CREST AWARDS | SUPERSTAR

Bridge Blunder

Organiser's Card

About the activity

This activity is designed to get children thinking about weights, forces and measures.

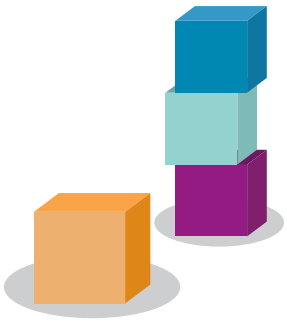
Children are set the challenge of helping Star Spans, a design company, fix their bridge and stop it swaying.

Through this activity you will support your group to:

- Build different models of bridges.
- Test their different models to see which can hold the most weight and why.
- Record and share their results.

Kit list

- A4 paper – 12 sheets per team (2 for initial exploration, 5 for their first trial, 5 for the final bridge). Have a few pieces in reserve. Scrap paper is fine.
- Sellotape – you should restrict this to a short strip per group. Sellotape is only for securing things, not for wrapping round the paper.
- 10 and 100 gram masses, coins, blocks or other equipment to act as 'weights' – bridges can support a surprisingly large mass.
- Play blocks or similar to create the 20 cm gap for the bridge – or gap between chair and tables.
- Pictures of bridges (optional)



What to do

1. Introduce the activity using the story of Star Spans. You may want to show the children some pictures of different shaped bridges.
2. Give out activity cards and equipment to the children.
3. Explain that they will be using the equipment provided to test the best design for a bridge. Give the children a little time to talk together and to try making strong shapes using single sheets of paper. They can fold or cut the paper if they wish.
4. Encourage children to discuss their ideas and how to carry out their investigations.
   Prompt questions:
   - How many different kinds of bridge do you know?
   - Are some shapes stronger than others?
   - How will they make sure their test is fair?
   - How will they record their results?

5. Now give each group 5 sheets of paper and a small amount of tape. Tell them they have 10 minutes to try out ideas for how they might make their bridge. This will not be the final bridge. Let each group test their bridge with weights as they go along. You will need to decide together where to put the weights on the bridges to test them.
6. Encourage children to evaluate the design. What do they need to change to make the bridge stronger? Now they will make their final bridge. They will need more paper. Warn them that they are not allowed to use any of the old paper but can use their earlier ideas to help them.
7. Support children to conduct their tests and make their own records of their results. They could also take photographs or make drawings. After children have tested their bridges, provide time for them to talk through what was successful and what didn't work.
8. Ask the children to present their bridge to the rest of the group and test it.

Things to think about

Make sure the weights are placed, not dropped, on the bridges.

You can decide to spread weights evenly across the bridge (like the children in the story) or focus them in the centre. To make fair comparisons between the bridges the same test should be carried out on each one.

Do not fasten the ends of the bridge to the supports. This does strengthen the bridge but if well fastened it can require large weights to make even a single piece of paper collapse.

There are many solutions to this problem. The shape is all important.

The weakest bridge is often a flat sheet of paper. It can be made stronger by flat folding, creating a triangular prism shape or rolling the paper along its length. Walls can add strength as can pillars or arches. Suspending the bridge can also help.

We have used the term 'weights', rather than the more scientifically accurate 'masses', since this is the term that young children are more likely to know.

Keywords

- Construction
- Weights
- Masses
- Suspension
- Support

Take it further

Children could act out a design award to showcase the bridge or bridges that were the strongest.

Children could sketch their bridge and make notes about how it worked.

Watch out!

Avoid weights falling from a height.

If bridges are high, you will need a bucket of sand or cardboard box filled with crumpled paper underneath to catch falling weights.

BRITISH SCIENCE ASSOCIATION

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Activity Card

A sparkling new footbridge has been built in Startown. Class 4 of Startown Primary School were invited to the grand opening. All the children stood on the bridge as their classmate Anil (aged 8) cut the official tape.

Even before the cheers had died down the bridge began to sway and bend. All the children were hastily rushed to one end and the bridge was closed.

Star Spans, the designers of the bridge, looked very red faced.

"We're not sure what went wrong. The bridge was such a beautiful shape. What do we do now? Can anyone help us?"

Your challenge

Can you help Star Spans design a bridge that can be used safely?

When people design bridges they build models. This is what you will need to do.

