

Programming Practice

2018-11-1

Week 9

Practice Lecture

How to swap struct objects

```
1 #include <stdio.h>
2
3 struct mstruct{
4     char name[31];
5     char id[11];
6     int score;
7 };
8
9 void swap(struct mstruct *student1, struct mstruct *student2){
10     struct mstruct tempdata = *student1;
11     *student1 = *student2;
12     *student2 = tempdata;
13 }
14
```

Homework Problems

1. Tower of Hanoi
2. Merge Sort
3. Permutation
4. Sorting Students

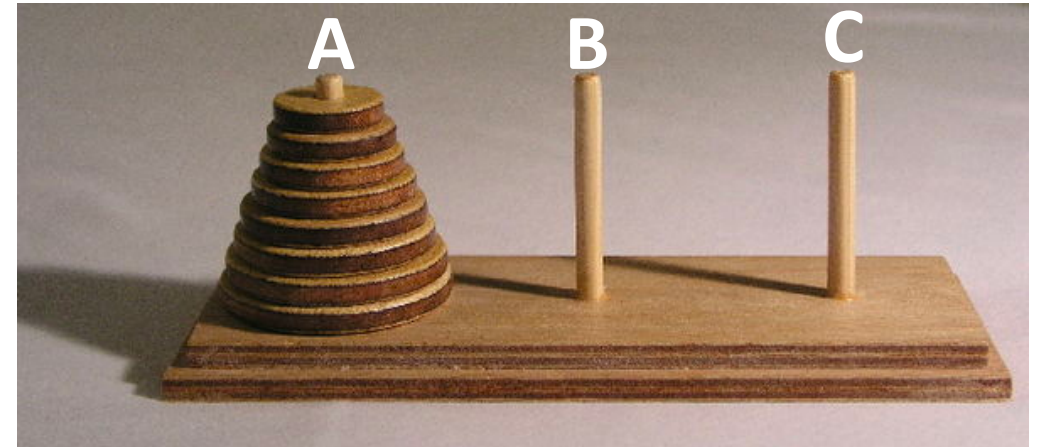
Tower of Hanoi

Tower of Hanoi consists of three rods(A,B,C) and a number of disks of different sizes, which can slide onto any rod. The puzzle starts with the disks in a neat stack in ascending order of size on rod A, the smallest at the top, thus making a conical shape. To solve Tower of Hanoi, you should move the entire stack of disks to rod C, obeying the following simple rules:

- 1) Only one disk can be moved at a time.
- 2) Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack or on an empty rod.
- 3) No disk may be placed on top of a smaller disk.

→based on

https://en.wikipedia.org/wiki/Tower_of_Hanoi



Ex) Tower of Hanoi with 8 disks

Problem. 1

Tower of Hanoi

Description

Write a program that gets the number of disks as input, and prints out sequence of moving instructions to solve tower of hanoi.

Input

a single integer n ($1 \leq n \leq 10$).

Output

moving instructions to solve Tower of Hanoi.
(please refer to the sample output for the concrete form)

Sample

[input]

3

[output]

Move from A to C

Move from A to B

Move from C to B

Move from A to C

Move from B to A

Move from B to C

Move from A to C

Problem. 2

Merge Sort

Description

Write a program that gets the number of integers as input, and sort the array in ascending order by using **merge sort**.

The first line of the input will state the number of integers that will be given : N ($1 \leq N \leq 100,000$).

The second line contains N integers without duplicates, all of which are within the range of `int`.

Print the ascending sorted array.

Input

First line contains a single integer N ($1 \leq N \leq 100,000$).

The second line contains N integers.

Output

Print the ascending sorted array.

Sample

[input]

5

6 -5 -7 5 2

[output]

-7 -5 2 5 6

Problem. 3

Permutation

Description

Write a program that gets an integer N and an integer X as input, and prints out X^{th} (according to lexicographical order) N -permutation.

* N -permutations : if N is 3 then there are 6 permutations; 123,132,213,231,312,321.

*lexicographical order: 123->132->213->231->312->321

Input

First line contains a single integer N ($1 \leq N \leq 9$).

The second line contains a single integer X ($1 \leq X \leq N!$).

Output

Print the X^{th} N -permutation.

Sample

[input]

3

2

[output]

132

[input]

4

4

[output]

1342

Problem. 4

Sorting Students

Description

Given information about students of SNU Programming Practice, make a program showing that information in various order.

your program should be able to sort the list according to Name, Student ID and Exam Score.

Name: a String(length \leq 30) without space.(consist of only lowercase)[ex> kimdo]

Student ID: a normal SNU Student ID.[ex> 2018-12345]

Exam Score: an integer s between 0 and 100($0 \leq s \leq 100$)

*There is no duplicate Name, ID and Score.

***you can write more clean code with “struct”!!!**

Input

First line contains the number of students n ($1 \leq n \leq 10$). N = by name

Next n lines each contains Name, Id and Score. I = by ID

The last line contains a single character, indicating ordering mode S = by Score

Output

Print the information ordered by (Name or ID or Score)

*When dealing with Name or ID, use lexicographical order.

*When dealing with Score, use descending order.

Sample

[input]

2

masteryi 2016-12312 11

teemo 2017-11111 100

S

[output]

teemo 2017-11111 100

masteryi 2016-12312 11