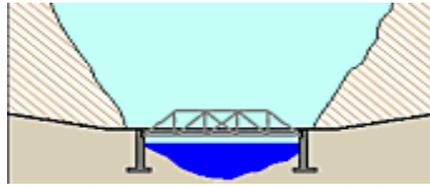


# The Bridge Building Adventure



<http://bridgecontest.usma.edu/index.htm>

## Objective:

1. Build a “working bridge” that spans 24” between two movable tables, is as light as possible, and can support up to 10 pounds. Using a modified design process (TIDEE, 2000), build your bridge out of materials provided. Use this project as a means to learn elements of middle school mathematics (fractions, perimeters, simple geometry).

Students will make a 30 second presentation to our panel of judges (WSU Professors). Each judge will cast a vote for which bridge best meets the goals.

## Goals:

1. Continue to develop team concepts and collaboration.
2. Review the design process from the internet movie on the pop-bottle design ([www.tidee.ce.wsu.edu](http://www.tidee.ce.wsu.edu) or see brief notes attached).\*
3. Develop a trial “first-run” bridge as you “play with” your materials.
4. Create your finished product, test it to see what fraction of 10 pounds it can support.

## Materials(to be provided)

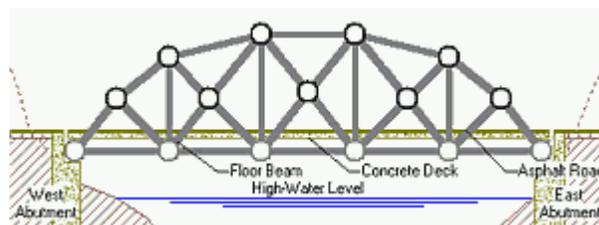
1. Plastic Straws (can use as many as you want)
2. Finishing nails, pins, gumdrops-
3. Masking tape
4. 6”x25” sheet of tag board or manila file folder stock

## Procedure:

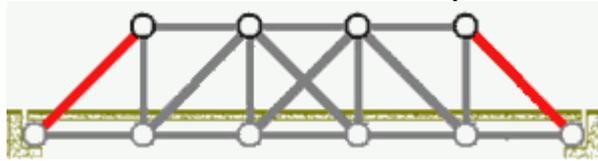
**1<sup>st</sup> Week: Approximate time 30 minutes.**

Begin to experiment with materials, methods of attachment, strength, load bearing, and so on. Write down your efforts, as well as your findings. Decide on your design as a team.

**Homework: sketch a scale drawing of your proposed design at a ratio of 1”=4” .**



...go this way →



## 2<sup>nd</sup> Week Approximate time 30 minutes.

Now it's time to roll up your sleeves and **build a bridge!** As you construct your bridge, be mindful that we want to **measure everything**. Notice that there are multiple geometric shapes in bridges (trapezoids, triangles, parallelograms, etc). Use your materials scientifically and creatively.

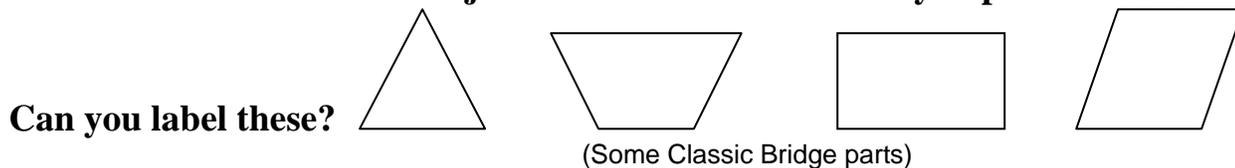
Creative Question: Can you think of famous bridges and their designs?  
Tacoma, Spokane, Lake Washington?

## 3<sup>rd</sup> Week Approximate time 30 minutes

**1. Measure everything—with the help of your tutors:** height, width, length, number of fastening devices, amount of tape used, -total length of the straws used. The next page will have a work sheet.

**2. Test your bridge, but don't break it!** Base the test of the bridge on hanging the test weight at the middle of the bridge. This will make comparisons of strength fair. You can wrap a cord around the bridge bed at its middle and suspend weights from the cord, up to 10 pounds.

**3. Fill out as much of the Project Measurements Sheet as you possible can.**



## At the end of the 3<sup>rd</sup> day (measure and test day) of bridge work

➔ Students will give a 30 second “demonstration/commercial” that attempts to “sell” their product to our panel of judges, who will watch a recording of the commercials to make their decisions. Awards will be given the following week during tutorials. (4<sup>th</sup> week)

Evaluation:

- Your **Scale Drawing**, the **Project Management Sheet** and the **Response Log Entries** from your binders will be used for evaluation.
- Points will be given based on individual measurements in relation to the other teams. See the Project Management Sheet for details.

# Project Measurements Sheet

## The Bridge Adventure

Name \_\_\_\_\_

Group \_\_\_\_\_

Date \_\_\_\_\_

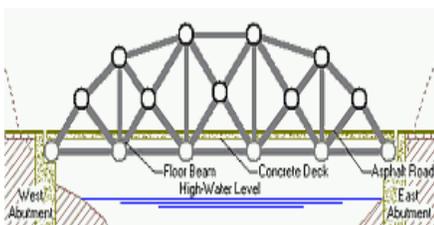
**Directions:** After you finish your bridge project, use a tape measure or string and ruler to get measurements.

*For weights choose something standard, like little weights from the weight room, or be creative!*

One of the project goals is to minimize the weight of the materials used to support 10 pounds, or to minimize the ratio of bridge weight to weight supported.

1. What is the total weight of your bridge? \_\_\_\_\_
2. How many triangles can you count in your bridge? \_\_\_\_\_
3. Perimeter of largest triangle in the bridge \_\_\_\_\_
4. Ratio of number of nails used to number  
of straws used in the bridge \_\_\_\_\_
5. Number of trapezoids in the bridge \_\_\_\_\_
6. Number of parallelograms in the bridge \_\_\_\_\_

7. **TEST OF THE BRIDGE:** Base the test of the bridge on hanging the test weight at the middle of the bridge. This will make comparisons of strength fair. You can wrap a cord around the bridge bed at its middle and suspend weights from the cord, up to 10 pounds.



**How much weight does your bridge hold?** \_\_\_\_\_

8. Create a table for properties of all triangles in the bridge

BASE Length	HEIGHT Perpendicular to base	AREA	PERIMETER

-Etc., etc.

9. THOUGHT QUESTIONS: How many triangles (minimum number required) are required to make a parallelogram? \_\_\_\_\_

10. How do the areas of these triangles compare to one another and to the area of the resulting -parallelogram? \_\_\_\_\_