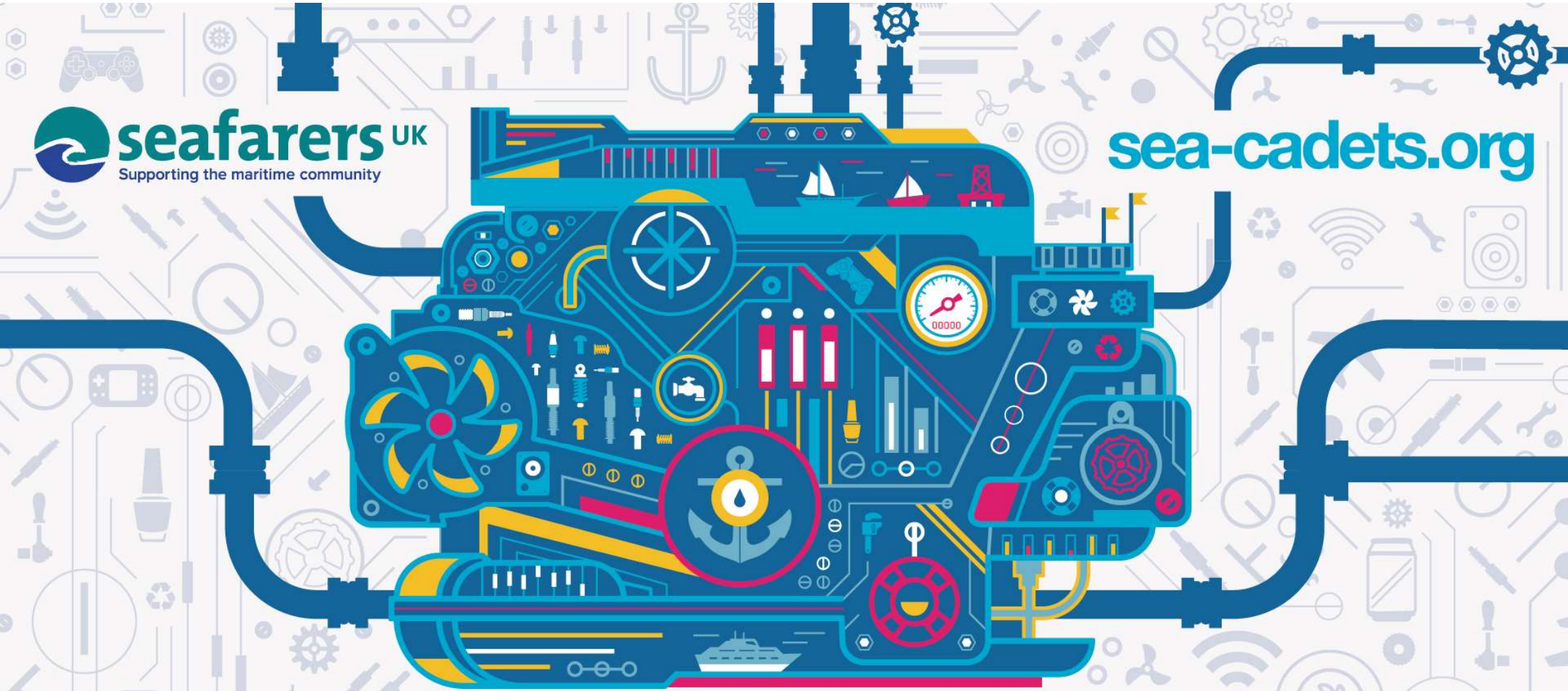
seafarers UK
Supporting the maritime community

sea-cadets.org

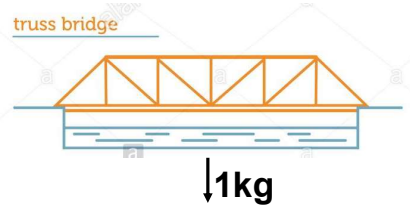


MEP Bridge Building Project

The Bridge Building Challenge – Building your own Bridge

You will need:

Someone to help you.
Cardboard to make approx. 10mm x 500mm strips & several shorter lengths of 10mm.
4cm x 4 cm Plywood squares.
String/thread (if you decide to build a suspension bridge
Glue (preferably PVA)
Paint for decoration, if you like.



Your Challenge:

To build a bridge strong enough to carry a load of 1kg in the middle. Your bridge cannot bend more than 5mm from its unloaded horizontal position.

Your bridge must be wide enough to allow a miniature vehicle (a toy car) to pass over unobstructed.

The bridge should be made from the cardboard strips but the road deck can be made from a single length of cardboard.

Before building your bridge you will need to produce a plan. It should include how you are going to build your bridge, with some detail about your building processes and how you will make sure it is strong enough to do its job.

