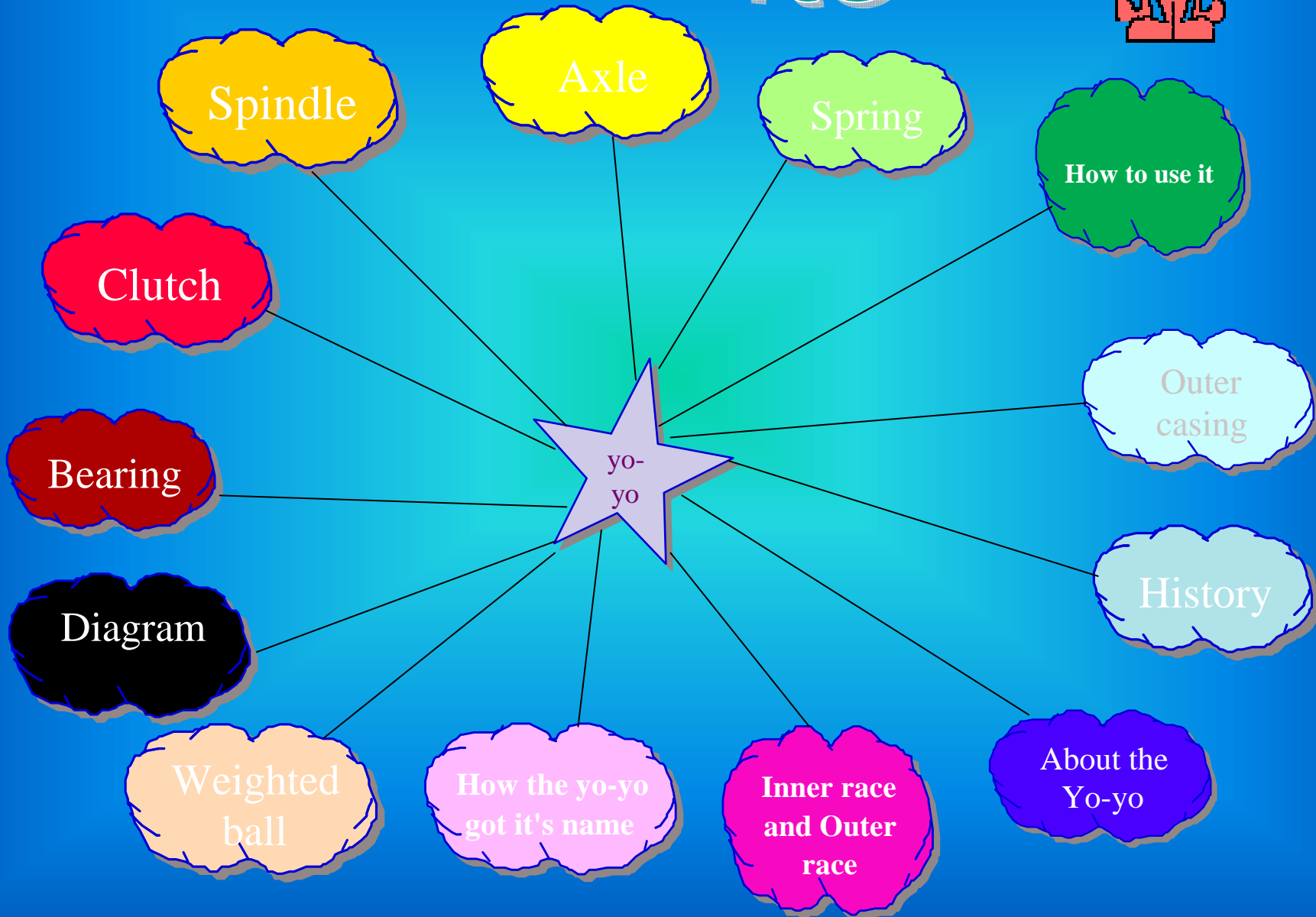
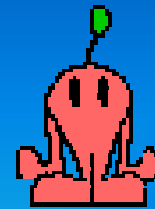
# Techno Challenge 2005

Yo-yo



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On the surface, the yo-yo is an incredibly simple toy. It's really nothing but a spool attached to a length of string. But in the right hands, it can be something extraordinary: An accomplished yo-yoist can send the yo-yo flying out in all directions, make it hover in mid air, then snap it back into his or her palm. Ordinary string and wood (or plastic) are brought to life. When the yo-yo reaches the end of the string, it can't fall any further. But, because it has a good deal of pointed momentum, it will keep spinning. The spinning motion gives the yo-yo **gyroscopic stability**. A spinning object resists changes to its axis of rotation because an applied force moves along with the object itself. If you push on a point at the top of a spinning wheel, for example, that point moves around to the front of the wheel while it is still feeling the force you applied. As the point of force keeps moving, it ends up applying force on opposite ends of the wheel -- the force balances itself out. This phenomenon keeps a yo-yo's axis perpendicular to the string, as long as the yo-yo is spinning fast enough.

