

# Types of Bridges



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# Types of Bridges

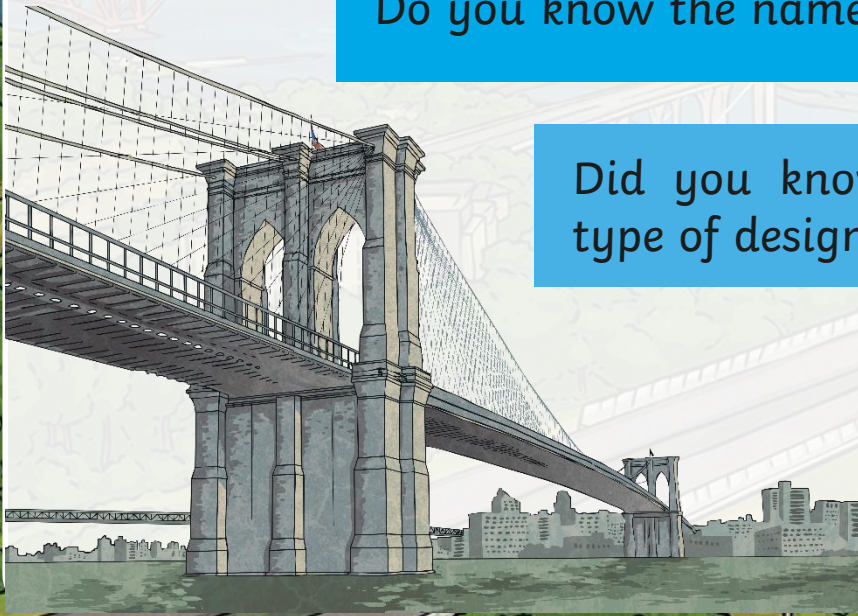
What are bridges used for?

What bridges have you seen in real life? Where were they? Were they designed for people to walk over?

Do you know the name and location of any famous bridges?

Did you know that there is more than one type of design for bridges?

Let's take a look at some of them.

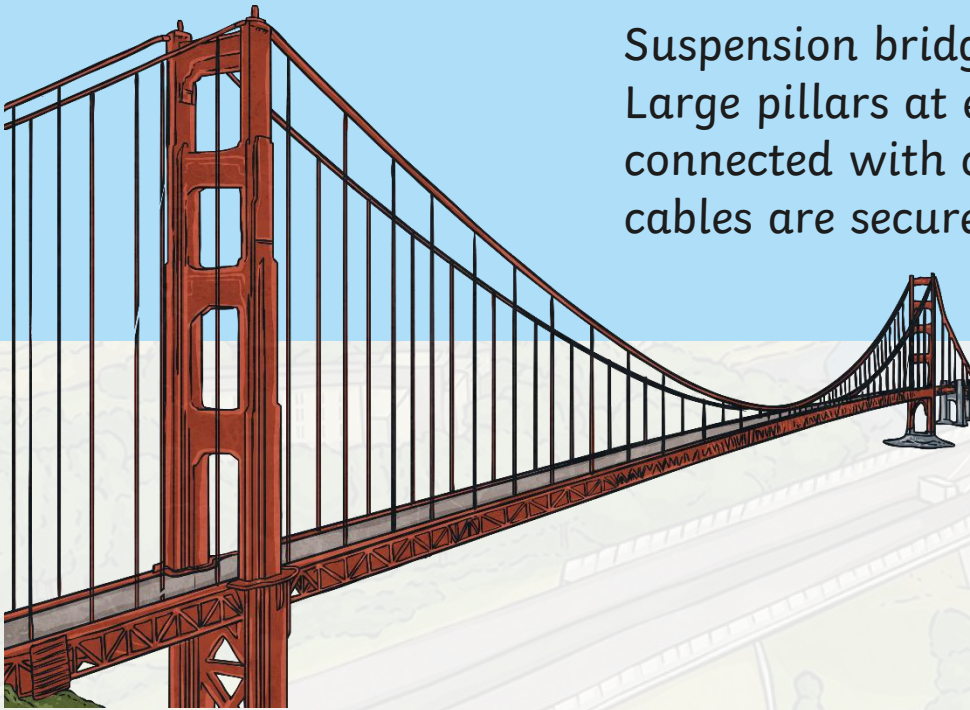


# Suspension Bridges

A suspension bridge uses ropes, chains or cables to hold the bridge in place. Vertical cables are spaced out along the bridge to secure the deck area (the part that you walk or drive over to get from one side of the bridge to the other).

Suspension bridges can cover large distances. Large pillars at either end of the waterways are connected with cables and the cables are secured, usually to the ground.

Due to the variety of materials and the complicated design, suspension bridges are very expensive to build.

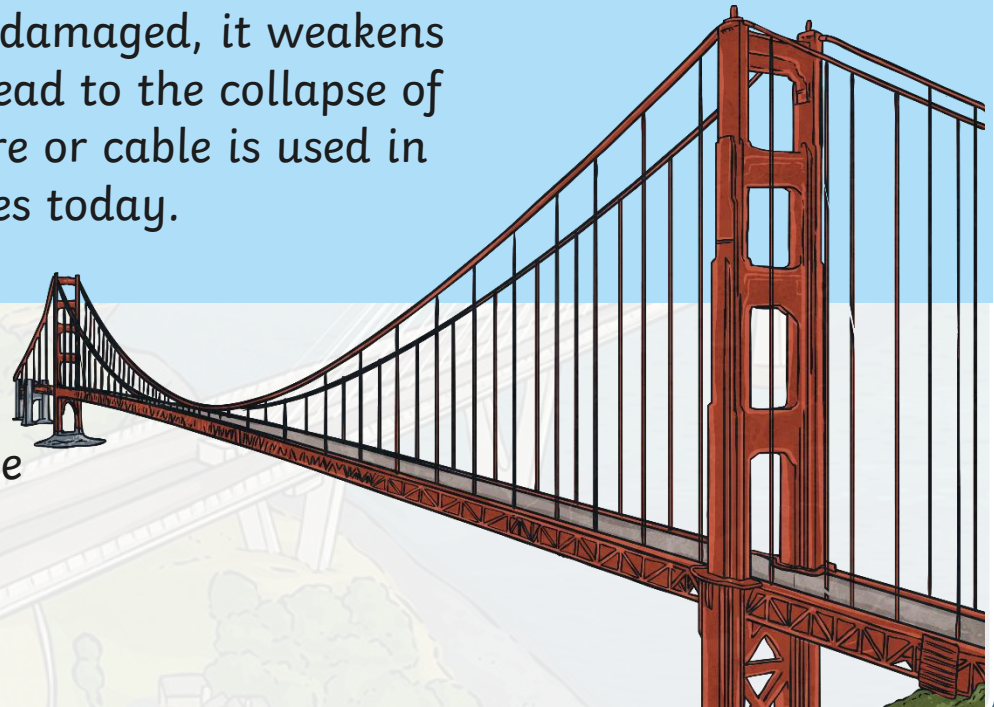


# Suspension Bridges

The structure of suspension bridges has changed throughout the years. Jacob's Creek Bridge in Pennsylvania was built in 1801. It was the first suspension bridge to be built using wrought iron chain suspensions. It was 21 metres long.

If one single link in a chain is damaged, it weakens the whole chain which could lead to the collapse of the bridge. For this reason, wire or cable is used in the design of suspension bridges today.