Research

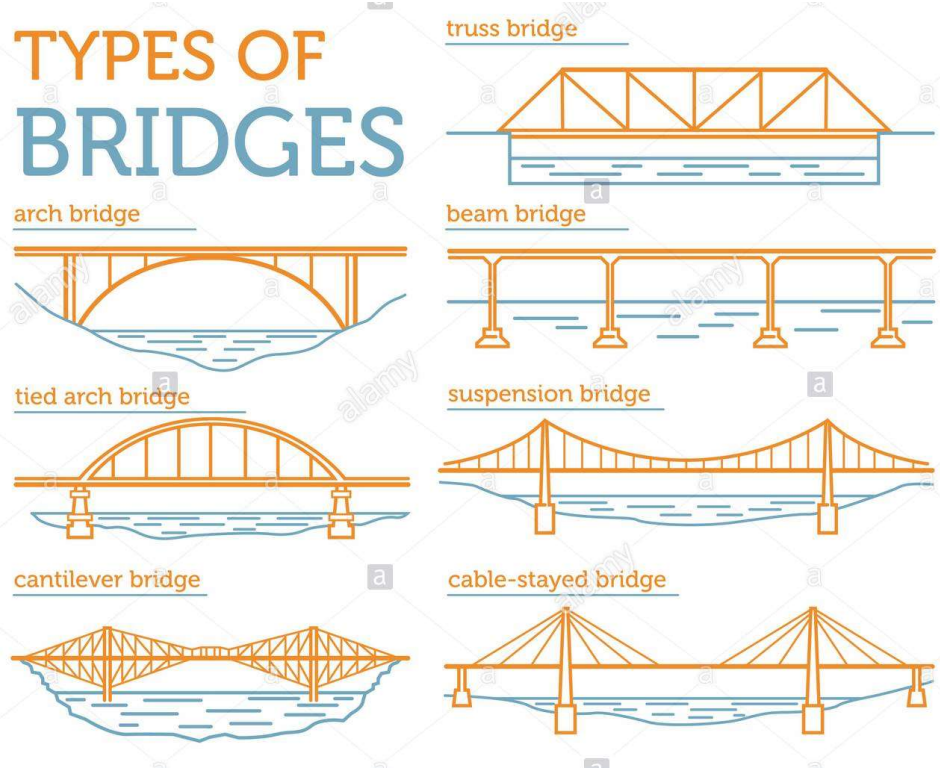
Before embarking on your build lets do a little bit of research to help you understand how Civil Engineers have built bridges before:

Can you:

- **Select 2 or more different bridge designs.**
- **For each bridge can you find out a little bit about them, such as:**

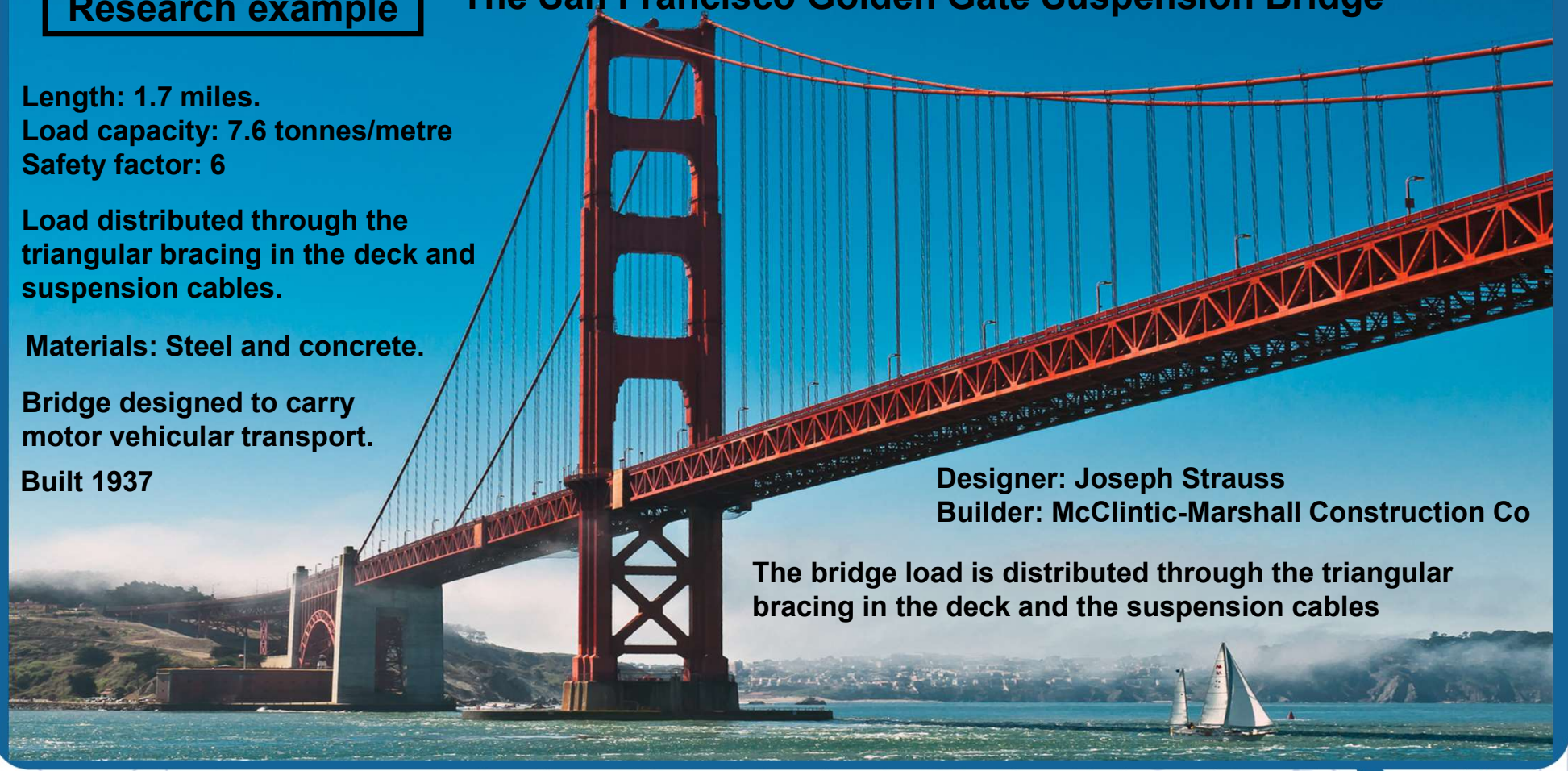
1. **What do they look like? Can you find a short description and maybe a photograph?**
2. **What type of bridge is it and what is its name?**
3. **What are its strengths and weaknesses?**
4. **What shapes are used in its construction?**

