**Name:** ______________________________

This assignment continues the thread of *JJ's Jolly Jumping Journey*, or *J5*, from previous ones. The primary **goal** is to use simple graph algorithms as the context for gaining further experience in mapping concrete problems to abstract ones, finding solutions to the abstract problems (using known solutions from books, papers, and other sources), and implementing the solutions in a concrete context. Secondary goals are gaining more experience with programming, documenting algorithms and programs, studying performance, and conducting and summarizing experiments.

**The main problem** JJ has reached the sharky sea of sinking slides. The sea has numerous small islands, connected by slides. Each slide connects two islands. The slides are barely afloat. Swimming is not an option due to sharks, so the only way to travel is using the slides. By zipping across a slide quickly, JJ can traverse it, but only once because it sinks to the bottom of the sea immediately upon such use. At the middle of each slide is a precious jewel. The *main task* is figuring out the maximum number of jewels that JJ can collect without getting stranded, and returning to the starting position. The input specifies JJ's starting position and the configuration of slides and islands. The desired output is a sequence of islands and slides that JJ can visit in the order provided to return to the initial position and collecting as many jewels as possible. (There should be no solution that allows JJ to collect more jewels.)

## Questions

1. (1 pt.) Write your name in the space provided above.
2. (9 pts.) Provide an abstract formulation of the main problem, using familiar mathematical concepts that are independent of JJ's journey or any other specific application. Describe the abstract formulation as precisely and as concisely as possible. Indicate how a solution to the abstract problem may be used to solve JJ's specific problem above.

3. (10 pts.) Describe an efficient algorithm for solving the problem of Question 2. Describe the algorithm in English as precisely as possible. Clearly indicate how the algorithm uses widely known solutions to the problem of Question 2, its subproblems, or related problems. Provide suitable citations for such work.

4. (10 pts.) Explain why the algorithm of Question 3 is correct.

5. (10 pts.) Provide pseudocode, using the textbook's style as a guide, for the algorithm of Question 3. Include explanatory comments and outline a proof of its correctness.

6. (10 pts.) State and justify the running time of the algorithm of Question 5 as a function of the number $s$ of slides (and, optionally, the number $b$ of islands).