Begin by showing artist video

OPTIONAL

Leonardo da Vinci

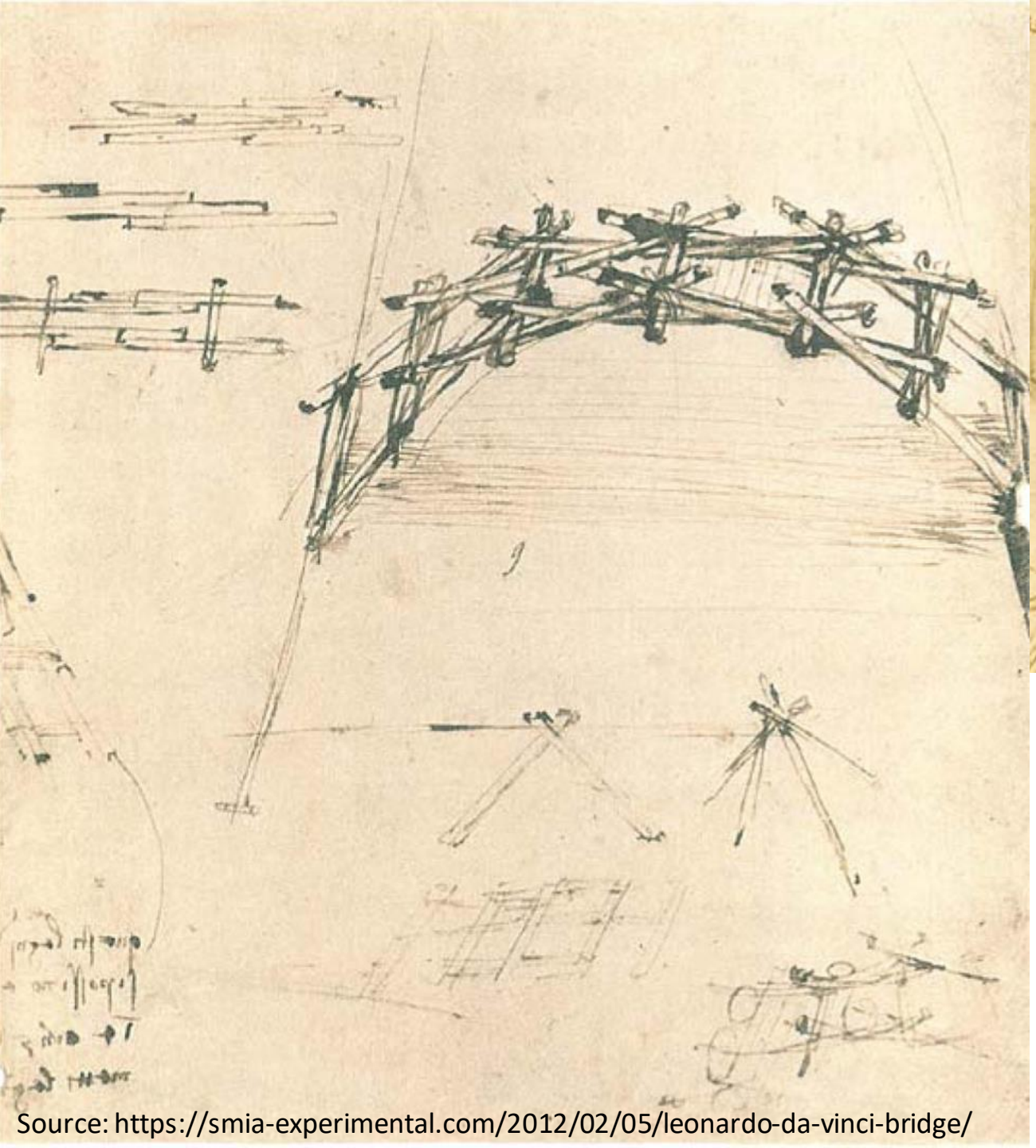
Artist

Scientist

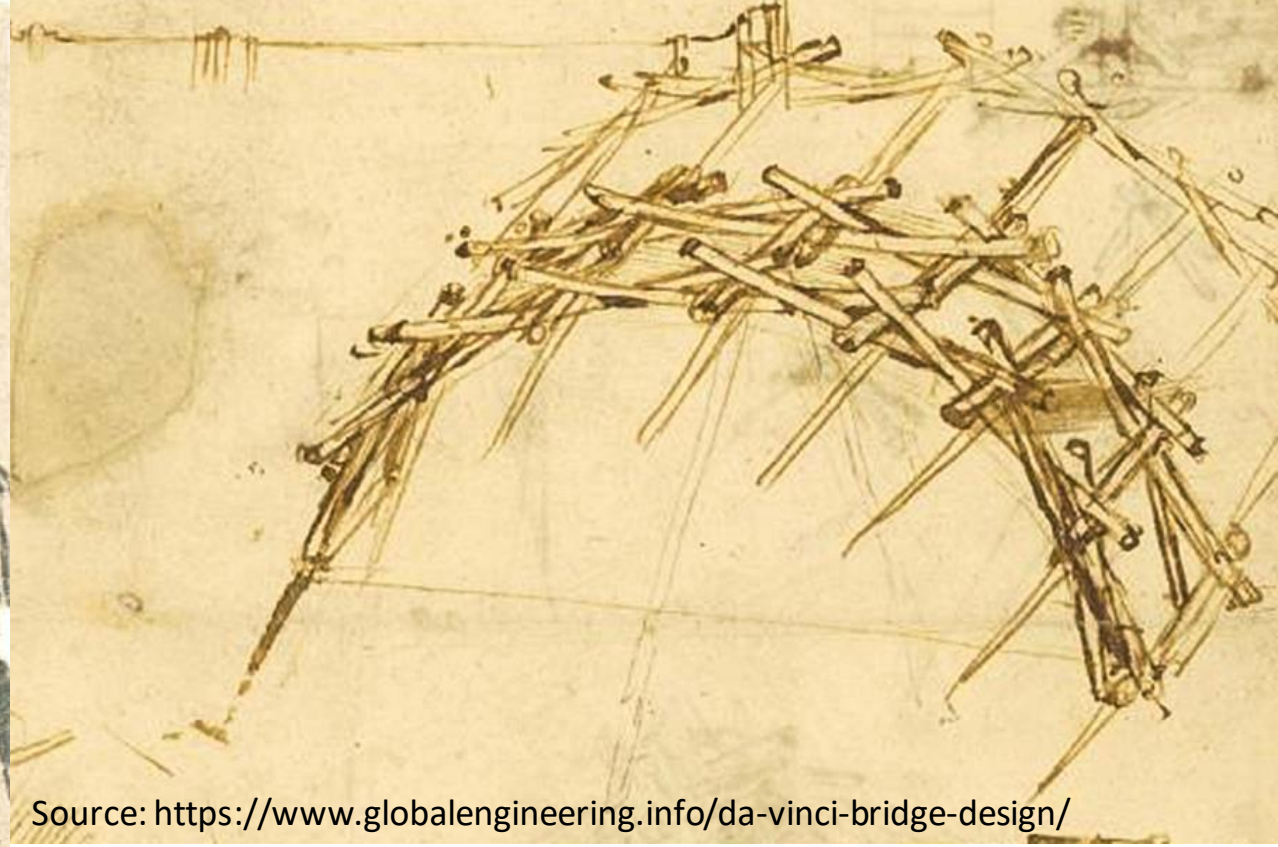
Architect

Engineer

Inventor



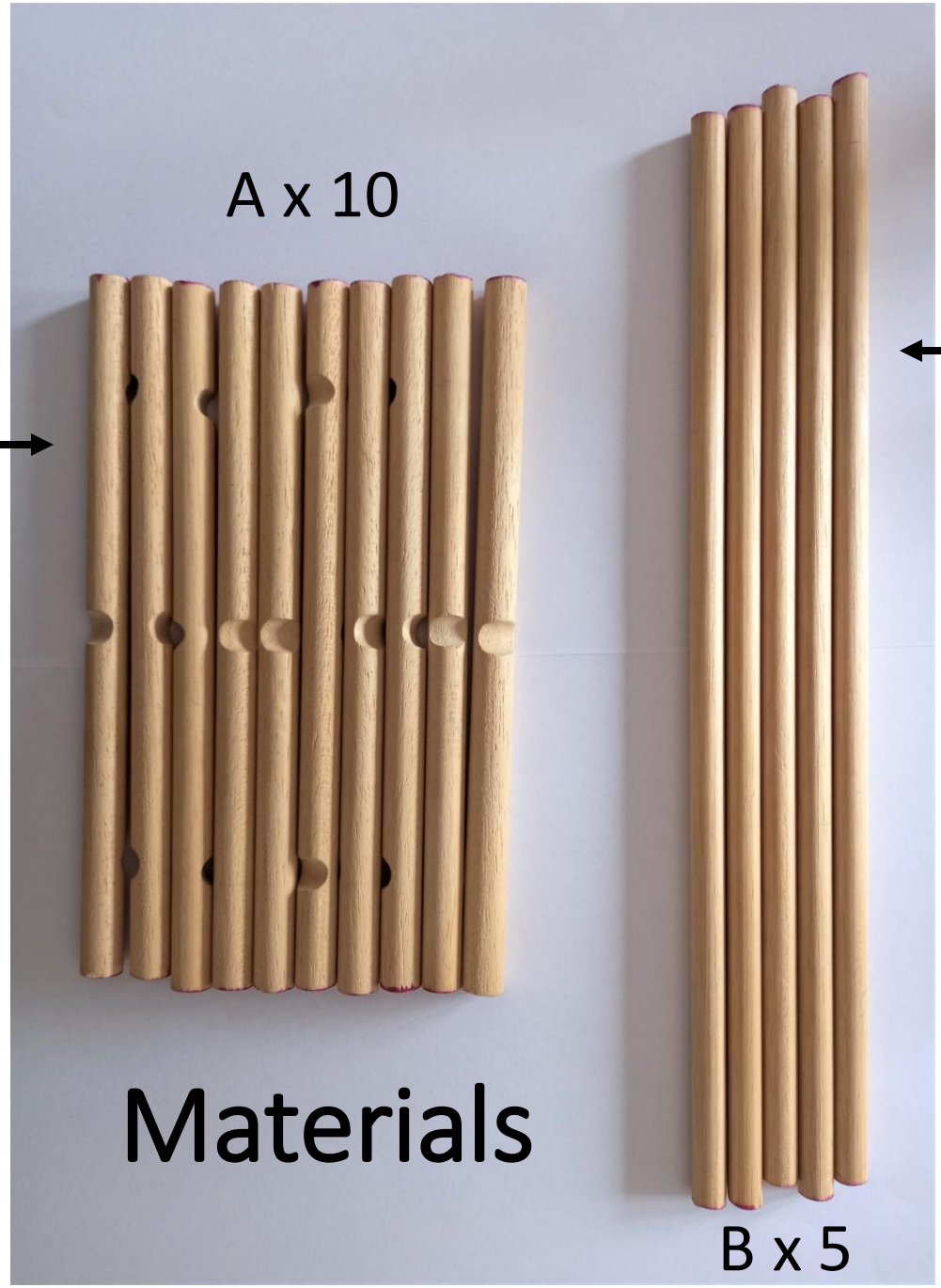
Source: https://smia-experimental.com/2012/02/05/leonardo-da-vinci-bridge/