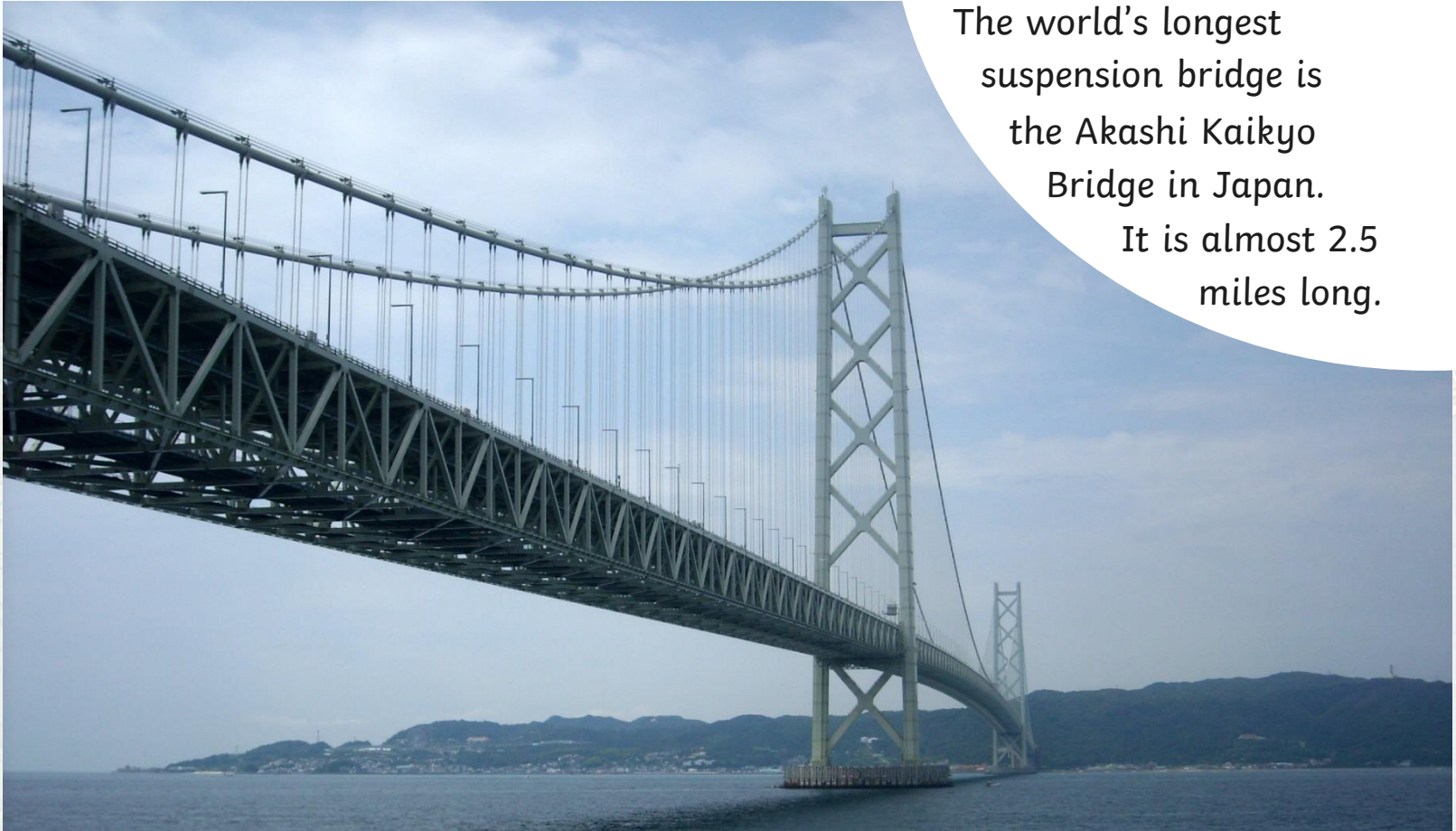
Even though engineer James Finlay promised that the bridge would stay standing for 50 years, it was damaged in 1825 and replaced in 1833.



# Suspension Bridges

Akashi Kaiko Bridge, Japan

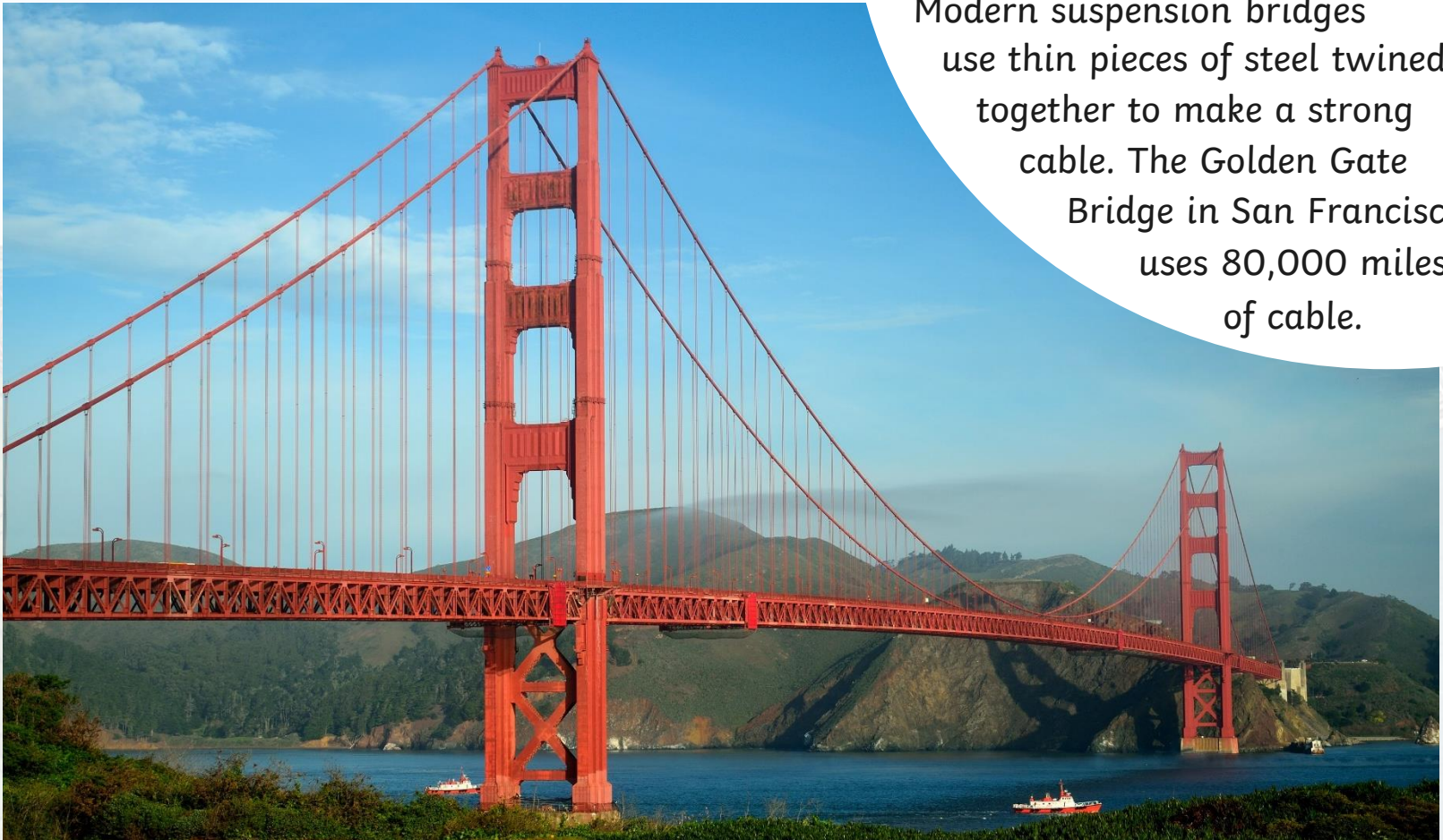
The world's longest suspension bridge is the Akashi Kaikyo Bridge in Japan. It is almost 2.5 miles long.



