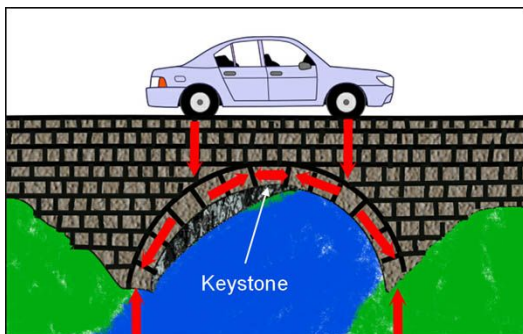


Building Big/BRIDGES

1. A bridge is an example of a “structural system” -- components that work together to serve a structural function. What is the function of a bridge?
2. Ancient Rome was the first bridge-building culture. What materials were used to make the first bridges?
3. Stone was one of the first materials to make bridges post-war. What are the advantages of using stone?
4. The first and simplest bridges were “post and beam” bridges -- draw a sketch of a simple beam bridge:
5. Disadvantages of beam bridges led next to arch bridges -- what are some benefits of arch bridges over beam bridges?
6. In the arch diagram below, the arrows show the force at work once the keystone is in and additional stones placed around the arch; what is this force called?



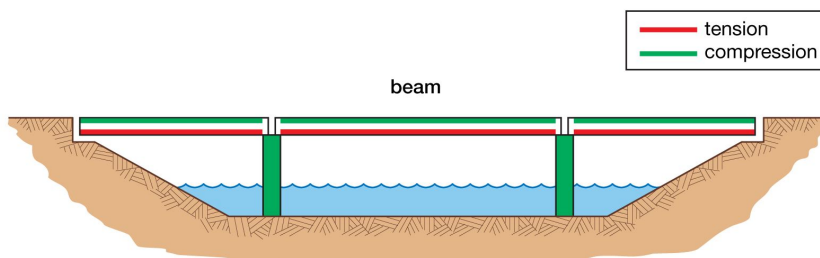
7. What are the disadvantages of using stone as a bridge-building material?
8. The first iron bridge was built in England out of cast iron. What is “cast” iron and how is it made?

9. What are some benefits of using this new material iron over stone?

10. This was a successful material until trains (heavier loads) exposed a disadvantage of cast iron; what was that disadvantage?

11. What stress caused the failure of the Dee Railroad bridge in 1847?

Using arrows, show this force at work on the bridge below:



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12. Bridge designers next turned to wrought iron and steel because of this and other similar bridge disasters -- what are the benefits of these materials over stone and cast iron?

13. In 1884, Eiffel made 2 famous structures -- an arch bridge over the Garabit in France and the famous Eiffel Tower in Paris. These were made of wrought iron with minimal materials. What TWO safety design features were built into these structures to stabilize them?

14. What is a "truss" design? How does the design make bridges stronger? Use a diagram to explain your answer.

15. The Firth of Forth Bridge in Scotland is one of the strongest ever built, but its design was not copied -- what was its disadvantage?

16. What are the benefits of suspension bridges?

17. Using arrows, label where the forces of tension and compression are at work in a suspension bridge:



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18. In order for bridges to be safe, there must be an _____ of opposing forces (the forces have to be balanced).

19. What were some of the challenges in building the Brooklyn Bridge?

20. What is the function of the George Washington bridge?

21. What kind of span does the Golden Gate "bridge"? How big is the span?

22. Why was it needed?

23. How many individual wires are compacted together to make the huge cables that support this bridge?

24. What is the job of the cables in a suspension bridge?

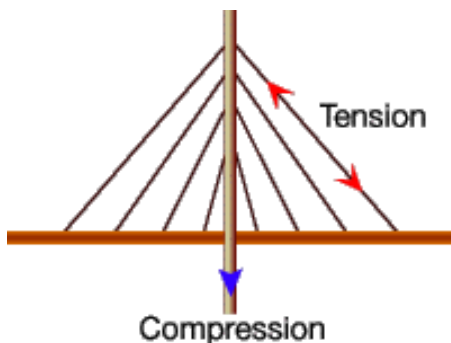
25. What are some “live” environmental loads that bridges must withstand?

26. What force caused the Tacoma Narrows Bridge in Washington State to fail?

27. What was to blame in the bridge design?

28. Other suspension bridges were reinforced after this disaster. Not all movement can be eliminated, however, and this quality of _____ can be scary in high winds, but would also save it from failing in an earthquake.

29. Our own Zakim Bunker Hill Bridge in Boston is an example of a _____ bridge, which is kind of part suspension, part beam bridge. Using the arrows, show where the forces of tension and compression are at work:



30. As of this video, the longest bridge in the world was 1 ¼ miles long in Japan. What is the longest bridge in the world today????