

Tricky toy

Materials

- Craft knife
- Chopping board
- Bouncy ball
- Paper
- Scissors
- Sticky tape



Instructions

1. Use the craft knife to carefully cut the bouncy ball in half.
2. Place one half-ball on a flat surface, round side down, and push down one side of the ball. Notice that it wobbles back into a stable position.
3. Using the paper, scissors and sticky tape, make a cylinder that fits snugly around the half-ball. It should be about 10 cm long.
4. Tape the cylinder onto the ball with the ball poking out one end of the cylinder.
5. Use the scissors to cut pieces off the cylinder until the cylinder stands up straight when you let go of the ball.
6. Knock over the cylinder and it should bounce back up.
7. Drop the ball on a table and watch it bounce around before it bobs back up.

What happens?

The half-ball tends to wobble back into a stable position when it is pushed because of gravity. The most stable position for the half-ball is when the weight of the ball is as low as possible. The cylinder adds weight to the ball and it falls over to become more stable, with the weight of the cylinder as low as possible. When the cylinder is cut shorter, it becomes lighter. When it is short enough, the most stable position is with the paper standing up straight and the weight of the half-ball as low as possible.

Why does it matter?

Gravity is a force that pulls down on objects all the time. An object, or a person, will fall over unless it is in a stable position. The centre of gravity of an object is the centre of the object's weight (or more correctly, the centre of its mass). It is the point where the weight on one side is equal to the weight on the opposite side, and this is true in all directions, in all three dimensions. The centre of gravity of an object tends to move as low as possible unless it is supported by a sufficiently strong and wide support base. For example, a sky scraper might have a lot of mass, but it is stable

because the mass is supported by a very heavy and strong support base in the foundations of the building.

Related activities

Decorate the paper cylinder in the tricky toy to make it look like a wobbly clown.

Try doing the same activity using different materials, such as feathers attached to half a tennis ball.

Another method of making a wobbly toy uses plastic eggs that are available in craft shops around Easter time. You need the type of egg that can be pulled in half. Add something heavy such as plasticine to the bottom half of the egg, put the egg back together and it will wobble up like the toy in this activity.

Play with wobbly toys like 'Weebles'.

Test how stable you are when you are standing in different positions: standing on tippy toes (high centre of gravity and small support base) compared to standing with feet wide apart and knees bent (low centre of gravity and wide support base), and standing on one leg compared to standing on two legs.

Build towers with blocks and discuss which support bases give the most stability.