"Akashi Kaikyo Bridge, Kobe, Japan" by Andrew Green is licensed under [CC BY 2.0](https://creativecommons.org/licenses/by/2.0/)

# Suspension Bridges

Golden Gate Bridge, USA



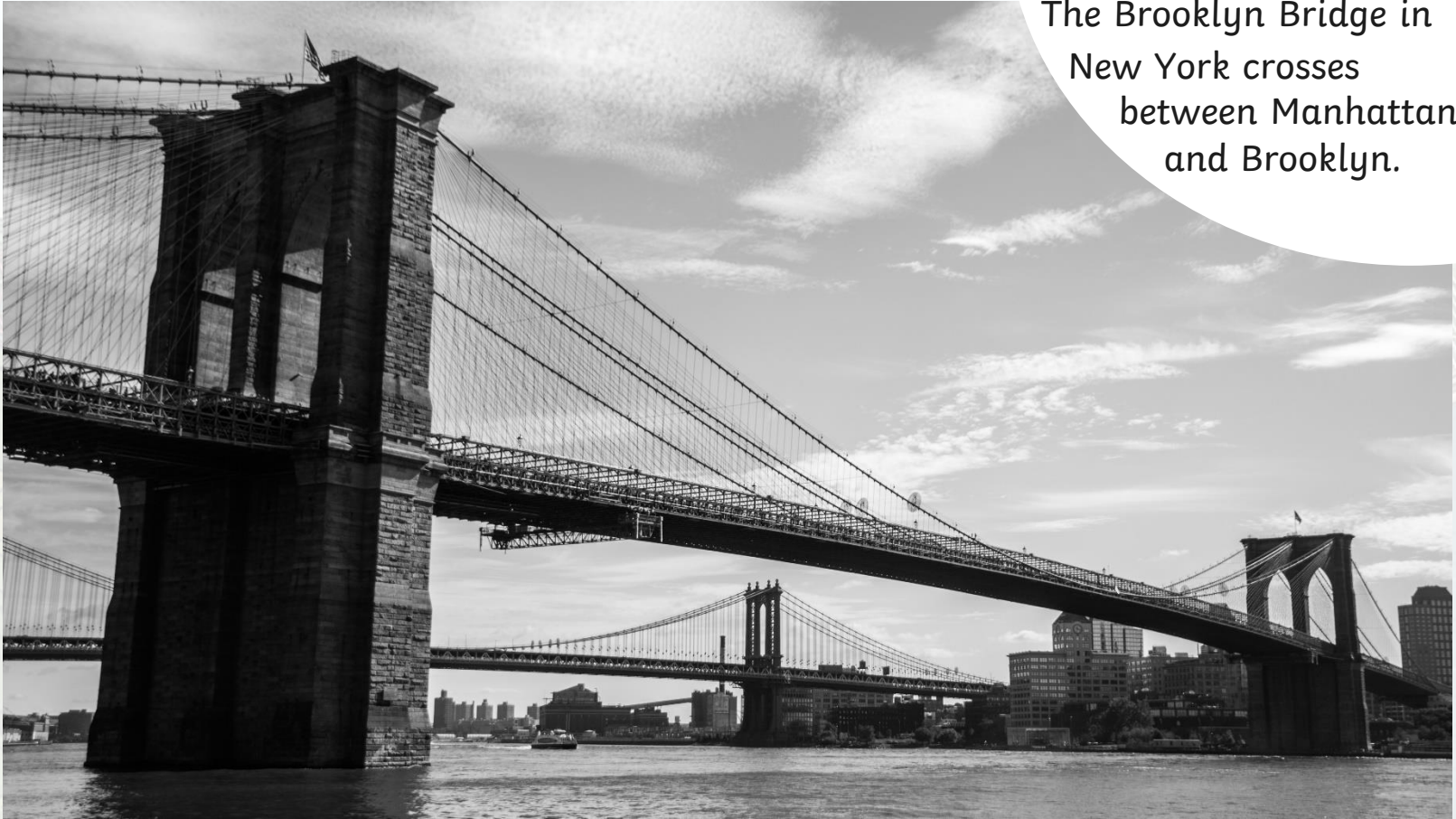
Modern suspension bridges use thin pieces of steel twined together to make a strong cable. The Golden Gate Bridge in San Francisco uses 80,000 miles of cable.

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# Suspension Bridges

Brooklyn Bridge, USA

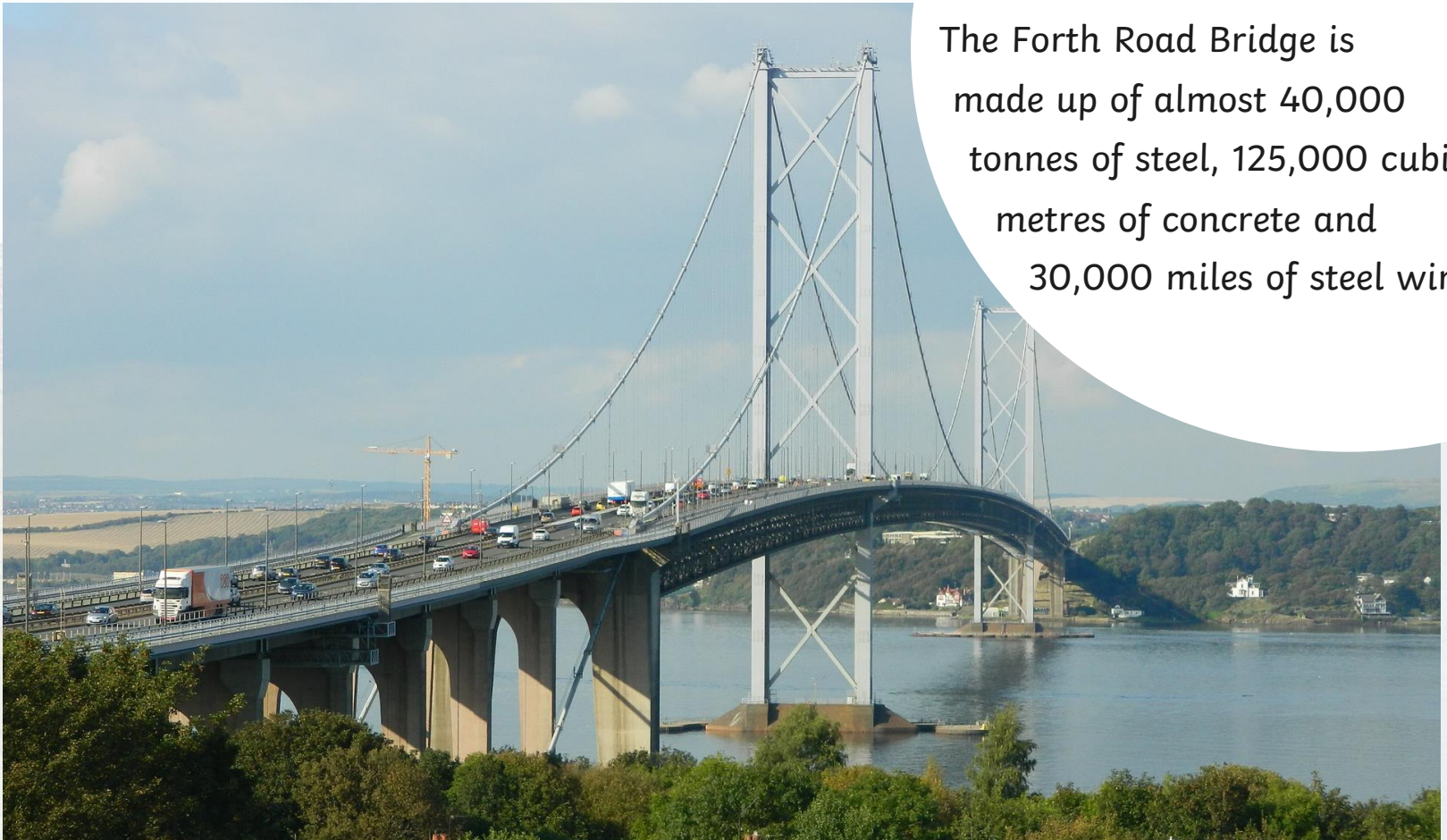
The Brooklyn Bridge in New York crosses between Manhattan and Brooklyn.



