# Lëtzebuerger Informatiksolympiad 2026

Qualifications

Task descriptions

Instructions

- The allowed programming languages are Python 3, Java and C/C++.

- All the programs must be realized in the form of a console application. For instructions how to realize a console application in the allowed programming languages, please refer to the remarks on the site `www.infosolympiad.lu` under the heading *The tasks*.

- Under the input of the program is meant either the direct entry of data from the keyboard or the redirection from a text file in console mode. Under output of the program is meant either the direct display of data to the screen or the redirection to a text file in console mode.

- The formats of the input and output data shown in the execution examples must absolutely be respected.

- For testing, submitting and evaluating a program, the source file with a file extension `py`, `java` or `c/cpp` must be uploaded to the automated online judge CMS (Contest Management System), accessible via the homepage `www.infosolympiad.lu` or directly via the URL `https://158.64.50.79/`. Please use your personal login (username and password) to access your account on the CMS. The filename of the single source file should be the same than the task name. Please refer to the CMS for technical details on how to test and submit a program.

- Please refer to the CMS for technical details like time limits and memory limits as well as compilation commands.

- You have the right to ask questions via the CMS, but the answers will not teach you how to use a programming language nor tell you how to solve the tasks by using a specific algorithm. The questions should be in relation with the CMS or should treat clarification issues concerning the task descriptions.
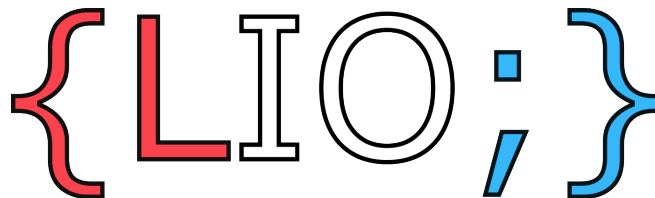
Remove a digit

Description

Your friend is very good at maths, and believes if you come up with a number, they can tell you which digit - when removed - results in the highest remaining number. You've decided to prove them wrong, and thus have to write a program to confirm whether your friend gets the correct answer.

Task

Given a number N, find which digit to remove so that the remaining number is maximal and output the remaining number.

Example

You choose the number $N = 5261$

- Removing 5 $\rightarrow$ 261
- Removing 2 $\rightarrow$ 561
- Removing 6 $\rightarrow$ 521
- Removing 1 $\rightarrow$ 526

Removing 2 gives the best result. Thus the output should be 561

Constraints

- $10 \leq N \leq 10^{18}$

Input and output of program

Input data

The first line contains the number N

Output data

The highest possible value when one digit is removed.

Execution example

Input

5261

Output

561

Distribution of points

Subtask	Constraints	Points
1	$N \leq 100$	8
2	$N \leq 10^6$	13
3	No constraints	4

Technical constraints

Task name	removedigit
Input file	standard input
Output file	standard output
Time limit	1 second
Memory limit	256 megabytes

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Flowers in a pot

Description

You have recently won a garden centre raffle. The prize was N pots and C different colour flower seeds. You have decided you want every pot to have the same number of each flower colour; that's to say, if one pot contains two blue and one red flower, all other pots must as well. Any unused seeds will have to be binned, so to reduce waste, you want to maximise the number of flowers planted. How many of each colour of flower should the pots have?

Task

Given the number of pots N, the number of colours C, and the number of flowers of each colour C_i, find the optimal flower distribution.

Example

You have 10 pots ($N = 10$) and flowers of three different colours ($C = 3$) : red, blue, green.

Colour	Count C_i
Red	17
Blue	25
Green	13

The optimal solution would be to have 1 red, 2 blue, and 1 green flower in each pot. This would result in only 15 unused flowers. Thus, your program should output 1 2 1

Constraints

- $1 \le N \le 10^4$
- $2 \le C \le 100$
- $0 \le C_i \le C - 1$
- $C_0 + ... + C_{C-1} \le 10^5$

Input and output of program

Input data

The first line contains N and C separated by single spaces; representing the number of pots and number of unique colours. The next line contains C integers separated by single spaces; representing the number of flowers of colour C_i.

Output data

For each colour C_i, output the number of said flowers that any individual pot would contain.
The order of the output should follow the order of the input.

Execution example

Input

```
10 3
17 25 13
```

Output

```
1 2 1
```

Distribution of points

Subtask	Constraints	Points
1	C = 2: *There are exactly two colours*	4
2	N = 1: *You only have one flower pot*	4
3	$C_i = C_{i+1}$ for all $i < C - 1$: *You have the same number of seeds of each colour*	6
4	No constraints	11

Technical constraints

Task name	flowers
Input file	standard input
Output file	standard output
Time limit	1 second
Memory limit	256 megabytes

Addition to palindrome

Description

A palindrome is a number that can be read in the same way from the back and the front. For example, 45754 is a palindrome, while 127 is not (because $7 \neq 1$). Lia has an interesting challenge for you, she will give you a number n and is interested in the smallest number m to add to n such that $n + m$ is a palindrome.

Task

Return the smallest number m such that $n + m$ is a palindrome.

Constraints

- $1 \leq n < 10^8$

Input and output of program

Input data

The first line contains the number n

Output data

The number m.

Execution example

Sample 01

Input

```
12345
```

Output

```
76
```

Notice that $12345 + 76 = 12421$ is a palindrome.