Source: https://www.globalengineering.info/da-vinci-bridge-design/

Notebook drawings- Self-Supporting Bridge Design

https://shop.questacon.edu.au/Leonardo-Da-Vinci-Bridge.html



12mm thickness x 10 pieces

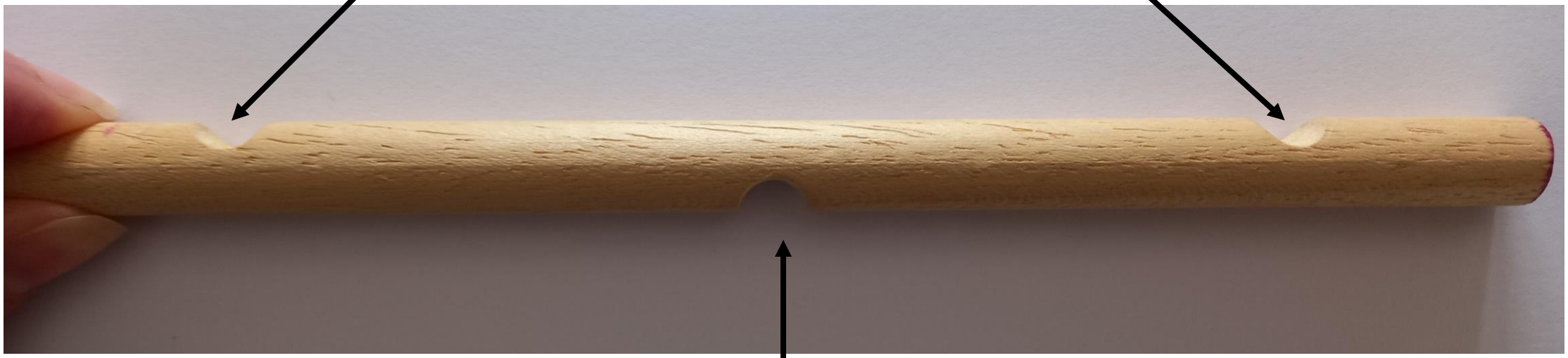
(length of each piece is 200mm)