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# Suspension Bridges

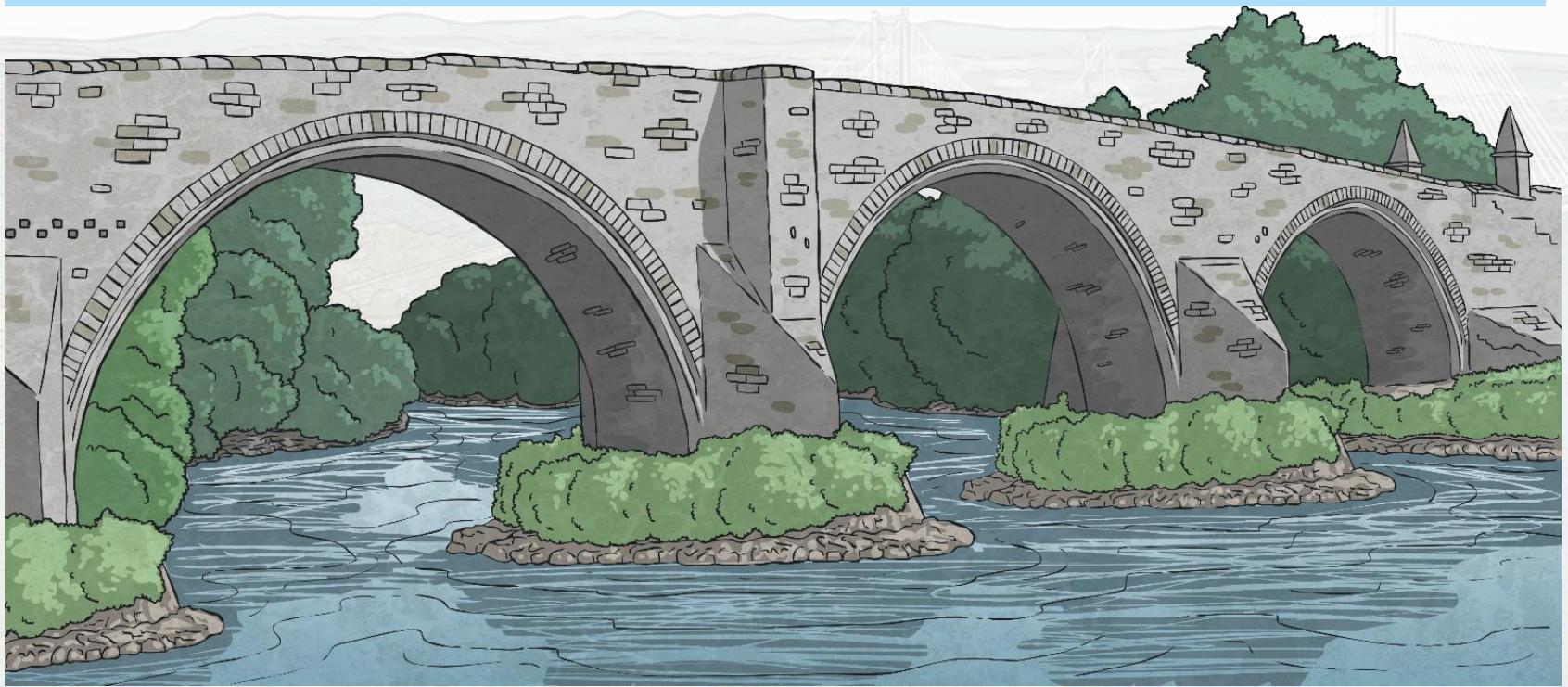
## Forth Road Bridge, Scotland



The Forth Road Bridge is made up of almost 40,000 tonnes of steel, 125,000 cubic metres of concrete and 30,000 miles of steel wire.

# Arch Bridges

The arch bridge design is over 3000 years old. In the past, arch bridges were usually made of stone, brick or wood. More modern arch bridges are usually reinforced with steel or concrete. The supporting pillars that are at either end of the arches are called abutments.



# Arch Bridges

An arch bridge uses a curved shape to spread the weight from the bridge over the curve, rather than the weight bearing straight down. Any weight put on the bridge is carried outwards towards supports that are built into the ground on either side of the bridge. The arch is usually a semicircular shape.

The design of the arch bridge and the materials they are made with means that they are usually very strong bridges.



# Arch Bridges

Sydney Harbour Bridge, Australia



Between 2500 and 4000 people were involved in the building of Sydney Harbour Bridge. The bridge has the nickname 'The Coat Hanger' due to its shape. Can you see why?

# Arch Bridges

## Chaotianmen Bridge, China

The Chaotianmen Bridge has six lanes of traffic going across it. There are also two 'lanes' for people to use to walk across the bridge.



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# Arch Bridges

Rialto Bridge, Italy



The Rialto Bridge is in Venice. It is the oldest bridge to cross over the Grand Canal. It was built between 1588 and 1591.

