

Bridge Detectives!

The hunt for the missing facts!

A self-guided tour of the
Clifton suspension bridge.

Leader(s): Group Leader	Topic: History of the Clifton Suspension Bridge.	Curriculum area: History, English, Maths, Science, Geography
Suitable for: KS2 and KS3	Short Description: A self-guided tour of the Clifton Suspension Bridge.	
Duration: 45 minutes – 1 hour	Location: On the bridge, starting at the museum.	Number of pupils: Maximum 25 pupils per group on the bridge. Please split your group into smaller groups, max 5 students with one adult leader per group.
Learning Objectives • Learn who the engineers who designed and built the Clifton Suspension Bridge are. • Understand how the bridge is maintained. • Understand who uses the bridge. • Understand the Avon Gorge as a Site of Special Scientific Interest.		
Curriculum Links History • An aspect in British History that extends pupils' chronological knowledge • Understand local history to link to wider historical concepts. Geography • Describe and understand key aspects of physical geography, including rivers. Maths • Sequencing events in chronological order, recognising dates. Art • Improve their mastery of art and design techniques, learn about great architects. English • Opportunity to listen to stories, poems and non-fiction. • Writing narratives about personal experiences and those of others, writing about real events. Science • Properties of materials		
Preparation/Before the Session Introduction to Isambard Kingdom Brunel		
Resources & further reading • Who was Brunel • Brunel in Bristol • Spaghetti Structures • How was the Bridge built? • Workers at the Bridge • Useful Bridge Facts and Figures		

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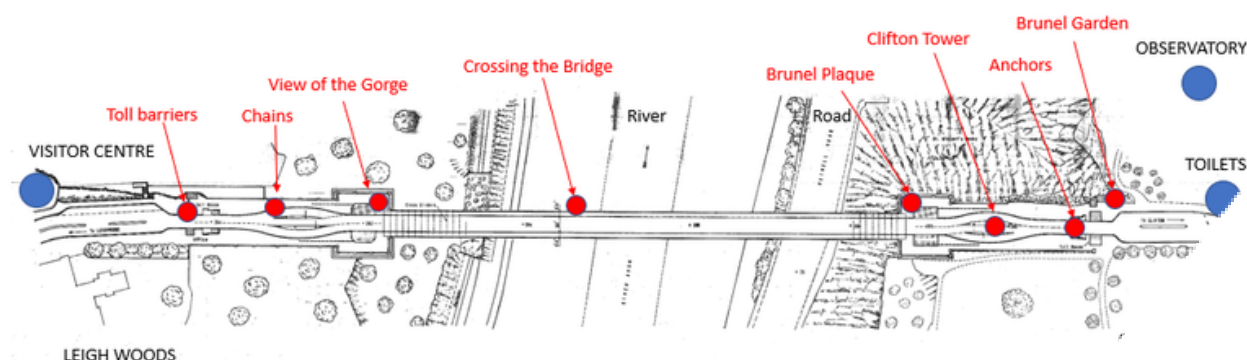
Welcome to the Clifton Suspension Bridge! The Museum Learning Officer needs your help. They are giving a talk this evening and need their facts checked!

Follow the map and complete the activities at each stop to learn about the history of the bridge and how it is maintained. This will help you find all the facts you need to fill in the missing information in the script.

You should complete this activity in groups of 5 people max.

Remember to stay on the pavement and watch out for traffic, and other people using the bridge!

This map shows your stops in red.



Stop 1: The Toll Barriers

Find the blue sign.

How much does it cost to cross the bridge today?



Look at this old toll ticket.



How much did it cost to cross the bridge in a car in the early 1900s?

pre decimalisation key

£=pounds d=pennies s=shillings

In 1971, Britain adopted a new currency system, decimalisation. The shilling was removed and a pound was broken up into 100 pennies.

decimalisation key

£=pounds p=pennies

Look at this conversion table.

Can you spot anything interesting?

