Week 03

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1 4-1 Exercise 07

Problem: Apply insertion sort to sort the list E, X, A, M, P, L, E in alphabetical order.

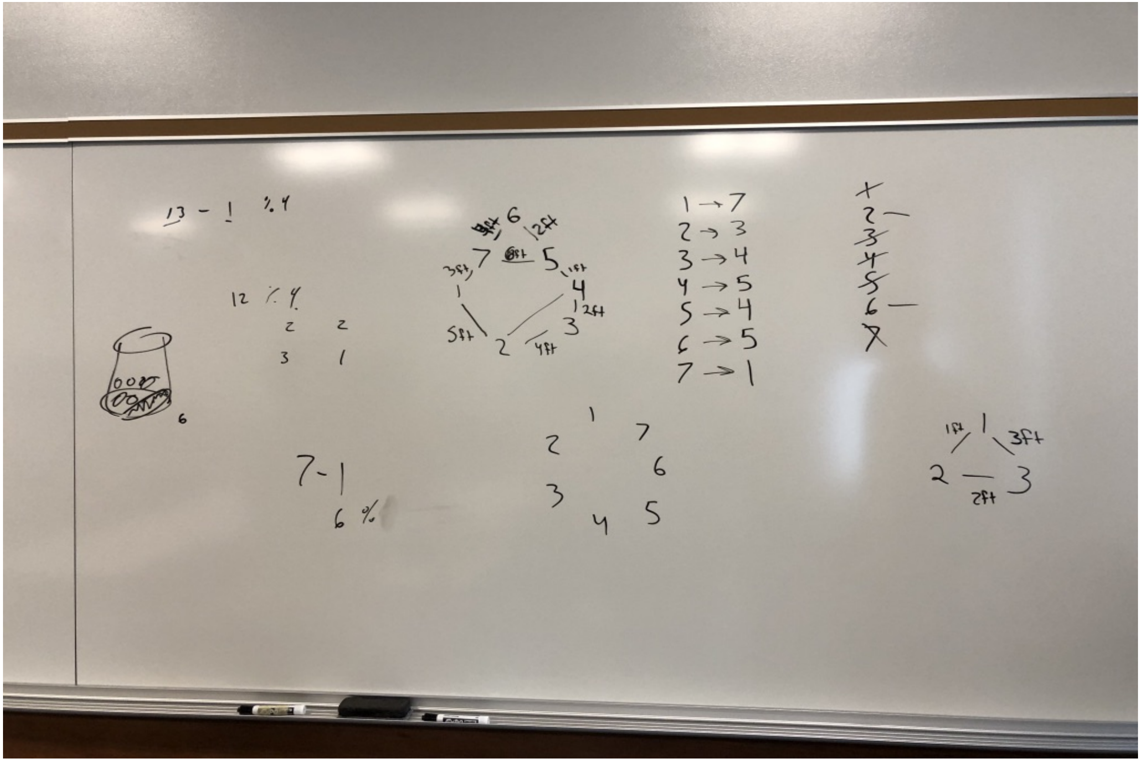
Code written in Python

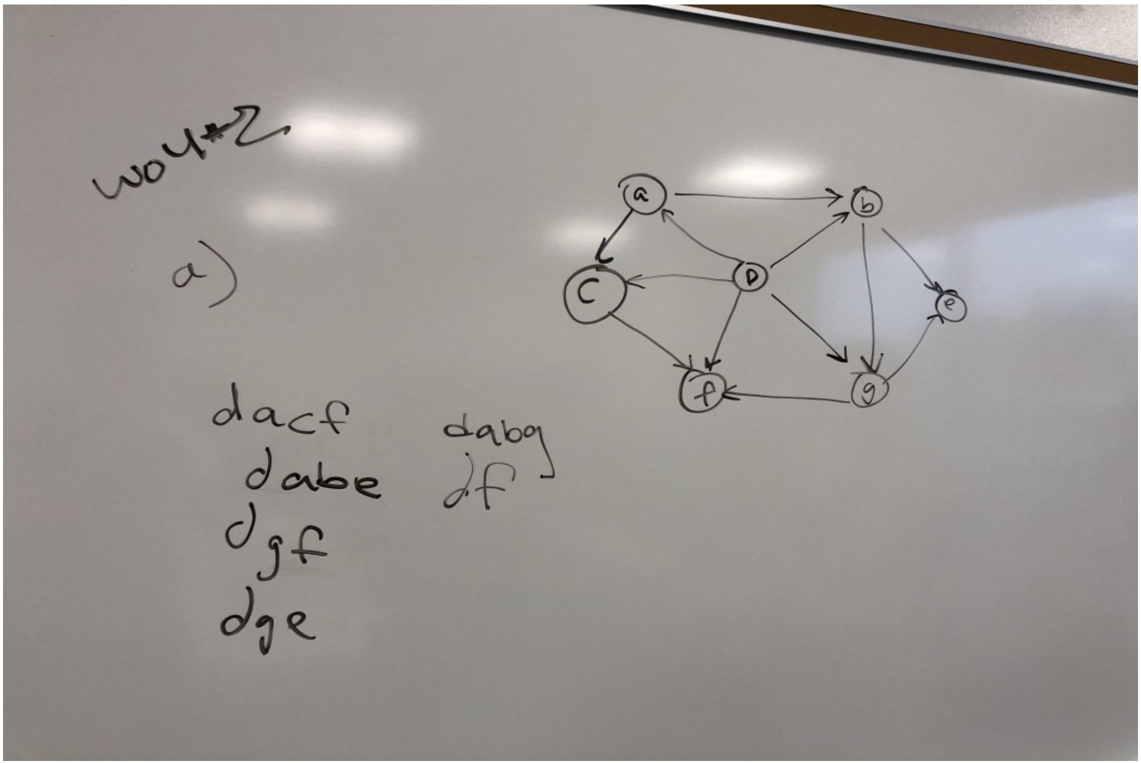
```
############################################################
# Exerccise 4.1 - #07
# Apply insertion sort to sort the list E, X, A, M, P, L, E
# in alphabetical order.
#
# Reference: https://www.geeksforgeeks.org/insertion-sort/
############################################################
def insertionSort(letters):
    for i in range(1, len(letters)):    # keep track of the index
        key = letters[i]                    # assign current letter to key
        j = i-1                             # j is the last letter looked at
        while j >= 0 and key < letters[j]:  # while current letter < last letter
            letters[j+1] = letters[j]           # assign the next spot to the
                last letter
            j -= 1                              # decrement j
        letters[j+1] = key                  # assign the next value in letters
            to the current value
    print(letters)

insertionSort(['E', 'X', 'A', 'M', 'P', 'L', 'E'])
```

2 4-2 EXERCISE 01

Problem: Apply the DFS-based algorithm to solve the topological sorting problem for the following digraphs.

Results





wo4#2

a)

