

Design and Build Your Model Bridge

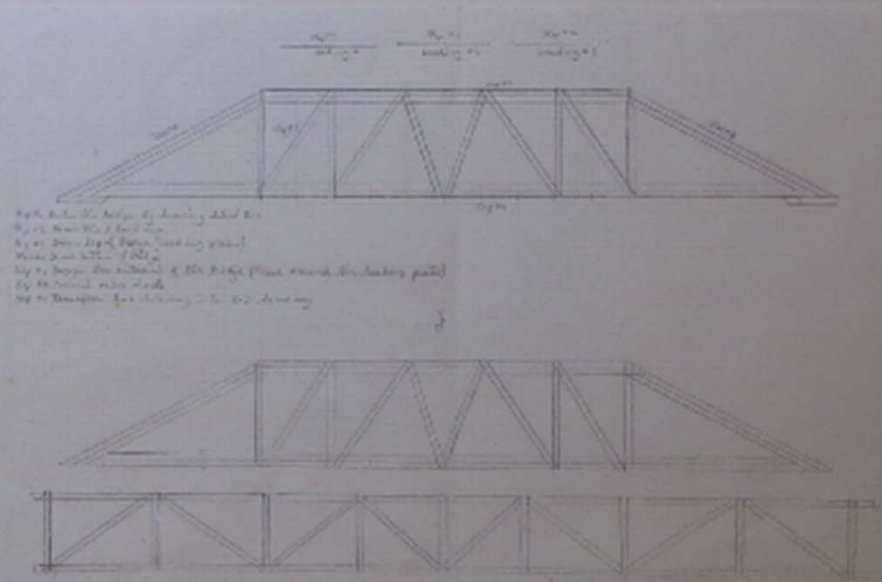
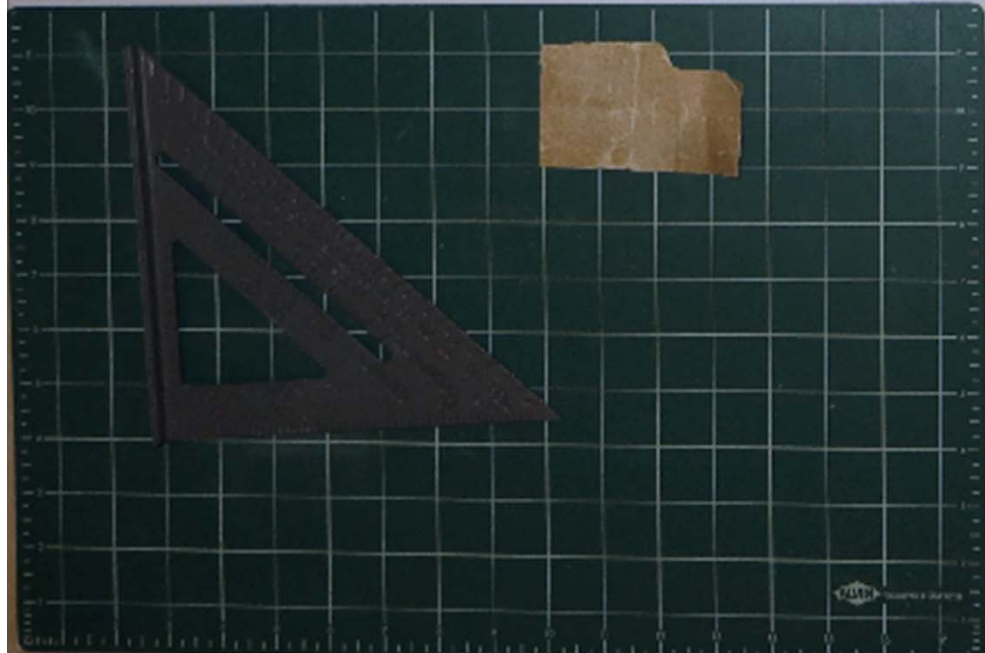


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Main Materials:

- Grid paper (12"x18")
- Pencil (# 2, or 2-H)
- Ruler (metric)
- Cutting tools
- Glues (Elmer's or wood)
- Ceiling tile
- T-pin
- Wax paper
- Sand paper
- Bull nose clamp
- $\frac{3}{4}$ binder clamp
- Cutting mat
- $\frac{3}{32}$ basswood (density about .07 gram per 1 inch)



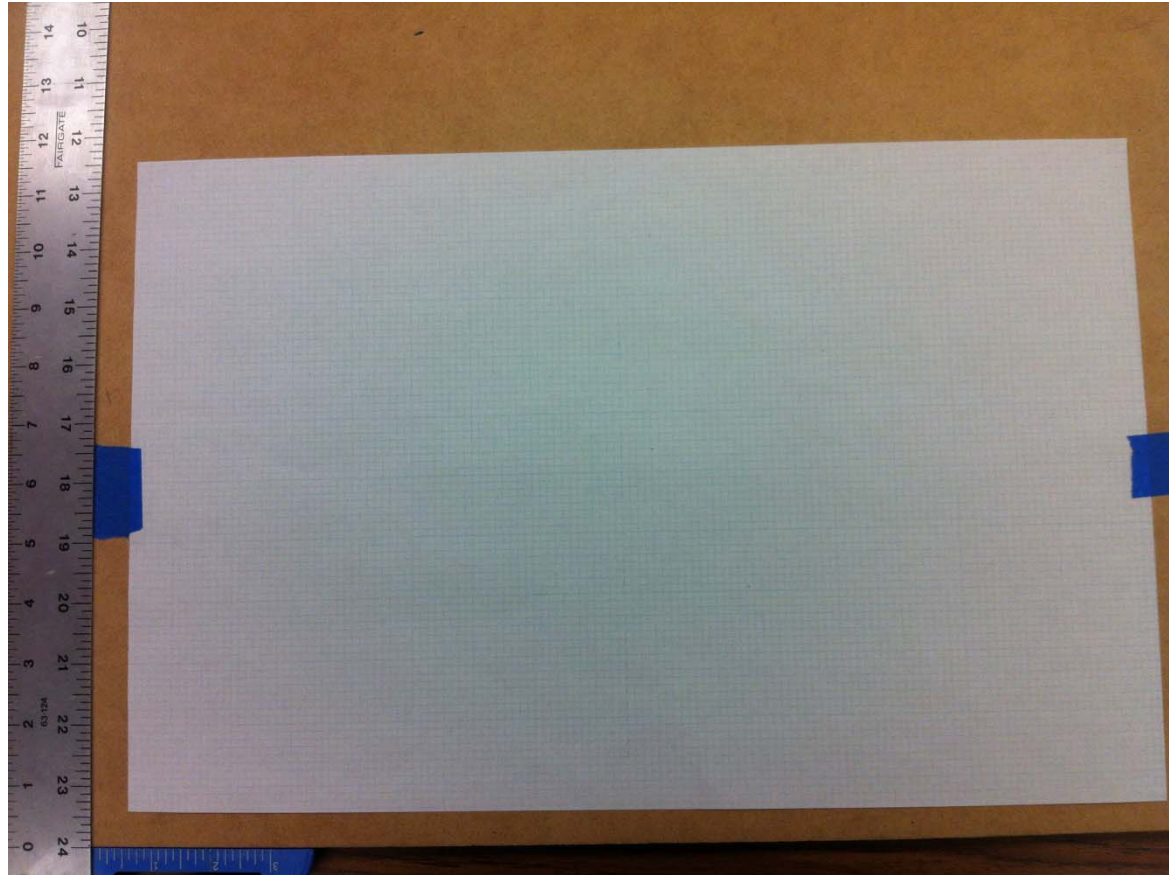
Optional Tools

- Triple beam balance
- Needle file
- T-Square
- Safety goggles
- Compass
- Torpedo level
- Dremel tool
- Blue tape
- Drafting triangle
- Tweezers

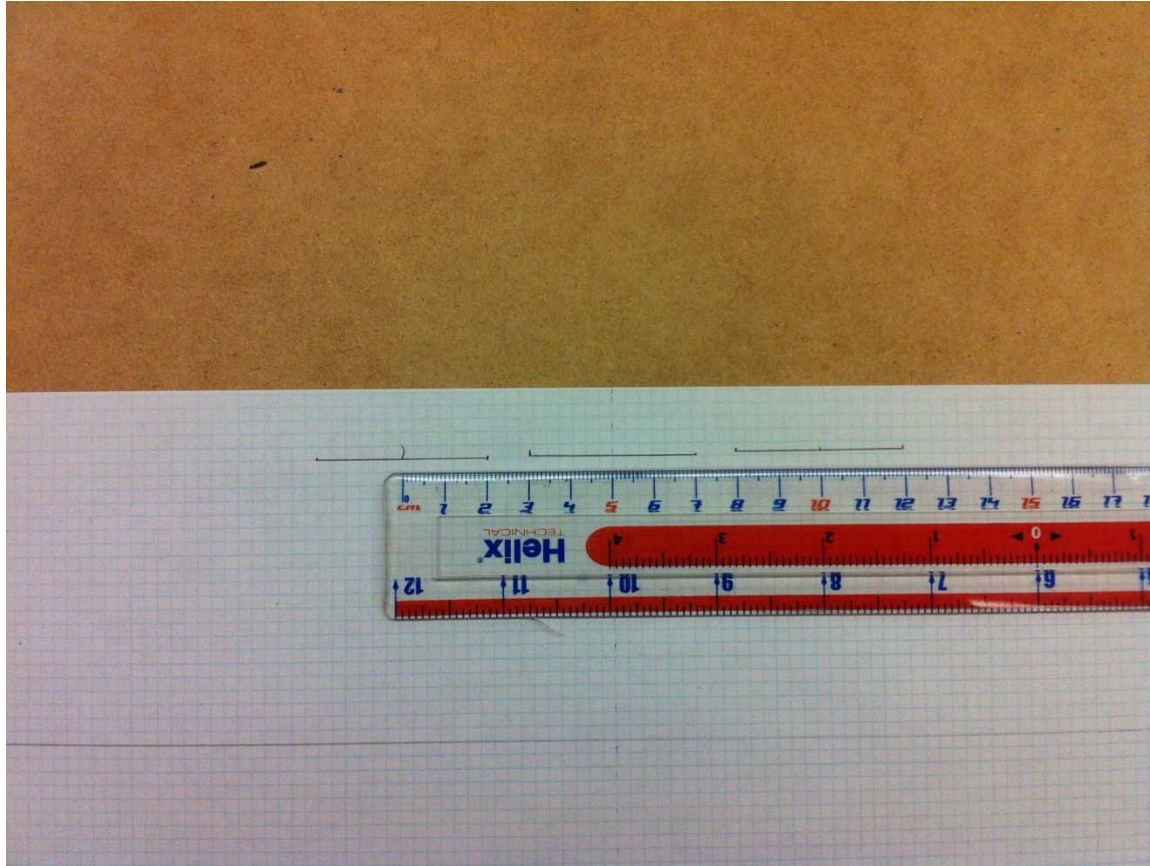


Know the Rules

- a. Be able to define in your own words what the bridge must accomplish
- b. Limit the bridge weight
- c. Keep it simple
- d. Do not get disqualified!!!!