HINT – If your struggling the next slide might help!



Research example

The San Francisco Golden Gate Suspension Bridge



Length: 1.7 miles.
Load capacity: 7.6 tonnes/metre
Safety factor: 6

Load distributed through the triangular bracing in the deck and suspension cables.

Materials: Steel and concrete.

Bridge designed to carry motor vehicular transport.

Built 1937

Designer: Joseph Strauss
Builder: McClintic-Marshall Construction Co

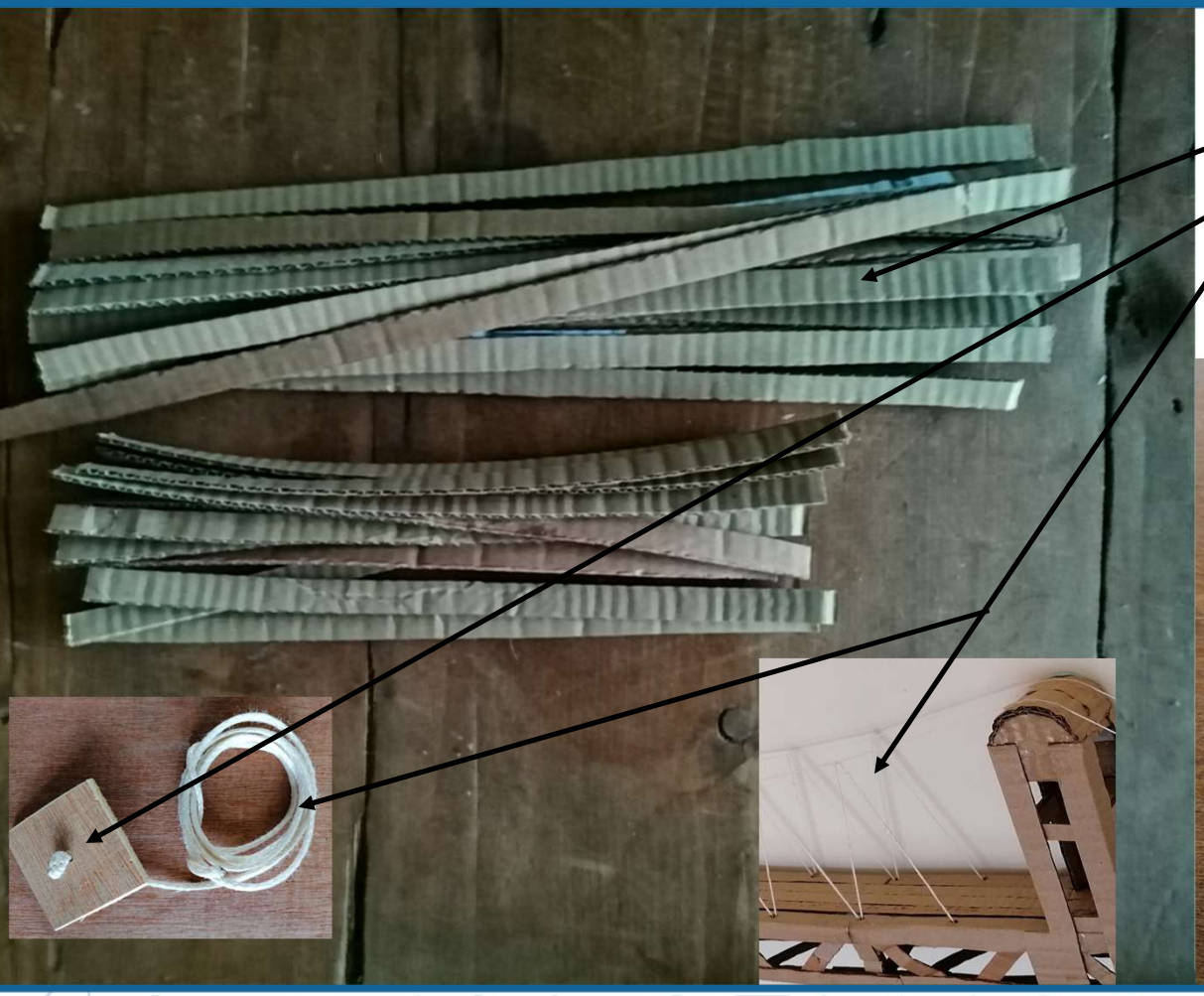
The bridge load is distributed through the triangular bracing in the deck and the suspension cables

Great! You've done your research, now lets get back to your challenge. Your final bridge might look like this!

