

# Design and Build Your Model Bridge

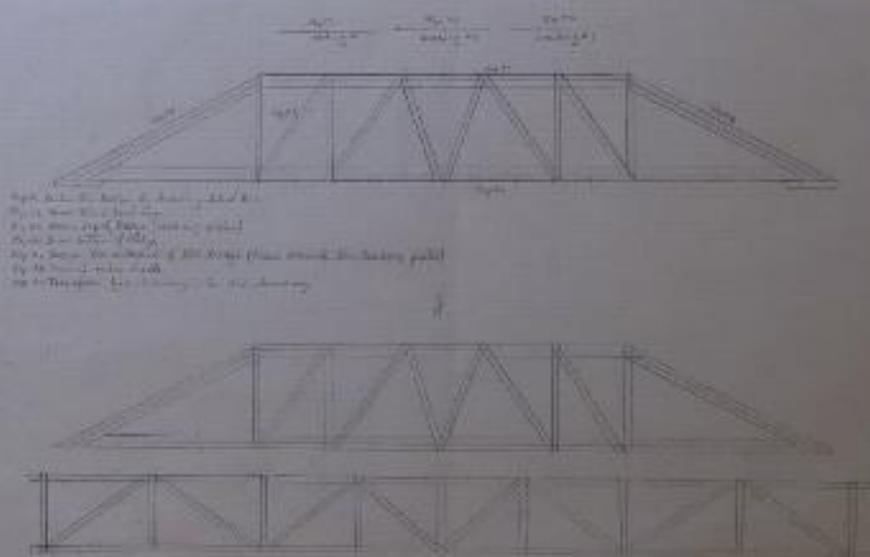
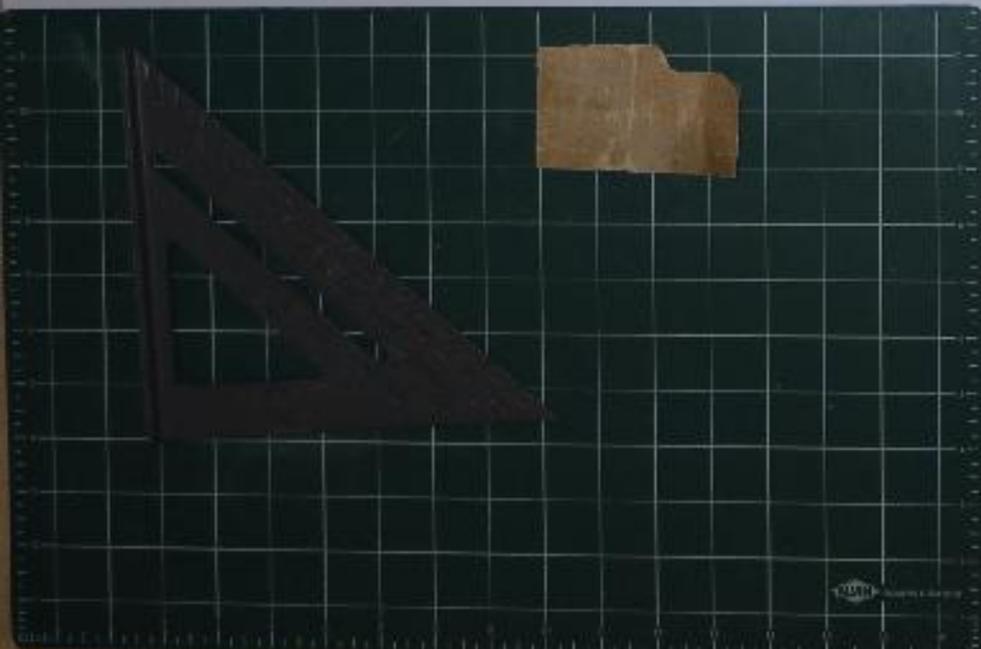


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# Main Materials:

- 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)



