All quiz rules from the course syllabus are in effect for the real quiz, in addition to what follows.

If you have questions about the test, please ask *on Piazza* as a **private** post, viewable only by you and the instructors. The instructors will make an announcement if something needs to be said to the entire class.

You may use anything from lecture, discussion, or homework without proof or citation.

This quiz is to be individual effort. Students are permitted to use notes, electronics, and bring textbooks. The work you submit for each quiz is expected to be produced by *you, alone and solely for this assessment*. You may not reuse or repurpose anything you wrote at another time. However, despite being allowed notes and electronics, you may *not* seek out the answer to a question in any way, nor may you communicate with anyone during the exam, *for any reason*, with the exception of asking a question on Piazza *set as instructors-only for visibility.*

You will have 40 minutes for this quiz, plus an additional ten minutes to upload to GradeScope. Please be sure to **tag both your answers** in GradeScope at the real test.

As this is the sample quiz, you may complete this any way you would like, and are not obligated to submit anything. However, I encourage you to allocate time as if this were the real quiz, as that will provide you some feedback about your preparation.

Suppose we have an even number of people who are going to play (doubles) tennis, forming teams of size two. Each player has a *tennis rating*, (a positive number, where a higher number can be interpreted to mean a better player). The *quality* of each team is the *lower* tennis rating of a member of the team.

Our goal is to maximize the *sum* of the quality of teams formed.

1. (4 points) Consider the following **greedy heuristic**: pair the best player (highest tennis rating) with the worst player (lowest tennis rating) and solve recursive with unpaired players until everyone has a partner. Give a counter-example to demonstrate that this heuristic *does not* achieve the optimal solution.

2. (5 points) Prove the following claim. The standard for how formal the proof needs to be is the same as it was in the relevant lecture and the homework

   Consider the following algorithm. We pair the two best players together, then the third and fourth best players, and so on. This will maximize the sum of the quality of teams formed.

   Claim: There is an optimal algorithm for this problem that makes the same decision I described in the previous paragraph.

   Hint: if the two best aren't paired together, who are they paired with?