1 Gold Quality and Quantity

A fictitious gold mining company, make some bars with the gold ore, places marks at equal lengths so the ore bar can be cut into blocks. Each piece of the bar has a number indicating the gold available in that particular piece.

Assume that Rohan is given such a gold bar and asked to cut the bar into blocks of different sizes and distribute amongst his F friends. Rohan would cut the bar into F+1 blocks using F number of cuts. Each block shall have consecutive pieces from the bar. Rohan is not so greedy so he decides to take piece or block (among F+1) blocks with the minimum total gold and give the rest to his friends.

Given an array of probable gold available in each piece of ore gold bar, find the maximum total gold that Rohan can get by cutting the bar into pieces optimally.

Input/Output

Input	Output	Comments
1 2 3 4 5 6 7 8 9 **5**	**6**	• First Line **1 2 3 4 5 6 7 8 9** represent the probable weights of gold that can be found in each piece. i.e., 1st piece has 1 unit of gold, 2nd piece has 2 units, 3rd piece has 3 units of gold, …, 9th unit has 9 units of gold • Second Line 5 represents the number of friends • Rohan has 5 friends so he must cut the bar into 5+1=6 blocks • He can divide the bar into the 6 blocks *[1,2,3], [4,5], [6], [7], [8], [9].* The minimum sum of gold amongst those 6 blocks is 6.
1 2 2 1 2 2 1 2 2 **2**	**5**	• First Line **1 2 2 1 2 2 1 2 2** represent the probable weights of gold that can be found in each piece. i.e., 1st piece has 1 unit of gold, 2nd piece has 2 units, 3rd piece has 2 units of gold, …, 9th unit has 2 units of gold. • Second Line 2 represents the number of friends • Rohan has 2 friends so he cut the bar into 2+1=3 blocks. • He can divide the bar into the three blocks *[1,2,2], [1,2,2], [1,2,2]* • The sum of each is 5 and that's the minimum amongst all blocks as well.
5 6 7 8 9 1 2 3 4 **8**	**1**	• There are 8 friends. So, Rohan must cut the bar into a block of 8+1=9 pieces • Only one block and the minimum he can have is the piece with 1 unit of gold.

2 Shortest Encoded String

Given a **non-empty** string, encode the string such that its encoded length is the shortest.

The encoding rule is: *k[encoded_string],* where the *encoded_string* inside the square brackets is being repeated exactly *k* times.

Note:

- *k* will be a positive integer and encoded string will not be empty or have extra space.
- You may assume that the input string contains only lowercase English letters. The string's length is at most 160.
- If an encoding process does not make the string shorter, then do not encode it, return same input string. If there are several solutions, return any of them is fine.

Input/Output

Input	Output	Comments
aaaaa	5[a]	• "5[a]" is shorter than "aaaaa" by 1 character.
aaaaaaaaaa	10[a]	• "a9[a]" or "9[a]a" are also valid solutions, both of them have the same length = 5, which is the same as "10[a]"
aabcaabcd	2[aabc]d	• "aabc" occurs twice, so one answer can be "2[aabc]d"
abbbabbbcabbbabbbc	2[2[abbb]c]	• "abbbabbbc" occurs twice, but "abbbabbbc" can also be encoded to "2[abbb]c", so one answer can be "2[2[abbb]c]"
aaa	Aaa	• There is no way to encode it such that it is shorter than the input string, so we do not encode it.

3 Maximum Gold Coins in Minimums

In a palace, there were several rooms that form a 2D grid G with R rows and C columns. All rooms have doors on all four sides i.e., east, west, north and south. The first room is assumed to be at **[0, 0]** while the last room at **[R-1, C-1]**. In each room, there is a pot with some gold coins. Starting from the first room, there is a way to reach the last room and get out of it as well.

In order to reach the last room, one must always start from the first room collect the gold coins, get into any unvisited room in either in south or east (down or right) directions and collect the gold coins from it. One must choose a path that gives the minimum number of gold coins. From each possible paths get the minimum number of gold coins excluding the gold coins of first and last room.

Given a matrix of integers G with R rows and C columns, find the maximum gold coins of the minimum gold coins found for the possible paths.

Input/Output

Input	Output	Comments
2 2 5 1 4 5	4	• First line 2 2 corresponds to number of rows and columns • There are four rooms. 1st room has 5 gold coins, last room has 5 gold coins. • Possible paths are ○ 5 → 1 → 5 => min value is 1 ○ 5 → 4 → 5 => min value is 4 • Return the max value among minimum values => max(4, 1) = 4
2 3 1 2 3 6 5 1	2	• 2 rows and 3 columns. • 1st room has (1) gold coin. Last room has (1) gold coin. • Possible paths are ○ 1-> 2 -> 3 -> 1 (min 2) ○ 1-> 2 -> 5 -> 1 (min 2) ○ 1-> 6 -> 5 -> 1 (min 5) ○ So min of all the paths = [2, 2, 5]. • Max(2, 2, 5) is 5. So, return 5 • Note that we don't include the first and final entry.