Start with grid paper
Use ruler to establish the center of the
bridge



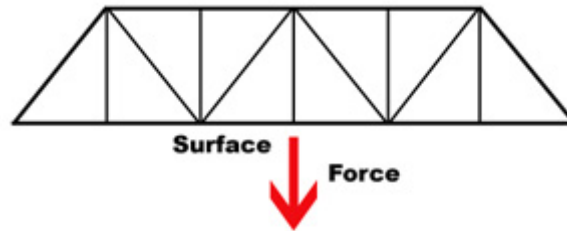
Draw the loading area.

Design the Bridge

- a. Design the bridge around the loading points
 - Plan for extra bracing around load areas
- b. Choose a truss to use
 - Warren
 - Pratt
 - Howe
 - K truss
- c. Draw the bridge to scale
 - Use graph paper
 - Draw forces
 - Label everything

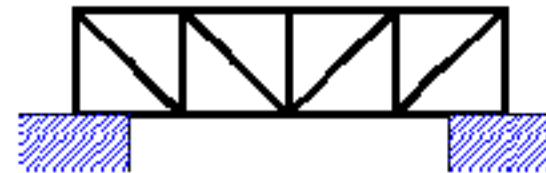
Truss Design

- Warren



Warren (vertical support)
Truss Bridge

- Pratt



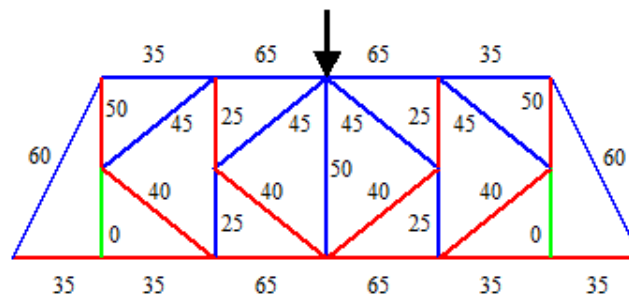
Pratt or N-shaped Truss.

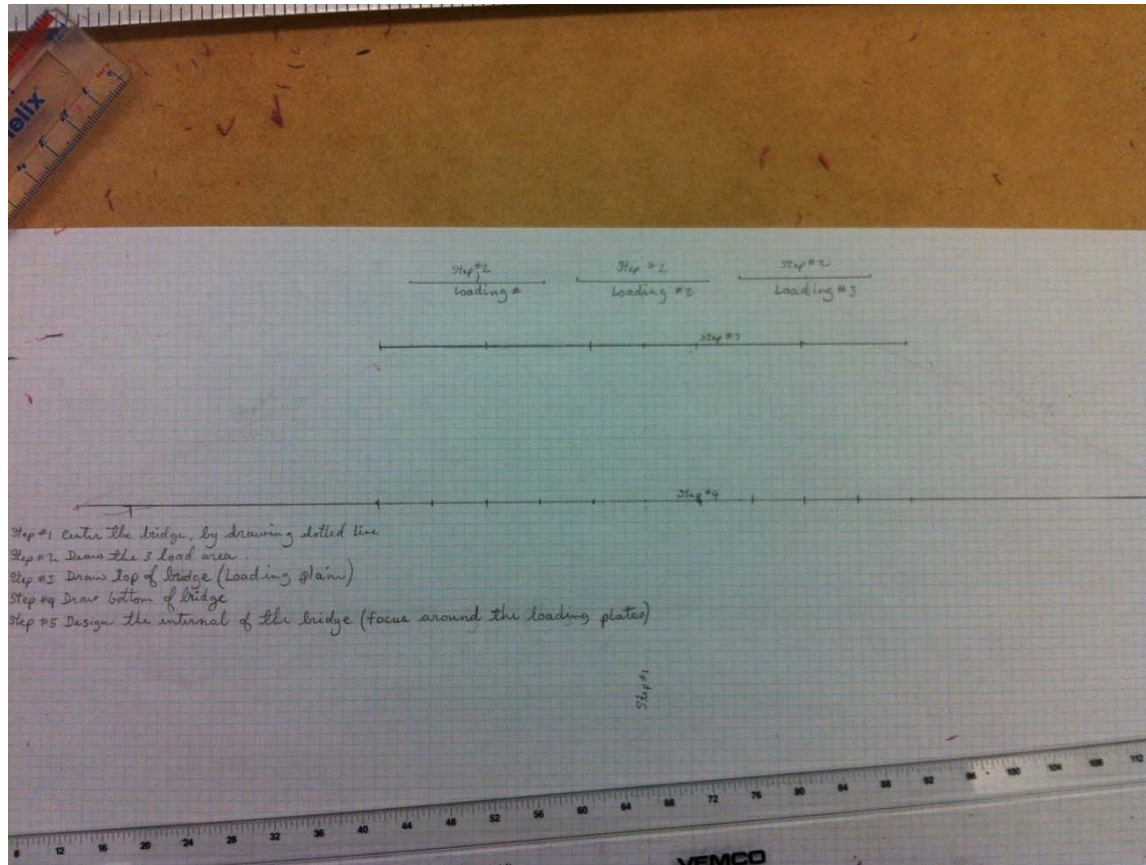
- Howe



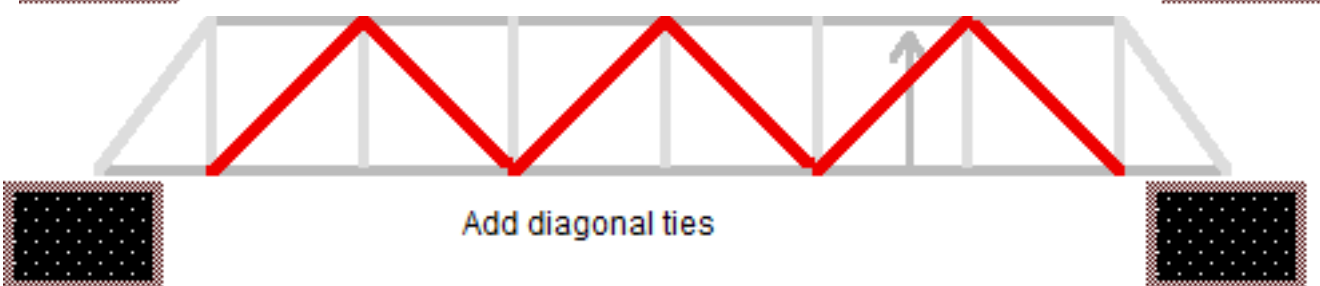
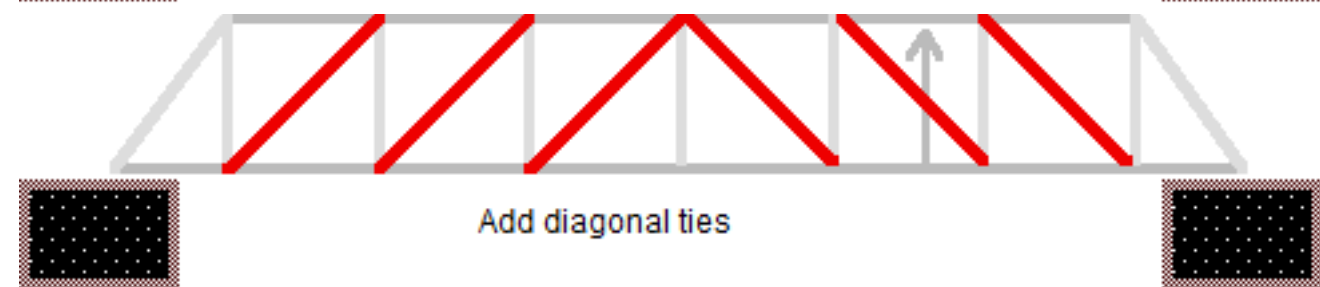
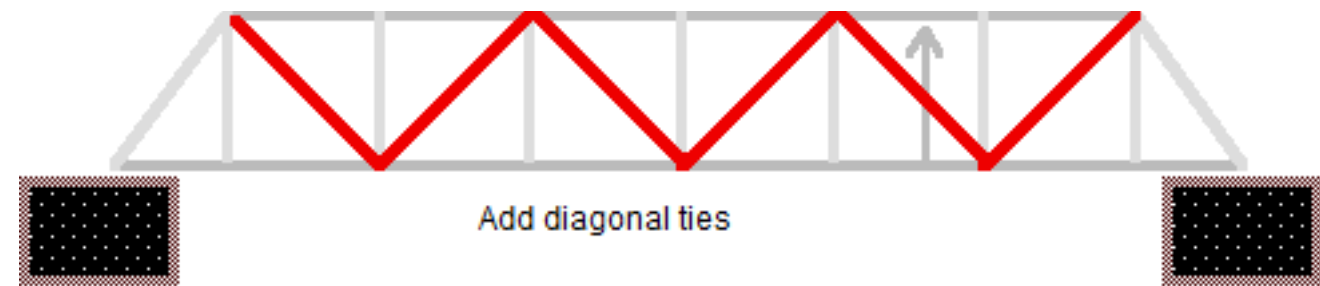
Howe Truss.