dacf

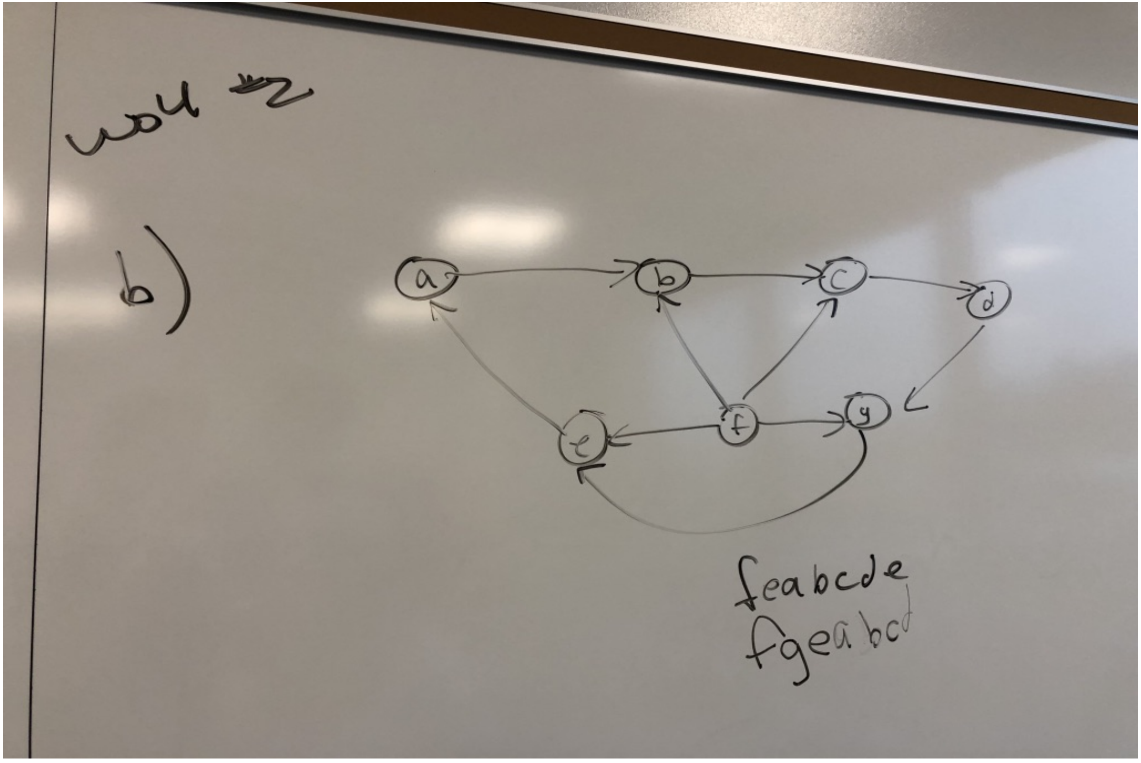
dabe

dgf

dge

dabg

df



wo4 #2

b)