9mm thickness x 5 pieces

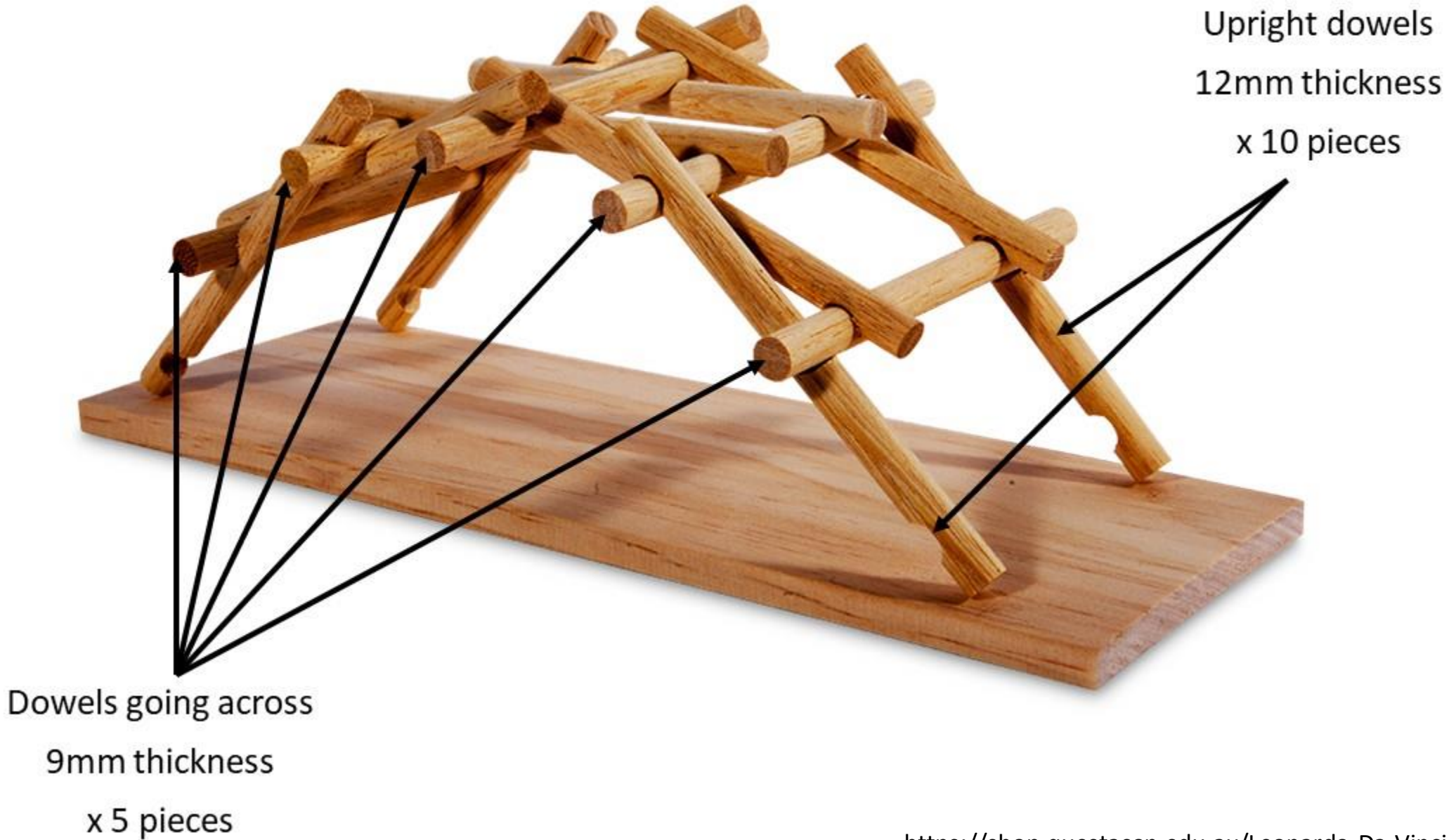
(length of each piece is 300mm) the can be same length as others

10 piece set

Grooves (filed into the wood)



Groove (filed into the wood 180° underneath)



