SILVER PROBLEMS

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Three problems numbered 6 through 8

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Problem 6: Buying Hay [Neal Wu, 2007]

Farmer John is running out of supplies and needs to purchase H (1

<= H <= 50,000) pounds of hay for his cows.

He knows N (1 <= N <= 100) hay suppliers conveniently numbered 1..N.

Supplier i sells packages that contain P\_i (1 <= P\_i <= 5,000)

pounds of hay at a cost of C\_i (1 <= C\_i <= 5,000) dollars. Each

supplier has an unlimited number of packages available, and the

packages must be bought whole.

Help FJ by finding the minimum cost necessary to purchase at least

H pounds of hay.

PROBLEM NAME: buyhay

INPUT FORMAT:

\* Line 1: Two space-separated integers: N and H

\* Lines 2..N+1: Line i+1 contains two space-separated integers: P\_i

and C\_i

SAMPLE INPUT (file buyhay.in):

2 15

3 2

5 3

OUTPUT FORMAT:

\* Line 1: A single integer representing the minimum cost FJ needs to

pay to obtain at least H pounds of hay.

SAMPLE OUTPUT (file buyhay.out):

9

OUTPUT DETAILS:

FJ can buy three packages from the second supplier for a total cost of 9.

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Problem 7: Guarding the Farm [Fatih Gelgi, 2008]

The farm has many hills upon which Farmer John would like to place

guards to ensure the safety of his valuable milk-cows.

He wonders how many guards he will need if he wishes to put one on

top of each hill. He has a map supplied as a matrix of integers;

the matrix has N (1 < N <= 700) rows and M (1 < M <= 700) columns.

Each member of the matrix is an altitude H\_ij (0 <= H\_ij <= 10,000).

Help him determine the number of hilltops on the map.

A hilltop is one or more adjacent matrix elements of the same value

surrounded exclusively by either the edge of the map or elements

with a lower (smaller) altitude. Two different elements are adjacent

if the magnitude of difference in their X coordinates is no greater

than 1 and the magnitude of differences in their Y coordinates is

also no greater than 1.

PROBLEM NAME: guardian

INPUT FORMAT:

\* Line 1: Two space-separated integers: N and M

\* Lines 2..N+1: Line i+1 describes row i of the matrix with M

space-separated integers: H\_ij

SAMPLE INPUT (file guardian.in):

8 7

4 3 2 2 1 0 1

3 3 3 2 1 0 1

2 2 2 2 1 0 0

2 1 1 1 1 0 0

1 1 0 0 0 1 0

0 0 0 1 1 1 0

0 1 2 2 1 1 0

0 1 1 1 2 1 0

OUTPUT FORMAT:

\* Line 1: A single integer that specifies the number of hilltops

SAMPLE OUTPUT (file guardian.out):

3

OUTPUT DETAILS:

There are three peaks: The one with height 4 on the left top, one of

the points with height 2 at the bottom part, and one of the points with

height 1 on the right top corner.

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Problem 8: Time Management [SLPC, 2008]

Ever the maturing businessman, Farmer John realizes that he must

manage his time effectively. He has N jobs conveniently numbered

1..N (1 <= N <= 1,000) to accomplish (like milking the cows, cleaning

the barn, mending the fences, and so on).

To manage his time effectively, he has created a list of the jobs

that must be finished. Job i requires a certain amount of time T\_i

(1 <= T\_i <= 1,000) to complete and furthermore must be finished

by time S\_i (1 <= S\_i <= 1,000,000). Farmer John starts his day at

time t=0 and can only work on one job at a time until it is finished.

Even a maturing businessman likes to sleep late; help Farmer John

determine the latest he can start working and still finish all the

jobs on time.

PROBLEM NAME: mtime

INPUT FORMAT:

\* Line 1: A single integer: N

\* Lines 2..N+1: Line i+1 contains two space-separated integers: T\_i

and S\_i

SAMPLE INPUT (file mtime.in):

4

3 5

8 14

5 20

1 16

INPUT DETAILS:

Farmer John has 4 jobs to do, which take 3, 8, 5, and 1 units of

time, respectively, and must be completed by time 5, 14, 20, and

16, respectively.

OUTPUT FORMAT:

\* Line 1: The latest time Farmer John can start working or -1 if

Farmer John cannot finish all the jobs on time.

SAMPLE OUTPUT (file mtime.out):

2

OUTPUT DETAILS:

Farmer John must start the first job at time 2. Then he can do

the second, fourth, and third jobs in that order to finish on time.

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