



BRIDGE ENGINEERING CHALLENGE

Challenge Goal: To design and build a freestanding bridge that can hold weight.

How do engineers design bridges?

1. Ask questions: Where is the bridge being build? What materials would be used? What kind of natural phenomena must the bridge withstand?
2. Determine the types of loads or forces the bridge is expected to carry. This means traffic loads from trains, cars, bikes, or natural loads from wind, rain, snow, earthquakes, rivers, and more.
3. Calculate the largest anticipated force from all those possible load combinations using mathematical equations.
4. Brainstorm different design ideas, model those ideas and test!

Instructions:

Using materials of your choice, build a bridge that can stand on it's own and hold weight. If you're looking for an extra challenge, build a bridge without using adhesives to hold it together.

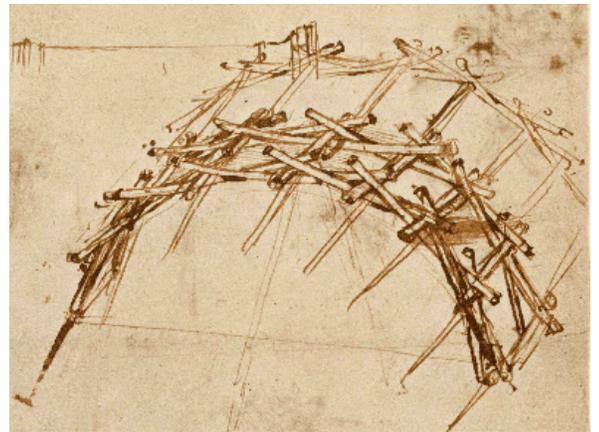
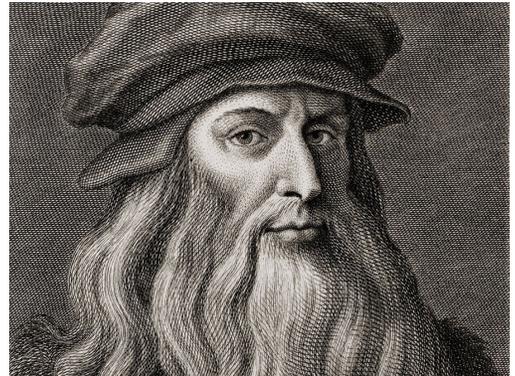
Materials:

A variety of materials can be used to build a bridge. Here are some examples: chopsticks, pencils, blocks, popsicle sticks, rubber bands, glue, tape, and more.

DA VINCI BRIDGE

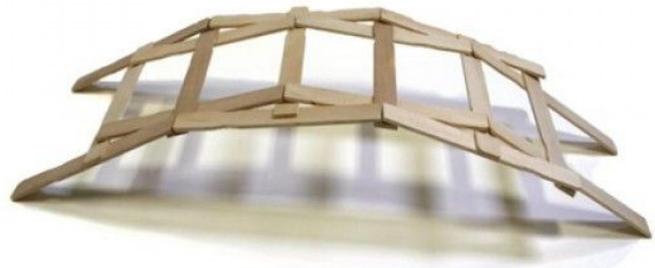
What is a da Vinci bridge?

Leonardo da Vinci was an artist, architect and engineer who combined intelligence, skill and imagination into his impressive arts and inventions. In 1502, da Vinci proposed his design for a 919' bridge that had an arch tall enough to allow sailboats to pass below. It was stable enough to withstand lateral motion, or forces acting on the sides of the bridge like during an earthquake. Although his bridge wasn't build and his original sketch was lost for centuries, the design shows a deep understanding of geometry and forces.



How does a da Vinci bridge work?

A series of wooden poles and beams, no nails, screws or other fasteners, hold the bridge in place. Instead, friction and gravity where the poles connect increases the stability of this self-supporting bridge.



ENGINEERING DESIGN PROCESS

Ask:

What kind of materials are you using to build the bridge?

What kind of forces does it need to sustain?

Imagine:

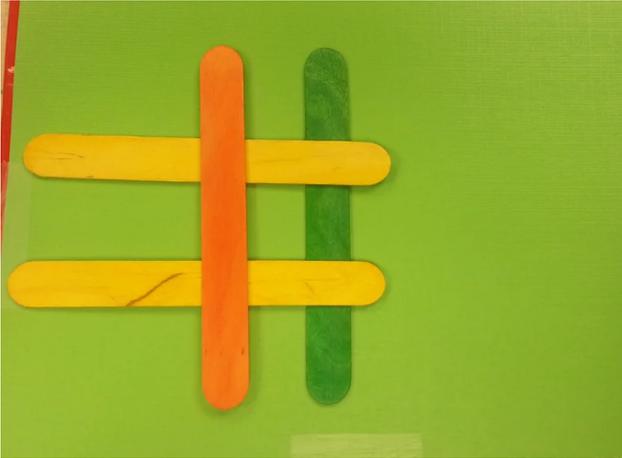
Sketch your bridge design.