https://shop.questacon.edu.au/Leonardo-Da-Vinci-Bridge.html

Large Bridges

Source: https://www.pinterest.at/pin/383580093262320739/

Uprights do not need to be round

&

If the wood is heavy enough it will work without the grooves

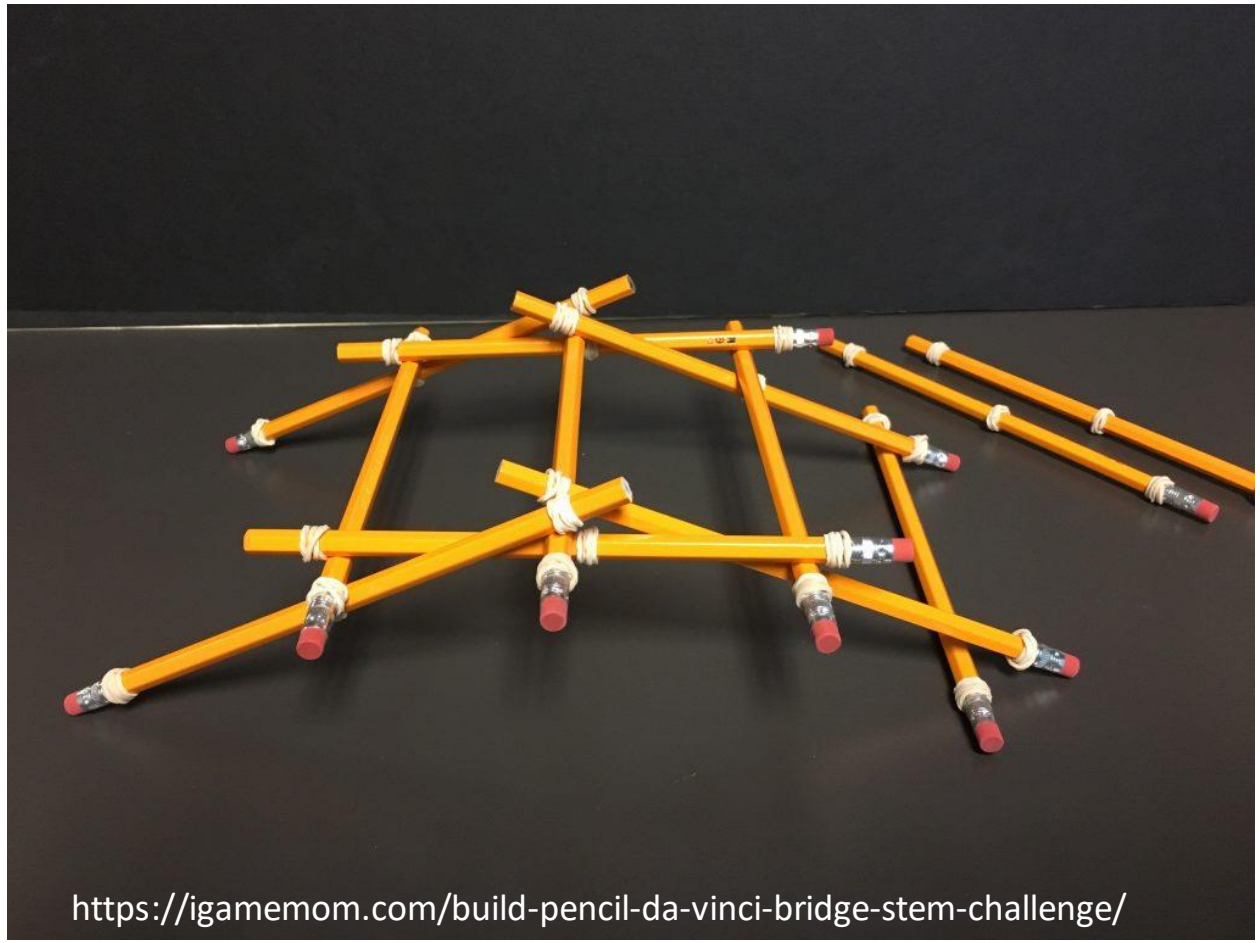
But it is trickier

Large Bridges

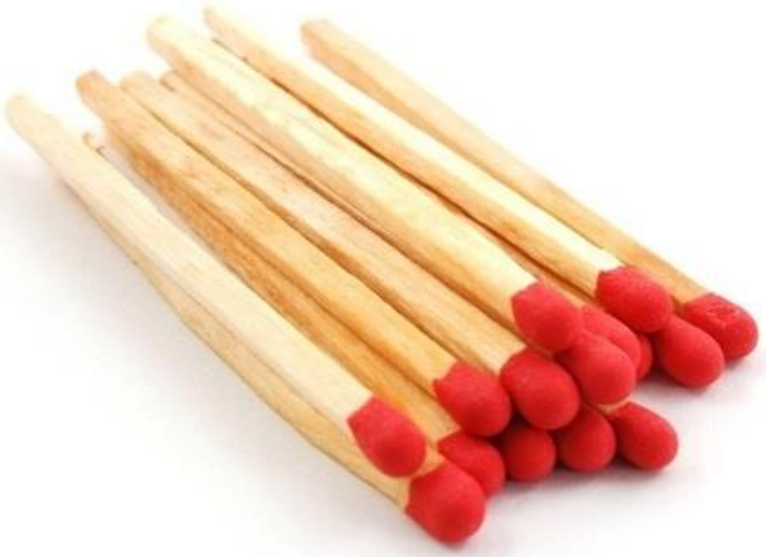
Source: http://victoriabeatty.org/blog/?p=3251

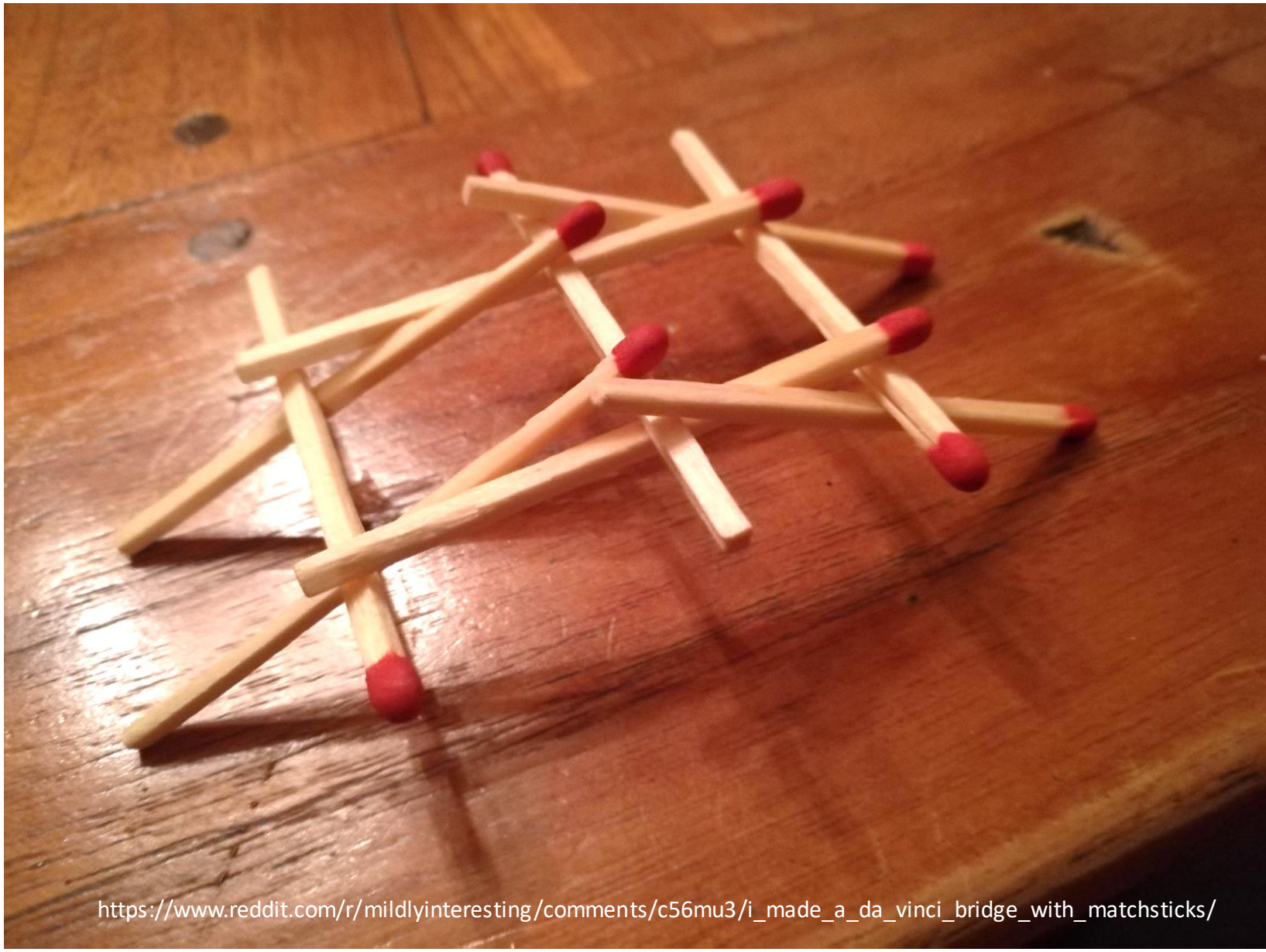

Source: https://www.core77.com/posts/65043/Leonardo-da-Vincis-Ingenious-Design-for-a-Self-Supporting-Bridge


