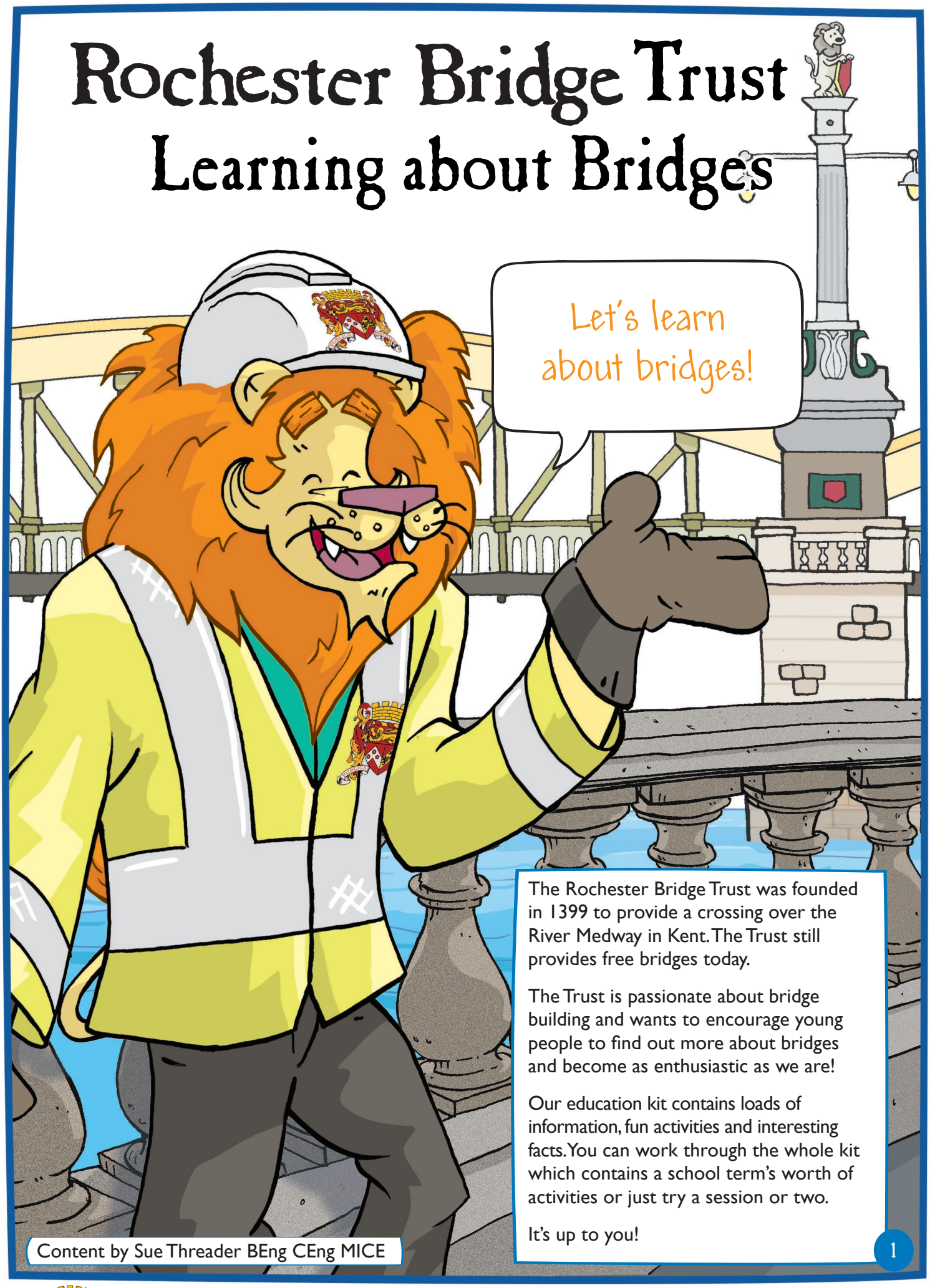
Rochester Bridge Trust
Learning about Bridges



The Rochester Bridge Trust was founded in 1399 to provide a crossing over the River Medway in Kent. The Trust still provides free bridges today.