Sample 02

Input

```
99992111
```

Output

```
7888
```

Distribution of points

Subtask	Constraints	Points
1	$n \leq 10$	4
2	$n \leq 1000$	6
3	The first $n/2$ digits are 9s, i.e., the numbers have one of the following formats: $9, 9x, 9xx, 99xx, 99xxx, 999xxx, 999xxxx, 9999xxxx$	7
4	No additional constraints	8

Technical constraints

Task name	palindrome
Input file	standard input
Output file	standard output
Time limit	1 second
Memory limit	256 megabytes

Number Guessing (interactive)

Description

Your friend has a secret number N that you want to find in as few guesses as possible.

However since the secret number N can be any number between 2 and 10^{18}, your friend allows you more guesses if the secret number is big, and fewer guesses if it is small; you don't know how many guesses you are allowed until you find N. In particular, you are allowed $\lceil 2 \cdot \log_2(N) \rceil$ guesses (where $\lceil x \rceil$ means rounding x up to the next integer).

Task

Find the secret number N within the allowed number of guesses.

This is an *interactive* problem. You must implement a function that interacts with a grader by calling `ask(x)`**.**

Functions

This is an *interactive* problem. You should use the template files given in the CMS and implement the following function:

C++	`long long guess()`
Java	`long guess()`
Python	`def guess(ask) -> int`

- This function is called exactly once for every testcase.

- This function should return the number N.

Your program can call the following function:

C++	`int ask(long long x)`
Java	`int grader.ask(long x)`
Python	`def ask(x: int) -> int`

- x: The number you ask your friend to compare to N .

- `ask(x)` returns 1 if $x > N$ (your guess is too high).

- `ask(x)` returns -1 if $x < N$ (your guess is too low).

- `ask(x)` returns 0 if $x = N$ (you found the number).

- x should be an integer between 0 and 10^{18}.

You should not read any input/output. This will result in a Wrong Answer, so make sure you do not include any debugging output when submitting your solution.

See Sample Implementation for an example how you should implement your solution, and how to use the sample grader.

Example 1

Suppose the secret number is $N = 37$. You are allowed 11 guesses (since $2\log_2(37) \approx 10.42$).

Your program could do the following calls for example:

Table 1: Example interaction for $N = 37$

Query	Response	Explanation
ask(5)	−1	$5 < 37$ (too low)
ask(41)	1	$41 > 37$ (too high)
ask(38)	1	$38 > 37$ (too high)
ask(36)	−1	$36 < 37$ (too low)
ask(37)	0	$37 = 37$ (found!)

After finding that $N = 37$, the function guess should return 37.

Example 2

If the secret number is $N = 10000000000000 = 10^{12}$ you are allowed 80 guesses.

Constraints

- $2 \leq N \leq 10^{18}$

Distribution of points

Your amount of points will depend on the amount of times you call the ask function, noted Q. You will receive the smallest amount of points across all test cases

- If $Q \leq \lceil 2 \log_2(N) \rceil$, you get 25 points

- else, you will receive $\left\lfloor 25 \cdot \exp\left(-0.6 \cdot \frac{Q - \lceil 2 \log_2(N) \rceil}{\lceil 2 \log_2(N) \rceil}\right) \right\rfloor$ points

- If you achieve $Q \leq 60$ across all test cases, you will receive 10 points

Here are some examples of how many points a solution would score for different values of N, and Q calls to the function ask.

Q \ N	37	100	10^{12}	10^{18}
11	25	25	25	25
13	25	22	25	25
25	15	11	25	25
60	10	10	25	25
80	0	1	25	25
120	0	0	18	25

Sample Implementation

Suppose we want to implement a solution which only checks if N is 5, and returns 5 if that is the case. Otherwise it returns 37. Below we provide a simple solution which performs exactly this.

The program calls ask(5), which returns 0 if N equals 5. So if this is the case, we can return 5. Otherwise, we don't exactly know what N is, so we guess 37 (which will most likely be wrong).

Below are implementations for this in C++, Python and Java. These are also provided as attachments in the CMS.

C++

```cpp
#include "guessing.h"

long long guess(){
    if (ask(5) == 0) return 5;
    return 37;
}
```

Python

```python
def guess(ask) -> int:
    if ask(5) == 0:
        return 5
    return 37
```

Java

```java
public class guessing {
    public static long guess() {
        if (grader.ask(5) == 0) return 5;
        return 37;
    }
}
```

Sample Grader

You can locally test your solutions by using the graders provided in the CMS. Download the respective file(s) for your language and follow the instructions below to test your program.

The sample grader reads the input in the following format:

- Line 1: N

When submitting to the CMS, you should only submit the file `guessing.[cpp/py/java]`.

C++

- Files needed: `guessing.cpp`, `grader.cpp`, `guessing.h`
- You should write your solution in `guessing.cpp`

To compile your solution locally, use the command:

```
g++ guessing.cpp grader.cpp -o guessing
```

And to execute it:

```
./guessing
```

See below for interactions using the sample code above.

Python

- Files needed: `guessing.py`, `grader.py`
- You should write your solution in `guessing.py`

To test your solution locally, use the command:

```
python grader.py
```

See below for interactions using the sample code above.

Java

- Files needed: `guessing.java`, `grader.java`
- You should write your solution in `guessing.java`

To compile your solution locally, use the command:

```
javac grader.java guessing.java
```

And to execute it:

```
java grader
```

See below for interactions using the sample code above.

Interaction 1

Input:

```
5
```

Output:

```
Accepted: Q=1 Score=25
```

Interaction 2

Input:

```
12
```

Output:

```
Wrong answer: Your guess was 37
```

Technical constraints

Task name	guessing
Input file	no reading/interactive
Output file	no output/interactive
Time limit	1 second
Memory limit	256 megabytes