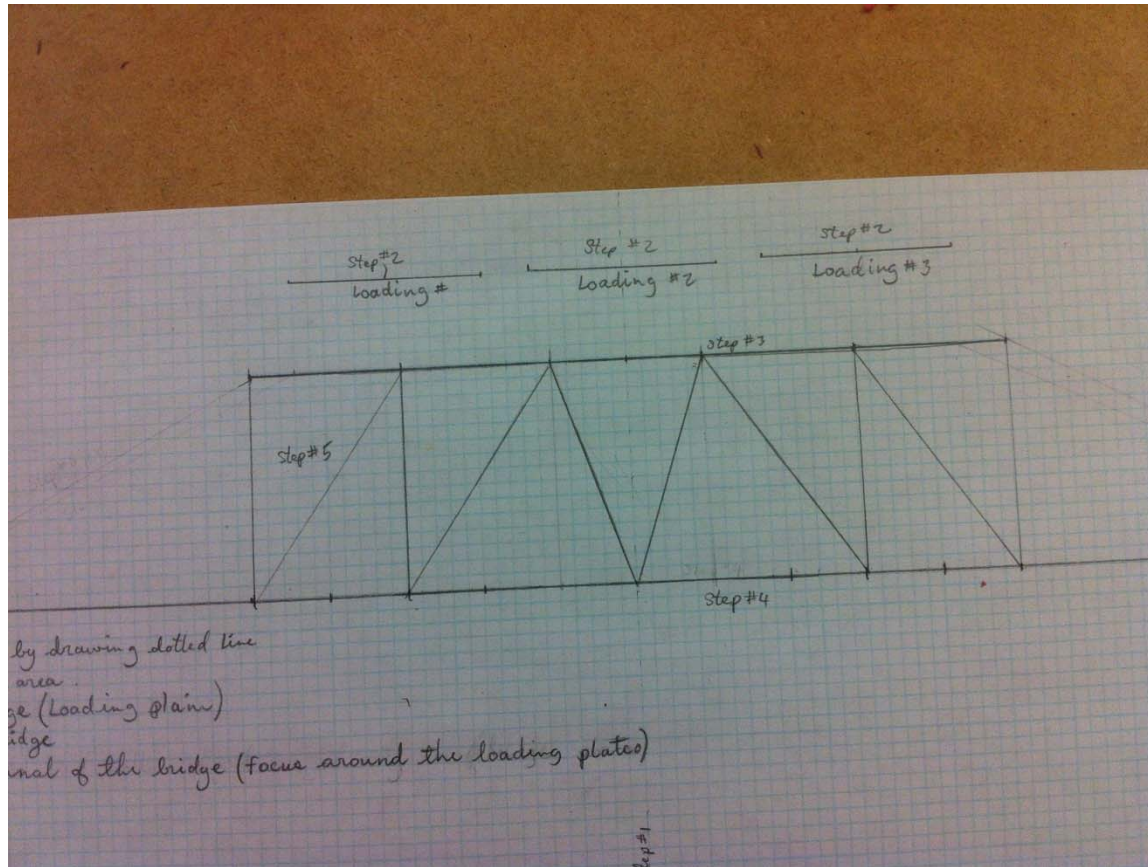
- K-Truss



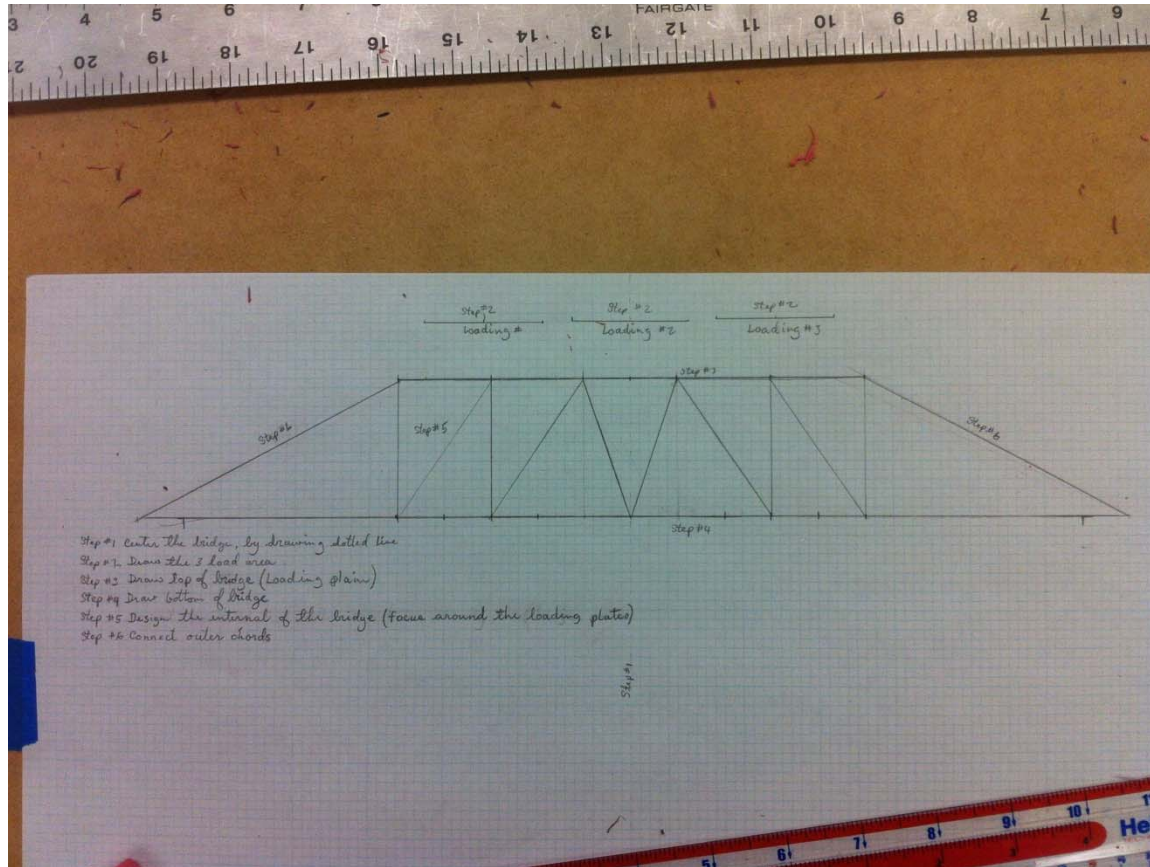


Draw the top and bottom of your bridge
Locate the point where you can use to build the internal members

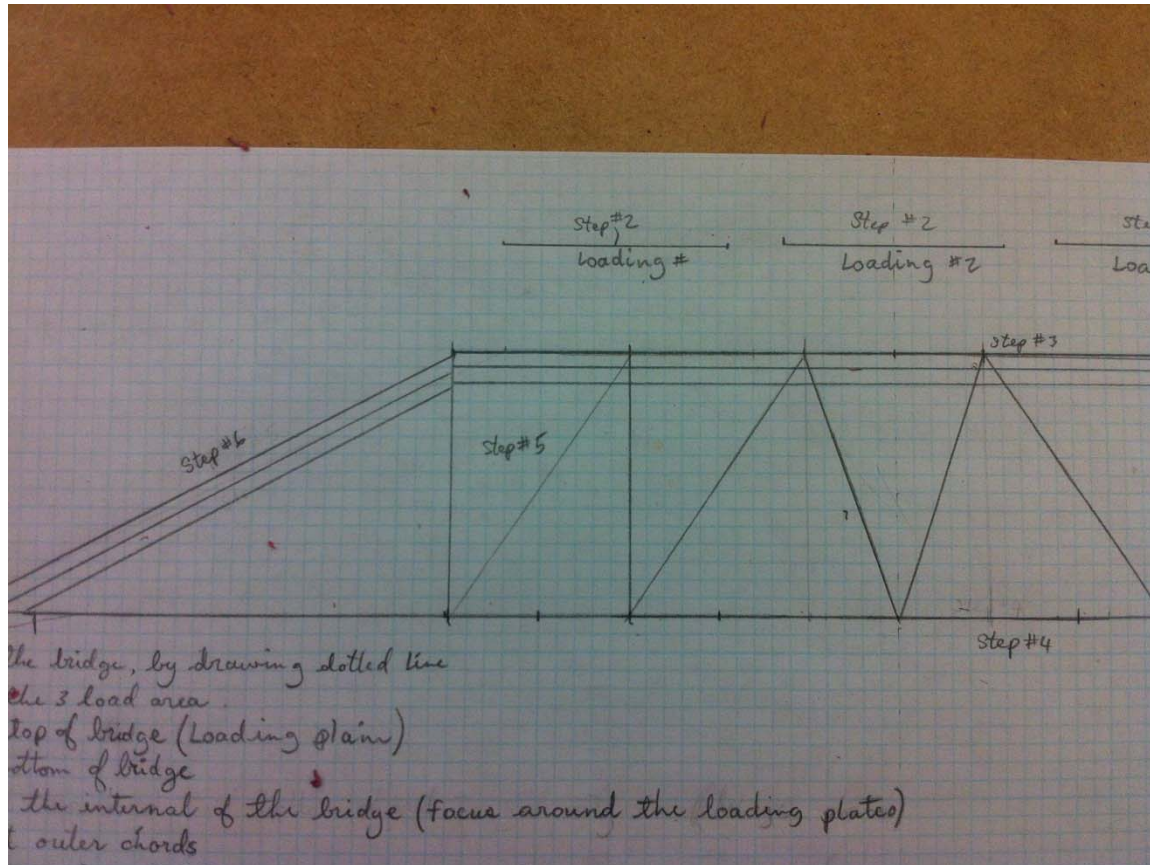




Draw the internal members



Draw the two side members to connect the top and bottom of the bridge.