Small bridges
https://www.instructables.com/Da-Vinci-Popsicle-Stick-Bridge/


https://igamemom.com/build-pencil-da-vinci-bridge-stem-challenge/

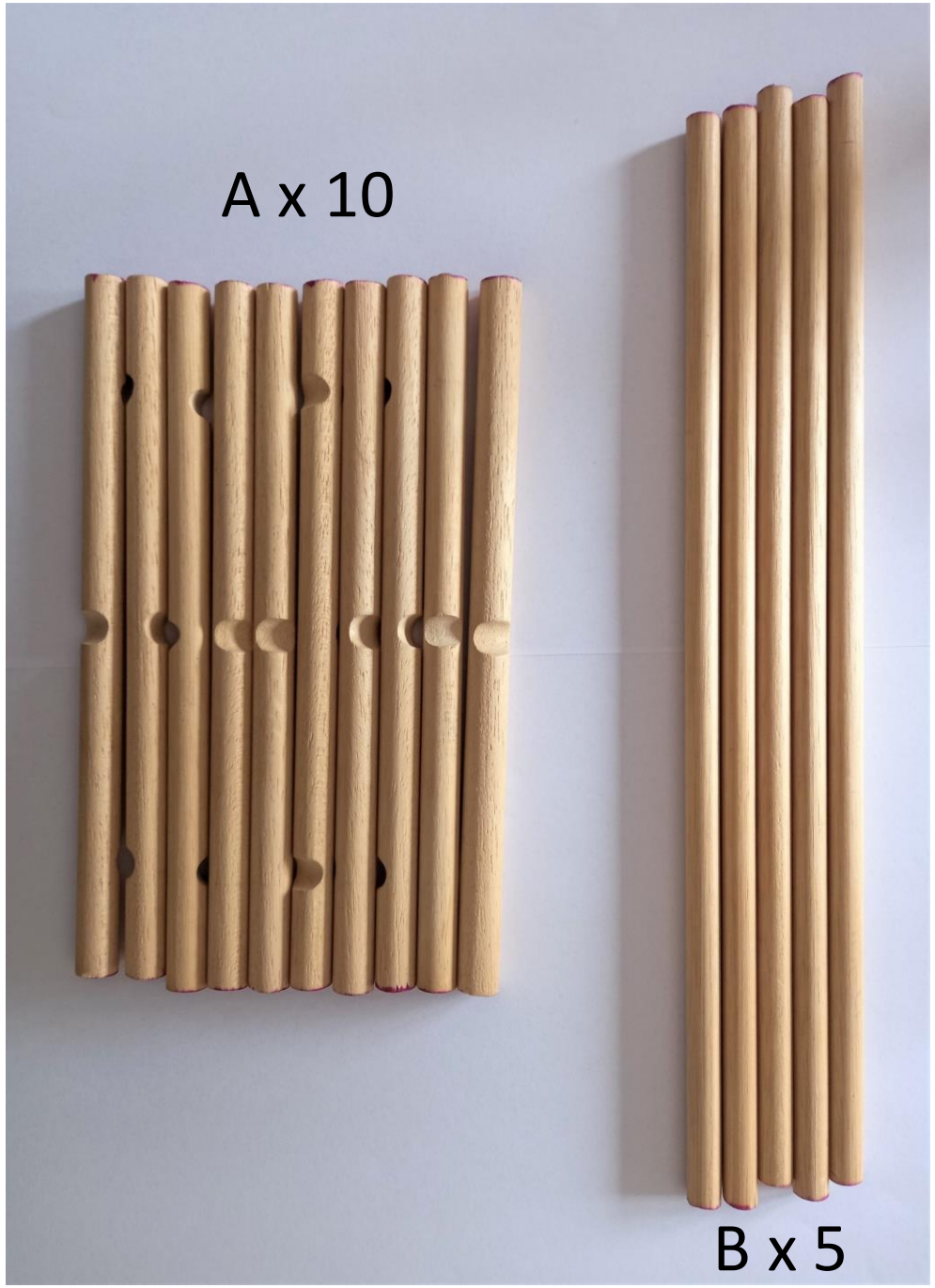

iGameMom.com



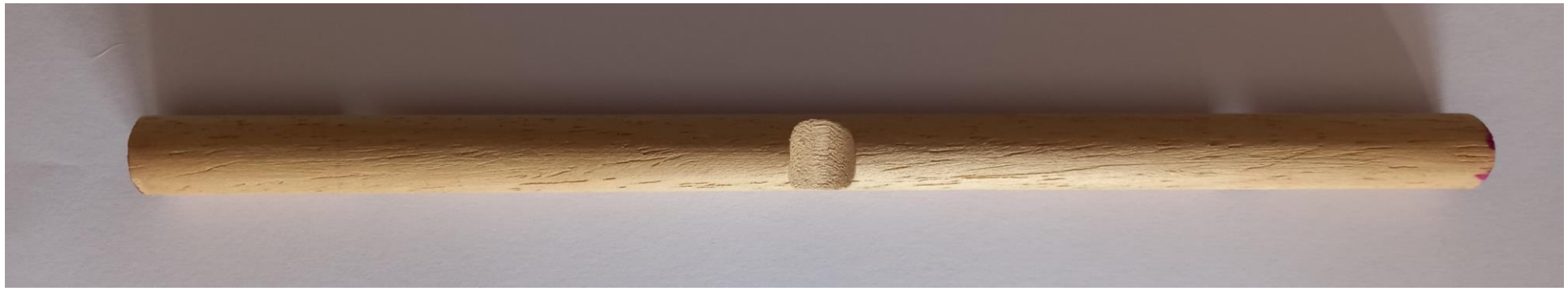

https://www.reddit.com/r/mildlyinteresting/comments/c56mu3/i_made_a_da_vinci_bridge_with_matchsticks/

