Using GeoGebra to Create Interactive and Dynamic Displays
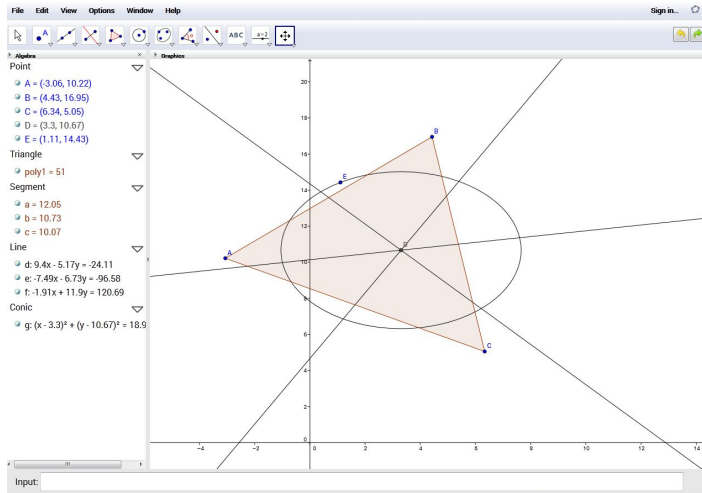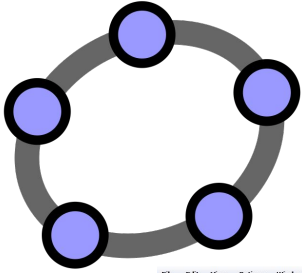
Yehchan Yoo (DDM)

Introducing Myself!

- Currently a UC Berkeley undergraduate majoring in Statistics and Political Economy (& minoring in Data Science)
- Began as a research apprentice through URAP during Spring 2023; currently a part-time research assistant
- Part of the DDM team

GeoGebra

An interactive geometry, algebra, statistics, and calculus program designed to help students study and teach math and science!

- Developed by Markus Hohenwarter at the University of Salzburg during his time in graduate school
- Still being developed today with leadership at the University of Linz

How I Got Into GeoGebra!

- Competed in math competitions (including UC Berkeley's very own Berkeley Math Tournament!) during middle school and high school years
- Struggled a lot with geometry theories
- Wanted an interactive approach to learning about geometry – not just for myself, but for teaching younger students
- Became very popular on GeoGebra website for developing and sharing interactive proofs
  - Garnered over 15,000 views overall

Demo

Development Process

- Not the most difficult, but still remains pretty challenging!
    - Has to deal with a complexity of geometric objects and variables
    - Information about the objects and the variables scattered throughout (instead of being programmed in a few text files)
    - Has its own scripting language (GeoGebra script – can also use Javascript)
- Still the best tool around for mathematical demonstrations!
    - Has math, statistics, geometry, calculus tools for doing various kinds of analysis
    - Especially great for freeform geometry demonstrations
    - Does not require complicated code to make
- Once complete, can be shared easily!
    - Can share file
    - Can upload on the GeoGebra website
   - Can be embedded into a website like a YouTube video

How the User Can Interact

- Slider
    - Can be used for precise human control of a variable
    - Can be used to facilitate an animation
    - **Very useful for facilitating interactive proofs in GeoGebra!**
- Button
    - Helpful for having students move from one step to another
- Check Box
    - Allows user customization of the UI
- Input Box
    - Allows users to freely input numbers they want
    - Rarely used for interactivity
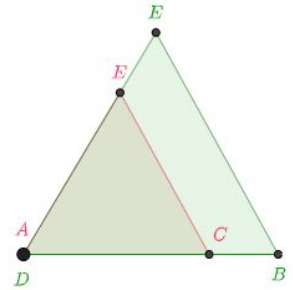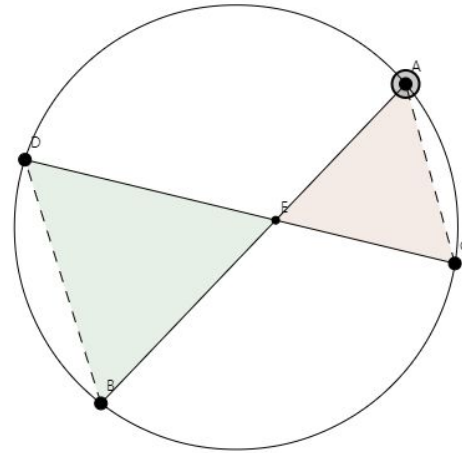- Can also interact directly with geometry elements!

Tip #1

Utilize animations!
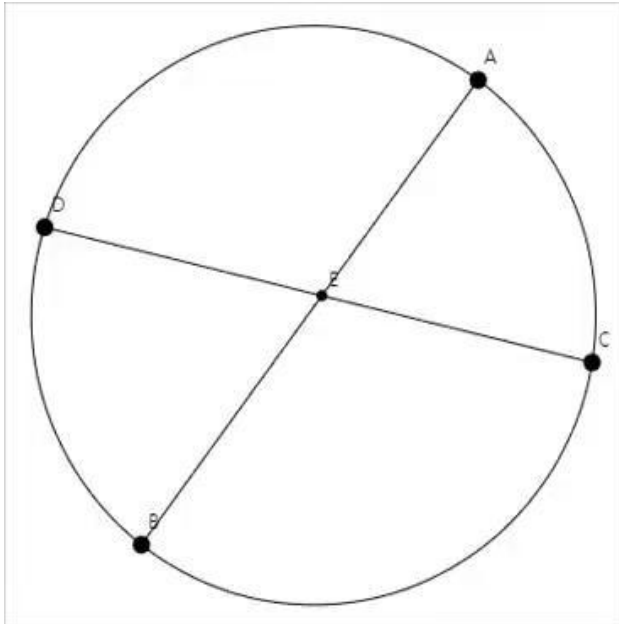
Tip #2

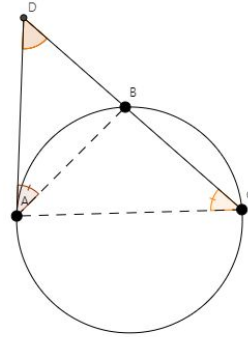Add color to highlight the elements in action!

Tip #3

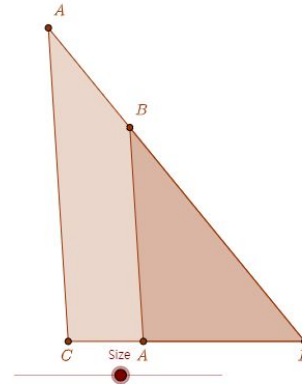Allow user interaction with the elements!

Tip #4

Add explanations!

4. As △DCA and △DAB share ∠D and share a congruent pair of angles, by AA similarity, $\triangle DCA \sim \triangle DAB.$

Previous | Next

☑ Show Models of ΔDCA and ΔDAB Next to the Buttons

☐ Show ΔDCA.   ☐ Show ΔDAB.

Conclusion

- A lot of potential for interactive and dynamic displays for educational purposes!
- Not easy, but not too challenging to make interactive educational applets with GeoGebra
- Easy to share!
- Effective way to visualize mathematical concepts in a relatively quick and easy manner without too much programming
- Usage of colors and animations, as well as adding in explanations and allowing user interaction, can help with creation of effective interactive proofs

Thank you!

My GeoGebra library:

https://www.geogebra.org/u/focicle2020