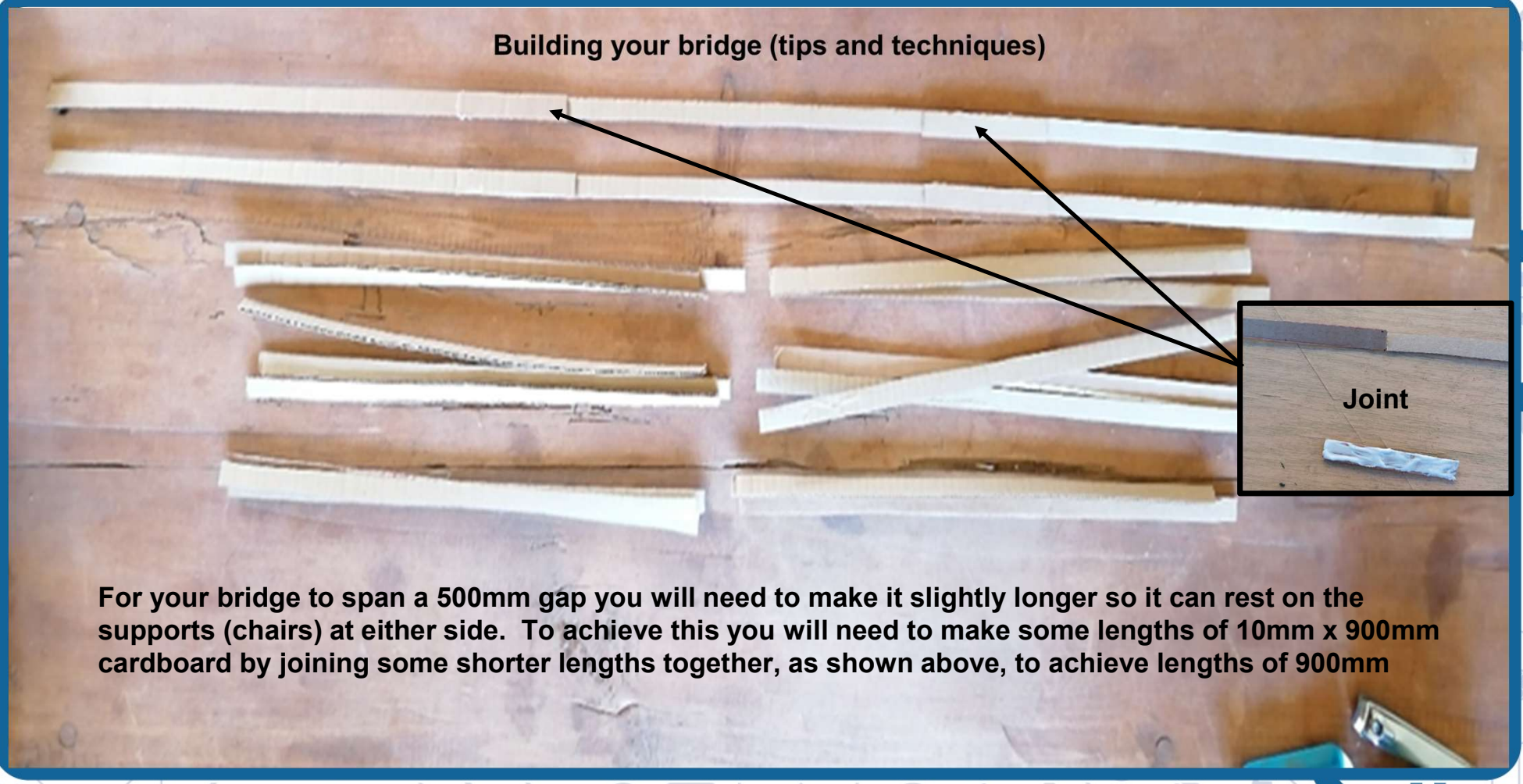
Lets look at some things we used for our bridge that will help you get building!

