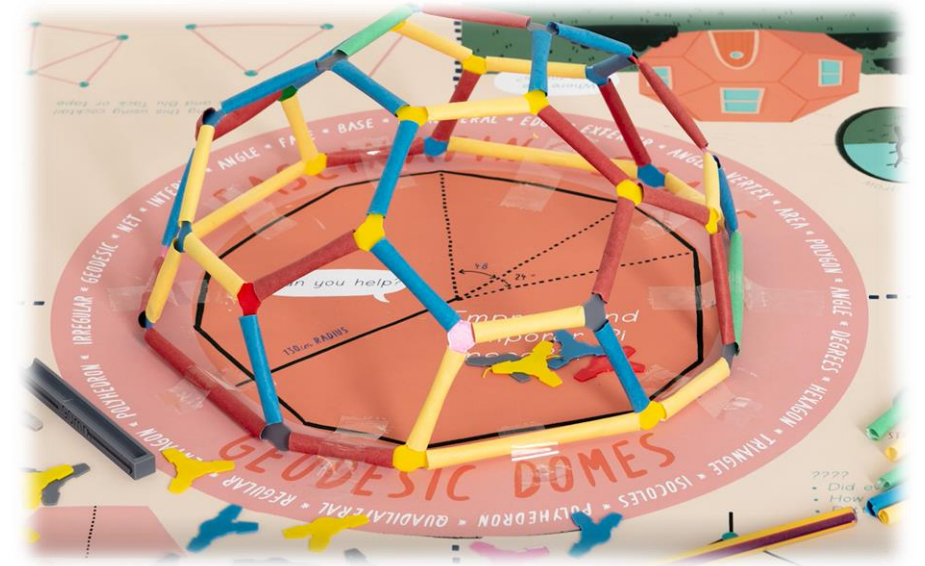


Introduction

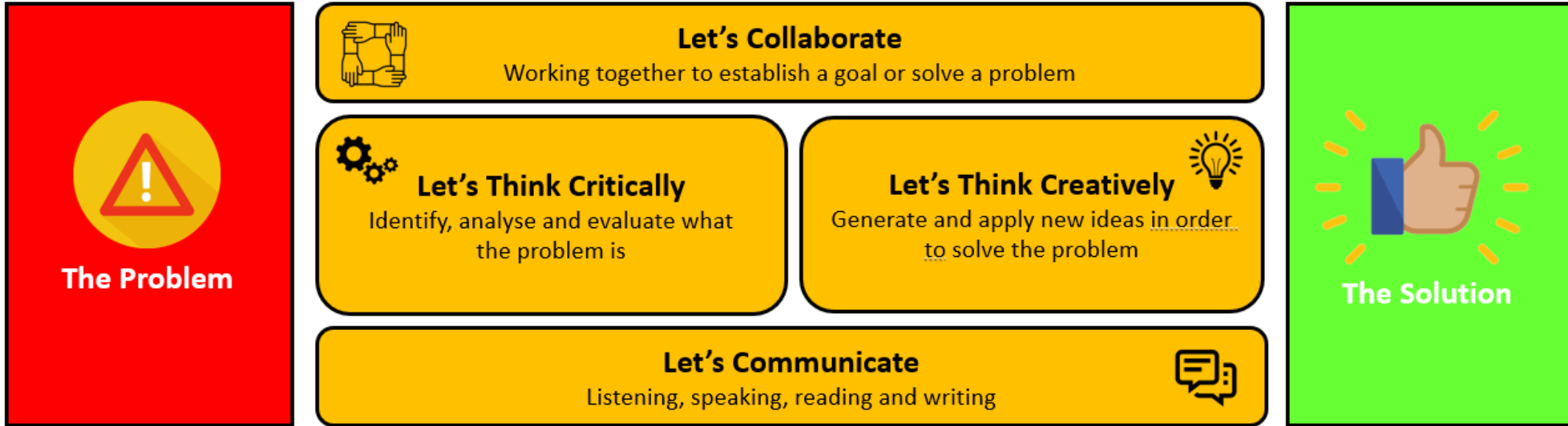
In this project you will be developing your 21st Century Learning Skills and learning how to construct a geodesic dome.

