BALANCING NAILS

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BALANCING NAIL PUZZLE

Find the center of gravity as twelve nails find precarious stability on the head of just one nail. The object of the challenge is to balance all of the nails on the head of a single nail. All of the nails have to be balanced at the same time and cannot touch anything but the top of the nail that is stuck in the base. The key is finding a way to keep the nails held together, then positioning them on their center of gravity or balancing point.

Materials
- 13 nails
- Hammer
- Board

EXPERIMENT
1. Firmly place one nail into the center of the board. Place the block flat on a desk or table and try balancing the remaining 11 nails on the head of the standing nail. Be creative! But don't cheat by using things like magnets, glue, gum, spit, etc.

NOTE: To win this challenge, all 11 nails must balance exclusively on the single standing nail. None of the eleven nails may touch the wood block, the desk or table, or anything else that might help hold them up. No additional equipment other than the wood block and the nails may be used. Impossible? We'll show you how it's done! The key is to arrange the nails so all of their mass is evenly distributed and they can be supported on one point. Ready?
2. Lay any nail flat on the table with the head on either the right or left side. This is nail #1. Hook the head of nail #2 over #1 so that it is next to the head of #1. #2 is perpendicular to #1. Nail #3 also hooks over #1 but points in the opposite direction as #2 and is also perpendicular to #1. The heads of #2 and #3 should be separated by about the width of nail #1. Continue laying the nails in alternating directions, leaving one nail aside. When you have done this, you should have five nails on one side and four on the other.

3. Nail #11 is laid on top of all the heads but points in the opposite direction as #1. Nail #11 rests nicely between the heads of the nails you just hooked to #1.

4. Use two hands and carefully lift all the nails by holding the ends of #1 and #11 together. Now, use the center of the group and balance all 11 nails on top of the lone standing nail. It might take you a couple of tries, but trust us… you'll get it!

**HOW DOES IT WORK?**
The trick to balancing the nails is in locating their balance point. Gravity pulls an object toward the Earth as if all of the object's weight were concentrated at one point on the object. It's called the center of gravity or the center of mass (if gravity is uniform). As you'd expect, an object falls over when its center of gravity is not supported. For balanced, symmetrical objects like a baseball or a meter stick, the center of gravity is exactly at the center of the object - inside it. For objects that are not symmetrical, like a baseball bat or a hammer or your glom of nails, the center of gravity is closer to the heavier end and can sometimes even be outside the object. In this trick the stability of the nails depends on the center of gravity of the glom being right at or directly below (that is, outside of) the point where they touch the lone standing nail. Add more nails to the left side or the right side and not the other side, you'll move the center of gravity in that direction or away from its support. The mass becomes unstable and falls off the lone nail with a crash!
HERE IS WHAT YOU NEED

HAMMER
13 IDENTICAL NAILS
WOOD BLOCK
1. Hammer the nail into the center of the base.

This is what it will look like.
TRY TO BALANCE A NAIL ON THE SINGLE BRAD HEAD

TRY TO BALANCE THE REMAINING NAILS ON THE SINGLE BRAD HEAD
PLACE THE LAST NAIL ON TOP WITH ITS HEAD GOING IN THE OPPOSITE DIRECTION AS THE BASE NAIL.
5
Now it's time to balance the nails on the stand.