Materials

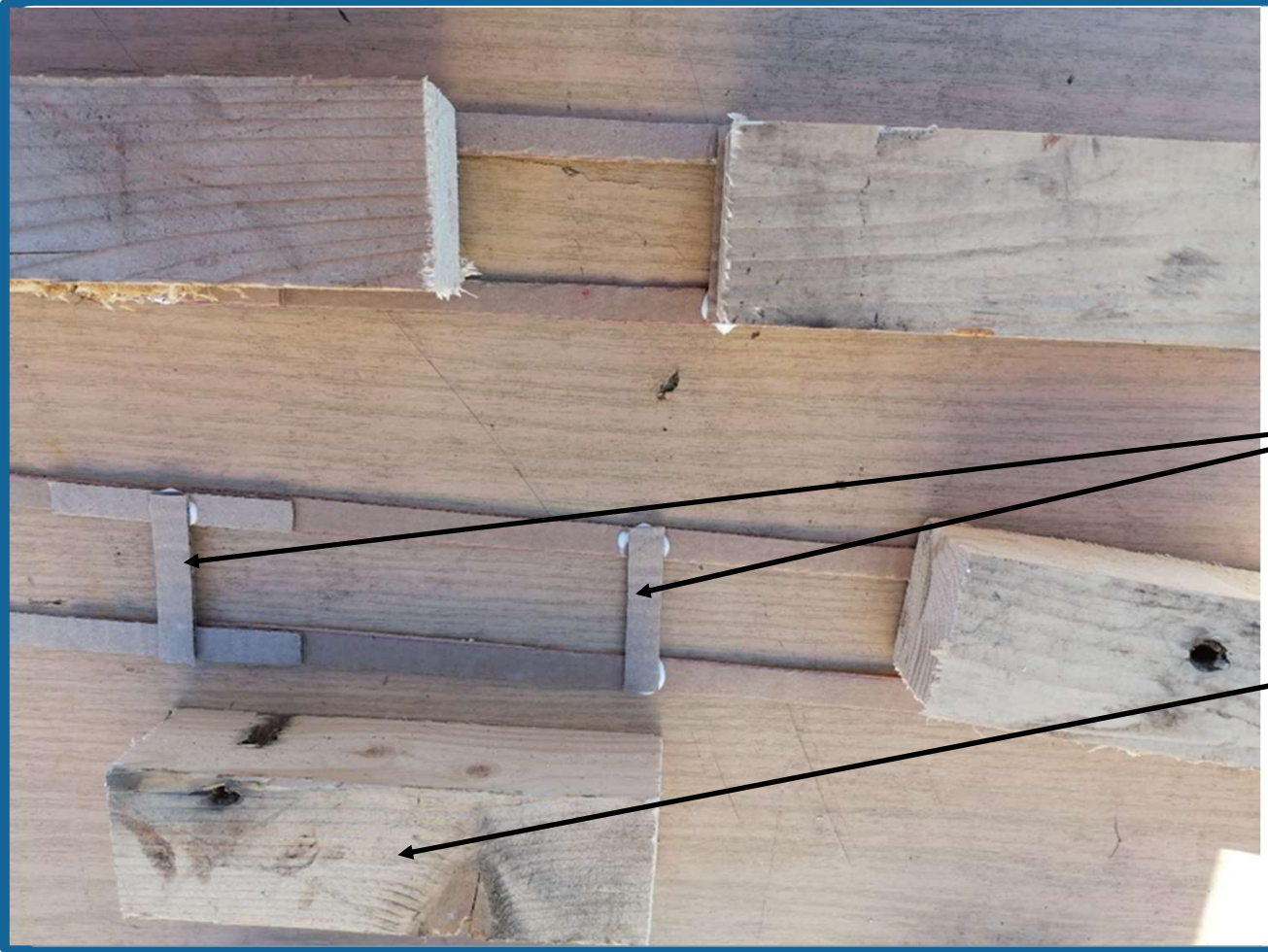
10mm cardboard strips.
4cm x 4cm plywood
Thread/strong string
Glue.



Building your bridge (tips and techniques)