THE CLIFTON SUSPENSION BRIDGE TRUST

TOLLS CHARGED under Section 43 of the Clifton Suspension Bridge Act 1952

FOOT PASSENGERS:

For every person on foot (except any person or persons in charge of or accompanying any vehicle in respect of which the Trustees may charge tolls under the Clifton Suspension Bridge Act 1952):

- | | | | | | |
|---|---|---|---|---|----|
| (i) Who shall enter upon but not Pass over the bridge | - | - | - | 2 | 1p |
| (ii) Who shall pass over the bridge | - | - | - | 2 | 1p |

VEHICLES:

For every vehicle [other than a vehicle drawn by a horse or other animal or a mechanically-propelled vehicle (but including a bicycle to which is attached a means of mechanical propulsion)]

- | | | | | | |
|--|---|---|---|---|----|
| For every vehicle drawn by a horse or other animal | - | - | - | 2 | 1p |
| For every motor cycle | - | - | - | 1 | 0 |
| For every motor cycle to which is attached a side-car or trailer | - | - | - | 5 | 2p |
| For every mechanically-propelled invalid chair | - | - | - | 5 | 2p |
| For every mechanically-propelled vehicle being a private motor car or hackney carriage | - | - | - | 2 | 1p |

For every mechanically-propelled vehicle designed or adapted for commercial use the weight of which unladen when added to the weight unladen of any trailer attached to such vehicle:

- | | | | | | | | | |
|------------------------------|---|---|---|---|---|---|---|-----|
| (i) does not exceed two tons | - | - | - | - | - | 1 | 0 | 5p |
| (ii) exceeds two tons | - | - | - | - | - | 5 | 0 | 25p |

ANIMALS:

- | | | | | | | | |
|--|---|---|---|---|---|---|----|
| For every horse, mule or ass—per head | - | - | - | - | - | 2 | 1p |
| For every four or less number of oxen, cows, bulls or head of neat cattle less than twenty | - | - | - | - | - | 2 | 1p |
| If more than twenty, for every score or part of a score | - | - | - | - | - | 1 | 0 |
| For every eight or less number of calves, pigs, goats, sheep or lambs less than twenty | - | - | - | - | - | 2 | 1p |
| If more than twenty for every score or part of a score | - | - | - | - | - | 5 | 2p |

BOOK OF TICKETS:

VEHICLES (unladen weight not exceeding two tons):

New Pence

20 Single 1/- Tickets—10/- | 50p

FOOT PASSENGERS AND BICYCLES:

50 Single 2d. Tickets—5/- | 25p

ALLEN DAVIES & CO. LTD., KNAPSALL, CHESHIRE, ENGLAND

Stop 2: The Chains

Look at the chains.

The chains look more like gigantic bicycle chains than the round links you might have been thinking of!

Read this riddle to work out what the chains are made from.

I am a metal, strong and grey,
Used to build in many ways.
If left out wet, I'll turn reddish-brown,
As rust begins to spread around.
Magnets stick to me with ease,
I help support the bridge you see.
What am I, the metal used
In Clifton's famous hanging chains?



Urea prills, made from calf wee, are used to prevent ice on the bridge in cold weather instead of the salt that is usually used on other roads.



What are the chains made from?

What would happen if salt was put on the bridge?

Look at this archive photo



Maintaining the bridge and the chains is a big job! The chains need to be regularly inspected. Before the introduction of health and safety regulations, workers used to walk the chains with no harness securing them to the bridge.

How would you feel walking the chains without any safety gear?

Stop 3: View of the gorge

Have a look at the view from the abutment.

When the bridge was built the river would have been busy with tall ships sailing in and out of Bristol's port.

The bridge deck is 75 meters above the high tide of the River Avon.



Why was this a good place to build a bridge?

What different methods of transport can you spot today: on, above and below the bridge? Circle all you can see.



Why will you not see some of these road vehicles on the bridge itself?
This sign will give you a clue.



Stop 4: Crossing the bridge

The deck of the bridge is held up by hangers, which are attached to the chains.

Look at the suspension rods

Count how many rods there are to the middle of the bridge.

How many rods are on one side? Double your first answer.



How many rods are there in total? Double your second answer.

The bridge looks a bit different from when it was first built. Originally the chains were red! You can see these strange holes on the metal barrier between the footway and the road. This metal barrier is called the longitudinal girder.

Find these holes



What do you think used to be here? Use the archive picture below to help you.

If you were repainting the bridge chains, what colour would you paint them?



Stop 5: Brunel Plaque

This stop may be unavailable if the Clifton Observatory side walkway is closed.

Read the Plaque.

This plaque contains many dates which tell the story of Brunel and the Bridge.