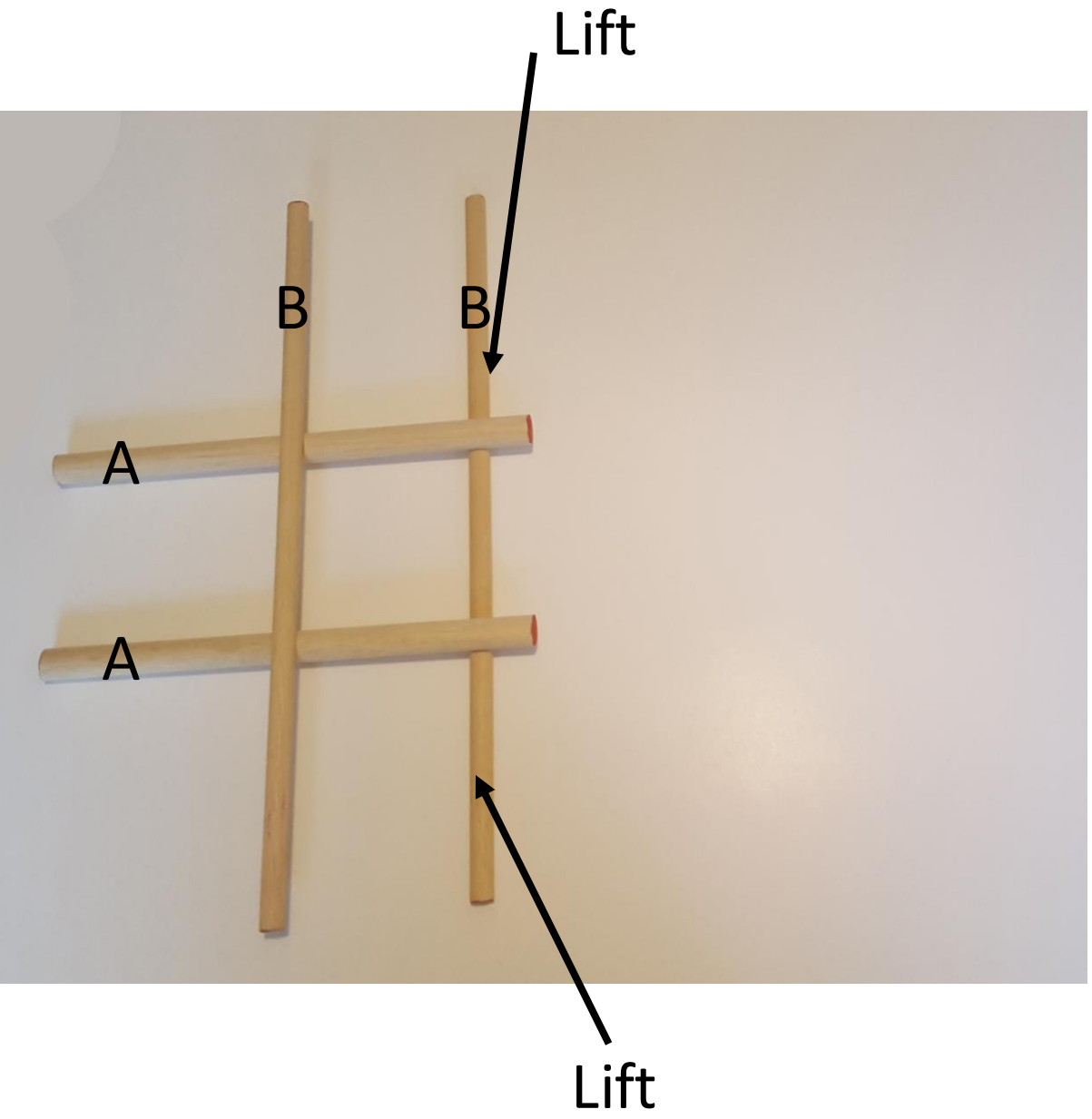
How to Build a Bridge

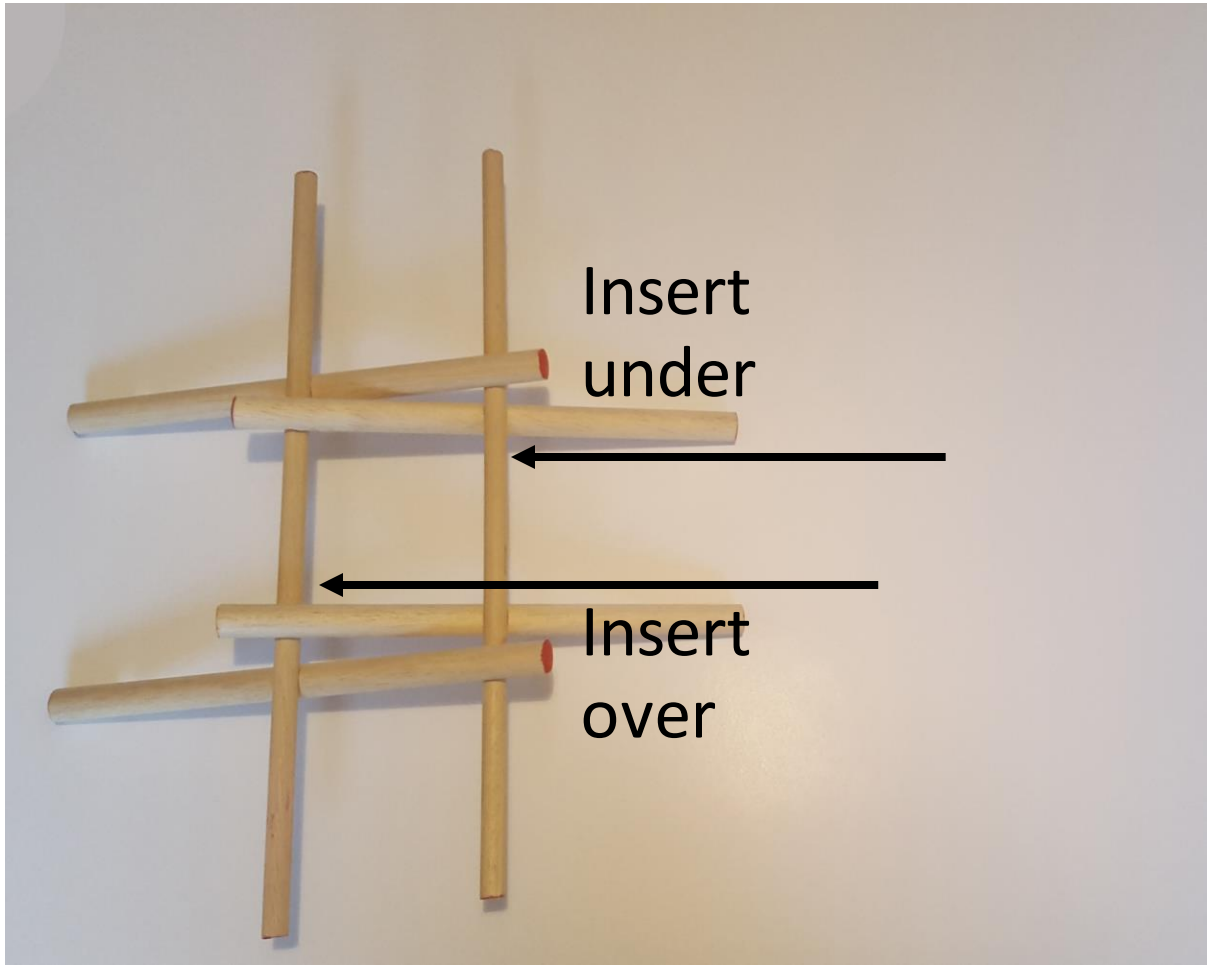
Instructions

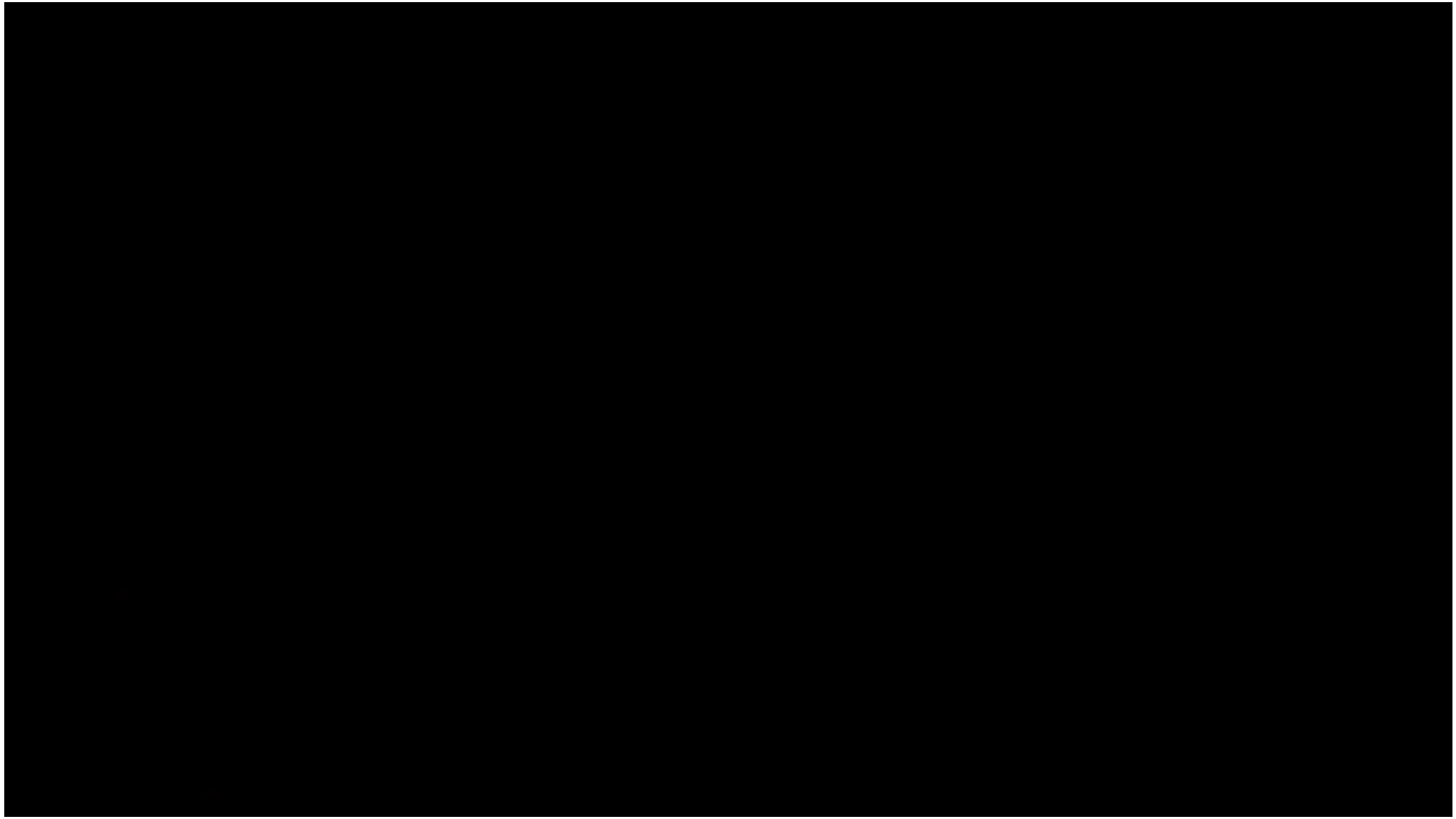

A x 10
B x 5

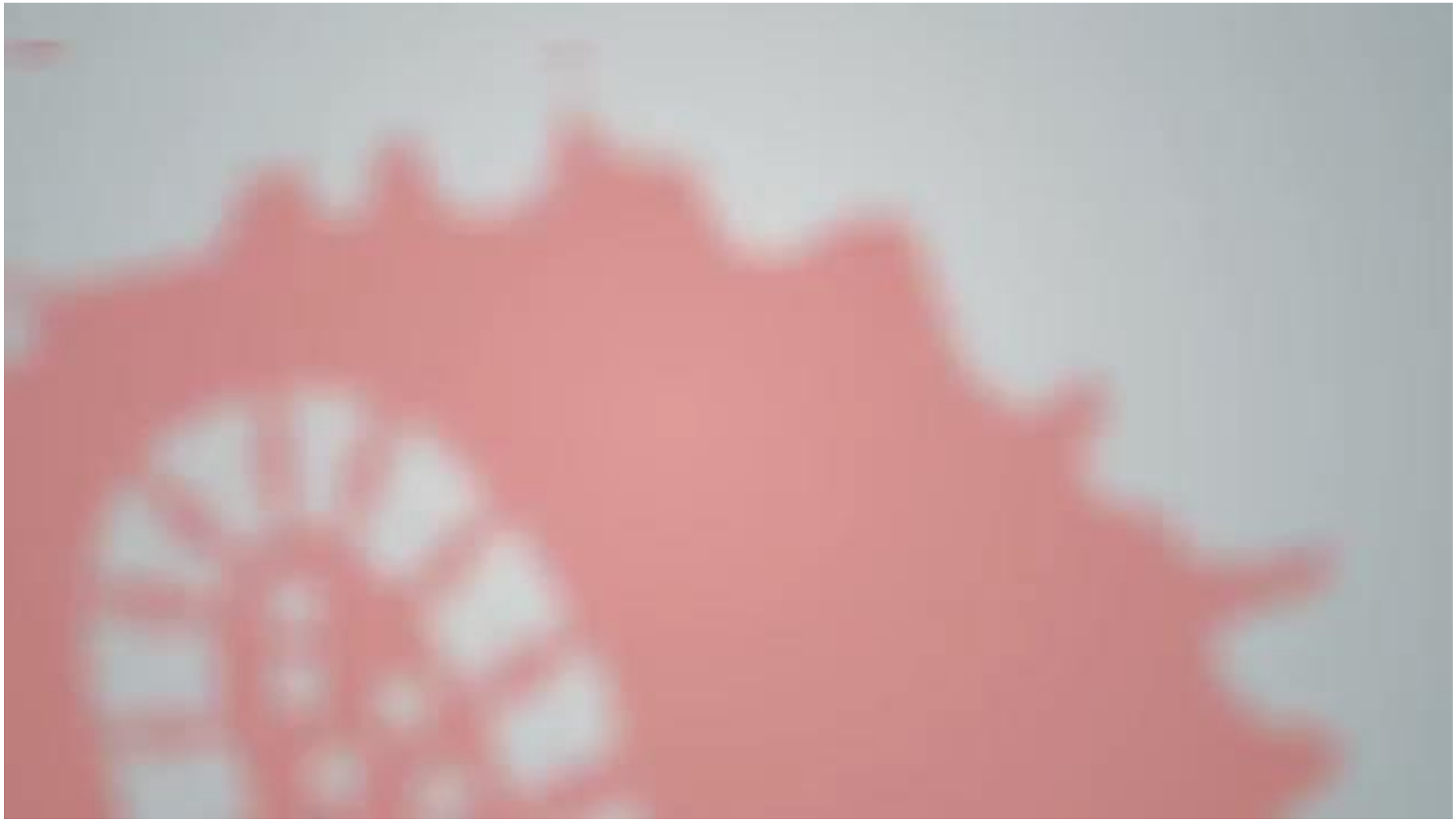
Top Tip



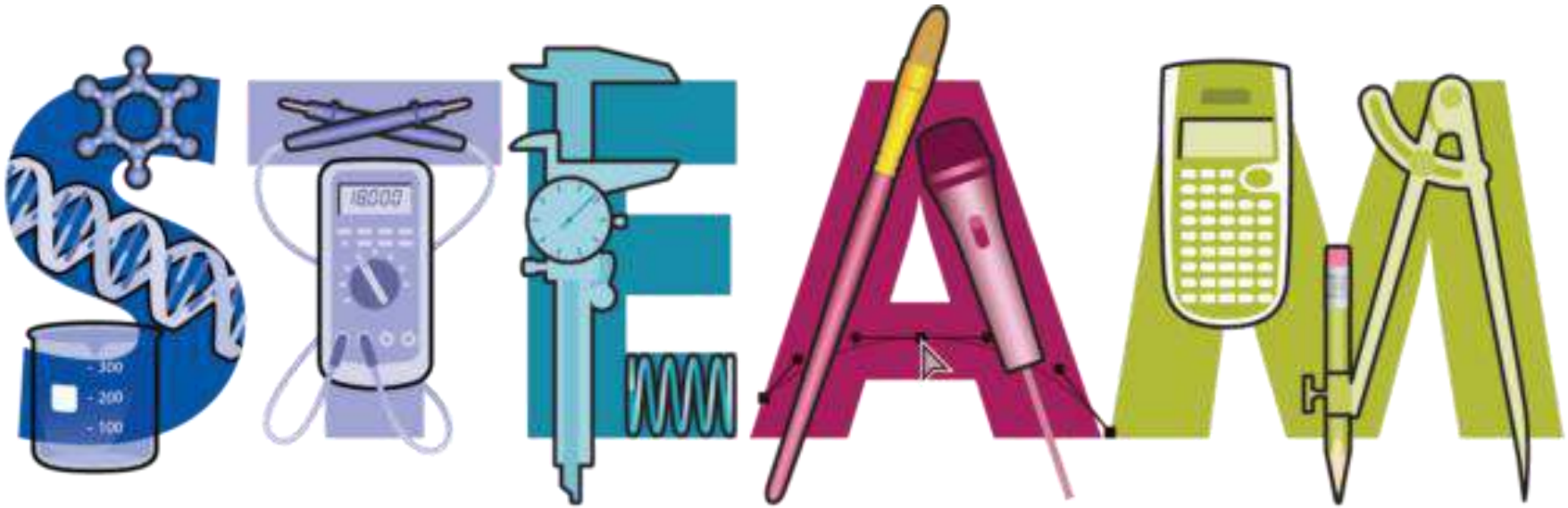

Lift
B
B
A
A
Lift


Insert
under
Insert
over





Identify the STEAM Disciplines in this activity



Going Further Ideas

Real Life Connection

Bat bridge

https://greennews.ie/44587-2/

Samuel Beckett Bridge

https://panoramicireland.com/photo-tours-blog/dublin-night-photography-samuel-beckett-bridge

Going Further Ideas

Real Life Connection

Bridges – what is there purpose?

Metaphor of a bridge

Bridge as a symbol

STEAM Characteristics in this activity

- Real World Context ✓
- Disciplinary & Interdisciplinary Learning ✓
- Digital Literacy ✓
- Problem Solving ✓
- Creativity ?
- Design Thinking ?
- Appropriate Teaching Approaches (IBL) ✓

Using this Activity with Learners

Consider the following:

- What is the size of your group?
- How long you want to spend on the activity?
- Will you include Artist Context?
- Will you include any research aspects? (Leonardo da Vinci Historical references)
- Will you make a bridge model from scratch with learners?
- Will you use premade models of bridges in workshop with learners?
- Going further ideas/activities
- Reflection and Discussion activities
- Curriculum Connections
- Mind the Gap – How to include Design Thinking and Creativity?
- Mind the Gap - How to include Science and Technology?

Resources Provided

- PowerPoint Presentation x 2
- Artist project example x 1 video
- Videos of bridge building x 2
- Handout with intro instructions to get started
- Handout with full instructions
- Files to 3D print your bridge pieces

