

Rigidity in a Structure

Rigid structures are all around us. What makes buildings so amazing? Apart from being lovely to look at and wonderful to work in, an amazing building is quite often the product of very clever engineering. In other words, it's built not just on rocks or earth but on cutting-edge science and technology.



Context

Rigidity is the property of a structure that does not bend or flex under applied force. Rigid structures enable buildings and bridges to withstand the stresses placed on them everyday. Due to triangles ability to withstand tremendous pressure, this shape is often found in architecture to provide stability. Some of the world's most famous architectural marvels like the Eiffel Tower, Great Pyramids of Giza, and the Louvre Pyramid use the support of triangles to make beautiful, durable structures.



This is the first activity in the Summer Challenge.

Go to <https://www.whizz.com/summer-challenge-2022/> to access the full set of activity packs

Have you ever thought...

What makes a structure rigid?
Can you identify the shapes used when building or reinforcing structures?
Which shapes are the strongest?

Have a look



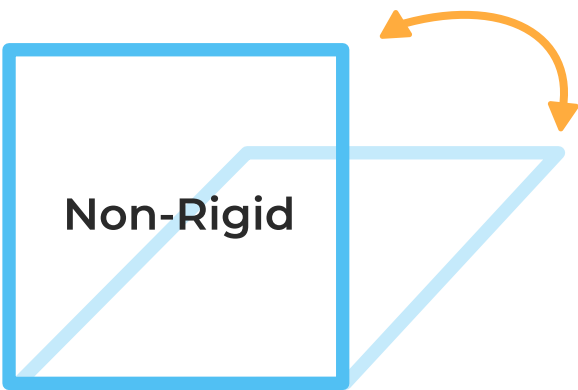
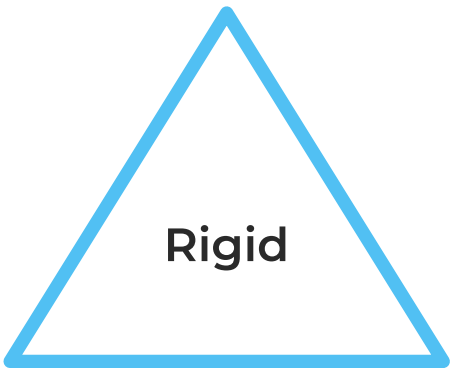
What shapes are in the structures where you live?

You can record the shapes you see by either drawing them or taking a photo.
Remember to describe what you see in terms of shape.
Make a record of what you find.

Triangle	Square	Rectangle
Circle	Hexagon	Pentagon
Add a shape _____	Add a shape _____	Add a shape _____

Investigate...

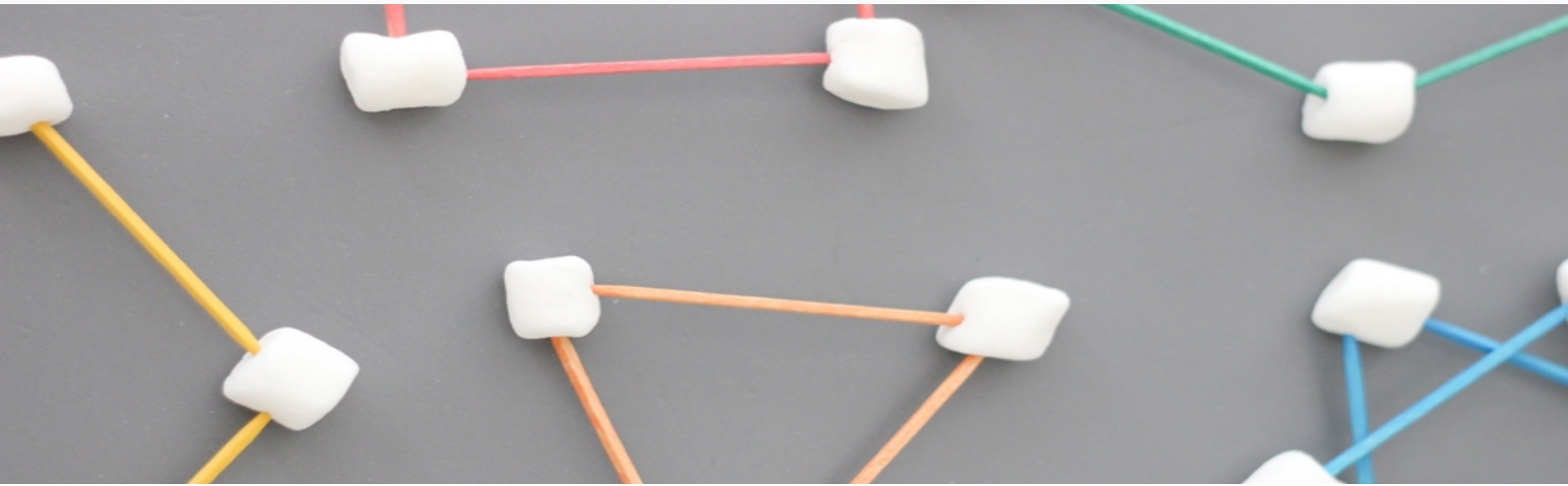
Which shapes are rigid?