The Trust is passionate about bridge building and wants to encourage young people to find out more about bridges and become as enthusiastic as we are!

Our education kit contains loads of information, fun activities and interesting facts. You can work through the whole kit which contains a school term's worth of activities or just try a session or two.

It's up to you!

Content by Sue Threader BEng CEng MICE

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About the Rochester Bridge Trust

The first bridge at Rochester was built by the Romans soon after the invasion of Britain in AD43. Once the Romans left, their bridge was maintained by the local people of Kent until the 14th century. In 1381, the River Medway froze solid and, when the thaw came, the ice and floodwater swept away the Roman Bridge.

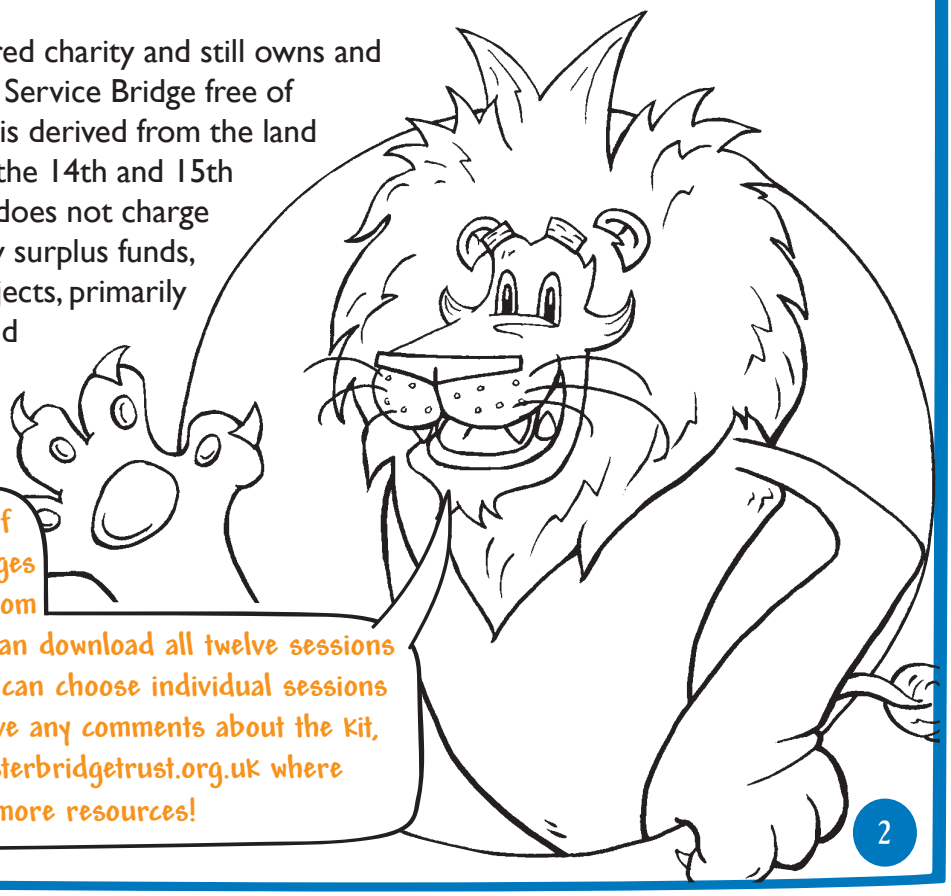
Two benefactors built a new stone bridge one hundred yards upstream which was opened in September 1391. Their names were Sir John de Cobham and Sir Robert Knolles. Together the benefactors also persuaded their friends and acquaintances to make donations of land and money for the perpetual maintenance of Rochester Bridge. In 1399, King Richard II granted letters patent which allowed the Rochester Bridge Trust to be set up to care for the bridge and its property. Two Wardens were appointed to manage the bridge.

For the next 457 years, the Wardens looked after the medieval bridge. Major improvements were carried out by the civil engineer, Thomas Telford, in 1827. However the increase in road and rail traffic as a result of the industrial revolution meant the stone bridge's days were numbered.

