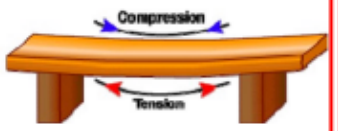
We Are Engineers: Bridges — Knowledge Organiser

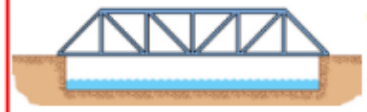
Key Knowledge

Learn this information

There are 4 main types of bridge construction:

Beam bridge – The force of compression manifests itself on the top side of the beam bridge's deck (or roadway). This causes the upper portion of the deck to shorten. The result of the compression on the upper portion of the deck causes tension in the lower portion of the deck. This tension causes the lower portion of the beam to lengthen.

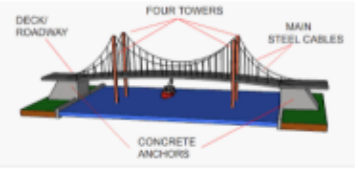




Cantilever/Truss bridge - a bridge built using cantilevers, structures that project horizontally into space, supported on only one end. For small footbridges, the cantilevers may be simple beams; however, large cantilever bridges designed to handle road or rail traffic use trusses built from structural steel, or box girders built from prestressed concrete.

Arch bridge - a curved design, which does not push load forces straight down, but instead they are conveyed along the curve of the arch to the supports on each end. These supports (called abutments) carry the load of entire bridge and are responsible for holding the arch in the precise position unmoving position. Conveying of forces across the arch is done via central keystone on the top of the arch.





Hanging/Suspension bridge - suspend the roadway by cables, ropes or chains from two tall towers. These towers support the majority of the weight as compression pushes down on the suspension bridge's deck and then travels up the cables, ropes or chains to transfer compression to the towers. The towers then dissipate the compression directly into the earth.

Key Skills

Practise and perform these skills

Create successful bridges, including **Da Vinci bridges** out of ....

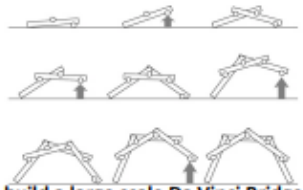
1) Wooden blocks and lolly sticks (small scale)







2) Longer lengths of wood and dowels (larger scale).



How to build a large scale Da Vinci Bridge video:
https://www.youtube.com/watch?v=QKdQV2q5PRk





Bridges can **collapse** if they are not strong enough, or if they are put under too much force. Bridge disasters have previously been caused, this can be due to **worn out or inferior parts and materials** during construction and maintenance, **adverse weather** or **too much load** or traffic. Therefore, regular safety checks are very important.

Key Vocabulary

Understand these key words

Word	Definition	Word	Definition
Bridge	A structure across a river, road, or other obstacle.	Pressure	Continuous physical force exerted on or against an object.
Arch bridge	A semi-circular structure with abutments on each end.	Span (beam)	The distance between two bridge supports.
Abutments	Supports that carry the load of the bridge.	Framework	An essential supporting structure of an object.
Hanging/ suspension bridge	A bridge that has its roadway suspended from two or more cables and is anchored at the ends.	Suspension	Supported by attachment from above; hanging.
Beam bridge	A rigid horizontal structure that is resting on two piers, one at each end.	Support	A thing that bears the weight of something or keeps it upright.
Cantilever bridge	A cantilever bridge is a bridge built using a cantilever.	Cantilever	Something that sticks out sideways from a support. It is only supported at one end.
Bascule bridge 	A moveable bridge with an upward swing to provide clearance for boat traffic .	Truss	A truss is an assembly of beams or other elements that creates a rigid structure.
Draw bridge	Commonly refers to all types of moveable bridges, including bascule bridges.	Forces	Forces make things move and stop moving.
Compression	What happens when you push down on a spring and collapse it? - You compress it, and shorten its length.	Tension	What happens to a rope during a game of tug-of-war? - It undergoes tension from the two teams pulling on it.
Keystone/ locking stone/ Vouussirs	Forces are carried across the arch via the keystone because its weight pushes the surrounding stones	Girder	A large iron or steel beam.

We Are Engineers: Bridges — Knowledge Organiser

Famous bridges in the UK

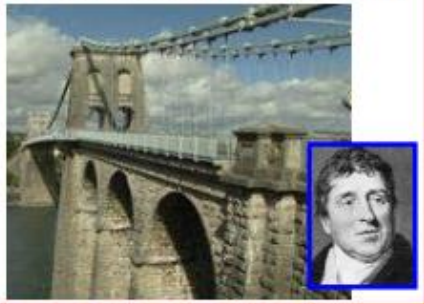
and their Architects.

Clifton Suspension Bridge (Bristol) – Isambard Kingdom Brunel





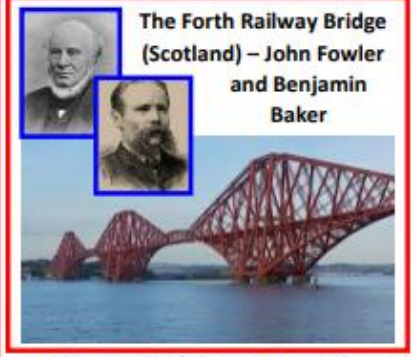
Menai Bridge (Wales) – Thomas Telford



Tower Bridge (London) – Horace Jones



The Forth Railway Bridge (Scotland) – John Fowler and Benjamin Baker



Severn Bridge (Wales) - Gilbert Roberts



Famous bridges in the world

and their Architects.

Ponte Vecchio - a medieval shop bridge (Florence, Italy) - Taddeo Gaddi



Chaotianmen Bridge (Chongqing, China) – world's longest arch bridge - Design institute of China Railway Major Bridge Engineering Group



Pont du Gard, Roman Aqueduct bridge (Southern France) - Henri Pitot



Sydney Harbour bridge (Australia) - Ralph Freeman



Golden Gate Bridge (San Francisco, USA) - Joseph Strauss et al.



Although all of the engineers above are male, it is important to note that women have long played a significant role in engineering, many overcoming discrimination to bring some of the most significant advances to the field. From bulletproof vests to windshield wipers, women have made and continue to make outstanding engineering contributions to society.