2023 NORTHERN INDIANA HIGH SCHOOL CODING COMPETITION

Round Two

COMPUTER SCIENCE AND INFORMATICS
COLLEGE OF LIBERAL ARTS AND SCIENCES
INDIANA UNIVERSITY SOUTH BEND

Problem 1. **Alarm Clock**

We are going to design a digital alarm clock, which accepts two inputs: the current time and the number of minutes of sleep. It will then output the time the alarm will go off, which is determined by the following formula.

Alarm Time = Current Time + Sleeping Time

Both the Current Time and the Alarm Time are represented in the following format (there is a white space between **mm** and **xx**).

h:mm xx

Where **h** is an integer representing hours with range [1, 12], **mm** are two digits representing minutes with range [00, 59], and **xx** is a two-character string with value "**am**" or "**pm**" representing morning or afternoon time. For example, **12:00 am** is midnight while **12:00 pm** is noon.

The first line of the input should be the current time, the second line of the input should be the number of minutes of sleep (a positive integer), and the output line should be the alarm time.

Note: To get credit, your output must follow the specifications. For example, **12:01 am** is a correct display while **0:01 am** or **12:1 am** are not correct because the range of the hour should be from 1 to 12, and the minutes should always be displayed with two digits.

Sample input and output:

Input:
12:00 am
61
Output: 1:01 am

Input:
12:00 am
781
Output: 1:01 pm

Input:
4:30 am
241
Output: 8:31 am

Input:
4:30 am
281
Output: 9:11 am

Problem 2. Word Search

You are given a word and a two-dimensional array of letters. You are asked to search for the word in a straight line in the array in any direction (horizontally, vertically, or diagonally) forward or backward. If the word can be found (one way or multiple ways), output yes, otherwise output no.

The input contains several lines. The first line contains the word (all in upper cases) less than 20 characters. The second line contains two positive integer numbers **m n**, separated by a space, representing the dimension of the array: **m** rows and **n** columns. Assume that both **m** and **n** are less than 20. The rest of the lines are the character array (all in upper cases), separated by spaces, each row on its own line.

Sample input and output:

Input:
DOG
3 4
X B D M
E O O W
G B N D

Output: yes

Input:
IUSB
3 4
F U N M
E O B W
G B F M

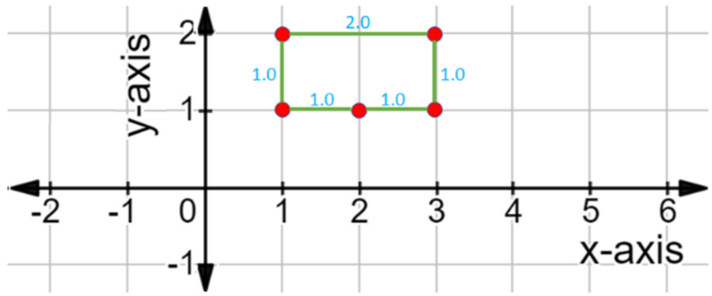
Output: no

Input:
BEND
4 5
N U S D B
E O B N D
B B N E P
A D C B T

Output: yes

Problem 3. Shortest Cycle

Given the coordinates of n points (x_1, y_1), (x_2, y_2), … (x_n, y_n), find the shortest cycle connecting all points. A cycle is a path that starts and ends at the same point. In the following example, the shortest cycle of the 5 red points is 6.0: (1, 1)➔(2, 1)➔(3, 1)➔(3, 2)➔(1, 2)➔(1, 1).



Note: the distance between two points (x_1, y_1) and (x_2, y_2) is $\sqrt[2]{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

The input has two lines. The first line contains an integer number (greater than or equal to 3 and less than or equal to 15) representing the number of points. The second line contains integers separated by spaces representing the coordinates of the points x_1 y_1 x_2 y_2 x_3 y_3 … x_n y_n

The output is a floating pointing number with precision greater than 0.01 representing the shortest cycle. More displayed decimal digits are acceptable.

Sample input and output:

Input:
3
-1 0 1 0 0 1
Output: 4.828

Input:
4
0 0 1 0 0 1 1 1
Output: 4.0

Input:
6
-1 -1 0 0 1 1 1 -1 0 1 1 0
Output: 7.414

Input:
10
1 3 2 0 1 0 2 2 2 1 2 3 0 0 0 3 0 1 0 2
Output: 10.0