ETGG 4803 **Lab 1: Crossing a Bridge (30 points)**

Submit your program solution on Blackboard as *YourLastName_Lab1*. The language is your choice, but your program must run unedited on *repl.it* in order to receive any credit.

Original Problem: There are four people who want to cross a bridge; they all begin on the same side. It is night and they have one flashlight. A maximum of two people can cross the bridge at one time. Any party that crosses, either one or two people, must have the flashlight with them. The flashlight must be walked back and forth; it cannot be thrown, for example. Each person walks at a different speed: Person 1 takes one minute to cross the bridge, Person 2 takes two minutes, Person 3 needs five minutes, and Person 4 requires ten minutes. A pair must walk together at the slower person's pace, and no one can be carried across the bridge. None of the four can swim and there are no boats, cars, or anything that flies available, so everyone must walk across the bridge. What is the shortest time to get everyone across the bridge to the other side together?

1. **(5 points)** If we were to use brute force, then how many different potential solutions would have to be checked? ***Convince me!***

2. **(15 points)** Write a program that takes as input the walking times for each of four people and outputs the shortest time possible for them to all cross the bridge as well as the order in which they should cross. Assume the walking times are all integer values, but do not assume that the walking times are different for each person. The program should give the shortest time for any set of four walking times. (As discussed in class, the shortest solution in the original problem is 17 minutes. What happens if the walking times are one, four, six, and ten minutes?)

3. **(10 points)** Write an analysis of your method to convince me that it always finds the optimal solution. Can your implementation be improved? If so, how?

Bonus: Accept the walking times for five people and output the shortest time possible for all to make it to the other side of the bridge together. All other conditions remain exactly as in the original problem.

Bonus: Accept the walking times for $n > 0$ people and output the shortest time possible for all to make it to the other side of the bridge together. All other conditions remain exactly as in the original problem.