

Assignment Question (Jan 2023)

Problem 1 - Swapping Min Max

You are given two lists a and b of n positive integers each. You can apply the following swap operations to them any number of times.

Select an index i ($1 \leq i \leq n$) and swap a_i with b_i (i.e. a_i becomes b_i and vice versa).

Write a function `minmax(a,b)` which takes two lists a and b of size n as inputs and returns an integer, which is the minimum possible value of $\max(a_1, a_2, \dots, a_n) \times \max(b_1, b_2, \dots, b_n)$ you can get after applying the swap operation any number of times (possibly zero).

Example - Consider that the list starts with index 0

Consider the lists : $a = [1, 2, 6, 5, 1, 2]$ and

$b = [3, 4, 3, 2, 2, 5]$

In this case, you can apply the **swap** operation at indices 1 (between 2 and 4) and 5 (between 2 and 5),

then $a = [1, 4, 6, 5, 1, 5]$ and $b = [3, 2, 3, 2, 2, 2]$

and $\max(1, 4, 6, 5, 1, 5) \times \max(3, 2, 3, 2, 2, 2) = 6 \times 3 = 18$

Sample Input 1

[1, 2, 6, 5, 1, 2]

[3, 4, 3, 2, 2, 5]

Output

18

Sample Input 2

[8,7,9,6,5,6,6,5,6,4,6,7,8,5,4,3,2,1,4,5,6,7,8,7,8]

[2,4,5,6,7,6,7,8,9,8,7,6,7,6,5,4,3,2,3,4,5,5,5,4,5]

Output

63

Sample Input 3

[1,2,3,2,3,4,5,3,5,6,7,8]

[2,1,5,3,4,6,4,3,2,3,1,2]

Output

32

Problem 2 - Employee Listings

Each line in the file *employees.csv* contains the full name, role and division of employees separated by a comma. Every line corresponds to one employee.

The user wants to collect the details of :

1. Employees who are managers in the R&D division. For managers the string for the role is 'Manager' and the division string for employees working in the R&D division is 'R&D'.
2. Employees who do not have last names. The name is a combination of first and last name, separated by a space.

Write a program to collect the required details and write the output into files *managers.csv* and *single_name_employees.csv*

Assume that the employees.csv is present in the present working directory and generate the output in the same directory.

Sample Input 1

Entries in employees.csv file -

Name,Role,Division
Hari Ram,Team-Lead,R&D
Nirmal Pandey,GET,Production
Ruban,Manager,R&D
Aswath,Manager,Production
Nazar,Team-Lead,Production
Daniel Jacob,GET,R&D

Output

Entries in manager.csv file -

Ruban,Manager,R&D

Entries in *single_name_employees.csv* file -

Ruban,Manager,R&D

Aswath,Manager,Production

Nazar,Team-Lead,Production

Problem 3 - Combination Sort

Write a program that takes a list of unique strings as an argument, where each string is a combination of a letter from **a - z** and a number from **0 - 99**, the initial character in string being the letter. For example a23, d5, z0, q99 are some strings in this format. The program should sort the list and return the lists L1 and L2 in the order mentioned below.

L1 : First list should contain all strings sorted in ascending order with respect to the first character only. All the strings with the same initial character should be in the same order as in the original list.

L2 : In the list L1 above, sort the strings starting with the same character, in descending order with respect to the number formed by the remaining characters.