Discuss

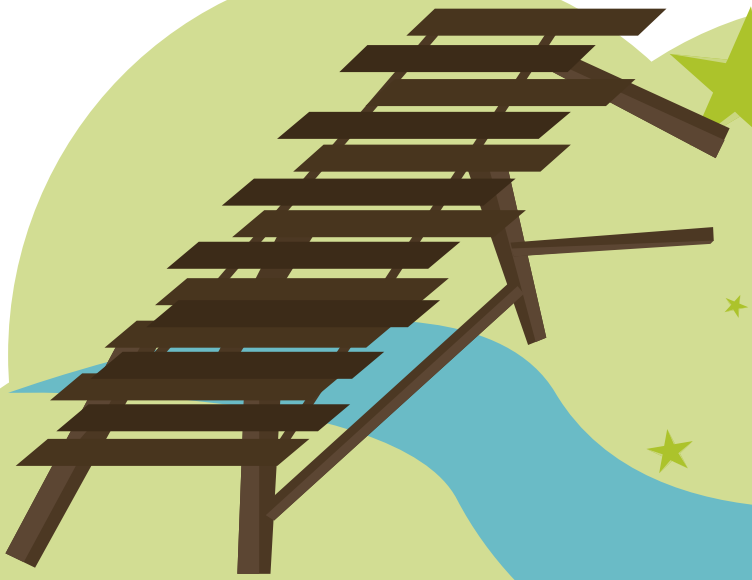
- How many different kinds of bridge do you know?
- Are some shapes stronger than others?

Getting started

Your bridge needs to span 20 cm. Think about which shapes are the strongest.

Try exploring bridge shapes with single pieces of paper. You can cut the paper if you wish.

Why not try rolling, curving and folding the paper.



Test your ideas

Test it with weights.

Does it matter where you put the weights?

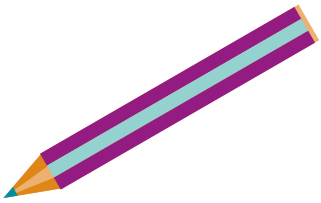
Remember the children were standing across the whole length of the bridge when it started to wobble.

Now make one final model.

You might like to record your results in a table like this:

Bridge	Maximum weight bridge could hold
Bridge #1	
Bridge #2	
Bridge #3	

Share your ideas



Show your bridge to the rest of the class.

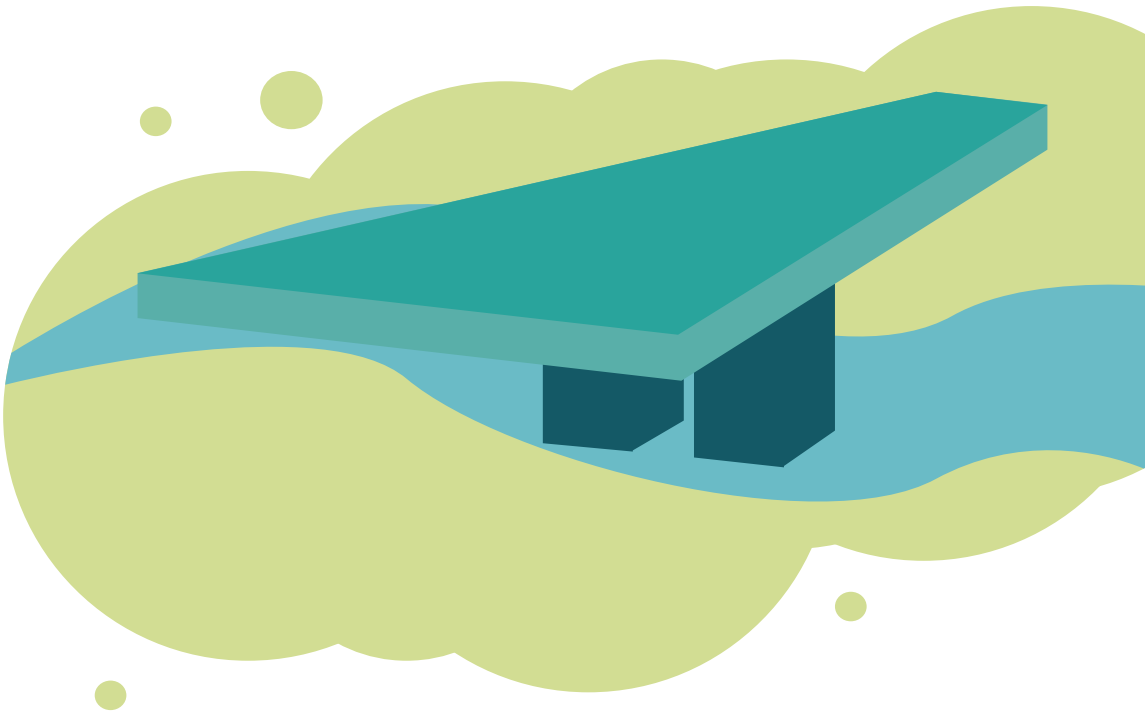
You could take pictures and add notes about what you think might make your bridge stronger and more stable.

Extra things to do

Can you find out about the highest and longest bridges in the world?

What did people in ancient times use to build bridges? How does this compare to bridges built today?

You could find out about different bridges and make models of them to show how they work.



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