Make the top chord of the bridge thicker by drawing the a second and third lines to product the shape of 1-3 sticks.

Possible top design



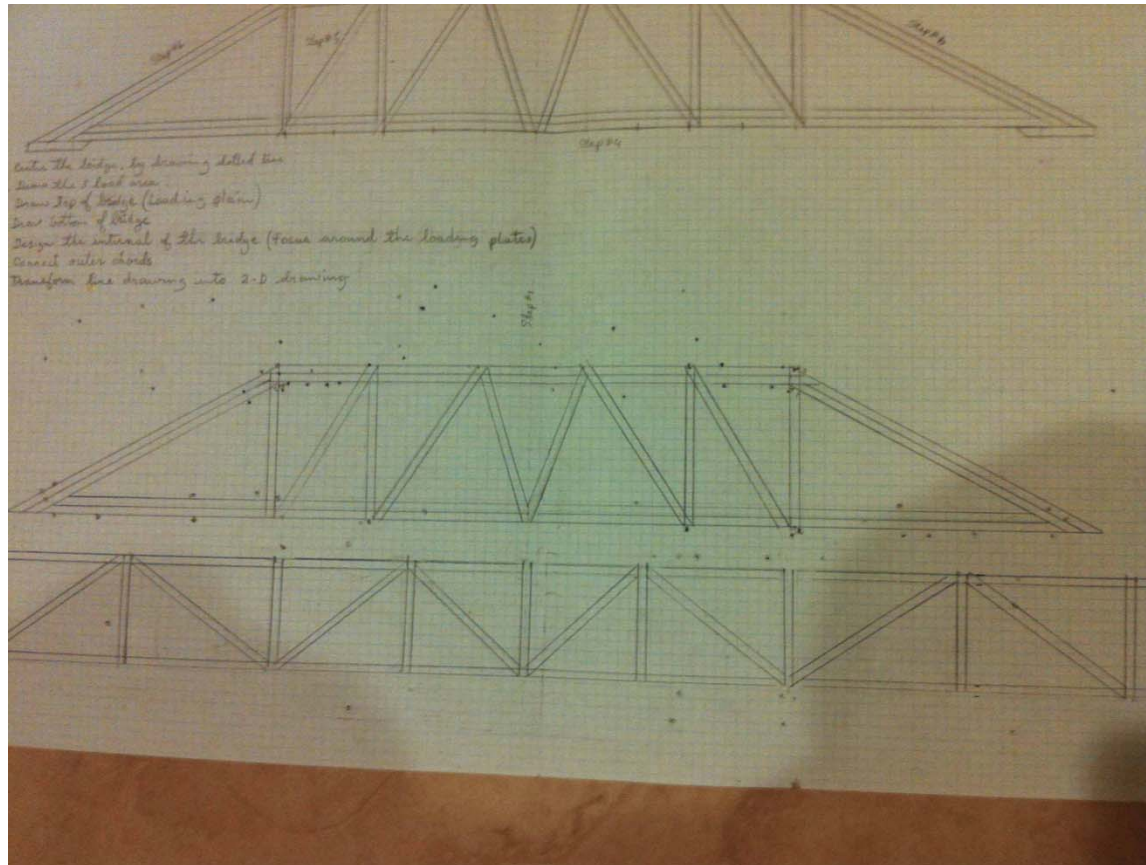
Make top design



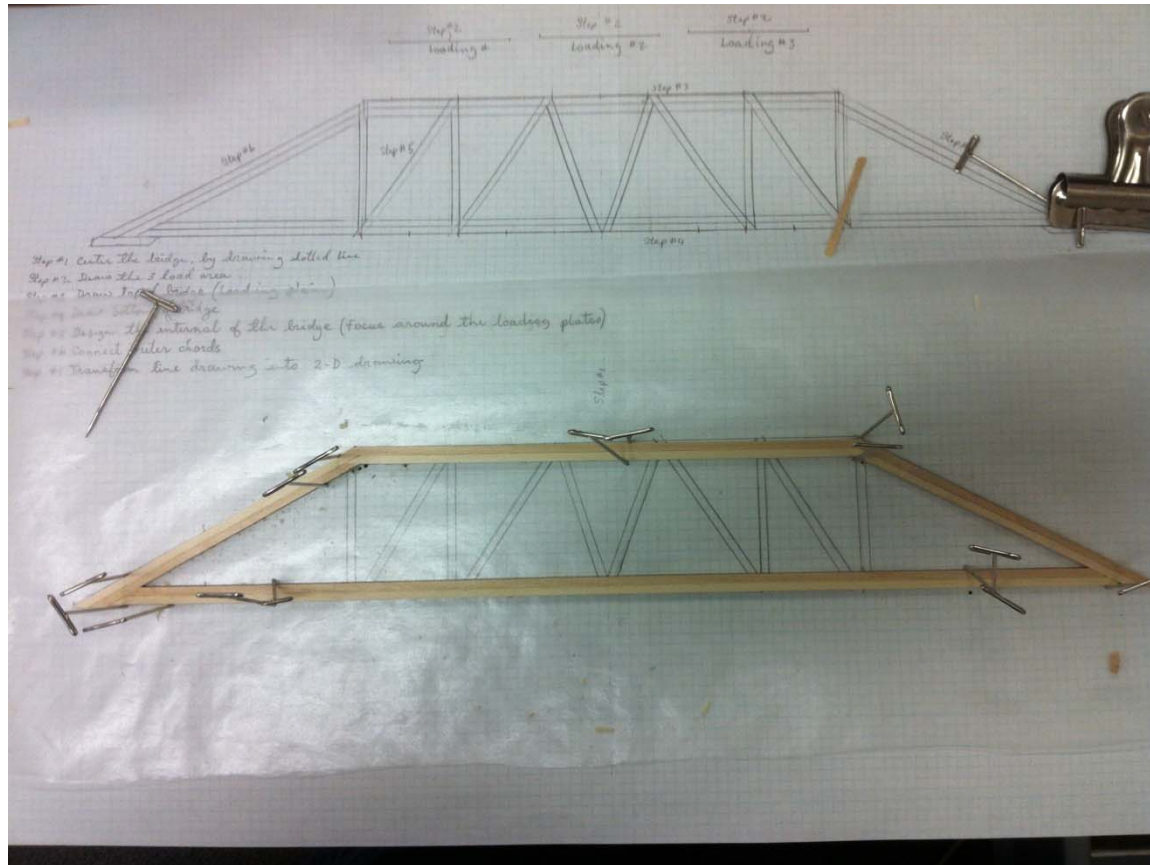
Make top design



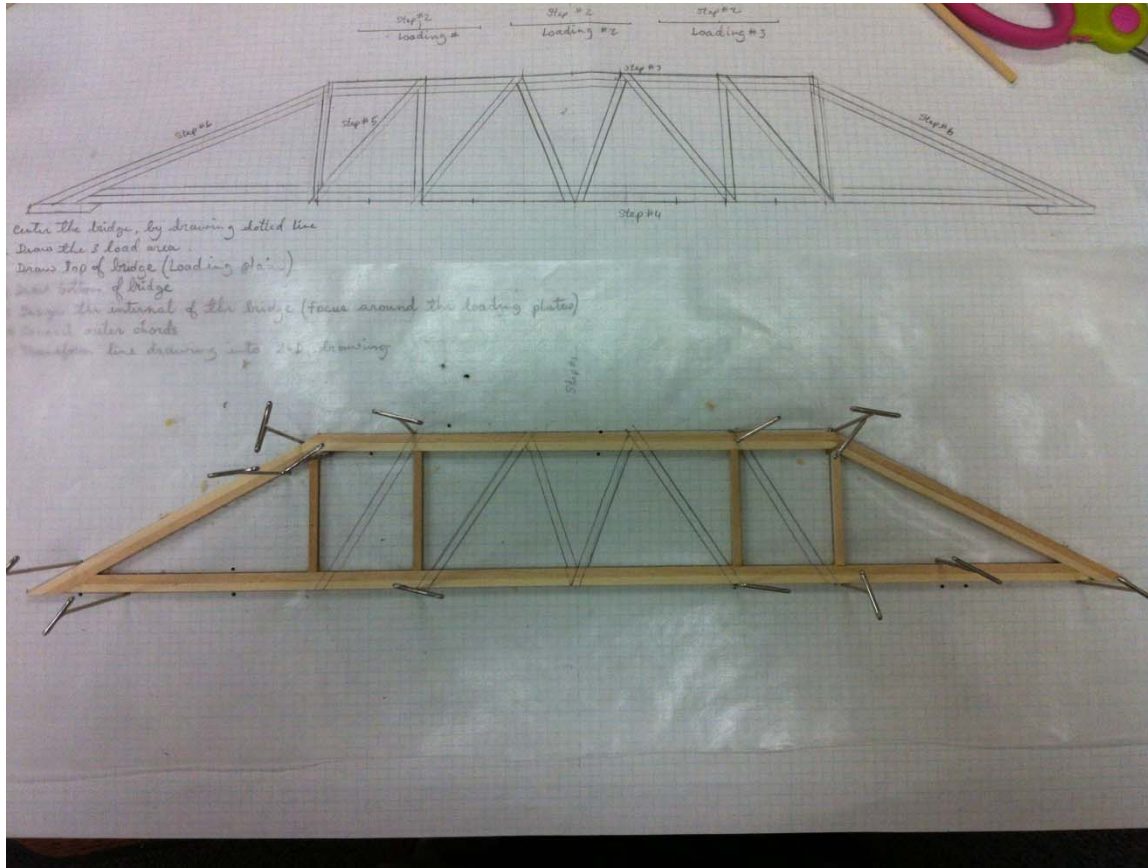