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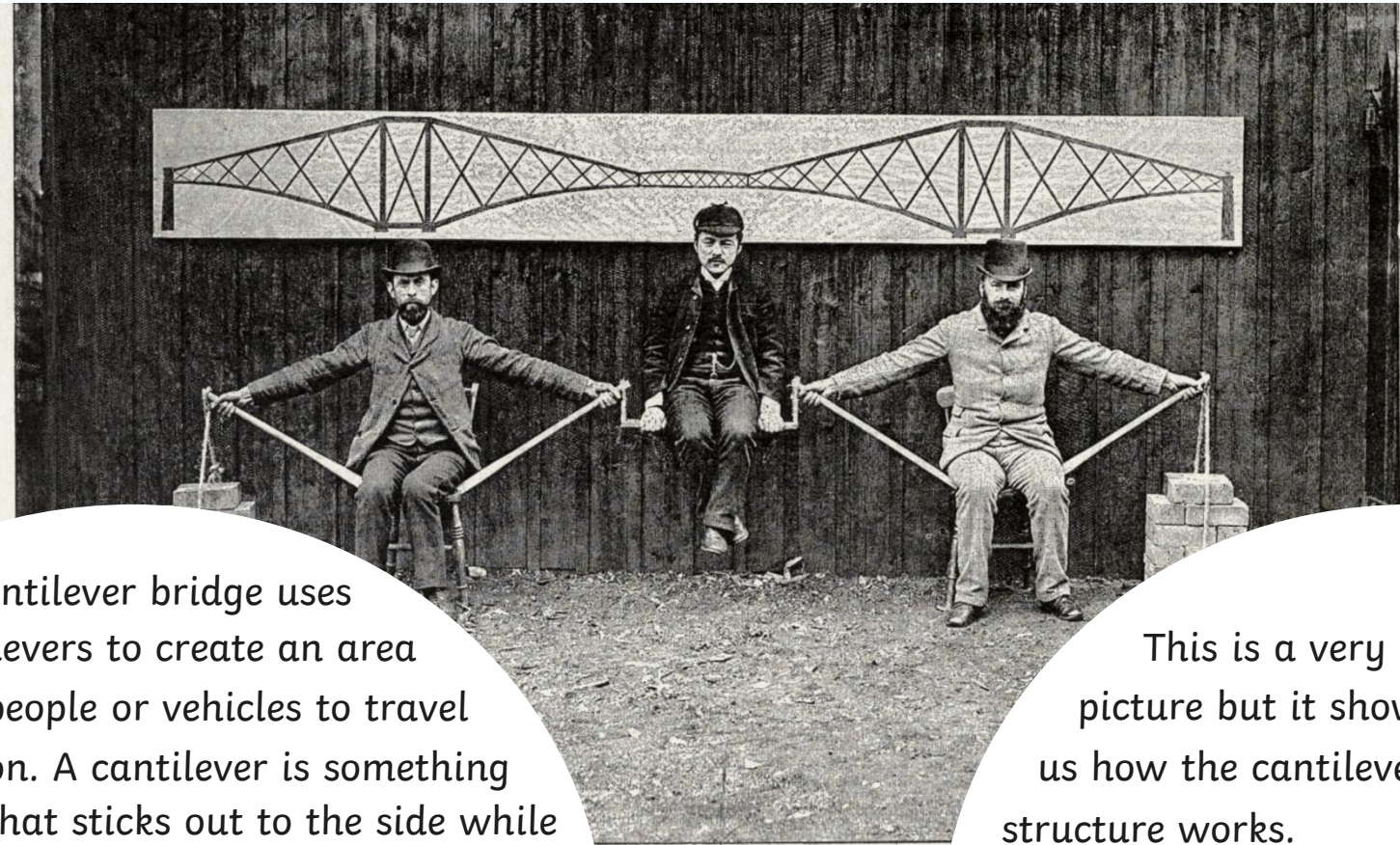
# Cantilever Bridges

The first cantilever bridge was built in 1867 by Heinrich Gerber. He wanted to create a bridge long enough to cross larger distances, such as the Main River in Germany. He was able to create a structure which had arms that met in the middle of the Main River, allowing it to be crossed.



Compared to today's cantilever bridges, Gerber's was basic and small but this design allowed more complex and larger structures to be built. It was innovative and new, making Gerber a famous name in the engineering of bridges.

# Cantilever Bridges

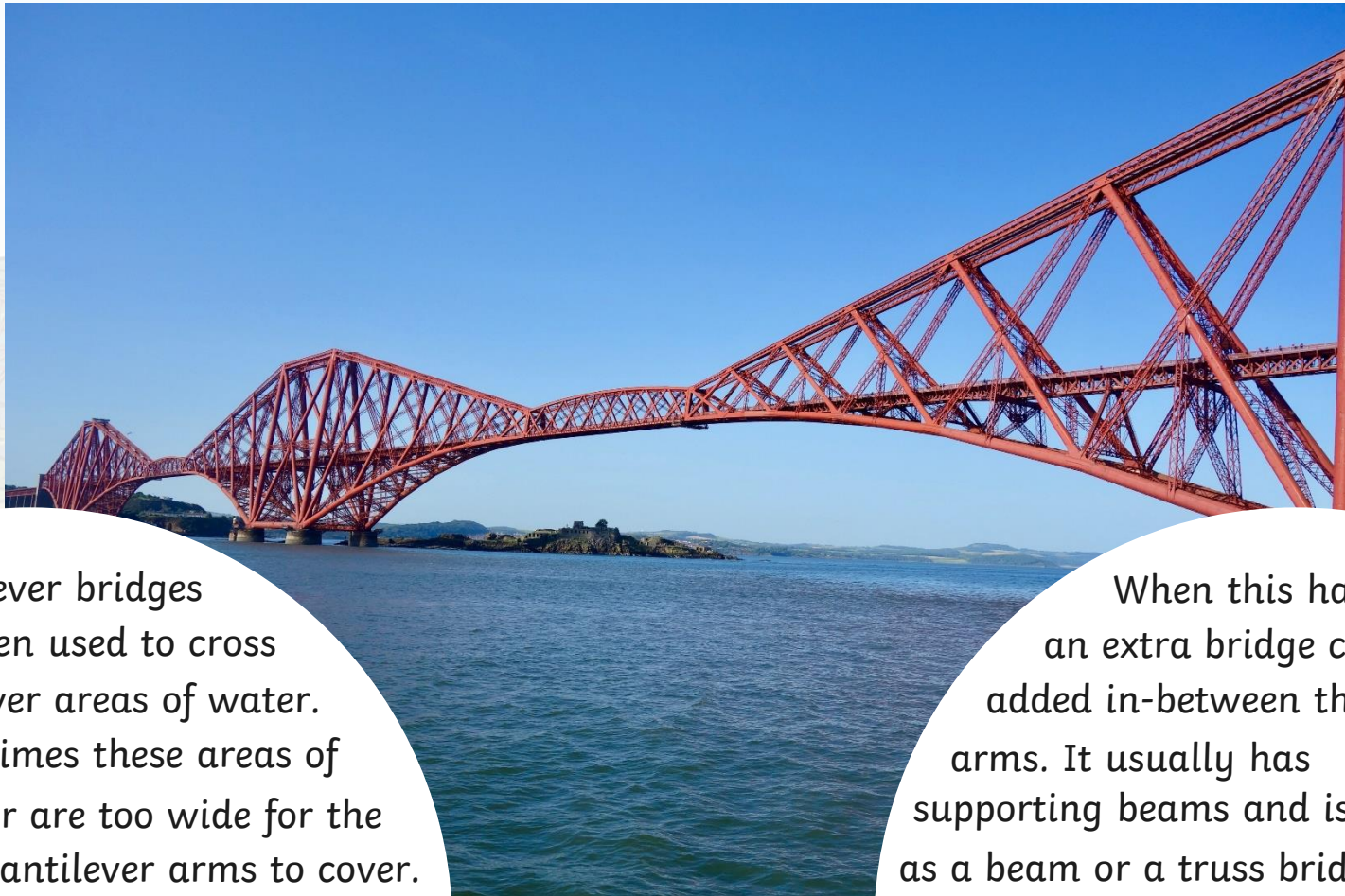


A cantilever bridge uses cantilevers to create an area for people or vehicles to travel on. A cantilever is something that sticks out to the side while being supported by something else.