You will also develop knowledge and understanding of:

- Hexagons and pentagons
- Geodesic dome construction using straws and connectors
- Accurate measurement and cutting
- Real life applications of geodesic domes



Let's Develop 21st Century Learning Skills



- Let's Think Critically - Identify, analyse and evaluate what the problem is
- Let's Think Creatively - Generate and apply new ideas in order to solve the problem
- Let's Communicate: Listening, speaking, reading and writing
- Let's Collaborate: Working together to establish a goal or solve a problem

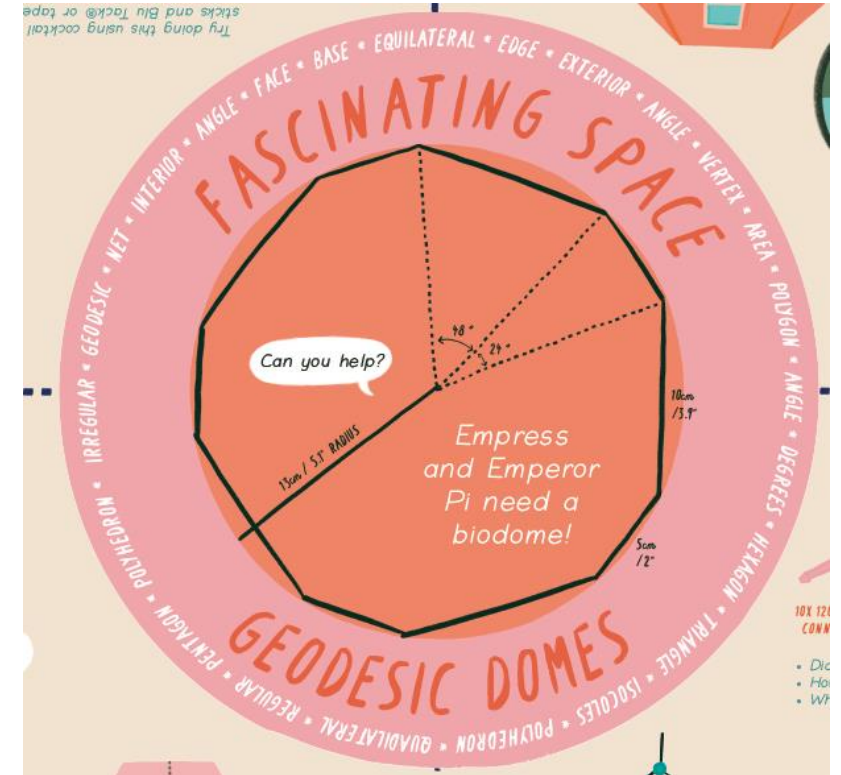
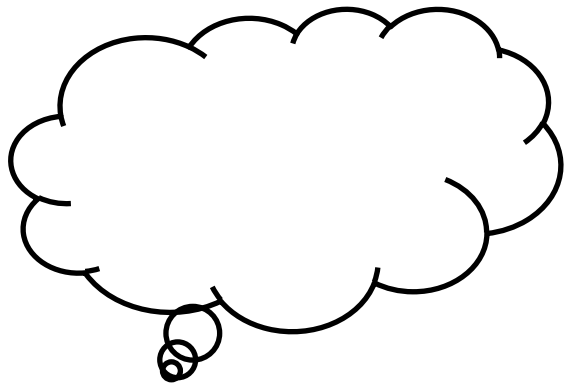


Key Words

Have a look at the key words around the centre circle of the mat.

- Which words are you familiar with?
- Which words are you unsure about?

Discuss the meaning or definition of each word with your team.