Make top design



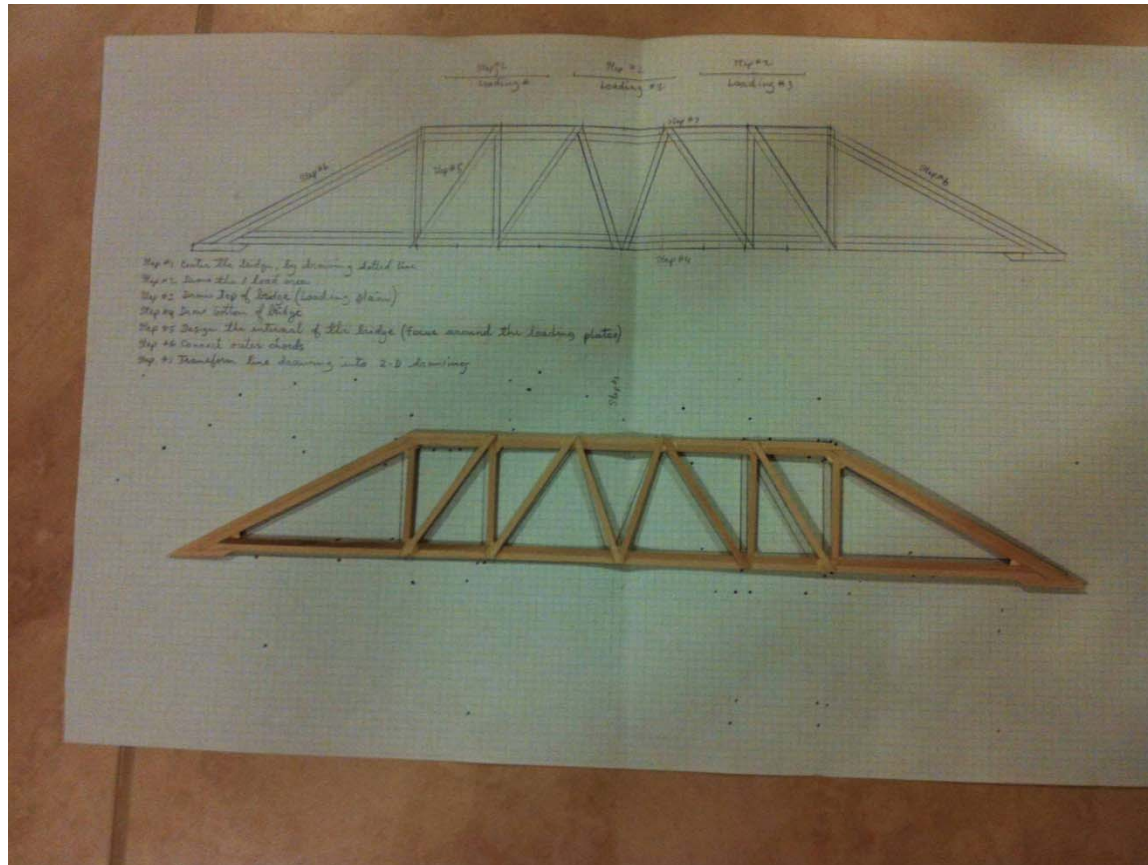
**Design the top of your bridge.
Please note that the sides of the bridge will be
longer because of the slope.**



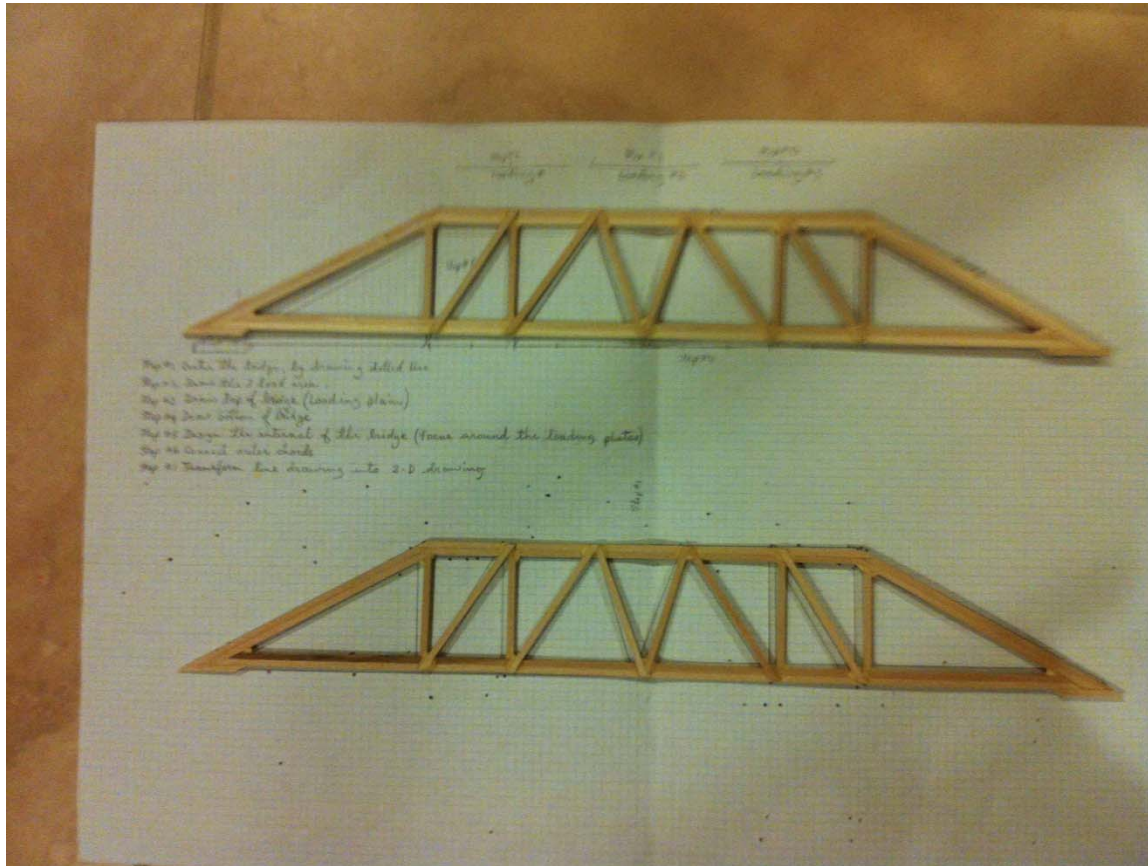
**Cut and glue the outer members of your bridge
Make sure to put wax paper down first!**



