

Worksheet on Axiomatic Systems and Constructions 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.

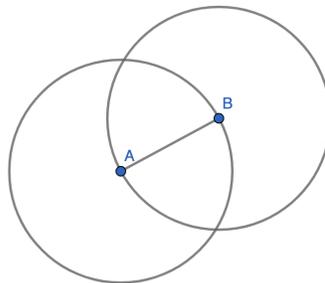
Welcoming Environment: Actively listen to others and encourage everyone to participate and try to help each other! Keep an open mind as you engage in our class activities, explore consensus and employ collective thinking across barriers. Maintain a professional tone, show respect and courtesy, and make 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.

Equilateral Triangle I-1

2. Open GeoGebra Geometry, an Interactive Geometry Software (IGS), and take out the handout of Book 1 of *Euclid's Elements*. Start with a segment. Construct an equilateral triangle with only straightedge, compass, and intersection point features. Then, using the measure tools, measure the interior angles and side lengths. Finally, using Move, drag the vertices to demonstrate that the construction seems to apply in a wide variety of examples.



Beginnings of I-1. Add to this after #4 below.

Discuss with your group how the IGS and this exploration are going for you and help each other, if needed. Write down one related item or an update.

3. What was the key point in the proof of I-1—in terms of why the triangle we constructed was actually equilateral?

Bisect a Segment: I-10

4. Begin a new document with a segment \overline{AB} . Using only straightedge, compass, and intersection point features, construct the midpoint: use both intersection points from the I-1 construction—NOT the midpoint feature in GeoGebra—and add to the sketch above to show the construction.

5. Measure the distances between A and the midpoint and between B and the midpoint. Then, using Move, drag the vertices to demonstrate the construction seems to apply in a wide variety of examples. Next, view the script/commands of your construction—in GeoGebra this is the calculator symbol—and write something you found interesting from the commands.

6. Use I-1 and I-9 among other reasoning from Euclid's Book I in order to write a rigorous proof in paragraph form which identifies underlying assumptions and justifies I-10. You may refer to Euclid's definitions, postulates, common notions up through I-9. Start with \overline{AB} as given and work from there as follows:
Proof: Look at \overline{AB} . We will show we can bisect the segment by constructing a midpoint. First use I-1...

7. 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 own proof? If so, what?

8. Contrast benefits of the IGS with benefits of the proof. Discuss various perspectives with your group and write down one item you found interesting.

9. **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.