

BRIDGING THE GAP

EXPERIMENT: STRAW BRIDGES

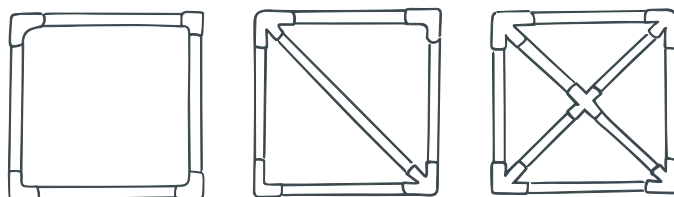
Travel is easier when you have a bridge to help you get across a rushing river or huge gorge that's in your path. There are many different bridge designs, but they all have the same function: to provide passage over an obstacle.

MATERIALS

- ☐ 35 non-bendy straws
- ☐ Clear tape
- ☐ Scissors
- ☐ Meter stick
- ☐ 200 to 300 pennies
- ☐ Small cup
- ☐ Pencil
- ☐ Paper
- ☐ Two chairs or tables

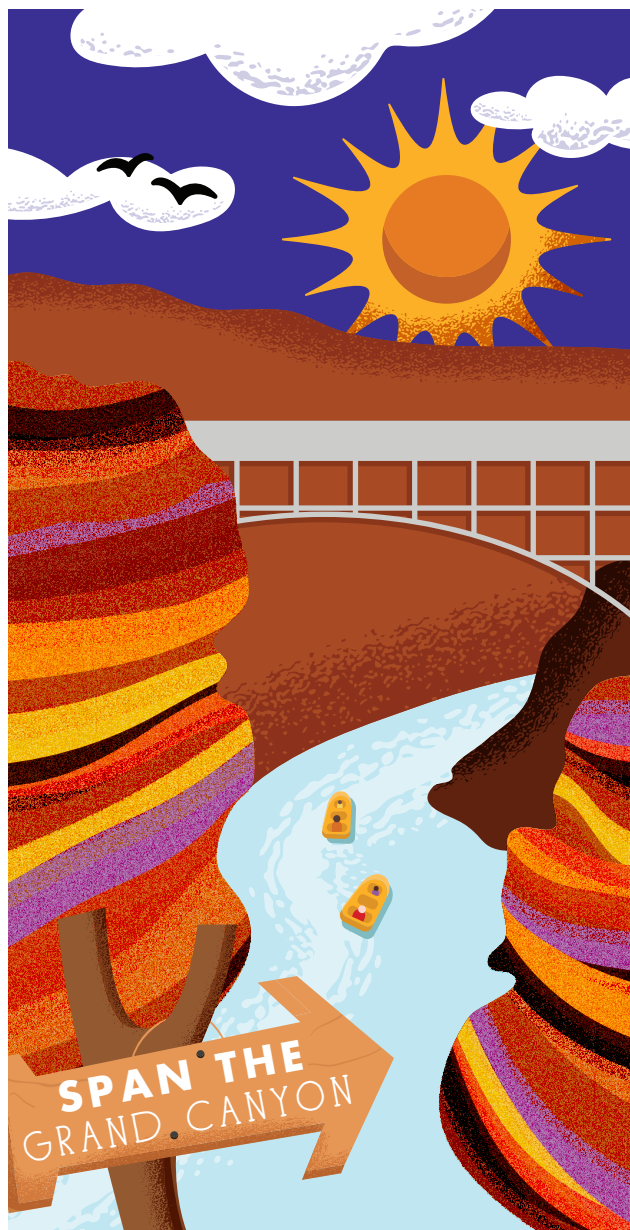
INSTRUCTIONS

Start with a quick activity to understand which shape is strongest. Tape together straws to make three squares like the ones below. On one square, tape a straw on the diagonal through the center. On another square, tape two straws through the center to make an X. Stand up each shape and push down gently on the top. Which shape feels strongest?



Your challenge is to build a bridge using shapes that you think will make your bridge the strongest and able to hold the most weight. It must meet these requirements:

1. Span at least 25 centimeters across two tables or chairs and not be taped or attached to them.
2. Use no more than 20 straws, but they can be cut into smaller pieces.
3. Securely hold a small cup in the middle of the bridge. This is where you place pennies to test the weight limit.



Before you build, come up with an idea of how you will design the bridge. Draw sketches if it helps you think through your ideas. Build your bridge using only straws and clear tape. When you are satisfied with your bridge place it between two tables or chairs that are 25 centimeters apart. Place the cup in the middle and add a few pennies at a time. Count the pennies and keep adding them until the bridge collapses. How many pennies did it hold? How did the bridge break? Can you change your design to make it stronger?

PRIMARY BRIDGE TYPES

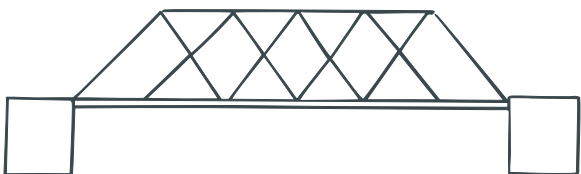
Beam



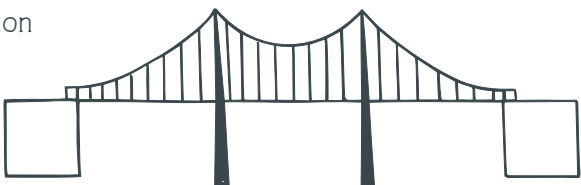
Arch



Truss



Suspension



WHAT'S HAPPENING?

Look at a steel or wooden bridge and often you will see triangle shapes making up most of the bridge's support structure. These are called truss bridges. Triangles are structurally the strongest shape because they allow weight to be evenly spread throughout a structure, allowing it to support heavy loads. Truss patterns are used in other structures as well, such as roofs, radio towers, crane arms and more. Engineers must consider loads, or the weights and forces that a structure must withstand. The dead load of a structure is the weight of the structure itself. The dead load of a bridge includes beams, cables and the deck. The live load of a structure is the weight that is added to the structure, including people, cars and wind.



GAME ON

Have a bridge-building competition with your family or friends. Give everyone the same amount of materials and try to build the strongest bridge in a specific amount of time. Or try building a bridge over a longer distance. You can also try building bridges with other materials, such as craft sticks or dry spaghetti.

LEARN MORE

Marvel at the 60-foot Golden Gate Bridge made entirely from LEGO® bricks in MSI's *Brick by Brick* exhibit, then try your hand at several building challenges.

RECOMMENDED READING

Bridges and Tunnels: Investigate Feats of Engineering by Donna Latham