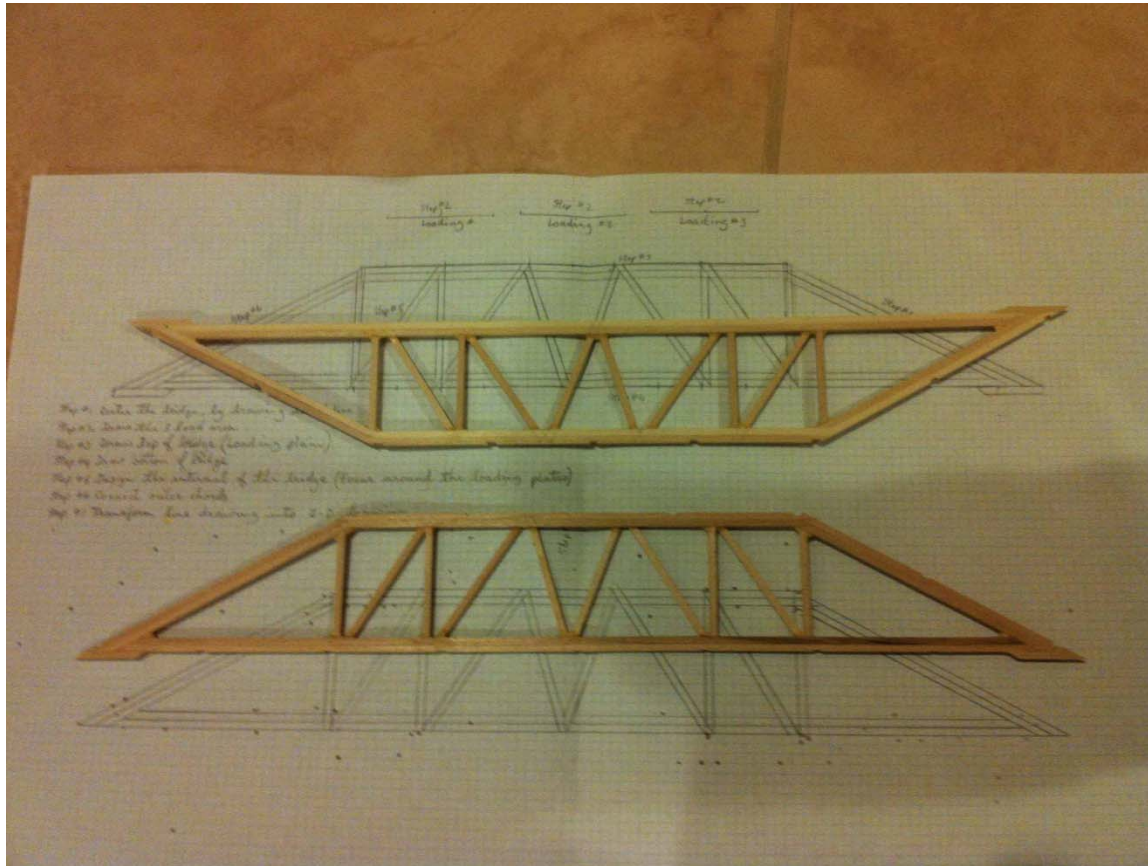
Glue the vertical members



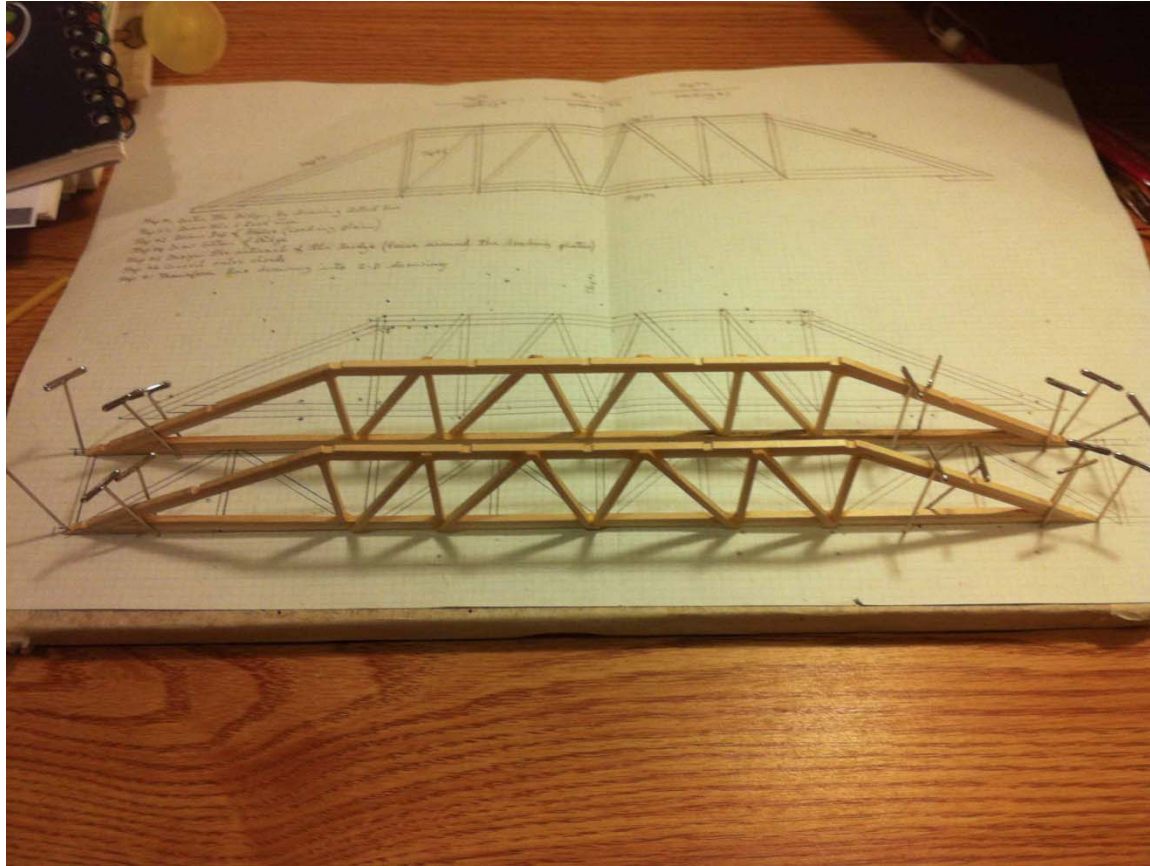
Glue the diagonal members



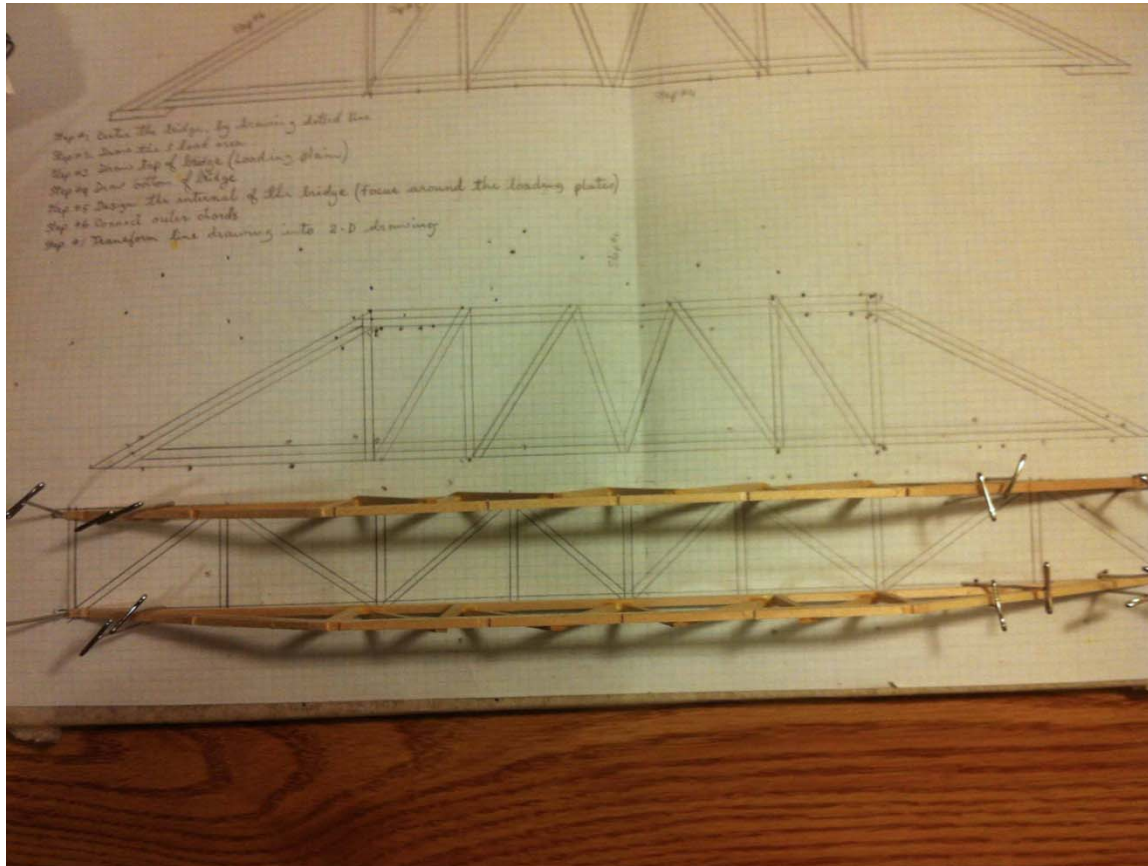
Make another truss the same as the first



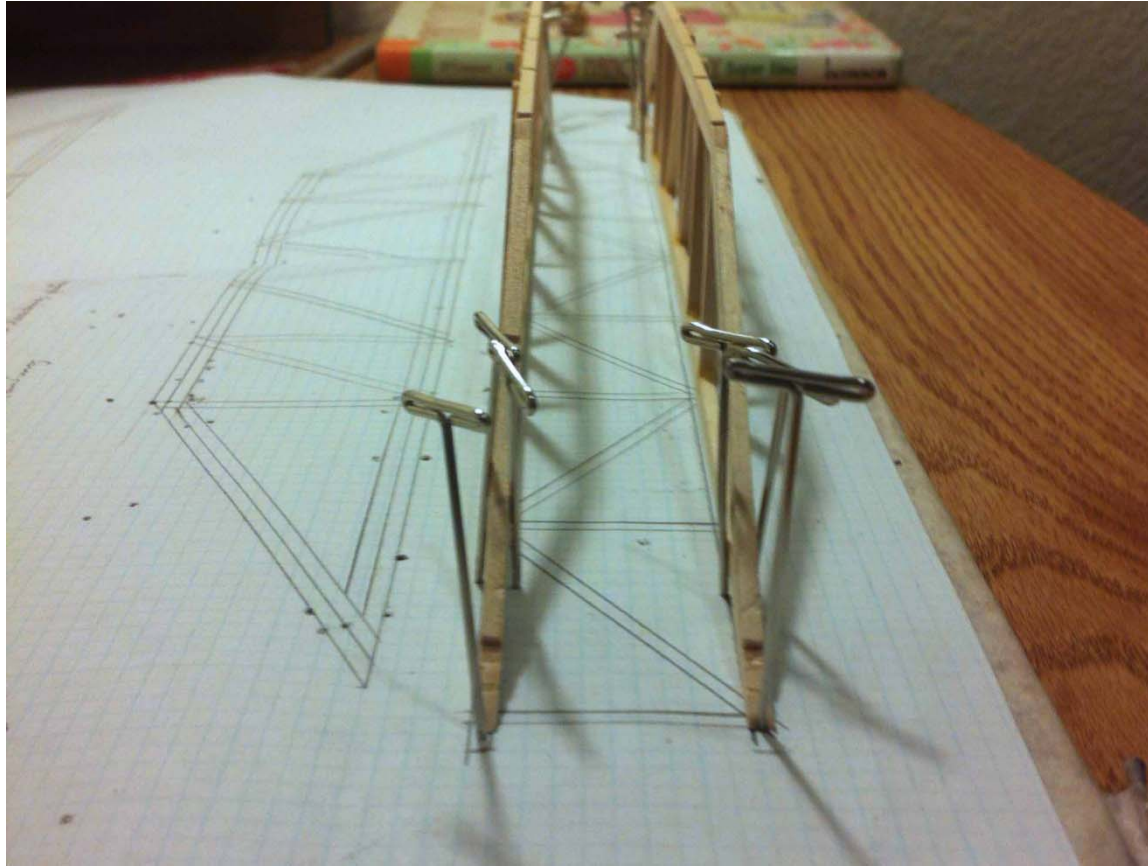
Here are the trusses ready to build your bridge



