Graphs-and-Number-Theory

Project Link:

https://github.com/jeopardy1234/Graphs-and-Number-Theory

`main.pdf` contains the actual book

`main` directory contains all the `.tex` files

Prerequisites:

The reader must have some basic insight on graphs and its types. The first chapter lists the important basic algorithms which will be used in the subsequent chapters implicitly. You may directly start reading from chapter 2 if you know these basics.

For the Number Theory section, nothing much is required. You should just know the basics of Algebra. This includes some insights on concepts like GCD and binary exponentiation

Topics Covered:

Apart from basic DFS and BFS in the introductory chapter, the book covers the following topics/algorithms:-

- ✅ Dijkstra
- ✅ Bellman Ford
- ✅ Floyd Warshall
- ✅ Binary Lifting
- ✅ Lowest Common Ancestor(LCA)
- ✅ Jarvis Mar
- ✅ Graham's Scan
- ✅ Prim's Algorithm
- ✅ Kruskal's Algorithm
- ✅ Kahn's Algorithm
- ✅ Sieve of Eratosthenes

- ✅ Linear Sieve
- ✅ Segmented Sieve
- ✅ Euclidean Algorithm for GCD
- ✅ Extended Euclidean Algorithm
- ✅ Modular Arithmetic
- ✅ Euler Totient Function
- ✅ Fermat's Little Theorem

I have tried to include some interesting examples for certain topics. Some of these include k-hop (toposort) and binary coefficient modulo prime.

TODO's:

There were other topics I wanted to address but couldn't due to time constraints and their intricacy. These will be added to the book later when I get time. These are some of the topics:

- ◯ Kuhn's Algorithm for Bipartite Matching
- ◯ Chinese Remainder Theorem
- ◯ LCA in $O(1)$