DOES THE TYPE OF BRIDGE DESIGN AFFECT HOW MUCH WEIGHT IT CAN HOLD?

BY ENRIQUE RASCON

Introduction

In this experiment I will be testing two of the most well known bridges: the arch bridge and the Truss bridge.

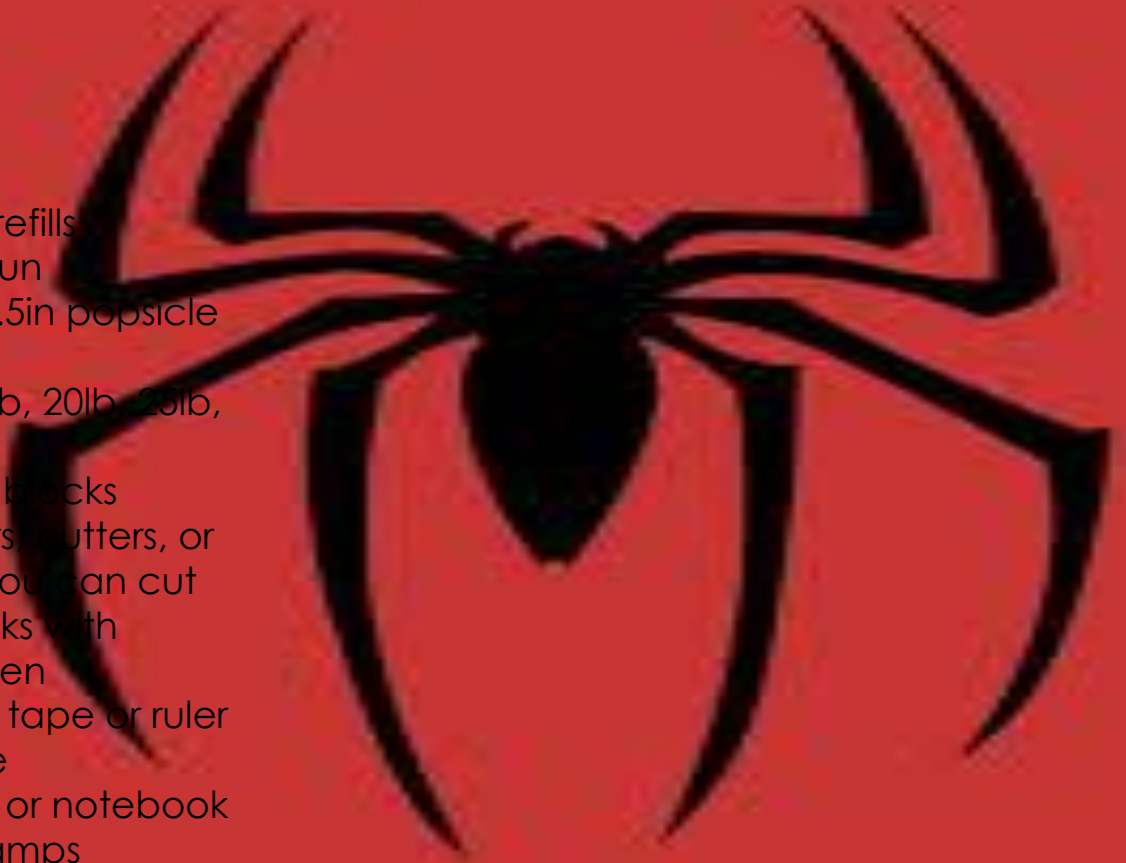
(Important and relevant information regarding the research question and background research, such as what work scientists and engineers have already completed on the topic, should be discussed here.)

Statement of the Problem

The problem in this experiment is there are many different types of bridges but which one is the best? I want to do this experiment because I find engineering very interesting and this experiment heavily involves engineering. The information gained from this experiment will help others by informing them what the strongest type of bridge is.

I hypothesize that a truss bridge will be the strongest design. I believe this because the sources I have found state that the truss bridge is stronger than the arch bridge.

Materials



- 10 Hot glue refills
- 1 Hot glue gun
- About 300 4.5in popsicle sticks
- 5lb, 10lb, 15lb, 20lb, 25lb, 50lb weights
- 4 Styrofoam blocks
- 1 Pair Scissors, cutters, or something you can cut popsicle sticks with
- 1 Pencil or pen
- 1 Measuring tape or ruler
- 1 Food scale
- 1 Computer or notebook
- 10 Paper clamps

Variables

- Independent- bridge design/pattern, number of supports, or glue type
- Dependent- the amount of weight the bridge can hold before breaking
- Control- environment, the number of sticks, bridge span, glue type, and how weight is added.

Procedures

(I did intend on typing out the instructions for the construction of the bridges but it was WAY too confusing and hard to understand, so I ended up finding videos on how to build the bridges instead.)