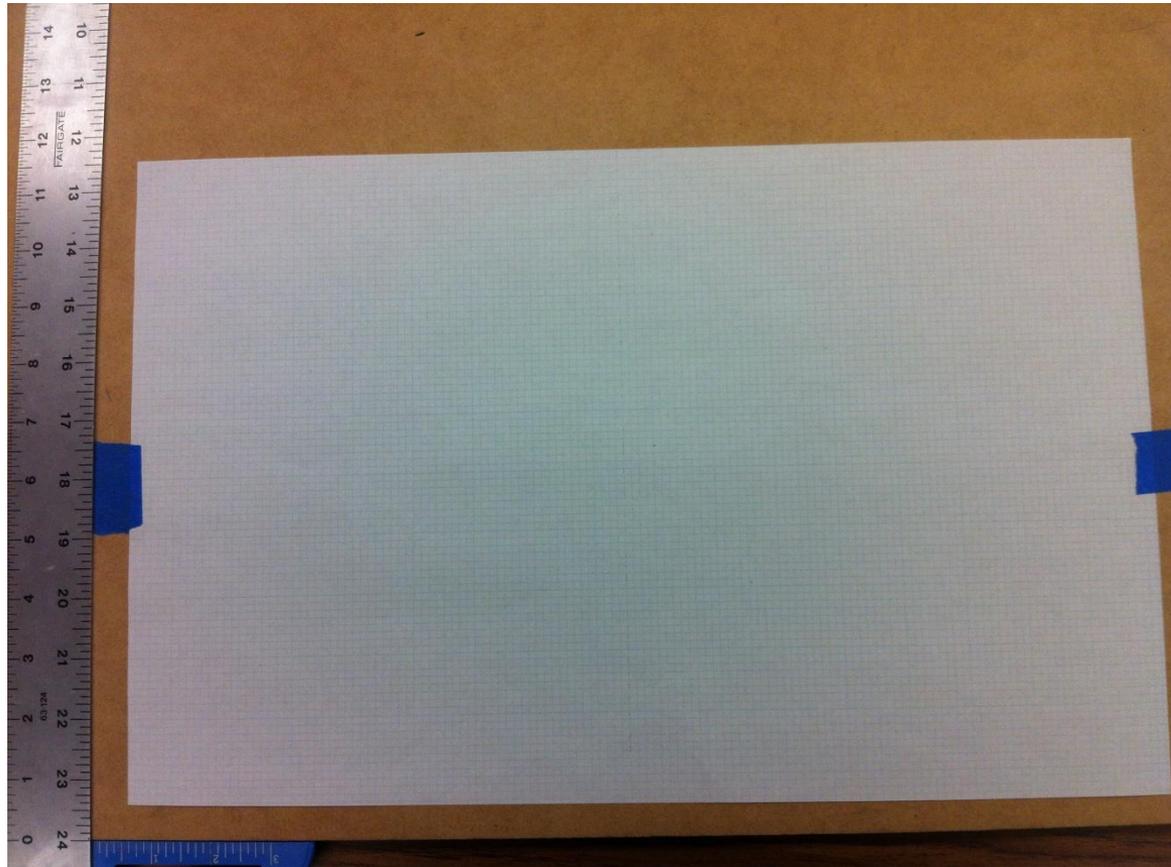
# Optional Tools

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

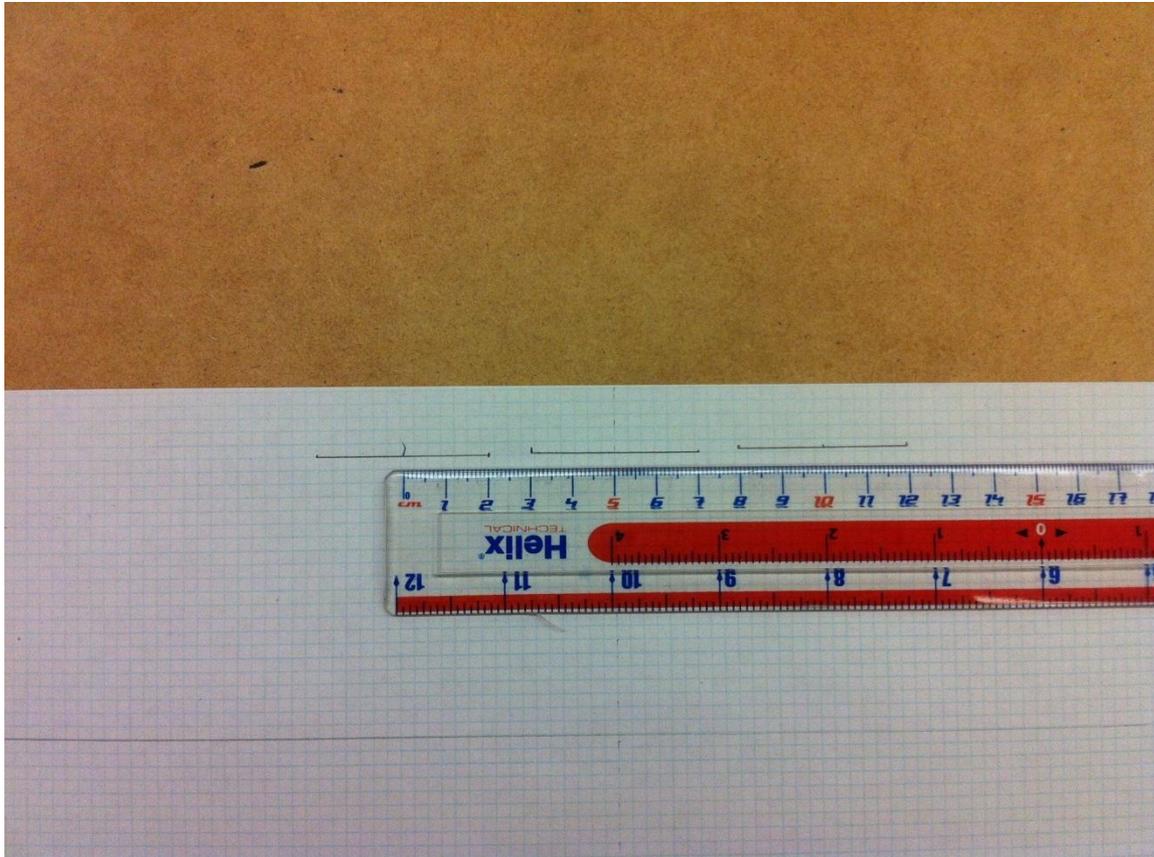


# Know the Rules

- 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**



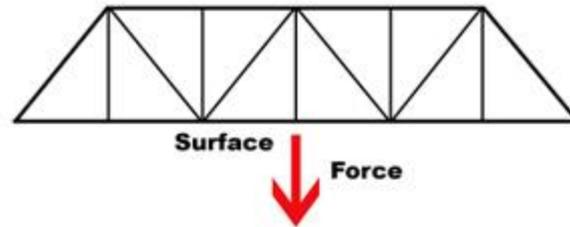
**Draw the loading area.**

# 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

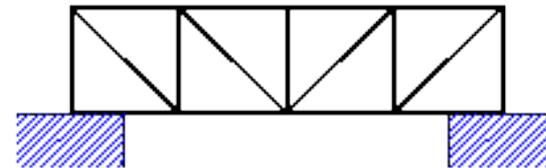
# Truss Design

- Warren



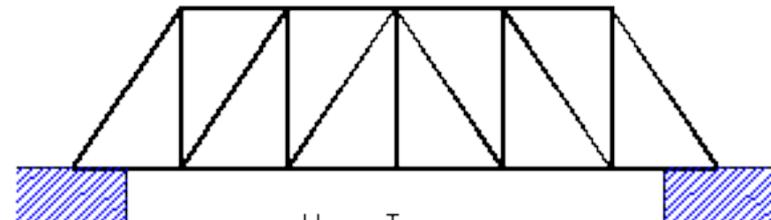
Warren (vertical support)  
Truss Bridge

- Pratt



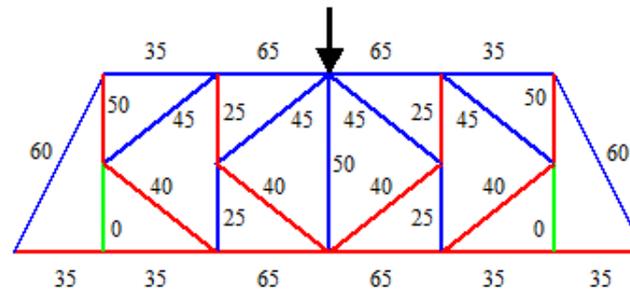
Pratt or N-shaped Truss.

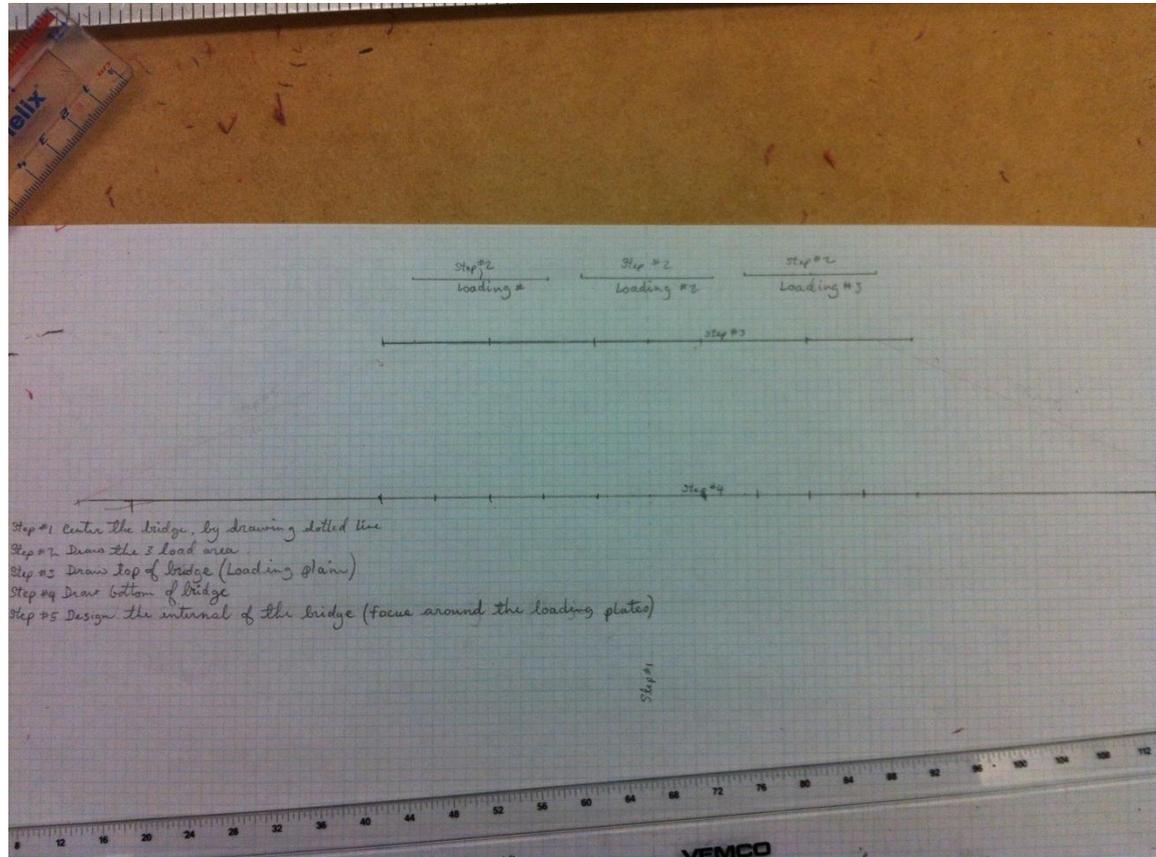
- Howe



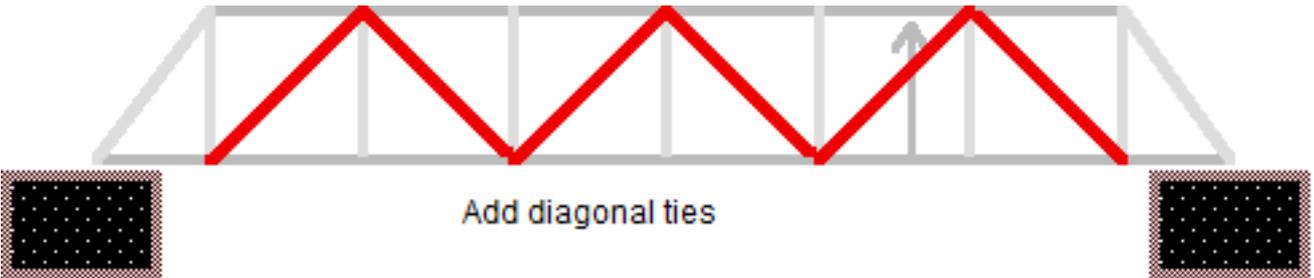
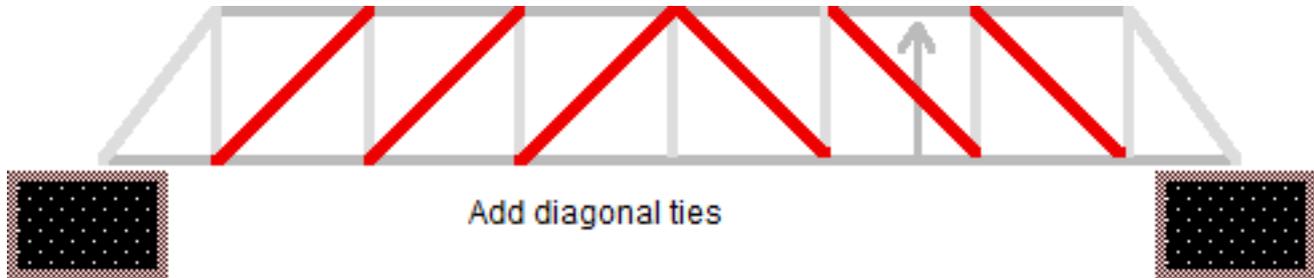
Howe Truss.

