Worksheet on Learning Goals

Dr. Sarah's MAT 3610: Introduction to Geometry

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.

2. Our catalog requires concept development and connections among multiple perspectives, so we will examine the foundations of geometry through the lenses of historical perspectives, intuition, reasoning and proofs, manipulatives, visualization, Interactive Geometry Software, and modern applications. To make additional explicit connections we will use a standards-based model based on associated course learning goals (standards) and we'll make connections to these today and in future course activities. One of the four goals is ***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**. Discuss how all the words in this learning goal arose in the video and in what context by using the following guiding questions:
   - discover relationships—how IGS helped us discover relationships—what did we discover in the video?
   - why is "seem" needed in the learning goal?
   - wide variety of examples—what are the benefits of dynamic dragging in IGS (versus still picture or no visualization)?

   Then summarize a significant takeaway.

3. If you have a laptop, tablet or phone with you, open the GeoGebra Geometry App or GeoGebra Geometry `https://www.geogebra.org/geometry`.
   If not, have someone in your group open it. If none of you have a laptop, tablet, or phone with you, let me know. Next, construct a triangle in GeoGebra using the *Segment* tool. Then, under More and Construct, construct the midpoints (*Midpoint or Center* tool) of each of the sides in GeoGebra. Then connect the midpoints by the *Segment* tool. Consider what seems to happen when we drag the triangle around. Sketch an example here.

4. Recall from the video that the axioms of incidence geometry are
   - Axiom 1) For each two distinct points there exists a unique line on both of them.
   - Axiom 2) For every line there exists at least two distinct points on it.
   - Axiom 3) There exist at least three distinct points.
   - Axiom 4) Not all points lie on the same line.

   To prove that "if l and m are two distinct lines that meet, then they meet at a unique point," consider that we'll start all future proofs by assuming the givens, and in this case we can see that this is:

   Assume the givens: Assume that l and m are two distinct lines that meet.

   For this proof, we'll continue via proof by contradiction of the "then" part. Consider the contradiction of "they meet at a unique point" when we already know that they meet from the givens—how many points must they at least meet at?

   Write the contradiction in this context: Assume for contradiction that...

   Next, discuss which axiom would fail. Then write the short proof in paragraph form from start to finish, assuming the givens, writing the contradiction in this context, and finishing off the short proof:

   Write the paragraph proof from start to finish:

5. Another learning goal is ***Geometric Perspectives*: I can compare and contrast multiple geometric perspectives**. Consider how the following geometric perspectives arose in the video

   - comparing and contrasting axiomatic systems
   - comparing and contrasting models
   - comparing and contrasting parallels
   - comparing and contrasting informal intuition (like paper folding and IGS) and rigorous proof

   and discuss any questions you have on this. Then compare and contrast incidence geometry and Euclidean geometry using the language of the video.

6. Discuss proof considerations as you review your video notes, and then, using bullet points, briefly list all the contexts where connections to this learning goal arose: ***Proof Considerations*: I can write rigorous proofs in geometry, identify underlying assumptions, and understand limitations and applications**.

7. Discuss significant takeaways and any remaining questions from the axiomatic and constructions 1 interactive video including: 1) peanut butter and jelly robot, 2) Minesweeper, 3) incidence geometry, 4) Euclid's *Elements*, and 5) quadrilateral midpoints. Try to help each other solidify! Then select one to summarize a significant takeaway in writing here.

8. Our fourth course learning goal is ***Educational Connections*: I can make connections between learning geometry in this class and learning and teaching geometry, especially in high school**. Did high school arise in your group discussions last class?

   Circle one: yes no

9. Revisit #3. Using only each other (no web!), discuss how to approach proving something about it.

   Circle one: discussed and proven discussed but not proven didn't have time to discuss

10. **PDF responses to ASULearn**: 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 before the next class. I provide personalized feedback as I grade these for a good faith effort. Mobile apps like Adobe Scan or CamScanner can work well. You can also use many printers or photo copiers to scan to PDFs—the school library lists that as an option and they can help: `https://library.appstate.edu/services-search/print-zone-tech-help`