**Triangle Inequality using Bars**

Current Catalog:

<https://docs.google.com/document/d/1pR9XsK7w2vJvvyxE6jmktTteqbgHztIPwsPPww_DtVc/edit>

More Ideas:

Flipbook to illustrate [Voronoi Diagrams](https://drive.google.com/drive/folders/1laKmd4K6Rms68mvsf3qMID5LtqjZ-XFS) (Research on Wikipedia)

Sum of triangular numbers (forms a pyramid)

Doing something involving e, pi, or spinning around **imaginary numbers (two sticks of overlapping cardboard)**

Create a set of those Caroll Lewis Optical illusion squares (hand-held with frame)

Explore other visualizations of the Fibonacci numbers

**You can create as many CAD files as you would like - and then include them on applications (such as for discrete mathematics)**

Helpful Links

[MathMoments - AMS](https://www.ams.org/publicoutreach/mathmoments/mathmoments)

[Math in Media - AMS](https://mathvoices.ams.org/mathmedia/)

[Math Problems - AMS](https://www.maa.org/math-competitions/teachers/curriculum-inspirations)

Make sure to look over existing models (and think about them the best you can) before commiting to designing a model.

MathHappens = Nonprofit organization that aims at creating public presentations of mathematics outside school.

Mathematical Models that are physical expressions of mathematical ideas

Constraints

Strengths

* Cheap (made out of household items) → Accessible
* Can be picked up (as opposed to virtual)
* Can be played around with (and not only static)

A real experience with mathematics

Engrave Relevant Formulas on the Wood

| **Idea** | **Model** | **Description** | **Similar Projects** |
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| Recursion | Towers of Hanoi | Rectangular base (maybe rules inscribed on wood)  1 inch thick at bottom  This would be the three disc problem  Place [rectangular](https://www.orientaltrading.com/self-adhesive-magnets-72-pc--a2-48_2573.fltr?sku=48%2F2573&BP=PS544&ms=search&source=google&cm_mmc=GooglePLA-_-17376747105-_-136513381919-_-48%2F2573&cm_mmca1=OTC%2BPLAs&cm_mmca2=GooglePLAs&gclid=CjwKCAjwqauVBhBGEiwAXOepkUKBHswNB1hQqXQbHH-zsFcZ6Ib4jBTOnpH9nze37YLUti908PPR3RoCa-UQAvD_BwE) or circular magnets to prevent incorrect discs from being place atop another |  |
| Revolutions | Whirligig | I am not sure of the mathematics of a whirligig |  |
| Cyclic Quadrilaterals |  |  |  |
| Oddly shaped wheels | Mathematics behind oddly shaped wheels |  | * Car made out of wood |
| Bubble-Catcher Circle | Circle that can catch bubbles | A piece of circular wood and bubbles provided - explanation of why bubbles are always spherical (are they) and description of surface area to Volume |  |
| Mathematics in Art | Images | Find mathematics in famous painting - Pythagorean theorem, Golden Ratio | * Similar activities with Nature: Add Link |
| Missing Square | 5 x 5 / 8 x 8 square | Learn about the missing squares problem and its link to the Fibonacci equation  (Fn)2 = (Fn-1)(Fn+1) + (-1)n + 1 where n>=2  Question: I wonder what the limit of the area of the missing parallelogram is (why is it a parallelogram)? | Charles Dodson:  <https://www.youtube.com/watch?v=FnHtFhgzbNo> |
| Alternate Pythagorean Theorem (show how 2d generalizes to 3d by folding flat) | Triangle + Hexagons on sides | Learn Pythagorean theorem and how to calculate the area of regular hexagon  Question: I wonder if the area of a regular hexagon is proportional to its side length squared | 10minutemath: <http://www.10minutemath.com/2019/01/pythagorean-pancakes.html#more> |
| Adjustable Monochord | Mathematics of music | Wooden slab with string or knotted rubber band and different slots to place the end of the chord | <https://www.youtube.com/watch?v=c1aCNMIZ5lM> |
| Birthday Paradox | Probability | Wooden sheet with engraved calendar, and on the top a slider with marking of percentage of an collision alongside number of people - how does the problem change when we are looking for a range (within 1-2 days of birthday) |  |
| Rotation of Reuleaux Triangle within a square |  |  | Already done by Lauren Siegel in her car |
| Wristband Shape |  |  |  |

<http://www.10minutemath.com/2009/08/subway-factorials.html>

<https://www.vanderbilt.edu/career/career-exploration/recommended-online-resources/>

<https://whatcanidowiththismajor.com/major/mathematics/>

| Tessellations |  |
| --- | --- |
| Tensegrity table |  |
| Greeks saw numbers in terms of geometry (weren’t super abstract things that modern set theory makes them out to be) | Circumscription - Putting Polygons around a circle to approximate pi  Putting polyogns around other polygons (the problem I wanted to research since I was first in high school) |
| Create quadrant of Unit Circle that can move and has slots for 30-60 and 45-45-90 Triangle | Already done: <https://www.mathhappens.org/take-and-make-mini-unit-circle/> |
| Prime numbers coloring sheet - Sieve of Aristophanes | Piece of paper with normal set up, except all the numbers are made up of primes (choose a color for each prime) |
| Calculus - Approximating area using slices | Take wooden slices of an object |
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