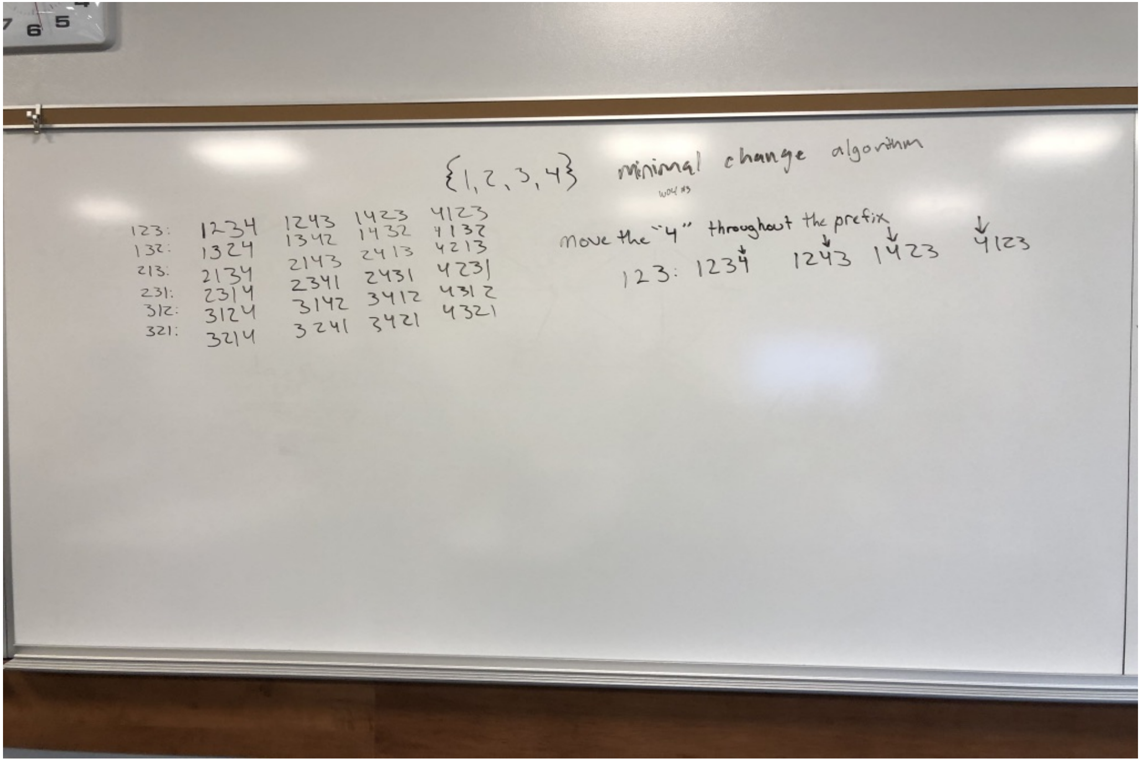
feabcde

fgeabcd

3 4-3 Exercise 02

Problem: Generate all permutations of 1, 2, 3, 4 by:
a. The bottom-up minimal-change algorithm
b. The Johnson-Trotter algorithm
c. The lexicographic-order algorithm

Results



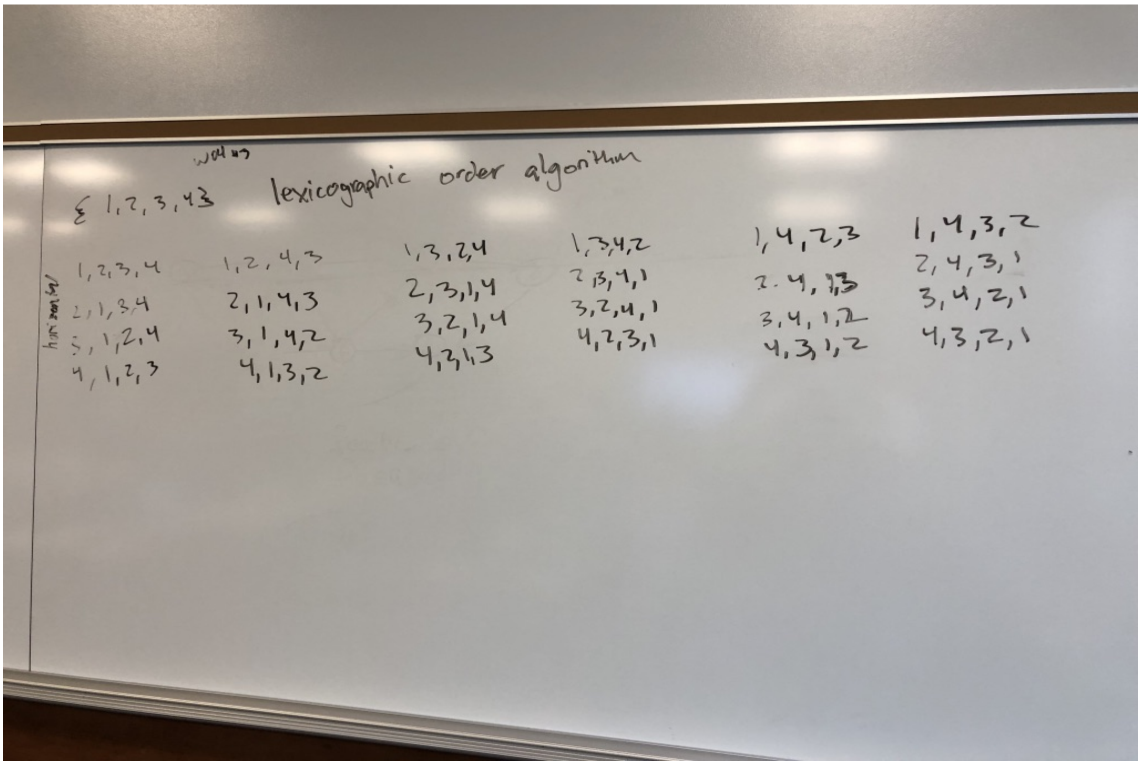
{1, 2, 3, 4} minimal change algorithm

W04 #3

123:	1234	1243	1423	4123
132:	1324	1342	1432	4132
213:	2134	2143	2413	4213
231:	2314	2341	2431	4231
312:	3124	3142	3412	4312
321:	3214	3241	3421	4321