The Bigger Picture

What is a Geodesic Dome?

A geodesic dome is based on a hemisphere (half a sphere). It is made up of polygons or triangles. The framework distributes stresses within the structure making it very strong and stable. They are lightweight, easy to construct and resistant to wind. The sphere encloses the largest volume of interior space with the least amount of surface area, thus saving on materials and cost. It was further developed by American engineer R. Buckminster Fuller.



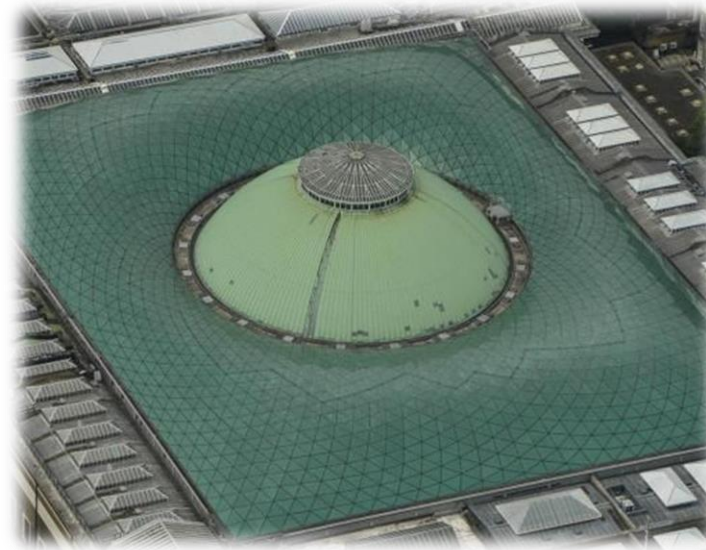
Real world examples of geodesic domes

The Eden Project in Cornwall uses connected geodesic domes.



Real world examples of geodesic domes

Although the British Museum roof is not a complete dome it uses a similar construction method.



Use the internet to carry out further research on real world geodesic domes.



Career Links

Nicholas Grimshaw is the **architect** that designed the Eden Project. He hit on the idea of creating connecting domes after seeing soap bubbles and the way they settle on any surface. The land that was allocated for building was a clay pit that kept moving so the geodesic domes were perfect for adapting to the shifting landscape.

Architects create spaces to live and work in. They can visualise, draw and make 3D models of the buildings that they design.

<https://www.edenproject.com/mission/about-our-mission/architecture#:~:text=Designed%20by%20Grimshaw%20Architects%2C%20our,middle%20by%20the%20Link%20building.>



Section 1– Getting Started

In this section you will draw a circle 26cm / 10.2” in diameter.
From this starting point you will construct a floor plan for the dome using a ruler and a protractor.

Top tips and key questions to support that section of the video

- How can you make sure all your straws are cut accurately?
- How does a jig help the process?
- What two shapes are we creating in the structure?
- You need to be able to use a protractor very accurately and find 24 degrees and 48 degrees



Section 2 – Building your dome

In this section you will cut straws to 9cm/3.5in and 4.5cm/1.8in and then use these and the connectors to build the first layer of your dome.

Top tips and key questions to support that section of the video

- Carefully identify the two different connectors
- Can you see a pattern of shapes emerging?
- Layout the base pieces; one long then one short using the 120/60/180 pieces to connect them
- You will need 5 x 4.5cm/1.8in straws and 5 x 9cm/3.5in straws cut for the base, and 10 connectors