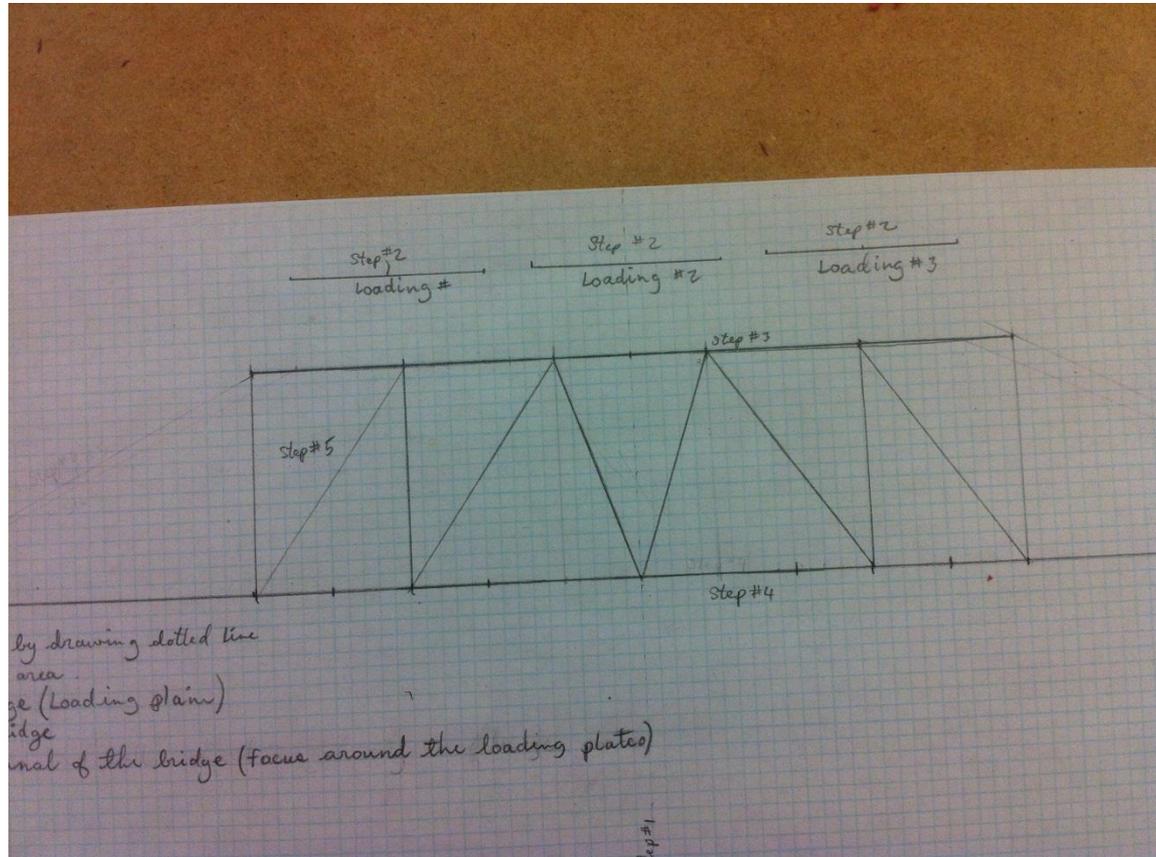
- K-Truss



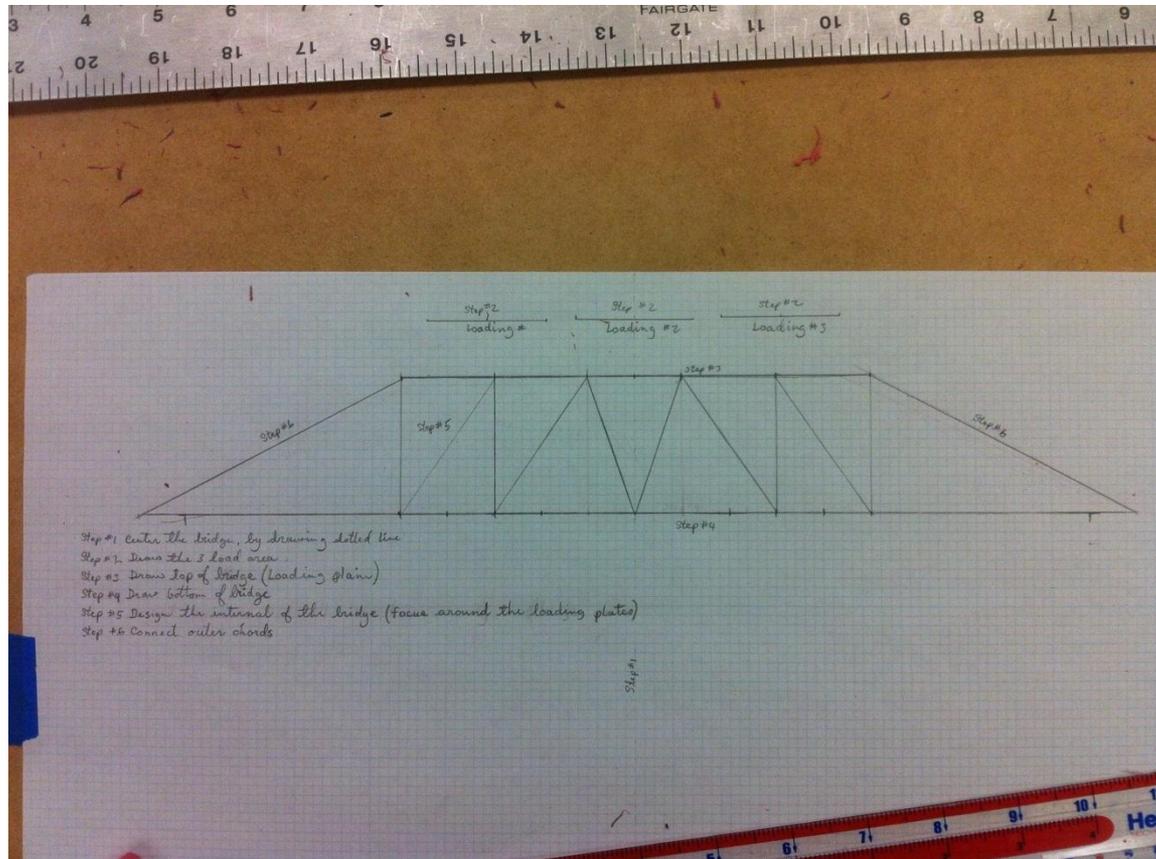


**Draw the top and bottom of your bridge**  
**Locate the point where you can use to build the**  
**internal members**

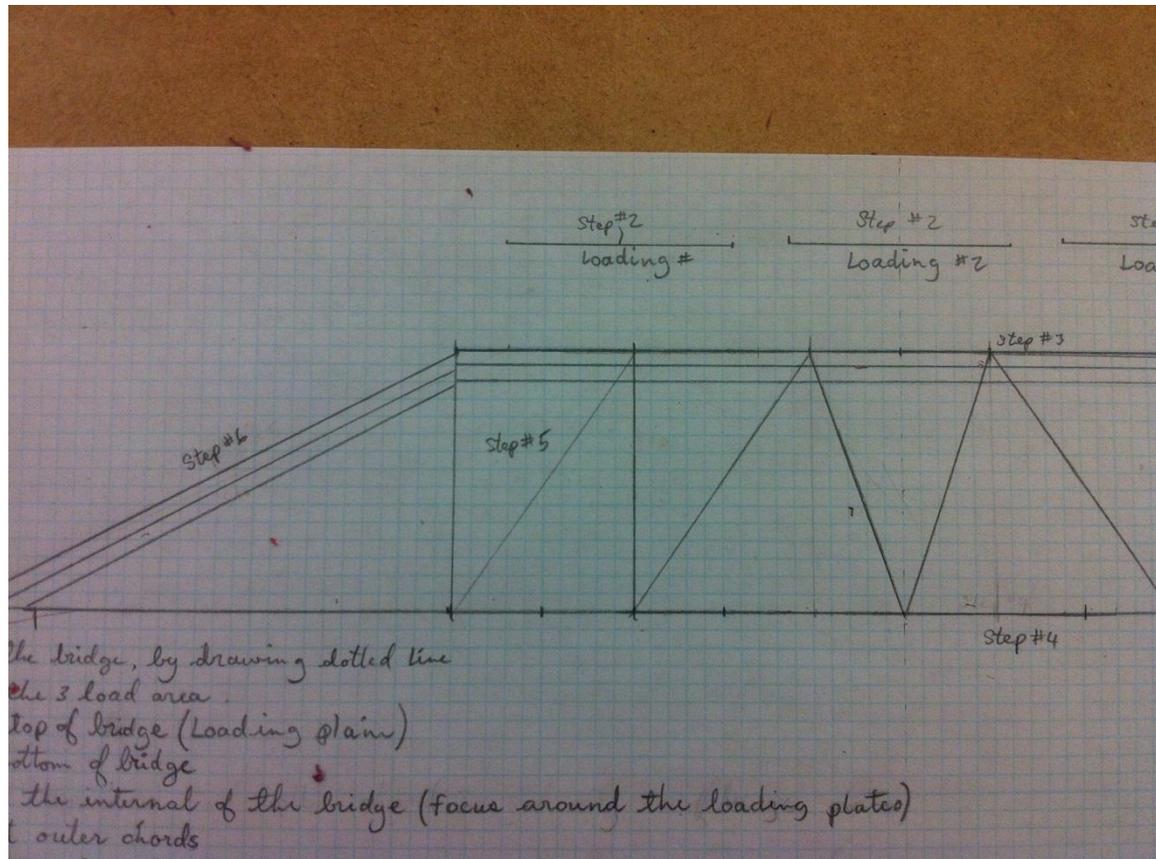