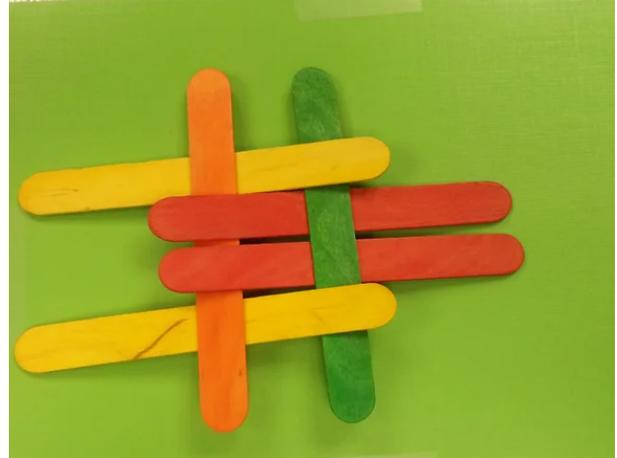
POPSICLE STICK DA VINCI BRIDGE

Follow along with these steps if you would like to try to make a popsicle stick da Vinci bridge!

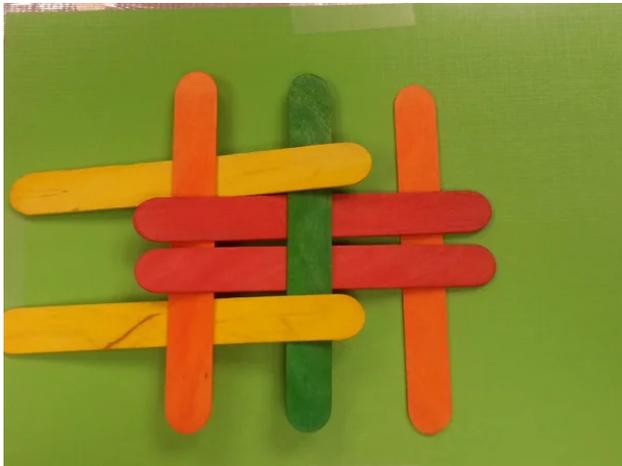
Step 1: Four sticks



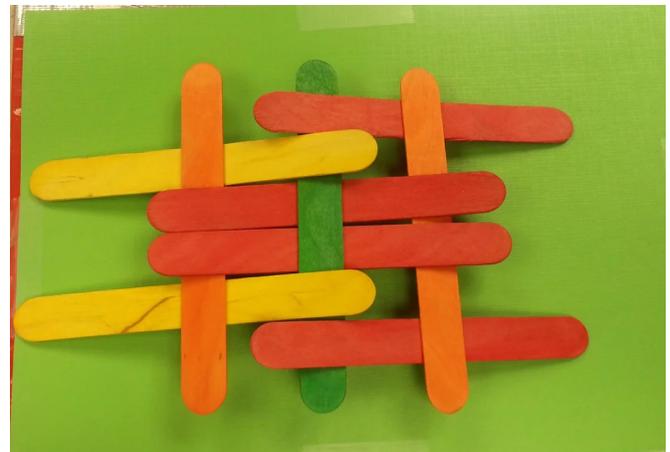
Step 2: Add sticks 5 & 6



Step 3: Add stick 7



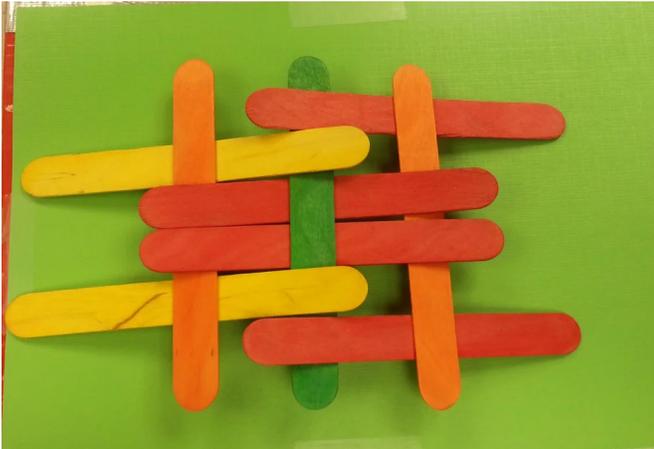
Step 4: Add sticks 8 & 9



