Worksheet on Pythagorean Theorem 1

Dr. Sarah's MAT 3610: Introduction to Geometry

goals:

- IGS Exploration
  I can use Interactive Geometry Software (IGS) to discover relationships and demonstrate they seem to apply in a wide variety of examples.
- Geometric Perspectives
  I can compare and contrast multiple geometric perspectives.

Welcoming Environment: Keep it a safe place to express meaningful ideas and opinions. Actively listen to others and encourage everyone to participate. Part of the welcoming environment is to keep an open mind as you engage in our class activities, explore consensus and employ collective thinking across barriers. Maintain a professional tone, show respect and courtesy, and make your contributions matter.

1. **Building Community**: What are the preferred first names of those sitting near you? If you weren't able to be there write N/A or give reference to anyone you had help from.

Visualizations of Euclid's *Elements* Proof of the Pythagorean Theorem

2. Explore `https://www.geogebra.org/m/fYDFzQ5N` by dragging the slider k. If the big square opposite C has side c, the square opposite A has side a and the square opposite B has side b, then what does this visualization seem to show about $a^2 + b^2$ versus c^2?

3. Roughly sketch the right triangle, the squares, and the lines through the squares.

4. Explore `https://www.geogebra.org/m/cSvQ3svX` as follows:
   - First go to the slider point on the b^2 square and drag it. Notice that is a shear.
   - Then slide the new point that arose on the other side of the b^2 square and slide it along the dotted line (another shear).
   - Then slide the next new point in the opposite corner of the b^2 rectangle into the c^2 square (a rotation).
   - Repeat with the a^2 square.

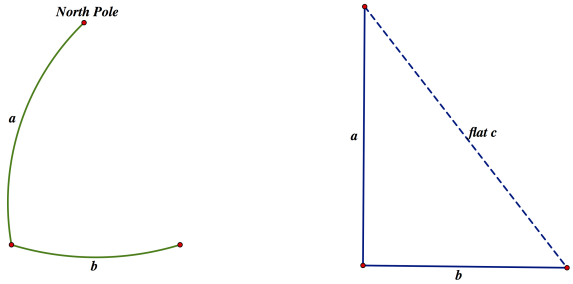
     Do these transformations preserve the areas of the b^2 square and a^2 square?

周髀算經 or *Zhoubi Suanjing* Puzzle Visualization of the Pythagorean Theorem

5. Try to fit the puzzle pieces into a square. Sketch the completed puzzle. Then, on your sketch below, label the hypotenuse as c, the longest base as a and the short base as b.

Pythagorean Exploration on the Sphere

6. As in the Euclidean and Spherical Perspectives video, start from a North Pole, go down to an approximate equator and then over some. Measure out a and b using the string. Then create a flat right triangle on the table with the string, with sides a and b pulled tightly (you might need some extra hands). Be sure that the angle is a right angle and then measure out the hypotenuse c_{flat}. Finally, put just the c_{flat} string back from the equator and head toward the North pole. Does the string go past the North pole?



7. What does this tell us about the spherical hypotenuse compared to the flat hypotenuse?

8. What does this tell us about the Pythagorean theorem on the sphere?

Burden of Proof Activity

9. If we have time to work on the Burden of Proof Activity, then what was your role?

10. **Help each other and PDF responses to ASULearn**: If you are finished with the worksheet before I bring us back together, first ensure that your entire group is finished too, and if not, help each other. If your entire group is finished, then split up and pull up chairs so that you can discuss your responses with other groups. Collate your handwritten responses, preferably on this handout, into one full size multipage PDF for submission in the ASULearn assignment. I recommend you turn it in sometime today, but you have until the next class.