In 1856, the Trust completed a new cast-iron arch bridge on the line of the original Roman Bridge. It was designed by Sir William Cubitt who had been the civil engineer for the Crystal Palace built for the Great Exhibition in 1851. The old medieval bridge was then blown up for the Wardens by the Royal Engineers using gunpowder.

The Victorian Bridge was reconstructed in 1914 as a bowstring truss and is today known as the Old Bridge. A second road bridge, the New Bridge was opened to traffic in 1970. Between the two road bridges there is the Service Bridge which carries pipes and cables across the river.

The Rochester Bridge Trust is a registered charity and still owns and maintains the two road bridges and the Service Bridge free of charge to the public. The Trust's money is derived from the land and money given by the benefactors in the 14th and 15th Centuries. It receives no public money, does not charge tolls and does not raise funds. With any surplus funds, the Trust supports other charitable projects, primarily the preservation of historic buildings and education projects in the field of engineering, particularly civil engineering.



Hello! I'm Langdon the Lion, guardian of Rochester Bridge. Welcome to my Bridges Education Kit, which was downloaded from www.rochesterbridgetrust.org.uk. You can download all twelve sessions along with presentation slides, or you can choose individual sessions with supporting worksheets. If you have any comments about the kit, please visit our website www.rochesterbridgetrust.org.uk where you will also find lots more resources!

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Session 8 – Arch Bridges (Part 2)

Aims & Objectives

- *To build an* **Arch Bridge**

Context

The Romans specialised in the use of **Arch Bridges**. *They joined them together to make long road bridges called viaducts and sometimes placed them on top of each other to make aqueducts to carry water over the valleys. Their arches were so strong and useful that some Roman* **Arch Bridges** *still survive today. See* **Roman Bridges (Handout)** *for examples.*

You Will Need:

- ☐ HANDOUT: Roman Bridges
- ☐ Arch Building Kit

For the Roman Style Arch Bridge:

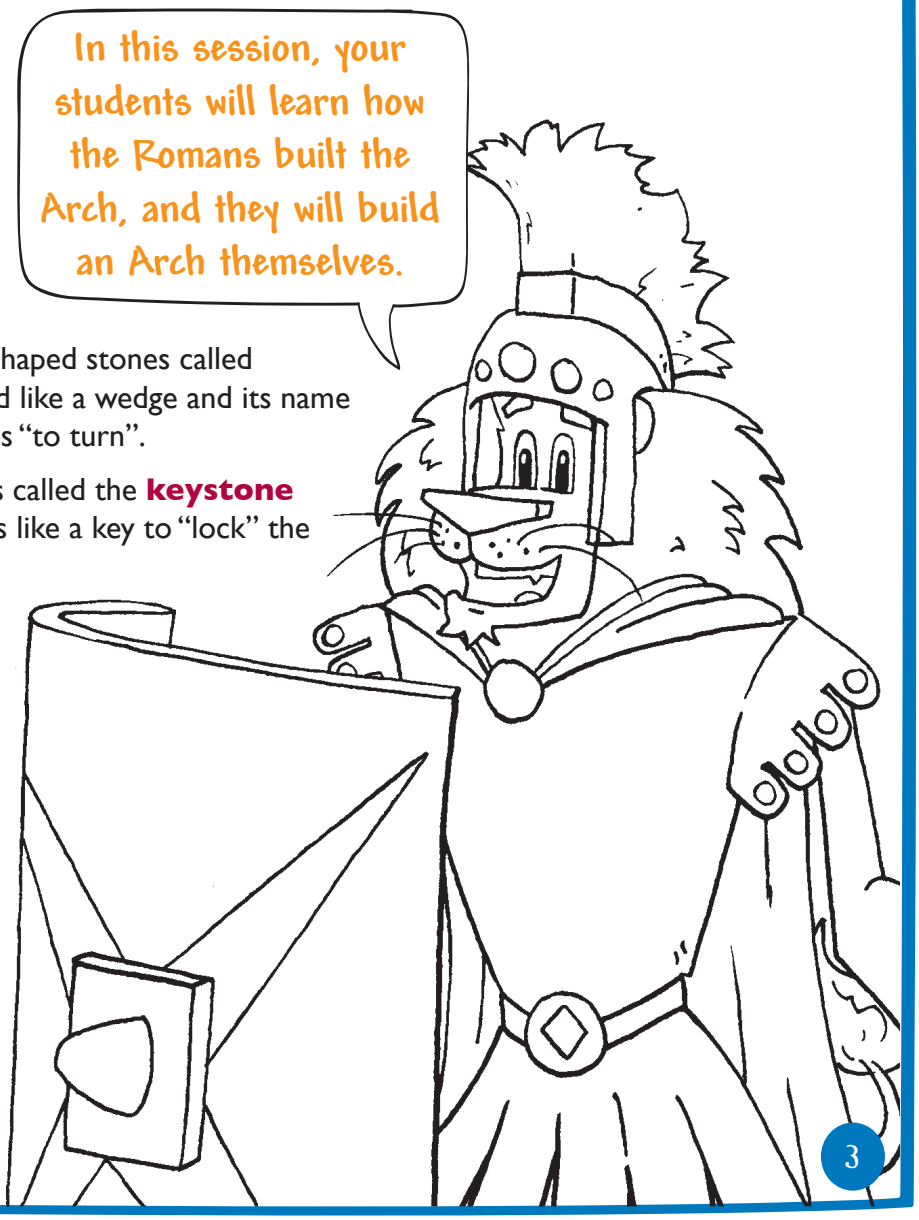
For each group of 2 to 4 children:

