

Dynamic Programming

- minimization / maximization

↓
minimum moves
" score



CSES Problem Set

Removing Digits

TASK | SUBMIT | RESULTS | STATISTICS | TESTS | QUEUE

Time limit: 1.00 s Memory limit: 512 MB

You are given an integer n . On each step, you may subtract one of the digits from the number.

How many steps are required to make the number equal to 0?

Input

The only input line has an integer n .

Output

Print one integer: the minimum number of steps.

Constraints

- $1 \leq n \leq 10^6$

Example

Input:
27

Output:
5

Explanation: An optimal solution is $27 \rightarrow 20 \rightarrow 18 \rightarrow 10 \rightarrow 9 \rightarrow 0$.

Dynamic Programming

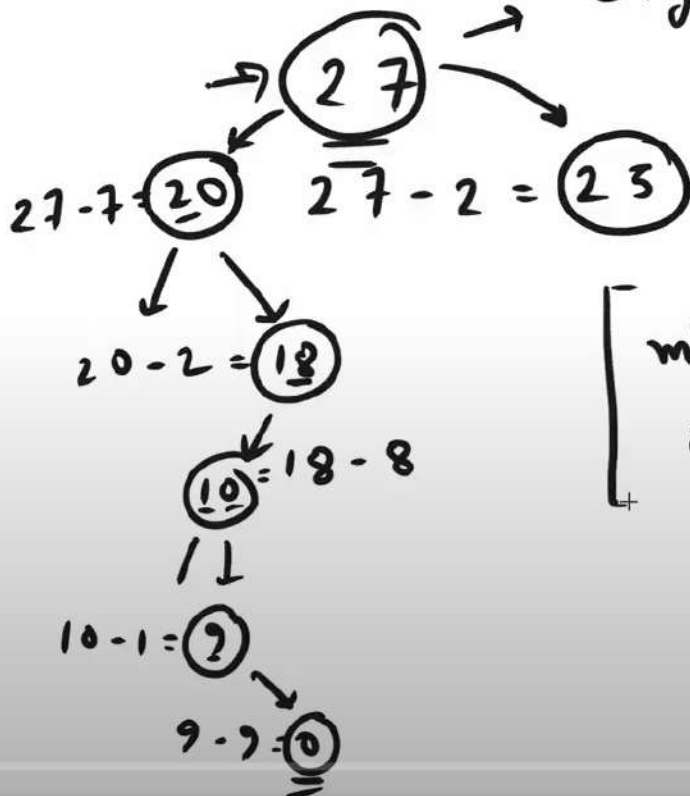
| | |
|----------------------|---|
| ... | |
| Minimizing Coins | ✓ |
| Coin Combinations I | ✓ |
| Coin Combinations II | ✓ |
| Removing Digits | ✓ |
| Grid Paths | ✓ |
| Book Shop | - |
| Array Description | ✓ |
| Counting Towers | ✗ |
| ... | |

Your submissions

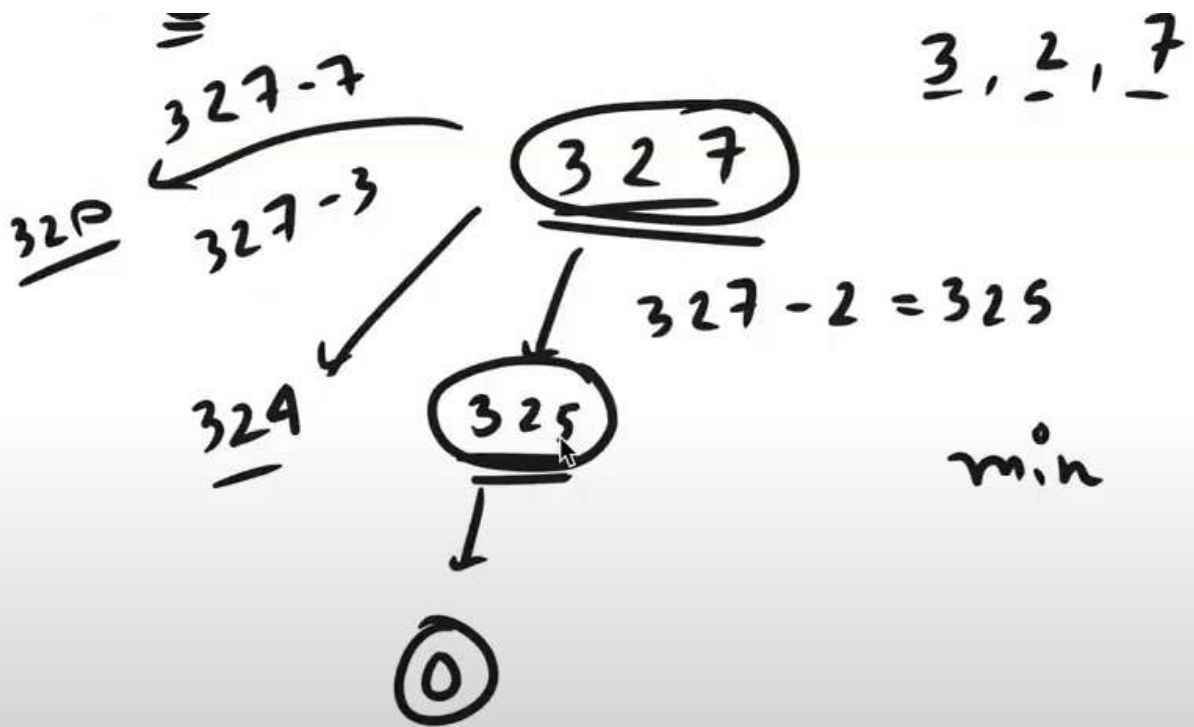
| | |
|---------------------|---|
| 2021-07-12 11:23:38 | ✓ |
|---------------------|---|

11 score

digit (2), (7)



minimum move or
0 (or) less than 0.

