Bridge Challenge

What you'll need

- ☐ Straws and/or popsicle sticks
- ☐ String
- ☐ Tape
- ☐ Some hard-to-break item to act as a weight (about the size and weight of a coffee cup works well)
- ☐ Pencils
- ☐ Scrap paper with at least one side blank

***Note**: If you don't have straws or popsicle sticks, use cardboard cut into strips instead!*

Introduction

In this challenge, you and your child will build a bridge using the same techniques real engineers use. For real bridges, engineers often have to follow a set of requirements: the bridge must hold a certain weight, and cross a certain distance.

Bridge types and how bridges work:
To help understand a couple of types of bridges and how they work, watch this video: "What Makes Bridges So Strong?" by SciShow Kids on YouTube: https://youtu.be/oVOnRPefcno

Once finished, go through the bridge examples at the end of this guide, and discuss these questions:

- What shapes do you see in this bridge?
- What holds the bridge up?

Do it!

The rules of the challenge are:

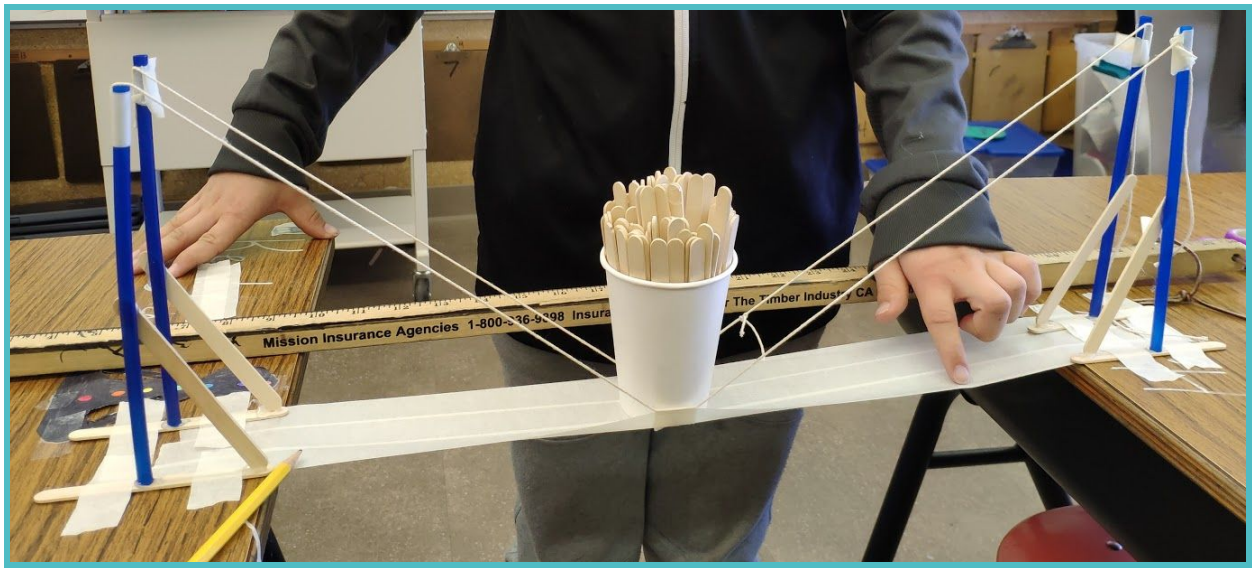
- The bridge must hold a weight
- The bridge must cross a gap of two feet (for younger children, see Adaptations)

If you like, you may have your child draw their bridge idea before the build it (similar to the Blueprinting activity).

Depending on your child's confidence level, you can either build your own bridge, or help them with theirs.

Adaptations	Vocabulary	Fun facts
For Younger children Change the gap requirement to 1 foot, and/or remove the weight requirement. **For An Extra Challenge** Increase either the weight or the gap, *or* limit the number of materials that can be used.	**Engineers**: People who design and build things like bridges. **Requirement**: A rule that engineers follow when they are building something.	**Awesome bridges**: Though some bridges aren't very pretty, some are designed to look really cool. Search online for "amazing bridges" to see some examples of really amazing bridges.

Bridge example:



Bridge types

Here are several examples of the most common types of bridge design. Look through them and notice how they are similar and different. Most bridges are based on at least one of these types, but sometimes they combine several types into one bridge!

1. Beam bridge

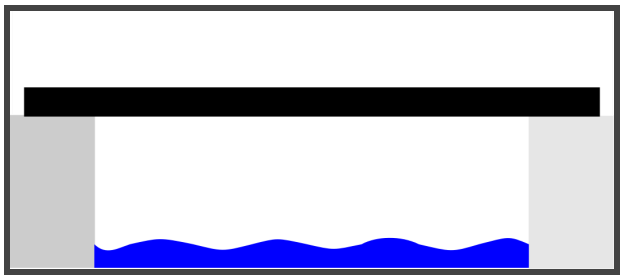


Image credit: TheMightyQuill, wikimedia commons

A beam bridge is made with a flat piece across two or more supports. This is the simplest kind of bridge. It works well for short gaps.