- ☐ Large Cylinder
- ☐ Play-Doh® or modelling clay
- ☐ Stones or pebbles of a similar size
- ☐ Sheet of cardboard or newspaper to protect the table

Session Activities

1. Exploring Arch Bridges

- The Romans realised that to build an **Arch Bridge** they would first have to build some wooden supports called **centring**. The **centring** was a bit like modern scaffolding.
- Once the **centring** was complete, they could start to add the specially shaped stones called **voussoirs**. Each **voussoir** is shaped like a wedge and its name comes from an old word which means "to turn".
- The stone in the middle of the arch is called the **keystone** and is the most important part. It acts like a key to "lock" the other stones together.
  Without the **keystone** the arch would collapse. Only once the **keystone** had been put in place could the Romans remove the **centring**.
- Look at **Roman Bridges (Handout)** for examples. Try to name the different features of some of the famous **Arch Bridges** using the correct terminology.



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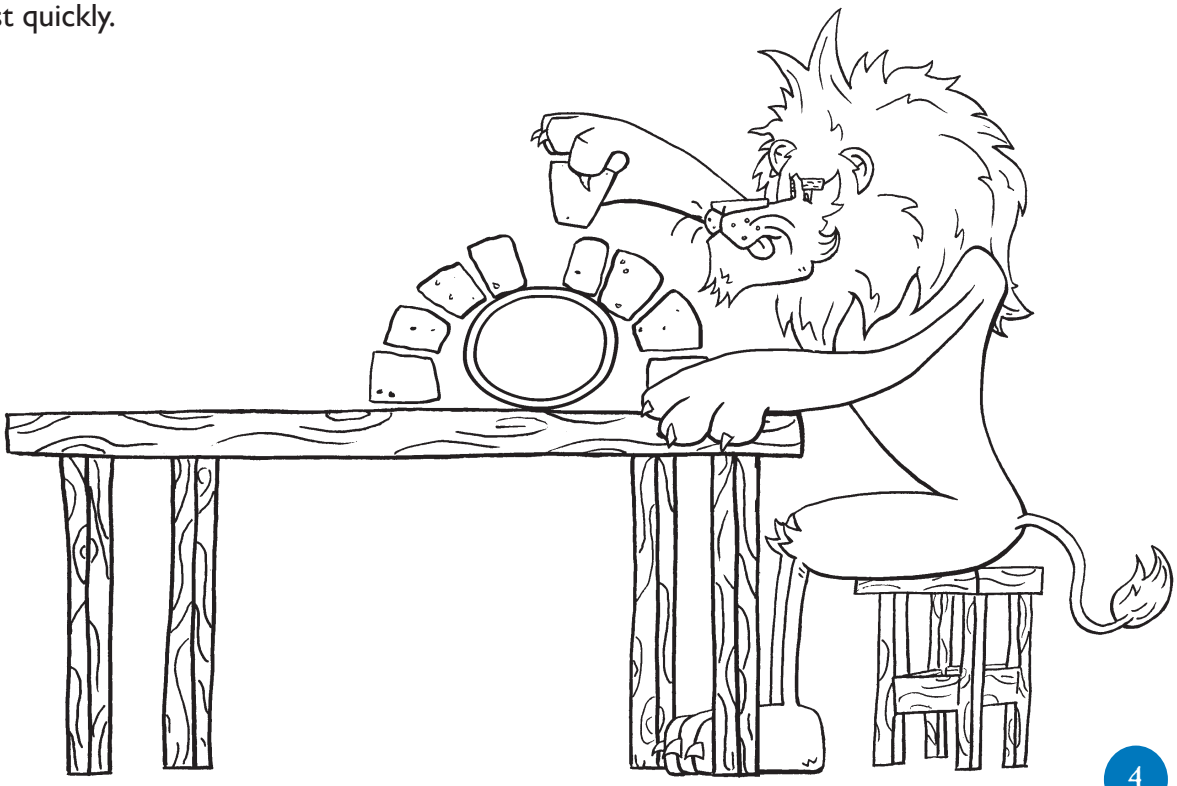
2. Build an Arch, Roman Style