1. First, collect all the materials listed in the materials section. Some if not most will be household items and if not, all items are relatively easy to obtain.
2. Next, start assembling the arch bridge. Go to this video for building instructions: Popsicle stick arch bridge #189
3. Next, start assembling the truss bridge. Go to this video for building instructions: Diy Popsicle stick Baltimore truss bridge #181
4. Next, use the styrofoam blocks as supports and place them where land would be on a real life bridge (on each end of the truss and on each end of the arch bridge as well as underneath the wood supports on the arch bridge).
5. Next, place your weights on each bridge starting from 5lbs and working up to 50lbs (Make sure to place the weight in the center of mass of the bridge).
6. Lastly, use the materials you have prepared to record to record the highest amount of weight each bridge could hold.

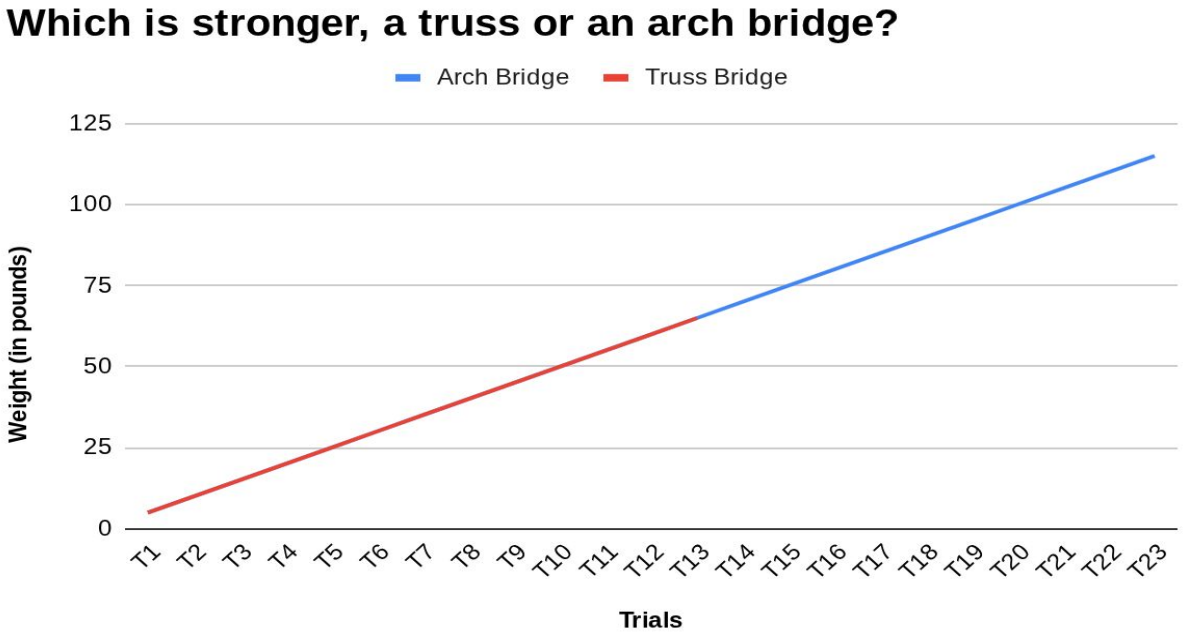
Results and Data

In this study, the results showed that my hypothesis was incorrect and the arch bridge was able to successfully hold more weight than the truss bridge. The arch bridge successfully carried 110lbs and began to collapse at 115, and the truss bridge successfully carried 60lbs and began collapsing at 65lbs.

Results: Data Table

	Arch Bridge	Truss Bridge
T1	15	5
T2	20	10
T3	25	15
T4	30	20
T5	35	25
T6	40	30
T7	45	35
T8	50	40
T9	55	45
T10	60	50
T11	65	55
T12	70	60
T13	75	65
T14	80	
T15	85	
T16	90	
T17	95	
T18	100	
T19	105	
T20	110	
T21	115	

Results: Data Graph



Photographs of Project:

(Pictures of the results and any other pictures you would like to include can go here. Please be sure to include **captions** with each picture.)

Conclusion

In this experiment, my objective was to test arch bridges and truss bridges to see which one can hold the most weight and I completed that objective by testing each bridge to their limit. In my experiment, my hypothesis was incorrect. In my hypothesis, I stated that I believed that the truss bridge would be the strongest design yet the arch bridge was able to withstand more weight. The data I collected in my results told me that the arch bridge was capable of supporting much more weight than the truss bridge.

Implications and Ideas for Future Research…

If I were to conduct this experiment again, I would do a few things differently. First, I would probably be more precise with the design of the bridges since though the arch bridge held more weight than the truss bridge, the arch bridge failed much more catastrophically than the truss bridge. Leading me to think that the truss would have been stronger if I had built it better. Second, I would attempt to make a larger sample size so I could have more than two bridges to test. Though I hypothesized wrong, overall I would say this was a very successful project and I am very happy with the results.

References

Popsicle stick arch bridge #189

Diy Popsicle stick Baltimore truss bridge #181

platform.cysf.org

https://www.all-science-fair-projects.com/science_fair_projects/850.html

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Hypothesis

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