**Draw the internal members**



**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



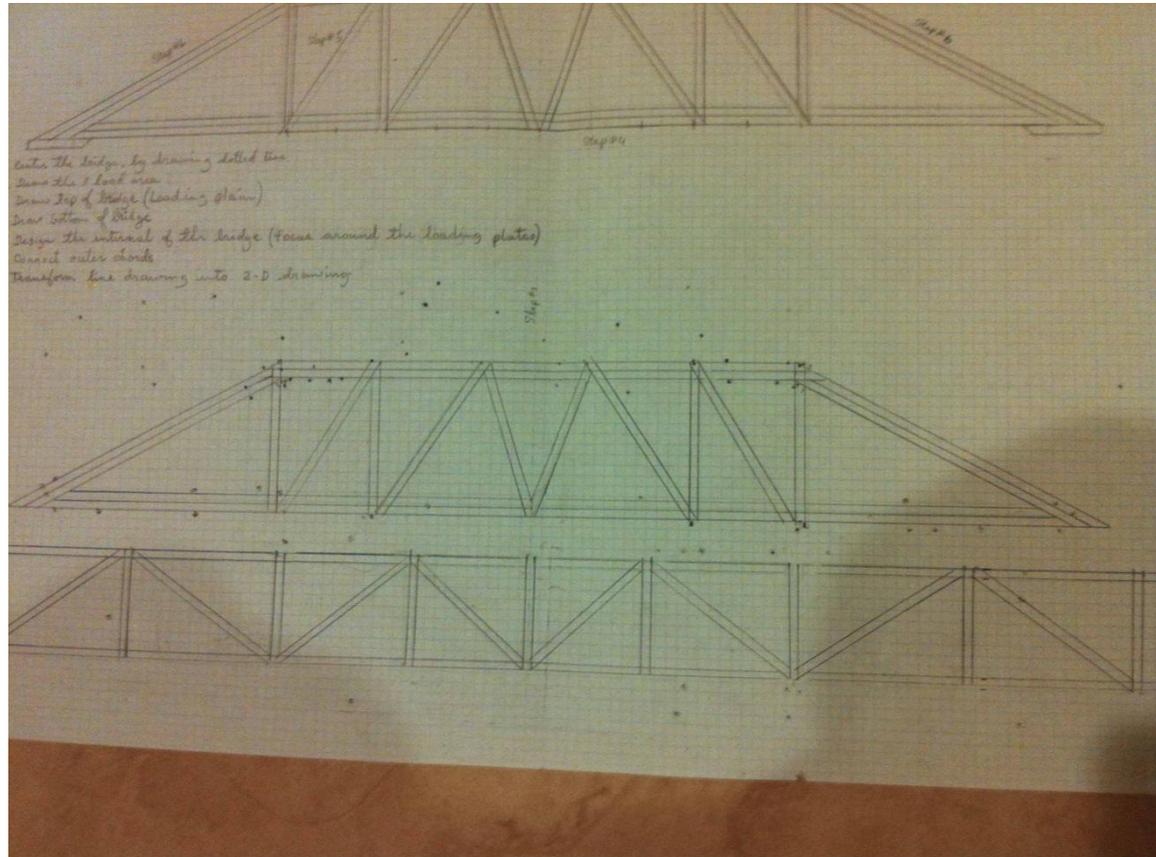
Make top design



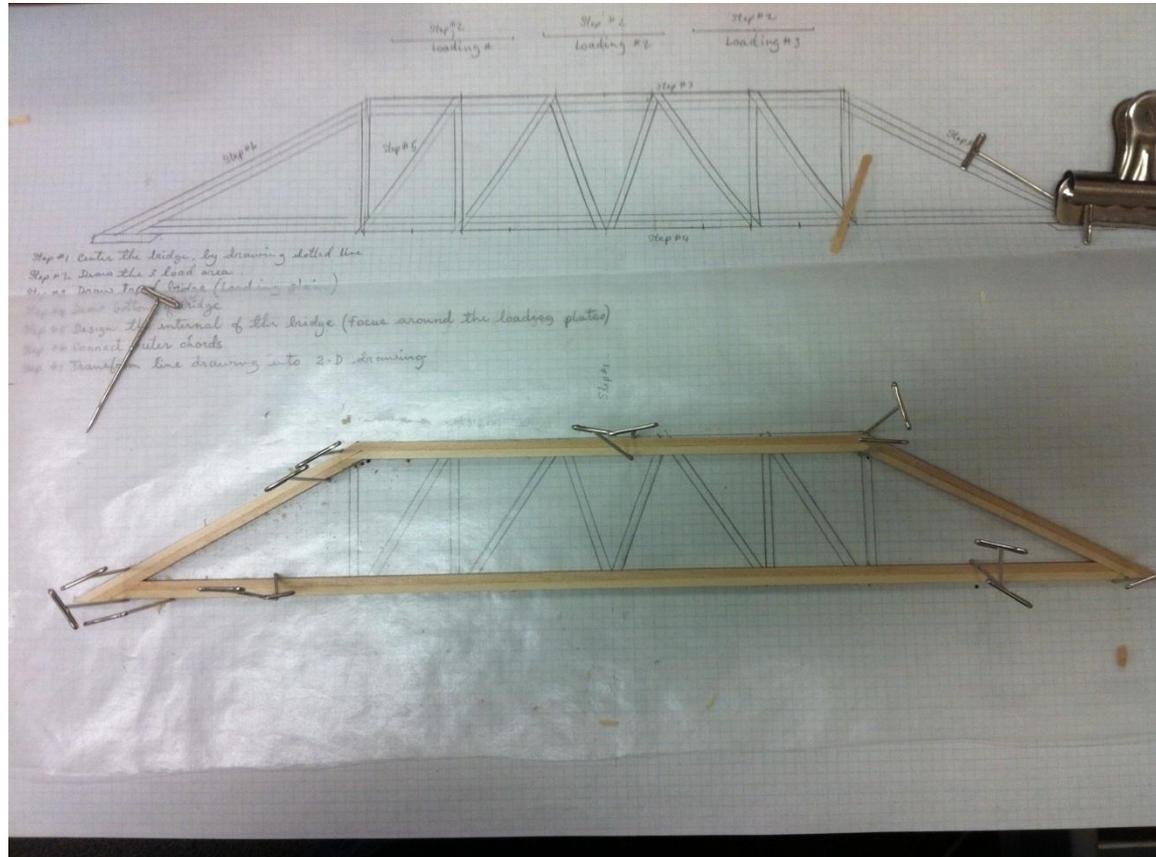
Make top design



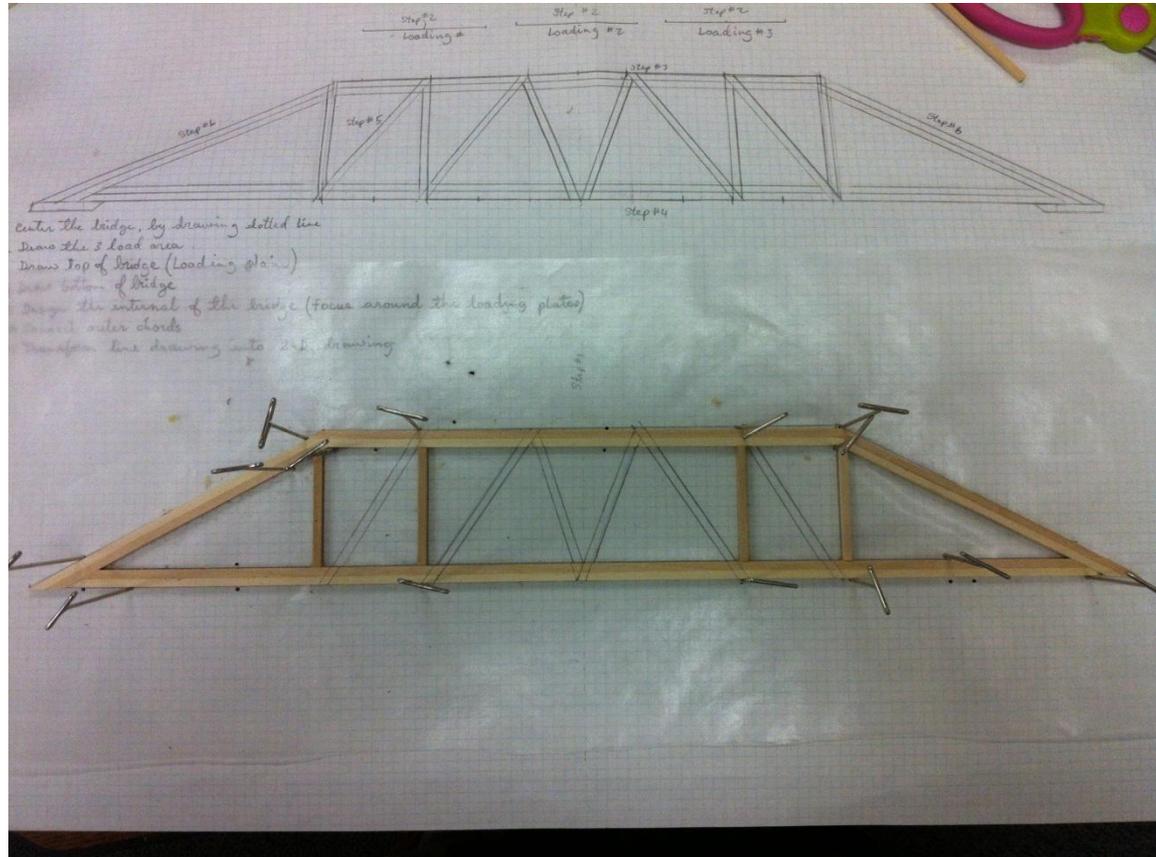
Make top design