This activity can be completed individually or in groups of 2 to 4 children

- Each group needs a large cylinder (Pringles® tube or similar is ideal), some Play-Doh® or modelling clay, a number of stones or pebbles of a similar size (these can be bought from builders' merchants or garden centres), and something to protect the table surface such as a sheet of cardboard or newspaper.
- The tube is used as **centring**. Using the clay as **mortar**, help the children to fit the pebbles together over the **centring** to form the **Arch Bridge**.
- Remove the **centring**.
- If air-dry clay and a cardboard base are used then the bridges should be stable enough to be taken home or displayed.

3. Build an Arch from a Kit

- Ask the children to build an arch with and Arch Building Kit. For local schools, a kit is available to borrow from the Rochester Bridge Trust. Small arch kits are made by Montessori and can be purchased from www.amazon.co.uk
- Encourage the children to work out how to build a strong and stable bridge using the pieces provided. Test the strength of the bridge by applying a load to the top; and its weakness by removing a piece from underneath.
- Encourage them to realise that an Arch Bridge is very weak until it is complete and the need to build centring to hold it up during construction means engineers have to build this type of bridge twice.
- In small teams, have a competition to see which group can construct a stable Arch Bridge most quickly.



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Building an arch bridge with the arch building kit

1

The arch building kit with centring

2

Stand the widest piece up on a flat surface. Add the supports for the centring between the two sides.

3

Place the arched piece on top of the supports. This will act as the centring.

4

Place the individual voussoirs on top of the centring one-by-one from the outside-in.

5

Add the final middle piece. This is the keystone.

6

Remove the centring and the supports. You now have a freestanding arch bridge!

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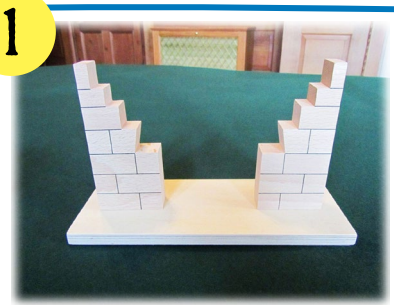
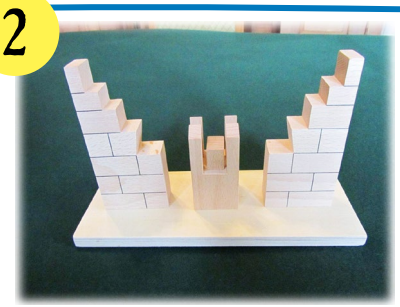
Building an arch bridge with the Montessori arch building kit

1



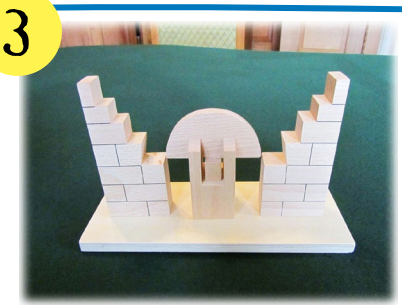
Stand the Montessori arch building kit base on a flat surface.