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# History



This toy is a lot more elaborate than the terra-cotta yo-yos of ancient Greece, but it has the same basic appeal. Yo-yos continue to be so popular because of their wonderful simplicity. There's some undefinable magic about taking an ordinary spool and, with nothing but a flick of the wrist, turning it into an active, spinning top. No matter what advanced mechanisms are added to yo-yos, this simple joy will be the heart of their appeal. It is believed that the yo-yo most likely originated in China. The first historical mention of the yo-yo, however, was from Greece in the year 500 B.C. These ancient toys were made out of wood, metal, or painted terra cotta disks and called just that, a disc. It was customary, when a child turned of age, to offer toys of their youth to certain gods. Due to the fragile nature of the material, it is presumed that the disks made of terra cotta (clay) were used for this purpose rather than for actual play. A vase painting from this time period shows a Greek youth playing with a yo-yo. Such vases, as well as an actual terra cotta disk can be found in the National Museum of Athens, Greece. The yo-yo is one of the most popular and enduring toys of all time. The ancient Greeks were playing with them more than 2,500 years ago, and there's some evidence that the Chinese had developed similar toys before that. In any case, the yo-yo has demonstrated phenomenal longevity -- it's older than any other toy except the doll.

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# How the yo-yo got it's name



The word "yo-yo" and the modern yo-yo design come from the Philippines. Unlike the original Chinese and Greek yo-yos, Philippine yo-yos (the word means "come come" or "come back" in the native Tagalog language) had the ability to "sleep." This unique toy may have been an adaptation of the Chinese yo-yo, or it may have developed out of a Philippine **hunting weapon**. In any case, it dates back at least a few hundred years in the region. In the 1920s, a Philippine immigrant named **Pedro Flores** decided to bring this yo-yo design to the United States. He achieved some success right away, and in 1929, he sold his company to a businessman named Donald Duncan. Duncan trademarked the name "yo-yo" and, over the next few decades, built his company up into the premiere yo-yo manufacturer.

Duncan's competitors released similar products, under several different names (including "twirler" and "whirl-a-gig"). But the public adopted the term "yo-yo," leading the rival companies to challenge Duncan's trademark. In 1965, the Federal Court of Appeals ruled that the term had become generic, and so could be used by anyone. In the same year, the Duncan company went bankrupt, selling the Duncan name to the Flambeau Plastics Company, which still sells Duncan-brand yo-yos today.

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# Spindle



As in the ball-bearing yo-yo we looked at in the last section, this yo-yo design does not let the string touch the axle directly. Instead, the string is wound around a **spindle** piece. The axle, which is mounted to the two halves of the yo-yo, runs through the middle of the spindle, but the two pieces are not actually connected. The spindle and axle will move in unison when the yo-yo spins slowly, however, thanks to the yo-yo's clutch mechanism.

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# Spring

The clutch mechanism, which is housed inside one of the yo-yo discs, consists of two metal **spring-loaded arms**. These arms are weighted at one end and connected to the body of the yo-yo at the other end. When the yo-yo is stationary or spinning slowly, the springs press the arms up against the spindle, so the spindle's rotation turns the entire yo-yo. But as the yo-yo speeds up, centrifugal force pushes the weighted ends of the arms outward, against the springs. The arms release the spindle, so that the spindle and the rest of the yo-yo move independently.

# Clutch

The new yo-yos use a **centrifugal clutch** to make it easy for the yo-yo to sleep. The string is attached to a spindle, and the spindle is free to spin on the axle. Inside one half of the yo-yo is the clutch. When the yo-yo is not spinning (or is spinning slowly), the clutch clamps onto the spindle and holds it. When the yo-yo is spinning fast enough, weights in the clutch are thrown outward and the spindle is free to spin on the shaft. As the yo-yo slows down, the clutch weights move inward again, grab the shaft and the yo-yo returns. The yo-yo automatically knows when to stop sleeping based on the speed it is spinning!

