Greed

1. A local baker has come to you with the following problem. There are many orders that need to be filled, and for each item there is a baking time, b_i, and a subsequent cooling time, c_i. Each item must be baked and then cooled. Furthermore, only one item can be baked at any given time, since the oven is not large enough to fit two of the pans.

   The baker must decide on the order for baking the items. That is, the first item will be baked and then taken out of the oven to cool. The second item may be baked as soon as the first is taken out of the oven (that is, while that first item cools), and so on. The baker's goal is to minimize the overall time spent on the process (that is until all items have cooled).

   Consider the following three strategies. One of them works; the other two do not. For each flawed rule, provide a relatively simple instance that demonstrates the non-optimality of the result. For the rule that is valid, give a proof that it guarantees an optimal completion time.

   (a) Order the schedule based on b_i, from smallest baking time to largest baking time.

   (b) Order the schedule based on c_i, from largest cooling time to smallest cooling time.

   (c) Order the schedule based on the composite quantity $b_i + c_i$, ordered from smallest to largest.