This is a very old picture but it shows us how the cantilever structure works.

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# Cantilever Bridges



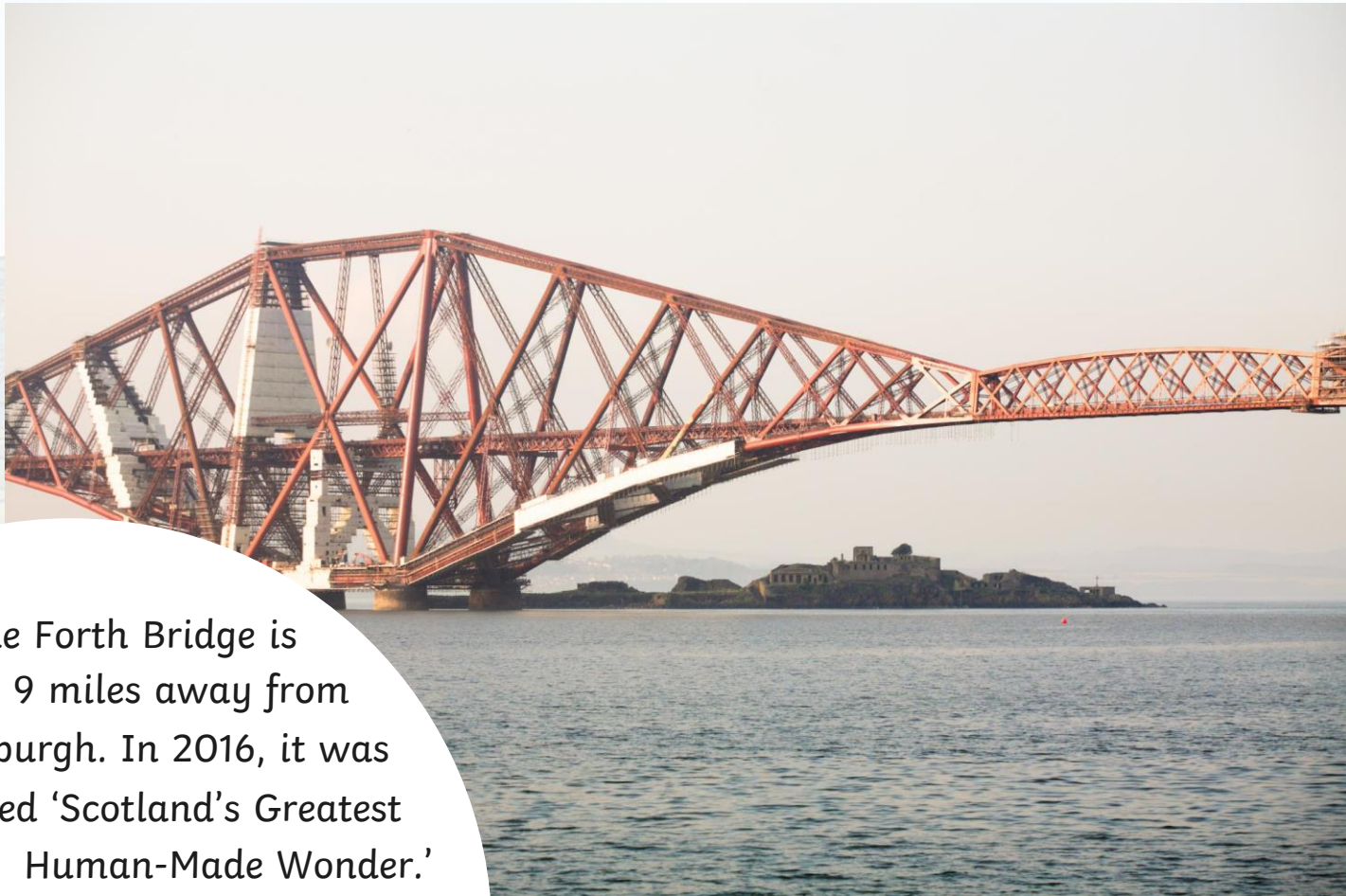
Cantilever bridges are often used to cross over areas of water. Sometimes these areas of water are too wide for the cantilever arms to cover.

When this happens, an extra bridge can be added in-between the two arms. It usually has supporting beams and is known as a beam or a truss bridge.

"Forth Bridge (1890)" by Sonse is licensed under [CC BY 2.0](https://creativecommons.org/licenses/by/2.0/)

# Cantilever Bridges

Forth Bridge, Scotland



The Forth Bridge is about 9 miles away from Edinburgh. In 2016, it was voted 'Scotland's Greatest Human-Made Wonder.'

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# Cantilever Bridges

Quebec Bridge, Canada



The Quebec Bridge crosses over the Saint Lawrence River in Canada. While it was being built, it collapsed twice killing 88 people.

# Beam Bridges

A beam bridge is the simplest type of bridge that you may come across. Think of a plank of wood that someone might use to cross a stream: this is a simple beam bridge. The beam part of the bridge is supported at either end, where the weight of the bridge pushes down.

You might also hear a beam bridge being called a 'girder' bridge.



