Worksheet on Congruence and Similarity 1

Dr. Sarah's MAT 3610: Introduction to Geometry

Goals:

- IGS Exploration
  I can use Interactive Geometry Software (IGS) to discover relationships and demonstrate that they seem to apply in a wide variety of examples.
- Proof Considerations
  I can write rigorous proofs in geometry, identify underlying assumptions, and understand limitations and applications.
- Geometric Perspectives
  I can compare and contrast multiple geometric perspectives.

Welcoming Environment: Actively listen to others and encourage everyone to participate and try to help each other! 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.

Discuss and ask me questions during group work time as well as when I bring us back together:

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.

Euclidean SSA

2. In the video, you explored SSA via `https://www.geogebra.org/m/kwm26arv`. Discuss and then sketch and label measurements for two different triangles with the same SSA that are not congruent.

3. With the measurements listed there, use the law of cosines $c^2 = a^2 + b^2 - 2ab\cos C$ to obtain a quadratic equation and then solve for the third side of the triangle with help from the quadratic formula. Show work.

4. Write an analytic geometry proof in paragraph form that two triangles satisfying SSA do not necessarily have to be congruent. Start your proof with these 2 triangles and their measurements as given and mention that these triangles are valid as the law of cosines provides valid Euclidean triangles. Then continue by addressing SSA assumptions and how the conclusion of SSA does not hold with this counterexampe.

5. Trade with someone so that you can give each other constructive suggestions as well as positive comments. Think of yourself as the robot and consider what would help their proof. Discuss. After these trades and discussions, is there anything you would change in your proof? If so, what?

6. What theorem is used to prove the law of cosines in the proof section of
   `https://artofproblemsolving.com/wiki/index.php/Law_of_Cosines`

Transformations of an acute angle

7. Open
   `https://www.geogebra.org/geometry/dpu4xqhw`
   and roughly sketch the acute angle (get it?) to the right here and label point A.

8. Next, use the following Transform Tools to get used to these as you explore the effects of transformations **on the entire image**
   (a) Translate by Vector
   (b) Rotate around Point
   (c) Reflect about Line
   (d) Dilate from Point
   Help each other as you work on these together: a) Roughly sketch the output of each of these (given the input above—you can undo using the curvy arrow or reload the page to get back to that configuration), include the original point A to provide a sense of the movement, b) specify the name of the transformation, and c) write congruence or similarity as applicable, plus what dilation factor you used.

Shearing a Euclidean rectangle

9. Go to
   `https://www.geogebra.org/m/uct4xgv5`
   and slide b in order to see the effect of a horizontal shear. Is similarity preserved?

10. If not, are there any other geometric measurements that are preserved?

11. **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. Then submit this, continue reviewing and solidifying or discuss upcoming class work. 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.