

Basics of Gravity and Balance

We understand gravity in its simplest form as a force that pulls objects back down to earth. If you throw something into the air, it falls back down. We also know that to keep something from falling, you have to hold it up. In other words, exert a force that opposes gravity.

But sometimes, even if we hold them up, objects tip over and fall to the ground. Try balancing a pencil on the edge of a ruler, for example. So what's going on here?

Let's find out, with a simple experiment.

Let's Get Started!

You will need a few items that can be found around the home for this experiment.

- An empty Soda can
- A small funnel or jug that can be used to fill the can with water
- A hard surface such as a bench top or work table

Now try to balance the empty can on its edge, as you see in the image.

Can you balance it? Possibly for a few seconds, yes, but then it tips over, doesn't it?

Now fill the can to about a third of its height with water, using a funnel or jug so you don't make a mess. Then try again.

Does it work? Try reducing and increasing the amount of water in the can, until you get it to balance. If you're patient, it will balance!



What Have We Learned?

The Earth tries to pull everything down towards its centre. This pull is called the force of gravity. We can resist it by applying an opposite force - that's what you do when you something or throw it up in the air.

But what about balance? Why did the Soda can balance when we put some water in it? This is because of something called the "centre of gravity" of an object. It has to do with the object, not with the earth that exerts a gravitational force.

Have you tried balancing a pencil on your finger or the edge of a ruler? It's difficult, but if you get the exact mid point (like a see saw) it will balance. This point is called the **centre of gravity** of the pencil. That is the point on which gravity pulls down, so if you can support it exactly at that point, it will balance.

It's the same with the Soda can. When it is empty, the centre of gravity is somewhere near the middle of the can (*the blue arrow in the image*). As you can see, that's not near the point where the can is supported by the table (*the red arrow*), so it tips over.

When you put some water in it, the water is heavy and the result is like having an adult sitting on one side of a see saw and a child on the other - the balance shifts. In this case, it shifts towards the bottom of the can (*the yellow arrow*). So if you fill it with the right amount of water, it will balance.

What will happen if the can is full? Try it. Does it balance?

