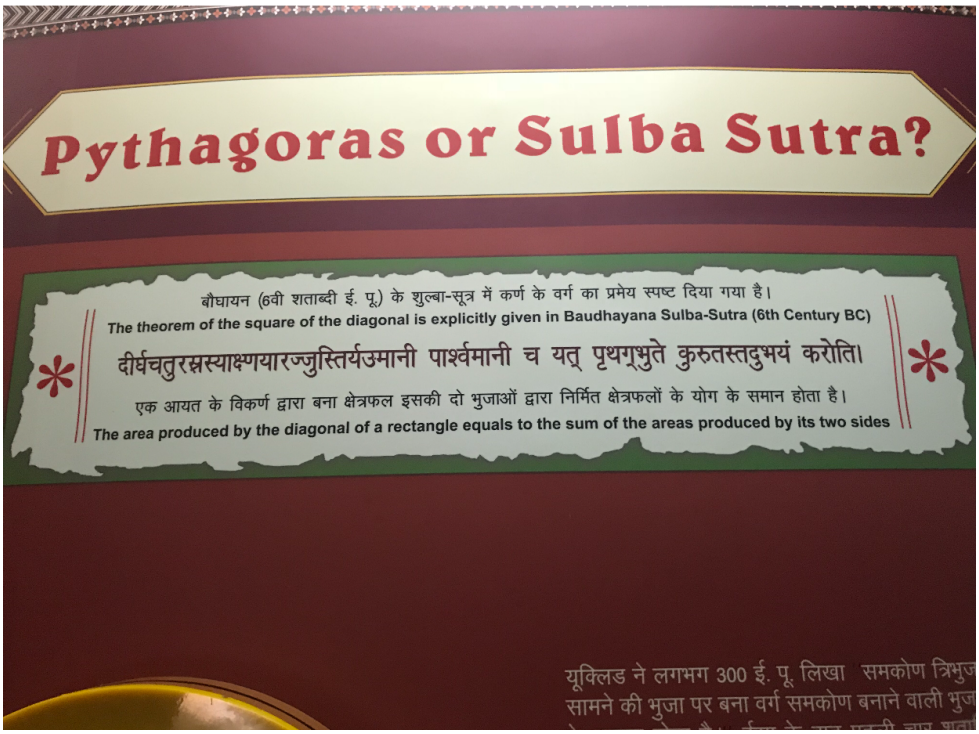
MATH299M/CMSC389W
Spring 2019 – Ajeet Gary, Devan Tamot, Vlad Dobrin
Model H6: Visual Proof of the Baudhayana Theorem
Assigned: Monday March 4th, 2019
Due: Monday March 18th, 2019 11:59PM

Right now, we're learning how to use Graphics, giving you a powerful tool in making presentations and in general, like this class's title implied you should learn, visualization. I'm sure you're all familiar with the *Pythagorean Theorem*, that for a right triangle with hypotenuse c and legs a and b,

$$a^2 + b^2 = c^2$$

A formula so ubiquitous it's in Word's function drop down menu (yes, I type these in Word, I'll learn LaTeX eventually leave me alone). However, have you ever seen *why* it works? We learn this formula early on in grade school, but they neglect to show us a proof of it, and then even if you take upper level math classes you probably won't see a proof unless you take a geometry course specifically (I highly recommend MATH430 – Euclidian and Non-Euclidian Geometries).



Nehru Museum of Science, Mumbai, India

Hold on a second though – that's not the name of this assignment, our task is to prove the *Baudhayana Theorem*. And what is "Sulba Sutra"? Punchline: The Baudhayana Theorem *is* the Pythagorean Theorem, or rather I should say the Pythagorean Theorem is the Baudhayana Theorem since Baudhayana came first – you see, the Baudhayana Sutras are a group of Vedic Sanskrit texts on dharma, daily rituals, and mathematics, amongst other things, and in them states:

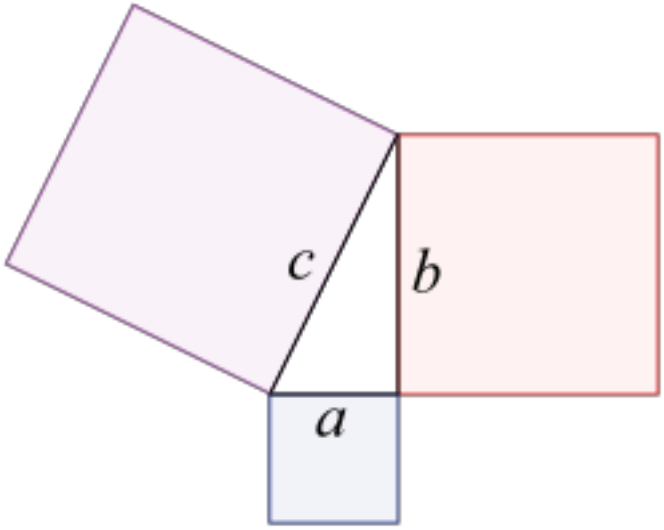
दीर्घचतुरश्रस्याक्ष्णया रज्जु: पार्श्वमानी तिर्यग् मानी च यत् पृथग् भूते कुरुतस्तदुभयं करोति ॥

Which translates to:

"A rope stretched along the length of the diagonal produces an area which the vertical and horizontal sides make together."

what we call today "The Pythagorean Theorem" thanks to the all-too-common practice of Europeans giving themselves credit for things in the literature.

And, now that you've been reverse-propagandized, that's it. I want you to make a visualization of the proof of the Baudhayana Theorem. You can use any proof you want, or a qualitative special-reasoning kind of visualization pseudo-proof. End product: I want something that will convince me that $a^2 + b^2 = c^2$ for a right triangle, something that establishes the intuition about why this theorem works. Two things to remind you of that might be helpful in deciding how to visualize this:



This is Wikipedia's cover image for the "Pythagorean" Theorem – it shows a geometric interpretation of what squaring the side lengths means, but visually it’s not obvious that the sum of the a and b squares is that of the c square.

The Wolfram MathWorld page on the Pythagorean Theorem might be helpful:
http://mathworld.wolfram.com/PythagoreanTheorem.html
And the Wikipedia page:
https://en.wikipedia.org/wiki/Pythagorean_theorem