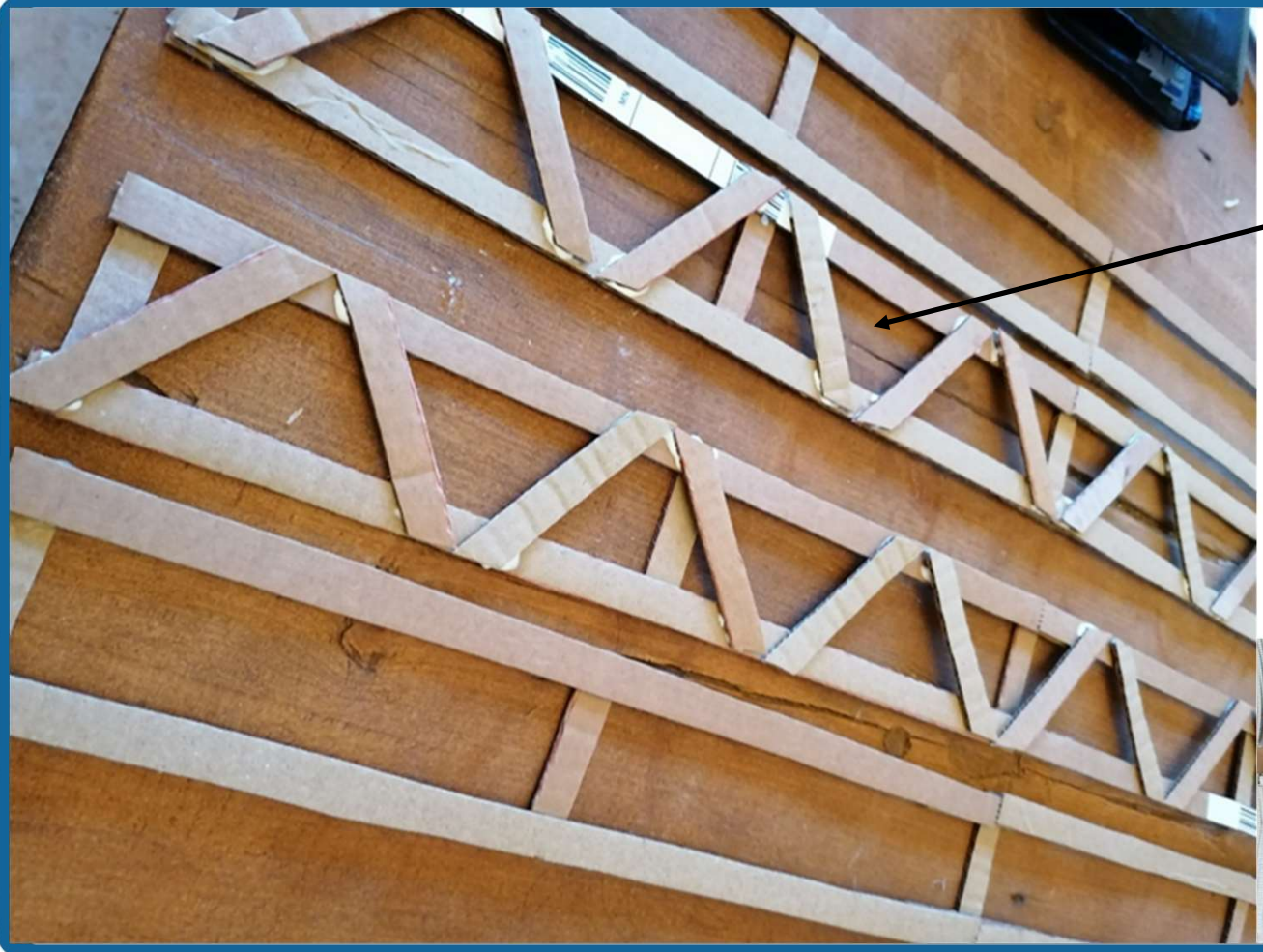


For your bridge to span a 500mm gap you will need to make it slightly longer so it can rest on the supports (chairs) at either side. To achieve this you will need to make some lengths of 10mm x 900mm cardboard by joining some shorter lengths together, as shown above, to achieve lengths of 900mm



Join the 900mm lengths together to form the main panels of the structure.

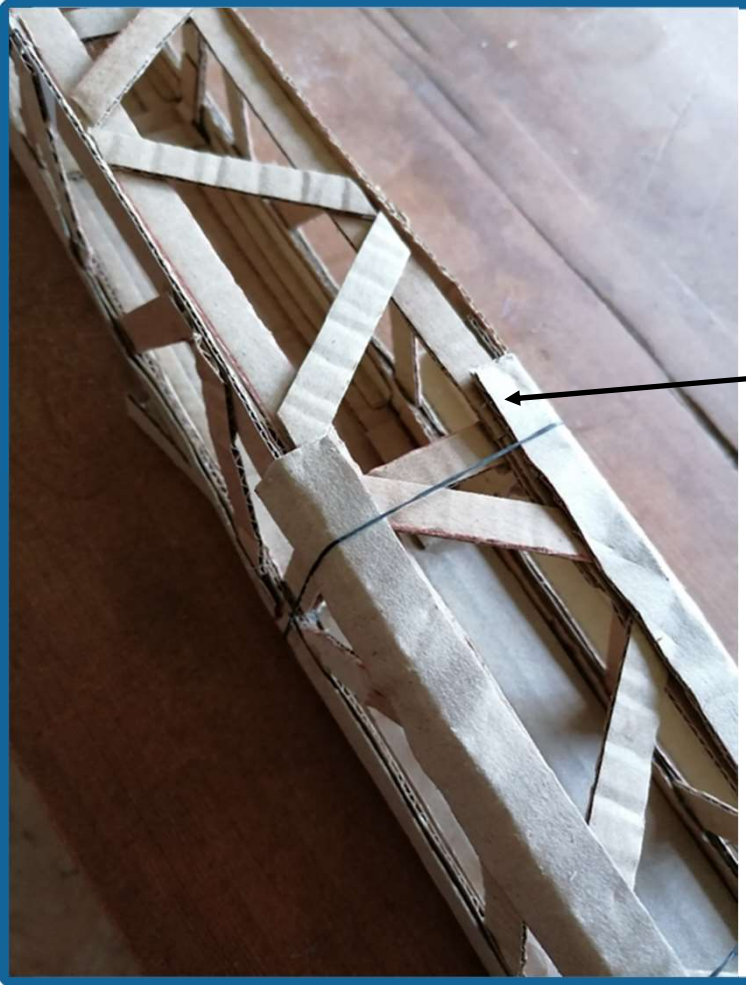
Wooden blocks can be used to hold the joining pieces in place while the glue sets, it might take a few minutes.