Sample Input 1

d34, g54, d12, b87, g1, c65, g40, g5, d77

Output

L1 : b87, c65, d34, d12, d77, g54, g1, g40, g5

L2 : b87, c65, d77, d34, d12, g54, g40, g5, g1

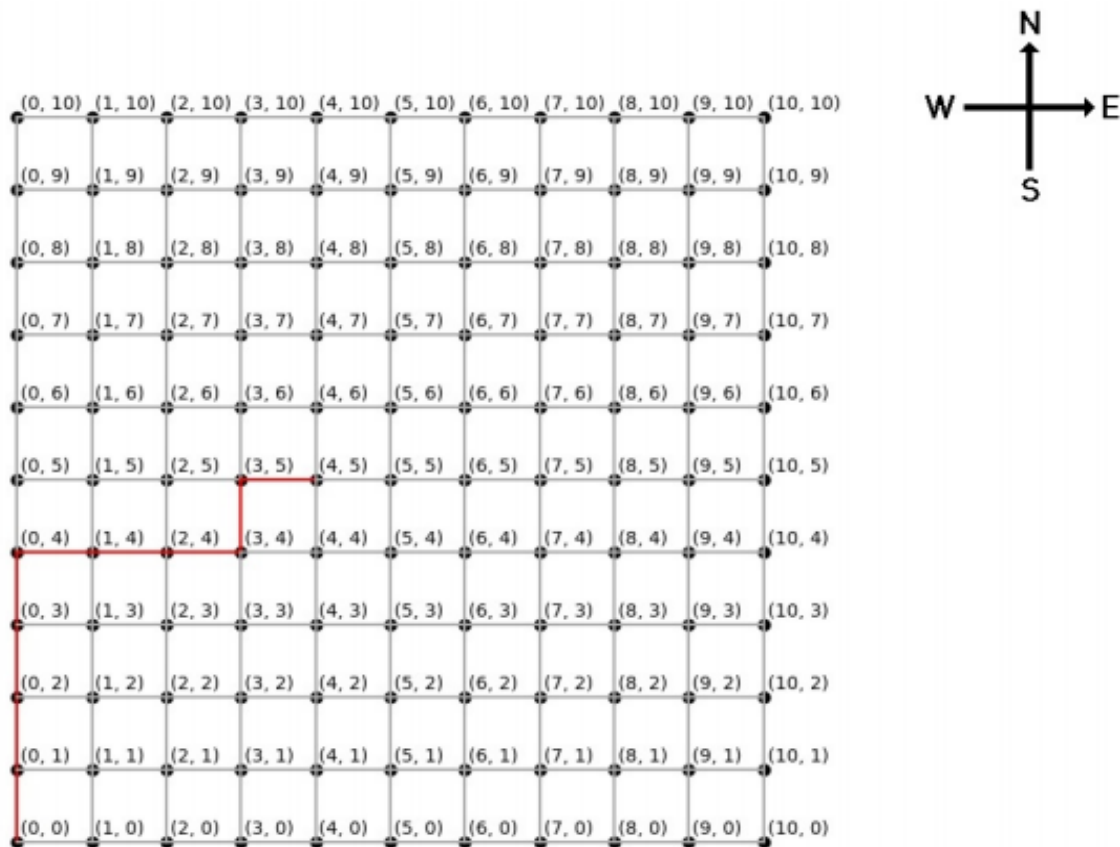
Problem 4 - Shortest Distance of Manhattan Path

The below image represents a grid having 11x11 nodes numbered from 0 to 10.

- Distance between one node to the next connected node is 1 unit.
- One can go in any direction, each letter counts as 1 unit in each direction.

- **N** North
- **S** South
- **E** East
- **W** West

The below graph shows the path of “**NNNNEEENE**” starting from (0,0)



Write a program to take

- a start point as an array containing two elements as x and y coordinate, and
- a string as input

from the user and print the shortest distance between the start and end point.

Sample Input 1

[0, 0]

NNNNEEENE

Output

6.4 [Hint : $\sqrt{((4-0)^2 + (5-0)^2)} = 6.4$]

Sample Input 2

[1, 2]

NEWS

Output

0

Problem 5 - Perfect Number

A perfect number is a positive integer that is equal to the sum of its proper divisors (excluding itself). Write a program that checks whether the input integer is perfect or not. It should return true if the number is perfect. Otherwise it should return false.

Sample Input 1

8

Output

false

Sample Input 2

28

Output

true

Sample Input 3

496

Output

true