Additional Resource – Spaghetti Bridge

YES! YOUTH ENGINEERING SOLUTIONS PROGRAMME

SPAGHETTI BRIDGE CHALLENGE

Design and build a spaghetti bridge that will support a bag of sugar

BRAINSTORM & DESIGN

Look at your materials and think about the questions below. Then sketch your ideas on a piece of paper. Think about

1: How will you make the bridge strong enough to support a heavy load without sagging/breaking?

2: Should your bridge be long or short, wide or narrow? (Remember you have to support a bag of sugar so measure that out!)

3: Looking at the images of different truss bridges on the next page, which is a better design to use with spaghetti?

4: How many trusses/joints will you need and how will you secure them?

BUILD, TEST, EVALUATE & REDESIGN

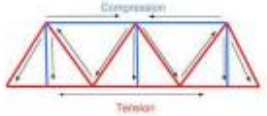
Use the materials to build your bridge. Then test it by adding the sugar. When you test, your design may not work as planned. When engineers solve a problem, they try different ideas, learn from mistakes, and try again. The steps they use to arrive at a solution is called the *design process*. Study the problems and then redesign. For example, if:

- The base of the bridge snaps/breaks - add more layers. This will strengthen it.
- The bridge collapses completely - Try making the span of the bridge shorter by pushing the supports (books etc.). This will reduce the force of the sugar on the bridge and distribute the weight!
- The joints won't hold - Try different adhesive, glue, stronger tape, blu tac etc.

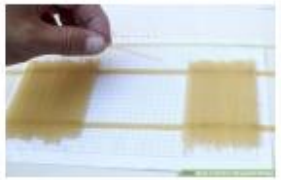
MATERIALS (per person)

- Packet of spaghetti
- Tape (or craft glue, Blu tac)
- 1 sheet of newspaper
- Bag of sugar
- Books for a stand (Supports)

Newspaper to protect surfaces

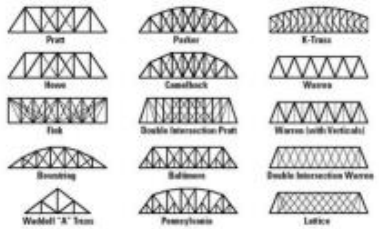