Build the triangles sections, these give strength to the structure

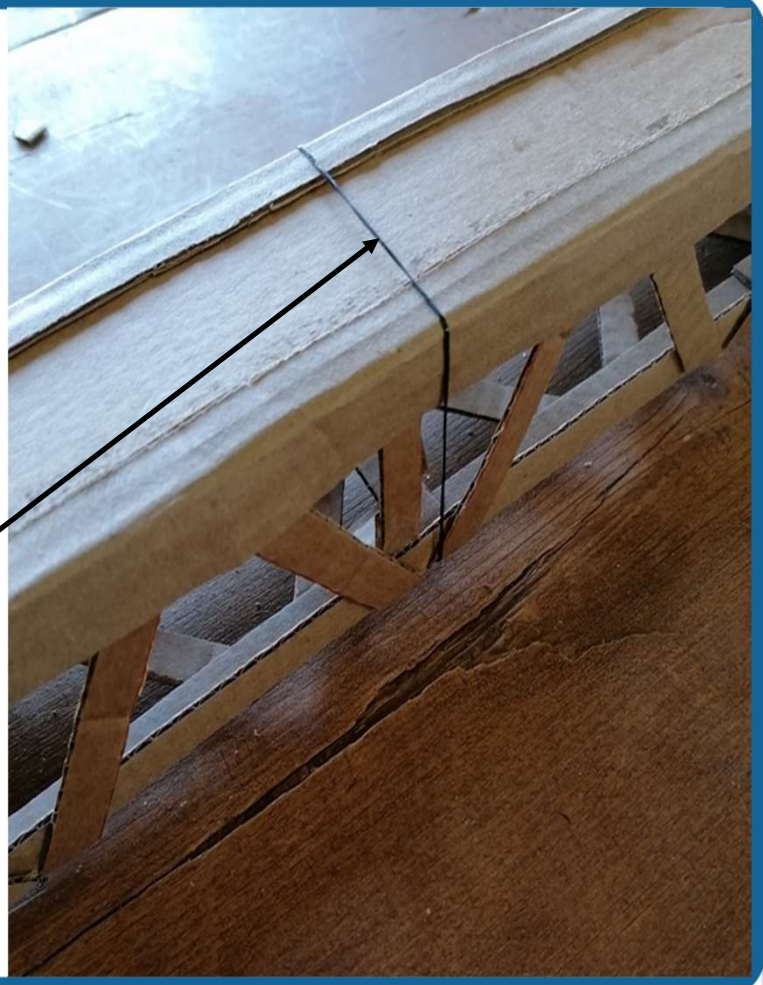
The top of your bridge should have a flat deck.

Brackets used to join your bridge panels together



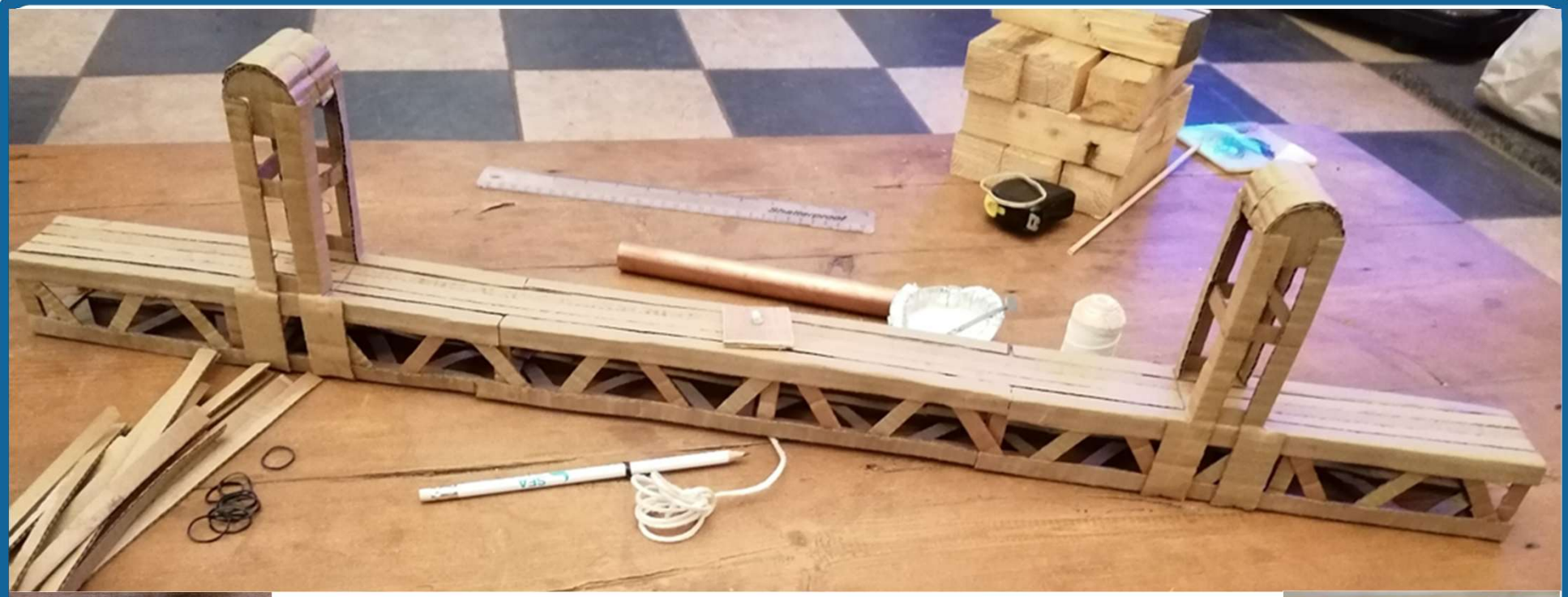
The structure can be given extra strength by using 90 degree angle brackets as shown in the photographs.

The brackets can be held in place with rubber bands until the glue has cured.



If you decide to build a suspension bridge you will need to build two towers.

