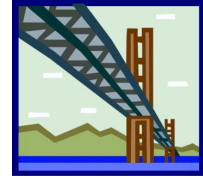




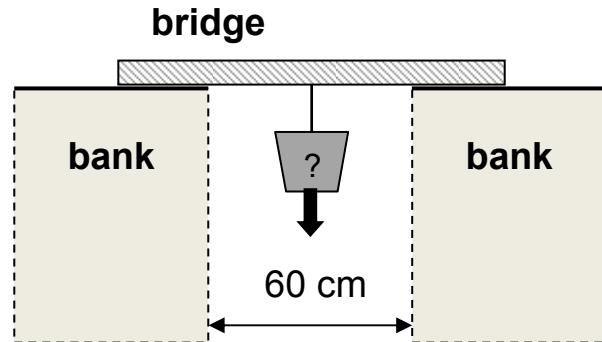
Bridge Design Challenge



Using the kit provided design and build a bridge which spans a 60cm gap.

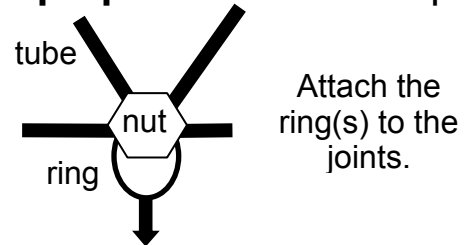
KIT LIST

- A4 paper
 - tube roller
 - hole punch
 - nuts and bolts
 - masking tape
 - 2 standard rings
- these are used to attach the load.



CONSTRUCTION

1. Practise making strong paper tubes. You will need to organise your team to make a tube **production line**.
2. Join the tubes together using the nuts and bolts. Only use one nut on each bolt.
3. Design your bridge. Use the Engineering **top tips** overleaf to help you.
4. Remember to attach the ring(s), the load will be attached at these point(s).
5. **Test!** The engineer will measure the maximum load taken and the mass of your bridge.



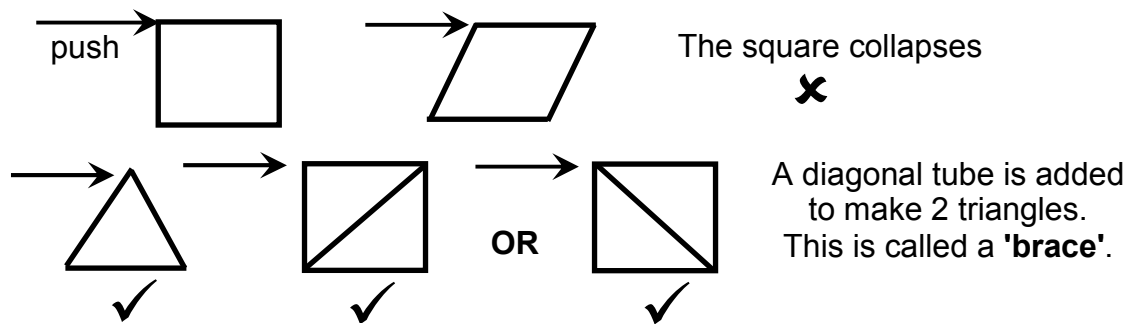
$$\text{strength of bridge} = \frac{\text{maximum load taken}}{\text{mass of bridge}}$$

☺ **Top Tip:** Are all the tubes, nuts and bolts in your structure necessary? Try to reduce the materials used so that your design is more efficient.

Sponsors:



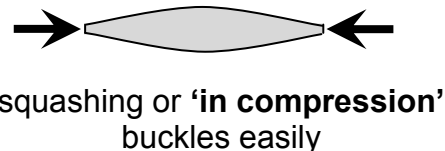
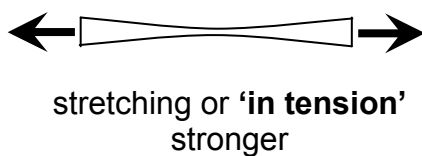
STRONG STRUCTURES USE TRIANGLES



☺ **Top Tip:** You can still use squares – just add a diagonal or 'brace'

☺ **Top Tip:** A sheet of A4 paper will make a long or short tube depending on how you roll it. Make your basic structure using short tubes (length of the short side of the paper). You can then use the long tubes for any diagonals.

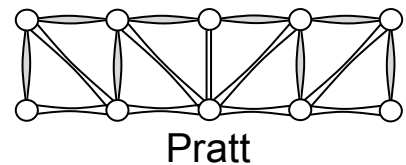
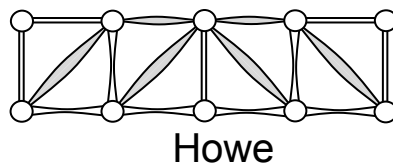
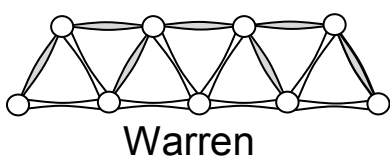
STRETCHING AND SQUASHING



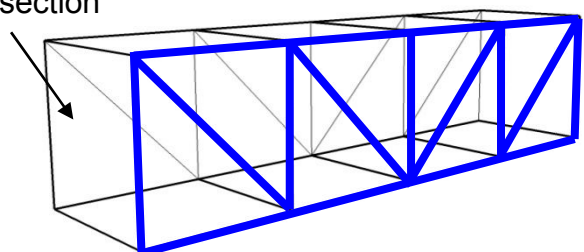
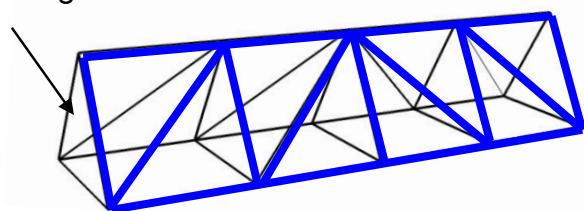
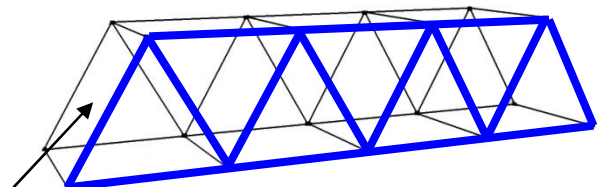
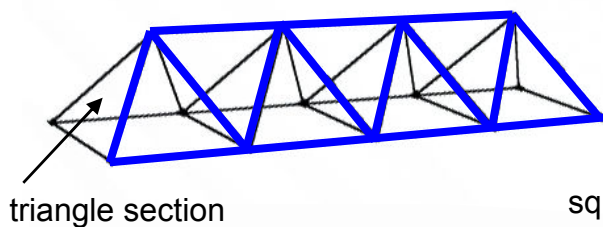
☺ **Top Tip:** Spot which tubes are in 'tension' or in 'compression' in your design. Try to strengthen any tubes which are in compression.

TRUSS DESIGNS

Bridges are made with 2D patterns. Here are some common designs.



Can you make a 3D truss for your bridge? Here are some starting ideas.



☺ **Top Tip:** Each side of the bridge is a 2D truss. Think carefully about how you can join them together.