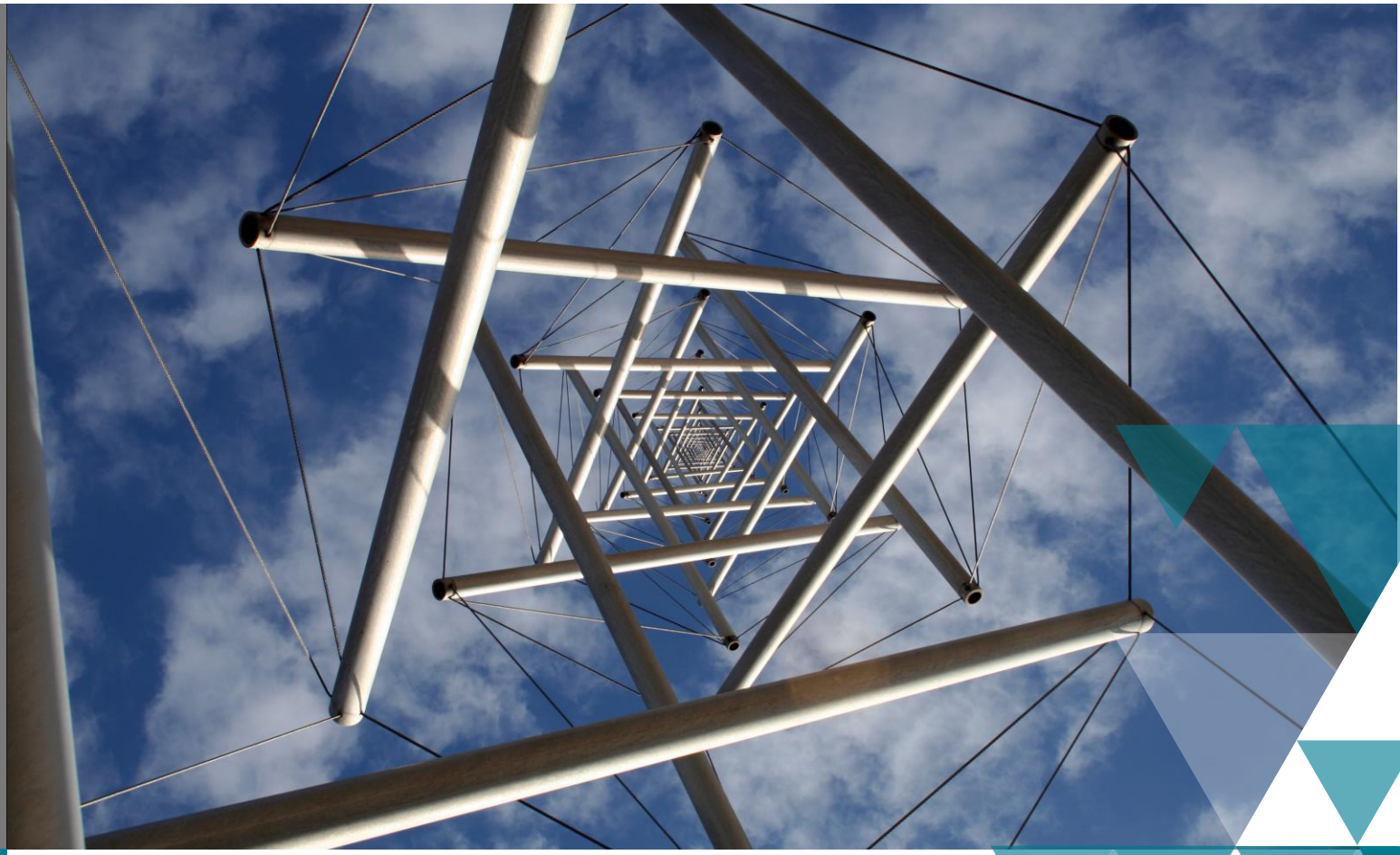

Tensegrity

A do-at-home civil engineering activity for ages 4-18.

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Tensegrity – support with ‘strings’

Tensegrity is a word which was created by sculptor Kenneth Snelson when he worked with famous engineer Buckminster Fuller and is a combination of the words ‘tension’ and ‘integrity’.

Integrity in structures means strong and stable.

Tension is a ‘pull’ force – like when you stretch a piece of elastic.

The integrity of most structure design primarily uses compression forces to stay strong – a pushing force the opposite of tension – but some special structures use tension, especially to create lightweight and flexible shapes. These include ‘geodesic’ domes and some amazing structures and sculptures where heavy steel appears to be floating in the air, held up by tension forces from thin cables. A great example is the Tensegrity Tree at the University of Kent.

Your challenge is to create a tensegrity structure where a solid shape is given integrity using strings.

Cover image: Needle Tower by Kenneth Snelson in Hirshhorn Sculpture Garden by Ben Stephenson from Wikimedia Commons

What you’ll need

- 8 short stiff sticks or rods (e.g. colouring pencils/pens lolly sticks or wooden dowels)
- 8 strong elastic bands and papertape or sellotape
- Approx. 1m of string or wool – parcel string is best – and a pair of scissors

Activity instructions

1. Create two separate triangle shapes out of the rods using the elastic bands or tape.
2. Place the triangles flat on your table and to the corner of one of the triangles attach another rod so it is sticking up vertically. On the other triangle attach the vertical rod from the middle of one of the sides. It’s important to secure the upright rods very securely so they hardly move at all – use several elastic bands looped from different directions as needed. The tension between them will make your sculpture stand up.
3. Now it’s time to assemble your sculpture using the string to create the tension.
4. Take the triangle with the rod in the middle of the side and place that on table. Attach a string securely to the top.
5. Now cut and attach 3 strings (about one and a half times as long as your rods) securely to each of the corners of the second triangle.

6. Use a half-knot to tie each corner to the bottom triangle - they are loose because you might need to adjust them to get the tension right.
7. Now tie the string hanging from top of the first vertical rod to the bottom of the vertical rod on the top triangle – creating a diagonal tension line.
8. Adjust all the string lengths as required to get your top triangle to 'float' without touching the table or any of the other rods. This can be fiddly! Remember to look at which strings have tension and which don't as you adjust.

For 11-16 year olds

Calculate the tension of a single steel bar from the Tensegrity Tree weighing 50kg.
The tension on an object is equal to the mass of the object x gravitational force plus/minus the mass x acceleration.

T = mg + ma

T = tension, N, kg-m/s2

m = mass, kg

g = gravitational force, 9.8 m/s2

a = acceleration, m/s2

For 16-18 year olds

For a longer project why not have a go at making a tension-based geodesic dome out of paper.
Download template and instructions from geo-dome.co.uk

Tell us what you thought!

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