Name_____

Class Period _____

Bridge Unit (100 points)

The purpose of this assignment is to give the students the opportunity to use the internet to find information about bridges, Bridge Builder software to test different designs, and simple tools to construct a model bridge. Students will be introduced to a number of terms and concepts relating to bridge construction as well as some of the materials that are used in modern bridge construction.

Class time given to complete: Students will be given 4 class periods to complete this unit. Students will be allowed to use the computers in the classroom in order to complete the internet and software portion of this assignment.

There are three (3) parts to this unit. The first part is to use the internet and work through the attached worksheets. The second part is to design a bridge using the Bridge Builder software on the computers. The final part of this lesson is to design and build a bridge using only spaghetti, poster board, and hot glue.

This assignment is a team effort. This means you will be paired up with one other student who is in your color group. Both students will be given the same grade for the assignment.

PART 1- Website based worksheet (30 points)

Go to the website: http://www.pbs.org/wgbh/buildingbig/bridge/index.html and answer the questions that are on the attached worksheet.

Part 2- Use Bridge Builder software (20 Points)

Using the Bridge Builder software design a bridge that is not only stable but it must also be designed with a budget. The Bridge Builder software can be downloaded for free from the website: http://bridgecontest.usma.edu/

The bridge must meet the following statistics:

- Must span a distance of 44 meters with a height above the river of 24 meters
- Must have a clear span- no additional piers are allowed
- Must have standard abutments- no arch abutments are allowed
- Must be able to support the truck as it passes across the bridge
- Bridge design must cost **LESS THAN $500,000** dollars

Must have teacher approval of bridge to receive credit for this portion of the assignment- teacher must watch test of bridge and record results of test. The stable bridge that costs the least in the class will receive an additional 10 extra credit points.

Part 3- Bridge Construction (50 points)

Using only spaghetti, poster board, and hot melt glue, build a bridge that supports the best ratio of weight compared to others built by your classmates.

- The bridge must span a clear distance of 12 inches.
- The bridge must also allow a Matchbox Car to travel freely across it when the bridge is tipped slightly.
- The roadway needs to have enough room in the center of your span to hold a 16 ounce Styrofoam cup. The cup will be used to hold the weight used to test your bridge.
- Each student will be given 1 bag of spaghetti with 50 pieces in it.
- Each group of 2 students will be given a single piece of poster board (3x12 inches) to be used as they feel necessary for their bridge.
- Each group of 2 students will be given 4 hot glue sticks for the construction of their bridge.

To receive the full 50 points your bridge must be complete and withstand a weight 3 times the weight of your bridge. A ratio of bridge weight to failure weight will determine how successful your bridge is. Results of your bridge will be compared to those of others in the class. The three strongest bridges in the class will receive extra credit for their success. First place = 25 extra credit points, Second place = 15 extra credit points, Third place = 5 extra credit points.

ADDITIONAL EXTRA CREDIT (25 points possible): Five (5) points will be given for each bridge that you research (maximum of 5 bridges). The research should include a picture of the bridge, the location, the length, cost, and the date it was constructed.

Name_____

Bridge Vocabulary

Strength-

Stiffness-

Compression-

Tension-

Torsion-

Roadway-

Girder-

Truss-

Gusset plates-

Cable-

Pier-

Name_____

Bridge Worksheet

Use the website: http://www.pbs.org/wgbh/buildingbig/bridge/index.html to answer the following questions.

Use the **"Bridge Basics"** part of the website to answer questions 1-10.

1-4. What are four different types of bridges?

1. _____
2. _____
3. _____
4. _____

5. Which type of bridge has the shortest span? _____

6. Which type of bridge has the longest span? _____

7. What is the length of the Firth of Forth Bridge? _____

8. What is the length of the Sunshine Skyway Bridge? _____

9. What was the cost of the New River Gorge Bridge? _____

10. Why is the George P. Coleman Bridge different from most bridges?

_____

Use the **"Bridge Challenge"** part of the website to answer questions 11-20.

11-12. What type of bridge did you choose for area #1? _____
Why? _____

13-14. What type of bridge did you choose for area #2? _____
Why _____

15-16. What type of bridge did you choose for area #3? _____
Why? _____

17-18. What type of bridge did you choose for area #4? _____
Why? _____

19. What happened to the Tacoma Narrows Bridge on November 7, 1940?

_____

20. Where is the Akashi Kaikyo Bridge located?

_____

Use the **"Forces Lab"** part of the website to answer questions 21-30.

21. What is compression? _____

22. What is tension? _____

23. What is shear? _____

24. What is used to strengthen bridges with high temperatures around them?
_____

25. What is used to strengthen bridges with vibration?
_____

26. What is one "pro" for the use of steel in bridge construction?
_____

27. What is one "con" for the use of cast iron in bridge building?
_____

28. What is one "pro" for the use of wood in bridge construction?
_____

29. What is one "con" for the use of brick in bridge construction?
_____

30. What is one "pro" for the use of plastic in bridge construction?
_____