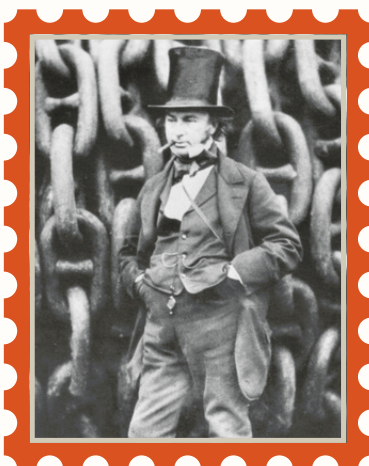


How old was Brunel when he designed the bridge?

How many years after it was designed did the bridge open?

How old were the Hungerford Bridge chains when the Clifton Bridge was opened?

How old is the bridge today?



Although Brunel never got to see his Bridge completed, throughout his career he did keep trying to raise the funds to finish it.

Brunel called this Bridge his "first child, my darling".

Stop 6: Clifton Tower

Look at the top of the Clifton Tower and read the writing.

Who completed the building of the Bridge?



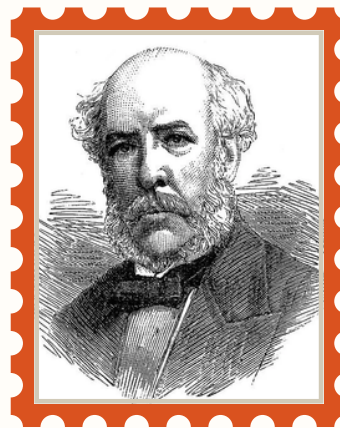
Brunel's original design was for a wooden decked bridge, held up by two iron chains. There would also be no separate footway.

How does the final design compare to Brunel's original design?
Complete the sentences by looking at the bridge.

The deck is made from _____.

There are _____ chains holding the deck up.

There is/isn't a footpath on either side of the roadway.



These two engineers not only completed the building of the Clifton Suspension Bridge, but also had other great engineering achievements; from the development of new railway sleepers, the development of the Circle Line of the underground and the building of the Suez Canal.

What would you like to create if you were an engineer?

Stop 7: Anchors

Look at the anchor points.

This is where the chain goes into the ground and anchors the bridge. The chains are locked in place by cast iron anchor plates, bolted to the rock. Extra strong Blue Staffordshire brickwork is in front of the plate.

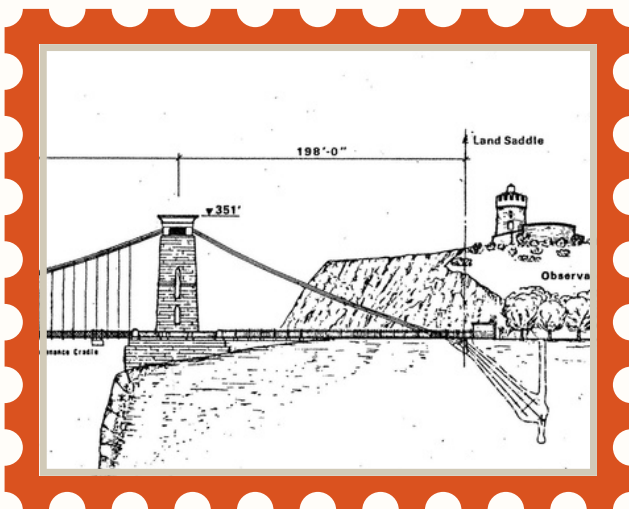


Look at this diagram

The anchors go down 18.3m down into the rock. They are accessed by a 21m tunnel.

Can you find the tunnel on this diagram?

Would you like to go down the narrow tunnel?



Look at this archive photograph.

This photo was taken in 1926 when work was done to strengthen the anchors.

Do you think this worker is missing modern health and safety gear? What should he be wearing? - circle them



Stop 8: Brunel Garden

Have a look at all the plants in the garden.

The Avon Gorge is a site of Special Scientific Interest and is filled with rare plants and flowers.



Find the name of a purple flower.

Find the name of a yellow flower.

During the building of the Bridge, Elizabeth Glennie, the wife of Brunel's assistant, warned that the building of the Bridge would destroy the Autumn Squill, a very rare plant. Brunel had the bulbs dug up and replanted further along the gorge. Thanks to this action the Autumn Squill still grows in the gorge.

