

Botanical Gardens



_ACTIVITY BOOK
RIBA KS3 | Mathematics

Which form had the **lowest R**?

This means this shape loses less heat and therefore needs less energy to run.

If you have time try experimenting, creating imaginative new surfaces.



'LET'S DO SOME MATHS!'

ACTIVITY /

Today you are going to help Sophie and Tomas design Towncaster's new Botanical Gardens and will build a model of a Market Hall using recycled materials.

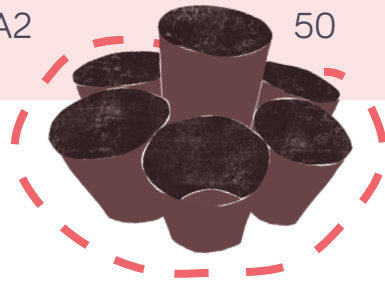
Your teacher will organise you into groups of 4 or 5.



First **check** that you have the right materials, your group should have:



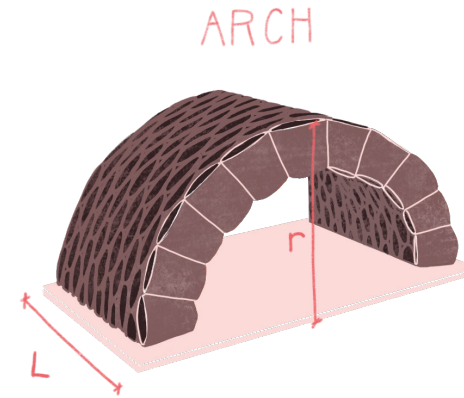
MATERIAL	SIZE	QUANTITY
Recycled Drinking Cups	78mm x78mm or similar	60
Paper Clips	Large	100
Clear Sticky Tape	Roll on Dispenser	2
Green Card (various shades)	A4	3
Ruler	30cm	1
Sheet Corrugated Cardboard, 6mm thick	A2	50



“The main material you will use are ordinary, everyday, **plastic drinking cups** which you may have been helping to collect. These have been designed to throw away after use which is not good for the environment; however you can put them to good use in this activity before they go into the recycling bin.”

MATHS 1 /

Use the formulae below to work out **R** for the **Arch** form.



$$S = \pi rL + \pi r^2$$

$$V = \frac{\pi r^2 L}{2}$$

$$R = S/V$$

MATHS 2 /

Use the formulae below to work out **R** for the **Dome** form.

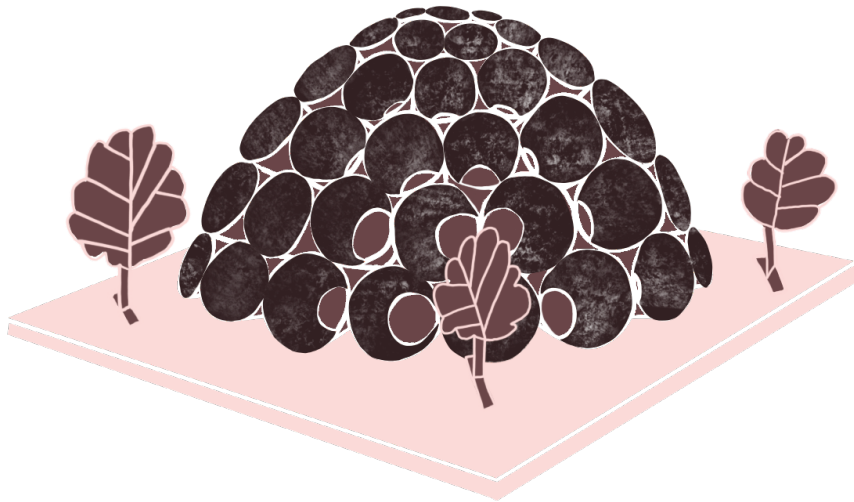


$$S = 2\pi r^2$$

$$V = \frac{2\pi r^3}{3}$$

$$R = S/V$$

'LET'S DO SOME MATHS!'



"Now you can use some **mathematics** to work out which is the best shape for Botanical Gardens."



NOTE:

Remember that a greenhouse traps heat from the sun. A **low Surface to Volume Ratio, R**, is best for keeping that heat inside the building.

STEP 1 /

In your group you can use paper clips and sticky tape to experiment with connecting the cups together to make a curved surface. The type of surface you create will depend on how you connect the cups together.



"If you connect the cups in a **curving line** like this you can join these to make an arch or tunnel shaped surface"



STEP 2 /

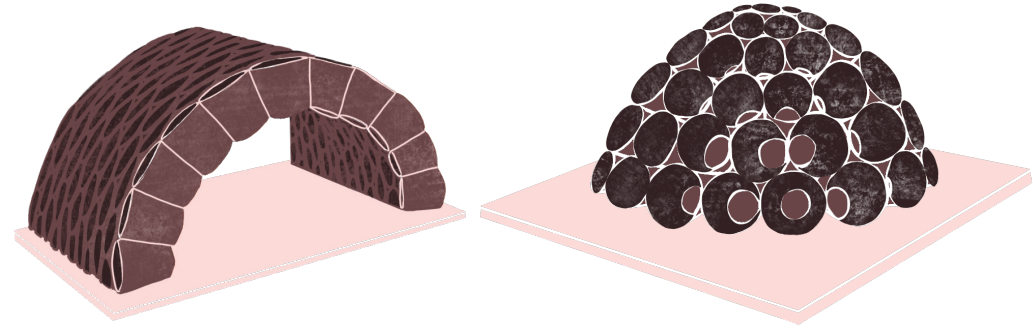
If you connect the cups into **hexagon** and **pentagon** shaped clusters you can then join these together following the pattern you find on a football.



“If you follow the pattern on a traditional football you can create a surface in the form of a **dome** – try experimenting.”

STEP 3 /

Once you have created a surface, you can **fix it using sticky tape** to a sheet of corrugated cardboard that can form the base of your model.



STEP 4 /

Make trees and bushes from the green card and add them to your models.

“You may have an **arch shape** or a **domed shape**. Imagine how these could be giant greenhouses which can house big trees and bushes.”

