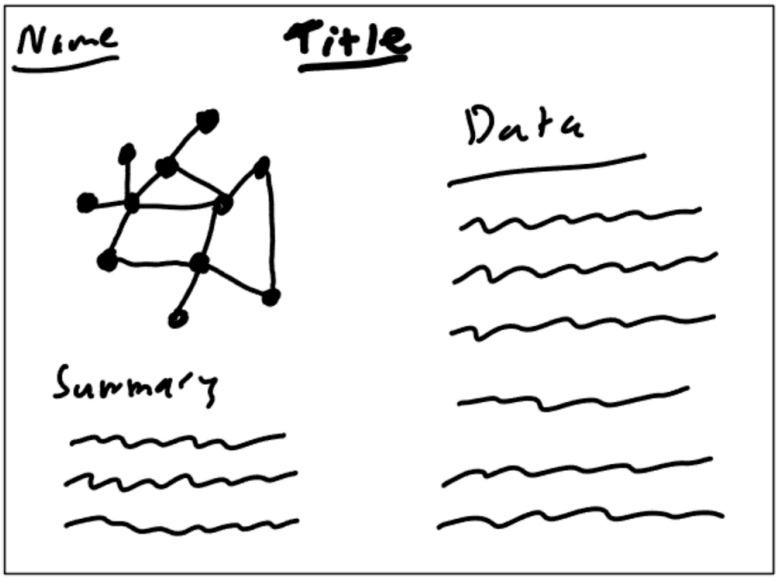


Graph Theory Final Project

We have spent the last few weeks developing the language of *graph theory*, a branch of math which is helpful to model the *relationship between things*. Now, we will follow your interests to model a real-life system using this language!



Date

Step #1: Pick a Topic

Pick a situation/set of relationships/system that you want to model using graph theory. Be creative! Have a clear idea of what the *vertices* and *edges* of your graphs will represent.

Here are some examples of topics you might choose to model:

- Family trees/Friend groups
- TV Shows/Movies (Love Island? Spongebob? Survivor?)
- Ecology and food chains
- Transportation Systems (Metro/Bus/Plane)
- Wikipedia Game (NOT just a path from A to B)
- Food
- Social Media/Internet Beef

Answer the following:

1. The **vertices** of my graph represent
   _____
2. The **edges** of my graph represent
   _____

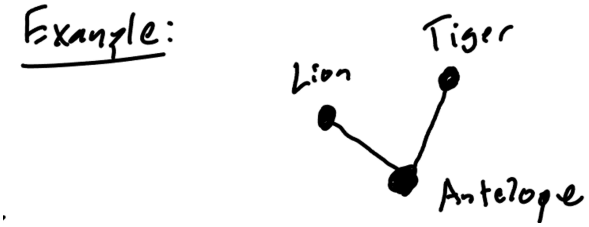
Date

Step #2: Draft your Graph

In this step, you will do research on your chosen topic and make a draft of your graph on a piece of paper. When you're done, tell Mr C before moving on to the poster.

Your graph should satisfy the following criteria:

- Draw a graph (or multiple graphs) with at least 10 vertices.
- Your graph should **not** be one of the standard graph families we have defined; too boring! The more complex the better.
- Your graph does **not need to be** connected but **must** contain a connected subgraph with at least 5 vertices.
- Draw your vertices as black dots, and label with words above. You might choose to label your edges as well.'



- **Get your graph approved by Mr C**, who might suggest some ideas to make your graph more interesting/informative.

Step #3: Analyze Your Graph

We are going to use some of the graph theory language we developed to describe our situation. While you're answering these questions, think about *what they mean* in your specific situation.

You'll put this data on your poster.

Data

- Number of Vertices
- Number of Edges
- Connected or Disconnected?
- Minimum degree $\delta(G)$
- Maximum degree $\Delta(G)$
- The diameter of the graph
- Largest cyclic subgraph (if it exists)
- A minimum dominating set.
- TWO GRAPH THEORY TOPICS OF YOUR CHOOSING

- Look up “Glossary of Graph Theory” and look for something that looks understandable. Run your choice by Mr C.
- This is a chance to do research - skim & dive!

Step #4: Prepare your Presentation

You are going to give a 3-5 minute presentation about your topic using the language of graph theory and your poster as a visual aid. The presentation should mostly describe the situation you modelled, and the graph theory language should help you do it.

For example: *In my presentation on baked goods, flour is vertex with the highest degree, and that’s because basically all baking recipes have flour in them.*

Write 5 bullet points on a notecard that outline your presentation.

Then turn those 5 bullet points into sentences. You’ll add those sentences to your poster in a “Summary” section.

Step #5: Make the Poster

Your poster should have

1. A title
2. Your name
3. Your graph, LARGE AND LEGIBLE
4. All the DATA from Step 3
5. The SUMMARY sentences from Step 4

Make it look nice!!!!