DO NOW

- Name two reasons why bridges are built.
- Name two places where you would find a bridge?
- Before bridges were invented how would an individual travel across a large span of land or huge masses of water?
Objectives:
SWBAT:
understand different bridge types
compare and contrast form versus function
AIM:

Why don’t all bridges look the same?
CONCEPT Of Bridges

- Bridge is not a construction but it is a concept.
- The concept of crossing over large spans of land or huge masses of water.
- The idea behind a bridge is to connect two far-off points eventually reducing the distance between them.
A beam bridge was derived from the log bridge. It is built from shallow steel beams, box girders and concrete.

Highway overpasses, flyovers or walkways are often beam bridges.

A horizontal beam supported at its ends comprises the structure of a beam bridge.

The construction of a beam bridge is the simplest of all the types of bridges.
THE WOOD BEAM BRIDGE

Throughout history people have built bridges. The early bridges were tree trunks laid across the banks of streams. Stone slabs were then used and eventually wooden frames and finally steel.

A simple solution to crossing a small stream, still used today, is to lay a wooden beam across it.
Simple beam bridge Eagle County, Colorado
Beam Bridge

Continuous beam

Abutment

Deck

Overpass

Parapet

Pier

Underpass
A truss bridge is built by connecting straight elements with the help of pin joints.

Owing to the abundance of wood in the United States, truss bridges of the olden times used timbers for compression and iron rods for bearing tension.

Truss bridges came to be commonly constructed from the 1870s to the 1930s.

Consists of an assembly of triangles. Truss bridges are commonly made from a series of straight, steel bars.
The truss bridge...consists of an assembly of triangles. Truss bridges are commonly made from a series of straight, steel bars. The Firth of Forth Bridge in Scotland is a cantilever bridge, a complex version of the truss bridge.

Cantilever bridge Firth of Forth Bridge S. Queensferry & N. Queensferry, Scotland
What shape is the truss bridge made from?
The Arch Bridge

- Has great natural strength
- Thousands of years ago, Romans built arches out of stone.
- Today, most arch bridges are made of steel or concrete, and they can span up to 800 feet.
- Going by its name, it is arch-shaped and has supports at both its ends.
- The weight of an arch-shaped bridge is forced into the supports at either end.
The arch bridge... has great natural strength. Thousands of years ago, Romans built arches out of stone. Today, most arch bridges are made of steel or concrete, and they can span up to 800 feet.
Arch Bridge: Forces
The arch is squeezed together, and this squeezing force is carried outward along the curve to the supports at each end. The supports, called abutments, push back on the arch and prevent the ends of the arch from spreading apart.
The Arch Bridge
Cantilever Bridge

- Consist of two independent beams, cantilevers, that extend from opposite banks of a waterway.

- Cantilever bridges have spans as long at 1800 ft.
Cable-stayed Bridges

- Have roadways that hang from cables.
- The cables are connected directly to towers.
Moveable Bridges

- Have roadway that is moved to provide enough clearance for boats or large ships to pass.
- An example of a moveable bridge is a drawbridge that tilts the roadway upward.
Moveable Bridges
A bridge falling under this category is suspended from cables.

The suspension cables are anchored at each end of the bridge.

The load that the bridge bears converts into the tension in the cables.

These cables stretch beyond the pillars up to the dock-level supports further to the anchors in the ground.
Suspension Bridge: Forces
In all suspension bridges, the roadway hangs from massive steel cables, which are draped over two towers and secured into solid concrete blocks, called anchorages, on both ends of the bridge. The cars push down on the roadway, but because the roadway is suspended, the cables transfer the load into compression in the two towers. The two towers support most of the bridge's weight.
Suspension Bridges

- Have a roadway that hangs from steel cables supported by two high towers.

- The cables of a suspension bridge are not connected to the bridge - the cables pass through a hole in the top of the towers.

- Have at least two main cables that extend from one end of the bridge to the other. Suspender cables hang from these main cables. The other end of the suspender attaches to the roadway.
Suspension Bridges

- Suspension bridges have the longest spans in the world and are used to cross great distances.

- Longest suspension bridge in the world is in Japan (the Akashi-Kaikyo Bridge) and has a span over a mile long.
How does a suspension bridge work?

- The cables must be secured and anchored past the ends of the bridge. Why?
Why does a suspension bridge work?

- To feel the difference between a cable that ends at the tower top and one that goes over it and continues to the ground, grab your head with your right hand and gently pull (see picture at right). If you try to keep your head straight, your neck will feel compressed, but also pulled to the right.

- Now interlace the fingers of your hands, put them over your head and pull with both arms (see picture at right). Your head and neck will feel compressed, but your neck will not feel a pull to the right or left, since the force of your right arm is balanced by that of your left arm.
Golden Gate Bridge, San Francisco and Sausalito, California
The Suspension Bridge

- What is meant by the word tension and why is a suspended bridge in tension?
The Suspension Bridge
Summary

- What is a beam bridge commonly built from?

- What type of joint allows a Truss bridge to be held up?

- What are most arch bridge made of?
Exercise

- On the graph paper provided, draw a design idea for a bridge you would like to make. The more detailed and accurate your design the better!
Homework

- Look up three different types of bridges that we learned about in today's lesson.
- For each bridge,
  - State the location, Name, and the individuals that helped design the bridge.
Step 2 - Do your homework.

- Arch bridge
- Beam bridge
- Suspension bridge
- Cable-stayed bridge