# Beam Bridges

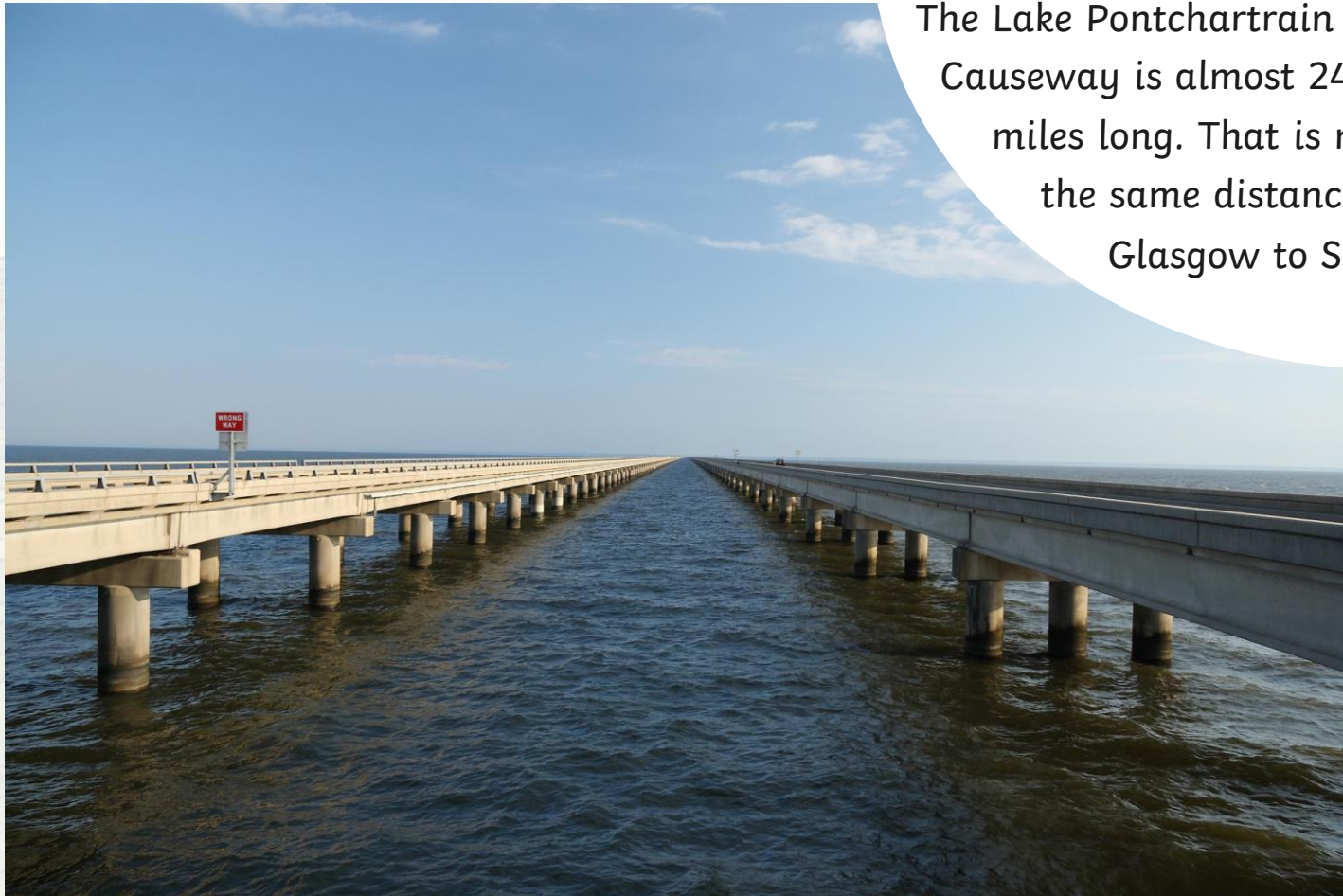
A beam bridge is usually short, with a maximum length of 250 feet. This is because the further apart the supports are, the weaker the bridge becomes. Imagine a ruler positioned between two tables, with an eraser at either end of the ruler. Putting a small amount of weight on the ruler will cause the bridge to collapse. By bringing the tables and erasers closer together, more weight can be put on the beam.

One beam bridge can be joined to another to create one long stretch of beam bridges.

# Beam Bridges

Lake Pontchartrain Causeway, USA

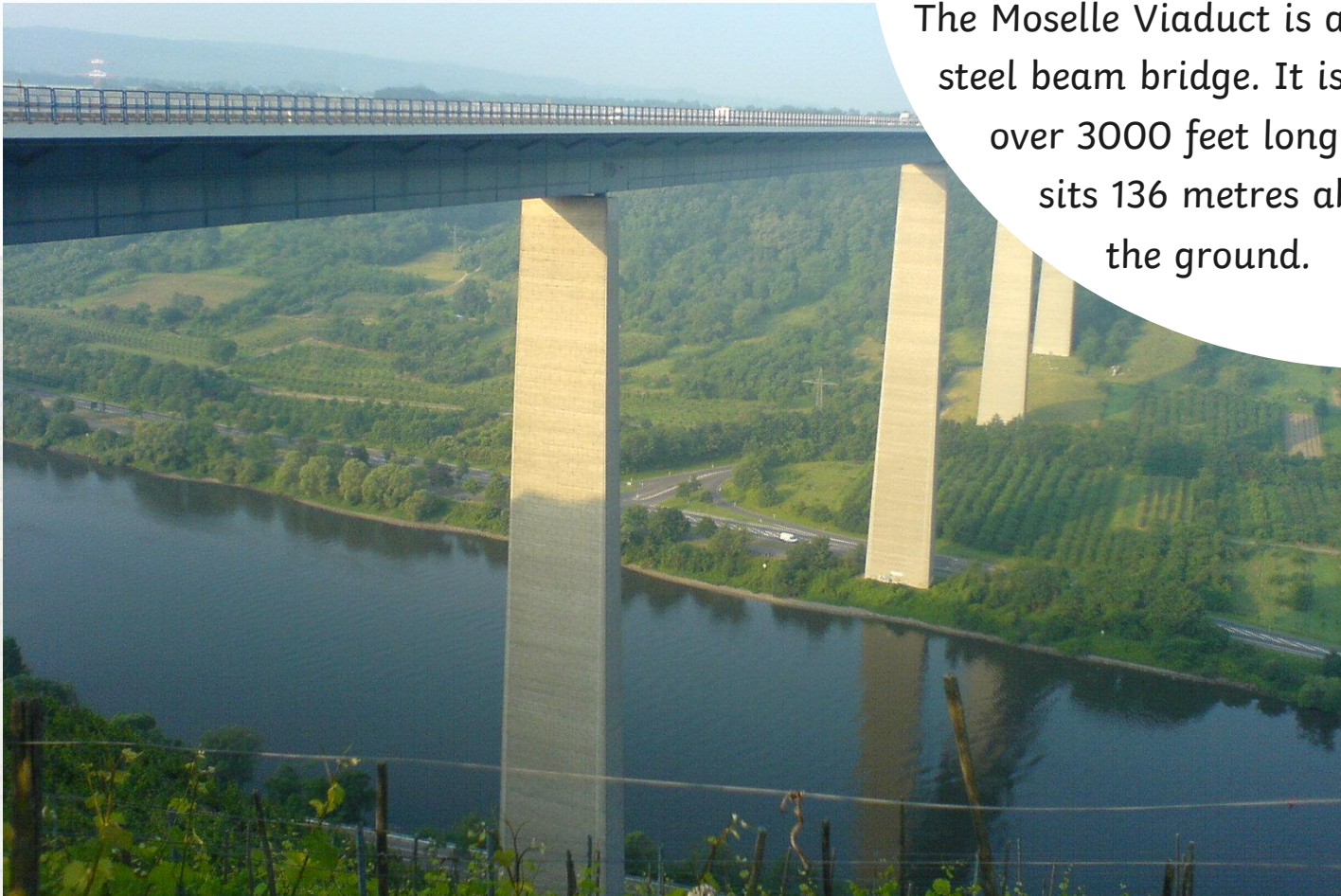
The Lake Pontchartrain Causeway is almost 24 miles long. That is nearly the same distance as Glasgow to Stirling!