As well as plants, animals have made their home in the Avon Gorge.

Can you see any Wall Lizards, Goats or Perigree Falcons?



Script for special event

The Clifton Suspension Bridge was designed by Isambard Kingdom Brunel in _____. Construction began in 1831, but the Bridge was not completed until _____. Brunel never got to see his bridge finished as he died in 1859. Two other engineers called _____ and _____ finished building the bridge. They changed Brunel's design by _____

The Bridge is made up of 3 chains made of _____, which connect _____ suspension rods to the bridge deck. The chains are held in place by the anchors. The deck is 214m long and is 75m above the Avon river. This height used to allow tall _____ to pass underneath it during the Victorian period.

Whilst 97% of the bridge is still original, it has been through some changes. Now we have LED lights, but when it was open _____ were used to light up the road. The bridge also used to be red, but it is now painted white. Regular maintenance happens to ensure the bridge is well looked after!

To ensure the Clifton Suspension Bridge Trust can keep looking after the bridge, it costs motor vehicles _____ to cross the bridge. When the bridge was first opened, people, animals and bicycles all had to pay a toll.

The Bridge is built over the Avon Gorge which is a site of Special Scientific Interest and is filled with rare plants such as the yellow flowered _____ and the purple flowered _____. You may also spot a Wall lizard, a goat or a Peregrine Falcon in the gorge.

Thank you for listening. You can find more about the Clifton Suspension Bridge by visiting the museum!

Answers

Page 4

£1

9 pence

interesting things: animal tickets, pedestrian tickets, price changes

Page 5

Iron

It would rust

feelings about walking the chains: scared, excited

Page 6

The bridge would be high enough to let the tall ships into Bristol harbour

circle what you see

weight limit on the bridge/ lorries and buses are too heavy.

Page 7

41

82

164

gas lamps

Chain colour discussion

Page 8

24

34

21

162

Page 9

Hawkshaw and Barlow

Iron

three

is

Page 10

discussion on going down a narrow tunnel

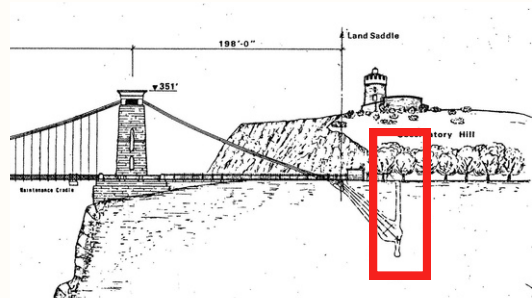
hard hat, hi-vis, safety boots

Page 11

Autumn squill, Bristol onion

birds foot trefoil

Wall Lizards are usually found on the walls behind the garden and along to the hub on a hot day. Goats may not be seen, but are used to manage greenery on the gorge. Perigree Falcons nest in the gorge.



Script for special event

The Clifton Suspension Bridge was designed by Isambard Kingdom Brunel in 1830. Construction began in 1831, but the Bridge was not completed until 1864. Brunel never got to see his bridge finished as he died in 1859. Two other engineers called Hawkshaw and Barlow finished building the bridge. They changed Brunel's design by adding a 3rd chain, widening the deck and building the deck from iron.

The Bridge is made up of 3 chains made of iron, which connect 164 suspension rods to the bridge deck. The chains are held in place by the anchors. The deck is 214m long and is 75m above the Avon river. This height used to allow huge ships to pass underneath it during the Victorian period.

Whilst 97% of the bridge is still original, it has been through some changes. Now we have LED lights, but when it was open gas lamps were used to light up the road. The bridge also used to be red, but it is now painted white. Regular maintenance happens to ensure the bridge is well looked after!

To ensure the Clifton Suspension Bridge Trust can keep looking after the bridge, it costs motor vehicles £1 to cross the bridge. When the bridge was first opened, people, animals and bicycles all had to pay a toll.

The Bridge is built over the Avon Gorge which is a site of Special Scientific Interest and is filled with rare plants such as the yellow flowered birds foot trefoil and the purple flowered Autumn Squill. You may also spot a Wall lizard, a goat or a Perigree Falcon in the gorge.

Thank you for listening. You can find more about the Clifton Suspension Bridge by visiting the museum!