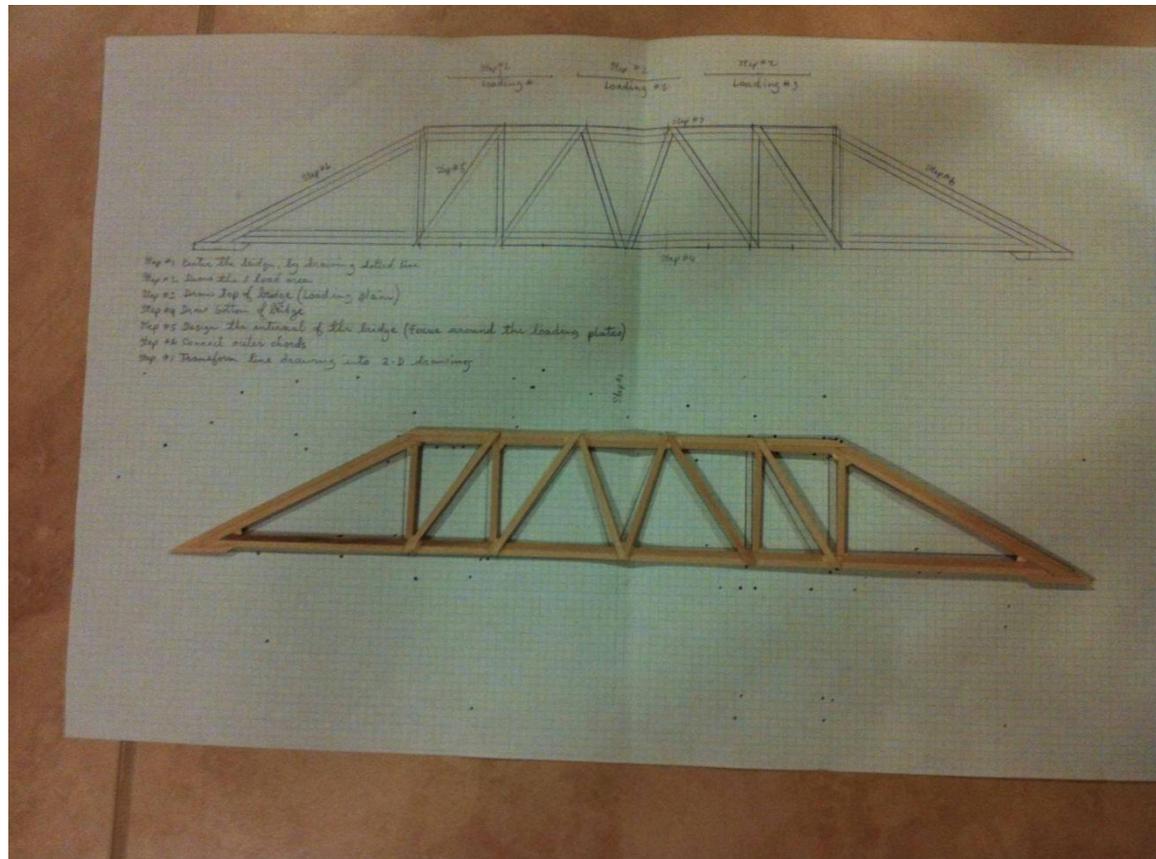
**Design the top of your bridge.  
Please note that the sides of the bridge will be longer because of the slope.**



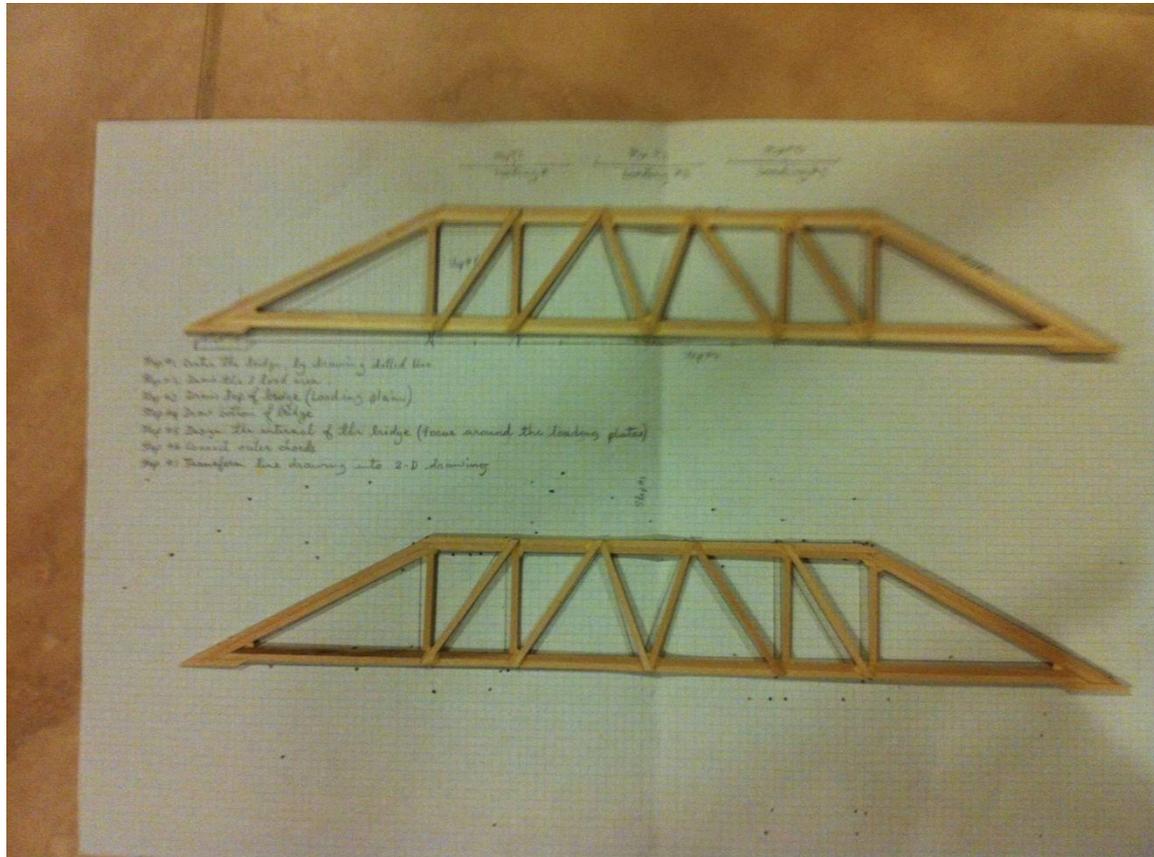
**Cut and glue the outer members of your bridge  
Make sure to put wax paper down first!**