2. Truss bridge

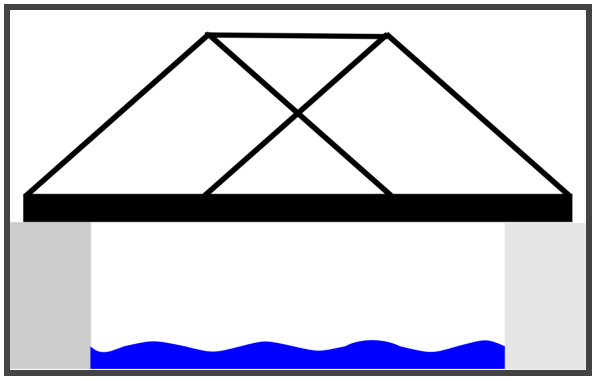


Image credit: TheMightyQuill, wikimedia commons

Image credit: Silverije (via Wikimedia Commons)

A truss bridge is similar to the beam bridge, but is made out of triangle shaped “trusses” instead of being a flat beam. Adding diagonals (sideways slanting pieces) to create triangles helps to make a structure stronger. This works well for short gaps, when the bridge needs to carry a lot of weight.

3. **Arch bridge** (Ex. Sellwood bridge, Portland, OR)

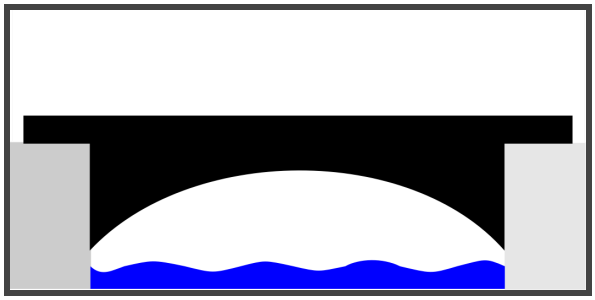


Image credit: TheMightyQuill (Via Wikimedia Commons)

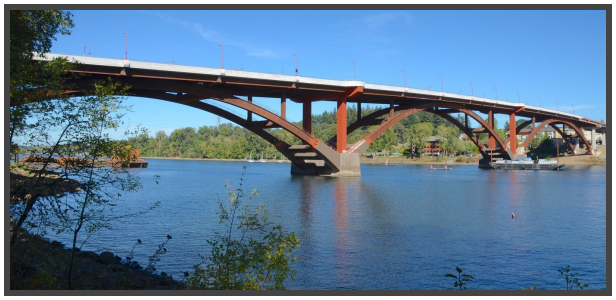


Image credit: Steve Morgan (Via Wikimedia Common

The arch bridge is one of the oldest types of bridge. The weight in the middle of the bridge pushes down and out on the ends of the bridge, which holds it in place.

4. **Suspension bridge** (Ex: St. John's Bridge, Portland, OR)

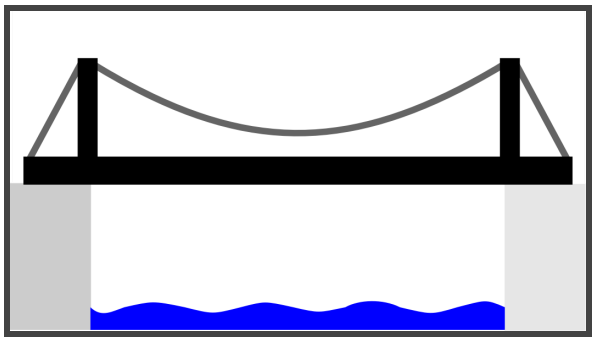


Image credit: TheMightyQuill (Via Wikimedia Commons)

Image credit: Cacophony (Via Wikimedia Commons)

The suspension bridge uses two towers connected with a thick cable, with smaller cables running down to hold the road up. The cables are tied to the ground on each end, and help hold the towers up.

5. **Cable-stayed bridge** (Ex: Tilikum Crossing Bridge, Portland, OR)

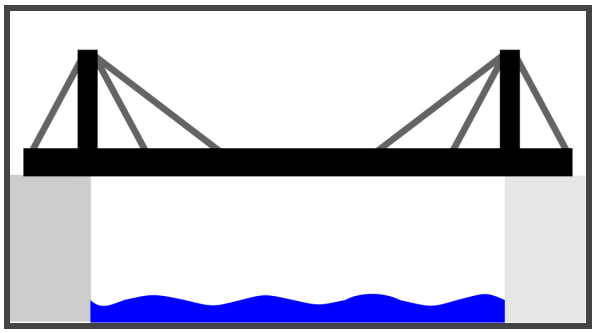


Image credit: TheMightyQuill (Via Wikimedia Commons)

Image credit: Steve Morgan (Via Wikimedia Commons)

Cable-stayed bridges are very similar to suspension bridges, but use less cable, so the towers must be higher to make up for that.