CS2302 - Data Structures
Spring 2023
Practice Exam 1 Programming - Version 2

1. (Lists) Write the function *swap(L,i,j)* that receives a list L and integers i and j and swaps the items at positions i and j in L.

2. (Arrays) Write the function *reverse_1D(A)* that receives a 2D array A and returns a 1D array containing the elements of A in reverse order. For example, if $A=np.array([[2,5,3],[0,8,1]])$, your function should return the 1D array *[1 8 0 3 5 2]*).

3. (Sets) Write the function *first_repeat(L)* that receives a list L and returns the first repeated item in L. For example, *first_repeat([4,7,1,3,9,8,7,1,3,9])* should return 7. If L has no repeated characters, your function should return *None*. Your function must run in $O(n)$.

4. (Dictionaries) Write the function *first_k_letters(W,k)* that receives a list of words W and an integer k and returns a dictionary D, where $D[w]$ contains the words in W that start with the k-letter string w. For example, *first_k_letters(W,3)* would return a dictionary D where $D['dat']$ is *['data', 'date', 'database']*.

5. (Lists) Write the function *interleave(L1,L2)* that receives two lists of the same length $L1$ and $L2$ and returns a list containing $[L1[0], L2[0], L1[1], L2[1], L1[2], L2[2], ...]$.

6. (Arrays) Write the function *sum_corners(A)* that receives a 2D array A and returns the sum of the items in the four corners of A. Assume A has at least two rows and two columns.

7. (Sets) Write the function *appears_in_1(L1,L2)* that receives two lists of integers $L1$ and $L2$ and returns a set containing the elements that appear in $L1$ or in $L2$ but not in both.

8. (Dictionaries) Write the function *occurrences(S,n)* that receives a string S and an integer n and builds and returns a dictionary containing the number of times each substring of S of length n appears in S.