OpenUpScience

Issue 12

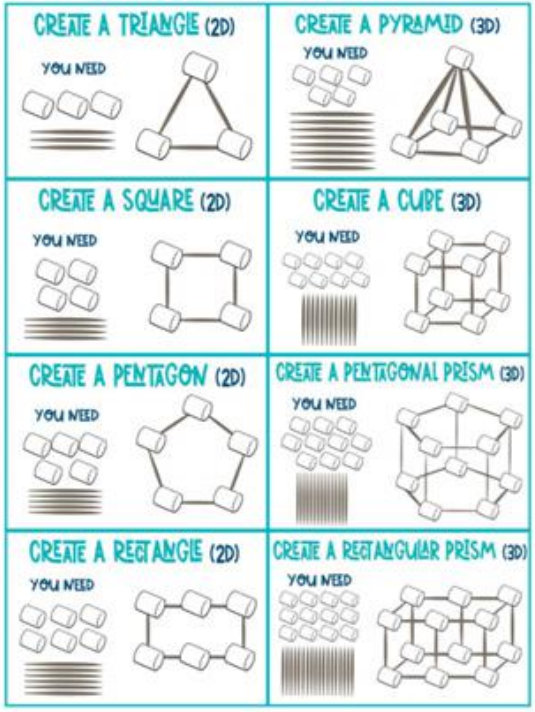
Welcome to OpenUpScience, the weekly magazine from Cambridge Science Centre. In this week's issue we will be exploring all sorts of structures. Inside there are towers to build, sculptures to construct, bridges to balance and even a bit of chocolate welding!

A structure is something that is built or arranged in a definite way to provide support. Structures can be natural, like a spider's web, leaves or a skeleton. They can also be man made, like skyscrapers, roads and bridges. In this issue we will be exploring man-made structures. We'll show you some unusual and fun ways of making your own structures. So let's get building!

Spark, Ignite, Fuel, Illuminate

Spaghetti Towers

Engineers have been constructing tall buildings for thousands of years. The pyramids of Ancient Egypt are over 140 m tall. Today, engineers can construct much taller buildings, which are popular because they provide lots of office space or living space on a small piece of land. Cities across the world now feature thousands of skyscrapers, making it possible for many people to work and live in a very small area.



Strong shapes are important for your spaghetti towers.

Practice these shapes using mini marshmallows or midget gem sweets and cocktail sticks.

Which shape is the strongest?

Did you know?

The World's tallest tower is the Burj Khalifa in Dubai. It has a total height of 829.8 m and it has 163 floors. The lifts travel at 10 m per second – to travel from the ground floor, to the observation deck on the 124th floor only takes one minute!

Spaghetti towers

Now you're ready for some BIG tower building!

What you'll need

- Uncooked spaghetti
- Bag of marshmallows (you can use mini, or full size!)
- A flat surface to build on

What to do

- The aim is to see how tall you can make your tower.
- Use strands of spaghetti as the framework and support for the tower.
- The marshmallows are used as the connectors.
- The more the marshmallow can grip the spaghetti, the stronger the joint.
- Try using multiple strands of spaghetti, or smaller pieces to brace your structure.

This Week's Challenge

Build a bridge and test how much weight it will hold. It's up to you **how** you make your bridge! You can go big, or small, simple or complicated, any material. Let us know how much weight your bridge can hold and send a picture to:
OpenUpScience@cambridgesciencecentre.org
Look out for your bridge on Science@6, YouTube, Monday 6pm.

Build safely!

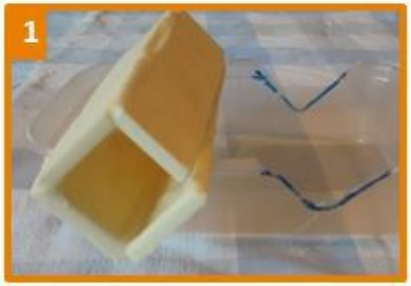
Chocolate welding

Hot water! Adult supervision required!

What you'll need

- A helpful adult
- A plastic tub
- Scissors
- Weights or coins
- Two plastic cups
- At least 6 Milky Bars
- A straight sided glass bottle with screw top lid (e.g. a wine bottle)
- Hot water
- Oven gloves

Get an adult to help with cutting boxes and pouring hot water!!



1. Cut two pairs of right angle-shaped notches into the plastic tub. These are supports for the chocolate bars while they set.

2. Next, test a simple bar bridge – balance a single Milky Bar between two cups. Add weight until the bridge breaks. How much weight can this bridge hold?

3. Now, fill the bottle with hot water. Use oven gloves to handle the bottle once it's filled with hot water.
4. Carefully use the side of the hot bottle to melt the edge of one Milky bar.
5. Join this Milky bar to another to make a right angle. Make a second set of right angles. Leave these to set on your plastic tub.