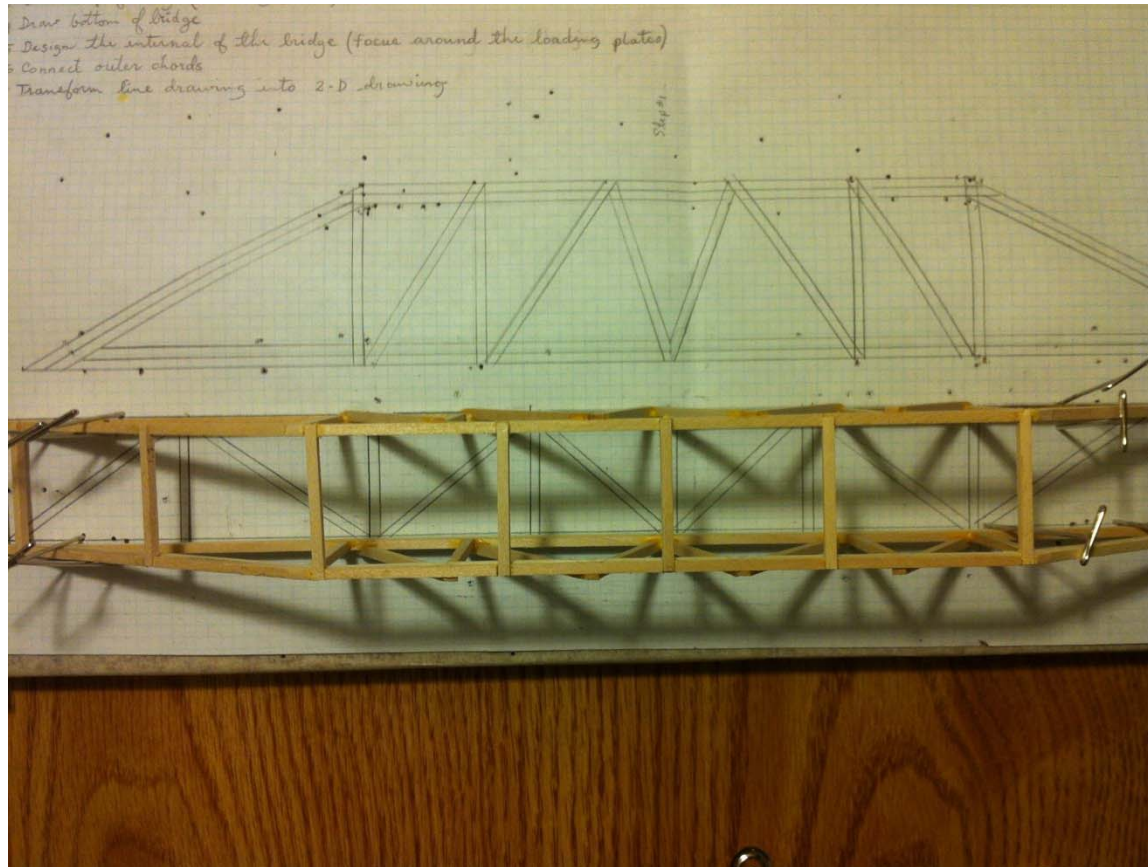
Use the T-pins to set up the two trusses



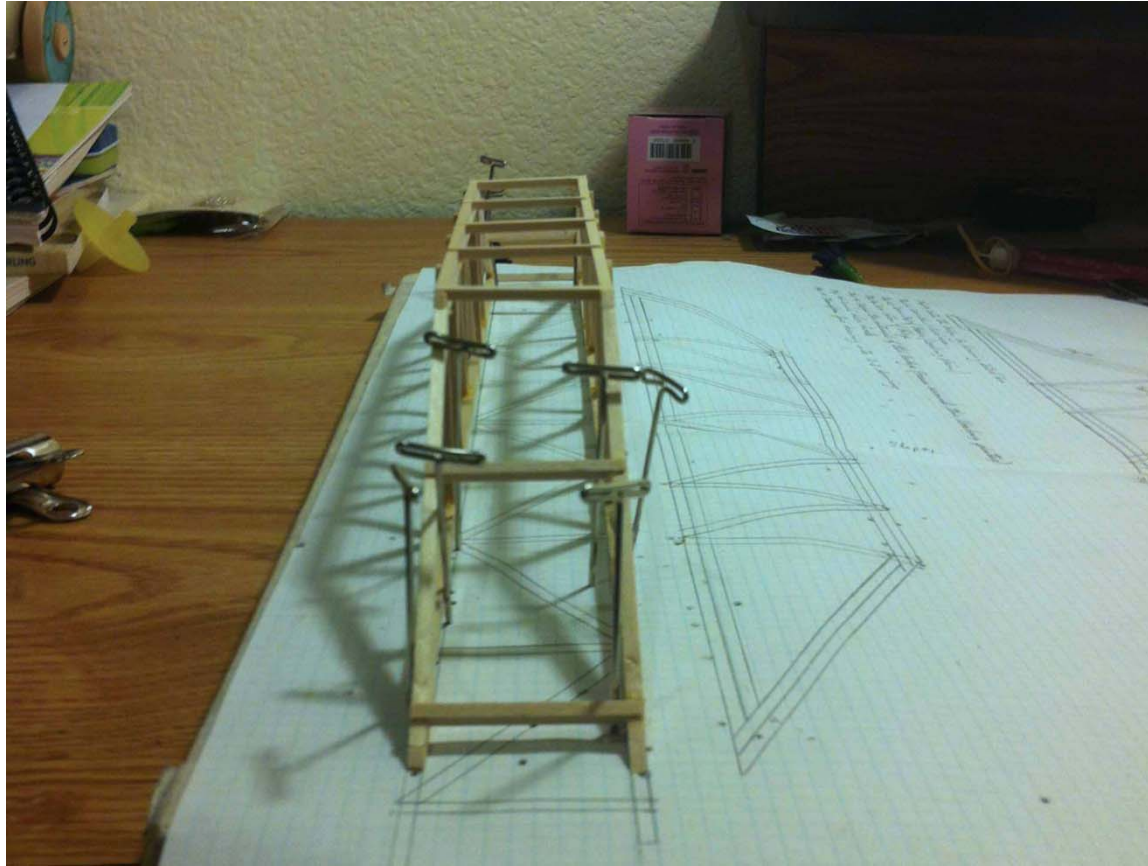
Make sure the two trusses are at 90 degree with the base.



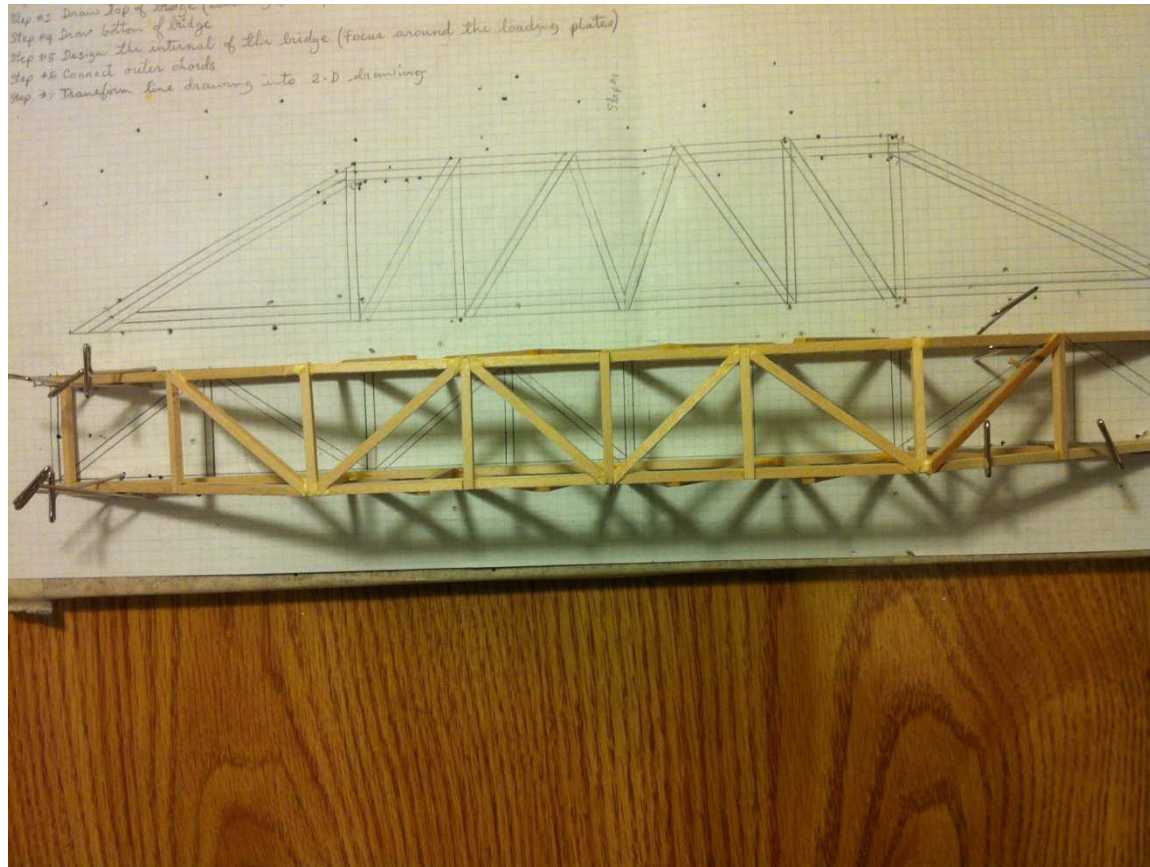
Look down the two ends to make sure they are 90 degree with the base