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# Inner race and Outer race

The bearing assembly consists of two **races**, essentially grooved tracks for ball bearings. The inner race immediately surrounds the axle and the outer race is spaced a bearing's width apart.

The ball bearings are positioned between the two races. The yo-yo string is looped around the outer race, so it never touches the axle itself.

The races are not bound together: The inner race can tilt slightly inside the outer race.

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# Axle



In the modern yo-yo, there is less friction between the string and the axle, since the string is only looped around the axle. When the spool completely unwinds, it will not automatically grip the string -- it will simply spin freely. To get the yo-yo to **rewind**, the yo-yoist jerks on the string a little bit. This tug briefly increases the friction between the string and the axle so that the axle starts rewinding the string. Once it starts rewinding, this sort of yo-yo will return to the yo-yoist just like the older design. In the original yo-yo design, the string was secured to the axle. In the modern design, the string is only looped around the axle, allowing the yo-yo to "sleep."

The ability to make the yo-yo spool spin on the end of its string, or "**sleep**," made yo-yoing a much more interesting challenge. Yo-yoists try to keep the spool sleeping while making shapes with the string and swinging the yo-yo around them. Another trick is to "**walk the dog**" -- let the spinning spool roll along the ground before pulling it back in.

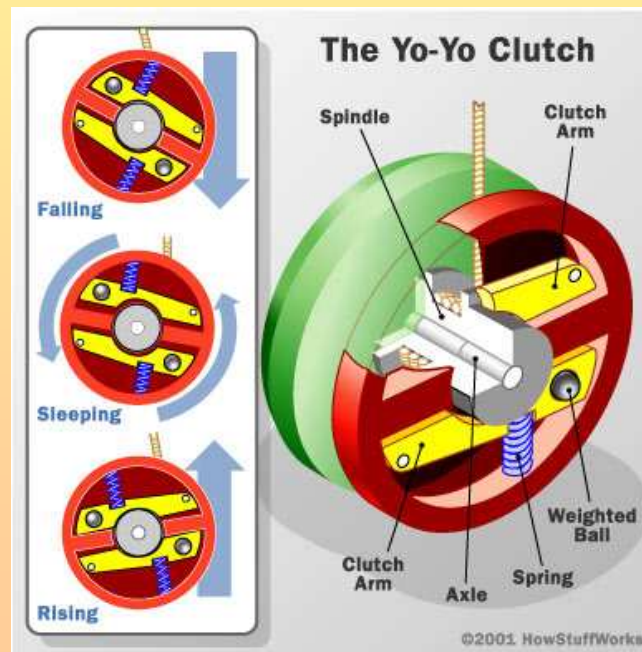
# Outer casing

The outer case is the part outside the yo-yo, the pretty bit that we see. It usually has attractive pictures on them to make people like the yo-yo. The picture is usually painted or stuck on. The pictures are pictures that are popular characters or just a fancy cover. All of them are different colours.

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# Weighted Ball 🤖

The weighted ball is a ball which makes the yo-yo balance. It is next to the spring.



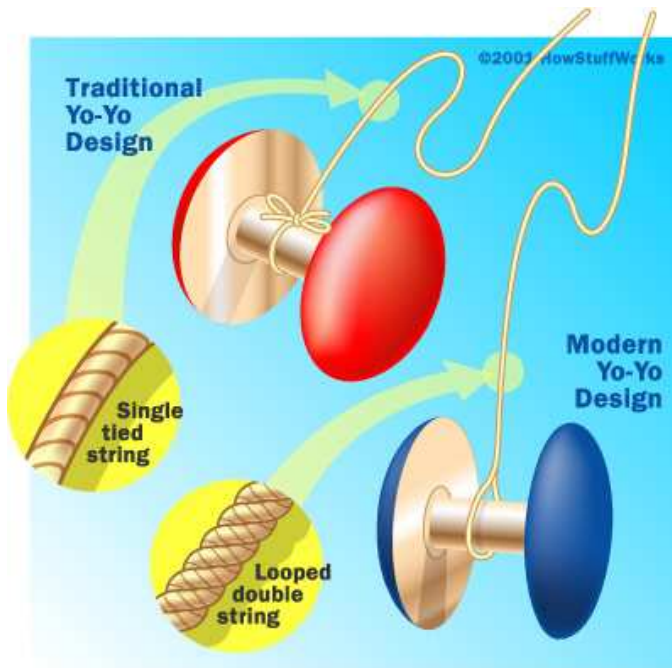
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# Bearing

