

# Project 1 - Design with Trigonometry



Here's a picture of a playset I built over the summer for my daughter. As you might be able to guess from the photo, the project involved plenty of measurement, along with a fair amount of trigonometry. Your Mod 4 project will involve designing some sort of structure and using trigonometry to solve for any unknown angles or sides. I don't expect it to be as complicated as this play structure, but it must have some angles that are not 90 degrees where you use trigonometric ratios to perform computations.

## Using Trigonometry for Architectural/Wood Working Design

Design a physical structure that you could build/create. The structure must have some non-right angles (it can also have many right angles!) in it. Make blueprint-style drawings showing all the dimensions including height, width, etc. Be sure to use a straightedge when making your drawings! Find the dimensions of all the pieces needed for the project and write up a budget and "cut list" that someone could use for the project.

Make sure to use trigonometry where needed to compute dimensions and/or cut lengths. For example, the height of an A-frame is not the same as the length of the

beams that make the A-frame, and the support braces must also be calculated. You must have a ***minimum*** of three different trig calculations using trig ratios.

Past projects have included a dog house, chairs, swing set, slide with ladder, and porch swing with A-frame.

Your project must include:

1. A write-up of the project, including drawings, calculations and a write-up of what you learned
2. A 3-5 minute presentation that you can give to your classmates

Your write-up must include:

- ☐ Introduction: give an introduction to your project including your reasons for choosing the structure that you chose.
- ☐ Drawings: create drawings of the structure indicating all dimensions. Drawings must be...
  - ☐ Neat and organized (use a straight-edge!)
  - ☐ From the three different perspectives (front, side and top). You may also include a drawing from a different angle if you like
  - ☐ Clearly labeled with all lengths and angles
- ☐ Calculations: Show all the calculations you used in your design, including the trigonometry calculations you did to find unknown sides and/or angles. Make sure your calculations are clear and neat. I recommend doing them on scratch paper first and then copying them into your notebook.
  - ☐ You must have at least two calculations where you used sine, cosine or tangent to find an unknown side or angle.
  - ☐ You must have at least one calculation where you used the Pythagorean Theorem to find an unknown length. Note: You can always calculate the diagonal of some rectangle in your design to meet this requirement, even if the diagonal is not integral to your design.
- ☐ Materials list and budget: write out a list of all the pieces of wood needed for the project. Then use the website of a store like Lowe's or Home Depot to find the cost of all the lumber. You do not need to include the cost of screws, bolts, tools, paint, etc.
- ☐ Scale model: Use popsicle sticks, cardboard, or whatever you have available to you and make a ***measured scale model***. I recommend 1:10 for metric or 1:12 for English. Be sure to properly measure the pieces used to make your model so that it is proportional to what the real thing would be. Include photographs of your scale model from different angles.

- ☐ Conclusion: Write at least one paragraph about what you learned from the project. What was interesting? What did you find challenging? How did the project change your understanding of/appreciation for wood working and architectural design?
- ☐ Optional: Actually construct the thing you designed and see how well your design worked and how accurate your budget was! (This has been done a couple of times)
- ☐ If you did a slideshow for your presentation, put a link to the slideshow in the report!

Your 3-5 minute presentation must include:

- ☐ Introduction/overview of the project
- ☐ Photographs of the drawings and scale model (show us the scale model as well!)
- ☐ A quick explanation of how you used trigonometry, and what other measurement tools/techniques were involved (you do NOT need to take us through all the calculations that you did)
- ☐ A quick summary of what you learned doing the project

## Sample Projects

D&D Tower:

<https://docs.google.com/document/d/1L1BEX--9mZr1L9pJP3GKzKb83S4GSPsVYbNpSnub2hg/edit?usp=sharing>

Patchwork skirt:

[https://docs.google.com/presentation/d/1iUERnjNpnUCJHiurnaPS\\_gdVldLWg4aJ7KIZluUB7m0/edit?usp=sharing](https://docs.google.com/presentation/d/1iUERnjNpnUCJHiurnaPS_gdVldLWg4aJ7KIZluUB7m0/edit?usp=sharing)