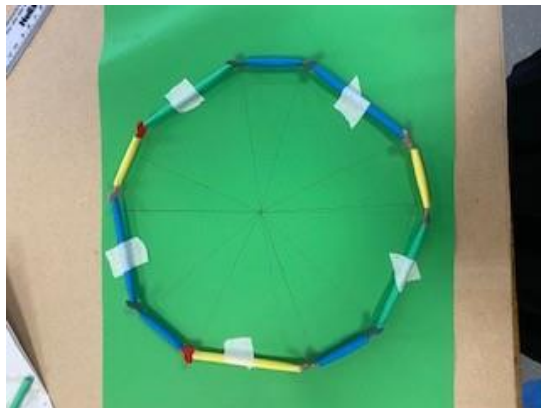
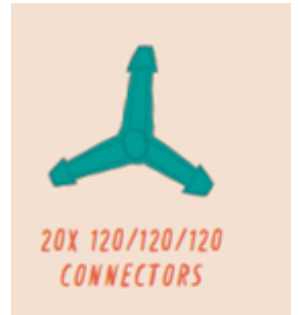


Section 3 – Living in your dome

You will build up the second and third layers of the dome following the video carefully.

Top tips and key questions to support that section of the video

- You will need your 120/120/120 connectors for this section
- Cut 32 short 4.5cm/1.8in straws
- Start connecting in the short lengths to the free arm of the base connectors

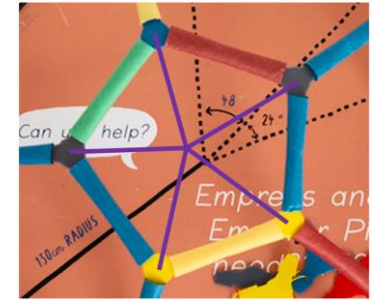


Section 4 – Exploring with maths

In this section you are going to look at the maths behind the dome.

Top tips and key questions to support that section of the video

- What pattern of shapes can you see in the dome?
- Can you spot a hexagon and a pentagon?
- Draw a hexagon and see if you can split it into equilateral triangles
- Draw how you could make the whole dome out of triangles
- Do you think you could make a net of your geodesic dome? Sketch it out.



Extension Activities

Could you use a dome? Could you live in a dome?

Design Challenges

1. Design a new campsite or holiday park featuring a large enclosed tropical swimming pool with an attached jungle garden and camping pods/glamping domes around it.
2. We are going to design a Mars space station for the first settlers on this planet. Design a Space station and dwelling pods.
3. Your school would like to develop a strong, stable dance/sports space on uneven ground. Design the structure that will house that space.



Review / Evaluation

- Describe what has worked well for you while building the dome?
- What would you do differently next time?
- Make a list of the skills you have developed?
- Was using your maths skills to making the base challenging?
- How have you used the dome structure in your new design?
- What advantages does creating this dome have over straight sided structures?



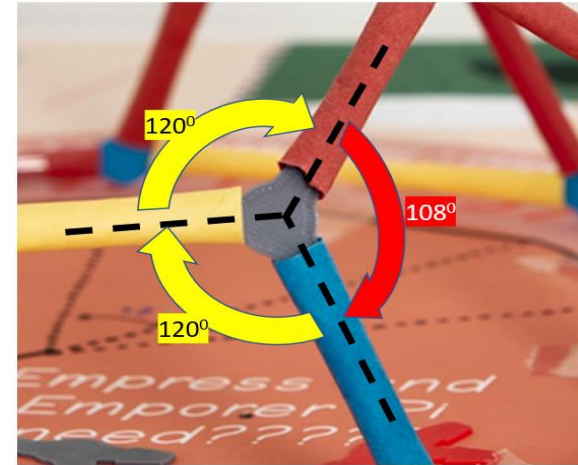
Further study / research

Home learning opportunities

The inside angles of a pentagon add up to 108 degrees and the inside angles of a hexagon is 348 degrees.

A circle has 360 degrees.

Why are they all different?



Interior angle of a pentagon = 108°

Interior angle of a hexagon = 120°

$$108 + 120 + 120 = 348^\circ$$

The total angle of a circle = 360°

Why is this different?

Geodesic domes provide strong, lightweight structures that can cope with uneven ground.

Design a flat pack kit that could be taken to disasters like earthquakes to provide emergency housing.