The forces that hold a bridge up - compression and tension. **Compression** pushes the bridge inward, preventing it from being pulled apart. **Tension** opposes compression, pulling the bridge apart and preventing it from caving in. The balance of compression and tension is what allows bridges to hold weight.



YES! YOUTH ENGINEERING SOLUTIONS PROGRAMME

BRIDGE TRUSS TYPE



ENGINEERING CONNECTION

Many people in different types of engineering work to build bridges. Civil engineers are responsible for design and construction of bridges, however they also work with mechanical engineers and material engineers to design the most stable structures. These engineers must consider many variables when creating plans, such as the distance to be spanned, where the bridge is being built, the expected type of traffic it will have, materials available, budget and what the bridge will look like.

Engineers are developing bridges that use advanced technologies and construction techniques that limit their impact on the environment and in some cases, protect fragile ecosystems from human damage. Many of these structures are not only good for the earth, they're also architecturally amazing. Check out these examples:

1. An amazing network of pedestrian bridges is suspended 120 feet over Telok Blangah Hill Park near Singapore. It lets visitors enjoy the park without disturbing its delicate ecosystem. Designers and engineers were careful to avoid doing environmental damage during the construction process.

2. The Langkawi Sky Bridge was designed to give people a view of the Malaysian jungle. The footbridge was helicoptered to the top of Machinchang Mountain. It's reached by cable car rather than road or hiking path, limiting impact on the environment.

Thank You

Any Questions