2



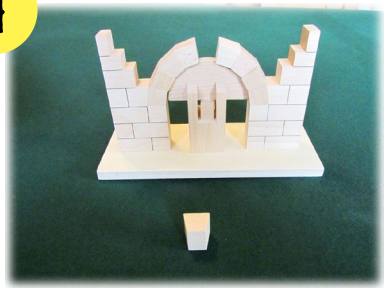
Add the support for the centring in the center of the the gap.

3



Place the arched piece on top of the support. This will act as the centring.

4



Place the individual voussoirs on top of the centring one-by-one from the outside-in.

5

Add the final middle piece. This is the keystone.

6

Remove the centring and the supports. You now have a freestanding arch bridge!

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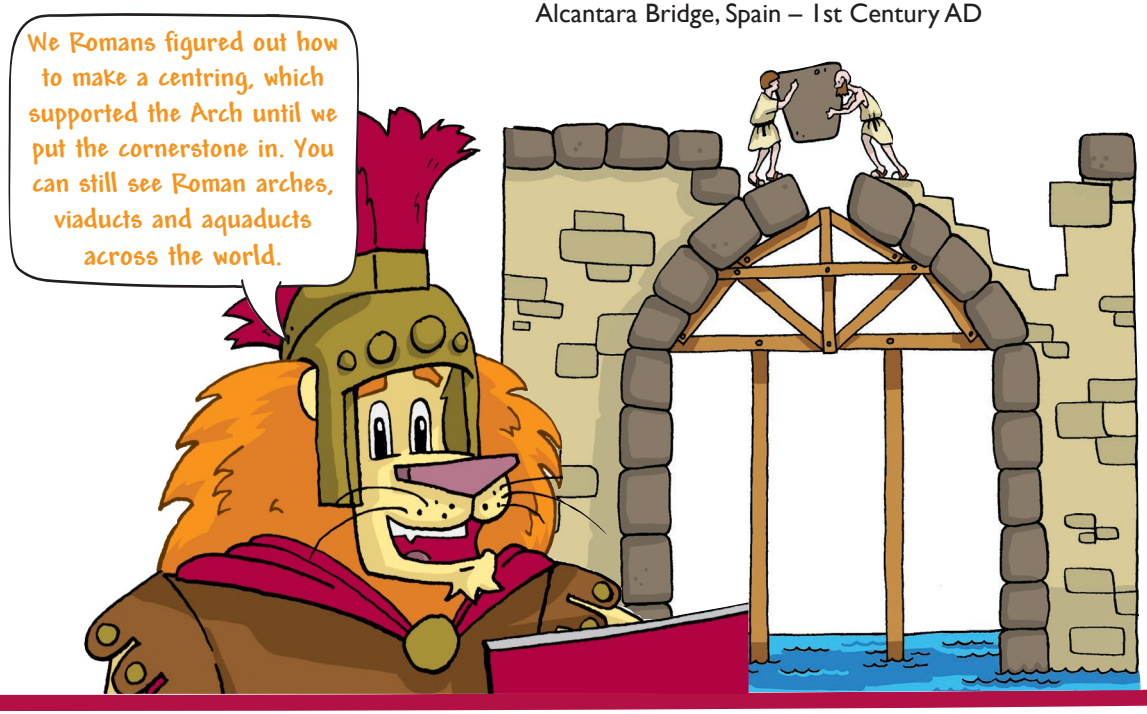
Roman Bridges (Handout)

Pont Flavien, St Chamas, France – 1st Century BC

Alcantara Bridge, Spain – 1st Century AD

Pont du Gard, Remoulins, France – 1st Century AD



SESSION 8

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