Which is the strongest shape?

Using cocktail sticks and marshmallows or straws and pipe cleaners or geostrips, make different 2D shapes and test them by giving the shape a gentle push.

How can you be sure the gentle push is the same each time?



Do the sides of the shape move/ collapse?

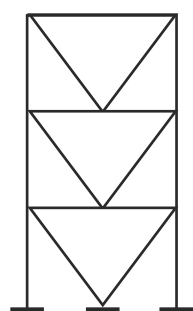
Find an effective way to organise and record your results.

Name of the Shape	What happens?
...	...
...	...

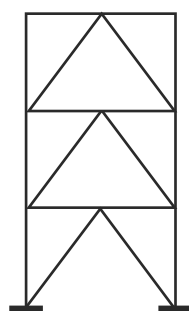
Explore

Stability is crucial in the design of structures.

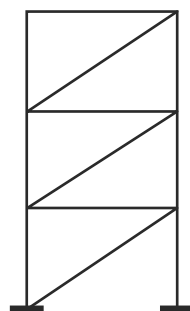
How could you make some of the shapes stronger?



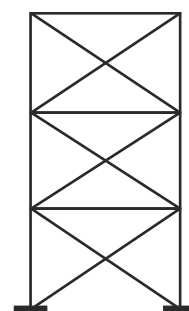
V-Bracing



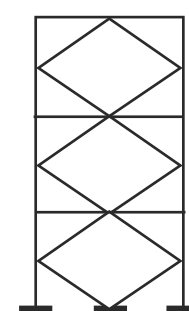
Inverted V-Bracing



Diagonal Bracing



X-Bracing



K-Bracing

This is called **bracing**, giving the structure support.

Try some of these ideas on your shapes. What happened to the shape? Did it collapse easily?

How tall can you build a structure strong enough to support a marble? This could be a short timed task e.g. 20 minutes plus time to agree on a design. You can use resources readily available.

Challenge

Triangles are stable shapes so creating structures out of interlocking triangles make very strong rigid structures.

Is this what you found out in the investigate section? Did you find that your model of a square could easily be transformed into a parallelogram?

Domes made of triangles are called geodesic domes

Build a self-supporting dome out of triangles.



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Did you know?

Domes are the strongest human shelter ever conceived. The even distribution of weight is how domes efficiently distribute stress along the entire structure. They are the world's highest earthquake resistant structures and domes are aerodynamic. They can withstand hurricane winds of even 320 km/h.

The Millenium Dome, now known as the O2 in London, is one of the largest of its type in the world. Externally, it appears as a large white marquee with twelve 100-metre-high yellow support towers, one for each month of the year, or each hour of the clock face, representing the role played by Greenwich Mean Time.



The Mathematics

The students through the investigation and exploration activities will use the mathematics vocabulary and properties associated with a range of polygons. They will be involved in a wide range of problem-solving, recording, describing, conjecturing and justifying to support and develop their mathematical thinking.



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