

Balancing Tricks

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IF you have ever tried to balance your exercise book on your finger tip you must have found out that there is one and only one point at which the object can be balanced. The point through which the resultant of the weights of all the particles of the body acts is called its Centre of Gravity. An object can be balanced if it is supported directly under its centre of gravity.



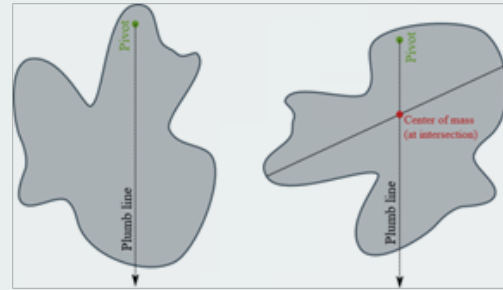
A tightrope walker never simply walks across the rope. Some stretch their arms out or carry a long stick. Others crouch down or bend their knees. Still others ride bicycles with weights dangling some way beneath them. These balancing aids help to give tightrope walkers more control over their center of gravity. If they can keep their center of gravity directly above the rope at all times, they will never fall off. If they start moving to one side, a turning force will start to topple them in that direction. So they have to quickly move a part of their body to the other side to make a turning force in the opposite direction and restore their balance.

Here are a few simple activities which you could perform at home to help you understand the concept of centre of mass or centre of gravity and how it further helps to balance the objects.

Center of mass of an object

A simple way to find the center of mass of an object is through the use of a plumb line. Suspend the mass from each vertex and trace the plumb line's location. Since the center of mass

will fall below the suspension point the center of mass will be at the intersection of all of the plumb lines.



Balancing stick

We unconsciously balance objects every day, but rarely think about the conditions that must take place to achieve balance. Try this activity and find out an object's Centre of gravity by balancing a stick.

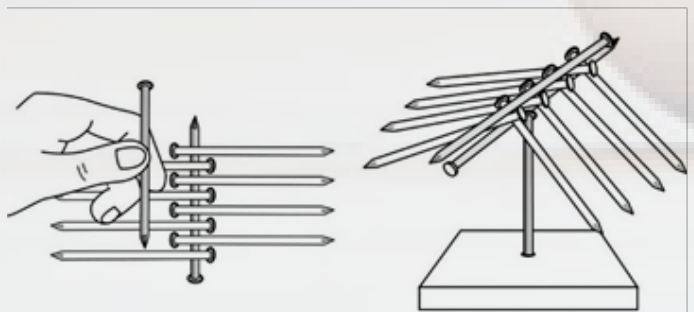
Simply hold your hands out in front of you about two feet apart. Stick out your index fingers, as if you were pointing at someone and lay the wooden stick across them. When you try to move your fingers closer together, the one that is carrying less weight will slide more easily. This finger will continue to slide more easily until it gets closer to the center of gravity than the other finger, at which point the situation will reverse and the other finger will begin to slide faster. Your left and right fingers simply alternate moving until they meet at the center of gravity, where both fingers support equal weight.



Balancing nails

When an object is balanced, it is in a state of equilibrium. Any forces on the object are balanced by forces in the opposite direction.

To perform this balancing act, you need ten long nails with big flat heads. Lay one of the nails on a steady surface.



Then lay seven of the remaining nails across it. Lay the ninth nail on top. Carefully hold the ends of the bottom nail and lift slowly. You can now easily balance all nine nails on top of the tenth. The entire set of nails balances comfortably due to the weight of the inclined nails on both sides of the base nail, the weight of the entire set-up acts below the balancing point.

Balance an egg on its end

It sounds impossible, but is quite simple when you use a little science and make use of household things.



Make a small pile of salt on a hard and smooth surface. Place an egg carefully on the salt. Then blow the excess salt away. The trick is that the egg is supported by unseen salt crystals which make a good base for the egg to balance on. With a little bit of patience, you could even balance an egg on a smooth table.

Balance a stick on the tip of index finger

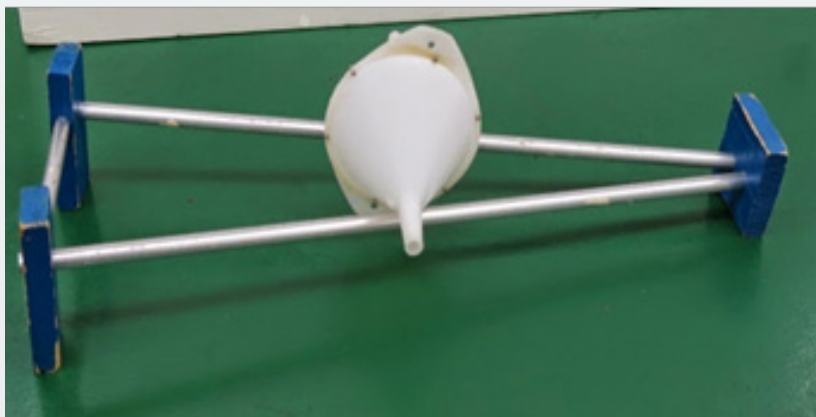
Cut a length of wire that is slightly longer than the stick. Wrap the wire around the stick twice or thrice, about an inch away from the end of the stick. Holding the stick and wire in place, bend the left arm of the wire over the top of the stick. Do the



same with the right arm of the wire. Now arc the two ends of the wire downward slightly and fix the washers at each end. Take the stick and try to balance on your index finger. Adjust the wire closer, its curve, or the position of the washers. Once you get the position right, you'll be surprised how easy it is to balance.

Double cone climbs up inclined rails by itself

An object tends to roll down an inclined plane, with increased speed if friction or other conditions allow this, because the force of Earth's gravitation is applied to the object and pulls it downwards to the lowest point possible. But can an object,



without any external or internal source of energy, climb up an inclined plane by itself?

Try this activity to demonstrate that the center of gravity of objects always tends to the lowest point possible in order to reach rest.

Take two plastic funnels and stick together with adhesive tape to make a double cone. Make a sloping track using



aluminum pipe and wooden block. Place the double cone at the lower end of the frame; surprisingly it will automatically start to roll upward, giving the impression of defying the universal law of gravitational force.

This happens because the diverging structure enables the center of gravity of the double cone to go down while at the same time the double cone itself climbs up the rails. In this case the center of gravity of the double cone is lowered more by the diverging structure than it is raised by the climbing process.

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