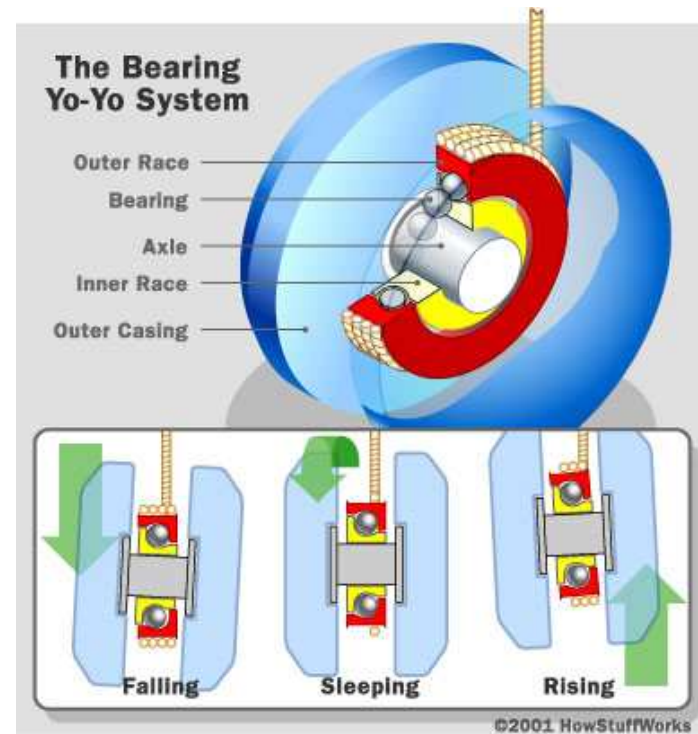
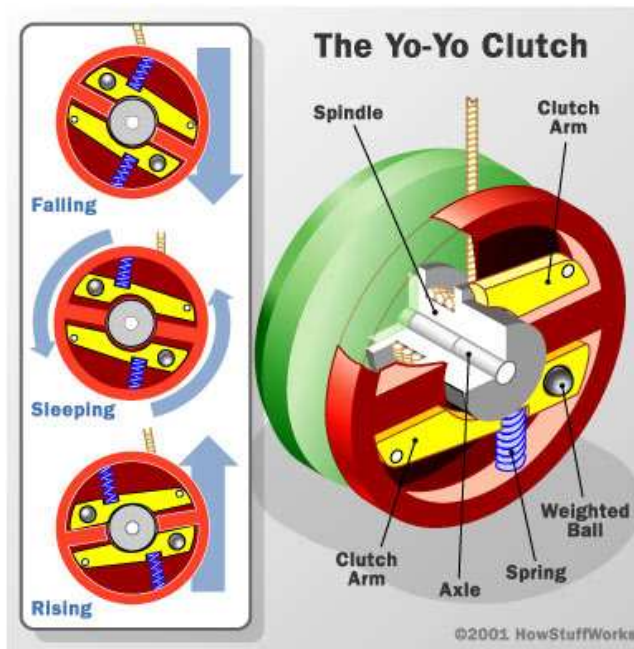


Bearing are mechanical device for decreasing friction in a yo-yo in which a moving part bears—that is, slides or rolls while exerting force—on another part. Usually in a bearing the support must allow the moving part one type of motion, for example, rotation, while preventing it from moving in any other way, for example, sidewise. The commonest bearings are found at the rigid supports of rotating shafts where friction is the greatest.

Bearings were invented early in history; when the wheel was invented. It was mount on an axle where the wheel and axle touched was a bearing. The bearing slides or rolls while exerting force—on another part.



# Diagrams





# How to use it



1. Wind the yo-yo up.
2. Put your index finger through little hoop on the string.
3. Let go of the yo-yo when you're ready.
4. When the yo-yo nearly touches the ground, pull it up a little bit.
5. Then the yo-yo will go back down.
6. Continue to do this until the yo-yo stops going down.
7. If you like start again and continue the fun.
8. Then when you become an expert of playing the yo-yo, try and learn some yo-yo tricks.



← Inside yo-yo



Yo-yo case ↗

# Pictures



## Resources:



- [www.google.com](http://www.google.com)
- [www.howstuffworks.com](http://www.howstuffworks.com)

Thankyou for watching our power point presentation and we hope that you have learnt something about yo-yos.☺