move the "4" throughout the prefix

123: 1234 1243 1423 4123



working

{ 1,2,3,4} lexicographic order algorithm

horizontal

1,2,3,4
2,1,3,4
3,1,2,4
4,1,2,3

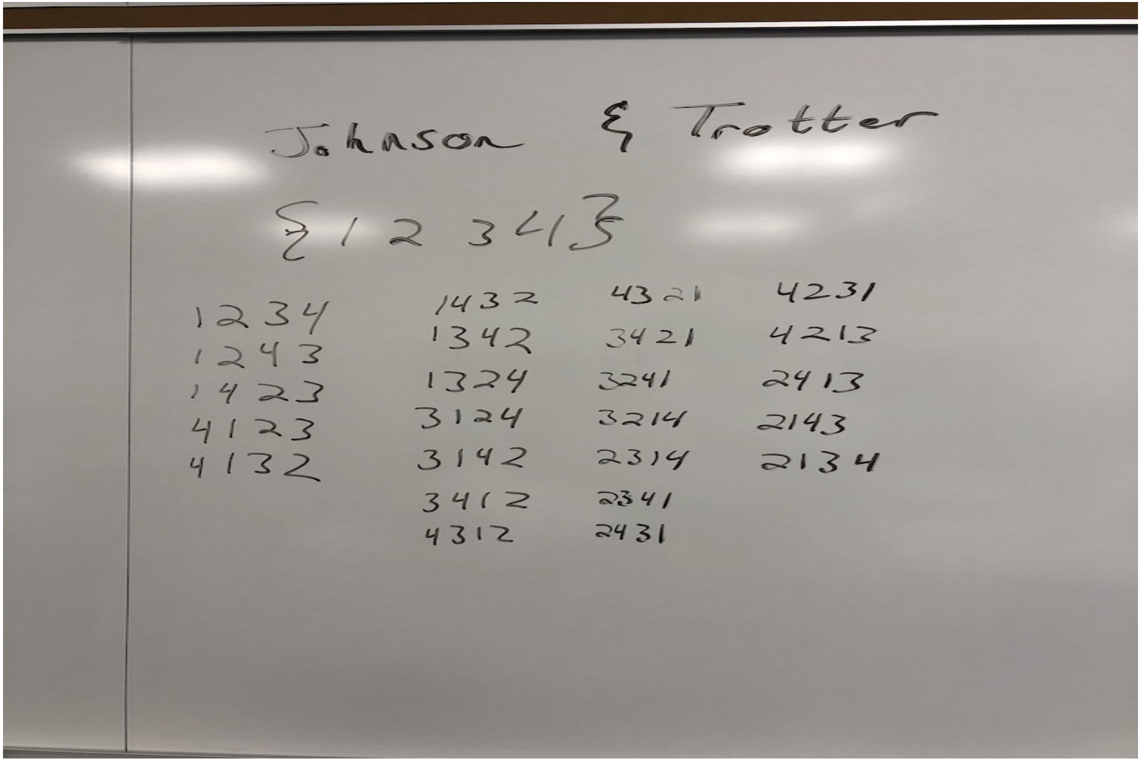
1,2,4,3
2,1,4,3
3,1,4,2
4,1,3,2

1,3,2,4
2,3,1,4
3,2,1,4
4,2,1,3

1,3,4,2
2,3,4,1
3,2,4,1
4,2,3,1

1,4,2,3
2. 4, 1,3
3,4,1,2
4,3,1,2

1,4,3,2
2,4,3,1
3,4,2,1
4,3,2,1



Johnson & Trotter

{1 2 3 4}

1234
1243
1423
4123
4132

1432
1342
1324
3124
3142
3412
4312

4321
3421
3241
3214
2314
2341
2431

4231
4213
2413
2143
2134