Chocolate welding

Hot water! Adult supervision required!

6. Once set, you can join both of your chocolate bar right angles together to make a box girder.
7. Now test your box girder bridge on your cups. Add weight or coins until the box girder breaks.

We need to test our bridges to find the maximum weight they can hold before they break. This is the kind of measurement that engineers perform on materials and structures to make sure they can withstand heavy loads or lots of use.

What was the maximum load that your bar bridge could take? How did it break? Did it start cracking slowly, or break all at once? What factors do you think could have affected this?

What about the maximum load for your box girder bridge?

Finally, who thinks chocolate would be a good material for bridges in the real world?

Did you know...?

The steel suspension Millennium Bridge in London was nicknamed the 'Wobbly Bridge'. When it opened, huge numbers of people walked over the bridge. As they walked, the bridge started to sway, so the people walked in time with the swaying bridge. The more people responded to the movement, the worse it got. Eventually the bridge was closed for two years to correct the wobble!

Paper pyramid

The pyramids of Giza in Egypt were built about 4,500 years ago, and are still in pretty good condition! Pyramids were usually built as tombs, believed to keep a person's body safe after death. The engineering of the pyramids was so impressive, that even today scientists don't know exactly how they were built.

What you'll need

- Newspaper (lots)
- Tape or a stapler

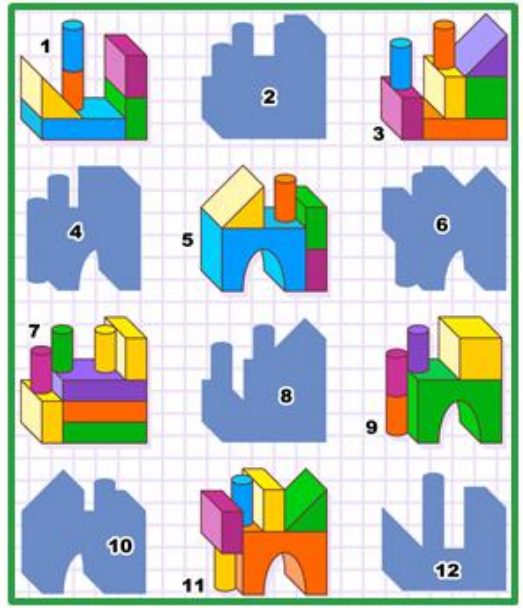
What to do

1. Lay out two sheets of newspaper.
2. Starting from one corner, roll the sheets of newspaper as tightly as you can.
3. Secure with a piece of tape.

The tighter the roll, the stronger your structure will be

4. Make lots and lots of newspaper rolls!
5. Now you can start to join the rolls together to form your structure.
6. Join three rolls together to make triangles.
7. You can make many structures with this technique

Try a pyramid or a geodesic dome



Structure shadows

(Answers on back page.)

Match the structure to its shadow.

I had a joke about construction...

But I'm still working on it!

Can you construct?

Create the longest structure, or build a whole city!

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What you'll need

- Toilet roll tubes
- Paint (optional)
- Scissors
- A flat surface to build on

What to do

1. Paint your toilet roll tubes, if you want.
2. Cut your tubes into different lengths.
3. Make small slits in the edges of your tubes.
4. Start constructing!
5. Try to build outwards instead of upwards.

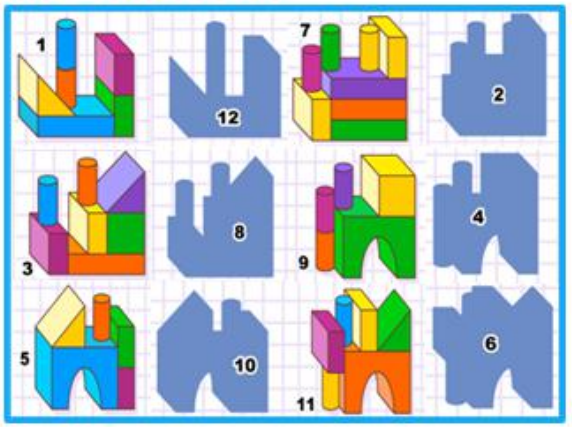
What is the widest structure you can build?

Did you know..?

The longest man-made structure on Earth is the 21,196 km Great Wall of China

The Great Barrier Reef is the largest living structure on Earth, covering an area of 348,700 km^2

Puzzle Solution



1 = 12
3 = 8
5 = 10
7 = 2
9 = 4
11 = 6

Next Issue: Summer Science

Send us your work! OpenUpScience@cambridgesciencecentre.org

Send us your questions! Look out for the answers on:
Science@6 - YouTube, Monday, 6pm

Help us improve OpenUpScience!
Let us know what you think:
https://link.cambridgesciencecentre.org/feedbackissue12

Find out what else we're up to:

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