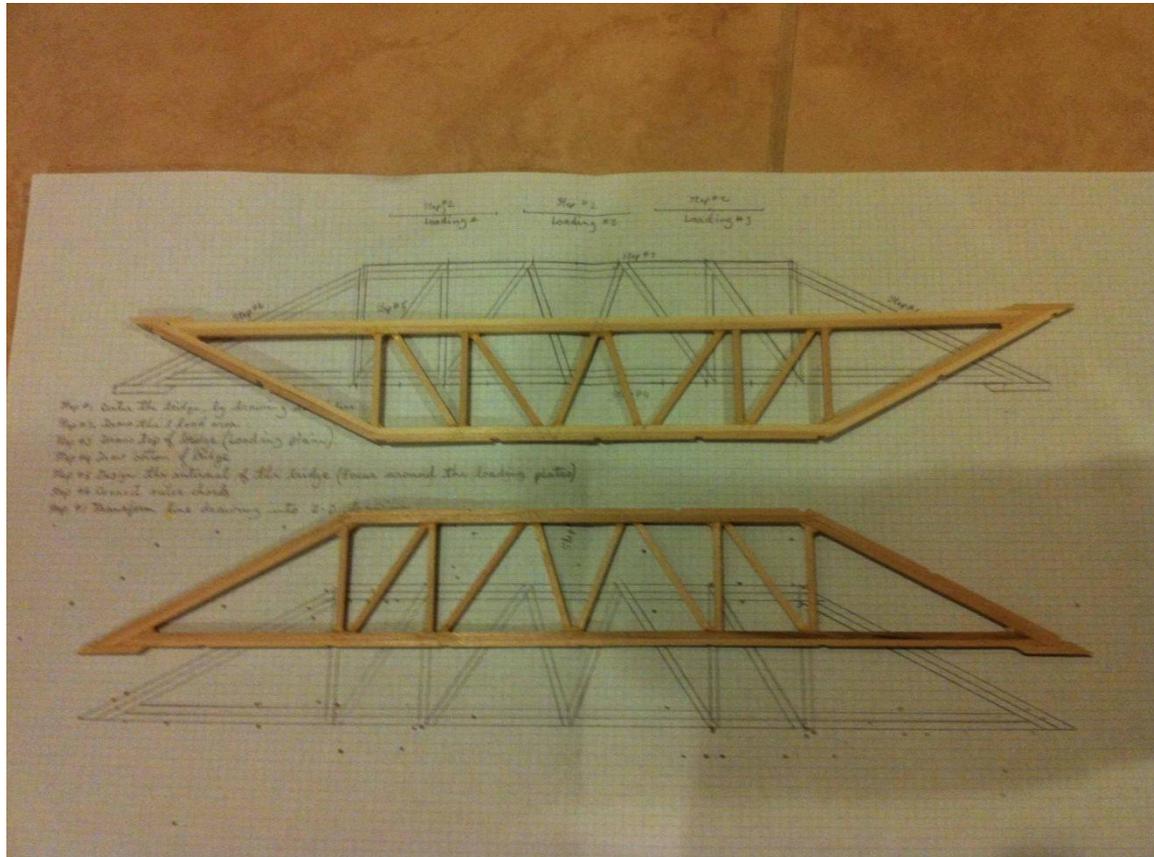
**Glue the vertical members**



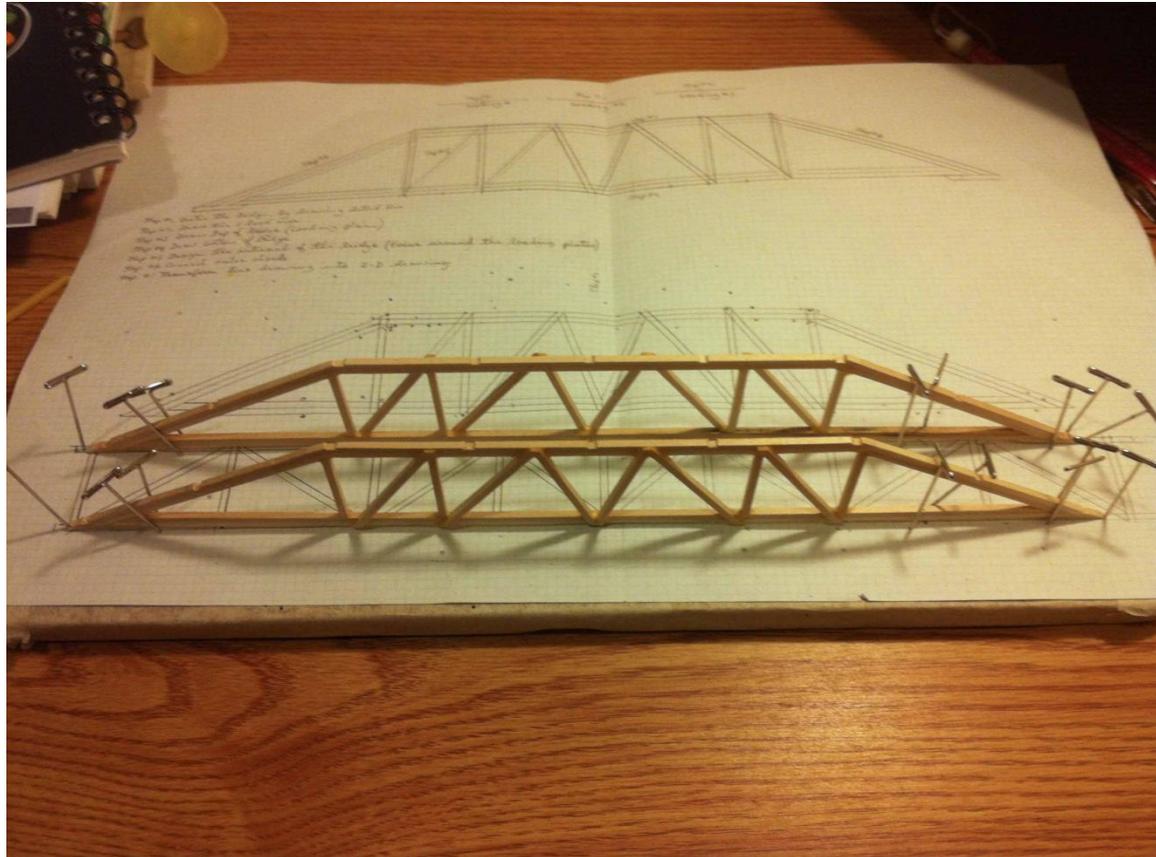
**Glue the diagonal members**



**Make another truss the same as the first**

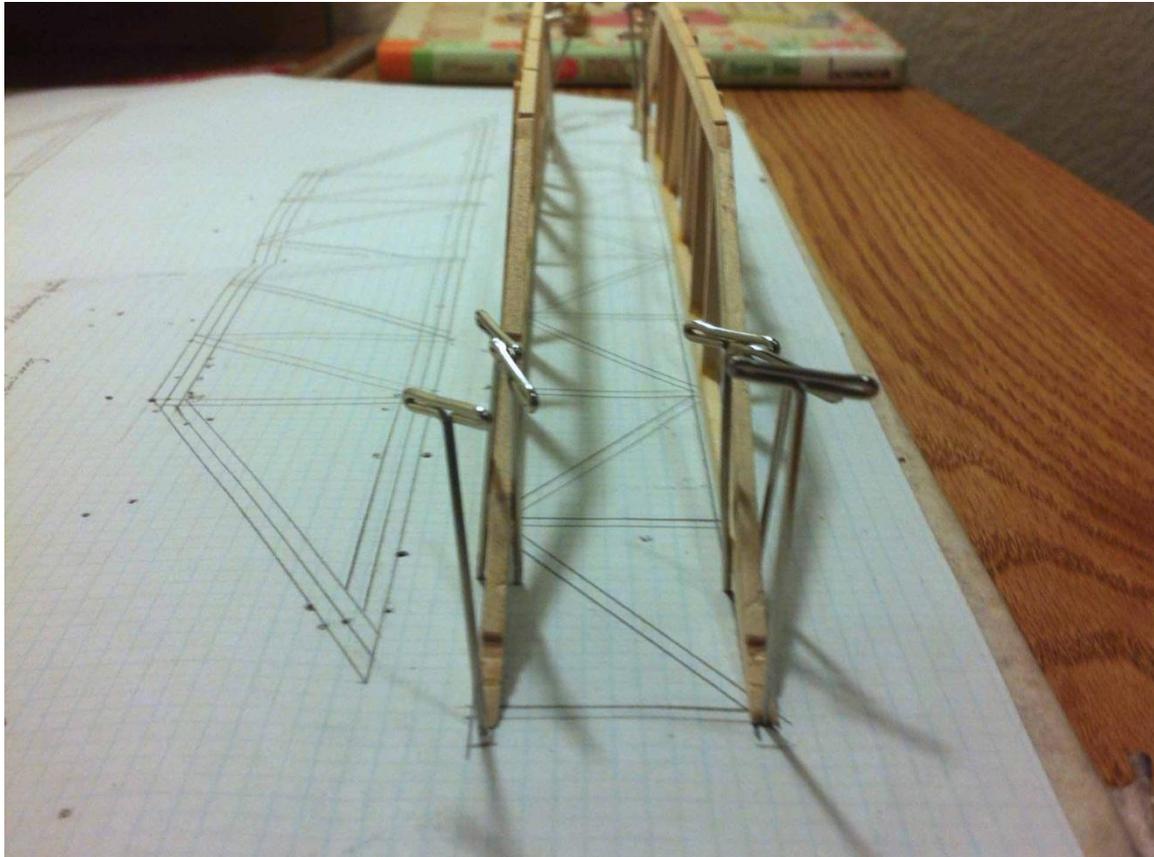


