

## Classroom activity:

# Why did engineers design food containers to be cylinders?

**Introduction:** Problem solving activity which can be run as a demonstration, or pupils can make their own shapes with paper and test how much weight the shape can support.

The simple answer is that cylinders can withstand greater pressure, so are a useful shape for packaging and storing food. But can pupils prove it?

Suitable from 10 years of age and up.

**Aim:** Pupils predict which shape is the strongest and will be able to support the heaviest weight.

**Curriculum links:** STEM, especially engineering and problem solving.

**Real world context:** Tin cans, drinks cans, Pringles tubs and many other food products are packed into cylinders. And other products as well like shampoo, cleaning products and so on.

### Equipment you will need:

- Coloured sugar paper/construction paper
- Sticky tape
- A heavy book or more than one reading book or notebook

### Risk assessment:

You will need to carry out your own risk assessment for your setting and your young people, and it's helpful to practise in advance. Think about:

- ensuring any heavy objects do not drop on toes or elsewhere
- potential for paper cuts
- perhaps run it as a demonstration
- perhaps prepare the paper shapes in advance

### Engineering process

#### 1) What is the problem that pupils will need to solve in this activity?

Find out which shape is the strongest.

#### 2) How will they investigate?

- Create a simple 3D shape from sugar paper/construction paper.
- Pupils can work in groups or pairs to make a triangle, a cylinder or a 4 sided-box shape.  
Taking an A4 sheet; to make a triangular shape, fold the paper - landscape - into 3 equal sections,  
To make a 4-sided box shape, fold the paper – landscape - into 4 equal sections.  
To make a cylinder, roll the paper – portrait - into a tube.
- For all shapes, tape on the join, without overlapping the paper.

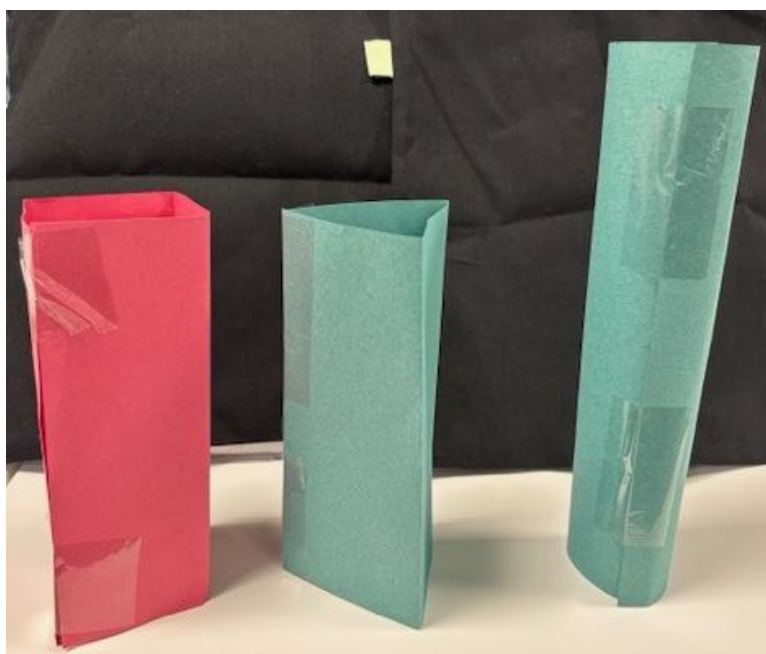
iv. Use the weight given to prove the cylinder is the only one that doesn't crumble. Use a notebook or reading book as the weight. You may need one or more books.

3) What do they need to consider to improve their solutions?

Discussion about making the shapes stronger. For instance, choosing different materials or overlapping the layers.

What would be the impact of making changes? For instance, increased costs and use of raw materials.

### Example of set up



### The science:

A can offers the most volume for the smallest amount of packaging. That means it takes less material to make a can than it does to make a box that holds the same amount of food or beverage.

While a sphere is the most cost-effective packaging shape, it will roll, so a cylinder is the next best, easy-to-manufacture option. Therefore, if a manufacturer can package its products in cans, it can save money.

The second reason is strength. Cans can withstand up to 90 pounds per square inch of pressure. That means carbonated beverages won't burst through the packaging if internal pressure builds. Also, there aren't the intrinsic weak points you'd have with a rectangular shape. On a cube, every edge is a weak point. Plus, the walls of a rectangle would need to be reinforced to be as strong as a can.

Overleaf is a page that can be shown on a screen or printed as a reminder of the activity.

Create a simple 3D shape from the  
coloured paper



Which shape is the strongest and can  
support the heaviest weight?