Logistics:

How do I turn in the assignment?

- Run "make turnin" from your main PA directory

I cannot run "make turnin" without errors

- Make sure to run "cs101w" before starting any development

I still cannot turn in my code!

- Try sshing into an ieng6 machine and running through the previous steps. If none of these seem to solve your problem, check and post on Piazza with a detailed explanation of your issue.

My executable don't recompile when I change my code

- Try running "make clean" before re-compiling

Can I write helper methods?

- Yes, feel free to add helper methods if needed, as long as the code remains readable and compiles with the original .hpp files

Do we need to worry about memory leaks in valgrind?

- No, we will not be testing memory leaks.

How can I check my code?

- We have provided example test cases from the writeup in the repository. Create your own to thoroughly test your implementation.

My graph.hpp is not compiling, what should I do?

- You probably forgot the keyword "Test" in your make command. For example, 'make DFS' instead of 'make TestDFS'. Please try running the make command with the Test keyword!

If I work with a partner do we both need to turn in the code?

- No, only one person needs to turn it in, as long as **both students' information** is in the header of your .cpp files

Is it okay to look up pseudocode online?

- Yes, it is fine to take pseudocode and turn it into C++. It is **not okay** however, to directly copy code from online sources. Any websites you consult must also be added to your header.

Graph.hpp

Can I add fields to the objects or modify Graph.hpp?

- No

Why is there an Edge class and an Edge adjacency list?

- We need the Edge class to keep track of the weights as well as to make lookup a lot easier

Can I write my own class and custom comparator instead of using Alarm?

- Yes, feel free to do so. Be sure to add these in your .cpp file instead of in Graph.hpp

Do I need to sanitize the fields in my Vertex again?

- We will help you initialize your Vertex fields this time. visited will be set to false, distance will be set to FLT_MAX, and prev and id will be set to the same id value.

Dijkstra/Prim

Why do I need the Alarm object when I can keep track of the distance in the node itself?

- The Alarm object is useful for figuring out what node we need to explore next (the node with the shortest path for Dijkstra's or the node with the smallest weight edge for Prim's). You can decide not to use it if you like.

I thought a Priority Queue sorted by largest element?

- Our comparator is reversed so that Alarms will be sorted by their smallest times. If you create your own comparator you will need to do something similar.

What's the difference between the total cost of an SPT and the sum of the cost of all paths?

- The cost of an SPT is simply the sum of the edges we have used to construct the tree. This is much different than the cost of all paths together, since some paths will use the same edges.

What if there are multiple paths to a vertex with the same cost? How do I break ties?

- We will not test graphs where there are two different paths with the same cost.

Do I need to manually add both edges into the test file for my graph to be undirected?

- No, the tester will automatically add both edges to the graph that is an input to your function.

Will there be multiple edges between two nodes?

- No. There will be at most one edge between any two nodes.

What does it mean for an SPT/MST to be rooted at a node?

- The root is where we start exploring. This is only relevant for an SPT, since an MST has the same cost no matter where we start.

My code is infinitely looping!

- Make sure you are setting nodes to visited one they are added into your tree vertex set.

PrimDijk

What exactly is **c**?

- c represents is how much we care about the length of the path to the node when we decide what to add next to our tree. If it is 0 we do not care at all (Prim's), and if it is 1 we care about the entire path length (Dijkstra's).

These graphs are really large and I exceeded my quota!

- You should have enough space for all the graphs you generate, but if not, then you will need to run "make clean_graphs" between generations to free up space. Try cleaning out other files in your home directory as well.

I've been waiting for a long time and nothings happening.

- PrimDijk should take at most a minute to run on very large very dense graphs. Anything more than this and there may be something wrong in your code.

How do I know if my values make any sense?

- Compare your values with the provided graphs and sanity check values in the write up.

How detailed does my analysis need to be?

- You should provide some explanation for why you see the values you do in the table, as well as how this relates to Prim's and Dijkstra's algorithm.

Do I turn in my PDF using turnin?

- No, your writeup is **turned in on Gradescope**.

Does that mean I still have to turn in my .cpp files?

- Yes.

Bitvest

How do the fees work?

- The fees are applied before and after trading based on the two currencies you are trading between. Thus, a trade between BTC and ETH will first incur fees from BTC, then after exchanging, incur the fees from ETH. Below is a formula to calculate the final transacted amount:
  - Final amount = (starting amount) * (1 - BTC fee) * (exchange rate) * (1 - ETH fee)

Are the fees percentages or decimals?

- The fees will be represented in the **fees** map as a decimal amount. This means a fee value of 0.001 is equivalent to a 0.1% fee.

How efficient does my algorithm need to be?

- Your code can run in up to O(|VE|) time.

If there is an edge from u to v are we also guaranteed an edge from v to u?

- No, but you are guaranteed a path between any two nodes u and v

Is the graph a giant SCC?

- Since there is a path between any two nodes it will be an SCC.

Do we have a set starting currency or amount?

- No, you only need to determine if such a set of trades exist, not the specifics of the trade. If you find it easier to work through your code by starting at a set vertex with a set amount of money feel free to do so.

Will there be self-loops?

- No.

I am having trouble comparing float values because I lose precision when performing float calculations.

- If you are running into issues where you end up with the same amount of currency you start with and float precision is messing up your comparison, you may want to check if your values are within a certain FLT_EPSILON of each other. In other words, instead of comparing the values end > start, we will look at end > (start + FLT_EPSILON). FLT_EPSILON can be set to any sufficiently small number, like 0.000000001.
    - Note that none of our tests should require such fine float precision due to the fees incurred when trading.

Is this a directed graph?

- Yes. Exchange rates are one-way.