**Here are the trusses ready to build your bridge**

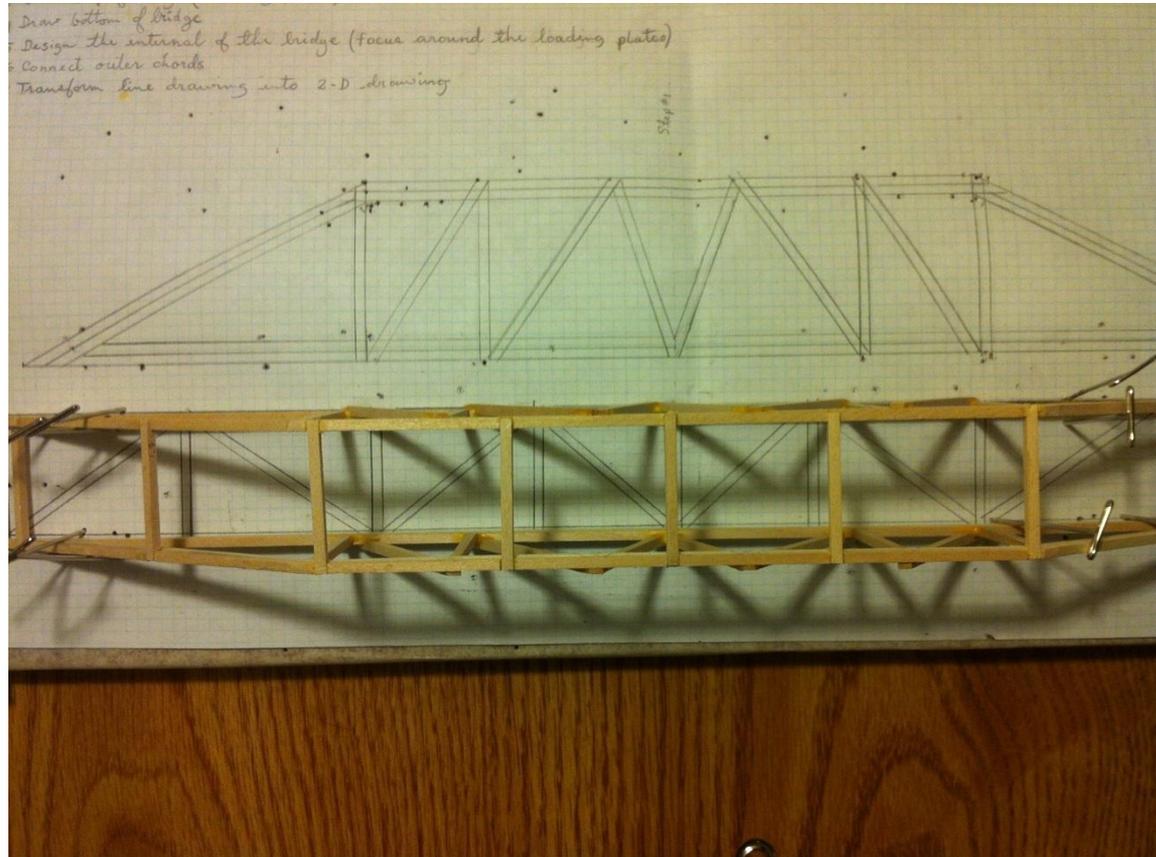


**Use the T-pins to set up the two trusses**

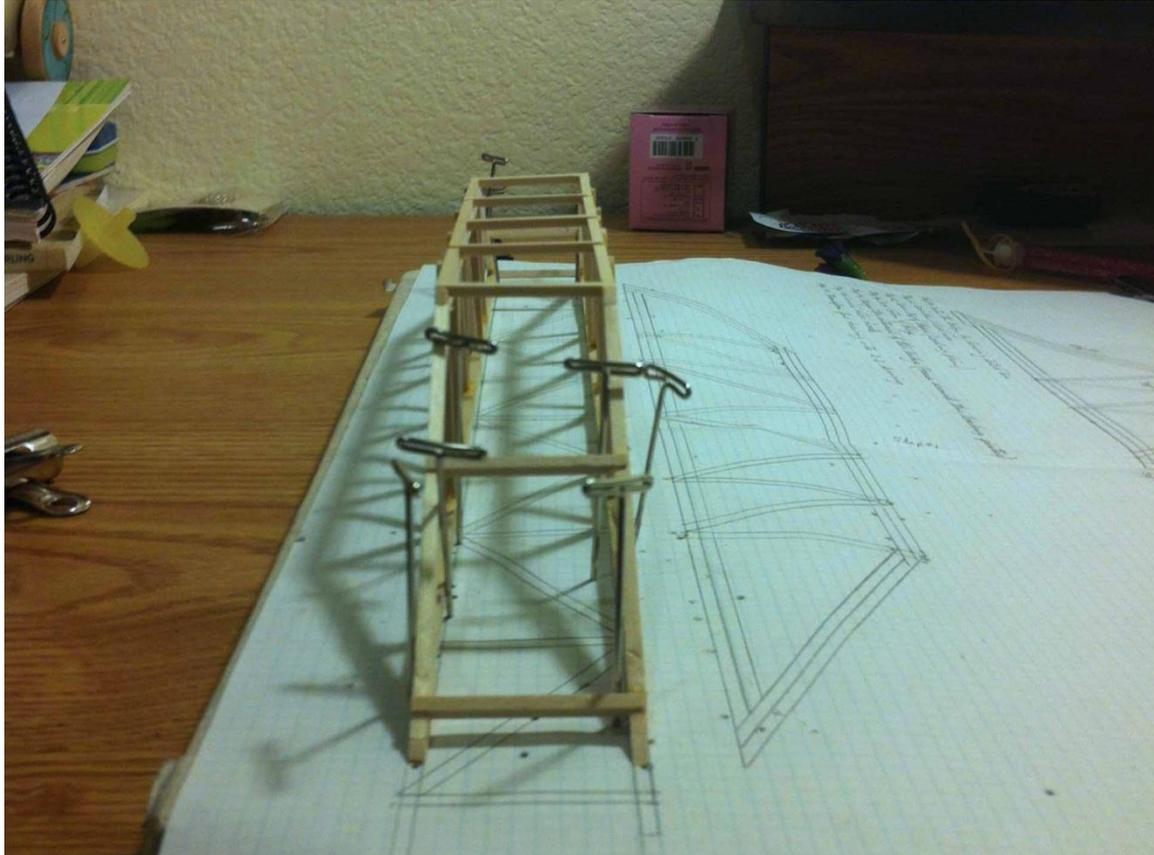




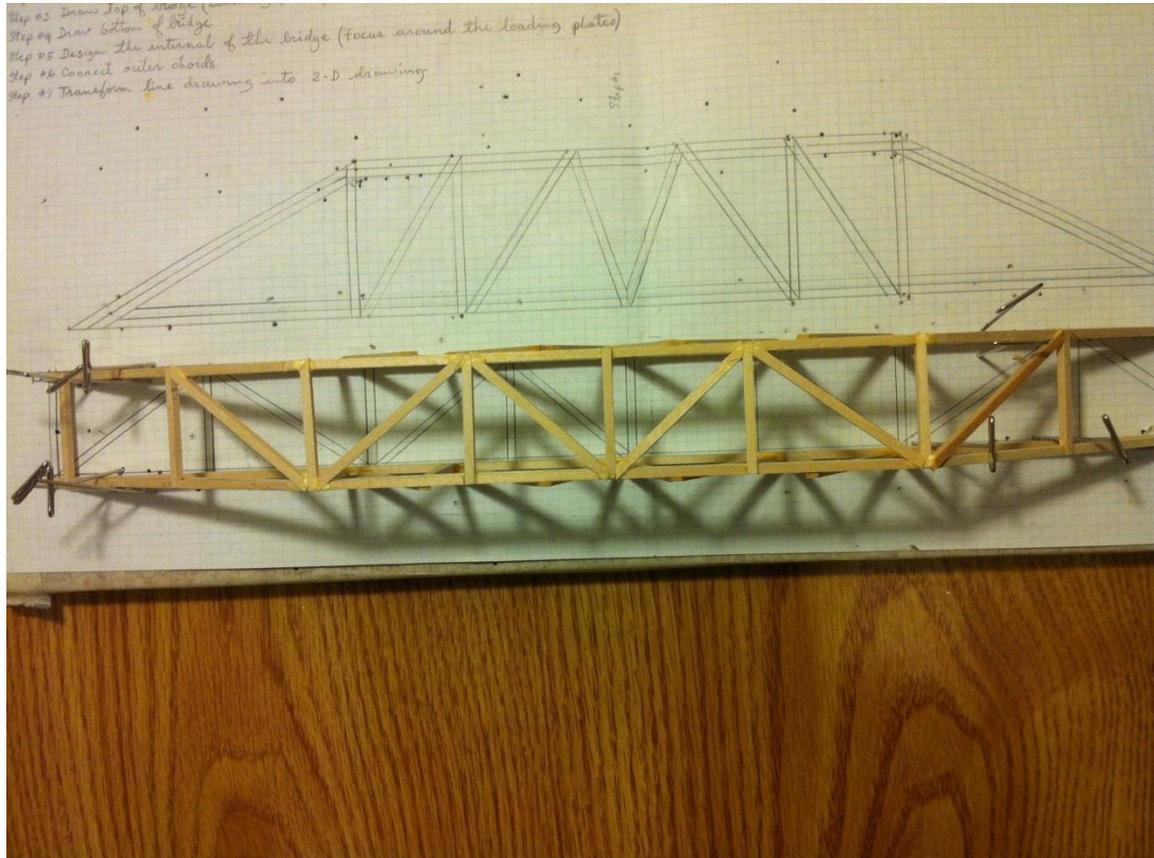
**Look down the two ends to make sure they are 90 degrees with the base**