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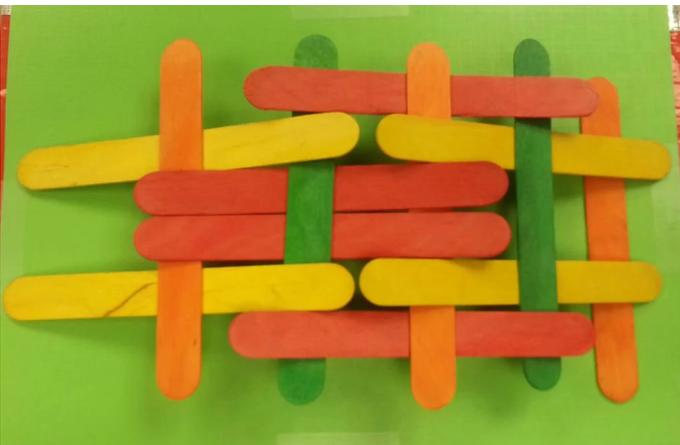
Step 5: Add sticks 10 & 11



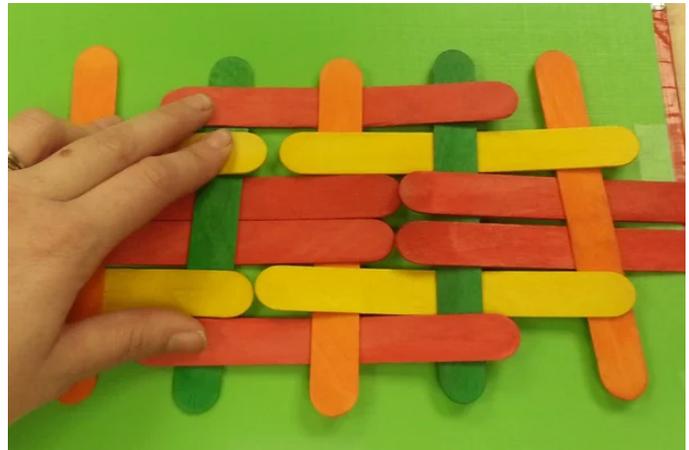
Step 6: Add stick 12



Step 7: Add stick 13



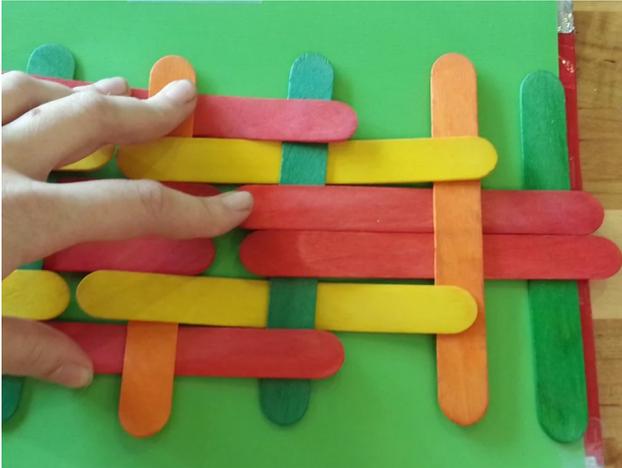
Step 8: Add sticks 14 & 15



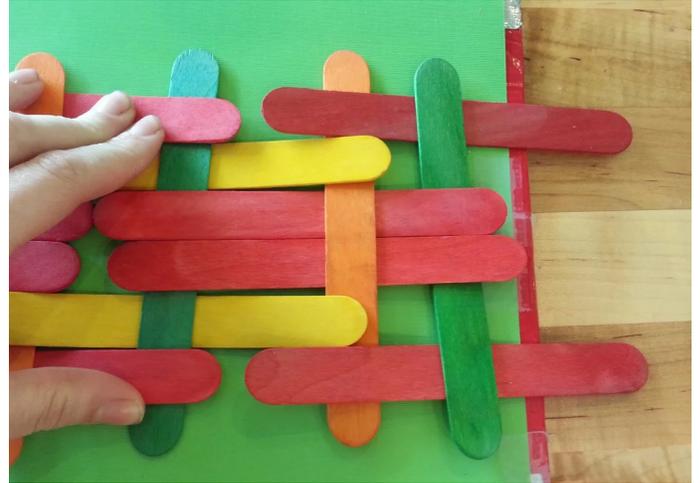
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Step 9: Add stick 16



Step 10: Add sticks 17 & 18



Step 11: Ta Da!