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# Beam Bridges

Moselle Viaduct, Germany



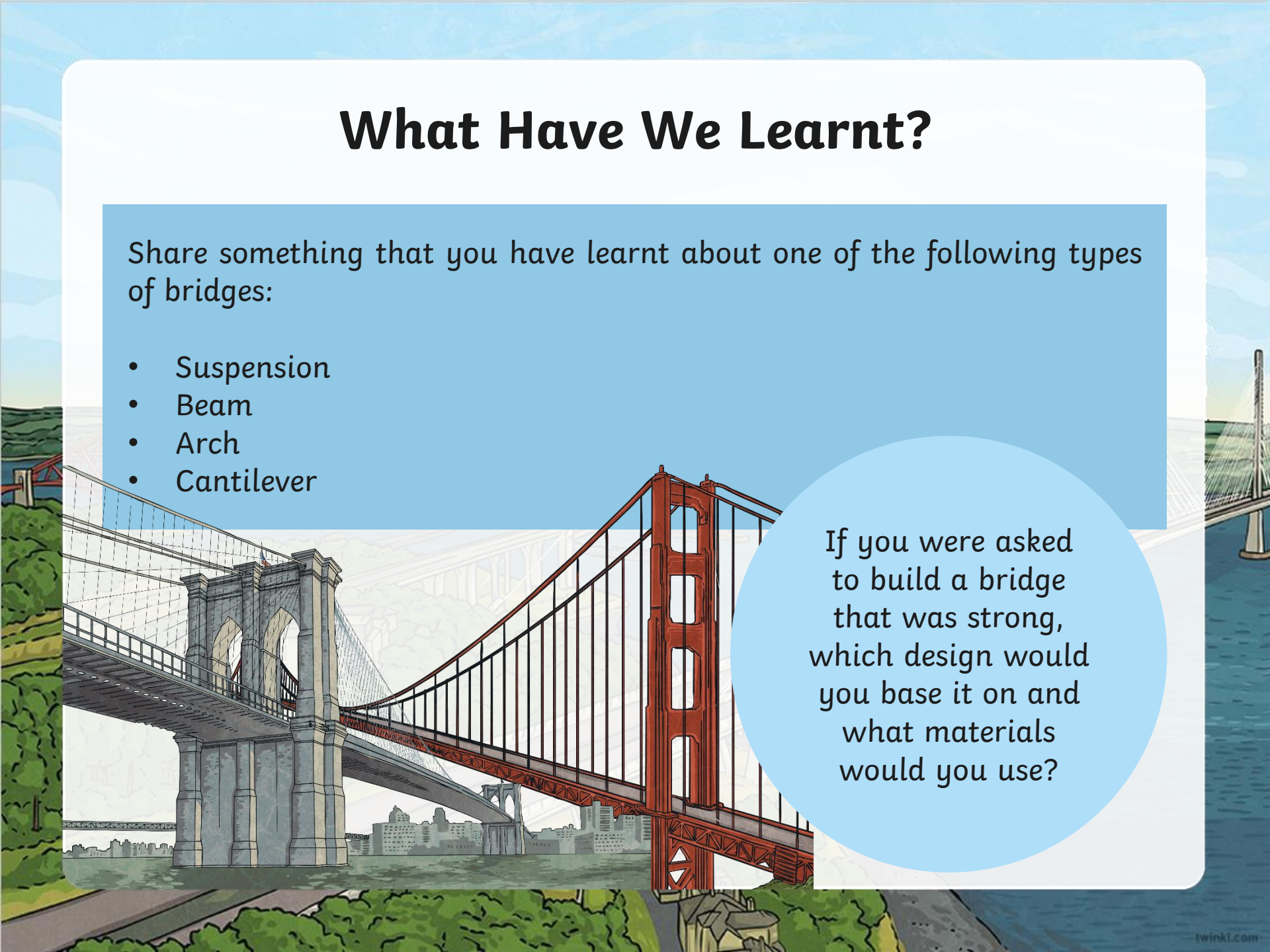
The Moselle Viaduct is a steel beam bridge. It is just over 3000 feet long and sits 136 metres above the ground.

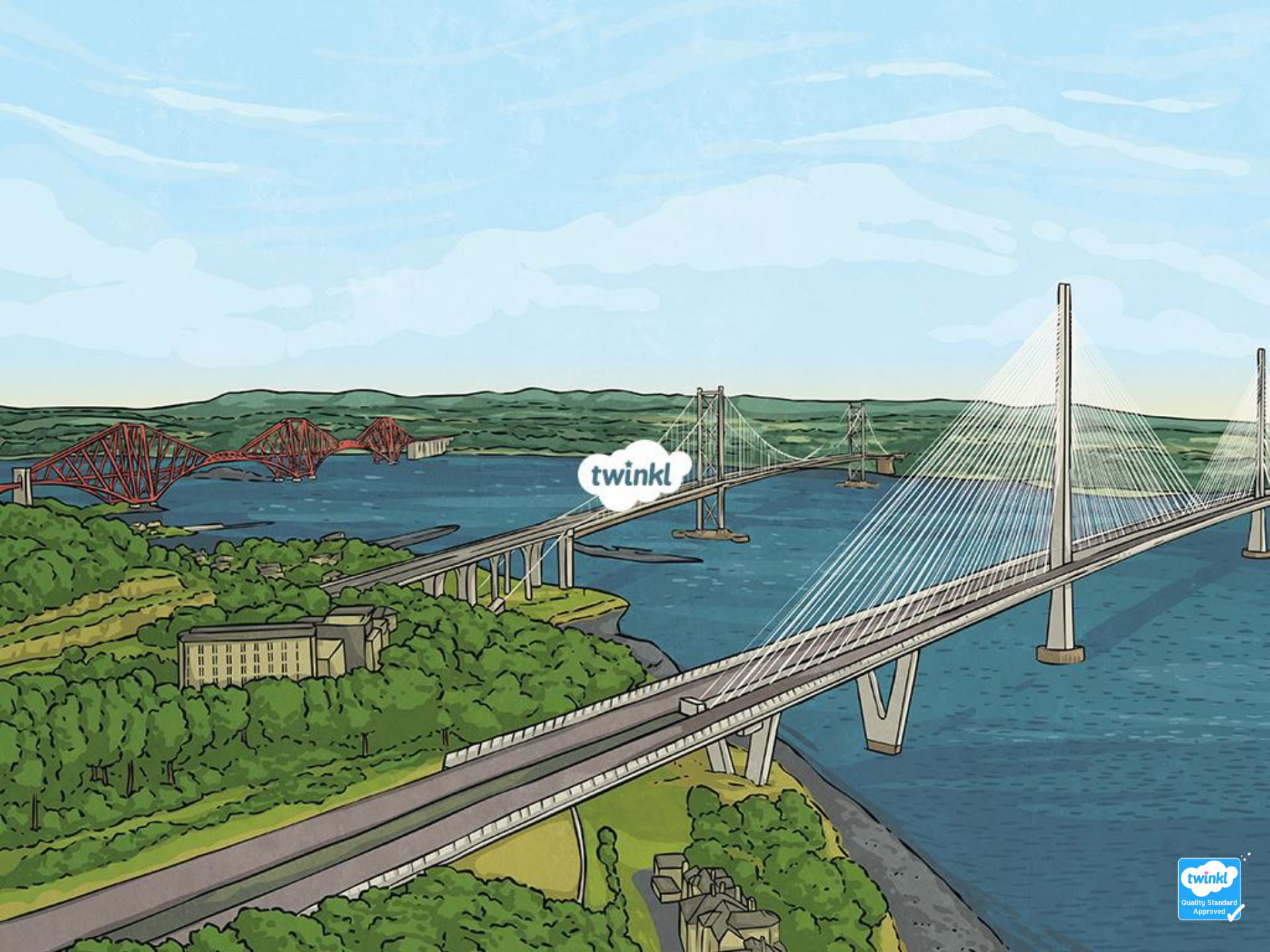
# What Have We Learnt?

Share something that you have learnt about one of the following types of bridges:

- Suspension
- Beam
- Arch
- Cantilever

If you were asked to build a bridge that was strong, which design would you base it on and what materials would you use?





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