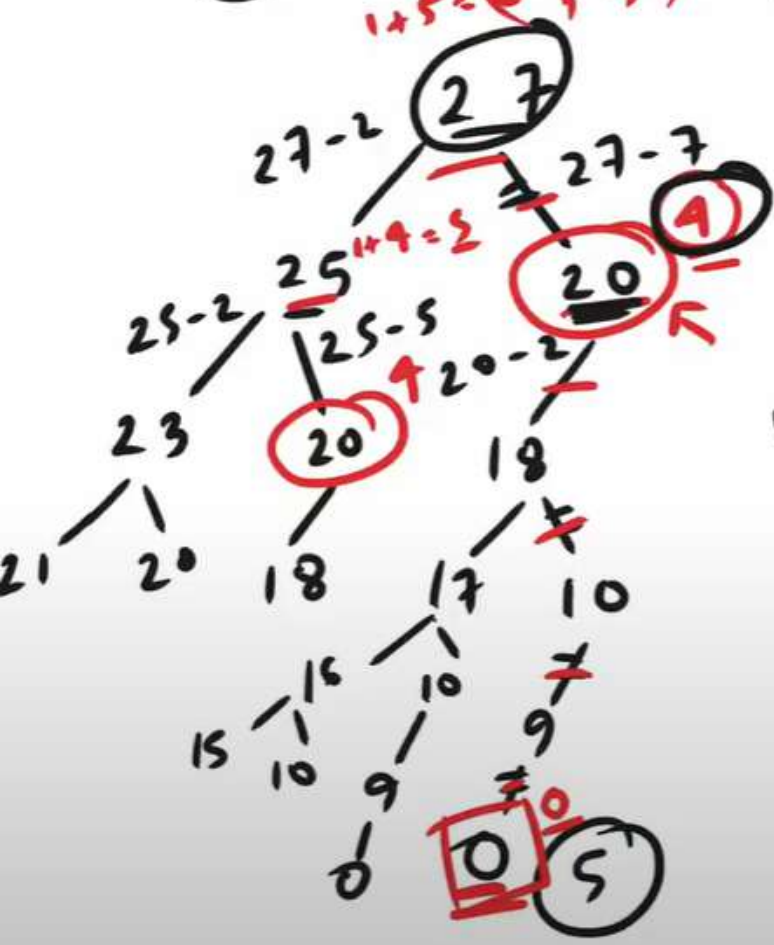


①

$1+5=6, 5)$

$2, 1, +$

$1+4$



$2, 0, \times$

$20-0+$

$1+4=5$

⑤ ⑥

9
⑤

$m \rightarrow 0$

$1+4=5$

Contest Duration: 2019-01-06(Sun) 17:00 - 2019-01-06(Sun) 22:00 (local time) (300 minutes)

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Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 100 points

Problem Statement

There are N stones, numbered $1, 2, \dots, N$. For each i ($1 \leq i \leq N$), the height of Stone i is h_i .

There is a frog who is initially on Stone 1. He will repeat the following action some number of times to reach Stone N :

- If the frog is currently on Stone i , jump to Stone $i + 1$ or Stone $i + 2$. Here, a cost of $|h_i - h_j|$ is incurred, where j is the stone to land on.

Find the minimum possible total cost incurred before the frog reaches Stone N .

Constraints

- All values in input are integers.
- $2 \leq N \leq 10^5$
- $1 \leq h_i \leq 10^4$

Input

Input is given from Standard Input in the following format:

```
N
h1 h2 ... hN
```

Bruteforce



$$\begin{aligned} i+1 &\rightarrow |h[i] - h[i+1]| + \text{solve}(i+1) \\ i+2 &\rightarrow |h[i] - h[i+2]| + \text{solve}(i+2) \end{aligned} \quad \left. \vphantom{\begin{aligned} i+1 &\rightarrow |h[i] - h[i+1]| + \text{solve}(i+1) \\ i+2 &\rightarrow |h[i] - h[i+2]| + \text{solve}(i+2) \end{aligned}} \right\} \underline{\text{min}}$$

$$\boxed{\text{solve}(i) =}$$

Contest Duration: 2019-01-06(Sun) 17:00 - 2019-01-06(Sun) 22:00 (local time) (300 minutes)

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B - Frog 2

Editorial

🇯🇵 / 🇬🇧

Time Limit: 2 sec / Memory Limit: 1024 MB

Score: 100 points

Problem Statement

There are N stones, numbered $1, 2, \dots, N$. For each i ($1 \leq i \leq N$), the height of Stone i is h_i .

There is a frog who is initially on Stone 1. He will repeat the following action some number of times to reach Stone N :

- If the frog is currently on Stone i , jump to one of the following: Stone $i + 1, i + 2, \dots, i + K$. Here, a cost of $|h_i - h_j|$ is incurred, where j is the stone to land on.

Find the minimum possible total cost incurred before the frog reaches Stone N .

Constraints

- All values in input are integers.
- $2 \leq N \leq 10^5$
- $1 \leq K \leq 100$
- $1 \leq h_i \leq 10^4$

Input

Input is given from Standard Input in the following format:

2024-12-29 (Sun)
22:50:02 +06:00

$\begin{bmatrix} i+1 \\ i+2 \end{bmatrix}$

$\begin{bmatrix} 1+2 & 5 \\ 1+3 & 9 \\ 1+4 & 5 \end{bmatrix}$

$|h(i) - h[j]|$

for (int $j=1$; $j \leq K$; $j++$) {
 $i \rightarrow i+j$ $\text{cost} + \text{solve}(i+j)$
}