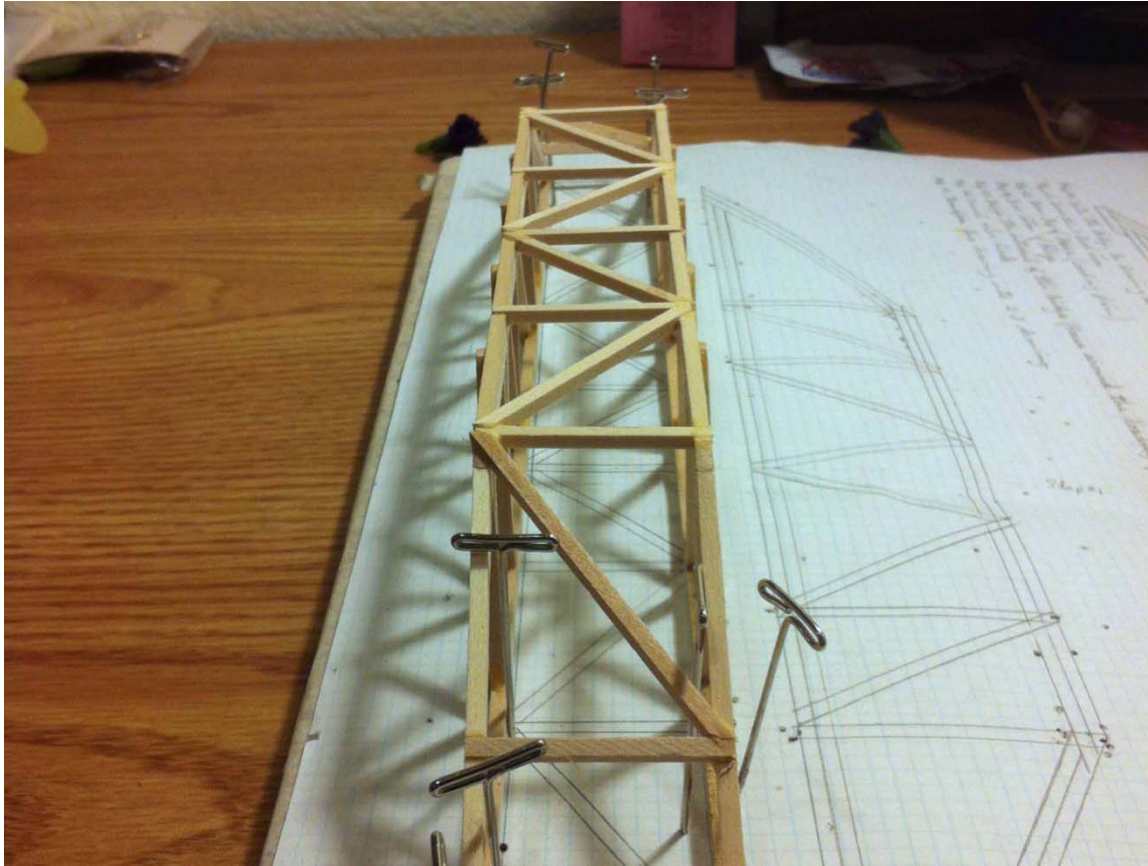
Connect the trusses with cross members



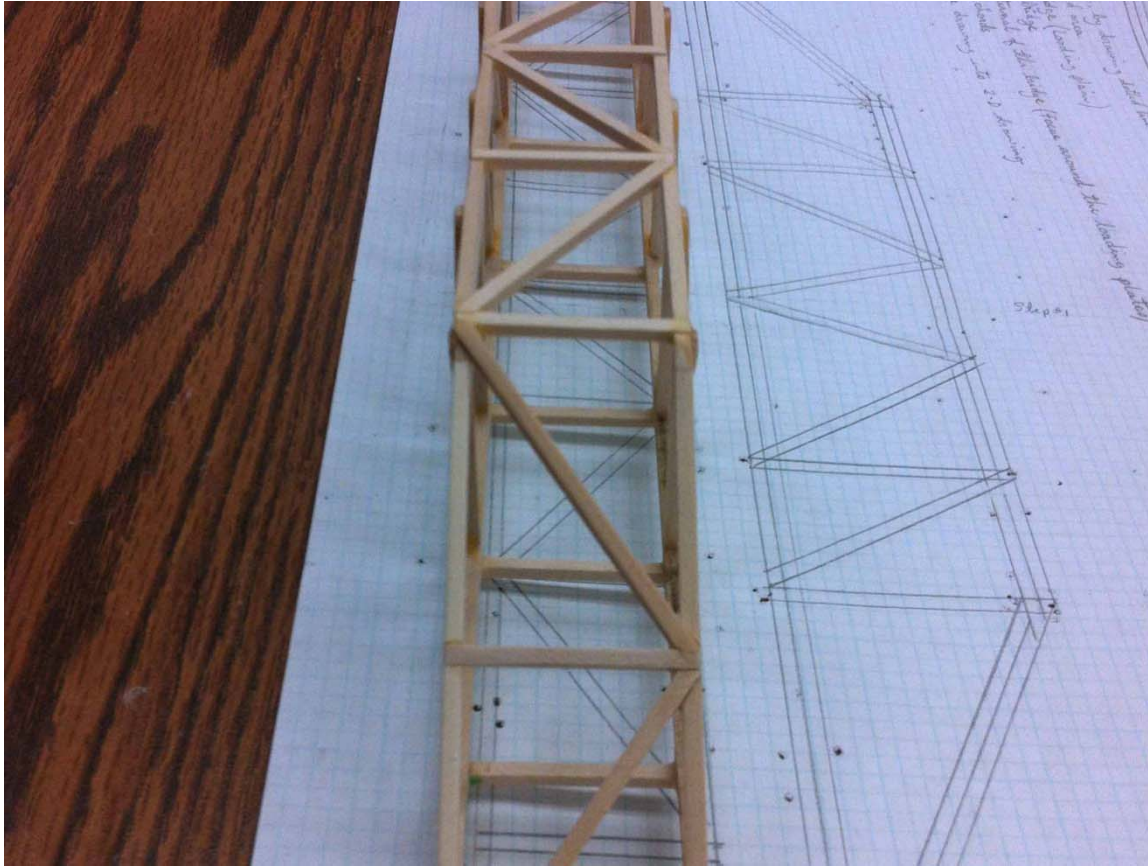
Look down the two ends to make sure the bridge is still at 90 degree with the base



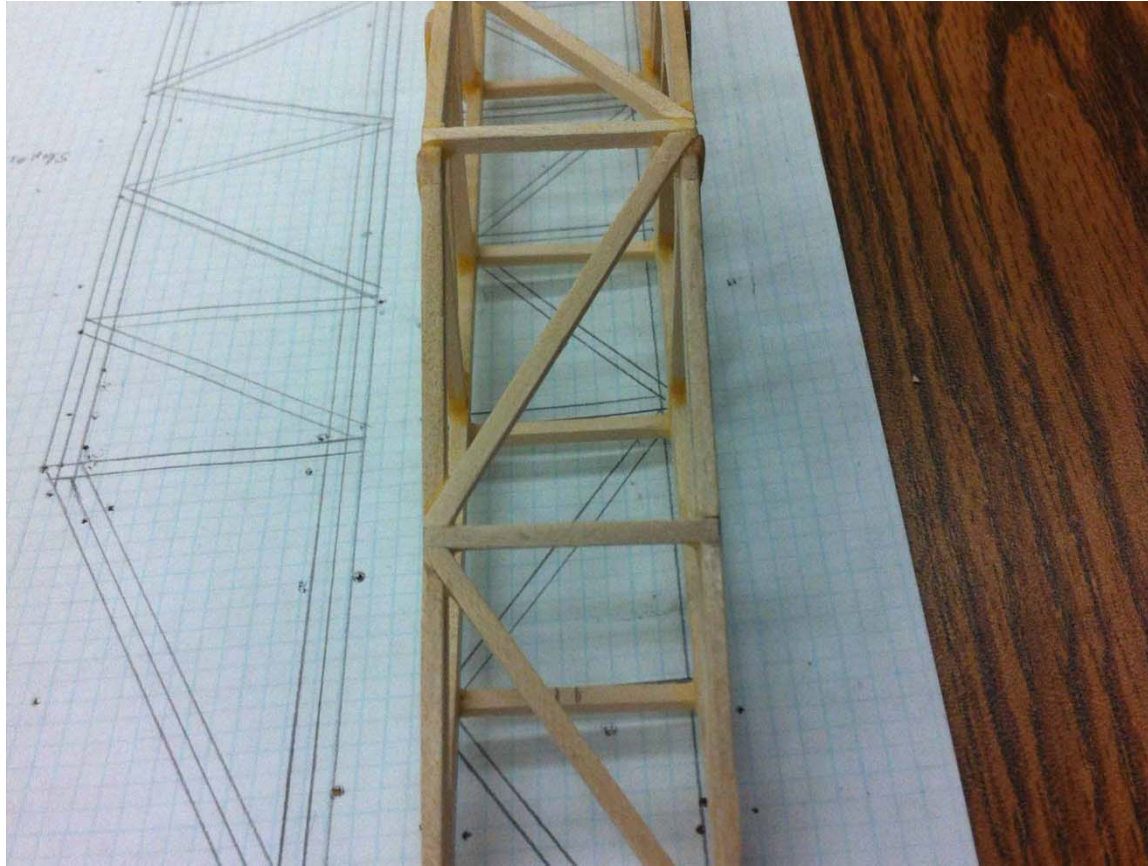
Add the diagonal members



Check to make sure the bridge still look good from the two ends



At the bottom cross members



Sand any extra unwanted wood to reduce the mass of the bridge and you are done.

Good Tips

- Try not to use too glue
- Practice good craftsmanship
- Sand extra weight off
- Be creative
- Make and test as many bridges as possible
- Try out different truss design
- Look around your environment for idea
- Use Elmer's or wood glue (CA glue dry too fast)

Good Resources

- <http://www.garrettsbridges.com/design/trussdesign>
- <http://www.jhu.edu/virtlab/bridge/bridge.htm>
- <http://pghbridges.com/basics.htm>
- <http://www.knexusergroup.org.uk/acatalog/K96168X.pdf>

Please give warm thanks to the following people : **Paul, Walt, Casey, Tanner, Charles, Steven, Janet, and Richard, and many others** for making this event very successful every year.

Thanks You For Coming 😊

See you on **March 1, 2014**