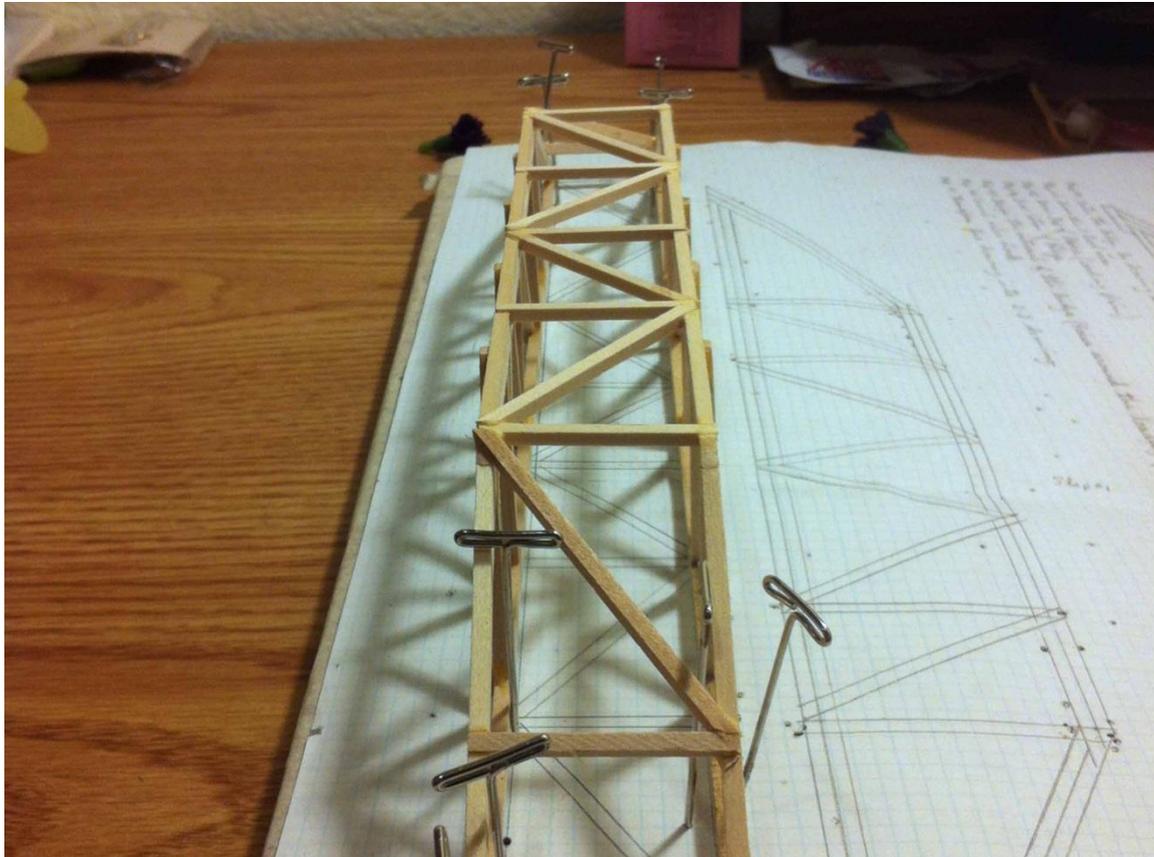
**Connect the trusses with cross members**



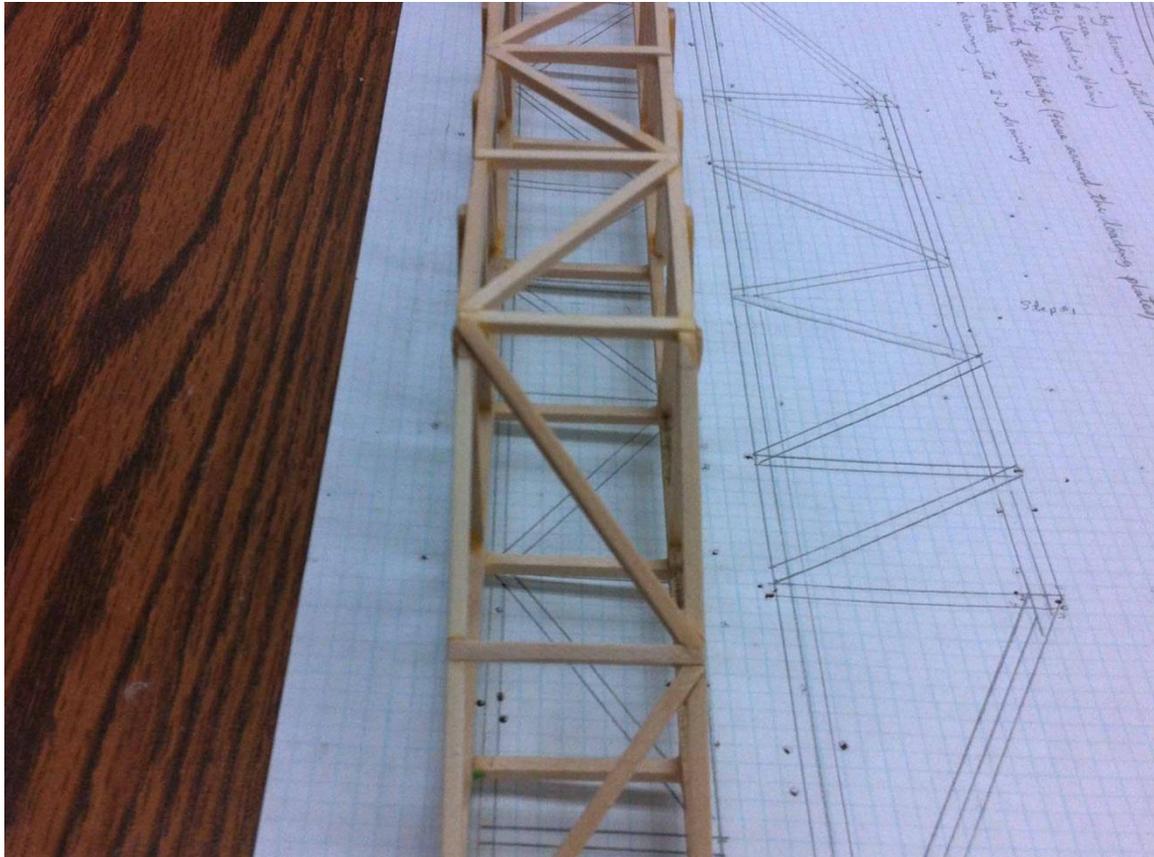
**Look down the two ends to make sure the bridge is still at 90 degrees with the base**



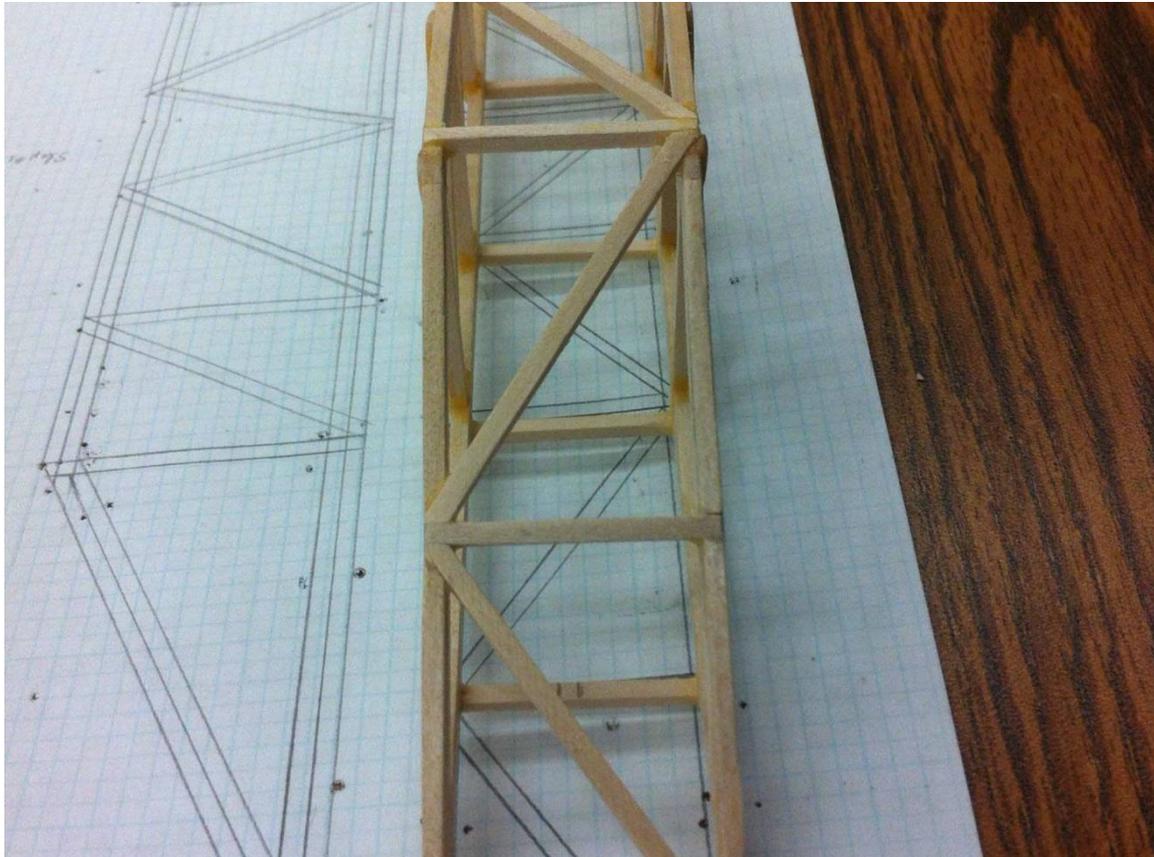
**Add the diagonal members**



**Check to make sure the bridge still looks 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 much 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 ideas
- Use Elmer's or wood glue (CA glue dries 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 2, 2013**