

WOBURN CHALLENGE

2018-19 Online Round 4

Friday, March 22nd, 2019

Junior Division Problems

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wcipeg.com

For more problems from past contests, visit:

woburnchallenge.com

Problem J1: A Fistful of Quarters

11 Points / Time Limit: 2.00s / Memory Limit: 16M

Submit online: <http://wcipeg.com/problem/wc184j1>

Billy, the king of video games, began his career off the back of a particular arcade game: *Donkey Kong*. Though he's masterfully played many other games since, there's nothing quite like popping in a few quarters and returning to the arcade classic.

Beginning a game of *Donkey Kong* requires the player to first insert at least D ($1 \leq D \leq 5$) dollars in change. Billy had previously already inserted Q ($1 \leq Q \leq 20$) quarters into his personal *Donkey Kong* arcade cabinet. He's now looking to insert zero or more additional quarters so that he can start playing.

What's the minimum number of additional quarters which Billy must insert such that the total amount of inserted change will come out to at least D dollars?



Input Format

The first line of input consists of a single integer, D .
The next line consists of a single integer, Q .

Output Format

Output a single integer, the number of additional quarters which Billy must insert.

Sample Input 1

2
3

Sample Output 1

5

Sample Input 2

1
20

Sample Output 2

0

Sample Explanation

In the first case, Billy has already inserted \$0.75 (3 quarters), and must insert an additional \$1.25 (5 quarters) to bring his total up to at least \$2.00.

In the second case, Billy has already inserted at least \$1.00 worth of quarters, so no more are required.

Problem J2: Life Insurance

21 Points / Time Limit: 2.00s / Memory Limit: 16M

Submit online: <http://wcipeg.com/problem/wc184j2>

Today, Billy feels the need to unwind by returning to one of his favourite video games, the classic role-playing game *Paper Mario*. There's nothing more satisfying than replaying the final boss battle against Bowser!

When in battle, Mario's current health is represented by an integral "HP" value. His HP begins at 50, and may increase or decrease over the course of the battle.

While battling against Bowser, a sequence of N ($1 \leq N \leq 100$) events will occur, the i -th of which will cause Mario's HP to increase by H_i ($-100 \leq H_i \leq 100$, $H_i \neq 0$). Note that H_i may either be negative (indicating an attack by Bowser) or positive (indicating a healing item used by Mario). If an event would cause Mario's HP to become greater than 50, it instead becomes equal to exactly 50. On the other hand, if an event would cause Mario's HP to become less than or equal to 0, then let's just say that our hero's in trouble!



However, Billy has planned against such an eventuality, by stocking Mario up on an abundance of Life Shroom items. When Mario's HP becomes less than or equal to 0, he automatically consumes a Life Shroom, which restores his HP and causes it to become equal to 10 instead!

Assuming that Mario will never run out of Life Shrooms, help Billy determine how many of them Mario will consume over the course of the entire battle.

Input Format

The first line of input consists of a single integer, N .
 N lines follow, the i -th of which consists of a single integer, H_i , for $i = 1..N$.

Output Format

Output a single integer, the number of Life Shrooms which Mario will consume.

Sample Input

6
 -30
 -20
 50
 -59
 1
 -10

Sample Explanation

- After the 1st event, Mario's HP will drop to 20.
- After the 2nd event, Mario's HP will drop to 0, causing him to consume a Life Shroom and have his HP restored to 10.
- After the 3rd event, Mario's HP will increase to the limit of 50.
- After the 4th event, Mario's HP will drop below 0, resulting in the consumption of another Life Shroom.
- After the 5th event, Mario's HP will increase to 11.
- After the 6th event, Mario's HP will drop to 1.

Sample Output

2 Overall, Mario will have consumed 2 Life Shrooms (after the 2nd and 4th events).

Problem J3: Inventory

28 Points / Time Limit: 2.00s / Memory Limit: 16M

Submit online: <http://wcipeg.com/problem/wc184j3>

Billy, the king of video games, has received exclusive early access to play the upcoming action role-playing game *Diablo Immortal*! He's found that it truly revolutionizes the *Diablo* series, not only by moving to the superior gaming environment of a mobile phone, but by introducing a new system for managing the player's item inventory.



Billy has 1 or more items which he'd like his character to carry around, each of which has a certain size which indicates how many inventory slots it takes up. There are A size-1 items (which take up 1 inventory slot each), B size-2 items, and C size-3 items ($0 \leq A, B, C \leq 1,000,000,000$, $1 \leq A + B + C \leq 1,000,000,000$).

The character isn't allowed to carry all of these items around directly, as that would be unrealistic. Instead, they must be packed into knapsacks. Each knapsack has 3 inventory slots, meaning that it can fit 1 or more items as long as the sum of their sizes is at most 3. Each item must be packed entirely into a single knapsack.

The character may carry any number of knapsacks, but each one must be purchased through an in-game microtransaction, so Billy would prefer to use as few as possible. Help him determine the minimum number of knapsacks required to fit all of the items!

Subtask

In test cases worth 16/28 of the points, $A + B + C \leq 100$.

Input Format

The first and only line of input consists of three space-separated integers, A , B , and C .

Output Format

Output a single integer, the minimum number of knapsacks required.

Sample Input 1

1 1 1

Sample Input 2

100 0 0

Sample Output 1

2

Sample Output 2

34

Sample Explanation

In the first case, Billy can fill one knapsack with both the size-1 and the size-2 items, and a second knapsack with the size-3 item. In the second case, Billy can fill 33 knapsacks with 3 size-1 items each, and pack the single leftover size-1 item into a 34th knapsack.

Problem J4: Your Name, Please

40 Points / Time Limit: 2.00s / Memory Limit: 16M

Submit online: <http://wcipeg.com/problem/wc184j4>

Billy is just about to begin playing the classic role-playing game *EarthBound*! His first order of business will be to enter a name for his character.

EarthBound's name entry system displays the uppercase letters "a" through "z" in a row, with a cursor indicating the one currently selected (initially "a"). It also displays the name which the player has entered so far (initially an empty string).



At any point in time, Billy may press a button to perform one of the following actions:

- "<": Move the cursor to the previous letter, wrapping around to the end if necessary (e.g. "y" → "x", "a" → "z")
- ">": Move the cursor to the next letter, wrapping around to the start if necessary (e.g. "i" → "j", "z" → "a")
- "A": Append the currently-selected letter to the end of the current name (without moving the cursor)
- "+": Submit the current name, thus completing the name entry process

Given any name, there are multiple possible sequences of button presses which would end up submitting it. However, as the king of video games, Billy will showcase his skills right off the bat by entering his name of choice using the minimum possible number of button presses.

What remains is choosing an appropriate name...

Billy has decided that his name will consist of exactly N ($1 \leq N \leq 100$) letters. To make things particularly interesting, he's also decided to choose a name such that the minimum number of button presses required to enter it is exactly K ($1 \leq K \leq 10,000$). Help Billy come up with any name satisfying both of the above criteria, or determine that no such name exists!

Input Format

The first and only line of input consists of two space-separated integers, N and K .

Output Format

Output a single string, either a valid name consisting of N uppercase letters, or "Impossible" if no such name exists.

Sample Input 1	Sample Input 2	Sample Explanation
2 6	1 20	In the first case, "CB" meets both criteria: it consists of 2 letters, and requires a minimum of exactly 6 button presses to enter (">", ">", "A", "<", "A", "+"). Note that other outputs would also be accepted.
Sample Output 1	Sample Output 2	
CB	Impossible	In the second case, there exists no single-letter name whose minimum number of required button presses is exactly 20.