

# Competitive Programming SS24

Submit until end of contest



**Problem: Extraction** (1 second timelimit)

Haily Hacker trained years for this moment!  
She took courses like “WWW” and “ISEC”.  
She knows more abbreviations than anyone else.  
She is finally ready to hack the main server of HPI, where all students’ grades are stored.



Haily Hacker Hacking.  
Generated using deepai.org

Sitting in a dark room, beaming green binary numbers on the walls, she frantically types on her keyboard. After using the isanet to create an indanet bridge to China and back, she exclaims: “I’m in! ”.

Now Haily needs to extract the  $N$  byte long adminkey. She realizes that it is stored in a buffer named “buf” of size  $2N$  bytes. The first  $N$  bytes contain the adminkey and the rest of the buffer consists of only zero-bytes. The adminkey itself contains only non-zero bytes.

Haily already found the start-address of the buffer. However, she doesn’t know  $N$ , which is the main obstacle towards the extraction. To avoid leaving unnecessary traces, she needs to find out  $N$  with just a few memory accesses, while never accessing memory outside of the buffer.

Can you help Haily efficiently recover  $N$  without leaving a trace?

index	...	-1	0	1	2	3	4	5	6	7	8	...
buf	...	×	78	67	80	67	0	0	0	0	×	...

*The contents of the buffer in sample interaction 3 are shown here.*

## Interaction

This is an interactive problem where interaction proceeds in rounds. In each round your program can attempt to read a byte from the buffer or report the answer (the value of  $N$ ):

**read:** Write a line containing “buf [ $i$ ]” if you want to try to read the  $i$ th byte of the buffer. If  $0 \leq i < 2N$ , then you will get the value of the byte stored in the buffer at index  $i$ . If  $i < N$ , this value will be an integer between 1 and 255, otherwise it will be 0. If  $i \geq 2N$  or  $i < 0$ , you will get the response “-1”. This means that you accessed memory outside of the buffer, and your program should exit.

**answer:** Write a line containing “strlen(buf) =  $M$ ” if you want to report that you think that  $N = M$ . Afterwards your program should exit. Your submission will

be accepted if you answered correctly, if you did not access memory outside of the buffer, and if you did not attempt to read entries from the buffer too many times.

A maximum of  $2\lceil \log_2 N \rceil$  reads can be made. If your program attempts to read from the buffer after reaching the limit, it will get the response “-2” and your program should then exit.

It is guaranteed that  $2 \leq N \leq 10^{18}$ .

**Read**

**Sample Interaction 1**

**Write**

	buf [1]
65	
	buf [2]
0	
	strlen(buf) = 2

**Read**

**Sample Interaction 2**

**Write**

	buf [1]
50	
	buf [5]
0	
	buf [7]
-1	

**Read**

**Sample Interaction 3**

**Write**

	buf [0]
78	
	buf [1]
67	
	buf [2]
80	
	buf [3]
67	
	buf [4]
-2	