I have used a copper pipe to form the top of the towers and used rubber bands to hold them in place on the pipe while the glue cures



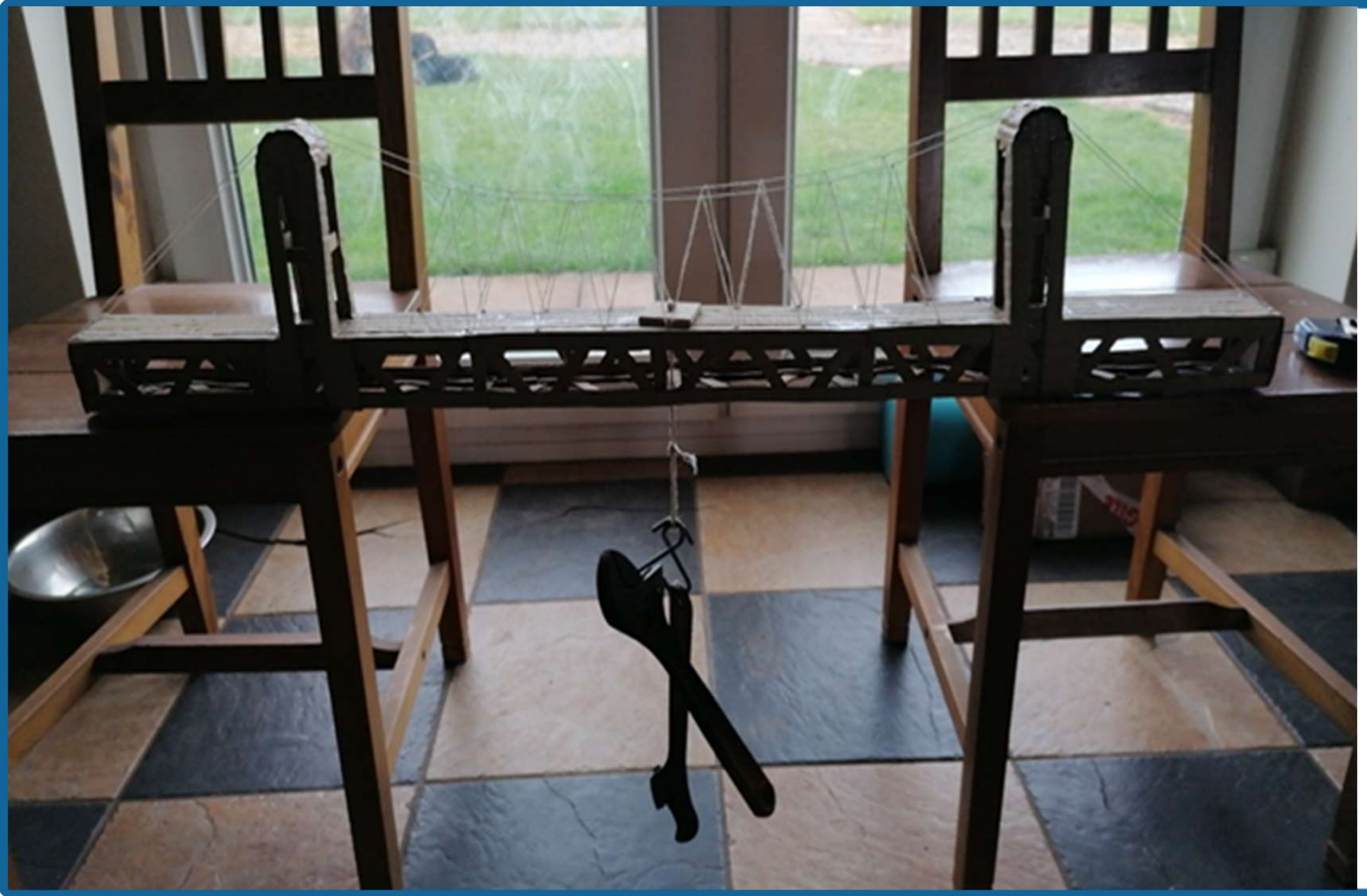
At this point you will need to install your test loop to which you will attach your test weights. It consists of a length of string and a 40mm x 40mm piece of plywood. Drill a hole in the centre of the bridge and feed the string through until the plywood is in contact with the deck,

If you have built a suspension bridge you will need to install the two main suspension cables and the suspender cables. There are numerous ways this can be done, it is your decision which method to adopt.

To test you bridge you will need weights. If you don't have scale weights you can use anything available such as engineers spanners and sockets. Start by placing each item on a scale and make a note of its mass.

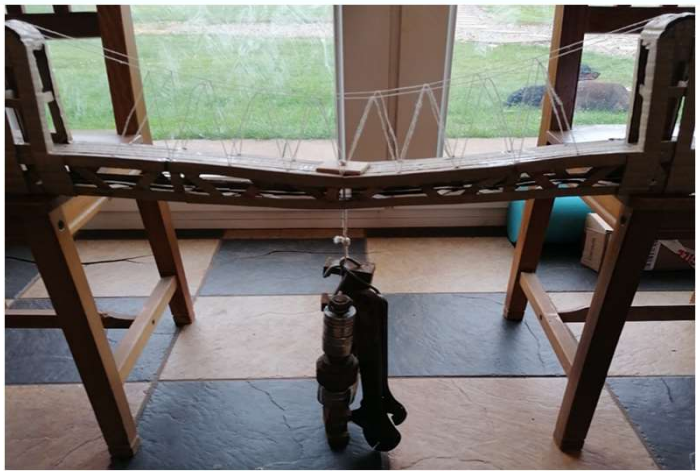
Testing

Set your bridge over a 500mm void, such as 2 chairs, and place hooks in your test loop.



Start by testing your bridge to establish if it can hold the design load of 1kg without deflecting more than 5mm from the middle.

Now keep adding weights until your bridge collapses



My bridge collapsed at 5.9kg.

How did your bridge do?