Introduction to Algorithms Assignment1

Due Date: 2018/10/30 23:59:59

Young tableaus (p.167)

Definition:

An m × n Young tableau is an m × n (m,n∈N) matrix such that the entries of each row are in sorted order from left to right and the entries of each column are in sorted order from top to bottom. Some of the entries of a Young tableau may be ∞ , which we treat as nonexistent elements. Thus, a Young tableau can be used to hold r <= mn finite numbers.

e.g.

2	3	12	14
4	8	16	∞
5	9	∞	∞
∞	∞	∞	∞

1. Design a program to insert a new element into a nonfull m × n Young tableau.

Hint:

m × n Young tableau Y is empty if Y [1, 1] =∞

Y is full (contains mn elements) if Y [m,n] < ∞(represent ∞ as x) (50%)

2 (means two young tableaus)

1 (means use insert method)

6 7 (Insert 6, 7)

2 3 12 14

4 8 16 x

5 9 x x

x x x x

1

13

1 3 5

2 4 7

6 9 14

11 12 x

Output:

Insert 6 7

2 3 6 14

4 7 8 16

5 9 12 x

x x x x

Insert 13
1 3 5
2 4 7
6 9 13
11 12 14

2. Design a program to implement EXTRACT-MIN on a nonempty m × n Young tableau.(represent ∞ as x)(50%)

2(means two young tableaus)
2(means use extract-min method)
2 3 12 14
4 8 16 x
5 9 x x
x x x x

2
1 3 5
2 4 7
6 9 14
11 12 x

Output:
Extract-min 2
3 8 12 14
4 9 16 x
5 x x x
x x x x

Extract-min 1
2 3 5
4 7 14
6 9 x
11 12 x

(Only provide the means of input and output. Please check format of input and output file.)

Rule of programing and the dataset:

(1) Element type is Integer.
(2) Cannot use the already existed sort API.
(3) Do not handle the empty and full exception.
(4) There are many solutions, you only print one of them.
(5) Input and output txt file automatically and the relative path is beside the main program.
(6) Cannot use not standard header file or you should attach on your zip.