Advanced Coding Practice
Coding Problem #3

2023 Fall, CSE4152
Sogang University

Matrix Addition

There is a $N \times N$ matrix A initialized by arbitrary values. Given 5 values $R1$, $R2$, $C1$, $C2$ and V , there is a program like below. ($1 \leq R1, R2, C1, C2 \leq N$ integers, V : a real value)

```
for k := 1 to N do
   read (R1,R2,C1,C2, V );
   for i := R1 to R2 do
      for j := C1 to C2 do
         A[i][j] := A[i][j] + V ;
      end
   end
end
```

If this program is executed, it takes $O(N^3)$ time. Design a more efficient method.

Example

Input

4 // N

1 3 1 3 1 // R1, R2, C1, C2, V

2 4 2 4 1

3 4 3 4 1

1 1 1 1 2

Output

3 1 1 0

1 2 2 1

1 2 3 2

0 1 2 2

Half-Circle Property

There is an circle C centered at (0,0) and there are many points on the circumference (원주) of the circle. Let us denote the set of points by S. If there exists a line L passing through point (0,0) such that all points of S lie on the one side of L, then we say that S satisfies 'Half-circle property'. For a given set of point, design an algorithm that finds whether the set satisfies half-circle property or not. And compute its time and space complexity.

Example:

1st example: (0.5, 1.0), (1.0, -0.5), (0.5, 1.0).

2nd example: (0.5, 1.0), (1.0, -0.5), (-0.5 -1.0), (-1.0, 0.5).

Solution of Examples:

1st example point set satisfies half-circle property.

2nd example point set does not.

Example

Input

3 // number of points

0.5 1.0 // points on the circle (x,y)

1.0 -0.5

0.5 1.0

Output

HCP

Input

4 // number of points

0.5 1.0 // points on the circle (x,y)

1.0 -0.5

-0.5 -1.0

-1.0 0.5

Output

NO HCP